LAMBERT-ST. LOUIS INTERNATIONAL AIRPORT

MASTER PLAN UPDATE

NOVEMBER 2012

Prepared by

Landrum & Brown, Incorporated

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CHAPTER ONE
EXECUTIVE SUMMARY

1.1 INTRODUCTION

An airport master plan is a tool used to analyze market trends, assess facility requirements to accommodate anticipated growth, and guide future airport development. The St. Louis Airport Authority (STLAA) prepared this Master Plan Update for Lambert-St. Louis International Airport (Lambert Airport) to account for the numerous changes that have taken place at Lambert Airport, in the St. Louis Region, and in the aviation industry, since the previous master play study was completed in 1996, and since the opening of the third parallel runway (Runway 11-29) at Lambert Airport in 2006.

The nationwide growth in aviation traffic slowed after the September 11th attacks in 2001. Furthermore, the continual rise in fuel prices has adversely affected the economics of the regional jet, and regional jet operations drove many of the delay issues associated with Lambert Airport's runway capacity issues of the 1990s. The trending growth of hub operations at Lambert Airport has continually slowed since 2001 as the airlines reevaluated their network structure to find ways to contain costs. September 11th also brought about significant changes in airport and airline security that has affected the operations and efficiencies of the existing passenger and cargo terminals.

The Lambert Airport of today has surplus capacity on the airfield and in the terminals. This Master Plan Update has reviewed airport operations and passenger enplanements relative to the current and forecast demand levels and evaluated the airport system to create an action plan to position Lambert Airport to meet the future needs of the traveling public and airport users and tenants in a safe, efficient, and financially prudent manner.

1.1.1 WHY IS THE LAMBERT AIRPORT MASTER PLAN BEING UPDATED?

This Master Plan Update provides a timely reassessment of the planning issues and facilities at Lambert Airport, which includes the passenger and cargo terminals, general aviation, parking facilities, airline- and airport-support facilities, and the evaluation of airport access. The Federal Aviation Administration (FAA) recommends that airports update their master plans every five to ten years to ensure that the plans remain current with the aviation industry and local and national trends.

Lambert Airport's most recent Master Plan Update was completed in 1996. Significant changes have occurred in the airline industry nationwide and at Lambert Airport since the 1996 Master Plan Update was completed, including:

- Airline bankruptcies, acquisitions and ongoing mergers, which includes the acquisition of Trans World Airlines (TWA) by American Airlines (American) and the reduction in size of the TWA hub at Lambert Airport
- The impact of the economic downturn including the current worldwide recession and trends in the St. Louis economy and business environment
- Significant growth of low-cost/low-fare airlines impacting legacy carriers
- Aviation fuel costs and oil-market fluctuations
- Reductions locally and nationally in domestic seat capacity
- "Open Skies" agreements
- Changing airline business models, including changes in airline fleets and hub strategies
- Incorporating "sustainability/green initiatives" into airport facility planning
- Maximizing the cost-effectiveness and cost-benefit of capital-development
- Fluctuations in traditional sources of revenue and airport trends in diversifying revenue sources
- Changes in security requirements that have resulted in expanded passenger, baggage, and air cargo security, which in turn have influenced the design of terminal facilities
- The costs to airports to meet the changing security requirements
- Changes in aircraft types and aircraft fleet mix nationally and locally
- Opening of Runway 11-29 at Lambert Airport
- The relocation of the 131st Fighter Wing of the Missouri Air National Guard (MOANG) from Lambert Airport

1.1.2 GOALS AND OBJECTIVES

According to the *Airport Mission Statement*, Lambert Airport is committed to maintaining a first class, safe, and efficient airport for the St. Louis Region. Lambert Airport, along with airline partners, is dedicated to providing the best service possible to customers, the airline passengers, by developing a user friendly environment that promotes air travel. To that end, the Lambert Airport priorities are:

- To keep the airport operating safe, efficient and financially viable,
- To put passenger's comfort and convenience first and foremost,
- To develop and maintain an effective "community awareness program", and
- To support the economic health of the region by providing the very best airport and air service possible.

The City of St. Louis, Missouri, through the STLAA, must continue to provide for the development of infrastructure to support the economic growth of the region. Lambert Airport has been and continues to be a major factor in attracting businesses and development to the region. To continue in this role, this Master Plan Update developed a set of goals and objectives. The previous Master Plan centered on airfield capacity. This Master Plan Update focuses on:

- Long-term improvements to existing facilities in the terminal area
- Managing existing airport assets to maximize potential
- Development of airport-owned lands to support economic growth in the immediate vicinity and the region at large, and to provide added revenue for airport needs and operation
- Opportunities for developing new air cargo operations
- Incorporating environmental sustainability and energy efficiency into airport facilities planning and development

1.1.3 IMPLEMENTATION AND FUNDING PLAN

In accordance with FAA guidelines, this Master Plan Update includes a preliminary financial plan providing the STLAA with a strategy to implement the goals and objectives for Lambert Airport. For planning purposes, the implementation of the Master Plan Update recommended development has been divided into the following four phases:

- 2017 Improvements Program (2012-2017)
- Phase I Program (2018-2022)
- Phase II Program (2023-2027)
- Phase III Program (2028-2030)

While every effort has been made to develop realistic timing for each identified project, the actual implementation schedule will be defined by development triggers and demand growth rather than by specific years. However, for purposes of these analyses a specific implementation schedule is presented. The actual funding strategies to be used will be determined at the time of implementation, reflecting the financial health of Lambert Airport, passenger demand, local funding capacity and the overall worldwide economic conditions. Additional information about the implementation plan is provided in **Chapter Seven, *Implementation Plan***.

The estimated costs for each of the Master Plan implementation projects were developed to provide a starting point for the development of a financial plan. The projects were generally grouped into four categories: *Airfield*, *Terminal*, *Parking and Roadways*, and *Hangar and Other Projects*. These projects are discussed in more detail in Sections 1.4, 1.5, 1.6, and 1.7 of this chapter. A summary of the estimated project costs by phase and type is presented in **Table 1.1-1, *Estimated Master Plan Costs (in Thousands)***. The total cost to implement all the recommended improvement projects is estimated to be $443,221,000. All costs were escalated to the mid-point of construction to account for the impact of projected inflation.

Table 1.1-1
ESTIMATED MASTER PLAN COSTS (IN THOUSANDS)
Lambert-St. Louis International Airport

	Total Costs[1]	*Fiscal Years Ending June 30*			
		2012-2017	2018-2022	2023-2027	2028-2030
Airfield Projects	$128,995	$45,935	$41,123	$39,156	$2,780
Terminal Projects	$794,643	$73,159	$0	$283,829	$437,655
Parking and Roadway Projects	$84,231	$68,332	$6,513	$6,601	$2,785
Hangar and Other Projects	$135,755	$111,060	$24,696	$0	$0
TOTAL MASTER PLAN PROJECTS	**$1,143,625**	**$298,485**	**$72,332**	**$329,586**	**$443,221**

Notes: 1 Project costs escalated based on the projections for CPI from the Budget of the U.S. Government.
Totals may not equal sum due to rounding.

Source: Landrum & Brown, 2011

Based on the recommended projects and timing presented above and the funding sources available, a proposed funding plan has been developed that attempts to maximize the use of external resources and minimize the amount of funding derived from local sources. Potential funding sources include the following:

- Airport Improvement Program (AIP) grants
- Passenger Facility Charge (PFC) revenue (both *"Pay-As-You-Go"* PFC revenue and PFC revenue leveraged through the issuance of PFC-backed bonds)
- Transportation Security Administration (TSA) funding
- Monies in the Airport Development Fund (ADF)
- General Airport Revenue Bonds (GARBs)
- Other debt financing including special facility bonds

Additional information on project costs and potential funding sources is provided in **Chapter Eight**, ***Financial Plan***.

1.1.4 AVATION ACTIVITY FORECAST

The aviation activity forecast is a critical component in the master planning process. A forecast of aviation demand for the purpose of planning future facilities at Lambert Airport was last prepared in 1996 when Lambert Airport functioned as a primary hub for TWA and connecting passenger traffic at the airport accounted for 60 percent of overall enplanements. In the intervening years, the traffic characteristics have changed dramatically as Lambert Airport has catered to an increasing proportion of originating passengers, i.e. residents of, and visitors, to the St. Louis Area. In April 2001, under considerable financial pressure, TWA was purchased by American. With domestic hubbing operations at nearby Chicago O'Hare and Dallas-Ft. Worth airports, coupled with its own financial problems following the 2001 economic recession and September 11th terrorist attacks, American has progressively drawn down the hub at Lambert Airport. However, as American has reduced its footprint at Lambert Airport other airlines have taken the opportunity to expand service at Lambert Airport. The downsize of the American hub may have resulted in less markets served; however, the variety of airlines has expanded from approximately seven in 2001 to 13 in 2011, giving the consumer a wider choice of services. Southwest Airlines has been at the forefront of this competitive response and other Low Cost Carriers (LCCs) have also established service at the airport, albeit on a smaller scale.

Future activity levels were projected for this Master Plan Update for annual passenger enplanements, and aircraft operations. This forecast was approved by the FAA in August 2009. In September 2009, American announced a significant reduction in its flight schedule. The schedule cuts primarily reflected a strategic de-emphasis of Lambert Airport as a connecting hub in American's domestic network. In order to determine the potential impact of American's service cuts on the baseline forecast developed for this Master Plan Update, a sensitivity analysis was conducted in October/November 2009 that updated the passenger aircraft operations and enplanements components of the Master Plan forecast. The sensitivity analysis was used to evaluate proposed facility requirements developed for this Master Plan Update. **Exhibit 1.1-1, *Operations and Enplanements Forecast***, shows the total operations and enplanements from the Master Plan Update forecast and subsequent sensitivity analysis. As shown in Exhibit 1.1-1, total operations at Lambert Airport are forecast to grow to approximately 265,000 and enplanements are forecast to increase to over nine million by 2028. It should be noted that cargo, civil, and military forecasts remain unchanged between the Master Plan Update forecast and sensitivity analysis.

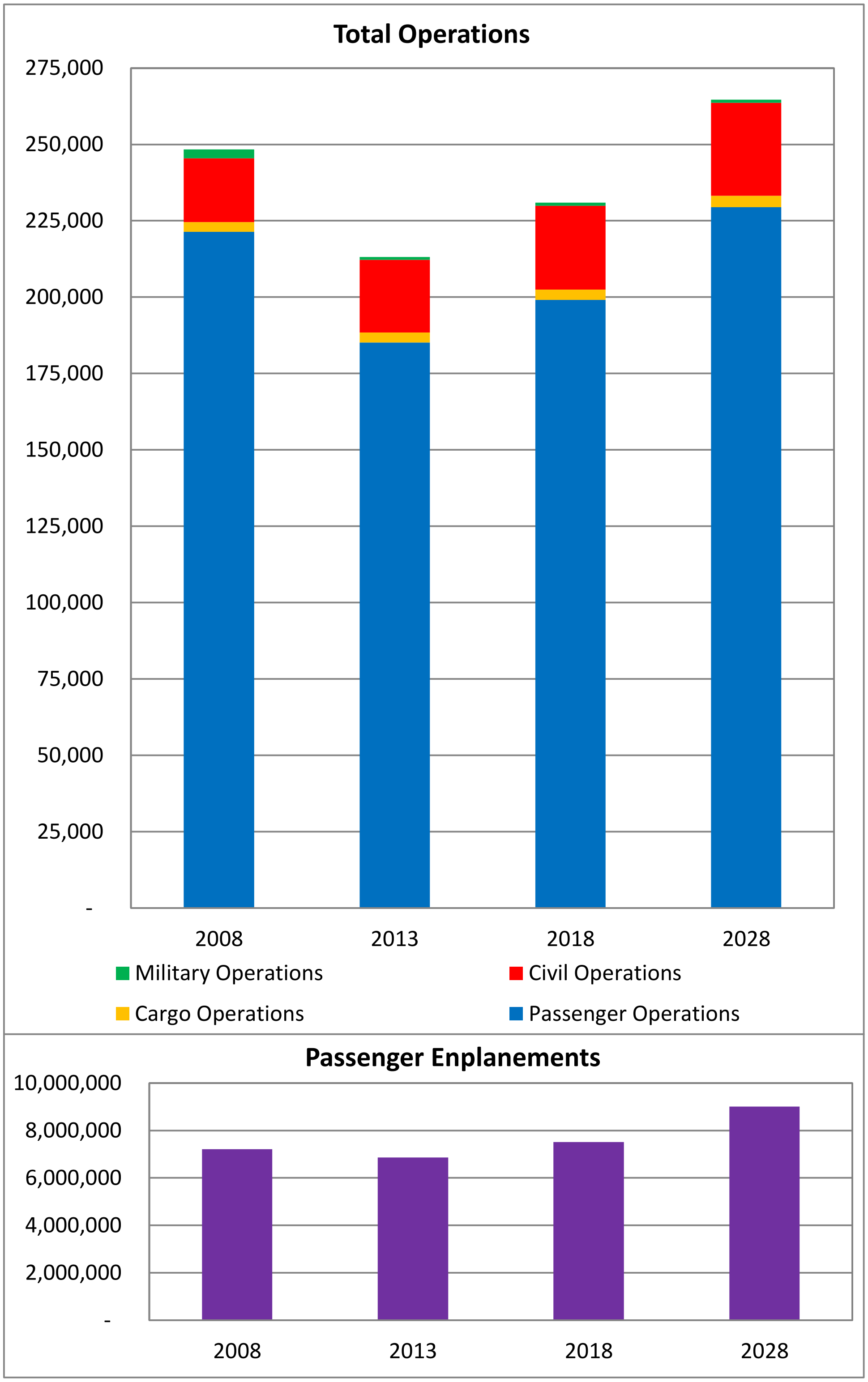
The terminal planning alternatives account for the potential impact of the downsizing by American and increase in LCC operations to ensure that adequate space is being reserved for aircraft gates and associated terminal areas for passenger carriers at Lambert Airport. Additional information regarding the sensitivity analysis is included in **Appendix A, *Sensitivity Analysis***.

1.1.5 PLANNING DURING UNCERTAIN TIMES

The history of commercial aviation demonstrates the dynamic nature of the industry. This has been particularly evident during the past five years (2006-2011) with the significant number of industry events that have occurred. The many changes experienced in the aviation industry, both nationally and locally have demonstrated the critical need for Lambert Airport to develop a flexible future plan; one that enables Lambert Airport and the airlines to quickly and proactively respond to changes.

The recommended airport improvements identified this Master Plan Update have been structured to ensure that the implementation of capital projects occur only when justified by demand and the expected operational and economic benefits. This plan acknowledges that fiscally prudent capital improvements and the related funding requirements must be triggered by actual demand rather than long-term projections.

Exhibit 1.1-1
OPERATIONS AND ENPLANEMENTS FORECASTS
Lambert-St. Louis International Airport



Source: Landrum & Brown, 2011.

1.2 REGIONAL CONTEXT

An airport master plan is prepared with consideration given to local and regional data, issues, and trends. The intrinsic links between the level of aviation activity and economic growth are well documented. Simply put, growth in population, income, and business activity typically lead to increased demand for air travel. In turn, an airport is a generator of local and regional economic growth by providing jobs, and business links.

1.2.1 AIRPORT CATCHMENT AREA

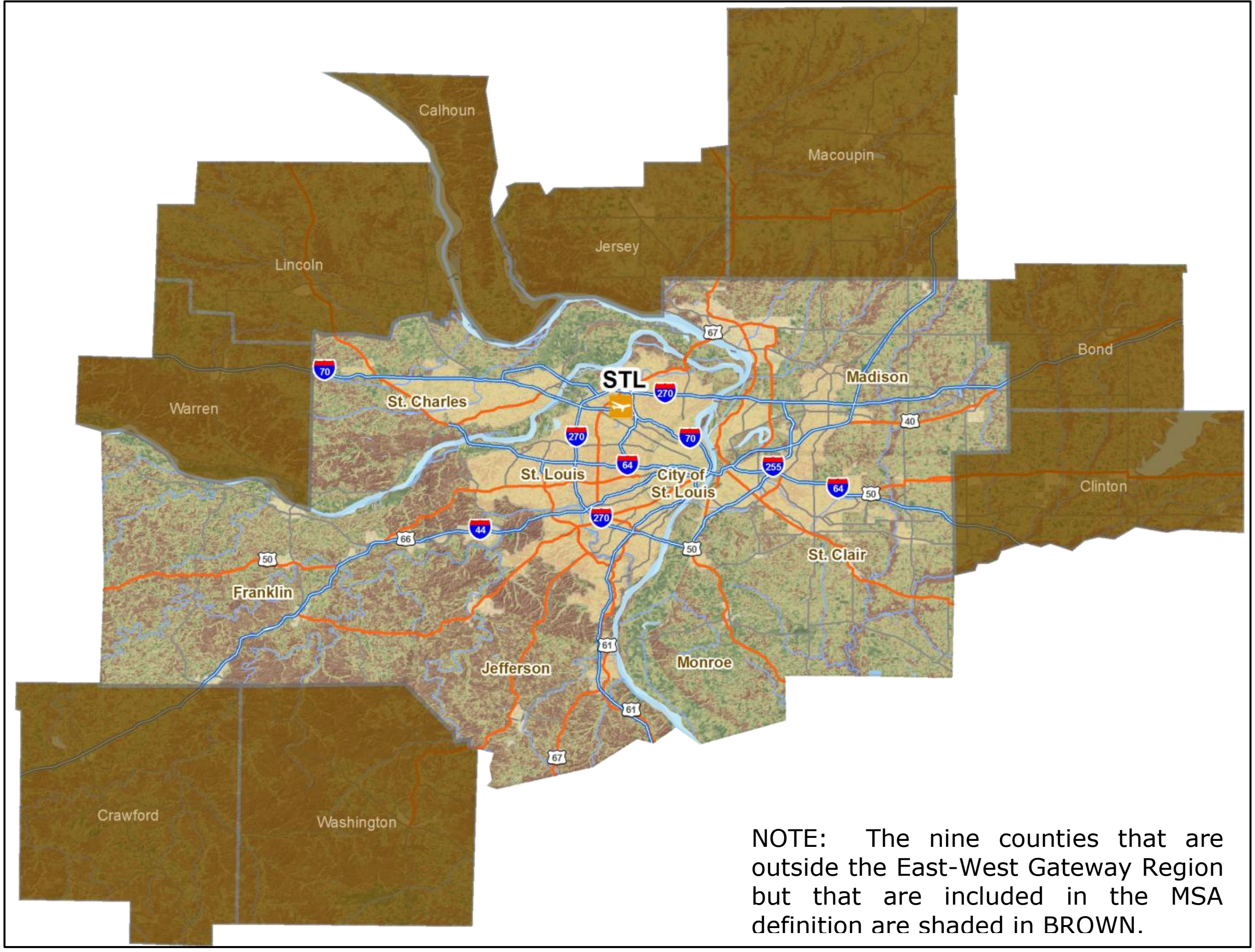
The U.S. Census Bureau defines the St. Louis Metropolitan Statistical Area (MSA) as the independent city of St. Louis plus a contiguous sixteen county area. Nine of the St. Louis MSA counties are in Missouri (the City of St. Louis, St. Louis County, Jefferson County, St. Charles County, Franklin County, Crawford County, Washington County, Warren County, and Lincoln County) and eight are in Illinois (Madison County, St. Clair County, Monroe County, Clinton County, Bond County, Macoupin County, Jersey County, and Calhoun County). An estimated 2.8 million people reside in the MSA, making it the 19th largest MSA in the United States.

A more geographically concentrated eight-county definition is used by the local East-West Gateway Council of Governments comprising St. Charles County, City of St. Louis, St. Louis County, Jefferson County, and Franklin County in Missouri and Madison County, St. Clair County, and Monroe County in Illinois. The East-West Gateway Region accounts for just over half of the physical area of the broader MSA but over 90 percent of the population and employment of the larger MSA.

Exhibit 1.2-1, *St. Louis Metropolitan Statistical Area (MSA)*, provides a geographical depiction of the St. Louis MSA compared to the East-West Gateway Region. Lambert Airport is the primary airport serving both passenger and cargo traffic in the region. There are a number of other smaller airports in the region that are predominantly used by general aviation and military aircraft; none of these airports currently has scheduled passenger air service. Allegiant Air had offered limited scheduled passenger service from Mid America Airport since February 2006 but discontinued the service effective January 2009.

There are no other major commercial service airports located within 200 statute miles of Lambert Airport. The closest major commercial service airports are: Indianapolis International Airport (229 miles), Kansas City International Airport (237 miles), Memphis International Airport (257 miles), Chicago Midway International Airport (251 miles), Chicago O'Hare International Airport (258 miles), Des Moines International Airport (259 miles), and Nashville International Airport (272 miles).

Exhibit 1.2-1
ST. LOUIS METROPOLITAN STATISTICAL AREA (MSA)
Lambert-St. Louis International Airport



NOTE: The nine counties that are outside the East-West Gateway Region but that are included in the MSA definition are shaded in BROWN.

Source: U.S. Census Bureau; Landrum & Brown analysis

1.2.2 REGIONAL ECONOMIC CONDITIONS

Lambert Airport is among the busiest airports in the U.S. and is a critical component in the St. Louis transportation infrastructure. The Airport generates an estimated $5.1 billion annual economic impact for the St. Louis Region. Lambert employs over 15,000 people through airlines, vendors, service companies, and the City of St. Louis.[1]

The states of Illinois and Missouri are home to almost 19 million people, representing six percent of the total population of the United States. At 2.8 million residents, the St. Louis MSA accounts for 15 percent of the combined population of both states. The St. Louis MSA had a median household income of almost $54,000 in 2007 according to data published by the St. Louis Regional Chamber & Growth

[1] Lambert-St. Louis International Airport web page, *Lambert Facts*: http://www.flystl.com/flystl/about-lambert/facts/

Association. According to data obtained from the Bureau of Economic Analysis and the Bureau of Labor Statistics, Per Capita Personal Income for the St. Louis MSA is approximately $38,000, which has tracked between two and five percent above the national average since the early 1990s.

Gross Regional Product (GRP) is a measure of the value of goods and services produced in a state or county. Historically, GRP for the St. Louis MSA has experienced positive growth, albeit at a somewhat slower pace than the states of Illinois and Missouri and the U.S. as a whole, averaging 2.3 percent annually. Through 2030, the GRP of the region is expected to continue to grow, averaging 2.1 percent per annum.[2]

1.2.3 THE ROLE OF LAMBERT AIRPORT IN ECONOMIC GROWTH

The economic health of the region and the central location of the City of St. Louis in relation to the regional and national population are key elements for future growth at Lambert Airport. Through this Master Plan Update, the STLAA seeks to capitalize on these strengths and create a plan to facilitate growth in commercial passenger enplanements and cargo at Lambert for the betterment of the regional economy. Growth in air commerce will lead to growth in jobs and employment, development/ redevelopment of land for new business ventures, and growth in the local tax base.

[2] Woods & Poole Economics 2007.

1.3 MASTER PLANNING PROCESS

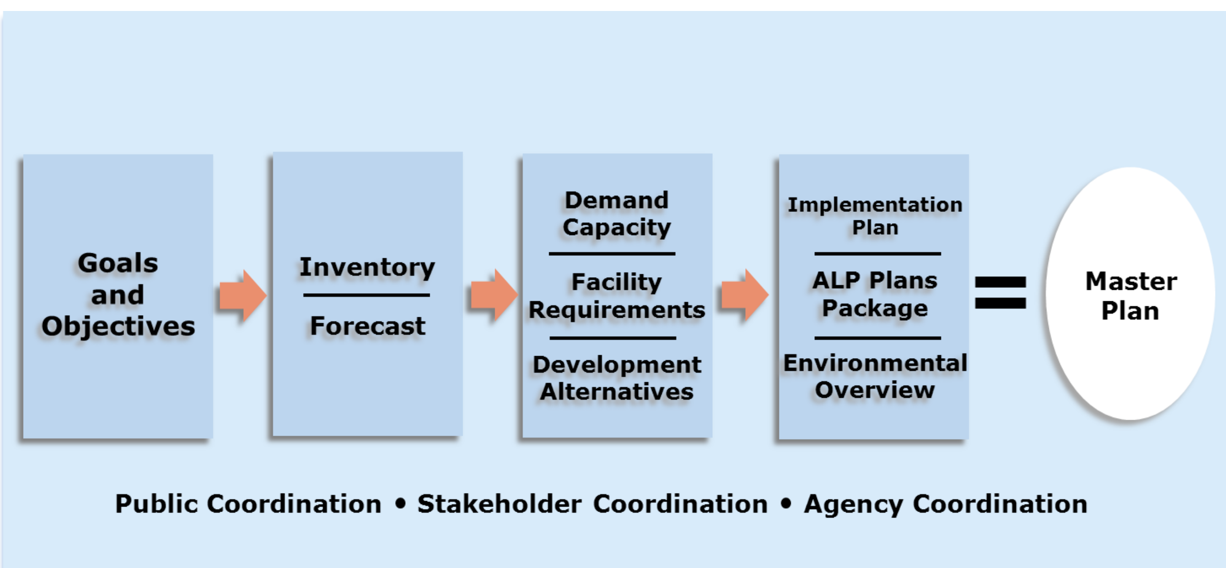
This Master Plan Update provides a detailed description of individual development projects that are based on the outputs of the technical planning analysis. An example of a development project is the reorganization of the midfield taxiway geometry discussed in Section 1.4, *Airfield*.

As with the 1996 Master Plan Update, this Plan is based on a consultative process. It encompasses nine sequential work elements that describe in more detail the overall airport vision and how it transforms through the future forecast of growth to the future runway and terminal strategies, surface access needs, sustainability assessments, and the link to the Capital Improvement Program (CIP).

The relationship between this Master Plan Update and the CIP pertains to the implementation of the development strategy. The intent is to provide the purpose and need for the essential capital investments in a logical manner with sufficient detail and justification.

The process used to prepare the Master Plan Update was open and deliberate, and complied using the guidelines set forth by the FAA in Advisory Circular 150/5070-6B. This process involved extensive opportunities for public involvement and comment, as well as input from all stakeholders, including the airlines, FAA, TSA, Lambert Airport tenants, the public, and other aviation experts. The following steps performed for the Master Plan Update have resulted in the recommended plan, as shown in **Exhibit 1.3-1, *Master Planning Process***.

Exhibit 1.3-1
MASTER PLANNING PROCESS
Lambert-St. Louis International Airport



Source: Landrum & Brown, 2011

Features of a successful master plan that have been adopted into this process include the following elements:

Financially Feasible – The phasing of capital projects is aligned with the ability to secure available funding;

Environmentally Compatible – The plan strives for environmental stewardship in accordance with Lambert Airport's Environmental Management System (EMS);

Balanced – The plan maintains a balance between airport development needs and community impacts;

Technically Sound – The plan complies with federal, state, and local requirements and can be constructed efficiently and cost effectively; and

Responsive – The plan addresses the physical and operational needs of all stakeholders

The Lambert Airport Master Plan Update progressed concurrently with the 14 CFR Part 150 *Noise Compatibility Planning Study Update* (Part 150) and a variety of environmental document reviews and updates that addressed both the on- and off-airport environs. The Part 150 and Master Plan Update were closely coordinated with respect to the following common elements:

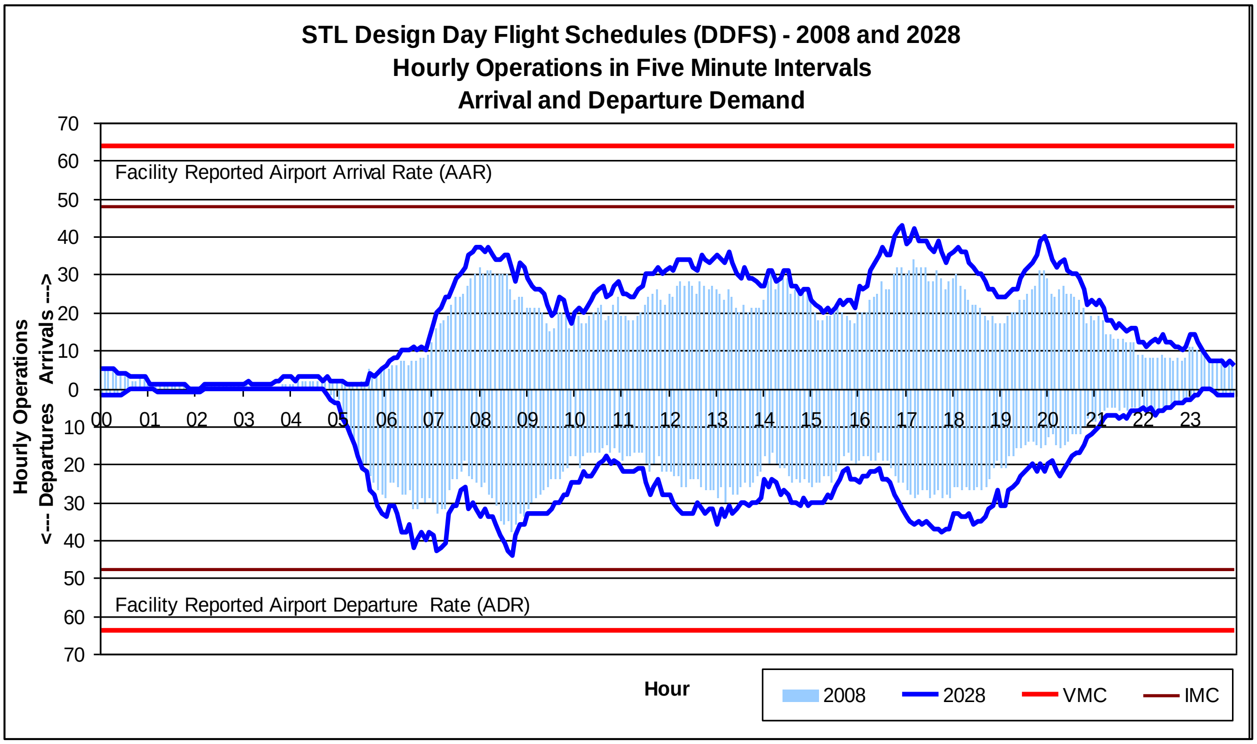
- Data inventory process
- Development of aviation activity forecasts
- Development of potential alternative activity scenarios
- Proposed aviation-related development
- Proposed on-airport land use development
- Public outreach efforts
- Financial feasibility and capital programming

This Master Plan Update provides the framework needed to guide future development at Lambert Airport that will cost-effectively satisfy aviation demand, while also addressing relevant environmental and socioeconomic issues.

1.4 AIRFIELD

Alternatives for providing capacity and capability enhancement of the airfield were evaluated based on meeting the needs of the 20-year planning horizon and minimizing airport operating costs. Airport master plans strive to maximize airfield efficiency and improve usability while meeting specific design criteria to maintain the highest possible levels of safety. The existing airfield facilities provide sufficient capacity to meet the forecast operations as shown in **Exhibit 1.4-1**, ***Airfield Demand Compared to Capacity***, which depicts the hourly capacity compared to the existing and projected arrival and departure demand.

Exhibit 1.4-1
AIRFIELD DEMAND COMPARED TO CAPACITY
Lambert-St. Louis International Airport



Source: Landrum & Brown, 2011

As shown in Exhibit 1.4-1, the airfield at Lambert Airport has sufficient capacity; therefore, the analysis focused on the refinement of existing airfield facilities, referred to as Asset Management. The major functional airfield areas evaluated were (1) an extension of Runway 12R-30L to support future long-haul service; (2) an extension of Taxiway F to improve safety and support development on unused or underdeveloped property the northeast side of the airfield; and (3) the modernization of the existing airfield configuration by removing old taxiway connectors to enhance safety and decrease airport operations and maintenance costs.

Alternatives and concepts were evaluated with regard to FAA design criteria, such as Runway Safety Area (RSA) requirements, and where applicable the relative ongoing cost to operate and maintain pavement. Airfield planning objectives were identified that became the basis for developing and defining the evaluation criteria. These airfield planning objectives include "Meeting the Needs of 20-year Planning Horizon and Beyond," and "Minimize Ongoing O&M Costs Associated with Airfield Pavement." As a result, this Master Plan focused on the potential need for runway length and safety improvements such as eliminating threshold displacements, with improvement to the existing RSAs.

In general, recommended airport improvements are typically structured to ensure that the implementation of capital projects occurs only when justified by demand and their expected operational and economic benefits. At Lambert Airport, all five-year airfield capital projects identified in the Capital Improvement Program (CIP) will commence by 2012. Out of a total of twenty CIP capital projects, eight capital projects are airfield-related. Also listed in the CIP, future airfield improvements over the next 20-year planning horizon are organized into three phases and will commence in 2018 with Phase I continuing through to the beginning of Phase III in 2028. It is estimated that the entire airfield capital program will total approximately $129 million through 2028.

Exhibit 1.4-2, *Future Airfield Geometry*, illustrates the recommended changes to the existing airfield. The majority of these changes are located between the parallel runways as pavement is removed and replaced to provide a modern, efficient, and less complex airfield configuration. In addition to the reconfigured taxiways, two additional pavement areas are shown; the Taxiway F Extension on the northeast corner of the airfield and the extension of Runway 12R-30L and its parallel taxiways on the west side of the airfield, as well as realigned Taxiway Victor.

Additional information on airfield project implementation and phasing can be found in Chapter Seven, *Implementation Plan*. Additional information on airfield project costs and funding is included in Chapter Eight, *Financial Plan*.

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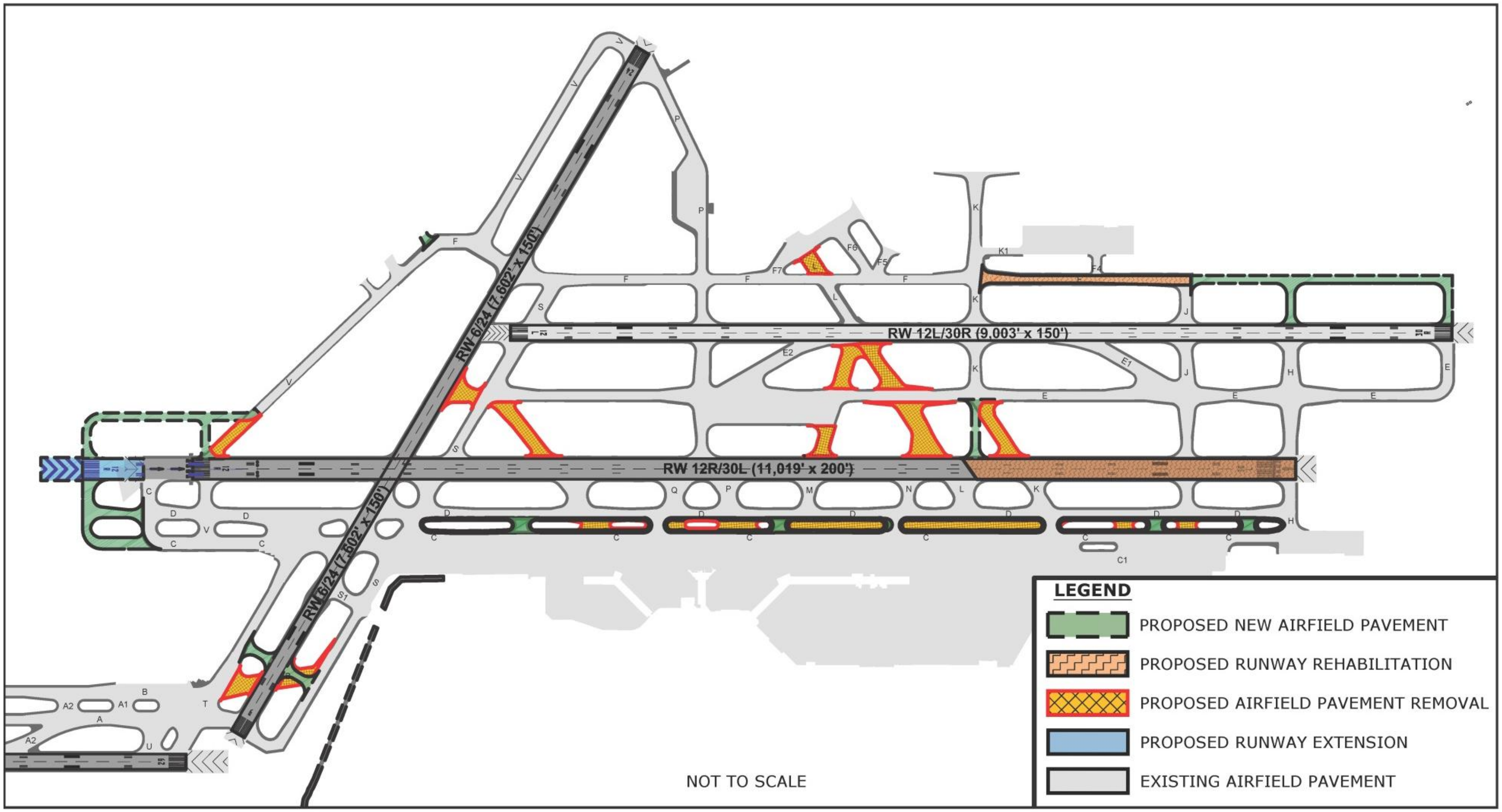
Exhibit 1.4-2
FUTURE AIRFIELD GEOMETRY
Lambert-St. Louis International Airport



Source: Landrum & Brown, 2011

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1.5 TERMINAL AREA

Generally, master plans strive to maximize efficiency and improve user convenience for future facilities by increasing capacity and providing operational enhancements for airside, terminal, and landside components of the plan. The existing terminal facilities at Lambert Airport provide sufficient capacity throughout the planning period; therefore, the analysis in this Master Plan Update focused on the optimization of those facilities and enhancements to the existing configuration to ultimately provide a convenient and functional facility that supports user convenience and provides opportunities to maximize potential revenues. Additionally, terminal area plans endeavor to be flexible and responsive to changing operational scenarios that may emerge over time. In order to identify the best future terminal area plan, this study examined fourteen (14) concepts before selecting the single preferred terminal alternative. These concepts explored the potential for expanding and consolidating the existing terminals.

The preferred terminal concept is shown in **Exhibit 1.5-1, *Scenario II-B-1***. This concept consolidates all passenger operations at Terminal 1, by constructing a new linear double-loaded concourse alignment to take advantage of the existing Terminal 1 and its parking infrastructure, and addresses the operational challenges on the airside. Scenario II-B-1 provides for the required 50 contact gates with 6,600 linear feet (LF) of apron frontage. Additionally, this alternative permits the flexibility to expand to the ultimate configuration or, should conditions require a less ambitious program, move toward a configuration consistent with Scenario I-B-1b that continues to use Terminal 2. Scenario I-B-1b also provides the required 50 contact gates with 6,690 LF of apron frontage. This concept is illustrated in **Exhibit 1.5-2, *Scenario I-B-1b***. Additional information on the terminal concepts is included in Chapter Five, *Airport Concept Development and Evaluation*.

The estimated capital expenditure for the preferred scenario through the ultimate planning period is estimated at $794,643,000. The majority of this expenditure is anticipated to occur beyond 2023 based on the projected future demand. It is important to note that this scenario has the flexibility to accommodate the full consolidation of terminals or to continue serving passenger and airline needs using a split terminal operation. Scenario II-B-1 focuses on asset management through the redevelopment of the current terminal assets into future terminal facilities. One example is the *Airport Experience*, which is currently underway with "re-lifing" and upgrading the existing terminal facilities, such as the baggage handling system in Terminal 1.

Key Features:

Airside

- Meets the 2028 aircraft gate capacity in a single contiguous flight line with the potential for incremental gate expansion
- Realigned concourse alignment at Terminal 1 allows for pushback zone to increase airside taxi flow efficiency
- Potential for dual taxilanes
- Retains existing ATCT
- Minimal apron rehabilitation/expansion

Terminal

- Consolidated terminal operations at Terminal 1
- Reuse of existing terminals and concessions with ability to grow into existing capacity (some additional area required in baggage make-up area of Terminal 1)
- Efficient wider double-loaded concourses
- Automated People Mover (APM)
- Centralized security for more efficient operation which flows all outbound passengers past a primary concession hall and allows enhanced product variety and revenue performance
- Landside "walk to" international arrivals processing facility

Landside

- Reuse of some of the existing entrance roadway infrastructure
- Maintains existing "Metrolink" light rail station
- Convenience of close-in covered parking
- New lowered arrivals level roadway
- New parking garage expansion

Environmental

- Partial new construction offers opportunity to incorporate LEED sustainability design principles and materials

Additional information on terminal project implementation and phasing can be found in Chapter Seven, *Implementation Plan*. Additional information on terminal project costs and funding is included in Chapter Eight, *Financial Plan*.

Exhibit 1.5-1
SCENARIO II-B-1
Lambert-St. Louis International Airport

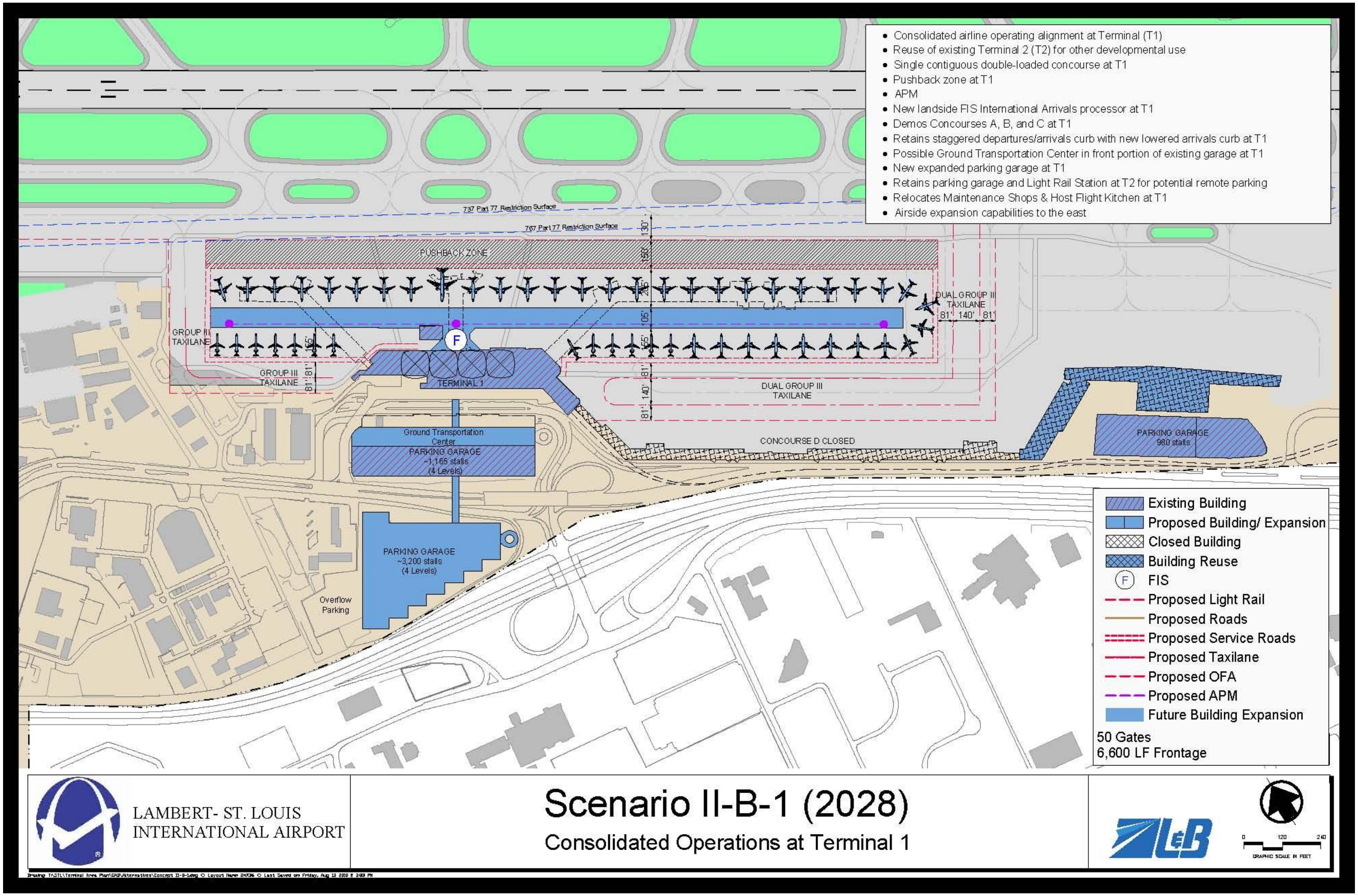
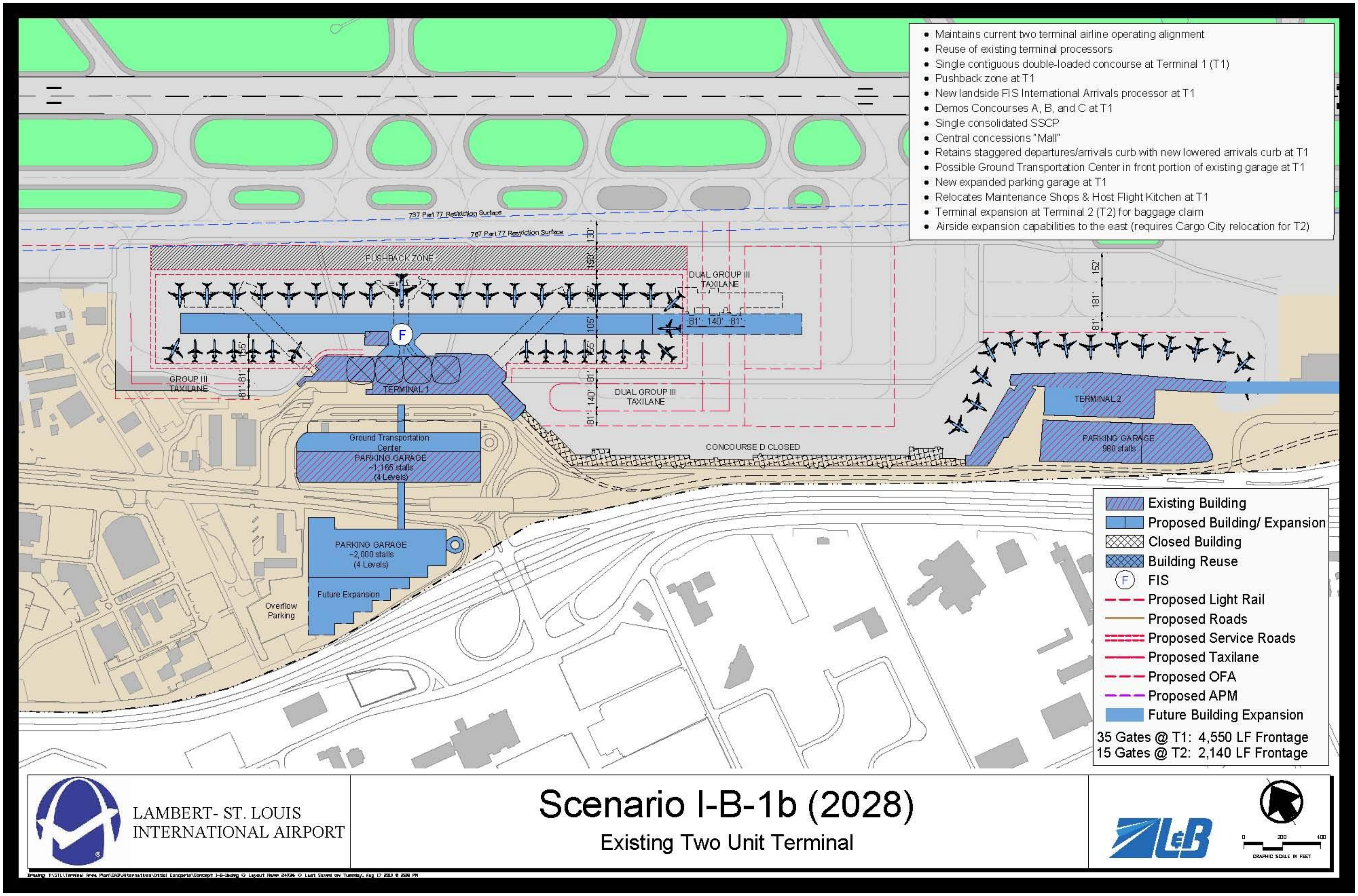


Exhibit 1.5-2
SCENARIO I-B-1b
Lambert-St. Louis International Airport



1.6 PARKING

This Master Plan Update reviewed existing parking capacity relevant to forecast demand to determine if existing parking facilities were sufficient to meet that demand. According to this assessment, the projected peak parking demand in 2013 is 8,837 vehicles; an increase of 1,292 vehicles (*see* **Table 1.6-1, *Current and Projected Parking Demand***). By 2028, the projected peak parking demand is 11,614 vehicles; an increase of 4,069 vehicles. It is anticipated, based on these calculations, that there would be a shortage of on-airport parking spaces before 2013 during peak seasons. Regarding specific parking facilities, there would be a shortage of parking spaces during peak seasons in Terminal 2 Garage before 2013. Currently, parking at the Terminal 1 Garage is marginal. Peak demand at the Terminal 1 Garage is 1,815 vehicles, which is near the capacity of 2,017 parking spaces. Furthermore, the Terminal 2 Garage is at capacity three days a week during peak seasons from 7:00 a.m. to 3:00 p.m. When the Terminal 2 Garage is full, passengers tend to park in Lot A, the Terminal 1 Garage or at an off-site parking provider.

It is important to provide sufficient parking spaces to serve those with longer-term parking needs. By 2018, the peak demand at Lot C and Lot D is anticipated to be greater than the existing supply; the peak demand at Lot B will be greater than the existing supply shortly after 2013; and the demand at Lot A will exceed supply between 2023 and 2028. Therefore, to meet the projected peak parking demand, additional parking spaces would be needed before 2013. Development of new parking facilities would provide Lambert Airport with additional revenue and enable the Airport to better compete with off-airport parking facilities.

Table 1.6-1
CURRENT AND PROJECTED PARKING DEMAND
Lambert-St. Louis International Airport

Parking Facility	Actual Number of Spaces	Current Peak Demand	Parking Utilization Ratio	Projected Peak Parking Demand (# of Spaces)[1]			
				2013	2018	2023	2028
Lot D	1,223	1,071	0.19	1,119	1,228	1,350	1,471
Lot B	486	474	0.10	589	646	710	774
Lot C	3,174	2,841	0.50	2,946	3,232	3,552	3,871
Lot A	993	745	0.13	766	840	923	1,007
Terminal 1 Garage	2,017	1,815	0.32	1,885	2,068	2,273	2,478
Terminal 2 Garage	980	980	0.26	1,532	1,680	1,847	2,013
Total	**8,873**	**7,545**	**N/A**	**8,837**	**9,695**	**10,655**	**11,614**
Originating Enplanements	N/A	N/A	N/A	5,891,500	6,463,200	7,103,000	7,742,800

Note: 1 The projected parking demand is calculated as follows: (# of Originating Passenger Enplanements x Parking Utilization Ratio) / 1,000

Source: Central Parking statistics, Landrum & Brown analysis.

The Master Plan Update assessed several options for increasing automobile parking to meet the forecast demand. In addition to the expansion of the Terminal 2 Parking Garage identified in the terminal concepts, three additional surface parking options are available as shown in **Exhibit 1.6-1, *Automobile Parking***. One option is to provide a small surface lot east of Cargo City with relatively close access to Terminal 2, although limited in size to approximately 200 spaces. The second option is a surface lot in the Brownleigh area. While not providing the same level of convenience as the other parking options, the Brownleigh site does provide a significant area for parking that is in relatively close proximity to Terminal 2 that would be competitive with other off-airport parking providers. In total, the Brownleigh site could accommodate up to 10,000 surface parking spaces and could be developed in phases at minimal cost and be easily modified, should demand for property with direct airfield access materialize in the future. The third option is the Concourse D apron parking facility, which would be accessed from Lambert International Boulevard via an access point created by cutting through the existing Concourse D structure. Additional information on parking project implementation and phasing can be found in Chapter Seven, *Implementation Plan*.

The total estimated capital expenditure for parking and roadway improvements through the ultimate planning period is approximately $84,231,000.[3] This includes approximately $1,978,000 to construct a surface parking lot east of Cargo City, $48,701,000 to construct a surface parking lot at the Brownleigh Site, and $3,868,000 to develop a surface parking lot at the Concourse D Apron. Additional information on parking project costs and funding is included in Chapter Eight, *Financial Plan*.

[3] Note that this estimated cost does not include expansion of the existing Terminal 1 Parking Garage and access roadway network, which is included in the Terminal Area Redevelopment discussed in Section 1.5.

Exhibit 1.6-1
AUTOMOBILE PARKING
Lambert-St. Louis International Airport

Source: Landrum & Brown, 2011

1.7 AIR CARGO

The cargo facilities at Lambert Airport were found to be of adequate size to meet forecast demand. However, the facilities are not optimally configured to meet the needs of potential cargo tenants. Sixty percent of the cargo buildings are configured for belly cargo, but only 14 percent of airport cargo is carried via aircraft belly cargo holds at Lambert Airport. Furthermore, the north cargo building and supporting taxilane have design limitations and cannot readily accommodate the Boeing 747 because it would block access and have limited space to maneuver.

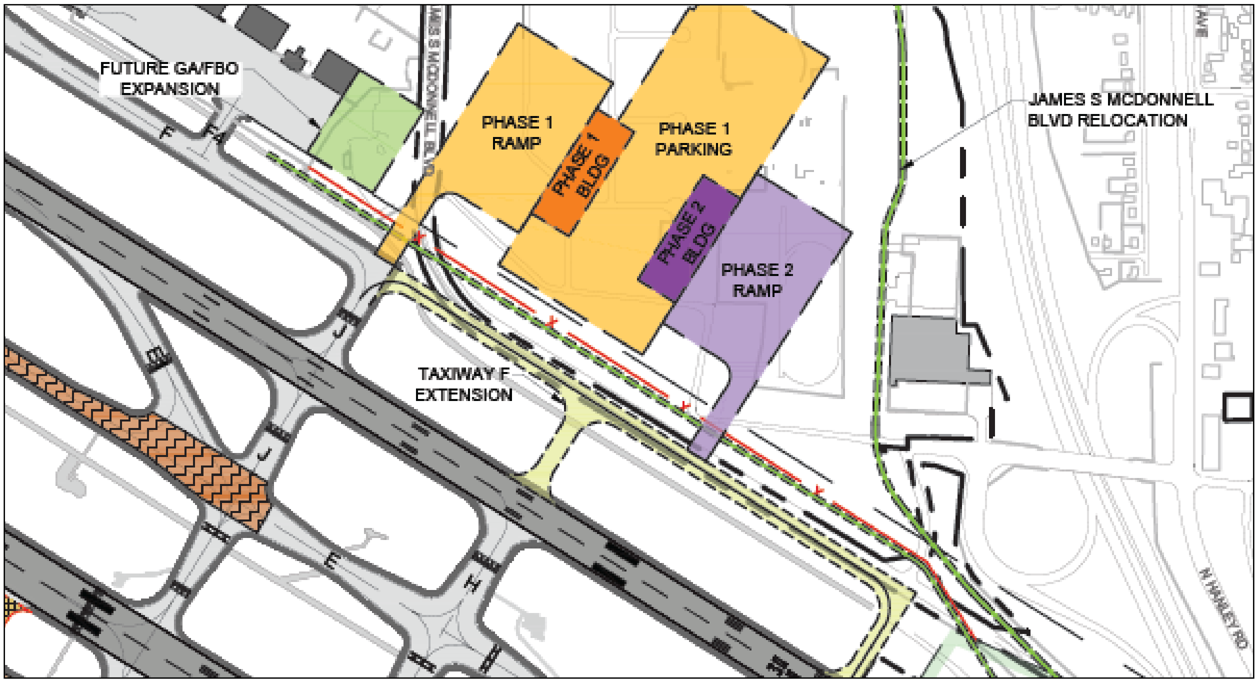
There are three general areas on the airfield that are suitable for future on-airport aviation-related expansion, the land area north of Runway 11-29, the Northern Tract, and the Brownleigh Site. Of these three areas, the latter two are appropriate for future cargo development.

Exhibit 1.7-1, *Cargo Concept on Brownleigh Site*, illustrates the potential layout of cargo facilities on the Brownleigh site. Expansion of cargo facilities at the Brownleigh site would require relocation of James S. McDonnell Boulevard. As shown in Exhibit 1.7-1, Cargo Concept on Brownleigh Site, a cargo development on this site could be accomplished in two phases. The second phase would require the extension of Taxiway Foxtrot. Additional information about project implementation and phasing can be found in Chapter Seven, *Implementation Plan*. Phase I and Phase II of a cargo development at the Brownleigh Site would cost approximately $53,360,000; plus an additional $24,323,000 for the extension of Taxiway Foxtrot and $2,503,000 to relocate McDonnell Boulevard. Additional information on project costs and funding is provided in Chapter Eight, *Financial Plan*.

Exhibit 1.7-2, *Northern Tract Development Site*, illustrates the potential layout of cargo facilities on the Northern Tract. The total estimated capital expenditure for a cargo development at the Northern Tract is approximately $51,162,000. It is assumed that this project would be funded with third-party or special facility financing and that the debt service payments on such special facility bonds would be paid from the lease revenues of those facilities, and will not be obligations of Lambert Airport.

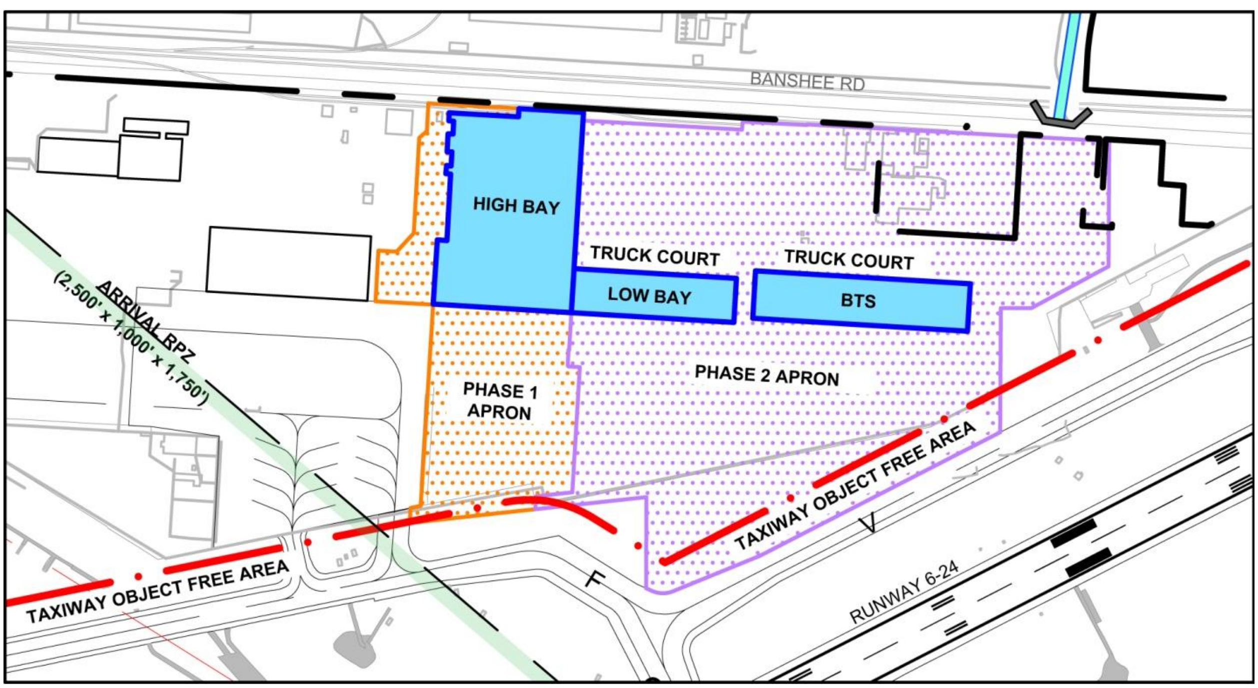
The central location and economy of the St. Louis Region make Lambert Airport an attractive location for air cargo. This Master Plan Update identified air cargo as a core opportunity for growth at Lambert Airport. International cargo connections would also provide an important incentive for new business growth in the St. Louis Region. The cargo expansion at the Northern Tract and the Brownleigh site would accommodate future domestic and international air cargo expansion opportunities, including the China cargo operations, which began at Lambert Airport in September 2011, after a considerable marketing effort to attract that service.

Exhibit 1.7-1
CARGO CONCEPT ON BROWNLEIGH SITE
Lambert-St. Louis International Airport



Source: Landrum & Brown, 2011

Exhibit 1.7-2
NORTHERN TRACT DEVELOPMENT SITE
Lambert-St. Louis International Airport



Source: Landrum & Brown, 2011

1.8 COLLATERAL DEVELOPMENT

OVERVIEW

Lambert Airport, like other hub airports that have expanded to provide capacity for the primary air carrier operators, has acquired a significant amount of contiguous land area that is currently unutilized or underutilized. Without an active tenant on the property, the land does not generate revenue and typically has associated expenses for maintenance and on-going security. The potential to generate revenue from underutilized land is increasingly attractive to airports as operating costs continue to rise. An in-depth analysis of the available land at Lambert Airport determined that four of the unutilized/underutilized areas could be developed for aviation-related uses to support the core mission of Lambert Airport and/or non-aviation related uses could be developed to provide a stable base of revenue support.

These four tracts of Lambert Airport-owned land, referred to as development sites A, B, C, and D, and the Northern Tract development area are discussed below and shown on **Exhibit 1.8-1**, ***Major On-Airport Development Tracts***.

- Development Site A: the former Brownleigh Subdivision
  - General Attributes: terrain is generally flat to gently rolling, close proximity to and north of Runway 30R, easily accessible to Interstates 70 and 170, McDonnell Boulevard, and the north and east airfields, and numerous roadways and light vegetation on site.
  - Area: 123.1 acres
  - Past Uses: central portion of the site contained a school campus with an elementary and high school, while the remainder of the site was made up of residential and neighborhood commercial.
  - Potential Future Uses: aviation use such as aerospace manufacturing and technology with airfield access, air cargo facilities, or long-term surface auto parking.
- Development Site B: along north side of Runway 11-29
  - General Attributes: this site is in close proximity to and north of Runway 11-29, easy access to Interstate 270, Missouri Bottom Road and Lindbergh Boulevard, light vegetation on southern half of site, and dense vegetation on northern half of site, and limited by steep and irregular topography through the center of the area and has a large quantity of acreage devoted to the Cowmire Creek Detention Basin, which was required as a part of the development program for Runway 11-29.
  - Area: 238 acres
  - Past Uses: Predominately residential with a fire-station and city park on the western end of the site.

Exhibit 1.8-1
MAJOR ON-AIRPORT DEVELOPMENT TRACTS
Lambert-St. Louis International Airport

Source: Landrum & Brown, 2011

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- Potential Future Uses: the area fronting Taxiway B could be used for aviation use such as a Fixed Base Operator (FBO); the demand for cargo and MRO (maintenance, repair, and overhaul) facilities is unlikely due to the amenities and development of the Northern Tract (see discussion below).

- Development Site C: located west of I-270
  - General Attributes: gently rolling terrain with irregular area, close proximity to and west of Runway 11 and Interstate 270 but no direct access, access to site provided via two roads (Gist Road and Woodford Way), and numerous interconnecting roadways and dense vegetation on site.
  - Area: 313 acres
  - Past Uses: Predominately residential over the majority of the site with a few commercial lots in the northwest corner of the site.
  - Potential Future Uses: Greatest potential is commercial application of solar generation or non-aviation commercial subject to market conditions.

- Development Site D: runs along the south side of Runway 11-29
  - General Attributes: steep and irregular terrain, isolated with close proximity to and south of Runway 11, easy access to Interstate 270 and Natural Bridge Road, and numerous roadways and dense vegetation on site.
  - Area: 95 acres
  - Past Uses: Single-family residential.
  - Potential Future Uses: Not viable for aviation use, possible uses include recreation such as the relocation of the golf course or recreation center for Bridgeton, or medical such as the expansion of the DePaul Health Center.

- Northern Tract: current site of the former McDonnell Douglas/Boeing Aircraft Facilities that is being redeveloped by a third-party developer
  - General Attributes: direct airfield access; good surface access
  - Area: 88 acres

SUMMARY

The Master Plan Update identified an array of concerns, conditions, and potential issues to be considered in the decision-making process relative to the development potential of the sites owned by Lambert Airport. The three primary concerns are: (1) a significant percentage of the land presently available for development was purchased through the implementation of noise compatibility programs (these lands are referred to as "Noise Land"),[4] (2) current FAA rules regarding land purchased for noise compatibility purposes using Airport Improvement Program (AIP) grant funds could limit the re-use potential of the land for aviation-related development,[5] and (3) the FAA may require the land purchased with noise funds to be classified as surplus and sold. Furthermore, given that the current market demand for raw developable land within most major urban areas simply no longer exists, could significantly undermine the value of the property and negate the goal for which the FAA guidance was established. Additional information about collateral development areas and potential uses is included in **Appendix C, *Collateral Development***.

4 Noise Land is land that has been acquired by an airport owner/sponsor to remove or prevent a use that is incompatible with aircraft noise.

5 FAA Program Guidance Letter 08-02, *Management of Acquired Noise Land: Inventory, Reuse, Disposal*, dated February 1, 2008.
Land acquired under airport noise compatibility programs is unique. When this land, also known as noise land, is acquired with Airport Improvement Program (AIP) grant funds, it is subject to Grant Assurance 31, *Written Assurances on Acquiring Land*. The purpose of the assurance, which is based on 49 USC §47107(c)(2)(A), is to assure that optimal use is made of the federal share of the proceeds from the disposal of noise land (disposal proceeds). The assurance requires that when noise land is no longer needed for noise compatibility, the land will be disposed of and that the federal share of the disposal proceeds will be either paid to the *Airport and Airway Trust Fund* or will be used for another noise compatibility project. "Disposal" of noise land does not mean that an airport must sell the property to another. Whether unneeded noise land is sold, kept by the airport and leased, or exchanged is the airport's decision.

1.9 ENVIRONMENTAL CONSIDERATIONS

1.9.1 REGULATORY SETTING

The National Environmental Policy Act (NEPA) significantly affects airport planning by requiring that environmental impacts of proposed airport development be considered early and throughout the planning process. Environmental feasibility is as important as economic or engineering feasibility in determining how an airport will be developed. The Master Plan improvement projects have undergone a preliminary environmental review per FAA Advisory Circular 150/5070-6B.[6] Prior to implementation, the recommended Master Plan improvement projects will require and environmental review with a scope and complexity according to FAA guidance for implementing NEPA, including the guidance found in FAA Order 1050.1E[7] and FAA Order 5050.4B.[8]

1.9.2 EXISTING CONDITIONS AND ENVIRONMENTAL FINDINGS

Lambert Airport is located within a highly urbanized area and is surrounded by existing residential, commercial, institutional, recreational, and other land uses. The following sections summarize the environmental conditions at Lambert Airport related to air quality, hazardous materials, historic resources, noise, and water quality. Additional information on environmental conditions is provided in **Chapter Six, *Environmental Overview***.

ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

The Lambert Airport Environmental Management System (EMS)[9] implements a variety of environmental initiatives to reduce the overall environmental footprint of airport operations and facilities. It is the policy of the STLAA and Lambert Airport to comply with all environmental laws and regulations, prevent pollution, and to continually improve environmental performance. The environmental policy of Lambert Airport[10] states that the EMS provides the framework for identifying environmental priorities, setting goals, and for monitoring progress.

EMS brings together the people, policies, plans, review mechanisms, and procedures used to manage environmental issues at Lambert Airport in a comprehensive, systematic, planned, and documented manner. The Lambert Airport environmental policy empowers each individual to contribute to the goal of

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6 FAA Advisory Circular 150/5070-6B, Change 1, *Airport Master Plans*, May 1, 2007.
7 FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures*, March 20, 2006.
8 FAA Order 5050.4b, *NEPA Implementing Instructions for Airport Actions*, April 28, 2006.
9 Lambert-St. Louis International Airport Program Management Office. *Environmental Management System (EMS) Manual*. Volumes I and II.
10 Lambert-St. Louis International Airport® Environmental Policy, signed by Rhonda Hamm-Niebruegge, Director of Airports, dated: August 12, 2010. *See* Internet website: http://www.flystl.com/flystl/about-lambert/environmental/

environmental stewardship and by identifying environmental compliance as part of the EMS, Lambert Airport is able to identify regulatory compliance issues and address the cause of the compliance problems to prevent recurrence.

The EMS process clearly outlines the responsibilities associated with achieving and maintaining compliance with environmental regulations to ensure that potential environmental issues do not affect the Lambert Airport mission. The Master Plan Update has taken into consideration the potential environmental issues that could materialize from the recommended development projects and programs identified in the analysis of facility requirements, forecasts of operations and enplanements, and the evaluation of alternatives.

The Lambert Airport environmental policy commits to:

- Prevent pollution
- Adhere to environmental regulations
- Continually improve overall environmental management performance
- Act as a good neighbor
- Serve as an economic engine for the St. Louis area

The EMS shifts the focus on environmental issues from reactive to one that is proactive and based on sound planning and informed decision-making. The EMS has established the framework to collectively, across all departments, work together to identify and recognize the potential impact that environmental issues may have on the mission and goals of the Lambert Airport.

* * * * *

The investigation of environmental conditions found that significant environmental impacts are not likely to occur with the implementation of the Improvements Program outlined in Chapter Seven, *Implementation Plan*. Prior to the construction of projects identified on the Lambert Airport ALP, a detailed NEPA environmental review document would be required to identify and disclose the potential adverse environmental impacts; the environmental review documents will need to be approved by the FAA. In addition, environmental permits and coordination with environmental regulatory agencies may be necessary.

AIR QUALITY

Lambert Airport is located in St. Louis County, Missouri, which has been designated by the U.S. Environmental Protection Agency (USEPA) as a non-attainment area for the average eight-hour concentration of ozone and for emissions of fine particulate matter.[11] Lambert Airport has made vast improvements on its contribution to regional emissions. The aircraft operations are less than half of what they were in 2001 due to the loss of airline hubbing operations and there have been improvements in aircraft engine technology. These events affected the measurable reductions in air quality emissions from Lambert Airport.

To satisfy the requirements of a NEPA environmental review document for potential impacts to air quality that could occur from the implementation of the Improvements Program, the following regulatory actions and agency coordination would be necessary:

- General Conformity Determination: Because Lambert Airport is in an area of nonattainment a General Conformity Determination is required from the U.S. Environmental Protection Agency to (1) ensure Federal activities do not interfere with the budgets in the State implementation plan (SIP); (2) ensure actions do not cause or contribute to new violations, and (3) ensure attainment and maintenance of the national ambient air quality standards (NAAQS).
- Coordinate with the U.S. Environmental Protection Agency, Region 7 to establish mutually acceptable procedures for conducting air quality analyses
- Identify appropriate measures to reduce construction air quality impacts on surrounding communities

NATURAL AND WATER RESOURCES:

Lambert Airport has a strong active program to monitor all outfalls. New methods for capturing glycol have been implemented that will virtually eliminate the discharge of glycol effluents in to Coldwater Creek. Coldwater Creek has been channeled and runs underground beneath the central airfield and there are several wetlands and streams located on the periphery of airport property. Therefore, to avoid, minimize, or mitigate potential future contamination that may result from stormwater runoff with the implementation of the Improvements Program, agency coordination may be necessary to satisfy the requirements of a NEPA environmental review document.

- Coordinate with the U.S. Fish and Wildlife Service
- Coordinate with the Missouri Department of Natural Resources (MDNR)

[11] U.S. Environmental Protection Agency, *Nonattainment Status for Each County by Year for Missouri,* http://www.epa.gov/air/oaqps/greenbk/anay_mo.html (website accessed on June 21, 2010).

- Coordinate with the U.S. Army Corps of Engineers, St. Louis District. Section 404 Dredge and Fill Permit would be required for dredge and fill activities involving Waters of the U.S.
- Coordinate with the U.S. Environmental Protection Agency, Region 7
- Update current National Pollution Discharge Elimination System (NPDES) Permit (coordinate with the U.S. EPA Office of Wastewater Management)

HAZARDOUS MATERIALS

Lambert Airport has an active program to manage and remediate past hazardous waste sites on the airport (i.e., fuel storage facilities and pre-World War II facilities). Most previously identified sites have been remediated. However, to satisfy the requirements of a NEPA environmental review document for potential hazardous materials impacts that could occur from the implementation of the Improvements Program, the following regulatory actions and agency coordination would be necessary:

- Coordinate with the Missouri Department of Natural Resources (MDNR) to determine if further assessments or abatement practices are necessary
- Coordinate with the U.S. Environmental Protection Agency, Region 7

NOISE

While aircraft noise is a concern for many living near an airport, the aircraft noise exposure footprint has decreased in size at Lambert Airport due the reduction in total aircraft operations and the continued phase-out of older, louder aircraft. The future 2020 noise exposure contour, prepared for the Lambert Airport Part 150 Noise Compatibility Program, illustrates that future aircraft noise will be mostly contained on airport property and where it extends off airport property mitigation has been applied to all eligible structures.

* * * * *

Additional information on the environmental findings of this Master Plan Update can be found in Chapter Six, *Environmental Overview*.

Lambert Airport committed to the proactive consideration of environmental concerns at the onset of project formulation and throughout the development of this Master Plan Update. Furthermore, environmental issues will be considered as necessary per NEPA guidelines, the Council on Environmental Quality Regulations for Implementing NEPA, and FAA requirements prior to and during the implementation phases of the Master Plan Update Improvements Program.

CHAPTER TWO
INVENTORY OF EXISTING CONDITIONS

INTRODUCTION

To establish a baseline for the analysis in this Master Plan Update, an inventory of the existing conditions was conducted. The inventory provides an overview of the many physical facilities that make up Lambert Airport. These physical facilities have been grouped into the following categories: airside operating environment, passenger terminal facilities, aviation support facilities, General Aviation facilities, cargo facilities, utilities, on- and off- airport roadways, and transportation facilities. This information is used throughout the Master Plan Update analysis to determine the need for future aviation facilities and to evaluate alternatives.

2.1 AIRSIDE OPERATING ENVIRONMENT

Airside capacity is a function of an airport's physical facilities and the operational factors that affect how the facilities are used, otherwise referred to as the operating environment. This section focuses on the airside-operating environment, which includes the airspace and the elements that define the air traffic control procedures.

The airside operating environment discussion begins with a description of airspace classifications and the regional environment in which the Lambert-St. Louis International Airport (STL or Lambert Airport) operates, and continues with a discussion of main airspace routes, wind and weather conditions, runway operating configurations, and air traffic control procedures.

2.1.1 AIRSPACE CLASSIFICATION

Airspace classes are established by the Federal Aviation Administration (FAA) to enhance the safety of aircraft operations by protecting arriving and departing Instrument Flight Rules (IFR)[1] aircraft using air traffic control services from uncontrolled Visual Flight Rules (VFR)[2] aircraft. Depending on the class of airspace, VFR operations are subject to certain operational restrictions and must remain under controller/radar surveillance at all times. These restrictions affect GA users the most since flight activity by these aircraft operators compose the majority of VFR traffic.

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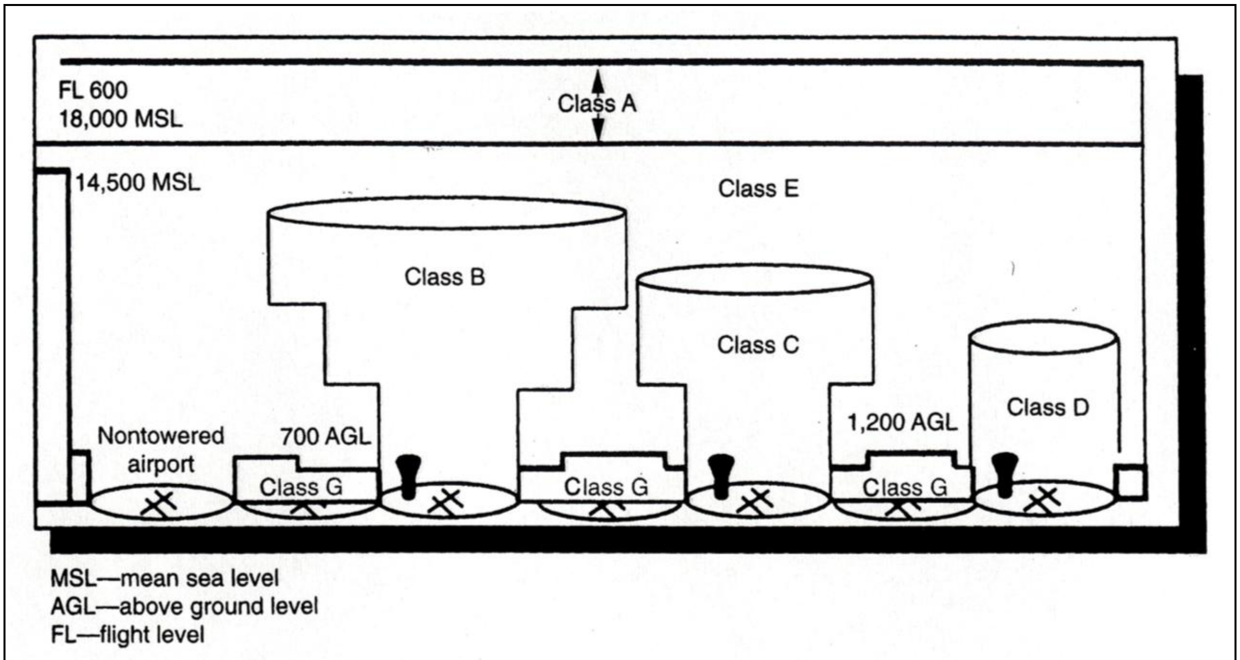
[1] IFR - Instrument Flight Rules - Rules governing the procedures for conducting instrument flight. Also a term used by pilots and controllers to indicate type of flight plan, FAR/AIM 2007.

[2] VFR – Visual Flight Rules – Regulations governing the procedures under which a pilot may operate an aircraft by visually identifying obstacles, terrain, or other traffic, FAR/AIM 2007.

The FAA has classified the nation's airspace using an alphabetic reference system of A through G.[3]. These specific airspace classes are illustrated in **Exhibit 2.1-1, *Typical Airspace Classes***. STL has Class B airspace that extends a radius of 20 to 30 nautical miles from the airfield; *see* **Exhibit 2.1-2, *STL Class B Airspace***.

Exhibit 2.1-1
TYPICAL AIRSPACE CLASSES
Lambert-St. Louis International Airport



Source: FAR/AIM 2007

Class B Airspace – Class B airspace extends from the surface to 10,000 feet MSL (mean sea level) and surrounds STL at a radius of 20 to 30 nautical miles. Class B airspace is established at the nation's busiest airports based on the IFR operations or passenger enplanements. An ATC clearance is required for all aircraft operating in the Class B airspace, and all cleared aircraft receive separation services within the airspace. All aircraft must be equipped with an operable two-way radio capable of communicating with ATC on appropriate frequencies for that Class B airspace, this communication capability is known as Mode C. Mode C communication is required of all aircraft within 30 nautical miles of an airport.

While Exhibit 2.1-1 shows a Class B airspace that is a round shape, the St. Louis Class B airspace[4] includes "wings" aligned with the primary arrival and departure runways. These wings extend the STL Class B airspace to 30 nautical miles from the airfield.

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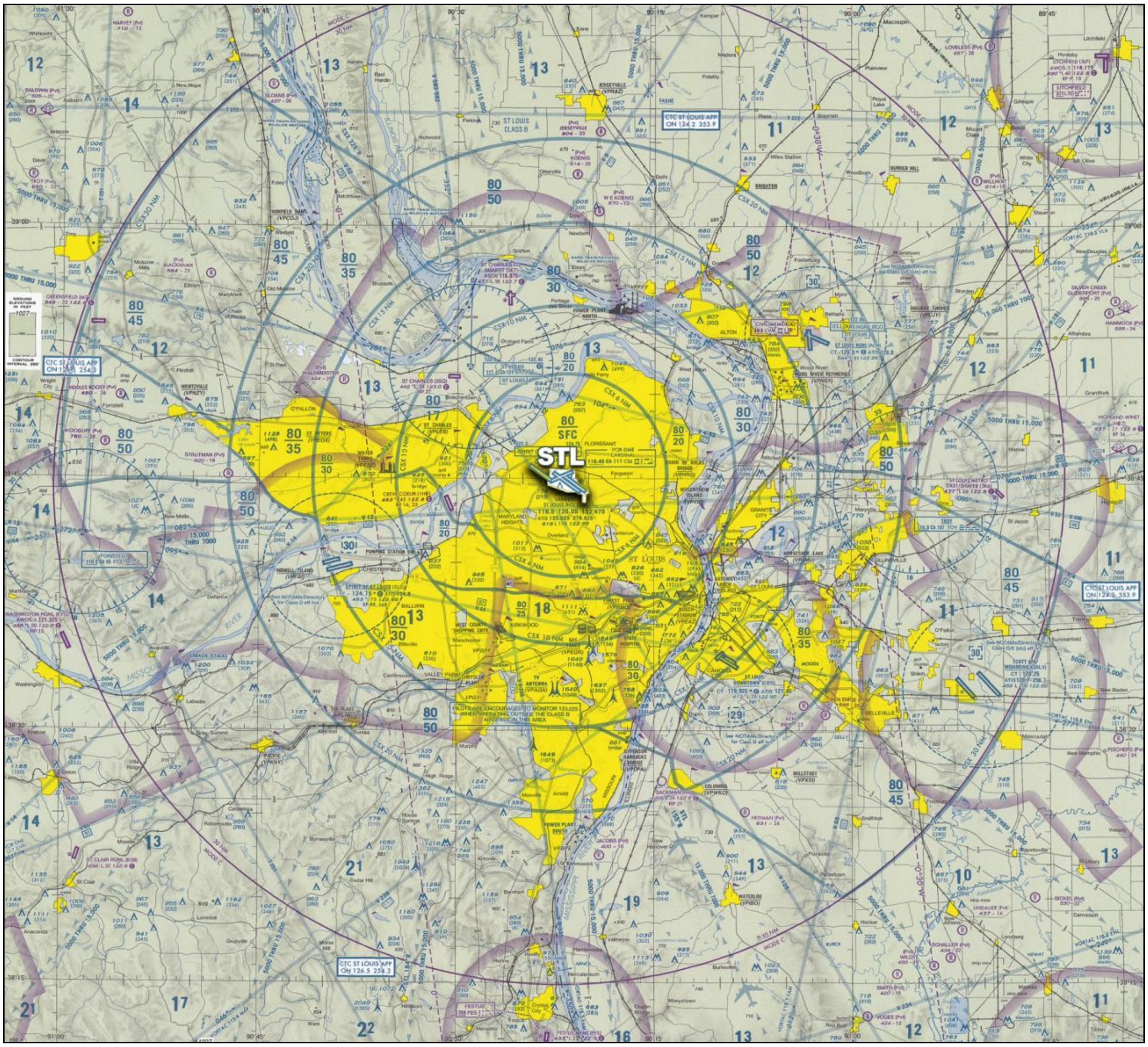
3 FAR/AIM 2007
4 *See* FAA Order HI 7400.9V, *Airspace Designations and Reporting Points*, dated August 9, 2011, Subpart B – *Class B Airspace*, §3000 *ACE MO B St. Louis, MO.*

Exhibit 2.1-2
STL CLASS B AIRSPACE
Lambert-St. Louis International Airport



Sources: Jeppesen Sanderson, JeppView 3.7.1.0, August 2010

2.1.2 REGIONAL ENVIRONMENT

The St. Louis Class B airspace and Mode C communication area overlies the following regional public airports that have paved runway surfaces:

- **Scott Air Force Base / Mid-America Airport (BLV)** – This military and commercial airport is approximately 28 miles southeast of STL and has a pair of parallel runways. Runway 14L-32R is 10,000 feet long and 150 feet wide and Runway 14R-32L is 8,011 feet long and 150 feet wide.
- **St. Louis Downtown (CPS)** – This reliever airport is approximately 15 miles southeast of STL and has a pair of parallel runways with a third, crosswind runway. Runway 12R-30L is 6,997 feet long and 100 feet wide, Runway 12L-30R is 5,300 feet long and 75 feet wide. The crosswind, Runway 5-23, is 2,799 feet long and 75 feet wide.
- **Spirit of St. Louis (SUS)** – This reliever airport is approximately 14 miles southwest of STL and has a pair of parallel runways. Runway 8R-26L is 7,486 feet long and 150 feet wide and Runway 8L-260R is 5,000 feet long and 75 feet wide.
- **St. Louis Regional Airport (ALN)** – This reliever airport is approximately 19 miles northeast of STL and has two intersecting runways. Runway 11-29 is 8,098 feet long and 150 feet wide, and Runway 17-35 is 6,500 feet long and 100 feet wide.
- **Creve Coeur (1H0)** – This General Aviation (GA) airport is approximately 7 miles southwest of STL and has one paved runway and one turf runway. Runway 16-34 is 4,500 feet long and 75 feet, and turf Runway 7-25 is 3,120 feet long and 220 feet wide.
- **St. Charles County-SMARTT (SET)** – This GA airport is approximately 11 miles north of STL and has two intersecting runways. Runway 18-36 is 3,800 feet long and 75 feet wide and Runway 9-27 is 2,000 feet long and 75 feet wide.
- **Greensfield (M71)** – This GA airport is approximately 29 miles west of STL and has a single runway. Runway 9-27 is 3,227 feet long and 50 feet wide.
- **St. Louis Metro – East/Shafer (3K6)** – This privately owned public use airport is approximately 27 miles east of STL and has a single runway. Runway 13-31 is 2,662 feet long and 50 feet wide.
- **Sackman Field (H49)** –This GA airport is approximately 22 miles south of STL and has a single turf runway. Runway 3-21 is 2,450 feet long and 150 feet wide.

In addition to public use airports, the St. Louis Class B airspace overlies the following private GA airports:

- Sloan's Airport – Runway 17-35
- Ben Emge Airport – Runway E/W
- Ralph Jacob's Airport – Runway 9-27
- Woodliff Airpark – Runway 18-36
- Blackhawk Airport – Runway 4-22
- Heitman Aerodrome – Runway 6-24
- Strutman Field Airport – Runway 9-27
- Riddles Roost Airport – Runway 9-27

2.1.3 AIR TRAFFIC PROCEDURES

When the en-route air traffic controller prepares to hand off control of the arriving aircraft under Instrument Flight Rules (IFR) conditions (including most commercial and military aircraft even in Visual Meteorological Conditions (VMC)), the aircraft is cleared to the destination airport via a Standard Terminal Arrival Route (STAR) putting the aircraft on a designated route. STARs uses a combination of published routes that follow specific radio signal radials, intersections, the ATC-assigned headings (known as vectors), altitudes, and speeds to route the aircraft into sequence with other arriving aircraft.

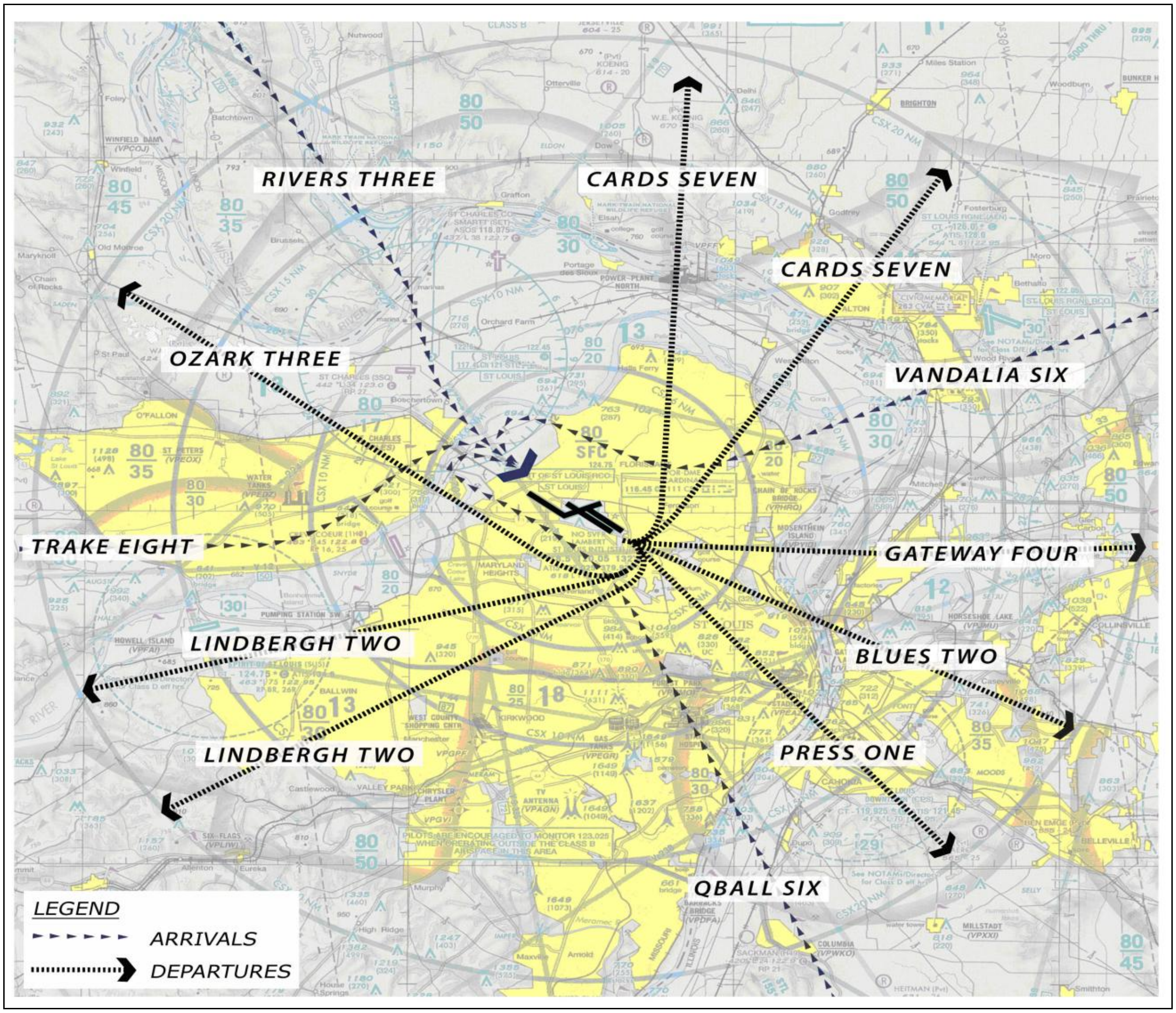
There are four STARs at STL. These are shown in **Exhibit 2.1-3, *East Flow Map***, and **Exhibit 2.1-4, *West Flow Map***.

- *RIVERS Arrival* – aircraft arriving from the north
- *VANDALIA Arrival* – aircraft arriving from the east
- *QBALL Arrival* – aircraft arriving from the south
- *TRAKE Arrival* – aircraft arriving from the west

When aircraft depart from STL under IFR, the FAA uses a Standard Instrument Departure (SID). The objective of using a SID is to improve the communication between ATC and the pilot by shortening the departure clearance. Generally, the pilot will fly a controller-assigned heading and altitude immediately after takeoff and join the assigned SID. The secondary objective of a SID is to aid in transitioning the aircraft from terminal airspace to en-route airspace. Currently there are six SIDs at STL. Each has one to four separate "transitions" or route instructions to navigate the aircraft as directly towards its destination as possible. The six SIDs for STL are shown in Exhibit 2.1-3 and Exhibit 2.1-4:

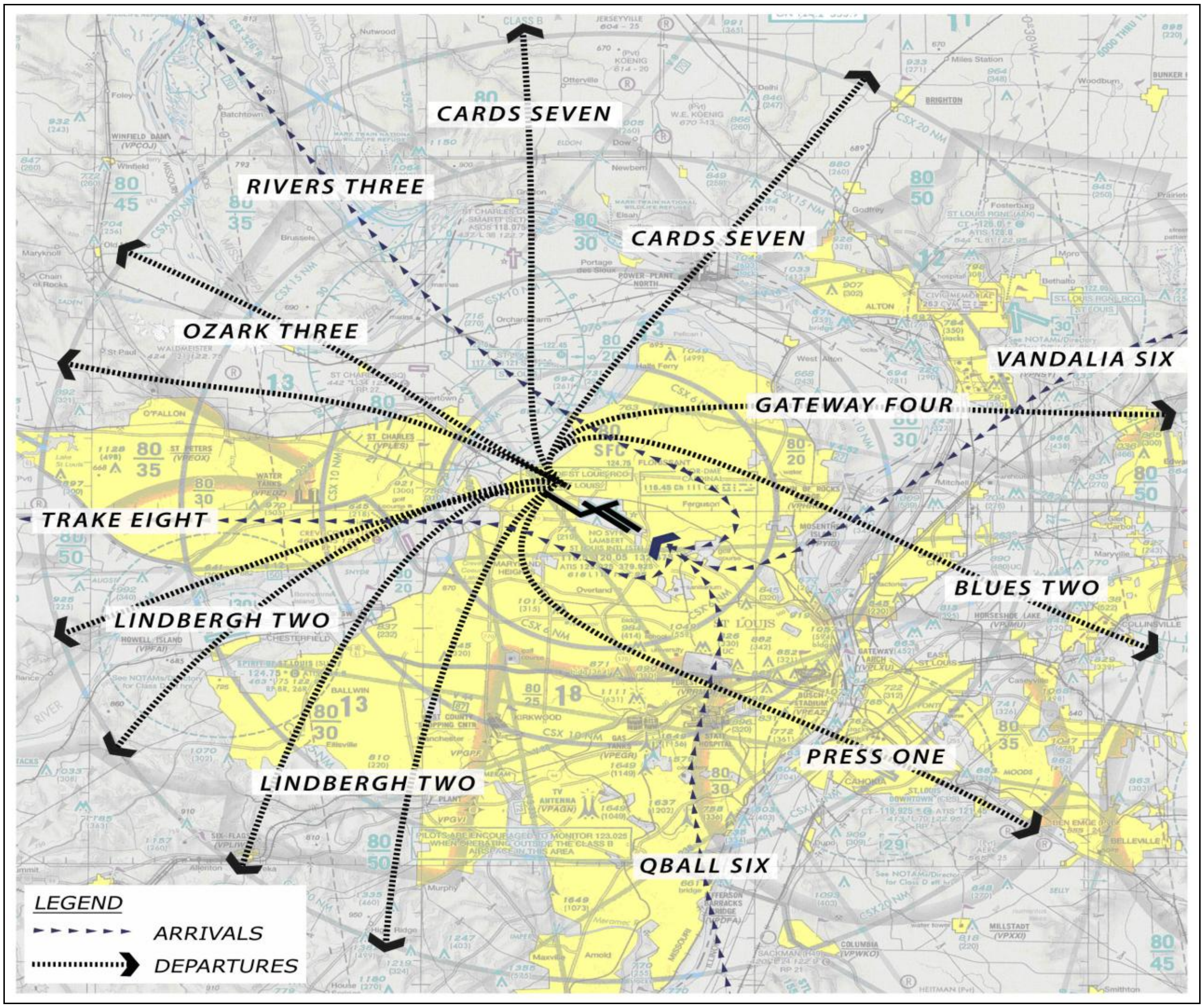
- *CARDS Departure* – aircraft departing to the north and northeast
- *LINDBERGH Departure* – aircraft departing to the southwest and south
- *GATEWAY Departure* – aircraft departing to the east
- *OZARK Departure* – aircraft departing to the west
- *BLUES Departure* – aircraft departing to the west and southwest
- *PRESS Departure* – aircraft departing to the southwest

Exhibit 2.1-3
STANDARD TERMINAL ARRIVAL ROUTE (STAR) – EAST FLOW MAP
Lambert-St. Louis International Airport



Source: Lambert St. Louis Air Traffic Control Tower (ATCT)

Exhibit 2.1-4
STANDARD TERMINAL ARRIVAL ROUTE (STAR) – WEST FLOW MAP
Lambert-St. Louis International Airport

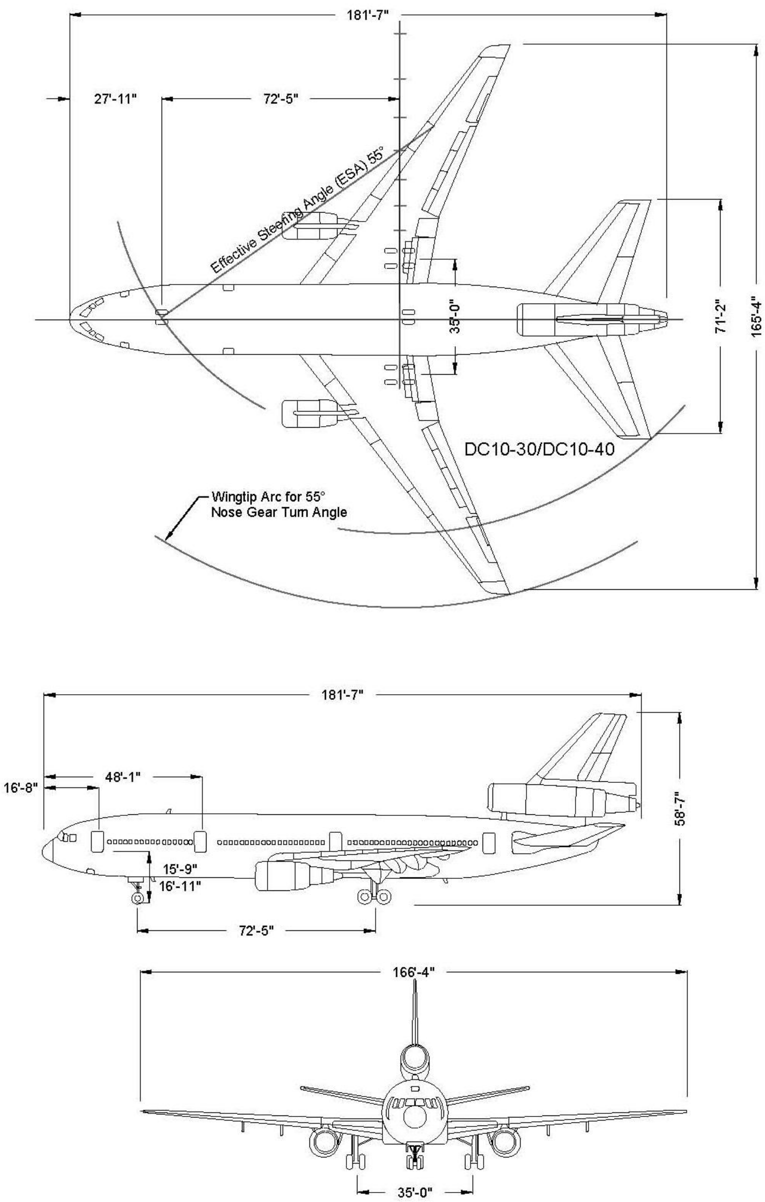


Source: Lambert Air Traffic Control Tower (ATCT)

2.1.4 AIRFIELD DESIGN REQUIREMENTS

Airfield systems are designed in accordance with FAA guidelines and requirements, and are based on an airport's role, the number of operations, and the "critical" aircraft using the airport. The critical, or design, aircraft is defined as the most demanding aircraft that could operate at the airport on a regular basis. To be considered a critical aircraft, the aircraft (or type of aircraft) typically performs 250 landings and 250 takeoffs (500 total operations) annually at an airport. Based on STL records and the forecast of aviation demand, the McDonnell Douglas DC-10/MD-10 is the critical or design aircraft (*see* **Exhibit 2.1-5, *STL Critical Aircraft – McDonnell Douglas DC-10/MD-10***).

Exhibit 2.1-5
STL CRITICAL AIRCRAFT – MCDONNELL DOUGLAS DC-10-30
Lambert-St. Louis International Airport



MCDONNELL DOUGLAS DC-10-30/40

Wingspan:
165 feet 4 inches

Length Overall:
181 feet 7 inches to
182 feet 3 inches

Max Take-Off Weight:
555,000–590,000 pounds

Approach Speed:
145-151 Knots

Airport Reference Code (ARC): D-IV

Source: Burns & McDonnell Aircraft Characteristics, 10th Edition

Copyright Aircraft Templates, 1999

Based on FAA standards, the MD-11 has an Airport Reference Code (ARC) of D-IV. The ARC is an FAA coding system to relate the airport design criteria to the operational and physical characteristics of an airport's critical aircraft. The ARC has two components. The first component is the Airport Approach Category (AAC), which relates to aircraft approach speed, and is commonly designated by a letter; A through E (*see* **Table 2.1-1, *FAA Design Standards***). The AAC represents the operational characteristic element of the ARC code, and generally applies to runways and runway-related facilities. Each AAC represents a grouping of aircraft based on 1.3 times the stall speed in the aircraft landing configuration, at the maximum certified landing weight.

Table 2.1-1
FAA DESIGN STANDARDS
Lambert-St. Louis International Airport

FAA AIRCRAFT APPROACH CATEGORIES		
Approach Category	**Approach Speed (kts)**	**Typical Aircraft Type**
A	Less than 91	Beech Baron 55, Cessna 172
B	91, but less than 121	King Air, Citation II, Metroliner
C	121, but less than 141	A319/A320/EMB/CRJ/B737/B757/B767/B777
D	**141, but less than 166**	**A380/B747/B767-300/B737-900/DC-10**
E	166 or more	Boeing 787
FAA WINGSPAN DESIGN GROUPS		
Design Group	**Wingspan (feet)**	**Typical Aircraft Type**
I	Less than 49	Cessna, Learjet
II	49, but less than 79	EMB/CRJ
III	79, but less than 118	B727/B737/DC9/MD80/A319/A320
IV	**118, but less than 171**	**DC8/767/DC10/MD11**
V	171, but less than 214	B747/B777
VI	214, but less than 262	A380

Source: FAA Advisory Circular 150/5300-13, Change 17, *Airport Design.*

The second element of the ARC relates to the Airplane Design Group (ADG); it is based on the airplane wingspan and tail height of the design aircraft. The ADG is identified by a Roman numeral ranging from I through VI (*see* Table 1.1-2). Each ADG represents a grouping of aircraft based on wingspan and tail height within specified ranges, and relate primarily to the separation criteria for taxiways and taxilanes.

The Critical Aircraft and design requirements for STL are:

- Critical Aircraft McDonnell Douglas MD-11
- Airport Approach Category – D
- Airplane Design Group – IV
- **Airport Reference Code – D-IV**

The ARC is used in conjunction with the runway approach minima information to define the required airport design standards and dimensional criteria. These criteria, explained in FAA Advisory Circular AC 150\5300-13, (Change 14) *Airport Design,* are used to determine the location and configuration of an airport runway and taxiway system.

The STL aircraft approach minima is presented in **Table 2.1-2, *STL Runway Approach Minima***. According to FAA guidance, "for airports with two or more runways, it may be more practical to design some airport elements, e.g., a secondary runway and its associated taxiway, to standards associated with a lesser demanding runway"[5] than identified for the airport as a whole. Therefore, while the overall reference code for STL is D-IV, some of the runways are designed to the D-V standard because of the aircraft that operated at STL during the height of the TWA hub presence.

Table 2.1-2
STL RUNWAY APPROACH MINIMA
Lambert-St. Louis International Airport

RUNWAY	TYPE	DECISION HEIGHT	DECISION ALTITUDE (FEET)	RUNWAY VISUAL RANGE (RVR)
Runway 6	ILS	751	200	24
Runway 11	ILS	818	200	18
Runway 12L	ILS	741	200	18
Runway 12R	ILS	790	250	40
Runway 24	ILS	734	200	40
ILS RWY 29	ILS	830	250	40
Runway 30L	ILS	783	200	24
Runway 30R	ILS	805	200	18
Runway 11	ILS/CAT II	718	100	12
Runway 12L	ILS/CAT II	641	100	12
Runway 30R	ILS/CAT II	705	100	12
Runway 11	ILS/CAT IIIc			NA
Runway 12L	ILS/CAT IIIc			NA
Runway 30R	ILS/CAT IIIc			NA

Source: FAA digital-Terminal Procedures Publication (d-TPP), NC-3 10Mar2011 to 07APR2011.

5 Advisory Circular 150/5300-13 (Change 17) *Airport Design*, dated September 30, 2011, p. 1.

In addition to the ARC and runway approach minima, there are three key design standard requirements, referred to as airfield safety areas, which have a direct relationship to the runway system. These airfield safety areas include the RSA, ROFA, and the RPZ. Each is briefly described below. This information is based on design guidelines provided in FAA AC 150/5300-13, Change 17, *Airport Design.*

- The Runway Safety Area (RSA) is centered on the runway centerline; it extends both laterally from the centerline of the runway and beyond both ends of the runway for a distance specified in FAA AC 150/5300-13 for the designated aircraft approach category and airplane design group. The RSA must be clear, graded, and devoid of hazardous ruts, depressions, or other surface variations; it must be drained to prevent water accumulation and capable, under dry conditions, of supporting snow removal equipment, aircraft rescue and fire fighting equipment, and the occasional passage of aircraft, without causing structural damage. The RSA should also be devoid of objects other than those that must be located in the RSA due to their aviation-related function; however, these should be constructed on frangible (impact resistant) structures with the frangible point no higher than three inches off the ground.
- The Runway Object Free Area (ROFA) is also centered on the runway centerline and extends beyond the end of the runway a distance equal to that of the RSA. The ROFA is a two dimensional surface that requires the clearing of above ground objects that extend above the runway safety edge elevation. It is acceptable to place objects in the ROFA that are needed for air navigation, or the ground maneuvering of aircraft, as well as, to taxi and hold aircraft in the ROFA. It is not acceptable to park aircraft or to conduct agricultural operations within the ROFA.
- The Runway Protection Zone (RPZ) is as a two dimensional trapezoid and is centered on the extended runway centerline. As noted previously, the dimensions of the RPZ are a function of the approach visibility minimums associated with each runway end and the design aircraft. The function of the RPZ is to enhance the protection of people and property on the ground by clearing RPZ areas of incompatible objects and activities. Thus, the FAA requires that the airport sponsor acquire adequate property interest in RPZ areas sufficient to provide land use compatibility with airport operations. Specific land uses are prohibited from the RPZ, including residences and places of public assembly, including churches, schools, hospitals, shopping centers, office buildings, and other land uses having similar concentrations of population. The FAA also precludes the development of fuel storage facilities within the RPZ.

The following discussion in Section 2.1.5, *Existing Airfield Environment*, describes the STL-specific runway reference codes, the characteristics of each runway, and the conditions affecting the existing RSAs, ROFAs, and RPZs.

2.1.5 EXISTING AIRFIELD ENVIRONMENT

The airfield is comprised of four runways; three parallel runways (oriented in a northwest/southeast direction) and a crosswind runway oriented in a northwest/southeast direction; two of the runways intersect. The airfield includes a network of taxiways and apron taxilanes, aprons and hold pads to support the runway system. **Exhibit 2.1-6, *STL Existing Airfields***, depicts the existing airfield and highlights the runway taxiway system and other associated airfield elements that are served by or are accessed by the system of runways.

2.1.5.1 Runways

The three parallel runways are Runway 12R-30L, Runway 12L-30R, and Runway 11-29. The crosswind runway is designated as Runway 6-24. A detailed summary of all runway data is presented in **Table 2.1-3, *Runway Data***.

2.1.5.1.1 RUNWAY 12R-30L

Runway 12R-30L is the primary runway. It is capable of accommodating all of the transport category aircraft that serve STL for both the passenger airline and the air cargo fleets. When the airfield operates in a Southeast Flow, Runway 12R-30L is used extensively for aircraft arrivals due to the proximity of the Runway end 30L to the terminal complex and the taxiway system access to this runway. Runway 12R-30L is located north of the airport terminal complex and is oriented 302.9 degrees off of a due east/west alignment. Runway 12R-30L is 11,019 feet in length, 200 feet in width, and is designed to conform to AAC-D and ADG-V; for an ARC of D-V. Two elements of this runway do not conform to the requirements of ARC D-V; the pavement shoulders, at a width of 25 feet, and the Runway 12R-30L blast pads off each runway end, these are 200 feet in length and 220 feet wide. Lambert Airport serves, and is forecast to serve, ARC D-IV aircraft; therefore, the current configuration meets the requirements of the aircraft using the airfield.

The threshold of Runway 12R has been displaced 467 feet from the physical end of runway pavement purportedly to accommodate obstructions along Banshee Road. However, review of the 2008 ALP Update and associated ALP narrative report did not identify an object or objects that could be identified as the controlling object for the 467-foot threshold displacement. At some point in time, the controlling object, which resulted in the 467-foot threshold displacement, must have been removed. Therefore, the future Runway 12R threshold location and potential to decrease or remove the displaced threshold will be evaluated in subsequent chapters of the master plan. The Runway 30L threshold has a 201-foot displacement from the end of full-strength pavement allegedly to accommodate terrain penetrations of the imaginary surfaces. Similar to Runway 12R, the controlling object for the 201-foot displaced threshold could not be identified. Therefore, the future Runway 30L threshold location and potential to decrease or remove the displaced threshold will be evaluated in subsequent chapters of the master plan.

Exhibit 2.1-6
STL EXISTING AIRFIELD
Lambert-St. Louis International Airport

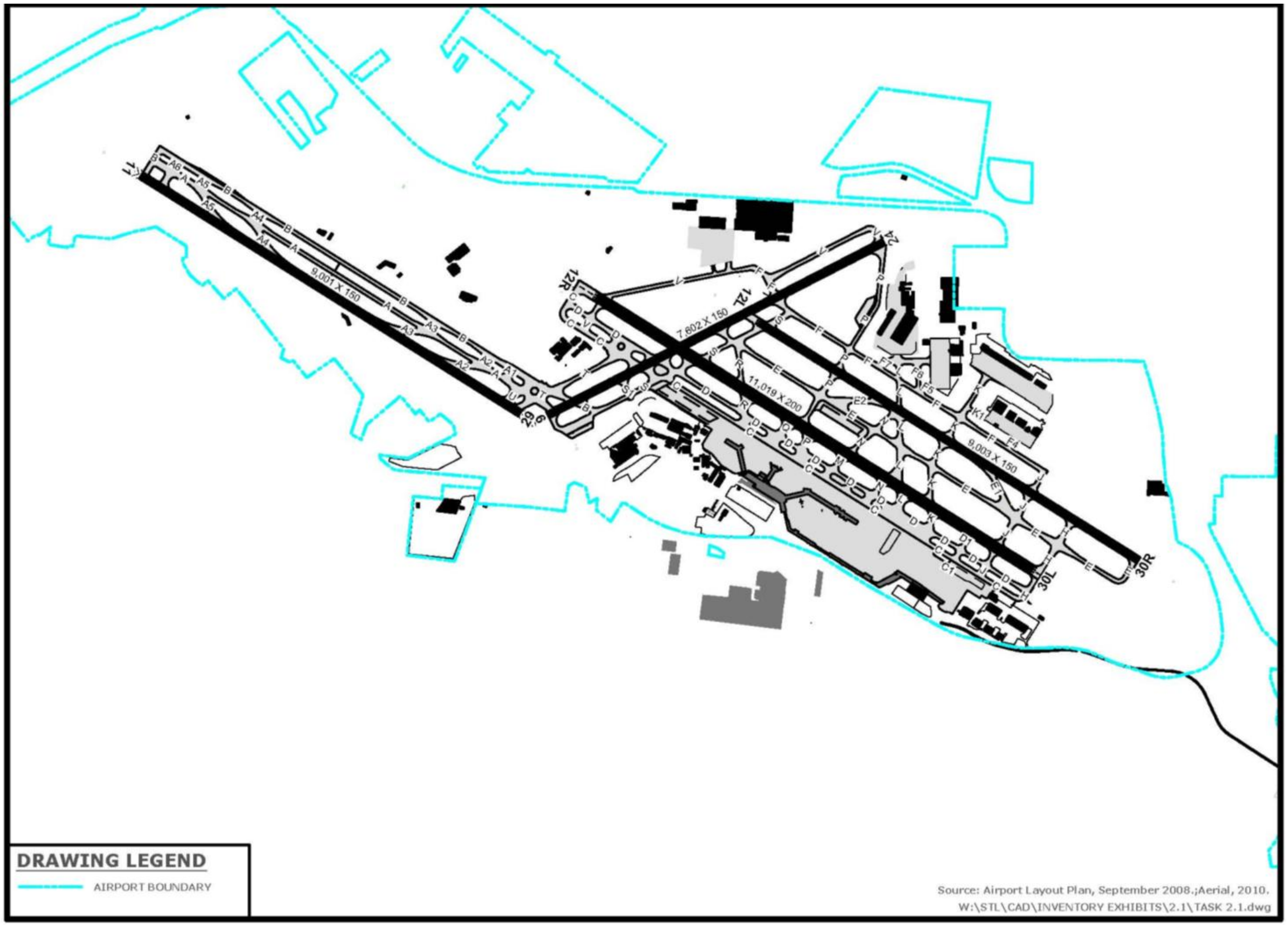


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Table 2.1-3
RUNWAY DATA
Lambert-St. Louis International Airport

RUNWAY	6	24	11	29	12L	30R	12R	30L
Reference Code	D-IV		D-V		D-V		D-V	
Runway Length and Width (feet)	7,602 x 150		9,000 x 150		9,012 x 150		11,019 x 200	
Approach Surface Slope	50:1	50:1	50:1	50:1	50:1	50:1	50:1	50:1
Runway End Elevation (feet MSL)	551.31	533.75	617.92	555.95	528.49	604.88	541.91	586.16
Runway Threshold Elevation (feet MSL)	551.31	533.75	617.92	555.95	528.49	604.88	540.01	582.80
Runway Marking and Instrumentation	Precision		Precision		Precision		Precision	
Runway Lighting	HIRL		HIRL		HIRL		HIRL	
Approach Lights/Aids	MALSR PAPI-4	MALS PAPI-4	ALSF2 PAPI-4	ALSF2 PAPI-4	ALSF2 PAPI-4	ALSF2 PAPI-4	MALSR PAPI-4	MALSR PAPI-4
Pavement Type and Treatment	Concrete Grooved		Concrete Grooved		Concrete Grooved		Concrete Grooved	
Pavement Strength (pounds)	SW 75,000 DW 176,000 DTW 280,000 DDTW 660,000		SW 75,000 DW 200,000 DTW 325,000 DDTW 700,000		SW 75,000 DW 200,000 DTW 350,000 DDTW 760,000		SW 75,000 DW 200,000 DTW 350,000 DDTW 760,000	

Notes: MSL = Mean Seal Level
HIRL = High Intensity Runway Lighting
ALSF2 = Standard 2,400 foot-High Intensity Approach Lighting System with Centerline Sequenced Flashers
MALSR = Medium Intensity Approach Light System with Runway Alignment Indicator Lights
PAPI = Precision Approach Path Indicator
SW = Single Wheel Aircraft
DW = Dual Wheel Aircraft
DTW = Dual Tandem Wheel Aircraft
DDTW = Double Dual Tandem Wheel Aircraft

Source: Airnav.com, November 24, 2008; ALP Update, Dated Feb. 2 2007 by Parsons Brinckerhoff (Runway Threshold Elevation); FAA Digital Airport/Facility Directory 2011.
Runway End Point Elevations and Displaced Threshold Elevations are based on the 2008 survey completed for the 2008 ALP Update, completed by Parsons Brinkerhoff.

Runway 12R-30L has a maximum grade change of 1.7 percent. The runway is constructed of concrete and the surface is grooved; it has a load bearing capacity of 75,000 pounds single wheel (SW), 200,000 pounds dual wheel (DW), 350,000 pounds double tandem (DT), and 760,000 pounds dual double tandem (DDT).[6]

The runway RSA, ROFA, and RPZ must conform to the requirements of the designated AAC and ADG along with the visibility minimums associated with the runway approaches. The RSA, ROFA, and RPZ requirements for Runway 12R-30L are described below.

<u>Runway 12R-30L RSA</u> – The RSA should be 500 feet in width (250 feet on either side of the runway centerline) and extend 1,000 feet beyond each runway end. The Runway 12R-30L fully complies with RSA requirements.

<u>Runway 12R-30L ROFA</u> – The width of the ROFA is 800 feet (centered on the runway centerline, 400 feet on either side of the centerline) and extends beyond each runway end a distance equal to that of the RSA. Both runway ends maintain a standard length of 1,000 feet beyond the runway end

<u>Runway 12R-30L RPZ</u> – Runway ends 12R and 30L both have a displaced threshold so each runway end is required to have two RPZs: a departure RPZ and an approach RPZ. The approach RPZs at the ends of Runway 12R-30L are both the same size, reflecting the instrument approach capability available on both ends of the runway. The 12R-30L approach RPZs begin 200 feet beyond the displaced arrival thresholds (instead of the runway end), are centered on the runway centerline, and are 1,000 feet wide at this point. Both approach RPZs extend outward 2,500 feet along the extended runway centerline and are 1,750 feet in width at the outer edge of the RPZ. Each approach RPZ encompasses an area of 78.9 acres. Runway 12R-30L also has departure RPZs off both runway ends, both of these are contained within the boundaries of the approach RPZs. The start of the departure RPZs are situated 200 feet beyond the runway end and are 500 feet wide at this point. The departure RPZs are centered on the extended runway centerline and extend outward 1,700 feet, at which point the width of the surface is 1,010 feet.

[6] Airnav.com, March 2011.

The Runway 12R approach RPZ overlies approximately 200 feet of North Lindbergh Boulevard and 1,430 feet of Banshee Road. All of the Runway 12R approach RPZ is contained within the existing airport property with the exception of those portions that extend across public roads. The airport owns the majority of the 12R approach RPZ, with the exception of 1.6 acres, which is currently owned by the county. The majority of the Runway 30L approach RPZ is contained within existing airport property with the exception of 1.9 acres of land in the southern corner of the surface. Additionally, the right-of-way of McDonnell Boulevard and the MetroLink Rail System bisect the southeast portion of the approach RPZ. No places of public assembly are located within the boundaries of either the approach or departure RPZs for Runway 12R-30L.

2.1.5.1.2 RUNWAY 12L-30R

Runway 12L-30R is the primary arrival runway with a length of 9,012 feet and width of 150 feet. This runway is intended to conform to design standards associated with AAC-D and ADG-V; for an ARC of D-V. This runway is located to the northeast of the airport terminal complex.

When the airfield is operating in a Northwest Flow, Runway 12L-30R is used extensively for arrivals and in Southeast Flow Runway 12L is used for departures. The pavement is constructed to a load bearing capacity for landing gear configurations of 75,000 pounds SW, 200,000 DWL, 350,000 pounds DT, and 760,000 pounds DDT.[7] Runway 12L-30R is constructed of concrete with a grooved surface and has a maximum grade change of 1.5 percent.

<u>Runway 12L-30R RSA</u> – Based on FAA ARC D-V requirements, Runway 12L-30R should have a RSA of 500 feet in width and extend 1,000 feet beyond each runway end. The length of the RSA for Runway 30R is 1,000 feet and conforms to requirements. The RSA for Runway 12L is deficient due to the location of the localizer within 1,000 feet of the end of pavement. The length of the RSA for 12L is 935 feet. Both RSA's on Runway 12L-30R maintain a standard RSA width of 500 feet.

<u>Runway 12L-30R ROFA</u> – The width of the ROFA is 800 feet (centered on the runway centerline, 400 feet on either side of the centerline). The length of the ROFA for Runway 12L is 935 feet beyond the runway end and for Runway 30R the ROFA is 1,000 feet beyond the runway end. According to the FAA requirements, the ROFA should extend beyond the runway end by a distance equal to the RSA, which for Runway 12L-30R is 1,000 feet. The length of the ROFA for Runway 12L does not conform to FAA requirements.

<u>Runway 12L-30R RPZ</u> – Both of the approach RPZs are the same size and reflect the full instrument approach capability available on both ends of the runway. The approach RPZs begin 200 feet beyond the runway thresholds and are 1,000 feet wide at this point, and are centered on the runway centerline. Both approach RPZs extend outward 2,500 feet along the extended runway centerline and are

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7 www.airnav.com/airport/KSTL

1,750 feet in width at the outer edge of the RPZ. The Runway 12L end also has a departure RPZ due to the location of the Runway 30R Localizer. The departure RPZ for Runway 30R begins 135 feet (200 feet–65 feet=135 feet) beyond the runway threshold and the dimensions for each are a function of the AAC. Runway 30R serves AAC C and D aircraft so the departure RPZ has an inner width of 500 feet, an outer width of 1,010 feet, and a length of 1,700 feet.

Each approach RPZ encompasses a total area of 78.9 acres. The airport owns all 78.9 acres in the Runway 12L approach RPZ. The airport owns approximately 47.3 acres of the Runway 30R approach RPZ; the other 31.6 acres is owned by the county and state. The central portion of Taxiway V and a small portion of the northwest end of Taxiway E lie within the Runway 12L approach RPZ; however, the area encompassed does not create any significant operational issues for the use of these two taxiways. The Runway 30R approach RPZ extends over McDonnell Boulevard and Interstate 170.

2.1.5.1.3 RUNWAY 11-29

Runway 11-29 is oriented in a northwest/southeast alignment and is located northwest of the terminal complex. Runway 11-29 is 9,000 feet in length, 150 feet in width, and is intended to conform to the design standards associated with AAC-D and ADG-V; for an ARC of D-V. The blast pads for Runway 11-29 are 220 feet wide by 400 feet in length off each runway end.

Runway 11-29 has an effective gradient of 0.7 percent over its length and a maximum grade change of 0.8 percent. The runway is constructed of concrete; the surface is grooved and has a load bearing capacity of 75,000 pounds SW and 200,000 pounds DW, 325,000 pounds DT, and 700,000 pounds DDT. Based on the analyses contained in the *2007 Pavement Management Study*, the condition of Runway 11-29 pavement has a rating of "excellent," stemming from a PCI value of 85 to 100 for the entire runway.

Runway 11-29 RSA – The RSAs fully comply with the RSA requirements providing an RSA that measures 500 feet in width (centered on the runway centerline; 250 feet on either side of the centerline) and 1,000 feet beyond each runway end is required.

Runway 11-29 ROFA – The ROFA for Runway 11-29 is 800 feet in width (centered on the runway centerline; 400 feet on either side of the centerline) and extends beyond each runway end a distance equal to that of the RSA. Both runway ends for Runway 11-29 maintain a standard length of 1,000 feet beyond the runway end.

Runway 11-29 RPZ – The RPZs for Runway 11-29 are of different sizes due to the different minimums at each runway end. The RPZ for Runway 11 begins 200 feet beyond the runway end and is centered on the runway centerline, and is 1,000 feet wide at this point. The RPZ extends out 2,500 feet along the extended runway centerline and at its termination point is 1,750 feet wide and encompasses an area of 78.9 acres. The Runway 11 RPZ overlies a small area of Interstate 270, as well as Grundy Drive and Selwyn Lane. The majority of the Runway 11 RPZ is located within the existing Airport property (with the exception of 2.4 acres on the northwest side). The RPZ for Runway 29 begins 200 feet beyond the runway end and is centered on the runway centerline, and is 1,000 feet wide at this point. The RPZ extends out 1,700 feet along the extended runway centerline and at its termination point is 1,510 feet in width and encompasses an area of 49.0acres, of which the airport owns 47.2 of those acres. The Runway 29 RPZ overlies Runway end 6, the southwest portion of Taxiway S, the apron adjacent to the American Airlines maintenance office/shop, and portions of the Cell Phone Lot. The RPZ also extends over the right-of-ways of Interstate 70 and Lambert International Boulevard. The majority of the Runway 29 RPZ is located within the existing STL property boundary.

2.1.5.1.4 RUNWAY 6-24

Runway 6-24 is oriented along a southwest/northeast alignment and is located northwest of the terminal complex. Runway 6-24 is 7,602 feet in length, 150 feet in width, and is intended to conform to design standards associated with AAC-D and ADG-IV; for an ARC of D-IV. As the crosswind runway, Runway 6-24 does not experience a significant degree of use when compared to the other three runways, but provides the ability to accommodate air carrier aircraft.

The Runway 6-24 blast pads, at 200 feet wide by 100 feet in length, do not meet ARC D-IV design standards. For runways designed for ARC D-IV, a blast pad of 200 feet wide by 200 feet in length is typically required off each runway end.

Runway 6-24 is constructed of concrete with a grooved surface treatment and has a load bearing capacity for landing gear configurations of 75,000 pounds SW, 176,000 pounds DW, 280,000 pounds DT, and 660,000 pounds DDT. The runway has a maximum grade change of 0.9 percent, and has no identified line-of-sight violations.

<u>Runway 6-24 RSA</u> – Based on FAA requirements for ARC D-IV, Runway 6-24 should have a RSA 500 feet in width and extend 1,000 feet beyond each runway end. The length of the RSA for Runway 24 is 746 feet; it does not conform to the requirements. The RSA for the Runway 6 end is compliant with FAA standards listed above.

<u>Runway 6-24 ROFA</u> – The ROFA for Runway 6-24 is 800 feet in width (centered on the runway centerline; 400 feet either side of the centerline) and should extend beyond each runway end a distance equal to that required of the RSA, which in this case is 1,000 feet. The length of the ROFA for Runway 24 is 746 feet and does not conform to the requirements of ARC D-IV. The length of the ROFA on Runway 6 conforms to FAA standards.

<u>Runway 6-24 RPZ</u> – The RPZs for Runway 6-24 are of different size reflecting the difference in visibility minimums to each runway end. The RPZ for Runway 6 begins 200 feet beyond the runway end, is centered on the runway centerline, and is 1,000 feet wide at this point. The RPZ extends out 2,500 feet along the extended runway centerline and at its termination point is 1,750 feet in width and

encompasses an area of 78.9 acres. The Runway 6 RPZ is almost entirely contained within the existing Airport property. A small section of the RPZ extends over Runway end 29, the Interstate 70 right-of-way, and portions of the Super Park C and Super Park D Lot.

The approach RPZ for Runway 24 begins 200 feet beyond the existing runway end, is centered on the runway centerline, and is 1,000 feet wide at this point. The approach RPZ extends outward 1,700 feet along the extended runway centerline and is 1,510 feet in width at the outer edge of the RPZ. The majority of the Runway 24 approach RPZ is located within the existing STL property boundary. The RPZ extends over the right-of-way of Banshee Road, McDonnell Boulevard, and the Norfolk Southern rail line. The Runway 24 end also has a departure RPZ due to the location of the Runway 6 Localizer. The departure RPZ for Runway 6 begins 54 feet (254 feet–200 feet=54 feet) prior to the runway threshold and the dimensions for each are a function of the AAC. Runway 6 serves AAC C and D aircraft so the departure RPZ has an inner width of 500 feet, an outer width of 1,010 feet, and a length of 1,700 feet.

2.1.5.2 Taxiways

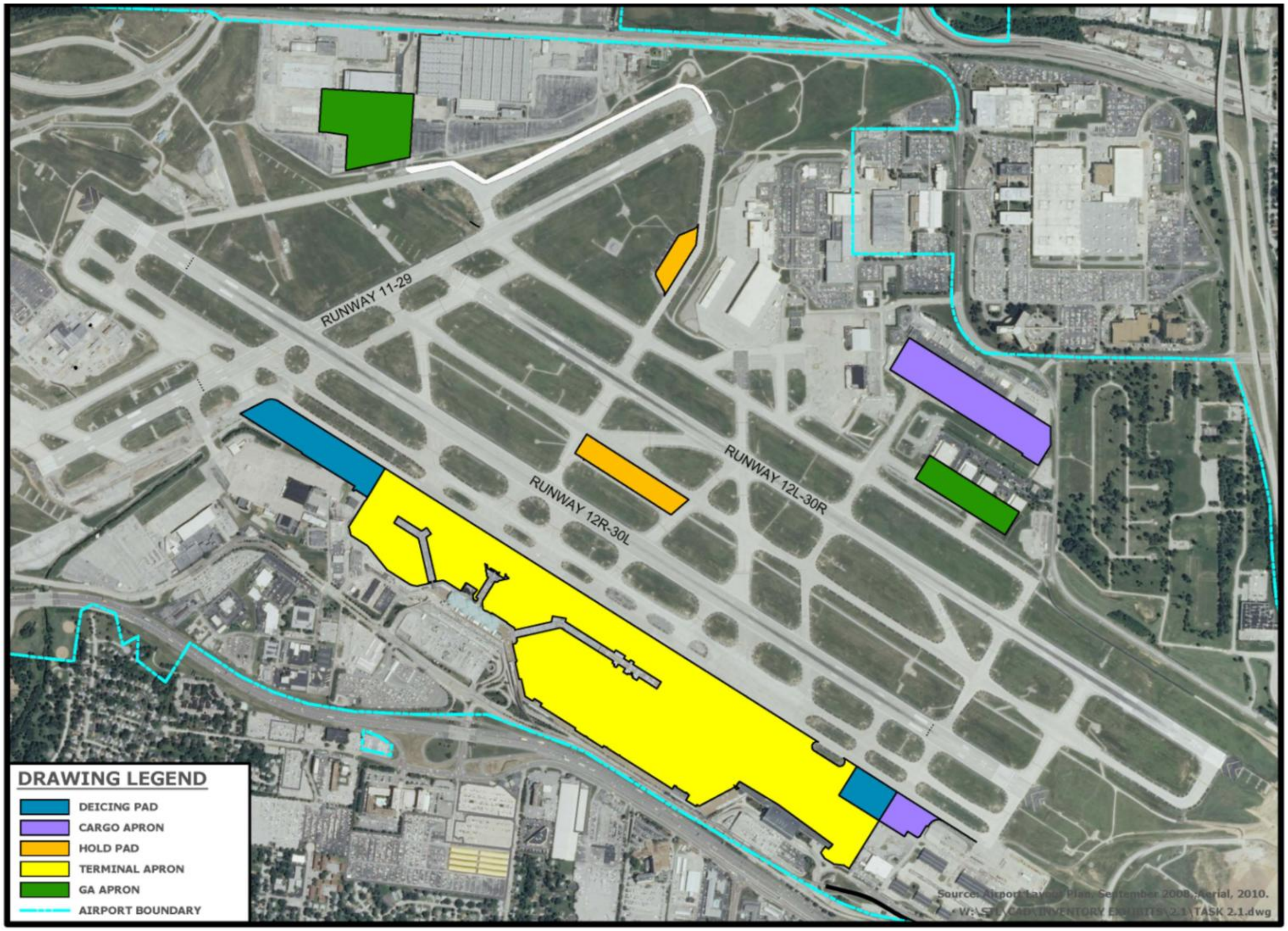
The taxiway system provides aircraft access among the four runways, the passenger terminal complex, general aviation areas, air cargo facilities, and other aircraft parking/service areas. All of the taxiways are a minimum of 75 feet wide. Three of the four runways provide at least one full-length parallel taxiway with multiple exit locations, and in a couple instances, these runways have dual parallel taxiways along a portion of the runway. The configuration of the taxiway system is depicted on Exhibit 2.1-2.

As of December 2011, Taxiway Victor is being evaluated as a potential End Around Taxiway (EAT). The taxiway is marked to hold aircraft out of the approach to Runway 12L. For departures in the opposite direction, the FAA has expressed concern that departing aircraft might perceive aircraft on Taxiway V as occupying the runway. No determination has been made (as of December 2011) and there may be potential operating restrictions on Taxiway Victor that will affect operations in the vicinity, including aircraft using the Northern Tract Development Site.

2.1.6 AIRFIELD APRONS AND PARKING RAMPS

Exhibit 2.1-7, *Apron Area Classifications*, depicts the location of the different apron areas found on the airfield. The areas are classified as cargo aprons, deicing pads, holdpads, terminal apron areas, and general aviation apron areas. A detailed discussion of each apron area is found within the respective facility's section of this document.

Exhibit 2.1-7
APRON AREA CLASSIFICATIONS
Lambert-St. Louis International Airport



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2.1.7 PAVEMENT CONDITIONS

As part of its Pavement Management Program, Lambert Airport conducts regular inspections of airfield pavements with the assistance of a consulting engineer. The pavement areas are ranked on a 100-point scale based on condition and serviceability as follows:

- 86-100 Excellent
- 71-85 Very Good
- 56-70 Good
- 41-55 Fair
- 26-40 Poor
- 11-25 Very Poor
- 0-10 Failed

The majority of pavements on the airfield are identified as Very Good or Excellent and no pavement areas are identified as Failed or Very Poor. One section of Runway 12R-30L at the 12R approach end is identified as Fair and is included in a future pavement rehabilitation project that extends from the 12R approach end to Taxiway Echo. Two sections of Taxiway Delta are identified as Good including the section from Taxiway Sierra to Taxiway Romeo, scheduled for reconstruction in FY 2012, and the section between Taxiway Kilo and Taxiway Juliet, scheduled for reconstruction in FY 2012. Taxiway Echo also contains several sections of pavement identified as Good. The section of Taxiway Echo from Taxiway Lima to Taxiway Juliet is scheduled for reconstruction in FY 2011 and the section from Taxiway Papa to Taxiway Lima is scheduled for reconstruction in FY2012. The final section of Taxiway Echo pavement scheduled for reconstruction includes the length from Taxiway Papa to Runway 6-24.

2.1.8 AIRPORT LIGHTING

Airfield lighting is essential for the safe and efficient movement of aircraft on the various components of the runway, taxiway, and ramp surfaces. Several types of airfield lighting are in service at STL and each provides for a different need and has a different purpose, as described in the following sections.

2.1.8.1 Airport Rotating Beacon

Airports routinely use a rotating beacon to aid in identifying the general location of the airfield at night, particularly for airports located in, or adjacent to urban areas where lights from other sources can make the identification of an airport difficult. The rotating beacon at STL is equipped with an optical system that projects two beams of light, one green and one white, 180 degrees apart, and is visible miles from the airport. This beacon is located east of the Signature FBO north of Runway 12L-30R.

2.1.8.2 Runway End Identifier Lights

Runway End Identifier Lights (REILs) provide additional delineation of the runway threshold location and are particularly beneficial in areas where significant background lighting can make the identification of an airport difficult at night. REILs also identify runways having a lack of contrast with surrounding terrain or for the identification of runway ends during periods of reduced visibility. REILs consist of a pair of synchronized flashing lights, often referred to as strobes, each located laterally on the side of the runway threshold to provide additional delineation. The ends of Runway 12L and Runway 30L are equipped with REIL and are being considered for decommissioning in FY 2012.

2.1.8.3 Approach Lighting

Approach Lighting Systems (ALS) are used in the vicinity of runway thresholds in conjunction with electronic navigational aids for the final portion of Instrument Landing System (ILS) approaches under Instrument Flight Rule (IFR) conditions, and as visual guides for nighttime approaches under Visual Flight Rule (VFR) conditions. These systems provide the basic means to transition from instrument flight to visual flight for landing. The approach lighting system supplies the pilot with visual cues concerning aircraft alignment, roll, height, and position relative to the runway threshold. ALS is typically situated atop a series of towers that extend along the extended runway centerline.

All eight runway ends at STL are equipped with some form of ALS in support of an instrument approach capability. There is a MALS on the approach end of Runway 24; a MALSR on the approach end of Runway 6, Runway 12R, and Runway 30L. STL has an Approach Lighting System with Sequenced Flashing Lights (ALSF-II) on the approach to Runway 11, Runway 12L and Runway 30R supporting the CAT II and CAT III approach capability on these runways. Runway 29 has an ALSF-II Approach Lighting System, but the runway does not have a published CAT II approach **Table 2.1-4, *Approach Light System (ALS) by Runway End*** identifies the type of ALS associated with each runway end at STL.

Table 2.1-4
APPROACH LIGHT SYSTEM (ALS) BY RUNWAY END
Lambert-St. Louis International Airport

RUNWAY END	ALS TYPE	ALS LENGTH
6	MALSR	1,400 feet
24	MALS	1,400 feet
11	ALSF-II	2,400 feet
29	ALSF-II	2,400 feet
12L	ALSF-II	2,400 feet
30R	ALSF-II	2,400 feet
12R	MALSR	1,400 feet
30L	MALSR	1,400 feet

Source: Airnav.com, March 2011.

2.1.8.4 Visual Approach Descent Indicators

Visual Approach Descent Indicators (VADI) is a generic reference to several systems used by airports to provide pilots with a visual reference of their relative vertical position along an approach to a runway during night operations. At STL, the visual descent information is provided by a Precision Approach Path Indicator (PAPI). **Table 2.1-5, *Visual Approach Descent Indicators at STL*** summarizes the VADI associated with each runway end at STL.

Table 2.1-5
VISUAL APPROACH DESCENT INDICATORS AT STL
Lambert-St. Louis International Airport

RUNWAY END	TYPE OF INDICATOR	CONFIGURATION
6	PAPI	4 lights
24	PAPI	4 lights
11	PAPI	4 lights
29	PAPI	4 lights
12L	PAPI	4 lights
30R	PAPI	4 lights
12R	PAPI	4 lights
30L	PAPI	4 lights

Source: Airnav.com, November 24, 2008.

PAPIs are installed in a single row of two or four lights that project a red and white beam. These lights are visible from a distance of three to five miles during daylight conditions and up to 20 miles or more at night. These systems provide visual guidance to pilots during approach to landing typically by radiating a directional pattern of high intensity red and white focused light beams that indicate whether a pilot is on the approach path. If the pilot sees red/white lights, the aircraft is on the approach path; if the pilot sees white/white lights, the aircraft is flying above the approach path; and if the pilot sees red/red lights, the aircraft is flying below the approach path. The PAPI system is typically positioned on the left side of the runway relative to the pilot's perspective.

2.1.8.5 Runway Edge and Centerline Lighting

Runway edge lighting is used to outline the edges of a runway during periods of darkness or restricted visibility. Runway lighting is classified by the intensity/ brightness of the light system. These classifications are High Intensity Runway Lights (HIRL), Medium Intensity Runway Lights, (MIRL), and Low Intensity Runway Lights (LIRL).

Runway edge lights are generally white and visible for 360 degrees. For runways with instrument landing capability, the lenses covering the runway lights are white except for the final 2,000 feet of each runway end or half the runway length of an instrument runway, whichever is less. The lenses covering the lights within the aforementioned portions of the runway are half yellow and half white to establish a caution zone for landing aircraft, providing a visual reference to the pilot that the landing aircraft is nearing the end of pavement. At STL, Runway 6-24 is equipped with MIRL edge lighting; Runway 11-29, Runway 12R-30L, and Runway 12L-30R are equipped with HIRL edge lighting.

Centerline lighting in conjunction with the Touchdown Zone (TDZ) lighting better identifies the runway environment at night and during poor visibility conditions. The color scheme of centerline lights in conjunction with runway edge lights provide visual cues to the pilot that the aircraft is approaching the end of the runway. The centerline lighting changes from a path of solid white centerline lighting to alternating red and white lighting beginning 3,000 feet from the rollout end of the runway and changing to red centerline lighting along the final 1,000 feet of runway.

Centerline lights are installed at 50-foot intervals along the length of a runway. Only three of the four runways at STL are equipped with centerline lights – Runway 11-29, Runway 12L-30R, and Runway 12R-30L.

TDZ lights are located 100 feet from the landing threshold and extending 3,000 feet down the runway from the landing threshold. TDZ lights consist of two rows of steady burning white lights situated on transverse light bars installed symmetrically about the runway centerline. Similar to centerline lights, TDZ lighting is not typically provided for every runway. At STL, TDZ lighting has been installed to support landing operations on Runway 11-29, Runway 12L-30R, and the end of Runway 12R. Runway 6-24 and the end of Runway 30L are not equipped with either runway centerline or TDZ lighting.

2.1.8.6 Threshold Lights

The threshold lights are located on a line perpendicular to the extended centerline at each end of each runway at STL and define the longitudinal limits of the useable runway. There are three to four threshold lights on each side from the runway centerline depending on the type of runway edge lighting system being used. The threshold lights emit green light towards the approach area while the runway end lights emit red light towards the runway.

2.1.8.7 Taxiway Lighting

Taxiway lighting, which delineates the taxiway edges and/or centerline, provides guidance to pilots during periods of low visibility and at night. The most commonly used type of taxiway edge lighting at airports in the U.S. consists of a series of elevated blue fixtures generally located at two hundred-foot intervals along the taxiway edges. The distance between taxiway lights decreases in the vicinity of taxiway exits. Elevated lights are employed along most of the taxiway system at STL. Centerline lighting is also used at taxiway intersections as noted below. Those taxiways that extend along the edge of an airport parking apron, such as portions of Taxiways C and E are not delineated with taxiway edge lights.

Pavement centerline lights function similarly to runway centerline lights. These lights omit green light and alternate from green to yellow on runway exits to inform the pilot that the aircraft is in a runway critical area. The majority of taxiway centerline lights at STL are located on the periphery of the apron/terminal area.

2.1.8.8 Runway Guard Lighting

In addition to taxiway centerline and edge lighting, both elevated and in pavement runway guard lighting has been installed to delineate runway hold positions on the airfield. Elevated runway guard lights, consisting of two yellow flashing lights, are typically referred to as wig-wags. These lights are typically located on both sides of a taxiway that provides access to an active runway.

In-pavement runway guard lights consist of a row of in pavement yellow flashing lights that are installed across the width of a taxiway providing access to an active runway.

2.1.8.9 Lighted Wind Cones

In accordance with FAA Advisory Circular (AC) 150/5345-27C, current edition, lighted wind direction indicators (cones) are located near the approach ends of all STL runways to provide wind direction information visually to the pilot while on final approach and prior to takeoff.

2.1.9 NAVIGATIONAL AIDS (NAVAIDS)

Navigational Aids (NAVAIDs) refer to both electronic and visual devices that assist the pilot in flight and during the visual segment of landing procedures. The existing runway markings, lights, and NAVAIDs are listed in **Table 2.1-7, *Runway Visual and Navigational Aids***. There are 24 published instrument approach procedures for STL that use these NAVAIDs (*see* **Table 2.1-6, *Instrument Approach Procedures***).

Table 2.1-6
INSTRUMENT APPROACH PROCEDURES
Lambert-St. Louis International Airport

RUNWAY	6	24	11	29	12L	30R	12R	30L
Area Navigation (RNAV) GPS	X	X	X	X	X	X	X	X
ILS Category I	X	X	X	X	X	X	X	X
ILS Category II			X		X	X		
ILS Category III			X		X	X		
ILS Precision Runway Monitoring (PRM) Simultaneous Close Parallel								X
ILS Precision Runway Monitoring (PRM) Category II Simultaneous Close Parallel					X	X		X
ILS Precision Runway Monitoring (PRM) Category III Simultaneous Close Parallel					X	X		X
TACAN							X	X
LDA/DME								X
Simultaneous Close Parallel LDA DME								

Source: FAA Digital – Terminal Procedures Publication (*d-TTP*), 2011.

Table 2.1-7
RUNWAY VISUAL AND NAVIGATIONAL AIDS
Lambert-St. Louis International Airport

RUNWAY	06	24	11	29	12L	30R	12R	30L
Runway Airport Reference Code	D-IV		D-V		D-V		D-V	
Runway Marking Instrumentation	Precision		Precision		Precision		Precision	
Lighting (Visual Aids)	HIRL, MALSR, PAPI-4	HIRL, MALS, PAPI-4	HIRL, CL, ALSF2, TDZL, PAPI-4	HIRL, CL, ALSF2, TDZL, PAPI-4	HIRL, CL, ALSF2, TDZL, PAPI-4, REIL	HIRL, CL, ALSF2, TDZL, PAPI-4	HIRL, CL, MASLR, TDZL, PAPI-4	HIRL, CL, MALSR, PAPI-4, REIL
Navigation Aids (Instrument Approaches)	VOR, ILS, LOC, GS, RNAV, PRM, RVR, DME, ASR, ASDE	VOR, ILS, LOC, GS, MM, OM, PRM, RVR, RNAV, DME, ASR, ASDE	VOR, ILS, LOC, GS, IM, RVR, PRM, RNAV, DME, ASR, ASDE	VOR, ILS, LOC, GS, IM, RVR, PRM, DME, RNAV, ASR, ASDE	VOR, ILS, LOC, GS, MM, IN, ASR, RVR, DME, PRM, RNAV, ASR, ASDE	VOR, ILS, LOC, GS, OM, MM, IM, RNAV, RVR, DME, PRM, ASR, ASDE	VOR, ILS, LOC, GS, OM, MM, RVR, RNAV, LDA/ DME, ASR, ASDE, PRM, TACAN	VOR, ILS, LOC, GS, OM, MM, RVR, RNAV, LDA/PRM LDA/DME, ASR, ASDE, PRM TACAN

Notes: ALSF 2 = High Intensity Approach Lighting System with Centerline Sequenced Flashers
ASDE = Airport Surface Detection Equipment
ASR = Air Surveillance Radar
CL = Centerline Lights
DME = Distance Measuring Equipment
GS = Glide Slope
HIRL = High Intensity Runway Lights
ILS = Instrument Landing System
IM = Inner Marker
LDA = Localizer-Type Directional Aid
LOC = Localizer
MALS = Medium Intensity Approach Light System
MALSR = Medium Intensity Approach Light System with Runway Alignment Indicator Lights
MM = Middle Marker
OM = Outer Marker
PAPI = Precision Approach Path Indicator
PRM = Precision Runway Monitor
REIL = Runway End Identifier Lights
RNAV = Area Navigation
RVR = Runway Visual Range
TACAN = Tactical Area Navigation System
TDZL = Touchdown Zone Lighting
VOR = Very High Frequency Omni-directional Range

Source: FAA digital Airport Facility Directory (*d-AFD*) 2011.

2.1.9.1 Instrument Landing System (ILS)

An Instrument Landing System (ILS) is comprised of three components: the approach lighting system (ALS), an electronic localizer (LOC), and a glide slope (GS) facility. The LOC antenna provides azimuth steering information to the pilot for aircraft position laterally, relative to the runway centerline. In short, the LOC provides an electronic beam that provides the pilot with an indication of whether aircraft alignment is to the left or right of the appropriate course to the runway threshold. The LOC is installed at the far end of the landing threshold.

To provide the pilot with the required information regarding the aircraft's vertical position relative to the runway threshold and the approach slope to the runway, each runway end is equipped with a glide slope antennae and support facilities. The GS antennae are located along the side of the runway, approximately 1,000 feet from the landing threshold. The GS provides electronic approach path steering information to the pilot so the proper approach slope and consequent rate of descent to the touchdown point on the runway can be maintained.

All the approaches to STL are precision approaches and have an ILS installed.

Marker beacons – Outer (OM), Middle (MM), and Inner (IN) – are often a part of an ILS approach. Beacons are installed along the approach path and alert the pilot to the aircraft status on the ILS path. The OM is positioned at the point where aircraft are able to intercept the glide path at a certain altitude. The MM is located approximately 2,700 feet from the landing threshold, indicating 200 feet above the landing threshold. On CAT II ILS procedures, an Inner Marker (IM) may be installed to alert the pilot of the decision height on the approach to the runway. Table 2.1-7 details the marker beacons by runway end at STL.

2.1.9.2 Air Surveillance Radar (ASR)

Air Surveillance Radar (ASR) is utilized at airport facilities to monitor aircraft movement in the air. The radar scans through 360 degrees of azimuth and aids air traffic controllers with directing traffic. STL's ASR facility is located south of the Runway 11-29 adjacent to a residential subdivision off Fee Fee Road.

2.1.9.3 Very High Frequency Omnidirectional Radio Range (VOR) and Distance Measuring Equipment (DME)

The STL Very High Frequency Omnidirectional Radio Range (VOR) facility (named CARDINAL VOR/DME) is located on the airfield, northeast of the convergence of Runways 6-24, and 12L-30R. This facility is used to both provide and support approach capabilities at STL. The VOR is also used for terminal and enroute navigation purposes. The STL VOR is also equipped with Distance Measuring Equipment (DME). This allows the pilot to determine the distance of the aircraft to or from the VOR as the various radials are flown.

2.1.9.4 Runway Visual Range (RVR)

Runway Visual Range (RVR) refers to the distance of visible runway; it is used to ensure safe landings at an airport. Equipment used to calculate RVR consists of transmitters and receivers placed on 14-foot towers spaced 250 feet apart. A transmitter omits a gauged intensity of light toward the receiver, which is then calculated into an RVR value. Fog, rain, or snow impact the intensity of light omitted from the transmitter to receiver, lowering the RVR value. Minimum RVR values are established in order to maintain safe landing procedures at airport facilities. RVR facilities are located on the existing airfield to provide for the following areas and operational activities at STL:

- Approach Runway 6 - Rollout Runway 6 and Touchdown Runway Zone
- Approach Runway 11 - Rollout Runway 11 and Touchdown Runway Zone
- Approach Runway 12L - Rollout Runway 12L and Touchdown Runway Zone
- Approach Runway 12R - Rollout Runway 12R and Touchdown Runway Zone
- Approach Runway 24 - Rollout Runway 24 and Touchdown Runway Zone
- Approach Runway 29 - Rollout Runway 29 and Touchdown Runway Zone
- Approach Runway 30L - Rollout Runway 30L and Touchdown Runway Zone
- Approach Runway 30R - Rollout Runway 30R and Touchdown Runway Zone
- Midfield Runways 12L-30R and 11-29

2.1.9.5 Area Navigation (RNAV)

Area Navigation (RNAV) can be defined as a method of navigation that allows aircraft to travel any desired course within an envelope of an established navigational system. RNAV systems are designed to facilitate an efficient use of airspace by channeling aircraft from origin to destination using various NAVAIDs. The resulting affect of RNAV procedures is evident in the saving of time, fuel, and Air Traffic Control contact time.

2.1.10 AIRFIELD SIGNAGE

Airport signage provides essential guidance information that is useful to the pilot during all phases of movement on the airfield. STL is equipped with an array of lighted airfield signage. These include the six types of signs delineated below:

1. Mandatory instruction signs have a red background with white lettering and are used to identify an entrance to a runway or airfield critical area, or areas where an aircraft is prohibited from entering. These include runway holding position signs, ILS critical area signs, and no entry signs. Mandatory instruction signs are used at STL to identify taxiway/runway intersections and runway/runway intersections. The taxiway/runway intersection signs are used with holding position markings and are co-located with these markings. The signs are generally installed on the left side of the hold line as it is viewed from the holding side. At locations where it is

impractical to install the sign on the left side, the sign is installed on the right side. Where the hold line is over 150 feet long, signs are installed on both ends of the hold line. Runway/runway intersection signs are used on Runway 6-24 at the Runway 12L-30R intersection. All of these signs are lighted and have white legends and red background.

2. Location signs are used to identify a runway or a taxiway on which the aircraft is situated, while other location signs are used to assist the pilot in determining when the aircraft has exited a particular area. These signs generally have either a black background with yellow lettering or a yellow background with black lettering. These signs include taxiway location signs, runway location signs, and ILS critical area boundary signs. Location signs are used at STL to identify the taxiway or runway upon which the aircraft is located. All of these signs are lighted. They have yellow inscriptions on a black background with a yellow border and do not contain arrows.
3. Direction signs are used at STL to indicate directions of other taxiways leading out of taxiway intersections. All of these signs are lighted. They have black lettering on a yellow background and always contain arrows. The arrows are oriented to approximate the direction of turn.
4. Destination signs also have a yellow background with black inscription and always include an arrow, showing the direction of the taxi route to specified destinations on the airport. Typical destinations normally referenced will include the terminal ramp, general aviation area, or air cargo areas.
5. Information signs have a yellow background with black lettering and are used to provide information on such items as radio frequencies and noise abatement procedures. The airport sponsor determines the location, need, and size of these signs. All destination signs used at STL are lighted.
6. Runway distance-remaining signs have a black background with white numbering and are normally found along the left hand side of the runway alignment. The number on the sign indicates the distance (in thousands of feet) of the remaining runway length. All four of the runways at STL are equipped with distance-remaining signs.

The location of all holding position markings/signs for runway/taxiway intersections at STL meets or exceeds the perpendicular distances from runway centerline specified in FAA AC 150/5340-1, as amended. Runway holding position markings are located 282 feet from the runway centerline for all runways.

2.1.11 AIRFIELD PAVEMENT MARKINGS

Airfield pavement markings assist pilots during landings, takeoffs, and taxiing on the airfield. These markings adhere to the recommended standards set forth by the FAA to ensure safety and efficiency while aircraft negotiate the airfield. Markings found on an airfield can be categorized as runway markings, taxiway markings, hold position markings, and other markings. Runway markings are painted white while all other markings found on taxiways, such as centerline striping, hold positions, edge markings, and shoulder markings are painted yellow.

Different marking types and colors provide an easily recognizable system of information to assist in ensuring a pilot's situational awareness on the airfield. A discussion of the STL airfield pavement markings is provided in the following section.

2.1.11.1 Runway Markings

The runways at STL meet or exceed the FAA standards as recommended and defined in FAA AC 150/5340-1, Marking of Paved Areas on Airports. Runway markings at STL consist of the following:

- Designators (white) – Numbers that are sometimes supplemented with the letters L for Left, R for Right, or C for center that identify the runway. The runway number generally designates the compass orientation in degrees of the particular runway heading. For example, the designation Runway 15R indicates the runway is generally oriented along a 150-degree heading and that the runway is the parallel runway on the right when on approach.
- Centerline Marking (white) – Identifies the center of the runway to aid in aligning aircraft on departures and arrivals, and consists of uniformly spaced stripes and gaps.
- Aiming Point Marking (white) – Serves as a visual aid for aiming during a landing procedure. The aiming point markings consist of a broad white stripe located on each side of the centerline, approximately 1,000 feet from the landing threshold.
- Touchdown Zone (TDZ) Marking (white) – Visually identifies the TDZ and consists of groups of one, two, and three rectangular bars arranged in pairs on either side of the runway centerline, and are coded to provide distance information in 500-foot intervals.
- Side Stripe Marking – Identifies the edges of the runway and consists of a solid white line along both sides of the active runway pavement.
- Threshold Markings (white) – Aids in identifying the beginning of the runway that is available and suitable for landing.
- Demarcation Bar (yellow) – Separates the blast pad, taxiway, or stopway from the runway, when a displaced or relocated threshold is in place such as is the case on the Runway 10 and Runway 28 ends.
- Chevrons (yellow) – Identifies pavement, usually aligned with the runway and off the runway ends, which is not intended for normal operational use by aircraft conducting landings or takeoffs.
- Threshold Bar (white) – Indicates the beginning of the portion of the runway suitable for landing.
- Displaced Threshold Markings (white) – A set of arrows pointing in the direction of the displaced threshold, ending at the threshold bar.

Runways 6-24, 11-29, 12L-30R and 12R-30L are all precision instrument runways and are marked with runway designation, threshold, TDZ, centerline, fixed distance, and side stripe markings. The thresholds of Runway 12R-30L are displaced 467 feet and 201 feet respectively, and these displaced thresholds have the appropriate displaced threshold markings, consisting of painted arrows leading to the threshold bar, are in place. Runway 6-24, Runway 11-29, and Runway 12L-30R markings include a threshold bar to delineate the threshold of the runway.

Airports with converging runway configurations must mark the runways according to precedence, driven by the runway's level of precision. Because Runway 12R-30L is a Category II/III precision instrument runway, it has a higher precedence over Runway 6-24. The markings for Runway 12R-30L continue through the runway intersection uninterrupted by the other converging runway.

2.1.11.2 Taxiway Markings

Taxiway markings assist the pilot in the same manner as runway markings. These markings ensure that the pilot has the necessary information to safely negotiate the airfield. Taxiway markings specific to STL consist of the following:

- Centerline markings
- Hold position markings
- Taxiway edge markings
- Surface painted signs

Taxiways at STL all have yellow centerline markings, a minimum of six inches in width. All centerlines that lead into or cross runways are interrupted by runway hold position markings placed perpendicular to the taxiway centerline. These markings are used to inform the pilot to hold short of the runway and contact the Air Traffic Control Tower for clearance to either cross or enter the runway. Runway holding position markings are located 219 feet from the runway centerline for all runways.

ILS hold positions consist of two solid yellow lines spaced two feet apart, connected by sets of two perpendicular solid yellow lines running the length of the pavement. These markings function in the same way as runway hold positions, and require ATC clearance prior to aircraft movement past the ILS hold position.

Taxiway edge markings are used on the STL airfield in areas where pavement is not intended for aircraft traffic and the edges of the taxiway. Edge markings are either continuous or dashed double yellow lines, spaced six inches apart, delineating the appropriate amount of pavement suitable for aircraft movement.

Other markings found on the airfield consist of surfaced-painted signs that provide information to the pilot while taxiing the aircraft. Painted directional and location signs are provided when it is not possible to place a lighted sign on the airfield, or to enhance the airfield signage system. These signs are placed in close proximity to the centerline to ensure maximum pilot visibility.

2.2 PASSENGER TERMINAL AND GATES

2.2.1 TERMINAL FACILITIES

Lambert-St. Louis International Airport (STL) has two passenger terminals with scheduled airline service. Terminal 1 has 73 gates at full capacity and Terminal 2 has 16 gates at full capacity[8]. Three gates of Terminal 2 can be used for international arrivals activity as shown in **Exhibit 2.2-1, *2010 Terminal Area Gate Layout***. Terminal 1 opened in 1956 and was expanded incrementally. Today it consists of the processing building with four radiating concourses (A, B, C and D). Terminal 2 and Concourse E opened in 1998. In December 2009, STL announced the planned renaming of the terminals as part of the $1.2 million Wayfinding Signage Project[9]. Terminal 1 was formerly known as the Main Terminal and Terminal 2 was the East Terminal.

Connectivity between terminal buildings is limited at STL. A 12-gate section of Concourse D (D12 thru E40) was closed at the end of 2008, and as a result there is no connectivity for pedestrians between the existing terminals other than by an airport shuttle service, which stops at each terminal. This is not an issue as passenger connections between the two terminals are minimal if any. The boarding level of Concourse B was completely closed at the end of May 2010 and as a result Air Tran was relocated to Concourse C Gates C18 and C24[10]. As of August 1st 2010 the remaining gates on Concourse D were closed and Cape Air was relocated from Gates D8 and D10 to Concourse C Gate C7. Frontier and Midwest were relocated from Concourse D Gates D4 and D6 to Concourse C Gates C23 and C21 respectively. On June 17, 2010 Alaska Airlines announced service to STL in the fall with one daily round trip flight to Seattle utilizing B737 aircraft[11]. Alaska operates out of Delta's gate A10.

In 2006, STL completed the *Airport Experience Program* conceptual plan and in 2008, the program was implemented; it will continue over several years with projects to improve and upgrade existing facilities and passenger experience in Terminal 1. The first phase of projects completed under this program include the Dome Resurfacing to improve sound absorption and lighting, Flight Information Display System (FIDS), improved concessions and retail space, In-Bound Baggage Claim to improve the reliability and efficiency of the baggage claim process as well as improving existing sight lines throughout the claim area, and Wayfinding and Signage to improve airport navigation. In the fall of 2010 phase two was initiated with projects including an In-Line EDS system to improve baggage screening processing, additional concessions and retail space, and renovations to Concourses A and C including new surface treatments, restroom improvements, and lighting.

8 Terminal 2 gate E2 currently has no jetway and is not accessible yielding a total gate count of 88 capable gates
9 http://www.flystl.com/flystl/media-newsroom/news-release/12-2-09.pdf
10 Per STL Planning staff
11 http://www.flystl.com/flystl/media-newsroom/news-release/Archival/2010/pdf/6-17-10-1.pdf and STL planning staff

Additional renovations planned in this phase for Terminal 1 include new ticket counters and floor treatment on the upper level, and new and renovated restrooms, brighter ceiling treatments, a dedicated performance area, and upgrades to the Concourse C security checkpoint on the claim level. Throughout Terminal 1 and Concourses A and C new signage and directories will be installed as well as the introduction of new art displays both static and interactive.

Terminal 1 is constructed of reinforced concrete with a moment resisting frame. Consisting of three levels (apron, baggage claim/concourse, and ticketing), the terminal structure supports four reinforced copper roof domes.

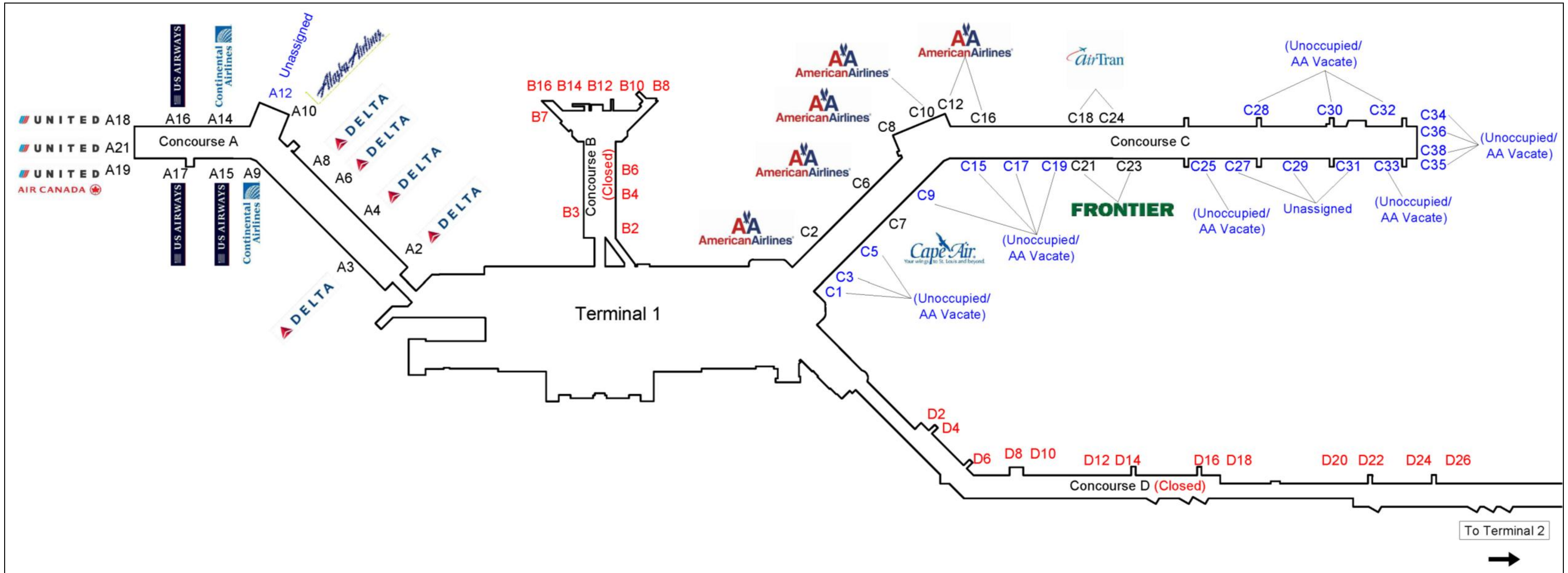
The terminal originally consisted of three intersecting barrel vaults, utilizing thin-shell concrete, glass facades and no interior columns. This design was the foundation for similar designs at John F. Kennedy Airport in New York and Charles DeGaulle Airport in Paris. A fourth dome was added in 1968 as part of a $200 million airport expansion program. Concourse D was added to the terminal in 1982[12]. The original building foundation consists of reinforced concrete spread footings, while reinforced concrete piles support the addition of Terminal 2.

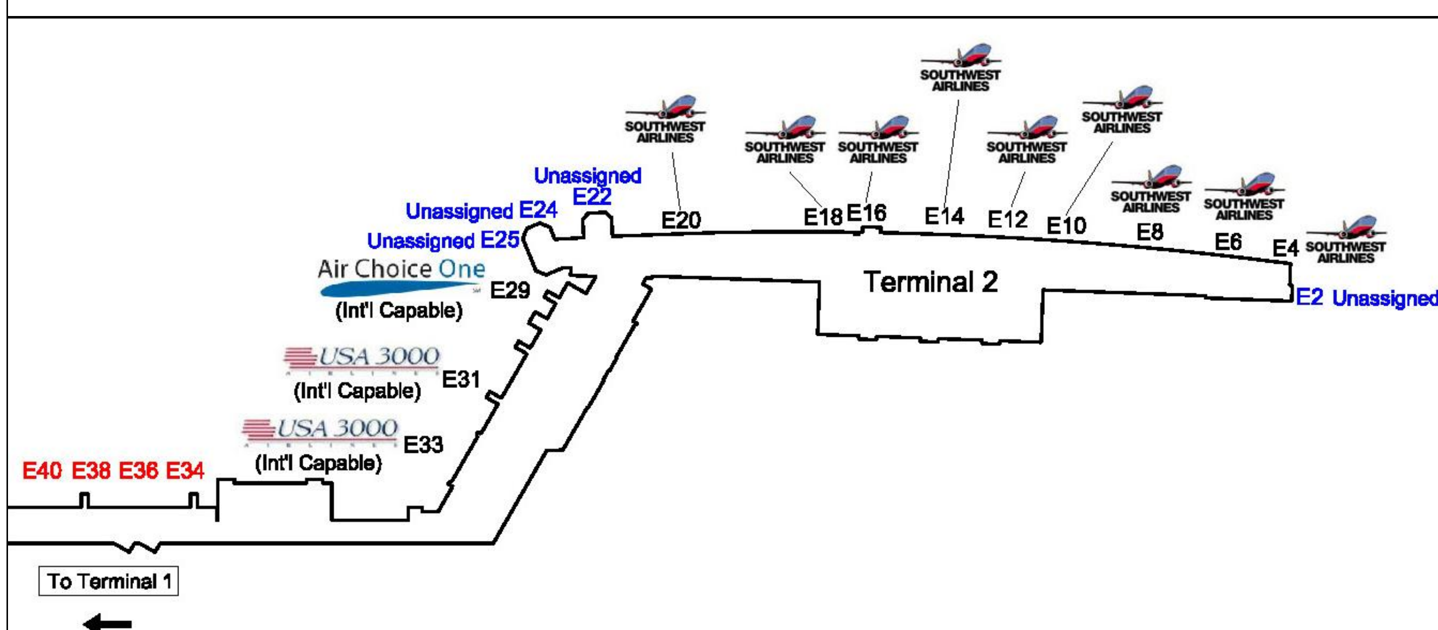
Terminal 1 is approximately 1,150 feet wide by 250 feet deep. Concourses A, B, C and D are accessed from Terminal 1 via the concourse/claim level. Terminal 2 is approximately 350 feet wide by 80 feet deep. Concourse E is accessed via Terminal 2.

The following paragraphs describe the general configuration of each of the two terminals and the concourses. In addition, tables are provided that identifies major allocation of floor space, such as hold rooms, security, ticketing, etc. It should be noted that these tables include the planned additions described in the *Airport Experience Program*.

12 http://www.flystl.com/flystl/about-lambert/history/

Exhibit 2.2-1
2010 TERMINAL AREA GATE LAYOUT
Lambert-St. Louis International Airport





Note: American continues to lease all "Unoccupied/AA Vacate" gates on Concourse C through their current lease agreement that expired in June 2011

Source: Created based on Lambert-St. Louis International 2010 Airport data

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2.2.2 TERMINAL 1

Terminal 1 built in 1956, has three levels (apron, concourse/baggage claim, and ticketing) and totals approximately 600,600 gross square feet overall with the planned *Airport Experience Program* additions. Serving as a central ticketing, baggage claim and circulation hub for Concourses A through D, the Terminal itself does not contain any gates or hold rooms. The existing Terminal 1 capacity information is summarized in **Table 2.2-1, *Terminal 1 Space by Level*.**

The apron level (approximately 213,600 gross square feet) consists of baggage operations, non-secure storage, concessions offices/storage, non-public circulation, and USO space. Approximately 97 percent of this space is currently occupied. Most of the occupied space on this level is used for baggage operations.

The concourse level (approximately 259,800 gross square feet) includes baggage claim, TSA passenger security screening, secure and non-secure concessions, circulation, and airport administration. Approximately 96 percent of this space is currently occupied. Most of the space on this level is used for baggage claim and public circulation.

The ticketing level (approximately 127,200 gross square feet) includes ticketing, non-secure concessions and storage, public circulation, and airport administration. Approximately 98 percent of this space is currently occupied. Most of the space on this level is used for ticketing operations and public circulation.

2.2.3 CONCOURSE A

Concourse A was originally constructed as part of the original Terminal 1 in 1956 with two levels (apron and concourse) totaling approximately 107,600 gross square feet. It has 16 gates of which 14 are currently in use. There are two large regional gates, 12 narrowbody gates, one B757 gate, and one widebody gate. Gate A5 was decommissioned in 2010 and renovated for additional concessions space. Its passenger boarding bridge will be relocated to Gate A6. There are no international capable gates at Concourse A. The existing Concourse A area capacity information is summarized in **Table 2.2-2, *Concourse A Space by Level*.**

The apron level (approximately 40,700 square feet) consists of airline operations, non-public circulation, secure concessions offices/storage, and mechanical & electrical space. Approximately 75 percent of this space is occupied of which most is utilized for airline operations.

The concourse level (approximately 66,900 square feet) includes airline offices, air carrier gates, hold rooms, secure concessions, secure circulation space and restrooms. Approximately 97 percent of this space is occupied. Most of the space on this level is used for passenger-related airline and concession services.

2.2.4 CONCOURSE B

Concourse B was constructed as part of the original Terminal 1 in 1956. It consists of two levels (apron and concourse) totaling approximately 58,400 gross square feet overall. It has 10 numbered gates all of which were closed to airline activity as of June 2010. The existing Concourse B capacity information is summarized in **Table 2.2-3, *Concourse B Space by Level*.**

The apron level (approximately 24,000 square feet) consists of airline operations, city space, non-public circulation, and mechanical & electrical space. With the closure of Concourse B the assumption is that all space which is mostly used for airline operations will be closed.

The concourse level (approximately 34,000 square feet) includes city offices, airline offices, air carrier gates, hold rooms, secure concessions, secure circulation space, and restrooms. This level, which is used for passenger-related airline and concession services, has been closed to airline activity. The TSA security screening checkpoint remains as a reliever to Concourses A and C during peak periods of activity with passengers being bused to Concourse A and Concourse C.

The tower/roof level consists of 400 square feet of city office space utilized by the STLAA operations division and accessed via the apron or concourse levels.

2.2.5 CONCOURSE C

Concourse C was originally constructed as part of the original Terminal 1 in 1956. It consists of three levels (apron, concourse, and upper level) totaling approximately 275,200 gross square feet overall. It has 30 gates of which 11 were in use as of August 2010. The majority of the unused gates are located at the end of the Concourse C extension (C25, C27-36, and C38). American Airlines continued to pay for their unoccupied gates through their lease agreement, which expired in June 2011. There are four medium regional gates, five large regional gates, nine narrowbody gates, five B757 gates, five widebody gates, and two jumbo gates with six international capable swing[13] gates at the end Concourse C. The international gates currently serve no departing or arriving passenger activity. With Cape Air utilizing Cessna 402 aircraft Gate C7 is accessed via the ramp/apron level and a new elevator was constructed between the concourse and apron levels. US Airways is currently occupying Gates A15, A16, and A17 and are contemplating a move to Concourse occurring with the spring 2011 schedule[14]. The existing Concourse C capacity information is summarized in **Table 2.2-4, *Concourse C Space by Level***.

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[13] The term "swing" gate refers to a gate that is capable of accommodating both Domestic and outbound International traffic as well as International arriving traffic.
[14] Per STL planning staff

The apron level (approximately 122,000 square feet) consists of airline operations, non-public circulation, secure concessions offices/storage, and mechanical & electrical space as well as an unutilized 42,500 square foot Customs & Border Protection (CBP) International arrivals facility. Approximately 58 percent of this space is occupied.

The concourse level (approximately 134,800 square feet) includes airline offices, air carrier gates, hold rooms, secure concessions, secure circulation space, and restrooms. Approximately 55 percent of this space is occupied. Most of the space on this level is used for passenger-related airline and concession services.

The upper level (approximately 18,400 square feet) includes airline offices, TSA offices, secure concessions, and secure circulation space. Most of the space on this level is used for passenger-related airline and concession services.

The tower/roof level consists of approximately 940 square feet of airline ramp control space.

2.2.6 CONCOURSE D

Concourse D was added to Terminal 1 in 1982 to house Ozark Airlines. It has two levels (apron and concourse) totaling 212,200 gross square feet overall. All of its 13 numbered gates along with four from Concourse E (34, 36, 38, and 40) are closed to passenger and airline operations. The existing Concourse D capacity information is summarized in **Table 2.2-5, *Concourse D Space by Level.***

The apron level (approximately 101,900 square feet) consists of airline operations, city space, non-public circulation, utility corridor, cooling tower, and mechanical & electrical space. This space, which is mostly used for airline operations, is assumed to be unoccupied.

The concourse level (approximately 110,300 square feet) includes airline offices, air carrier gates, hold rooms, secure concessions, secure circulation space, restrooms and city provided space. This space, which is used for passenger-related airline and concession services, is closed with the exception of the concession node to the entrance of Concourse D.

2.2.7 TERMINAL 2/CONCOURSE E

Terminal 2 opened for operation in March 1998, adding 220,000 square feet of terminal space[15]. The Terminal building is approximately 350 feet wide by 80 feet deep. Concourse E was constructed as part of Terminal 2 and has two levels (concourse/ticketing, and apron/baggage claim) totaling approximately 348,400 gross square feet overall. It currently has 16 gates of which 13 are currently in use. The entire complex is capable of serving narrowbody aircraft with

[15] http://www.flystl.com/flystl/about-lambert/history/

three international swing[16] capable gates at Concourse E (gates 29, 31, and 33). Gates E2, E24, and E25 are currently unused and have no jet bridges. Given the current Southwest Airline gate configuration, Gate E2 is likely to remain unoccupied. The existing Terminal/Concourse E capacity information is summarized in **Table 2.2-6, *Terminal 2/Concourse E Space by Level***.

The apron/baggage claim level (approximately 171,400 square feet) consists of baggage claim, airline operations, baggage inspections, concessions offices/storage, city and USO space, and non-public circulation as well as a 43,100 square foot Customs & Border Protection (CBP) International arrivals facility. Approximately 99 percent of this space is currently occupied. Most of the occupied space on this level is used for baggage claim and operations.

The concourse/ticketing level (approximately 177,100 square feet) includes ticketing, baggage screening, hold rooms, secure concessions, and TSA passenger security screening. In November 2009, STL opened a second security checkpoint consisting of an additional two lanes on the west end of the terminal ticketing level[17]. Approximately 94 percent of this space is currently occupied. Most of the space on this level is used for ticketing, hold rooms, concessions, and circulation.

[16] The term "swing" gate refers to a gate that is capable of accommodating both Domestic and outbound International traffic as well as International arriving traffic.
[17] http://www.flystl.com/flystl/media-newsroom/news-release/Archival/2009/pdf/11-9-09.pdf

Table 2.2-1
TERMINAL 1 SPACE BY LEVEL
Lambert-St. Louis International Airport

	Terminal 1 Space by Level (includes AEP)	Units	Existing Terminal Space (2008) Ticketing	Conc/Claim	Apron	Total
Airline Space	**Domestic Airline Space**					
	Ticket Counter					
	Linear Counter Check-in Positions (Kiosk)	pos	137 (49)	-	-	**137 (49)**
	Total Check-in Locations (Kiosk)	pos	159 (55)	-	-	**159 (55)**
	Total Linear Position Length	lf	570	-	-	**570**
	Counter Area (Includes any curb check)	sf	8,298	-	-	**8,298**
	Ticketing Queue (including any free standing kiosks)	sf	8,247	-	-	**8,247**
	Curbcheck Positions	pos	16	-	-	**16**
	Airline Ticket Offices	sf	9,350	2,429	-	**11,779**
	Baggage Claim					
	Claim Devices	units	-	6	-	**6**
	Linear Frontage	lf	-	954	-	**954**
	Baggage Claim Hall (Includes Device, Queues & Circulation)	sf	-	31,926	-	**31,926**
	Baggage Services	sf	-	5,447	-	**5,447**
	Airline Clubs/VIP Lounges	sf	11,751	3,782	-	**15,533**
	SubTotal:		**37,646**	**43,584**	**-**	**81,230**
	International Airline Space (included in Domestic)					
	Ticket Counter					
	Linear Counter Check-in Positions (Kiosk)	pos	-	-	-	incl. in Dom
	Total Check-in Locations (Kiosk)	pos	-	-	-	incl. in Dom
	Total Linear Position Length	lf	-	-	-	incl. in Dom
	Counter Area (Includes any curb check)	sf	-	-	-	incl. in Dom
	Ticketing Queue (including any free standing kiosks)	sf	-	-	-	incl. in Dom
	Curbcheck Positions	pos	-	-	-	incl. in Dom
	Airline Ticket Offices	sf	-	-	-	incl. in Dom
	Airline Clubs/VIP Lounges	sf	-	-	-	incl. in Dom
	SubTotal:		**-**	**-**	**-**	**-**
	Other Airline Space					
	Outbound Bag Make-Up	sf	-	-	64,962	**64,962**
	Inbound Bag Delivery	sf	-	-	54,515	**54,515**
	Checked Baggage Screening (TSA Space)	sf	7,799	-	-	**7,799**
	Airline Operations	sf	-	-	-	**-**
	Other Airline Offices/Systems and Support	sf	-	4,620	-	**4,620**
	Other Airline Space	sf	1,222	1,255	-	**2,477**
	SubTotal:		**9,021**	**5,875**	**119,477**	**134,373**
	Departure Lounges					
	Air Carrier Gates					
	Small Regional (Cessna/Metro)	sf	-	-	-	**-**
	Medium Regional (BE1/CRJ,CR7,9/ERJ/SF340)	sf	-	-	-	**-**
	Large Regional (E170,175,190)	sf	-	-	-	**-**
	Narrowbody (Q400/A320/B737w)	sf	-	-	-	**-**
	B-757(winglets)	sf	-	-	-	**-**
	Widebody (B767/MD11)	sf	-	-	-	**-**
	Jumbo (B747,787,777/A330,340)	sf	-	-	-	**-**
	NLA (A380)	sf	-	-	-	**-**
	SubTotal:		**-**	**-**	**-**	**-**
Concessions Space	**Non-Secure Concessions Space**					
	Rental Car					
	Number Counters	pos	-	6	-	**6**
	Counter Area/Offices	sf	-	2,197	-	**2,197**
	Queue	sf	-	1,613	-	**1,613**
	Non-Secure Concessions	sf	9,589	9,510	-	**19,099**
	Non-Secure Storage	sf	5,435	942	21,197	**27,574**
	SubTotal:		**15,024**	**14,262**	**21,197**	**50,483**
	Secure Concessions Space					
	Secure Concessions	sf	-	14,133	-	**14,133**
	Secure Storage	sf	-	2,611	-	**2,611**
	SubTotal:		**-**	**16,744**	**-**	**16,744**

Table 2.2-1 *(continued)*
TERMINAL 1 SPACE BY LEVEL
Lambert-St. Louis International Airport

	Terminal 1 Space by Level (includes AEP)	Units	Existing Terminal Space (2008) Ticketing	Conc/Claim	Apron	*Total*
Public Space	**Security**					
	Number of Lanes	units	-	15	-	**15**
	Checkpoint Area	sf	-	16,992	-	**16,992**
	Queuing Area	sf	-	8,534	-	**8,534**
	TSA Offices	sf	-	4,064	-	**4,064**
	SubTotal:		**-**	**29,590**	**-**	**29,590**
	Circulation					
	Ticket Lobby Circulation	sf	11,258	-	-	**11,258**
	Baggage Claim Circulation	sf	-	17,871	-	**17,871**
	Secure Circulation	sf	-	17,623	-	**17,623**
	Secure Vertical Circulation (Fire Exit/Service Stairs)	sf	-	205	150	**355**
	General Public Circulation (Includes Vestibules, Vertical Circ)	sf	25,981	45,457	-	**71,438**
	Vertical Circulation (Secure/Non-Secure)	sf	2,338	778	-	**3,116**
	Public Seating	sf	-	-	-	**-**
	Domestic Meeter/Greeter Lobby	sf	-	770	-	**770**
	Transportation (Shuttle Service) & Hotel Courtesy Phones	sf	-	100	-	**100**
	SubTotal:		**39,577**	**82,804**	**150**	**122,531**
	Restrooms					
	Public Restrooms - Secure	sf	-	-	-	**-**
	Public Restrooms - Non-Secure	sf	752	4,581	-	**5,333**
	SubTotal:		**752**	**4,581**	**-**	**5,333**
	Other Space					
	Misc Tenant					
	American Credit Union (AAFCU), Central Carts, Chapel, USO, USPS	sf	1,688	7,189		**8,877**
	Smoking Lounge	sf	-	237	-	**237**
	Other (Displays, Information Counters, Visitors Commission etc)	sf	-	677	-	**677**
	SubTotal:		**1,688**	**8,103**	**-**	**9,791**
Non-Public Space	**Non-Airline Tenant Space**					
	Airport Administration					
	Offices/Support (City)	sf	11,800	34,342	9,686	**55,828**
	Airport Police	sf	-	1,853	-	**1,853**
	Other Tenants					
	Misc Tenant	sf	-	-	4,636	**4,636**
	SubTotal:		**11,800**	**36,195**	**14,322**	**62,317**
	Other Space					
	Non-Public Restrooms	sf	920	-	1,245	**2,165**
	Non-Public Circulation	sf	4,854	1,654	7,992	**14,500**
	Other	sf	-	-	-	**-**
	SubTotal:		**5,774**	**1,654**	**9,237**	**16,665**
	Terminal Function					
	Maintenance/Janitorial/Storage/Shops	sf	41	545	620	**1,206**
	Mechanical/Electrical/Telephone/Plumbing	sf	1,540	6,512	44,028	**52,080**
	Building Systems (Structure/Non-net/Void)	sf	4,355	9,338	4,613	**18,306**
	Exterior - Other (ie Public Gardens, etc)	sf	-	-	-	**-**
	SubTotal:		**5,936**	**16,395**	**49,261**	**71,592**

Table 2.2-1 *(continued)*
TERMINAL 1 SPACE BY LEVEL
Lambert-St. Louis International Airport

Summary — Terminal 1 Space by Level (includes AEP)	Units	Existing Terminal Space (2008) Ticketing	Conc/Claim	Apron	Total
Airline Space	Units				
Domestic Airline Space	sf	37,646	43,584	-	**81,230**
International Airline Space (Included in Domestic Airline Space)	sf	-	-	-	**-**
Other Airline Space	sf	9,021	5,875	119,477	**134,373**
Departure Lounges	sf	-	-	-	**-**
SubTotal:		**46,667**	**49,459**	**119,477**	**215,603**
Concessions					
Non-Secure Concessions Space	sf	15,024	14,262	21,197	**50,483**
Secure Concessions Space	sf	-	16,744	-	**16,744**
SubTotal:		**15,024**	**31,006**	**21,197**	**67,227**
US Customs & Border Protection Services					
Primary Inspection	sf	-	-	-	**-**
Baggage Claim	sf	-	-	-	**-**
Secondary Inspection	sf	-	-	-	**-**
Support Space	sf	-	-	-	**-**
Other Space	sf	-	-	-	**-**
SubTotal:		**-**	**-**	**-**	**-**
Public Space					
Security	sf	-	29,590	-	**29,590**
Circulation	sf	39,577	82,804	150	**122,531**
Restrooms	sf	752	4,581	-	**5,333**
Other Space	sf	1,688	8,103	-	**9,791**
SubTotal:		**42,017**	**125,078**	**150**	**167,245**
Non-Public Space					
Non-Airline Tenant Space	sf	11,800	36,195	14,322	**62,317**
Other Space	sf	5,774	1,654	9,237	**16,665**
Terminal Functions	sf	5,936	16,395	49,261	**71,592**
SubTotal:		**23,510**	**54,244**	**72,820**	**150,574**
SubTotal Functional Terminal Space by Level:		***121,282***	***243,392***	***164,383***	
SubTotal Gross Terminal Space by Level:		***127,218***	***259,787***	***213,644***	
Total					
Total Functional Terminal Area:					**529,057**
Total Gross Terminal Area:					**600,649**

Note: Includes *Airport Experience Program* completed and planned list of projects.

Source: Landrum & Brown analysis, 2011

Table 2.2-2
CONCOURSE A SPACE BY LEVEL
Lambert-St. Louis International Airport

	Concourse A Space by Level		Existing Terminal Space (2008)			
		Units	Concourse	Apron		Total
Airline Space	**Domestic Airline Space**					
	Ticket Counter					
	Linear Counter Check-in Positions (Kiosk)	pos	-	-	-	-
	Total Check-in Locations (Kiosk)	pos	-	-	-	-
	Total Linear Position Length	lf	-	-	-	-
	Counter Area (Includes any curb check)	sf	-	-	-	-
	Ticketing Queue (including any free standing kiosks)	sf	-	-	-	-
	Curbcheck Positions	pos	-	-	-	-
	Airline Ticket Offices	sf	-	-	-	-
	Baggage Claim					
	Claim Devices	units	-	-	-	-
	Linear Frontage	lf	-	-	-	-
	Baggage Claim Hall (Includes Device, Queues & Circulation)	sf	-	-	-	-
	Baggage Services	sf	-	-	-	-
	Airline Clubs/VIP Lounges	sf	-	-	-	-
	SubTotal:		**-**	**-**	**-**	**-**
	International Airline Space					
	Ticket Counter					
	Linear Counter Check-in Positions (Kiosk)	pos	-	-	-	-
	Total Check-in Locations (Kiosk)	pos	-	-	-	-
	Total Linear Position Length	lf	-	-	-	-
	Counter Area (Includes any curb check)	sf	-	-	-	-
	Ticketing Queue (including any free standing kiosks)	sf	-	-	-	-
	Curbcheck Positions	pos	-	-	-	-
	Airline Ticket Offices	sf	-	-	-	-
	Airline Clubs/VIP Lounges	sf	-	-	-	-
	SubTotal:		**-**	**-**	**-**	**-**
	Other Airline Space					
	Outbound Bag Make-Up	sf	-	-	-	-
	Inbound Bag Delivery	sf	-	-	-	-
	Checked Baggage Screening (TSA Space)	sf	-	-	-	-
	Airline Operations	sf	-	28,056	-	**28,056**
	Other Airline Offices/Systems and Support	sf	4,624	-	-	**4,624**
	Other Airline Space	sf	-	-	-	-
	SubTotal:		**4,624**	**28,056**	**-**	**32,680**
	Departure Lounges					
	Air Carrier Gates					
	Small Regional (Cessna/Metro)	sf	-	-	-	-
	Medium Regional (BE1/CRJ,CR7,9/ERJ/SF340)	sf	-	-	-	-
	Large Regional (E170,175,190)	sf	-	-	-	-
	Narrowbody (Q400/A320/B737w)	sf	-	-	-	-
	B-757(winglets)	sf	-	-	-	-
	Widebody (B767/MD11)	sf	-	-	-	-
	Jumbo (B747,787,777/A330,340)	sf	-	-	-	-
	NLA (A380)	sf	-	-	-	-
	SubTotal:		**25,264**	**-**	**-**	**25,264**
Concessions Space	**Non-Secure Concessions Space**					
	Rental Car					
	Number Counters	pos	-	-	-	-
	Counter Area/Offices	sf	-	-	-	-
	Queue	sf	-	-	-	-
	Non-Secure Concessions	sf	-	-	-	-
	Non-Secure Storage	sf	-	-	-	-
	SubTotal:		**-**	**-**	**-**	**-**
	Secure Concessions Space					
	Secure Concessions	sf	8,368	683	-	9,051
	Secure Storage	sf	1,057	-	-	1,057
	SubTotal:		**9,425**	**683**	**-**	**10,108**

Table 2.2-2 *(continued)*
CONCOURSE A SPACE BY LEVEL
Lambert-St. Louis International Airport

	Concourse A Space by Level		Existing Terminal Space (2008)			
		Units	Concourse	Apron		*Total*
Public Space	**Security**					
	Number of Lanes	units	-	-	-	**-**
	Checkpoint Area	sf	-	-	-	**-**
	Queuing Area	sf	-	-	-	**-**
	TSA Offices	sf	-	-	-	**-**
	SubTotal:		**-**	**-**	**-**	**-**
	Circulation					
	Ticket Lobby Circulation	sf	-	-	-	**-**
	Baggage Claim Circulation	sf	-	-	-	**-**
	Secure Circulation	sf	20,498	-	-	**20,498**
	Secure Vertical Circulation (Fire Exit/Service Stairs)	sf	1,574	1,614	-	**3,188**
	General Public Circulation (Includes Vestibules, Vertical Circ)	sf	-	-	-	**-**
	Vertical Circulation (Secure/Non-Secure)	sf	748	-	-	**748**
	Public Seating	sf	-	-	-	**-**
	Domestic Meeter/Greeter Lobby	sf	-	-	-	**-**
	Transportation (Shuttle Service) & Hotel Courtesy Phones	sf	-	-	-	**-**
	SubTotal:		**22,820**	**1,614**	**-**	**24,434**
	Restrooms					
	Public Restrooms - Secure	sf	1,905	-	-	**1,905**
	Public Restrooms - Non-Secure	sf	-	-	-	**-**
	SubTotal:		**1,905**	**-**	**-**	**1,905**
	Other Space					
	Misc Tenant					
	American Credit Union (AAFCU), Central Carts, Chapel, USO, USPS	sf		-		**-**
	Smoking Lounge	sf	324	-		**324**
	Other (Displays, Information Counters, Visitors Commission etc)	sf	-	-	-	**-**
	SubTotal:		**324**	**-**	**-**	**324**
Non-Public Space	**Non-Airline Tenant Space**					
	Airport Administration					
	Offices/Support (City)	sf	-	-	-	**-**
	Airport Police	sf	-	-	-	**-**
	Other Tenants					
	Misc Tenant	sf	-	234	-	**234**
	SubTotal:		**-**	**234**	**-**	**234**
	Other Space					
	Non-Public Restrooms	sf	-	-	-	**-**
	Non-Public Circulation	sf	192	3,780	-	**3,972**
	Other	sf	-	-	-	**-**
	SubTotal:		**192**	**3,780**	**-**	**3,972**
	Terminal Function					
	Maintenance/Janitorial/Storage/Shops	sf	398	-	-	**398**
	Mechanical/Electrical/Telephone/Plumbing	sf	1,128	5,092	-	**6,220**
	Building Systems (Structure/Non-net/Void)	sf	796	1,280	-	**2,076**
	Exterior - Other (ie Public Gardens, etc)	sf	-	-	-	**-**
	SubTotal:		**2,322**	**6,372**	**-**	**8,694**

Table 2.2-2 *(continued)*
CONCOURSE A SPACE BY LEVEL
Lambert-St. Louis International Airport

Summary: Concourse A Space by Level	Units	Existing Terminal Space (2008): Concourse	Apron		Total
Airline Space	Units				
Domestic Airline Space	sf	-	-	-	**-**
International Airline Space (Included in Domestic Airline Space)	sf	-	-	-	**-**
Other Airline Space	sf	4,624	28,056	-	**32,680**
Departure Lounges	sf	25,264	-	-	**25,264**
SubTotal:		**29,888**	**28,056**	**-**	**57,944**
Concessions					
Non-Secure Concessions Space	sf	-	-	-	**-**
Secure Concessions Space	sf	9,425	683	-	**10,108**
SubTotal:		**9,425**	**683**	**-**	**10,108**
US Customs & Border Protection Services					
Primary Inspection	sf	-	-	-	**-**
Baggage Claim	sf	-	-	-	**-**
Secondary Inspection	sf	-	-	-	**-**
Support Space	sf	-	-	-	**-**
Other Space	sf	-	-	-	**-**
SubTotal:		**-**	**-**	**-**	**-**
Public Space					
Security	sf	-	-	-	**-**
Circulation	sf	22,820	1,614	-	**24,434**
Restrooms	sf	1,905	-	-	**1,905**
Other Space	sf	324	-	-	**324**
SubTotal:		**25,049**	**1,614**	**-**	**26,663**
Non-Public Space					
Non-Airline Tenant Space	sf	-	234	-	**234**
Other Space	sf	192	3,780	-	**3,972**
Terminal Functions	sf	2,322	6,372	-	**8,694**
SubTotal:		**2,514**	**10,386**	**-**	**12,900**
SubTotal Functional Terminal Space by Level:		***64,554***	***34,367***	**-**	
SubTotal Gross Terminal Space by Level:		***66,876***	***40,739***	**-**	
Total					
Total Functional Terminal Area:					**98,921**
Total Gross Terminal Area:					**107,615**

Source: Landrum & Brown analysis, 2011

Table 2.2-3
CONCOURSE B SPACE BY LEVEL
Lambert-St. Louis International Airport

	Concourse B Space by Level	Units	Existing Terminal Space (2008) Concourse	Apron	Tower/Roof	*Total*
Airline Space	**Domestic Airline Space**					
	Ticket Counter					
	Linear Counter Check-in Positions (Kiosk)	pos	-	-	-	**-**
	Total Check-in Locations (Kiosk)	pos	-	-	-	**-**
	Total Linear Position Length	lf	-	-	-	**-**
	Counter Area (Includes any curb check)	sf	-	-	-	**-**
	Ticketing Queue (including any free standing kiosks)	sf	-	-	-	**-**
	Curbcheck Positions	pos	-	-	-	**-**
	Airline Ticket Offices	sf	-	-	-	**-**
	Baggage Claim					
	Claim Devices	units	-	-	-	**-**
	Linear Frontage	lf	-	-	-	**-**
	Baggage Claim Hall (Includes Device, Queues & Circulation)	sf	-	-	-	**-**
	Baggage Services	sf	-	-	-	**-**
	Airline Clubs/VIP Lounges	sf	-	-	-	**-**
	SubTotal:		**-**	**-**	**-**	**-**
	International Airline Space					
	Ticket Counter					
	Linear Counter Check-in Positions (Kiosk)	pos	-	-	-	**-**
	Total Check-in Locations (Kiosk)	pos	-	-	-	**-**
	Total Linear Position Length	lf	-	-	-	**-**
	Counter Area (Includes any curb check)	sf	-	-	-	**-**
	Ticketing Queue (including any free standing kiosks)	sf	-	-	-	**-**
	Curbcheck Positions	pos	-	-	-	**-**
	Airline Ticket Offices	sf	-	-	-	**-**
	Airline Clubs/VIP Lounges	sf	-	-	-	**-**
	SubTotal:		**-**	**-**	**-**	**-**
	Other Airline Space					
	Outbound Bag Make-Up	sf	-	-	-	**-**
	Inbound Bag Delivery	sf	-	-	-	**-**
	Checked Baggage Screening (TSA Space)	sf	-	-	-	**-**
	Airline Operations	sf		18,975	-	**18,975**
	Other Airline Offices/Systems and Support	sf	1,546	-	-	**1,546**
	Other Airline Space	sf				**-**
	SubTotal:		**1,546**	**18,975**	**-**	**20,521**
	Departure Lounges					
	Air Carrier Gates					
	Small Regional (Cessna/Metro)	sf	-	-	-	**-**
	Medium Regional (BE1/CRJ,CR7,9/ERJ/SF340)	sf	-	-	-	**-**
	Large Regional (E170,175,190)	sf	-	-	-	**-**
	Narrowbody (Q400/A320/B737w)	sf	-	-	-	**-**
	B-757(winglets)	sf	-	-	-	**-**
	Widebody (B767/MD11)	sf	-	-	-	**-**
	Jumbo (B747,787,777/A330,340)	sf	-	-	-	**-**
	NLA (A380)	sf	-	-	-	**-**
	SubTotal:		**17,515**	**-**	**-**	**17,515**
Concessions Space	**Non-Secure Concessions Space**					
	Rental Car					
	Number Counters	pos	-	-	-	**-**
	Counter Area/Offices	sf	-	-	-	**-**
	Queue	sf	-	-	-	**-**
	Non-Secure Concessions	sf	-	-	-	**-**
	Non-Secure Storage	sf	-	-	-	**-**
	SubTotal:		**-**	**-**	**-**	**-**
	Secure Concessions Space					
	Secure Concessions	sf	2,334	-	-	2,334
	Secure Storage	sf	-	-	-	-
	SubTotal:		**2,334**	**-**	**-**	**2,334**

Table 2.2-3 *(continued)*
CONCOURSE B SPACE BY LEVEL
Lambert-St. Louis International Airport

	Concourse B Space by Level	Units	Existing Terminal Space (2008) Concourse	Apron	Tower/Roof	*Total*
Public Space	**Security**					
	Number of Lanes	units	-	-	-	**-**
	Checkpoint Area	sf	-	-	-	**-**
	Queuing Area	sf	-	-	-	**-**
	TSA Offices	sf	-	-	-	**-**
	SubTotal:		**-**	**-**	**-**	**-**
	Circulation					
	Ticket Lobby Circulation	sf	-	-	-	**-**
	Baggage Claim Circulation	sf	-	-	-	**-**
	Secure Circulation	sf	6,624	-	-	**6,624**
	Secure Vertical Circulation (Fire Exit/Service Stairs)	sf	521	534		**1,055**
	General Public Circulation (Includes Vestibules, Vertical Circ)	sf	-	-	-	**-**
	Vertical Circulation (Secure/Non-Secure)	sf	-	-	-	**-**
	Public Seating	sf	-	-	-	**-**
	Domestic Meeter/Greeter Lobby	sf	-	-	-	**-**
	Transportation (Shuttle Service) & Hotel Courtesy Phones	sf	-	-	-	**-**
	SubTotal:		**7,145**	**534**	**-**	**7,679**
	Restrooms					
	Public Restrooms - Secure	sf	1,248	-	-	**1,248**
	Public Restrooms - Non-Secure	sf	-	-	-	**-**
	SubTotal:		**1,248**	**-**	**-**	**1,248**
	Other Space					
	Misc Tenant					
	American Credit Union (AAFCU), Central Carts, Chapel, USO, SUPS	sf		-		**-**
	Smoking Lounge	sf	240	-		**240**
	Other (Displays, Information Counters, Visitors Commission etc)	sf	-	-	-	**-**
	SubTotal:		**240**	**-**	**-**	**240**
Non-Public Space	**Non-Airline Tenant Space**					
	Airport Administration					
	Offices/Support (City)	sf	440	1,896	403	**2,739**
	Airport Police	sf	-	-	-	**-**
	Other Tenants					
	Misc Tenant	sf	-	-	-	**-**
	SubTotal:		**440**	**1,896**	**403**	**2,739**
	Other Space					
	Non-Public Restrooms	sf	-	-	-	**-**
	Non-Public Circulation	sf	-	39	-	**39**
	Other	sf	-	-	-	**-**
	SubTotal:		**-**	**39**	**-**	**39**
	Terminal Function					
	Maintenance/Janitorial/Storage/Shops	sf	153	197	-	**350**
	Mechanical/Electrical/Telephone/Plumbing	sf	600	1,440	-	**2,040**
	Building Systems (Structure/Non-net/Void)	sf	2,742	914	-	**3,656**
	Exterior - Other (ie Public Gardens, etc)	sf	-	-	-	**-**
	SubTotal:		**3,495**	**2,551**	**-**	**6,046**

Table 2.2-3 *(continued)*
CONCOURSE B SPACE BY LEVEL
Lambert-St. Louis International Airport

Summary – Concourse B Space by Level	Units	Existing Terminal Space (2008) Concourse	Apron	Tower/Roof	Total
Airline Space	Units				
Domestic Airline Space	sf	-	-	-	**-**
International Airline Space (Included in Domestic Airline Space)	sf	-	-	-	**-**
Other Airline Space	sf	1,546	18,975	-	**20,521**
Departure Lounges	sf	17,515	-	-	**17,515**
SubTotal:		**19,061**	**18,975**	**-**	**38,036**
Concessions					
Non-Secure Concessions Space	sf	-	-	-	**-**
Secure Concessions Space	sf	2,334	-	-	**2,334**
SubTotal:		**2,334**	**-**	**-**	**2,334**
US Customs & Border Protection Services					
Primary Inspection	sf	-	-	-	**-**
Baggage Claim	sf	-	-	-	**-**
Secondary Inspection	sf	-	-	-	**-**
Support Space	sf	-	-	-	**-**
Other Space	sf	-	-	-	**-**
SubTotal:		**-**	**-**	**-**	**-**
Public Space					
Security	sf	-	-	-	**-**
Circulation	sf	7,145	534	-	**7,679**
Restrooms	sf	1,248	-	-	**1,248**
Other Space	sf	240	-	-	**240**
SubTotal:		**8,633**	**534**	**-**	**9,167**
Non-Public Space					
Non-Airline Tenant Space	sf	440	1,896	403	**2,739**
Other Space	sf	-	39	-	**39**
Terminal Functions	sf	3,495	2,551	-	**6,046**
SubTotal:		**3,935**	**4,486**	**403**	**8,824**
SubTotal Functional Terminal Space by Level:		***30,468***	***21,444***	***403***	
SubTotal Gross Terminal Space by Level:		***33,963***	***23,995***	***403***	
Total					
				Total Functional Terminal Area:	**52,315**
				Total Gross Terminal Area:	**58,361**

Source: Landrum & Brown analysis, 2011

Table 2.2-4
CONCOURSE C SPACE BY LEVEL
Lambert-St. Louis International Airport

	Concourse C Space by Level	Units	Existing Terminal Space (2008) Upper Level	Concourse	Apron	Total
Airline Space	**Domestic Airline Space**					
	Ticket Counter					
	Linear Counter Check-in Positions (Kiosk)	pos	-	-	-	-
	Total Check-in Locations (Kiosk)	pos	-	-	-	-
	Total Linear Position Length	lf	-	-	-	-
	Counter Area (Includes any curb check)	sf	-	-	-	-
	Ticketing Queue (including any free standing kiosks)	sf	-	-	-	-
	Curbcheck Positions	pos	-	-	-	-
	Airline Ticket Offices	sf	-	-	-	-
	Baggage Claim					
	Claim Devices	units	-	-	-	-
	Linear Frontage	lf	-	-	-	-
	Baggage Claim Hall (Includes Device, Queues & Circulation)	sf	-	-	-	-
	Baggage Services	sf	-	-	-	-
	Airline Clubs/VIP Lounges	sf	-	-	-	-
	SubTotal:		**-**	**-**	**-**	**-**
	International Airline Space					
	Ticket Counter					
	Linear Counter Check-in Positions (Kiosk)	pos	-	-	-	-
	Total Check-in Locations (Kiosk)	pos	-	-	-	-
	Total Linear Position Length	lf	-	-	-	-
	Counter Area (Includes any curb check)	sf	-	-	-	-
	Ticketing Queue (including any free standing kiosks)	sf	-	-	-	-
	Curbcheck Positions	pos	-	-	-	-
	Airline Ticket Offices	sf	-	-	-	-
	Airline Clubs/VIP Lounges	sf	-	-	-	-
	SubTotal:		**-**	**-**	**-**	**-**
	Other Airline Space					
	Outbound Bag Make-Up	sf	-	-	-	-
	Inbound Bag Delivery	sf	-	-	-	-
	Checked Baggage Screening (TSA Space)	sf	-	-	-	-
	Airline Operations	sf	-	-	59,493	**59,493**
	Other Airline Offices/Systems and Support	sf	2,515	4,028	-	**6,543**
	Other Airline Space	sf	-			-
	SubTotal:		**2,515**	**4,028**	**59,493**	**66,036**
	Departure Lounges					
	Air Carrier Gates					
	Small Regional (Cessna/Metro)	sf	-	-	-	-
	Medium Regional (BE1/CRJ,CR7,9/ERJ/SF340)	sf	-	-	-	-
	Large Regional (E170,175,190)	sf	-	-	-	-
	Narrowbody (Q400/A320/B737w)	sf	-	-	-	-
	B-757(winglets)	sf	-	-	-	-
	Widebody (B767/MD11)	sf	-	-	-	-
	Jumbo (B747,787,777/A330,340)	sf	-	-	-	-
	NLA (A380)	sf	-	-	-	-
	SubTotal:		**-**	**48,459**	**-**	**48,459**
Concessions Space	**Non-Secure Concessions Space**					
	Rental Car					
	Number Counters	pos	-	-	-	-
	Counter Area/Offices	sf	-	-	-	-
	Queue	sf	-	-	-	-
	Non-Secure Concessions	sf	-	-	-	-
	Non-Secure Storage	sf	-	-	-	-
	SubTotal:		**-**	**-**	**-**	**-**
	Secure Concessions Space					
	Secure Concessions	sf	5,633	15,518	-	21,151
	Secure Storage	sf	-	4,318	546	4,864
	SubTotal:		**5,633**	**19,836**	**546**	**26,015**

Table 2.2-4 *(continued)*
CONCOURSE C SPACE BY LEVEL
Lambert-St. Louis International Airport

US Customs & Border Protection Services (CBP)

Concourse C Space by Level	Units	Existing Terminal Space (2008) Upper Level	Concourse	Apron	Total
Primary Inspection					
Primary Inspection Booths (Double Counters)	units	-	-	4	4
Area Primary Inspection Booths	sf	-	-	760	760
Primary Inspection Queue	sf	-	-	3,962	3,962
Primary Inspection Support	sf	-	-	11,566	11,566
SubTotal:		**-**	**-**	**16,288**	**16,288**
Baggage Claim					
Claim Devices	units	-	-	2	2
Linear Frontage	lf	-	-	266	266
Baggage Claim Hall	sf	-	-	9,388	9,388
SubTotal:		**-**	**-**	**9,388**	**9,388**
Secondary Inspection					
Passport Control Check Positions	pos	-	-	-	-
Area Passport Control Check	sf	-	-	incl in Secondary	-
Area Secondary Waiting	sf	-	-	incl in Secondary	-
Pairs Secondary Inspection X-Rays	units	-	-	-	-
Area Secondary Inspection	sf	-	-	8,384	8,384
Agriculture Inspection Stations	units	-	-	-	-
Area Agriculture Inspection	sf	-	-	-	-
Secondary Inspection Support	sf	-	-	5,058	5,058
SubTotal:		**-**	**-**	**13,442**	**13,442**
Support Space					
CBP Administration	sf	-	-	incl in Primary	-
CBP Administration Support	sf	-	-	incl in Primary	-
SubTotal:		**-**	**-**	**-**	**-**
Other Space					
Sterile Circulation	sf	-	2,765	-	2,765
Secure Vertical Circulation (Fire Exit/Service Stairs)	sf	-	376	-	376
In-Transit/Sterile Holding Areas	sf	-	-	-	-
Public Sterile Restrooms	sf	-	-	623	623
General Circulation (Includes Vertical Circ)	sf	-	458	187	645
Greeter Lobby					
Greeter Waiting Area	sf	-	-	-	-
		-	-	-	-
Baggage Recheck					
Number Recheck Positions	pos	-	-	-	-
Area Recheck Positions	sf	-	-	2,560	2,560
Queue Baggage Recheck	sf	-	-	incl in Recheck	-
SubTotal:		**-**	**3,599**	**3,370**	**6,969**

Table 2.2-4 *(continued)*
CONCOURSE C SPACE BY LEVEL
Lambert-St. Louis International Airport

	Concourse C Space by Level	Units	Existing Terminal Space (2008) Upper Level	Concourse	Apron	*Total*
Public Space	**Security**					
	Number of Lanes	units	-	-	-	**-**
	Checkpoint Area	sf	-	-	-	**-**
	Queuing Area	sf	-	-	-	**-**
	TSA Offices	sf	2,212	-	-	**2,212**
	SubTotal:		**2,212**	**-**	**-**	**2,212**
	Circulation					
	Ticket Lobby Circulation	sf	-	-	-	**-**
	Baggage Claim Circulation	sf	-	-	-	**-**
	Secure Circulation	sf	4,815	44,882	-	**49,697**
	Secure Vertical Circulation (Fire Exit/Service Stairs)	sf	770	2,401	1,225	**4,396**
	General Public Circulation (Includes Vestibules, Vertical Circ)	sf	-	-	-	**-**
	Vertical Circulation (Secure/Non-Secure)	sf	261	599	101	**961**
	Public Seating	sf	-	-	-	**-**
	Domestic Meeter/Greeter Lobby	sf	-	-	-	**-**
	Transportation (Shuttle Service) & Hotel Courtesy Phones	sf	-	-	-	**-**
	SubTotal:		**5,846**	**47,882**	**1,326**	**55,054**
	Restrooms					
	Public Restrooms - Secure	sf	290	4,111	-	**4,401**
	Public Restrooms - Non-Secure	sf	-		-	**-**
	SubTotal:		**290**	**4,111**	**-**	**4,401**
	Other Space					
	Misc Tenant					
	American Credit Union (AAFCU), Central Carts, Chapel, USO, USPS	sf	-	-	-	**-**
	Smoking Lounge	sf	-	410	-	**410**
	Other (Displays, Information Counters, Visitors Commission etc)	sf	-	-	-	**-**
	SubTotal:		**-**	**410**	**-**	**410**
Non-Public Space	**Non-Airline Tenant Space**					
	Airport Administration					
	Offices/Support (City)	sf	-	-	-	**-**
	Airport Police	sf	-	-	-	**-**
	Other Tenants					
	Misc Tenant	sf	-	-	-	**-**
	SubTotal:		**-**	**-**	**-**	**-**
	Other Space					
	Non-Public Restrooms	sf	-	-	698	**698**
	Non-Public Circulation	sf	-	-	451	**451**
	Other	sf	-	-	-	**-**
	SubTotal:		**-**	**-**	**1,149**	**1,149**
	Terminal Function					
	Maintenance/Janitorial/Storage/Shops	sf	-	579	227	**806**
	Mechanical/Electrical/Telephone/Plumbing	sf	652	3,166	14,474	**18,292**
	Building Systems (Structure/Non-net/Void)	sf	1,275	2,735	2,260	**6,270**
	Exterior - Other (ie Public Gardens, etc)	sf	-	-	-	**-**
	SubTotal:		**1,927**	**6,480**	**16,961**	**25,368**

Table 2.2-4 *(continued)*
CONCOURSE C SPACE BY LEVEL
Lambert-St. Louis International Airport

Summary	Concourse C Space by Level	Units	Existing Terminal Space (2008) Upper Level	Concourse	Apron	Total
	Airline Space	Units				
	Domestic Airline Space	sf	-	-	-	**-**
	International Airline Space (Included in Domestic Airline Space)	sf	-	-	-	**-**
	Other Airline Space	sf	2,515	4,028	59,493	**66,036**
	Departure Lounges	sf	-	48,459	-	**48,459**
	SubTotal:		**2,515**	**52,487**	**59,493**	**114,495**
	Concessions					
	Non-Secure Concessions Space	sf	-	-	-	**-**
	Secure Concessions Space	sf	5,633	19,836	546	**26,015**
	SubTotal:		**5,633**	**19,836**	**546**	**26,015**
	US Customs & Border Protection Services					
	Primary Inspection	sf	-	-	16,288	**16,288**
	Baggage Claim	sf	-	-	9,388	**9,388**
	Secondary Inspection	sf	-	-	13,442	**13,442**
	Support Space	sf	-	-	-	**-**
	Other Space	sf	-	3,599	3,370	**6,969**
	SubTotal:		**-**	**3,599**	**42,488**	**46,087**
	Public Space					
	Security	sf	2,212	-	-	**2,212**
	Circulation	sf	5,846	47,882	1,326	**55,054**
	Restrooms	sf	290	4,111	-	**4,401**
	Other Space	sf	-	410	-	**410**
	SubTotal:		**8,348**	**52,403**	**1,326**	**62,077**
	Non-Public Space					
	Non-Airline Tenant Space	sf	-	-	-	**-**
	Other Space	sf	-	-	1,149	**1,149**
	Terminal Functions	sf	1,927	6,480	16,961	**25,368**
	SubTotal:		**1,927**	**6,480**	**18,110**	**26,517**
	SubTotal Functional Terminal Space by Level:		***16,496***	***128,325***	***105,002***	
	SubTotal Gross Terminal Space by Level:		***18,423***	***134,805***	***121,963***	
	Total					
					Total Functional Terminal Area:	**249,823**
					Total Gross Terminal Area:	**275,191**

Source: Landrum & Brown analysis, 2011

Table 2.2-5
CONCOURSE D SPACE BY LEVEL
Lambert-St. Louis International Airport

	Concourse D Space by Level	Units	Existing Terminal Space (2008) Concourse	Apron		Total
Airline Space	**Domestic Airline Space**					
	Ticket Counter					
	Linear Counter Check-in Positions (Kiosk)	pos	-	-	-	-
	Total Check-in Locations (Kiosk)	pos	-	-	-	-
	Total Linear Position Length	lf	-	-	-	-
	Counter Area (Includes any curb check)	sf	-	-	-	-
	Ticketing Queue (including any free standing kiosks)	sf	-	-	-	-
	Curbcheck Positions	pos	-	-	-	-
	Airline Ticket Offices	sf	-	-	-	-
	Baggage Claim					
	Claim Devices	units	-	-	-	-
	Linear Frontage	lf	-	-	-	-
	Baggage Claim Hall (Includes Device, Queues & Circulation)	sf	-	-	-	-
	Baggage Services	sf	-	-	-	-
	Airline Clubs/VIP Lounges	sf	-	-	-	-
	SubTotal:		**-**	**-**	**-**	**-**
	International Airline Space					
	Ticket Counter					
	Linear Counter Check-in Positions (Kiosk)	pos	-	-	-	-
	Total Check-in Locations (Kiosk)	pos	-	-	-	-
	Total Linear Position Length	lf	-	-	-	-
	Counter Area (Includes any curb check)	sf	-	-	-	-
	Ticketing Queue (including any free standing kiosks)	sf	-	-	-	-
	Curbcheck Positions	pos	-	-	-	-
	Airline Ticket Offices	sf	-	-	-	-
	Airline Clubs/VIP Lounges	sf	-	-	-	-
	SubTotal:		**-**	**-**	**-**	**-**
	Other Airline Space					
	Outbound Bag Make-Up	sf	-	-	-	-
	Inbound Bag Delivery	sf	-	-	-	-
	Checked Baggage Screening (TSA Space)	sf	-	-	-	-
	Airline Operations	sf	-	31,770	-	**31,770**
	Other Airline Offices/Systems and Support	sf	7,694	-	-	**7,694**
	Other Airline Space	sf				-
	SubTotal:		**7,694**	**31,770**	**-**	**39,464**
	Departure Lounges					
	Air Carrier Gates					
	Small Regional (Cessna/Metro)	sf	-	-	-	-
	Medium Regional (BE1/CRJ,CR7,9/ERJ/SF340)	sf	-	-	-	-
	Large Regional (E170,175,190)	sf	-	-	-	-
	Narrowbody (Q400/A320/B737w)	sf	-	-	-	-
	B-757(winglets)	sf	-	-	-	-
	Widebody (B767/MD11)	sf	-	-	-	-
	Jumbo (B747,787,777/A330,340)	sf	-	-	-	-
	NLA (A380)	sf	-	-	-	-
	SubTotal:		**11,044**	**5,496**	**-**	**16,540**
Concessions Space	**Non-Secure Concessions Space**					
	Rental Car					
	Number Counters	pos	-	-	-	-
	Counter Area/Offices	sf	-	-	-	-
	Queue	sf	-	-	-	-
	Non-Secure Concessions	sf	-	-	-	-
	Non-Secure Storage	sf	-	-	-	-
	SubTotal:		**-**	**-**	**-**	**-**
	Secure Concessions Space					
	Secure Concessions	sf	5,568	-	-	5,568
	Secure Storage	sf	1,221	-	-	1,221
	SubTotal:		**6,789**	**-**	**-**	**6,789**

Table 2.2-5 *(continued)*
CONCOURSE D SPACE BY LEVEL
Lambert-St. Louis International Airport

	Concourse D Space by Level	Units	Existing Terminal Space (2008)			
			Concourse	Apron		*Total*
Public Space	**Security**					
	Number of Lanes	units	-	-	-	**-**
	Checkpoint Area	sf	-	-	-	**-**
	Queuing Area	sf	-	-	-	**-**
	TSA Offices	sf	-	-	-	**-**
	SubTotal:		**-**	**-**	**-**	**-**
	Circulation					
	Ticket Lobby Circulation	sf	-	-	-	**-**
	Baggage Claim Circulation	sf	-	-	-	**-**
	Secure Circulation	sf	72,632	-	-	**72,632**
	Secure Vertical Circulation (Fire Exit/Service Stairs)	sf	2,202	2,451	-	**4,653**
	General Public Circulation (Includes Vestibules, Vertical Circ)	sf	-	-	-	**-**
	Vertical Circulation (Secure/Non-Secure)	sf	853	322	-	**1,175**
	Public Seating	sf	-	-	-	**-**
	Domestic Meeter/Greeter Lobby	sf	-	-	-	**-**
	Transportation (Shuttle Service) & Hotel Courtesy Phones	sf	-	-	-	**-**
	SubTotal:		**75,687**	**2,773**	**-**	**78,460**
	Restrooms					
	Public Restrooms - Secure	sf	2,738	529	-	**3,267**
	Public Restrooms - Non-Secure	sf	-	-	-	**-**
	SubTotal:		**2,738**	**529**	**-**	**3,267**
	Other Space					
	Misc Tenant					
	American Credit Union (AAFCU), Central Carts, Chapel, USO, USPS	sf		-		**-**
	Smoking Lounge	sf	247	-		**247**
	Other (Displays, Information Counters, Visitors Commission etc)	sf	-	-	-	**-**
	SubTotal:		**247**	**-**	**-**	**247**
Non-Public Space	**Non-Airline Tenant Space**					
	Airport Administration					
	Offices/Support (City)	sf	1,181	4,196	-	**5,377**
	Airport Police	sf	-	-	-	**-**
	Other Tenants					
	Misc Tenant	sf	-	-	-	**-**
	SubTotal:		**1,181**	**4,196**	**-**	**5,377**
	Other Space					
	Non-Public Restrooms	sf	40	1,170	-	**1,210**
	Non-Public Circulation	sf	-	518	-	**518**
	Other	sf	-	-	-	**-**
	SubTotal:		**40**	**1,688**	**-**	**1,728**
	Terminal Function					
	Maintenance/Janitorial/Storage/Shops	sf	755	560	-	**1,315**
	Mechanical/Electrical/Telephone/Plumbing	sf	1,580	51,678	-	**53,258**
	Building Systems (Structure/Non-net/Void)	sf	2,562	3,254	-	**5,816**
	Exterior - Other (ie Public Gardens, etc)	sf	-	-	-	**-**
	SubTotal:		**4,897**	**55,492**	**-**	**60,389**

Table 2.2-5 *(continued)*
CONCOURSE D SPACE BY LEVEL
Lambert-St. Louis International Airport

Summary – Concourse D Space by Level	Units	Existing Terminal Space (2008) Concourse	Apron		Total
Airline Space	Units				
Domestic Airline Space	sf	-	-	-	**-**
International Airline Space (Included in Domestic Airline Space)	sf	-	-	-	**-**
Other Airline Space	sf	7,694	31,770	-	**39,464**
Departure Lounges	sf	11,044	5,496	-	**16,540**
SubTotal:		**18,738**	**37,266**	**-**	**56,004**
Concessions					
Non-Secure Concessions Space	sf	-	-	-	**-**
Secure Concessions Space	sf	6,789	-	-	**6,789**
SubTotal:		**6,789**	**-**	**-**	**6,789**
US Customs & Border Protection Services					
Primary Inspection	sf	-	-	-	**-**
Baggage Claim	sf	-	-	-	**-**
Secondary Inspection	sf	-	-	-	**-**
Support Space	sf	-	-	-	**-**
Other Space	sf	-	-	-	**-**
SubTotal:		**-**	**-**	**-**	**-**
Public Space					
Security	sf	-	-	-	**-**
Circulation	sf	75,687	2,773	-	**78,460**
Restrooms	sf	2,738	529	-	**3,267**
Other Space	sf	247	-	-	**247**
SubTotal:		**78,672**	**3,302**	**-**	**81,974**
Non-Public Space					
Non-Airline Tenant Space	sf	1,181	4,196	-	**5,377**
Other Space	sf	40	1,688	-	**1,728**
Terminal Functions	sf	4,897	55,492	-	**60,389**
SubTotal:		**6,118**	**61,376**	**-**	**67,494**
SubTotal Functional Terminal Space by Level:		***105,420***	***46,452***	**-**	
SubTotal Gross Terminal Space by Level:		***110,317***	***101,944***	**-**	
Total					
				Total Functional Terminal Area:	**151,872**
				Total Gross Terminal Area:	**212,261**

Source: Landrum & Brown analysis, 2011

Table 2.2-6
TERMINAL 2/CONCOURSE E SPACE BY LEVEL
Lambert-St. Louis International Airport

	Terminal 2/Concourse E Space by Level	Units	Existing Terminal Space (2008)			
			Tkt/Conc	Claim/Aprn		*Total*
Airline Space	**Domestic Airline Space**					
	Ticket Counter					
	Linear Counter Check-in Positions (Kiosk)	pos	38 (8)	-	-	**38 (8)**
	Total Check-in Locations (Kiosk)	pos	38 (8)	-	-	**38 (8)**
	Total Linear Position Length	lf	196	-	-	**196**
	Counter Area (Includes any curb check)	sf	2,845	-	-	**2,845**
	Ticketing Queue (including any free standing kiosks)	sf	1,826	-	-	**1,826**
	Curbcheck Positions	pos	-	-	-	**-**
	Airline Ticket Offices	sf	5,607	-	-	**5,607**
	Baggage Claim					
	Claim Devices	units	-	2	-	**2**
	Linear Frontage	lf	-	360	-	**360**
	Baggage Claim Hall (Includes Device, Queues & Circulation)	sf	-	10,264	-	**10,264**
	Baggage Services	sf	-	363	-	**363**
	Airline Clubs/VIP Lounges	sf	-	-	-	**-**
	SubTotal:		**10,278**	**10,627**	**-**	**20,905**
	International Airline Space (included in Domestic)					
	Ticket Counter					
	Linear Counter Check-in Positions (Kiosk)	pos	-	-	-	incl. in Dom
	Total Check-in Locations (Kiosk)	pos	-	-	-	incl. in Dom
	Total Linear Position Length	lf	-	-	-	incl. in Dom
	Counter Area (Includes any curb check)	sf	-	-	-	incl. in Dom
	Ticketing Queue (including any free standing kiosks)	sf	-	-	-	incl. in Dom
	Curbcheck Positions	pos	-	-	-	incl. in Dom
	Airline Ticket Offices	sf	-	-	-	incl. in Dom
	Airline Clubs/VIP Lounges	sf	-	-	-	incl. in Dom
	SubTotal:		**-**	**-**	**-**	**-**
	Other Airline Space					
	Outbound Bag Make-Up	sf	-	25,120	-	**25,120**
	Inbound Bag Delivery	sf	-	5,632	-	**5,632**
	Checked Baggage Screening (TSA Space)	sf	2,609	-	-	**2,609**
	Airline Operations	sf	-	17,937	-	**17,937**
	Other Airline Offices/Systems and Support	sf	494	698	-	**1,192**
	Other Airline Space	sf	17	382		**399**
	SubTotal:		**3,120**	**49,769**	**-**	**52,889**
	Departure Lounges					
	Air Carrier Gates					
	Small Regional (Cessna/Metro)	sf	-	-	-	**-**
	Medium Regional (BE1/CRJ,CR7,9/ERJ/SF340)	sf	-	-	-	**-**
	Large Regional (E170,175,190)	sf	-	-	-	**-**
	Narrowbody (Q400/A320/B737w)	sf	47,670	-	-	**47,670**
	B-757(winglets)	sf	-	-	-	**-**
	Widebody (B767/MD11)	sf	-	-	-	**-**
	Jumbo (B747,787,777/A330,340)	sf	-	-	-	**-**
	NLA (A380)	sf	-	-	-	**-**
	SubTotal:		**47,670**	**-**	**-**	**47,670**
Concessions Space	**Non-Secure Concessions Space**					
	Rental Car					
	Number Counters	pos	-	In Main Term	-	**-**
	Counter Area/Offices	sf	-	In Main Term	-	**-**
	Queue	sf	-	In Main Term	-	**-**
	Non-Secure Concessions	sf	629	-	-	**629**
	Non-Secure Storage	sf	213	-	-	**213**
	SubTotal:		**842**	**-**	**-**	**842**
	Secure Concessions Space					
	Secure Concessions	sf	16,927	-	-	16,927
	Secure Storage	sf	3,399	2,435	-	5,834
	SubTotal:		**20,326**	**2,435**	**-**	**22,761**

Table 2.2-6 *(continued)*
TERMINAL 2/CONCOURSE E SPACE BY LEVEL
Lambert-St. Louis International Airport

	Terminal 2/Concourse E Space by Level	Units	Existing Terminal Space (2008)			
			Tkt/Conc	Claim/Aprn		*Total*
US Customs & Border Protection Services (CBP)	**Primary Inspection**					
	Primary Inspection Booths (Double Counters)	units	-	4	-	4
	Area Primary Inspection Booths	sf	-	988	-	988
	Primary Inspection Queue	sf	-	3,388	-	3,388
	Primary Inspection Support	sf	-	5,722	-	5,722
	SubTotal:		**-**	**10,098**	**-**	**10,098**
	Baggage Claim					
	Claim Devices	units	-	1	-	1
	Linear Frontage	lf	-	130	-	130
	Baggage Claim Hall (Includes Device, Queues & Circulation)	sf	-	6,690	-	6,690
	SubTotal:		**-**	**6,690**	**-**	**6,690**
	Secondary Inspection					
	Passport Control Check Positions	pos	-	-	-	-
	Area Passport Control Check	sf	-	incl in Sec	-	-
	Area Secondary Waiting	sf	-	incl in Sec	-	-
	Pairs Secondary Inspection X-Rays	units	-	2	-	2
	Area Secondary Inspection	sf	-	3,926	-	3,926
	Agriculture Inspection Stations	units	-	-	-	-
	Area Agriculture Inspection	sf	-	-	-	-
	Secondary Inspection Support	sf	-	4,397	-	4,397
	SubTotal:		**-**	**8,323**	**-**	**8,323**
	Support Space					
	CBP Administration	sf	1,185	incl in Primary	-	1,185
	CBP Administration Support	sf	-	incl in Primary	-	-
	SubTotal:		**1,185**	**-**	**-**	**1,185**
	Other Space					
	Sterile Circulation	sf	3,591	7,220	-	10,811
	Secure Vertical Circulation (Fire Exit/Service Stairs)	sf	795	-	-	795
	In-Transit/Sterile Holding Areas	sf	-	-	-	-
	Public Sterile Restrooms	sf	-	551	-	551
	General Circulation (Includes Vertical Circ)	sf	521	-	-	521
	Greeter Lobby					
	Greeter Waiting Area	sf	-	3,956	-	3,956
			-	-	-	-
	Baggage Recheck					
	Number Recheck Positions	pos	-	2	-	2
	Area Recheck Positions	sf	-	150	-	150
	Queue Baggage Recheck	sf	-	incl in M/G	-	-
	SubTotal:		**4,907**	**11,877**	**-**	**16,784**

Table 2.2-6 *(continued)*
TERMINAL 2/CONCOURSE E SPACE BY LEVEL
Lambert-St. Louis International Airport

	Terminal 2/Concourse E Space by Level	Units	Existing Terminal Space (2008) Tkt/Conc	Claim/Aprn		Total
Public Space	**Security**					
	Number of Lanes	units	6	-	-	**6**
	Checkpoint Area	sf	4,160	-	-	**4,160**
	Queuing Area	sf	1,180	-	-	**1,180**
	TSA Offices	sf	2,353	-	-	**2,353**
	SubTotal:		**7,693**	**-**	**-**	**7,693**
	Circulation					
	Ticket Lobby Circulation	sf	12,275	-	-	**12,275**
	Baggage Claim Circulation	sf	-	6,993	-	**6,993**
	Secure Circulation	sf	43,951	-	-	**43,951**
	Secure Vertical Circulation (Fire Exit/Service Stairs)	sf	3,727	2,767	-	**6,494**
	General Public Circulation (Includes Vestibules, Vertical Circ)	sf	1,284	8,829	-	**10,113**
	Vertical Circulation (Secure/Non-Secure)	sf	1,880	889	-	**2,769**
	Public Seating	sf	-	incl in Claim	-	**-**
	Domestic Meeter/Greeter Lobby	sf	-	Incl in Claim Circ	-	**-**
	Transportation (Shuttle Service) & Hotel Courtesy Phones	sf	-	150	-	**150**
	SubTotal:		**63,117**	**19,628**	**-**	**82,745**
	Restrooms					
	Public Restrooms - Secure	sf	3,811	-	-	**3,811**
	Public Restrooms - Non-Secure	sf	773	2,020	-	**2,793**
	SubTotal:		**4,584**	**2,020**	**-**	**6,604**
	Other Space					
	Misc Tenant					
	American Credit Union (AAFCU), Central Carts, Chapel, USO, USPS	sf	-	1,141	-	**1,141**
	Smoking Lounge	sf	1,150	-	-	**1,150**
	Other (Displays, Information Counters, Visitors Commission etc)	sf	-	107	-	**107**
	SubTotal:		**1,150**	**1,248**	**-**	**2,398**
Non-Public Space	**Non-Airline Tenant Space**					
	Airport Administration					
	Offices/Support (City)	sf	320	3,987	-	**4,307**
	Airport Police	sf	-	-	-	**-**
	Other Tenants					
	Misc Tenant	sf	3,034	1,479	-	**4,513**
	SubTotal:		**3,354**	**5,466**	**-**	**8,820**
	Other Space					
	Non-Public Restrooms	sf	-	1,434	-	**1,434**
	Non-Public Circulation	sf	1,672	3,437	-	**5,109**
	Other	sf	-	-	-	**-**
	SubTotal:		**1,672**	**4,871**	**-**	**6,543**
	Terminal Function					
	Maintenance/Janitorial/Storage/Shops	sf	1,280	1,140	-	**2,420**
	Mechanical/Electrical/Telephone/Plumbing	sf	4,597	32,284	-	**36,881**
	Building Systems (Structure/Non-net/Void)	sf	1,280	4,897	-	**6,177**
	Exterior - Other (ie Public Gardens, etc)	sf	-	-	-	**-**
	SubTotal:		**7,157**	**38,321**	**-**	**45,478**

Table 2.2-6 *(continued)*
TERMINAL 2/CONCOURSE E SPACE BY LEVEL
Lambert-St. Louis International Airport

Terminal 2/Concourse E Space by Level	Units	Existing Terminal Space (2008)			
Summary		Tkt/Conc	Claim/Aprn		*Total*
Airline Space	Units				
Domestic Airline Space	sf	10,278	10,627	-	**20,905**
International Airline Space (Included in Domestic Airline Space)	sf	-	-	-	**-**
Other Airline Space	sf	3,120	49,769	-	**52,889**
Departure Lounges	sf	47,670	-	-	**47,670**
SubTotal:		**61,068**	**60,396**	**-**	**121,464**
Concessions					
Non-Secure Concessions Space	sf	842	-	-	**842**
Secure Concessions Space	sf	20,326	2,435	-	**22,761**
SubTotal:		**21,168**	**2,435**	**-**	**23,603**
US Customs & Border Protection Services					
Primary Inspection	sf	-	10,098	-	**10,098**
Baggage Claim	sf	-	6,690	-	**6,690**
Secondary Inspection	sf	-	8,323	-	**8,323**
Support Space	sf	1,185	-	-	**1,185**
Other Space	sf	4,907	11,877	-	**16,784**
SubTotal:		**6,092**	**36,988**	**-**	**43,080**
Public Space					
Security	sf	7,693	-	-	**7,693**
Circulation	sf	63,117	19,628	-	**82,745**
Restrooms	sf	4,584	2,020	-	**6,604**
Other Space	sf	1,150	1,248	-	**2,398**
SubTotal:		**76,544**	**22,896**	**-**	**99,440**
Non-Public Space					
Non-Airline Tenant Space	sf	3,354	5,466	-	**8,820**
Other Space	sf	1,672	4,871	-	**6,543**
Terminal Functions	sf	7,157	38,321	-	**45,478**
SubTotal:		**12,183**	**48,658**	**-**	**60,841**
SubTotal Functional Terminal Space by Level:		***169,898***	***133,052***	**-**	
SubTotal Gross Terminal Space by Level:		***177,055***	***171,373***	**-**	
Total					
Total Functional Terminal Area:					**302,950**
Total Gross Terminal Area:					**348,428**

Source: Landrum & Brown analysis, 2011

2.2.8 OCCUPANCY

2.2.8.1 Airlines

Thirteen commercial passenger airlines operate at STL in the following terminals and concourses:

TERMINAL 1

Concourse A

- Air Canada
- Alaska
- Continental
- Delta
- United
- US Airways

Concourse B

- *This concourse is closed*

Concourse C

- American
- Cape Air
- Frontier

Concourse D

- *This concourse is closed*

TERMINAL 2 / CONCOURSE E

- Southwest / Air Tran
- Air Choice One
- USA3000
- Charters

No airlines occupy space in more than one terminal or concourse.

2.2.8.2 Concessions

There are two primary concessionaires at STL: HMS Host and The Paradies Shops. HMS Host covers food and beverages, whereas The Paradies Shops handle news and gifts. Terminal 1 and its concourses contain approximately 112,500 square feet of potential concession and support space. With the closure of Concourse B and D this area is reduced to approximately 85,900 square feet.

Secure concessions and support space or space inside the secure terminal and concourse areas (post security) total approximately 42,100 square feet with non-secure space totaling approximately 43,800 square feet. Some of this space is part of the completed and planned list of projects under the Lambert Advantage Program in coordination with the *Airport Experience Program* that began in July 2008[18]. STL is unique compared to most airports in that the concessions space is approximately split 50/50 between the landside (51 percent non-secure) and airside (49 percent secure/post security) portions of Terminal 1 and its concourses. This is due to an entire bay at the west end of the ticketing level devoted to public food & beverage space as well as news/gift and food/beverage on the baggage claim level (lower level). The Terminal contains approximately 69 percent of the total Terminal 1 concessions program with Concourse A containing 12 percent and Concourse C 19 percent.

The Terminal 2 concession and support program totals approximately 23,600 square feet with 96 percent of this space allocated to the secure portions of the terminal and concourses.

2.2.8.3 Other Space

The TSA has one security checkpoint at the entrance to each concourse at Terminal 1 consisting of five lanes at Concourse A, seven at Concourses C and D, and two at Concourse B totaling 14 lanes (Concourse B is used to relieve other checkpoints). As part of the *Airport Experience Program* Concourses C and D checkpoint will be reconfigured and expanded from 7 to 8 possible lanes. This expansion enables the area to accommodate additional passenger queuing and space needed to handle the latest passenger screening equipment such as Advanced Imaging Technology (AIT) also known as Whole Body Image (WBI) devices which will run in parallel with the traditional magnetometer.

Terminal 2 has two checkpoints at the terminal midpoint and west end of the ticketing level. These checkpoints have four and two security lanes, respectively, with capacity for additional expansion[19].

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18 http://www.flystl.com/flystl/airport-exp/shops-restaurants/
19 http://www.flystl.com/flystl/media-newsroom/news-release/Archival/2009/pdf/11-9-09.pdf

2.2.9 PASSENGER MOVEMENT

2.2.9.1 Departures

Passengers access both terminals from one of three options: curbfront, parking garages located in front of each terminal, or the MetroLink light-rail system that has a stop at both terminals.

Upon entering the terminal, passengers proceed through the vestibules to the airline ticketing area. Luggage is screened by the TSA in the ticketing areas via standalone Explosive Detection Systems or EDS machines, and then passed along the baggage belts to the make-up areas. Each passenger then proceeds down one level to the TSA security screening checkpoint (SSCP) associated with that passenger's assigned gate in Terminal 1. In Terminal 2 both SSCP are located on the same level as ticketing and centrally located in the terminal prior to entering the concourse area. One checkpoint serves an entire concourse and its corresponding gates/hold rooms. Once past the designated SSCP area, passengers have no access to other gates or to the non-secure (pre-security) concession areas.

2.2.9.2 Arrivals

Arriving passengers deplane by jet bridge. The exceptions are Cape Air and Air Choice 1; those passengers deplane at the ramp level and are escorted to hold room areas. Upon leaving the hold room area, passengers proceed through the circulation corridor to the baggage carousels located on the same level in Terminal 1 and down one level in Terminal 2. Once baggage is retrieved, passengers may immediately exit the terminal facility by means of the circulation corridor through the terminal vestibules to the curb front or the parking garages.

Passengers arriving from international destinations utilize the U.S Customs and Border Protection (CBP) arrival facilities located beneath Gates E29, E31, or E33 at Terminal 2. After deplaning passengers enter a sterile corridor system and escalate down one level to primary processing. They first pass through the primary inspection desks, then retrieve their luggage at a baggage claim carousel located downstream from primary inspection. At this point passengers will either exit to a public meter & greeter area or pass through a customs inspection area before exiting. Terminating passengers can then exit the terminal or for connecting passengers, re-check their baggage and enter a non-secure corridor that leads to the domestic baggage claim area of the terminal. At this point they will escalate up one level to the ticketing level.

The CBP facilities at STL total approximately 46,100 square feet at Terminal 1 (currently closed) and 43,100 square feet at Terminal 2.

2.2.9.3 Connecting Passengers

Connecting passengers must exercise care when arriving at STL in that they will have to be re-screened by the TSA if they inadvertently leave the secured concourses. Because TSA checkpoints are set up at the entrance to each concourse certain connecting passengers, particularly those connecting to other airlines, will have to be re-screened if their connecting gate is not in the same concourse as their arrival gate. Passengers requiring connections between terminals use the airport's shuttle service. At this point passengers will be re-screened by the TSA at the security checkpoint for their designated gate.

2.2.10 PASSENGER FACILITY CONDITIONS

As part of the on-going *Airport Experience Program,* a facility condition report was produced in 2006 to assist Lambert Airport in identifying the mechanical and structural items that required maintenance activities or consideration for inclusion in the Airport's CIP. By its nature, as a part of the AEP, the facility condition report focused primarily on the Terminal 1 building, concourses, building infrastructure, and landside facilities. The following sections provide a description of the issues identified in five major categories: site development, site signage, structural systems, mechanical systems and baggage processing systems.

2.2.10.1 Site Development

The facility condition report identified several issues associated with the roadways at the front of the Terminal 1. The Departing Passenger Roadway (Ticketing Drive) noted significant issues with the wearing surfaces and expansion joints, which were permitting moisture and deicing salt to intrude into the concrete structure. The Arriving Passenger Drive (Baggage Claim Drive) was also noted to have water and deicing salt penetration through the wearing layer and at the expansion joints. Additionally the report noted evidence of structural deterioration of the cast-in-place concrete bridge decks where Ticketing Drive exits the terminal area over Baggage Claim Drive.

Following the publication of the AEP condition report STL completed several projects to address the issues noted above including a $1.4 million project in 2008 which focused on waterproofing repairs on Baggage Claim Drive, a project focused on replacing concrete slabs, curbs and gutters on Lambert International Boulevard (LIB), and an asphalt resurfacing of LIB. A separate project was completed to make repairs to the bridges supporting Ticketing Drive.

2.2.10.2 Site Signage

The AEP facility condition report also noted problems with the existing trailblazer and way-finding signage at the entrance to the terminal area. Although the signage was found to be in good condition, the report indicated that the content of the signs was lacking and sometimes confusing. The placement of the signs and lack of constant terminology between MoDOT signage and Airport Signage increased the confusion experienced by passengers.

In 2010, STL began the installation of new trailblazing and way-finding signage. This effort, coordinated with MoDOT, provides consistent signage from the access highways to the terminal area. It is also important to note that STL also upgraded the traffic control systems on the LIB and linked them into a complete Internet Protocol based traffic management system.

2.2.10.3 Structural Systems

The AEP report did not identify any major issues or structural deficiencies associated with Terminal 1 or the A, B, C, and D concourses. There were some minor issues raised relative to spalled concrete and, in a few instances, spalled and cracking concrete resulting in exposed reinforcing materials. The escalators in the Terminal 1 parking garage were noted to be in poor conditions. The airport has since replaced the aging escalators with new elevators and stairs.

2.2.10.4 Architectural Systems

The AEP noted several deficiencies in Terminal 1 including the ceiling in the ticketing hall, glazing in the main terminal and the fixtures and furnishings in the ticketing hall, specifically the airline ticket counters. On-going repair to the copper roof has mitigated most of the moisture intrusion issues that lead to discoloration of the ceiling in Ticketing Hall. Cosmetically, the Ticketing Hall has undergone a significant transformation with the refinishing of the ceiling with brighter paint, refurbishment of six skylights to permit greater natural light transmission and the addition of an LED light system to provide nighttime color accents to the main terminal. As part of the ticketing hall renovations the some of the Airline Ticket Counters were updated.

2.2.10.5 Mechanical Systems

The facility condition report identified major issues with several of the mechanical systems associated with Terminal 1 and the A, B, C, and D concourses. Issues included rooftop air handler units, exhaust fans, HVAC systems, chilled water systems, heating systems, control systems and fire protection systems. Most of the issues identified have been addressed as part of the $11.8 million project. The climate control improvements and make up air fan for the baggage claim area have not been completed but are on the list of future projects. An item was identified in the AEP report and remains a concern for staff is the lack of space in

the utility tunnels. As systems are upgraded or replaced, the old systems have been left in place and the tunnels are becoming crowded and repairs to original systems, such as the fire suppression lines, is increasingly difficult to perform.

2.2.10.6 Electrical Systems

The normal power and emergency power systems at STL were highlighted in the ARP facility conditions report as an area of concern. Two separate power substations (34.5kV to 4.1kV) power STL. The condition of the switchgear varies depending on the history of outages that have occurred and the ease of replacing equipment. Given the electrical demands, the distribution voltage would not be 4.1kV. Instead, STL would ideally be served by a 13.8kV or 14.47kV system. The St. Louis Airport Authority (STLAA) continues to evaluate the costs associated with maintaining the current system relative to the cost of upgrading to a more modern distribution power distribution system.

2.2.10.7 Baggage Processing Systems

Both inbound and outbound baggage systems were identified as reaching the end of their normal useful life expectancy. Subsequent to the AEP report a state of the art inbound luggage system was installed; it includes new carousels that are faster and quieter. Besides providing increased performance and reliability, the new carousels are of a lower profile design, which enhances the visual appearance in the baggage claim area.

The deficiencies of the outbound baggage system are generally associated with the changes in baggage screening protocol that has occurred since the systems were originally installed. STLAA is studying the alternatives available to provide in-line screening system that will eliminate the need for EDS machines in the Ticketing Hall.

2.3 AIRPORT AND AIRLINE SUPPORT FACILITIES

2.3.1 GROUND SERVICE EQUIPMENT

In addition to accommodating aircraft, the apron area must also provide space for maneuvering, parking, and storage requirements of Ground Support Equipment (GSE). Aircraft GSE varies considerably according to the type of aircraft and airline methods of operations. GSE includes the following:

- Passenger loading (all devices used to transfer passengers between the terminal and aircraft (loading bridges, stairs, and transporters)
- Baggage, cargo, and mail processing – all equipment used to transport baggage, cargo, and mail between the terminals and aircraft (baggage carts and tugs, container and pallet dollies, belt conveyors, transporters, loaders and trucks
- Aircraft catering and cleaning – used to provision the aircraft for passenger in-flight service including hi-lift catering trucks, lavatory service trucks, water trucks, and cabin service vehicles
- Aircraft towing – tugs used for aircraft towing and push-out operations
- Aircraft fueling – mobile tankers and hydrant dispensers
- Other equipment – ground power units, air starters, air conditioners, deicing vehicles, etc.

GSE staging areas are those areas used to preposition equipment that should be present to service an aircraft upon its arrival at a gate. Staging areas are typically located on the right side of the aircraft immediately outside the equipment limit lines. GSE storage areas are those areas used to accumulate GSE that is not immediately needed to service an aircraft. Storage areas should be located as close as possible to the aircraft gates. At STL the GSE storage is located at the aircraft gates, aircraft aprons adjacent to the Cargo City Area and Commercial Air Cargo facilities, and aircraft aprons adjacent to the southwest of Terminal 1.

Maintenance of GSE equipment utilized in commercial passenger operations typically occurs away from the aircraft gate in separate GSE maintenance facilities. At STL the GSE maintenance occurs at a site immediately northeast of Cargo Building 1, and at the airline ground service vehicle maintenance facility, which is situated directly west of the main power plant and cooling towers. The cargo operators and FBOs accommodate GSE maintenance within their existing building or on the adjacent aircraft apron.

2.3.2 AIRCRAFT FUELING AND FUEL STORAGE

This section discusses existing facilities, equipment, and procedures for the handling, storage, and distribution of aviation fuel at STL. As of February 2009, Allied Aviation provided fuel distribution from the central airport fuel farm located on the southwest corner of Lambert International Boulevard and Airport Exit Road to all commercial airlines at STL, as well as, to the air cargo operators at the airport. In addition, Signature Flight Support and Airport Terminal Services (ATS) have fuel storage areas for general aviation customers. As of February 2009, all commercial aircraft fueling operations at STL were performed via the in-ground hydrant fueling system. **Exhibit 2.3-1, *Fuel Storage Areas***, depicts all the fuel storage areas at Lambert Airport.

2.3.2.1 Fuel Farm

The Central Fuel Farm is located southwest of Terminal 1, adjacent to Super Park A on Lambert International Boulevard, and is operated by Allied Aviation. The fuel farm site encompasses an area of approximately nine acres.

The fuel farm consists of forty-one underground fuel tanks used exclusively for the storage of Jet-A aircraft fuel. These tanks have an overall fuel storage capacity of 1,590,000 gallons (37,857 barrels). However, the actual useable capacity is slightly less to accommodate expansion of the fuel and for minimum levels in each tank maintained to eliminate the transfer of sediment. The inventory of fuel storage tanks by number of tanks, and tank capacities are listed below in **Table 2.3-1, *Central Fuel Farm Storage Capacity***.

Table 2.3-1
CENTRAL FUEL FARM STORAGE CAPACITY
Lambert-St. Louis International Airport

TANK QUANTITY	ISLANDS	TANK CAPACITY (GALLONS) [1]	TANK CAPACITY (BBL) [2]	FUEL TYPE[3]	TOTAL TANK CAPACITY (GALLONS)
12	6	60,000	1,429	Jet-A	1,590,000
29		30,000	714		

Notes: 1 Capacity values are for each individual tank.
2 BBL refers to barrels; one barrel is equivalent to 42 gallons.
3 Primary fuel sources: Conoco/Phillips Wood River Refinery and St. Louis Pipeline Co.

Source: *Fuel Farm Supply Lines*, provided by Airport

Fuel is typically delivered to the facility utilizing underground supply lines, which are maintained by Conoco/Phillips Wood River Refinery and St. Louis Pipeline Co. In the event that the direct supply lines are not functioning, the fuel can be delivered by tanker truck via the six fuel-receiving islands. At the islands, fuel would be filtered, metered, and piped to the storage tanks for distribution to aircraft. Jet fuel distribution pipe circulates throughout the terminal area. The pipeline ranges in size from six, eight, and ten inch wide diameters. Allied Aviation regularly maintains a three to four day supply of Jet-A fuel.

Exhibit 2.3-1
FUEL STORAGE AREAS
Lambert-St. Louis International Airport

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2.3.2.2 General Aviation Fuel Storage

Signature Flight Support and ATS Jet Center have separate general aviation fuel storage areas, both located in the northern quadrant of STL. Signature Flight Support has underground fuel storage tanks situated north of the general aviation facilities. The fuel storage area is enclosed with a security perimeter fence and gate access. ATS has fuel storage tanks located on the Haith Cargo Ramp and at the relocated facility at 130 Banshee Road. The inventory of fuel storage tanks, tank capacities, fuel providers and fuel types are listed below in **Table 2.3-2, *General Aviation Fuel Farm Storage Capacity***.

Table 2.3-2
GENERAL AVIATION FUEL FARM STORAGE CAPACITY
Lambert-St. Louis International Airport

TENANT	TANKS	TANK CAPACITY (GALLONS) [1]	TANK CAPACITY (bbl) [2]	FUEL TYPE[3]	FUEL PROVIDERS
ATS	2	25,000 each	595 each	Jet-A	Air BP
Signature Flight Support	3	12,000 each	238 each	Jet-A, AvGas	AvFuel
	2	2,000 each	48 each	Auto, used oil	-

Notes: 1 Capacity values are fore each individual tank.
2 BBL refers to barrels; one barrel is equivalent to 42 gallons.

Source: Airnav.com, March 16, 2009, Greg Lamm of ATS, January 27, 2010, Lee Lancaster of Signature Flight Support, August 5, 2009, and Landrum & Brown analysis

As of 2009, Air BP and ATS moved from the former Sabreliner facility and relocated to the Trans State Maintenance facility on Banshee Road. Boeing now leases the former Air BP and ATS facilities on Aviation Drive. The Trans State Maintenance facility is situated immediately west of the Low/High Bay Hangar (Bldg. #2) and north of the Taxiway V and F intersection of the airfield. Air BP will continue to provide fuel for ATS. Aviation Drive, which ties to Genaire Drive, provides truck access to the ATS fuel storage tank for the delivery of fuel. The fuel storage area is not directly accessible from the general aviation ramp. However, fuel trucks can go through the ATS vehicular parking area, which is accessible by Aviation Drive, a public road, in order to access the fuel farm. Aviation Drive is a bidirectional service road that provides access into the fuel loading and receiving islands and tanks. In addition, it allows for safe and efficient movements of fuel deliveries and for the movement of the fuel delivery trucks in the fuel storage area.

James S McDonnell Boulevard provides truck access to the Signature Flight Support fuel storage area for the delivery of fuel. The fuel storage area is not directly accessible from the general aviation ramp. Fuel trucks have direct access from James S McDonnell Boulevard, a public road, in order to access the fuel farm. However, fuel trucks have to go through a vehicle access gate to get to the fuel storage area. James S McDonnell Boulevard is a bidirectional road that provides vehicular access to various facilities at Lambert Airport and movement along the eastern corridor of the Lambert Airport property boundary.

2.3.3 AIRCRAFT DEICING

There are two components to the aircraft deicing system at STL. First, is the storage system for glycol before it is used by the airlines; and second, is the processing system for spent fluid after aircraft are deiced.

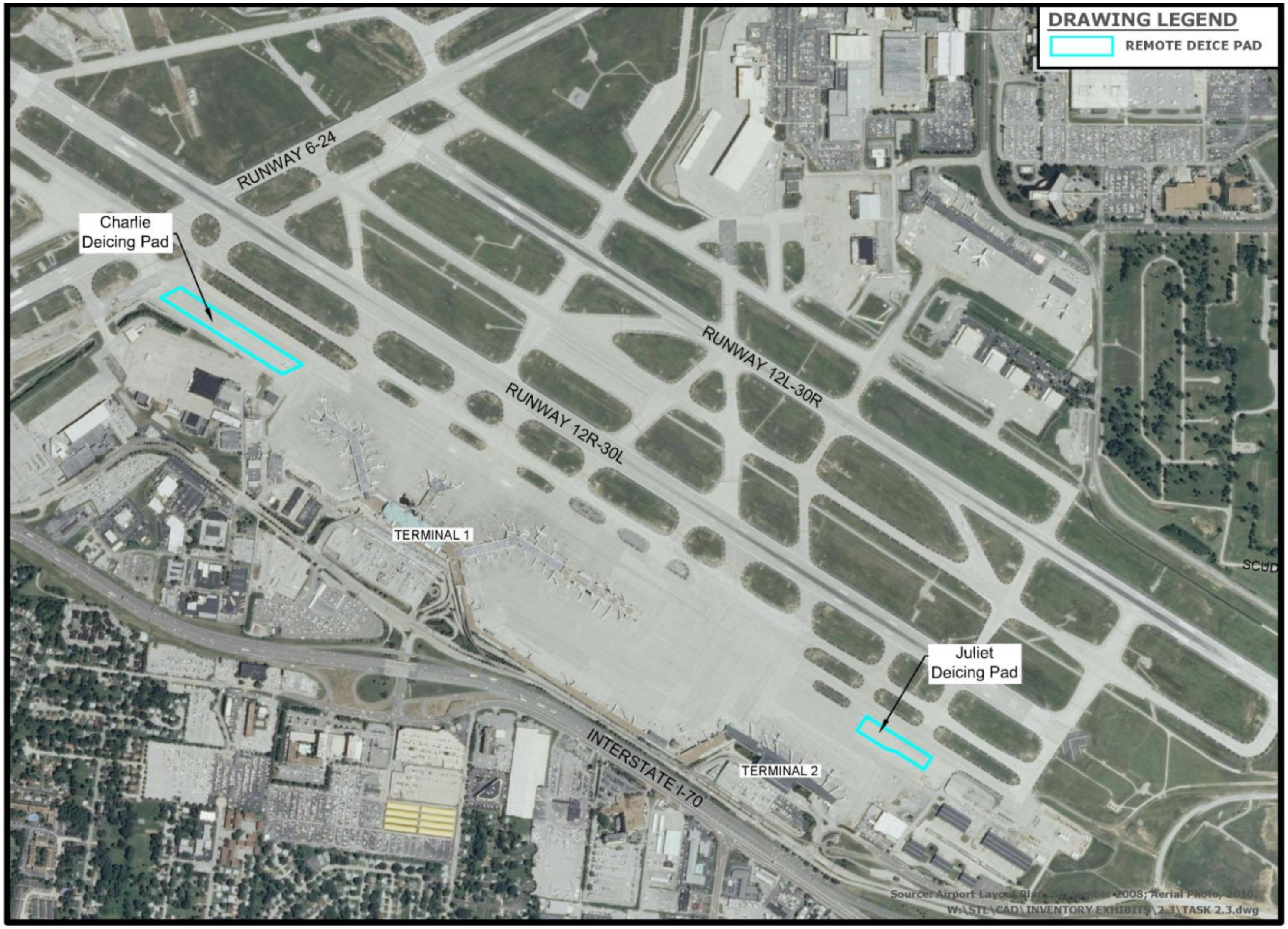
The glycol storage at STL is operated by individual airlines and applicators. Each is responsible for maintaining an adequate supply of deicing fluid and applying it to specific aircraft as needed. The glycol fluid is delivered by truck to storage tank areas near the terminal gates. Aircraft are deiced at the gates and on the remote deicing pads; Charlie Pad and Juliet Pad, illustrated on **Exhibit 2.3-2, *Remote Deicing Pads***. Some airlines contract with Airport Terminal Services for deicing needs.

The deicing fluid is captured in an apron drainage system and a series of tanks and pumping stations collect and direct the glycol/water runoff from the to an above-ground runoff storage tank located on Ruth Lane. The combined capacity of the glycol effluent tanks is 1.7 million gallons. Over the road tanker trucks are utilized to transport the spent glycol to a wastewater treatment plant for processing.

Limited deicing of air cargo carriers is conducted in the North Cargo area. The UPS Cargo facility has been designed and constructed for the collection of deicing runoff. The UPS system is not connected to the main deicing fluid collection system. All other carriers in the North Cargo area use the remote deicing pads.

The UPS deicing runoff is collected through trench drains and goes to two above-ground storage tanks located in the immediate vicinity of the North Cargo area facilities. The site of the two storage tanks encompass an area of approximately 3,020 square feet and is located directly north of the Commercial Air Cargo and UPS Cargo facilities, and immediately south of the James S. McDonnell Boulevard and Airport Road intersection. Once collected, glycol/water runoff is currently released into the sanitary sewer system, which discharges to the Water Treatment Plant under an industrial discharge permit from St. Louis County.

Exhibit 2.3-2
REMOTE DEICING PADS
Lambert-St. Louis International Airport



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2.3.4 AIRCRAFT RESCUE AND FIRE FIGHTING FACILITIES (ARFF)

The St. Louis Fire Department provides fire fighting and rescue services for aircraft and other equipment, and for all buildings at STL. These range from the passenger terminals, cargo buildings, and parking areas, to the rail station and fuel farm. The ARFF District of Lambert-Lambert Airport is the Eighth District of the St. Louis Fire Department.

Personnel and equipment are based in two ARFF stations located at the Lambert Airport. The North ARFF Station is a 10,075-square foot facility situated north of Runway 12L-30R and southeast of the Runway 24 threshold. The West ARFF Station, a 10,792-square foot facility is located on the north side of Runway 11-29. The former South ARFF Station, a 9,580-square foot facility located south of Runway 12R-30L and east of the Runway 6 threshold, has been de-commissioned is being used as a medical storage facility. These facilities are shown in **Exhibit 2.3-3, *Aircraft Rescue and Firefighting Facilities***.

The ARFF District personnel consist of firefighters, company commanders, a training officer and chief officer. The district's vehicles include seven units of ARFF apparatus, two units of rescue apparatus, two units of structural firefighting apparatus, and two staff vehicles. The vehicles and equipment are owned by the ARFF District and are in good condition. A breakdown of vehicles is provided in **Table 2.3-3, *STL ARFF Vehicles***.

Table 2.3-3
STL ARFF VEHICLES
Lambert-St. Louis International Airport

VEHICLE TYPE	YEAR	MANUFACTURER	MODEL
Fire Simulator	1998	INCIPIENT	EP98-801C
Fire Truck	-	SIMON	QS 110 ARIEL LADDER
	-	FORD	F450
	2006	OSHKOSH	TI-3000
	1998	SAULSBURY	842
	2003	OSHKOSH	Striker 3000
	1989	OSHKOSH	STRIKER 3000
	2006	OSHKOSH	T-1500
	1999	FORD	F550 XLT MK III RIV
	1996	FORD	F550 XL
	2003	OSHKOSH	ST1-1500
	2007	FORD	F-550
Generator	1992	BRIGGS & STRATTON	171432
Trailer	2007	WELLS CARGO	EW2024W
	2006	WELLS CARGO	EW2624W
	2006	UNITED	U712TA35
Utility 4WD Full	2007	CHEVROLET	TAHOE
	2002	CHEVROLET	TAHOE
Van Step	2002	FREIGHTLINER	MT55

Source: STL Complete Asset Listing document, provided by Airport.

2.3.5 AIRPORT MAINTENANCE FACILITIES

As illustrated in **Exhibit 2.3-4, *Airport Field Maintenance Facilities***, the field maintenance facilities are concentrated in two main locations; a centralized area an area on the west side. The centralized area provides space for fueling services and operations. It is located between North Supersaber Road and Airfield Service Road, and encompasses approximately two acres. The west side area includes vehicle maintenance, equipment and vehicle storage, warehousing, and sand storage. It is located on the west side of the airfield along Old Natural Bridge Road and between Runways 12R-30L and 11-29. These two field maintenance areas encompass approximately 18 acres of land.

2.3.5.1 Airport Field Maintenance Facilities

The centralized airport field maintenance area provides space for fueling services and operations. These maintenance facilities are accessible from two separate areas. Accessibility from the landside area is provided by Airfield Service Road, which is just off of Lambert International Boulevard. Airside accessibility to the maintenance facilities is provided by an airport service road connecting the terminal apron located west of Concourse A at Terminal 1. The centralized field maintenance area includes two major structures of varying size and configuration.

Building 308 is approximately 7,092 square feet in size and is used for the maintenance of fuel service vehicles. This building offers six at-grade garage bays, a single level floor plan, and appears to be in good condition. The building is accessible through at least one door on each of its four sides, except for the west side of the building, which has two entrance doors. Numerous vehicles are parked and stored adjacent to, in front of and behind this building. Behind the building to the northwest there are six oversized parking spaces for large trucks and 19 standard size parking spaces within a 48,500 square-foot area. In front of the building to the southeast there are 22 standard size parking spaces within a 14,850 square-foot area. Building 309 is located southeast and beyond the parking area of Building 308.

Building 309 is used for maintenance operations of fuel service vehicles. This facility provides approximately 3,239 square feet of floor space and is reported to be in good condition. This building is situated between Supersaber Road and Aviation Service Road, which are accessible from Lambert International Boulevard. Building 309 has a single level floor plan and can be accessed by one door on each side. Fronting the building to the southeast there are 19 standard size parking spaces within a 12,000 square-foot area.

Exhibit 2.3-3
AIRCRAFT RESCUE AND FIREFIGHTING FACILITIES
Lambert-St. Louis International Airport

Exhibit 2.3-4
AIRPORT FIELD MAINTENANCE FACILITIES
Lambert-St. Louis International Airport

From the landside, the Building 309 (fueling services operations building) parking lot, which encompasses 12,000 square feet and 19 parking spaces, is accessible via a non-delineated portion of Airfield Service Road. Building 309 has two parking lots and they are only accessible from the landside via Airfield Service Road. Access to this facility requires proper identification at an entry security gate along Airfield Service Road. The parking lot located south of Building 308 (fueling services maintenance building) is a 14,850 square-foot area with 22 parking spaces. From the airside, there is a parking lot north of Building 308 is accessible via an airport service road that connects to the terminal apron located west of Concourse A at Terminal 1. Within this parking area there are 6 large fuel truck parking spaces and 19 parking spaces within a 48,500 square-foot area.

The second major concentration of field maintenance-related facilities, are located on the west side of STL along Old Natural Bridge Road, and between Runways 12R-30L and 11-29. The maintenance area encompasses approximately 15 acres of mostly asphalt areas and is accessible from the airfield at two separate locations. The first point of access is provided from the south via an airport service road that connects from the intersection of Taxiways B and T to the maintenance area. Access to the maintenance area from the north is provided via two paved access drives from Taxiway C. This airport field maintenance area includes a total of seven major structures of varying size and configuration.

Located in the southwest portion of this concentration of airport field maintenance facilities, Building 401 consists of three separate buildings. The first building, median in size compared to the other two buildings, has approximately 7,340 square feet of floor space within a single level floor plan. The building is used for storage of landscape equipment and is accessible through one at-grade garage bay and one door, both facing the south. Based on a visual inspection the structure appears to be in good condition. Minimal equipment and vehicles are stored immediately adjacent to the building. In close proximity to the building there are piles of dirt and asphalt within a 76,700 square-foot area. Furthermore, fencing runs along both the east and west sides of the building.

The second building that makes up Building 401, the smallest of the three buildings, has 5,518 square feet of floor space within a single level floor plan and is used for storage of landscape equipment. The building is only accessible through four at-grade garage bays that face the north, and based on a visual inspection the structure appears to be in good condition. Within the 10,770 square-foot area immediately adjacent to the building, minimal equipment and vehicles are stored, and fencing completely surrounds the south, east, and west sides of the building.

The third building, which is significantly larger than the other two buildings, has approximately 52,532 square feet of floor space within a single level floor plan. The building is accessible on practically all sides of the structure. Fronting the south, there is a door and an at-grade garage bay. Facing the east, there are two doors and an at-grade garage bay providing access. Fronting the west, there are a door, an at-grade garage bay, and two vehicle loading bays. On the north side of the building, there are no access points. Based on a visual inspection the structure appears to be in fair condition. Activities conducted at this building include warehousing of landscape materials. The immediate adjacent land areas to the north, south, and west have minimal equipment and vehicles stored within the 28,680 square-foot area. However, further out along the west side of the building is a 52,800 square-foot parking area where maintenance employees park their vehicles. Fencing encloses most of the parking area except for the south side, which adjoins to an open collection/runoff area. In addition, the east side of the building has equipment sitting out; such as new and old tires. Fencing also encloses this building on the north and east sides.

Building 402 located to the northwest of Building 401 (landscape equipment warehouse and office) includes office areas used by the landscape division. This one-story facility has 6,642 square-feet of floor space within an approximate 12,770 square-foot area of land. Based on a limited visual inspection of the building it appears to be in relatively fair condition. A door is positioned on the west side of the building which provides main access through.

East of Building 402 (landscape office), Building 403 is approximately 16,455 square feet in size, has a single level floor plan, and is used for vehicle maintenance. Activities conducted at this building include all maintenance vehicle repairs. Situated on approximately 31,900 square feet of land, the building offers 12 at-grade garage bays, 6 bays on both the east and west sides. Based on a visual inspection and discussions with staff the structure appears to be in fair condition as it lacks any fire suppression capabilities. Due to the inadequate height and width of the garage doors, vehicle maintenance is routinely conducted just outside of the facility. Access through is provided by entrance doors on both the north and south sides.

To the Southeast of Building 403 (maintenance buildings C and D) is Building 404. This building accommodates vehicle maintenance, is approximately 17,323 square feet in size, and has a single level floor plan. Activities conducted at this building include all maintenance vehicle repairs. Situated on approximately 67,400 square feet of land, the building offers 18 at-grade garage bays, 7 bays on both the east and west sides, and 4 bays on the south side. Access through is also provided by entrance doors on the north, south, and east sides of the building.

Similar to Building 403, based on a visual inspection and discussions with staff Building 404 appears to be in fair condition as it lacks any fire suppression capabilities. Furthermore, due to the inadequate height and width of the garage doors, vehicle maintenance is routinely conducted just outside of the facility. Immediately adjacent to Building 404 to the southeast, there are two canopy-covered fuel pumps in separate locations. The closest fuel pump supplies unleaded fuel and the farthest gas pump supplies diesel fuel. On the east side of the maintenance building there are 2 at-grade garage bays which are intended to act as a small vehicle wash bay, but it is seldom used due to its inadequate location and size. Beyond the diesel fuel pump, to the southeast, is an asphalt parking area for maintenance trucks and vans.

The last major structure within this concentration of airport field maintenance facilities is Building 405, which is located southwest of Building 404 (maintenance building A and B). Building 405 is a one-story facility that is 4,288 square feet in size, and is used for asphalt and sand storage. Based on a limited visual inspection of the building it appears to be in relatively fair condition. Situated on approximately 111,370 square feet of land, the building offers 6 at-grade garage bays, 3 bays on both the north and south sides. Numerous equipment and vehicles are stored immediately adjacent to the building. Fronting to the west side of the building are some parking spaces for maintenance trucks and other vehicles. Along the east side, there is a 2,700 square-foot sand heater and seven V-box spreaders.

Southeast of Building 405, within a land area of approximately 57,500 square-feet there is a general parking area for large maintenance trucks such as dump trucks with plows. Southwest of the large maintenance truck general parking area, there is additional parking area for deicing and snow removal vehicles. A breakdown of deicing and snow removal vehicles is provided in *Section 2.3.5.1.2 Maintenance Vehicle Inventory*

Direct access is to these buildings provided by way of a dead-end road portion of Old Natural Bridge Road. Access to the maintenance facilities is provided via a paved, unmarked driveway that runs along a security fence that surrounds the maintenance facilities. One large automobile parking lot serves the five airport field maintenance facilities. The parking lot is located northwest of the Building 401 (landscape equipment warehouse and office), encompasses an area of 52,800 square feet. Due to the lack of delineated parking spaces within this area, the approximately number of employee parking spaces is unknown.

For ease of reference, **Table 2.3-4, *Existing Airport Field Maintenance Facilities at STL***, provides the breakdown of space by functional use and building number for the structures comprising the airport field maintenance facilities. Overall, existing airport field maintenance facilities provide approximately 125,369 square feet of enclosed building/structure space and support four major airport field maintenance functions including vehicle maintenance, vehicle storage, warehousing, and sand storage.

Table 2.3-4
EXISTING AIRPORT FIELD MAINTENANCE FACILITIES AT STL
Lambert-St. Louis International Airport

BUILDING NUMBER	FUNCTIONAL USE	AREA (S.F.)
308	Fueling Services Maintenance Building	7,092
309	Fueling Service Operations Building	3,239
401	Landscape Equip. Warehouse & Office	65,390
402	Landscape Office	6,642
403	Maintenance Buildings C and D	16,455
404	Maintenance Buildings A and B	17,323
405	Sand Storage	8,288
	TOTAL	**124,429**

Source: STL Complete Asset Listing document, provided by Airport Staff.

2.3.5.2 Aircraft Maintenance Facilities

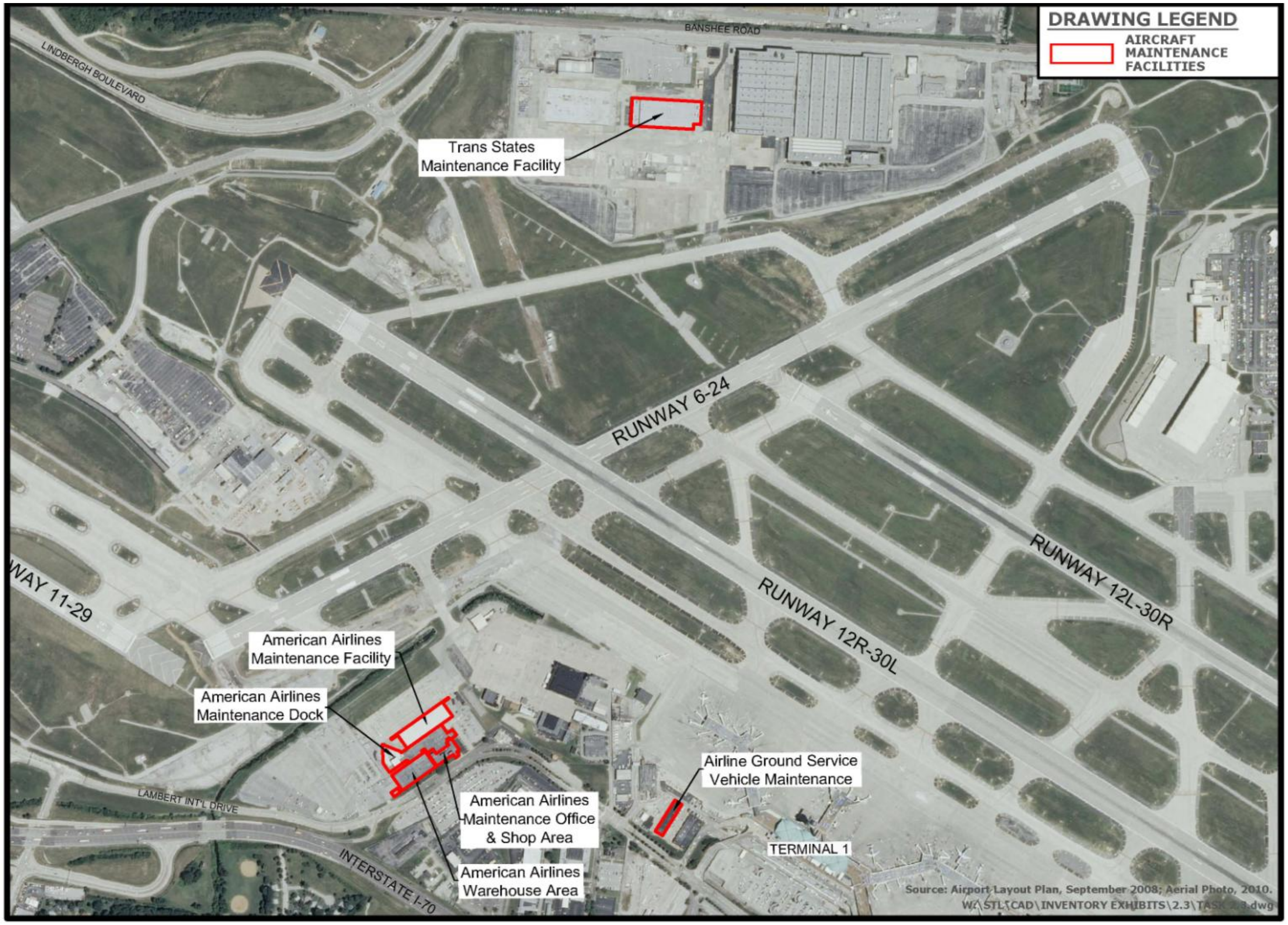
Aircraft maintenance facilities are typically utilized in one of two ways; to conduct scheduled maintenance overhauls, inspections, cleaning, etc.; and to conduct non-scheduled aircraft repairs that arise due to mechanical malfunctions. Typically, airlines will establish a primary facility at a location within their route system offering a minimal en route distance from a majority of the cities they serve, or at an airport where a large portion of their activity occurs. In addition to primary maintenance facilities, airlines establish non-scheduled maintenance facilities throughout their route system. The non-scheduled maintenance facilities conduct necessary repairs on an as-needed basis. The use and placement of these facilities are entirely dependent on individual airlines policies and may therefore vary widely from airline to airline. This type of facility is entirely dependent on the airlines and therefore is difficult to predict.

As shown on **Exhibit 2.3-5, *Aircraft Maintenance Facilities***, there are three airlines facilities.

The Trans States Maintenance Facility (Building 505) is located in the western sector of Airport on Banshee Road. The building has 99,380 square-feet of floor space and the southeast portion houses the ATS Jet Center.

A GSE maintenance facility (Building 310) is located immediately west of the terminal drop-off area on Power Plant Drive. The building has 16,315 square-feet of floor space and 12 at-grade garage bays on the east and west sides of the building.

Exhibit 2.3-5
AIRCRAFT MAINTENANCE FACILITIES
Lambert-St. Louis International Airport



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The third maintenance facility area is located east of Runway 6 on Lambert International Boulevard and is comprised of four American Airlines maintenance buildings. Building 301 is a maintenance hangar with 52,442 square feet of floor space. Building 302 is a 63,759 square-foot facility housing shops and a docking hangar subleased to Cape Air. Building 303 is a warehouse and has 41,747 square feet of floor space and 6 at-grade garage bays. Building 304 is a 19,238 square-foot office building.

A breakdown of the aircraft maintenance facilities is provided in **Table 2.3-5, *Existing Aircraft Maintenance Facilities at STL***.

Table 2.3-5
EXISTING AIRCRAFT MAINTENANCE FACILITIES AT STL
Lambert-St. Louis International Airport

BUILDING NUMBER	FUNCTIONAL USE	AREA (S.F.)
301	AA Maintenance Hangar	52,442
302	AA Maintenance Dock (subleased by Cape Air) & Shop Area	63,759
303	AA Warehouse Area	41,747
304	AA Maintenance Office	19,328
310	Airline Ground Service Vehicle Maintenance	16,315
505	Trans States Maintenance	99,380
	TOTAL	**292,971**

Source: STL Complete Asset Listing document, provided by Airport.

2.3.6 AIRPORT POLICE AND SECURITY

Airport police and associated services are provided to STL by the St. Louis Airport Police Department. The Lambert Airport Police Department is full service law enforcement agency with all law enforcement duties at Lambert-St. Louis International Airport. The primary mission of the police department is to ensure a safe and secure environment for the traveling public. The Lambert Airport Police Department is responsible for traffic control, criminal investigations, airport community oriented policing, airport security, enforcement of local, state and federal laws at the airport and providing canine explosive detection support to the airport and surrounding communities.

The St. Louis Airport Police Department is located on Terminal 1 Level near door MT 18. At STL there are a total of 102 personnel including 88 police officers, administrative staff, and the Canine unit. The Lambert Airport Police Department has a split operation at STL, with facilities and activities occurring at various locations around the airport. There is a satellite office in Terminal 1 Building that houses prisoner holding cells, storage for Segways, and a Threat Containment Unit. The Lambert Airport Police Department operates 34 patrol vehicles from this location.

A new consolidated facility located in the former Bridgeton City Hall is under consideration for the Airport Police units. The Canine Unit occupies Building 511, which is adjacent to the former City Hall. Building 511 includes office space, kennels, and outdoor training/exercise area.

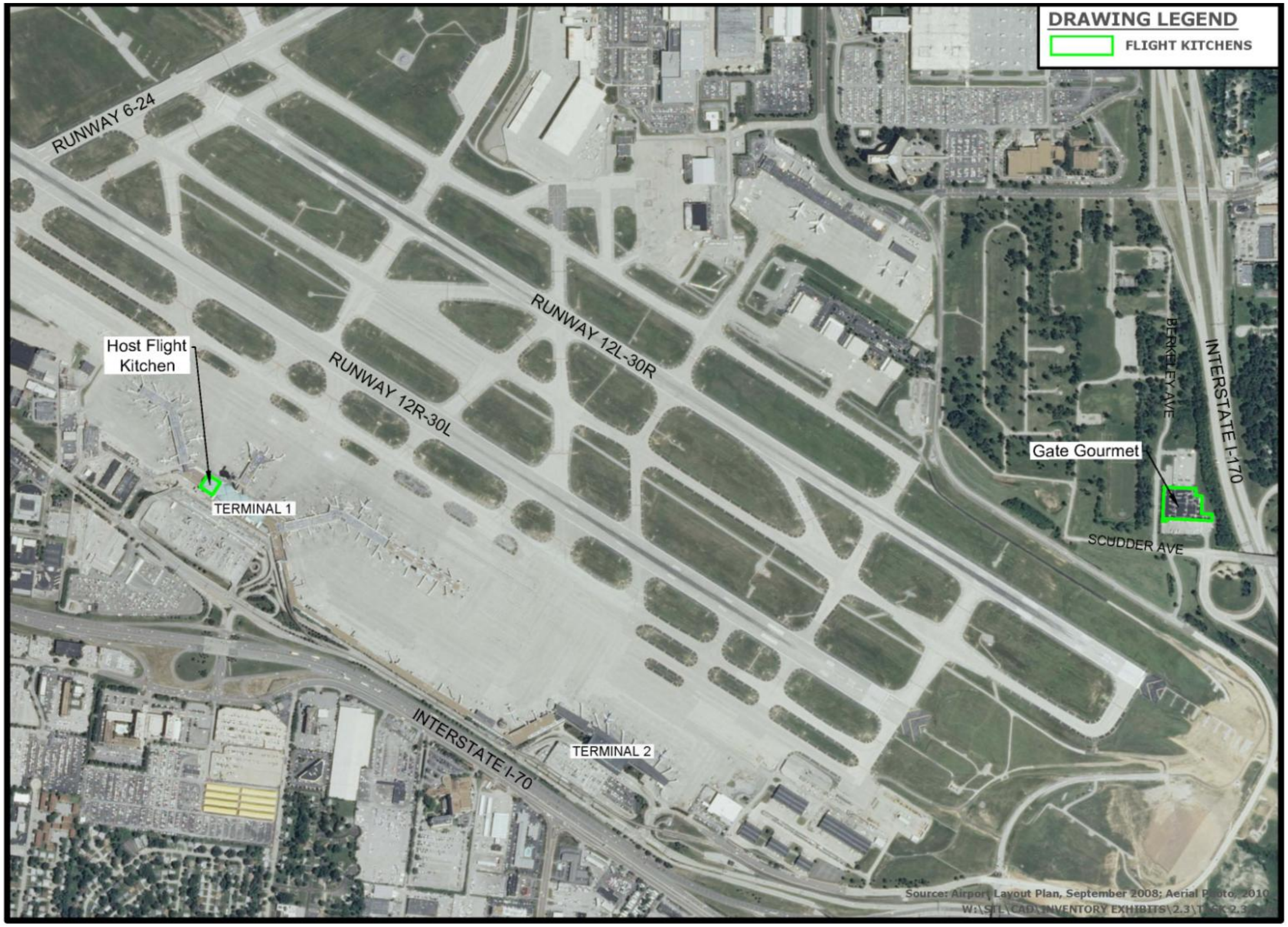
2.3.7 FLIGHT KITCHEN SERVICE

Flight kitchens include the facilities dedicated to preparing in-flight meals and/or storing of other food items. Although airlines are the primary users of flight kitchens, independent catering companies that provide food-handling services under contract with airlines commonly operate these facilities. **Exhibit 2.3-6, *Flight Kitchens***, illustrates the HMSHost and Gate Gourmet flight kitchen locations at Lambert Airport.

The flight kitchen leased by HMSHost is no longer utilized as a traditional flight kitchen. This function has been incorporated into the other restaurants the company manages at the airport.

Gate Gourmet provides in-flight catering services. According to Gate Gourmet personnel, in 2008 approximately 900 meals per day were served from the facility located at Scudder Avenue and Barkley Drive to the northeast of the terminal area. The total land area encompassing the facility is approximately 354,230 square feet. Included in this square footage is a two-story building, an automobile parking lot with an estimated 65,102 square feet of space, and a truck loading/parking lot measuring approximately 55,760 square feet. The building is in excellent condition, and Gate Gourmet has been the sole occupant of the building since it was constructed in 2003. The building contains approximately 85,640 square feet of floor space, twenty-five truck loading docks, six at-grade garages, 178 automobile parking spaces and twenty-five truck parking spaces adjacent to the building. The off-ramp from Interstate 170 provides an unsignalized intersection with Scudder Road directly in front of the Gate Gourmet facility.

Exhibit 2.3-6
FLIGHT KITCHENS
Lambert-St. Louis International Airport



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2.4 FIXED BASE OPERATION / GENERAL AVIATION FACILITIES

2.4.1 INTRODUCTION AND DEFINITION

General Aviation describes those facilities and operational activity by all aviation users other than scheduled commercial flights and military aviation. It includes recreational and flight training activities, for hire charter activity along with aerial observation, news reporting, traffic observation, environmental surveys, wildlife counts, police patrol, emergency medical evacuation, pipeline patrol, crop dusting, and business air travel are among the many applications that are part of the general aviation activity.

General aviation aircraft encompass a broad range of aircraft size and capabilities, from two-seat light sport aircraft, like the Diamond Eclipse or the four-seat Cessna Skyhawk, to the most advanced long-range business jets, including such models as the Gulfstream G-V, Bombardier Global Express, or the Boeing Business Jet (BBJ). General aviation aircraft also includes rotorcraft, gliders, ultralights, experimental aircraft, and balloons. According to the General Aviation Manufacturers Association (GAMA), over 231,000 general aviation airplanes were flying in the U.S. in 2007.

While the aircraft fleet has changed, general aviation has always been part of the aircraft activity recorded at STL. Today, this activity accounts for an estimated 8.5 percent[4] of STL overall aircraft operations and 53[5] general aviation aircraft are based at the airport. To obtain an understanding and inventory of existing general aviation facilities, interviews and a site visit were conducted in February 2009. This inventory included the collection of current information about general aviation tenants, ATS Jet Center and Signature Flight Support,[6] which as of September 2009 were the two Fixed-Base Operators at STL.

2.4.2 AIRSIDE AND LANDSIDE FACILITIES

As depicted in **Exhibit 2.4-1, *General Aviation Facilities Location Map***, there are two general aviation areas. Signature Flight Support occupies a 20 acre site located in the northeast quadrant of the airfield, between the alignment of the Taxiway K on the west, John S McDonnell Boulevard on the north and east, and the Taxiway F to the south.

The other area is occupied by the ATS Jet Center. It contains on 16 acres and is located in the northern quadrant adjacent to the High/Low Bay Hangar (Building 504), between Banshee Road on the north and Taxiway V on the south.

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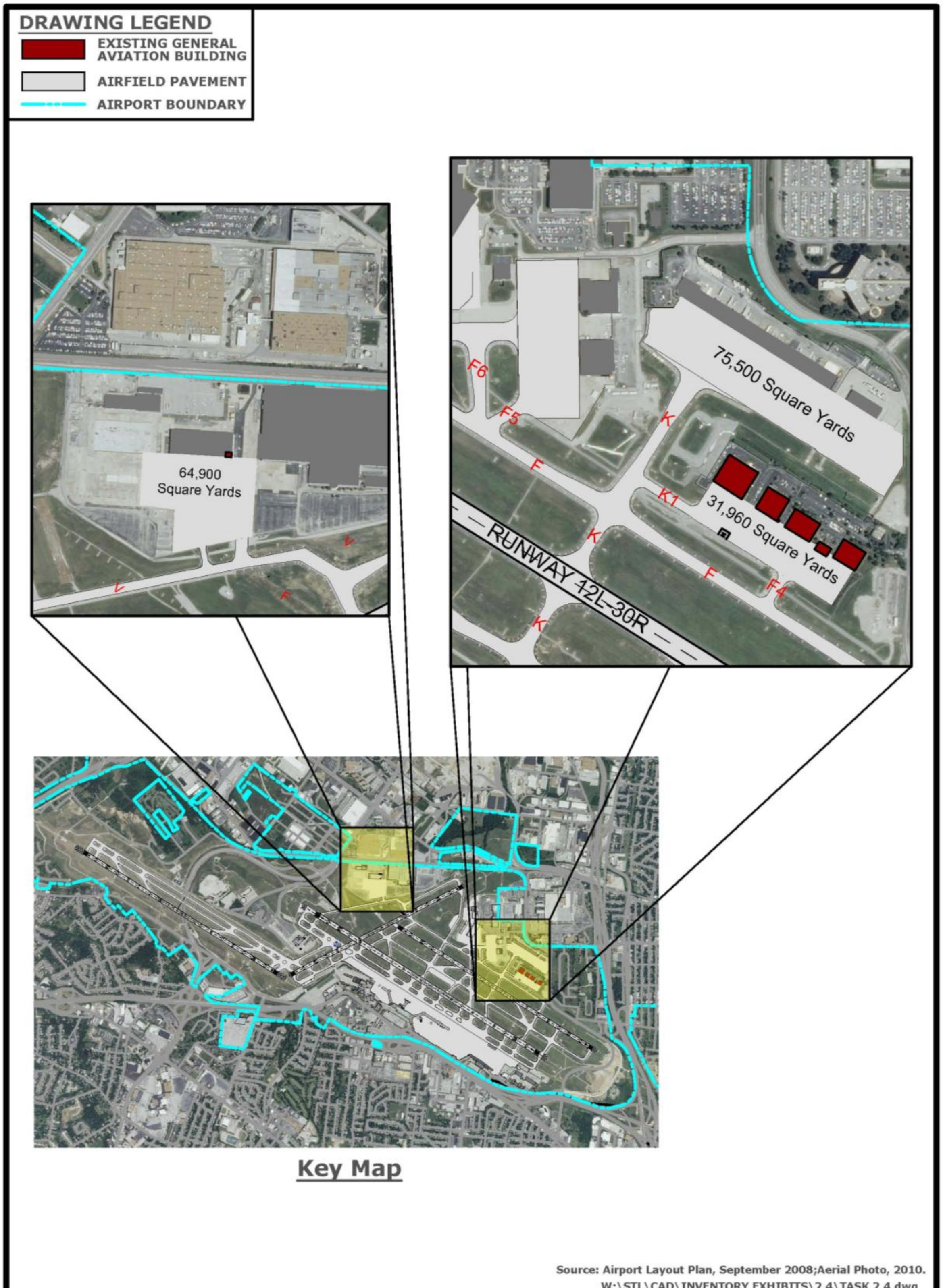
4 Percentage based on data contained in the 2008 Lambert Airport Operation Forecasts conducted by Landrum & Brown.

5 Number of based aircraft derived from Airport Master Record Form 5010, January 2009.

6 At the time of the airfield inventory ATS Jet Center and Signature Flight Support were the prime leaseholders of all general aviation facilities located at STL. All other general aviation tenants sublease spaces from Signature Flight Support.

Exhibit 2.4-1
GENERAL AVIATION FACILITIES LOCATION MAP
Lambert-St. Louis International Airport



For purposes of description, the characteristics of the existing general aviation airside and landside facilities at STL were divided into two sections, one section consisting of those facilities on the airside and the other section discussing landside components of the general aviation area. The inventory of facilities provides the foundation for subsequent analyses including the airfield demand/capacity analysis and determination of facility requirements to be presented in subsequent sections of the Long-Range Needs Assessment.

2.4.2.1 Airside Facilities

Airside Facilities are defined for purposes of analysis, as consisting of the taxilanes/taxiways, ramps, aprons.

GENERAL AVIATION RAMPS

As indicated in **Exhibit 2.4-2, *General Aviation Facilities***, the primary access to the ATS Jet Center facility is from Taxiway V, which extends from the Runway 12R threshold to the Runway 24 threshold. This taxiway is 75 feet wide and can accommodate Design Group V aircraft (wingspans 172 feet to 214 feet).

The ATS aircraft parking apron is located immediately west of the High/Low Bay Hangar (Bldg. 504). The ATS aircraft apron is served by two taxilanes that are near perpendicular to Taxiway V. Both taxilanes are 165 feet in length, and the widths are 47 feet in and 98 feet respectively. One taxilane extends north from Taxiway V and other extends in a northwesterly direction from Taxiway V to the ATS aircraft apron. In addition, these two taxilanes provides access to the Trans States Maintenance Hangar.

The ATS Jet Center apron area is about 75,000 square feet. There are no aircraft based at ATS and apron use is solely for transient aircraft. The apron has undergone various maintenance activities throughout its time and based on comments received during interviews and visual inspection the apron remains in good condition.

The Signature Flight Support apron has airfield access primarily from Taxiway F. Taxilanes F4 and K1 then provide points of entry from Taxiway F. Taxilane F4 is 60 feet wide and 240 feet in length. Taxilane K1 is also 60 feet wide, starts at Taxiway K and extends 450 feet to connect the Signature apron. Both taxilanes can accommodate up to Aircraft Design Group IV (wing spans 118 feet to 171 feet).

The Signature Flight Support FBO apron has some 288,000 square feet for aircraft parking. The apron is used by both based aircraft and transient aircraft. The apron has undergone various maintenance activities throughout its time and based on comments received during interviews and visual inspection the apron remains in good condition.

2.4.2.2 Landside Facilities

Landside facilities are defined for purposes of this analysis as consisting of clear-span hangars, T-hangars, FBO terminal, and ancillary facility buildings and structures, along with ground access and automobile parking facilities within the two FBO areas.

BUILDINGS/HANGARS

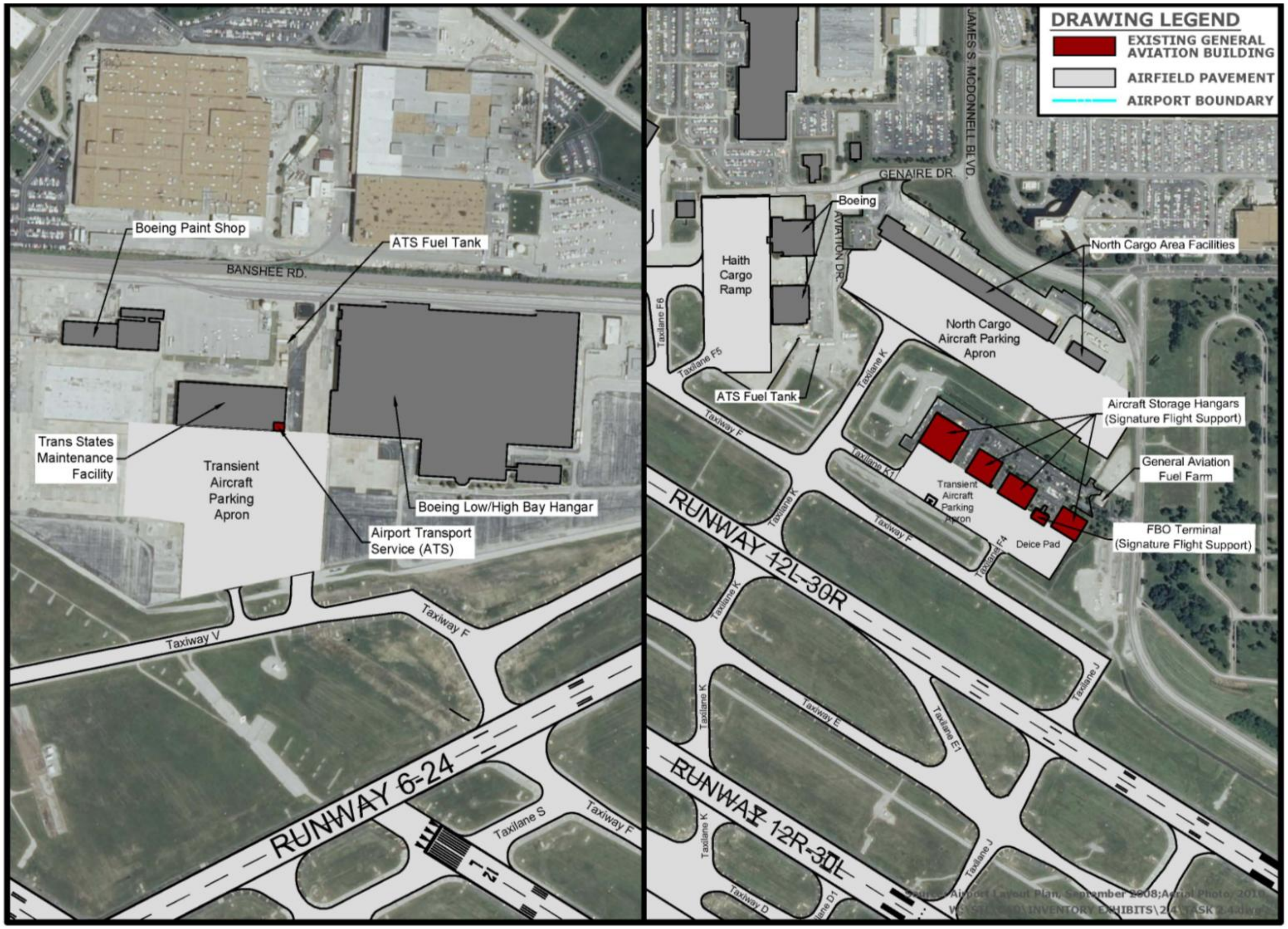
The ATS Jet Center is housed in the southeast portion of the Trans States maintenance hangars, where it occupies 1,929 square feet of office and support space. ATS provides limited services including fuel, aircraft parking, deicing, and ground power. Within the terminal building is lounge space for pilots and passengers, rental car, catering and other passenger amenities. The building is in good condition.

Signature Flight Support provides a number of services to tenants and airport users including fuel sales, 24-hour camera surveillance and security, aircraft support services (deicing and preheating) oxygen and nitrogen, and ground transportation services. Currently, there are 12 aircraft based in their facilities. The FBO operates a small number of ground support equipment (GSE), including three ground power units (GPU), power carts, tow tractor, air conditioner units, luggage carts, and air start units. All GSE are usually staged on the apron, except during the winter season when all equipment that is cold sensitive is stored in hangars until needed.

The Signature Flight Support campus has five building and is located immediately south of the North Cargo Area. Four buildings are aircraft hangars and the other building is a terminal. Hangar 4 is the western most and the largest hangar with an area of 41,960 square feet. Hangar 3, southeast of Hangar 4, is approximately 23,075 square feet in area. Hangar 2 is 22,200 square feet and Hangar 1 is 19,200 square feet. All hangar floor area is rented and occupied by corporate tenants and flight departments.

Signature has a two story terminal building, which contains 9,250 square feet of floor area. The FBO terminal provides full services for pilots and passengers.

Exhibit 2.4-2
GENERAL AVIATION FACILITIES
Lambert-St. Louis International Airport



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ROADWAY ACCESS

The STL general aviation areas have two separate access points. First, access to the ATS JetCenter facility is provided directly via Banshee Road, a three-lane road that runs east to west. Access to the ATS JetCenter facility entrance drive is un-signalized and does not have any dedicated turn lanes.

Access to the Signature Flight Support FBO facilities is directly via from John S McDonnell Road, a two-lane thoroughfare that runs along the eastern border of the airport property boundary. The access driveway that adjoins John S McDonnell Boulevard is un-signalized and parallels the front of the hangars and FBO buildings, providing vehicle access to the various general aviation facilities. Dedicated turn lanes going to and from the Signature Flight Support FBO access driveway via John S McDonnell Boulevard are provided.

AUTOMOBILE PARKING

Both FBO facilities provide individual automobile parking lots are located immediately adjacent to each of FBO facility, providing a total of 345 parking spaces. The ATS JetCenter facility parking lot is located to the west of the terminal building, encompasses 38,871 square feet of area, and offers 24 parking spaces. Based upon visual interpretation of site, the ATS auto parking lot is adequately sized to accommodate both customer and staff parking. According to ATS personnel staff, there is room to for approximately 10 more parking spaces. In addition, the condition of the concrete is considered to be 'good' as the new pavement has been installed within the past year.

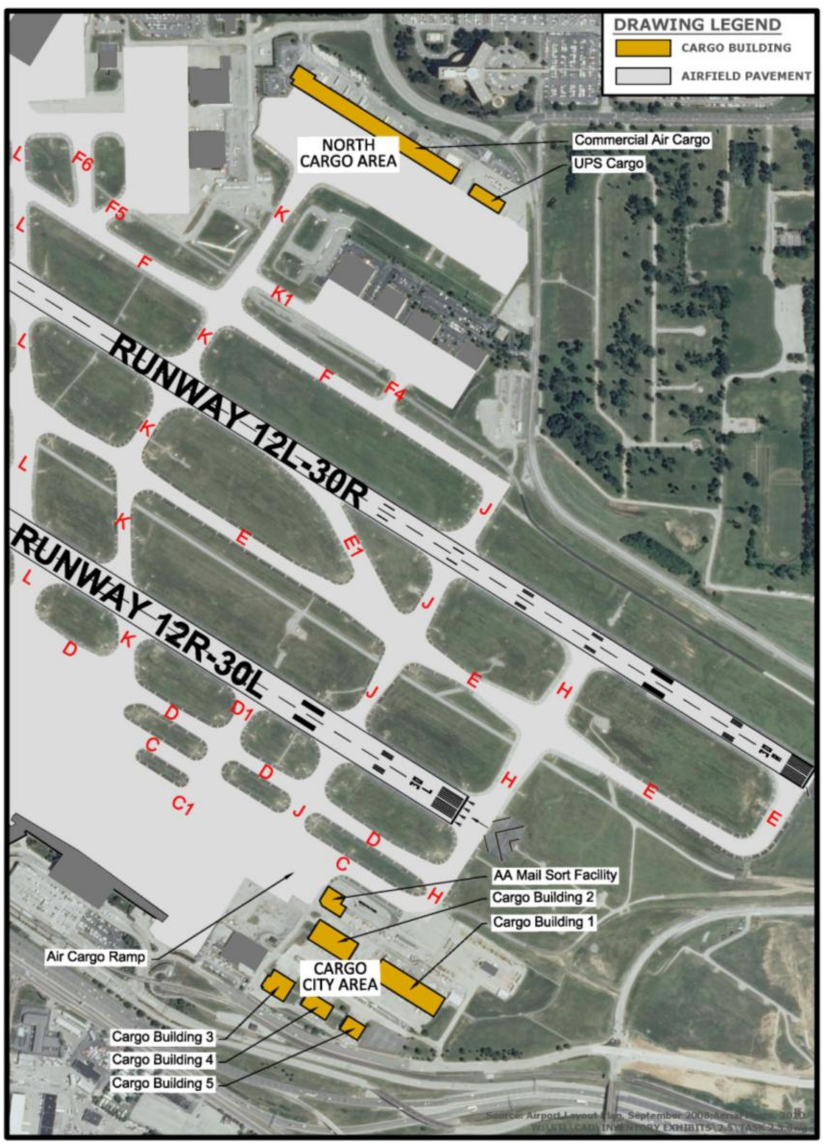
The Signature Flight Support FBO facilities' parking lot is located to the north of the buildings, north of Taxiway F, south of the Boeing Facility, east of the Commercial Air Cargo Facility, and west of John S McDonnell Boulevard. The parking lot accommodates five buildings and offers 335 parking spaces, encompassing an area of 188,524 square feet. Based upon visual interpretation of site, the Signature Flight Support FBO facility parking lot is adequately sized to accommodate both customer and staff parking. In addition, the condition of the concrete is considered to be 'good' as some cracks of varying sizes run throughout the lot. Overall, the paved parking lots of ATS and Signature Flight Support FBO facilities encompass an area of approximately 227,395 square feet.

2.5 EXISTING AIR CARGO FACILITIES

2.5.1 AIR CARGO FACILITIES

The designated air cargo facilities at Lambert-St. Louis International Airport (STL) are located in two primary areas. The first area is known as the Cargo City Area. **Exhibit 2.5-1, *Air Cargo Facilities***, illustrates the location of the area. Combined, the facilities in this cargo area comprise approximately 152,127-square feet of building space at STL. The second area, located to the north of the Cargo City Area, is known as the North Cargo Area. Exhibit 2.5-1 illustrates the location of the area. Combined, the facilities in this cargo area comprise approximately 117,080 squared-feet of building space at STL.

Exhibit 2.5-1
AIR CARGO FACILITIES
Lambert-St. Louis International Airport



2.5.1.1 Cargo City Area

The Cargo City Area consists of six cargo buildings ranging in size from approximately 10,219 square feet for Building 5, to about 54,481 square feet for Building 1, as shown in Exhibit 2.5-1. The building areas were identified by aggregating areas identified in the current Airport Layout Plan, and verified by reviewing and analyzing as-built drawings of the cargo area buildings. The building areas for each cargo building (as delineated in the tables on the following pages) do not include parking areas or loading docks, nor the areas that are comprised of interior walls and other non-leasable space. As a result, the tabulation of each building's space by category may not exactly total to match the square footage of the building footprint.

2.5.1.1.1 CARGO BUILDING 1

Cargo Buildings 1through 5 do not have direct access to aircraft apron areas.

Cargo Building 1 is the both eastern-most and largest of the six existing cargo buildings in the Cargo City Area with an approximate length of 440 feet and an area of 54,481-square feet of floor space. Building 1 is owned by STL and leased by American Airlines.

Building 1 has publicly accessible loading docks on the south side of the building. The north side of the building has limited airside access to the cargo ramp via a secure tug route to the cargo apron.

Building 1 has a two-level floor plan with a mezzanine (*see* image) comprised of warehouse/office space. There are thirteen loading docks and four at-grade garage doors in the building. Building 1 has approximately 1,000 linear feet of loading dock and at-grade garage door frontage available for freight-related operations. Building 1 is approximately 124 feet wide by 440 feet in length.

Image: American Airlines Cargo Facility in Cargo Building 1. Photograph taken on 2/5/09.

2.5.1.1.2 CARGO BUILDING 2

Cargo Building 2 possesses a similar configuration as that of Building 1; however, it is smaller in both square footage and in building length. Building 2 consists of a building length of 260 feet and a width of 128 feet for an estimated 33,409-square foot of total available floor space. The building is situated aligned to the north and parallel with Building 1, and perpendicular to Buildings 3 and 4.

Like Building 1, Building 2 has limited airside access to the cargo ramp via a secure tug route to the cargo apron. Although this portion of the building has access to the airside, there are no aircraft parking positions directly adjacent to Building 2. All cargo is transferred from parked aircraft to the building via trucks and tugs.

Currently, Building 2 is owned by STL and leased by Air General. Air General uses the building for warehouse/office space, aside from part of the building being vacant. The rest of the building is use is warehouse/office. Utilization of the building is split between belly haul cargo activities of tenants including Delta Airlines, United Airlines, US Airways, Frontier Airlines, Continental Airlines, and Northwest Airlines. Building 2 has a two-level floor plan and has approximately 275 linear feet of frontage on the northeast side used for loading docks and at-grade garages (*see* image). Building 2 also has approximately 255 linear feet of docks and garages on the southwest side. Building 2 consists of about 510 linear feet of loading dock and at-grade garage door frontage. In addition, Building 2 has a total of thirteen loading docks and three at-grade garages available for cargo or other operations.

Image: Cargo Building 2.
Photograph taken on 2/5/09.

2.5.1.1.3 CARGO BUILDING 3

Cargo Building 3 is different in design to Buildings 1 and 2. Building 3 is considerably smaller with an estimated 18,324-square foot of total available floor space, and was temporarily being occupied by the STL Police Canine Unit at the time of the inventory. Building 3 is situated to the west of Building 2, and is aligned parallel with Buildings 4 and 5.

Building 3 is not directly adjacent to the cargo apron area at STL. The building has limited airside access to the cargo apron. Any cargo tenant of Building 3 would have to transfer cargo from aircraft to tugs for transit to the cargo building and then distribute cargo to trucks via the landside loading docks.

Building 3 has a two-level floor plan with a mezzanine. There are a total of eight loading docks in Building 3, all which are located on the northeast side of the building, and only one at-grade garage. In addition, there is approximately 100 linear feet of loading dock frontage. Building 3 has an estimated 300 linear feet of loading dock and at-grade garage door frontage available for freight-related operations. Building 3 is irregular-shaped of approximately 130 feet wide by 141 feet in length, with an additional warehouse space to the north of the building.

Image: Cargo Building 3.
Photograph taken on 2/5/09.

2.5.1.1.4 CARGO BUILDING 4

Cargo Building 4, as compared to Building 3, is smaller in both length and total square footage. Building 4 has of an approximate length of 159 feet and a width of 90 feet for an estimated 14,284-square foot of total available floor space. Building 4 is presently owned by STL and is leased by Southwest Airlines and JetStar Aviation (*see* image). The remaining unit in Building 4 is currently vacant. Building 4 is situated to the west of, and perpendicular to the alignment of Buildings 1 and 2.

Building 4 is not directly adjacent to the cargo apron area at STL. The building has limited airside access to the cargo apron. Any cargo tenant of Building 4 would have to transfer cargo from aircraft to tugs for transit to the cargo building and then distribute cargo to trucks via the landside loading docks. Space allocations within Building D are delineated in **Table 2.5-1, *Cargo Space Utilization by Tenant – Building 4***.

Building 4 has a single level floor plan. There are eight loading docks in Building 4, all are located on the northeast side of the building, with three at-grade garages. Building 4 has 150 linear feet of frontage on the northeast side that is used for loading docks. Building 4 has approximately 300 linear feet of loading dock and at-grade garage door frontage available for freight-related operations.

Table 2.5-1
CARGO SPACE UTILIZATION BY TENANT - BUILDING 4
Lambert-St. Louis International Airport

TENANT	SQUARE FOOTAGE	USE
JetStar Aviation	1,627	Maintenance/Engineering
Southwest Airlines	8,160	Maintenance/Engineering
Vacant	4,497	---
TOTAL	**14,284**	

Source: STL As-Built Cargo drawings, dated 2/1/09, provided by Lambert-St. Louis Airport.

Image: Cargo Building 4.
Photograph taken on 2/5/09.

2.5.1.1.5 CARGO BUILDING 5

Cargo Building 5, as compared to Building 4, is smaller in both length and square footage. Building 5 has of a building length of 115 feet and a width of 89 feet for an estimated 10,219-square foot of total available floor space. Cargo Building 5 is the smallest cargo building at STL. The utilization of space (by tenant) is presented in **Table 2.5-2, *Cargo Space Utilization by Tenant – Building 5*.**

Building 5 has a two-level floor plan with a mezzanine (*see* image). There are six loading docks in Building 5, all located on the northeast side of the building; with one at-grade garage. Building 5 has an approximate 115 linear feet of frontage on the northeast side that is used for loading docks. Building 5 has approximately 230 linear feet of loading dock and at-grade garage door frontage available for freight-related operations.

Table 2.5-2
CARGO SPACE UTILIZATION BY TENANT - BUILDING 5
Lambert-St. Louis International Airport

TENANT	SQUARE FOOTAGE	USE
Brendan Airways	4,093	Maintenance/Engineering
Southwest Airlines	6,126	Maintenance/Engineering
TOTAL	**10,219**	

Source: STL As-Built Cargo drawings, dated 2/1/09, provided by Lambert-St. Louis Airport.

Image: Cargo Building 5. Photograph taken on 2/5/09.

2.5.1.1.6 AMERICAN AIRLINES MAIL SORT FACILITY

The American Airlines (AA) Mail Sort Facility encompasses 21,410-square feet of floor space. The building is both the northern-most facility and the only other cargo facility located in the Cargo City Area (Cargo Buildings 1-5 is the other facility in the Cargo City Area). The northeast and northwest sides of the building face the airside, and the southeast and southwest sides face the landside of STL. The AA Mail Sort Facility is directly adjacent to the southeast of the cargo apron area, but does have direct access to the apron. The building has a single level floor plan, and does not have any loading bays.

The AA Mail Sort Facility has 70 linear feet of open frontage on the southeast side and an estimated 130 linear feet of open frontage of the southwest side that are used for cargo operations. The total open frontage available for cargo or other operations in the AA Mail Sort Facility is approximately 200 linear feet.

2.5.1.2 North Cargo Area

The North Cargo Area consists of two cargo buildings ranging in size from approximately 15,506 square feet for the United Parcel Service Facility, to about 99,600 square feet for the Commercial Air Cargo Facility, as shown in Exhibit 2.5-1. The building areas were identified by aggregating areas identified in the current Airport Layout Plan, and verified by reviewing and analyzing as-built drawings of the cargo area buildings. The building areas for each cargo building (as delineated in the tables on the following pages) do not include parking areas or loading docks, nor do they include the areas that are comprised of interior walls and other non-leasable space. As a result, the tabulation of each building's space by category may not exactly total to match the square footage of the building footprint.

2.5.1.2.1 COMMERCIAL AIR CARGO FACILITY

The Commercial Air Cargo Facility is the largest cargo building at STL and encompasses 99,600-square feet of floor space. Taking up only a small portion of the building's total square footage, the main entrance has a two-level floor plan. This particular sector of the building is comprised of office space. The remaining larger portion of the building consists of warehouse space. At the time of this study, the facility was owned by Haith and Company, Inc. The facility utilization of space (by tenant) is presented in **Table 2.5-3, *Cargo Utilization by Tenant – Commercial Air Cargo Facility*.** Federal Express and United Parcel Service anchor the ends of the facility, and in between lies Burlington Air Express (BAX), Integrated Airline Services (IAS), and Forward Air.

The entire airside of the Commercial Air Cargo Facility fronts the cargo apron area, allowing aircraft to park nose into the building. FedEx routinely parks two aircraft, typically an Airbus A300 and a DC-10, on the ramp to the rear of the building adjacent to its own space in this building.

The Commercial Air Cargo Facility has 6 at-grade garages and approximately 1,149 linear feet of bay area frontage available for cargo operations. Of that, an estimated 1,049 feet is presently devoted to actual loading operations.

The remainder of the frontage is composed of office uses associated with the tenants located in the building, and associated parking that fronts on the building as well. On the airside of the building, the Commercial Air Cargo Facility has 54 loading docks and 1,049 linear feet of loading dock frontage available for cargo operations. The building has approximately 2,098 linear feet of loading dock and at-grade garage frontage available for cargo or other operations.

Table 2.5-3
CARGO UTILIZATION BY TENANT – COMMERCIAL AIR CARGO FACILITY
Lambert-St. Louis International Airport

TENANT	BAYS	SQUARE FOOTAGE	USE
Federal Express	1-28	57,400	Warehouse/GSE Maint.
Vacant	29-33	10.000	Vacant
Burlington Air Express (BAX)	34-42	12,500	Warehouse
Integrated Airline Services (IAS)	43-44	4,900	Warehouse/GSE Maint.
Forward Air	45-54	14,800	Warehouse
TOTAL		**99,600**	

Source: Existing Airport Layout Plan, completed February 2, 2007, provided by Lambert-St. Louis International Airport.

Image: Truck loading area of Commercial Air Cargo Facility, looking southeast.
Photograph taken on 2/5/09.

2.5.1.2.2 UNITED PARCEL SERVICE FACILITY

The UPS Cargo Facility has a total floor space of 17,480-square feet. The UPS Cargo Facility is approximately 80 feet wide by 219 feet in length. The building is situated aligned to the south and parallel with the Commercial Air Cargo Facility. At the time of this study, the facility was owned by Haith & Company, Inc. The entire airside of the UPS facility fronts the cargo apron allowing aircraft to park nose into the building. UPS routinely parks two of its aircraft, typically MD-11 or Boeing 757s; although any of the UPS fleet may utilize the ramp.

The UPS Cargo Facility has 5 bay areas and 218 linear feet of bay area frontage available for cargo operations. Of that, an estimated 109 feet is presently devoted to actual loading operations. The remainder of the frontage is composed of office uses associated with the tenants located in the building, and associated parking that fronts on the building as well. On the northwest side of the building, the UPS Cargo Facility has 17 loading docks and 218 linear feet of loading dock frontage available for cargo operations. The building has approximately 327 linear feet of loading dock and bay area frontage available for cargo or other operations.

2.5.1.3 Cargo Building Truck Loading Docks

The majority of cargo buildings at STL provide an area for truck loading and unloading on the landside or public side of the cargo building. These loading positions allow trucks to back up to an elevated dock that provides direct access from the rear of the truck into the cargo building via a large overhead door. The height of the dock is constructed to provide a level interface between the bed of the truck trailer and the floor of the cargo building. Cargo tenants lease their adjacent truck loading dock area. Truck docks for the majority of the cargo buildings at STL are 50 feet by approximately 12 feet wide. Truck maneuvering in front of Buildings 1-2 and behind Buildings 3-5 into and out of the loading docks has the potential to be impeded by the location of a double-loaded vehicle parking area in front of the building. The combined buildings in the Cargo City Area and North Cargo Area provide 120 truck dock positions.

The breakdown is shown in **Table 2.5-4, *Existing Cargo Loading Docks and Frontage***.

Table 2.5-4
EXISTING CARGO LOADING DOCKS AND FRONTAGE
Lambert-St. Louis International Airport

CARGO BUILDING	NUMBER OF LOADING DOCKS	CARGO LOADING DOCK FRONTAGE (LINEAR FEET)
CARGO CITY AREA		
Building #1	13	452
Building #2	13	279
Building #3	8	152
Building #4	8	178
Building #5	6	127
AA Mail Sort Facility	0	0
Subtotal	**48**	**1,188**
NORTH CARGO AREA		
Commercial Air Cargo Facility		
Federal Express	28	624
Vacant	5	100
Burlington Air Express	9	127
Integrated Airline Services (IAS)	2	49
Forward Air	10	149
UPS Cargo Facility	18	217
Subtotal	**72**	**1,266**
TOTAL	**120**	**2,454**

Source: Existing Airport Layout Plan, completed February 2, 2007, provided by Lambert-St. Louis International Airport.

2.5.1.4 Cargo Area – Automobile Parking

Two parking areas are located near the Cargo City Area; (1) limited parking on the side of Building 5, and (2) in a central parking area in the middle of Buildings 1-5 (*see* image). The central parking area is within a reasonable walking distance of the Cargo City Area situated to minimize the potential impact of tractor-trailers accessing the cargo docks. A physical inventory of the thru parking areas indicates that there are 226 striped spaces in the Cargo City Area specifically dedicated for automobile parking. Of the 226 spaces, 90 of them are located to the side of Building 5, and 136 spaces in the central parking area. Site visits coupled with the review of several recent aerial photographs indicated that some parking also occurs in the immediate vicinity of the cargo buildings in areas not specifically striped for auto parking use.

Additionally, there are three parking areas in the vicinity of the North Cargo Area, which include (1) Limited parking immediately in front of the UPS Cargo facility, (2) additional parking areas in front of both the Commercial Air Cargo and UPS Cargo facilities, and (3) an additional parking area on the north side of the Commercial Air Cargo facility, next to the customer entrance to Federal Express intended for use by cargo tenants or visitors to the Commercial Air Cargo Facility.

An estimated 58 auto parking and 24 truck parking spaces are situated in direct proximity to the UPS Cargo facility. An additional 73 shared parking spaces are located in front of both the Commercial Air Cargo and UPS Cargo facilities, and there are 111 parking spaces next to the Federal Express entrance area. While this represents those spaces actually designated for passenger vehicles, it should be noted that parking, in many instances, occurs in front of loading docks and is relatively haphazard. A physical inventory of the thru parking areas indicates that there are 242 striped spaces in the North Cargo Area specifically dedicated for automobile parking. The total parking spaces between the Cargo City Area and the North Cargo Area is an estimated 468 parking spaces.

Image: Central automobile parking area in front of Cargo Building 1, looking east. Photograph taken on 2/5/09.

2.5.1.5 Cargo Apron Areas

Airside cargo apron areas are located at STL in the North Cargo Area and adjacent to Cargo City.

Identified on Exhibit 2.5-1, the Juliet Pad provide apron that supports activity in Cargo City. The pad is about 4.2 acres in size and span 800 feet in length with 230 feet of depth. It can accommodate any size aircraft and could park three, widebody Boeing 747 freighters. There is a single security checkpoint between the Juliet Pad and Cargo City for controlling the movement of cargo tugs between the secured ramp and various cargo buildings.

The cargo ramp area at the North Cargo Area presently encompasses approximately 15.0 acres. Taxilanes accessing the North Cargo Area apron are of sufficient width and separation to accommodate widebody airplanes up to Design Group IV (wingspans 125 feet to 171 feet).

The North Cargo Area apron spans 1,800 linear feet and has parking positions for up to seven, wide-body Design Group IV aircraft. About 550 linear feet is allocated to the UPS facility and the remainder to the Commercial Air Cargo Building.

Cargo handling equipment occupies a portion of North Cargo Area apron, with much of the equipment being stored along the airside of the buildings between the aircraft parking position and the north and south edges of the apron. On the north end of the Commercial Air Cargo Building, a designated equipment storage area has been defined on the ramp, and is routinely utilized for equipment storage and staging.

2.5.1.6 Cargo Access

Automobile access to the Cargo City Area is via Air Cargo Road (*see* image). Air Cargo Road is accessible via three thoroughfares: James S McDonnell Boulevard from the north, Natural Bridge Road from the south, and Lambert International Boulevard from the west. Access from Juliet to the Cargo City Area is controlled by a manned security kiosk. The transfer of belly-loaded cargo between the cargo buildings and the passenger aircraft is accomplished by the use of container tug trains. Tenants in the Cargo City Area have direct access to the Juliet Pad through their bays.

Image: Automobile access area (left) from Air Cargo Road, looking southeast.
Photograph taken on 2/5/09.

Automobile access to the North Cargo Area is via Genaire Drive from the north to the Commercial Air Cargo Facility and via James S McDonnell Boulevard from the east to the UPS Cargo Facility. Genaire Drive is accessible via James S McDonnell Boulevard from the north and south. James S McDonnell Boulevard is accessible via Airport Road from the east.

2.6 EXISTING AIRPORT UTILITIES

To define the existing utilities at STL an intensive study was conducted involving the collection of records, drawings, reports, and site investigation of the critical utilities. The information collected was translated into electronic Micro station drawings for the utilities located at STL and on adjacent surrounding properties and provided to Airport staff. A summary of each of the utilities is provided below.

2.6.1 AVIATION FUEL

The 10-inch aviation fuel pipeline that serves the airport enters the airport property at the northeast corner of the airport near the intersection of Airport road and McDonnell Boulevard. From this point, it follows the west side of McDonnell Boulevard to a point immediately east of the intersection of Taxiways F and J. From that point, it follows along the south and west side of McDonnell Boulevard around the end of Runways 12L-30R and 12R-30L to the north side of Interstate 70 where it turns west and follows the north side of Interstate 70 ending at the fuel farm located between Interstate 70 and Lambert International Drive, which sits immediately east of the Air National Guard facility. From the fuel farm, individual fuel lines serve gates along the concourses. In addition to these supply lines there are three-inch and six-inch lines that travel around the west end of Runway 12R-30L. The three-inch line terminates approximately 1,280 feet north of the runway and the six-inch line ends near Lindbergh Boulevard and Banshee Road.

2.6.2 LACLEDE GAS

Laclede gas supplies natural gas to the airport and surrounding communities. They have numerous facilities within the perimeter roads surrounding the airport and beginning at the north side near Lindbergh Boulevard and proceeding east there is a 16-inch steel supply feeder pressure gas line that runs along the north side of McDonnell Boulevard from Lindbergh Boulevard to a point north of the intersections of Taxiways F and J. At this point, the main increases in size to a 22-inch steel supply feeder pressure that proceeds east along Scudder Road crossing Interstate 170.

Along the east side of the airport on the west side of McDonnell Boulevard are two Laclede gas lines, a 12-inch steel intermediate pressure and a six-inch steel supply feeder. The six-inch line turns west at Interstate 70 and follows the north side of the interstate and terminates at the west end of the east terminal. The 12-inch crosses Interstate 70 and continues south.

The main terminal receives its feed from a six-inch steel intermediate pressure line that crosses under Interstate 70 approximately 670 feet east of Airflight Road.

From Lindbergh Boulevard south of Interstate 70, a 20-inch steel supply feeder lies along the east side of Lindbergh to the north side of Natural Bridge where it turns west and follows the north ROW line, past the Lindbergh tunnel to a point where it turns north east and changes into two 24-inch diameter pipes and crosses under W1W perpendicular to Runway 11-29. North of the Lindbergh tunnel, the two 24-inch diameter mains combine into one 30-inch diameter pipe. This 30-inch diameter pipe follows Lindbergh Boulevard north approximately 240 feet west of the centerline until it crosses Missouri Bottom Road where it jogs to Fee Fee Road and heads north parallel to the east Right of Way line. Finally, a 20-inch steel supply feeder gas line is in and beside the east ROW line of Lindbergh Boulevard from the north that terminates at Banshee Road.

2.6.3 SANITARY SEWERS

The sanitary and storm sewer system serving Lambert Airport and the surrounding communities is owned and maintained by the St. Louis Metropolitan Sewer District (MSD).

Lambert Airport is located within three watersheds; Cowmire Creek to the west, Coldwater Creek in the center where the majority of the airport falls within, and Maline Creek to the east.

The limits of the Cowmire Creek watershed within the airport boundary are Gist Road to the south, the railroad tracks to the north, and just west of Fee Fee Road to the east. The main sanitary trunk sewer where it crosses under Interstate 270 is a 12-inch diameter ductile iron pipe. Immediately upstream of the Interstate 270 manhole the sewer reduces to 10-inch diameter and 600 feet upstream of that point the sewer narrows to eight-inch diameter which is the size pipe found in the remainder of the watershed. The sewer line runs east of the centerline of Cowmire Creek generally from the south to north direction. North of the railroad tracks Fee Fee Road is the approximate dividing line between the Cowmire watershed to the west and the Coldwater watershed to the east. The trunk sewer that serves this area is a 10-inch cast iron pipe (CIP) that crosses under Interstate 270 approximately 1600 feet southwest of McDonnell Boulevard.

The limits of the Maline Creek watershed within the airport boundary are south of Scudder Road, and east of the east end of Runway 12L – 30R. The sewer main that serves this area crosses under Interstate 170 approximately 1320 feet south of Scudder Road. All sewer lines on this branch system are eight-inch diameter vitrified clay pipe.

The remainder of the airport and by far the largest contributor to sanitary flow falls within the Coldwater Creek watershed. Downstream of the airport the Coldwater Creek trunk sewer is parallel and west of Coldwater Creek.

The pipe size is 42-inch diameter where it crosses under McDonnell Boulevard downstream of the airport and 36-inch diameter where it crosses under Interstate 70 upstream of the airport. The majority of the sewer is approximately 200 feet west of Runway 6-24. A 21-inch diameter secondary system ties into the

Coldwater Creek trunk sewer near where the Coldwater Creek sewer crosses under Taxiway V. This sewer drains from north to south and is approximately parallel to and 270 feet east of Taxiway L. The sewer generally serves the Woodson Terrace community south of the airport.

2.6.4 STORM SEWERS

At the west end of the airport, Cowmire Creek east of Interstate 270 branches into two forks, the W1W detention basin occupies the south fork and the north fork accepts runoff from the Cowmire Creek watershed north of the Norfolk Southern railroad tracks. Downstream of the confluence of both forks Cowmire Creek discharges to a 6 foot wide x 8 foot high concrete box culvert that crosses under Interstate 270 at Interstate 370.

At the east end of the airport the boundary separating the Maline Creek watershed and the Coldwater Creek watershed occurs near the north-south centerline of the east end of Taxiway E. Runoff generally flows east from this location and down an embankment towards Interstate 170. Runoff from there enters culverts that carry it under Interstate 170 just north of Interstate 70.

The majority of the storm water runoff from the airport property drains into Coldwater Creek, which flows generally from north to south, and is located at the approximate center of the airport property. Coldwater creek enters twin 10-foot x 15-foot arch culverts west of the Missouri Air National Guard facility on the south side of the airport. Then exits twin 10 foot x 15 foot wide box culverts north of the airport immediately upstream of the railroad tracks north of Banshee Road. The twin culverts that convey Coldwater Creek cross under Runway 6-24. Numerous sub drainage systems to Coldwater Creek occur throughout the airport property. Laterals serving grassed areas between runways and taxiways drain into a south to north flowing nine-foot horseshoe sewer near taxiway P and a south to north flowing 13-foot horseshoe sewer near Taxiway L. Both of these sewers extend further to the south beyond the airport property and serve the Woodson Terrace community. The horseshoe culverts connect to the Coldwater creek sewer within 300 feet of each other north of Taxiway F and west of Taxiway P.

The airport property west of Coldwater Creek has numerous 48-inch diameter or less storm sewers that connect to the Coldwater Creek truck sewer. Storm sewers of notable size include an 84 inch pipe that drains the W1W north detention basin, parallels Taxiway V and discharges to the Coldwater Creek trunk sewer at a point approximately 100 feet downstream of where Coldwater Creek crosses Taxiway V and a 10 foot x 15 foot box culvert that drains the area immediately west of runway 12R-30L. This storm sewer connects to the Coldwater Creek sewer east of Taxiway S and south of Taxiway C. A third major 72 inch diameter storm sewer that drains the W1W south detention basin connects to the Coldwater Creek drainage channel approximately 300 feet south of the centerline of Interstate 70.

2.6.5 PORTABLE WATER SUPPLY

Missouri American Water Company owns and maintains the potable water lines that serve the airport and surrounding communities. On the north side of the airport there is a 20-inch waterline located near the west ROW line of old Lindbergh Boulevard. This waterline increases in size to 24 inch where it crosses directly below the new runway and reverts to a 20 inch diameter line before it reaches Natural Bridge Road. This 20-inch pipe tees approximately 1,000 feet south of Natural Bridge Road with one leg of the tee continuing south along Lindbergh Boulevard and the other leg of the tee following Natural Bridge Road and then Lambert International Boulevard in front of the main and east terminal. The 20-inch diameter pipe tees at McDonnell Boulevard with a 12-inch diameter line heading south crossing Interstate 70 and a 24-inch diameter line heating north along McDonnell Boulevard. The 24-inch pipe reduces in size to a 20-inch diameter pipe at the bend in McDonnell Boulevard opposite the intersections of Taxiways F and J. The 20-inch diameter pipe continues north to Airport Road where it tees with a 16 inch diameter pipe heading east away from the airport and a 30 inch pipe continuing along McDonnell Boulevard on the north and east side of the ROW. The 30 inch turns to the north at Banshee Road and follows Eva Avenue away from the airport. Paralleling the 20-inch, 24-inch, and 30-inch water lines from Lambert International Drive is a 12-inch diameter pipe which continues to head west along the south ROW line of Banshee Road until it reduces to an eight-inch diameter pipe 2200 feet east of Lindbergh Boulevard. It remains an eight-inch diameter pipe until it reaches Lindbergh Boulevard.

Serving the area north of the railroad tracks, north of W1W are a 20-inch diameter pipe on Fee Fee Road, an eight-inch diameter pipe on Phantom Drive, a 12-inch diameter pipe on Missouri Bottom Road, a 12-inch diameter pipe on Summit Avenue, and a 20-inch diameter pipe on McDonnell Boulevard.

2.6.6 ELECTRIC

Ameren UE provides electric service for the airport and surrounding communities. Lambert International currently has two 34kv ~ 4kv substations located at each terminal and are billed by Ameren through two separate meters. Ameren suggests that any future expansion by the Lambert Airport Authority could be added to its existing system without adding additional meters.

Adjacent properties owned by the airport with prospective tenants demanding loads comparable to major manufacturing consumption can be supplied by the following existing facilities:

A 138kv ~ 12kv Transmission and sub-transmission lines are EAST of the airport along the I-170 corridor. NORTH of the airport, a 34kv transmission exists along the I-270 corridor to I-370. WEST of the airport 12kv transmission is carried to the east and through the Lindbergh tunnel. SOUTH of the airport 4kv transmission exists along the I-70 corridor. A 4kv transmission line exists; buried under the east end of the airport running along the east side of McDonnell Boulevard cutting across the airfield east of the end of Runway 12L–30R heading north to Scudder. The 4kv buried transmission mentioned heading north to Scudder; it is scheduled to be converted to 12kv.

Ameren also suggests having a one-year advanced notice of any tenant proposing a major commitment to the airport authority with details allowing Ameren to access the tenant's requirements of the system. Keeping in mind, normal service required by tenants with proposals smaller in scope can be accommodated and supplied within a one to three month period.

As part of the two- to five-year plan for the area, Ameren is scheduled to complete a new 138kv ~ 12kv substation located at the new North Park Development north of I-70 off of North Hanley. The existing 4kv transmission south of the airfield along I-70 is scheduled to be upgraded to 12kv.

2.7 MILITARY FACILITIES

2.7.1 MISSOURI AIR NATIONAL GUARD

The Missouri Air National Guard complex at Lambert includes on airport and off airport facilities. The Air National Guard was based at Lambert from 1932 through 2009 at which time it was shut down at the direction of the Defense Base Closure and Realignment Commission (BRAC). The operated F-15 Eagles out of the airside facility until the wing ceased operations.

Personnel were reassigned to a new 131st Bomb Wing 1 at Whiteman Air Force Base. This Wing became the first Air National Guard unit assigned to the fly the B-2 Bomber.

Approximately half of the Wing's staff relocated Whiteman AFB, the remaining staff, including human resources, security forces, engineering, medical, and other support specialties remain at the facility. These support functions are primarily housed in site across Lambert International Boulevard. A final decision has not been made on the future of the MoANG facility; the on-airport facility remains essentially vacant.

As shown on **Exhibit 2.7-1, *Missouri Air National Guard (MoANG) Facilities***, the on-airport facility is located west of Terminal. The area encompasses approximately 22.6 acres of which 198,000 square feet is hangar and buildings, 445,000 square feet of apron, and 343,000 square feet of parking/roads and open space.

2.7.2 AIRCRAFT ARRESTING GEAR

Aircraft arresting gear is installed on three runway ends. The gear resembles arresting systems on aircraft carriers and uses a cable for emergency stopping by military jets.

The cables are retracted into the runway pavement and when requested by a military aircraft the cables can be deployed in remotely by staff in the air traffic control tower. The cables elevate from recessed resting locations in the pavement to permit the aircraft tail hook to catch the cable as it passes by on landing. The aircraft arresting systems are located on the approach ends to Runways 06, 12R and 30L.

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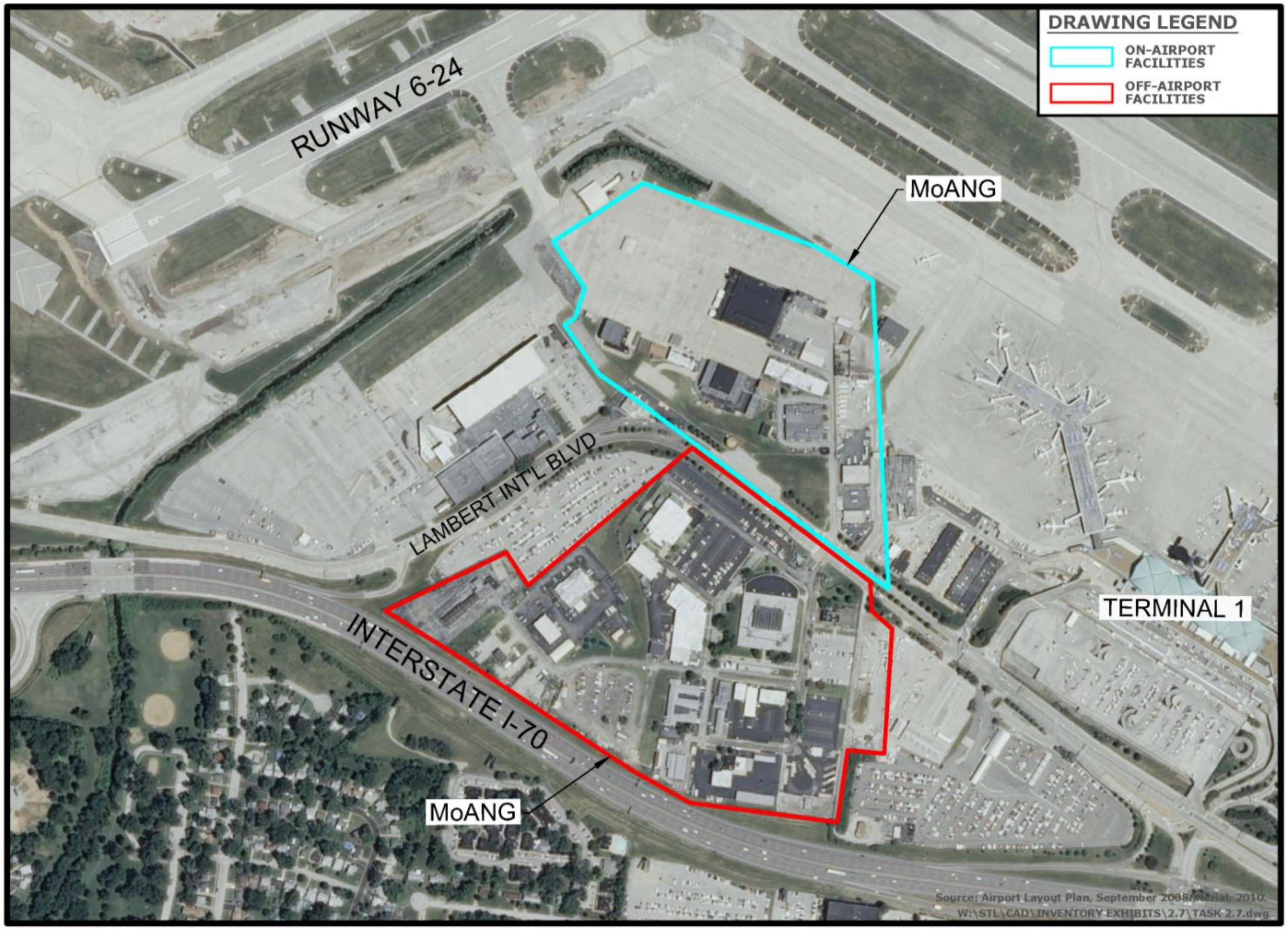
Exhibit 2.7-1
Missouri Air National Guard (MoANG) Facilities
Lambert-St. Louis International Airport



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2.8 EXISTING ON AND OFF-AIRPORT AND REGIONAL TRANSPORTATION / ROADWAY FACILITIES AND ACTIVITY

2.8.1 REGIONAL TRANSPORTATION

The inventory of regional transportation includes existing highways, secondary roadways, bus, and rail near Lambert Airport. Under the guidance of the Missouri Department of Transportation and the St. Louis County Highway and Transportation Department, base data on state, county, and local transportation improvement/ development plans were derived. While the majority of the assessment was focused primarily on major arterial roadways, consideration was also given to select collector roadway alignments that are likely to be influenced or impacted by airport-related development actions. Lesser roadway alignments included John S. McDonnell Boulevard in the vicinity of the Brownleigh Subdivision and Gist Road along the north side of Runway 11-29 and on the west side of Interstate 270.

The following types of data were gathered for this inventory:

- Major regional roadways and traffic volumes
- Regional transit
- Proposed/planned regional improvement plans

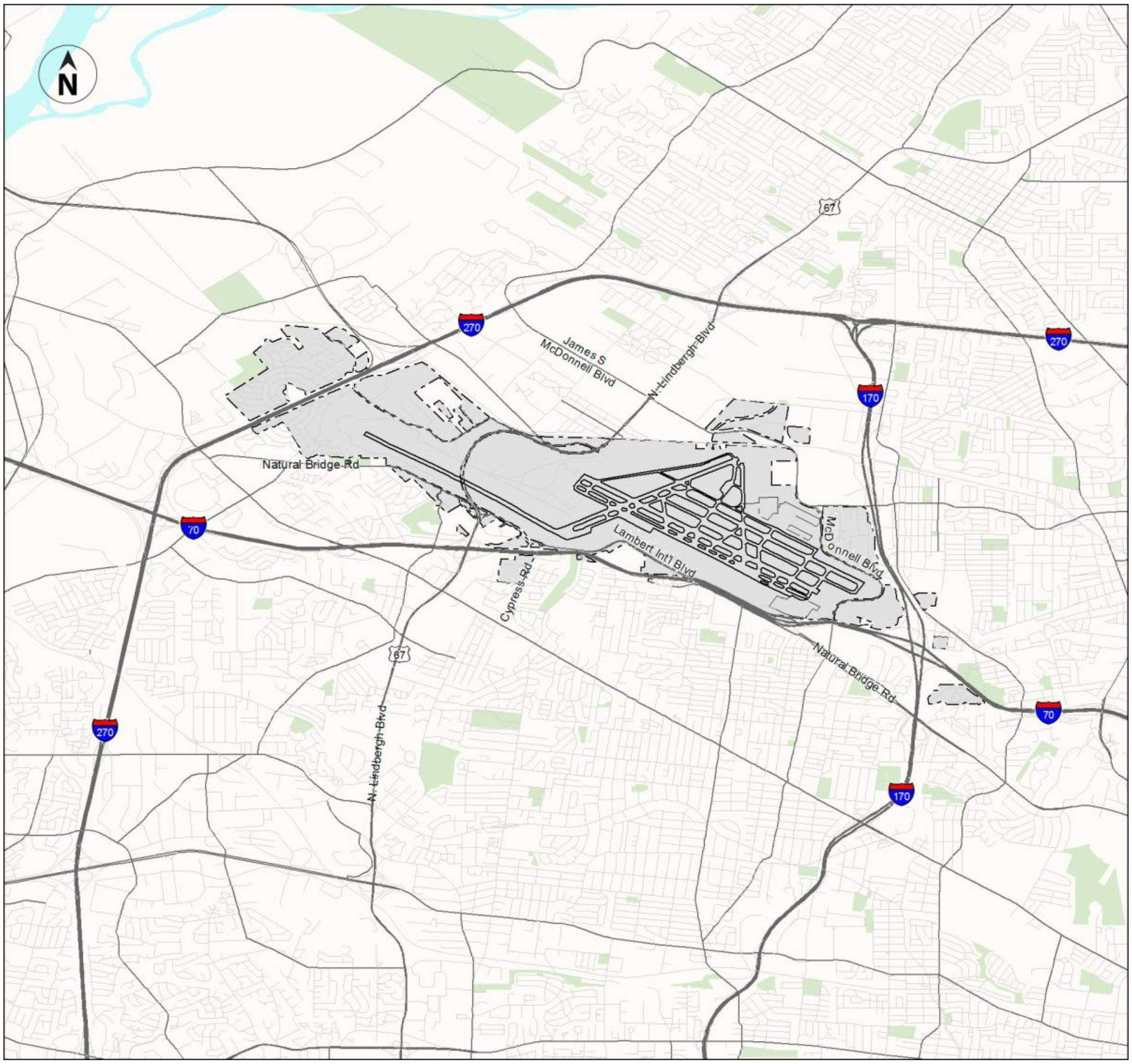
2.8.1.1 Regional Roadway and Access

2.8.1.1.1 MAJOR REGIONAL ROADWAYS AND TRAFFIC VOLUMES

Regional roadways provide access to Lambert Airport from outlying municipalities and communities. Typically, these roadways are classified as freeways or arterials, as they are designed for high speeds and are capable of carrying high traffic volumes with anywhere from one to four lanes of traffic in each direction. Freeways or interstate highways are limited access roads providing largely non-interpreted travel while serving nearly all major US cities, with many passing through downtown areas. Arterials or US and state routes are expected to carry large volumes of traffic and are often divided into major and minor arterials. Currently, within a ten-mile diameter there are seventeen freeway or arterial roadways providing access to the vicinity of Lambert Airport.

Given the location of Lambert Airport relative to downtown St. Louis and regional population centers, the primary regional access routes to and from the airport have historically been from the east and downtown. The following is brief summary of major access routes to the airport, which are depicted in **Exhibit 2.8-1, *Regional Roadways and Key Access Routes***. Summaries of major access routes are based on Average Annual Daily Traffic (AADT) data provided by the Missouri Department of Transportation.

Exhibit 2.8-1
REGIONAL ROADWAYS AND KEY ACCESS ROUTES
Lambert-St. Louis International Airport



Source: Landrum & Brown.

2.8.1.1.2 ACCESS FROM THE EAST AND DOWNTOWN

There are two primary access routes from the east depending on whether the passenger is coming from northeast or southeast of the airport. Traffic from the northeast uses I-270 westbound to Exit 23-John S. McDonnell Boulevard. Traffic then turns and heads southeast onto John S. McDonnell Boulevard until it meets and turns southwest onto N. Lindbergh Boulevard. N. Lindbergh Boulevard then winds around, crosses through a tunnel under Runway 11-29 where it meets with Natural Bridge Road and turns southeast onto it. Natural Bridge Road winds around and turns into Lambert International Boulevard and into the airport entrance. Approximately, four miles of this route are on city streets after exiting the interstate. The route is generally well signed and reasonably easy to follow, but there are a large number turns to take.

Traffic from the southeast uses I-70 westbound to Exit 235C-Natural Bridge Road. Traffic off the exit turns right and heads southeast onto Natural Bridge Road where it immediately turns into Lambert International Boulevard and into the airport entrance. The route is very well signed and easy to follow. This route is by far easier and quicker than coming in from the northeast.

2.8.1.1.3 ACCESS FROM THE SOUTH

There are two primary access routes from the south depending on whether the passenger is coming from east or west of the airport. Traffic from west of the airport uses I-270 northbound to Exit 20A-I-20 Mark Twain Expressway. Traffic then merges onto I-70 and heads east to Exit 235C-Cypress Rd/Airport. From there traffic winds around the ramp to Cypress Road, turns right to head north on Cypress Road and then meets with Lambert International Boulevard into the airport entrance. Less than a quarter-mile of this route is on city streets after exiting the interstate. The route is very well signed and easy to follow.

Traffic from east of Lambert Airport uses I-170 northbound to Exit 7C-Lambert-St. Louis Airport. Traffic exits onto Lambert International Boulevard and heads northwest to the airport entrance. Approximately, one mile of this route is on city streets after exiting the interstate. The route is also very well signed and easy to follow. This route is easier and quicker than coming in from west of the airport.

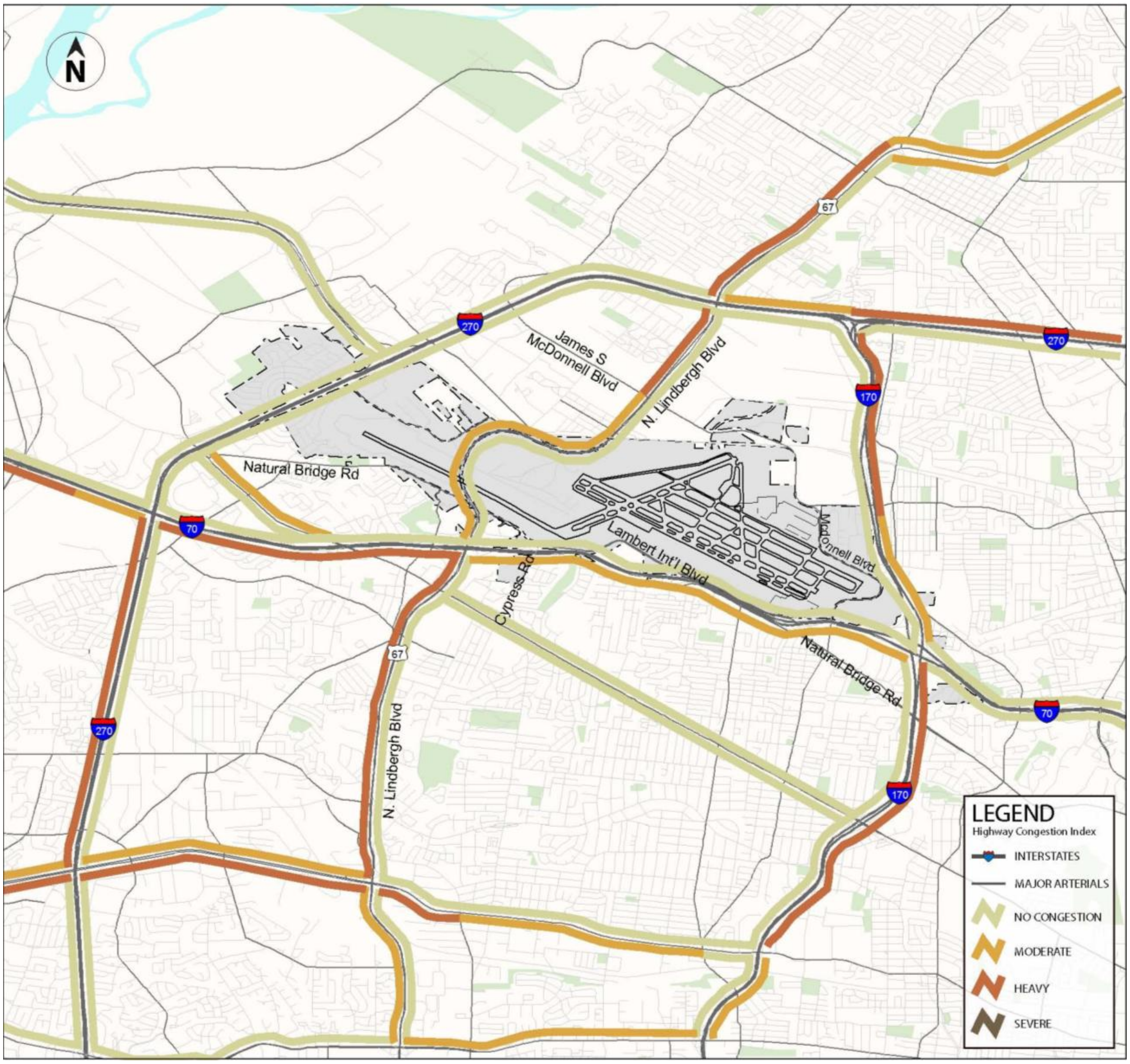
2.8.1.1.4 ACCESS FROM THE NORTH AND WEST

Primary access from the northwest is I-70 eastbound to Exit 235C-Cypress Road/Airport, similar to coming from the south, west of the airport. From there traffic winds around the ramp to Cypress Road, turns right to head north on Cypress Road and then meets with Lambert International Boulevard into the airport entrance. Less than a quarter-mile of this route is on city streets after exiting the interstate. The route is very well signed and easy to follow.

Traffic congestion has historically been a challenge for the region. Congestion is a result of growth over time in metropolitan area. The Legacy 2035: Long-Range Transportation Planning document, prepared by the East-West Gateway Council of Governments, measures regional highway congestion levels around Lambert Airport. According to this document, traffic congestion within the region varies greatly during morning and evening peak periods on Interstates 70, 170 and 270, and US Route 67. The range of traffic congestion varies between 'no congestion' to 'heavy' congestion. However, no highway is classified as having 'severe' congestion.

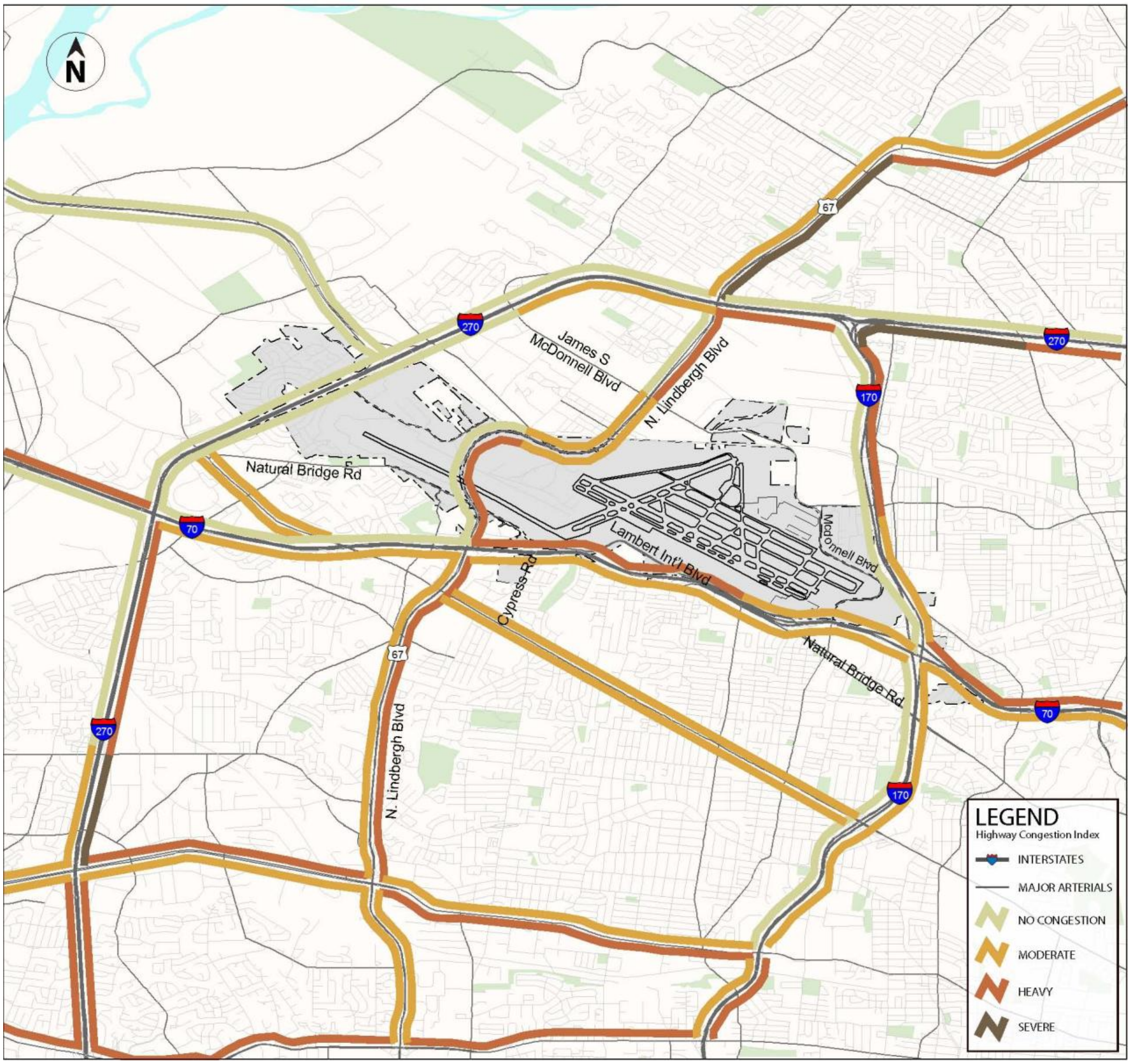
Exhibit 2.8-2, *Morning Peak Traffic Period Congestion Levels*, and **Exhibit 2.8-3, *Evening Peak Traffic Period Congestion Levels***, illustrate congestion levels in the spring of 2000 for the morning (6:00 a.m. to 9:00 a.m.) and evening (3:30 p.m.to 6:30 p.m.) peak traffic periods of the main highways that provide access to Lambert Airport.

Exhibit 2.8-2
MORNING PEAK TRAFFIC PERIOD CONGESTION LEVELS
Lambert-St. Louis International Airport



Source: East-West Gateway Council of Governments, *State of the Transportation System*, and Landrum & Brown.

Exhibit 2.8-3
EVENING PEAK TRAFFIC PERIOD CONGESTION LEVELS
Lambert-St. Louis International Airport



Source: East-West Gateway Council of Governments, *State of the Transportation System*, and Landrum & Brown.

2.8.1.1.2 REGIONAL TRANSIT

The St. Louis metropolitan area is served by two major rail services, and one major bus service. Amtrak provides intercity passenger train service throughout the U.S. except for Wyoming and South Dakota. MetroLink is a division of Metro, a multi-modal system that provides passenger bus and light rail service to the St. Louis metropolitan region. MetroLink serves as the St. Louis metropolitan region's commuter rail system. Greyhound Bus Service provides intercity common carrier service of passengers throughout the entire U.S.

Amtrak – California, South, Midwest and West Regions

Amtrak provides service from regional train stations located in downtown St. Louis, Kirkwood, Missouri, and Alton, Illinois to California, and the Southern, Midwest and Western regions of the U.S. In addition, Amtrak operates the Texas Eagle service, which is only long-distance train through Missouri. The Texas Eagle services daily through Chicago-St. Louis-Dallas-San Antonio-Los Angeles.

Amtrak also operates the following shorter-distance trains through Missouri and Illinois:

- The Missouri River Runner (daily St. Louis-Kansas City, MO)
- The Illinois Service (daily Chicago-Quincy/St. Louis/Carbondale)

Amtrak serves the St. Louis, Kirkwood, and Alton stations daily during the following service hours:

- St. Louis: 12:00 a.m. – 1:00 a.m. and 3:30 a.m. – 11:59 p.m.
- Kirkwood: 6:30 a.m. – 9:15 p.m.
- Alton: 6:30 a.m. – 4:30 p.m.

Metrolink – Commuter Rail Line

MetroLink serves the airport and operates daily from the Lambert Airport Station at both Terminals 1 and 2 extending to Shiloh-Scott Station in St. Clair County, Illinois. According to Metro, the Bi-State Development Agency that provides the St. Louis area with local and regional transit services, the following are characteristics of the MetroLink system:

- In 1990, construction was started on the initial MetroLink alignment from Lambert Airport to the Firth and Missouri Station in East St. Louis. The portion between North Hanley and Fifth and Missouri Stations opened in July 1993, the line was extended westward to the Lambert Airport Main Station in 1994. The capital cost to build the initial phase was $464 million; of that amount, the Federal Transit Administration supplied $348 million.
- MetroLink is comprised of 37 rail stations, 18 Park-N-Ride lots and stretches 46 miles serving several municipalities in the St. Louis County, Missouri, St. Clair and Monroe Counties in Illinois, and the City of St. Louis. The MetroLink fleet consists of 87 light rail vehicles. **Table 2.8-1, *Metrolink Light Rail Service Information*** presents MetroLink light rail service information.
- At Lambert Airport, passenger pickup for MetroLink is located in Terminal 1 at exit door MT1, on the upper level east of the American Airlines Credit Union. In Terminal 2, the MetroLink passenger pickup is located south of the terminal accessible through the parking garage on all levels.
- MetroLink has a passenger peak capacity of 1,800 single directions per hour and a passenger capacity per vehicle of 70 two-seated and 100 plus standing. In addition, MetroLink conducts six train operations per hour.

- According to the *Public Transportation Ridership Report* produced by the American Public Transportation Association (APTA), in 2008 there were 20,212,700 unlinked transit passengers serviced by the Bi-State Development Agency in the Greater St. Louis Area. That averages to an estimated 59,000 passengers per weekday.

All MetroLink light rail stations are ADA (American with Disabilities Act) accessible as ramps or elevators are provided. In addition, each MetroLink vehicle is equipped with four priority seating locations for customers with disabilities.

Table 2.8-1
METROLINK LIGHT RAIL SERVICE INFORMATION
Lambert-St. Louis International Airport

SERVICE INFORMATION	DAILY SERVICE
Start Time	4:00 a.m.
End Time	12:30 a.m.
Travel Time[1]	1 hour, 10 minutes
Fares	Adults - $2.25
	Disabled, Seniors (65+ years), Children (5-12 years): $1.10

Note: 1 Travel time is from Lambert Airport to Shiloh-Scott Station in St. Clair, Illinois.

Source: "Inside Metro," *Metro* website on August 3, 2009.

Greyhound

Regional bus stations for Greyhound Bus Service include downtown St. Louis and Lambert Airport. The downtown St. Louis bus station is located on South Fifteenth Street between Interstate 64 and the Savvis Center. Passenger pickup for Greyhound at Lambert Airport is located at the Bus Port, which is located off Lambert International Boulevard south of Terminal 1. Courtesy Terminal Shuttle service is available to connect to the Bus Port. Passenger pickup in Terminal 1 is located at exit door MT12 and at exit door ET15 in Terminal 2.

2.8.1.1.3 LOCAL TRANSIT

The Greater St. Louis Area is served by local public bus service offered by two transit agencies: Madison County Transit and MetroBus. Madison County Transit (MCT) provides fixed route bus service around Madison County, Illinois, which is located approximately twenty miles northeast of St. Louis. MCT operates a fleet of 73 buses, carries 8,000 riders daily, 40,000 riders weekly and 2.5 million riders annually.

MetroBus is a division of Metro, a multi-modal system that provides passenger bus and light rail service to the St. Louis metropolitan region. MetroBus provides bus transportation services to and around the Greater St. Louis Area, including service to Lambert Airport. The Bus Port at Lambert Airport handles all MetroBus service, and is located off Lambert-International Boulevard south of Terminal 1. A courtesy terminal shuttle is available at Lambert Airport to connect to the Bus Port. The shuttle stops make regularly scheduled stops at the Bus Port on its route between Terminals 1 and Passenger pickup for courtesy terminal shuttle is at Exit Door MT12 in Terminal 1 and at Exit Door ET15 at Terminal 2.

In addition, Metro utilizes bus transfer centers to serve as hubs with several connecting routes. To optimize travel capabilities, Metro has connected many MetroBus routes and MetroLink stations for convenient transfers between bus and light rail service. MetroBus service to Lambert Airport is provided on the following three bus routes:

MetroBus Route No. 45 – Hazelwood-Ferguson

The MetroBus No. 45 bus route provides service between the North Hanley Station and the Lambert Airport area. (*See* **Table 2.8-2, MetroBus Route No. 45 Service Information**.)

Key service points include: Vatterott College, Ferguson, Lambert Airport, Florissant, Hazelwood, Village Square Shopping Center, Valley Industries, and North Park.

Table 2.8-2
METROBUS ROUTE NO. 45 SERVICE INFORMATION
Lambert-St. Louis International Airport

SERVICE INFORMATION	DAILY A.M. SERVICE	DAILY P.M. SERVICE
Start Time	4:21 a.m.	12:33 p.m.
End Time	12:29 p.m.	10:52 p.m.
Travel Time[1]	1 hour, 12 minutes	1 hour, 14 minutes
Fares	Adults - $2.00	Adults - $2.00
	Disabled, Seniors (65+ years), Children (5-12 years): $1.00	Disabled, Seniors (65+ years), Children (5-12 years): $1.00

Note: 1 Travel time is from North Hanley Station to eight scheduled stops, then concluding at North Hanley Station.

Sources: Metro, "MetroBus Maps and Routes," September 8, 2009. *See* internet website: http://www.metrostlouis.org/MetroBus/MapsRoutes.asp.
Metro, "Metro Fares," September 8, 2009. http://www.metrostlouis.org/Fares/FareChart.asp.

MetroBus Route No. 49 – Lindbergh

The MetroBus No. 49 bus route provides service between the North Hanley Station and the Lambert Airport area. (*See* **Table 2.8-3, MetroBus Route No. 49 Service Information**.)

Key service points include: World Parkway Circle, Lambert Airport (Lambert Busport), Northwest Plaza Shopping Center, Ballas MetroBus Center, St. John's Hospital, St. Anthony's Hospital, South County Mall, and Jefferson Barracks Veteran's Hospital.

Table 2.8-3
METROBUS ROUTE NO. 49 SERVICE INFORMATION
Lambert-St. Louis International Airport

SERVICE INFORMATION	DAILY A.M. SERVICE	DAILY P.M. SERVICE
Start Time	5:19 a.m.	12:13 p.m.
End Time	12:09 p.m.	12:01 a.m.
Travel Time[1]	2 hours, 5 minutes	2 hours, 15 minutes
Fares	Adults - $2.00	Adults - $2.00
	Disabled, Seniors (65+ years), Children (5-12 years): $1.00	Disabled, Seniors (65+ years), Children (5-12 years): $1.00

Note 1 Travel time is from North Hanley Station to Jefferson Barracks Veteran's Hospital.

Sources: Metro, "MetroBus Maps and Routes," September 8, 2009. *See* internet website: http://www.metrostlouis.org/MetroBus/MapsRoutes.asp.
Metro, "Metro Fares," September 8, 2009. http://www.metrostlouis.org/Fares/FareChart.asp.

<u>MetroBus Route No. 66 – Clayton Airport</u>

The MetroBus No. 66 bus route provides service between the Village Square Shopping Center and the Lambert Airport area. (*See* **Table 2.8-4, *MetroBus Route No. 66 Service Information***)

Key service points include: Valley Industries, Lambert Airport (Lambert Busport), St. Louis Auto Museum, Overland Plaza, Olive Commons, St. Louis County Government Center, and Clayton MetroBus Center.

Table 2.8-4
METROBUS ROUTE NO. 66 SERVICE INFORMATION
Lambert-St. Louis International Airport

SERVICE INFORMATION	DAILY A.M. SERVICE	DAILY P.M. SERVICE
Start Time	6:02 a.m.	3:39 p.m.
End Time	7:50 a.m.	6:00 p.m.
Travel Time[1]	48 minutes	51 minutes
Fares	Adults - $2.00	Adults - $2.00
	Disabled, Seniors (65+ years), Children (5-12 years): $1.00	Disabled, Seniors (65+ years), Children (5-12 years): $1.00

Note: 1 Travel time is from the Village Square Shopping Center to the Clayton MetroBus Center.

Sources: Metro, "MetroBus Maps and Routes," September 8, 2009. *See* internet website: http://www.metrostlouis.org/MetroBus/MapsRoutes.asp.

In descending order, below are MetroBus passenger ridership statistics, obtained from Metro website, of select MetroBus route locations in close proximity to Lambert Airport. Passenger boardings reported below represent an average day, based on passenger count data collected from September 2006 – February 2007.

- Page at Schnucks: 190 Daily Boardings
- St. Charles Rock Road at Cypress: 183 Daily Boardings
- Fleischer at LHB Industries: 146 Daily Boardings
- Northwest Plaza: 139 Daily Boardings
- Lackland at Altom: 127 Daily Boardings
- Page at Hanley: 104 Daily Boardings

All MetroBus vehicles are equipped with lifts and ramps and most have kneelers to assist passengers who cannot use or have difficulty using the stairs. In addition, priority seating is available for passengers having difficulty standing while riding. There are also two reserved seating areas for customers using wheelchairs and scooters.

Metro Call-A-Ride provides curb-to-curb van service in St. Louis City and County with advance reservations for people with physical, visual, or cognitive disabilities who are functionally unable to independently use bus or light rail service, due to their disability.

Service is provided to ADA-eligible customers who have registered to use the service. ADA service is available everyday to registered customers taking an ADA-Mandated Trip. Generally, ADA-Mandated Trips can be booked up to three day in advance, except on Friday where trips can be booked up to five days in advance. This eliminates the need to call on weekends to book ADA-eligible trips.

2.8.2 AIRPORT LANDSIDE

For the inventory of the landside facilities, "landside" is defined as the terminal curbside and entrance roadway, vehicle parking (public and employee), surface access to the cargo buildings, the fixed base operators and the Boeing facilities, access to airport-owned property that includes areas near the Berry Hill Golf course west of Interstate 270, the Brownleigh subdivision area, and in Kinloch and other areas purchased under the Lambert Airport noise mitigation program. The term "regional" is defined as the public roadways outside of the airport boundary that provide the major points of access to airport facilities and airport development areas both those built-out and those under consideration as a part of this airport master planning process.

The data presented summarizes the existing system of roadways serving STL, characteristics associated with current traffic flows, inventory methodologies, and data accumulated during the study to date. This information is intended to determine the need for improvements that optimize performance and level of service, as well as to analyze and evaluate the effects of improvements.

The inventory of the airport landside, regional traffic flows, and roadway facilities describe the existing physical features for the following facilities:

- Local system of airport roadways
- Terminal roadways and curbsides
- Public, employee, and cargo parking facilities
- Rental car facilities

2.8.2.1 Airport Landside Roadway and Access

As of July 2009, there were four public access routes to Lambert Airport (*see* **Exhibit 2.8-4, *Airport Access Roads***). These public access routes provide direct access to Terminals 1 and 2.

- Interstate 70 eastbound off-ramp to Pear Tree Lane, to Airflight Drive, to Lambert International Drive.
- Interstate 70 westbound off-ramp to Lambert International Drive or westbound off-ramp to Airflight Drive, to Lambert International Drive.
- Serving traffic from the west, western end of Lambert International Drive to Airflight Drive from the Cypress Road and Natural Bridge Road intersection.
- Air Cargo Road connecting John S. McDonnell Boulevard to Lambert International Drive.

Airport landside traffic is projected to steadily increase in the coming years. According to the *Lambert-St. Louis Airport Access Route Report*, dated January 1996, US-67/N. Lindbergh Boulevard is projected to be the most congested roadway immediately surrounding the STL in 2010. With an average two-way daily traffic volume of 63,500 vehicles, US-67/N. Lindbergh Boulevard is projected to have 4,900 more vehicles than US-67/S. Lindbergh Boulevard. Furthermore in 2015, the two-way daily traffic volume increases by 6,400 to a maximum 69,900 vehicle count for US-67/N. Lindbergh Boulevard, and an increase of 5,900 to a maximum 64,500 count for US-67/S. Lindbergh Boulevard. The projected roadway daily traffic volumes are presented in **Table 2.8-5, *Airport Landside Access/Traffic Volume Projections***.

2.8.2.2 Existing Terminal Curbside Layout

The passenger terminals share similar curb front configurations with grade separated departure and arrival curbs. The departure curb consists of three movement lanes and one diagonal parking lane between the first and second movement lane. At each terminal, the traffic on the departure curb is restricted to private passenger vehicles, taxi drop off, limousines, and parking lot shuttles. The arrivals curb consists of five lanes with a pedestrian island between Lanes 3 and 4. Lane 1, nearest the terminal, serves private passenger vehicles and hotel shuttles. Lanes 2 and 3 are the movement lanes associated with Lane 1. Lane 4 serves off-airport parking lot shuttles and hotel shuttles and Lane 5 serves as the movement lane for Lane 4.

2.8.2.3 Parking Facilities

The availability and convenience of parking is a critical element in improving the overall passenger experience at Lambert Airport. The location of all public parking facilities is illustrated in **Exhibit 2.8-5, *Public Parking Facilities***.

Table 2.8-5
AIRPORT LANDSIDE ACCESS/TRAFFIC VOLUME PROJECTIONS
Lambert-St. Louis International Airport

ROADWAY	AVERAGE TWO-WAY DAILY TRAFFIC VOLUMES		
	1995 AVERAGE	2010 PROJECTED AVERAGE	2015 PROJECTED AVERAGE
I-70[1]	n/a	n/a	n/a
I-170[1]	n/a	n/a	n/a
I-270[1]	n/a	n/a	n/a
US 67/N. Lindbergh Boulevard	42,370	63,500	69,900
US 67/S. Lindbergh Boulevard	49,210	58,600	64,500
MO 115[1]	n/a	n/a	n/a
Cypress Road	15,110	24,000	25,400
Lambert International Drive[1]	n/a	n/a	n/a
McDonnell Boulevard	9,700	17,050	18,800
Natural Bridge Road	14,560	21,100	23,200
St. Charles Rock Road[1]	n/a	n/a	n/a
Woodson Road[1]	n/a	n/a	n/a

Note: 1 Not observed.

Source: *Lambert-St. Louis Airport "Access Route Report," January 1996.*

Exhibit 2.8-4
AIRPORT ACCESS ROADS
Lambert-St. Louis International Airport

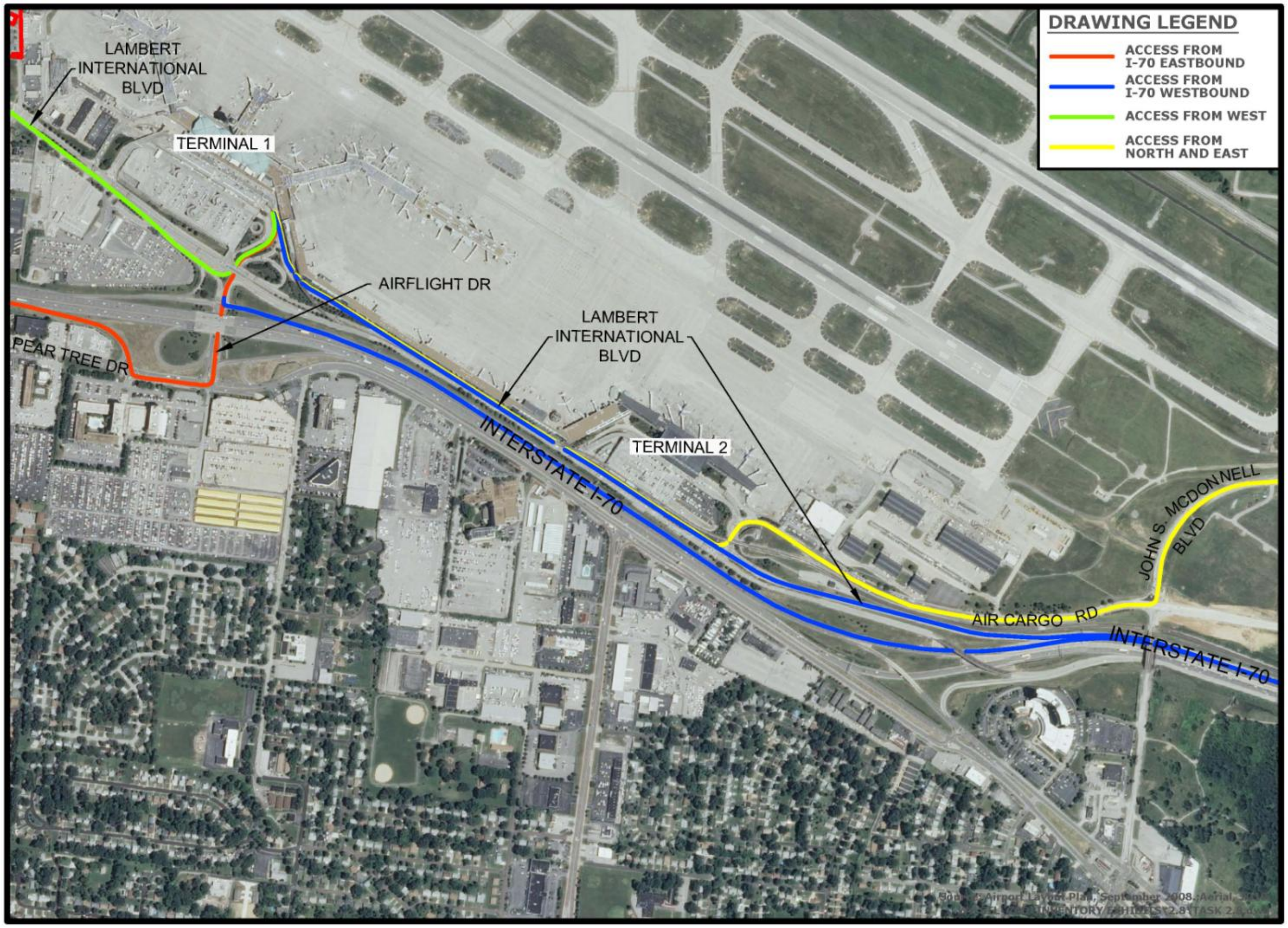
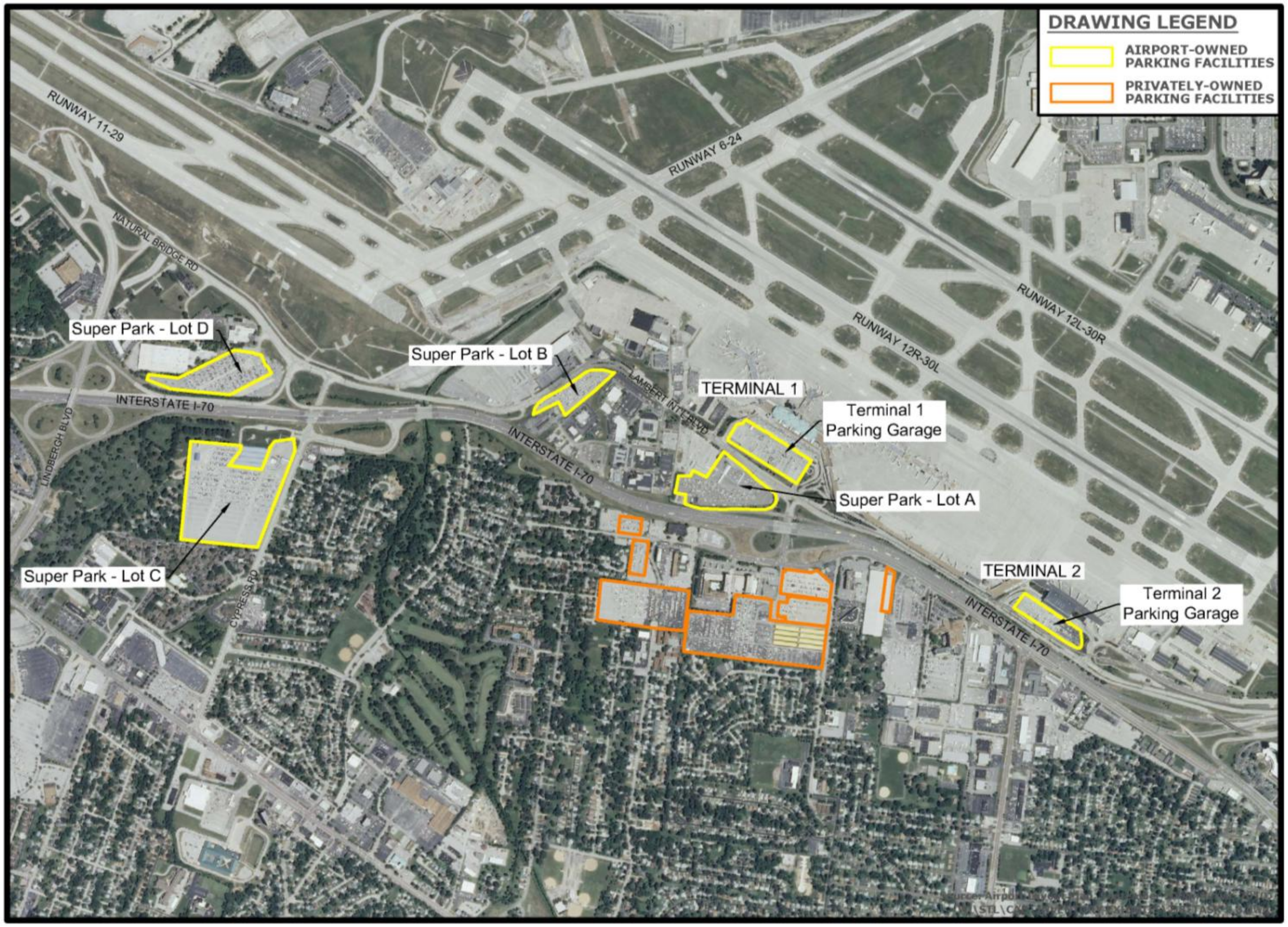


Exhibit 2.8-5
PUBLIC PARKING FACILITIES
Lambert-St. Louis International Airport



2.8.2.3.1 PUBLIC PARKING FACILITIES

Airport-owned public parking facilities are divided into three categories: short-term, long-term, and overflow with 8,873 spaces in six locations. Of these total spaces, approximately 7,880 spaces are available for use on a full-time basis. An additional 993 overflow spaces are included in the parking supply during peak holiday travel periods. Additionally, there is one airport-owned cell phone lot and eight privately-owned parking facilities.

Airport-Owned Facilities – Short Term Parking

The four-level Terminal 1 hourly garage is a short-term parking facility located on Lambert International Boulevard directly in front of Terminal 1; it has 2,017 spaces. The parking rate is $1.00 for each half-hour with a daily maximum rate of $20.00. The Terminal 1 hourly garage does not offer shuttle service to the Terminals.

During 2007-2008, there were 927,996 parking transactions at the Terminal 1 hourly garage. During this same timeframe, the average overnight count of parked vehicles was 857. The peak occupancy during the busy month of March was 1,815 vehicles. In addition, the peak period of parked vehicles during the week was on Thursday nights with peak occupancy of 1,100 vehicles.

The Terminal 2 hourly garage is also a short-term parking facility located on Lambert International Boulevard directly in front of Terminal 2; it has 980 spaces. In September 2008, 26 additional spaces were added at the old entrance on the roof of the garage. Similar to Terminal 1 hourly garage, the parking rate is $1.00 for each half-hour with a daily maximum rate of $20.00. The Terminal 2 hourly garage does not offer shuttle service to the Terminals.

During 2007-2008, there were 376,452 parking transactions at the Terminal 2 hourly garage. During this same timeframe, the average overnight count of parked vehicles was 508. The peak occupancy during the busy month of March was 980 vehicles. The peak period of parked vehicles during the week was on Thursday nights with peak occupancy of 980 vehicles. Generally, this garage overflows its capacity on Tuesdays, Wednesdays, and Thursdays between 7:00 a.m. and 3:00 p.m. Airport parking officials have noted that by 3:00 p.m. the parking operator may have to turn away between 150-200 meet and greet patrons who are directed to park in the Intermediate Lot and ride a shuttle to the terminal area.

Table 2.8-6, *Airport-Owned Public Parking Garages*, shows a diagram of parking rates, transactions, peak occupancies and utilization for both of the airport-owned public parking garages from 2007-2008.

Table 2.8-6
AIRPORT-OWNED PUBLIC PARKING GARAGES –
2007-2008 PARKING TRANSACTIONS AND PEAK OCCUPANCIES
Lambert-St. Louis International Airport

DESCRIPTION	TERMINAL 1 PARKING GARAGE Super Park 1	TERMINAL 2 PARKING GARAGE Super Park 2
Parking Rates	Each Half Hour: $2.50 Daily Maximum: $21.00	Each Half Hour: $2.50 Daily Maximum: $21.00
Space Counts	2,017	980
Parking Transactions by Duration (2007-2008)	927,996	376,452
Peak Period of Parked Vehicles	Thursday (pm)	Tuesday (am)
Average Overnight Count (2007-2008)	847	508
Peak Occupancy during Busy Month (March)	1,815	980
Peak Occupancy Utilization (March)	90%	100%
Peak Occupancy during Peak Day (Wednesday)	1,100	980
Number of Shuttles per Hour	0	0

Notes: 1 Parking transaction and peak occupancy data are estimates from physical observations.
2 Parking rates derived from Lambert Airport website, March 12, 2010.

Source: *Commission Meeting December 3, 2008* document (2007-2008), and Michael Coleman of *Central Parking*, March 26, 2009.

Airport-Owned Facilities – Long Term Parking

There are four long-term parking lots serving passengers all under the name Super Park. The four surface lots are Super Park A, Super Park B, Super Park C, and Super Park D. Super Park A, B, and D are located on Lambert International Boulevard. Super Park C is located on Cypress Road. Super Park D is located one half-mile west of Cypress Road; Super Park B is located one mile east of Cypress Road; and Super Park A is less than one quarter-mile west of Air Flight Drive. Super Park C is located one quarter-mile south of Interstate 70.

Table 2.8-7, *Airport-Owned Public Surface Parking Facilities*, lists the parking rates, transactions, and peak occupancies for each of the four airport-owned public surface parking facilities for 2007-2008.

Table 2.8-7
AIRPORT-OWNED PUBLIC SURFACE PARKING FACILITIES – 2007-2008 PARKING TRANSACTIONS AND PEAK OCCUPANCIES
Lambert-St. Louis International Airport

DESCRIPTION	SUPER PARK A	SUPER PARK B	SUPER PARK C	SUPER PARK D
Parking Rates	Surface Daily: $13.00	Surface Daily: $10.00	Surface Daily: $9.00	Surface Daily: $7.00
Parking Spaces	993	486	3,174	1,223
Parking Transactions by Duration (2007-2008)	95,426	40,461	203,038	83,948
Peak Period of Parked Vehicles	Thursday (2:00 p.m.)	Wednesday (2:00 p.m.)	Saturday (morning)	Saturday (morning)
Average Overnight Occupancy (2007-2008)	558	366	2,062	894
Peak Occupancy during Busy Month (March)	745	474	2,841	1,071
Peak Occupancy during Peak Day (Wednesday)	650	415	2,200	1,000
Number of Shuttles per Hour	3	3	10	3

Note: 1 Parking transaction and peak occupancy data are estimates from physical observations.
2 Parking rates derived from Lambert Airport website, March 12, 2010.

Source: *Commission Meeting December 3, 2008* document (2007-2008), and Michael Coleman of *Central Parking*, March 26, 2009.

Cell Phone Lot

The Cell Phone Lot, located one half-mile east of Cypress Road on Lambert International Boulevard, provides 150 free short-term parking spaces for people waiting for arriving travelers. While using the lot, drivers must remain with their vehicle at all times, and is open from 7:00 a.m. to 11:00 p.m.

Privately Owned Off-Airport Parking and Utilization

There are eight privately owned lots operated by seven companies. Each lot runs a continuous shuttle bus service from their lot to the STL terminals. All of the lots are open 24 hours per day, seven days a week.

Table 2.8-8, *Privately-Owned Public Parking Facilities*, lists the privately operated off-airport parking facilities, the number of spaces, and the peak daily utilization rates. This data was obtained from the "Commission Meeting December 3, 2008" document and from discussions with parking personnel on March 25, 2009.

Table 2.8-8
PRIVATELY-OWNED PUBLIC PARKING FACILITIES – 2008-2009 PARKING TRANSACTIONS
Lambert-St. Louis International Airport

PARKING LOT	CLASS	DAILY PARKING RATES	SPACES	PEAK OCCUPANCY
AirPark 4607 Airflight Drive	Surface/ Covered	Surface: $8.95 Valet: $11.95 Covered: $12.95 Covered Valet: $14.95	2,855	50-60%
FASTTRACK 4607 Airflight Drive	Surface/ Covered	Surface: $8.95 Valet: $12.95 Covered: $12.95 Covered Valet: $14.95	n/a	n/a
EZ Park 4531 Crestshire Lane	Surface	Surface: $7.95	732	100%
Hilton Hotel 10330 Natural Bridge Road	Surface	Surface: $10.00	854	n/a
Park Express 9050 Natural Bridge Road	Surface/ Covered	Surface: $11.95 Covered: $13.95 Covered Valet: $16.00	n/a	n/a
Parking Spot 10534 Natural Bridge Road	Surface/ Covered	Open-air: $11.95 Open-air Valet: $12.95 Covered: $16.95 Covered Valet: $17.95	n/a	84%
Parking Spot 2 10486 Natural Bridge Road	Surface/ Covered	Surface: $11.95 Covered: $14.95	872	100%
SkyPark 4500 Crestshire Lane	Surface	Surface: $7.00 Valet: $11.50	1,656	n/a

Note: 1 Parking transaction and peak occupancy data were estimated from field observations.

Source: *Commission Meeting December 3, 2008* document (2007-2008), *AirPark* management, March 25, 2009, *EZ Park* and *Parking Spot II* management, March 25, 2009, and aerial photo parking space counts by Landrum & Brown.

2.8.2.3.2 CARGO PARKING FACILITIES

There are three cargo facilities at STL. Automobiles and long-haul trucks have allocated parking spaces at each cargo facility. **Table 2.8-9, *Cargo Parking Facilities – Existing Parking Spaces***, shows the number of automobile and long-haul truck parking spaces.

Table 2.8-9
CARGO PARKING FACILITIES – EXISTING PARKING SPACES
Lambert-St. Louis International Airport

FACILITY	AUTOMOBILE PARKING SPACES	LONG-HAUL TRUCK PARKING SPACES
Commercial Air Cargo	184	20
Cargo City Area	226	0
UPS Cargo	58	24

Source: Landrum & Brown analysis

2.8.2.3.3 EMPLOYEE PARKING FACILITIES

Employee parking services had been delegated to Central Parking System in the 2008-2009 timeframe, however, the employee parking program has since been discontinued.[20] All of the airport-owned parking facilities are open to the public. Due to the price structure for parking, STL employees are encouraged to park at the Super Park-Economy Lot at the rate of $5.00 a day.

2.8.2.4 Rental Car Facilities

All rental car services are located near the Terminal Area and are allocated amongst each of the rental car agencies. The rental car customer service area is located in the lower level of Terminal 1 between doors MT12 and MT17. The free shuttle bus service to the rental car facilities is located at exit doors MT17 in Terminal 1 and ET12 in Terminal 2 (*see* **Exhibit 2.8-6, *Taxi Staging Area and Rental Car Facilities***). Eight rental car agencies serve STL; Alamo, Avis, Budget, Dollar Rent-A-Car, Enterprise, Hertz, National, and Thrifty.

2.8.2.5 Taxi and Limousine Staging Areas

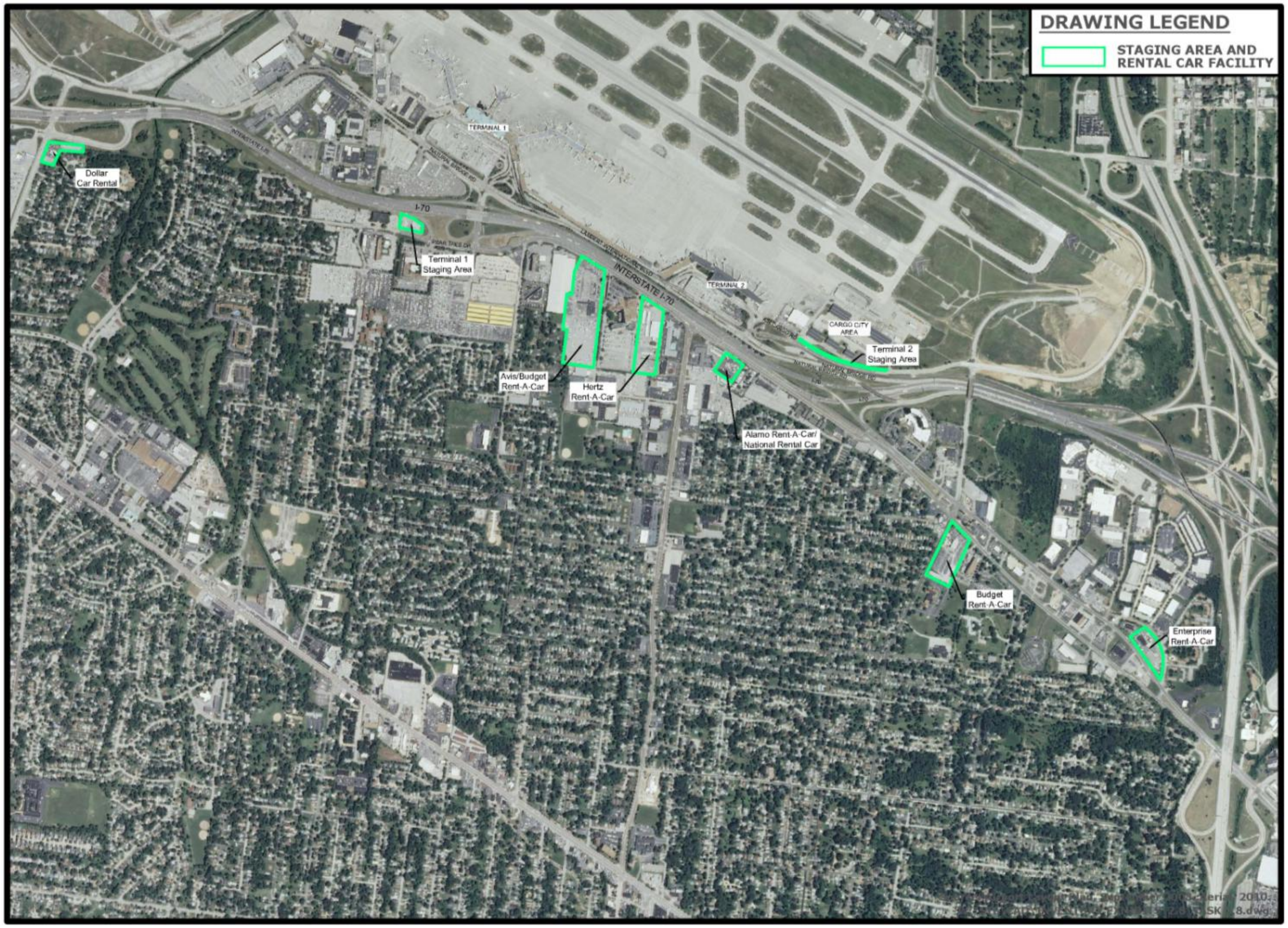
Taxi services are provided for all passengers and airport travelers in collaboration with the Metropolitan Taxicab Commission. The taxi passenger pickup is located in Terminal 1 between doors MT14 and Terminal 1 Garage Yellow Level, and in Terminal 2 at door ET12. Fares are dependent upon the final destination. An Airport Use Fee of $3.00 is charged to all customers for each pickup at the terminals.

[20] Information provided to Landrum & Brown by Michael Coleman of Central Parking System; March 25, 2009.

Limousine and sedan service is also provided by 14 different companies. There is no designated passenger pickup area; however, passenger pickup is accommodated at both Terminal 1 and Terminal 2. The fares are dependent upon the final destination and the fare differs between the companies.

The vehicle staging area for taxis and limousines is located in two separate on-airport locations for passenger pickups at Terminal 1 and Terminal 2. The Terminal 1 staging area is on Pear Tree Drive, immediately south of Interstate I-70, and encompasses approximately 45,934 square feet. The Terminal 2 staging is located along Airport Cargo Road, immediately south of the Cargo City Area. This staging area is 21,600 square feet, 1,200 feet in length, and is comprised of a one-lane roadway section and a two-lane roadway section. The locations of these staging areas are shown in Exhibit 2.8-6.

Exhibit 2.8-6
TAXI STAGING AREAS AND RENTAL CAR FACILITIES
Lambert-St. Louis International Airport



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CHAPTER THREE
FORECAST OF AVIATION DEMAND

Notes to Aviation Activity Forecasts:

Sections 3.1 through 3.10 reflect forecasts prepared and published in June 2009. These forecasts were approved by the FAA on August 27, 2009.

Appendix A reflects a sensitivity analysis conducted in November 2009 and published in final in August 2010. The June 2009 forecasts were re-approved by the FAA on September 27, 2010 pursuant to FAA review of the sensitivity analysis.

INTRODUCTION

This chapter presents comprehensive forecasts of aviation demand for the Lambert-St. Louis International Airport (STL or Lambert Airport) Master Plan Update for the years 2013, 2018, 2023, and 2028. The aviation activity forecast is a critical component in the master planning process. Future activity levels were projected for annual passenger enplanements, air cargo volumes, and aircraft operations. In addition, peak period (monthly, daily, and hourly) forecasts were also prepared to guide the planning process.

Forecasts of aviation demand for the purpose of planning future facilities were last prepared in 1996 when STL functioned as a major hub for Trans World Airlines (TWA). At the turn of the decade, TWA succumbed to financial difficulties and was purchased by American Airlines. American has since reduced the size of the hub considerably resulting in a significant reduction in connecting traffic at the airport. As a result, STL has changed from being a predominantly connecting hub to an airport primarily servicing demand for travel to and from the St. Louis metropolitan area. As the passenger base has changed, the mix of carriers and mix of aircraft has also changed. Indeed, in contrast to the reduction in service by American, the presence of Low Cost Carriers (LCCs) has increased. As a result of the many changes at STL in the past 12 years, new forecasts are needed.

Three enplaned passenger forecast scenarios were developed for the Master Plan: baseline, high, and low. The high and low growth scenarios were developed to provide the Airport Authority with a range of information from which it will be able to anticipate the airport's future activity levels, and plan for facilities that might be needed to accommodate future air transportation demand. Understanding the potential range of future activity will allow the Authority to avoid being surprised by potential stronger growth or unexpected slowdowns in growth. The baseline forecast predicts passenger activity will grow from 7.2 million enplanements in 2008 to 9.9 million enplanements by 2028. The high and low scenarios result in 2028 enplanements that range from 8.3 to 10.9 million. The baseline forecast represents the most likely scenario and will be used for future planning.

Each of the forecast scenarios represents market-driven demand for air service. The forecasts are "unconstrained" and as such do not take facility constraints or other outside limiting factors into consideration. In other words, for purposes of estimating future demand, the forecast assumes facilities can be provided to meet the demand. After determining what facilities are needed to accommodate the forecast aviation activity, alternatives to provide any such facilities will be identified and evaluated.

The forecasts developed for this Master Plan provide the St. Louis Airport Authority with a customized, adaptive, and enduring framework to meet the needs of long-term facilities planning. Periodic updates of the aviation activity forecasts will be necessary to ensure the key Master Plan recommendations are consistent with the characteristics of the actual activity and reasonable expectations of future activity levels.

3.1 ECONOMIC BASE FOR AIR TRANSPORTATION

The intrinsic links between the level of aviation activity and economic growth are well documented. Simply put, growth in population, income, and business activity typically lead to increased demand for air travel. An individual's demand for air travel is often referred to as "underlying demand" in that it cannot be realized without the presence of air service at a price that results in the decision to fly. This section provides an overview of the global, national, and local economic factors that generate the underlying demand for air travel.

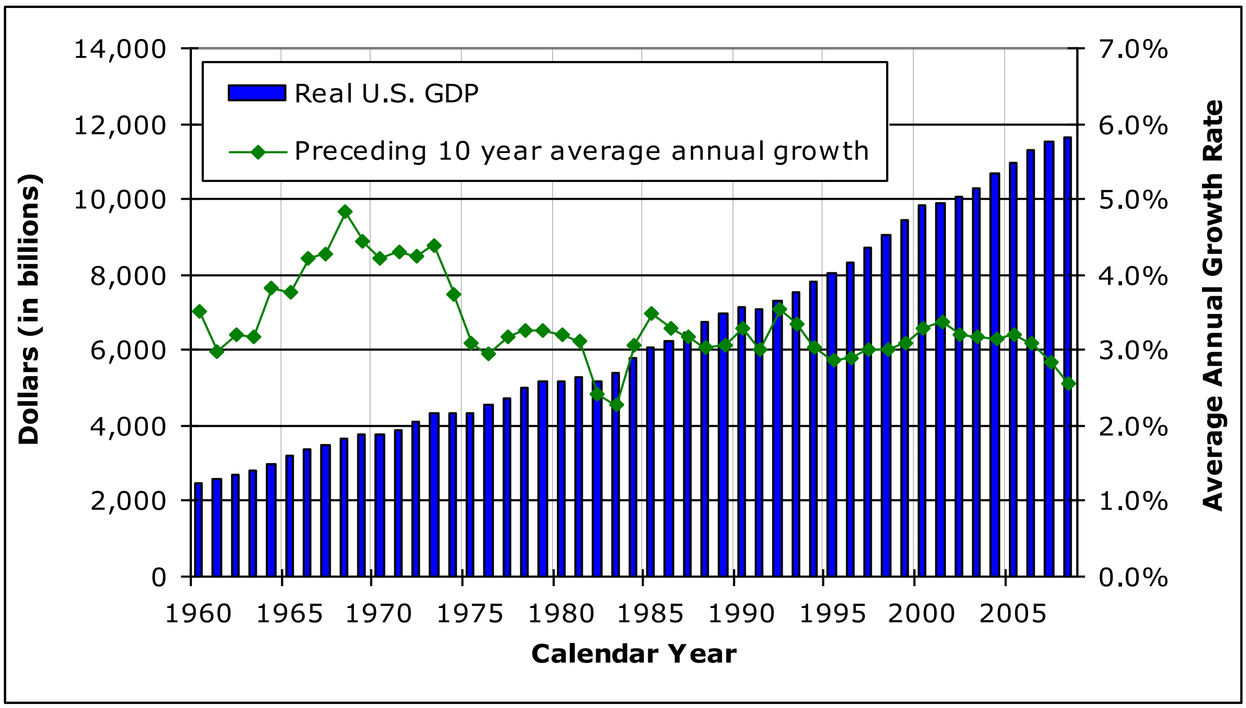
3.1.1 UNITED STATES ECONOMY

Historically the U.S. economy, as measured by Gross Domestic Product (GDP), has grown at a relatively steady rate; averaging 3.3 percent per year between 1960 and 2008 (*see* **Exhibit 3.1-1, *Historical Trends in U.S. Gross Domestic Product ($2000 Constant Dollars)***). The rate of growth, particularly since 1985, has been remarkably stable, reflecting both the size and maturation of the U.S. economy. Individual years have fluctuated around the long-term trend for a variety of reasons including pure macro-economic factors, fuel shocks, war, and terrorist attacks.

There have been two official economic recessions in the U.S. thus far in the 21st century. The first occurred between March and November 2001, and it was compounded by the September 11, 2001 terrorist attacks. The deleterious impact of these events on the airline industry is well documented. The recession itself was short-lived by historical standards and the economy returned to more normal growth rates quite quickly, fueled in large part by a gradual but prolonged reduction in interest rates.

The second official economic recession in the U.S. started in 2007 when the economy had begun to slow again and currently (as of 2011) finds itself in the midst of the worst financial crisis to affect the United States since the Great Depression. According to the National Bureau of Economic Research, the U.S. has been in a recession since December of 2007 (already 16 months long at the writing of this report and the longest recession since airline deregulation[1] in 1978). The U.S. and other industrialized western countries are faced with an increasing credit crisis. Twenty-five banks failed in 2008 and 25 more failed in the first four months of 2009.[2] Numerous financial institutions, the U.S. auto industry, and homeowners facing foreclosure have received 'bail-out' funds from the U.S. government. Corporate profits from current production were down 1.6 percent in 2007 and down another 10.1 percent in 2008.[3] Approximately 5.1 million jobs have been shed in the U.S. from December 2007 through March 2009. The unemployment rate rose to 8.5 percent in March 2009 (compared to 4.4 percent in March 2007).[4]

Exhibit 3.1-1
HISTORICAL TRENDS IN U.S. GROSS DOMESTIC PRODUCT
($2000 Constant Dollars)
Lambert-St. Louis International Airport



Sources: Bureau of Economic Analysis; Landrum & Brown analysis, 2011

According to projections published by the Federal Reserve in February 2009, U.S. real GDP is expected to decline by 0.5 to 1.3 percent in 2009 before returning to positive growth in 2010 (*see* **Table 3.1-1, *Forecast of U.S. Real Gross Domestic Product***). Annual growth is then expected to reach 3.8 to 5.0 percent in 2011 before slowing down to between 2.5 and 2.7 percent annual growth in the long-term.

[1] Deregulation refers to the Airline Deregulation Act of 1978 which reduced government control over commercial aviation.
[2] Federal Deposit Insurance Corporation (FDIC) Failure Bank List, April 20, 2009
[3] Bureau of Economic Analysis (BEA) News Release: Gross Domestic Product and Corporate Profits
[4] Bureau of Labor Statistics, Employment Situation Summary, March 2009

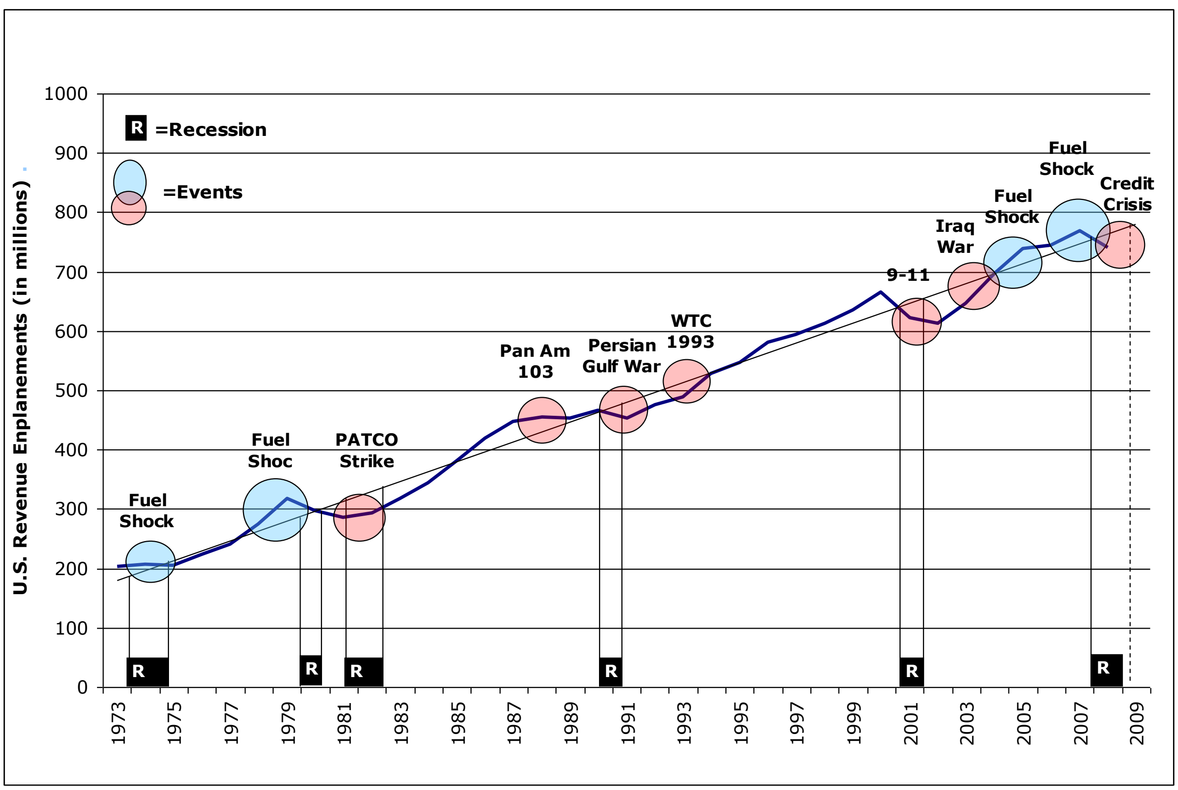
Demand for air travel in the U.S. correlates strongly with fluctuations in the economy. As shown in **Exhibit 3.1-2, *Aviation System Shocks and Recoveries (1973-2008)***), passenger traffic has typically declined during economic contractions and returned to positive growth during subsequent economic expansions. Indeed, in 2008, the combined impact of a slowing economy and rapidly rising fuel prices resulted in a 3.7 percent decline in U.S. revenue enplanements.[5] Positive growth in airline traffic is expected to return as the economy recovers.

Table 3.1-1
FORECAST OF U.S. REAL GROSS DOMESTIC PRODUCT
Lambert-St. Louis International Airport

Year	Lower End	Upper End
2009	-1.3%	-0.5%
2010	2.5%	3.3%
2011	3.8%	5.0%
Longer Run	2.5%	2.7%

Sources: Federal Reserve projections as of February 2009; Landrum & Brown analysis, 2011

Exhibit 3.1-2
AVIATION SYSTEM SHOCKS AND RECOVERIES (1973-2008)
Lambert-St. Louis International Airport



Sources: Air Transport Association of America; Landrum & Brown analysis, 2011

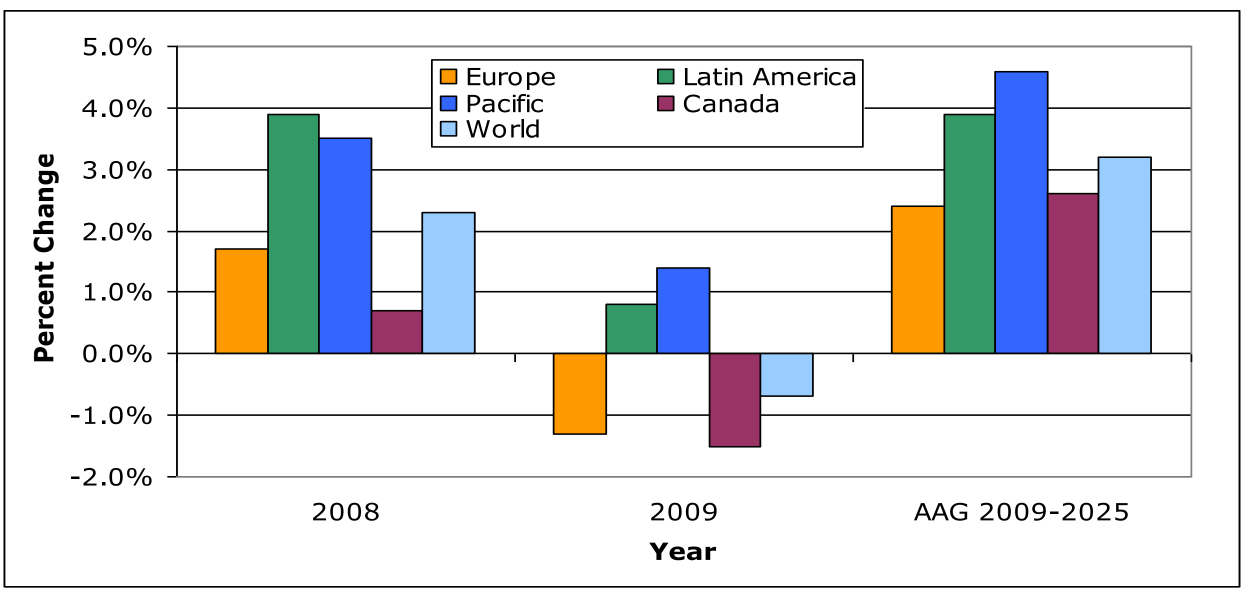
5 U.S. Department of Transportation, Bureau of Transportation Statistics.

3.1.2 WORLD ECONOMY

The current economic and financial crisis is not unique to the United States; in fact, the effects are being experienced around the globe. Japan, the United Kingdom, the 16-country Eurozone, and numerous other countries have all declared recessions. Global Insight predicts world GDP will contract by 0.7 percent in 2009 – the first such contraction since the Great Depression. Similar to the U.S., China and some European governments have initiated 'bail-out' or economic stimulus packages to help revive sluggish economies and improve consumer confidence.

While the near-term economic picture is certainly weak, history suggests that the world economy will return to positive growth over the long-term, which will be fundamental to the potential expansion of international air service at STL. Economic forecasts published in the FAA's March 2009 Aerospace Forecasts for the years 2009 through 2025 call for the world economy to begin to recover in 2010 with positive growth of 2.4 percent (*see* **Exhibit 3.1-3, *Summary of International GDP Forecasts by Travel Region***). The FAA feels that economic stimulus packages in China and the U.S. will fuel the recovery. Europe is expected to recover slower than the U.S. because the housing market corrections have occurred later there and the policy actions are more cautious. After 2010, world economic growth is forecast to average 3.3 percent annually. The Latin America and Asia/Pacific regions are expected to experience the highest growth rates (3.9 and 4.6 percent average annual growth respectively), while the more mature economies of Canada and Europe are expected to experience slower growth rates of 2.4 and 2.6 percent per year, respectively. These positive growth rates in the world economy will support the demand for air travel.

Exhibit 3.1-3
SUMMARY OF INTERNATIONAL GDP FORECASTS BY TRAVEL REGION
Lambert-St. Louis International Airport



AAG=Average Annual Growth

Source: FAA Aerospace Forecast, Fiscal Years 2009-2025

3.1.3 STL CATCHMENT AREA

The U.S. Census Bureau defines the St. Louis Metropolitan Statistical Area (MSA) as the independent city of St. Louis plus a contiguous sixteen county area.[6] Nine of the St. Louis MSA counties are in Missouri (the City of St. Louis, St. Louis County, Jefferson County, St. Charles County, Franklin County, Crawford County, Washington County, Warren County, and Lincoln County) and eight are in Illinois (Madison County, St. Clair County, Monroe County, Clinton County, Bond County, Macoupin County, Jersey County, and Calhoun County). An estimated 2.8 million people reside in the MSA, making it the 19th largest MSA in the United States.

A more geographically concentrated eight-county definition is used by the local East-West Gateway Council of Governments comprising St. Charles County, City of St. Louis, St. Louis County, Jefferson County, and Franklin County in Missouri and Madison County, St. Clair County, and Monroe County in Illinois. The East-West Gateway Region accounts for just over half of the physical area of the broader MSA but over 90 percent of the population and employment of the larger MSA.

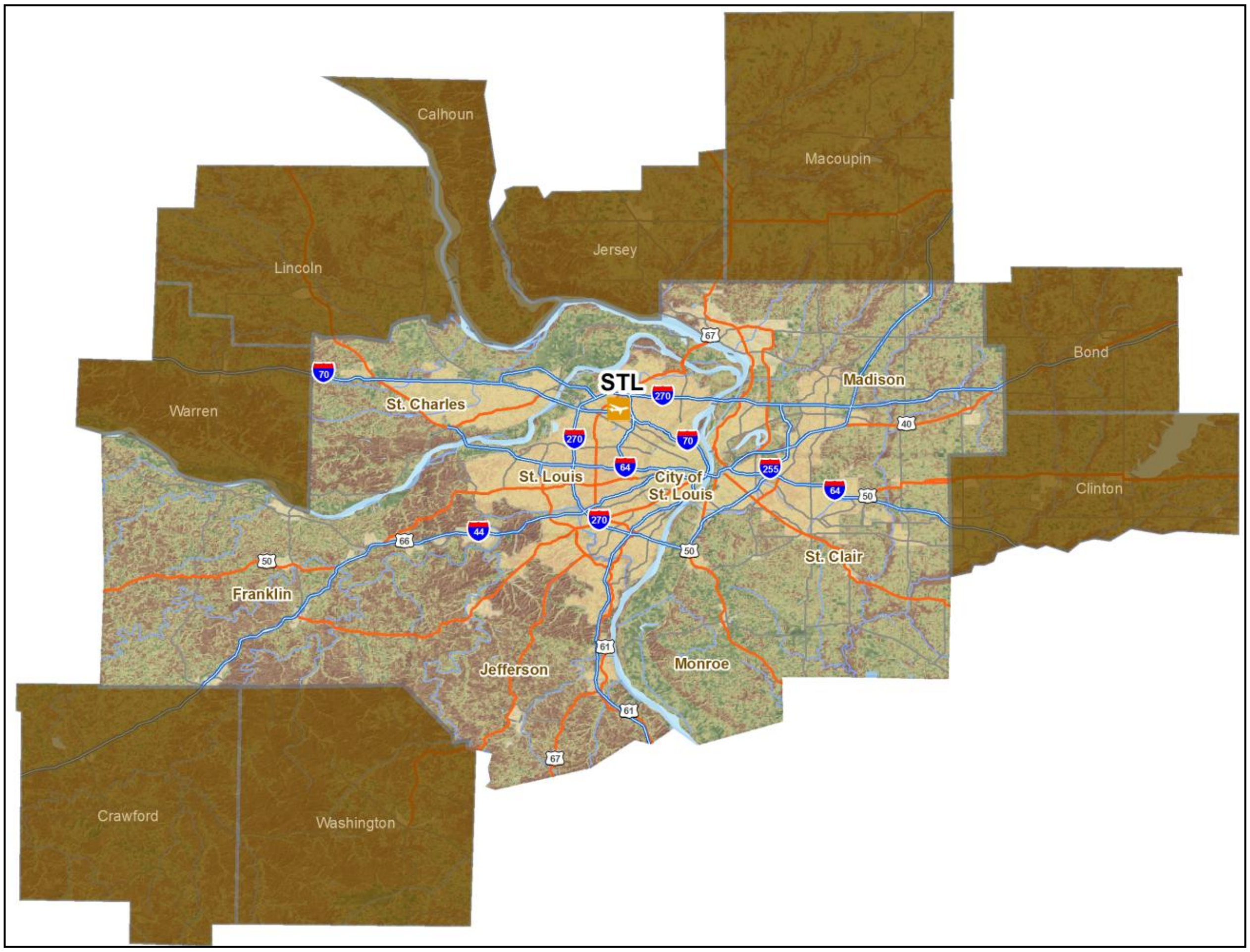
Exhibit 3.1-4, *St. Louis Metropolitan Statistical Area (MSA)*, provides a geographical depiction of the St. Louis MSA compared to the East-West Gateway Region. The nine counties located outside of the East-West Gateway Region but included in the MSA definition are shaded in brown.

STL is the primary airport serving both passenger and cargo traffic in the region. There are a number of other smaller airports in the region that are predominantly used by general aviation and military aircraft; none of those airports currently has scheduled passenger air service. Allegiant Air had offered limited scheduled passenger service from MidAmerica Airport since February 2006 but discontinued the service effective January 2009.

There are no other major commercial service airports located within 200 statute miles of STL. The closest major commercial service airports are: Indianapolis International Airport (229 miles), Kansas City International Airport (237 miles), Memphis International Airport (257 miles), Chicago O'Hare International Airport (258 miles), Chicago Midway International Airport (251 miles), Des Moines International Airport (259 miles), and Nashville International Airport (272 miles).

[6] The St. Louis Metropolitan Statistical Area (MSA) definition obtained from the U.S. Census Bureau, data released in November 2007.

Exhibit 3.1-4
ST. LOUIS METROPOLITAN STATISTICAL AREA (MSA)
Lambert-St. Louis International Airport



Sources: U.S. Census Bureau; Landrum & Brown analysis, 2011

3.1.4 ST. LOUIS MSA SOCIO-ECONOMIC TRENDS

This section summarizes recent trends and future forecasts of population, Per Capita Personal Income (PCPI), employment, and Gross Regional Product (GRP) for the St. Louis region. Comparisons with the states of Illinois and Missouri and the U.S. as a whole are presented, where appropriate, for reference and benchmarking purposes. The socio-economic data used in this analysis was obtained from: Woods and Poole Economics, Inc. of Washington, D.C; U.S. Bureau of Economic Analysis (BEA); U.S. Bureau of the Census; East-West Gateway Council of Governments; St. Louis Regional Chamber & Growth Association (RCGA); Missouri Economic Research and Information Center (MERIC); University of Missouri Office of Social and Economic Data Analysis (OSEDA); St. Louis County; the Missouri and Illinois Departments of Employment Security; and the St. Louis Convention & Visitors Commission (CVC). Economic variables are presented in constant dollars where appropriate to eliminate distortions resulting from inflation.

3.1.4.1 Population

The states of Illinois and Missouri are home to almost 19 million people, representing six percent of the total population in the United States. At 2.8 million residents, the St. Louis MSA accounts for 15 percent of the combined population of both states. Three quarters of the St. Louis MSA population resides in Missouri, with Illinois home to the remaining quarter (*see* **Table 3.1-2, *Population by County (2007)***).

Table 3.1-2
POPULATION BY COUNTY (2007)
ST. LOUIS MSA
Lambert-St. Louis International Airport

State	County	Population	% of Total
Missouri	St. Louis*	1,001,951	35.4%
	St. Charles*	346,148	12.2%
	City of St. Louis*	343,895	12.1%
	Jefferson*	220,543	7.8%
	Franklin*	101,355	3.6%
	Lincoln	50,697	1.8%
	Warren	30,122	1.1%
	Washington	24,452	0.9%
	Crawford	24,331	0.9%
	Subtotal	**2,143,494**	**75.6%**
Illinois	Madison*	265,743	9.4%
	St. Clair*	260,663	9.2%
	Macoupin	48,906	1.7%
	Clinton	36,800	1.3%
	Monroe*	32,527	1.1%
	Jersey	22,648	0.8%
	Bond	18,154	0.6%
	Calhoun	5,162	0.2%
	Subtotal	**690,603**	**24.4%**
TOTAL MSA		**2,834,097**	**100.0%**
East-West Gateway Region Counties		**2,572,825**	**90.8%**

*Counties included in East-West Gateway Region definition

Source: Woods & Poole Economics 2007; Landrum & Brown analysis, 2011

Population growth in the St. Louis MSA has generally been lower than in the states of Illinois and Missouri and the U.S. as a whole (*see* **Table 3.1-3, *Summary of Historical and Forecast Population (in Thousands)***). This trend is projected to continue through 2030. According to Woods & Poole Economics, an estimated 3.1 million people are expected to reside in the STL catchment area in 2030, an increase of approximately 240,000 people over current levels (0.4 percent average annual growth). These projected growth rates are in line with those published by the East-West Gateway Council of Governments in its June 2004 *"Long Range Population and Employment Projections"* which called for long-term growth of 0.5 percent per year for the core Gateway region.

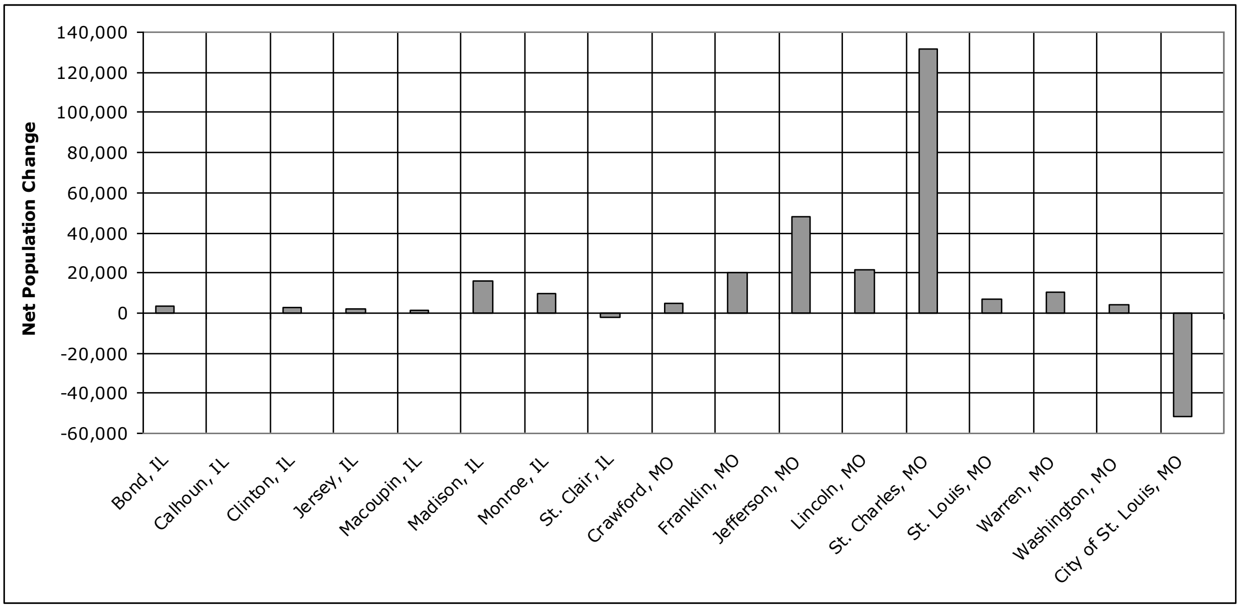
Table 3.1-3
SUMMARY OF HISTORICAL AND FORECAST POPULATION (in Thousands)
Lambert-St. Louis International Airport

Calendar Year	STL MSA	State of Illinois	State of Missouri	United States
Actual				
1990	2,605	11,453	5,129	249,623
1991	2,618	11,562	5,178	252,868
1992	2,632	11,672	5,227	256,156
1993	2,645	11,783	5,277	259,487
1994	2,659	11,895	5,327	262,861
1995	2,673	12,008	5,378	266,278
1996	2,683	12,094	5,423	269,392
1997	2,693	12,180	5,468	272,543
1998	2,704	12,266	5,514	275,730
1999	2,714	12,353	5,560	278,955
2000	2,725	12,441	5,607	282,217
2001	2,744	12,525	5,643	285,226
2002	2,760	12,595	5,680	288,126
2003	2,774	12,650	5,712	290,796
2004	2,790	12,714	5,753	293,638
2005	2,806	12,765	5,798	296,507
2006	2,820	12,832	5,843	299,398
2007	2,834	12,940	5,897	303,097
Forecast				
2010	2,854	13,166	6,017	311,884
2015	2,897	13,581	6,233	327,311
2020	2,946	14,025	6,462	343,360
2025	3,004	14,505	6,707	360,202
2030	3,072	15,037	6,976	378,317
Average Annual Growth Rate:				
1990-07	0.5%	0.7%	0.8%	1.1%
2007-15	0.3%	0.6%	0.7%	1.0%
2015-30	0.4%	0.7%	0.8%	1.0%
2007-30	0.4%	0.7%	0.7%	1.0%

Sources: Woods & Poole Economics 2007; Landrum & Brown analysis, 2011

Between 1990 and 2007, the MSA experienced a net gain of almost 230,000 residents. However, growth has not been evenly distributed at the county and city level. The City of St. Louis lost approximately 13 percent of its population over this 18-year period, which is equivalent to 52,000 residents (*see* **Exhibit 3.1-5, *Absolute Change in Population by County (1990-2007)***). In contrast, St. Charles County gained 132,000 residents.

Exhibit 3.1-5
ABSOLUTE CHANGE IN POPULATION BY COUNTY (1990-2007)
ST. LOUIS MSA
Lambert-St. Louis International Airport



Sources: Woods & Poole Economics 2007; Landrum & Brown analysis, 2011

3.1.4.2 Income Trends

This subsection presents trends in median household income and PCPI. Household income represents the average income per housing unit, while per capita personal income corresponds to the average income per inhabitant (total income divided by total population). Income statistics are broad indicators of the relative earning power and wealth of the region and inferences can be made related to resident's ability to purchase air travel.

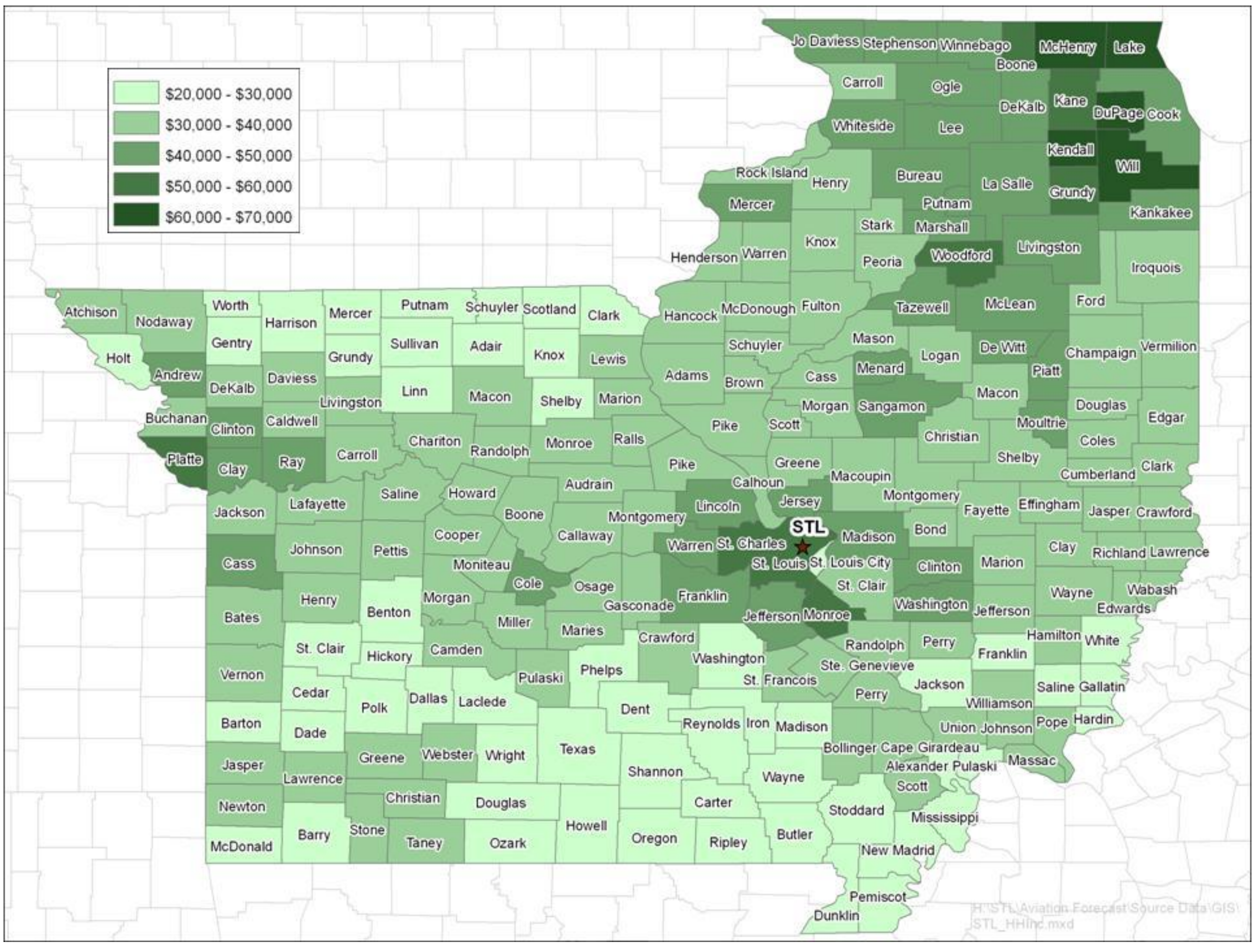
In the first quarter of 2008, Missouri and Illinois were ranked, respectively, the 5th and 24th states with the lowest cost of living of the United States. For this period, St. Louis MSA had a cost of living index 10 percent lower than the U.S. on average. In addition to affordable living conditions, the St. Louis MSA provides a competitive market for employers, which drives somewhat higher than average wages when compared to national benchmarks.[7] As a result, the St. Louis market ranks 23rd in the U.S. in terms of effective buying income, which is commonly known as disposable personal income.[8]

[7] U.S. Bureau of Labor Statistics and the St. Louis Regional Chamber & Growth Association
[8] *St. Louis Air Service Assessment*, December 2008

HOUSEHOLD INCOME

Median household income at the county level was used to understand the distribution of wealth in the St. Louis MSA and more broadly in the states of Missouri and Illinois. The strong urban areas of both states around St. Louis, Kansas City, and Chicago are the regions with the highest median household incomes as they provide the core employment base. Rural regions typically have the lowest household incomes (*see* **Exhibit 3.1-6, *Median Household Income by County ($1999)***).

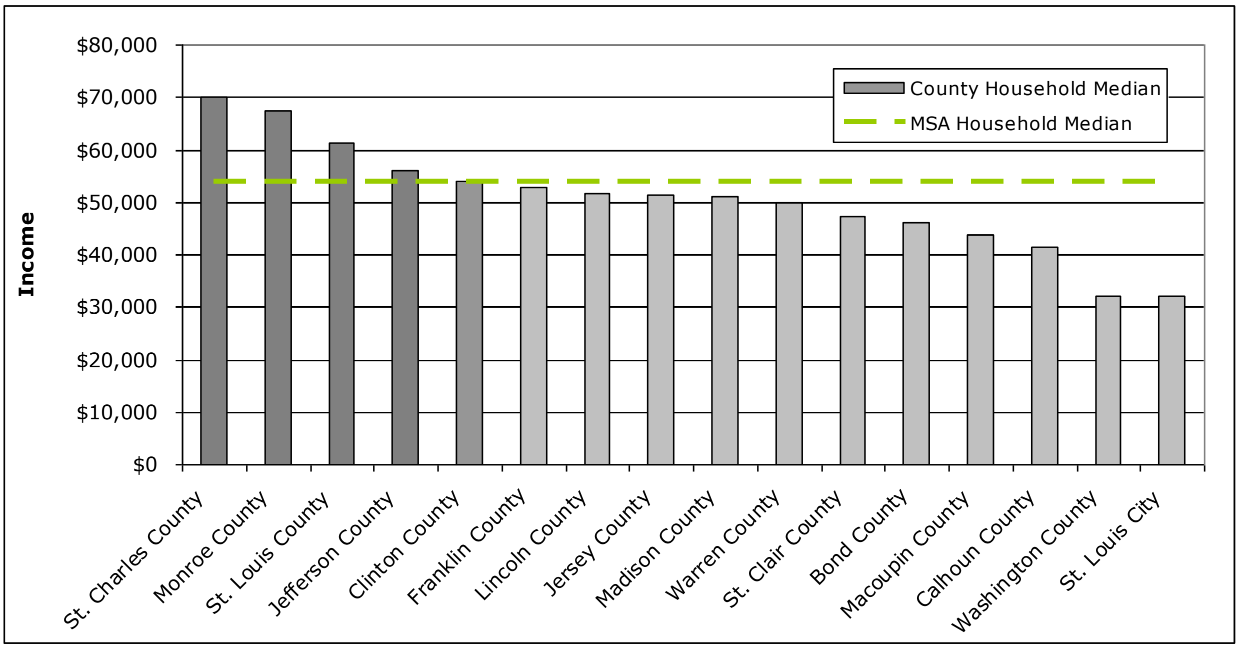
Exhibit 3.1-6
MEDIAN HOUSEHOLD INCOME BY COUNTY ($1999)
Lambert-St. Louis International Airport



Sources: U.S. Census Bureau; Landrum & Brown analysis, 2011

The St. Louis MSA had a median household income of almost $54,000 in 2007 according to data published by the St. Louis Regional Chamber & Growth Association. Notably, counties such as Monroe and Jefferson, which have accounted for a significant share of the overall population growth, are also among the highest income counties in the MSA. The City of St. Louis and Washington County have the lowest median household incomes in the MSA (*see* **Exhibit 3.1-7, *Median Household Income by County ($2007)***).

Exhibit 3.1-7
MEDIAN HOUSEHOLD INCOME BY COUNTY ($2007)
ST. LOUIS MSA
Lambert-St. Louis International Airport



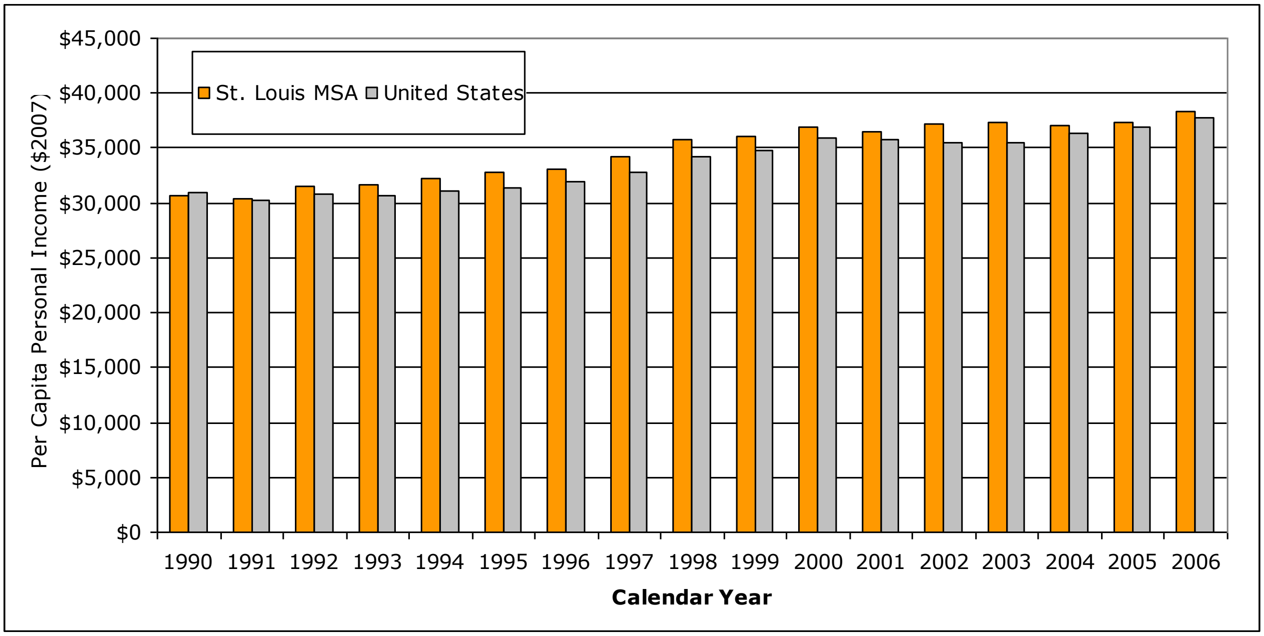
Sources: St. Louis Regional Chamber & Growth Association; Landrum & Brown analysis, 2011

PER CAPITA PERSONAL INCOME (PCPI)

PCPI for the St. Louis MSA has tracked between 2 and 5 percent above the national average since the early 1990s (*see* **Exhibit 3.1-8, *Historical Trends in Per Capita Personal Income ($2007)***).[9] Lower inflation experienced in the St. Louis MSA versus the U.S. average has also been a positive contributor to real PCPI growing at a marginally faster rate than the national benchmark since 1990. The historical rate of real PCPI growth for the St. Louis MSA is expected to continue in the future, with Woods & Poole Economics projecting long-term growth of 1.6 percent per annum through 2030.

[9] The data presented in Exhibit 2.2-8 are BEA values for per capita personal income for the St. Louis MSA and the United States. BEA measures of per capita personal income are higher than those produced by the U.S. Census Bureau as the definition of personal income is broader than the Census definition which is limited to cash and its equivalents received by individuals.

Exhibit 3.1-8
HISTORICAL TRENDS IN PER CAPITA PERSONAL INCOME ($2007)
ST. LOUIS MSA vs. UNITED STATES
Lambert-St. Louis International Airport



Sources: Bureau of Economic Analysis; Bureau of Labor Statistics; Landrum & Brown analysis, 2011

3.1.4.3 Employment

Growth in employment is an important indicator of the overall health of the local economy. Population changes and employment changes tend to be closely correlated as people migrate in and out of areas largely depending on their ability to find work in the local economy.

MAJOR EMPLOYERS

St. Louis boasts a diverse business base and is home to nine Fortune 500 companies. There are also a number of the largest privately held companies located in St. Louis such as Enterprise Rent-A-Car, Graybar Electric, and Edward Jones. [10] A list of the St. Louis MSA's top 10 largest employers is provided in **Table 3.1-4, *Top 10 Largest Employers (2007)***).

[10] St. Louis Regional Chamber & Growth Association

Table 3.1-4
TOP 10 LARGEST EMPLOYERS (2007)
ST. LOUIS MSA
Lambert-St. Louis International Airport

Company	**Industry**	**Employment**
BJC Healthcare	Health	23,378
Boeing	Aerospace	16,000
Scott Air Force Base	Military	14,150
Wal-Mart	Retail	13,400
U.S. Postal Service	Government	12,700
Washington University	Education	12,390
SSM Health Care	Health	12,102
Schnucks Markets	Grocery	10,500
AT&T	Telecom	8,990
St. John's Mercy Health Care	Health	8,876

Source: St. Louis Regional Chamber & Growth Association

EMPLOYMENT GROWTH

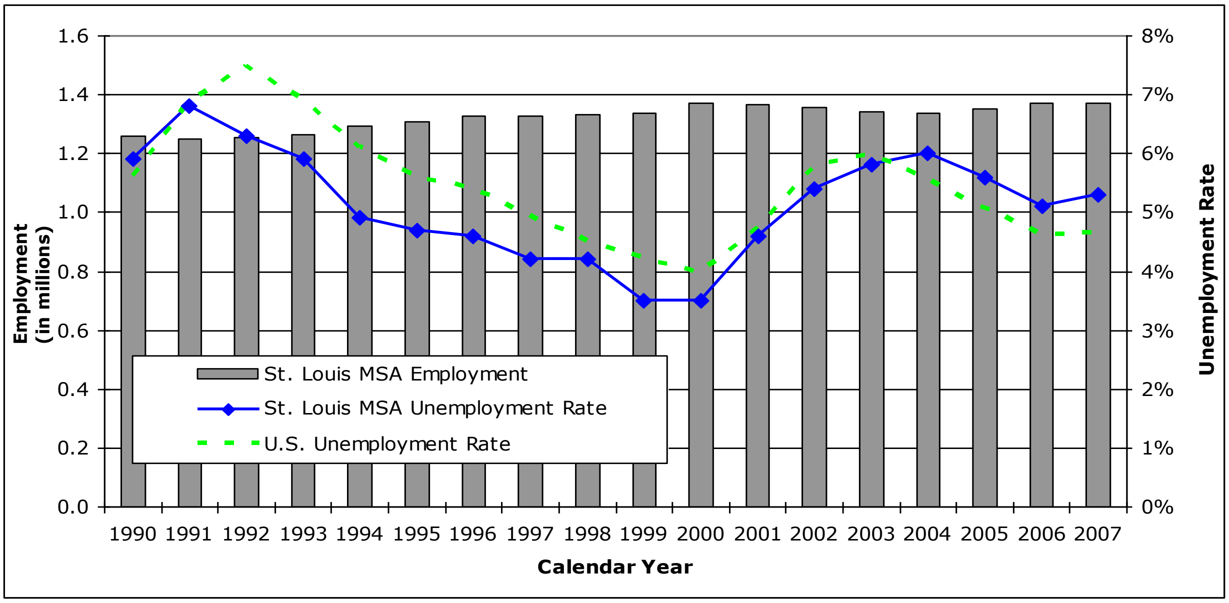
Employment has grown at a similar rate as the population of the St. Louis MSA, averaging 0.5 percent per year since 1990. The unemployment rate tracked below the national average through 2004 but in more recent years has somewhat exceeded the national average (*see* **Exhibit 3.1-9, *Trends in Employment and Unemployment (2007)***). Over the years, the St. Louis MSA's share of the states of Illinois and Missouri employment has decreased.

Historically the St. Louis MSA has had lower unemployment rates than the U.S. However, that trend was reversed beginning in 2004. In 2007, the unemployment rate in the St. Louis MSA averaged 5.3 percent of the total labor force versus 4.5 percent, 4.8 percent, and 4.6 percent for the states of Illinois and Missouri, and the U.S. respectively.[11]

Projections made by the East-West Gateway Council of Governments call for positive long-term employment growth of 0.4 percent per year through 2030 for the smaller Gateway Region, however, these projections should be indicative of the broader St. Louis MSA.

[11] St. Louis Regional Chamber & Growth Association

Exhibit 3.1-9
TRENDS IN EMPLOYMENT AND UNEMPLOYMENT (2007)
ST. LOUIS MSA
Lambert-St. Louis International Airport



Source: Bureau of Labor Statistics

EMPLOYMENT & INDUSTRY CLUSTERS

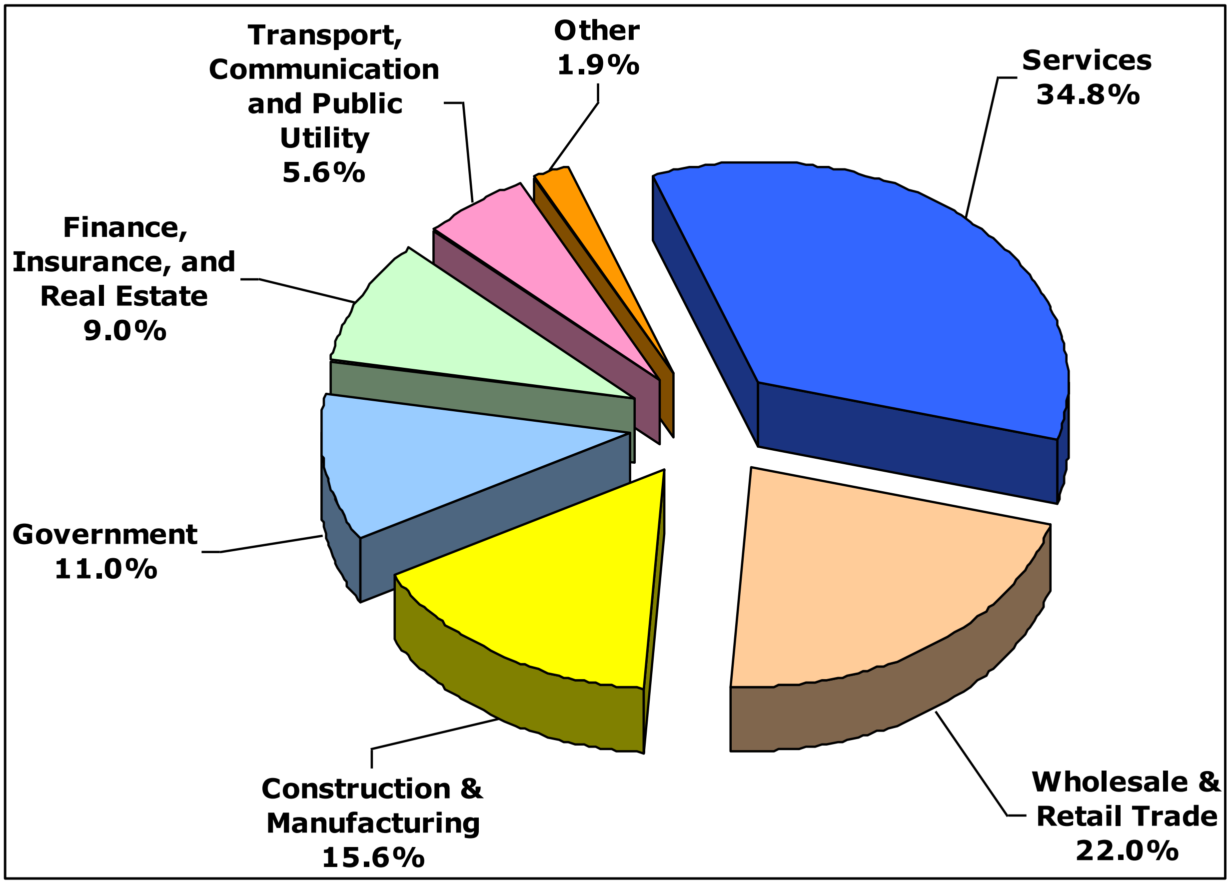
The St. Louis MSA is an important market for companies specializing in medical sciences, information technology, and advanced manufacturing. **Exhibit 3.1-10, *Employment by Industry (2007)*** provides an overview of the key industry sectors. The St. Louis Regional Chamber & Growth Association has identified five clusters as part of its ongoing economic and employment development strategy for the region:

- Plant and Medical Sciences
- Advanced Manufacturing
- Information Technology
- Transportation and Distribution
- Financial Services

These clusters already account for approximately one quarter of total employment but over 40 percent of the total dollar output for the MSA. Additionally, average income for persons employed in these clusters was almost 40 percent higher than the MSA average.[12] The strategic targeting of high wage clusters ripples across the entire local economy and also into the air travel market as people with higher incomes tend to fly more often.

[12] *Economic Development Strategy in St. Louis: An Assessment of Key Industry Clusters*, Region Wise, February 2004. Table 1: Year 2000 St. Louis MSA Economy – Cluster Comparison.

Exhibit 3.1-10
EMPLOYMENT BY INDUSTRY (2007)
ST. LOUIS MSA
Lambert-St. Louis International Airport



Sources: Woods & Poole Economics 2007; Landrum & Brown analysis, 2011

3.1.4.4 Gross Regional Product (GRP)

Gross Regional Product is a measure of the value of goods and services produced in a state or county. Historically, GRP for the St. Louis MSA has experienced positive growth albeit at a somewhat slower pace than the states of Illinois and Missouri and the U.S. as a whole, averaging 2.3 percent annually. Through 2030, the GRP of the region is expected to continue to grow, averaging 2.1 percent per annum (see **Table 3.1-5,** ***Summary of Historical and Future Gross Regional Product (Millions of $2004)***).

Table 3.1-5
SUMMARY OF HISTORICAL AND FUTURE GROSS REGIONAL PRODUCT (Millions of $2004)
Lambert-St. Louis International Airport

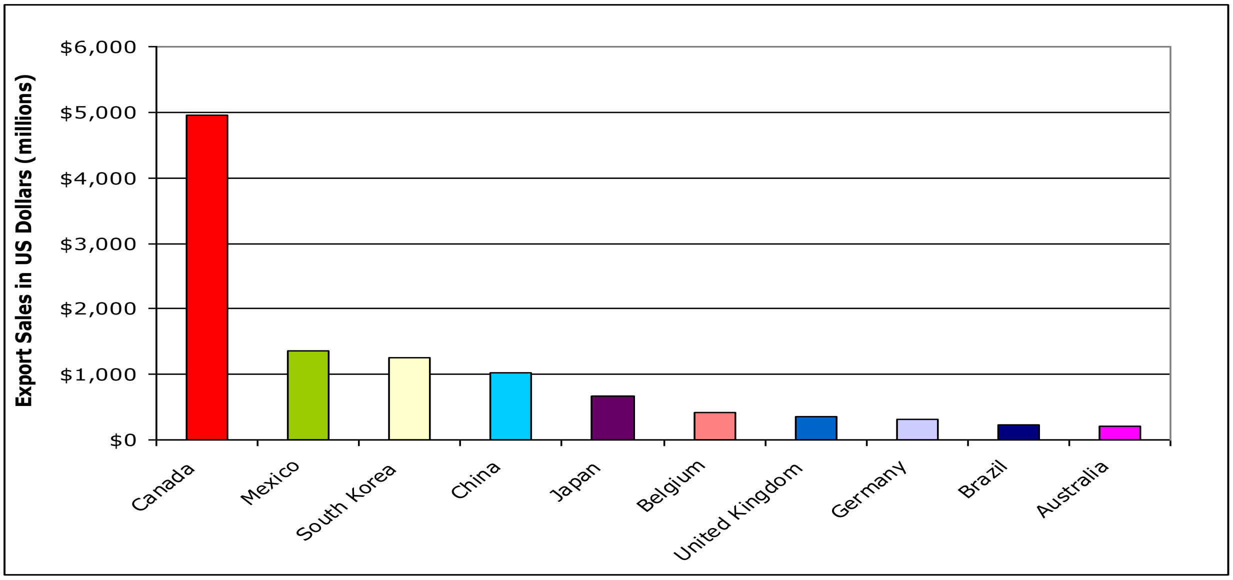
Calendar Year	STL MSA	State of Illinois	State of Missouri	United States
Actual				
1990	$81,869	$375,956	$143,541	$7,693,521
1995	$91,824	$428,792	$166,697	$8,629,633
1996	$94,167	$442,712	$171,387	$8,986,095
1997	$96,571	$457,084	$176,209	$9,357,282
1998	$99,036	$471,923	$181,166	$9,743,801
1999	$101,564	$487,243	$186,263	$10,146,286
2000	$104,156	$503,061	$191,504	$10,565,396
2005	$112,995	$540,051	$209,054	$12,026,607
2006	$117,513	$561,699	$217,927	$12,285,328
2007	$119,750	$573,965	$222,200	$12,564,662
Forecast				
2010	$126,890	$612,954	$235,814	$13,452,132
2015	$140,106	$684,820	$260,969	$15,088,265
2020	$155,071	$765,969	$289,387	$16,936,569
2025	$172,004	$857,620	$321,476	$19,025,830
2030	$191,160	$961,158	$357,706	$21,388,808
Average Annual Growth Rate:				
1990-07	2.3%	2.5%	2.6%	2.9%
2007-15	2.0%	2.2%	2.0%	2.3%
2015-30	2.1%	2.3%	2.1%	2.4%
2007-30	2.1%	2.3%	2.1%	2.3%

Sources: Woods & Poole Economics 2007; Landrum & Brown analysis, 2011

3.1.4.5 International Trade

The St. Louis economy is an integral cog in the state of Missouri's international trade. According to the Missouri Economic Research & Information Center, Missouri set a record in 2007 with $13.4 billion in exports to 194 countries, a five percent increase over the previous year. Transportation equipment, chemicals, and machinery are the primary exported items from the state. Canada is Missouri's primary export partner, importing almost five billion dollars of goods in 2007 (*see* **Exhibit 3.1-11*****, State of Missouri – Top Ten Export Partners (2007)***).

Exhibit 3.1-11
STATE OF MISSOURI – TOP TEN EXPORT PARTNERS (2007)
Lambert-St. Louis International Airport



Source: Missouri Economic Research & Information Center, *Missouri Economic Report 2008.*

3.1.4.5 Tourism & Attractions

St. Louis is located on the eastern border of Missouri along the Mississippi River and is often referred to as the 'Gateway to the West.' According to the St. Louis CVC *Fiscal Year 2007 Annual Report*, the St. Louis area has over 22 million visitors annually, 21 percent of whom arrive via air transportation. According to the December 2008 *St. Louis Air Service Assessment*, 44 percent of STL air travelers are visitors to the St. Louis area. Visitor spending was estimated to be over four billion dollars in 2006 with 4.4 percent, or $179 million, being attributed to air transportation.[13]

Among the many attractions that bring visitors to St. Louis is the Gateway Arch which was constructed in 1963 as a commemoration of the westward expansion of the United States. In addition to the Arch, other attractions in the area include the St. Louis Zoo, museums, Anheuser-Busch Brewery, Six Flags, riverboat tours, the St. Louis Rams (National Football League), the Cardinals (Major League Baseball), and the Blues (National Hockey League).

The St. Louis area has over 36,000 hotel rooms and obtained 60 percent occupancy in 2006. The City of St. Louis has excellent conference and meeting facilities. The America's Center, St. Louis' largest convention center, incorporates over 500,000 square feet of open floor space in six exhibit halls, 83 meeting rooms, the 66,000-seat Edward Jones Dome, the 1,411-seat Ferrara Theater, a 28,000 square-foot ballroom, and the St. Louis Executive Conference Center.[14]

13 St. Louis Convention & Visitors Commission *Fiscal Year 2007 Annual Report*
14 St. Louis Convention & Visitors Commission

3.2 HISTORICAL AVIATION ACTIVITY

This section provides a discussion of STL's role, a summary of historical activity levels, and an overview of current domestic and international air service offered at STL. The purpose of this section is to start building a context for the forecast. It answers questions such as who does STL serve and why? The past is not always a good predictor of the future; however, an analysis of historical data provides the opportunity to understand those factors that have caused traffic to increase or decrease and how those factors may change in the future, thus influencing the forecast. While the socioeconomic base is one of the fundamental underpinnings of the forecast, demand cannot be realized without air service at a price that induces demand. Ultimately, understanding the historical relationships between the economy and aviation activity at STL will form the building blocks of the forecast.

3.2.1 AIRPORT ROLE

STL is among the busiest airports in the U.S. and is a critical component in the St. Louis transportation infrastructure. The Airport generates an estimated $5.1 billion annual economic impact for the St. Louis region.[15] STL is one of 37 U.S. airports which enplane between 0.25 and 1.0 percent of total U.S. enplanements annually. As a result it is designated as a "Medium Hub Primary Commercial Service Airport" by the Federal Aviation Administration (FAA).[16] In 2008, STL ranked 29th among U.S. airports in terms of total domestic originating enplanements[17] and 31st in North America in terms of total passengers.[18] The airport caters to a diverse customer base including cargo operators, fractional jet operators, private pilots, and the military; however, it is scheduled passenger airlines that account for the majority of the operational activity at STL.

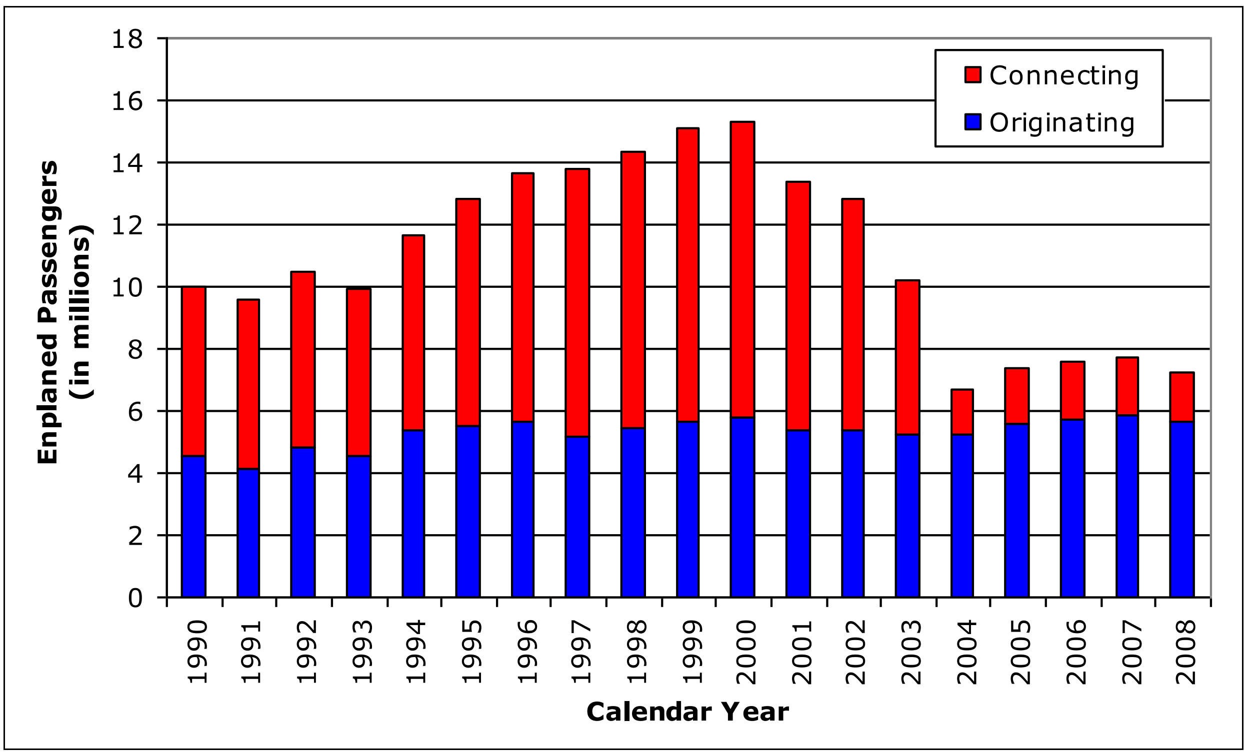
Up until 2000, TWA operated its largest U.S. domestic hubbing operation at STL, with an average of over 450 passenger flight departures per day. In April 2001, under considerable financial pressure, TWA agreed to be purchased by American Airlines and promptly declared bankruptcy for the third time in a decade. With domestic hubbing operations at nearby Chicago O'Hare and Dallas Ft. Worth coupled with its own financial problems that ensued following the 2001 economic recession and 9-11 terrorist attacks, American has progressively drawn down the hub at STL to approximately a third of its former size. As a result, the profile of traffic has changed quite dramatically and STL has become an airport serving predominantly originating passengers with a much smaller percentage of connecting traffic than historically has been the case. STL has an increasingly strong LCC presence. Southwest Airlines initiated service at STL in 1985 and has progressively increased its presence. Other LCCs have also established service at the airport, albeit on a smaller scale than Southwest.

15 *See* Internet website: http://www.flystl.com/flystl/about-lambert/facts/
16 2009-2013 *National Plan of Integrated Airport Systems* (NPIAS)
17 USDOT, *Air Passenger Origin-Destination Survey*
18 Airports Council International –North America (ACI-NA)

3.2.2 HISTORICAL ENPLANED PASSENGERS

During the 1990s, growth in enplanements at STL owed much to the continued expansion of TWA's connecting hub at the airport. Growth was particularly robust from 1994 onward after TWA transferred capacity back to STL following its attempt to build a hubbing operation at Atlanta-Hartsfield and an organizational restructuring after two successive bankruptcies in 1992 and 1995. Between 1990 and 2000, passenger traffic at STL increased from 10.0 million to 15.3 million, averaging growth of 4.4 percent per year (*see* **Exhibit 3.2-1, *Historical Enplaned Passengers***). During this ten year period, connecting traffic accounted for approximately three quarters of the net increase in enplanements at the airport.

Exhibit 3.2-1
HISTORICAL ENPLANED PASSENGERS
Lambert-St. Louis International Airport



Note: Excludes non-revenue, charter, and other enplanements.

Sources: Airport Records; USDOT, *Air Passenger Origin-Destination Survey*; Landrum & Brown analysis, 2011

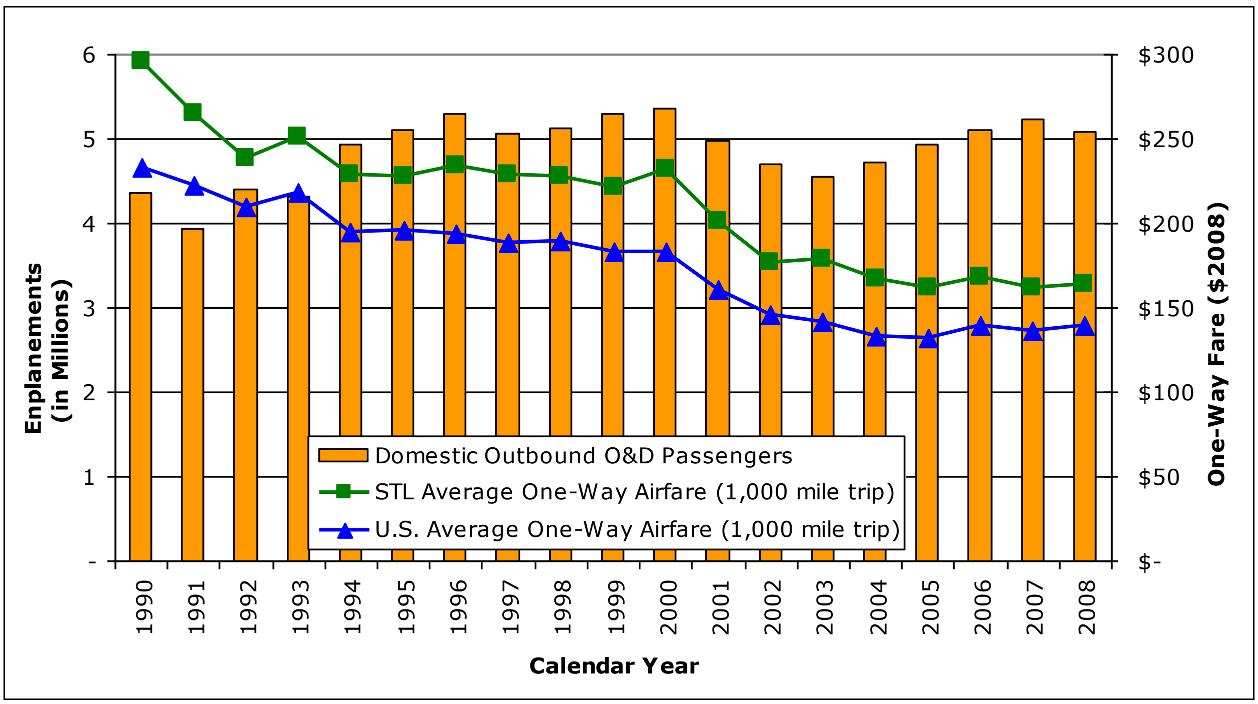
The financial problems that troubled TWA in the first half of the 1990s re-emerged in 2000. In April 2001, American Airlines acquired the airline assets of TWA and TWA declared bankruptcy for a third time subsequent to the purchase agreement. The transition of TWA into the American Airlines operation was completed on December 1, 2001. As discussed in the preceding section, American has drawn down the hub at St. Louis since acquiring TWA. Between 2003 and 2004, American reduced its operation at STL by almost half. The impact on connecting passenger traffic at STL has been dramatic. According to DOT statistics, 9.5 million enplaned passengers connected with flights at STL in 2000 versus just 1.5 million today.

Although total enplanements at STL reached a two-decade low of 6.7 million in 2004, passenger traffic grew each year through 2007, driven primarily by increased originating traffic (traffic is down in 2008 due to the economic recession).

3.2.2.1 Domestic O&D Traffic and Average Passenger Air Fares

As the TWA/American hub has contracted in size at STL, domestic originating traffic has become the largest passenger segment at the airport. In 2008, originating passengers traveling on purely domestic itineraries accounted for 70.5 percent of total enplanements at STL. Growth in domestic origin and destination (O&D) traffic has generally tracked with changes in the local and national economy and has been less impacted by the strategic decisions of TWA and American. Between 1990 and 2007, pure domestic O&D traffic at STL averaged growth of 1.1 percent per year, increasing from 4.4 million enplanements to 5.2 million enplanements (*see* **Exhibit 3.2-2, *Domestic O&D Traffic & Average One-Way Fare Paid (Inflation Adjusted $2008)***). Domestic originating enplanements were down 3.1 percent in 2008 as the airlines cut service.

Exhibit 3.2-2
DOMESTIC O&D TRAFFIC & AVERAGE ONE-WAY FARE PAID
(Inflation Adjusted $2008)
Lambert-St. Louis International Airport



Notes: 1 CPI data published by the Bureau of Labor Statistics was used to adjust fares published in nominal dollars to account for the effects of inflation.
2 Excludes non-revenue, charter, and other enplanements.

Sources: USDOT, *Air Passenger Origin-Destination Survey*; Landrum & Brown analysis, 2011

While difficult to prove definitively, the sheer scale of the hubbing operation historically at STL has likely been to the detriment of growth of other passenger airlines. As the hub has contracted in size, airlines, and in particular LCCs, have begun to expand or introduce new point-to-point service at STL, stimulating domestic originating traffic. Indeed domestic originating traffic jumped 15 percent at STL from 2003 to 2007, fueled by 70 percent growth in domestic originating traffic handled by LCC carriers. In spite of the fact that total domestic originating traffic was down 3.1 percent in 2008, LCC domestic originating enplanements were up 8.7 percent in 2008 over 2007.

Since deregulation, air travel has become increasingly affordable throughout the United States. At STL, inflation-adjusted airfares have declined almost uninterrupted since 1990. In 2008, the average fare paid for a 1,000 mile trip at STL was 45 percent lower than in 1990. However, domestic airfares at STL have typically been higher than the national average, in large part due to the historical dominance of activity by a single carrier. The data suggests that fares are diverging with national benchmarks as LCCs account for an increasing share of the domestic originating traffic at STL. In 2007, the average one-way fare paid for a 1,000 mile trip was 18 percent higher at STL than the U.S. average, compared with 25 to 26 percent higher at the peak of TWA's hubbing operation in 2000 and 2001.

3.2.2.2 International Origin and Destination Traffic

International travel has historically been a relatively small component of the overall passenger base at STL. International O&D traffic at STL can be divided into two main categories:

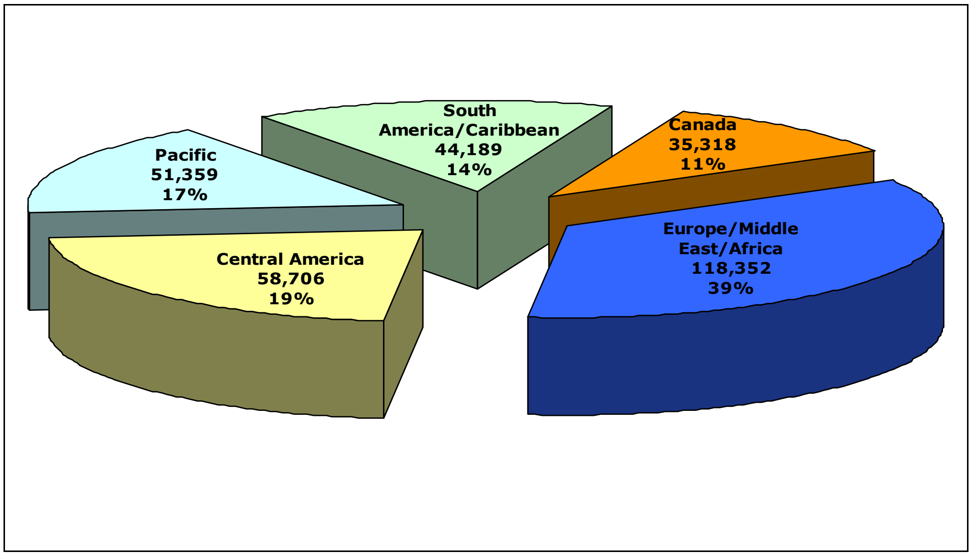
1. **Bound for International Destinations**:
   Passengers bound for international destinations that enplane a *domestic* flight at STL and connect with an international flight at another U.S. gateway.

2. **Pure International O&D Enplanements**:
   Passengers that enplane an *international* flight at STL.

BOUND FOR INTERNATIONAL DESTINATIONS

In 2008, an estimated 317,132 passengers enplaned domestic flights at STL and flew through another U.S. gateway to an international destination. This traffic segment has been growing at an average annual rate of 4.2 percent since 1990. Europe, Central America (including Mexico), and the Pacific are the key regions for passengers bound for international destinations from STL (*see* **Exhibit 3.2-3, *Enplaned Passengers Bound for International Destinations (2008)***).

Exhibit 3.2-3
ENPLANED PASSENGERS BOUND FOR INTERNATIONAL DESTINATIONS (2008)
Lambert-St. Louis International Airport



Sources: USDOT, *Air Passenger Origin-Destination Survey*; Landrum & Brown analysis, 2011

Table 3.2-1, *Enplaned Passengers Bound for International Destinations (2008)*, shows the primary U.S. gateways and the corresponding destination regions for passengers originating travel from STL. Chicago O'Hare is the primary gateway for European, Pacific, and Canadian traffic; Dallas-Ft. Worth for Central American traffic; and Miami for South American traffic.

Table 3.2-1
ENPLANED PASSENGERS BOUND FOR INTERNATIONAL DESTINATIONS (2008)
Lambert-St. Louis International Airport

				Region as % of Gateway Total				
Rank	Gateway	STL Enpax	% of Total	Europe/Middle East/Africa	Central America	Pacific	South America/ Caribbean	Canada
1	ORD	80,818	25.5%	51.4%	6.4%	24.0%	2.0%	16.2%
2	DFW	37,146	11.7%	6.5%	74.2%	3.2%	9.6%	6.6%
3	ATL	34,984	11.0%	40.7%	25.2%	8.5%	24.9%	0.8%
4	MIA	33,536	10.6%	0.8%	27.0%	0.0%	72.2%	0.0%
5	DTW	16,525	5.2%	52.9%	0.4%	31.2%	1.0%	14.6%
6	JFK	14,471	4.6%	72.4%	0.0%	19.9%	6.3%	1.4%
7	IAH	13,028	4.1%	4.3%	78.4%	2.3%	13.1%	2.0%
8	MSP	12,060	3.8%	20.2%	0.9%	21.3%	0.0%	57.6%
9	EWR	12,009	3.8%	73.5%	0.6%	19.8%	3.8%	2.3%
10	LAX	11,780	3.7%	0.2%	3.1%	94.7%	0.5%	1.4%
11	IAD	9,195	2.9%	86.4%	0.5%	5.5%	3.7%	3.9%
12	DEN	6,249	2.0%	0.3%	32.1%	0.0%	0.0%	67.6%
13	PHL	5,187	1.6%	89.8%	0.4%	2.2%	1.4%	6.1%
14	CLT	5,057	1.6%	18.5%	15.9%	1.1%	59.6%	4.8%
15	PHX	4,676	1.5%	0.0%	90.3%	0.0%	0.2%	9.5%
16	CVG	3,862	1.2%	73.1%	2.0%	1.0%	0.0%	23.9%
17	MEM	3,818	1.2%	26.4%	19.9%	4.5%	49.2%	0.0%
	Other	12,731	4.0%	34.2%	3.1%	29.4%	16.1%	17.1%
	Total	**317,132**	**100.0%**	**35.1%**	**22.0%**	**16.6%**	**15.4%**	**11.0%**

Sources: USDOT, *Air Passenger Origin-Destination Survey*; Landrum & Brown analysis, 2011

PURE INTERNATIONAL O&D ENPLANEMENTS

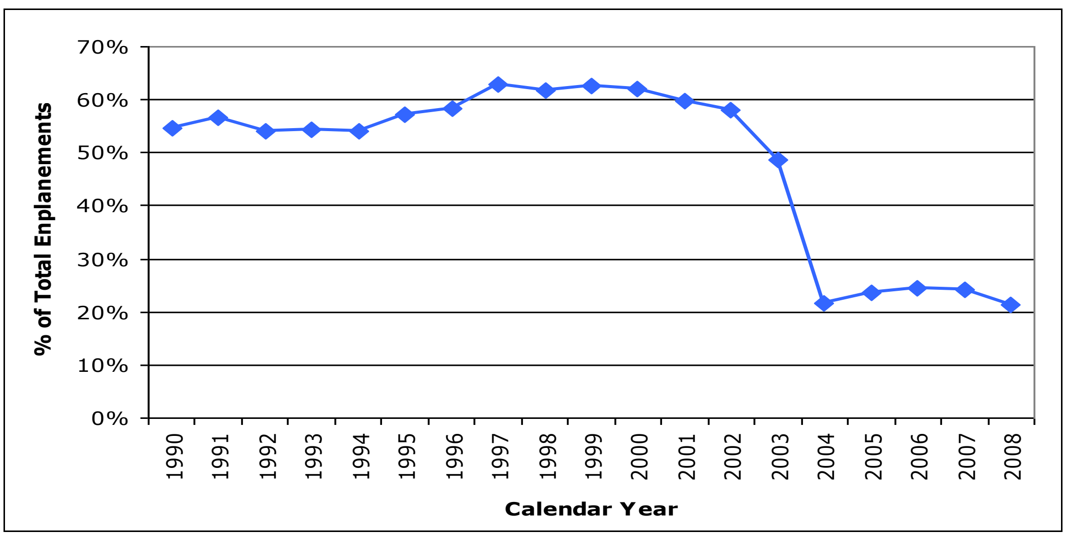
In 2008, 95,945 passengers boarded international flights at STL, of which 99 percent were originating passengers. Destinations in Mexico such as Cancun accounted for over 60 percent of international O&D enplanements at STL. The Caribbean (20 percent) and Canada (17 percent) were the next largest markets.[19]

3.2.2.3 Connecting Traffic

St. Louis' central position in the United States makes it an ideal geographic location for a connecting hub. At the peak of TWA's hub, connecting traffic accounted for almost 63 percent of total enplanements at STL. As American has drawn down the hub at STL, connecting traffic has declined; however, connecting traffic still continues to account for 20 to 25 percent of total enplanements at the airport. Indeed, the share of connecting traffic has remained relatively stable at STL since 2004 (*see* **Exhibit 3.2-4, *Connecting Enplanements Share of Total Enplanements***).

In 2008, 1.5 million connecting enplanements were reported at STL. American and its regional affiliates account for almost 80 percent of connecting traffic at the airport, while Southwest accounted for almost all the remaining connections.

Exhibit 3.2-4
CONNECTING ENPLANEMENTS SHARE OF TOTAL ENPLANEMENTS
Lambert-St. Louis International Airport



Sources: USDOT, *Air Passenger Origin-Destination Survey*; Landrum & Brown analysis, 2011

19 Based on T-100 data for the 12 months ending October 2008.

3.2.3 HISTORICAL AIR CARGO TRAFFIC

Air cargo (freight and mail) is shipped between airports by two modes: (1) either in the cargo compartment, or belly, of passenger aircraft or (2) aboard all-cargo or dedicated freighter aircraft.

The majority of cargo shipped through STL is handled by all-cargo carriers such as FedEx and UPS. Since 2000, the share of air cargo handled by dedicated freighters has increased from 66.9 percent of total air cargo tonnage to almost 89 percent by 2008 (*see* **Table 3.2-2, *Historical Air Cargo Volumes (in metric tonnes)***). While this is a trend seen at many airports around the U.S. a specific contributing factor at STL is the increased deployment of regional jets in passenger service which limit available space for air cargo in the belly of passenger aircraft.

Table 3.2-2
HISTORICAL AIR CARGO VOLUMES (in metric tonnes)
Lambert-St. Louis International Airport

Calendar Year	Belly Total	All Cargo Total	Total Cargo	Percent All Cargo
1999	45,461	85,596	131,057	65.3%
2000	43,045	87,122	130,167	66.9%
2001	33,666	87,794	121,460	72.3%
2002	51,942	82,925	134,868	61.5%
2003	32,657	85,843	118,500	72.4%
2004	17,289	87,669	104,958	83.5%
2005	12,400	88,793	101,192	87.7%
2006	10,692	78,190	88,883	88.0%
2007	8,760	74,491	83,251	89.5%
2008	9,155	71,924	81,080	88.7%
Average Annual Growth Rate:				
2000-08	-17.6%	-2.4%	-5.7%	

Note: Includes enplaned and deplaned mail and freight.

Sources: Airport Records; Landrum & Brown analysis, 2011

The volume of air cargo handled at STL has steadily declined from 130,000 metric tons in 2000 to 81,080 tons in 2008. Notably, air cargo handled by all-cargo carriers has declined less than cargo handled by passenger airlines. The overall decline in air cargo at STL is likely less indicative of local market forces than broader national trends in the movement of domestic cargo. The shipping industry has moved away from "Next Day" to time definite second and third day delivery which has shifted a proportion of air cargo to trucks. The higher price of fuel has also caused shippers to use ground shipment of cargo whenever possible. The geographic location of STL may also be a factor in the decline of air cargo at the airport as so many major markets are within reasonable driving distance. It is worth noting that the decline in belly cargo volumes at STL leveled off in 2008, with volumes up slightly from 2007.

Table 3.2-3, *2008 Air Cargo Carrier Market Share (in metric tonnes)*, provides a summary of air cargo tonnages by carrier. In 2008, FedEx handled 47.8 percent of total air cargo tonnage at STL. UPS was the second ranked carrier in terms of cargo tonnage, handling 23.0 percent of air cargo at STL.

Table 3.2-3
2008 AIR CARGO CARRIER MARKET SHARE (in metric tonnes)
Lambert-St. Louis International Airport

Airline	Freight	Mail	Tons of Air Cargo	Percent of Total
All Cargo				
Fedex	38,730	-	38,730	47.8%
UPS	1,604	17,071	18,675	23.0%
Capital Cargo	9,629	-	9,629	11.9%
ASTAR	4,890	-	4,890	6.0%
Total	**54,853**	**17,071**	**71,924**	**88.7%**
Passenger				
American	757	3,062	3,819	4.7%
Southwest	3,109	-	3,109	3.8%
Other	1,032	1,195	2,228	2.7%
Total	**4,898**	**4,258**	**9,155**	**11.3%**
Total Cargo	**59,751**	**21,328**	**81,080**	**100.0%**

Sources: Airport Records; Landrum & Brown analysis, 2011

3.2.4 HISTORICAL AIRCRAFT OPERATIONS

Almost 250,000 operations (arrivals and departures) were recorded at STL in 2008. Commercial passenger operations have historically accounted for between 86 and 92 percent of total annual operations at the airport (*see* **Table 3.2-4, *Historical Aircraft Operations***).

The current level of passenger operations is almost half the number operated at STL during the second half of the 1990s, reflecting the draw-down of the TWA/American hub.

All-cargo operations have typically accounted for between one and two percent of total operations at STL. In 2008, all cargo carriers averaged approximately 11 operations a day, assuming a typical 5.5 day cargo week. While all cargo operations have trended downward at STL since 1995, in the first seven months of 2008 all-cargo operations increased 3.7 percent.

In 2008, air taxi and general aviation operations accounted for 8.4 percent of total aircraft operations. STL has a single FBO, Signature Flight Support, which provides fuel, aircraft parking, and passenger and pilot terminal lounges.

The 131st Fight Wing of the Missouri Air National Guard is located at STL and has historically been a key component of the military activity at the airport. As part of the 2005 Base Realignment and Closures (BRAC), the 131st Fighter Wing was put on the list of closings and in July 2009 the wing will be transitioned to Whiteman Air Force Base, Missouri. Boeing also completes final production of the F15 and F18 fighter jets and often flies test flights from STL runways. In 2008, military operations accounted for 1.2 percent of total aircraft operations at STL.

TABLE 3.2-4
HISTORICAL AIRCRAFT OPERATIONS
Lambert-St. Louis International Airport

Calendar Year	Passenger	All-Cargo	Air Taxi & GA	Military	Total
1995	452,586	9,218	49,123	7,034	517,961
1996	456,704	8,096	43,212	5,837	513,849
1997	464,096	8,304	39,427	5,057	516,884
1998	457,032	7,948	33,794	4,899	503,673
1999	455,230	8,402	33,300	4,307	501,239
2000	438,122	7,614	34,404	4,084	484,224
2001	438,658	7,462	28,711	4,116	478,947
2002	400,790	5,620	42,842	2,552	451,804
2003	349,326	5,942	35,565	3,630	394,463
2004	247,966	5,852	30,213	5,676	289,707
2005	258,102	5,466	25,322	8,114	297,004
2006	245,844	3,432	14,351	18,226	281,853
2007	228,520	3,278	16,228	8,902	256,928
2008	221,410	3,186	20,860	2,941	248,397
Average Annual Growth Rates:					
1995-00	-0.6%	-3.8%	-6.9%	-10.3%	-1.3%
2000-08	-8.2%	-10.3%	-6.1%	-4.0%	-8.0%
1995-08	-5.4%	-7.8%	-6.4%	-6.5%	-5.5%

Sources: Airport Records; FAA ATADS; Landrum & Brown analysis, 2011

3.2.5 COMMERCIAL PASSENGER AIR SERVICE

The base year for the Master Plan is 2008 so airline schedules from the Official Airline Guide (OAG) for August 2008 were analyzed to determine the level and type of air service being offered at STL during a typical busy month. Unless otherwise noted, the air service data in this section is based on the August 2008 airline schedules. Changes that have occurred in 2009 are noted as appropriate throughout the section.

A total of 15 airlines provided scheduled passenger air service at STL in August 2008. Ryan International Airlines stopped operating at STL in April 2008 and Midwest Airlines ceased operations in September.

The STL airlines operated a total of 310 average daily flight departures to 70 domestic airports and 3 international airports in August 2008. STL lost service to St. Petersburg, Florida (PIE) in September 2008 and to Santa Ana, California (SNA) and Springfield, Illinois (SPI) in December 2008. In addition to dropping service to these 3 markets, the airlines have been cutting back service and decreasing frequency on some markets. As a result, scheduled domestic seats are down 12.8 percent in 2009 over 2008. Domestic scheduled seats for American are down 22.8 percent while Southwest is down only 3.8 percent. Scheduled international seats are down 13.9 percent in 2009 over 2008.

3.2.5.1 Domestic Air Service

Domestic air service accounts for 99 percent of scheduled passenger operations at STL. This subsection provides an analysis of trends in airline market shares, destinations served, and changes in the type of passenger aircraft deployed to domestic destinations from STL.

AIRLINE MARKET SHARES

American continues to be the largest carrier at STL, accounting for 40 percent of scheduled domestic capacity (*see* **Table 3.2-5, *Airline Domestic Market Shares (August 2008)***) and providing service to 40 U.S. markets in August 2008. Southwest is the second largest carrier at STL accounting for almost 35 percent of domestic capacity and offering service to 24 destinations. No other airline accounts for more than six percent of domestic capacity at the airport. While the two largest carriers still dominate the market with a 75 percent market share, this is down from a 90 percent market share in 2000.

LCCs have accounted for an increasing share of traffic at STL (*see* **Exhibit 3.2-5, *LCC Share of Scheduled Seats on Domestic Departing Flights***). In part this has been due to a reduction in the size of TWA's operation (and subsequently American's operation) at STL. LCC capacity has increased sharply since 2004, coinciding with American's decision to draw down the hub. In 2008, scheduled seats on departing LCC flights were up 25 percent over 2004 levels. Although Southwest continues to be the dominant LCC at STL (*see* **Exhibit 3.2-6, *Domestic Airline Market Shares***), Frontier, USA 3000, and AirTran also currently provide LCC service from the airport.

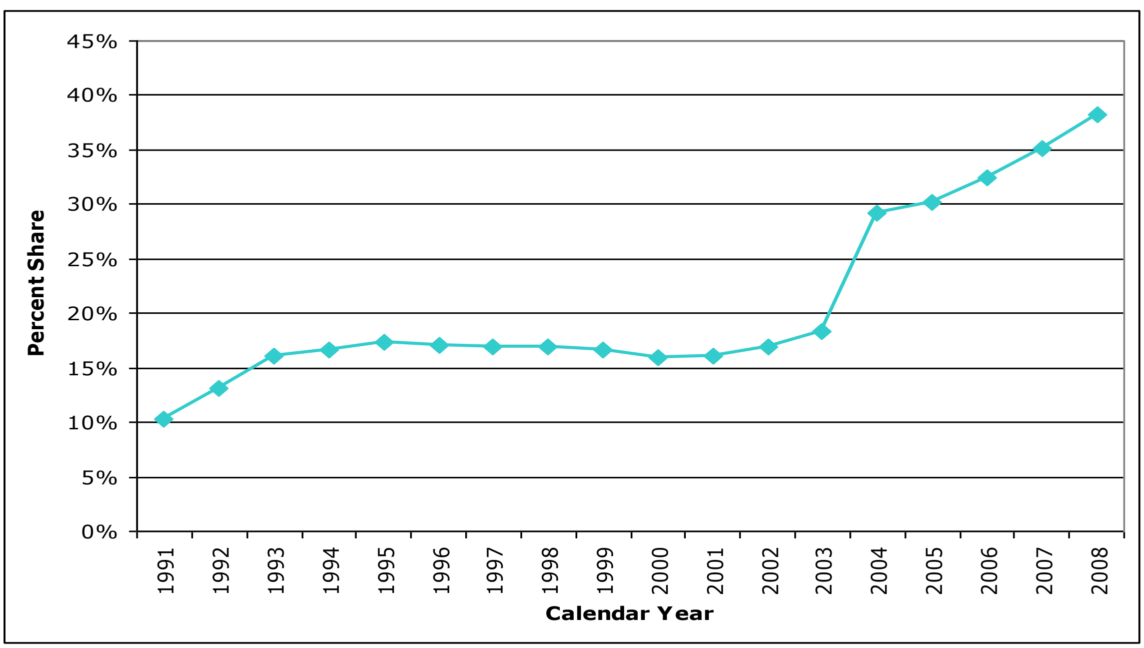
Table 3.2-5
AIRLINE DOMESTIC MARKET SHARES (AUGUST 2008)
Lambert-St. Louis International Airport

Airline [1]	Markets [2] Served	Departing Flights Avg. Daily	Departing Flights % of Total	Departing Seats Avg. Daily	Departing Seats % of Total	Seats Per Departure
American	40	133	43.1%	11,531	40.2%	87
Southwest	24	73	23.8%	9,976	34.8%	136
Northwest	3	14	4.6%	1,347	4.7%	95
Delta	4	17	5.6%	1,332	4.6%	77
US Airways	4	14	4.6%	1,189	4.1%	83
United	3	18	5.8%	1,131	3.9%	63
Continental	3	15	4.8%	738	2.6%	50
AirTran	2	4	1.4%	513	1.8%	117
Frontier	1	3	1.0%	399	1.4%	133
Great Lakes	5	13	4.2%	245	0.9%	19
USA 3000	2	1	0.3%	130	0.5%	168
Midwest	1	2	0.5%	82	0.3%	50
GoJet	1	1	0.3%	66	0.2%	66
Total	**62**	**308**	**100.0%**	**28,679**	**100.0%**	**93**
Legacy	49	211	68.5%	17,268	60.2%	82
LCC	27	82	26.8%	11,084	38.6%	134
Other	7	15	4.7%	327	1.1%	23
Total	**62**	**308**	**100.0%**	**28,679**	**100.0%**	**93**

Notes: 1 "Airline" includes regional partners.
2 Multi-airport markets such as Chicago with Chicago-O'Hare and Chicago-Midway airports are grouped together.

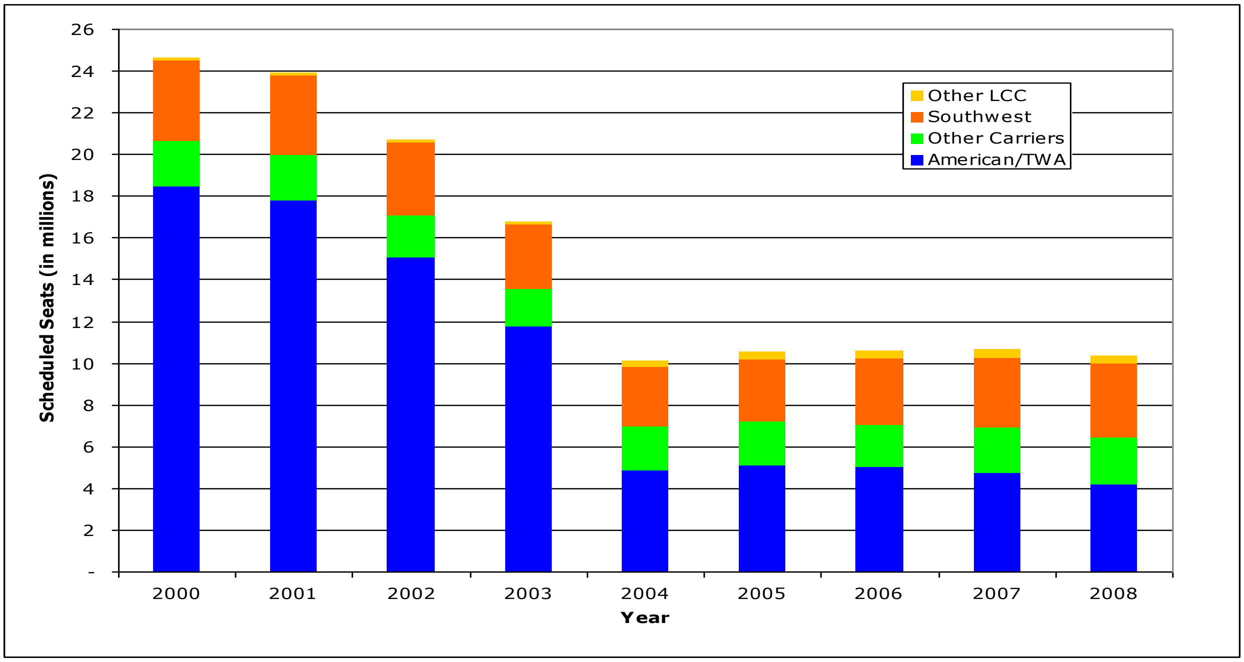
Sources: *Official Airline Guide*; Landrum & Brown analysis, 2011

Exhibit 3.2-5
LCC SHARE OF SCHEDULED SEATS ON DOMESTIC DEPARTING FLIGHTS
Lambert-St. Louis International Airport



Sources: *Official Airline Guide*; Landrum & Brown analysis, 2011

Exhibit 3.2-6
DOMESTIC AIRLINE MARKET SHARES
Lambert-St. Louis International Airport



Sources: *Official Airline Guide*; Landrum & Brown analysis, 2011

DESTINATIONS SERVED

The airlines provided service to 62 domestic markets (70 airports) in August 2008. All of STL's 25 top domestic O&D markets had non-stop service from STL (*see* **Table 3.2-6, *Air Service in Top 25 Domestic O&D Markets***). Of the top 50 domestic O&D markets, only Portland, Sacramento, Honolulu, and Manchester were without non-stop service in 2008. The O&D data also indicates the potential for increased service to a number of existing non-stop markets such as Ft. Lauderdale, San Diego, Austin, Hartford, and Jacksonville because these markets have high load factors.

Table 3.2-6
AIR SERVICE IN TOP 25 DOMESTIC O&D MARKETS
Lambert-St. Louis International Airport

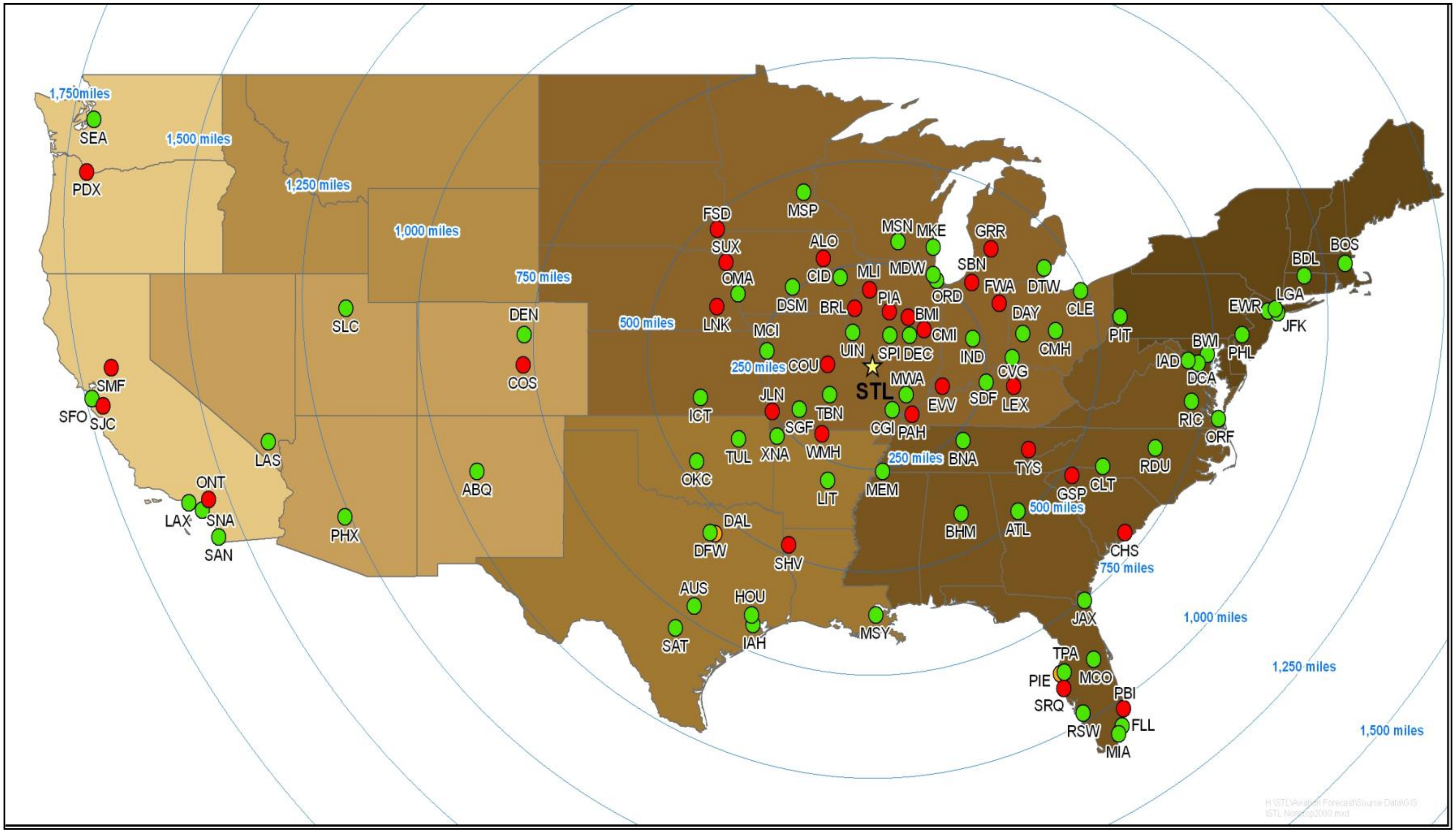
		2007	Aug 08	
Rank	**Market**	**Annual Enplanements**	**Daily Dep Flts**	**Daily Dep Sts.**
1	Chicago [1]	335,180	32	3,681
2	Washington [2]	281,070	13	1,382
3	Dallas/Ft. Worth [3]	275,210	17	2,513
4	New York [4]	253,720	17	1,222
5	Los Angeles [5]	249,380	6	847
6	Orlando	183,480	7	924
7	Denver	163,870	13	1,322
8	Atlanta	155,820	15	1,425
9	Phoenix	154,330	8	1,010
10	Las Vegas	148,190	5	667
11	Detroit [6]	143,860	7	868
12	Houston [7]	143,520	10	823
13	San Francisco [8]	130,280	2	380
14	Minneapolis-St Paul	106,990	13	883
15	Philadelphia	104,450	9	702
16	Kansas City	89,430	4	610
17	Seattle	89,280	2	380
18	Tampa	88,430	3	414
19	Boston	85,420	3	393
20	Cleveland	84,310	5	424
21	Fort Myers	77,920	2	228
22	San Diego	75,190	1	140
23	Ft. Lauderdale	74,210	1	137
24	Omaha	71,600	3	374
25	Miami	64,410	2	380
	Top 25 Markets	3,629,550	201	22,131
	Other	1,614,090	107	6,548
	Total	**5,243,640**	**308**	**28,679**

Notes:
1 Includes O'Hare and Midway airports
2 Includes Ronald Reagan National, Baltimore-Washington, and Washington Dulles airports
3 Includes Dallas/Ft. Worth and Love Field airports
4 Includes John F Kennedy, La Guardia, and Newark airports
5 Includes Los Angeles, John Wayne, Ontario, Long Beach, and Burbank airports
6 Includes Detroit and Wayne County Airports
7 Includes Bush-Intercontinental and Hobby airports
8 Includes Oakland, San Jose, and San Francisco airports

Sources: *Official Airline Guide*; USDOT, *Air Passenger Origin-Destination Survey*; Landrum & Brown analysis, 2011

The number of destinations served at STL has declined from 101 airports in August 2000 to 70 airports in August 2008. **Exhibit 3.2-7, *Destinations Served Non-Stop (August 2008 Versus August 2000)***, provides a graphical depiction of how the number of destination served non-stop from STL has changed in the past eight years. It is interesting to note that many of the destinations that have lost service are small and non-hub airports within 500 miles of STL. Historically, these airports functioned as spokes on the connecting hub when TWA and American had a large hubbing operation at STL. TWA and American flowed passengers from smaller communities over STL, primarily connecting them to larger mainline aircraft destined for major cities. As the hub has contracted in size, the economics of serving these small relatively short-haul spoke markets has deteriorated. Airlines operating at STL have retained service to the majority of large metropolitan areas in the United States as these markets provide greater densities of passengers that can be more readily supported with demand for air travel to and from the St. Louis area (i.e. originating traffic). Since August 2008, STL has lost service to SNA, SPI, and PIE (the only new market shown on the map).

Exhibit 3.2-7
DESTINATIONS SERVED NON-STOP (AUGUST 2008 VERSUS AUGUST 2000)
Lambert-St. Louis International Airport



Sources: *Official Airline Guide*; Landrum & Brown analysis, 2011

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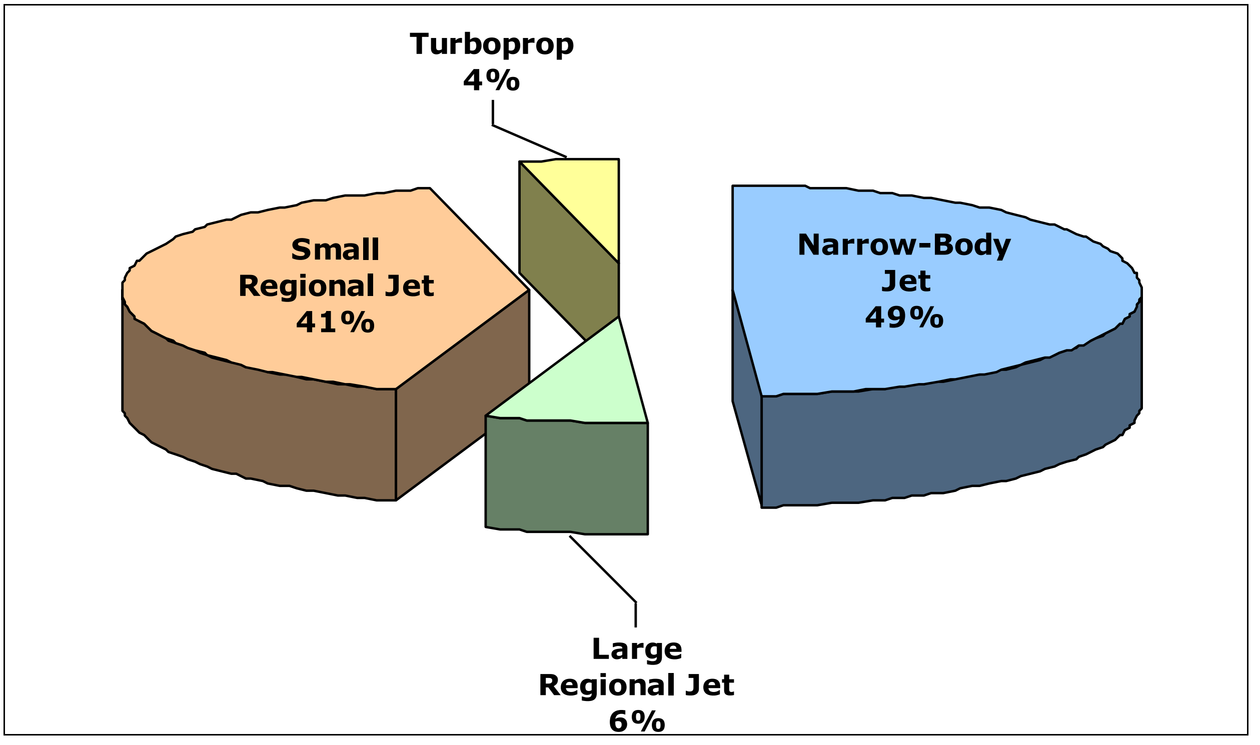
PASSENGER AIRCRAFT FLEET MIX

A variety of aircraft are deployed by the airlines operating at STL, reflecting the different aircraft fleets of the incumbent airlines and the range of market densities in which those aircraft are flown.

In terms of aircraft groups, narrow-body jet aircraft accounted for the largest share of commercial passenger operations at STL in 2008 (*see* **Exhibit 3.2-8, *Passenger Aircraft Fleet Mix (2008)***). Key aircraft within the narrow-body group are the 737-300 and 737-700 deployed by Southwest and the MD80 aircraft deployed by American.

Exhibit 3.2-8
PASSENGER AIRCRAFT FLEET MIX (2008)
Lambert-St. Louis International Airport



Sources: Airport Records; *Official Airline Guide*; Landrum & Brown analysis, 2011

Small regional jets, categorized as those with 50 seats or less, accounted for 41 percent of scheduled commercial passenger operations in 2008. The regional partners of American Airlines accounted for 66 percent of the small regional jet service at STL. Since 2004, American has increasingly relied on its regional partners to provide service at STL, often to maintain frequency using smaller aircraft in markets where it has reduced mainline capacity.

Large regional jets accounted for seven percent of commercial passenger operations at STL in 2008. These aircraft range from 50 to 90 seats. At STL, the main types of large regional jet are the Bombardier CRJ-700 and CRJ-900. The deployment of large regional jets is increasing throughout the United States primarily due to the improved economics and higher levels of comfort they provide compared with smaller 35 to 50-seat variants. However, American Airlines' pilot scope clause currently limits the use of large regional jet aircraft. As a result, this may also limit the deployment of large regional jet aircraft at STL in the future.

3.2.6 INTERNATIONAL PASSENGER AIR SERVICE

Four airlines provided international service to five destinations from STL in 2008 (*see* **Table 3.2-7, *International Air Service (2008 & 2009)***). Air Canada provides year-round service to Toronto, Canada on Canadair regional jets. USA 3000 Airlines serves Cancun, Mexico and the Dominican Republic on a year-round basis with Airbus 320s. All other international service from STL was seasonal (winter/spring) and does not appear to be scheduled to resume in the winter of 2009.

Table 3.2-7
INTERNATIONAL AIR SERVICE (2008 & 2009)
Lambert-St. Louis International Airport

		2008 & 2009 Scheduled Service	
Airline	**Aircraft**	**Destination**	**Months**
Air Canada	CRJ	Toronto, Canada	year-round
USA 3000	A320	Cancun, Mexico	year-round
	A320	Dominican Republic	year-round
	A320	Jamaica	November 2008-April 2009; no service scheduled for winter of 2009
	A320	Puerto Vallarta, Mexico	January 2009-April 2009; no service scheduled for winter of 2009
Frontier	A319	Cancun, Mexico	January 2008-April 2008; no service scheduled in 2009
Ryan International	B737-400	Cancun, Mexico	February 2008-April 2008; no service scheduled in 2009
	B737-400	Jamaica	February 2008-April 2008; no service scheduled in 2009
	B737-400	Puerto Vallarta, Mexico	January 2008-April 2008; no service scheduled in 2009

Sources: *Official Airline Guide*, 2008 and 2009; Landrum & Brown analysis, 2011

STL previously had transatlantic service to London and Paris as well as destinations in the Caribbean, Mexico, and Canada. The forecast will take into account current airport initiatives underway for expanded international services. In the future, the projected level of international originating passengers will likely be a key determinant in the potential for expanded international service at STL, more so than the volume of connecting traffic.

3.3 FORECAST IMPACT FACTORS

Forecasting future aviation activity is an inexact science and there are many factors that influence future aviation trends. Compounding this is the fact that the commercial passenger aviation industry is currently in an unprecedented period of uncertainty. Oil prices surged to historically high levels in 2006 through 2008, just as the U.S. airline industry as a whole returned to profitability following the most recent economic downturn and the aftermath of the September 11, 2001 terrorist attacks. The U.S. (and much of the world) is in the midst of the worst economic downturn since the Great Depression. While the recession has led to decreased demand for oil and prices have come down in the 4th quarter of 2008 and thus far in 2009, crude oil prices are still above historical prices and are expected to go up in the future. This section discusses the impact of the above events and other factors that affect aviation demand.

3.3.1 ECONOMIC CYCLES

Demand for air travel in the United States correlates closely with the health of the economy. Aviation activity typically contracts during recessions and expands during subsequent economic expansions. In fact, enplanements at STL were down 6.6 percent in 2008 over 2007 and airline schedule filings for STL indicate a further decline of 10-13 percent in scheduled seats for 2009. The STL Master Plan forecast focuses on long-term trends but does take into consideration the impact of the current economic recession. Over the 20-year forecast horizon, fluctuations should be expected around the long-term trend.

3.3.2 FUEL PRICES

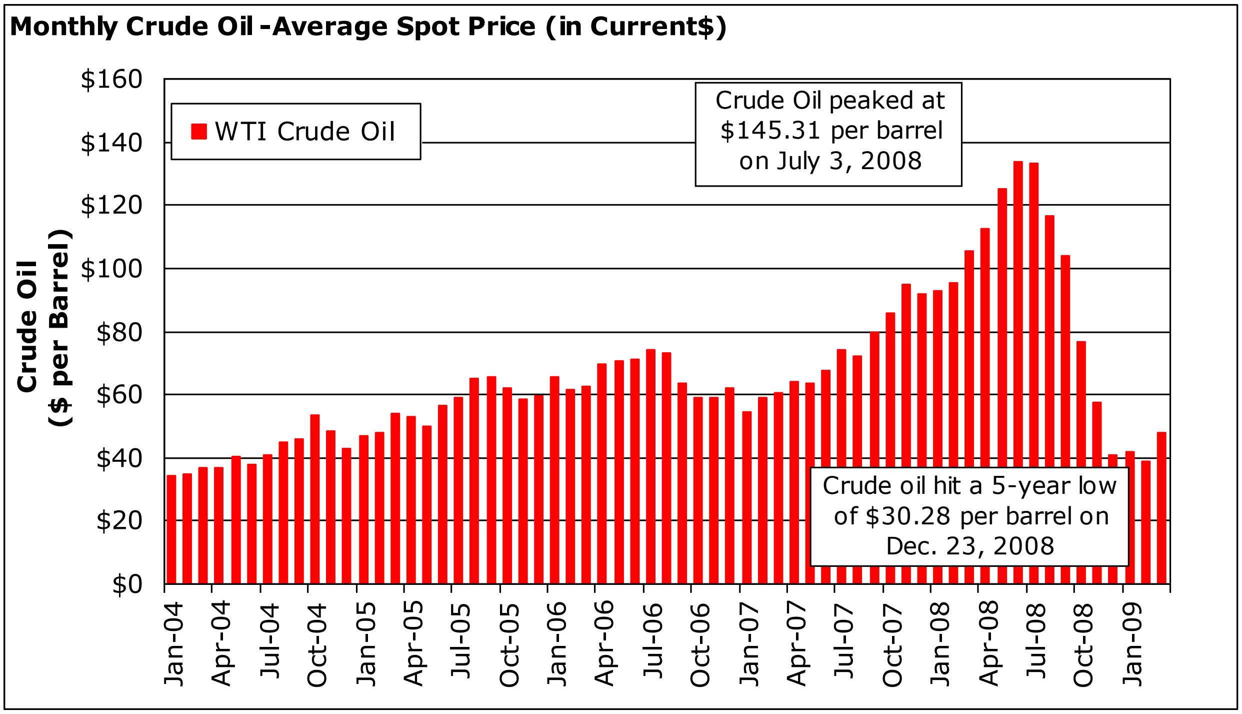
The price of fuel is one of the biggest costs to the airlines. The price of West Texas Intermediate (WTI) crude oil increased dramatically in the 2006 to 2008 time period, posting a 290 percent increase in June 2008 vs. January 2004 (*see* **Exhibit 3.3-1, *Crude Oil Prices***). After averaging $20 to $30 per barrel in the 2000 to 2003 time period, spot crude oil prices surged to $145.31 per barrel on July 3, 2008. Several factors drove the increase, such as strong global demand particularly in China and India, a weak U.S. dollar, commodity speculation, political unrest, and a reticence to materially increase supply.

Because of the surge in the price of oil, airlines experienced significant increases in their jet fuel costs. Fuel has historically accounted for 10 to 15 percent of U.S. passenger airlines' operating expenses. In the 4th quarter of 2008, fuel expenses had increased to a third of airline costs, representing the airlines' largest expense.[20]

Due to the recession, demand for oil decreased which led to a decline in crude oil prices beginning in August of 2008. Spot crude oil prices fell to a five-year low of $30.28 on December 23, 2008. Falling oil prices have provided relief to the struggling airline industry and may well help a number of U.S. airlines be profitable in 2009 despite the weak economic climate.

[20] Air Transport Association (ATA)

Exhibit 3.3-1
CRUDE OIL PRICES
Lambert-St. Louis International Airport



Sources: Energy Information Administration (EIA); Landrum & Brown analysis, 2011

While it is doubtful that crude oil prices will return to the highs seen during the summer of 2008, the low prices currently being experienced are not likely to be sustainable either. The Energy Information Administration (EIA) projects the price per barrel (in $2007) will be $49 in 2010 before increasing to $115 in 2020 and to $124 by 2030.[21]

One factor to consider in the price of oil is the potential for legislation to regulate greenhouse gases. In recent years there has been an increasing interest in global warming and increases in the production of man-made greenhouse gases. As a result, some countries have taken steps to reduce greenhouse gas emissions by enacting legislation to regulate those greenhouse gases. Currently the largest program is the European Union's Emission Trading Scheme (EU ETS). This system is called a "cap and trade" system as the government puts a limit on the total allowable emissions for a given time period and participants must remain within their limits or trade allowances with those who have not exceeded their limit.

Aside from the EU, other countries have adopted either a similar cap and trade system or are in the process of creating one. The U.S. Congress has tried to enact such a system in the past but has not been successful thus far. If a cap and trade system is enacted in the U.S. it would increase fuel prices, which without concomitant reductions in airline operating costs, could increase airfares.

[21] EIA *Annual Energy Outlook 2009*, Updated in April 2009

3.3.3 AIRLINE INDUSTRY CHANGES

The financial health of the airlines will play a major role in the determination of future forecasts for STL. This section contains a summary of the airline industry factors that were considered in the STL Master Plan forecast.

3.3.3.1 Low Cost Carriers (LCCs)

When LCCs enter air markets prices tend to decline and travel (especially leisure travel) increases. LCCs enjoy a 38.3 percent market share of scheduled seats at STL (up from just 10 percent in the early 1990s). Southwest Airlines, the largest LCC in the United States, is the second largest airline at STL, accounting for 35.1 percent of scheduled seats in 2008. Due to the increasing presence of LCCs at STL, the average fare paid for a 1,000-mile trip at STL in 2008 was 45 percent lower than in 1990. The LCC presence at STL is expected to remain strong throughout the forecast period.

3.3.3.2 Airline Costs

Since 2004 and in the first half of 2008 in particular, airlines have been faced with significant upward pressure on costs due to the price of fuel. At the same time, the airlines are limited in their ability to extract further unit cost savings from labor, which provided significant concessions in the last round of restructuring following September 11, 2001. With fuel cost largely beyond their control, airlines increased fares, cut traditional amenities, and began charging for checked bags, among other measures to balance the variables of supply and demand. Oil prices have declined rapidly in the 4th quarter of 2008 and thus far in 2009 as worldwide demand for commodities declined under the weight of the recession. However, oil prices are still above historical levels.

Until now, the post-deregulation environment has been characterized by a period of declining fares, causing passenger traffic to reach record levels. As the industry is now collectively faced with significantly higher costs and the traveling public with higher fares, there is the very real possibility that fewer people will fly. In the current weak consumer environment, increases in airfares are likely to have a much greater negative effect on demand. Airlines are recognizing this and are reducing capacity, parking aircraft, and restructuring route networks. The new higher cost industry will affect each airport differently, depending upon the mix of airlines, aircraft, and air services offered.

3.3.3.3 Airline Bankruptcies and Consolidations

There have been dramatic changes to the financial health of the airline industry in the 21st century. Numerous airlines have declared Chapter 11 bankruptcy at least once, including four of the legacy[22] carriers. There was a rash of bankruptcies between 2001 and 2005, and another more recent round in 2008 resulting from the

[22] Legacy carriers include United, American, Delta, US Airways, Continental, and Northwest. US Airways, United, Northwest, and Delta Air Lines have all filed bankruptcy since 2000.

current economic recession. As shown in **Table 3.3-1, *STL Airlines Filing Bankruptcy***, six of the STL airlines have declared bankruptcy this century, but only one (Frontier) is part of the most recent round in 2008. STL's two largest carriers (American and Southwest) have not had to declare bankruptcy. The STL Master Plan forecast assumes the airlines will weather the current financial crisis.

Table 3.3-1
STL AIRLINES FILING BANKRUPTCY
Lambert-St. Louis International Airport

Airline	Bankruptcy Status
TWA	Filed Chapter 11 in Jan. 2001 as part of an acquisition by American
United Airlines	Filed Chapter 11 in Dec. 2002
Air Canada	Filed in April 2003
US Airways	Filed Chapter 11 in Aug. 2002 and again in Sept. 2004; emerged in Sept. 2005 in conjunction with acquisition by America West
Delta Air Lines	Filed Chapter 11 in Sept. 2005
Northwest Airlines	Filed Chapter 11 in Sept. 2005
Frontier Airlines	Filed Chapter 11 in April 2008

Sources: Official Airline Guide; Air Transport Association, Landrum & Brown analysis, 2011

Airline mergers and alliances can also affect the airline industry. In particular, STL was dramatically affected by the purchase of TWA by American Airlines in 2001. American has progressively drawn down the hub at STL to approximately a third of its former size. As a result, the profile of traffic has changed dramatically and STL has become an airport serving predominantly originating passengers with a much smaller percentage of connecting traffic than historically had been the case.

3.3.3.4 Domestic Capacity

After five years of negative earnings, the U.S. airline industry collectively returned to profitability in 2006 after savings from labor cuts, salary concessions, and removal of many flight perquisites were realized. The success of restructuring has produced an industry that is already relatively streamlined with very little fat left to trim. The surge in oil prices in 2008 pushed airlines to start raising fares and cutting capacity. To survive and be profitable, the airlines have had to reduce domestic capacity to avoid losing money on unprofitable routes and excessive frequencies that are not supported with sufficient demand. As evidence of this, a capacity reduction of 12.9 percent (in terms of scheduled seats) at STL is scheduled for 2009. In addition, two carriers (Midwest Airlines and Ryan International Airlines) ceased operating at STL in 2008.

The efforts that the airlines are making to reduce losses by cutting the number of flight options comes with additional infrastructure costs that require the retirement of less fuel-efficient aircraft and the furlough of thousands of airline employees. Although costly, higher capacity provides choices to air travelers and has an impact on the resulting demand for air travel. The short-haul market in particular is likely to suffer when air travelers are faced with fewer flight options and have the ability to simply get in their cars and drive. In the near-term, flight options are expected to decrease, and will continue to do so until the airlines find a new capacity equilibrium that works with the price of fuel, acceptable air fares, and passenger demand. However, over the long-term, airlines are projected to increase service offerings as the U.S. economy returns to growth.

3.3.4 AIRCRAFT TRENDS

Variable fuel costs, aircraft type, and aircraft age have an impact on which aircraft the airlines choose to fly. The next-generation Boeing 737s and Airbus 320/321s have among the best fuel economy in the industry. The airlines have designated certain aircraft for retirement that have poor fuel economy compared to newer models. The MD-80/90, DC-9, and B737-300,400,500 have all been marked for reduction of use or retirement by many domestic airlines. Small regional jets like the EMB-135/140 and the CRJ-100/200, as well as the EMB-120 turboprop are also under much scrutiny and going through reductions. The current fleet mix is changing fast and bringing many new challenges to airlines that are forced to cut capacity, aircraft, and labor in an effort just to survive.

3.3.5 AIRPORT INITIATIVES

The STL Airport Authority has implemented a variety of initiatives to attract more passengers and new carriers to STL. The Lambert Advantage program, which began in 2007, focuses on new and improved amenities and services at the airport in order to make the passenger experience more pleasant. The Airport Authority actively attempts to attract new carriers to STL in order to improve the level of air service offered.

Additionally, the Foreign Trade Zone (FTZ) around STL was expanded from 11 acres to 820 acres in February 2009. This is a key step in the development of international air cargo service at STL. Lambert is part of the Midwest China Hub Commission (the China Group). This group, which represents local business and government interests, has been working "to establish the St. Louis region as a multi-state commercial hub for China."[23]

[23] February 17, 2009 Lambert-St. Louis International Airport News Release

3.4 COMMERCIAL PASSENGER FORECAST

The enplanement forecast facilitates the planning process in that it allows for the evaluation of the airside, terminal, landside, and access roadways. The enplanement forecast provides the critical path for the commercial passenger operations forecast that is derived from assumptions related to the average aircraft size and load factor. The passenger forecasts presented in this section are annual volumes through 2030 for the purpose of demonstrating the long-term trends. Throughout the rest of the forecast chapter, results are presented for the horizon years of 2013, 2018, 2023, and 2028, coinciding with 5-, 10-, 15-, and 20-year milestones from the 2008 base year.

The baseline commercial passenger forecast is presented in Sections 2.5.1 through 2.5.6. Alternative scenarios were also developed to understand the full range of potential demand. These forecasts are presented in Section 2.5.7.

3.4.1 PASSENGER FORECAST METHODOLOGY

Passenger traffic at STL was divided into five segments for purposes of developing the forecast:

(1) Domestic O&D passengers that travel on purely domestic itineraries

(2) O&D passengers that board domestic flights at STL and travel to another U.S. gateway to connect with international flights

(3) O&D passengers that board international flights at STL on purely international itineraries

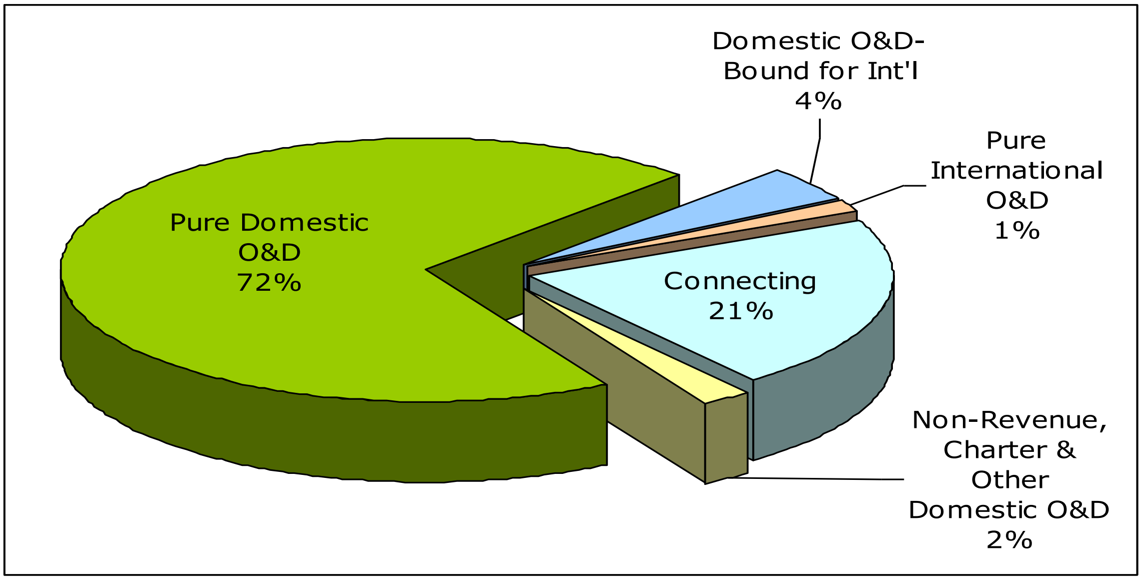
(4) Connecting passengers

(5) Non-revenue, charter, and other domestic O&D passengers

Exhibit 3.4-1, *2008 Passenger Enplanements by Segment*, provides the estimated market share for each key passenger segment for 2008. The level of originating passengers, both domestic and international, reflects the attractiveness of the St. Louis Metropolitan Area as a place to visit, and as a place to work and conduct business. Passengers traveling to or from the St. Louis metro area accounted for almost 80 percent of traffic at STL in 2008. The originating passenger forecast is a critical input to assess future demand for terminal and landside facilities such as ticketing, baggage claim, automobile parking, and access roadways.

In 2008, connecting traffic represented approximately 21 percent of the total enplanements at STL. The volume of connecting passengers reflects the quality and quantity of air service offered by domestic hubbing airlines and international gateway carriers, and is typically gauged by the frequency of departures and the number of destinations served.

Exhibit 3.4-1
2008 PASSENGER ENPLANEMENTS BY SEGMENT
Lambert-St. Louis International Airport



Notes: The connecting passenger portion includes non-revenue, charter & other connections. The non-revenue, charter and other O&D segment is shown separately.

Sources: Airport Records; USDOT, *Air Passenger Origin-Destination Survey*; Landrum & Brown analysis, 2011

Exhibit 3.4-2, *Baseline Enplanement Forecast Approach and Methodology*, summarizes the overall approach and methodology used to develop the baseline forecasts. The baseline forecasts for O&D traffic (segments 1-3) were developed using an econometric approach that ties traffic volumes to historical and forecast economic data for the St. Louis region. The baseline connecting traffic forecast was derived in part from the resulting domestic O&D enplanements forecast and input from American Airlines, the primary connecting carrier at STL.

Exhibit 3.4-2
BASELINE ENPLANEMENT FORECAST APPROACH AND METHODOLOGY
Lambert-St. Louis International Airport

Traffic Segment	Short-Term (2009-2013)	Long-Term (2014-2030)
Domestic Originating	* Incorporate recession impact and subsequent recovery	* Based on statistical relationship between historical traffic and personal income
Bound for Int'l Destinations	* Initial decline, reflecting the state of the world economy	* Based on statistical relationship between historical traffic and world GDP
International O&D	* Initial decline, reflecting the state of the world economy	* Reflects growth in bound for international destinations segment and new nonstop destinations
Connections	* Incorporate recession impact and subsequent recovery	* Based on airline network management strategies

Source: Landrum & Brown analysis, 2011

3.4.2 BASELINE DOMESTIC O&D ENPLANEMENTS FORECAST

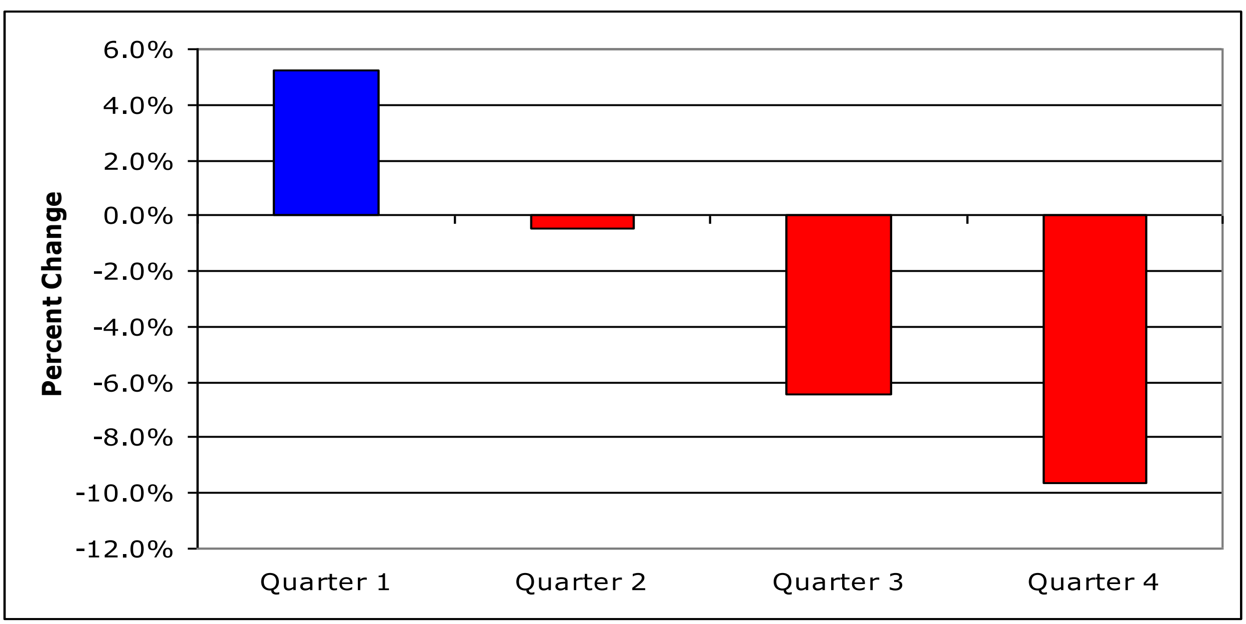
This section presents the forecast for pure domestic originating enplanements (those passengers who travel on a purely domestic itinerary). A two-step process was used to develop a blended domestic O&D enplanement forecast:

- A short-term 5-year forecast (2009 through 2013) was developed. This approach provided the opportunity to incorporate a more appropriate year-to-year estimate of the impact of the current economic crisis and subsequent recovery on passenger traffic levels. The short-term forecast takes into account current airline schedule filings for 2009, which are important indicators of anticipated near-term demand levels, as well as annual economic forecasts promulgated by the Federal Reserve Board through 2011.
- A long-term forecast (2013 through 2030) was developed based on statistical relationships between historical demographic and economic activity in the St. Louis MSA and domestic originating passenger traffic.

3.4.2.1 Short-Term Domestic O&D Forecast

In 2008, STL domestic O&D traffic declined 3.1 percent year-over-year. On a quarterly basis, first quarter 2008 gains (+5.2 percent) gave way to quarterly declines as demand for air travel contracted at STL in response to the continued deterioration in the local and national economy (*see* **Exhibit 3.5-3, *2008 Quarterly Domestic Originating Passengers***).

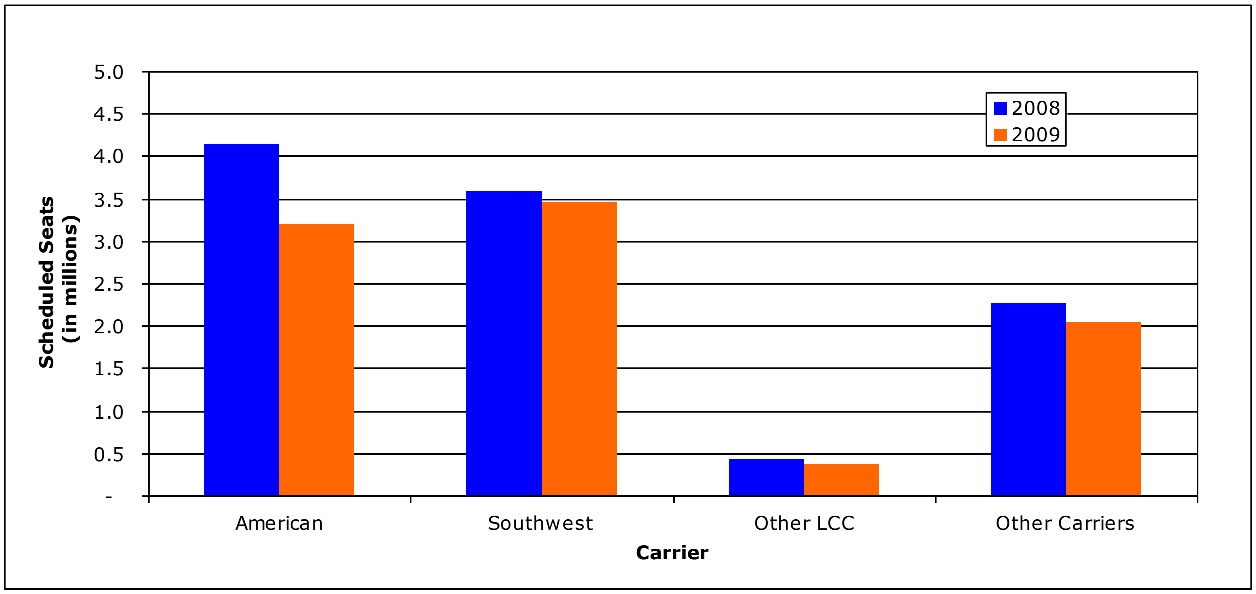
Exhibit 3.4-3
2008 QUARTERLY DOMESTIC ORIGINATING PASSENGERS
Lambert-St. Louis International Airport



Sources: USDOT, *Air Passenger Origin-Destination Survey*; Landrum & Brown analysis, 2011

Domestic O&D traffic is expected decline further in 2009 both nationally and at STL as the national economy contracts and unemployment continues to rise. In anticipation of the continued erosion in passenger demand, the airlines operating at STL have collectively reduced the supply of seats on scheduled domestic departing flights in the St. Louis market by almost 13 percent in 2009 versus 2008 (equivalent to 1.3 million seats). **Exhibit 3.4-4, *Change in Domestic Capacity 2008 v 2009***, provides a summary of the absolute and percentage reduction in domestic airline capacity planned for 2009 for key carriers.

Exhibit 3.4-4
CHANGE IN DOMESTIC CAPACITY 2008 v 2009
Lambert-St. Louis International Airport

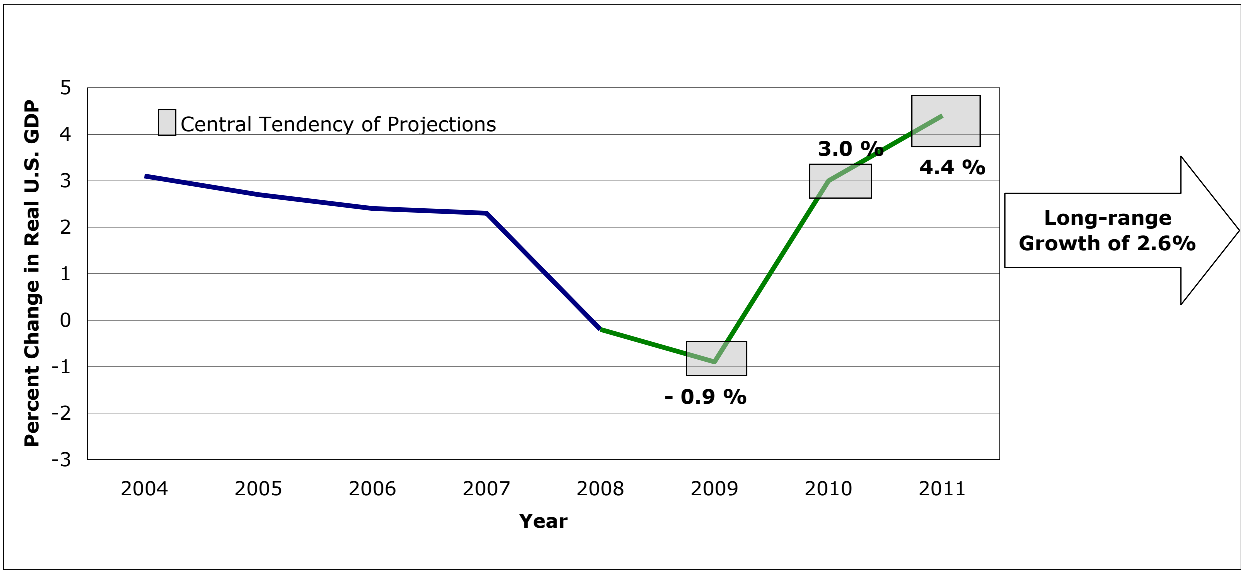


Sources: Official Airline Guide; Landrum & Brown analysis, 2011

Airline schedule filings indicate that domestic O&D traffic will likely be less impacted, in percentage terms, than connecting traffic in 2009. American Airlines, STL's primary hubbing carrier, is reducing capacity by 23 percent in 2009, removing close to 1.0 million seats from the St. Louis market. The remaining carriers at STL predominantly handle originating traffic and are reducing capacity by just six percent, year-over-year. It was assumed that the airlines will attempt to make more efficient use of their aircraft assets during the current downturn and operate at somewhat higher load factors than in 2008. As a result of the foregoing analysis, domestic O&D enplanements at STL are projected to decline a further 7.5 percent in 2009.

The year 2009 is assumed to represent the floor in the current cycle for both economic activity and passenger traffic. Economic forecasts released in February 2009 by the Federal Reserve project that the economy will shrink 0.5 to 1.3 percent in 2009 (*see* **Exhibit 3.4-5, *U.S. Economic Forecasts***). Economic recovery is expected to begin, albeit gradually, in 2010, with growth expectations in the 2.5 to 3.3 percent range.

Exhibit 3.4-5
U.S. ECONOMIC FORECASTS
Lambert-St. Louis International Airport



Sources: Federal Reserve projections as of February 2009; Landrum & Brown analysis, 2011

The recovery is expected to gather pace in 2011 with growth rates reaching 3.8 to 5.0 percent, temporarily exceeding longer-term estimates.

The shape of the economic recovery will influence the recovery in passenger traffic, both in terms of national demand levels and at STL. The airline industry is generally considered to be a lagging economic indicator. As a result, a relatively modest gain in domestic O&D traffic of 1.5 percent is projected for 2010 at STL, followed by growth of 4.0 percent in 2011, 4.0 percent in 2012, and 2.2 percent in 2013. The growth rates forecast for 2011 through 2013 are above long-term trends which is indicative of acceleration from the trough of the current economic cycle. In absolute terms, domestic O&D traffic at STL is projected to recover to 2007 levels (5.2 million domestic O&D enplanements) by 2013.

3.4.2.2 Long-Term Forecast

The long-term forecast was guided by an econometric approach that quantified the relationship between local domestic passengers and independent demographic and economic variables. The forecast models were developed using multi-linear regression techniques, with the dependent variable (domestic O&D enplanements) computed using a linear function. The methodology for preparing the O&D forecasts recognizes that key parameters such as population and per capita personal income will change over time. However, it assumes that the fundamental mathematical relationships between the independent variables and domestic O&D passenger traffic will persist and will support the development of realistic forecasts.

Multi-linear regressions were developed based on an 18-year history from 1990 to 2007.[24] A longer history, dating back to 1985, was also considered but rejected as this methodology was overestimating the domestic O&D traffic due to the unbalanced number of growth years versus economic downturns (the average growth rate was 2.6 percent from 1985 to 2007 versus 1.1 percent from 1990 to 2007). Independent variables considered for use in the regression included population, employment, personal income, gross regional product, and yield.[25]

Several regressions of various combinations of independent variables were tested but ultimately rejected for various reasons, such as:

- Inadequate test statistics (i.e. low r-squared values or other inadequate regression statistics) which indicates the independent variables are not good predictors of STL traffic.
- Poor forecast results (Regression models produce "forecasts" of historical data called residuals. A satisfactory model will generate estimates that are close to actual values.)
- Theoretical contradictions (e.g. the model indicates that GDP growth is negatively correlated with traffic growth).
- Overly aggressive or low forecast results that are incompatible with historical averages.

In the evaluation of the various regressions, personal income, which is the product of total population and per capita income for the STL MSA, proved to correlate well with domestic O&D traffic at STL. Yield and other pricing variables did not appear to correlate with the STL domestic O&D traffic and therefore were not used in the econometric model.

The regression models usually include dummy variables to consider unusual events that do not correlate to underlying socioeconomic trends and airline yields. The only unusual event that had a noticeable impact on STL traffic was the September 11, 2001 terrorist attacks. This event had the effect of depressing traffic at U.S. airports and throughout the world for several years. The use of a dummy variable corrects for the downturn in traffic that is not reflected in the standard socioeconomic variables used to forecast future aviation activity.

A regional model was used to evaluate domestic O&D traffic to the different regions of the country independently. The regional model selected for this forecast differentiates the Midwest from the other regions. Indeed, Midwest domestic O&D enplanements have decreased substantially since 1990 due to the region's short-haul characteristics (predominantly markets within 500 miles of STL). The strategic draw down of the TWA/AA hub at STL, new security requirements and

[24] Full calendar year 2008 statistics were not available at the time of this analysis.
[25] Yield is defined as the average revenue an airline obtains from carrying a passenger one mile. It reflects fare, length of haul, the level of competition, carrier costs, and other factors. Yield is a commonly accepted measure of the price of air travel.

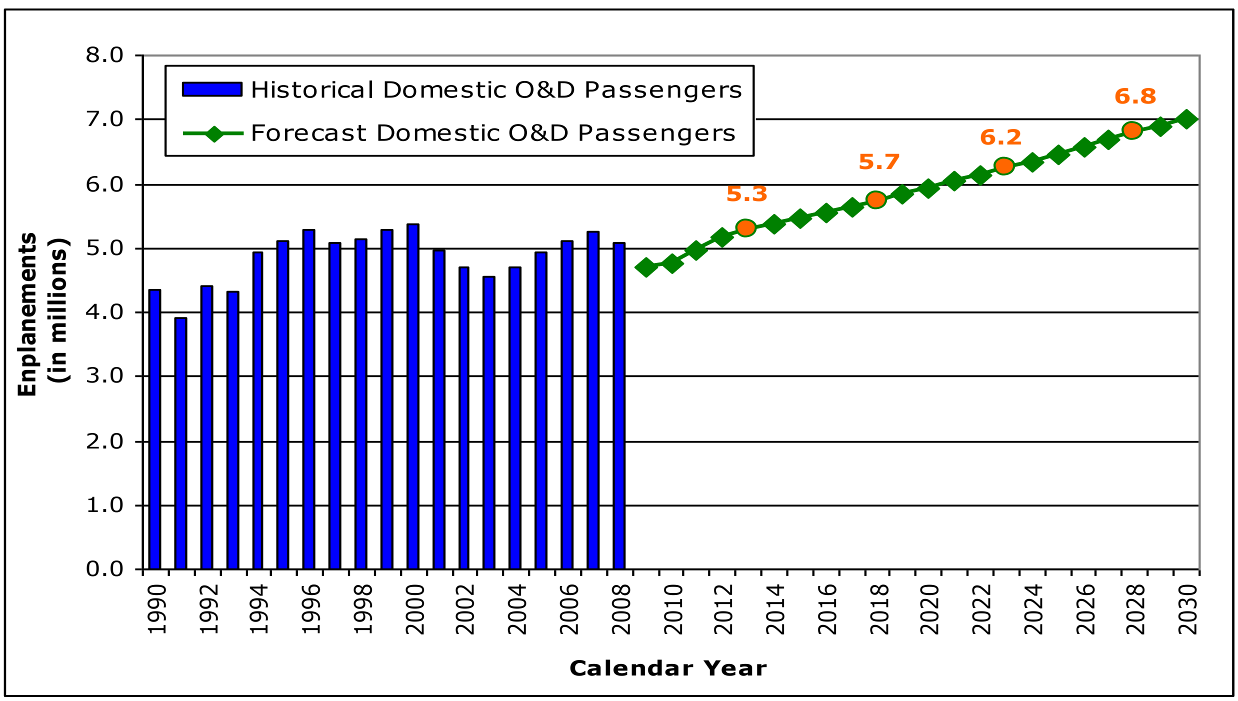
related wait times, and increases in fares made short-haul air travel less attractive than other modes of transportation and particularly impacted intra-Midwest O&D travel.

Ultimately, the chosen regression model considered STL traffic for all regions except the Midwest against its service area's personal income and a dummy variable to take into account the September 11, 2001 terrorist attacks. Despite the fact that the Midwest region has seen its domestic O&D traffic decrease over the past decade, its traffic has leveled out at about 1.0 to 1.1 million enplanements since 2003. It was assumed that Midwest would respond positively to future growth in the STL service area economy and therefore grow at half the growth rate of the service area's economy. This regression analysis results in a long-term growth rate of 1.7 percent per annum from 2014 to 2030.

3.4.2.3 Final Domestic O&D Enplanements Forecast

Based on the short-term and long-term forecasts discussed above, domestic O&D enplanements are expected to grow at an average annual rate of 1.5 percent over the forecast period to 7.0 million enplanements by 2030 (*see* **Exhibit 3.4-6, *Domestic O&D Enplanements Forecast***).

Exhibit 3.4-6
DOMESTIC O&D ENPLANEMENTS FORECAST
Lambert-St. Louis International Airport



Sources: Airport Records; USDOT, *Air Passenger Origin-Destination Survey*; Landrum & Brown analysis, 2011

3.4.3 BASELINE ENPLANED PASSENGERS WITH INTERNATIONAL ITINERARIES FORECAST

Forecasts were created for two categories of international O&D enplanements:

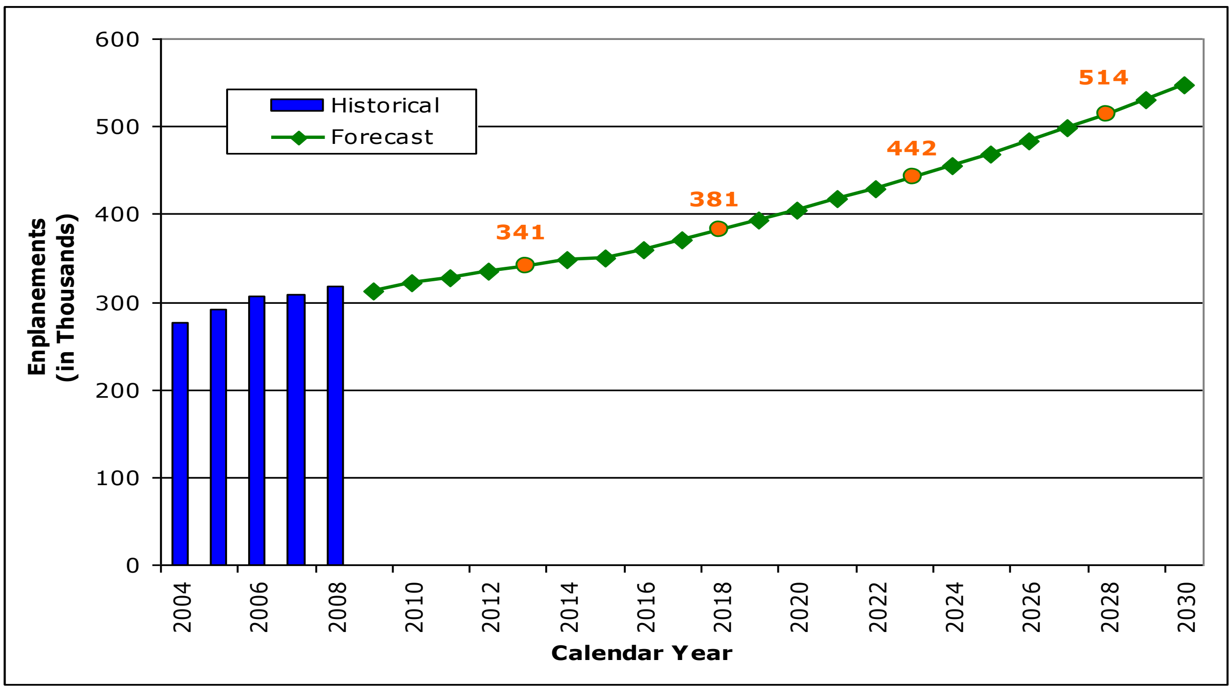
- Bound for International Destinations: this category refers to passengers traveling to or from the STL metro area that board a domestic flight at STL and fly to another U.S. gateway airport in order to make a connection to an international destination;
- International O&D Enplanements: this category refers to passengers traveling to or from the STL metro area that board an international flight at STL and fly to an international destination.

Over 411,000 STL O&D enplaned passengers had an international itinerary in 2008. Seventy-seven percent of these passengers flew through another U.S. gateway prior to arriving at their final international destination (i.e. bound for an international destination). The forecast for the "bound for international destinations" category was developed using an econometric approach that correlated this traffic segment with anticipated growth in the world economy. The "international O&D enplanements" forecast was developed based on assumptions regarding growth in existing international services at the airport and the potential for airlines to add new international service to certain international markets as demand reaches a critical mass to be served non-stop from STL.

3.4.3.1 Bound for International Destinations Forecast

A number of regression analyses were developed that correlated growth in passengers bound for international destinations with world economic growth at the aggregate level and by world region. The world economic growth rates were weighted to take into account historical market share of specific world regions for this traffic segment in the St. Louis market. Based on this approach, traffic is expected to grow 2.5 percent annually from 317,132 enplanements in 2008 to 547,500 enplanements in 2030 (*see* **Exhibit 3.4-7, *Forecast of Enplanements Bound for International Destinations***). Latin America, the Pacific, and Europe are expected to be the fastest growing segments.

Exhibit 3.4-7
FORECAST OF ENPLANEMENTS BOUND FOR INTERNATIONAL DESTINATIONS
Lambert-St. Louis International Airport



Sources: Airport Records; USDOT, *Air Passenger Origin-Destination Survey*; USDOT, Schedule T-100; FAA Aerospace Forecasts various years; Landrum & Brown analysis, 2011

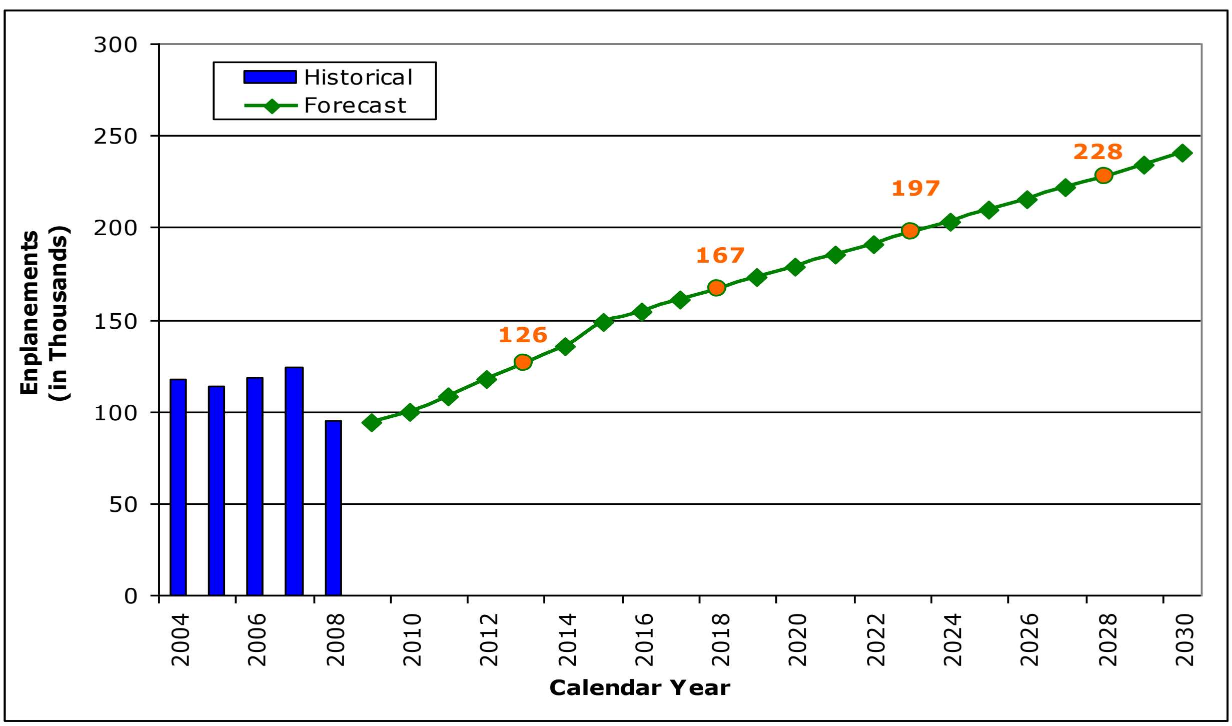
3.4.3.2 International O&D Forecast

The level of international O&D enplanements were derived in part from the "bound for international destinations" enplanements. Indeed, the higher the level of "bound for international destinations" enplanements in a particular region, the greater the potential for non-stop service. Therefore, the forecast of international O&D enplanements was based on the following key considerations:

- Latin America: Additional daily non-stop service is forecast to be in place by 2014 using narrow-body jet aircraft (150 seats) with an average load factor of 75 percent. This service is projected to increase to two daily flights by 2030.
- Europe: Seasonal service is expected by 2015 using B767 aircraft (230 seats) with an average load factor of 75 percent. This service is expected to increase to year round daily service by 2030.

International O&D enplanements are expected to decline initially, reflecting the state of the world economy. International O&D enplanements are expected to return to positive growth rates in 2010. Based on these assumptions, international O&D enplanements are forecast to grow by 4.3 percent per year from 94,795 enplanements in 2008 to 240,000 enplanements by 2030 (*see* **Exhibit 3.4-8, *International O&D Enplanements Forecast***).

Exhibit 3.4-8
INTERNATIONAL O&D ENPLANEMENTS FORECAST
Lambert-St. Louis International Airport

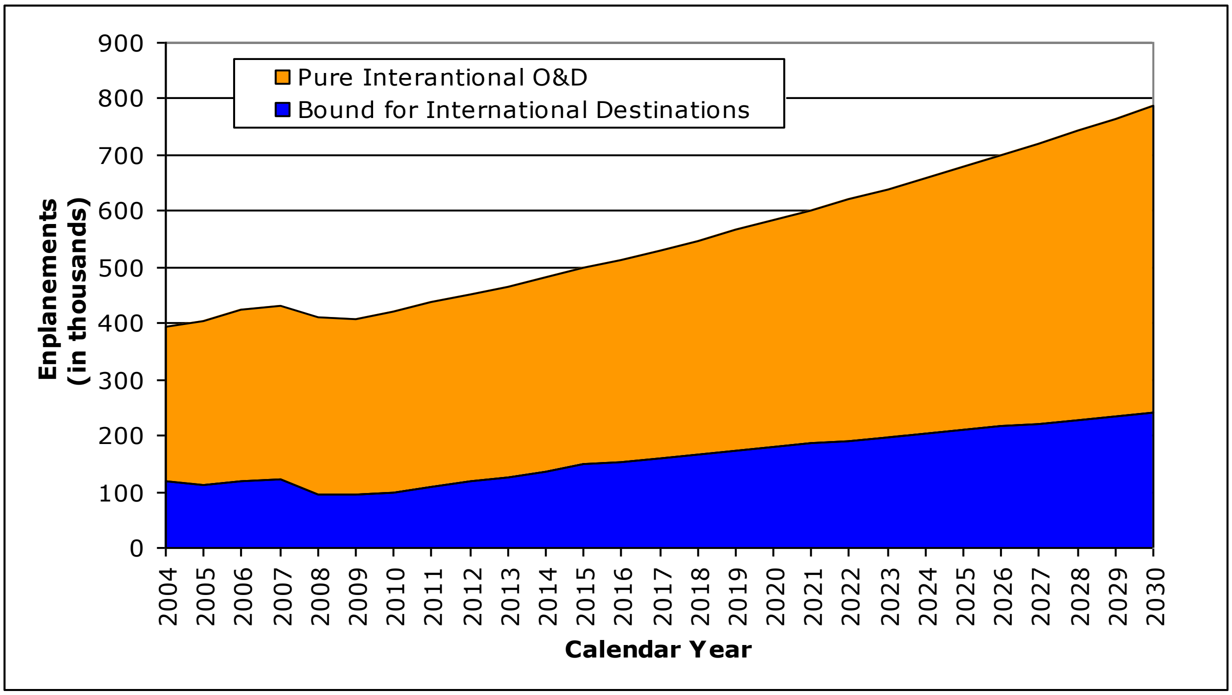


Sources: Airport Records; USDOT, *Air Passenger Origin-Destination Survey*; USDOT, Schedule T-100; FAA Aerospace Forecasts various years; Landrum & Brown analysis, 2011

3.4.3.2 International O&D Forecast Summary

By 2028, the number of originating passengers with international itineraries is forecast to reach 742,300. The share of passengers that connect through another U.S. gateway to reach their international destination is forecast to decline from 77 percent in 2008 to 69 percent by 2028 (*see* **Exhibit 3.4-9, *International O&D Forecast***) as more non-stop international destinations are added from STL.

Exhibit 3.4-9
INTERNATIONAL O&D FORECAST
Lambert-St. Louis International Airport



Sources: Airport Records; USDOT, *Air Passenger Origin-Destination Survey*; USDOT, Schedule T-100; FAA Aerospace Forecasts various years; Landrum & Brown analysis, 2011

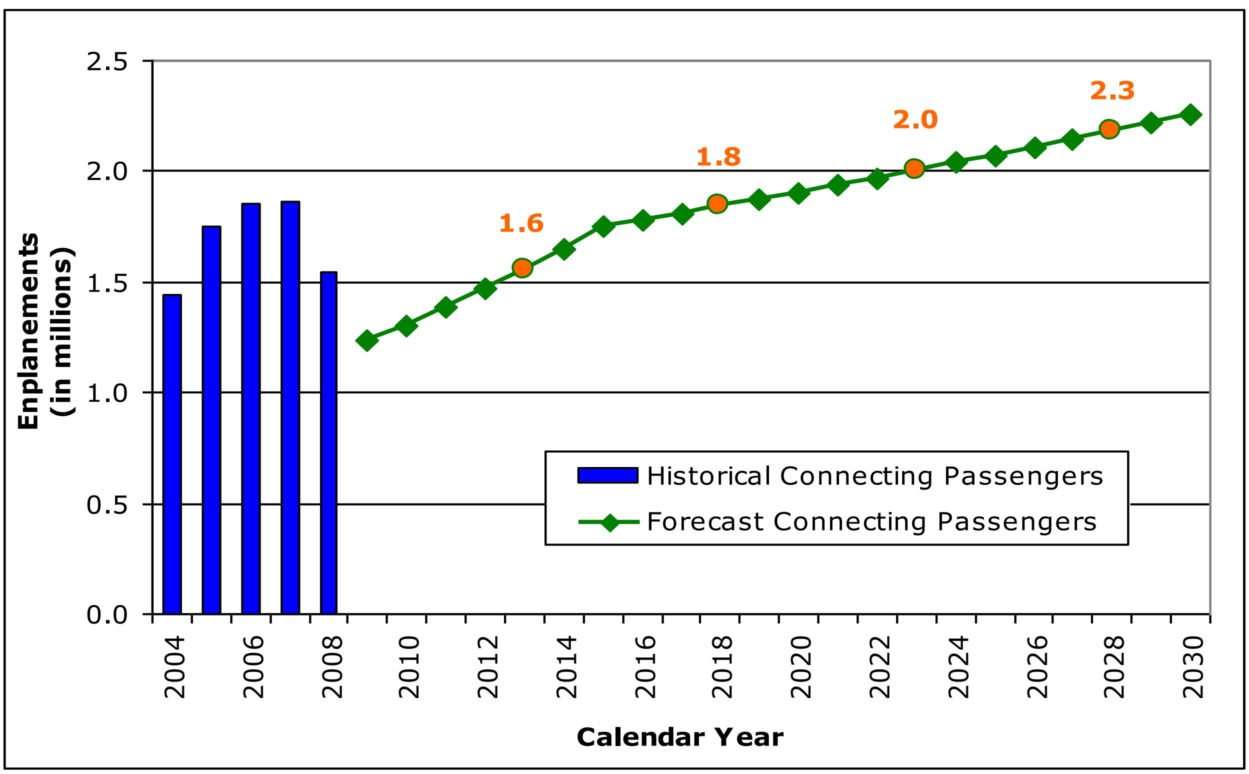
3.4.4 CONNECTING ENPLANEMENTS FORECAST

The airport reported total enplanements in 2008 that were 7.6 percent higher than the number of enplanements reported by airlines to the U.S. DOT. This difference reflects non-scheduled charter and non-revenue traffic that is not reported to U.S. DOT. Non-revenue traffic includes airline employees and crew commuting to/from their assigned routes. The number of non-revenue connections is relatively high at hub airports like STL. It is estimated that 20 percent of the 1.5 million connecting enplanements reported at STL in 2008 were non-revenue. As a result, the discussion of connecting enplanements in this section includes both revenue and non-revenue connections and reflects the assumption that the O&D/connecting split of the charter/non-revenue category averages a 30/70 split throughout the forecast period.

Connecting enplanements have accounted for a declining share of total enplanements at STL over the historical period. In the late 1990s, at the height of the TWA hub, connections accounted for over 60 percent of total enplanements. In 2008, connecting passengers represented 21 of total enplanements. The volume of connecting passengers occurs largely due to the airline network management strategies. American continues to account for 70 percent of the connecting traffic at STL while Southwest accounts for 23 percent.

In 2008, connecting traffic at STL declined 17 percent compared to the year prior and is projected to decline a further 20 percent in 2009. Based on airline schedule filings, American plans to remove close to one million seats from the STL market in 2009. Almost half of the capacity reduction is aimed at American's regional partners, which currently handle 80 percent of American's connecting traffic at STL. Connecting traffic is expected to stabilize at approximately 22 percent of STL total enplanements by 2014, and maintain this share thereafter, essentially growing in proportion with originating traffic. It is assumed that American will continue to operate a hub at the airport over the forecast period, connecting between 35-40 percent of its total enplanements at STL. Southwest is also expected to increase its connecting passenger volumes at the airport. As shown in **Exhibit 3.4-10, *Connecting Enplanements Forecast***, connecting enplanements are forecast to reach 2.3 million in 2030.

Exhibit 3.4-10
CONNECTING ENPLANEMENTS FORECAST
Lambert-St. Louis International Airport



Sources: Airport Records; USDOT, *Air Passenger Origin-Destination Survey*; Landrum & Brown analysis, 2011

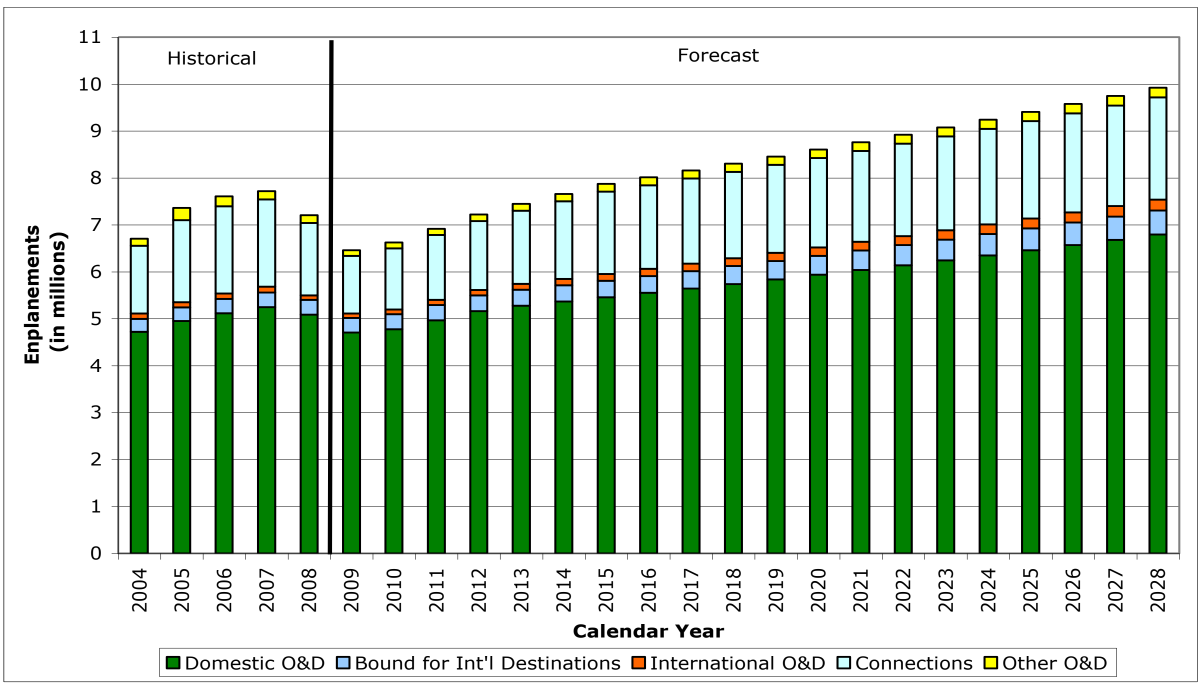
3.4.5 BASELINE OTHER O&D ENPLANEMENTS FORECAST

A small proportion of the O&D traffic reported at STL is unaccounted for in the DOT statistics. Historically, this traffic has accounted for two to four percent of total enplanements at STL. This category of traffic is forecast to grow at the same rate as total domestic enplanements.

3.4.6 BASELINE ENPLANEMENTS FORECAST SUMMARY

A summary of the enplaned passenger forecast is shown on **Exhibit 3.4-11, *Enplanements Forecast Summary***. Total enplanements are forecast to increase from 7.2 million enplanements in 2008 to 9.9 million enplanements by 2028, an average annual growth rate of 1.6 percent. Domestic O&D enplanements are expected to continue to account for the largest share of passenger traffic throughout the forecast period, making up 68 percent of total enplanements in 2028. Passengers with international itineraries (either connecting through another gateway or flying non-stop from STL) will increase in share from 5.7 percent of total enplanements in 2008 to 7.5 percent in 2028.

Exhibit 3.4-11
ENPLANEMENTS FORECAST SUMMARY
Lambert-St. Louis International Airport



Source: Landrum & Brown analysis, 2011

For purposes of forecasting aircraft operations, the enplaned passenger forecast was segmented into air carrier and commuter categories for domestic and international traffic (*see* **Table 3.4-1, *Enplanements Forecast by Air Carrier and Commuter***). The "bound for international destinations" segment is included in the domestic category because the immediate down line city on departure or up line city on arrival is in the continental U.S., Alaska, Hawaii, or a U.S. territory.

The forecast calls for domestic air carrier enplanements to grow at a rate of 1.6 percent annually over the forecast period versus 1.5 percent for domestic commuter enplanements. Air carrier enplanements made up 74 percent of domestic activity in 2008 and this split is expected to remain relatively unchanged through 2028.

Air carrier activity made up the vast majority (82 percent) of international activity in 2008. International air carrier enplanements are forecast to grow at a rate of 4.7 percent per annum through 2028 due to the expected introduction of new non-stop service to Latin America and Europe. The air carrier segment will make up 87 percent of international activity in 2028. International commuter enplanements are expected to average growth of 2.8 percent annually between 2008 and 2028.

Table 3.4-1
ENPLANEMENTS FORECAST BY AIR CARRIER AND COMMUTER
Lambert-St. Louis International Airport

Calendar	Domestic		International		
Year	Air Carrier	Commuter	Air Carrier	Commuter	Total
History					
1995	12,028,657	733,439	82,928	2,753	12,847,777
2000	14,199,805	903,873	160,031	37,869	15,301,578
2005	5,144,441	2,097,474	101,118	19,885	7,362,918
2006	5,322,701	2,161,513	100,423	20,261	7,604,898
2007	5,543,893	2,045,408	105,074	20,959	7,715,334
2008	5,231,273	1,880,672	78,856	17,089	7,207,890
Forecast					
2009	4,718,800	1,646,200	75,400	18,300	6,458,700
2010	4,837,600	1,688,400	80,600	19,000	6,625,600
2011	5,046,900	1,762,200	88,200	20,300	6,917,600
2012	5,265,900	1,839,500	95,900	21,500	7,222,800
2013	5,425,900	1,896,200	103,600	22,700	7,448,400
2018	6,027,100	2,111,100	139,700	27,000	8,304,900
2023	6,573,000	2,307,400	168,600	28,800	9,077,800
2028	7,171,500	2,523,200	198,100	29,900	9,922,700
Average Annual Growth Rates					
95-08	-6.2%	7.5%	-0.4%	15.1%	-4.3%
08-28	1.6%	1.5%	4.7%	2.8%	1.6%

Sources: Airport Records; USDOT, Schedule T-100; *Official Airline Guide*; Landrum & Brown analysis, 2011

3.4.7 ALTERNATIVE ACTIVITY SCENARIOS

The preceding sections provided a description of the baseline enplaned passenger forecast. This is the forecast that will be used to plan the facilities needed at STL over the 20-year planning horizon. In addition to the baseline forecast, high and low scenarios were also developed; these forecasts are described in this section. **Table 3.4-2, *Scenario Assumptions***, provides a summary of the potential factors driving the high and low scenarios.

Table 3.4-2
SCENARIO ASSUMPTIONS
Lambert-St. Louis International Airport

HIGH SCENARIO		
	Passenger Traffic Segment	
	Originating	**Connecting**
Near-Term Forecast	* Recovery from recession more favorable than in base case * Enplanements return to pre-recession levels by 2011-2012	* AA adds back 2009 capacity cuts in 3-5 year time frame
Long-Term Forecast	* Economic growth rates modeled at 25% above base forecast * New entrant LCC establishes mini-focus city	* AA re-emphasizes STL hub * Connections account for 30% of total enplanements

LOW SCENARIO		
	Passenger Traffic Segment	
	Originating	**Connecting**
Near-Term Forecast	* Protracted economic recession * Enplanements return to pre-recession levels by 2014-2015	* Continued de-emphasis of AA connecting hub * AA connecting hub eliminated by 2013
Long-Term Forecast	* Economic growth rates modeled at 75% of base forecast	* No other airline establishes a hub at STL

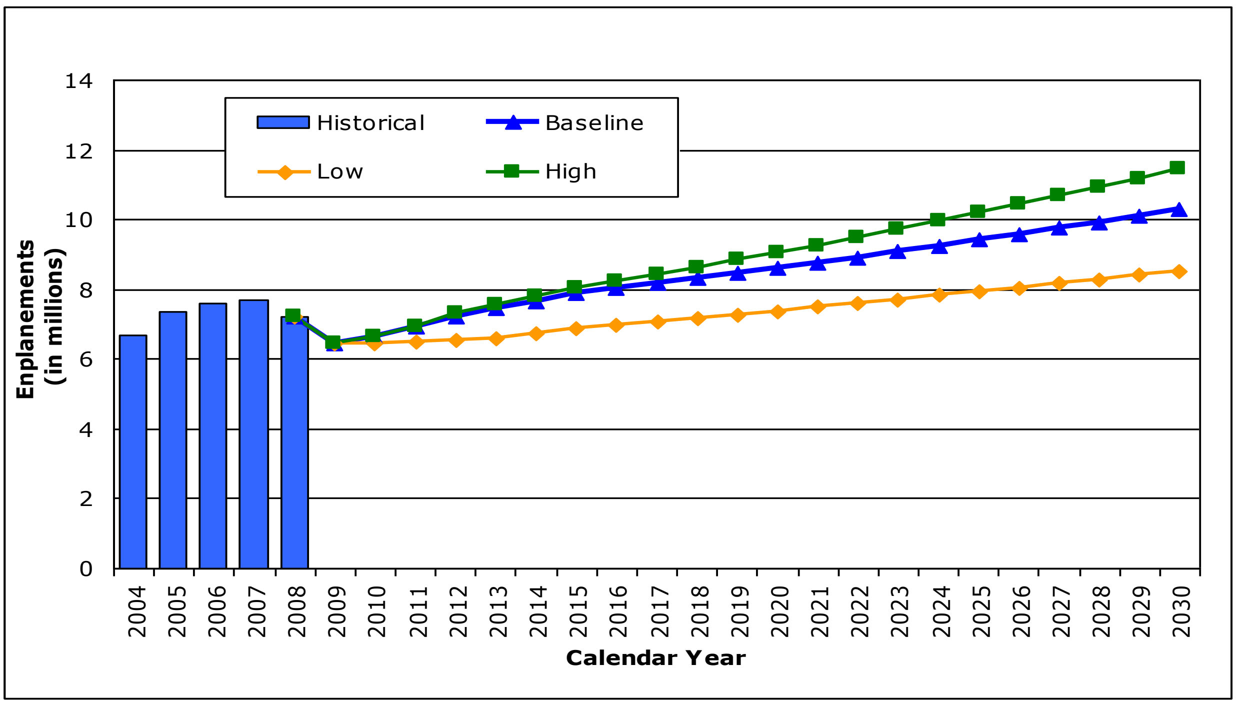
Source: Landrum & Brown analysis, 2011

The high scenario assumes that STL can recover from the recession faster than expected in the base case and that the economy continues to grow faster than the base case through 2028. The high scenario also assumes a new entrant LCC makes STL a mini-focus city. This scenario reflects higher connections levels due to the new entrant LCC and a re-emphasis of the STL hub by American.

The low scenario reflects a protracted economic recession and lower economic growth in the long-term than in the baseline forecast. The low scenario also reflects the abandonment of the American Airlines hub in 2013.

Exhibit 3.4-12, *Enplanements Forecast Comparison*, shows a comparison of the two scenarios and the baseline forecast. The high scenario results in STL enplanements increasing to 10.9 million by 2028, which represents an average annual growth rate of 2.1 percent (versus 1.6 percent in the base case). The low scenario results in 8.3 million passengers in 2028 (less than one percent average annual growth).

Exhibit 3.4-12
ENPLANEMENTS FORECAST COMPARISON
Lambert-St. Louis International Airport



Source: Landrum & Brown analysis, 2011

3.5 AIR CARGO TONNAGE FORECAST

This chapter presents an overview of the air cargo industry, historical trends in air cargo at STL, and air cargo tonnage forecasts for the Master Plan years of 2013, 2018, 2023, and 2028.

3.5.1 AIR CARGO INDUSTRY

This section presents background on the air cargo industry and the factors that are needed for an airport to have a successful air cargo operation.

3.5.1.1 Air Cargo Business Partners

A successful air cargo operation is predicated upon the efficient interaction of a number of businesses with different operating requirements and facility needs. These firms have different levels of involvement based on the nature of the cargo and the markets through which it moves. In an ideal environment, most of these operations would be co-located on the airport, creating an efficient, integrated, air cargo community. Operating costs would be lower, economies of scale could be achieved, and international goods could be cleared faster and with fewer problems. The realities of limited on-airport space and higher leasing costs have required businesses to situate operations off-airport that do not require more immediate ramp access.

Freight Forwarders are exporters that serve as travel agents for a shipper's freight. These firms control the routing of about 70 percent of the international freight, and about ten percent of the domestic. A forwarder facility will typically involve a small amount of office space and about 5,000 square feet of warehouse, although some larger forwarder operations may require as much as 100,000 square feet. Still, they do not need to be on the airport nor are they usually prepared to pay higher airport leasing rates.

Customs Brokers facilitate the clearance of international cargo through local federal customs. Like forwarders, they usually maintain a small amount of office space but typically have little need for warehouse space. Customs brokers prefer instead to form alliances with trucking companies to handle any large storage requirements. They do not need to be on-airport and handle most of their business with the federal clearance agencies electronically. Like their forwarder counterparts, customs brokers are located off-airport.

Federal Agencies have dual responsibility for interdiction and facilitation. The bulk of the cargo activity involves U.S. Customs and Border Protection (CBP). Law enforcement agencies at the federal, state, and local levels all provide assistance as required. At an airport with a substantial international presence, it is absolutely, critical that these agencies have ready access to the cargo. A centralized facility where all the agencies are located together is ideal. Such an arrangement allows for rapid coordination on clearance issues and minimizes ground traffic by shippers and consignees.

Consolidators work with freight forwarders to provide assembly points for cargo prior to its delivery to a carrier on the airport. Consolidation is critical in that it creates economies of scale and reduces the shipping cost per pound to specific destinations. The ability to consolidate shipments and the frequency of flights to such a broad range of destinations are important to an airport's success in air cargo. Consolidators do not have to be on the airport, but as with forwarders and brokers, relatively easy access is important to allow for delivery of the cargo to the carriers on the airport. These operations are typically located in larger shipping regions.

Container Freight Stations are typically located off-airport and handle the breakdown of inbound international freight. Their function is similar to a consolidator in that they provide relatively inexpensive space for redistribution to a number of clients. In many instances, these operations are bonded to allow for the rapid movement of inbound cargo through the customs process. These operations are typically located in larger shipping regions.

Freighter Airlines are those carriers that specialize in heavy freight as opposed to small packages or mail. Polar, Cargolux, and Nippon Cargo Airlines are examples of such carriers. Recently, throughout the industry, there has been substantial growth in "wet leases." This kind of leasing arrangement provides carriers with an option of leasing aircraft, crew, maintenance, and insurance (ACMI) through such carriers as Atlas and Gemini. This provides additional capacity and flexibility to carriers enabling them to consider expansion to new markets.

Integrators are those carriers that operate a trucking component as well as aircraft and offer point-to-point as opposed to airport-to-airport delivery. They specialize in overnight express. Examples include FedEx, UPS, and DHL. Their business is driven by time definite delivery. Proximity to regional business districts is important to their operation. Depending on their level of activity at an airport, they tend to require substantial amounts of aircraft parking although they may not require a large amount of building space. They also frequently require large amounts of truck parking, and because they are labor intensive, they have a higher demand for employee parking.

Combination Carriers are defined as airlines that fly freighters and passenger aircraft. These carriers prefer to process both belly and freighter cargo in the same facility when possible. In rare instances, a carrier will split their belly cargo and freighter operations between airports when capacity becomes a factor.

Cargo Handling Companies operate on a contract basis providing service to carriers on the apron where they load and unload the aircraft and/or in the warehouse where they assemble or breakdown the freight. Their business is best conducted on the airport. Their revenue is generated on a fee for services basis.

Trucking Companies make up the ground component of air cargo operations. While these companies rarely lease space on an airport, it is very important that air cargo facilities be designed to accommodate trucking, including frontage, access, and roadway geometry. The trucking industry will typically service the air cargo market on a priority basis given the value of cargo. However, the trucking industry is facing substantial driver shortages in the future. It is unclear what future impacts will be.

3.5.1.2 The Nature of Air Cargo

The FAA classifies air cargo as either freight or mail. It is also typically categorized as either international or domestic. It can move in the belly of passenger aircraft or aboard all-cargo (freighter) aircraft. Most passenger airlines accommodate air cargo as a by-product to the primary activity of carrying passengers. They fill belly space in their aircraft that would otherwise be empty. The incremental costs of carrying cargo in a passenger aircraft have traditionally been negligible, and include only ground handling expenses and an increase in fuel consumption.

It is important to remember that virtually all air cargo begins or ends its journey on a truck making the ground distribution system equally critical. The design and location of airports and their cargo facilities must take this into consideration and be capable of accommodating growth in the landside component of the operation commensurate with growth on the airside.

Freight forwarders, who effectively function as booking links between manufacturers, shippers and logistics operations, along with the non-integrated carriers, control about 70 percent of international cargo. Typically, to keep costs down, they book blocks of space with carriers in the belly of passenger aircraft. The other 30 percent of air cargo is carried by the integrators who will accept shipments directly from shippers, and upon occasion, will take bookings from a forwarder. On international shipments, integrators may compete directly with airline/forwarder alliances for business but overnight delivery does not necessarily play as vital a role in international shipping as it does in domestic. Forwarders and shippers will also utilize freighters operated either independently or by the passenger carriers. In certain instances, carriers may lease freighter aircraft from a company such as Atlas or Gemini, but the numbers of such operations and their impact on airport handling requirements and infrastructure are not typically significant. One of the keys to successful international goods movement is clearance by the federal agencies. Easy and timely access for inspection is vital. If the federal agencies do not have the staffing to accommodate timely inspection and clearance, the best facilities and location in the world will not move international cargo effectively.

Domestic cargo differs dramatically from international. Domestic cargo is not regulated by customs clearance, it is dominated by the integrators with very little influence by forwarders, it has an enormous trucking component, and it creates substantial demands on the airport's aeronautical infrastructure. Integrators carry 90 percent of domestic cargo. Competition among the integrated carriers is driven by guaranteed overnight (or other time definite) delivery to almost any location. Integrators operate with a very tight shipping window to their Midwest distribution hubs; this creates a concentration of ground traffic within a region as trucks bring the packages to the airport at the last possible minute. Large volumes of domestic freight also move in the bellies of passenger aircraft. The goods are not typically as time sensitive and arrive at the cargo facilities in smaller concentrations, with much greater frequency, and without well-defined shipping windows.

In combination, these segments of the cargo business create pressure on airports to provide more a) passenger terminal capacity and proximate aircraft apron, b) expanded warehousing, Ground Service Equipment (GSE), and office space, c) a more extensive network of restricted service roads, d) more remote apron and accessing taxiways, e) building frontage, customer and employee parking, and f) improved roadway access and geometry. Very few airports are positioned to deal effectively with the future requirements of both the passenger and cargo segments of their business.

In an ideal environment, space for the on-airport cargo community would be expansive enough to include a full complement of the supporting and ancillary businesses that are important components of an air cargo operation. Geographic proximity to the carriers allows these other businesses to realize operational and financial benefits, while providing a higher level of service to their customers.

3.5.1.3 Critical Cargo Variables

A number of critical variables of goods movement by air are described below. All of these variables impact STL to some degree. Although some of the variables are not air cargo specific, they reflect changes that will eventually affect air cargo volumes and its long-term compatibility with industry needs.

Growth in the passenger markets - Global forecasts by the FAA and Boeing predict that the world passenger market could double over the next 20 years. Airports will be challenged to provide the resources to achieve targeted levels of service for both passenger and cargo growth. In instances where the capacity of an airport is exhausted, choices must be made in the allocation of resources. As a result, there may be pressure to shift the most easily relocated business segment – in most cases, cargo – to the nearest, most viable alternative airport. Over the next 5 years, cargo growth will be constrained by the airports' ability to develop new facilities and accommodate aircraft parking.

Growth in the cargo markets – Although world air cargo traffic was down more than 10 percent for the 12 months ended April 2009,[26] over the long term global forecasts call for a tripling of air cargo volumes within the next 20 years. The corollary of this air cargo growth is the potential for issues with roadway access and truck parking and the need for planning to prevent massive queuing, maneuvering, and loading problems. When combined with anticipated long term passenger growth, particularly at major gateways, the constraints of the land envelope warrant business strategies, lease management practices, and physical planning that will optimize airport access and airport property and the ability to serve customers. In many cases, airports will be unable to create additional capacity, despite their best efforts.

[26] ACI, *Freight Flash Summary,* April 2009

Key shipping windows - Two of the great myths in the industry are that air cargo aircraft operate around the clock, or only at night; this is not the case. Integrators typically schedule departures from the West Coast between 8:00 p.m. and 11:00 p.m. to reach Midwest sort facilities by midnight. Sortation occurs between 3:00 a.m. and 6:00 a.m. While not as time specific as the integrated carriers, freight carriers must also operate out of shipping windows to allow for a) coordinated pickup and delivery at local and regional destinations, b) integration of transshipments, and c) restrictive overseas airport and government controls. The result is a clustering of operations and aircraft parking requirements. This causes a peaking of demand in the early evening for aircraft parking on a daily basis.

Aircraft parking - Shipment tracking, reliability of delivery, and cost have accelerated the utilization of freighter traffic in general, and integrated carrier traffic in particular. With the increased utilization of freighters, there is a correlating need to expand apron space. Cargo carriers operate as transient commercial traffic at many airports and utilize apron space within specified windows. The result is peak demand for space followed by down time. Airports are shifting from exclusive ramp space per carrier to a common use operation and rate structure. The increased use of freighters results in flight routes focused on the main gateways. This is due to the increased volume that freighters carry and the limited number of airports that have the infrastructure to accommodate them. Freight is collected at main gateways by trucking in goods or flying small shipments on small planes known as "feeders." The feeder service brings cargo from smaller markets to the gateway airports essentially "feeding" the freighter. The increasing feeder service is creating opportunities for smaller alternate airports, known as secondary and reliever airports, to fit into the network needs of the integrators, which may lead to increased cargo volumes. On the other hand, feeder service increases airport operations and creates unique scenarios for apron use of both large aircraft and small planes.

The growth of truck substitution - One of the most difficult variables to evaluate in air cargo is the truck substitution component. Trucks have nearly replaced regional air freight service due to the cost savings and increased efficient service. Their services have expanded to provide the transport of freight to gateway airports for consolidation: a number of carriers transport cargo by truck to build their own volumes. Many air cargo facilities are operating to a greater extent than in the past as truck terminals, yet requirements to report truck-to-truck traffic are scarce.

Airports cannot realistically evaluate comprehensive space demands, effectively plan for and phase new development, or fully capture business opportunities without careful consideration of the truck substitution component. Additionally, as truck substitution continues to play a greater role, airports must address the fact that an air cargo facility is an intermodal facility, and it must be designed to accommodate trucks as well as aircraft. At some point, airports must make a determination as to whether or not the value of the trucking component outweighs the value of the land.

E-Commerce - Many of the shipments generated by home shopping networks, catalog shopping, and most recently e-commerce, require specialized facilities for efficient processing and expedited delivery. Repair of electronic equipment, computers, and telephones is a particularly active growth area. Accordingly, these shipments have a greater tendency to move by air or expedited trucking. This has accelerated demand for air cargo operations in general and freighter operations in particular. Much of this business has gone to the integrators, although there is spillover that impacts domestic belly cargo and to a greater extent, domestic trucking.

Manufacturing creep - Manufacturing facilities, particularly those focused on time sensitive products, in response to demand for faster delivery, are moving and/or locating key warehouse facilities closer to airports, or onto airports. This reduces inventory, trucking costs, and staffing requirements while increasing levels of customer service. There is also a growing tendency for industry to decentralize, or regionalize distribution.

High-speed logistics - The changes in manufacturing and shipping are giving rise to the design of new high-speed logistics facilities that can effectively integrate a number of diverse industry segments. The facilities can handle throughput and sortation, kitting (minor assembly), and returns, as well as traditional operations. These value-added distribution centers can be major job generators, in some cases approaching the employment levels of traditional manufacturing operations. However, the size of these buildings, often exceeding 500,000 square feet, makes them unlikely to occur on most airports.

Building technology – Due to the escalating cost of storing goods, and the general shortage of on-airport property, modern cargo facilities are being designed to emphasize speed of transition rather than warehousing. The result is taller buildings to handle highly mechanized equipment with sufficient depth and adequate airside and landside doors. It should be noted, however that not every air cargo operation requires sophisticated equipment. The demand is a function of the size of the operation, the nature of the cargo, the scheduling needs of the shippers and forwarders, and budget. New security requirements will necessitate facility modifications that could reduce existing floor capacity and require more internal storage at traditional gateways, creating pressure for new warehousing that cannot be met.

Aircraft technology - Modern passenger and freighter aircraft are more fuel-efficient, have greater range, and carry larger payloads than older aircraft. This trend, most clearly illustrated by the number of deliveries and orders for the passenger version of the A-380 and the Boeing 747-800F, will continue the evolution of global shipping patterns. (Airbus has delivered 13 passenger A-380s and has 198 orders as of December 31, 2008.[27] Boeing currently has orders for 78 B-747-800Fs, with the first delivery expected in the third quarter of 2010.[28]) The ability of new aircraft to over-fly traditional points of entry, as well as the

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[27] *Airbus 2008 Annual Review* (*see* Internet website: www.airbus.com)
[28] *See* Internet website: www.boeing.com

inability of many airports to accommodate the new aircraft will affect the selection of origin and destination airports. A 747-800 will carry 120 tons while a 767 carries less than half that amount. The A380 freighter program was suspended in March 2007 and currently has no customers and had been designed to off load up to 152 tons of air cargo. It is not anticipated however that the belly component of the A-380 passenger aircraft will deliver cargo volumes in excess of what is typically handled in today's routine shipments given the anticipated volumes of luggage.

Belly cargo capacity - While strong growth is expected in the passenger airline industry in the long-term, most recently the passenger airlines have decreased the number of flights they operate and have reduced the size of aircraft on many remaining flights. This has reduced the aircraft belly capacity available for cargo, which has consequently forced the diversion of cargo to trucking and dedicated freighter/integrator aircraft. Additionally, because of the more stringent application of the "known shipper rule,"[29] passenger carriers are either reluctant to, or are constrained from, accepting some freight. As a result, more freight flows through to freight forwarders, who make use of multiple modes of cargo shipment. Security requirements for cargo shipped on passenger aircraft are becoming even more stringent; The *Improving America's Security Act of 2007* was signed into law by President Bush on August 3, 2007. This law requires that 50 percent of cargo on passenger aircraft be screened by February 2009, and 100 percent be screened by August 2010. According to the FAA, "…the law will lead to increased cost and time requirements for shipment of cargo on passenger air carriers."[30] This law is very likely to result in lower belly cargo shipments.

3.5.1.4 Air Cargo Success Factors

As the industry undergoes major changes, the basic ingredients of an airport's successful air cargo operation have remained essentially intact:

Substantial passenger market - In order to accommodate high belly cargo volumes, an airport must be served by aircraft of sufficient size to accommodate cargo in the belly compartment. The regional jets used by American Airlines at STL have limited capacity for belly cargo volumes. Southwest Airlines uses Boeing 737s which can accommodate reasonable belly cargo volumes. STL is geographically well positioned to experience growth in passenger traffic but will need to have larger gauge aircraft operations to affect an impact on belly cargo.

Regional production and consumption - The large and growing population of the region, along with the City of St. Louis and the State of Missouri's promotion of logistics and related jobs could generate sufficient volumes of outbound cargo to further enhance STL's positioning as a potential commerce center. Achieving the critical mass of outbound cargo can provide the balance that is essential to the

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[29] On October 8, 2001, the FAA issued the "known shipper rule" (Emergency Amendment EA 109-01-01A). This rule requires freight forwarders to verify the legitimacy of their customers unless they had done business with the customer before September 1, 1999, and have booked at least 24 shipments with the shipper.

[30] FAA Aerospace Forecast, Fiscal Years 2008-2025

financial success of an air cargo operation. One of the keys to success will be the ability to expand the airport's catchment region to capture surrounding cargo traffic.

***Lift to a large number of markets* -** A substantial number of operations to diverse domestic markets and sufficient volumes of cargo to each destination enables shippers to consolidate shipments, reducing overall shipping rates. STL's user base could enable efficient interlining between domestic passenger and international cargo aircraft. STL has 300 daily passenger flights including 112 on American Airlines. In addition, STL is served by two of the largest integrators (FedEx and UPS), offering immediate cargo connections to the global market.

Roadway infrastructure and an effective highway distribution system – One of the side effects of air cargo growth is a corresponding increase in truck traffic and its impact on regional traffic patterns and flows. The overall growth of passenger traffic and cargo traffic has brought about the problem of congestion at many major gateways. This is not the case with STL. The airport is strategically located in the central U.S. at a major intersection of north-south and east-west highways with excellent access to the surrounding region and to the cargo areas themselves.

Physical capacity to accommodate growth - The most obvious criterion for the future success of an air cargo program is the physical capacity to accommodate the airside and landside requirements of both tenants and users. This includes aeronautical infrastructure, physical facilities, landside parking, and roadways. These will ensure that the airport functions as an intermodal facility. The airport is finalizing negotiations for the development of new cargo facilities. This new world-class infrastructure will both accommodate immediate demand and position the airport for long-term growth.

***Geographic positioning* -** STL is well positioned in the middle of the U.S. to serve as a transshipment hub for both domestic and international cargo. The Airport can function effectively as a consolidation and distribution center for both north-south and east-west movement of goods. The roadway catchment area is nearly 400,000 square miles and includes all of the mid-western states. New technology and longer-range aircraft broaden the ability of STL to serve international markets. Asian carriers are beginning to seek entry to more destinations in the central U.S. to take advantage of the ground transportation network. The Airport's location also creates a potential for interlining provided it can attract an Asian or South American carrier. The multi-continental potential combined with the existing huge domestic distribution capability is a major strength.

Bi-lateral agreements - The use of U.S. airports by foreign flag carriers is based on international trade agreements which formally grant nations and carriers access. STL will typically not be one of the first markets which international carriers seek, however, with the liberalization of cargo bi-laterals, opportunities could increase over the next five years. There is a strong economic and political will to expand the international outreach of the region.

Supporting business infrastructure - Almost 90 percent of the domestic cargo in the U.S. is controlled by the integrated carriers. Conversely, the integrators' role in international shipping is much smaller with freight forwarders and customs brokers controlling approximately 70 percent of that market. These segments of the industry typically position facilities on or near the transportation facility they wish to utilize. There are over fifty freight forwarders and customs brokers located in the St. Louis MSA, including international forwarders BAX Global, Schenkers International, Eagle, Expeditors International, Nippon Express, and Panalpina. There are also more than 250 trucking firms in the same area, offering competitively priced distribution and consolidation to virtually every location in North America.

3.5.2 AIR CARGO INDUSTRY TRENDS

The cargo industry has become a nearly seamless global operation connecting nations. Countries like China and India are changing the manufacturing supply chain network and effecting business markets. Their influences have led to new products being brought to the market, new carriers emerging, new route development, and the development of cargo operations at airports that previously were not heavily involved in that segment of the aviation industry. The actual process of moving products around the world, known as logistics, is evolving rapidly, causing the industry to experience growing pains. Leading this expansion is the sense of urgency created from increasing e-commerce shipping and high speed logistics. Airports will be forced to re-evaluate how they do business to adapt to the influences of the dynamic freight industry. Airports are a point of service for both passenger and cargo traffic. These services have changed over the past five years due to terrorist attacks, the severe acute respiratory syndrome (SARS) virus, wars, labor issues, and a steady increase in fuel prices. The carrier-driven operational changes are causing airports to revise their strategic goals, market priorities, and cargo capacity. The air cargo community, made up of freight forwarders, custom brokers and truckers, is changing as a result of mergers, acquisitions, global manufacturing expansion, and security issues.

The FAA, Boeing, and Airbus publish cargo forecasts on a regular basis. These forecasts were consulted to provide an understanding of historical and future cargo trends at a national and international level.

3.5.2.1 Historical Trends

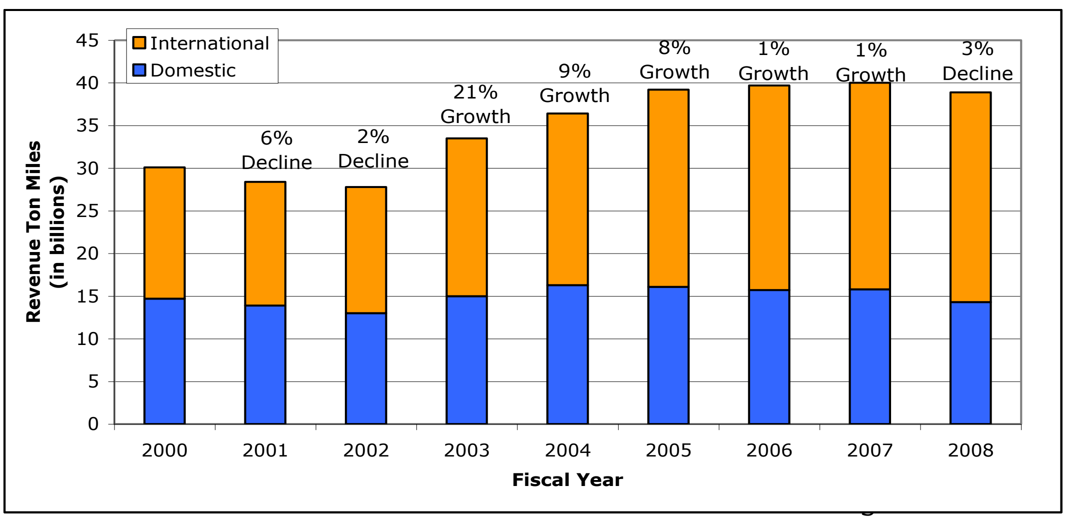
The air cargo industry has experienced many changes in the last decade. The general U.S. economic downturn that began in 2000 adversely affected U.S. air cargo activity. After the terrorist attacks of September 11, 2001, cargo activity in the U.S. was immediately impacted. Critical impacts included the increased use of trucks, an escalation of insurance costs, consolidation among smaller firms, the failure of many small cargo airlines and smaller support firms, higher security costs, longer processing time because of security, and increased available freighter capacity which drove down rates. The cargo industry recovered by 2003 and posted strong growth for several years.

Growth in U.S. air cargo activity began to slow down in 2006 as the price of oil surged to record high levels (ultimately peaking at almost $147 per barrel in July 2008), causing shipping by other modes to become more attractive. While oil prices declined significantly in the fourth quarter of 2008, economic activity deteriorated in late 2008 and the resulting global recession limited the positive impact of the lower oil prices. In fact, the 2 largest cargo carriers at STL (FedEx and UPS) both experienced a decrease in domestic volumes in 2008:

- FedEx reports on a fiscal year ending May 31. FedEx Express average daily domestic volumes were down two percent and three percent in the third[31] and fourth[32] quarters of fiscal year 2008, respectively, compared to the same period in fiscal year 2007. Domestic volumes fell further through November of 2008 compared to the same period in 2007 (a decline of five percent and eight percent in the first[33] and second[34] quarters of fiscal year 2009).[35]
- UPS saw a shift away from its premium air products to ground in calendar year 2008. UPS average daily domestic air volumes fell 5.2 percent in 2008 over 2007. Next day domestic air volumes were down 7.1 percent in 2008 while deferred domestic air volumes were down 2.8 percent in 2008. Conversely, UPS international volumes were up 3.7 percent in 2008.[36]

Exhibit 3.5-1, *Historical Revenue Ton Miles* illustrates the historical growth by U.S. cargo carriers as measured in revenue ton miles (RTMs).

Exhibit 3.5-1
HISTORICAL REVENUE TON MILES (Revenue Ton Miles)
U.S. COMMERCIAL CARGO CARRIERS
Lambert-St. Louis International Airport



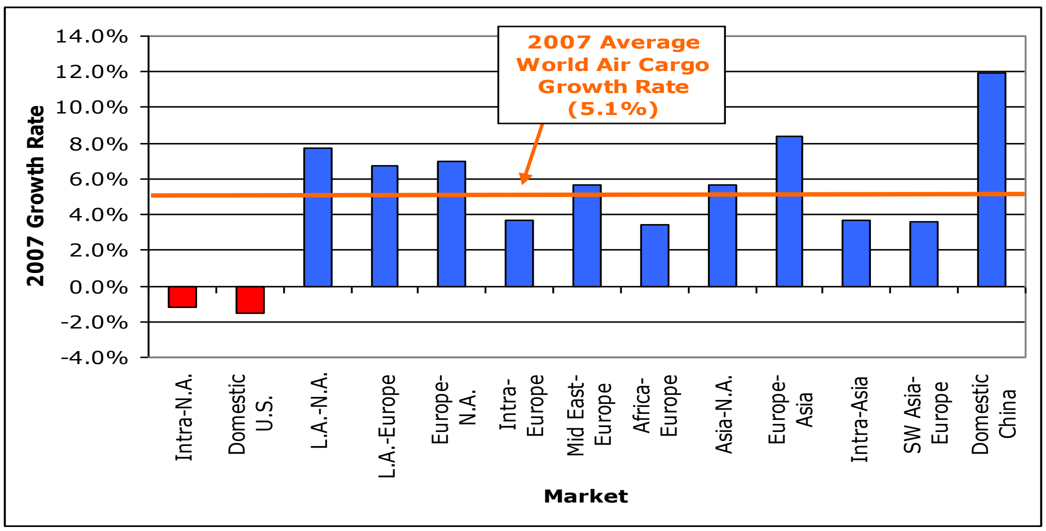
Sources: *FAA Aerospace Forecast*, Fiscal Years 2006-2017 and 2009–2025; Landrum & Brown analysis, 2011

31 December 1, 2007 – February 29, 2008
32 March 1, 2008 – May 31, 2008
33 June 1, 2008 – August 31, 2008
34 September 1, 2008 – November 30, 2008
35 *See* Internet website: http://ir.fedex.com/releases.cfm
36 *UPS 2008 Annual Report*

In contrast, intra-North America cargo traffic shrunk by 1.2 percent and the domestic U.S. market declined by 1.5 percent in 2007 (*see* **Exhibit 3.5-2, *2007 Air Cargo Growth by Major Market***). International shipments to and from the U.S. increased as the Latin America-North America, Europe-North America, and Asia-North America markets all experienced growth in 2007 that exceeded the world average. The highest growth market in 2007 was the domestic China market (almost 12 percent growth over 2006).

Worldwide cargo activity for 2008 was not available at the time of this analysis, however, early reports from the carriers "point to either continuing weak or negative growth."[37]

Exhibit 3.5-2
2007 AIR CARGO GROWTH BY MAJOR MARKET
(Revenue Tonne Kilometers)
Lambert-St. Louis International Airport



Source: *Boeing World Air Cargo Forecast 2008-2009*

3.5.2.3 Forecast Trends

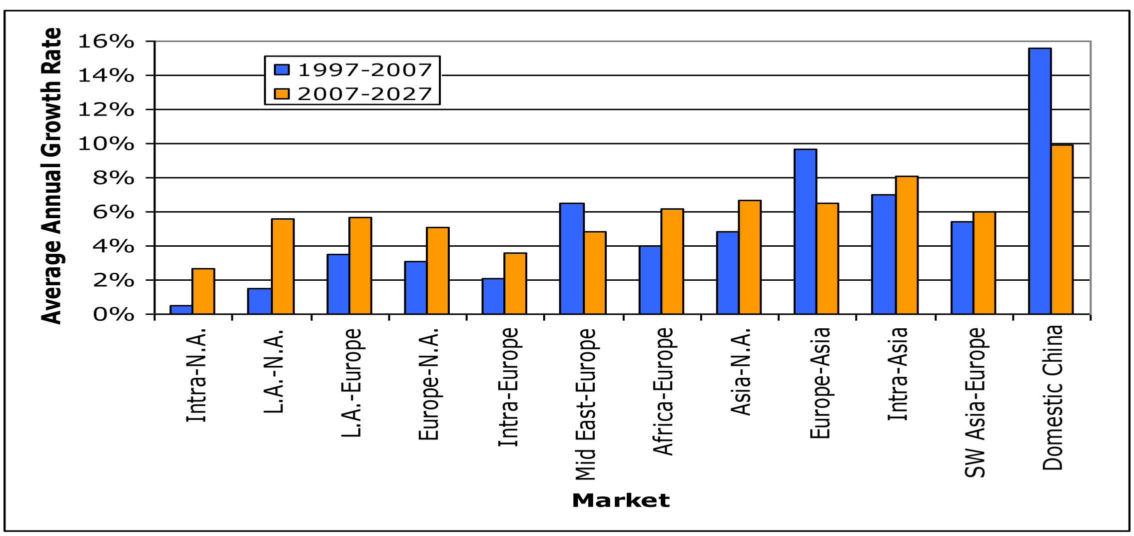
In spite of the current downturn, the Airbus, Boeing, and FAA forecasts all predict positive growth in the future:

- The 2007-2026 Airbus forecast is based on 2006 data. Airbus expects world cargo, measured in freight tonne kilometers (FTK), to grow at an average annual rate of 5.8 percent from 2007 to 2026. The U.S. domestic cargo market is expected to grow at an annual rate of 2.8 percent from 2007 to 2026, with faster growth of 3.0 percent annually occurring from 2007 to 2016.[38]

37 Boeing *World Air Cargo Forecast 2008-2009*, Introduction
38 *Airbus Global Market Forecast, 2007-2026*

- Boeing's 2008-2009 base forecast predicts world air cargo traffic (measured in RTKs) will grow at a rate of 5.8 percent annually from 2007 to 2027, with most of the growth in Asian markets (*see* **Exhibit 3.5-3, *Boeing Average Annual Air Cargo Growth Rates by Major Market***). Boeing's high forecast predicts world growth of 6.7 percent annually while the low forecast calls for 4.8 percent average annual growth. Boeing's base forecast predicts the domestic U.S. market will grow at an average annual rate of 2.6 percent through 2027. Boeing's high forecast for the U.S. domestic market calls for 2.7 percent average annual growth while the low forecast predicts 2.4 percent average annual growth from 2007 to 2027.[39] The Boeing forecast acknowledges the current economic crisis. In spite of the global recession, the Boeing forecast anticipates that world air cargo growth will return to historic levels based on "the continuing globalization of the industry, increasing adoption of inventory-reduction strategies, and anticipated operating cost reductions in the freighter fleet…"[40]
- The FAA's most recent forecast was published in early 2009. The FAA forecasts domestic U.S. cargo RTMs will drop by 8.3 percent in 2009, grow by 2.5 percent in 2010, and then increase at an annual rate of 2.4 percent from 2010 to 2025. The resulting annual growth rate for the 2008 through 2025 period is 1.8 percent. The FAA expects the all-cargo (freighter) share of domestic cargo to increase to 88.4 percent by 2025, from 85 percent in 2008.[41]

Exhibit 3.5-3
BOEING AVERAGE ANNUAL AIR CARGO GROWTH RATES BY MAJOR MARKET
(Revenue Tonne Kilometers)
Lambert-St. Louis International Airport



Source: Boeing *World Air Cargo Forecast 2008-2009*

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39 *Boeing World Air Cargo Forecast 2008-2009*
40 *Boeing World Air Cargo Forecast* 2008-2009
41 *FAA Aerospace Forecasts, Fiscal Years 2009-2025*

In addition to the industry forecasts, the 2008 Annual Reports for FedEx and UPS (STL's largest cargo carriers) were also reviewed in order to estimate the impact of the global recession on cargo volumes in 2009. FedEx does not anticipate "significant improvement in the U.S. economy" in fiscal year 2009 and expects "…U.S. domestic shipping volumes to remain at the pre-2000 levels experienced in the fourth quarter of (fiscal year) 2008."[42] In fact, FedEx Express domestic shipments in the second half of calendar year 2008 decreased even further than FedEx had projected in June of 2008. UPS expects continued declines in volumes in calendar year 2009 and believes "…2009 will be even more difficult than 2008." [43]

3.5.3 AIR CARGO AT STL

STL's existing role in the cargo logistics chain is to facilitate the shipment of freight to and from the St. Louis metro area (i.e. it does not function as a cargo hub for an airline). **Table 3.5-1, *2008 Air Cargo Market Share Summary (in metric tonnes)***, shows the air cargo volumes by carrier type at STL in 2008. According to airport records, almost 89 percent of air cargo at STL was carried by all-cargo operators while the remainder was transported in the belly compartments of passenger aircraft.

Table 3.5-1
2008 AIR CARGO MARKET SHARE SUMMARY (in metric tonnes)
Lambert-St. Louis International Airport

Airline	Freight	Mail	Total Air Cargo	Percent of Total
All Cargo				
Fedex	38,730	-	38,730	47.8%
UPS	1,604	17,071	18,675	23.0%
Capital Cargo	9,629	-	9,629	11.9%
ASTAR	4,890	-	4,890	6.0%
Total	**54,853**	**17,071**	**71,924**	**88.7%**
Passenger				
American	757	3,062	3,819	4.7%
Southwest	3,109	-	3,109	3.8%
Other	1,032	1,195	2,228	2.7%
Total	**4,898**	**4,258**	**9,155**	**11.3%**
Total Cargo	**59,751**	**21,328**	**81,080**	**100.0%**

Sources: Airport Records; Landrum & Brown analysis, 2011

[42] *FedEx Corporation Annual Report 2008*, June 24, 2008 (*see* Internet website: http://ir.fedex.com/annuals.cfm)

[43] UPS *2008 Annual Report*, Letter to Shareholders (*see* Internet website: http://investor.shareholder.com/ups/index.cfm)

The all-cargo carriers serving STL include:

- **FedEx** – FedEx accounted for the largest share of air cargo (47.8 percent of total air cargo) in 2008. Virtually all of the cargo processed by FedEx (over 99 percent) at STL is loaded or unloaded from flights to its hubs in Indianapolis and Memphis.
- **UPS** - UPS is the second largest cargo carrier at STL with a 23.0 percent market share in 2008. As with FedEx, over 99 percent of the cargo transported at STL is on flights to and from its Louisville, Kentucky and Rockford, Illinois hubs.
- **Other Cargo Airlines** - In 2008, STL was also served by Capital Cargo (which was acquired by ABX in November of 2007) and ASTAR Air Cargo. Together, these carriers accounted for almost 18 percent of the cargo volumes at STL in 2008. ABX's main customer is DHL. ASTAR's target customers are DHL Worldwide Express and the U.S. Air Force. DHL ceased all U.S. ground and air cargo services in 2008.

In 2008, approximately 9,160 metric tons of air cargo was transported in the belly compartments of passenger airlines at STL. American and Southwest Airlines together accounted for almost 76 percent of the STL belly cargo in 2008.

3.5.4 STL CHINA INITIATIVE

As discussed in Section 2.6.2, much of the growth in the cargo industry over the next 20 years will be in the international markets. The domestic U.S. market is relatively more mature and, while domestic growth is expected to be positive, international markets, especially China, are expected to grow the fastest. As a result, the State of Missouri, the City of St. Louis, STL, and private firms within the region have formed the China Hub Exploratory Group (the China Group). The China Group has been exploring the feasibility of creating a Chinese center for logistics and trade development in the central U.S. The China Group envisions commercial development with a Chinese air cargo operator with direct service to China at its core. This concept would capitalize on the major strengths of the airport and the region and would integrate both air cargo and logistics facility development. This would position the region to accommodate the transshipment of international goods and the creation and growth of an origin and destination base for products shipped by air. Such an operation would allow the region to extend interconnectivity to Europe and Latin America. If successful, this would solidify St. Louis as a full-scale consolidation and distribution center.

In order for this type of development to occur, the success factors discussed in Section 2.6.1.4 must be addressed. Any international air carrier that initiates direct service at STL will consider costs, profits, and a balance of inbound and outbound volumes in its decision.

Regional competition for international air cargo service must also be considered. Air China has an established operation in Chicago O'Hare (ORD) – a major gateway. This represents a competitive challenge for efforts to redirect or expand operations to STL. In spite of the competition at Chicago O'Hare, nearby MidAmerica Airport is expanding its international cargo service. MidAmerica recently announced the initiation of connecting goods movement between China and South America. Under the proposed operating scenario, China will send a plane carrying electronics and computer goods to ORD, from which the cargo will then be trucked to MidAmerica. From MidAmerica, the cargo will be flown to Miami International Airport (MIA) for subsequent transport and distribution throughout South America. On October 30, 2008, flowers from South America (Bogotá, Colombia) were flown to MidAmerica, stored in the on-airport refrigerated warehouse, and distributed to floral wholesalers completing the first international delivery to the airport. These flights are now scheduled to occur on a weekly basis. It is contemplated that International Harvester and Caterpillar equipment parts will also be flown to MIA for shipment to Latin America. This new service at MidAmerica Airport confirms that the international air cargo industry sees some market potential in the region and that there are potential initiatives that could help create changes in logistics operations to help STL succeed.

As an initial component of the planning by the China Group, a survey of the major freight forwarders in the region was conducted as part of this Master Plan Update to develop a strategic context from which potential issues and next steps could be identified. The survey found that STL could easily accommodate three B-747 flights per week. Increased frequencies and low costs would not only attract a new market but also help retain it. However, two major obstacles were identified:

- The headquarters of most major forwarders control the routing and selection of gateway city from which all international traffic is exported. Unless there is some extraordinary change in the regional shipping dynamic it would appear that displacing ORD would be challenging.
- Trucking to STL rather than to ORD could result in higher shipping costs. Currently truckers can maximize shipments to ORD because of the multiple destinations and flights. Without this diversity at STL, there will be less demand for truck capacity, less trucked volumes, and higher costs.

Because of the uncertainty of this initiative, the forecast for the Master Plan will be based on a continuation of the current role of STL without any new international service. The Master Plan will however consider the potential impacts of the China Initiative.

3.5.5 AIR CARGO TONNAGE FORECAST

The forecast is predicated on the assumption that the structural changes to the air cargo industry discussed in this chapter are permanent and that emerging trends for air cargo security will continue. Additionally, it is assumed that long-term economic growth in the STL Air Service Area and the broader U.S. economy will increase the demand for the shipment of goods and services over the forecast period. The air cargo tonnage forecast also reflects the current global economic recession in the short-term.

The forecast represents a continuation of the airport's current role. Virtually all the air cargo tonnage at STL leaves on domestic flights. The forecast assumes STL will continue to act as a spoke airport serving the integrators' hubs and the majority of air cargo will be domestic in nature. As a result, the higher growth rates that industry analysts have projected for the international markets are not expected to apply at STL. The FAA, Boeing, and Airbus forecasts expect domestic growth to range from 2.6 percent to 3.0 percent annually. The Boeing forecast was deemed the most appropriate forecast to use for STL as it aligned more closely with the anticipated economic growth in the St. Louis economy. The Boeing forecast predicts the U.S. domestic market will grow at a rate of 2.6 percent annually through 2027. Boeing forecasts faster growth in the first 10 years (2.9 percent annually) than in the 2017 to 2027 period (2.3 percent per year).

Before applying the long-term growth rates from the Boeing forecast, the short-term effects of the global recession on STL cargo volumes were analyzed. Total cargo volumes for the year 2008 were down 2.6 percent over 2007 based on airport traffic reports. STL cargo volumes in the first quarter of 2008 were actually

up 5.6 percent over 2007. However, cargo volumes fell by 2.8 percent in the second quarter and by 3.2 percent in the third quarter. Cargo volumes fell significantly in the fourth quarter of 2008 – by 10.6 percent.

Both FedEx and UPS expect calendar year 2009 to be challenging, especially for domestic shipments. As a result, due to STL's role of major feeder to FedEx and UPS hub, cargo volumes are forecast to decline by 10 percent in 2009. The economy is expected to rebound and STL cargo volumes are forecast to experience positive growth during the recovery period estimated to occur from 2010 to 2012 (2.0, 4.0, and 4.0 percent, respectively). The Boeing forecast growth rates (2.9 percent per annum through 2017; 2.3 percent annually thereafter) were applied beginning in 2013; resulting in total STL cargo volumes increasing to 119,270 metric tons in 2028 (*see* **Table 3.5-2, *Air Cargo Tonnage Forecast (in metric tonnes)***).

Belly cargo volumes have declined at STL since 2002 due to the downsizing of the American Airlines' fleet from narrow-body aircraft to regional jets that have less belly cargo capacity. The share of belly cargo at STL has declined from a high of 38.5 percent in 2002 to 11.3 percent in 2008. This reduction in belly cargo share is consistent with national trends. According to FAA statistics, the domestic U.S. all-cargo share has increased from 65.4 percent in 1997 to 85 percent in 2008. The FAA predicts that the all-cargo share for the U.S. as a whole will increase to 88.4 percent by 2025 due to increases in the capacity of cargo aircraft and new security regulations.[44]

As a result of the new security regulations, belly cargo volumes at STL are forecast to drop by more than half by 2012. The cargo that in the past has been transported in the belly of passenger aircraft is expected to shift to all-cargo aircraft. This results in the all-cargo share at STL increasing to 95.5 percent in

[44] *FAA Aerospace Forecasts, Fiscal Years 2009-2025*, page 39

2012. The all-cargo share is forecast to remain at this level through 2028. As a result, all-cargo volumes are forecast to increase from 71,924 metric tons in 2008 to 113,870 metric tons by 2028. Belly cargo volumes will decrease from 9,155 metric tons in 2008 to 5,400 tons in 2028.

Table 3.5-2
AIR CARGO TONNAGE FORECAST (in metric tonnes)
Lambert-St. Louis International Airport

Calendar Year	Belly	All-Cargo	Total	Percent All-Cargo
History				
2008	9,155	71,924	81,080	88.7%
Forecast				
2013	3,750	79,090	82,840	95.5%
2018	4,300	90,710	95,010	95.5%
2023	4,820	101,640	106,460	95.5%
2028	5,400	113,870	119,270	95.5%
Average Annual Growth Rate:				
08-13	-16.3%	1.9%	0.4%	
13-18	2.8%	2.8%	2.8%	
18-28	2.3%	2.3%	2.3%	
08-28	-2.6%	2.3%	1.9%	

Source: Landrum & Brown analysis, 2011

3.6 AIRCRAFT OPERATIONS FORECAST

Aircraft operations, defined as arrivals plus departures, were forecast separately for the four major categories of users at STL: commercial passenger airlines, commercial all-cargo carriers, civil aviation, and military.

3.6.1 COMMERCIAL PASSENGER OPERATIONS

Passenger aircraft operations were derived from the enplaned passenger forecasts. The aggregate number of commercial operations at an airport depends on three factors: total passengers, average aircraft size, and average load factor (percent of seats occupied). The relationship is shown in the equation below.

$$\text{Operations} = \frac{\text{Total Passengers}}{\text{Average Load Factor x Average Aircraft Size}}$$

This relationship permits literally infinite combinations of load factors, average aircraft size, and operations to accommodate a given number of passengers. In order to develop reasonable load factor and aircraft gauge assumptions, commercial passenger operations were disaggregated into the same broad categories of activity as in the enplaned passenger forecast. Passenger operations were first segmented into domestic and international operations. Domestic operations consist of all scheduled and non-scheduled activity by passenger airlines in which the immediate down line city on departure or up line city on arrival is in the continental U.S., Alaska, Hawaii, or a U.S. territory.

Domestic passenger operations were further divided into domestic air carrier operations and domestic commuter operations. The breakout of domestic commuter service is based on the individual carrier's mode of operation (i.e., providing regional feed to its major airline partners, generally within 300 miles) and certification with the FAA. These commuter carriers typically operate turboprop and regional jet aircraft.

The fundamental approach to deriving the passenger operations forecast is essentially the same at all airports. However, the underlying assumptions at each airport are inherently different due to differences in how airlines choose to serve the demand for air travel to, from, and over each airport. These differences may result, for example, from a strategic focus on unit revenues versus unit costs, or an emphasis on a hub-and-spoke system versus a point-to-point operation.

A number of sources were used to develop the historical passenger operations, load factor, and aircraft gauge data. The Official Airline Guide (OAG); the FAA Air Traffic Activity System (ATADS); and U.S. Department of Transportation (USDOT) Schedule T-100 data were all used to develop total departures and the number of departing seats for each segment. Average seats per departure (ASPD or gauge) for each of the major groups of passenger activity were calculated from total departures and total departing seats. Aircraft load factors were calculated for each group of passenger operations by dividing total enplaned passengers by total departing seats. To calculate total operations, the total number of departures was multiplied by a factor of two.

3.6.1.1 Gauge and Load Factor Assumptions

Table 3.6-1, *Gauge and Load Factor Assumptions*, presents the ASPD and load factor assumptions for each segment of passenger activity.

DOMESTIC AIR CARRIER GAUGE AND LOAD FACTOR ASSUMPTIONS

Domestic air carrier gauge increased from 125 in 1995 to 142 seats per departure in 2002. Thereafter, ASPD for domestic air carrier flights fluctuated within a relatively narrow band between 134 and 142 seats per departure. This reflects the historical deployment of narrow-body jet aircraft at STL in the 135-seat to 145-seat range, such as the Boeing 737-300/700 by Southwest and MD80 aircraft operated by TWA and then American. Southwest Airlines, which accounts for the largest proportion of the domestic air carrier operations at STL, currently operates only three sizes of B737 aircraft and has no stated plans to diversify its fleet in the future. Similarly, the second largest air carrier airline at STL (American) currently operates only two aircraft types (MD80s and Boeing 757s) at the airport. Indeed, the assumed evolution of the domestic air carrier fleet at STL is primarily towards similarly sized, next generation replacement aircraft (e.g. Boeing 737-700 replacing Boeing 737-300 aircraft or Boeing 737-800 replacing MD80 aircraft) rather than wholesale fleet changes. The following assumptions were made as a basis for the domestic air carrier commercial passenger operations forecast:

- Southwest will continue to replace its B737-300s and B737-500s with B737-700s.
- By 2013, MD-80 and MD-90 aircraft will be replaced by more fuel efficient B737-800 aircraft (American, Delta).
- By 2013, American will have phased out its B757s and replaced them with B737-800s.
- Other airlines at STL will focus their fleet on A319s and A320s (Delta/Northwest, Frontier, United and US Airways), as well as B737-700s (AirTran).
- There will be a shift from small regional jets (less than 60-seat aircraft according to the FAA definition) to larger regional jet aircraft (more than 60-seat aircraft) over the forecast period as major domestic commuter airlines upgauge their fleet).[45]

As a result of these assumptions, the domestic air carrier gauge is forecast to decrease from 139 seats in 2008 to 137 seats in 2009. Over the forecast period, the domestic air carrier fleet is projected to average about 139 seats per flight.

[45] Scope clauses limit the ability of American to operate larger regional jets.

Table 3.6-1
GAUGE AND LOAD FACTOR ASSUMPTIONS
Lambert-St. Louis International Airport

Calendar Year	Average Seats Per Departure: Domestic Air Carrier	Domestic Commuter	International Air Carrier	International Commuter	Total
History					
1995	124.8	27.6	227.3	50.0	102.0
2000	134.1	35.4	151.7	50.0	112.2
2001	132.4	37.6	169.2	49.9	108.0
2002	141.9	39.3	193.3	48.8	108.8
2003	141.5	40.4	196.6	50.0	96.7
2004	134.4	41.7	190.0	50.0	82.6
2005	138.9	42.5	162.2	50.0	82.9
2006	139.3	45.3	159.8	50.0	86.5
2007	139.0	49.0	150.7	50.0	92.9
2008	139.3	48.5	165.0	50.0	93.0
Forecast					
2013	139.1	49.8	162.9	50.0	94.4
2018	139.6	50.4	168.6	50.0	95.3
2023	139.1	51.0	170.3	50.0	95.8
2028	139.1	51.7	174.0	50.0	96.6
Average Annual Growth Rates					
95-08	0.8%	4.4%	-2.4%	0.0%	-0.7%
08-28	0.0%	0.3%	0.3%	0.0%	0.2%

Calendar Year	Load Factor: Domestic Air Carrier	Domestic Commuter	International Air Carrier	International Commuter	Total
History					
1995	56.1%	49.5%	56.1%	49.6%	55.7%
2000	62.7%	53.3%	88.7%	69.3%	62.3%
2001	56.5%	52.2%	71.3%	67.7%	56.3%
2002	58.7%	60.5%	62.8%	48.9%	58.9%
2003	59.8%	61.3%	67.7%	96.9%	60.4%
2004	66.9%	62.2%	63.4%	51.8%	65.5%
2005	69.9%	66.1%	72.8%	67.3%	68.8%
2006	72.4%	69.5%	74.1%	68.3%	71.5%
2007	72.9%	72.0%	76.3%	65.2%	72.7%
2008	70.2%	69.2%	88.0%	55.0%	70.0%
Forecast					
2013	71.0%	68.6%	84.1%	55.8%	70.5%
2018	71.6%	69.6%	81.5%	57.0%	71.2%
2023	72.2%	70.6%	80.3%	58.3%	71.8%
2028	72.8%	71.6%	79.5%	59.5%	72.5%
Average Annual Growth Rates					
95-08	1.7%	2.6%	3.5%	0.8%	1.8%
08-28	0.2%	0.2%	-0.5%	0.4%	0.2%

Sources: Airport Records; *Official Airline Guide*; USDOT, Schedule T-100; Landrum & Brown analysis, 2011

Domestic air carrier load factors have increased from about 56 percent in 1995 to 73 percent in 2007. The average domestic air carrier load factor decreased to 70 percent in 2008, reflecting the sharp decline in air travel demand in the latter half of 2008. The average domestic air carrier load factor is expected to increase to 72 percent in 2009, reflecting a continued tightening of airline capacity. During the recovery period (2010-2013) domestic air carrier load factors are forecast to decrease slightly as the airlines increase capacity back to 2008 levels. Domestic air carrier load factors are forecast to range between 71 percent in 2013 to 73 percent in 2028.

DOMESTIC COMMUTER GAUGE AND LOAD FACTOR ASSUMPTIONS

The domestic commuter ASPD grew from 28 seats per departure in 1995 to 49 seats per departure in 2008 due to increased deployment of regional jets at STL. In the mid-1990s, airlines used mainly small turboprop equipment (19-seat to 30-seat aircraft) such as Jetstream 31 and Embraer 120. By the beginning of the 21st century, the airlines had shifted from these small turboprop aircraft to larger 30-seat to 50-seat regional jet aircraft. During this period, domestic commuter load factors increased drastically from 50 percent in 1995 to 72 percent in 2007 before declining to 69 percent in 2008.

Larger regional jets in the 70-90 seats range are increasingly used by airlines in the United States. However, American Airlines has one of the stricter mainline pilot scope clauses that limit the size and number of aircraft regional partners can operate. Consequently, it is assumed that while upgauging to larger regional jet aircraft will occur at STL, 34-seat to 50-seat regional jets will continue to be an important component of the commercial passenger fleet at the airport.

Based on these assumptions, the average domestic commuter aircraft gauge is expected to increase to 52 seats per departure by 2028. Over the forecast period, it is assumed that the average load factor for domestic commuter activity will increase to 72 percent by 2028.

INTERNATIONAL AIR CARRIER GAUGE AND LOAD FACTOR ASSUMPTIONS

Since 1995, the international air carrier ASPD has varied significantly depending on the service offerings. International gauge has fallen from 227 seats per departure in 1995 to 165 in 2008. This reflects the use of B767 and MD80 aircraft by TWA in the late 1990s, followed by a greater use of A320s and B737s in the 21st century by USA3000 and Ryan International Airlines.

International air carrier load factors have also varied significantly depending on the airline(s) offering the international service. Load factors have increased from a low of 56 percent in 1995 to 88 percent in 2008.

Frontier and Ryan International dropped scheduled international service from STL in 2008, leaving USA 3000 as the sole provider of scheduled international air carrier service in 2009. The enplaned passenger forecast assumes travel to Latin America will develop by 2014 with a mix of A319 and A320 aircraft, and European destinations will be introduced by 2015 with B763s. As a result, STL will see its international air carrier fleet focus mainly on A319/A320 aircraft and partially upgauge to wide-body aircraft after 2015. As a result, the international air carrier ASPD ratio is expected to increase to 174 seats per departure by 2028. International load factors are expected to decrease over the forecast period from 88 percent in 2008 to 80 percent in 2028 as new service is added.

INTERNATIONAL COMMUTER GAUGE AND LOAD FACTOR ASSUMPTIONS

Air Canada Jazz currently provides the only international commuter service from STL and exclusively serves Canada using 50-seat regional jets. TWA/AA operated some international commuter flights to Canada from 2001 to 2003 using 44-seat to 50-seat regional jets. Over the forecast period, it is assumed that Air Canada Jazz will be the only international commuter airline at STL. As a result, the international commuter ASPD is expected to remain at 50 through 2028. International commuter load factors are expected to increase from 55 percent in 2007 to 60 percent by 2028.

3.6.1.2 Commercial Passenger Operations Forecast

The result of the foregoing assumptions regarding load factor and ASPD is that domestic air carrier operations are forecast to grow from 107,030 operations in 2008 to 141,800 operations by 2028, representing average annual growth of 1.4 percent (*see* **Table 3.6-2, *Commercial Passenger Operations Forecast***). Domestic commuter operations are expected to increase from 112,052 operations in 2008 to 136,400 operations by 2028 (average annual growth rate of 1.0 percent).

Table 3.6-2
COMMERCIAL PASSENGER OPERATIONS FORECAST
Lambert-St. Louis International Airport

Calendar Year	Commercial Passenger				
	Domestic		International		
	Air Carrier	Commuter	Air Carrier	Commuter	Total
History					
1995	343,578	107,486	1,300	222	452,586
2000	337,774	95,784	2,378	2,186	438,122
2005	106,002	149,206	1,712	1,182	258,102
2006	105,626	137,336	1,696	1,186	245,844
2007	109,418	115,988	1,828	1,286	228,520
2008	107,030	112,052	1,086	1,242	221,410
Forecast					
2013	109,800	111,000	1,520	1,620	223,940
2018	120,600	120,400	2,040	1,900	244,940
2019	122,600	121,800	2,120	1,920	248,440
2023	131,000	128,200	2,460	1,980	263,640
2028	141,800	136,400	2,860	2,020	283,080
Average Annual Growth Rates					
95-08	-8.6%	0.3%	-1.4%	14.2%	-5.4%
08-28	1.4%	1.0%	5.0%	2.5%	1.2%

Sources: Airport Records; *Official Airline Guide*; USDOT, Schedule T-100; Landrum & Brown analysis, 2011

International air carrier operations are expected to grow 5.0 percent per year from a relatively low base to reach 2,860 operations by 2028. International commuter operations are forecast to grow from 1,242 operations in 2008 to 2,020 operations by 2028 (2.5 percent growth annually).

3.6.1.3 Commercial Passenger Fleet Mix

Once the operations forecast was developed for domestic air carrier, domestic commuter, international air carrier, and international commuter activity, a top-down approach was employed to allocate these operations to aircraft groups and specific aircraft types. The fleet mix was developed to match the ASPD targets for each of the four components of commercial passenger demand presented in the previous subsections. The process of developing the fleet mix allowed for the calibration of those assumptions and, where appropriate, modifications were made prior to finalizing the assumptions presented in the preceding subsections.

The allocation of domestic commercial passenger operations by aircraft type is shown in **Table 3.6-3, *Domestic Commercial Passenger Operations Fleet Mix***. The primary assumptions underpinning the fleet mix forecast for the three scenarios are:

- Narrow-body jet activity is expected to continue to account for the predominant share of domestic passenger operations at STL. The continued expansion of Southwest Airlines operations is assumed to account for much of the increase in narrow-body jet activity. As a result, narrow-body aircraft are expected to make up 51 percent of domestic passenger operations by 2028.
- By 2013, there will be a shift in the fleet of the legacy airlines (American and Delta mainly), retiring all MD80s and MD90s and replacing these aircraft with more fuel-efficient aircraft such as B737-800s.
- By 2013, B757s will be retired and replaced by B737-800s (American).
- By 2014, all B737-300s and B737-500s will have been replaced by B737-700s (Southwest).
- Large regional jet aircraft will continue to account for an increasing share of passenger operations. It is assumed that the operating advantages of these aircraft over smaller regional jets will make large regional jets increasingly attractive to commuter airlines and their mainline partners. The population of large regional jets is expected to increase its share of passenger operations, reaching 13.7 percent in 2028 vs. 6.4 percent in 2008.
- Smaller regional jets will continue to account for an important component of the passenger fleet due to American's continued hubbing operation at STL and limitations on large regional jets for to its mainline pilot scope clause.
- Turboprop aircraft are expected to remain a small part of the STL domestic commercial aircraft fleet through 2028, operated exclusively by Great Lakes.

Table 3.6-3
DOMESTIC COMMERCIAL PASSENGER OPERATIONS FLEET MIX
Lambert-St. Louis International Airport

		Aircraft Operations						Percent of Total Aircraft Operations					
Aircraft Type	**Gauge**	**2008**	**2009**	**2013**	**2018**	**2023**	**2028**	**2008**	**2009**	**2013**	**2018**	**2023**	**2028**
Wide Body Jet		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Narrow Body Jet													
757	190	6,834	2,753	-	-	-	-	6.4%	2.9%	-	-	-	-
320	168	1,679	460	1,000	1,000	1,000	1,000	1.6%	0.5%	0.9%	0.8%	0.8%	0.7%
738	148	109	-	35,200	39,800	43,000	46,600	0.1%	-	32.2%	33.0%	32.8%	32.9%
M80/M83/M88	140	31,944	29,326	-	-	-	-	29.8%	31.1%	-	-	-	-
73G	137	21,228	21,611	47,600	67,200	72,400	78,000	19.8%	22.9%	43.5%	55.7%	55.3%	55.0%
733	137	28,126	25,154	11,600	-	-	-	26.3%	26.7%	10.6%	-	-	-
319	129	3,034	3,539	11,000	10,600	11,800	12,600	2.8%	3.8%	10.1%	8.8%	9.0%	8.9%
DC9	125	5,346	3,487	-	-	-	-	5.0%	3.7%	-	-	-	-
735	122	4,624	4,430	-	-	-	-	4.3%	4.7%	-	-	-	-
318	120	436	686	-	-	-	-	0.4%	0.7%	-	-	-	-
717	117	3,185	2,664	1,800	-	-	-	3.0%	2.8%	1.6%	-	-	-
E90	100	294	-	1,200	2,000	2,800	3,600	0.3%	-	1.1%	1.7%	2.1%	2.5%
Other		191	90	-	-	-	-	0.2%	0.1%	-	-	-	-
Total		**107,030**	**94,200**	**109,400**	**120,600**	**131,000**	**141,800**	**48.9%**	**49.3%**	**49.7%**	**50.0%**	**50.5%**	**51.0%**
Large Regional Jet													
E75	86	1,364	1,586	1,800	2,000	2,200	2,400	9.7%	9.4%	9.2%	7.9%	7.2%	6.3%
CR9	80	3,136	5,252	3,400	4,000	4,600	5,200	22.4%	31.2%	17.3%	15.9%	15.0%	13.7%
E70	75	929	464	400	600	600	600	6.6%	2.8%	2.0%	2.4%	2.0%	1.6%
CR7	67	8,584	9,531	14,000	18,600	23,200	29,800	61.3%	56.6%	71.4%	73.8%	75.8%	78.4%
Total		**14,013**	**16,833**	**19,600**	**25,200**	**30,600**	**38,000**	**6.4%**	**8.8%**	**8.9%**	**10.5%**	**11.8%**	**13.7%**
Small Regional Jet													
CRJ/ERJ/ER4	50	57,639	37,853	51,000	50,800	53,200	55,200	64.5%	52.9%	61.7%	59.1%	60.6%	62.7%
ERD	44	29,492	33,721	31,600	35,200	34,600	32,800	33.0%	47.1%	38.3%	40.9%	39.4%	37.3%
ER3	37	1,871	-	-	-	-	-	2.1%	-	-	-	-	-
FRJ	32	300	-	-	-	-	-	0.3%	-	-	-	-	-
Total		**89,302**	**71,574**	**82,600**	**86,000**	**87,800**	**88,000**	**40.8%**	**37.4%**	**37.5%**	**35.7%**	**33.9%**	**31.6%**
Turboprop	**19**	**8,737**	**8,593**	**8,400**	**9,200**	**9,800**	**10,400**	**4.0%**	**4.5%**	**3.8%**	**3.8%**	**3.8%**	**3.7%**
Total		**219,082**	**191,200**	**220,000**	**241,000**	**259,200**	**278,200**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: Airport Records; *Official Airline Guide*; USDOT, Schedule T-100; Landrum & Brown analysis, 2011

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The international commercial passenger operation fleet mix is presented in **Table 3.6-4, *International Commercial Passenger Operations Fleet Mix***, and is based on the following assumptions:

- New wide-body traffic in 2015 due to the introduction of traffic to Europe utilizing B767-300s. The share of wide-body aircraft is expected to reach 11.9 percent in 2028.
- B737-400 aircraft will be replaced by A320s aircraft by 2010. International airlines will make use of A319 and A320 aircraft over the forecast period as new Latin American destinations are introduced starting in 2014.

Table 3.6-4
INTERNATIONAL COMMERCIAL PASSENGER OPERATIONS FLEET MIX
Lambert-St. Louis International Airport

		Aircraft Operations					
Aircraft Type	**Gauge**	**2008**	**2009**	**2013**	**2018**	**2023**	**2028**
Wide Body Jet	**233**	**-**	**-**	**-**	**240**	**400**	**580**
Narrow Body Jet							
319	136	117	-	240	450	640	650
320	168	715	510	1,280	1,350	1,420	1,630
734	170	254	510	-	-	-	-
Total		**1,086**	**1,020**	**1,520**	**1,800**	**2,060**	**2,280**
Large Regional Jet	**70**	**-**	**-**	**-**	**-**	**-**	**-**
Small Regional Jet	**50**	**1,242**	**1,340**	**1,620**	**1,900**	**1,980**	**2,020**
Total		**2,328**	**2,360**	**3,140**	**3,940**	**4,440**	**4,880**

		Percent of Total Aircraft Operations					
Aircraft Type	**Gauge**	**2008**	**2009**	**2013**	**2018**	**2023**	**2028**
Wide Body Jet	**233**	**-**	**-**	**-**	**6.1%**	**9.0%**	**11.9%**
Narrow Body Jet							
319	136	10.8%	-	15.8%	25.0%	31.1%	28.5%
320	168	65.8%	50.0%	84.2%	75.0%	68.9%	71.5%
734	170	23.4%	50.0%	-	-	-	-
Total		**34.0%**	**43.2%**	**48.4%**	**45.7%**	**46.4%**	**46.7%**
Large Regional Jet	**70**	**-**	**-**	**-**	**-**	**-**	**-**
Small Regional Jet	**50**	**66.0%**	**56.8%**	**51.6%**	**48.2%**	**44.6%**	**41.4%**
Total		**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: Airport Records; *Official Airline Guide*; USDOT, Schedule T-100; Landrum & Brown analysis, 2011

3.6.2 ALL-CARGO OPERATIONS FORECAST

The air cargo tonnage forecast for the all-cargo operators was used to derive the all-cargo operations forecast, based on assumptions regarding the amount of air cargo tonnage handled per flight. Historical all-cargo operations by aircraft type were analyzed to better understand the fleet mix for the all-cargo carriers at STL. Additionally, aircraft orders for the largest all-cargo carriers (FedEx and UPS) were analyzed to evaluate how the cargo fleet mix might evolve in the future. Ultimately, these analyses allowed for the projection of all-cargo operations by aircraft type.

3.6.2.1 Capacity and Utilization Assumptions

Average cargo capacity was in the 24 to 25 tonnes per aircraft range from 2003 to 2005 (*see* **Table 3.6-5, *All-Cargo Capacity and Load Factor Assumptions***). Cargo capacity increased to above 32 tonnes per operation in 2006 through 2008 as FedEx (DC10s and A300s) and UPS (A300 and B757s) increased their presence at STL. Cargo load factors went up as well beginning in 2006, resulting in the actual tonnes per operation ratio increasing from about 16 in 2005 to above 22 through 2008.

Table 3.6-5
ALL-CARGO CAPACITY AND LOAD FACTOR ASSUMPTIONS
Lambert-St. Louis International Airport

Calendar Year	Estimated Capacity (tons/op.)	Estimated Utilzation Factor	Actual Volumes (tons/op.)
History			
2003	23.8	60.6%	14.4
2004	23.8	63.0%	15.0
2005	24.8	65.5%	16.2
2006	32.5	70.1%	22.8
2007	33.7	67.5%	22.7
2008	34.6	65.3%	22.6
Forecast			
2013	36.2	68.6%	24.8
2018	38.4	70.9%	27.2
2028	41.2	74.2%	30.5
Average Annual Growth Rates			
03-08	7.7%	1.5%	9.3%
08-28	0.9%	0.6%	1.5%

Source: Airport Records; USDOT, Schedule T-100; Landrum & Brown analysis, 2011

In 2008, FedEx was the largest carrier at STL with a 48 percent share of total cargo handled at STL. UPS was the second largest carrier with a 23 percent share. STL was also served by Capital Cargo (which was acquired by ABX in November of 2007) and ASTAR Air Cargo in 2008. ABX and ASTAR primarily served DHL, who decided to exit the U.S. domestic market in 2008. As a result, FedEx and UPS are expected to pick up an increasing portion of the cargo formerly carried for DHL while new cargo carriers are forecast to serve the remainder. FedEx and DHL operate larger aircraft than ASTAR and Capital so the average cargo aircraft capacity is expected to increase over the forecast period.

Load factors are expected to increase through 2013 as FedEx and DHL begin to serve more and more of the cargo formerly carried by Capital and ASTAR. Cargo load factors are expected to increase to 74 percent by 2028.

These assumptions result in the average amount of cargo per aircraft increasing from 22.6 tonnes per operation in 2008 to 30.5 tonnes per operation in 2028.

3.6.2.2 All-Cargo Operations and Fleet Mix Forecast

Once the capacity and load factor assumptions were developed for the all-cargo operators, a top-down approach was used to determine the forecast fleet mix. The process of developing the fleet mix allowed for the calibration of those assumptions and, where appropriate, modifications were made prior to finalizing the assumptions presented in the preceding subsection.

As shown in **Table 3.6-6, *All-Cargo Fleet Mix and Operations Forecast***, the 2008 all-cargo fleet at STL consisted of 47 percent wide-body aircraft, 52 percent narrow-body aircraft, and one percent turboprops. These aircraft carried an average of 22.6 tonnes per operation and it is estimated these flights were, on average, 65 percent full by weight.

Table 3.6-6
ALL-CARGO FLEET MIX AND OPERATIONS FORECAST
Lambert-St. Louis International Airport

Aircraft Type	Average Capacity (tonnes)	Percent of Total All-Cargo Operations 2008	2013	2018	2028
Wide-Body		**46.9%**	**47.4%**	**47.5%**	**47.0%**
DC-10/MD-10	113,000-114,000	53.7%	54.4%	53.4%	52.6%
A300 Series	85,600-110,000	35.0%	34.5%	34.0%	32.1%
MD-11	207,000	9.2%	9.3%	9.9%	10.9%
A310	61,900	1.2%	1.3%	1.5%	1.7%
B767 Series	132,200	0.9%	0.6%	1.2%	2.6%
Narrow-Body		**52.0%**	**52.4%**	**52.2%**	**52.6%**
B727 Series	27,700-46,000	76.8%	69.4%	47.4%	21.2%
B757 Series	45,800-88,000	17.1%	30.6%	52.6%	78.8%
DC-8 Series	100,000	3.5%	0.0%	0.0%	0.0%
DC-9 Series	22,400	2.5%	0.0%	0.0%	0.0%
B737-200C	45,000	0.1%	0.0%	0.0%	0.0%
Turboprop	1,600-2,500	**1.1%**	**0.3%**	**0.3%**	**0.3%**
Total		**100.0%**	**100.0%**	**100.0%**	**100.0%**
All-Cargo Tonnage		71,924	79,090	90,710	113,870
Capacity (tons/op.)		34.6	36.2	38.4	41.2
Load Factor		65.3%	68.6%	70.9%	74.2%
All-Cargo Operations		3,186	3,190	3,330	3,730

Source: Airport Records; USDOT, Schedule T-100; Landrum & Brown analysis, 2011

FedEx, the dominant carrier at STL, currently operates mainly DC/MD10s and A300s. FedEx does not currently have plans to replace any of the other aircraft it operates at STL, however, within its broader network it plans to replace its fleet of Boeing 727 aircraft with Boeing 757s.

UPS mainly operates A300s and B757s at STL and is expected to use an increasing share of B757s over the forecast period. UPS operates a small number of DC8s at STL which will be phased out by 2013. In response to the state of the economy and the resulting decrease in demand, sources at UPS indicated in April 2009 that the carrier will drop service to Rockford in 2009 and consolidate services to their Louisville hub using MD-11 aircraft. As the economy recovers, UPS expects the Rockford service will be reinstated, accompanied by a return to A300/B757 aircraft. The forecast assumes this occurs by 2013.

The amount of cargo transported by carriers other than FedEx and UPS is expected to decline from 43 percent in 2008 to 25 percent in 2028. STL cargo transported by these other cargo carriers in the future is assumed to be on B757 or similar capacity aircraft.

Based on these fleet assumptions, the share of wide-body aircraft is forecast to remain stable at between 47 and 48 percent through 2018. The share of widebody aircraft is expected to decline slightly between 2018 and 2028, mainly due to the deployment of B757s by FedEx and UPS as well as other cargo carriers after 2018. As a result, narrow-body aircraft are predicted to increase slightly to 52.6 percent share by 2028. Turboprop operations are expected to decline somewhat in share, to 0.3 percent in 2013 and remain stable thereafter.

Resulting all-cargo operations are forecast to increase from 3,186 in 2008 to 3,730 in 2028. This represents a 1.9 percent average annual growth rate.

3.6.3 CIVIL OPERATIONS

Civil activity includes all operations that are not composed of commercial, cargo, or military operations. For purposes of this analysis, the term "civil" includes two types of activity: non-commercial air taxi and general aviation (GA). Air taxi activity typically includes "for hire" aircraft chartered for specific trips on an on-demand basis. Air taxi operations are usually made up of larger GA aircraft, such as large turboprop aircraft and an array of corporate jets. GA activity includes diverse uses that can range from recreational flying, flight training activities, business travel, news reporting, traffic observation, police patrol, emergency medical flights, and even crop dusting.

Civil operations can be subdivided into two major subcategories: "itinerant" and "local" based on FAA classifications. Local operations are defined by the FAA as "operations remaining in the local traffic pattern, simulated instrument approaches at the airport…and operations to or from the airport and a practice area within a 20-mile radius of the tower."[46] Itinerant operations are all operations not classified as "local."

[46] FAA Order 7210.3, Facility Operation and Administration, Section 2, Airport Operations Count

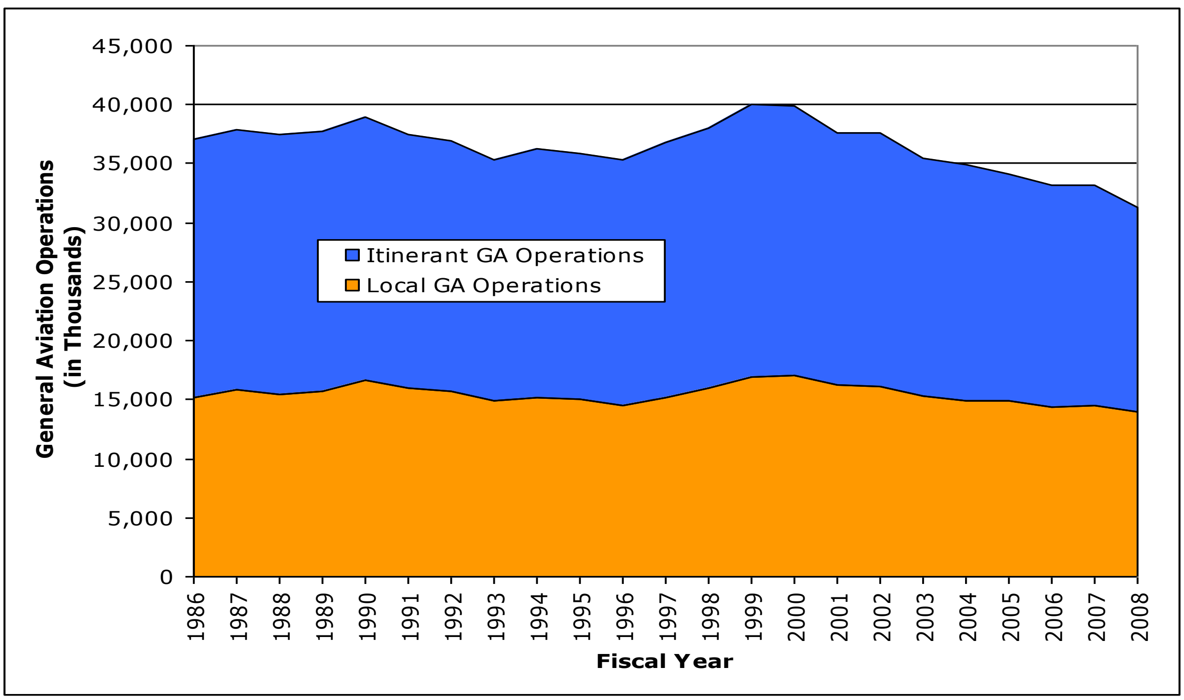
3.6.3.1 National Trends in Civil Operations

Understanding the history and current state of the civil aviation industry can help predict future aviation demand. This section discusses nationwide historical, emerging, and forecast trends in air taxi and general aviation activity.

HISTORICAL NATIONAL TRENDS

The civil aviation industry in the U.S. has experienced major changes over the last 30 years. GA activity levels were at their highest in the late 1970s through 1981. GA activity levels and new aircraft production reached all-time lows in the early 1990s due to a number of factors including increasing fuel prices, increased product liability stemming from litigation concerns, and the resulting higher cost of new aircraft. The passage of the 1994 General Aviation Revitalization Act (GARA)[47] combined with reduced new aircraft prices, lower fuel prices, resumed production of single-engine aircraft, continued strength in the production and sale of business jets, and a recovered economy led to growth in the general aviation industry in the latter half of the 1990s (*see* **Exhibit 3.6-1, *U.S. General Aviation Operations***).[48]

Exhibit 3.6-1
U.S. GENERAL AVIATION OPERATIONS
Lambert-St. Louis International Airport



Note: Represents operations at U.S. airports with Air Traffic Control Service.

Source: FAA Aviation Forecasts, Fiscal Years 1991-2002 and 1995-2006; FAA Aerospace Forecasts, Fiscal Years 2009-2025; FAA Air Traffic Activity Data System (ATADS); Landrum & Brown analysis, 2011

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47 GARA imposes an 18-year statute of repose on product liability lawsuits for general aviation aircraft.

48 Based on information from the General Aviation Manufacturers Association (GAMA).

The rebound in the U.S. general aviation industry that began with GARA started to subside by Fiscal Year (FY) 2000. General aviation traffic at airports with air traffic control service slowed considerably in FY 2001 due largely to a U.S. economic recession and to some extent the terrorist attacks of September 11, 2001. General aviation traffic at airports with air traffic control service continued to decline through FY 2006 as spikes in fuel costs occurred and the economy grew at a relatively even pace. For the first time since FY 1999, general aviation traffic at airports with air traffic control service increased in FY 2007, but just slightly (0.04 percent over FY 2006). However, general aviation operations declined by 5.6 percent at airports with air traffic control service in FY 2008.[49]

FAA NATIONAL FORECAST

The FAA annually publishes forecasts of the U.S. aviation industry. The GAMA *2007 General Aviation Statistical Databook & Industry Outlook* uses the FAA Aerospace Forecasts for its projections and is considered to be one of the most complete and reliable forecast available for civil activity in the U.S. The FAA forecasts[50] project the following trends in the U.S. general aviation industry from 2008 to 2025:

- The number of active general aviation aircraft is forecast to increase by 3.2 percent annually.
- Growth of 3.6 percent annually is expected in the number of general aviation hours flown.
- The number of student pilots is expected to decline by 5.7 percent per annum through 2010 and then increase at a rate of 1.2 percent annually through 2025.
- General aviation operations at airports with air traffic control service are forecast to decline by 3.1 percent annually through 2010 before increasing by 1.1 percent annually through 2025.
- Business use of general aviation aircraft has experienced historically high growth rates and will continue to grow more rapidly than recreational use.

EMERGING AIRCRAFT OWNERSHIP TRENDS

The concept of purchasing hours of jet time began to emerge in the 1990s with the fractional ownership of business jets gaining popularity. Fractional ownership, as it suggests, involves purchasing a share in a general aviation aircraft. The user also typically pays an hourly usage fee and a monthly management fee. The fractional owner will usually purchase the share from one of several operators that can also offer a variety of jet types that the potential purchaser can consider. Companies such as NetJets, FlexJet, Citation Shares, and others provide these types of services. The fractional ownership concept began with jets but has also begun to expand to all types of aircraft including single-engine piston aircraft. Fractional ownership has significantly contributed to the revitalization of the general aviation manufacturing industry in the 21st century. For example, NetJets alone

[49] *FAA Aerospace Forecasts, Fiscal Years 2009-2025*, Table 31
[50] *FAA Aerospace Forecast, Fiscal Years 2009-2025*

has purchased hundreds of corporate jet aircraft of varying sizes ranging up to the Boeing BBJ (typically a derivative of the Boeing 737 aircraft). Projected increases in fractional ownership activity levels are a large part of the FAA's projected growth in GA operations through 2025.

FLEET DIVERSIFICATION

A new category of personal jets, Very Light Jets (VLJs), has been introduced to the GA market in the 21st century. These jets are aimed chiefly at owners of twin-engine piston and turboprop aircraft. They are smaller than traditional entry-level jets, and achieve high performance at significantly lower ownership and operating costs. The cost for a VLJ is highly competitive with a number of twin-engine piston aircraft types and the more popular turboprop GA aircraft. A VLJ is defined as a small jet that seats four to eight people, is certified for single-pilot operation, and has a maximum takeoff weight of less than 10,000 pounds.

Initially, some aviation analysts believed the VLJs could lead to more travelers choosing general aviation over commercial air travel, particularly if delays at major airports lead to significant increases in missed flight connections, increased travel times, lost productivity, and cancelled flights. As a result, the 2008 FAA Aerospace Forecasts predicted a delivery rate of 400 to 500 VLJs per year to reach around 8,145 active aircraft by 2025. However, one of the major manufacturers of VLJs, Eclipse Aviation, declared bankruptcy in 2008 and DayJet (one of the largest users of VLJs) ceased VLJ operations in 2008. VLJ deliveries reached only 282 in 2008. In spite of the state of the economy and the uncertainty of the VLJ market, the FAA still predicts that a total of 200 VLJs will enter the active fleet in 2009 and 2010. The FAA believes up to 300 VLJs will enter the market each year through 2025, reaching 4,875 aircraft in 2025 (40 percent lower than the 2008 forecast).[51]

While VLJs are at the small end of the aircraft spectrum, new versions of corporate jets have also entered at the large aircraft spectrum expanding the range of options available to users and the need to consider the requirements of these aircraft in planning.

FUEL PRICES

Fuel prices increased to record highs over a four-year period ending in the summer of 2008. Decreased demand and the worldwide recession led to fuel prices subsequently dropping in the fourth quarter of 2008. Changes in fuel prices impact the economic relationships between modes of transportation and price differentials between different segments of the aviation market. Although fuel prices are a major problem for the commercial airlines, corporate general aviation users are relatively less sensitive to changes in fuel prices. Given the cost to own and operate a corporate aircraft or to charter a business jet, the incremental cost of fuel is typically a secondary consideration. Conversely, fuel prices have in many cases reduced recreational flying activity.

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51 *FAA Aerospace Forecast, Fiscal Years 2009-2025*

3.6.3.2 St. Louis Area Airports

STL is primarily a commercial service airport, serving over 250,000 total annual operations in 2008. Civil activity made up 8.4 percent of the total operations at STL in 2008. Civil activity makes up a relatively small percentage of the operations at STL because GA pilots often prefer not to operate at commercial service airports due to the congestion that typically occurs at these airports, the differences in approach speeds between small general aviation aircraft and commercial aircraft, and wake turbulence issues.[52] As a result, the FAA has "encouraged the development of high-capacity general aviation airports in major metropolitan areas. These specialized airports, called relievers, provide pilots with attractive alternatives to using congested hub airports." In order to be classified as a reliever, an airport "must have 100 or more based aircraft or 25,000 annual itinerant operations."[53]

There are 6 such reliever airports in the St. Louis 8-county region as defined by the East-West Gateway Council of Governments (St. Charles County, City of St. Louis, St. Louis County, Jefferson County, and Franklin County in Missouri and Madison County, St. Clair County, and Monroe County in Illinois). These airports, shown on **Exhibit 3.6-2, *St. Louis Area Airports***, include the Spirit of St. Louis Airport (SUS), St. Louis Downtown Airport (CPS), St. Louis Regional Airport (ALN), St. Charles County Smartt Airport (SET), St. Charles Airport (3SQ), and Creve Coeur Airport (1H0). Each of these relievers is located within approximately 30 miles of downtown St. Louis.

In addition to the six reliever airports, Scott Air Force Base/MidAmerica Airport (BLV), and St. Louis Metro-East Airport/Shafer Field (3K6) are also located within 30 miles of downtown St. Louis. BLV primarily serves military aircraft in addition to having scheduled air service. St. Louis Metro Airport used to have reliever status, but it is now classified by the FAA as a "General Aviation" airport.

There are four other public-use airports shown on the map. Three are in the East-West Gateway Region (St. Clair Regional, Sullivan Regional, and Festus Memorial) and one is just outside the region in Warren County (Washington Regional Airport). These airports are located more than 30 miles from downtown St. Louis and are very small facilities with less than 20,000 aircraft operations annually. Therefore, these airports are not included in this analysis.

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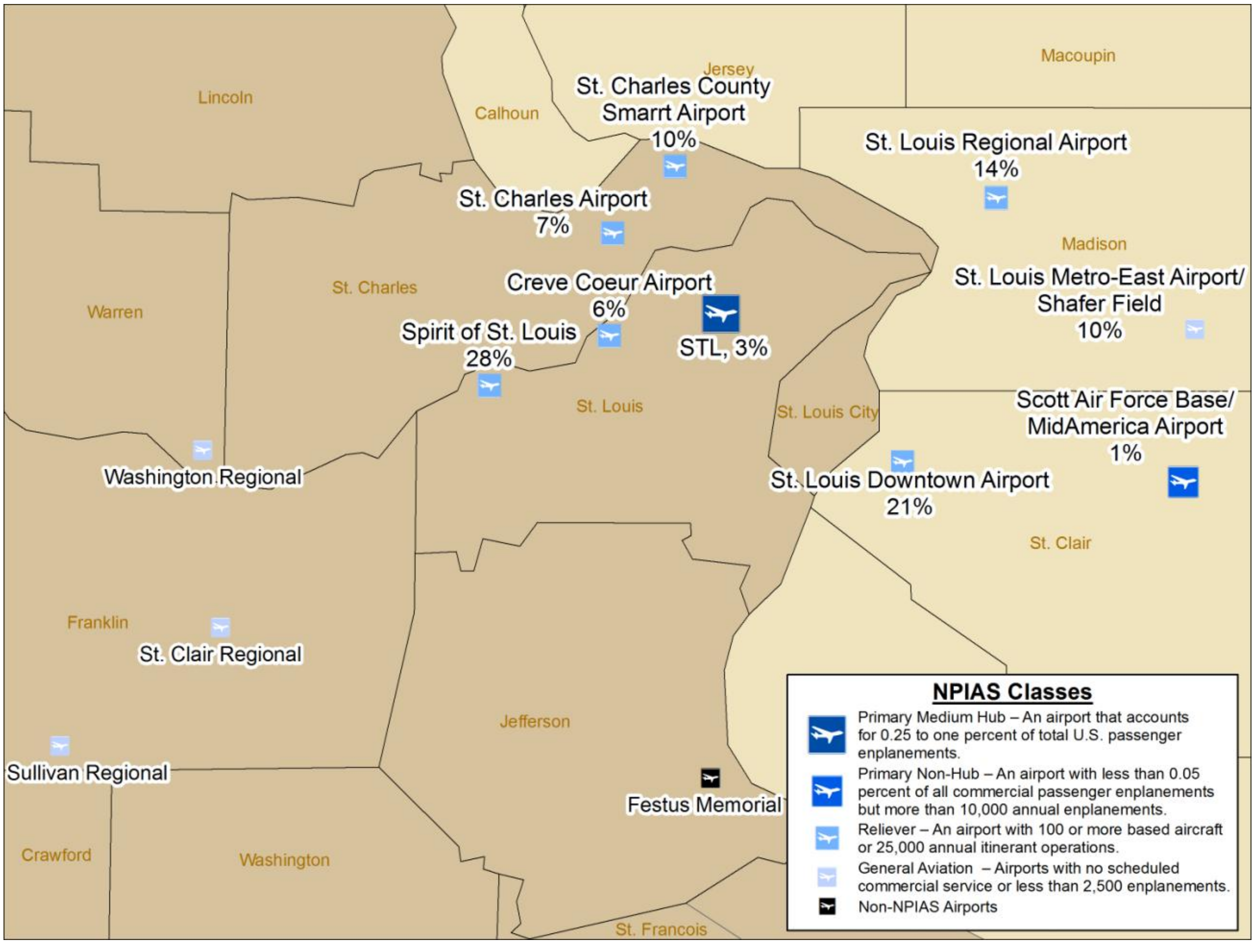
[52] Wake turbulence is the turbulence that is formed behind an aircraft as it passes through the air, similar to the wake created by a boat passing through the water.

[53] FAA National Plan of Integrated Airport Systems (NPIAS), 2009-2013 Report to Congress, page 8.

Exhibit 3.6-2
ST. LOUIS AREA AIRPORTS
Lambert-St. Louis International Airport

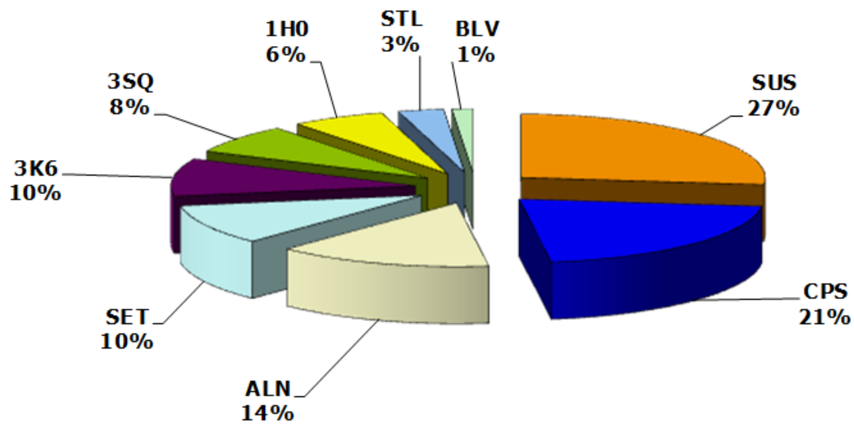


Sources: Internet website: airnav.com; FAA 2008 Terminal Area Forecast (TAF); FAA National Plan of Integrated Airport Systems (NPIAS), 2009-2013 Report to Congress; Landrum & Brown analysis, 2011

Almost 48 percent of the region's civil activity occurs at the Spirit of St. Louis Airport and the St. Louis Downtown Airport (*see* **Exhibit 3.6-3, *St. Louis Area Civil Aviation Activity (Fiscal Year 2007)***). Most of the region's business traffic occurs at these two airports and they serve most of the region's corporate jet and multi-engine aircraft activity. SUS and CPS accommodated almost 52 percent of the region's based aircraft in 2007. STL accounted for only three percent of the region's civil activity in 2007.

The majority of the civil activity at the other area airports (ALN, SET, 3SQ, 1H0, BLV, and 3SQ) is leisure or flight training activity. The vast majority (82 percent) of aircraft based at these airports are single-engine aircraft.

Exhibit 3.6-3
ST. LOUIS AREA CIVIL AVIATION ACTIVITY
(Fiscal Year 2007)
Lambert-St. Louis International Airport



Airport	Airport Code	FAA NPIAS Classification [1]	2007 Air Taxi & GA Ops.	2007 Based Aircraft
Spirit of St. Louis	SUS	Reliever	145,018	314
Cahokia/St. Louis Downtown Airport	CPS	Reliever	114,023	210
St. Louis Regional Airport	ALN	Reliever	77,108	107
St. Charles County Smartt Airport	SET	Reliever	55,200	95
St. Louis Metro-East Airport/ Shafer Field	3K6	GA	52,000	42
St. Charles Airport	3SQ	Reliever	40,260	77
Creve Coeur Airport	1H0	Reliever	33,600	103
Lambert-St. Louis International Airport	STL	Primary Medium Hub	16,228	35
Scott AFB/ MidAmerica	BLV	Primary Non-Hub	7,419	34
TOTAL			**540,856**	**1,017**

Notes: 1 FAA NPIAS Classification based on FAA National Plan of Integrated Airport Systems (NPIAS), 2009-2013 Report to Congress definitions:
- Primary Medium Hub – An airport that accounts for 0.25 to one percent of total U.S. passenger enplanements.
- Primary Non-Hub – An airport with less than 0.05 percent of all commercial passenger enplanements but more than 10,000 annual enplanements.
- Reliever – An airport with 100 or more based aircraft or 25,000 annual itinerant operations.
- GA – Airports with no scheduled commercial service or less than 2,500 enplanements.

Note: STL statistics are on a calendar year basis. The other airports are shown on a fiscal year basis.

Sources: Internet website: airnav.com; FAA 2008 Terminal Area Forecast (TAF); FAA National Plan of Integrated Airport Systems (NPIAS), 2009-2013 Report to Congress; Landrum & Brown analysis, 2011

3.6.3.3 STL Historical Trends in Civil Activity

Civil activity has historically made up between 5.1 and 10.4 percent of total operations at STL since 1995. STL civil operations declined from 49,123 in 1995 to 14,351 in 2006 (*see* **Table 3.6-7, *Historical Civil Operations***). This represents an average decline of 10.6 percent annually. However, civil operations have rebounded in the last two years, increasing by 13.1 percent in 2007 and by 28.5 percent in 2008.

Table 3.6-7
HISTORICAL CIVIL OPERATIONS
Lambert-St. Louis International Airport

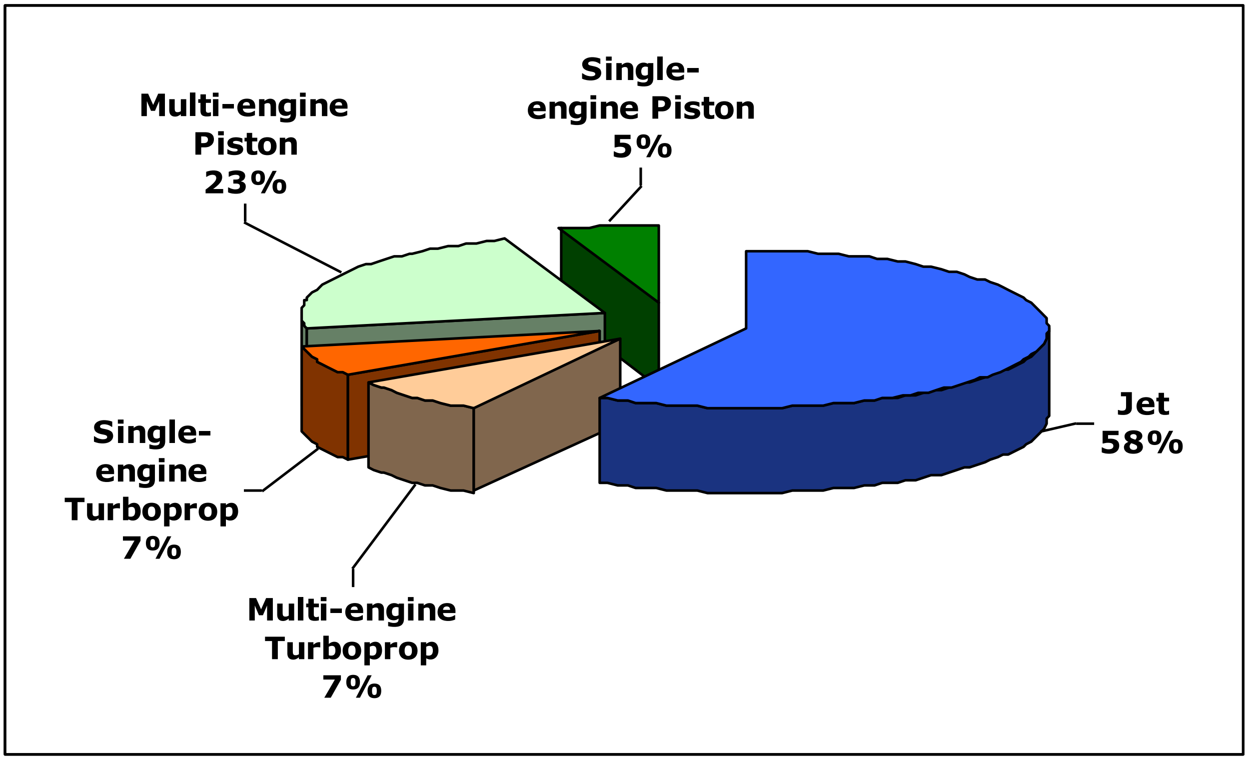
Calendar Year	Itinerant	Local	Total
1995	49,123	-	49,123
1996	43,212	-	43,212
1997	39,427	-	39,427
1998	33,794	-	33,794
1999	33,300	-	33,300
2000	33,902	502	34,404
2001	28,209	502	28,711
2002	42,565	277	42,842
2003	34,920	645	35,565
2004	29,273	940	30,213
2005	24,767	555	25,322
2006	13,634	717	14,351
2007	15,967	261	16,228
2008	20,691	169	20,860
Average Annual Growth Rates			
95-00	-7.1%	n.a.	-6.9%
00-08	-6.0%	-12.7%	-6.1%
95-08	-6.4%	n.a.	-6.4%

Sources: FAA Air Traffic Activity Data System (ATADS); Airport Records; Landrum & Brown analysis, 2011

Civil operations at STL are almost exclusively itinerant in nature. There were no local operations recorded by the Air Traffic Control Tower (ATCT) prior to 2000. After 2000, local operations made up anywhere from less than one percent of total civil operations to just over five percent.

Radar data for the one-year period ending August 2008 was analyzed to determine the types of civil aircraft that operate at STL (*see* **Exhibit 3.6-4, *2007-2008 Civil Aviation Fleet Mix***). Over 58 percent of the operations at STL in the 2007-2008 time period were jets and 14 percent were turboprop aircraft. The remaining 28 percent of operations were piston aircraft.

Exhibit 3.6-4
2007-2008 CIVIL AVIATION FLEET MIX
Lambert-St. Louis International Airport



Sources: Airport radar data, September 2007 to August 2008; Landrum & Brown analysis, 2011

There were 18 non-military aircraft based at STL in 2008 according to FAA records. A number of Fortune 500 companies base their corporate aircraft at STL. Corporate aircraft tend to be jets or large turboprops. As a result, almost 56 percent of the civil based aircraft were jets in 2008 and 39 percent were multi-engine aircraft (*see* **Table 3.6-8, *Historical Based Aircraft Fleet Mix***). There was only one single-engine aircraft based at STL in 2008.

TABLE 3.6-8
HISTORICAL BASED AIRCRAFT FLEET MIX
Lambert-St. Louis International Airport

Fiscal Year	Jet	Multi-Engine	Single-Engine	Civil Total	Military	Total
2003	10	1	1	12	16	28
2004	11	1	1	13	17	30
2005	9	7	1	17	18	35
2006	9	7	1	17	18	35
2007	9	7	1	17	18	35
2008	10	7	1	18	17	35

Source FAA 2008 Terminal Area Forecast (TAF); FAA Form 5010; Landrum & Brown analysis

3.6.3.4 STL Trends Compared to Region and U.S.

Historical operations data for the period 1995 to 2007 was obtained from the 2008 FAA Terminal Area Forecast (TAF) for each airport in the region, with the exception of STL. STL's civil operations totals are based on airport records and ATADS data. Reliable operations data for 2008 was not available from the TAF at the time of this analysis so the region's total traffic for 2008 was estimated. Based on FAA ATADS data for calendar year 2008, civil operations at STL, ALN, CPS, and SUS (the airports with ATCTs) collectively were down 12.6 percent versus 2007. It was assumed that this drop in civil operations is representative of all nine airports in the region. Therefore, civil operations at the region's airports were estimated at about 472,700 operations in 2008.

Civil operations at STL have decreased much faster than the other airports in the region (*see* **Table 3.6-9, *St. Louis Area Historical Civil Operations (STL, SUS, CPS, ALN, SET, 3K6, 3SQ, 1H0, BLV)***). Civil activity at the other airports grew at an annual rate of 2.0 percent from 1995 to 2000 while STL civil operations declined by 6.9 percent annually during the same time period. Civil activity at the other regional airports declined by 1.3 percent annually from 2000 to 2008 compared to an annual decline of 6.1 percent at STL. STL's civil operations share of the region's total has declined from 9.0 percent in 1995 to 4.4 percent in 2008.

Table 3.6-9
ST. LOUIS AREA HISTORICAL CIVIL OPERATIONS
(STL, SUS, CPS, ALN, SET, 3K6, 3SQ, 1H0, BLV)
Lambert-St. Louis International Airport

Fiscal Year	STL	Other Airports	Total	STL % of Total
1995	49,123	495,649	544,772	9.0%
1996	43,212	427,593	470,805	9.2%
1997	39,427	459,116	498,543	7.9%
1998	33,794	499,779	533,573	6.3%
1999	33,300	528,318	561,618	5.9%
2000	34,404	546,178	580,582	5.9%
2001	28,711	578,453	607,164	4.7%
2002	42,842	566,893	609,735	7.0%
2003	35,565	523,047	558,612	6.4%
2004	30,213	531,700	561,913	5.4%
2005	25,322	525,854	551,176	4.6%
2006	14,351	516,141	530,492	2.7%
2007	16,228	524,628	540,856	3.0%
2008	20,860	451,840	472,700	4.4%
Average Annual Growth Rates				
95-00	-6.9%	2.0%	1.3%	
00-08	-6.1%	-2.3%	-2.5%	
95-08	-6.4%	-0.7%	-1.1%	

Note: STL statistics are calendar year. The other airports are shown on a fiscal year basis.

Sources: FAA Terminal Area Forecast; FAA Air Traffic Activity Data System (ATADS); Airport Records; Landrum & Brown analysis, 2011

Nationwide, the number of active piston aircraft has declined since 2000 while the number of turboprops and turbojets has increased. In spite of the fact that over 70 percent of the 2007-2008 operations at STL were on turboprops and turbojets, the general trend in operations at STL has been downward. In fact, STL civil operations have declined two times faster than general aviation operations in the U.S. as a whole since 2000 (*see* **Table 3.6-10, *Historical Civil Operations Comparison STL vs. U.S.***). Additionally, STL's share of the nation's GA operations has been cut in half since 1995, although it has increased in the last 2 years.

Table 3.6-10
HISTORICAL CIVIL OPERATIONS COMPARISON
STL vs. U.S.
Lambert-St. Louis International Airport

Year	U.S. GA Operations	STL Civil Operations	STL Share of U.S.
1995	35,926,600	49,123	0.14%
1996	35,298,300	43,212	0.12%
1997	36,833,300	39,427	0.11%
1998	38,046,600	33,794	0.09%
1999	39,999,600	33,300	0.08%
2000	39,878,500	34,404	0.09%
2001	37,627,000	28,711	0.08%
2002	37,623,225	42,842	0.11%
2003	35,524,020	35,565	0.10%
2004	34,967,596	30,213	0.09%
2005	34,160,953	25,322	0.07%
2006	33,119,952	14,351	0.04%
2007	33,134,500	16,228	0.05%
2008	31,289,300	20,860	0.07%
Average Annual Growth Rate			
95-00	2.1%	-6.9%	
00-08	-3.0%	-6.1%	
95-08	-1.1%	-6.4%	

Note: STL statistics are calendar year. U.S. airports are shown on a fiscal year basis.

Sources: FAA Aerospace Forecasts, Fiscal Years 2009-2025; FAA Air Traffic Activity Data System (ATADS); Airport Records; Landrum & Brown analysis, 2011

3.6.3.5 STL Civil Aviation Operations Forecast

A regional approach was used to develop a forecast of civil operations at STL. The historical relationship between the MSA population and operations at the nine area airports was analyzed in order to forecast future civil operations for the region. Future civil activity at STL was subsequently calculated based on a market share analysis of the forecast traffic for the region.

The operations/population ratio for the nine regional airports has remained fairly steady over the last 14 years, hovering around 0.2. This ratio fell to a 14-year low in 2008 (0.166), reflecting the state of the economy. It is forecast that this ratio will dip further in 2009 to 0.150 and then gradually return to the historical average level of 0.2 by 2015. The operations/population ratio for the nine regional airports is expected to remain at 0.2 for the remainder of the forecast period. This results in the region's civil traffic increasing from an estimated 472,708 operations in 2008 to 609,400 in 2028 (*see* **Table 3.6-11, *Civil Operations Forecast – Market Share Analysis***).

Table 3.6-11
CIVIL OPERATIONS FORECAST – MARKET SHARE ANALYSIS
Lambert-St. Louis International Airport

Year	STL MSA Population	Regional Apts. Civil Operations	Ops/Pop. Ratio	STL Civil Operations	STL Mkt Share
History					
1995	2,672,661	544,772	0.204	49,123	9.0%
1996	2,682,225	470,805	0.176	43,212	9.2%
1997	2,692,211	498,543	0.185	39,427	7.9%
1998	2,702,626	533,573	0.197	33,794	6.3%
1999	2,713,480	561,618	0.207	33,300	5.9%
2000	2,724,783	580,582	0.213	34,404	5.9%
2001	2,743,703	607,164	0.221	28,711	4.7%
2002	2,759,993	609,735	0.221	42,842	7.0%
2003	2,773,605	558,612	0.201	35,565	6.4%
2004	2,789,698	561,913	0.201	30,213	5.4%
2005	2,806,221	551,176	0.196	25,322	4.6%
2006	2,820,377	530,492	0.188	14,351	2.7%
2007	2,834,097	540,856	0.191	16,228	3.0%
2008	2,840,862	472,708	0.166	20,860	4.4%
Forecast					
2013	2,878,723	523,400	0.182	23,800	4.5%
2018	2,925,695	585,700	0.200	27,500	4.7%
2023	2,979,977	596,500	0.200	28,900	4.8%
2028	3,043,967	609,400	0.200	30,500	5.0%
Average Annual Growth Rates					
95-08	0.5%	-1.1%	-1.5%	-6.4%	-5.3%
08-13	0.3%	2.1%	1.8%	2.7%	0.6%
13-18	0.3%	2.3%	1.9%	2.9%	0.6%
18-28	0.4%	0.4%	0.0%	1.0%	0.6%
08-28	0.3%	1.3%	0.9%	1.9%	0.6%

Note: STL statistics are calendar year. The other airports are shown on a fiscal year basis.

Sources: FAA, Air Traffic Activity Data System (ATADS); Airport Records; FAA Aerospace Forecasts Fiscal Years 2009-2025; Landrum & Brown analysis, 2011

STL's share of the region's civil traffic declined from a high of 9.2 percent in 1996 to a low of 2.7 percent in 2006. STL's share has since increased to 3.0 percent in 2007 and to 4.4 percent in 2008. It appears that the loss in market share for STL has bottomed out. Therefore, it is assumed that STL's market share will increase back to 5.0 percent by 2028. This results in STL civil operations increasing from 20,860 in 2008 to 30,500 in 2028 (1.9 percent average annual growth).

Table 3.6-12, *Forecast Civil Operations*, presents the STL civil operations forecast by itinerant and local categories. Local civil operations were estimated to remain stable at 200 operations over the forecast period. Itinerant operations will remain the major portion of the civil traffic at STL, accounting for approximately 99 percent of total civil operations in each year.

TABLE 3.6-12
FORECAST CIVIL OPERATIONS
Lambert-St. Louis International Airport

Calendar Year	Itinerant	Local	Total
History			
1998	33,794	-	33,794
2003	34,920	645	35,565
2004	29,273	940	30,213
2005	24,767	555	25,322
2006	13,634	717	14,351
2007	15,967	261	16,228
2008	20,691	169	20,860
Forecast			
2013	23,600	200	23,800
2018	27,300	200	27,500
2023	28,700	200	28,900
2028	30,300	200	30,500
Average Annual Growth Rates			
98-08	-4.8%	n.a.	-4.7%
08-13	2.7%	3.4%	2.7%
13-18	3.0%	0.0%	2.9%
18-28	1.0%	0.0%	1.0%
08-28	1.9%	0.8%	1.9%

Sources: FAA, Air Traffic Activity Data System (ATADS); Airport Records; FAA Aerospace Forecasts Fiscal Years 2009-2025; Landrum & Brown analysis, 2011

Table 3.6-13, *Civil Operations Fleet Mix Forecast*, presents the civil aircraft operations fleet mix forecast through 2028. Currently, 58 percent of the civil operations at STL are on jet aircraft. The FAA projects that the majority of the growth in the future will be on jets. This trend is expected to be particularly true for STL. Based on this premise, jet aircraft operations are expected to increase to 70 percent of total operations by 2028. The percentage of operations on turboprop aircraft is expected to increase slightly, from almost 14 percent in 2008 to 15 percent in 2028. The proportion of piston aircraft civil operations is expected to decline from 28 percent of total operations in 2008 to 15 percent in 2028.

Table 3.6-13
CIVIL OPERATIONS FLEET MIX FORECAST
Lambert-St. Louis International Airport

	Civil Aircraft Operations					AAGR
Aircraft Category	**2008**	**2013**	**2018**	**2023**	**2028**	**'08-'28**
Jet	12,130	14,735	17,900	19,582	21,350	2.9%
Multi-engine Turboprop	1,518	1,773	2,098	2,258	2,440	2.4%
Single-engine Turboprop	1,380	1,597	1,871	1,995	2,135	2.2%
Multi-engine Piston	4,734	4,606	4,538	4,067	3,660	-1.3%
Single-engine Piston	1,099	1,089	1,093	998	915	-0.9%
Total	**20,860**	**23,800**	**27,500**	**28,900**	**30,500**	**1.9%**
	Percent of Total Operations					
Aircraft Category	**2008**	**2013**	**2018**	**2023**	**2028**	
Jet	58.1%	61.9%	65.1%	67.8%	70.0%	
Multi-engine Turboprop	7.3%	7.4%	7.6%	7.8%	8.0%	
Single-engine Turboprop	6.6%	6.7%	6.8%	6.9%	7.0%	
Multi-engine Piston	22.7%	19.4%	16.5%	14.1%	12.0%	
Single-engine Piston	5.3%	4.6%	4.0%	3.5%	3.0%	
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	

Note: AAGR=Average Annual Growth Rate

Sources: Airport radar data, September 2007 to August 2008; FAA Aerospace Forecasts Fiscal Years 2009-2025; Landrum & Brown analysis, 2011

3.6.3.6 STL Civil Based Aircraft Forecast

In order to forecast future based aircraft, a number of factors must be taken into consideration including national trends and local demand. Nationally, the FAA Active Aircraft forecast in the *FAA Aerospace Forecasts, Fiscal Years 2009-2025* shows an initial decline of 0.6 percent annually in the number of active single-engine piston aircraft through 2010. The FAA expects single-engine piston aircraft to recover and grow at an average annual rate of 0.2 percent from 2010 to 2025. The number of multi-engine piston aircraft is expected to decline at an average annual rate of 0.9 percent from 2008 to 2025. Turboprops are forecast by the FAA to grow at rate of 1.4 percent annually while the number of jets is expected to grow the fastest at 4.8 percent annually.

Applying the FAA's national forecast to STL would result in the number of civil based aircraft doubling by 2028. This is out of line with the operations forecast which predicts modest growth in civil operations at STL. Given that civil operations at STL have declined faster than national and regional civil operations and that STL's share of national and regional civil aviation has been declining, a more modest based aircraft forecast is called for. As a result, it was assumed that the 2008 operations per based aircraft ratio would remain constant through 2028. This ratio is calculated by dividing the civil operations by the reported based aircraft at STL. In 2008, this ratio was determined to be 1,159 operations, reflecting a relatively high proportion of activity that is not physically based at STL. The based aircraft forecast results in a total of 26 civil based aircraft at STL in 2028 (*see* **Table 3.6-14, *Based Aircraft Forecast***).

TABLE 3.6-14
BASED AIRCRAFT FORECAST
Lambert-St. Louis International Airport

Fiscal Year	Number of Based Aircraft Jet	Multi-Engine	Single-Engine	Civil Total	Operations/ Based Aircraft
History					
2008	10	7	1	18	1,159
Forecast					
2013	12	8	1	21	1,159
2018	14	9	1	24	1,159
2023	15	9	1	25	1,159
2028	17	9	1	26	1,159
Average Annual Growth Rates					
08-13	3.7%	2.7%	0.0%	3.1%	
13-18	3.1%	2.4%	0.0%	2.7%	
18-28	2.0%	0.0%	0.0%	0.8%	
08-28	2.7%	1.3%	0.0%	1.9%	

Sources: FAA 2008 Terminal Area Forecast (TAF); FAA Form 5010; Landrum & Brown analysis, 2011

3.6.4 MILITARY OPERATIONS

Military activity in 2008 totaled 2,941 operations. The 131st Fight Wing of the Missouri Air National Guard is located at STL and has historically been a key component of the military activity at the airport. The National Guard will be leaving STL in July 2009. Another key component of STL military activity is Boeing test flights of F15 and FA-18 fighter jets which are assembled at its plant in St. Louis. In 2008, it is estimated Boeing test flights accounted for 29 percent of the military activity at STL.

With the Air National Guard leaving STL in 2009, military operations are expected to almost exclusively consist of Boeing test flights through 2028. Boeing provided the expected number of monthly test flights for the years 2009 to 2012. These flights are expected to be scheduled during the weekdays. However, during bad weather conditions, some flights may be rescheduled for the weekends. Over the next five years, an average of two to three test flights is expected each weekday.

Based on the Boeing test flights information, the number of military operations is forecast to drop to 1,000 in 2009 and remain constant thereafter (*see* **Table 3.6-15, *Military Operations Forecast***).

The Air National Guard had 17 military aircraft based at STL in 2008. With the relocation of the Air National Guard Wing, no military aircraft are forecast to be based at STL through 2028.

Table 3.6-15
MILITARY OPERATIONS FORECAST
Lambert-St. Louis International Airport

Calendar Year	Military Operations
History	
1995	7,034
1996	5,837
1997	5,057
1998	4,899
1999	4,307
2000	4,084
2001	4,116
2002	2,552
2003	3,630
2004	5,676
2005	8,114
2006	18,226
2007	8,902
2008	2,941
Forecast	
2013	1,000
2018	1,000
2019	1,000
2023	1,000
2028	1,000
AAGR	
95-08	-6.5%
08-28	-5.3%

Sources: FAA Air Traffic Activity Data System (ATADS); Boeing; Landrum & Brown analysis, 2011

3.6.5 AIRCRAFT OPERATIONS SUMMARY

Table 3.6-16, *Total Aircraft Operations Forecast*, provides a summary of the operations forecast described in the previous sections for each of the primary components of aircraft operations at STL. Aircraft operations are forecast to grow from 248,397 in 2008 to 318,310 in 2028, representing average annual growth of 1.2 percent.

Table 3.6-16
TOTAL AIRCRAFT OPERATIONS FORECAST
Lambert-St. Louis International Airport

Calendar Year	Commercial Passenger								
	Domestic		International						
	Air Carrier	Commuter	Air Carrier	Commuter	Total	Cargo	Civil	Military	Total
History									
1995	343,578	107,486	1,300	222	452,586	9,218	49,123	7,034	517,961
2000	337,774	95,784	2,378	2,186	438,122	7,614	34,404	4,084	484,224
2005	106,002	149,206	1,712	1,182	258,102	5,466	25,322	8,114	297,004
2006	105,626	137,336	1,696	1,186	245,844	3,432	14,351	18,226	281,853
2007	109,418	115,988	1,828	1,286	228,520	3,278	16,228	8,902	256,928
2008	107,030	112,052	1,086	1,242	221,410	3,186	20,860	2,941	248,397
Forecast									
2013	109,800	111,000	1,520	1,620	223,940	3,190	23,800	1,000	251,930
2018	120,600	120,400	2,040	1,900	244,940	3,330	27,500	1,000	276,770
2019	122,600	121,800	2,120	1,920	248,440	3,360	27,800	1,000	280,600
2023	131,000	128,200	2,460	1,980	263,640	3,490	28,900	1,000	297,030
2028	141,800	136,400	2,860	2,020	283,080	3,730	30,500	1,000	318,310
Average Annual Growth Rates									
95-08	-8.6%	0.3%	-1.4%	14.2%	-5.4%	-7.8%	-6.4%	-6.5%	-5.5%
08-28	1.4%	1.0%	5.0%	2.5%	1.2%	0.8%	1.9%	-5.3%	1.2%

Sources: USDOT, Schedule T-100; *Official Airline Guide*; FAA Air Traffic Activity Data System (ATADS); Airport Records; Landrum & Brown analysis, 2011

Table 3.6-17, *Total Aircraft Operations Forecast – Itinerant vs. Local Activity*, provides a summary of the operations forecast segmented into itinerant and local operations at the airport. Over the forecast period, almost all the activity at STL is expected to be itinerant in nature. The very small percentage of local activity is predominantly made up of local military test flights.

Table 3.6-17
TOTAL AIRCRAFT OPERATIONS FORECAST – ITINERANT VS. LOCAL ACTIVITY
Lambert-St. Louis International Airport

Calendar Year	Itinerant						Local			Total
	Commercial									
	Air Carrier	Commuter	Total	Civil	Military	Total	Civil	Military	Total	Total
History										
2008	125,315	99,281	224,596	20,691	2,352	247,639	169	589	758	248,397
Forecast										
2013	134,310	92,820	227,130	23,600	-	250,730	200	1,000	1,200	251,930
2018	151,170	97,100	248,270	27,300	-	275,570	200	1,000	1,200	276,770
2023	167,550	99,580	267,130	28,700	-	295,830	200	1,000	1,200	297,030
2028	186,390	100,420	286,810	30,300	-	317,110	200	1,000	1,200	318,310
Average Annual Growth Rates:										
08-28	2.0%	0.1%	1.2%	1.9%	-100.0%	1.2%	0.8%	2.7%	2.3%	1.2%

Note: Air carrier/commuter split based on the FAA 60-seat definition for comparison purposes with the FAA Terminal Area Forecasts; itinerant commercial operations include both passenger and all-cargo operations; itinerant civil operations include non-commercial air taxi and general aviation activity.

Sources: USDOT, Schedule T-100; *Official Airline Guide*; FAA Air Traffic Activity Data System (ATADS); Airport Records; Landrum & Brown analysis, 2011

Table 3.6-18, *Total Aircraft Operations Forecast – IFR vs. VFR Activity*, provides a summary of the operations forecast segmented into flights operated under instrument versus visual flight rules at STL. Less than one percent of flights are operated under visual flight rules at STL reflecting its status as a primary commercial service airport. No significant change in VFR activity is expected at STL over the forecast period.

TABLE 3.6-18
TOTAL AIRCRAFT OPERATIONS FORECAST – IFR VS. VFR ACTIVITY
Lambert-St. Louis International Airport

Calendar Year	Instrument Operations	Visual Operations	Total Operations
History			
2008	246,040	2,357	248,397
Forecast			
2013	249,530	2,400	251,930
2018	274,370	2,400	276,770
2023	294,630	2,400	297,030
2028	315,910	2,400	318,310
Average Annual Growth Rates:			
08-28	1.3%	0.1%	1.2%

Sources: USDOT, Schedule T-100; *Official Airline Guide*; FAA Air Traffic Activity Data System (ATADS); Airport Records; Landrum & Brown analysis, 2011

3.7 REVIEW OF PREVIOUS FORECASTS

Prior forecasts developed for STL were identified and reviewed to define their applicability to the Master Plan and to provide a base of comparison for the current forecast. Previous forecasts include the 1996 Master Plan (which was the basis of the EIS on the 3rd parallel runway), the 2007 bond issue, and the 2008 Federal Aviation Administration TAF.

3.7.1 1996 MASTER PLAN FORECAST

The 1996 Master Plan was developed when TWA still operated its primary domestic hubbing operation at STL. Three forecasts were prepared as part of the Master Plan. The first, the baseline forecast, assumed a continuation of the role of STL as a hub for TWA. A high scenario was developed based on increased growth of the existing carriers or a second airline establishing a hub at STL. The low scenario was based on the initial loss of the TWA hub and the subsequent establishment of another airline's hub later in the forecast period.

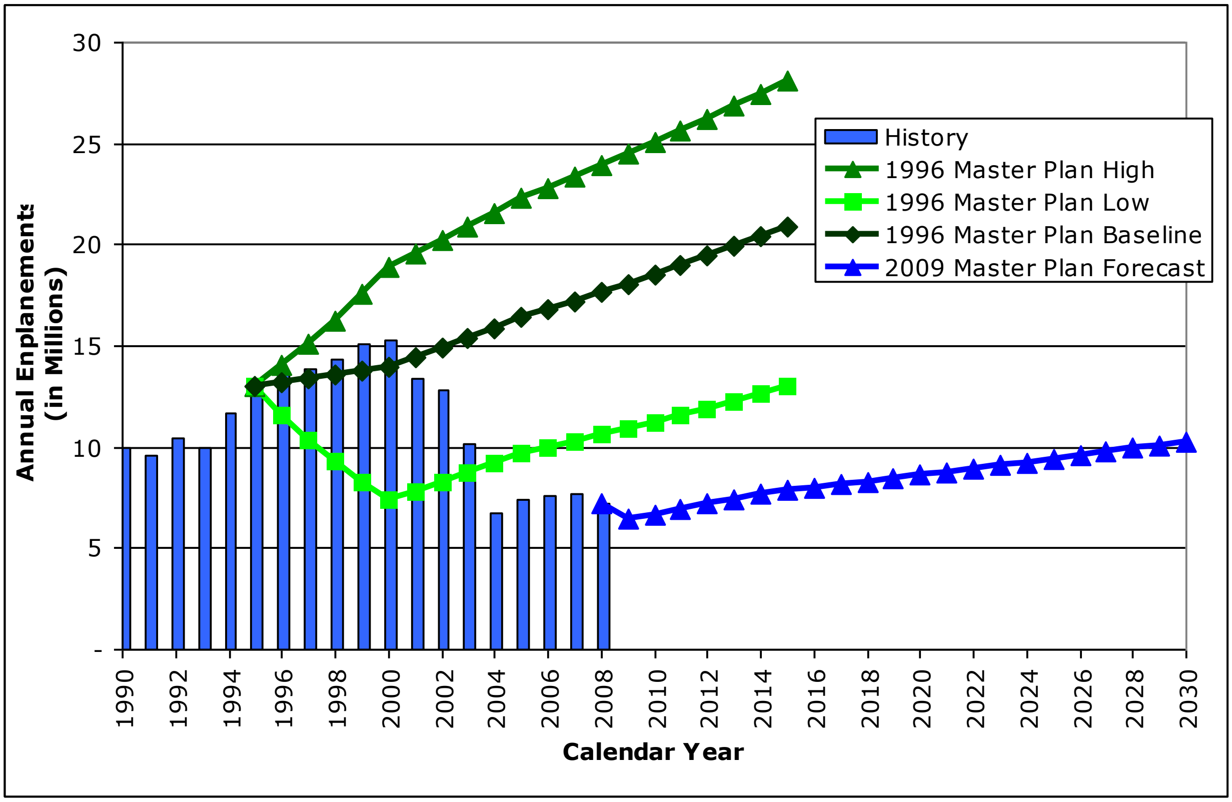
In 2001 TWA was purchased by American Airlines and STL became a secondary hub. The downgrading of the hub was compounded by the decline in air traffic nationwide after the terrorist attacks of September 11, 2001. As a result, the 1996 Master Plan overestimated future traffic levels.

3.7.1.1 Passenger Enplanements Forecast

The 1996 Master Plan baseline forecast resulted in 2.4 percent average annual growth in enplanements between 1995 and 2015. The high scenario resulted in enplanements growing at a rate of 3.9 percent annually from 1995 to 2015. The low scenario results in declining traffic levels from 1995 to 2000 due to the loss of the TWA hub. However, the low scenario assumed another airline would establish a hub operation at STL, allowing enplanements to recover to 1995 levels by 2015.

Actual traffic levels fell from a high of 15.3 million enplanements in 2000 to 6.7 million in 2004 after American downsized the STL hub. Due to this decrease in traffic, each of the three Master Plan forecast scenarios are much higher than actual traffic realized at the airport (*see* **Exhibit 3.7-1, *Comparison with 1996 Master Plan Forecast - Enplanements***). The 2009 Master Plan forecast reflects STL's current and anticipated future role and therefore results in lower enplanements levels than the 1996 Master Plan.

Exhibit 3.7-1
COMPARISON WITH 1996 MASTER PLAN FORECAST - ENPLANEMENTS
Lambert-St. Louis International Airport

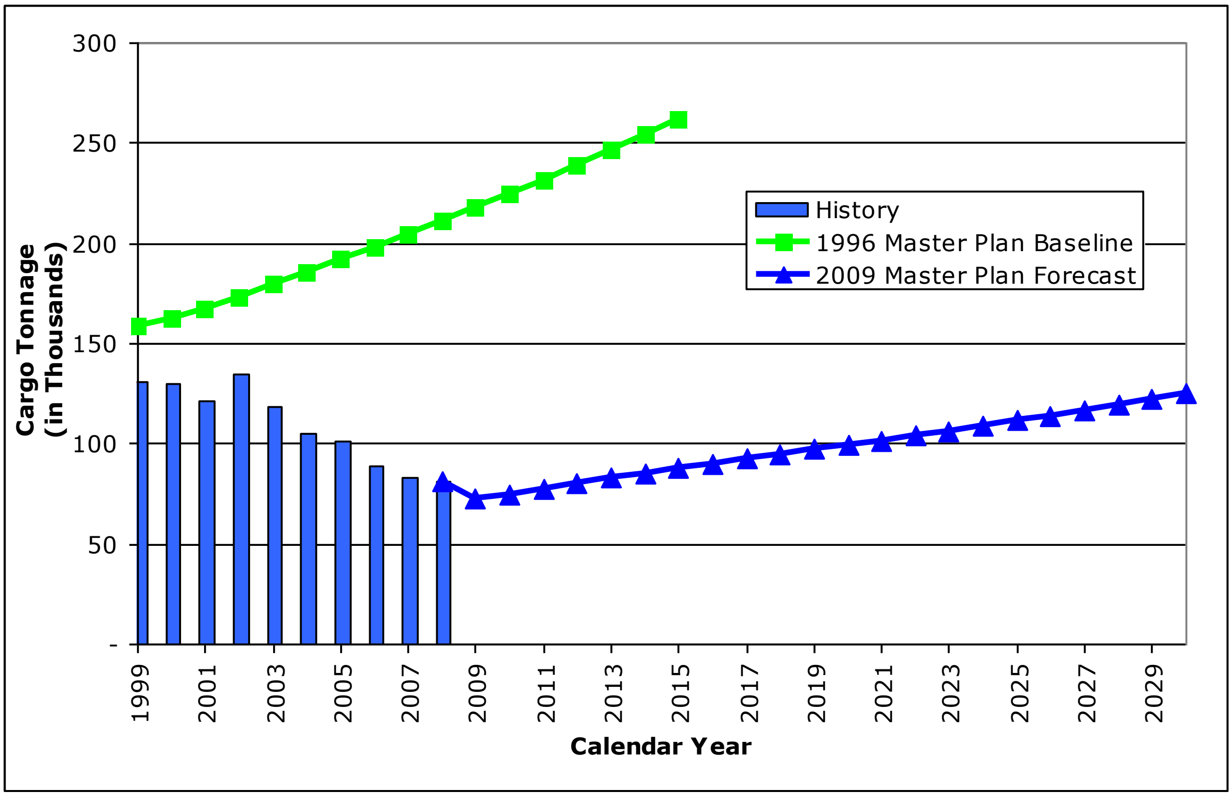


Sources: Lambert-St. Louis International Airport Master Plan Supplement Study, Final Report January 1996; Airport Records; Landrum & Brown analysis, 2011

3.7.1.2 Cargo Tonnage Forecast

The 1996 Master Plan predicted cargo tonnage would increase at a rate of three percent annually from 1994 to 2015 (*see* **Exhibit 3.7-2, *Comparison with 1996 Master Plan Forecast – Cargo Tonnage***). In fact, cargo volumes have fallen by 5.2 percent per annum since 1999.

Exhibit 3.7-2
COMPARISON WITH 1996 MASTER PLAN FORECAST – CARGO TONNAGE
Lambert-St. Louis International Airport

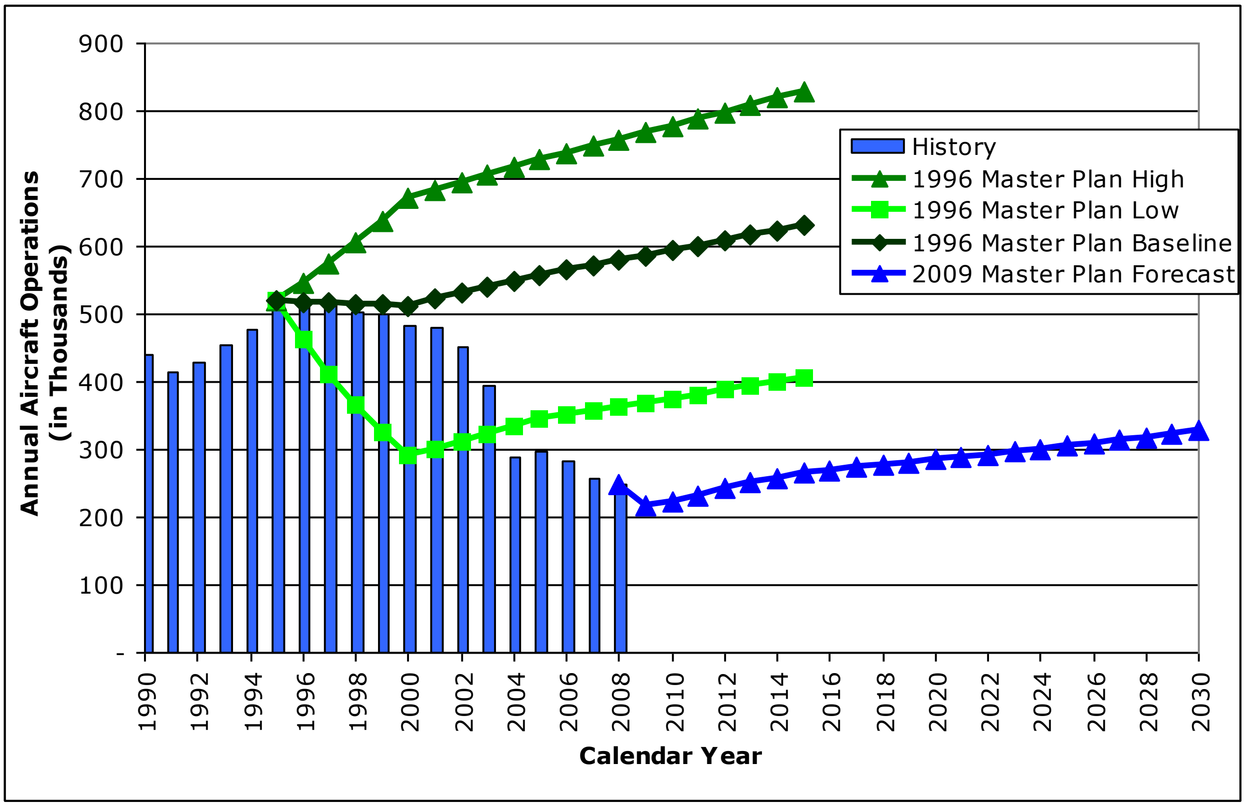


Sources: Lambert-St. Louis International Airport Master Plan Supplement Study, Final Report January 1996; Airport Records; Landrum & Brown analysis, 2011

3.7.1.3 Aircraft Operations Forecast

As with the enplaned passenger forecast, the baseline, high, and low operations forecasts developed for the 1996 Master Plan resulted in higher operations levels than actually occurred (*see* **Exhibit 3.7-3, *Comparison with 1996 Master Plan Forecast – Aircraft Operations***).

Exhibit 3.7-3
COMPARISON WITH 1996 MASTER PLAN FORECAST - AIRCRAFT OPERATIONS
Lambert-St. Louis International Airport



Sources: Lambert-St. Louis International Airport Master Plan Supplement Study, Final Report January 1996; Airport Records; Landrum & Brown analysis, 2011

3.7.2 2007 BOND ISSUE

An enplanements forecast was prepared as part of the City of St. Louis 2007 Bond Issue. This forecast predicted 7.01 million signatory[54] airline enplanements for Fiscal Year 2007, growing to 7.86 million in Fiscal Year 2011.[55] This represents average annual growth of 2.9 percent from 2007 to 2011 in line with the FAA 2007 TAF.

[54] A signatory airline is an air carrier that operates at the airport pursuant to a Use Agreement.
[55] Page 47 of the Official Statement Relating to the *$231,275,000 The City of St. Louis, Missouri Airport Revenue Refunding Bonds Series 2007A (Non-AMT) (Lambert-St. Louis International Airport)*

3.7.3 FEDERAL AVIATION ADMINISTRATION TERMINAL AREA FORECAST

The FAA develops the TAF on an annual basis for all active airports in the U.S. that are included in its National Plan of Integrated Airport Systems (NPIAS). The TAF is "prepared to meet the budget and planning needs of FAA and provide information for use by state and local authorities, the aviation industry, and the public."[56] The 2008 TAF was issued in December of 2008.

Table 3.7-1, *Aviation Forecasts Versus FAA 2008 TAF*, provides a comparison of this Master Plan forecasts with the FAA 2008 TAF for enplanements, commercial operations, and total aircraft operations for the 5, 10, and 15-year horizons. The Master Plan forecast is within 10 percent of the 2008 TAF in each planning horizon for both enplanements and aircraft operations. The Master Plan total based aircraft forecast is significantly lower than the current version of the FAA TAF, which does not reflect the reduction in military based aircraft due to the Air National Guard leaving STL in 2009.

Table 3.7-1
AVIATION FORECASTS VERSUS FAA 2008 TAF
Lambert-St. Louis International Airport

	Year	Master Plan Forecast	2008 TAF [4]	Percent Difference
Passenger Enplanements				
Base Yr.	2008	7,207,890	6,984,154	3.2%
Base Yr.+5 Yrs.	2013	7,448,400	7,080,612	5.2%
Base Yr.+10 Yrs.	2018	8,304,900	8,127,042	2.2%
Base Yr.+15 Yrs.	2023	9,077,800	9,331,255	-2.7%
Commercial Operations [1]				
Base Yr.	2008	224,596	241,314	-6.9%
Base Yr.+5 Yrs.	2013	227,130	224,860	1.0%
Base Yr.+10 Yrs.	2018	248,270	244,598	1.5%
Base Yr.+15 Yrs.	2023	267,130	266,084	0.4%
Total Operations [2]				
Base Yr.	2008	248,397	255,893	-2.9%
Base Yr.+5 Yrs.	2013	251,930	239,754	5.1%
Base Yr.+10 Yrs.	2018	276,770	260,447	6.3%
Base Yr.+15 Yrs.	2023	297,030	282,927	5.0%
Based Aircraft [3]				
Base Yr.	2008	35	35	0.0%
Base Yr.+5 Yrs.	2013	21	33	-36.4%
Base Yr.+10 Yrs.	2018	24	31	-22.6%
Base Yr.+15 Yrs.	2023	25	29	-13.8%

Notes:
1. Air taxi operations are included in the commercial operations totals for the TAF. The Master Plan forecast groups air taxi operations in the non-commercial category.
2. Excludes overflights.
3. Includes both civil and military based aircraft.
4. Data shown for the FAA 2008 TAF is presented on a fiscal year basis (12 months ended September).

Sources: FAA 2008 Terminal Area Forecast; Airport Records; Landrum & Brown analysis, 2011

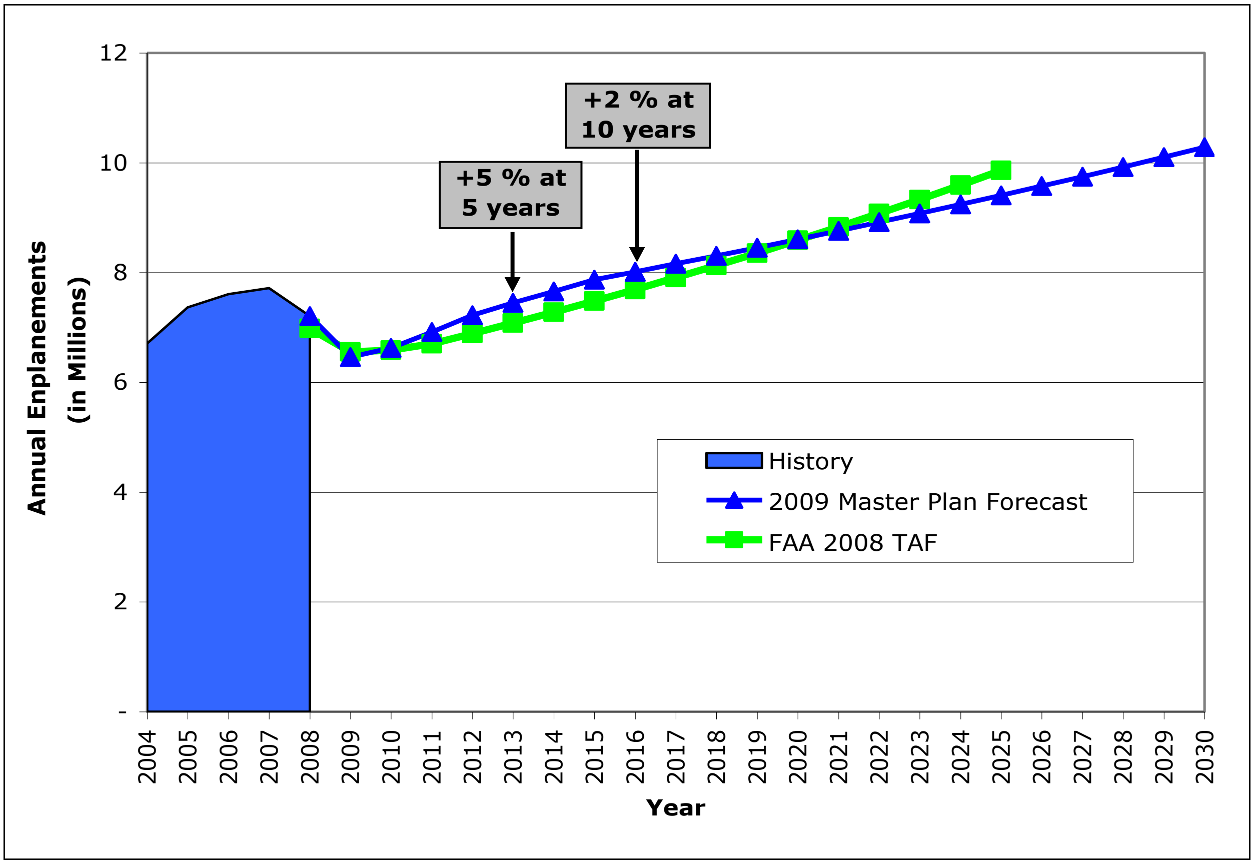
56 *See* Internet website: http://aspm.faa.gov/main/taf.asp

3.7.3.1 Passenger Enplanements Forecast

The 2008 TAF shows declining traffic levels in 2008 and 2009 as a result of the economic recession and related decline in aviation activity. In spite of the current U.S. recession and the downgrading of the STL hub by American, it is important to note that the FAA expects passenger traffic growth at STL over the long term. The 2008 TAF predicts enplanements will increase at an average annual rate of 1.9 percent through 2025.

Exhibit 3.7-4, *Comparison with FAA 2008 TAF – Enplanements*, provides a comparison between the enplanements forecast for this Master Plan and the FAA 2008 TAF for STL. The difference in growth assumptions results in a 5.2 percent difference in enplanements in 2013 and a 2.2 percent difference in enplanements by 2018.

Exhibit 3.7-4
COMPARISON WITH FAA 2008 TAF - ENPLANEMENTS
Lambert-St. Louis International Airport

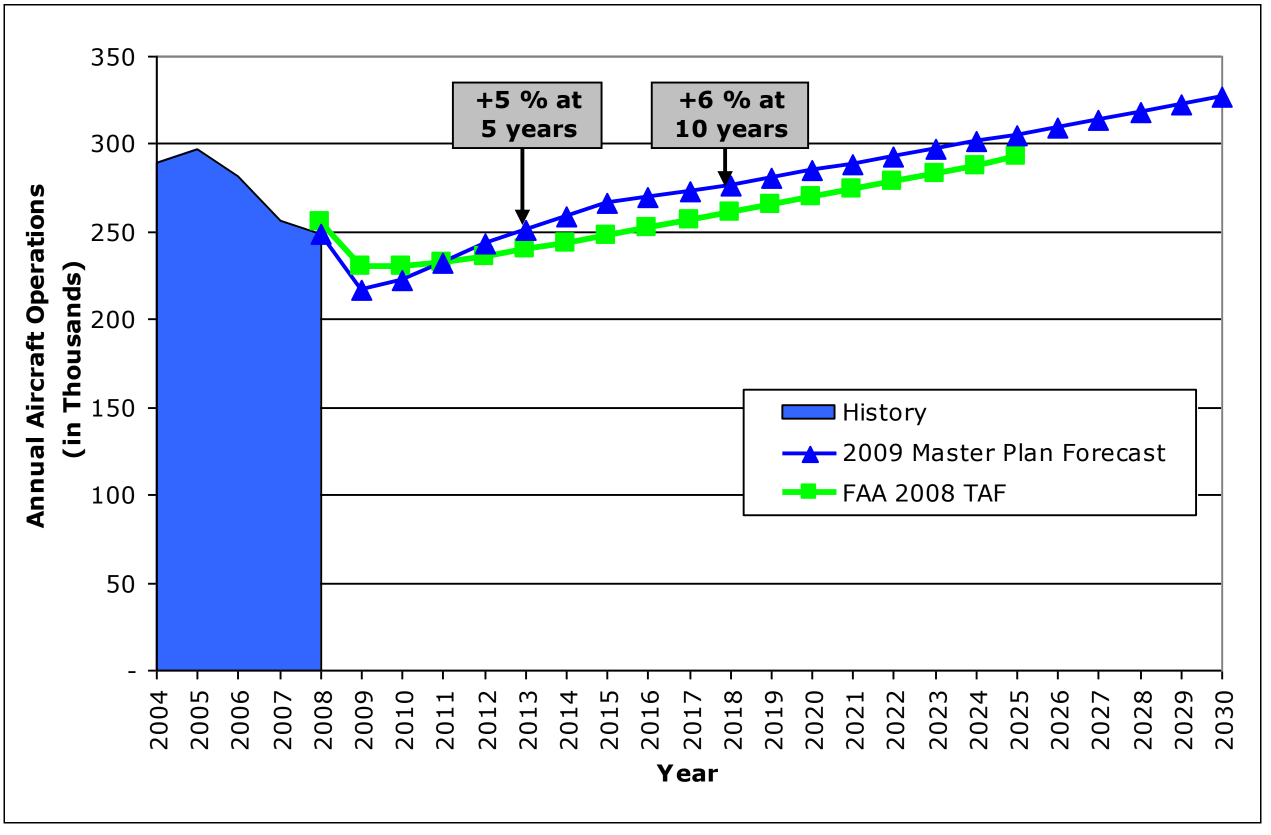


Sources: Federal Aviation Administration 2008 Terminal Area Forecast; Airport Records; Landrum & Brown analysis, 2011

3.7.3.2 Aircraft Operations Forecast

The FAA 2008 TAF predicts STL aircraft operations to reverse the decline experienced since the late 1990s. The FAA expects total aircraft operations at STL to grow 0.7 percent through 2025. The Master Plan aircraft operations forecast assumes an average annual growth rate of 1.2 percent through 2028. Total aircraft operations levels in the baseline forecast are 4.7 percent higher than the TAF in 2013 and 6.3 percent higher in 2018 (*see* **Exhibit 3.7 -5, *Comparison with FAA 2008 TAF – Aircraft Operations***).

Exhibit 3.7-5
COMPARISON WITH FAA 2008 TAF - AIRCRAFT OPERATIONS
Lambert-St. Louis International Airport



Sources: Federal Aviation Administration 2008 Terminal Area Forecast; Airport Records; Landrum & Brown analysis, 2011

3.8 DERIVATIVE FORECASTS

The traffic demand patterns imposed upon an airport are subject to seasonal, monthly, daily, and hourly variations. These variations result in peak periods when the greatest amount of demand is placed upon facilities required to accommodate passenger and aircraft movements. Peaking characteristics are critical in the assessment of existing facilities to determine their ability to accommodate forecast increases in passenger and operational activity throughout the study period. The objective of developing peak period forecasts is to provide a design level that sizes facilities so they are neither underutilized nor overcrowded too often.

In order to evaluate the peaking patterns at an airport, the annual enplanements and aircraft operations forecasts are converted to monthly, daily, and hourly equivalents. The STL design day is based on the activity levels that occur on an average weekday in the peak month (PMAWD).

Peak month, PMAWD, and peak hour factors were developed for the following categories:

- Commercial passenger activity
    - Domestic air carrier
    - Domestic commuter
    - International air carrier
    - International commuter
- Air cargo operations
- Civil operations
- Military operations

The peaking factors were used to create design day flight schedules. PMAWD schedules were created for use in the development of passenger terminal requirements. Average day flight schedules were also developed for use in the environmental analysis.

3.8.1 COMMERCIAL PASSENGERS

OAG scheduled seats data was used to determine the passenger peaking patterns at STL. OAG seat data was used as a proxy for passengers because historical passenger data was not available in the level of detail needed for this analysis. The seats peaking factors were used to develop the peak month, PMAWD, and peak hour passenger forecasts.

3.8.1.1 Peak Month Passengers

OAG data for three years (2007, 2008, and 2009) was analyzed. The month-to-month traffic patterns for 2008 and 2009 are skewed because the airlines reduced their schedules significantly in the last quarter of 2008 and for most of 2009.

Scheduled seats were down 14.1 percent in November 2008 and 12.9 percent in December of 2008 compared to the same months in 2007. The number of scheduled seats for January through October of 2009 is at least 10 percent lower for each month compared to 2008. The monthly factors in 2008 and 2009 are not considered indicative of future activity patterns. As a result, the peak month was selected based on 2007 patterns.

Based on the scheduled seats data for 2007, August was the peak month for domestic air carrier seats, domestic commuter seats, and total seats (*see* **Table 3.8-1, *2007 Monthly Scheduled Seats Factors***). June was the peak month for international commuter seats. While there are monthly variations in the number of scheduled seats for these segments of activity, the differences are not extreme. Conversely, the international air carrier segment has more pronounced seasonal variations. March was the peak month for international air carrier activity in 2007 while August was one of the lowest activity months for this segment of activity.

Table 3.8-1
2007 MONTHLY SCHEDULED SEATS FACTORS
Lambert-St. Louis International Airport

Month	Domestic		International		Total
	Air Carrier	Commuter	Air Carrier	Commuter	
January	8.2%	8.9%	10.6%	7.8%	8.4%
February	7.4%	8.0%	12.5%	7.3%	7.6%
March	8.3%	8.7%	**14.8%**	8.1%	8.5%
April	8.2%	8.1%	11.0%	7.8%	8.2%
May	8.6%	8.2%	6.3%	8.2%	8.5%
June	8.5%	8.1%	9.8%	**10.2%**	8.4%
July	8.7%	8.5%	9.2%	9.4%	8.7%
August	**8.8%**	**8.7%**	5.9%	9.3%	**8.7%**
September	8.2%	7.8%	4.3%	8.7%	8.1%
October	8.6%	8.5%	5.0%	8.7%	8.5%
November	8.3%	8.1%	4.6%	7.6%	8.2%
December	8.2%	8.5%	6.0%	7.0%	8.3%

Sources: *Official Airline Guide*, 2007; Landrum & Brown analysis, 2011

In order to most accurately develop future terminal requirements for both domestic and international activity, a composite PMAWD was created that reflects the seasonal aspect of the international air carrier service. Because August is the peak month for total seats, the monthly profiles were developed based on August data for all segments of activity except the international air carrier segment. The international air carrier profiles are based on March data. This results in a slightly higher overall monthly number of passengers than would result from applying the August ratios for all activity segments. However, this method provides the most accurate information for future planning.

It was assumed that the monthly seasonality patterns for the domestic segments and the international commuter segment would not change materially over the forecast period. As a result, the peak month seats factors for these segments are forecast to return to 2007 levels in 2010 and remain at those levels through 2028. The monthly seasonality in international air carrier service is expected to continue throughout the planning period but will be offset as new daily service to Latin America and Europe is added. As a result, the international air carrier peak month enplanement factor is expected to decrease from over 14 percent in 2007 to less than 11 percent by 2028.

3.8.1.2 PMAWD Passengers

Based on an analysis of OAG data, it was determined that Wednesdays represent typical average weekday activity for both domestic and international activity. Therefore, the following days were chosen as representative of the PMAWD for 2007, 2008, and 2009:

- Wednesday, August 15, 2007
- Wednesday, August 13, 2008
- Wednesday, August 12, 2009

The August design day was supplemented with international air carrier activity from the following days in March:

- Wednesday, March 14, 2007
- Wednesday, March 12, 2008
- Wednesday, March 11, 2009

The composite of the August activity and the additional March international air carrier activity results in the PMAWD schedule for each year.

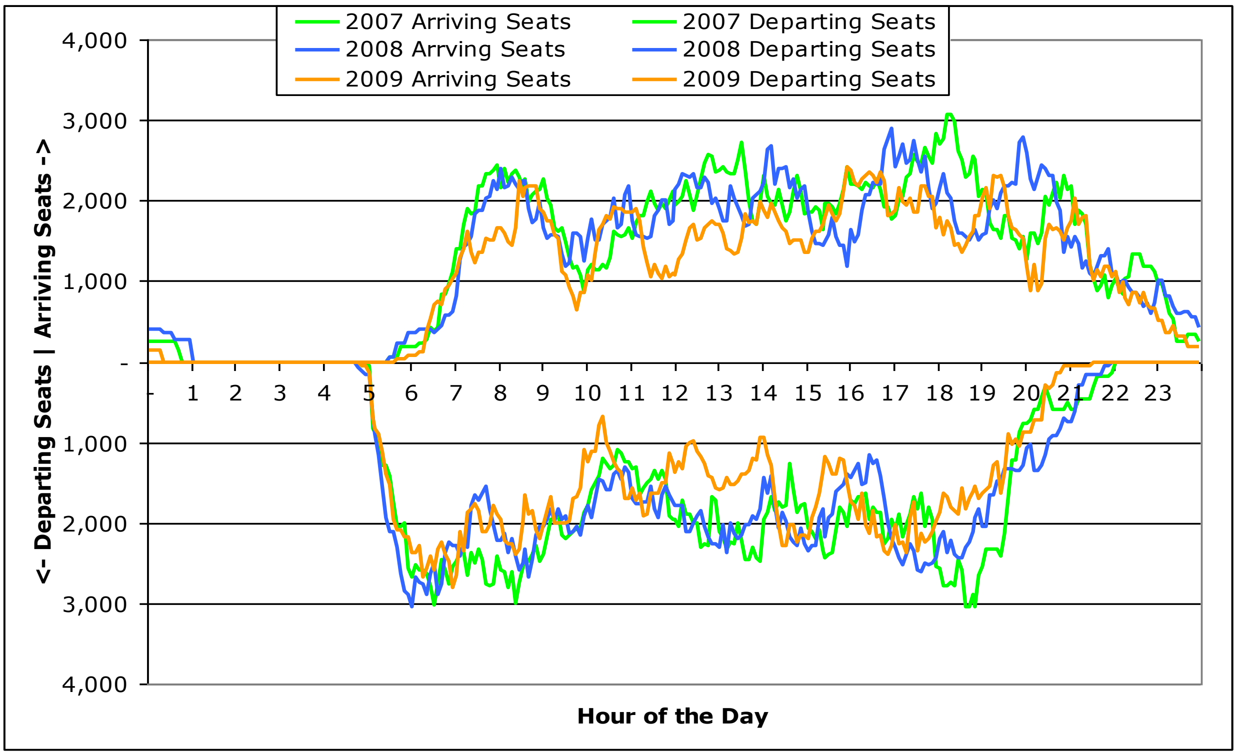
While the month-to-month variations in 2008 and 2009 are not indicative of future peaking patterns, the relationship of daily to monthly activity was fairly constant in 2007, 2008, and 2009. The domestic PMAWD represents 3.4 percent of August domestic seats in 2007, 2008, and 2009. The international commuter PMAWD factor was 3.3 percent in 2007 and 2008 and is scheduled to be 3.2 percent in 2009. International air carrier PMAWD seats represented 3.1 percent of March seats in 2007, 3.2 percent in 2008, and 3.1 percent in 2009. It is assumed that the 2009 PMAWD factors will continue through 2028.

3.8.1.3 Peak Hour Passengers

Peak hour enplanements and deplanements were derived from the OAG composite design day schedules discussed in Section 2.9.1.2. Peak hour load factors for each segment of activity are assumed to reach 85 percent for all types of activity for 2008 and all forecast years.

The hourly peaking patterns for the 2007, 2008, and 2009 design days are compared in **Exhibit 3.8-1, *Design Day Scheduled Seats Profile (2007 vs. 2008 vs. 2009)***. The daily activity is shown in five-minute increments on a rolling 60-minute basis. The peak hour of activity has shifted since 2007. Additionally, the number of seats in the peak hour is lower in 2009 than it was in 2007 due to service cutbacks.

Exhibit 3.8-1
DESIGN DAY SCHEDULED SEATS PROFILE
(2007 vs. 2008 vs. 2009)
Lambert-St. Louis International Airport

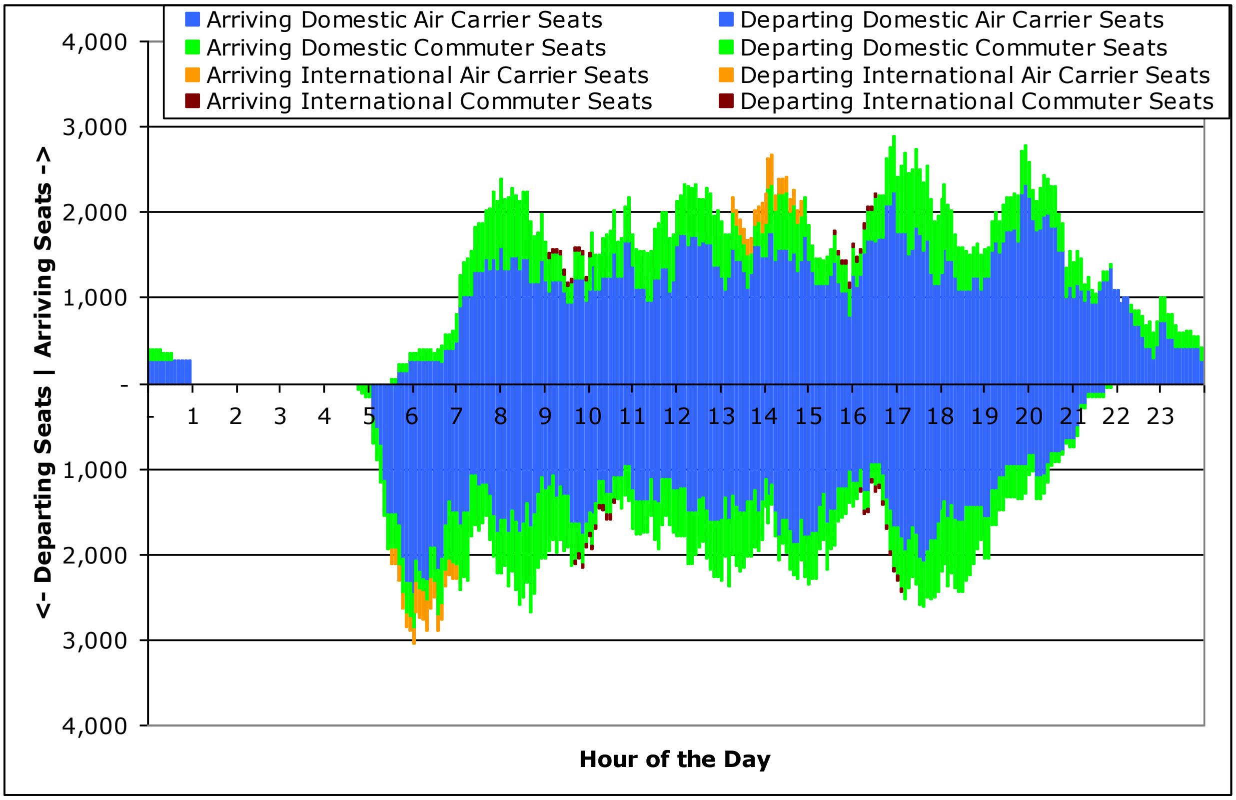


Sources: *Official Airline Guide*; Landrum & Brown analysis, 2011

The 2008 hourly profile was deemed to be the most reliable for developing factors to forecast future peak hour passengers. The August 2008 schedule reflects conditions before the cutbacks occurred in the fourth quarter of 2008 and in 2009. The base year 2008 design day scheduled seats profile is presented in **Exhibit 3.8-2, *Rolling 60-Minute Scheduled Seats Profile (August 13, 2008)***, in five-minute increments on a rolling 60-minute basis for each segment of activity. The 2008 total seats peak hour occurred between 17:10 and 18:10. The departing seats peak hour occurred between 06:00 and 07:00 while arriving seats peaked between 16:55 and 17:55 in 2008.

It is assumed that the peak hour factors from 2008 will continue through 2028 for domestic flights. The international air carrier and commuter peak hour factors are expected to fluctuate over the forecast horizon because there are a small number of international flights in the PMAWD schedule. As new flights are added, the peak hour factor is expected to decrease. A similar pattern exists for the international commuters.

Exhibit 3.8-2
ROLLING 60-MINUTE SCHEDULED SEATS PROFILE (August 13, 2008)
Lambert-St. Louis International Airport



Sources: *Official Airline Guide*; Landrum & Brown analysis, 2011

3.8.1.4 Peak Period Passenger Summary

Table 3.8-2, *Derivative Forecasts – Passenger Enplanements*, presents the results of the peak period activity forecasts for enplanements for the 2013, 2018, 2023, and 2028 planning horizons.

The table shows the peak hour totals for the individual components of activity. The peak hour for each of the various segments of activity does not necessarily occur in the same hour so the peak hour enplanements for the various categories of traffic cannot be aggregated across categories.

Peak hour enplanements, which were at 2,584 for the 2008 design day, are projected to increase to 3,423 by 2028.

Table 3.8-2
DERIVATIVE FORECASTS – PASSENGER ENPLANEMENTS
Lambert-St. Louis International Airport

Annual

		Domestic Passenger		International Passenger		Commercial
	Calendar Year	Air Carrier Enplanements	Commuter Enplanements	Air Carrier Enplanements	Commuter Enplanements	Passenger Enplanements
Base	2008	5,231,273	1,880,672	78,856	17,089	7,207,890
Forecast	2013	5,425,900	1,896,200	103,600	22,700	7,448,400
	2018	6,027,100	2,111,100	139,700	27,000	8,304,900
	2023	6,573,000	2,307,400	168,600	28,800	9,077,800
	2028	7,171,500	2,523,200	198,100	29,900	9,922,700

Peak Month

		Domestic Passenger		International Passenger		Commercial
	Calendar Year	Air Carrier Enplanements	Commuter Enplanements	Air Carrier Enplanements	Commuter Enplanements	Passenger Enplanements
Base	2008	463,275	152,528	15,677	1,630	633,110
Forecast	2013	478,237	164,170	15,357	2,108	659,872
	2018	531,227	182,776	18,711	2,507	735,221
	2023	579,342	199,771	20,404	2,674	802,191
	2028	632,094	218,455	21,662	2,776	874,987

Peak Month Average Week Day

		Domestic Passenger		International Passenger		Commercial
	Calendar Year	Air Carrier Enplanements	Commuter Enplanements	Air Carrier Enplanements	Commuter Enplanements	Passenger Enplanements
Base	2008	15,859	5,181	297	55	21,392
Forecast	2013	16,323	5,559	538	56	22,476
	2018	18,131	6,188	522	86	24,927
	2023	19,774	6,764	638	86	27,262
	2028	21,574	7,396	694	89	29,753

Peak Hour

		Domestic Passenger		International Passenger		Commercial
	Calendar Year	Air Carrier Enplanements	Commuter Enplanements	Air Carrier Enplanements	Commuter Enplanements	Passenger Enplanements
Base	2008	2,094	852	287	43	2,584
Forecast	2013	2,120	886	286	43	2,655
	2018	2,336	972	286	43	2,930
	2023	2,526	1,047	313	43	3,167
	2028	2,734	1,129	341	43	3,423

Note: Peak hour enplanements for each segment of activity represent the peak hour for that component of activity. The peak hours for the various types of activity do not necessarily occur at the same hour.

Source: Landrum & Brown analysis, 2011

3.8.2 AIRCRAFT OPERATIONS

Peak period operations factors were developed using FAA, ATADS; FAA, Enhanced Traffic Management System Counts (ETMSC); U.S. DOT, Schedule T-100 data; passenger airline schedules published in the OAG; and radar data. As with the peak period passenger forecasts, the passenger operations data was developed for domestic air carrier, domestic commuter, international air carrier, and international commuter operations. Additionally, peak period forecasts were developed for air cargo, civil, and military operations.

3.8.2.1 Commercial Passenger Operations

PEAK MONTH OPERATIONS

As with peak month seats, the 2007 factors were used because the cutbacks in airline schedules in 2008 and 2009 skewed the monthly profiles in these years. The 2007 peak month factors were 8.8 percent for domestic air carrier operations, 8.4 percent for domestic commuter operations, 15.2 percent for international air carrier operations, and 9.3 percent for international commuter operations.

It was assumed that the monthly patterns of activity for the domestic segments and the international commuter segment would not change materially over the forecast period. As a result, the peak month seats factors for these segments are forecast to return to their 2007 levels in 2010 and remain at those levels through 2028. The monthly seasonality in international air carrier service is expected to continue through 2028 but will be offset as new daily service to Latin America and Europe is added. As a result, the international air carrier peak month operations factor is expected to decrease from 15 percent in 2007 to 11 percent by 2028.

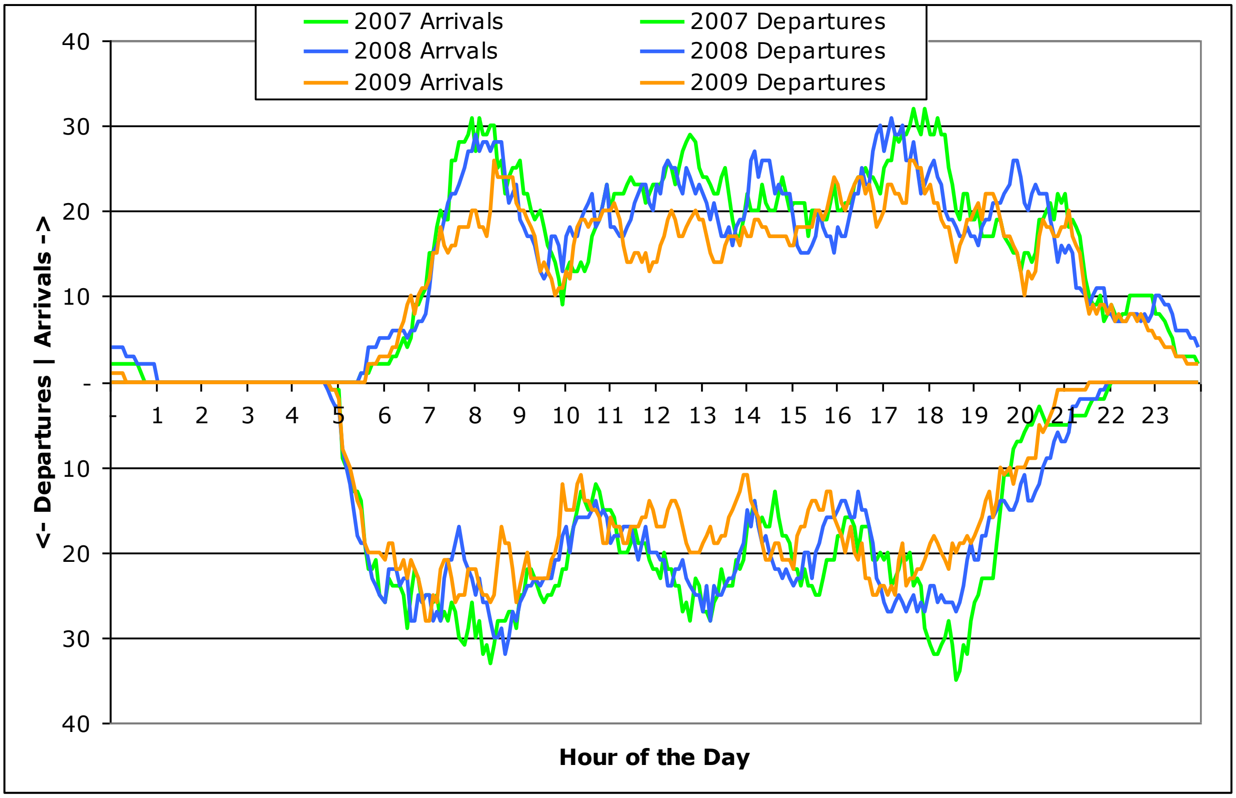
PMAWD OPERATIONS

The relationship of daily to monthly commercial aircraft operations was fairly constant in 2007, 2008, and 2009. PMAWD domestic operations have consistently made up 3.4 percent of peak month operations in each year. PMAWD international air carrier operations made up 3.2 percent of the peak month operations in 2007 and 3.1 percent in 2008 and 2009. PMAWD international commuter operations made up 3.3 percent of the peak month operations in 2007 and 2008, and 3.2 percent in 2009. It is assumed that the 2009 factors will continue through 2028.

PEAK HOUR OPERATIONS

The hourly peaking patterns for the 2007, 2008, and 2009 design days are compared on **Exhibit 3.8-3, *Design Day Scheduled Passenger Aircraft Operations Profiles Comparison (2007 vs 2008 vs. 2009)***. The daily activity is shown in five-minute increments on a rolling 60-minute basis. The peak hour of activity has shifted since 2007. Additionally, the number of operations in the peak hour is lower in 2009 than it was in 2007 due to service cutbacks.

Exhibit 3.8-3
DESIGN DAY SCHEDULED PASSENGER AIRCRAFT OPERATIONS PROFILES COMPARISON
(2007 vs. 2008 vs. 2009)
Lambert-St. Louis International Airport

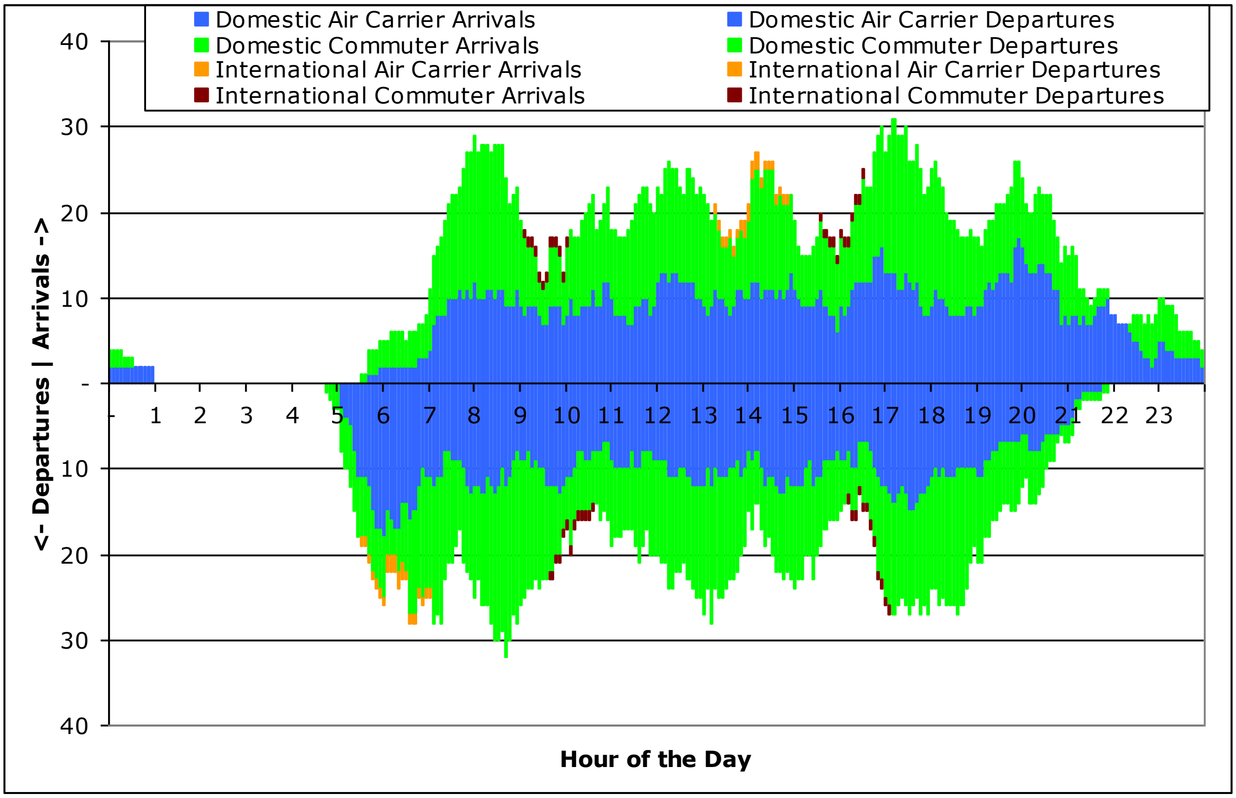


Sources: *Official Airline Guide*; Landrum & Brown analysis, 2011

Exhibit 3.8-4, *Rolling 60-Minute Schedule Passenger Aircraft Operations Profile (August 13, 2008)*, illustrates the 2008 base year baseline design day operations profile in five-minute increments on a rolling 60-minute basis for each segment of activity. The commercial passenger arrival operations peak hour occurred between 17:10 and 18:10 in 2008, consisting of 31 arrivals. The departures peak hour for total commercial passengers occurred between 08:40 and 09:40 in 2008 with 32 departures. Commercial passenger total operations peaked at three times through the day: 08:25 to 09:25, 08:30 to 09:30, and 17:10 to 18:10 (58 total commercial passenger operations in each of these three time periods). The 2008 daily profile was used to forecast future peak hour operations.

It is assumed that the domestic peak hour factors from 2008 will continue through 2028. As with the international peak hour seats factors, it is assumed that as new international service is added to different regions of the world, the international operations peak hour factors will decrease accordingly.

Exhibit 3.8-4
ROLLING 60-MINUTE SCHEDULED PASSENGER AIRCRAFT OPERATIONS PROFILE (August 13, 2008)
Lambert-St. Louis International Airport



Sources: *Official Airline Guide*; Landrum & Brown analysis, 2011

3.8.2.2 All-Cargo Operations

Radar data for the one-year period ending August 2008 was analyzed to determine the peaking patterns for all-cargo operations. The cargo carriers at STL operated between five and seven daily arrivals on Mondays through Fridays in August of 2008. The cargo carriers typically operated between three and five daily arrivals on Saturdays with the same number of corresponding departures on Mondays. There were no cargo flights on Sundays. This results in a PMAWD factor of 4.5 percent.

The hourly pattern of the cargo operations does not vary much on a day-to-day basis. In a typical day there would be one arrival in the midnight hour with the remainder of arrivals occurring between 04:00 and 07:00. There is typically one departure in the midnight hour, another between 06:00 and 08:00, with the remainder departing between 22:00 and 23:59.

The cargo monthly, daily, and hourly factors are not expected to change materially during the planning horizon.

3.8.2.3 Civil Operations

Based on an analysis of the radar data, August civil operations represented 8.8 percent of annual civil operations. The number of daily operations varies, with the number of operations being higher on weekdays than weekends. This is consistent with the business nature of the civil traffic at STL. August 2008 PMAWD operations made up 3.8 percent of monthly operations.

The hourly distribution of civil activity varies on a day-to-day basis with no distinct pattern. As a result, August 13, 2008 (the same design day used for the commercial passenger traffic) was used to determine hourly peaking patterns. This analysis shows that the civil aviation arrivals peak hour occurs at 19:45 and represents 15.6 percent of daily civil arrivals. The civil aviation departures peak hour is at 07:00 with 18.5 percent of the design day's departures. The civil aviation total operations peak hour occurs at 07:00, 13:40, 17:55, 19:50, and 20:15, with each of these 60-minute periods consisting of 10.2 percent of the design day's civil operations.

The civil operations monthly, daily, and hourly factors are not expected to change materially during the planning horizon.

3.8.2.4 Military Operations

Based on an analysis of the radar data, August military operations represented 8.9 percent of annual military operations. The Air National Guard is leaving STL in 2009. The vast majority of the remaining military activity will consist of fighter jet test flights by Boeing. Boeing provided monthly projections of activity through 2012. Based on these projections, August military operations are expected to represent 9.3 percent of annual in 2009, 9.0 percent in 2010, and 8.8 percent in 2011. The peak month factor is then expected to hold constant at 8.8 percent through 2028.

According to sources at Boeing, the test flights will primarily occur on weekdays unless there is a need to postpone the flights to the weekend due to weather. This results in a projected PMAWD ratio of four percent through 2028.

According to sources at Boeing, the fighter jet test flights are most likely to occur at 10:00 and 14:00. It is unlikely that there will be more than one military operation in any given time period throughout the planning horizon.

3.8.2.5 Peak Period Operations Summary

Table 3.8-3, *Derivative Forecasts – Aircraft Operations* provides a summary of the annual, monthly, PMAWD, and peak hour aircraft operations forecasts.

The total operations peak hour will grow from 66 operations in 2008 to 78 operations in 2028, mainly driven by the domestic passenger operations peak. The cargo operations peak hour will increase from four movements in 2008 to five in 2028. Civil operations are expected gain an additional three operations in the peak hour by 2028. Military peak hour operations will drop to one in 2009 and remain at this level in through 2028.

It is worth noting that the peak hour for individual categories of aircraft operations does not necessarily occur in the same hour. As a result, the peak hour operations for the various categories of operations cannot be aggregated across categories.

Table 3.8-3
DERIVATIVE FORECASTS – AIRCRAFT OPERATIONS
Lambert-St. Louis International Airport

Annual

		Domestic Passenger		International Passenger		Commercial				
	Calendar Year	Air Carrier Operations	Commuter Operations	Air Carrier Operations	Commuter Operations	Passenger Operations	All-Cargo Operations	Civil Operations	Military Operations	Total Operations
Base	2008	107,030	112,052	1,086	1,242	221,410	3,186	20,860	2,941	248,397
Forecast	2013	109,800	111,000	1,520	1,620	223,940	3,190	23,800	1,000	251,930
	2018	120,600	120,400	2,040	1,900	244,940	3,330	27,500	1,000	276,770
	2023	131,000	128,200	2,460	1,980	263,640	3,490	28,900	1,000	297,030
	2028	141,800	136,400	2,860	2,020	283,080	3,730	30,500	1,000	318,310

Peak Month

		Domestic Passenger		International Passenger		Commercial				
	Calendar Year	Air Carrier Operations	Commuter Operations	Air Carrier Operations	Commuter Operations	Passenger Operations	All-Cargo Operations	Civil Operations	Military Operations	Total Operations
Base	2008	9,558	9,548	218	120	19,444	238	1,836	260	21,778
Forecast	2013	9,662	9,330	230	150	19,372	238	2,094	88	21,792
	2018	10,612	10,120	278	176	21,186	248	2,420	88	23,942
	2023	11,526	10,774	300	184	22,784	260	2,544	88	25,676
	2028	12,476	11,464	314	188	24,442	278	2,684	88	27,492

Peak Month Average Week Day

		Domestic Passenger		International Passenger		Commercial				
	Calendar Year	Air Carrier Operations	Commuter Operations	Air Carrier Operations	Commuter Operations	Passenger Operations	All-Cargo Operations	Civil Operations	Military Operations	Total Operations
Base	2008	330	326	6	4	666	10	70	10	756
Forecast	2013	328	318	8	4	658	10	80	4	752
	2018	362	344	8	6	720	12	92	4	828
	2023	394	366	10	6	776	12	96	4	888
	2028	426	388	10	6	830	12	102	4	948

Peak Hour

		Domestic Passenger		International Passenger		Commercial				
	Calendar Year	Air Carrier Operations	Commuter Operations	Air Carrier Operations	Commuter Operations	Passenger Operations	All-Cargo Operations	Civil Operations	Military Operations	Total Operations
Base	2008	28	36	2	2	58	4	7	4	66
Forecast	2013	28	35	2	2	57	4	8	1	62
	2018	31	38	2	2	63	4	9	1	68
	2023	33	40	2	2	68	5	10	1	73
	2028	36	43	3	2	73	5	10	1	78

Note: Peak hour operations for each segment of activity represent the peak hour for that component of activity. The peak hours for the various types of activity do not necessarily occur at the same hour.

Source: Landrum & Brown analysis, 2011

3.9 FAA FORECAST REVIEW TABLES

In order to facilitate the forecast review process the FAA has developed template tables to compare the forecasts developed for the Master Plan Update with the FAA's Terminal Area Forecast. As discussed in section 2.8, the FAA publishes a Terminal Area Forecast annually for STL. At the time of developing the forecasts for the Master Plan Update the 2008 FAA Terminal Area Forecast served as the basis for comparison.

Table 3.9-1, *Aviation Forecasts Versus FAA 2008 TAF* provides a comparison of this Master Plan forecasts with the FAA 2008 TAF for enplanements, commercial operations, and total aircraft operations for the 5, 10, and 15-year horizons. The Master Plan forecast is within 10 percent of the 2008 TAF in each planning horizon for both enplanements and aircraft operations. The Master Plan total based aircraft forecast is significantly lower than the current version of the FAA TAF which does not reflect the reduction in military based aircraft due to the Air National Guard leaving STL in 2009.

Table 3.9-2, *Master Plan Update Forecast Summary* provides a more detailed summary of the forecast developed for the Master Plan Update using the FAA's Appendix B template. Also added to the template are existing and forecast annual operations for the existing/current design aircraft and future design aircraft. The data shown in the FAA template is for the 15-year period from the 2008 base year through 2023. The full forecast horizon for the Master Plan is the twenty year period ended 2028. The existing critical design aircraft (McDonald Douglas DC-10-30/40) currently exceeds 500 or more annual itinerant operations a year. Recognizing the Airport's role in facilitating economic growth, the critical design aircraft for future planning purposes of this Master Plan is the Boeing 747-400, which will align with ongoing discussions between civic leaders in the greater St. Louis area and business leaders and freight operators from the People's Republic of China.

Table 3.9-1
AVIATION FORECASTS VERSUS FAA 2008 TAF
Lambert-St. Louis International Airport

	Year	Master Plan Forecast	2008 TAF [4]	Percent Difference
Passenger Enplanements				
Base Yr.	2008	7,207,890	6,984,154	3.2%
Base Yr.+5 Yrs.	2013	7,448,400	7,080,612	5.2%
Base Yr.+10 Yrs.	2018	8,304,900	8,127,042	2.2%
Base Yr.+15 Yrs.	2023	9,077,800	9,331,255	-2.7%
Commercial Operations [1]				
Base Yr.	2008	224,596	241,314	-6.9%
Base Yr.+5 Yrs.	2013	227,130	224,860	1.0%
Base Yr.+10 Yrs.	2018	248,270	244,598	1.5%
Base Yr.+15 Yrs.	2023	267,130	266,084	0.4%
Total Operations [2]				
Base Yr.	2008	248,397	255,893	-2.9%
Base Yr.+5 Yrs.	2013	251,930	239,754	5.1%
Base Yr.+10 Yrs.	2018	276,770	260,447	6.3%
Base Yr.+15 Yrs.	2023	297,030	282,927	5.0%
Based Aircraft [3]				
Base Yr.	2008	35	35	0.0%
Base Yr.+5 Yrs.	2013	21	33	-36.4%
Base Yr.+10 Yrs.	2018	24	31	-22.6%
Base Yr.+15 Yrs.	2023	25	29	-13.8%

Notes:
1 Air taxi operations are included in the commercial operations totals for the TAF. The Master Plan forecast groups air taxi operations in the non-commercial category.
2 Excludes overflights.
3 Includes both civil and military based aircraft.
4 Data shown for the FAA 2008 TAF is presented on a fiscal year basis (12 months ended September).

Sources: FAA 2008 Terminal Area Forecast; Airport Records; Landrum & Brown analysis, 2011

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TABLE 3.9-2
MASTER PLAN UPDATE FORECAST SUMMARY
Lambert-St. Louis International Airport

	2008 Base Yr. Level	2009 Base Yr.+1 Yr.	2013 Base Yr.+5 Yrs.	2018 Base Yr.+10 Yrs.	2023 Base Yr.+15 Yrs.	CAGR Base Yr. to +1	CAGR Base Yr. to +5	CAGR Base Yr. to +10	CAGR Base Yr. to +15
Passenger Enplanements									
Air Carrier	5,715,390	5,150,100	5,983,700	6,794,200	7,506,900	-9.9%	0.9%	1.7%	1.8%
Commuter	1,492,500	1,225,500	1,429,000	1,510,700	1,570,900	-17.9%	-0.9%	0.1%	0.3%
Total	7,207,890	6,375,600	7,412,700	8,304,900	9,077,800	-11.5%	0.6%	1.4%	1.5%
Operations [1/]									
Itinerant									
Air Carrier	125,315	114,913	133,710	151,170	167,550	-8.3%	1.3%	1.9%	2.0%
Commuter	99,281	81,507	92,620	97,100	99,580	-17.9%	-1.4%	-0.2%	0.0%
Total Commercial Operations	224,596	196,420	226,330	248,270	267,130	-12.5%	0.2%	1.0%	1.2%
Air Taxi/General Aviation	20,691	18,800	23,600	27,300	28,700	-9.1%	2.7%	2.8%	2.2%
Military	2,352	500	-	-	-	n.a.	n.a.	n.a.	n.a.
Local									
General Aviation	169	200	200	200	200	18.3%	3.4%	1.7%	1.1%
Military	589	1,000	1,000	1,000	1,000	69.8%	11.2%	5.4%	3.6%
Total Operations	248,397	216,920	251,130	276,770	297,030	-12.7%	0.2%	1.1%	1.2%
Operations by Design Aircraft									
Existing Design (DC-10)	801	805	822	846	884	n.a.	n.a.	n.a.	n.a.
Future Design (B747-400)[2]	-	-	-	-	-	n.a.	n.a.	n.a.	n.a.
Instrument Operations	246,040	214,862	248,730	274,370	294,630	-12.7%	0.2%	1.1%	1.2%
Peak Hour Operations	66	53	62	68	73	-19.7%	-1.2%	0.3%	0.7%
Cargo/Mail (enplaned+deplaned tonnes)	81,080	72,970	82,840	95,010	106,460	-10.0%	0.4%	1.6%	1.8%
Based Aircraft									
Single Engine (non-jet)	1	1	1	1	1	0.0%	0.0%	0.0%	0.0%
Multi Engine (non-jet)	7	7	8	9	9	0.0%	2.7%	2.5%	1.7%
Jet Engine	10	9	12	14	15	-10.0%	3.7%	3.4%	2.7%
Helicopter	-	-	-	-	-	n.a.	n.a.	n.a.	n.a.
Air National Guard	17	-	-	-	-	n.a.	n.a.	n.a.	n.a.
Total	35	17	21	24	25	-51.4%	-9.7%	-3.7%	-2.2%

B. Operational Factors

	2008 Base Yr. Level	2009 Base Yr.+1 Yr.	2013 Base Yr.+5 Yrs.	2018 Base Yr.+10 Yrs.	2023 Base Yr.+15 Yrs.
Average Aircraft Size (seats)					
Air Carrier	133.1	128.1	129.2	128.4	126.8
Commuter	43.6	44.2	45.1	44.9	44.9
Average Enplaning Load Factors					
Air Carrier	70.3%	71.7%	71.0%	71.6%	72.2%
Commuter	68.9%	68.0%	68.4%	69.3%	70.3%
GA Ops. per Based Aircraft (exc. Military)	1,159	1,159	1,159	1,159	1,159

Note: 1 The air carrier/commuter split based on the FAA 60-seat definition for comparison purposes with the FAA Terminal Area Forecasts; itinerant commercial operations include both passenger and all-cargo operations; itinerant civil operations include non-commercial air taxi and general aviation activity. All design aircraft operations are assumed to be itinerant. Excludes overflights.

2 The critical design aircraft for future planning purposes of this Master Plan is the Boeing 747-400, which aligns with ongoing discussions between civic leaders in the greater St. Louis area and business leaders and freight operators from the People's Republic of China.

Sources: USDOT, Schedule T-100; *Official Airline Guide*; FAA Air Traffic Activity Data System (ATADS); Airport Records; Landrum & Brown analysis, 2011

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CHAPTER FOUR
DEMAND/CAPACITY AND FACILITY REQUIREMENTS

INTRODUCTION

One of the first steps in the master planning process is gathering an inventory of all airside and landside airport facilities. The next step is to calculate the future requirements of these facilities to determine which facilities are currently adequate, which are currently inadequate, and those that will be unable to meet the future projected demand, based on the Master Plan Update forecast.

The facilities previously analyzed include the airfield facilities such as runways, taxiways, NAVAIDs, and lighting; as well as the terminal facilities including gates and passenger processing facilities. This working paper is focused on the other facilities to be considered, including curbfronts, parking, air cargo, general aviation, and airport support facilities including fueling, aircraft and airfield maintenance, and security. This analysis will serve as the basis of the next step in the planning process: the definition and evaluation of development alternatives.

Results of the facility requirements analysis indicate that the Lambert-St. Louis International Airport (STL or Lambert Airport) is generally well positioned to accommodate the forecast passenger and aircraft demand through the study period. There are some specific areas, such as the terminal, parking, and field maintenance, which will need to be expanded and/or reconfigured over time. These and the other facilities are discussed in the following sections.

4.1 AIRSPACE CAPACITY

The existing airspace system uses a "four-corner post" design for arriving aircraft bound for airports within the STL Terminal Radar Approach Control (TRACON). The arrival gates into the STL TRACON are generally located at the north, south, east and west corners of the TRACON. The arrival gates are defined by a series of very high frequency omni-directional range (VOR) radial points or fixes. The choice of arrival gates depends on aircraft type, runways in use, and aircraft altitude and speed. Similarly, aircraft depart the STL TRACON airspace in the existing airspace system through six departure gates. **Exhibit 4.1-1, *East Flow Map***, and **Exhibit 4.1-2, *West Flow Map***, show the arrival flow and departure flow for aircraft operations in the STL TRACON airspace in the two predominant airfield use configurations. Fixes used by arriving aircraft include RIVERS (RIVRS), VANDALIA (VAL), QBALL, and TRAKE. The six departure gates include CARDS, LINDBERGH, GATEWAY, OZARK, BLUES, and PRESS.

4.1.1 ARRIVAL TRAFFIC

The enroute system uses a network of airways and Standard Terminal Arrival Routes (STARs) to merge traffic entering the TRACON over the four-cornerposts. The procedures for handling arrival traffic include the use of unique altitude tiers over each cornerpost. In general, turbojet aircraft landing Runways 6, 11, 12L or 12R enter the airspace at 15,000 feet mean sea level (MSL). Turbojet aircraft when arriving to Runways 24, 29, 30L or 30R enter the airspace at 11,000 feet MSL.

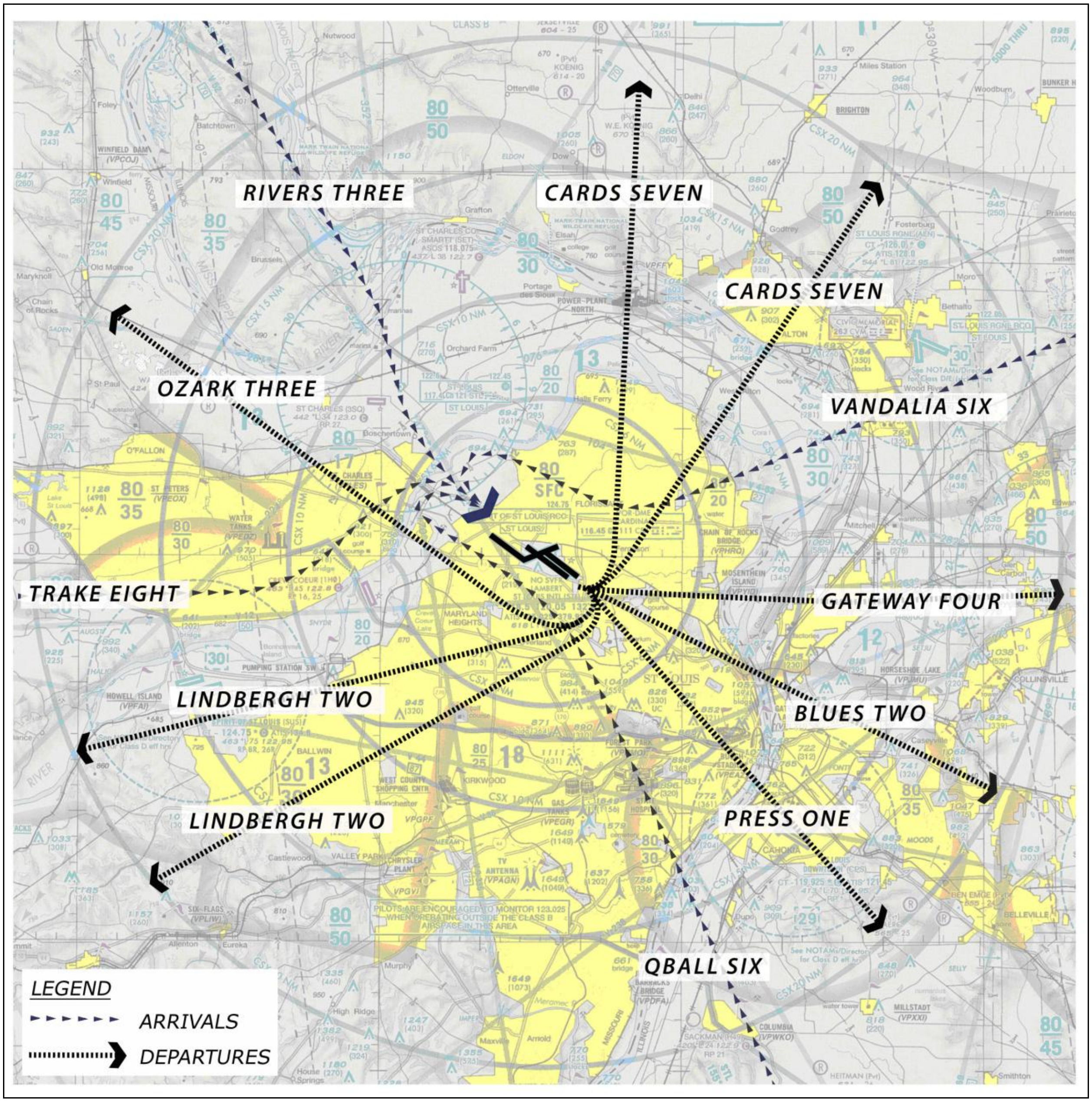
In general, arrival flows over the west (TRAKE) and south (QBALL) cornerposts are sequenced and merged together into one arrival stream to either end of the south parallel runways, Runway 12R/30L or Runway 11/29. Likewise, arrivals from the north (RIVRS) and east (VLA) typically use Runway 12L/30R. There are provisions in the arrival flows to cross over either the east traffic flow or west traffic flow to balance the traffic flows and accommodate heavy aircraft that may require the additional landing length that is available on the center parallel runway, Runway 12R/30L.

Each cornerpost has a capacity of approximately 45 to 55 arrivals per hour depending on the weather and mix of aircraft. Peak hour arrival flows into the TRACON are projected to increase from 34 in 2008 to 43 by 2028. The maximum hourly airspace arrival capacity for the TRACON would be 64 arrivals provided the weather is clear and visibility is unrestricted. The number of operations available goes down with decreased visibility and/or lower ceilings. To the degree that air traffic control (ATC) can segregate traffic flows into STL from the traffic flows into the satellite airports, the existing arrival airspace system has adequate capacity to accommodate the peak hour arrival flows into STL, and no significant modifications to the existing airspace system are anticipated within the master planning period.

4.1.2 DEPARTURE TRAFFIC

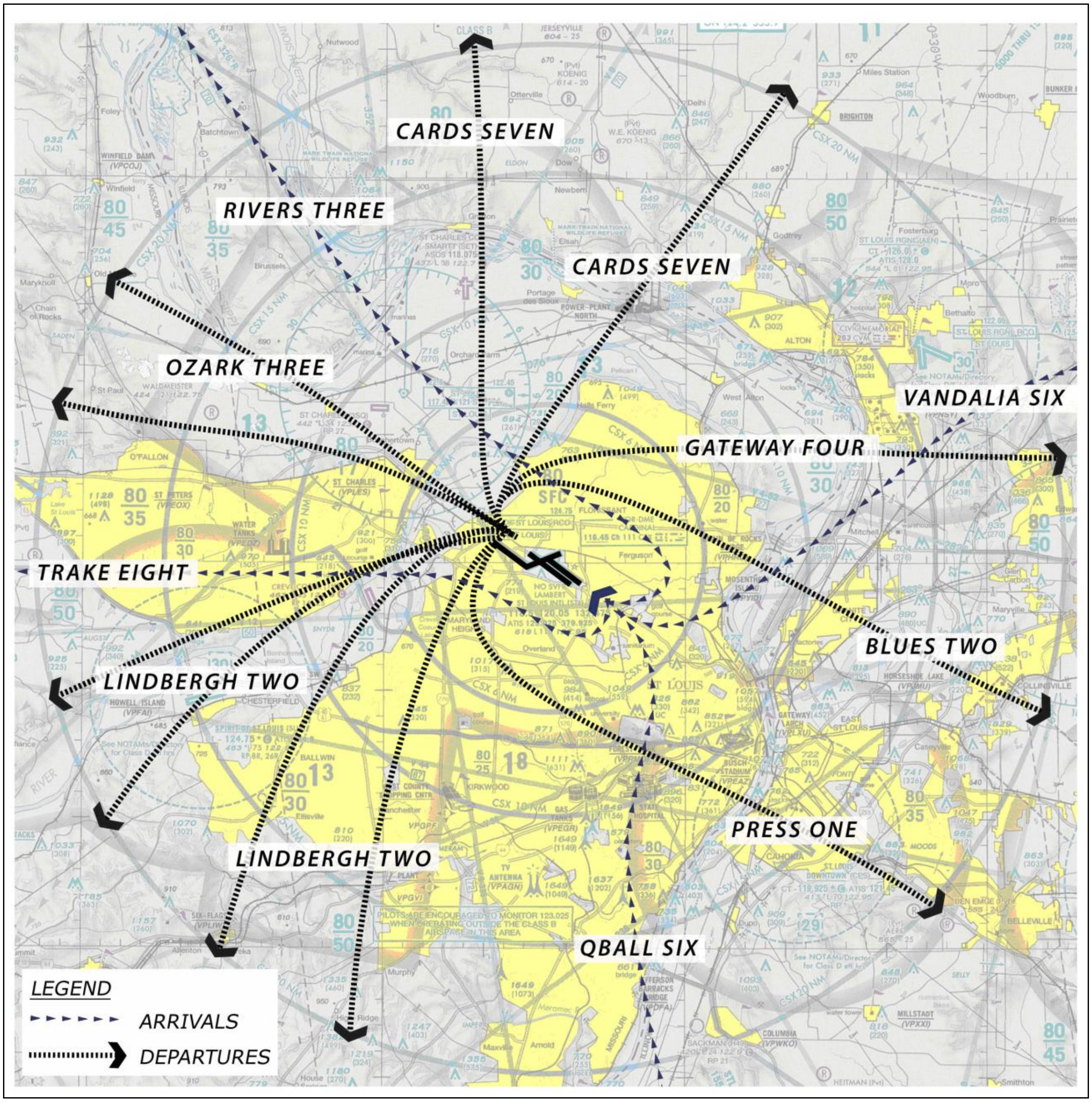
Aircraft depart the STL TRACON airspace in the existing airspace system through six departure gates. The departure gates, located on the sides of the TRACON boundary, are CARDS to the north, LINDBERGH to the south and southwest, OZARK to the west, and GATEWAY, BLUES and PRESS to the east. There are a total of 11 departure routes through the six departure gates. Each route has a capacity of between 50 and 60 departures per hour depending on weather and aircraft mix. The maximum hourly airspace departure capacity for the TRACON from STL would be 64 arrivals provided the weather is clear and visibility is unrestricted. The number of operations available goes down with decreased visibility and/or lower ceilings. The existing departure airspace system has adequate capacity throughout the planning period, and no modifications to the existing system are required.

Exhibit 4.1-1
EAST FLOW MAP
Lambert-St. Louis International Airport



Source: Lambert-St. Louis Air Traffic Control Tower (ATCT)

Exhibit 4.1-2
WEST FLOW MAP
Lambert-St. Louis International Airport



Source: Lambert ATCT

4.2 EXISTING AIRFIELD CAPACITY AND DELAY

The demand/capacity analysis examines the capability of the airfield system at STL to address existing levels of activity, as well as determine the capability of the airfield to meet the projected future levels of demand without incurring adverse levels of aircraft delay stemming from an airfield-related deficiency. The demand/capacity analysis was prepared based on both the existing and forecast aviation demand, as compared to the capacity of the current airfield layout and operational procedures.

A number of factors influence the capacity of an airfield to meet demand, both existing and as projected over the course of a 20-year planning horizon. This analysis utilizes predictions of annual operations by the specified fleet mix as projected in the Chapter Two, *Forecast of Aviation Demand*, while considering a variety of other factors central to the efficient operation of the current airfield. These additional factors are inherent in all of the methodologies used for the capacity calculations and are briefly described in the following sections.

4.2.1 AIRFIELD CHARACTERISTICS

In addition to the updated aviation activity forecasts, a number of the STL airfield characteristics and operational conditions must be considered to conduct the FAA capacity analyses. Elements that affect airfield capacity are listed below:

- Runway Configuration
- Aircraft Fleet Mix
- Taxiway Configuration
- Meteorological Conditions

When analyzed collectively, the above elements provide the basis for establishing the generalized operational capacity of an airport. The following sections will briefly overview each of these capacity related factors with respect to STL.

4.2.1.1 Runway Configuration

The runway system layout at an airport is a central component in the assessment of airfield capacity. Airports that utilize a single runway or intersecting runway systems to accommodate their demand generally have lower operational capacity than airports, like STL, that employ parallel runways. The STL airfield configuration consists of four paved runways as shown on **Exhibit 4.2-1, *Existing STL Airfield Layout***. Three runways are oriented in a general northwest/southeast parallel alignment (11/29 and 12/30). The fourth runway is a northeast/southwest (6/24) crosswind runway that lies almost perpendicular to the three parallel runways. Runway 11/29 and Runway 12L/30R maintain a centerline-to-centerline separation of less than 4,100 feet, which is below the separation required to permit simultaneous independent operations. A precision runway monitoring system, which permits simultaneous independent operations on runways not meeting the minimum runway separation requirement, is installed at the STL. However given the reduced traffic demand the Air Traffic Controllers are not trained on the equipment, the additional controller positions are not staffed, and the operations to parallel runways are dependent. The crosswind Runway 6/24 intersects with Runway 12R/30L and Runway 12L/30R. Runway 6/24 does not physically intersect with Runway 11/29, although the extended centerlines of both runways intersect a short distance west of the Runway 6 threshold and south of the Runway 29 threshold. The majority of the current aircraft operations are conducted on the parallel runways. The crosswind runway is mainly used when wind or weather conditions dictate, or as requested by pilots for operational convenience.

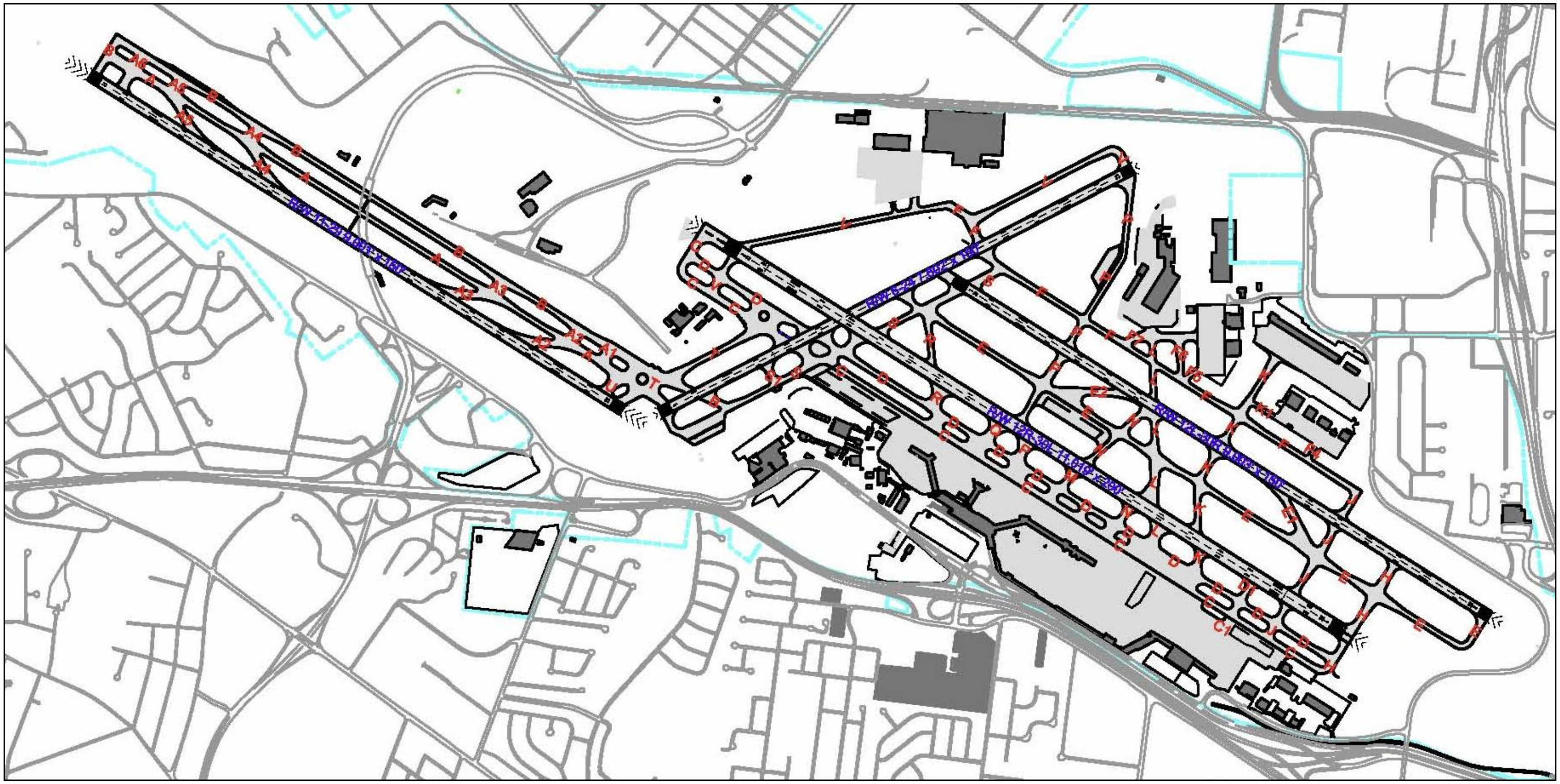
4.2.1.2 Aircraft Fleet Mix

Understanding the mix of aircraft operating into and out of an airport is critical to determining airfield capacity. The current and projected aircraft fleet mix for STL is defined in Chapter Two, *Forecast of Aviation Demand*.

This projection of annual fleet mix was refined into a Peak Month Average Day (PMAD) schedule for all airport users, including commercial passenger, air cargo, and general aviation (GA).

The mix of small, large, and heavy aircraft at an airport will influence its operational capacity, both on the airfield and in the surrounding airspace. Combining faster jet aircraft with slower aircraft results in a need for greater spacing between arrivals and departures. This corresponds to an increase in the time between arrivals and departures, which reduces the availability of the runway for operational use, or overall capacity.

Exhibit 4.2-1
EXISTING STL AIRFIELD LAYOUT
Lambert-St. Louis International Airport



Source: Lambert–St. Louis International Airport Layout Plan, 2010

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Wake turbulence considerations are dependent on the size and, in some cases, the type of aircraft operating at an airport and the runway separation distance. These can limit runway use and capacity by affecting the spacing of arriving and departing aircraft. For example, while the B757 is certainly not one of the largest aircraft flying today, the flight characteristics of its wing design has been found to create a greater potential for wake vortices, a phenomena that creates tornadic-like vortices that can remain in the air for several minutes. As a result, the FAA issued guidance to increase the horizontal separation between B757 aircraft and other generally smaller aircraft that follow, thereby resulting in a corresponding increase in time between arrivals and a resultant reduction in arrival capacity. The wake turbulence separation minima are applied to aircraft operating directly behind, or directly behind and less than 1,000 feet below, or following an aircraft conducting an instrument approach as follows:[1]

- Heavy behind heavy (four miles)
- Large/heavy behind B757 (four miles)
- Small behind B757 (five miles)
- Small/large behind heavy (five miles)

Additionally, parallel runways less than 2,500 feet apart are, for the purposes of wake turbulence separation minima, considered a single runway because of the possible effects of wake turbulence.

4.2.1.3 Taxiway Configuration

The ease and efficiency with which aircraft move to and from the runways via the taxiway system is another central element influencing the operational capacity of the airfield. To enhance runway capacity, it is important to provide multiple exit taxiways that are properly located along the runway and that lead to a parallel taxiway system, which further connects into the various airport development areas.

A properly designed taxiway system allows landing aircraft to decelerate and quickly exit the runway, making it available for additional landings or departures. Further, the efficiency of arriving aircraft movements from the runway to the parallel taxiway system can be further enhanced through the development of acute-angle (30-degree) "high-speed" exit taxiways. These high-speed exits allow aircraft to leave the runway at higher rates of speed than is possible on taxiways that intersect the runway at a 90-degree angle. The goal is to achieve an average runway occupancy time (ROT) of 50 seconds or less. This might allow for a reduction in separation (2.5 nautical miles) between aircraft established on the final approach course within 10 nautical miles of the landing runway. The following conditions must be in place for this to occur:

- The leading aircraft's weight class is the same or less than the trailing aircraft
- Heavy aircraft and the B757 are permitted to participate in the separation reduction as the trailing aircraft only

[1] FAA Order 7110.65R, Air Traffic Control, Section 5-5-4, 16 February 2006

- An average runway occupancy time of 50 seconds or less is documented
- Control tower radar displays are operational and used for quick glance references
- Turnoff points are visible from the control tower

The runway system is served by a system of parallel taxiways and numerous high-speed and acute-angled exit taxiways. **Table 4.2-1, *Runway Exist Data***, provides a list of exits for each runway end that can be used for aircraft landing operations and the average ROT for each runway based on the 2008 aircraft fleet mix. The FAA Runway Exit Design Interactive Model (REDIM) was used to determine the ROT based on the existing aircraft fleet mix, runway exit locations, and geometry.

Table 4.2-1
RUNWAY EXIT DATA
Lambert-St. Louis International Airport

RW END	EXIT DISTANCE (FT.)			AVG. ROT (IN SECONDS)
	90° Exit	45° Exit	30° Exit	
6	3,670 (TWY E) 4,999 (TWY F) 7,217(TWY P/V)			62.5
24	3,510 (TWY E) 4,795 (TWY D) 5,183 (TWY C) 5,770 (TWY S1) 6,721 (TWY B) 7,402 (TWY S)			55.9
11	8,475 (TWY U *)		4,883 (TWY A3) 6,183 (TWY A2)	48.1
29	8,372 (TWY A6) 8,813 (TWY B)		4,991 (TWY A4) 6,183 (TWY A5)	47.9
12L	4,210 (TWY K) 6,322 (TWY J) 8,817 (TWY H)		4,821 (TWY E1)	51.8
30R	4,410 (TWY K) 5,490 (TWY N/L) 7,042 (TWY P)		5,490 (TWY E2)	50.9
12R	5,287 (TWY M) 7,117 (TWY N) 8,354 (TWY K) 9,188 (TWY D1) 9,105 (TWY J) 10,818 (TWY H)	7,126 (TWY L)		58.0
30L	5,148 (TWY P) 5,657 (TWY Q) 6,657 (TWY R) 10,232 (TWY V) 10,832 (TWY C)	8,052 (TWY S)		56.6

Sources: FAA Runway Exit Design Interactive Model (REDIM) and Landrum & Brown

The REDIM results indicate that the average ROT for the 2008 fleet varies from 48 to 62 seconds. Runway 11/29, the most recently completed runway, achieves the lowest runway occupancy time of the three parallel runways due to the availability of two acute 30° high-speed exits in each landing direction. Runway 12L/30R, which has one acute 30° high-speed exit in each direction, achieves slightly longer runway occupancy times. Occupancy times on Runway 12R/30L are the highest of the three parallel runways; however, this runway has historically been utilized as the primary departure runway during peak demand periods, and the need for additional acute angled exits has not been identified. Similarly, Runway 6/24, which is generally used only during periods with strong crosswinds, does not have acutely angled high-speed exits. Given the limited use and utility of the runway, the expense the need for high-speed exits is not justified.

4.2.1.4 Meteorological Conditions

Meteorological conditions, such as wind or inclement weather, will influence pilot decisions about which runway to use during a landing or takeoff. Accordingly, meteorological conditions will affect overall airfield capacity. Runway utilization is determined by prevailing wind conditions, cloud ceiling height, and visibility.

A wind and weather analysis for STL was prepared using the Landrum & Brown (L&B) WIND36 wind analysis computer program and the application of 20 consecutive years of National Weather Service weather data for the period 1986 through 2005.

The purpose of this analysis is to determine how often wind and weather conditions at STL favor the use of Runways 11/29, 12/30 and 6/24 given several categories of weather conditions, which are:

- *All Weather*: Any and all weather conditions are included in the "all weather" category regardless of cloud ceiling height or surface horizontal visibility.
- *Visual Flight Rules (VFR)*: Occurs when the cloud ceiling is 3,000 feet or higher and the surface horizontal visibility is five statute miles or greater.
- *Marginal Visual Flight Rules (MVFR)*: Occurs when the cloud ceiling is 1,000 feet or higher and less than 3,000 feet and the surface horizontal visibility is three statute miles or greater and less than five statute miles.
- *Instrument Flight Rules (IFR)*: Occurs when the cloud ceiling is below 1,000 feet or when surface horizontal visibility is reported to be below three statute miles. Total IFR hours would be equal to the sum of IFR Category I, IFR Category II, and IFR Category III hours , described below:
    - *Category I Conditions Under IFR*: Occurs when the cloud ceiling is 200 feet to 900 feet above the surface or when the surface horizontal visibility is ½-mile to 2½ miles, or not less than 2,400 feet runway visual range (RVR). For a runway with touchdown zone and centerline lighting, the RVR may be reduced to not less than 1,800 feet (3/8 mile) under Category I conditions.

- *Category II Conditions Under IFR*: Occurs when the cloud ceiling is 100 feet, or the surface horizontal visibility is 1/4 mile to 3/8 mile (not less than 1,200 feet RVR) for runways without touchdown zone and centerline lighting. Otherwise, the visibility range is 1/4 mile to 5/16 mile.
- *Category III Conditions Under IFR*: Occurs when the cloud ceiling is zero or the surface horizontal visibility is zero to 3/16 mile (zero to 700 feet RVR). This visibility range would be valid for runways with or without touchdown zone and centerline lighting.

A summary of the data included in the analysis is given in **Table 4.2-2, *Wind and Weather analysis Data Summary***.

The analysis restricted the use of each runway end to a maximum tailwind of five knots, and calm winds were defined as five knots. The computer analysis was repeated to allow for maximum crosswind components of 10.5 knots, 13 knots, 16 knots, and 20 knots on each runway end. In accordance with FAA Advisory Circular (AC) 150/5300--13, *Airport Design*, the crosswind should not exceed the following velocities for the specific aircraft design groups:

- 10.5 knots for A-I and B-I
- 13 knots for A-II and B-II
- 16 knots for A-III, B-III and C-I through D-III
- 20 knots for A-IV through D-VI

Table 4.2-2
WIND AND WEATHER ANALYSIS DATA SUMMARY
Lambert-St. Louis International Airport

ANALYSIS PARAMETERS	WEATHER CATEGORY						
	ALL WEATHER	VFR	MVFR	IFR			
				CAT I	CAT II	CAT III	TOTAL IFR
Average Number of Annual Observations	8,766	7,121	997	599	22	27	648
Percent of Annual Occurrence	100.00	81.23	11.38	6.83	0.26	0.30	7.39
Percent Calm Wind Occurrence (≤ 5 knots)	26.99	28.21	19.76	22.61	33.92	64.03	24.69
Period of Analysis	1986 - 2005, 20 years						
Total Observations	175,320 over the 20-year period						

Sources: National Climatic Data Center (NCDC), Asheville, North Carolina, station WBAN 13994, data recorded at Lambert-St. Louis International Airport (STL) for the period 1986-2005 based on National Weather Service (NWS) Synoptic and Aviation Reports (SA), and Automated Surface Observation System (ASOS) data. WBAN is Weather Bureau Army-Navy, reference http://lwf.ncdc.noaa.gov/oa/climate/stationlocator.html#STNHIST and Landrum & Brown analysis, 2010.

The results of the analysis showed the percent of time wind conditions would be favorable for arrival and departure operations on each runway end, for each weather category, given the established crosswind and tailwind restrictions. The results are summarized in **Table 4.2-3, *Runway Use Based on Historical Wind and Weather Conditions***.

The analysis shows that, overall ("all weather" category) weather conditions at STL are most favorable for Runway 24 arrivals and departures for all crosswind allowance conditions. When considering just VFR weather conditions and wind direction, the preferable runway would be Runway 24. Runway 6 is the preferable runway in all IFR conditions. For all weather, VFR and IFR CAT I conditions, Runway 30 provides the second-highest percentage of coverage.

The wind and weather analysis results presented above did not take into consideration the actual capability of each runway end to accommodate aircraft operations during these specific conditions. The preferred operation is on the parallel runways, which provide wind coverage above 76 percent of the time for all four crosswind tolerances evaluated. Actual runway end usage is dependent on the runway and aircraft instrumentation, aircraft fleet mix, and flight destination.

In analyzing the airfield capacity and delay, the following steps were conducted:

1. Defined the characteristics of the runway and taxiway system along with the manner in which the airfield is used by the Air Traffic Control Tower (ATCT) to move aircraft to and from the runway system;
2. Utilized the Aviation Activity Forecasts to define the anticipated level of existing and future aviation demand and fleet mix characteristics;
3. Developed operational schedules for the peak month average day (PMAD) level of activity in the base year (2008) and the 2028 projected activity based on the forecast of aviation activity;
4. Determined the average capacity of the existing airfield; and
5. Conducted a demand/capacity analysis and determined the extent of resulting delay or excess capacity, if any.

The following sections describe the assumptions and results of the analysis performed for each of the above steps.

Table 4.2-3
RUNWAY USE BASED ON HISTORICAL WIND AND WEATHER CONDITIONS
Lambert-St. Louis International Airport

RUNWAY	CROSSWIND ALLOWANCE 10.5 KNOTS — PERCENT USE, BY RUNWAY END, BY WEATHER CATEGORY					
	ALL WEATHER	VFR	IFR	CAT I	CAT II	CAT III
Runway 12	70.60%	70.77%	5.06%	4.58%	0.20%	0.27%
Runway 30	71.90%	71.85%	5.36%	4.94%	0.18%	0.25%
Runway 06	66.21%	65.26%	**5.78%**	**5.26%**	**0.23%**	**0.29%**
Runway 24	**75.74%**	**76.64%**	4.76%	4.32%	0.18%	0.26%

RUNWAY	CROSSWIND ALLOWANCE 13 KNOTS — PERCENT USE, BY RUNWAY END, BY WEATHER CATEGORY					
	ALL WEATHER	VFR	IFR	CAT I	CAT II	CAT III
Runway 12	73.99%	74.23%	5.24%	4.76%	0.21%	0.27%
Runway 30	75.31%	75.30%	5.57%	5.14%	0.18%	0.25%
Runway 06	71.66%	70.60%	**6.28%**	**5.75%**	**0.24%**	**0.29%**
Runway 24	**82.82%**	**83.73%**	5.27%	4.81%	0.19%	0.27%

RUNWAY	CROSSWIND ALLOWANCE 16 KNOTS — PERCENT USE, BY RUNWAY END, BY WEATHER CATEGORY					
	ALL WEATHER	VFR	IFR	CAT I	CAT II	CAT III
Runway 12	75.13%	75.42%	5.29%	4.81%	0.21%	0.27%
Runway 30	76.44%	76.45%	5.64%	5.20%	0.18%	0.25%
Runway 06	73.74%	72.67%	**6.44%**	**5.91%**	**0.24%**	**0.29%**
Runway 24	**85.82%**	**86.79%**	5.45%	4.98%	0.19%	0.27%

RUNWAY	CROSSWIND ALLOWANCE 20 KNOTS — PERCENT USE, BY RUNWAY END, BY WEATHER CATEGORY					
	ALL WEATHER	VFR	IFR	CAT I	CAT II	CAT III
Runway 12	75.36%	75.65%	5.30%	4.82%	0.21%	0.27%
Runway 30	76.71%	76.73%	5.65%	5.22%	0.18%	0.25%
Runway 06	74.33%	73.25%	**6.49%**	**5.95%**	**0.24%**	**0.29%**
Runway 24	**86.85%**	**87.84%**	5.50%	5.03%	0.19%	0.27%

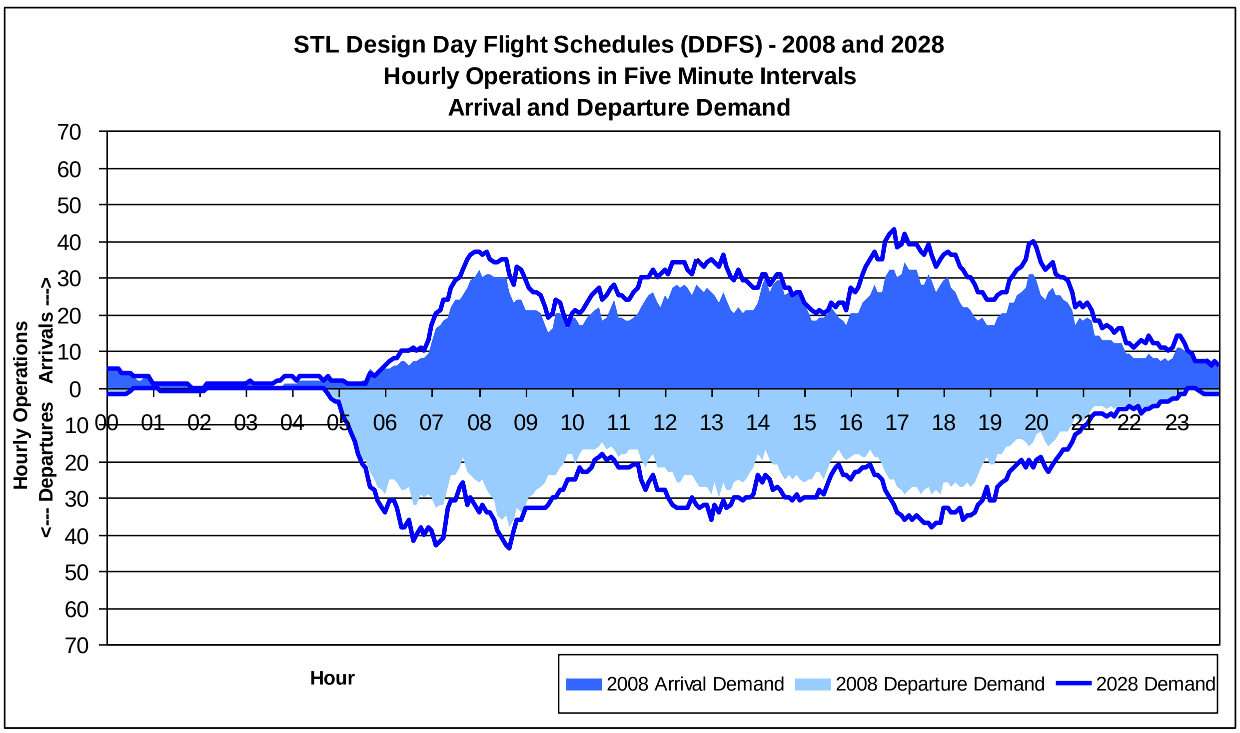
Note: The percent sums for Category I, II, and III equal the total IFR percentage.
Bold print emphasizes the runway end with maximum usage for each crosswind allowance.
Each percentage includes all the calm winds associated with the weather category.

Source: National Climatic Data Center (NCDC), Asheville, North Carolina, data recorded at Lambert–St. Louis International Airport for the period 1986-2005 based on National Weather Service (NWS) Synoptic and Aviation Reports (SA), and Automated Surface Observation System (ASOS) data. WBAN is Weather Bureau Army-Navy and WMO is the World Meteorological Organization, reference

4.2.2 AIRFIELD DEMAND

The current airfield system was evaluated based on a STL flight schedule for 2008 and a forecasted schedule for 2028. The aircraft arrival and departure flight schedule as shown on **Exhibit 4.2-2, *2008 and 2028 STL Flight Schedules***, was developed from FAA radar data associated with actual flight operations in August 2008. August was chosen because it is representative of the activity level that is associated with the Peak Month Average Day (PMAD) demand at STL. The PMAD represents a busy day, but not the busiest day, and is the industry standard for analyzing airfield capacity and delay. The flight schedule was broken down to show hourly demand in five-minute increments; for example, the demand shown at 1:05 a.m. represents hourly demand for the period from 1:05 a.m. to 2:05 a.m. The annual and PMAD demand is summarized in **Table 4.2-4, *STL Annual and Peak Month Average Day Aircraft Operations***.

Exhibit 4.2-2
2008 AND 2028 STL FLIGHT SCHEDULES
(ARRIVALS AND DEPARTURES)
Lambert-St. Louis International Airport



Source: STL Radar Data August 2008, FAA TAF FAA ASPM Database, and Landrum & Brown Analysis, 2011

Table 4.2-4
STL ANNUAL AND PEAK MONTH AVERAGE DAY AIRCRAFT OPERATIONS
Lambert-St. Louis International Airport

YEAR	ANNUAL OPERATIONS	PMAD OPERATIONS	PEAK HOUR OPERATIONS DEMAND
2008	248,397	756	66
2028	318,310	948	78

Source: STL Radar Data August 2008, FAA TAF and Landrum & Brown analysis

4.2.3 AIRFIELD CAPACITY

The existing airfield capacities indicated in **Table 4.2-5, *Existing STL Hourly Airfield Capacity***, are from the FAA Aviation System Performance Metrics (ASPM) database. The FAA uses this database to publish information about weather, capacities, delays, and runway use at all major airports in the U.S.

The FAA records the capacities in the ASPM database using the arrival and departure rates per each quarter hour at any airport, along with the runway configuration during each time period.

The STL capacities used for this analysis are an average of the capacities reported for 2008. It is assumed that the hourly airfield capacities will remain basically unchanged between 2008 and 2028 because neither the airfield layout instrumentation nor aircraft fleet mix is expected to vary greatly by 2028.

Table 4.2-5
EXISTING STL HOURLY AIRFIELD CAPACITY
Lambert-St. Louis International Airport

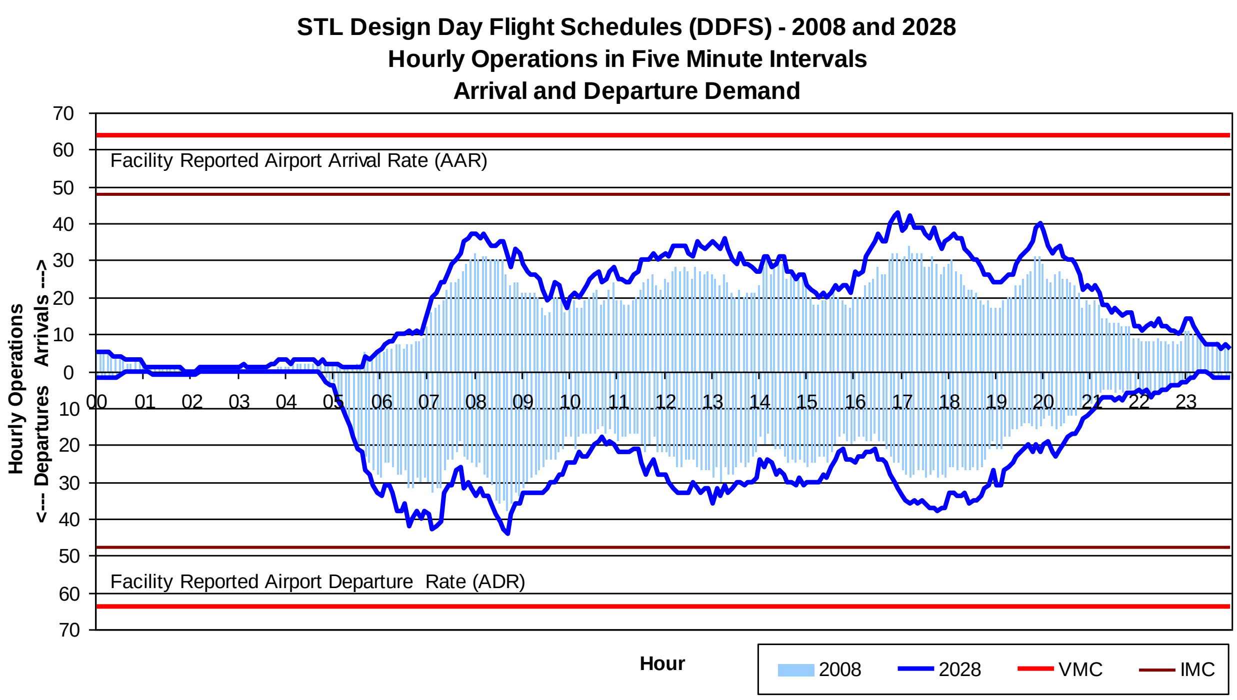
AIRFIELD CAPACITY TYPE	VFR CONDITIONS	MARGINAL VFR CONDITIONS	IFR CONDITIONS
Arrivals	64	48	48
Departures	64	48	48
Total Operations	**128**	**96**	**96**

Source: FAA ASPM Database (2008)

4.2.4 AIRFIELD DELAY

There was no actual delay/queuing model analysis conducted for the 2008 and 2028 demand levels because there are no points in the design day schedules during which the demand is projected to surpass VFR or IFR capacity. **Exhibit 4.2-3, *STL Demand vs. Capacity (Arrivals and Departures)***, shows the forecast arrival and departure demand for both 2008 and 2028 as compared to the VMC and IMC airfield capacities for the existing airfield. As shown, the airfield capacity exceeds operational demand during all times of day. At all of these times, there is sufficient overall capacity to meet the arrival or departure surges simply by altering how one or both runways are used.

Exhibit 4.2-3
STL DEMAND VS CAPACITY (ARRIVALS AND DEPARTURES)
Lambert-St. Louis International Airport



Source: STL Radar Data, FAA TAF (FY 2006), FAA ASPM Database (2006), and Landrum & Brown analysis

4.2.5 AIRFIELD DEMAND/CAPACITY CONCLUSIONS

The level of analysis undertaken for this project yields a conservative assessment of airfield capacity and assumes properly queued aircraft with no ground delays. Operational variables resulting from pilot actions, mechanicals, taxi delays, runway crossings, airborne crossings, etc. were not and cannot be fully accounted for in this study.

The capacity of the STL airfield facilities are defined as the number of aircraft operations that can be served without exceeding acceptable levels of delay. A standard definition of acceptable delay is not used in the industry because numerous operational factors and airport characteristics influence the acceptable amount of delay. Previous analysis of airport capacity and delay conducted by L&B at other major U.S. airports has shown that delay levels of six to 10 minutes indicated the need for additional facilities. As average aircraft delay increases above six minutes, passengers tend to perceive service reliability problems while airlines experience increased aircraft operating costs. As delay approaches 10 minutes per operation, further increases in demand are limited.

Average delays of six to seven minutes per aircraft at Miami, Philadelphia, and Detroit were indicative of peak delays, which resulted in significant disruption during certain periods of the day and year. While these airports were not operating at maximum capability, they would have benefited from airfield expansion as evidenced by the new runways built in Miami, Detroit, and Philadelphia. Based on historical evidence from these airports, a range of acceptable annual average delay between 6 and 10 minutes per operation was used for determining annual operations capacity. For any physical or operational improvement to be considered, the cost of the delay should exceed the cost of the improvement.

Evaluation of projected demand and expected capacity at STL over the forecast period, which ends in 2028, shows that the existing runway system should be fully capable of meeting demand during this time period. Based on the above analysis, there is no need for additional runways within the planning period to meet future demand.

4.3 AIRFIELD REQUIREMENTS

As noted in Chapter One, *Inventory of Existing Conditions*, the existing airfield layout consists of three parallel northwest/southeast runways and one northeast/ southwest crosswind runway. There are a number of airfield requirements to be considered for future planning purposes. This section will analyze the following:

- Runway length and width requirements
- Runway exit locations and geometry
- Taxiway requirements
- Airfield safety areas
- Airfield capital, technological, and operational improvements

Airside facilities needed at Lambert to accommodate the projected levels of aviation demand were determined using applicable FAA planning design standards and requirements. The planning and design of an airport are based on an airport's role, the number and type of aircraft operations, and the "critical" aircraft.

4.3.1 RUNWAY LENGTH REQUIREMENTS

All of the runways at STL can accommodate air carrier operations. The existing runway system provides the following runway lengths by runway alignment:

- Runway 12R/30L 11,019 feet
- Runway 12L/30R 9,003 feet
- Runway 11/29 9,000 feet
- Runway 6/24 7,602 feet

STL has served as a major domestic and international hub with non-stop 747-100/200 service between St. Louis and several European destinations during the period that TWA operated in St. Louis. This service, along with relatively long-haul activity using the Lockheed L1011 and Boeing 767-200/300 aircraft, provided the basis for the current runway lengths, and notably the length of Runway 12R/30L, which served then as now as the primary departure runway at the time.

Runway length requirements were calculated for a selection of aircraft from the fleet of passenger and cargo aircraft that were using STL in 2008, as well as those forecast to use STL in the year 2028. Passenger aircraft were chosen from the five longest routes to the top 20 market destinations from STL in 2008, which are Punta Arenas, CL South America; Rome, Italy; Cairo, Egypt; Frankfurt, Germany; and Anchorage, Alaska. Air cargo aircraft were chosen by the four most frequent air cargo aircraft forecast to be in operation at STL in 2028, which are the MD-11, B757, B727, and A300. The B767 was also analyzed as a cargo aircraft due to its number of operations at STL in 2008. Recognizing the Airport's role in facilitating economic growth, the runway length requirements of the Boeing 747-400 freighter aircraft were included to align the analysis with ongoing discussions between civic leaders in the Greater St. Louis area and business leaders and freight operators from the People's Republic of China. **Table 4.3-1, *Aircraft Characteristics for Runway Length Analysis***, presents the specific aircraft types and their key characteristics considered in the analysis.

The runway length requirements were calculated using charts published in the *Aircraft Characteristics for Airport Planning* manuals for each individual aircraft. Requirements were calculated by taking into consideration the airport elevation above mean sea level (MSL), hot day temperature, and the performance characteristics and operating weight of aircraft forecasted to be serving the airport. The operating weight of an aircraft is dependent on the amount of fuel needed to reach the destination, the amount of payload (passengers, baggage, and cargo) and operating empty weight (OEW).

Both the amount of fuel required to complete the flight, and the payload are variable quantities that can fluctuate depending on destination and season, among other factors. Where necessary, the requirements published in the individual aircraft planning manuals were adjusted to account for the actual mean maximum daily temperature in St. Louis by applying the methodology defined by the International Civil Aviation Organization (ICAO) in Chapter Three of the *Aerodrome Design Manual*.

Table 4.3-1
AIRCRAFT CHARACTERISTICS FOR RUNWAY LENGTH ANALYSIS
Lambert-St. Louis International Airport

Aircraft Type	Engine Type	Maximum Takeoff Weight (MTOW)	Maximum Landing Weight (MLW)	Maximum Payload	Maximum Fuel (In Pounds)
Boeing					
737-500	CFM56-3B1	133,500	110,000	33,470	38,880
737-700	CFM56-7B24	154,500	129,200	38,700	46,063
737-800	CFM56-7B27	174,200	146,300	47,000	46,063
737-900	CFM56-7B27	174,200	146,300	45,270	46,063
747-400	CF6-80C2B1	875,000	630,000	148,412	382,336
757-200	RB211-535E4B	255,000	210,000	47,060	75,550
767-300	CF6-80C2B7F	412,000	320,000	96,560	161,740
777-200LR	GE90-115BL	766,000	575,000	228,700	320,863
Airbus					
A300-600	CF6-80C2A5F	363,760	304,230	75,452	74,620
A319	CFM56-5A5	141,096	134,481	37,116	41,555
A320-200	CFM56-5A5	166,446	142,196	45,573	41,554
A330-200	CF6-80E1A4	507,055	396,825	108,139	243,077
McDonnell-Douglas					
MD-82	PW JT8D-217A	149,500	130,000	44,024	39,168
MD-83	PW JT8D-219	160,000	139,500	42,314	46,773
DC-10-30F	GE CF6-50C2	580,000	436,000	177,500	245,569
MD-11F	PW 4460	605,500	471,500	202,733	258,721
Embraer					
EMB 135	AE3007-A3	44,092	40,785	9,919	11,435
EMB 145	AE3007-A1E	48,502	42,549	12,755	11,435
EMB 170	GE CF34-8E5-A1	79,344	72,311	20,062	20,785
EMB 190	GE CF34-10E7	110,892	89,949	28,440	28,660
Bombardier					
CRJ-200	GE CF34-3B1	51,000	47,000	13,500	13,707
CRJ-700	GE CF34-8C1	75,000	67,000	18,750	19,450
CRJ-900	GE CF34-8C5	84,500	73,500	23,500	19,450

Source: *Aircraft Characteristics for Airport Planning Manuals*

4.3.1.1 Takeoff Length Requirements

All aircraft takeoff requirements are based on maximum takeoff weight (MTOW) at an airport elevation of 618 feet. The MTOW was used for this analysis to determine the maximum runway length needed for takeoff with no operational restrictions. One of the major planning parameters is air temperature. Takeoff runway length requirements can be determined for "standard day" (59 degrees Fahrenheit) or "hot day" conditions. For planning purposes, a hot day temperature was used for the takeoff runway length calculations. A hot day reference temperature is the safest option to choose when determining runway length since it accounts for days when longer-than-usual take off distances would be necessary. According to the National Oceanic and Atmospheric Administration (NOAA), the mean-maximum temperature at STL in July is 89.6 degrees Fahrenheit (F).[2]

The results of the runway takeoff length based on MTOW are shown on **Table 4.3-2, *Runway Takeoff Length at MTOW***. Typically, general aviation aircraft require substantially less runway length than air carrier aircraft. Therefore, general aviation aircraft are not incorporated in the runway length analysis. For the air carrier aircraft, the B777-200LR requires the longest runway length of 10,302 feet, and the B767-300 and Airbus A320-200 each requiring 9,180 feet of runway. The DC-10 cargo aircraft requires the longest takeoff length of 12,610 feet, followed by the 747-400F with 11,600 feet of runway. The DC-10 cargo aircraft is typically assigned to domestic cargo operations and is not suitable for long-haul cargo operations; therefore, it is not appropriate to plan future runway requirements for this equipment type.

4.3.1.2 Landing Length Requirements

Landing length calculations were based on the maximum landing weight (MLW) provided by the manufacturer in the *Aircraft Characteristics for Airport Planning* manuals using an airport elevation of 618 feet. Wet and dry runway lengths were calculated for all aircraft. The *Airbus Aircraft Characteristics* manuals do not provide information on landing length requirements for wet runways. Current FAA planning criteria[3] specifies that if the aircraft planning manual only provides dry landing conditions, this number should be increased by 15 percent to achieve wet landing conditions, but not more than 5,500 feet, whichever is less. The results of the landing length analysis are shown on **Table 4.3-3, *Runway Landing Length***.

2 National Oceanic and Atmospheric Administration (NOAA), *Climatology in the United States No. 81, Monthly Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1971-2000 – 23 Missouri*, February 2002.

3 FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, 7/1/05.

Table 4.3-2
RUNWAY TAKEOFF LENGTH AT MTOW
Lambert-St. Louis International Airport

AIRCRAFT TYPE	ENGINE TYPE	HOT DAY PER PLANNING MANUALS	TAKEOFF PER HOT DAY IN MANUALS	ICAO ADJUSTMENT IN FEET	ICAO ADJUSTED 89.6° F
BOEING					
737-500	CFM56-3B1	86F/30C	8,800	176	8,976
737-700	CFM56-7B24	86F/30C	6,900	138	7,038
737-800	CFM56-7B26	86F/30C	8,200	164	8,364
737-900	CFM56-7B27	86F/30C	8,200	164	8,364
747-400	CF6-80C2B1	90F/32.2C	11,600	-0-	11,600
757-200	RB211-535E4B	84F/29C	7,200	216	7,416
767-300ER	CF6-80C2B7F	86F/30C	9,000	180	9,180
777-200LR	GE90-115BL	86F/30C	10,100	202	10,302
AIRBUS					
A300-600	CF6-80C2A5F	86F/30C	8,500	170	8,670
A319	CFM56-5A5	86F/30C	6,050	121	6,171
A320-200	CFM56-5A5	86F/30C	9,000	180	9,180
A330-200	CF6-80E1A4	86F/30C	10,500	210	10,710
MCDONNELL-DOUGLAS					
MD-82	PW JT8D-217A	86F/30C	8,500	170	8,670
MD-83	PW JT8D-219	86F/30C	8,900	178	9,078
DC-10-30F	GE CF6-50C2	95F/35C	13,000	-390	12,610
MD-11F	PW 4460	86F/30C	10,900	218	11,118
EMBRAER					
EMB 135	AE3007-A3	86F/30C	6,890	138	7,028
EMB 145	AE3007-A1E	86F/30C	5,900	118	6,018
EMB 170	GE CF34-8E5-A1	86F/30C	5,000	100	5,100
EMB 190	GE CF34-10E7	86F/25C	5,800	406	6,206
BOMBADIER					
CRJ-200	GE CF34-3B1	86F/30C	6,800	136	6,936
CRJ-700	GE CF34-8C1	86F/30C	6,100	122	6,222
CRJ-900	GE CF34-8C5	86F/30C	7,100	142	7,242

Source: *Aircraft Characteristics for Airport Planning Manuals*, Annex 14, ICAO *Aerodrome Design Manual*, Chapter Three, Landrum & Brown Analysis

Table 4.3-3
RUNWAY LANDING LENGTH
Lambert-St. Louis International Airport

AIRCRAFT TYPE	DRY RUNWAY LANDING LENGTH	WET RUNWAY LANDING LENGTH
BOEING		
737-500	4,700	5,450
737-700	4,900	5,700
737-800	5,850	6,800
737-900	6,050	6,950
747-400	6,400	7,400
757-200	5,000	5,750
767-300	5,600	6,400
777-200LR	5,250	6,100
787-800	No data	No data
AIRBUS		
A300-600	5,100	5,865*
A319	4,400	5,060*
A320-200	4,950	5,693*
A330-200	6,600	7,590*
A340-500	6,567	7,545*
A340-600	6,890	7,925*
MCDONNELL-DOUGLAS		
MD-82	5,400	6,100
MD-83	5,400	6,100
DC-10-30F	6,000	6,900*
MD-11F	8,400	9,500
EMBRAER		
EMB 135	4,500	5,175*
EMB 145	5,800	6,670*
EMB-170	4,400	5,060*
EMB 190	4,100	4,715*
BOMBARDIER		
CRJ-200	4,800	5,520*
CRJ-700	4,900	5,635*
CRJ-900	6,600	7,590*

Source: Aircraft Characteristics for Airport Planning Manuals, ICAO Aerodrome Design, Chapter Three, Landrum & Brown analysis, 2011

4.3.1.3 Runway Length Summary

The preceding analysis has identified the potential need, should long haul cargo service established at some point in the future, for a runway providing 11,600 feet of takeoff length to accommodate hot day, maximum takeoff weight operations by the B747-400. At the time such service is announced, a review of the specific operational characteristics should be conducted to determine if the operations would truly trigger the need to provide additional runway length.

Preliminary load planning analysis using the aircraft planning manual indicates that the B747-400 would incur a 45,000-pound payload penalty if operating off the existing runway with sufficient fuel to travel 6,000 nautical miles with temperatures at departure time of 89.6 Fahrenheit.

Actual payload requirement, time of operation, and stage length could negate the need for a runway extension. For planning purposes, the identified 11,600-foot requirement is further analyzed in the evaluation of alternatives to ensure that if this need would arise, the issue will have addressed and STL would be equipped to move forward with the best option to meet the need.

As it relates to landing lengths, the existing runway system is fully adequate to meet the needs of the current and potential aircraft fleet. No extension to any runway is deemed needed to address a landing-length deficiency.

4.3.1.4 Airfield Design Requirements

As noted in Chapter Two, *Inventory of Existing Conditions*, all of the runways and taxiways were designed to accommodate at least Airport Reference Code (ARC) D-IV aircraft. Runways 6/24, 11/29 and 12L/30R are 150 feet wide, Runway 12R/30L is 200 feet wide, and all taxiways are a minimum of 75 feet wide.

For long-term planning purposes, it is recommended that meeting Group D-V requirements be considered for future runways, taxiways, and apron areas and when feasible design to the more demanding standard to minimize future expense associated with reconfiguring the airfield from Group D-IV to the more demanding Group D-V standard, should future demand require the added separation.

4.3.2 TAXIWAY REQUIREMENTS

Taxiways are defined as paved areas established to move aircraft from one part of the airport to another. This section evaluates the existing taxiway system and summarizes the taxiway requirements at STL. Refer back to Exhibit 4.2-1 for the existing taxiway layout and runway exit locations.

4.3.2.1 Parallel Taxiways

Runways 11-29 has full-length dual parallel taxiways, and Runway 12R-30L has full-length dual parallel taxiways/taxilane on the south side of the runway and a length single parallel taxiway to the north, which extends form the Runway 30L approach end to Taxiway S. Runway 12L-30R is served by a single full-length parallel taxiway to the south and a second parallel taxiway to the north that ends at Taxiway J, well short of the 30R approach end of the runway. Runway 6/24 has a parallel taxiway east of the runway extending from the Runway 6 Approach end to Taxiway F and section of parallel taxiway extending from the Runway 6 Approach end to Taxiway D. The Runway 24 Approach end is served by Taxiway V to the West and Taxiway P to the East; Taxiway V has been realigned to run parallel to the runway to the intersection with Taxiway F. For maximum flexibility and operational efficiency, dual taxiway capability should be considered for future airfield expansions.

4.3.2.2 Runway Exits

Entrance/exit taxiways (also referred to as runway exits) connect runways to parallel taxiways. These taxiways provide paths for aircraft to enter the runway for departure or leave the runway after landing.

The type of runway exits and the location and number of exits depend on many factors including the location of parallel taxiways and the type of aircraft using the runway. The time it takes an aircraft to decelerate to a speed that is slow enough to exit the runway varies depending on the size and performance characteristics of the aircraft and condition of the runway.

If exits are not placed at the point(s) where the majority of aircraft using the runway reach their exit speed, the aircraft must continue down the runway at a relatively low rate of speed until it gets to an exit. Runways with adequate and properly spaced runway exits allow capacity to be optimized by minimizing the runway occupancy times of arriving aircraft.

Generally, a greater number of runway exits are needed for a diverse fleet mix to allow all aircraft to exit the runway at their optimal speed. In addition, acute-angled exits provide lower runway occupancy times compared to 90-degree exits. This is because aircraft can exit the runway at higher speeds with acute-angled exits, thereby allowing the aircraft to exit the runway sooner.

Runway 12R-30L has 13exits on the terminal side of the runway, of which eight are 90-degree, three widened 90-degree, and two are acute-angled exits. Runway 12L-30R has 10 exits, of which six are 90-degree, and four are acute-angled exits. Runway 6-24 has eight exits, of which five are 90-degree, and three are widened 90-degree-angled exits. Runway 11- 29 has seven exits, of which two are 90-degree, one is a widened 90-degree, and four are acute-angled exits.

The FAA's REDIM program was used to analyze both the existing fleet mix 2008 and the forecast 2028 fleet mix at STL on each runway. The resulting average ROTs for each runway end are shown on **Table 4.3-4, *Average Runway Occupancy Time by Runway End***. It is recommended that the average ROT be 50 seconds or less for optimal arrival spacing of aircraft. Therefore, with ROTs of more than 50 seconds for all runways except Runway 11/29, it is recommended that additional exits or reconfigured exits be considered for these runways. Reconfiguration of the Runway 12L/30R, 12R/30L, and 6/24 exits is discussed in more detail in Chapter 5, *Airport Concept Development and Evaluation*.

Table 4.3-4
AVERAGE RUNWAY OCCUPANCY TIME BY RUNWAY END
EXISTING 2008 FLEET MIX COMPARED TO PROJECTED 2028 FLEET MIX
Lambert-St. Louis International Airport

RUNWAY END	2008 AVERAGE ROT (IN SECONDS)	2028 AVERAGE ROT (IN SECONDS)
11	48.1	48.1
29	48.1	47.9
12L	52.7	51.8
30R	50.8	50.9
12R	58.5	58.0
30L	57.4	56.6
6	63.6	62.5
24	56.4	55.9

Source: FAA Runway Exit Design Interactive Model (REDIM) and Landrum & Brown.

In addition to runway occupancy times, the location of runway exits can have an impact on the ability of the pilot to navigate an aircraft safely across the airfield. Areas where multiple taxiways intersect the runway within close proximity to one another have the potential to cause pilot confusion.

Taxiway L, at the intersection with Runway 12L/30R, is an example of an area where multiple exit points may result in pilot confusion. A REDIM run was conducted for operations on Runway 12L/30R to determine the impact to the operation should the Airport choose to remove the taxiway from the airfield. The analysis suggests that the impact to 12L arrivals is less than 1 second while the impact to 30R arrivals is negligible.

A similar REDIM analysis was conducted to identify the impact of removing the pavement on Taxiway E between Taxiway S and Runway 6/24. STL and the FAA have identified this portion of pavement as a possible source of confusion for pilots taxiing westbound on Taxiway E. In the unlikely event the turn onto Taxiway S is missed, pilots would taxi onto to Runway 6/24. Removing this pavement increases the occupancy time on Runway 6 arrivals by approximately one second; operations on Runway 24 are not affected.

As stated previously, runways that have a proven average ROT of 50 seconds or less may be allowed closer spaced arrivals by the FAA. Should an unforeseen change in demand above and beyond the forecast put pressure on the arrival capacity at the Airport, additional high-speed runway exits should be considered for Runway 12L/30R to reduce the ROT to less than 50 seconds.

4.3.2.3 Terminal Area Taxiways

The airside of the terminal complex has single taxiway to the north between Terminal 1 and Taxiway D, the full-length taxiway parallel to Runway 12R/30L. This configuration is not optimal for efficient flow of aircraft in the terminal complex area as aircraft pushing back from the gate impede the movement of other aircraft. Terminal 2 aircraft are able to pushback onto the two taxilanes between the terminal and Taxiway D permitting aircraft to maneuver without impeding free movement. The southwest side of Concourse A is served by a single taxilane, which does not permit aircraft to pass during a gate pushback. The area between Concourses C and D is served by dual taxilanes permitting bypass capability during aircraft pushback from gates on these two terminals. The terminal area also includes the LIMA pad located between Terminals 1 and 2 for remain over night (RON) aircraft parking. This capability frees up gate space and allows carriers to keep aircraft near the terminal complex when RONs are required.

4.3.2.4 Bypass Taxiways

Bypass areas or run-up pads are areas used to position aircraft prior to takeoff. These are placed adjacent to the ends of runways and are designed so that aircraft can pass by one another when necessary. A bypass area allows the trailing aircraft to pass the leading aircraft if the takeoff clearance of the leading aircraft is delayed or a malfunction is experienced. In addition, bypass areas provide space for instrumentation and engine operation to be checked on piston-engine aircraft prior to takeoff. It is important for air carrier airports to have sufficiently sized bypass areas to accommodate existing and future aircraft.

The airfield taxiway configuration provides bypass capability on the ends of two of the four runways by providing dual parallel taxiways and/or bypass taxiways at each runway end. Runways 11/29 and 12R/30L have a bypass taxiway at each runway end.

4.3.2.5 Taxiway Summary

The taxiway analysis identified the following taxiway parameters for determining future needs:

- Provide full-length parallel taxiways for all air carrier runways, including new runways constructed in the future
- Provide additional or reconfigured runway exits and acute-angled exits where necessary
- Provide bypass areas for all air carrier runways

4.3.3 FAR PART 77 SURFACES AND OBSTRUCTIONS

Federal Aviation Regulation (FAR) Part 77, *Objects Affecting Navigable Airspace*, establishes standards for determining which structures pose potential obstructions to air navigation. This is accomplished by defining specific airspace areas around an airport that cannot contain any protruding objects. These airspace areas are referred to as imaginary surfaces. These imaginary surfaces include the primary, transitional, horizontal, conical, and approach surfaces. Data from the latest aeronautical survey for the approach, primary and missed approach surfaces of each runway is listed in **Table 4.3-5, *FAR Part 77 Obstructions***. (Please note - These obstructions will be verified through additional analysis during completion of the ALP and updated based on current physical conditions.) Any modifications to this data will be reported to the FAA for their reporting purposes.

Table 4.3-5
FAR PART 77 OBSTRUCTIONS (To be reviewed and updated with finalized ALP SET)
Lambert-St. Louis International Airport

RUNWAY END	OBSTRUCTION
6	Lighted Windsock Obstruction Light on Glide Slope Obstruction Light Transmissometers
24	Lighted Windsock Obstruction Light on Glide Slope ROD on Obstruction Light Glide Slope Obstruction Light Transmissometers
11	Lighted Windsock Obstruction Light on Glide Slope Obstruction Light Transmissometers ROD on Obstruction Light Glide Slope
29	Lighted Windsock Obstruction Light on Glide Slope Obstruction Light Transmissometers ROD on Obstruction Light Glide Slope
12L	Obstruction Light on Glide Slope Obstruction Light Transmissometers ROD on Obstruction Light Glide Slope
30R	Lighted Windsock Obstruction Light on Glide Slope Obstruction Light Transmissometers ROD on Obstruction Light Glide Slope
12R	Lighted Windsock Obstruction Light on Glide Slope Obstruction Light Transmissometers ROD on Obstruction Light Glide Slope
30L	Lighted Windsock Obstruction Light on Glide Slope Obstruction Light Transmissometers ROD on Obstruction Light Glide Slope

Sources: Airnav.com, November 24, 2008, and ALP Update, Dated Feb. 2 2007 prepared by Parsons Brinckerhoff (Runway Threshold Elevation)

4.3.4 AIRFIELD SAFETY AREAS

As stated in Chapter One, *Inventory of Existing Conditions*, the typical airport Safety Areas include the following, which are presented in more detail below:

- Runway Protection Zone (RPZ)
- Runway Safety Area (RSA)
- Object Free Zone (OFZ)
- Object Free Area (OFA)

4.3.4.1 Runway Protection Zone (RPZ)

The RPZ is trapezoidal in shape and is centered on the extended runway centerline. Each of the RPZ's at STL, for the most part, lies within the existing Airport property boundary. All the RPZ's, with the exception of the Runway 12L RPZ, overlay main thoroughfares that surround the Airport and in some cases parts of adjacent properties. Although specifically discouraged, parking facilities within the RPZ are permitted provided the parking facilities and any associated appurtenances are located outside the central portion of the RPZ.

As currently configured, the following facilities are located within some of the Airport's RPZs:

- The Super Park (D) parking area is located in the central portion of the Runway 6 RPZ; it is a legacy facility that is essential to the Airport's financial health. The lot is credit card only facility and there are no workstations or staffed revenue control booths. The lot is on the extended centerline to Runway 6 and the majority of parking spaces are within the Runway 6 RPZ. The RPZ size has been dictated by the Runway 6 RNAV approach, which has lower minima than the precision ILS approach. However, the RNAV approach like the ILS receives limited, if any, use. The Super Park D lot pre-dates the Runway 6 RNAV approach. Prior to implementing the RNAV approach, the lot would have been outside the RPZ. Over flight of the parking lot is nominal. Runway 6-24 is a crosswind runway with low use. Runway 6 experienced less than 200 arrivals in CY2011 and Runway 24 had 400 departures. Over flight by Runway 24 departures is rare. Runway 24 departures are routinely turned to a 300 heading as rapidly as feasible to prevent over flight of populated areas and to control the departure noise footprint. At the time the parking lot was constructed, in the 1980s, it was in accord with guidance that was applicable at the time of construction.
- The Super Park (C) is located on the extreme south edge of the Runway 6 RPZ away from the extended runway centerline; it is a legacy facility that is essential to the Airport's financial health. All workstations, the revenue control plaza, and surface parking are outside the RPZ. Covered parking is located within the RPZ, but outside both the inner approach OFZ and the inner transitional OFZ, and none of the covered parking structures penetrate the approach or departure surfaces. The RPZ size is dictated by the Runway 6 RNAV approach, which has lower minima than the precision ILS

approach. However, the RNAV approach like the ILS receives limited, if any, use. The Super Park C lot pre-dates the Runway 6 RNAV approach. Prior to implementing the RNAV approach, the lot would have been outside the RPZ. Over flight of the parking lot is nominal. Runway 6-24 is a crosswind runway with low use. Runway 6 experienced less than 200 arrivals in CY2011 and Runway 24 had 400 departures. Over flight by Runway 24 departures is rare. Runway 24 departures are routinely turned to a 300 heading as rapidly as feasible to prevent over flight of populated areas and to control the departure noise footprint. At the time the parking lot was constructed, in the 1980s, it was in accord with guidance that was applicable at the time of construction.

- The Hunter Engineering Buildings are located on the north edge of the Runway 6 RPZ. Unfortunately, the Hunter Engineering campus is located off-airport on private property and is outside the span of Airport control.
- An aircraft parking apron is located within the Runway 12L RPZ. The aircraft parking apron should be marked and or/signed to ensure that neither the airline nor the FBO park aircraft in the 12L RPZ.
- The Terminal 1 Cell Phone Lot is located within the Runway 29 RPZ and is under the inner transitional OFZ to Runway 29. The lot is located outside the Runway 29 inner approach OFZ. The lot provides a valuable customer service amenity and is essential to relieve terminal roadway congestion. The lot is buffered from potential Runway 11 overruns and potential Runway 24 overruns by Coldwater Creek. The airport should explore the possibility of relocating the cell phone lot.

All future runways or runway extensions should try to maintain the RPZ within the existing airport property. If this is not possible, it is recommended that STL purchase the land encompassed by the RPZ to maintain control of potential future development.

4.3.4.2 Runway Safety Area (RSA)

The RSA serves as a safety area if an aircraft overruns the paved surface. The RSA standard for STL's runways measures 500 feet wide and extends 1,000 feet beyond the runway end, centered on the centerline of the runway. The RSAs for Runways 11-29 and 12R-30L, and the approach ends to Runways 6 and 30R meet the requirement. The proximity of the localizer to the runway end is the limiting factor for Runway ends 12L and 24; Runway 24 is also limited by the proximity of the fence line along Banshee Road. In all cases where the full length RSA is not achieved, the Airport has implemented the appropriate declared distances to provide the necessary protection afforded by the RSA. The Airport should continue to make improvements to the airfield to meet the RSA requirements where practicable.

4.3.4.3 Obstacle Free Zone (OFZ)

The OFZ is a defined volume of airspace centered above the runway centerline. The OFZ clearing standard precludes taxiing and parked airplanes and object penetrations, except for frangible visual Navigational Aids (NAVAIDS) that need to be located in the OFZ because of their function. The OFZ is composed of the runway OFZ (ROFZ), and, when applicable, the precision OFZ (POFZ), the inner-approach OFZ, and the inner-transitional OFZ. The ROFZs extend 200 feet beyond each end of the runway, and are 400 feet in width. The POFZ is in effect only when certain operational conditions are met. Currently, no objects have been found to violate the OFZ for any of the runways. Therefore, there are no limits to capacity deriving from OFZ violations.

4.3.4.4 Runway Object Free Area (OFA)

Runways 6/24, 11/29, 12L/30R and 12R/30L should have OFAs that extend 1,000 feet from each runway end and measure 800 feet in width. The current OFAs for each of the runways are clear and free of obstructions (other than navigational aids that are fixed by their function), with the exception of the approach ends of Runway 12L and 24. All future runway OFAs will be compliant with FAA design standards.

4.3.5 AIRFIELD IMPROVEMENTS

In terms of capacity and capability, the STL airfield is sufficient to serve the needs of the forecast operations through the planning period. Improvements necessary moving forward are not required to meet operational demands, rather the improvements are necessary to improve the usability, efficiency and safety of the airfield. The Runway 11-29 complex represents the most modern design of an airfield complex for a commercial airport; exit geometries, pavement design and navigation aids are located with efficiency and safety in mind. The Runway 12R-30L and 12L-30R runway complexes represent an airfield that has undergone significant growth and many of the pavement areas and navigational aids are not in locations currently recommended by latest state of the art practices. Moving forward in the alternatives development of the Master Plan the following items will be evaluated; runway and taxiway geometries, including exit location, in the Runway 12R-30L and Runway 12L-30R complex, runway safety areas, locations of navigational aids and the need for any potential runway extensions.

4.4 PASSENGER TERMINAL

4.4.1 INTRODUCTION

This section of the chapter is devoted to the passenger terminal building facility requirements. The following sections describe the methodology and rationale for developing the aircraft gate and building area requirements.

4.4.2 METHODOLOGY

The approach used to develop the passenger terminal facility requirements for STL involved analyzing the current capacities of the existing terminal building, site observations, factors from comparable airports around the U.S., interviews with existing tenants and Airport staff, and the application of industry accepted planning standard guidelines. Current demand/capacity ratios were determined using the existing terminal 2008 facilities space allocations with updated 2010 terminal utilization values, the completed and planned *Airport Experience Program* list of projects and the August 11, 2010, demand day Official Airline Guide (OAG) flight schedule which serves to establish a baseline condition of demand to current facility capacities.

Airport terminal facilities are sized to accommodate the future forecast of passengers and aircraft operations. For the internal passenger processing functions of the terminal this typically involves using the demands associated with future projections of Annual and Peak Month Average Day Peak Hour (PMADPH) passenger volumes. Although annual enplanements are an indicator of overall airport size, Peak Hour volumes more accurately reflect the demand for specific functions within the terminal facilities.

Peak Hour volumes are often referred to as Design Hour passengers and are identified from a typical Busy Day or Design Day. The Peak Hour, or Design Hour, measures the enplaned (departing) and deplaned (arriving) passengers on aircraft in an elapsed hour of the Design Day. The Peak Hour generally does not correspond to a static hour or "clock hour" such as 6:00-6:59, but rather refers to a "rolling hour" which overlaps two "clock hours," e.g. 6:15-7:14, which better reflects airline scheduling patterns.

Design Hour passengers represent the number of persons in the terminal during peak periods. To capture the true anticipated demand on certain terminal functions, this Design Hour number may also include meeters and greeters, well-wishers (more commonly referred to as visitors), and employees. The Design Hour does not represent the absolute peak level of activity but instead is equal to the number of people occupying the space at any given point in time. The Design Hour is the approach that the industry has traditionally used as the level of activity by which most new terminal facilities are sized. These peaking characteristics are unique to each airport terminal due to the differences in operational factors that include variations in the airlines serving the airport and their respective flight schedules; the mix between mainline and regional aircraft types; varying activity levels of origin/destination (O&D) and connecting passengers; international and domestic passengers; and, business and leisure passengers.

4.4.3 AIRCRAFT GATES

4.4.3.1 Existing Gate Utilization

Initially the August 13, 2008 base schedule was "paired" (matching of arriving flights to departing flights) for each airline. This analysis produced such planning factors as turns or departures per gate, average time on gate, Domestic and International operations, Remain Overnight Night (RON) positions, and the total number of gates required. To reflect the current operating characteristics at STL the published schedule of August 11, 2010 was analyzed for the same planning factors as noted above. **Table 4.4-1, *Terminal 1 Gate Utilization – August 11, 2010 Schedule***, and **Table 4.4-2, *Terminal 2 Gate Utilization – August 11, 2010 Schedule***, summarize the utilization of gates by each airline and terminal from this schedule analysis. (To review the August 13, 2008 analysis, *see* Appendix B, *Terminal Demand/Capacity and Facility Requirements*.) A terminal "gate" is defined as a location where an aircraft is parked at the terminal for loading and unloading of passengers. Passengers using a gate can access an aircraft directly from the apron level via a stairway integrated into the aircraft, by a portable stairway or, more typically, though a passenger loading bridge, referred to as a "contact" gate.

At full operational capacity, STL has a total of 88 gates with 72 at Terminal 1 and 16 at Terminal 2. With the current closures of Concourse B and Concourse D, the total operating terminal capacity yields 61 gates (when including all Concourse C gates), 45 gates at Terminal 1 and 16 gates at Terminal 2. Gate E2 in Terminal 2 does not have a jet bridge and given the gate configuration of Southwest Airlines, it is unlikely that future operations will take place from this gate. This yields a total operational capacity of 60 gates between the two terminals. Of the 60 potential operational gates in 2010, 23 gates at Terminal 1 and 13 gates at Terminal 2 are leased by the airlines. When an airline had more RON aircraft than leased parking positions it required an "Extra RON" position as noted in Table 2.4-1 and Table 2.4-2.

To develop realistic estimates of gate requirements and RON parking requirements, assumptions need to be made regarding aircraft inter-gate time and which flights in the schedule are most likely to remain overnight prior to departure the next day. Inter-gate time refers to the additional time airlines typically reserve to prepare aircraft, enplane and deplane passengers, and preserve for off-schedule operations. The inter-gate time assumption explicitly removes a gate from potential use above and beyond an airlines scheduled departure and arrival time. A common practice when analyzing published airline flight schedules is to allow for an inter-gate time of 25 minutes, or 10 minutes before actual arrival time, and 15 minutes after scheduled departure time. This can have an effect on total gate need throughout the day by carrier. Another common assumption is the time in which RON flights are "towed" on or off the gate when an arrival/departure flight is not scheduled during the same 24-hour period. This can also affect total gate needs throughout the day and the actual operating schedules by carrier may differ from the results of the schedule analyses.

Table 4.4-1
TERMINAL 1 GATE UTILIZATION – AUGUST 11, 2010 SCHEDULE[1]
Lambert-St. Louis International Airport

Concourse	Airline	Gate #	Existing PBB	2010 PMAWD Operations	2010 Dep/Gate	Max AC Gauge	Active AC Gauge Utilization	2010 Extra RON	2010 Avg. Gate Time
Concourse A	Delta	A2	Y	60		B737-5,6,7,8,9w	CRJ/ERJ/CR7,9/ D94,95,9S/M88/ A319,320	3	0:42
		A3	Y			B737-5,6,7,8,9w			
		A4	Y			B737-5,6,7,8,9w			
		A6	Y			B727			
		A8	Y			B737-3,4			
		A10	Y			B737-5,6,7,8,9W			
	Total	**6**	**6**	**60**	**5.0**				**0:42**
	Unassigned	A12	Y			A321			
	Continental	A9	Y	26		B757-2,3	ERJ	1	0:39
		A14	Y			EMBRAER(E170,175)			
	Total	**2**	**2**	**26**	**6.5**				**0:39**
	US Airways	A15	Y	32		B737-5,6,7,8,9w	CRJ/ERJ/CR9/E70,75/ B733,734/A319,320	2	0:44
		A16	Y			B737-5,6,7,8,9w			
		A17	Y			B737-5,6,7,8,9w			
	Total	**3**	**3**	**32**	**5.3**				**0:44**
	United/Air Canada	A18	Y	46		B757	ER4/CR7/A320	3	0:43
		A19	Y			B737-7w			
		A21	Y			F70/F100			
	Total	**3**	**3**	**46**	**7.7**				**0:43**
Concourse B	Decommissioned/Closed	B2				MD80			
	Decommissioned/Closed	B3				COMMUTER			
	Decommissioned/Closed	B4				MD80			
	Decommissioned/Closed	B6				MD80			
	Decommissioned/Closed	B7				COMMUTER			
	Decommissioned/Closed	B8				CR2			
	Decommissioned/Closed	B14				COMMUTER			
	Decommissioned/Closed	B16				COMMUTER			
	Decommissioned/Closed	B10				B737			
	Decommissioned/Closed	B12				B737-5,6,7,8,9w			
Concourse C	American	C2	Y	68		B737-5,6,7,8,9,w	ER3/ERD/M80,83/ B757	3	0:46
		C6	Y			B757-200			
		C8	Y			A321			
		C10	Y			B757-200			
		C12	Y			B737-5,6,7,8,9,w			
	Total	**5**	**5**	**68**	**6.8**				**0:46**
	Cape Air[3]	C7	Y	32		F28	CNA402		0:58
	Total	**1**	**1**	**32**	**16.0**				**0:58**
	Midwest/AirTran[2,4]	C21	Y	18		Saab 340	ER3,4/B717,737		0:30
		C24	Y			B757-200			
	Total	**2**	**2**	**18**	**4.5**				**0:30**
	Frontier[2]	C23	Y	10		CRJ-7,9	A319		0:44
	Total	**1**	**1**	**10**	**5.0**				**0:44**
	Unoccupied/ AA Vacate	C1				RJ-70,85,100,115			
	Unoccupied/ AA Vacate	C3				RJ-70,85,100,115			
	Unoccupied/ AA Vacate	C5				Saab 340			
	Unoccupied/ AA Vacate	C9				EMBRAER(E170,175)			
	Unoccupied/ AA Vacate	C15				EMBRAER(E170,175)			
	Unoccupied/ AA Vacate[5]	C16				B737-5,6,7,8,9,w			
	Unoccupied/ AA Vacate	C17				B737-3,4			
	Unoccupied/ AA Vacate	C18				B707			
	Unoccupied/ AA Vacate[5]	C19				EMBRAER(E170,175)			
	Unoccupied/ AA Vacate	C25				B757			
	Unassigned	C27				B737-5,6,7,8,9,w			
	Unoccupied/ AA Vacate	C28				B767			
	Unassigned	C29				B737-5,6,7,8,9,w			
	Unoccupied/ AA Vacate - Intl	C30				B767			
	Unassigned	C31				B737-5,6,7,8,9,w			
	Unoccupied/ AA Vacate - Intl	C32				B767			
	Unoccupied/ AA Vacate	C33				B757			
	Unoccupied/ AA Vacate - Intl	C34				B767			
	Unoccupied/ AA Vacate - Intl	C35				MD80			
	Unoccupied/ AA Vacate - Intl	C36				B747-400			
	Unoccupied/ AA Vacate - Intl	C38				A330			
Concourse D/E[6]	Decommissioned/Closed	D2				B737-100,200			
	Decommissioned/Closed	D6				A318,319			
	Decommissioned/Closed	D4				B737-100,200			
	Decommissioned/Closed	D8[3]				EMBRAER			
	Decommissioned/Closed	D10[3]				EMBRAER			
	Decommissioned/Closed	D12				B757			
	Decommissioned/Closed	D14				MD80			
	Decommissioned/Closed	D16				MD80			
	Decommissioned/Closed	D18				B757			
	Decommissioned/Closed	D20				B757			
	Decommissioned/Closed	D22				MD80			
	Decommissioned/Closed	D24				B763			
	Decommissioned/Closed	D26				B727/MD80			
	Decommissioned/Closed	E34				DC9/B717			
	Decommissioned/Closed	E36				B757			
	Decommissioned/Closed	E38				EMBRAER			
	Decommissioned/Closed	E40				EMBRAER			

Totals

	Total Gates	PMAWD Operations	Dep/Gate	Total Extra RON	Total Avg. Time on Gate
Full Capacity	72	292	6.3	12	0:44
2010 Operational Capacity	45				
Assigned (2010)	**23**				
Unassigned	22				
Decommissioned/Closed	27				

Max AC Gauge Gate Mix	Full Capacity	% of Total	Active Max AC Gauge Utilized	2010	% of Total
Md Regional (Group II)	13	*18%*	Md Regional (Group II)	5	*22%*
Lrg Regional (Group III)	7	*10%*	Lrg Regional (Group III)	-	*0%*
Narrowbody (Group III)	33	*46%*	Narrowbody (Group III)	16	*70%*
B757w (Group IIIa)	10	*14%*	B757w (Group IIIa)	2	*9%*
Widebody (Group IV)	7	*10%*	Widebody (Group IV)	-	*0%*
Jumbo (Group V)	2	*3%*	Jumbo (Group V)	-	*0%*
Total	72	*100%*	Total	23	*100%*

Notes: AC =Aircraft
Dep/Gate = Aircraft Departures per Gate
PBB = Passenger Boarding Bridge
PMAWD = Peak Month Average Weekday
RON = Remain Overnight

1 The existing gate numbers, loading bridge, and aircraft gauge are based on field observations/assumptions, aerial data, and information received from Lambert Airport.
2 Frontier Airline Gates C21 and C23 operate from one hold room door with split jetways.
3 Cape Air will relocate from Gates D8 and D10.
4 Air Tran was relocated to Concourse C following the closure of Concourse B in June 2010.
5 Potential future gate for Alaska Airlines.
6 In December 2008, with the relocation of Cape Air, Lambert Airport closed a 12-gate section of Concourse D along with the entire concourse.

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Table 4.4-2
TERMINAL 2 GATE UTILIZATION – AUGUST 11, 2010 SCHEDULE[1]
Lambert-St. Louis International Airport

	Airline	Gate #	Existing PBB	2010 PMAD Operations	2010 Dep/Gate	Max AC Gauge	Active AC Gauge Utilization	2010 Extra RON	2010 Avg. Gate Time
Terminal 2/Concourse E	Southwest	E4	Y	166		B737	B733,735,73G	0	0:29
		E6	Y			B737			
		E8	Y			B737			
		E10	Y			B737			
		E12	Y			B737			
		E14	Y			B737			
		E16	Y			B737			
		E18	Y			B737			
		E20	Y			B737			
		E22	Y			B737			
	Total	**10**	**10**	**166**	**8.3**				**0:29**
	Unassigned	E2				B737			
	Unassigned	E24				B737			
	Unassigned	E25				B737			
	AirChoice One/USA 3000/Charter (International)	E29		2		B737	A320	N/A	
		E31	Y			B737			
		E33	Y			B737			
	Total	**3**	**2**	**2**	**0.3**				**0:00**

Totals	**Total Gates 2010**	16	**168**	**6.5**			**0**	**0:29**
	Assigned	**13**						
	Unassigned	3						
	Max Gate Mix	**Full Capacity**	**% of Total**	**Active Max AC Gauge Utilized**		**2010**	**% of Total**	
	Md Regional (Group II)	-	*0%*	Md Regional (Group II)		-	*0%*	
	Lrg Regional (Group III)	-	*0%*	Lrg Regional (Group III)		-	*0%*	
	Narrowbody (Group III)	16	*100%*	Narrowbody (Group III)		13	*100%*	
	B757w (Group IIIa)	-	*0%*	B757w (Group IIIa)		-	*0%*	
	Widebody (Group IV)	-	*0%*	Widebody (Group IV)		-	*0%*	
	Jumbo (Group V)	-	*0%*	Jumbo (Group V)		-	*0%*	
	Total	16	*100%*	Total		13	*100%*	

Notes: AC =Aircraft
Dep/Gate = Aircraft Departures per Gate
PBB = Passenger Boarding Bridge
PMAWD = Peak Month Average Weekday
RON = Remain Overnight

1 The existing gate numbers, loading bridge, and aircraft gauge are based on field observations/assumptions, aerial data, and information received from Lambert Airport.

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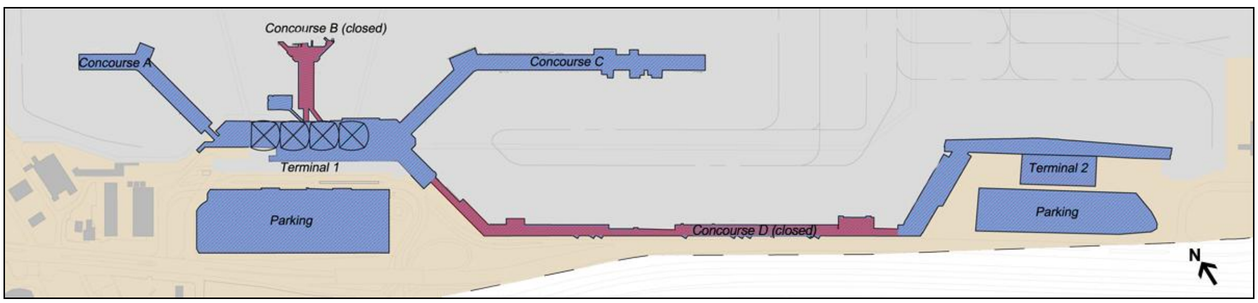
STL flights operate from two terminals that serve different carriers (*see* **Exhibit 4.4-1, *Existing Terminal Layout***):

- Terminal 1 – (formally the Main Terminal), includes both Domestic and International arrival operation capabilities
  - Preferential Use domestic flights operating from Concourses A & C
  - International "swing[4]" capable gates at the end of Concourse C[5]
- Terminal 2 – (formally the East Terminal), includes both Domestic and International arrival operation capabilities
  - Preferential Use domestic flights (Southwest Airlines)
  - International "swing" capable gates
  - Non-scheduled charter flights

Exhibit 4.4-1
EXISTING TERMINAL LAYOUT
Lambert-St. Louis International Airport



Source: Landrum & Brown, 2011

The following paragraphs describe existing gate utilization by terminal.

TERMINAL 1

Based on the STL August 11, 2010 Peak Month Average Week Day (PMAWD) schedule analysis the non-RON time on gate for the Domestic gates ranged from 30 minutes to just under an hour. On average, most flights had turn times of less than 45 minutes. Gate utilization, not including RON positions, varied from 4.5 to as much as 16 departures per gate. The lowest utilization was for the gates utilized by Midwest Connect and AirTran with 4.5 departures from its two available gates. The "Extra RON" aircraft as noted in Table 2.4.1 and 2.4.2 above, are either double-parked based on the gauge of the parking position, moved to "borrowed" or unassigned gates, or moved to designated hardstand positions adjacent to the terminals.

[4] The term "swing" gate refers to a gate that is capable of accommodating both Domestic and outbound International traffic as well as international arriving traffic.

[5] Currently no International arrival flight activity exists at Terminal 1 that requires facilities to process arriving international passengers who have not already been pre-cleared in the country of origin.

TERMINAL 2

Based on the same PMAWD schedule analysis, non-RON time ranged equated to just under 30 minutes. Gate utilization averaged slightly over eight departures per gate for domestic flights, less than one departure per gate for international flights.

4.4.3.2 Gate Forecast Requirements

GATE USE POLICIES

When assessing existing gate utilization and future demand, gate use policies should be taken into consideration. There are three standard gate use allocation categories: Exclusive, Preferential, and Common with each having different gate utilization rates. STL currently operates on a preferential gate and hold room use policy at both terminals. Discussions with the St. Louis Aviation Authority indicate that the present gate lease policy is anticipated to continue as part of the future master lease negotiations.

Generally, airports are moving away from exclusive use agreements that tend to result in a lower turn per gate utilization in favor of short-term (five-year) preferential leased gates. These agreements tend to have higher utilization rates and more operational flexibility. Preferential Use agreements typically have utilization criteria such as a minimum standard of operations or seats that allow the airport to reclaim the gates from the signatory airline if those gates are being underutilized. It also offers the Airport the operational flexibility given the contractual language to assign the gates to other airlines when not in use by the signatory airline.

Common Use gates tend to have the highest utilization rates of the three methods resulting from multiple airlines sharing a single gate, which typically increases the utilization of the gate.

The STL gates should be leased on a Preferential Use basis as required to maximize the utilization of the gates and provide the most flexibility for future demand. Depending on the airport and airlines involved, it is recommended that international gates be used on a common use basis and designed to handle both domestic and international departing and arriving passengers. Although Terminal 1 does not require the need to process international arriving passengers it, along with Terminal 2, have international "swing" capable gates. This allows for the sterile separation of arriving international passengers from both departing domestic and international passengers. Swing gates are another means to increase gate utilization.

GATE REQUIREMENT METHODOLOGIES

Various methods are used to forecast future gate requirements. Typically, these four methods are used to create a range of gate requirements:

- Annual Enplanements per Gate Method,
- Annual Departures per Gate Method,
- Peak Month Average Day (PMAD) Departure per Gate Method, and
- Future Design Day Flight Schedules (DDFS)

Four Design Day flight schedules were developed from the FAA-approved baseline forecast as described in the "*Aviation Activity Forecast*" to analyze the future gate demands. Based on the August 2008 airline schedules, three additional schedules were developed for years 2013, 2018, and 2028. Gate requirements are presented in five-year milestones from the base year; the horizon year 2023 gate requirements were interpolated from the 2018 and 2028 schedule analyses. Two additional gate demand scenarios were developed based on the "High" and "Low" forecasts to predict a potential future gate range that responds to the economic scenarios described in "*Aviation Activity Forecast.*"

Prior to American Airline's hub draw down announcement, the four Design Day schedules were run through Landrum & Brown's (L&B's) proprietary Gate Program. Output results include:

- Total gate need by airline (Domestic & International);
- Total Peak Hour gate need (exclusive of individual airline peak needs);
- Total operations by airline;
- Departures or "Turns" per gate by airline;
- Linear gate frontage need by airline;
- Airline total gate and linear frontage need by FAA Aircraft Design Group (ADG) as shown in **Table 4.4-3, *FAA Aircraft Design Group (ADG) Summary*.**

Table 4.4-3
FAA AIRCRAFT DESIGN GROUP (ADG) SUMMARY
Lambert-St. Louis International Airport

AIRCRAFT DESIGN GROUP		WINGSPAN	TYPICAL AIRCRAFT
I	Small Regional	< 49 Feet	Cessna/Learjet
II	Medium Regional	< 79 Feet	SF370/CRJ
III	Narrowbody/Large Regional	< 118 Feet	A320/B737/DCH8/E175
IV	B757 Specific	< 125 Feet	B757
IV	Widebody	< 171 Feet	MD11,B767
V	Jumbo	< 213 Feet	B747,777,787,A330,340
VI	Super Jumbo	< 262 Feet	A380

Source: FAA AC 150/5300-13, *Airport Design*

Because the gate need by airline by aircraft type peaks at varying times throughout the day, there is the potential for high levels of gate sharing by different size aircraft. For example, a gate that can accommodate a B757 could also be used by a B737 and regional jet aircraft. This would result in narrowbody and regional jet aircraft utilizing B757 capable parking positions. For this reason, potential aircraft gate sharing analyses were taken into account when determining final ADG gate requirements. For initial gate requirements and additional analyses prior to American Airline's capacity reduction see Appendix B, *Terminal Demand/Capacity and Facility Requirements*.

The following sections describe the potential range of gate requirements:

- Revised Gate Demand based on forecast sensitivity analyses resulting from American Airline's capacity cuts.
- High forecast scenario gate demand based on accelerated economical growth and new Low Cost Carrier entrant with STL as a mini-focus city.
- Low forecast scenario gate demand based on protracted economic recession and lower economic growth over the long-term.

FORECAST SENSITIVITY ANALYSIS

In September 2009, American Airline's announced a significant reduction in its 2010 flight schedule to 36 daily flights and nine destinations. Recently this has been further reduced to 34 daily flights and eight destinations. The schedule cuts primarily reflected a strategic de-emphasis of STL as a connecting hub in American Airline's domestic network. To determine the potential impact of the American Airline's service cuts on the baseline Master Plan Update forecast, a sensitivity analysis was conducted in October/November 2009 to evaluate the proposed facility requirements.

Based on the sensitivity analysis, the total enplaned passenger forecast was reduced by 9.2 percent or 916,300 enplanements at the 20-year planning level. The origin and destination passenger forecast was assumed to remain unchanged as Southwest Airlines, in particular, and other airlines operating at STL would likely backfill much of the demand for travel to and from the St. Louis area. The reduction in enplanements is assumed to primarily affect connecting activity at STL over the long-term. As a result, the sensitivity analysis projects connecting activity at STL will account for 14 percent of total enplanements at the 20-year planning level versus 22 percent in the baseline master plan forecast.

The passenger operations forecast was reduced to a greater degree than the enplanement forecast based on American Airline's decision to reduce service levels at STL. This is largely due to an assumed reallocation of O&D traffic among the carriers at STL and in particular Southwest Airlines, which has historically operated larger aircraft on average than American and the reduction of regional jet activity associated with American Connection at STL. Moving forward, American has announced it will shift its activity to predominantly narrowbody MD80 and 737-800 aircraft at STL in 2010 and this assumption was adopted under the sensitivity scenario. With the average size of aircraft assumed to be larger under the sensitivity scenario, fewer operations would be needed to meet the projected 20-year demand level. As a result, passenger operations were reduced 18.9 percent in the sensitivity scenario versus the baseline master plan forecast at the 20-year planning level. Additional information can also be found in the "*Aviation Activity Forecast.*"

The conclusions from this sensitivity analysis include:

- Lower enplanement volumes and commercial passenger operations versus the Master Plan Base Case
- Results should not impact alternatives developed for Master Plan Update and Part 150 study as the this analysis has been taken into account when developing the future terminal gate and space requirements
- Cargo, general aviation, and military forecasts remain unchanged from the Master Plan Forecasts
- No impact to Airport Reference Code outlined in Master Plan Update
- The Future (2015) Baseline developed for the Part 150 Study remains valid

The results of this sensitivity analysis are presented in the following tables:

- **Table 4.4-4, *Baseline Master Plan Forecast Passenger Enplanements***
- **Table 4.4-5, *Forecast Sensitivity Analysis Passenger Enplanements***
- **Table 4.4-6, *Baseline Master Plan Forecast Operations***
- **Table 4.4-7, *Forecast Sensitivity Analysis Operations***
- **Table 4.4-8, *Baseline Master Plan Forecast Design Day Flights***
- **Table 4.4-9, *Forecast Sensitivity Analysis Design Day Flights***
- **Table 4.4-10, *American Airlines 2010 Summer Flight Schedule***
- **Table 4.4-11, *American Airlines 2010 Summer Flight Schedule Fleet Mix***

REVISED GATE REQUIREMENTS

Using the existing DDFS, which recognize gate utilization changes due to shifts in airline forecast activity, and the results from the sensitivity analysis, a revised gate requirements analysis was performed. The original daily departures per gate utilization factors (Preferential Use) calculated from the DDFS (pre American Airline's capacity reduction) were assumed to remain relatively unchanged (*see* Appendix B, *Terminal Demand/Capacity and Facility Requirements*). The required number of gates for each year was then determined by dividing the revised annual departures by the annual departures per gate values. This method results in a requirement of 35 gates and 15 gates by the year 2028 for Terminal 1 and Terminal 2 respectively. This information is summarized in **Table 4.4-12, *Terminal 1 Projected Gate Demand – Preferential Use Scenario***, and **Table 4.4-13, *Terminal 2 Projected Gate Demand – Preferential Use Scenario***.

Table 4.4-4
BASELINE MASTER PLAN FORECAST PASSENGER ENPLANEMENTS
Lambert-St. Louis International Airport

	2008	2013	2018	2023	2028	AAG[2]
ORIGINATING ENPLANEMENTS						
AA	2,068,143	1,939,400	2,082,200	2,263,900	2,471,100	1.6%
WN	1,746,374	2,030,100	2,241,500	2,454,100	2,699,300	1.9%
OAL[1]	1,849,149	1,922,000	2,139,500	2,356,100	2,572,400	2.0%
Total	5,663,666	5,891,500	6,463,200	7,074,100	7,742,800	1.8%
CONNECTING ENPLANEMENTS						
AA	1,085,379	1,039,600	1,256,400	1,388,000	1,534,000	2.6%
WN	357,998	406,400	469,800	495,000	520,000	1.7%
OAL[1]	100,847	110,900	115,500	120,700	125,900	0.8%
Total	1,544,224	1,556,900	1,841,700	2,003,700	2,179,900	2.3%
TOTAL ENPLANEMENTS						
AA	3,153,522	2,979,000	3,338,600	3,651,900	4,005,100	2.0%
WN	2,104,372	2,436,500	2,711,300	2,949,100	3,219,300	1.9%
OAL[1]	1,949,996	2,032,900	2,255,000	2,476,800	2,698,300	1.9%
Total	7,207,890	7,448,400	8,304,900	9,077,800	9,922,700	1.9%

Notes: 1 OAL = All Other Airlines.
2 AAG = 2013 to 2028 Average Annual Growth Rate.

Source: Landrum & Brown analysis, 2011

Table 4.4-5
FORECAST SENSITIVITY ANALYSIS PASSENGER ENPLANEMENTS
Lambert-St. Louis International Airport

	2008	2013	2018	2023	2028	AAG[2]
ORIGINATING ENPLANEMENTS						
AA	2,068,143	1,120,036	1,202,505	1,307,440	1,427,101	1.6%
WN	1,746,374	2,624,305	2,870,556	3,134,547	3,441,947	1.8%
OAL[1]	1,849,149	2,147,159	2,390,139	2,632,113	2,873,752	2.0%
Total	5,663,666	5,891,500	6,463,200	7,074,100	7,742,800	1.8%
CONNECTING ENPLANEMENTS						
AA	1,085,379	197,653	212,207	230,725	251,841	1.6%
WN	357,998	656,076	717,639	783,637	860,487	1.8%
OAL[1]	100,847	113,008	125,797	138,532	151,250	2.0%
Total	1,544,224	966,738	1,055,643	1,152,894	1,263,578	1.8%
TOTAL ENPLANEMENTS						
AA	3,153,522	1,317,689	1,414,712	1,538,164	1,678,943	1.6%
WN	2,104,372	3,280,382	3,588,195	3,918,184	4,302,433	1.8%
OAL[1]	1,949,996	2,260,167	2,515,935	2,770,645	3,025,002	2.0%
Total	7,207,890	6,858,238	7,518,843	8,226,994	9,006,378	1.8%

Notes: 1 OAL = All Other Airlines.
2 AAG = 2013 to 2028 Average Annual Growth Rate.

Source: Landrum & Brown analysis, 2011

Table 4.4-6
BASELINE MASTER PLAN FORECAST OPERATIONS
Lambert-St. Louis International Airport

FLIGHT DEPARTURES						
	2008	2013	2018	2023	2028	AAG[2]
AA	47,713	45,700	51,200	55,600	60,500	1.9%
WN	26,278	29,200	32,000	34,400	37,000	1.6%
OAL[1]	36,714	37,070	39,270	41,820	44,040	1.2%
Total	110,705	111,970	122,470	131,820	141,540	1.6%
SEATS						
AA	4,021,389	3,852,600	4,280,600	4,641,100	5,046,200	1.8%
WN	3,565,004	3,994,100	4,388,800	4,707,000	5,062,800	1.6%
OAL[1]	2,707,187	2,723,500	3,001,800	3,286,400	3,570,300	1.8%
Total	10,293,580	10,570,200	11,671,200	12,634,500	13,679,300	1.7%
GAUGE						
AA	84	84	84	83	83	
WN	136	137	137	137	137	
OAL[1]	74	73	76	79	81	
Total	93	94	95	96	97	

Notes: 1 OAL = All Other Airlines.
2 AAG = 2013 to 2028 Average Annual Growth Rate.

Source: Landrum & Brown analysis, 2011

Table 4.4-7
FORECAST SENSITIVITY ANALYSIS OPERATIONS
Lambert-St. Louis International Airport

FLIGHT DEPARTURES						
	2008	2013	2018	2023	2028	AAG[2]
AA	47,713	12,070	13,397	14,566	15,899	1.9%
WN	26,278	39,313	42,350	45,634	49,449	1.5%
OAL[1]	36,714	41,214	43,814	46,711	49,372	1.2%
Total	110,705	92,598	99,561	106,911	114,720	1.4%
SEATS						
AA	4,021,389	1,593,260	1,768,390	1,922,706	2,098,678	1.9%
WN	3,565,004	5,377,456	5,808,237	6,251,491	6,766,179	1.5%
OAL[1]	2,707,187	3,027,973	3,349,151	3,677,103	4,002,582	1.9%
Total	10,293,580	9,998,689	10,925,777	11,851,299	12,867,438	1.7%
GAUGE						
AA	84.3	132.0	132.0	132.0	132.0	
WN	135.7	136.8	137.2	137.0	136.8	
OAL[1]	73.7	73.5	76.4	78.7	81.1	
Total	93.0	108.0	109.7	110.9	112.2	

Notes: 1 OAL = All Other Airlines.
2 AAG = 2013 to 2028 Average Annual Growth Rate.

Source: Landrum & Brown analysis, 2011

Table 4.4-8
BASELINE MASTER PLAN FORECAST DESIGN DAY FLIGHTS
Lambert-St. Louis International Airport

DESIGN DAY FLIGHTS (IN+OUT)[1]						
	2008	**2013**	**2018**	**2023**	**2028**	**AAG[3]**
AA	278	262	292	318	346	1.9%
WN	158	172	190	204	220	1.7%
OAL[2]	230	224	238	251	264	1.1%
Total	666	658	720	773	830	1.6%
PEAK HOUR FLIGHT DEPARTURES						
AA	20	19	21	23	25	1.8%
WN	9	10	11	11	12	1.2%
OAL[2]	14	14	15	15	16	0.9%
Total[4]	32	32	36	38	41	1.7%

Notes: AA = American Airlines
WN = Southwest Airlines

1 Design Day departures equals Design Day flights divided by two.
2 OAL = All Other Airlines.
3 AAG = 2013 to 2028 Average Annual Growth Rate.
4 Total Peak Hour departures is not the sum of the individual components as each may occur in separate hours.

Source: Landrum & Brown analysis, 2011

Table 4.4-9
FORECAST SENSITIVITY ANALYSIS DESIGN DAY FLIGHTS
Lambert-St. Louis International Airport

DESIGN DAY FLIGHTS (IN+OUT)[1]						
	2008	**2013**	**2018**	**2023**	**2028**	**AAG[3]**
AA	278	69	76	83	91	1.8%
WN	158	232	251	271	294	1.6%
OAL[2]	230	249	266	280	296	1.2%
Total	666	550	593	634	681	1.4%
PEAK HOUR FLIGHT DEPARTURES						
AA	20	5	5	6	7	1.8%
WN	9	13	15	15	16	1.2%
OAL[2]	14	16	17	17	18	1.0%
Total[4]	32	27	30	32	34	1.5%

Notes: AA = American Airlines
WN = Southwest Airlines

1 Design Day departures equals Design Day flights divided by two.
2 OAL = All Other Airlines.
3 AAG = 2013 to 2028 Average Annual Growth Rate.
4 Total Peak Hour departures is not the sum of the individual components as each may occur in separate hours.

Source: Landrum & Brown analysis, 2011

Table 4.4-10
AMERICAN AIRLINES 2010 SUMMER FLIGHT SCHEDULE
Lambert-St. Louis International Airport

	DESTINATION	GAUGE	SEATS	DAILY DEP	DAILY SEATS	ANNUAL DEP[1]	ANNUAL SEATS[1]
AA	DFW	M80	140	9	1,260	3,015	422,100
AA	ORD	M80	140	9	1,260	3,015	422,100
AA	LGA	M80	140	4	560	1,340	187,600
AA	DCA	M80	140	4	560	1,340	187,600
AA	AA LAX	AA M80	140	3	420	1,005	140,700
AA	MIA	757	190	2	380	670	127,300
AA	SEA	M80	140	1	140	335	46,900
AE	JFK	ERD	44	2	88	670	29,480
TOTAL				**34**	**4,668**	**11,390**	**1,563,780**

Notes: AA = American Airlines
AE = American Eagle

1 PMAD Daily factors were annualized by multiplying by 335 days

Sources: *St. Louis Post-Dispatch,* 9/17/09, Landrum & Brown analysis, 2011

Table 4.4-11
AMERICAN AIRLINES 2010 SUMMER FLIGHT SCHEDULE FLEET MIX
Lambert-St. Louis International Airport

AIRCRAFT DESIGN GROUP (ADG)		DAILY DEPARTURES	PERCENTAGE OF TOTAL DEPARTURES
I	Small Regional	-	-
II	Medium Regional	2	6%
III	Narrowbody/Large Regional	30	88%
IV	B757 Specific	2	6%
IV	Widebody	-	-
V	Jumbo	-	-

Sources: AA 2010 Summer Flight Schedule per the *St. Louis Post-Dispatch,* 9/17/09.

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Table 4.4-12
TERMINAL 1 PROJECTED GATE DEMAND – PREFERENTIAL USE SCENARIO
PEAK MONTH AVERAGE DAY DEPARTURES PER GATE SUMMARY
Lambert-St. Louis International Airport

	Existing Facilities 2010 Base Year Activity			RECOMMENDED FACILITIES Forecast Year Activity			
				2013	2018	2023	2028
Total Enplanements				3,577,856	3,930,647	4,308,810	4,703,945
Annual Passengers				7,155,712	7,861,294	8,617,620	9,407,890
PMAD Departures	146			159	171	182	194
Aircraft Design Group (ADG)	**Max AC Gauge Full Capacity[1]**	**Max AC Gauge Operational Capacity[2]**	**Active AC Gauge Utilized**	**RECOMMENDED GATES[3]**			
Small Regional (Group I)	-	-	-	-	-	-	-
Medium Regional (Group II)	13	4	5	11	12	13	13
Large Regional (Group II)	17	7	-	2	2	2	2
Narrowbody (Group III)	33(1)	20(1)	16	16(2)	17(2)	18(2)	19(2)
B757(Group IV)	10	6	2	-	-	-	-
Widebody (Group IV)	7(3)	6(3)	-	-	-	-	1(1)
Jumbo (Group V)	2(2)	2(2)	-	-	-	-	-
Total Gates[4]	72(6)	45(6)	23(0)	29(2)	31(2)	33(2)	35(3)
Departures per Gate			6.3	5.5	5.5	5.5	5.5
Total NBEG[5]	73.5	48.4	21.7	25.7	27.4	29.1	31.5
Total Linear Frontage[6]	10,520	6,900	3,130	3,720	3,960	4,200	4,550
Annual Enplanements per NBEG				139,200	143,500	148,100	149,300

Notes:
1 Represents the largest aircraft gauge in each Design Group, not necessarily the aircraft gauge currently being utilized
2 Total gates exclude Concourses B and D.
3 Existing and future international gate demand in parenthesis.
4 Existing Gates C21 and C23 operate from one hold room door with split jetways.
5 Narrowbody Equivalent Gate (NBEG): Used to normalize the apron frontage demand and capacity to that of a typical narrowbody aircraft gate.
6 Total Linear Frontage equals aircraft wingspan plus standard planning practice of 25-foot wingtip separation excluding any potential adjacency wingtip conflicts.

Source: Landrum & Brown analysis, 2011

Table 4.4-13
TERMINAL 2 PROJECTED GATE DEMAND – PREFERENTIAL USE SCENARIO
PEAK MONTH AVERAGE DAY DEPARTURES PER GATE SUMMARY
Lambert-St. Louis International Airport

	Existing Facilities 2010 Base Year Activity			RECOMMENDED FACILITIES Forecast Year Activity			
				2013	2018	2023	2028
Total Enplanements				3,280,382	3,588,195	3,918,184	4,302,433
Annual Passengers				6,560,764	7,716,390	7,836,368	8,604,866
PMAD Departures	84			116	126	136	147
Aircraft Design Group (ADG)	**Max AC Gauge Full Capacity[1]**	**Max AC Gauge Operational Capacity[2]**	**Active AC Gauge Utilized**	**RECOMMENDED GATES[3]**			
Small Regional (Group I)	-	-	-	-	-	-	-
Medium Regional (Group II)	-	-	-	-	-	-	-
Large Regional (Group II)	-	-	-	-	-	-	-
Narrowbody (Group III)	16(3)	15(3)	13(3)	12	13	14	15
B757(Group IV)	-	-	-	-	-	-	-
Widebody (Group IV)	-	-	-	-	-	-	-
Jumbo (Group V)	-	-	-	-	-	-	-
Total Gates	16(3)	15(3)	13(3)	12	13	14	15
Departures per Gate			6.5	9.7	9.7	9.7	9.8
Total NBEG[4]	16.0	15.0	13.0	12.0	13.0	14.0	15.0
Total Linear Frontage[5]	2,288	2,145	1,860	1,720	1,860	2,000	2,145
Annual Enplanements per NBEG				273,400	276,000	279,900	286,800

Notes:
1 Represents the largest aircraft gauge in each Design Group, not necessarily the aircraft gauge currently being utilized
2 Total gates exclude Concourses B and D.
3 Existing and future international gate demand in parenthesis.
4 Existing Gates C21 and C23 operate from one hold room door with split jetways.
5 Narrowbody Equivalent Gate (NBEG): Used to normalize the apron frontage demand and capacity to that of a typical narrowbody aircraft gate.
6 Total Linear Frontage equals aircraft wingspan plus standard planning practice of 25-foot wingtip separation excluding any potential adjacency wingtip conflicts.

Source: Landrum & Brown analysis, 2011

To forecast the revised fleet mix by planning year, the DDFS were reutilized using the original calculated departures per gate factors combined with the forecast sensitivity analysis enplanements and operations factors as shown in Tables 4.4-4 to 4.4-9. The results from the analyses assumed that Southwest Airlines and the other carriers would backfill American's capacity reduction for O&D passengers (*see* Table 4.4-5). Table 4.4-6 and Table 4.4-7 indicate a shift from a dominant regional jet mix in the base year to narrowbody type aircraft by 2013 for American's operations. The gauge of all other carriers (WN and OAL) remains relatively unchanged. Daily and Peak Hour flight departures tabulated in Table 4.4-8 and Table 4.4-9 indicate a substantial reduction in American Airline's operations from the baseline by 255 daily and 18 Peak Hour flight departures by 2028. The 2028 daily flights of Southwest Airlines increased by 74 operations from the baseline while four Peak Hour flight departures were added. All other carriers increased by 32 daily flights and 2 Peak Hour flight departures by 2028.

American's new gate demand was calculated by dividing the revised Design Day departure operations shown in Table 4.4-9 by the original departures per gate factor. The future ADG fleet mix was then determined from the 2010 summer flight schedule shown in Table 4.4-10. Table 4.4-11 indicates the percentage of departures by aircraft fleet mix. These factors were then assumed for the future planning horizons when forecasting American's future fleet mix gate requirements. It should be noted that the M80 and B757 equipment types are being phased out with the assumption they will be replaced by the B737-800. Similar analyses were conducted for Southwest and all other airlines on a Preferential Use basis using the sensitivity analyses and the DDFS. The results for both gate scenarios by terminal are summarized in Table 4.4-12 thru 4.4-13.

RECOMMENDED GATES SUMMARY

The 2028 planning activity level of 35 and 15 Preferential Use aircraft gates for Terminal 1 and Terminal 2 respectively have been recommended as the planning benchmark for development of terminal concepts in Chapter Five, *Airport Concept Development and Evaluation*. These aircraft gate requirements represent a reasonable future Master Plan estimate for sizing the terminal building requirements in 2028 and preparation of level of magnitude capital improvement costs.

With the two existing terminals providing an overall current operational capacity of 45 gates and 15 gates, there is not a need within the Master Plan 2028 forecast to provide additional gate capacity. Strictly from a gate capacity perspective, there is no need for new additional aircraft gates, however there are opportunities for improved operational efficiencies, passenger convenience, and revenue generation through the renovation and redevelopment of an improved gate complex layout in Terminal 1. Terminal 2 will essentially service Southwest Airlines from its 15 available gates that include the three international swing capable gates. These additional terminal facility needs are addressed in Section 4.4.4, *Recommended Terminal Facilities*. While there is not a gate capacity shortfall relative to future demand, there is a need to renovate and/or reconfigure the terminal gate complex and terminal buildings to achieve operational savings and functional efficiencies.

ALTERNATE FORECAST GATE SCENARIOS

Two additional gate requirements were developed from the alternative forecast scenarios described in the "*Aviation Activity Forecast.*" These analyses attempt to create a range of potential gate requirements based on airline and economic assumptions. As previously stated the two alternative forecasts include:

- High forecast scenario gate demand based on accelerated economical growth and new Low Cost Carrier entrant with STL as a mini-focus city.
- Low forecast scenario gate demand based on protracted economic recession and lower economic growth over the long-term.

The gate methodologies used to forecast each scenario include the Annual Enplanements per Gate and the Annual Departures per Gate approach. When averaging both gate methodologies for both the high and low scenarios a potential range of 55 to 69 gates is established with a high of 71 gates (see Appendix B for tables by gate methodology). From an overall Master Plan and land use perspective the higher number of potential aircraft gates of 71 (*see* **Table 4.4-14, *2028 Alternative Forecast Scenario Gate Summary***) from the high forecast scenario Annual Departure per Gate method, is recommended as the appropriate requirements to use to *preserve* a land envelope for future terminal development.

Table 4.4-14
2028 ALTERNATIVE FORECAST SCENARIO GATE SUMMARY
Lambert-St. Louis International Airport

DEMAND FORECAST SCENARIO	SCENARIO APPROACH		AVERAGE GATES
	ENPLANED PASSENGERS PER GATE	DEPARTURES PER GATE	
High	66	71	69
Low	53	57	55
Average	60	64	62

Source: Landrum & Brown analysis, 2011

To determine gate requirements by terminal the percentage splits resulting from the 2028 DDFS gate analysis (based on the forecast sensitivity analysis) was used. The gate demand at Terminal 1 resulted in 70 percent of the overall total of 50 gates by 2028. Therefore, 70 percent of the 71 forecasted gates (High Scenario) resulted in the potential need for 50 gates at Terminal 1 and 21 gates at Terminal 2 by the 2028 planning horizon.

4.4.4 RECOMMENDED TERMINAL FACILITIES

4.4.4.1 Methodology

Major data inputs into the space program include annual enplanements and Peak Hour enplaning and deplaning passengers which can be found in **Table 4.4-15, *Terminal 1 Peak Hour Activity Forecast***, and **Table 4.4-16, *Terminal 2 Peak Hour Activity Forecast***. This analysis used two types of peak passenger levels based on Preferential Use and common use scenarios for airline usage.

Preferential Use passenger levels refer to the peak activity for each carrier that occurs over a 60-minute period based on that airline's flight schedule. These Preferential Use peaks typically happen at slightly different times of the day and therefore do not typically coincide in the same clock hour. The assumption is that this Peak Demand is appropriate to use when determining the facility requirements for individual airlines that are operating under a Preferential Use agreement with the Airport. Preferential Use peak passenger activity levels are typically used for calculating requirements for functions like each individual airline's ticket counters gates/holdrooms and, in some instances, baggage claim facilities depending on the operating use agreement with the Airport.

Common use Peak Passenger levels refer to the cumulative Peak Passenger volume in a given "rolling" hour for all airlines at STL. Essentially, the common use activity peak assumes that all airlines will share in the use of the facilities under a common use operating agreement with STL. These common use Peak Demand levels are typically used for calculating non-airline specific functions such as passenger security screening, Explosive Detection Systems (EDS), and public areas including general seating and meeter/greeter lobbies.

Other functional area projections are typically determined by their relationship to the number and type of aircraft or the number of gates/seats serving the terminal area. The relationship of area projections per aircraft operations, or by gates/seats is also a typical way to compare airport building component requirements. These areas of the terminal can include airline operations space, inbound/outbound baggage operations, and secure public restrooms.

The complexities involved in understanding the aircraft capacity implications of the term "gate" has led to a methodology to standardize the capacity definition of a "gate." This standardization methodology is referred to as the Narrowbody Equivalent Gate (NBEG) index. This index converts the gate requirements of diverse aircraft, from commuters to new large aircraft, so that they are equivalent to the apron capacity of a narrowbody aircraft gate. The amount of space or linear frontage each aircraft requires is based on the maximum wingspan of the aircraft in its respective aircraft group. Aircraft are classified according to FAA Taxiway Design Groups as shown in **Table 4.4-17, *Narrowbody Equivalent Gate (NBEG) Index***.

Table 4.4-15
TERMINAL 1 PEAK HOUR ACTIVITY FORECAST
Lambert-St. Louis International Airport

	FORECAST PLANNING YEARS			
	2013	2018	2023	2028
Annual Enplanements	3,577,856	3,930,647	4,308,810	4,703,945
Peak Month Enplanements	313,296	344,342	374,492	408,795
Percent of Annual Enplanements	8.8%	8.8%	8.7%	8.7%
Peak Month Average Day Enplanements	10,684	11,747	12,771	13,941
Peak Hour Passengers[1]				
Enplaned	1,261	1,427	1,524	1,630
Deplaned	1,174	1,246	1,398	1,573
Total[2]	2,136	2,274	2,520	2,797
Percent Daily Activity in Peak Hour				
Enplaned	11.8%	12.1%	11.9%	11.7%
Deplaned	11.0%	10.6%	10.9%	11.3%
Total	20.0%	19.4%	19.7%	20.1%

Notes 1 Peak Hour Passenger values were derived from the forecast sensitivity analysis results.
2 The Total Peak Hour does not reflect the sum of the Enplaned/Deplaned Peak Hour components as each can occur in different hours.

Source: Landrum & Brown analysis, 2011

Table 4.4-16
TERMINAL 2 PEAK HOUR ACTIVITY FORECAST
Lambert-St. Louis International Airport

	FORECAST PLANNING YEARS			
	2013	2018	2023	2028
Annual Enplanements	3,280,382	3,588,195	3,918,184	4,302,433
Peak Month Enplanements	283,300	312,360	341,422	375,069
Percent of Annual Enplanements	8.6%	8.7%	8.7%	8.7%
Peak Month Average Day Enplanements	9,661	10,652	11,644	12,791
Peak Hour Passengers[1]				
Enplaned	1,568	1,695	1,777	1,868
Deplaned	1,254	1,387	1,467	1,556
Total[2]	2,195	2,620	2,705	2,801
Percent Daily Activity in Peak Hour				
Enplaned	16.2%	15.9%	15.3%	14.6%
Deplaned	13.0%	13.0%	12.6%	12.2%
Total	22.7%	24.6%	23.2%	21.9%

Notes: 1 Peak Hour Passenger values were derived from the forecast sensitivity analysis results.
2 The Total Peak Hour does not reflect the sum of the Enplaned/Deplaned Peak Hour components as each can occur in different hours.

Source: Landrum & Brown analysis, 2011

Table 4.4-17
NARROWBODY EQUIVALENT GATE (NBEG) INDEX
Lambert-St. Louis International Airport

FAA TAXIWAY DESIGN GROUP		WINGSPAN	TYPICAL AIRCRAFT	NBEG INDEX
I	Small Regional	< 49 Feet	Cessna/Learjet	0.4
II	Medium Regional	< 79 Feet	SF370/CRJ	0.7
III	**Narrowbody/Large Regional**	**< 118 Feet**	**A320/B737/DCH8/E175**	**1.0**
IV	B757 Specific	< 125 Feet	B757	1.1
IV	Widebody	< 171 Feet	MD11,B767	1.4
V	Jumbo	< 213 Feet	B747,777,787,A330,340	1.8
VI	Super Jumbo	< 262 Feet	A380	2.2

Source: FAA AC 150/5300-13, *Airport Design* and Hirsh & Associates, 2011

Another methodology used for terminal facility program comparisons, similar to that of NBEG, is the Equivalent Aircraft (EQA) Index. This methodology looks at the Passenger Demand associated with gate usage. With EQA, each gate is converted based on the seating capacity of the aircraft that can be accommodated. Originally developed in the 1970's, EQA was a technique for sizing terminal facilities when the majority of the aircraft in service had 80-110 seats with some larger narrow-bodied aircraft up to 150 seats. With new larger fleet mixes of regional and jet aircraft the basis for EQA has been revised. The base Equivalent Aircraft is still that of a Group III narrowbody; however, this group now typically has total seats in the range of 145-150. The new EQA of 1.0 has been established using 145 seats as the base. Smaller aircraft may use the gate but the EQA capacity should be based on the largest aircraft/seating typically in use. One example of where this methodology is used is ramp equipment (bag carts/containers) required for aircraft arrivals and departures at the gate. **Table 4.4-18, *Equivalent Aircraft (EQA) Index***, summarizes the EQA of each aircraft group.

Airport Planners will often use the International Air Transport Association (IATA) Level of Service (LOS) standards to qualitatively or quantitatively provide a LOS standard at various processing functions within a terminal building and its associated concourse(s). This standard was originally developed by Transport Canada in the mid to late 1970s and later adopted and modified by IATA in 1990. The LOS standards are defined as follows:

- Excellent LOS; condition of free flow; no delays; excellent level of comfort
- High LOS; condition of stable flow very few delays; high level of comfort
- Good LOS; condition of stable flow; acceptable brief delays; good level of comfort
- Adequate LOS; condition of unstable flow; acceptable delays for short periods of time; adequate level of comfort
- Inadequate LOS; condition of unstable flow; unacceptable levels of delay; inadequate level of comfort
- Unacceptable LOS; condition of cross flows; system breakdown and unacceptable delays; unacceptable level of comfort

The programs developed for the study generally assumed a LOS C as the minimum standard when developing and validating the functional spaces within the terminal and concourses. In some instances, higher LOS standards were used based on emerging operational trends seen in U.S. airport terminals today and insights from the St. Louis Airport Authority (STLAA) about STL operations.

The programmatic approach to sizing facility areas is commonly used as the first step during the planning and preliminary design of any terminal expansion project. As a terminal project proceeds through the design process functions such as hold rooms, circulation areas, concessions, and other space-based requirements will often change because of the physical configuration of the design and cost considerations. The programmatic information contained in this Master Plan Update is considered a minimum generic facilities requirement program that is recommended to support the Peak Hour passenger activity levels and, as such, does not represent any specific terminal concept or gate configuration. The uniqueness of a specific site or terminal concept may increase the requirement for additional space especially for public circulation and other support areas.

Table 4.4-18
EQUIVALENT AIRCRAFT (EQA) INDEX
Lambert-St. Louis International Airport

FAA TAXIWAY DESIGN GROUP		TYPICAL SEATS	TYPICAL AIRCRAFT	EQA INDEX
I	Small Regional	25	Cessna/Learjet	0.2
II	Medium Regional	50	SF370/CRJ	0.4
III	Large Regional	75	Dash 8, E175, CRJ-700,900	0.5
III	**Narrowbody**	**145**	**A320/B737/DCH8/E175**	**1.0**
IV	B757	185	B757	1.3
IV	Widebody	280	MD11,B767	1.9
V	Jumbo	400	B747,777,787,A330,340	2.8
VI	Super Jumbo	525	A380	3.6

Source: *The Apron & Terminal Building Planning Manual* for US DOT, FAA by The Ralph M. Parsons Company: July 1975 and updated values based on Hirsh & Associates data, 2011.

For STL the terminal space program requirements were broken out and tabulated for each of the two terminals at the Airport. Terminal 1 and Terminal 2 are organized into general categories of space with various sub components depending on the terminals functional layouts:

- General
  - Overall Airport Statistics (Annual Passenger Statistics, Peak Hour Passenger Statistics)
  - Gates (Aircraft Parking Positions – International)
- Airline Functions
  - Domestic Airline Functions (Ticketing, Baggage Claim, etc.)
  - International Airline Functions (Ticketing, etc. for Terminal 1 only)
  - Other Airline Functions (Operations, Checked Bag Screening, etc.)
  - Departure Lounges
- Other Terminal Functions
  - Security
  - Circulation (Secure, Non-Secure, General)
  - Restrooms
  - Non-Airline Tennant Space (Airport Admin, Other Tenants)
  - Terminal Functions (Maintenance/Janitorial/Storage, Mechanical/Electrical , Structure/Non-Net)
- International Arrivals Functions (for Terminal 1 only)
  - Primary Inspection
  - Baggage Claim
  - Secondary Inspection
  - Support Functions
  - Other Space (Sterile Circulation, Greeter Lobby, Baggage Recheck)
- Concessions Space
  - Non-Secure Concessions Space
  - Secure Concessions Space
- Overall Summary

The program areas were developed based on the overall space allocation of each terminal and the actual utilization of those terminals. It should be noted that the 2008 space allocations with updated 2010 values included the planned and completed *Airport Experience Program* list of projects such as ticket lobby renovations, bag claim device upgrades, non-secure concession renovations and expansions, security screening consolidation and expansion, and the in-line EDS system. The proposed programs are summarized by terminal in the tables that follow. Preferential Use (based on gates) programs were developed for each terminal to generate a range of potential future terminal space needs. Additional program scenarios and results which attempt to provide a range of potential space needs and can be found in Appendix B.

The proposed Terminal 1 and Terminal 2 programs are summarized in **Table 4.4-19, *Existing Facility Inventory and Future Terminal 1 Requirements–Preferential Use***, and **Table 4.4-20, *Existing Facility Inventory and Future Terminal 2 Requirements–Preferential Use***. The table data compares existing terminal areas tabulated from recent CAD files obtained from the client, the recommended facility areas required to meet the existing demand, and the future forecasted annual enplanement levels and their associated recommended terminal area requirements. For analysis purpose the full capacity for Terminal 1 (including Concourse C and D) was used to gauge whether the closed or "moth balled" portions of the terminal will potentially need to be re-opened in order to meet future programmed demand. From this data, the existing and future efficiencies and deficiencies can be compared.

Table 4.4-19
EXISTING FACILITY INVENTORY AND FUTURE TERMINAL 1 REQUIREMENTS – PREFERENTIAL USE
Lambert-St. Louis International Airport

		Units	Existing Terminal Space (sf) Full Capacity	2013 Recommended Facilities	2018 Recommended Facilities	2023 Recommended Facilities	2028 Recommended Facilities
General	**General [1]**						
	Overall Airport Statistics						
	Annual Passengers		**9,975,382**	**7,155,712**	**7,861,294**	**8,617,620**	**9,407,890**
	Annual Enplanements		4,987,691	3,577,856	3,930,647	4,308,810	4,703,945
	Annual Domestic Enplanements		4,967,151	-	-	-	-
	Annual International Enplanements		20,540	-	-	-	-
	O&D Passengers		-	3,267,195	3,592,644	3,939,553	4,300,853
	Connecting Passengers		-	310,662	338,004	369,257	403,092
	Peak Hour Passenger Statistics						
	Peak Hour Enplaned - Domestic		1,741	1,261	1,427	1,524	1,630
	Peak Hour Enplaned - International		287	286	286	313	341
	Total Peak Hour Enplaned [2]		**1,741**	**1,261**	**1,427**	**1,524**	**1,630**
	Peak Hour Deplaned - Domestic		1,745	1,174	1,246	1,398	1,573
	Peak Hour Deplaned - International		-	-	-	-	-
	Total Peak Hour Deplaned [2]		**1,745**	**1,174**	**1,246**	**1,398**	**1,573**
	Total Peak Hour[2]		**3,737**	**2,136**	**2,274**	**2,520**	**2,797**
	Aircraft Gates/Positions (International in parenthesis)						
	Small Commuter (Cessna)		-	-	-	-	-
	Medium Commuter (CRJ/ERJ/BE1)		13	9	11	12	12
	Large Commuter (CR7/E70)		7	-	-	-	-
	Narrowbody (B737/A320)		33 (1)	11 (2)	11 (2)	11 (2)	11 (2)
	B-757		10	-	-	-	-
	Widebody (B767)		7 (3)	-	-	-	1 (1)
	Jumbo (B777/A340/B747)		2 (2)	-	-	-	-
	NLA (A380)		-	-	-	-	-
	Total Gates:		**72**	**20**	**22**	**23**	**24**
	Total EQA[3]:		**73.6**	**14.6**	**15.4**	**15.8**	**17.7**
	Total NBEG[4]:		**73.5**	**17.3**	**18.7**	**19.4**	**20.8**
	Total Positions:		72	20	22	23	24

Notes:
1. Forecasted Annual Passenger numbers based on forecast sensitivity analysis section.
2. The total Peak Hour numbers represent the total enplanement/deplanements Peak Hour, not the sum of the components (i.e. the enplaned/deplaned and total Peak Hours do not necessarily occur in the same hour). Domestic and International Peak Hour may differ.
3. EQA normalizes gate based on seating capacity of accommodated aircraft.
4. NBEG: Used to normalize the apron frontage demand and capacity to that of a typical narrowbody aircraft gate.

Source: Landrum & Brown analysis, 2011

Table 4.4-19 *(continued)*
EXISTING FACILITY INVENTORY AND FUTURE TERMINAL 1 REQUIREMENTS – PREFERENTIAL USE
Lambert-St. Louis International Airport

Airline Space	Units	Existing Terminal Space (sf) Full Capacity	2013 Recommended Facilities	2018 Recommended Facilities	2023 Recommended Facilities	2028 Recommended Facilities
Domestic Airline Space						
Ticket Counter						
Linear Counter Check-in Positions (Kiosk)	pos	137 (49)	45(23)	50(25)	51(28)	55(32)
Total Check-in Locations (Kiosk)	pos	159 (55)	45(28)	50(30)	51(33)	55(38)
Total Linear Position Length	lf	570	190	220	210	220
Number of Unassigned Check-in Positions	pos	16	-	-	-	-
Total Unassigned Position Length	lf	82	-	-	-	-
Counter Area (Includes any curb check)	sf	8,298	2,100	2,400	2,300	2,400
Ticketing Queue (including any free standing kiosks)	sf	8,247	4,600	5,200	5,100	5,200
Curbcheck Positions	pos	16	6	6	6	6
Airline Ticket Offices	sf	11,779	5,700	6,500	6,300	6,500
Baggage Claim						
Claim Devices	units	6	3	3	4	4
Linear Frontage Required	lf	954	430	460	520	590
Linear Frontage Programmed	lf	-	480	480	640	640
Baggage Claim Hall (Includes Device, Queues & Circulation)	sf	31,926	16,800	16,800	22,400	22,400
Baggage Services	sf	5,447	2,000	2,100	2,300	2,600
Airline Clubs/VIP Lounges	sf	15,533	2,000	2,000	2,000	2,000
SubTotal:		**81,230**	**33,200**	**35,000**	**40,400**	**41,100**
International Airline Space						
Ticket Counter						
Linear Counter Check-in Positions (Kiosk)	pos	included above	8(0)	8(0)	8(0)	12(0)
Total Check-in Locations (Kiosk)	pos	included above	8(0)	8(0)	8(0)	12(0)
Total Linear Position Length	lf	included above	40	40	40	60
Counter Area (Includes any curb check)	sf	included above	400	400	400	600
Ticketing Queue (including any free standing kiosks)	sf	included above	1,000	1,000	1,000	1,500
Curbcheck Positions	pos	included above	0	0	0	0
Airline Ticket Offices	sf	included above	1,200	1,200	1,200	1,800
Airline Clubs/VIP Lounges	sf	included above	-	-	-	-
SubTotal:		**-**	**2,600**	**2,600**	**2,600**	**3,900**
Other Airline Space						
Outbound Bag Make-Up[4]	sf	64,962	44,900	47,900	50,800	56,900
Inbound Bag Delivery	sf	14,530	6,000	6,000	8,000	8,000
Baggage Train Circulation	sf	39,985	7,600	8,100	8,800	9,700
Checked Baggage Screening (TSA Space)[5]	sf	7,799	8,500	8,500	8,500	8,500
Level 1 Inspection Units (EDS)[6]	no	-	2	2	2	2
Airline Operations	sf	138,294	57,800	61,600	65,300	73,200
Other Airline Offices/Systems and Support	sf	27,504	8,700	9,200	9,800	11,000
SubTotal:		**293,074**	**133,500**	**141,300**	**151,200**	**167,300**
Departure Lounges						
Gates/Positions						
Small Regional (Cessna/Metro)	sf	-	-	-	-	-
Medium Regional (BE1/CRJ,CR7,9/ERJ/SF340)	sf	-	8,900	9,800	10,600	10,600
Large Regional (Q400/E170,175,190)	sf	-	2,200	2,200	2,200	2,200
Narrowbody (A320/B737w)	sf	-	31,400	33,400	35,400	37,300
B-757(winglets)	sf	-	-	-	-	-
Widebody (B767/MD11)	sf	-	-	-	-	3,000
Jumbo (B747,787,777/A330,340)	sf	-	-	-	-	-
Super Jumbo (A380)	sf	-	-	-	-	-
SubTotal:		**107,778**	**42,500**	**45,400**	**48,200**	**53,100**

Table 4.4-19 *(continued)*
EXISTING FACILITY INVENTORY AND FUTURE TERMINAL 1 REQUIREMENTS – PREFERENTIAL USE
Lambert-St. Louis International Airport

		Units	Existing Terminal Space (sf) Full Capacity	2013 Recommended Facilities	2018 Recommended Facilities	2023 Recommended Facilities	2028 Recommended Facilities
Concessions Space	**Non-Secure Concessions Space**						
	Rental Car						
	Number of Counters	pos	6	6	6	6	7
	Counter Area/Offices	sf	2,197	2,400	2,400	2,400	2,800
	Queue	sf	1,613	1,800	1,800	1,800	2,100
	Non-Secure Concessions	sf	19,099	10,400	11,000	11,900	13,100
	Non-Secure Storage	sf	27,574	2,600	2,700	3,000	3,300
	SubTotal:		**50,483**	**17,200**	**17,900**	**19,100**	**21,300**
	Secure Concessions Space						
	Secure Concessions	sf	52,237	33,000	34,700	37,800	41,500
	Secure Storage	sf	9,753	8,300	8,700	9,400	10,400
	SubTotal:		**61,990**	**41,300**	**43,400**	**47,200**	**51,900**

Table 4.4-19 *(continued)*
EXISTING FACILITY INVENTORY AND FUTURE TERMINAL 1 REQUIREMENTS – PREFERENTIAL USE
Lambert-St. Louis International Airport

		Units	Existing Terminal Space (sf) Full Capacity	2013 Recommended Facilities	2018 Recommended Facilities	2023 Recommended Facilities	2028 Recommended Facilities
US Customs & Border Protection Services (CBP)	**Primary Processing**	Units					
	Primary Inspection Booths (Double Counters)	units	4	5	5	6	7
	Area Primary Inspection Booths	sf	760	1,900	1,900	2,300	2,700
	Primary Inspection Queue	sf	3,962	4,700	4,700	5,600	6,600
	Primary Inspection Support	sf	11,566	700	700	700	700
	SubTotal:		**16,288**	**7,300**	**7,300**	**8,600**	**10,000**
	Baggage Claim						
	Claim Devices Required	units	2	3	3	3	4
	Linear Frontage Required	lf	266	470	470	520	590
	Linear Frontage Programmed	lf	-	510	510	510	680
	Baggage Claim Hall	sf	9,388	17,900	17,900	17,900	23,800
	SubTotal:		**9,388**	**17,900**	**17,900**	**17,900**	**23,800**
	Secondary Processing						
	Passport Control Check Positions	pos	0	1	1	1	1
	Area Passport Control Check	sf	-	200	200	200	200
	Area Secondary Waiting	sf	-	800	800	800	1,100
	Exam Podiums and Baggage Belts (2 belts per unit)	units	0	0	0	0	0
	Area Secondary Inspection	sf	8,384	-	-	-	-
	Baggage X-Ray Processing (1 X-Ray per unit)	units	0	1	1	1	1
	Area X-Ray Inspection	sf	-	1,500	1,500	1,500	1,500
	Secondary Inspection Support	sf	5,058	1,100	1,100	1,100	1,100
	SubTotal:		**13,442**	**3,600**	**3,600**	**3,600**	**3,900**
	Support Space						
	CBP Administration	sf	-	800	800	800	900
	CBP Administration Support	sf	-	600	600	600	700
	SubTotal:		**-**	**1,400**	**1,400**	**1,400**	**1,600**
	Other Space						
	Sterile Corridor Circulation	sf	3,141	4,300	4,300	4,300	7,200
	In-Transit/Sterile Holding Areas	sf	-	-	-	-	-
	Public Sterile Restrooms	sf	623	1,000	1,000	1,000	1,000
	General Circulation	sf	645	3,700	3,700	3,800	4,900
	Greeter Lobby						
	Greeter Waiting Area	sf	-	700	700	900	1,100
	Other	sf	-	-	-	-	-
	Baggage Recheck						
	Number Recheck Positions	pos	0	0	0	0	0
	Area Recheck Positions	sf	2,560	-	-	-	-
	Queue Baggage Recheck	sf	-	-	-	-	-
	SubTotal:		**6,969**	**9,700**	**9,700**	**10,000**	**14,200**

Table 4.4-19 *(continued)*
EXISTING FACILITY INVENTORY AND FUTURE TERMINAL 1 REQUIREMENTS – PREFERENTIAL USE
Lambert-St. Louis International Airport

		Units	Existing Terminal Space (sf) Full Capacity	2013 Recommended Facilities	2018 Recommended Facilities	2023 Recommended Facilities	2028 Recommended Facilities
Public Space	**Security Screening Checkpoint (SSCP)**						
	Number of Lanes	pos	15	7	8	8	8
	Queuing Area	sf	8,534	4,100	4,700	5,000	5,400
	Checkpoint Screening Area	sf	16,992	8,600	9,600	10,600	10,600
	TSA Offices	sf	6,276	1,300	1,400	1,600	1,600
	SubTotal:		**31,802**	**14,000**	**15,700**	**17,200**	**17,600**
	Circulation						
	Ticket Lobby Circulation	sf	11,258	4,200	4,700	4,600	4,700
	Baggage Claim Circulation	sf	17,871	4,800	4,800	6,000	6,000
	Secure Circulation (Incl. Fire/Service Stairs to Apron)	sf	180,721	69,400	74,000	78,600	85,100
	General Public Circulation (Includes Vestibules, Vert Circ, Corridors)	sf	77,438	38,900	41,100	45,400	48,600
	Public Seating	sf	-	6,000	6,600	7,200	7,900
	Domestic Meeter/Greeter Lobby	sf	770	5,100	5,400	6,100	6,900
	Transportation (Shuttle Service) & Hotel Courtesy Phones	sf	100	200	200	200	200
	SubTotal:		**288,158**	**128,600**	**136,800**	**148,100**	**159,400**
	Restrooms						
	Public Restrooms - Secure	sf	10,821	4,800	4,800	6,400	6,400
	Public Restrooms - Non-Secure	sf	5,333	5,600	5,900	6,600	7,300
	SubTotal:		**16,154**	**10,400**	**10,700**	**13,000**	**13,700**
	Other Space						
	Misc Tenant						
	American Credit Union (AAFCU), Central Carts, Chapel, USO, USPS	sf	8,877	8,900	8,900	8,900	8,900
	Smoking Lounge	sf	1,458	1,500	1,500	1,500	1,500
	Other (Displays, Information Counters, Visitors Commission etc)	sf	677	700	700	700	700
	SubTotal:		**11,012**	**11,100**	**11,100**	**11,100**	**11,100**
Non-Public Space	**Non-Airline Tenant Space**						
	Airport Administration						
	Offices/Support (City)	sf	63,944	64,800	64,800	64,800	64,800
	Airport Police (Includes Locker Facilities)	sf	1,853	2,000	2,000	2,000	2,000
	Other Tenants						
	Misc Tenant	sf	4,870	6,500	6,500	6,500	6,500
	SubTotal:		**70,667**	**73,300**	**73,300**	**73,300**	**73,300**
	Other Space						
	Non-Public Restrooms	sf	4,073	2,200	2,300	2,400	2,600
	Non-Public Circulation	sf	19,480	22,300	23,200	24,300	26,100
	Other	sf	-	-	-	-	-
	SubTotal:		**23,553**	**24,500**	**25,500**	**26,700**	**28,700**
	Terminal Function						
	Maintenance/Janitorial/Storage/Shops	sf	4,075	5,700	6,000	6,400	7,000
	Mechanical/Electrical/Telephone/Plumbing	sf	131,890	69,200	72,400	77,400	84,200
	Building Systems (Structure/Non-net/Void)	sf	36,124	16,600	17,400	18,500	20,200
	Exterior - Other (ie Public Gardens, etc)	sf	-	-	-	-	-
	SubTotal:		**172,089**	**91,500**	**95,800**	**102,300**	**111,400**

Table 4.4-19 *(continued)*
EXISTING FACILITY INVENTORY AND FUTURE TERMINAL 1 REQUIREMENTS – PREFERENTIAL USE
Lambert-St. Louis International Airport

		Units	Existing Terminal Space (sf) Full Capacity	2013 Recommended Facilities	2018 Recommended Facilities	2023 Recommended Facilities	2028 Recommended Facilities
Summary	**General**						
2008-2028	Annual Enplanements		4,987,691	3,577,856	3,930,647	4,308,810	4,703,945
	Annual O&D Enplanements (%)		3,917,292 (76.2%)	3,267,195 (91.3%)	3,592,644 (91.4%)	3,939,553 (91.4%)	4,300,853 (91.4%)
	Annual Connecting Enplanements (%)		1,186,226 (23.8%)	310,662 (8.7%)	338,004 (8.6%)	369,257 (8.6%)	403,092 (8.6%)
	Peak Hour Enplaned Domestic		1,741	1,261	1,427	1,524	1,630
	Peak Hour Enplaned International		287	286	286	313	341
	Peak Hour Deplaned Domestic		1,745	1,174	1,246	1,398	1,573
	Peak Hour Deplaned International		-	-	-	-	-
	Gates/Positions		72	29	31	33	35
	Airline Space						
	Domestic Airline Space	sf	81,230	33,200	35,000	40,400	41,100
	International Airline Space	sf	-	2,600	2,600	2,600	3,900
	Other Airline Space	sf	293,074	133,500	141,300	151,200	167,300
	Departure Lounges	sf	107,778	42,500	45,400	48,200	53,100
		SubTotal:	482,082	211,800	224,300	242,400	265,400
	Concessions						
	Non-Secure Concessions Space	sf	50,483	17,200	17,900	19,100	21,300
	Secure Concessions Space	sf	61,990	41,300	43,400	47,200	51,900
		SubTotal:	112,473	58,500	61,300	66,300	73,200
	US Customs & Border Protection Services[7]						
	Design Hour Passengers	pax	400	286	286	372	484
	Primary Processing	sf	16,288	7,300	7,300	8,600	10,000
	Baggage Claim	sf	9,388	17,900	17,900	17,900	23,800
	Secondary Processing	sf	13,442	3,600	3,600	3,600	3,900
	Support Space	sf	-	1,400	1,400	1,400	1,600
	Other Space	sf	6,969	9,700	9,700	10,000	14,200
		SubTotal:	46,087	39,900	39,900	41,500	53,500
	Public Space						
	Security	sf	31,802	14,000	15,700	17,200	17,600
	Circulation	sf	288,158	128,600	136,800	148,100	159,400
	Restrooms	sf	16,154	10,400	10,700	13,000	13,700
	Other Space	sf	11,012	11,100	11,100	11,100	11,100
		SubTotal:	347,126	164,100	174,300	189,400	201,800
	Non-Public Space						
	Non-Airline Tenant Space	sf	70,667	73,300	73,300	73,300	73,300
	Other Space	sf	23,553	24,500	25,500	26,700	28,700
	Terminal Functions	sf	172,089	91,500	95,800	102,300	111,400
		SubTotal:	266,309	189,300	194,600	202,300	213,400
	Total						
		Total Functional Terminal Area:	**1,082,000** [8]	**572,100**	**598,600**	**639,600**	**695,900**
		Total Gross Terminal Area:	**1,254,100** [8]	**663,600**	**694,400**	**741,900**	**807,300**

Notes:
4 Outbound Baggage Make-up based on Preferential Use
5 EDS area represents Airport Experience planned In-Line EDS inspection area. Existing area shown represents current in-lobby standalone airline baggage screening excluding American Airline's In-Line space (no info available), approximately 21,350 square feet will be reconfigured within the existing building drip line (per STL planning staff).
6 Existing recommended EDS units are based on existing standalone in lobby devices and existing AA In-Line baggage system.
7 These are minimum facility standards set by the Customs and Boarder Protection "Airport Technical Design Standards August 2006." The CBP may evaluate the airports traffic projections on a case-by-case basis and update any requirements as needed.
8 Represents the total current available functional and gross terminal square footage (leased, non-leased, airport owned, and closed areas) and totals may not sum due to rounding.

Source: Landrum & Brown analysis, 2011

Table 4.4-20
EXISTING FACILITY INVENTORY AND FUTURE TERMINAL 2 REQUIREMENTS – PREFERENTIAL USE
Lambert-St. Louis International Airport

	Units	Existing Terminal Space (sf) Full Capacity	2013 Recommended Facilities	2018 Recommended Facilities	2023 Recommended Facilities	2028 Recommended Facilities
General [1]						
Overall Airport Statistics						
Annual Passengers		**4,440,398**	**6,560,764**	**7,176,390**	**7,836,368**	**8,604,866**
Annual Enplanements		2,220,199	3,280,382	3,588,195	3,918,184	4,302,433
Annual Domestic Enplanements		2,144,794	-	-	-	-
Annual International Enplanements		75,405	-	-	-	-
O&D Passengers		-	2,624,305	2,870,556	3,134,547	3,441,947
Connecting Passengers		-	656,076	717,639	783,637	860,487
Peak Hour Passenger Statistics						
Peak Hour Enplaned - Domestic		1,048	1,568	1,695	1,777	1,868
Peak Hour Enplaned - International		-	-	-	-	-
Total Peak Hour Enplaned [2]		**1,048**	**1,568**	**1,695**	**1,777**	**1,868**
Peak Hour Deplaned - Domestic		932	1,254	1,387	1,467	1,556
Peak Hour Deplaned - International		-	-	-	-	-
Total Peak Hour Deplaned [2]		**932**	**1,254**	**1,387**	**1,467**	**1,556**
Total Peak Hour[2]		**1,630**	**2,195**	**2,620**	**2,705**	**2,801**
Aircraft Gates/Positions (International in parenthesis)						
Small Commuter (Cessna)		-	-	-	-	-
Medium Commuter (CRJ/ERJ/BE1)		-	-	-	-	-
Large Commuter (CR7/E70)		-	-	-	-	-
Narrowbody (B737/A320)		16 (3)	12	13	14	15
B-757		-	-	-	-	-
Widebody (B767)		-	-	-	-	-
Jumbo (B777/A340/B747)		-	-	-	-	-
NLA (A380)		-	-	-	-	-
Total Gates:		**16**	**12**	**13**	**14**	**15**
Total EQA[3]:		**16.0**	**12.0**	**13.0**	**14.0**	**15.0**
Total NBEG[4]:		**16.0**	**12.0**	**13.0**	**14.0**	**15.0**
Total Positions:		16	12	13	14	15

Notes:
1 Forecasted annual passenger numbers based on forecast sensitivity analysis section.
2 The total Peak Hour numbers represent the total enplanement/deplanements Peak Hour, not the sum of the components (i.e. the enplaned/deplaned and total Peak Hours do not necessarily occur in the same hour). Domestic and International Peak Hour may differ.
3 EQA normalizes gate based on seating capacity of accommodated aircraft.
4 NBEG: Used to normalize the apron frontage demand and capacity to that of a typical narrowbody aircraft gate.

Source: Landrum & Brown analysis, 2011

Table 4.4-20 *(continued)*
EXISTING FACILITY INVENTORY AND FUTURE TERMINAL 2 REQUIREMENTS – PREFERENTIAL USE
Lambert-St. Louis International Airport

		Units	Existing Terminal Space (sf) Full Capacity	2013 Recommended Facilities	2018 Recommended Facilities	2023 Recommended Facilities	2028 Recommended Facilities
Airline Space	**Domestic Airline Space**						
	Ticket Counter						
	Linear Counter Check-in Positions (Kiosk)	pos	38 (8)	21(6)	23(7)	24(8)	25(8)
	Total Check-in Locations (Kiosk)	pos	38 (8)	21(6)	23(7)	24(8)	25(8)
	Total Linear Position Length	lf	196	100	110	110	110
	Number of Unassigned Check-in Positions	pos	12	-	-	-	-
	Total Unassigned Position Length	lf	0	-	-	-	-
	Counter Area (Includes any curb check)	sf	2,845	1,000	1,100	1,100	1,100
	Ticketing Queue (including any free standing kiosks)	sf	1,826	2,200	2,400	2,400	2,500
	Curbcheck Positions	pos	0	0	0	0	0
	Airline Ticket Offices	sf	5,607	2,900	3,200	3,200	3,300
	Baggage Claim						
	Claim Devices	units	2	3	3	4	4
	Linear Frontage Required	lf	360	500	560	590	630
	Linear Frontage Programmed	lf	0	540	540	720	720
	Baggage Claim Hall (Includes Device, Queues & Circulation)	sf	10,264	18,900	18,900	25,200	25,200
	Baggage Services	sf	363	1,800	2,100	2,200	2,200
	Airline Clubs/VIP Lounges	sf	-	-	-	-	-
	SubTotal:		**20,905**	**26,800**	**27,700**	**34,100**	**34,300**
	International Airline Space						
	Ticket Counter						
	Linear Counter Check-in Positions (Kiosk)	pos	included above	0(0)	0(0)	0(0)	0(0)
	Total Check-in Locations (Kiosk)	pos	included above	0(0)	0(0)	0(0)	0(0)
	Total Linear Position Length	lf	included above	0	0	0	0
	Counter Area (Includes any curb check)	sf	included above	-	-	-	-
	Ticketing Queue (including any free standing kiosks)	sf	included above	-	-	-	-
	Curbcheck Positions	pos	included above	0	0	0	0
	Airline Ticket Offices	sf	included above	-	-	-	-
	Airline Clubs/VIP Lounges	sf	included above	-	-	-	-
	SubTotal:		**-**	**-**	**-**	**-**	**-**
	Other Airline Space						
	Outbound Bag Make-Up[5]	sf	25,120	25,200	27,300	29,400	31,500
	Inbound Bag Delivery	sf	5,632	5,400	5,400	7,200	7,200
	Baggage Train Circulation	sf	included above	4,600	4,900	5,500	5,800
	Checked Baggage Screening (TSA Space)[6]	sf	2,609	7,900	7,900	7,900	7,900
	Level 1 Inspection Units (EDS)[7]		4	2	2	2	2
	Airline Operations	sf	17,937	18,000	19,500	21,000	22,500
	Other Airline Offices/Systems and Support	sf	1,591	1,800	2,000	2,100	2,300
	SubTotal:		**52,889**	**62,900**	**67,000**	**73,100**	**77,200**
	Departure Lounges						
	Gates/Positions						
	Small Regional (Cessna/Metro)	sf	-	-	-	-	-
	Medium Regional (BE1/CRJ,CR7,9/ERJ/SF340)	sf	-	-	-	-	-
	Large Regional (Q400/E170,175,190)	sf	-	-	-	-	-
	Narrowbody (A320/B737w)	sf	47,670	30,200	32,700	35,200	37,700
	B-757(winglets)	sf	-	-	-	-	-
	Widebody (B767/MD11)	sf	-	-	-	-	-
	Jumbo (B747,787,777/A330,340)	sf	-	-	-	-	-
	Super Jumbo (A380)	sf	-	-	-	-	-
	SubTotal:		**47,670**	**30,200**	**32,700**	**35,200**	**37,700**

Table 4.4-20 ***(continued)***
EXISTING FACILITY INVENTORY AND FUTURE TERMINAL 2 REQUIREMENTS – PREFERENTIAL USE
Lambert-St. Louis International Airport

		Units	Existing Terminal Space (sf) Full Capacity	2013 Recommended Facilities	2018 Recommended Facilities	2023 Recommended Facilities	2028 Recommended Facilities
Concessions Space	**Non-Secure Concessions Space**						
	Rental Car						
	Number of Counters	pos	0	0	0	0	0
	Counter Area/Offices	sf	-	-	-	-	-
	Queue	sf	-	-	-	-	-
	Non-Secure Concessions	sf	629	700	700	800	900
	Non-Secure Storage	sf	213	200	200	200	200
	SubTotal:		**842**	**900**	**900**	**1,000**	**1,100**
	Secure Concessions Space						
	Secure Concessions	sf	16,927	16,700	17,900	19,700	20,600
	Secure Storage	sf	5,834	4,200	4,500	4,900	5,100
	SubTotal:		**22,761**	**20,900**	**22,400**	**24,600**	**25,700**

Table 4.4-20 *(continued)*
EXISTING FACILITY INVENTORY AND FUTURE TERMINAL 2 REQUIREMENTS – PREFERENTIAL USE
Lambert-St. Louis International Airport

		Units	Existing Terminal Space (sf) Full Capacity	2013 Recommended Facilities	2018 Recommended Facilities	2023 Recommended Facilities	2028 Recommended Facilities
Public Space	**Security Screening Checkpoint (SSCP)**						
	Number of Lanes	pos	6	7	8	8	8
	Queuing Area[8]	sf	1,180	4,500	4,900	5,100	5,300
	Checkpoint Screening Area[8]	sf	4,160	7,900	8,800	8,800	8,800
	TSA Offices[8]	sf	2,353	1,200	1,400	1,400	1,400
	SubTotal:		**7,693**	**13,600**	**15,100**	**15,300**	**15,500**
	Circulation						
	Ticket Lobby Circulation	sf	12,275	3,000	3,400	3,400	3,500
	Baggage Claim Circulation	sf	6,993	4,800	4,800	6,000	6,000
	Secure Circulation (Incl. Fire/Service Stairs to Apron)	sf	50,445	28,800	31,200	33,600	36,000
	General Public Circulation (Includes Vestibules, Vert Circ, Corridors)	sf	12,882	16,800	18,000	20,000	20,700
	Public Seating	sf	-	6,000	6,600	7,000	7,400
	Domestic Meeter/Greeter Lobby	sf	-	4,800	5,300	5,600	6,000
	Transportation (Shuttle Service) & Hotel Courtesy Phones	sf	150	200	200	200	200
	SubTotal:		**82,745**	**64,400**	**69,500**	**75,800**	**79,800**
	Restrooms						
	Public Restrooms - Secure	sf	3,811	3,200	3,200	3,200	3,200
	Public Restrooms - Non-Secure	sf	2,793	5,000	6,000	6,200	6,400
	SubTotal:		**6,604**	**8,200**	**9,200**	**9,400**	**9,600**
	Other Space						
	Misc Tenant						
	American Credit Union (AAFCU), Central Carts, Chapel, USO, USPS	sf	1,141	1,100	1,100	1,100	1,100
	Smoking Lounge	sf	1,150	1,200	1,200	1,200	1,200
	Other (Displays, Information Counters, Visitors Commission etc)	sf	107	100	100	100	100
	SubTotal:		**2,398**	**2,400**	**2,400**	**2,400**	**2,400**
Non-Public Space	**Non-Airline Tenant Space**						
	Airport Administration						
	Offices/Support (City)	sf	4,307	4,400	4,400	4,400	4,400
	Airport Police (Includes Locker Facilities)	sf	-	-	-	-	-
	Other Tenants						
	Misc Tenant	sf	4,513	6,600	7,200	7,800	8,600
	SubTotal:		**8,820**	**11,000**	**11,600**	**12,200**	**13,000**
	Other Space						
	Non-Public Restrooms	sf	1,434	1,500	1,600	1,700	1,800
	Non-Public Circulation	sf	5,109	7,600	8,100	8,700	9,200
	Other	sf	-	-	-	-	-
	SubTotal:		**6,543**	**9,100**	**9,700**	**10,400**	**11,000**
	Terminal Function						
	Maintenance/Janitorial/Storage/Shops	sf	2,420	2,500	2,700	2,900	3,100
	Mechanical/Electrical/Telephone/Plumbing	sf	36,881	30,500	32,700	35,800	37,500
	Building Systems (Structure/Non-net/Void)	sf	6,181	4,500	4,800	5,300	5,500
	Exterior - Other (ie Public Gardens, etc)	sf	-	-	-	-	-
	SubTotal:		**45,482**	**37,500**	**40,200**	**44,000**	**46,100**

Table 4.4-20 *(continued)*
EXISTING FACILITY INVENTORY AND FUTURE TERMINAL 2 REQUIREMENTS – PREFERENTIAL USE
Lambert-St. Louis International Airport

		Units	Existing Terminal Space (sf) Full Capacity	2013 Recommended Facilities	2018 Recommended Facilities	2023 Recommended Facilities	2028 Recommended Facilities
Summary	**General**						
	Annual Enplanements (2008-2028)		2,220,199	3,280,382	3,588,195	3,918,184	4,302,433
	Annual O&D Enplanements (%)		1,862,201 (83.9%)	2,624,305 (80.%)	2,870,556 (80.%)	3,134,547 (80.%)	3,441,947 (80.%)
	Annual Connecting Enplanements (%)		357,998 (16.1%)	656,076 (20.%)	717,639 (20.%)	783,637 (20.%)	860,487 (20.%)
	Peak Hour Enplaned Domestic		1,048	1,568	1,695	1,777	1,868
	Peak Hour Enplaned International		-	-	-	-	-
	Peak Hour Deplaned Domestic		932	1,254	1,387	1,467	1,556
	Peak Hour Deplaned International		-	-	-	-	-
	Gates/Positions (Unassigned in parenthesis)		16 (3)	12	13	14	15
	% of Unassigned Gates @ Terminal 2		19%	-	-	-	-
	Airline Space						
	Domestic Airline Space	sf	20,905	26,800	27,700	34,100	34,300
	International Airline Space	sf	-	-	-	-	-
	Other Airline Space	sf	52,889	62,900	67,000	73,100	77,200
	Departure Lounges	sf	47,670	30,200	32,700	35,200	37,700
	SubTotal:		121,464	119,900	127,400	142,400	149,200
	Concessions						
	Non-Secure Concessions Space	sf	842	900	900	1,000	1,100
	Secure Concessions Space	sf	22,761	20,900	22,400	24,600	25,700
	SubTotal:		23,603	21,800	23,300	25,600	26,800
	US Customs & Border Protection Services[9]						
	Design Hour Passengers	pax	400	-	-	-	-
	Primary Processing	sf	10,098	-	-	-	-
	Baggage Claim	sf	6,690	-	-	-	-
	Secondary Processing	sf	8,323	-	-	-	-
	Support Space	sf	1,185	-	-	-	-
	Other Space	sf	16,784	-	-	-	-
	SubTotal:		43,080	-	-	-	-
	Public Space						
	Security[8]	sf	7,693	13,600	15,100	15,300	15,500
	Circulation	sf	82,745	64,400	69,500	75,800	79,800
	Restrooms	sf	6,604	8,200	9,200	9,400	9,600
	Other Space	sf	2,398	2,400	2,400	2,400	2,400
	SubTotal:		99,440	88,600	96,200	102,900	107,300
	Non-Public Space						
	Non-Airline Tenant Space	sf	8,820	11,000	11,600	12,200	13,000
	Other Space	sf	6,543	9,100	9,700	10,400	11,000
	Terminal Functions	sf	45,482	37,500	40,200	44,000	46,100
	SubTotal:		60,845	57,600	61,500	66,600	70,100
	Total						
	Total Functional Terminal Area:		**303,000** [10]	**250,400**	**268,200**	**293,500**	**307,300**
	Total Gross Terminal Area:		**348,500** [10]	**287,900**	**308,400**	**337,500**	**353,400**

Notes:
5 Outbound Baggage Make-up based on Preferential Use.
6 Existing area shown represents current in lobby standalone airline screening area with future programmed area based on in-line system.
7 Existing recommended EDS units are based on existing standalone in lobby devices.
8 Existing area does not include new west expansion SSCP screening area.
9 These are minimum facility standards set by the Customs and Boarder Protection "Airport Technical Design Standards August 2006." The CBP may evaluate the airports traffic projections on a case-by-case basis and update any requirements as needed.
10 Represents the total current available functional and gross terminal square footage (leased, non-leased, airport owned, and closed areas) and totals may not sum due to rounding.

Source: Landrum & Brown analysis, 2011

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4.4.4.2 Terminal Area Requirements

The following sections describe the programmatic findings for Terminal 1 and Terminal 2 for the future 2028 planning level horizon. They are based on the *Airport Experience Program* completed and planned list of projects as well as the methodologies previously outlined. These sections are also organized by the major categories of space.

AIRLINE SPACE

This category of the terminal space program represents a major portion of the passenger processing functions of the terminal. It contains all the preferential areas typically required and leased by the airline tenants to support their operations. These functions include ticketing, baggage claim, airline operations and support, and departure lounges (hold rooms).

Initial airport tenant interviews were held with various station managers at the beginning of the study. These discussions along with on-site observations were used to determine the adequacy of the various airline functions. The airline requirements are presented in the following paragraphs:

Domestic/International Airline Space

Ticket Counter & Queue – This term refers to the area occupied by the ticket counter, ticket agents, and the ticket counter baggage belt. It is typically assumed as an exclusive use or Preferential Use operation for most U.S. airlines. In the case of STL, these areas are preferential per current lease agreements. This airline function is based on the Peak Hour originating passengers, their associated early arrival profiles, acceptable service times associated with the check-in process, and the percentage of the originating passengers that actually check-in at the terminal verses going directly to the gate or checking in at any offsite location. Data obtained from discussions with the airline tenants combined with industry accepted planning factors were used in determining the ticket counter requirements. The typical airline ticket counter has evolved over recent years to include both standard agent positions and the self-service electronic kiosks. These kiosks can either be converted from in-line counter positions, be freestanding in the ticketing queue area or a combination of both. Each airline, typically have their own arrangement within the ticketing area. This has ultimately reduced the need for some in-line counter positions but has increased the amount of queue space needed in the ticket lobby. The freestanding kiosk is typically referred to as a "Two-Step" process where the passenger checks in at the kiosk and the traditional in-line counter position accommodates the bag drop function while also serving as the location for additional airline assistance.

Based on a review of the lease drawings, on-site observations, the *Airport Experience Program* ticketing drawings and discussions with the airlines and the Airport, Terminal 1 had a total of 159 possible check-in locations for passengers made up of 104 traditional staffed agent positions, and 55 self-service kiosks of various arrangements depending on the airlines' ticket counter configuration.

Terminal 2 had a total of 38 check-in locations consisting of 30 agent positions and eight self-service kiosks set in-line with the ticket counter. However, with the Transportation Security Administration's (TSA) 100 percent baggage screening requirements this number is slightly less than what is potentially available with some EDS machines occupying the space of potential counter positions and queue area.

Currently both Terminals operate in a standard linear ticket counter arrangement with self-service kiosks either integrated within the standard in-line counter position or freestanding in the ticketing queue area; the exception being Delta, which uses a "two-step," kiosk/bag drop process. The existing ticket counters at STL vary in length and configuration based on terminal and individual airline preferences. Terminals 1 and 2 consist of an overall average of 4.2 feet and 5.2 feet per standard ticket agent position respectively compared to a domestic carrier average of 4.25 feet per agent and 5.5 feet to six feet for international carriers. A planning factor of five feet has been assumed for future requirements that also accounts for counter breaks for agent access.

The existing traditional linear counter areas measure between 10 feet to 13.5 feet from ticket counter and face to the back wall and are dependent on each airlines operational setup and terminal they occupy. For the program, a typical 10-foot depth has been assumed for each terminal.

The ticketing queue is a function of the counter frontage and the acceptable planning depth for passenger queuing in front of the counter positions. The existing depth by terminal varies based on each airline's ticketing configuration and the physical setup of the terminal check-in hall itself. A future depth of 20 to 25 feet has been used to account for required queue space needed for the area taken up by any freestanding kiosks and their passengers as well as an IATA LOS C typical planning factor of 15.1 square-feet per queued passenger. This area also includes the "Active Check-in Zone" or the space in front of the counters for passenger processing and cross circulation.

<u>Airline Ticket Offices (ATO)</u> - This category refers to the office area leased to the airlines and is generally located directly behind or adjacent to the ticket counter to provide support functions for the ticket agents and other airline administrative space. However, this space can be located in other terminal areas as necessary. Typically, the ATO space is 25 feet to 30 feet deep along the full-length of the ticket counters. However, this area ranges from approximately 10 to 23 feet for Terminal 1 and 27 feet for Terminal 2 for the space directly behind the linear check-in counters.

<u>Baggage Claim (Domestic)</u> - This category represents the area occupied by the baggage claim devices and the queuing area for active claiming. Baggage claim requirements are primarily based on the percentage of deplaned terminating passengers in a peak 20 minute period, the percentage of those passengers checking bags, and to a lesser extent, the number of bags checked. Because most passengers arrive at the claim area before their baggage arrives, sufficient claim frontage should be available to accommodate the concentration of these Peak

Passengers. A typical industry planning standard is to assume all passengers will be no more than one person deep to be able to reach in/around to the claim device when his/her baggage is presented. This results in an IATA LOS C planning ratio of 1.5-linear feet per claiming passenger. This analysis focused on using the existing Preferential Use claim areas for future requirements.

The existing claim devices range in size from 160-linear feet of frontage (Terminal 1) to 180 feet (Terminal 2). It is recommended that the future claim devices be sized at 160-linear feet for Terminal 1 and 180-linear feet for Terminal 2 to adequately handle a typical narrowbody aircraft with multiple flights by smaller regional aircraft. The recommendation for the baggage claim area is 35-square feet per linear feet of claim to provide adequate queuing and circulation space within the claim area.

Baggage Claim (International) - This category represents the area occupied by the baggage claim devices and the queuing area for active claiming within the international arrival processing functions. The approach for sizing the area and devices themselves is similar to that of the domestic baggage claim area. However, international claim devices are typical sized for greater baggage capacity because passengers must first clear U.S. Customs & Border Protection (CBP) primary processing before entering the baggage claim area as well as higher checked baggage per passenger ratios. Therefore, these devices are sized more for storage than for active claim frontage. An IATA LOS C planning ratio of 1.5-linear feet per claiming passenger was used.

The existing two claim devices average 140-linear feet of frontage. The future claim devices are recommended to be sized at 170-linear feet to adequately handle the 2028 DDFS average aircraft gauge. The future 2028 demand results in a need for approximately 590-linear feet of claim. The total provided claim length of 680-linear feet resulted in four claim devices or approximately 0.7-linear feet per Peak Hour terminating passenger.

The baggage claim hall area is recommended to be sized at 35-square feet per linear feet of claim to provide adequate queuing and circulation space within the claim area. The future demand results in a need of 23,800-square feet of claim hall by 2028

Baggage Services (Domestic) - This category includes the area of baggage service offices which are leased to the airlines. Typically, these offices are only required by airlines with sufficient activity to warrant staffing. A typical one-square foot per Peak Hour terminating passenger was used in the analysis.

Other Airline Space

Outbound Bag Make-Up - This category represents the area used for the accumulation, storage, and make-up of outbound baggage from the ticket counter and curbside check-in areas. This space typically consists of the make-up units, baggage train circulation and maneuvering lanes, the tug/cart staging areas and in some cases the TSA baggage screening EDS devices. A method for providing a consistent basis for baggage system planning involves using the EQA as previously described in Table 4.4-18. A planning ratio of 2,100-square feet per EQA for both Terminal 1 and 2 was used in the analysis. Airlines interviewed indicated as having sufficient space for their operational needs.

Inbound Bag Delivery - The inbound bag category represents the area that is used to feed bags to the baggage claim devices. This area includes a portion of the flat plate device where the bags are off-loaded or the remote conveyor that feeds the sloped bed unit, work aisles, and bypass lanes. Most airlines when interviewed voiced concerns of short input belt lengths and overcrowding when multiple inbound flights were utilizing the off-load area at the same time. A planning ratio of 2,000-square feet and 1,800-square feet per off-load area for Terminal 1 and Terminal 2 respectively was used in the analysis.

Checked Baggage Screening - Currently checked baggage screening for possible explosives is being done via five standalone EDS units in the Terminal 1 ticket lobby along with an integrated in-line system for American Airlines. Terminal 2 utilizes four standalone units in the ticketing area as well as an in-line system. Future program requirements assumed a fully integrated in-line system within the make-up area of both Terminals. (Note: STL is to receive a $42 million federal grant to move these standalone EDS units off the ticketing level in both terminals to a fully integrated in-line system.[6]) A planning ratio was used of 500 bags per hour with 65 percent of originating domestic passengers checking bags and 100 percent of international passengers checking bags. A domestic 0.8 bags per passenger and an international 1.5 bags per passenger ratios were used for Terminal 1 with 80 percent check bags and 0.7 bags per passenger for Terminal 2. A planning ratio of approximately 4,300-square feet per EDS unit was based on the *Airport Experience Program* plan for in-line EDS for Terminal 1 and 4,000-square feet per unit for Terminal 2.

Airline Operations - This category represents all of the area used by the airlines for their everyday operations which includes the apron level support spaces for aircraft crew, aircraft servicing, and other related support facilities. A program area is typically based on the number of gates expressed in EQA. The demand for operations space is a function of the size and number of aircraft being served based on individual airline or common use operating policies. A leased square-foot ratio of 2,700-square feet and 1,500-square feet per EQA for both Terminal 1 and 2 was used in the analysis. The airlines interviewed reported these areas as adequate to handle their current activity levels at STL.

6 *See* Internet website: http://www.stltoday.com/news/traffic/along-for-the-ride/article_812fd82a-c29e-11df-862e-00127992bc8b.html?mode=comments

Departure Lounges (Hold Rooms)

In evaluating the capacity of the hold rooms, physical location, and proximity to the gate are important factors to consider. The available hold room space needs to be in relatively close proximity to the gate. Multiple gates with adjacent hold rooms typically have additional hold room capacity resulting from sharing hold room seating between the gates. These factors were taken into consideration when evaluating the future requirements.

Hold rooms are based on the mix of gates and the average seating capacity of each aircraft design category. These areas generally consist of the passenger seating area, the airlines podium and associated queue space, the loading bridge egress corridor, circulation, and any additional square footage allowances for areas such as telephone banks, child play areas, etc.

When sizing these areas the amount of seating area is typically based on an industry standard of 80 percent of the aircraft seating capacity. Of this percentage, a range from 50 percent to 80 percent is allocated to the number of passengers seated with the remaining 20 percent to 50 percent standing. At STL, a typical IATA LOS B planning ratio of 80 percent seated and 20 percent standing has been applied. For these areas, a typical planning standard of 15-square feet and 10-square feet per sitting and standing passenger respectively has been used.

The physical layout of the preferred hold room consists of a 180-square foot (six-foot wide minimum) loading bridge egress corridor with an assumed average 30-foot deep hold room. The existing hold rooms in Terminal 1 vary in depth from 21 to 25 feet; in Terminal 2 the hold rooms are 28 feet in depth. The typical two-position podium range in size from 8 to 10 feet in length at Terminal 1 and 8 feet at Terminal 2 and are oriented towards the rear of the hold room with their queue space extending out towards the general circulation area. For this analysis an average podium position length of five feet as been assumed with a queue area equal to approximately 15 feet in depth. Existing hold rooms where available are paired as mentioned earlier and this has been assumed for future planning. This grouping has made it possible to reduce the physical amount of hold room seating area needed. For STL a five percent reduction in the seating/standing areas for each gate in a common group has been assumed. Additionally, to reflect the specific operating characteristics of airlines with frequent flights and short ground times, like Southwest's operation, a heavy utilization factor of 15 percent per gate has been used. This factor takes into account the additional passengers from more than one flight at the gate at the same time.

The average seating capacities and recommended hold room sizes for paired gates with shared utilization and those with high utilization are summarized in **Table 4.4-21, *Passenger Holdroom Typical Areas***.

Table 4.4-21
PASSENGER HOLDROOM TYPICAL AREAS
Lambert-St. Louis International Airport

AIRCRAFT DESIGN GROUP		TYPICAL SEATS	TYPICAL AIRCRAFT	SHARE AREA (SF)	HIGH UTILIZATION AREA (SF)
I	Small Regional	25	Cessna/Learjet	550	620
II	Medium Regional	50	SF370/CRJ	810	960
III	Large Regional	75	Dash 8, E175, CRJ-700,900	1,180	1,300
III	Narrowbody	145	A320/B737/DCH8/E175	1,970	2,400
IV	B757	185	B757	2,510	3,050
IV[1]	Widebody	233	MD11,B767	3,515	4,340

Note: 1 Seating capacity is based on the design day flight schedules.

Sources: FAA AC 150/5300-13, *Airport Design*, Hirsh & Associates, and Landrum & Brown analysis, 2011

CONCESSIONS SPACE

This category of the terminal space program represents all of the areas devoted to commercial concessions that generate revenue for the Airport. In general, these include food/beverage, news/gift/sundry (business centers, shoeshine, barbershops, specialty stores, etc.), rental car, duty-free shops, and other revenue-generating functions. These amenities provide the passenger with necessary services during the processing function and provide vital revenue to the airport.

A general planning rule suggests approximately eight to 12 percent of the public serving space be allocated to concessions. These areas typically include any space that the public has unrestricted access to. It is recommended that 80-90 percent of the total concessions area be allocated to the secured portion the terminal defined as airside and beyond the passenger security checkpoint. The remaining 10 to 20 percent would be allocated to the non-secure or landside portion of the terminal.

The revenue generating effectiveness of an airport's concession program is significantly affected by an airport's operating policies and the physical configuration of the terminals. Due to the financial importance of the concession program, it is suggested that the Airport staff seek a concessions planning specialist prior to determining a final airside/landside split. These specialists help to plan the physical configuration of concession areas and the identification of specific location in the terminal and concourses for retail and food/beverage concessions. For master planning purposes another accepted industry-planning standard uses a ratio of square feet of total concessions space per 100,000 annual enplanements.

A preliminary meeting was held with concessionaire HMS Host. The observations and concerns expressed by the HMS Host included:

- 32 total concessions areas ranging from as small as 400-square feet to as much as 3,000-square feet
- Overall "total" space is adequate but areas are dispersed
- Goods are delivered to the commissary building (18,000 to 19,000-square feet, approximately 40-50 years old) then HMS delivers to designated areas at the terminal and concourses
- Concessionaire passengers surveys indicate a 45-minute to one-hour and 30 minute dwell time
- A 85/15 to 90/10 percent split between concessions public space and storage areas
- Quick service concessions storage is adequate
- Would prefer to see storage directly below concessions
- Sit-down concessions need double the storage capacity
- More staging areas

The main goals of a concessions program are to achieve a high level of customer satisfaction while simultaneously optimizing the airport's revenue production. Planning considerations that support these goals include:

- Consolidate passenger flows through centralized and/or clustered commercial areas to provide enhanced visibility.
- Integrate passenger convenience facilities (restrooms, airline lounges, etc.) as well as primary passenger circulation routes and vertical access points (direct access to APM stations) within concession areas.
- Provide clear lines-of-sight for passengers between gate holding areas and centralized concession or cluster areas maximizes passenger dwell times, reduces passenger anxiety, and increases overall sales.
- Minimize walking distances post-security to gate holding areas from the centralized and/or clustered concessions areas.
- Terminal layouts that maximize the number of gates in close proximity to centralized or clustered concession areas will generate higher overall sales than those with decentralized layouts.
- Financially assess the implications of phasing operator income. In particular, the need to sometimes accelerate the development of revenue generating concessions in advance of the passenger-driven demand to allow revenues to assist in paying for the capital costs of providing the facilities.
- The concessions plan should provide for future flexibility for accommodating changes in passenger flows, customer demand, and phased development while minimizing impacts on current operations, achieving high levels of customer satisfaction, and maintaining satisfactory financial results for the Airport and concessionaires.

- Purpose-built areas for future concessions space could be used in the near-term for storage or other temporary passenger services.

Terminal 1 has approximately 12 percent of the public area allocated to concessions space, which is within the typical 8-12 percent planning standard. The revenue generating area in the secure area of the terminal accounts for 73 percent of the total public concessions space. The current terminal has a total of approximately 71,300-square feet of public concessions of which only 50,100 was utilized. This resulted in a ratio of approximately 1,000-square feet per 100,000 annual enplanements. For master planning purposes, the future concessions space requirements were based on a higher ratio of approximately 1,200-square feet per 100,000 annual enplanements. Using this higher concessions area to annual enplanements assumption resulted in a ratio of about 14 percent concession space to public areas in the terminal with approximately 76 percent of this concessions space located on the secured airside of the terminal. This is slighter higher than the existing 73 percent ratio to account for more centralized concessions space in the secure area of the terminal.

Terminal 2 has approximately nine percent of the public area allocated to concessions space with approximately 96 percent of the revenue generating area in the secure area of the terminal. The terminal currently has a total of approximately 17,500-square feet of public concessions resulting in a ratio of about 800-square feet per 100,000 annual enplanements. For future terminal area space requirements, a slightly higher ratio of 11 percent of the public serving areas with 96 percent of the space in the secure area of the terminal has been used.

In addition to the passenger service, side a portion of the overall concessions program is allocated to the "back-of-house" areas that are essential in supporting the concessions program. The types of concessions, as well as the number of concessionaires, determine the support space that needs to be located adjacent to the customer serving spaces. Larger operators with multiple locations may be served from a central storage/preparation area(s). The additional area typically reserved for storage and service areas is equal to 25-35 percent of the public concessions space program. These areas typically include storage areas, preparation kitchens, employee lockers, loading docks, trash compactors, and concessionaires' administrative offices.

For Terminal 1, a review of the Airport CAD drawings suggests there is an existing support area of approximately 34 percent of the total concessions area. It should be noted that these areas are a matter of interpretation from the CAD drawings as not all areas are specifically designated as support space. Additionally, with the closure of Concourses B and D, as well as the unutilized areas at the end of Concourse C, the concessionaires have less support areas to operate from. A more typical 25 percent has been used for future space requirements. Although this ratio is lower than what exists today it represents a more typical centralized concessions program rather than multiple dispersed locations. For Terminal 2, the existing 26 percent ratio has been used for future planning requirements.

When adding the public concessions space together with the support areas a total ratio of slightly less than 1,500 square feet per 100,000 annual enplanements or 18 percent of the total public areas results for Terminal 1. This is comparable to newer terminal concessions programs that have more centralized concession areas with smaller concourse nodes.

UNITED STATES CUSTOMS & BORDER PROTECTIONS SERVICES (CBP) - INTERNATIONAL ARRIVAL FACILITIES

The CBP services, formerly known as Federal Inspection Services, are required by law for the processing of international passengers into the U.S. with the exception of pre-cleared flights from most Canadian airports and a limited number of other airports with U.S. pre-cleared facilities. With its priority mission of homeland security, it consists of U.S. government agencies, which include U.S. Immigration and Naturalization Services (INS), U.S. Customs Services, Animal and Plant Health Inspection Services, and Public Health Services. CBP facilities consist of passenger processing areas for each agency as well as required support space for offices, maintenance, and other areas.

The future program's facility requirements and processing functions are assumed to reflect that of a two-step process adopted nationally. In this procedure, all international arriving passengers are subject to primary inspection by the INS and a secondary more selective inspection in the secondary processing function by U.S. Customs. Although this is a national policy, implementation may vary at each airport based on local conditions and annual activity levels. No interviews were conducted with CBP during the course of the study. As noted in the "*Aviation Activity Forecast*" activity levels in 2008 indicated approximately 95,945 passengers boarded flights to international destinations with 99 percent originating from STL. Destinations for the O&D enplanements included Mexico (60 percent) the Caribbean (20 percent) and Canada (17 percent). International O&D passenger enplanements are forecasted to grow at an annual average growth rate of 4.3 percent per year to approximately 228,000 by 2028. Future service includes destinations to Latin American using narrowbody 150 seat aircraft as well as seasonal service to Europe using B767 230 seat aircraft. Future 2028 DDFS indicated a need for three international capable arrival gates with nearly 500 Peak Hour arriving passengers.

The future CBP agency inspection and support area requirements are based on the U.S. Customs and Border Protection, <u>Airport Technical Design Standards Passenger Processing Facilities, March 2005 draft</u> document. CBP space requirements are sized for a capacity stated in terms of passengers per hour and the type of facility its planned for such as small (under 800 pax/hour), medium (800 to 2,000 pax/hour), and large (greater than 2,000 pax/hour) airports. STL under these scenarios would fall under the small airport category processing under 800 passengers per hour. The recommended future layout, space permitting, would have Primary Inspection, baggage claim, and Secondary Inspection on one level with other offices and support space on different levels as needed. At a minimum the Secondary Inspection and Support needs to be on the passenger processing level for direct access.

Currently the international arrivals facility on Concourse C at Terminal 1 has a two-level processing facility equal to an area of approximately 46,100-square feet. The disadvantages for an airside international arrivals facility include the need for terminating passengers to re-check their baggage to domestic claim devices on the non-secured side of the terminal and then process through a Security Screening checkpoint (SSCP) before entering the secured concourse. This location also limits direct access to meter/greeter areas for terminating passengers as well as direct access to check-in facilities for passengers connecting to domestic flights. This international arrivals area has been closed due to a newer facility located at Terminal 2. This slightly smaller 43,100-square foot, two-level landside processing facility is located at the west end of Terminal 2.

For alternative planning scenarios, it is assumed a future landside location at the airport for international arrivals processing will be located in a new or redeveloped Terminal 1 facility. Future CBP functions have been sized to handle a single widebody and two narrowbody aircraft processing through three international capable arrivals gates. The future 2028 demand forecasts a level of 484 passengers per hour resulting in a facility of approximately 53,500-square feet. Some of the future area requirements not directly tied to passenger processing functions are based on a Design Hour of 600 passengers per hour. Therefore, the CBP may evaluate the airports traffic projections on a case-by-case basis and update requirements as needed resulting in certain agency functions being combined or left out of the program all together.

PUBLIC SPACE

<u>Security Screening Checkpoint (SSCP)</u>

This area of the program is dedicated to the TSA space for screening departing passengers. Future planning requirements are based on the *Recommended Security Guidelines for Airport Planning, Design and Construction, June 2006* document published by the TSA and updated for Advanced Imaging Technology (AIT) published January 2010.

These areas generally include two types of screening configurations with multiple layouts based on equipment type. The “2 to 2” module includes two lanes with two x-rays per two magnetometers (WTMD) with footprints ranging from 28 feet by 59 feet to 30 feet by 62 feet. An additional 10 feet of depth has been added downstream for reconciliation of passenger baggage and personal belongings. Overall, this area requires an average of 1,050-square feet of space per lane.

The second module type is the “2 to 1” or two lanes consisting of two x-rays per one WTMD with footprints ranging from 25.5 feet by 58 feet to 25 feet by 68 feet with an additional 10 feet of depth downstream. The average for this module totals 1,020-square feet of space per lane. The “2 to 1” module type is becoming more prevalent according to TSA in that it provides greater flexibility for staffers to work among different checkpoint lanes. These modules generally consist of the primary screening areas and their equipment, and a secondary search area (holding or wanding area). Additional area needs to be added for passenger queuing and exits, and space permitting, area for TSA offices.

An additional "2 to 1" module type has been introduced for TSA's AIT or whole body imaging devices that are being distributed to specific airports around the country. Currently TSA is placing these devices either in the primary lane in parallel with the WTMD or in the secondary screening area downstream from the WTMD. The area required for these lanes ranges from 806-square feet per lane to as much as 856-square feet. Adding an additional 10 feet for passenger baggage reconciliation increases the total area to an average of 980-square feet.

For this analysis, an average of 1,020-square feet per lane (two x-rays per one WTMD) and an approximate queue depth of 50 feet have been used for both terminals.

Site observations of the TSA security screening checkpoint areas were conducted (interviews were not conducted with TSA staff). From these observations conducted in 2008 STL had four security checkpoints between the terminals consisting of a 1:1 module or one lane per one magnetometer. Terminal 1 has three checkpoint areas with 14 lanes; Concourse A has five lanes, Concourse B has two lanes), and Concourse C has seven lanes. Terminal 2 has one checkpoint area with four lanes.

With the closure of Concourse B at Terminal 1 in conjunction with the planned *Airport Experience Program* SSCP project, 15 lanes were used as the basis for the analysis at Terminal 1 using a 2:1 module configuration with five lanes at Concourse A and eight lanes at Concourse C. Terminal 2 added an additional two lanes for a total of six lanes.

The processing rates vary by airport and have been observed to range from approximately 100 passengers/lane/hour to over 200 passengers/lane/hour. Based on these numbers, an industry planning standard throughput of 180 passengers/ lane/hour was used for future planning requirements. This is typical of what is being surveyed in the industry but STL should periodically review these as activity levels change.

Security screening lanes and area requirements are a function of the peak 10 minute throughput per number of required check-in positions. However, a number of dynamic factors can affect this known throughput from check-in such as use of self-service kiosks at ticketing, and passenger discretionary time after check-in (use of concessions, amount of time before flight departure, experience using the terminal, queue length, etc.). Based on this information, 50 percent of originating passengers in a peak 30 minute period of the Peak Hour factor was used. A 10-minute wait time along with a 20-minute queue capacity using a 15.1 square foot per passenger LOS C was also used for this analysis. Additional information about the LOS A analysis and results is provided in Appendix B, *Terminal Demand/Capacity and Facility Requirements*.

Circulation

The following categories represent the public circulation areas within the terminal and concourse areas that include the ticket lobby, baggage claim, secure circulation, general circulation, public seating areas, a domestic meeter/greeter lobby for arriving passengers, and non-public circulation. Each of these categories is described below. See Appendix B for further detailed analysis and results.

- Ticket Lobby Circulation - This category represents the unobstructed clear path within the ticket lobby extending from any seating and vestibules leading up to the ticket counter queue. It is generally used for cross-circulation from the ticket counter to the security checkpoint areas. Calculations are generally based on total linear counter length multiplied by an acceptable cross-circulation depth. Existing cross circulation depths for each terminal have been used in the analysis.
- Baggage Claim Circulation - This category represents the main circulation area adjacent to the claim area; a depth of 25 feet for the terminals was used for cross circulation along the full length of the claim area.
- Secure Circulation - This category represents all the area beyond the security checkpoint areas and consists primarily of the central corridor of the concourses and any adjacent egress stairs on the holdroom level. For future planning, 45-foot double loaded corridors (i.e. gate holdrooms on both sides of the concourse) were assumed; this is more or less a typical planning standard for longer concourses requiring moving walks. For areas not requiring assisted passenger movement a single loaded corridor of 20 feet is standard.

  The future calculated area is based on NBEG or an area per equivalent concourse length determined by gates. However, the actual amount of secure circulation will depend on the proposed concourse configurations and whether gates are located on one or both sides of the corridor. For Terminal 1 an existing calculated square feet per NBEG ratio of 1,800 (30 foot corridor with no moving walks) was used. For Terminal 2 an existing calculated square feet per NBEG ratio of 2,400 (20 foot corridor with no moving walks) was utilized.
- General Circulation - This area of the program includes all the other areas of circulation (secure and non-secure) that make up the public functions of the terminals and include areas such as vertical circulation elements, corridors, and any other architectural spaces that tie the functional public elements of the terminals together. Typical planning ratios range from 15 to 30 percent of the public serving spaces. Existing ratios of 23 percent and 15 percent were used for Terminal 1 and Terminal 2 respectively.

- Public Seating - This category includes the general waiting areas near the ticket lobby, baggage claim area, and concessions. The typical planning standard is to provide seating for approximately 15 percent of the Peak Hour departing passengers and their well-wishers along with the meeters/greeters for the Peak Hour arriving passengers. Because survey data was not available, a typical ratio of 0.10 visitor/passenger was used along with a LOS C standard of 15-square feet per seated passenger/visitor.
- Domestic Meeters/Greeters Lobby - This category includes the functional space required to accommodate the arriving passenger's meters/greeters in and around the baggage claim area of the terminal. The calculations include factors such as Peak Hour arriving passengers, visitor to passenger ratios, square feet/visitor, and average dwell time per arriving passenger and their visitors. For this analysis a typical 0.15 visitor to passenger ratio has been assumed along with a LOS C standard of 20.5-square feet per passenger+visitor factor. Dwell times for arriving passengers and visitors used were IATA standards of five minutes and 30 minutes respectively.
- Transportation (Shuttle Service) & Hotel Courtesy Phones – According to the building plans is appears Terminal 1 has approximately 100-square feet and Terminal 2 with 150-square feet of area allocated to this functional area which is located in each of the baggage claim areas. A typical planning standard of 90- to 110-square feet per 1,000,000 annual enplanements is used. For this analysis, a factor of 100-square feet has been used.

Restrooms

This category represents the area of public space allocated to passenger restroom facilities. The program has been divided between the non-secure (ticketing, baggage claim, and concessions areas) and secure (concourse areas beyond security) portions of the terminal and related concourses.

Restrooms by code should have as many toilets for women as toilets and or urinals for men. Based on the airport's lease drawings the majority of the restrooms have more fixtures for women than men with the exception of Concourse A at Terminal 1 where it appears to be equal. A typical planning standard of 50/50 is appropriate when the gender split is unknown; however, a 25 percent increase for women's fixtures has been assumed for the purposes of this analysis. Planning factors are based on a typical 2 to 2.5-square feet per Peak Hour total O&D passenger and their visitors for non-secure areas and providing a restroom module in the secure concourse areas for every eight EQA. The typical module for concourses serving O&D activity is 1,600-square feet which includes both men's and women's facilities

Other Space

This category accounts for miscellaneous and other tenant space which includes areas such as business centers, American Credit Union, Central Carts, Chapel, United Service Organizations, U.S. Postal Service, smoking lounges, etc. Other areas which are accounted for include display areas, information counters, Visitors Commission, etc.

For Terminal 1 an existing planning factor of 180-square feet per 100,000 annual enplanements has been assumed for the miscellaneous tenants and 30-square feet for the smoking lounges. An existing ratio 140 square feet per 1,000,000 annual enplanements has been assumed for the information counters and display areas.

For Terminal 2 an existing planning factor of 50-square feet per 100,000 annual enplanements has been assumed for the miscellaneous tenants and 50-square feet for the smoking lounges. An existing ratio of 50 square feet per 1,000,000 annual enplanements has been assumed for the information counters and display areas.

NON-PUBLIC SPACE

Non-Airline Tennant Space

This category includes the "back of house" area that is not accessible to the public and generally consists of areas such as airport administration (if not in a remote location), airport police, and any airport related offices and support space.

- Airport Administration - This category represents the total area devoted to airport administration/city space functions. It generally consists of reception areas, offices, conference rooms, storage areas, work areas, communication and incident control centers, rooms for special events such as VIP press conferences, and other airport related operations-related space such as paramedics and airport police. The requirements for airport administration are a function of staffing generated by the airport. This area is principally located in an office complex adjacent to the terminal however; some space can be allocated within the terminal area.
- Other Tenants - This category accounts for any other miscellaneous tenant space within the terminal area. A planning factor of square feet per 100,000 annual enplanements has been used for the analysis. A ratio of 130-square feet for Terminal 1 has been used which is a slight increase in the existing ratio and accounts for any future potential tenant additions. For Terminal 2 an existing 200-square feet ratio has been used. Future space requirements should be reviewed by the Airport.

Other Space

This category accounts for the non-public restroom facilities and circulation areas typically found in airline operations and airport administrative space. The majority of the non-public restroom facilities, which in some areas include locker space, are accounted for on the apron level of both terminal buildings and their concourses. The existing ratio of non-public space to non-public restrooms has been used for future planning requirements for both terminals.

The Non-Public Circulation area provides access to the airline operations, airport administration areas, concessions, support, and other areas typically not used by the traveling public. Typical planning standards base this on 10 to 15 percent of the non-public functional areas. Based on the STL CAD[7] drawings, the current ratios fall below this range for each of the two terminals. For the purpose of this analysis, a ratio of 10 percent of the non-public terminal space has been used. It should also be noted that this area of the program is often a matter of interpretation by the consultant as to whether or not to include this space in the public or non-public category.

Terminal Functions

This category accounts for all the mechanical, electrical, utility, janitorial, storage, and shop areas as well as the structure and non-net areas of the building. These areas combined with the other functional areas of the terminal and concourse locations create the total gross footprint of the building.

Maintenance/Janitorial/Storage/Shops – This category accounts for the building maintenance facilities and consists of shops, storage, office space, circulation, and janitorial closets. Typical planning standards require one to two percent of the total functional areas. For this analysis one percent has been used which in an increase over the existing ratio range of 0.4 percent to 0.8 percent for Terminals 1 and 2 respectively.

Mechanical/Electrical/Telephone/Plumbing – This category of the program includes all the utility support areas for the terminal and is generally a percentage of the enclosed functional areas of the terminal, typically 10 to 12 percent. Recent trends in computer systems, telecommunications, and other building related systems have increased the demand for these areas within the terminal building. Some of these areas can be accommodated in the airline operations area whereas common use systems need to be located in the airport controlled areas. The existing ratio of 12 percent was used in the analysis.

Building Systems (Structural/Non-Net/Void) – This category ties together the previous functional elements of the program to provide an estimate of the total gross building area. Unusable space or special structures often make up this category of the program. Depending on how the gross areas are determined, a factor of two to five percent is typically added for this category. The existing terminal gross area was taken from the airport terminal CAD drawings. All functional elements were then added together and subtracted from the overall gross area footprint per terminal to calculate the non-net areas of the two buildings. The existing ratios of three percent and two percent for Terminal 1 and Terminal 2 respectively were used for the analysis.

[7] CAD is Computer-Aided Design.

4.4.4.3 Summary of Terminal Building Requirements

Analysis of these programs reveals when future demand levels may potentially exceed current terminal capacities and when additional terminal infrastructure would need to be in place. This however is linked to the actual realization of passenger and operations activity when demand volume exceeds capacity thresholds or "trigger points." Crossing a capacity threshold triggers the need to begin planning, design, and the construction process to replace facilities in time to meet the growing passenger demand levels. Replacement can also be triggered by the need to supplant the aging infrastructure and their growing functional obsolescence such as those found in certain portions of Terminal 1.

The future program may assume greater efficiencies by consolidating any of the functions that may be replicated by the current operational layouts of the two terminals. Although each analysis shows no additional capacity-driven space there may be a need for re-allocated space for demand as described below. **Table 4.4-22, *Summary of Recommended Facilities***, summarizes the gate and space needs by terminal.

Table 4.4-22
SUMMARY OF RECOMMENDED FACILITIES
Lambert-St. Louis International Airport

	BASE YEAR ACTIVITY			RECOMMENDED FACILITIES			
	2010			2013	2018	2023	2028
	Full Capacity	Operational Capacity	Utilized Capacity				
Terminal 1 Gates							
Building Program (square feet)	**72**	**45**	**23**	**29**	**31**	**33**	**35**
	1,254,100	984,400	823,600	663,600	694,400	741,900	807,300
Terminal 2 Gates							
Building Program (square feet)	**16**	**15**	**13**	**12**	**13**	**14**	**15**
	348,400	348,400	338,000	287,900	308,400	337,500	353,400

Source: Landrum & Brown analysis, 2011

Terminal 1 currently has a gross terminal area of approximately 1,254,100 square feet. With the closure of Concourses B and D, the operational capacity has decreased to approximately 984,400-square feet of which approximately 823,600 is currently utilized. By the 2028 demand year a total gross Preferential Use terminal area of 807,300-square feet is required which although below current available capacity, the age of the existing terminal infrastructure will need to be considered in the evaluation of potential expansion or redevelopment alternatives. Specific areas of the existing terminal however are undersized to meet future demand activity such as secure concessions storage, non-secure public seating, domestic meter/greeter area, non-secure restroom areas and circulation space, and maintenance/janitorial/storage shops.

Terminal 2 currently has a gross terminal area of approximately 348,400 square feet of which approximately 338,000 is currently utilized. By the 2028 demand year, a total gross Preferential Use terminal area of 353,400-square feet is required which is slightly above the current available capacity. Some areas of the existing terminal are undersized to meet the future demand activity such as domestic airline passenger (baggage claim) and operational support space, security screening functions, restrooms, and non-airline tenant space.

In some cases, the deficiencies can be converted from excess space within the terminal program. Some of the types of conversions include:

- Converting excess operations space to airline offices (station managers, accounting, etc.)
- Expanded baggage claim into circulation space provided adequate clearances and corridor widths are maintained
- Concessions support space may be accommodated by moving some of the Airport maintenance functions which are not directly required in the terminal area to another on-airport location
- Baggage make-up and or EDS screening can sometimes be converted from operations space, which in turn may require the relocation of existing operation functions and lease changes

The re-use of space within the terminal must always be studied and evaluated before making a simple subtraction of existing from future programmed gross terminal areas.

A typical method for comparing airport terminal programs with similar characteristics is Gross Terminal Area per NBEG. However, this should be done with careful thought and consideration as the terminal configuration can greatly affect the area per gate calculation. Such factors include extensive basements associated with baggage handling, Automated People Mover systems, and multiple unit terminals that generate a higher area per NBEG ratio than airports with fewer terminals and similar gate capacity. A typical range for new individual terminal programs can be anywhere from 15,000-square feet per NBEG for smaller domestic terminals to more than 24,000-square feet per NBEG for larger domestic terminals. International terminals can have well over 35,000-square feet per NBEG. Mixed domestic/international terminals will typically fall within the large domestic terminal range. These ratios however are increasing given the larger area requirements for certain processing functions for passengers and baggage and should be used for comparative purposes only. Terminal 1's 2028 Preferential Use demand level equated to an area of 25,500-square feet per NBEG. Terminal 2's 2028 demand level resulted in a 23,800-square feet per NBEG ratio resulting from an increase in Southwest's future passenger and aircraft operations forecasted to fill the capacity left by American's de-hubbing operation.

4.5 AIR CARGO

Cargo operations at STL have changed significantly over the last two decades as the amount of belly cargo and overall cargo has steadily declined. The current fleet at STL includes two express carriers, Federal Express (FedEx) and United Parcel Service (UPS), and an all-cargo carrier, Capitol Cargo International Airlines operating as a subsidiary to ABX Air. In addition, the passenger airlines offer belly cargo; these include American Airlines, United Airlines, Delta Airlines, US Airways, Southwest Airlines, and the various airlines operating under code-share and marketing agreements with the network carriers. There are also multiple freight forwarding operations at STL, including JetStar Aviation, Brendan Airways, Burlington Air Express (BAX), Integrated Airline Services (IAS), and Forward Air.

Sources such as the FAA and International Air Transport Association (IATA) produce guidelines to help airport planners to right-size cargo facilities. STL's existing cargo facilities, especially those developed after the advent of express carriers, reflect some of these planning models. Given the variety of business models (and operational needs therein) entailed in the air cargo industry, however, there is no "one size fits all" approach to cargo facilities planning. Principally, the operational differences are between carriers using airport cargo terminals as pipelines from airside to landside versus those using on-airport spaces for actual sorting. For example, the FedEx network has traditionally been oriented toward on-airport sort centers. Having only later developed its trucking resources, ground hubs were developed independently off-airport. In contrast, UPS, which operated solely as a ground delivery company for decades, has typically minimized its on-airport building requirements while utilizing as much ramp as possible.

The designated air cargo facilities at STL are located in two primary areas; North Cargo Area located in the northeast portion of the Airport, and Cargo City Area located in the southeast portion of STL along Air Cargo Road. Combined, these facilities have a total of 269,210 square feet of building space and 675,180 square feet (15.5 acres) of ramp space as shown in **Table 4.5-1, *Existing Cargo Space***.

In the North Cargo Area, Fedex operates in a multi-tenant building occupying 57,400 square feet of warehouse and 465,870 square feet of the contiguous ramp. Approximately 42,200 square feet of the building are occupied by other cargo tenants, predominately freight forwarders. UPS occupies its own facility with 17,480 square feet of warehouse and 209,310 square feet of ramp. In total, between the two cargo facilities there are 117,080 square feet of building space and 675,180 square feet (15.5 acres) of ramp space.

In the Cargo City Area, there is a combined 152,130 square feet of building space between six facilities with no dedicated airside cargo apron area. The lack of dedicated ramp space is a function of the different handling process for belly haul cargo. Carriers such as ABX use the Juliet pad to off-load and load containerized cargo that is transferred from truck to plane.

Table 4.5-1
EXISTING CARGO SPACE
Lambert-St. Louis International Airport

CARGO FACILITY	WAREHOUSE/SORT SPACE (SQUARE FEET)	RAMP SPACE (SQUARE FEET)	RAMP TO WAREHOUSE RATIO
Haith cargo building (FED EX and freight forwarding companies	99,600	465,780	4.67 : 1 total 8.1:1 Fed Ex only
UPS Cargo Facility	17,480	209,310	12 : 1
Cargo City	152,130	-	No dedicated ramp space

Sources: 2008 STL ALP and Landrum & Brown analysis, 2011

Multiple indicators run contrary to aggressive expansion at STL. Most obviously, cargo volumes at STL have been on an almost continuous downward trend since 1999 and forecasted cargo volumes (see **Table 4.5-2, *Historical and Forecast Air Cargo Volumes (Metric Tonnes)***) show future volumes not surpassing STL's historical peak year (2002) during which 134,000 metric tonnes were handled. The total volume projected by year 2028 is little less than the amount STL accommodated with its existing facilities; however, the change in distribution between all-cargo and belly cargo over time is significant.

Table 4.5-2
HISTORICAL AND FORECAST AIR CARGO VOLUMES (METRIC TONNES)
Lambert-St. Louis International Airport

CALENDAR YEAR	ALL-CARGO TONNAGE	BELLY TONNAGE	TOTAL AIR CARGO TONNAGE
1999	85,596	45,461	131,057
2000	87,122	43,045	130,167
2001	87,794	33,666	121,460
2002	82,925	51,942	134,868
2003	85,843	32,657	118,500
2004	87,669	17,289	104,958
2005	88,793	12,400	101,192
2006	78,190	10,692	88,883
2007	74,491	8,760	83,251
2008	71,924	9,155	81,080
2009	66,495	7,675	74,170
2013	74,360	8,480	82,840
2018	86,290	8,720	95,010
2023	97,830	8,630	106,460
2028	110,900	8,370	119,270

Source: Landrum & Brown analysis, 2011

The IATA *Airport Development Reference Manual*, 9th edition, includes planning ratios, for cargo terminal buildings that are useful for long-term planning purposes. The three categories presented in the manual identify cargo-processing capacity per square meter for three levels of automation. Low automation yields 5 tonnes power square meter (0.46 tonnes per square foot), low automation yields 10 tonnes per meter (0.98 tonnes per square foot) and high automation yields 17 tonnes per square meter (1.58 tonnes per square foot). As previously indicated, STL presently has 269,210 square feet of total cargo terminal building space. While the level of automation varies from tenant to tenant, applying the function associated with "low automation" in IATA's model was used to produce a conservative estimate of capacity. STL's total current cargo terminal capacity between the North Cargo Area and Cargo City Area should accommodate approximately 123,835 metric tonnes of cargo, slightly above the forecast total cargo tonnage.

According to IATA's cargo planning model, "the apron size for all cargo facilities lies in the range of 4 to 5 times that of the cargo terminal building area." This includes aircraft stands, internal taxilanes, airside roads, ground service equipment parking, and processing zones on the apron. With 675,180 square feet of ramp in the North Cargo Area, STL currently has a ratio of 5.7 to 1, slightly higher than the recommendation and indicative of the fact that the facilities were built to meet the needs of the express package carriers.

Analysis suggests that STL does not require a significant amount of additional ramp space for the period covered in the cargo forecasts. As with projecting cargo terminal area requirements, however, significant variables exist for ramp utilization. Most obviously, the same ramp may be used for multiple "turns" each day. At a non-hub spoke like STL, a carrier may park an aircraft all day until it departs after the evening cut-off, or it may continue to another spoke market after being unloaded at STL. As with "dwell-times" for cargo, the number of "turns" for ramp space is critical.

STL's cargo carriers have options in responding to growth in demand. As previously explored, the integrated carriers that accounted for much of the cargo growth at STL in recent decades have maximized their utilization of trucks to accommodate as much growth as possible in the relatively slow-growth US market. Moreover, rather than dedicating additional aircraft to STL, carriers might allocate a larger aircraft - possibly shared with another city, requiring a quicker turn. While a larger aircraft consumes more ramp space, it still may be considerably less than two smaller aircraft. Again, much depends on how long the carrier elects to leave the aircraft on the ground.

Although the forecast does not project a significant need for additional cargo facilities, it should be noted that the current cargo operators on the airfield occupy the facilities suitable for a true cargo operation. Space is available in Cargo City; however, the lack of directly adjacent ramp space will preclude many cargo operators from considering the facility as a viable alternative. Although the ultimate plan for the Aeroterm development at the site of the former Boeing manufacturing facility is not known, the Airport must consider the need for potential cargo expansion in the long term if demand beyond the levels identified in the forecast materializes. The ongoing discussions between representatives of the Greater St. Louis business community and representatives from the People's Republic of China underscore the need to look beyond the forecast models. Although no formal agreements have been announced, there appears to be significant movement toward attracting an Asian cargo operation to STL. The existing cargo facilities are not appropriately configured to handle such an operation, and accommodating such an endeavor will require at a minimum, improvement to the taxilanes in the North Cargo area to accommodate Design Group V aircraft. If a larger international cargo presence materializes the Aeroterm site as well as the Brownleigh area, east of the existing North Cargo facilities, are appropriate candidate sites for cargo expansion. At a minimum, the international cargo facilities would include ramp area, building for sorting and short term warehousing with truck docks, sufficient area for truck movement, inspection facilities, GSE vehicle maintenance and support and associated office and support facilities.

4.6 GENERAL AVIATION (GA)

Two Fixed Base Operators (FBO) at STL serve the general aviation community. Signature Flight Support provides a full array of services including ground support, fueling, tie-downs, hangar space, shuttle service, rental cars, lounging areas for flight crews and light maintenance. ATS JetCenter provides similar services, though is not able to provide light maintenance or hangar facilities given its current facility.

The Signature Flight Support facility is located in the Northeast Airfield off John S. McDonnell Boulevard, just south of North Cargo Area and southeast of the Boeing facilities. The GA apron includes only one distinct area for based aircraft parking. The GA terminal area consists of one terminal building that is 5,638 square feet in area, and four hangars totaling 106,223 square feet. Signature Flight Support staff indicate 12 aircraft were based in the four hangars, which is approximately 75 percent of the available total capacity.

The ATS JetCenter facility is located in the Northwest Airfield, immediately adjacent to Trans States maintenance facility and former Boeing low/high bay hangar. The GA area consists of a 1,929-square-foot office building, a 38,871-square-foot parking area, and 50,000-square-foot ramp area. The total space for the two facilities is used as the basis for the determination of space requirements over the planning period. As shown on **Table 4.6-1, *General Aviation Facility Requirements***, due to the slight increase in projected GA operations over the planning period, there is no forecast need for expansion of the land area dedicated to FBO facilities. Although ramp space and parking space are sufficient for the long term-needs, there is a need for additional hangar space.

For long-term planning considerations, planning space for additional facilities is recommended. The need for GA space is difficult to forecast, and needs generally arise based on changes for a small population of users. With only one facility on the airfield providing hangar space to General Aviation and Corporate Aviation users it is difficult to estimate the true demand for these facilities as users have no option at STL and are left with little room to negotiate. Although these users require premium on-airport locations with good access to the airfield, the inability, or perceived inability, to negotiate may drive them to other airports in the region.

Further, the reduction in operations has the potential to increase the attractiveness of STL to General Aviators and Corporate Aviation Departments. During the peak of the TWA/American Airlines hub operations, the increased block time associated with delays due to the high level of commercial airline operations would certainly factor into the decision to use one of the surrounding airports rather than STL. While the General Aviation operations at STL dropped during the period from 1995 to 2000, the activity at surrounding airports increased. In the past few years the trend has turned to the positive and GA operations at STL have increased, a trend that would certainly be stimulated with the addition of expanded choices for corporate and general aviation users.

Table 4.6-1
GENERAL AVIATION FACILITY REQUIREMENTS
Lambert-St. Louis International Airport

	GA/ MILITARY	AREA REQUIRED PER			Hangar				GA Apron				AUTO PARKING[2]			
	PMAD[1]	PMAD OPERATION (SQ FT)			AREA REQUIRED		SURPLUS (DEFICIT)		AREA REQUIRED		SURPLUS (DEFICIT)		AREA REQUIRED		SURPLUS (DEFICIT)	
YEAR	OPERATIONS	GA TERMINAL	APRON	PARKING	SQUARE FEET	ACRES	SQUARE FEET	ACRES	SQUARE FEET	ACRES	SQUARE FEET	ACRES	SQUARE FEET	ACRES	SQUARE FEET	ACRES
Actual 2008	70	1,300	2,400	1,280	91,032	2.09	22,758	0.5	168,000	3.8	171,071	3.9	89,600	2.1	137,795	3.2
Forecast 2013	80	1,300	2,400	1,280	104,037	2.38	9,753	0.2	192,000	4.4	147,071	3.4	102,400	2.3	124,995	2.9
2018	92	1,300	2,400	1,280	119,642	2.74	(5,852)	(0.1)	220,800	5.1	118,271	2.7	117,760	2.7	109,635	2.5
2023	96	1,300	2,400	1,280	124,844	2.86	(11,054)	(0.3)	230,400	5.3	108,671	2.5	122,880	2.8	104,515	2.4
2028	102	1,300	2,400	1,280	132,647	3.04	(18,857)	(0.4)	244,800	5.6	94,271	2.2	130,560	3.0	96,835	2.2

	Square Feet	Acres
2008 Hangar Area Available:	113,790	2.6
2008 Parking Available:	227,395	5.2
2008 Apron Space Available:	339,071	7.8

Notes: 1 PMAD - Peak Month Average Day
2 Parking requirements include circulation area.

Source: 2008 Airport Layout Plan Update and Landrum & Brown analysis, 2011

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4.7 AIRPORT AND AIRLINE SUPPORT FACILITIES

4.7.1 AIRCRAFT FUEL STORAGE

The commercial passenger aircraft fuel storage facility is located in the southeast quadrant of airport property, at the intersection of Airport Exit Road and Lambert International Boulevard. It consists of twelve 60,000-gallon tanks and twenty-nine 30,000-gallon tanks of Jet-A fuel. Assuming a 15 percent reduction of total tank capacity to account for expansion, fuel quality and safety the total capacity for all 41 tanks is 1.35 million gallons

The Jet-A fuel arrives at the facility via two separate underground supply lines, which are able to directly fill the 30,000-gallon tanks. To protect the quality of the fuel in the hydrant system, the 60,000-gallon tanks are not directly connected to the underground supply lines, and the fuel must be pumped from the 30,000-gallon tanks to the 60,000-gallon tanks that supply the hydrant fueling system. Once the fuel reaches the fuel hydrants, fueling trucks distribute the fuel to the aircraft. Allied Aviation regularly maintains a four-day supply of Jet-A fuel. Future commercial fuel farm requirements are shown on **Table 4.7-1, *Commercial Fuel Storage Requirements***. To maintain a four-day supply of fuel as operations increase in the future, further expansion beyond the 2.4-million-gallon capacity will be needed by 2013. Given the redundant supply lines to the facility and the fact that tanker trucks are not incorporated into the system, however, it is reasonable to assume that a three-day supply of JET-A is sufficient to serve the needs of the commercial passenger aircraft.

TABLE 4.7-1
COMMERCIAL FUEL STORAGE REQUIREMENTS
Lambert-St. Louis International Airport

Year	Gallons Per PMAD[1] Departures (gallons)	Commercial PMAD Departures[2]	PMAD Demand (gallons)	Storage Requirements 4 Day Supply (gallons)	Storage Requirements 3 Day Supply (gallons)	Surplus/ (Deficit) 3 Day Supply (gallons)
Actual						
2008	1,194	333	338,500	1,352,000	1,014,000	-
Forecast						
2013	1,360	275	316,250	1,265,000	948,800	403,200
2018	1,390	297	346,905	1,387,600	1,040,700	311,300
2023	1,420	321	381,990	1,528,000	1,146,000	206,000
2028	1,450	341	412,005	1,648,000	1,236,000	116,000
	2008 Storage Available (gallons): [3]		1,352,000			

Notes: 1 PMAD – Peak Month Average Day
2 Commercial PMAD departures do not include cargo, non-commercial air taxi, general aviation, or military departures.
3 Fuel storage capacity includes central fuel farm, but does not include general aviation fuel tanks or North Cargo area fuel storage. The stated tank capacity has been reduced by 15 percent to accommodate reductions necessary for safety, fuel expansion and product quality.

Sources: Lambert Airport, Airport Terminal Service, and Landrum & Brown analysis, 2011

4.7.2 FUELING SERVICES MAINTENANCE

The STL Airport fueling service operations are located west of Terminal 1 and consist of two buildings. Building 308 is 7,092 square feet in size and is used for the maintenance of fuel service vehicles. Building 309 houses the offices for the administrative support of the operations and occupies 3,239 square feet of floor space. Immediately adjacent to Buildings 308 and 309 there is an approximate combined area of 75,350 square feet allocated for parking. This area includes 60 standard-size parking spaces and six oversized parking spaces for large trucks. Landside accessibility to these buildings is provided via Airfield Service Road via Lambert International Boulevard. Airport airside accessibility to the maintenance facilities is provided by an airport service road that connects to the terminal apron located west of Concourse A at Terminal 1. Discussions with staff indicate that the facilities are sufficiently sized to accommodate the fuel service vehicle maintenance and administration for the demand levels forecast through the planning period.

4.7.3 GROUND SERVICE EQUIPMENT

Ground service equipment (GSE) is stationed at and around the terminal gates for the servicing of passenger aircraft. For cargo aircraft, they are stationed in designated GSE areas on each operator's aircraft ramp. For FBOs, GSE maintenance is accommodated within their existing maintenance building or on the adjacent aircraft apron. Commercial airline GSE maintenance occurs within the maintenance facility in Cargo City, Cargo Building 1 and at the airline ground service vehicle maintenance facility, which is situated directly west of the main power plant and cooling towers. Discussions with airline staff indicate that the existing facilities are sufficient to service current and future needs through the planning horizon.

4.7.4 AIRCRAFT RESCUE AND FIREFIGHTING (ARFF)

Currently, there are two ARFF facilities at STL that house personnel and equipment. First, the North ARFF station, a 10,075 square-foot facility, is situated north of Runway 12L/30R and southeast of the Runway End 24. The facility has 10 vehicle bays. The West ARFF station, a 10,792 square-foot facility, is located on the north side of Runway 11/29. A third ARFF station, known as the South ARFF station, was closed in August of 2010. That facility had 9,580 square-feet of floor space and six vehicle bays. In total, there is approximately 20,800 square feet of active ARFF facility space at STL.

During the Master Planning process, a separate analysis conducted by the City of St. Louis determined the South ARFF station was unnecessary because the North and West ARFF stations together have the ability to respond to any emergency on any part of the airfield within the required 2-3 minute time frame. With the current equipment and staffing the ARFF facilities are suitable for Group V operations. Follow up discussion with the Fire Chief indicated that the size of the existing facilities is adequate, but minor cosmetic improvements will be needed over the planning period.

4.7.5 AIRFIELD MAINTENANCE

Airport maintenance facilities are concentrated in a centrally located area of the airfield, between the extended centerline of Runway 12L/30R and Runway 11/29 along Old Natural Bridge Road (now NAVAID Road). The maintenance campus includes five buildings. Building 401 is composed of three large structures that total 65,390 square feet in size and is used for the landscape equipment storage and warehousing/central stores. Immediately adjacent, along the west side of Building 401, is a 52,800-square-foot employee parking area. Building 402 has 6,642 square feet of floor space and contains office space and rooms suitable for employee training. Building 403 is used for vehicle maintenance, and has 16,455 square feet of floor space. Building 404 is a 17,323-square-foot facility that is also used for vehicle maintenance. Building 405 is used for asphalt and sand storage, and has 8,288 square feet of floor space. In total, this maintenance area encompasses a combined facility area space of 114,098 square feet on approximately 15 acres of land.

As currently configured, the facilities are not well designed for the equipment in the STL fleet. The do not include suitable storage facilities for the snow and ice removal equipment. The FAA recommends that all snow and ice removal equipment be stored indoors to extend the life of the equipment. Airport staff indicated that the existing maintenance facilities are not designed to accommodate the size of modern airport equipment, requiring some maintenance activity to be performed outside. Additionally, the maintenance facilities do not include a dedicated wash facility, which results in potential wastewater runoff. Finally, the office space for field maintenance personnel is housed in a separate building from the repair and storage facility, which reduces communication abilities and impacts efficiency. Given the age, poor layout, and condition of the buildings, opportunities should be explored to modify or replace these structures in the near- to mid-term. A plan to replace the facilities with a more modern facility should be considered to provide the space required to repair vehicles inside the building and provide suitable covered and heated storage for the equipment.

4.7.6 AVIATION FACILITIES MAINTENANCE

The primary aviation facilities maintenance support facilities are located in a 13,000-square-foot building south of Concourse A. From this facility, Airport employees service the terminal complex including heating, ventilation, and air conditioning (HVAC), elevators, baggage conveyors, and other mechanical systems. Discussions with Airport employees indicated that the location of central stores on the opposite side of the airfield causes a significant amount of lost time while employees drive to and from the terminal area to central stores. Employees estimate that the round trip can take up to an hour. A plan is being developed by Airport staff to relocate some of the central stores inventory to the vacant space located within Cargo City.

4.7.7 AIRCRAFT MAINTENANCE

Aircraft maintenance at STL is performed in six aircraft maintenance buildings with a combined building area of 292,971 square feet and land area of 586,513 square feet. American Airlines occupies five of the buildings located at the east of the Runway 29 approach. Conversations with airline representatives indicate that the future use of the American hangar is closely tied to the fleet operated by the airline. As the airline phases out its fleet of older narrow-body aircraft, the need for the maintenance facility at STL will diminish. While it is possible that the Airline will repurpose the facility for another aircraft type, the reduction in overall service at STL significantly affects the likelihood of any future redevelopment. The Trans States facility is located on the north side of the airfield adjacent to the former Boeing McDonnell Douglas facility. Trans States indicated that the existing facility would adequately serve their needs through the planning period.

4.7.8 AIRPORT POLICE, SECURITY, AND SAFETY

The STL Police Department is located on the Terminal 1 Level near door MT 18. This 1,850-square-foot facility supports the police and security functions including housing prisoner holding cells, storage for Segways, and a Threat Containment Unit. The majority of the police officers and administrative staff are located at the Terminal 1 office. The investigative unit of the Airport Police and a training facility are currently housed in the former Trademart retail building located north of Runway 11/29. The former Bridgeton City Hall building was in the process of being remodeled to accommodate the Airport Police during the completion of the Master Plan Update. It is anticipated that all functions of the Airport Police will be housed in the newly remodeled facility, vacating all existing space except the space in Terminal 1, which will remain as a satellite post of the Airport Police. It is anticipated that no additional space would be needed through the planning period.

4.7.9 FLIGHT KITCHENS

Although flight kitchens were once a staple on an airfield, particularly airfields with hub airlines, changes in the industry have significantly changed, and the separate flight kitchen facility is fading away at many airports. Whereas the airlines once provided a free meal or substantial snack consisting of a sandwich, fresh fruit and desert on most flights, the common practice now is to provide a small-prepackaged snack and choice of beverage. True meals are reserved for long haul flights and the demand for kitchen space is minimal. Discussions with Gate Gourmet indicated that their current 85,640 square-foot facility on Scudder Road is more than adequate to provide the estimated 900 meals they prepare each day and any growth that may come in the planning period. The other provider on the airfield, HMSHost, has recently vacated their on-airport flight kitchen and is utilizing their other restaurant facilities within the terminal building to prepare meals for flights. As with Gate Gourmet, the management of HMSHost indicated that their existing space would adequately serve their needs throughout the planning horizon.

4.8 TERMINAL CURB FRONT

Curb front demand is a product of passenger enplanements, mode share, passenger occupancy per vehicle, average dwell time, and vehicle. The curb fronts at the two passenger terminals at STL are segregated by the primary passenger type being served and the terminal function located closest to the curb. Each of the terminals is served by a ticketing curb (departing passengers) and baggage curb (arriving passengers). As currently configured, the two curbs are completely separate and exist at different physical elevations.

Upon entering the terminal area of Terminal 1, vehicles have the opportunity to choose to continue to the Departures Curb or the Arrivals Curb. Departing passengers in private vehicles, taxis, limousines, Airport Terminal Shuttles, or Superpark Shuttles proceed to the departures curb, which consists of two movement lanes with diagonal parking located to the driver's right with an additional movement lane adjacent to the building to permit pull through operations in the diagonal parking. As configured, this layout permits an easy flow of traffic and support double parking in the right hand movement lane during peak demand periods. The effective curb length on the ticketing level is actually 150 percent of the linear curb length, which is approximately 990 feet.

The arrivals curb for Terminal 1, located to the drivers left upon entering the terminal area, is lower than the departures curb and consists of five lanes with a pedestrian median located between lanes 3 and 4, where lane 1 is the unloading lane closest to the terminal building. In addition to private vehicles picking up arriving passengers, the arrivals curb serves rental car, hotel and off-airport courtesy shuttles serving both arriving and departing passengers. Taxis are not permitted to utilize the arrivals curb and are located in the parking garage on the yellow level. With two movement lanes (lane 2 and 3) supporting the curb closest to the terminal the effective length of that portion of the curb is increased. The outer curb, serving the rental car and off-airport parking providers, has a single movement lane and therefore, double-parking to load or unload passengers is not possible. The total effective curb length for the Terminal 1 arrivals curb is approximately 1,668 feet.

Passengers entering the Terminal 2 area encounter a similar curb front operation. Departing passengers in private vehicles, taxis, limousines, Airport Terminal Shuttles, or Superpark Shuttles proceed to the departures curb, which consists of two movement lanes with diagonal parking located to the driver's right with an additional movement lane adjacent to the building to permit pull through operations in the diagonal parking. Similar in configuration to the Terminal 1 departures curb the layout permits double parking in the right hand movement lane during peak demand periods. The effective curb length on the ticketing level is actually 150 percent of the linear curb length, which is approximately 915 feet.

The arrival curb for Terminal 2, located to the drivers left upon entering the terminal area, is located directly below the departures curb and consists of four lanes with a pedestrian median located between lanes 2 and 3, where lane 1 is the unloading lane closest to the terminal building. In addition to private vehicles picking up arriving passengers, the arrivals curb serves rental car, hotel and off-airport courtesy shuttles serving both arriving and departing passengers. The total effective curb length for the Terminal 1 arrivals curb is approximately 1,200 feet.

4.8.1 AIRPORT ARRIVALS

Table 4.8-1, *Curbfront Demand Capacity Analysis Terminal 1 – Ticketing Curb*, shows the 2008 curb front demand during a peak hour for the Ticketing level of Terminal 1. **Table 4.8-2, *Curbfront Demand Capacity Analysis Terminal 1 – Arrivals Curb***, shows the 2008 demand for the Arrivals level at Terminal 1. **Tables 4.8-3, *Curbfront Demand Capacity Analysis Terminal 2 – Ticketing Curb***, and **Table 4.8-4, *Curbfront Demand Capacity Analysis Terminal 2 – Arrivals Curb***, provide the same information for Terminal 2 Ticketing and Arrivals levels.

The curb front demand was determined using the methodology described in ACRP Report 25, *Airport Passenger Terminal Planning and Design,*[8] with slight modifications to account for the specific layout and curb front usage requirements at STL. Modal share and passenger occupancy assumptions used in the calculation is based on the results of the Customer Survey conducted during the *Airport Experience Program* (AEP) in 2006. Vehicle length and dwell times are based on analysis conducted for the AEP with slight modifications based on airport observations and FAA guidelines.

The peak 15-minute demand is compared to the existing capacity and assigned a Level of Service rank between A and E. The recommended planning level is Level C, which represents a curb front utilization of 55 percent to 65 percent of the available length in the peak 15-minute period. As shown in Tables 1.4-1 through 1.4-4, the Terminal 1 arrival curb and Terminal 2 Departure curb provided sufficient capacity to support the peak 2008 demand. However, the Terminal 1 departure curb and Terminal 2 arrivals curb did not provide sufficient curb length to serve 2008 demand at a suitable level of service.

The same calculations were applied to passenger enplanements for forecast demand to project future demand and capacity at the terminal curb front. The results of these calculations are shown in the following four tables: **Table 4.8-5, *Projected Curbfront Demand Capacity Terminal 1 – Ticketing Curb*, Table 4.8-6, *Projected Curbfront Demand Capacity Terminal 1 – Arrivals Curb*, Table 4.8-7, *Projected Curbfront Demand Capacity Terminal 2 – Ticketing Curb***, and **Table 4.8-8, *Projected Curbfront Demand Capacity Terminal 2–Arrivals Curb***. These calculations show that existing arrival curb at Terminal 1 is sufficient for future passenger demand. However, the length available for departing passengers at both terminals and the arrival curb at Terminal 2 will need to be addressed through additional length or other potential alternatives to mitigate and or accommodate the excess demand.

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[8] Airport Cooperative Research Program, ACRP Report 25, *Airport Passenger Terminal Planning and Design, Volume 1: Guidebook,* Transportation Research Board of the National Academies, Sponsored by the Federal Aviation Administration, Washington, DC, 2010.

Table 4.8-1
CURBFRONT DEMAND CAPACITY ANALYSIS TERMINAL 1 – TICKETING CURB
Lambert-St. Louis International Airport

Vehicle Type	Design Hour Demand in Vehicles	Peak 15 Minutes as % of Demand	Vehicle Dwell Time (min.)	Multiple Stop Factor	Peak 15 Min. Demand in Minutes	Vehicle Length (ft)	Peak 15 Min. Demand (ft* min.)	Peak 15 Min. Demand (ft)
Private Auto	257	**77**	2.0	1.0	**154**	20	**3,089**	**206**
Rental Car Shuttle*	0	**0**	2.7	1.0	**0**	35	**0**	**0**
Taxis	51	**15**	3.0	1.0	**46**	20	**913**	**61**
Limousines	30	**9**	3.0	1.0	**27**	30	**822**	**55**
Hotel Shuttles*	0	**0**	2.6	1.0	**0**	35	**0**	**0**
Airport Shuttles*	48	**14**	2.6	1.0	**37**	35	**1,310**	**87**
Off Airport Parking	54	**16**	2.8	1.0	**45**	35	**1,588**	**106**
Paid Shuttle	11	**3**	2.7	1.0	**9**	35	**303**	**20**
Total	**451**	**135**	n/a	n/a	n/a	n/a	n/a	**535**

Existing Curbfront Length	660	ft	Existing Capacity Ratio	**0.54**	
Effective Parking Capacity**	**990**	ft	Existing Level of Service (LOS)	**B**	
			Required LOS 'C' Curbfront Range = from	**549**	ft
			to	**649**	ft

* Demand based on shuttle frequency of 1 every 5 minutes per operator for rental car and parking shuttles and 1 every 20 minutes for hotel operators
** Assumes diagonal parking configuration with ability to double park behind diagonally parked vehicles during peak periods

Source: Landrum & Brown analysis, 2011

Table 4.8-2
CURBFRONT DEMAND CAPACITY ANALYSIS TERMINAL 1 – ARRIVALS CURB
Lambert-St. Louis International Airport

Vehicle Type	Design Hour Demand in Vehicles	Peak 15 Minutes as % of Demand	Vehicle Dwell Time (min.)	Multiple Stop Factor	Peak 15 Min. Demand in Minutes	Vehicle Length (ft)	Peak 15 Min. Demand (ft* min.)	Peak 15 Min. Demand (ft)
Private Auto	258	**77**	2.0	1.0	**155**	20	**3,096**	**206**
Rental Car Shuttle*	84	**25**	2.7	1.0	**68**	35	**2,381**	**159**
Taxis	0	**0**	3.0	1.0	**0**	20	**0**	**0**
Limousines	31	**9**	3.0	1.0	**27**	30	**824**	**55**
Hotel Shuttles*	120	**36**	2.6	1.0	**94**	35	**3,276**	**218**
Airport Shuttles*	48	**14**	2.6	1.0	**37**	35	**1,310**	**87**
Off Airport Parking	54	**16**	2.8	1.0	**45**	35	**1,588**	**106**
Paid Shuttle	11	**3**	2.7	1.0	**9**	35	**304**	**20**
Total	**605**	**182**	n/a	n/a	n/a	n/a	n/a	**852**

Existing Curbfront Length	1,305	ft	Existing Capacity Ratio	**0.65**	
Effective Parking Capacity**	**1,305**	ft	Existing Level of Service (LOS)	**D**	
			Required LOS 'C' Curbfront Range = from	**1311**	ft
			to	**1549**	ft

* Demand based on shuttle frequency of 1 every 5 minutes per operator for rental car and parking shuttles and 1 every 20 minutes for hotel operators
** Double parking not permited on baggage claim level

Source: Landrum & Brown analysis, 2011

Table 4.8-3
CURBFRONT DEMAND CAPACITY ANALYSIS TERMINAL 2 – TICKETING CURB
Lambert-St. Louis International Airport

Curbfront Demand Capacity Analysis

Vehicle Type	Design Hour Demand in Vehicles	Peak 15 Minutes as % of Demand	Vehicle Dwell Time (min.)	Multiple Stop Factor	Peak 15 Min. Demand in Minutes	Vehicle Length (ft)	Peak 15 Min. Demand (ft* min.)	Peak 15 Min. Demand (ft)
Private Auto	155	**46**	2.0	1.0	**93**	20	**1,859**	**124**
Rental Car Shuttle*	0	**0**	2.7	1.0	**0**	35	**0**	**0**
Taxis	31	**9**	3.0	1.0	**27**	20	**550**	**37**
Limousines	18	**5**	3.0	1.0	**16**	30	**495**	**33**
Hotel Shuttles*	0	**0**	2.6	1.0	**0**	35	**0**	**0**
Airport Shuttles*	72	**22**	2.6	3.0	**168**	35	**5,897**	**393**
Off Airport Parking	0	**0**	2.8	1.0	**0**	35	**0**	**0**
Paid Shuttle	6	**2**	2.7	1.0	**5**	35	**183**	**12**
Total	**282**	**85**	n/a	n/a	n/a	n/a	n/a	**599**

Existing Curbfront Length	610	ft	Existing Capacity Ratio	**0.65**	
Effective Parking Capacity**	**915**	ft	Existing Level of Service (LOS)	**C**	
			Required LOS 'C' Curbfront Range = from	**921**	ft
			to	**1089**	ft

* Demand based on shuttle frequency of 1 every 5 minutes per operator for rental car and parking shuttles and 1 every 30 minutes for hotel operators
** Assumes diagonal parking configuration with ability to double park behind diagonally parked vehicles during peak periods

Source: Landrum & Brown analysis, 2011

Table 4.8-4
CURBFRONT DEMAND CAPACITY ANALYSIS TERMINAL 2 – ARRIVALS CURB
Lambert-St. Louis International Airport

Vehicle Type	Design Hour Demand in Vehicles	Peak 15 Minutes as % of Demand	Vehicle Dwell Time (min.)	Multiple Stop Factor	Peak 15 Min. Demand in Minutes	Vehicle Length (ft)	Peak 15 Min. Demand (ft* min.)	Peak 15 Min. Demand (ft)
Private Auto	138	**41**	2.0	1.0	**83**	20	**1,654**	**110**
Rental Car Shuttle*	42	**13**	2.7	1.0	**34**	35	**1,191**	**79**
Taxis	27	**8**	3.0	1.0	**24**	20	**489**	**33**
Limousines	16	**5**	3.0	1.0	**15**	30	**440**	**29**
Hotel Shuttles*	120	**36**	2.6	1.0	**94**	35	**3,276**	**218**
Airport Shuttles*	48	**14**	2.6	1.0	**37**	35	**1,310**	**87**
Off Airport Parking	54	**16**	2.8	1.0	**45**	35	**1,588**	**106**
Paid Shuttle	6	**2**	2.7	1.0	**5**	35	**162**	**11**
Total	**451**	**135**	n/a	n/a	n/a	n/a	n/a	**674**

Existing Curbfront Length	1,120	ft	Existing Capacity Ratio	**0.60**	
Effective Parking Capacity**	**1,120**	ft	Existing Level of Service (LOS)	**C**	
			Required LOS 'C' Curbfront Range = from	**1037**	ft
			to	**1225**	ft

* Demand based on shuttle frequency of 1 every 5 minutes per operator for rental car and parking shuttles and 1 every 20 minutes for hotel operators

** Double parking not permited on baggage claim level

Source: Landrum & Brown analysis, 2011

Table 4.8-5
PROJECTED CURBFRONT DEMAND CAPACITY TERMINAL 1 – TICKETING CURB
Lambert-St. Louis International Airport

	Peak 15 Minute Curbfront Demand (feet)				
Vehicle Type	**2008**	**2013**	**2018**	**2023**	**2028**
Private Auto	206	149	169	180	193
Rental Car Shuttle*	0	0	0	0	0
Taxis	61	44	50	53	57
Limousines	55	40	45	48	51
Hotel Shuttles*	0	0	0	0	0
Airport Shuttles*	393	393	393	393	393
Off Airport Parking	0	0	0	0	0
Paid Shuttle	20	15	17	18	19
Total	**735**	**641**	**673**	**692**	**713**
Level of Service	D	C	D	D	D
Curbfront range (feet) for LOS "C" from	1131	986	1036	1065	1097
to	1336	1165	1224	1259	1297

Source: Landrum & Brown analysis, 2011

Table 4.8-6
PROJECTED CURBFRONT DEMAND CAPACITY TERMINAL 1 – ARRIVALS CURB
Lambert-St. Louis International Airport

	Peak 15 Minute Curbfront Demand (feet)				
Vehicle Type	**2008**	**2013**	**2018**	**2023**	**2028**
Private Auto	206	139	147	165	186
Rental Car Shuttle*	113	113	113	113	113
Taxis	0	0	0	0	0
Limousines	55	37	39	44	50
Hotel Shuttles*	146	146	146	146	146
Airport Shuttles*	262	262	262	262	262
Off Airport Parking	82	82	82	82	82
Paid Shuttle	20	0	0	0	0
Total	**885**	**779**	**790**	**813**	**839**
Level of Service	C	B	B	B	B
Curbfront range (feet) for LOS "C" from	1361.5	1198.8	1215.4	1250.4	1290.7
to	1609	1417	1436	1478	1525

Source: Landrum & Brown analysis, 2011

Table 4.8-7
PROJECTED CURBFRONT DEMAND CAPACITY TERMINAL 2 – TICKETING CURB
Lambert-St. Louis International Airport

	Peak 15 Minute Curbfront Demand (feet)				
Vehicle Type	**2008**	**2013**	**2018**	**2023**	**2028**
Private Auto	124	185	200	210	221
Rental Car Shuttle*	0	0	0	0	0
Taxis	37	55	59	62	65
Limousines	33	49	53	56	59
Hotel Shuttles*	0	0	0	0	0
Airport Shuttles*	393	393	393	393	393
Off Airport Parking	0	0	0	0	0
Paid Shuttle	12	18	20	21	22
Total	**599**	**701**	**726**	**742**	**760**
Level of Service	C	D	D	D	D
Curbfront range (feet) for LOS "C" from	921	1078	1117	1142	1169
to	1089	1275	1320	1349	1382

Source: Landrum & Brown analysis, 2011

Table 4.8-8
PROJECTED CURBFRONT DEMAND CAPACITY TERMINAL 2 – ARRIVALS CURB
Lambert-St. Louis International Airport

	Peak 15 Minute Curbfront Demand (feet)				
Vehicle Type	**2008**	**2013**	**2018**	**2023**	**2028**
Private Auto	110	148	164	174	184
Rental Car Shuttle*	79	79	79	79	79
Taxis	33	44	48	51	54
Limousines	29	39	44	46	49
Hotel Shuttles*	218	218	218	218	218
Airport Shuttles*	87	87	87	87	87
Off Airport Parking	106	106	106	106	106
Paid Shuttle	11	15	16	17	18
Total	**674**	**737**	**763**	**779**	**796**
Level of Service	C	C	C	C	C
Curbfront range (feet) for LOS "C" from	1040	1130	1170	1200	1230
to	1230	1340	1390	1420	1450

Source: Landrum & Brown analysis, 2011

4.9 PUBLIC PARKING REQUIREMENTS

Currently there are 8,873 public parking spaces available on-airport. As evidenced by the presence of numerous off-airport parking providers, a portion of STL passengers are not served by the value proposition presented by the existing Super Park facilities.

Future parking demand is based on the number of projected originating passenger enplanements (passenger trips beginning or ending at STL) as well as peak parking demand. According to Central Parking staff, the month of March is typically considered peak seasons in terms of the number of originating passenger enplanements. The number of originating passenger enplanements is also high during the months of November and December.

To determine the projected airport parking demand, current peak parking utilization rates per 1,000 originating passenger enplanements were calculated for each parking facility. This ratio indicates the number of spaces needed at each facility to satisfy parking requirements during periods of high parking demand. The peak parking utilization ratio can then be applied to each parking facility for the years 2013, 2018, 2023 and 2028 to illustrate projected parking demand. **Table 4.9-1, *2008 Peak Parking Utilization Ratio***, shows the peak parking utilization ratio for each parking facility assuming the current size and utilization of each facility.

Table 4.9-1
2008 PEAK PARKING UTILIZATION RATIO
Lambert-St. Louis International Airport

PARKING FACILITY	ACTUAL # OF SPACES	PEAK UTILIZATION (%)	PEAK UTILIZATION (# OF SPACES)	PARKING UTILIZATION RATIO[1]
Lot D	1,223	88%	1,071	0.19
Lot B	486	98%	474	0.08
Lot C	3,174	90%	2,841	0.50
Lot A	993	75%	745	0.13
Terminal 1 Garage	2,017	90%	1,815	0.32
Terminal 2 Garage	980	100%	980	0.17
Total	**8,873**	**N/A**	**7,545**	**N/A**

Note: 1 The parking utilization ratio is calculated as (Peak Utilization / # of Originating Passenger Enplanements) x 1,000. In 2008, the estimated number of originating passenger enplanements was 5,663,666.

Source: Central Parking statistics and Landrum & Brown analysis, 2011

As shown, the demand for garage parking and lots B and C was quite high during the peak period in 2008. This high level of utilization combined with the fact that many off-airport paring providers have entered the market providing in excess of 14,000 additional spaces, suggests that the current parking utilization ratio is somewhat understated, particularly for Terminal 2 garage parking and Lot B. It is reasonable to assume that the utilization ratio of the Terminal 2 garage would more closely resemble the Terminal 1 garage utilization if sufficient space were available.

Further, given the similar pricing strategies and relative proximity to Terminal 1, it is reasonable to assume that the Lot B utilization would more closely resemble Lot C. **Table 4.9-2, *Projected Parking Demand***, shows the total projected peak parking demand for the years 2013, 2018, 2023 and 2028. This was calculated by multiplying the adjusted peak parking utilization ratio of each facility by the projected number of originating passenger enplanements for each specific year. The product was divided by 1,000 to estimate the peak parking demand in each facility for each of the planning years.

Table 4.9-2
PROJECTED PARKING DEMAND
Lambert-St. Louis International Airport

Parking Facility	Current Peak Demand	Parking Utilization Ratio[1]	Projected Peak Parking Demand (# of Spaces)[1]			
			2013	**2018**	**2023**	**2028**
Lot D	1,071	0.19	1,119	1,228	1,350	1,471
Lot B	474	0.10	589	646	710	774
Lot C	2,841	0.50	2,946	3,232	3,552	3,871
Lot A	745	0.13	766	840	923	1,007
Terminal 1 Garage	1,815	0.32	1,885	2,068	2,273	2,478
Terminal 2 Garage	980	0.26	1,532	1,680	1,847	2,013
Total Demand	**7,545**	**N/A**	**8,837**	**9,695**	**10,655**	**11,614**
Originating Enplanements	N/A	N/A	5,891,500	6,463,200	7,103,000	7,742,800

Note: 1 The projected parking demand is calculated as: (# of Originating Passenger Enplanements for each Specific Year x Parking Utilization Ratio) / 1,000.

Source: Landrum & Brown analysis, 2011

According to these calculations, the projected peak parking demand in 2013 is 8,837; an increase of 1,292 vehicles. By 2028, the projected peak parking demand is 11,614; an increase of 4,069 vehicles. It is anticipated, based on these calculations, that there would be a shortage of on-airport parking spaces before 2013 during peak seasons. Regarding specific parking facilities, there would be a shortage of spaces during peak seasons in the Terminal 2 Garage before 2013. Presently, parking at Terminal 1 Garage is also near capacity. Furthermore, the Terminal 2 Garage is at capacity three days a week during peak seasons from 7 a.m. to 3 p.m. When Garage 2 is full, passengers tend to park in Lot A, the Terminal 1 Garage, or select an off-site parking provider.

It is important to provide enough parking spaces to serve those with longer-term parking needs. By 2018, the peak demand at Lot C and Lot D is anticipated to be greater than the existing supply; the peak demand at Lot B will be greater than the existing supply shortly after 2013; and the demand at Lot A will exceed supply between 2023 and 2028. Therefore, to meet the projected peak parking demand, additional parking spaces would be needed before 2013.

4.10 TAXI AND LIMOUSINE STAGING AREA

Taxis presently park in the two separate staging areas along Airport Cargo Road and Pear Tree Drive. Currently, the taxi staging areas are considered adequate to meet current passenger demands however; the location of the Terminal 2 taxi staging is less than adequate. In terms of surface area required the taxi staging areas are not sufficient for future passenger demands in 2013, 2018, 2023, and 2028. The increase in staging areas required will need to be located within close proximity to the Terminal 2 area to support the growth in operations at that terminal. The taxi and limousine staging area requirements are shown on **Table 4.10-1, *Taxi/Limo Staging Area Requirements***.

Table 4.10-1
TAXI/LIMO STAGING AREA REQUIREMENTS
Lambert-St. Louis International Airport

YEAR	SQUARE FEET PER ORIGINATED PASSENGER	ORIGINATING PASSENGERS	AREA REQUIRED		SURPLUS/ (DEFICIT)	
			SQUARE FEET	ACRES	SQUARE FEET	ACRES
Actual						
2008	0.01	5,663,666	67,534	1.6	-	-
Forecast						
2013	0.01	5,891,500	70,300	1.6	(2,800)	(0.1)
2018	0.01	6,463,200	77,100	1.8	(9,600)	(0.2)
2023	0.01	7,103,000	84,700	1.9	(17,200)	(0.4)
2028	0.01	7,742,800	92,300	2.1	(24,800)	(0.6)
		Square Feet	**Acres**			
2008 Area Available:		67,534	1.6			

Sources: 2008 Airport Layout Plan Update, "STL Forecast Sensitivity_AA Cuts," and Landrum & Brown analysis, 2011.

4.11 PUBLIC TRANSPORTATION/LIGHT RAIL

The Metro Transit-St. Louis Agency (Metro) operates three public bus services to STL via Routes 45, 49, and 66. Route 45 runs eight stops, various times per day, from 4:21 a.m. to 10:52 p.m. Monday through Friday. There is a wide range of how many times Route 45 stops at its destinations. Route 45 runs only two times per day at the Valley Industries stop, and up to 24 times to the Village Square Shopping Center stop. It operates in a loop between stops in Ferguson, Florissant, and Hazelwood with intermediate stops. The bus route stops at STL at the bus stop located at Airport Road/North Hanley Road. This route is designed to serve Airport employees and not the general air traveler market. Therefore, it is anticipated that public transportation will not have a significant impact on the future transportation network capacity at STL. Similarly, it is not anticipated that bus Routes 49 and 66 will have a significant impact on the STL transportation network.

Metro also operates a light rail service, MetroLink, from both Terminal 1 and 2 to Shiloh-Scott Station in St. Clair County, Illinois. MetroLink runs from 4:00 a.m. to 12:30 a.m. daily, and conducts six train operations per hour. Passenger pickup for MetroLink is located in Terminal 1 at exit door MT1, on the upper level east of the American Airlines Credit Union. In Terminal 2, the MetroLink passenger pickup is located south of the terminal accessible through the parking garage on all levels. The average daily boarding's at the Terminal 1 MetroLink Station is 3,978 people, and is 1,095 people at the Terminal 2 MetroLink Station. According to the passenger survey conducted in 2006, approximately three percent of all STL passengers use the MetroLink station. Without major changes to the MetroLink network planned, this percentage is expected to remain constant over the planning period.

4.12 SUMMARY

The support facility requirements analysis identified a few facilities that need to be considered in the alternatives phase of the master planning process. Air cargo facilities and general aviation facilities are well positioned to provide for the short- and mid-term needs of the existing tenants; however, consideration for long-term needs must be incorporated into any discussion of on-airport lands that afford direct access to the taxiway network including those currently under consideration for collateral development opportunities. Discussions of terminal alternatives need to consider the constraints and limitations associated with the arrival level curbfronts at Terminal 1 and to a lesser degree Terminal 2. The number of off-airport parking providers and hotels providing shuttle service places a significant demand on the existing facilities. Finally, the airfield maintenance facilities do not function at the level required for efficient operation nor do they provide the necessary facilities to house the snow removal equipment; alternatives for rehabilitation or replacement of these facilities will be addressed in the alternatives evaluations.

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CHAPTER FIVE
AIRPORT CONCEPT DEVELOPMENT AND EVALUATION

INTRODUCTION

This chapter identifies and evaluates the airport development alternatives to meet the facility requirements for STL as defined in Chapter 4, *Demand/Capacity and Facility Requirements*. All major functional areas at STL require consideration during this process, which includes airfield development, terminal area expansion and aeronautical support functions. Other considerations include the potential for expanded auto parking and collateral development opportunities. A collateral development white paper was prepared as part of the master plan and is included as Appendix C. Many of the key functional areas of the airport are interrelated and affect the development potential of the surrounding land, either within the current 20-year planning horizon or beyond. The most viable plan will provide the optimum combination of financial viability, ease of construction, and flexibility to adapt to the needs of the aviation industry throughout the 20-year planning period and beyond.

5.1 AIRFIELD CONCEPTS

5.1.1 INTRODUCTION

This section investigates alternatives for providing capacity and capability enhancement of the airfield component within the context of the overall development plan for STL. Master plans strive to maximize efficiency and improve usability while meeting specific design criteria to maintain the highest possible levels of safety. As discussed in Chapter 4, the existing airside facilities at Lambert provide sufficient capacity to meet the demands of the forecast operations. This analysis, therefore, is focused on refinement of the existing airfield facilities to provide added efficiency, increased capability, improved levels of safety and reduced on-going maintenance by optimizing the airfield resources.

As discussed in Chapter 4, the potential for direct cargo service to Asia remains a part of the political and business discourse in St. Louis throughout the planning period. At the time of this report a final decision has not be made but talks with representatives from the People’s Republic of China appear to indicate a high likelihood of this service beginning in the near future. The aircraft type and specific destinations are not final but it current consensus indicates direct service will be provided to mainland China from STL utilizing a Boeing 747-400 Freighter. Analysis of the airfield performance of the 747-400 was conducted in Chapter 4 and the results of that analysis are incorporated in this discussion to understand the implications on the future airfield should the cargo service go into effect.

The following sections present an overview of the airfield alternatives analysis process and its findings. The analysis is presented in sections that describe the planning process and the objectives and evaluation of the runways and taxiways.

5.1.2 AIRFIELD PLANNING PROCESS

Ideas and concepts discussed with Airport staff and members of the advisory committees created the overall airfield development objectives, which guided the study. Given the capability of the airfield and the fact that the existing configuration meets the capacity needs of the forecast fleet throughout the planning period, the thrust of this analysis is on refinement of the existing facilities rather than an extensive large-scale airfield redevelopment. Alternatives and concepts identified were evaluated with regard to FAA design criteria and where applicable the relative ongoing cost to operate and maintain pavements.

5.1.3 AIRFIELD PLANNING OBJECTIVES

The airfield planning objectives identified in meetings with Airport staff and the advisory committees became the basis for developing and defining the evaluation criteria. The summarized airfield planning objectives are presented below:

- **Meet Needs Of 20-Year Planning Horizon and Beyond**
  - As currently configured, the airfield provides sufficient throughput capacity to meet the forecast demand; therefore, the primary objective is to maintain that capability.
  - Provide incremental capability in terms of efficiency and safety to maximize utility of existing infrastructure.
- **Minimize Ongoing O&M Costs Associated With Airfield Pavement**
  - Identify opportunities for airfield changes which eliminate pavement areas not needed for safe and efficient movement of aircraft

5.1.4 RUNWAY ALTERNATIVES ANALYSIS

Typically, a master plan for an Airport such as STL would include an extensive analysis of various runway alternatives to meet the capacity needs through the planning horizon. With the relatively recent opening of the third parallel runway, the runway system at STL provides sufficient capacity and the alternatives evaluated are focused on the potential need for runway length and improvement to existing runway safety areas.

5.1.4.1 Runway Length

As discussed in Chapter 4, *Demand/Capacity and Facility Requirements*, Runway 12R-30L at 11,019 feet long, provides sufficient capability to serve the existing and forecast aircraft fleet. However, given the introduction of direct cargo operations to Asia, specifically mainland China, there may be a need to provide additional runway length to accommodate the potential expansion of international cargo freight service.

The Boeing 747-400 Freighter aircraft is the potential equipment selected to provide cargo service to destinations in Asia, including mainland China. Analysis of the aircraft planning manuals indicate additional runway length requirements beyond the current 11,019 feet, assuming the aircraft departs at maximum takeoff weight (MTOW) during the hot weather conditions experienced in the summer months in St. Louis. Although the decision to start cargo operations is not final, it is prudent to assume that the aircraft may operate at MTOW during summer months to understand the potential implications. Clearly future decisions and opportunities with regard to cargo operations may have impacts on the runway length needed. An analysis of runway length requirements for the 747-400, during hot temperature days at MTOW, indicates the need for an additional 581 feet to provide sufficient runway length. The total length required would be 11,600 feet. It is important to note that operating at less than MTOW or during cooler time-periods reduces the need for additional runway length.

Both taxiways, Charlie and Delta, will extend to the future end of runway pavement. Extending both taxiways provides the same operational flexibility as the current configuration. However, the current and forecast demand levels do not support the need for both taxiways. It is possible that market forces may change and the flexibility associated with the dual parallel taxiways may be justified at a future date. For purposes of the airport master plan, it is prudent to protect the space for extension of the runway and both taxiways, yet recognize the fact that analysis of the costs associated with extending both taxiways may ultimately result in the construction of a single parallel taxiway to the end of the runway.

Finally, please note that the recommended runway length of 11,600 feet is significantly less than the runway extension suggested by the previous airport master plan. The primary reason for the previous runway extension was to relocate the imaginary surfaces associated with the runways such that the midfield terminal concept did not penetrate the surfaces. As discussed in Section 5.2.5 the midfield terminal is not moving forward and thus the runway length associated with clearing the terminal is no longer required.

5.1.4.2 Threshold Displacements

It is possible to provide the necessary physical pavement length by extending either end of Runway 12R-30L by 581-feet to provide 11,600. However to maximize the benefit of any additional runway pavement, the airspace beyond the runway ends must be evaluated to understand the impact of surrounding terrain and objects. To evaluate the utility of the runway extension it is important to understand the potential increase in both departure runway length available and arrival runway length available. As currently configured, the runway has displaced arrival thresholds at each end. The 30L approach is displaced 201 feet and the 12R approach is displaced 467 feet to accommodate obstructions located in the imaginary surfaces. Over time, the obstructions in the approach and departure surfaces change. To understand the impact of extending the runway, the obstruction data for the two ends of Runway 12R-30L was evaluated to determine if the arrival threshold displacements are still necessary or if the thresholds can be un-displaced.

Runway 30L Obstruction Analysis:

Review of the previously completed 2008 ALP Update and associated ALP narrative report did not provide definitive identification of the object or objects that penetrate the arrival surfaces or control the location of the arrival threshold for Runway 30L. Additionally, the airspace analysis conducted as part of this master plan did not identify any objects below the imaginary surfaces, which could be identified as the controlling object for the 201-foot threshold displacement. Simply stated, the object or objects that drove the need for the current arrival threshold displacement for Runway 30L are not known.

A thorough evaluation of the objects within the Runway 30L approach surfaces identified no objects that would preclude the relocation of the arrival threshold to the physical end of runway. As shown in plan and profile views below (see **Exhibit 5.1-1a, *Runway 30L TERPS W Surface Plan View***, and **Exhibit 5.1-1b, *Runway 30L TERPS W Surface Profile View***), the obstacles identified in the Runway 30L approach consist of the final three lights of the MALSR Approach Light System (ALS). Relocating the Runway 30L arrival threshold to the end of physical pavement requires the clearing of a 34:1 OCS. The final three approach lights (object numbers 8005, 8008, and 8010; in red) would penetrate the TERPS W surface if left in their current location; however, the relocation of the arrival threshold would require that these lights be relocated and reconfigured, and any penetration would be mitigated at that time.

Based on the information presented in the previous paragraphs, it appears that the entire 201-foot Runway 30L displaced threshold could be regained for arrivals. However, Runway 30L has existing design deficiencies relative to longitudinal grades, grade changes, and vertical curves that need to be addressed independent of the location of the runway end or threshold; these issues are presented below.

- The grade at the approach end of Runway 30L exceeds allowable gradients. The first 201 feet of Runway 30L has a negative slope of 1.6%, which exceeds the maximum allowable longitudinal grade of ±1.5 percent anywhere on the runway, as defined in AC 150/5300-13 section 502.2(a). Additionally this exceeds the maximum allowable longitudinal grade of ±0.8 percent in the first and last quarter of the runway length, as defined in AC 150/5300-13 section 502.2(a). These are an issue both with and without the 201-foot displaced threshold.
- The previous Master Plan (circa 2008) documented an issue concerning a vertical curve in the first quarter of Runway 30L at 750 feet. This is an issue both with and without the 201-foot displaced threshold.

Exhibit 5.1-1a
RUNWAY 30L TERPS W SURFACE PLAN VIEW
Lambert-St. Louis International Airport

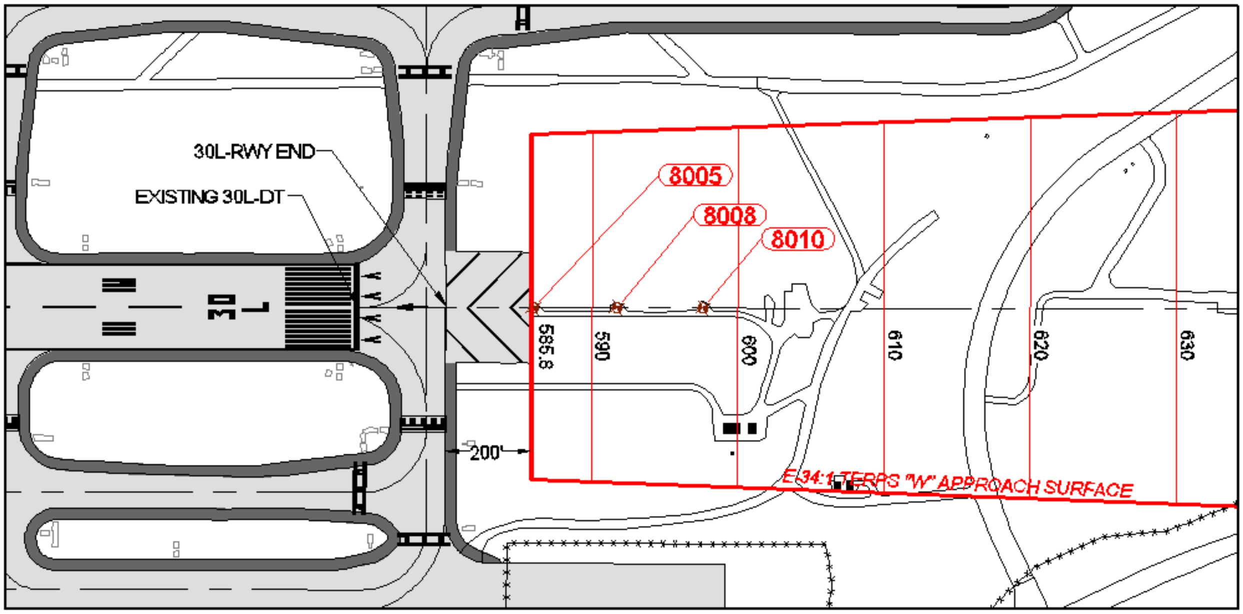
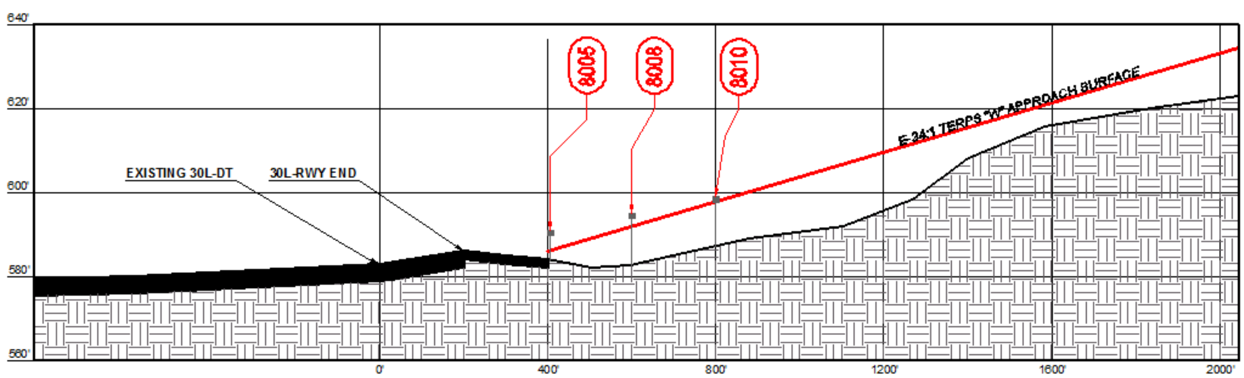


Exhibit 5.1-1b
RUNWAY 30L TERPS W SURFACE PROFILE VIEW
Lambert-St. Louis International Airport



According to the previous 2008 master plan and the current master plan, the aforementioned runway gradient design deficiencies are to be "corrected during reconstruction if feasible." Therefore, the existing Runway 30L arrival threshold could be relocated to the end of pavement (essentially un-displaced) and the length recovered for Runway 30L approaches when the gradient issues and vertical curves described above are corrected (i.e. Alternative 1).

Another option (i.e. Alternative 2) would be to eliminate the 201-foot displaced threshold by relocating the end of runway to the existing Runway 30L displaced threshold. This option would require Taxiway H to be relocated, as well as addressing the gradient issues and vertical curves described above. This option would shorten the runway by 201 feet. These two alternatives are described and analyzed in Appendix D.

Based on the analysis presented in Appendix D, the preferred location for the Runway 30L arrival threshold is at the existing end of runway pavement (i.e. Alternative 1). As discussed, there are design deficiencies relative to gradients and grade changes identified on Runway 30L. These deficiencies, along with any potential transverse gradient issues, should be addressed when the Runway is scheduled for reconstruction, and corrected if deemed practicable at that time. Based on this analysis, it would be possible to either: (1) relocate the existing arrival threshold to the end of pavement (essentially un-displaced), or (2) eliminate the 201-foot displaced threshold by relocating the end of runway to the existing Runway 30L displaced threshold and relocate Taxiway H, however, the runway gradients and grade issues will need to be addressed. Based on preliminary order of magnitude costs, Alternatives 1 and 2 are within 10 percent of one another, with Alternative 2 being the least expensive. However, this analysis did not include any obstacle mitigation costs that might be identified during the preliminary design phase; but it is likely that obstacle mitigation costs for Alternative 2 would be higher than Alternative 1 since the approach surface would be lower in elevation and therefore result in more obstructions. In addition, Alternative 2 results in a loss of 201 feet of departure length, which would require an additional 201-foot extension to Runway 12R to meet the runway length requirements identified in the current master plan.

In comparison, the Runway 30L Landing Distance Available (LDA) would increase by 201 feet with Alternative 1 (the removal of the existing 201-foot displaced threshold). At this time, the cost differential between Alternatives 1 and 2 is not significant enough to overcome the loss in operational capability resulting from Alternative 2. Therefore, relocating the existing arrival threshold to the end of pavement is the preferred alternative for the current master plan.

Runway 12R Obstruction Analysis:

As with the 30L approach end, review of the 2008 ALP Update and associated ALP narrative report did not identify an object or objects that penetrate the arrival surfaces to Runway 12R. The airspace analysis process described above did not identify any objects below the imaginary surfaces, which could be identified as the controlling object for the 467-foot threshold displacement. At some point in time, the controlling object, which resulted in the 467-foot threshold displacement, was removed.

While the service road closest to the 12R approach end of the runway clearly results in a penetration of the existing OCS surface and should be closed permanently or relocated to eliminate all traffic, it is not the controlling object for the 467-foot threshold displacement. The current master plan will show the service road to be relocated. Therefore, for this analysis, it is assumed that the service road will not be an obstacle.

Analysis of the traverse points and obstruction data reveal that the critical obstruction within the existing arrival surfaces is Banshee Road. **Exhibit 5.1-2a, *Runway 12R TERPS W Surface Plan View Existing Condition*** and **Exhibit 5.1-2b, *Runway 12R TERPS W Surface Profile View Existing Condition***, provide the profile and plan view of the existing condition of the TERPS W Approach Surface associated with Runway 12R. As shown, the alignment and elevation of Banshee road, with the appropriate 15-foot adjustment for vehicle traffic, is below the existing TERPS W surface. The most restrictive Banshee Road traverse point is 2.5 feet below the existing TERPS W surface.

Exhibit 5.1-2a
RUNWAY 12R TERPS W SURFACE PLAN VIEW EXISTING CONDITION
Lambert-St. Louis International Airport

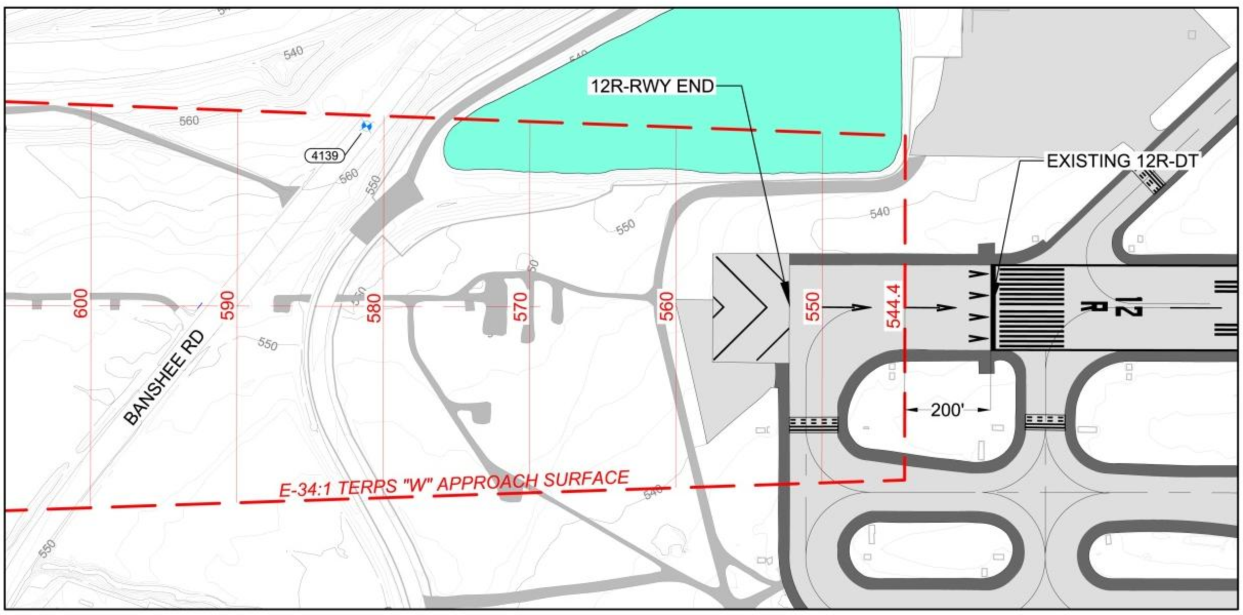
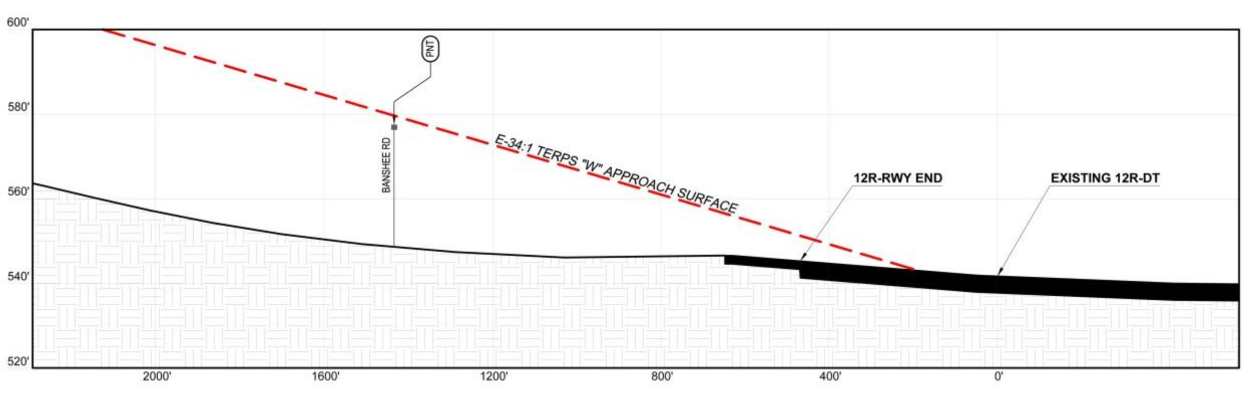


Exhibit 5.1-2b
RUNWAY 12R TERPS W SURFACE PROFILE VIEW EXISTING CONDITION
Lambert-St. Louis International Airport



To determine the amount of runway length that could potentially be recaptured by relocating the existing arrival threshold, the TERPS W surface was relocated westward along the runway centerline to the point at which the surface begins to contact the point in space 15 feet above Banshee Road. As shown in **Exhibit 5.1-2c, *Runway 12R TERPS W Surface Plan View Potential Threshold Relocation***, and **Exhibit 5.1-2d, *Runway 12R TERPS W Surface Profile View Potential Threshold Relocation***, below, the net gain is 86 feet. Attempts to recapture any additional runway length, beyond the 86 feet, would require the relocation of Banshee Road.

Exhibit 5.1-2c
RUNWAY 12R TERPS W SURFACE PLAN VIEW POTENTIAL THRESHOLD RELOCATION
Lambert-St. Louis International Airport

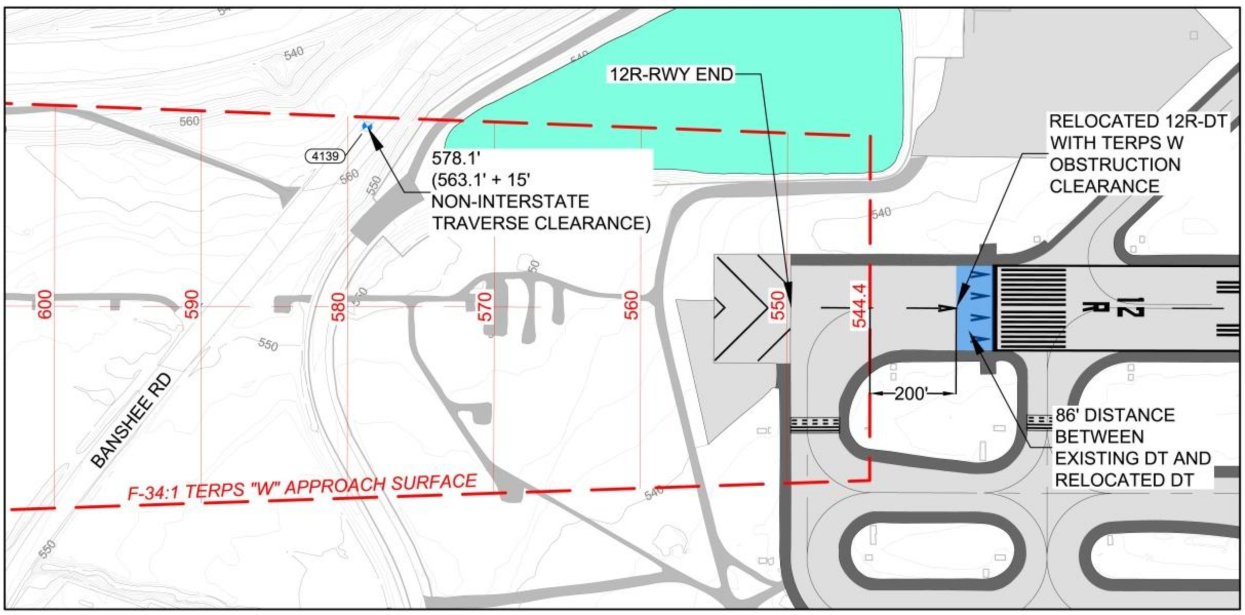
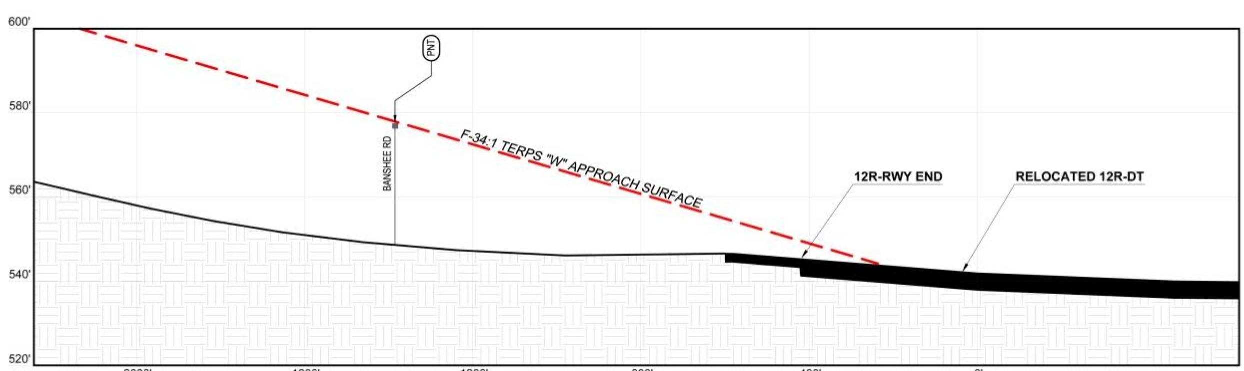


Exhibit 5.1-2d
RUNWAY 12R TERPS W SURFACE PROFILE VIEW POTENTIAL THRESHOLD RELOCATION
Lambert-St. Louis International Airport



Because of the planned 581-foot extension to Runway 12R, Banshee Road will need to be relocated to the west to avoid the future Runway Protection Zone, Runway Safety Area and Object Free Area. Therefore, for this analysis, it is assumed that Banshee Road will not be a penetration to an arrival threshold located at the end of the future 581-foot extension or the existing 467-foot displaced threshold. As a result, the entire 1,048 feet (581 feet + 467 feet) could be used for arrivals/LDA. As long as the existing airport service road and Banshee Road are relocated, the future Runway 12R arrival threshold will not require a displacement.

Please note that there will be the need for clearing of terrain and obstacles within the on-airport property in order to satisfy FAR Part 77 Precision approach requirements. However, this will be required with or without the 1,048-foot displaced threshold. All obstacles have been identified in the ALP Plans Package and have a disposition noted.

While the Runway 12R extension is required to meet departure length requirements identified by the current master plan, there are no obstructions that necessitate the extension be constructed as a displaced threshold, as long as the existing Airport service road and Banshee Road are relocated. The service road and Banshee Road will have to be relocated as a result of the Runway 12R extension and its safety surfaces, regardless if the extension is constructed as a displaced threshold or not. Therefore, for this analysis, it is assumed that the service road and Banshee Road will not be an obstacle and the 581-foot Runway 12R extension can be built for departures as well as takeoffs (i.e. no displaced threshold). As a result, the future Runway 12R LDA would increase by 1,048 feet with the removal of the existing 467-foot displace threshold and no need to displace the future 581-foot runway extension.

5.1.4.3 Runway Safety Areas

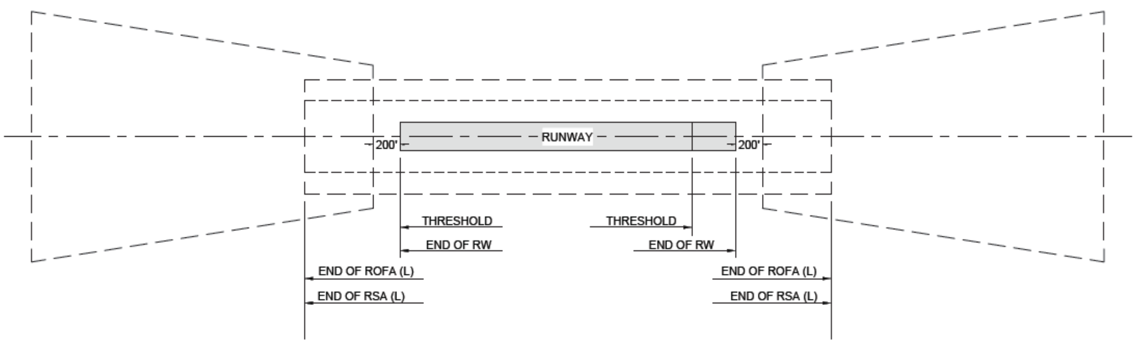
Two of the eight runway ends at Lambert do not provide full 500-foot wide by 1,000-foot long runway safety areas; 12L and 24. Each of the deficient runway ends is mitigated with the use of declared distances. **Table 5.1-1, *Declared Distances for Runways 12L-30R and 6-24***, provides an overview of the declared distances for each of the deficient runway ends. While these distances do not match the distances currently published in the FAA's Airport Facility Directory, North Central U.S. Effective November 15, 2012, they indicate the lengths available when evaluating the RSAs with a strict interpretation of the application of the fixed by function requirement in AC150-5300 with regard to navigational aids in the RSA. Given the declared distances published in the FAA's Airport Facility Directory, the Localizers for Runway 12L and 24 are currently located within the respective Runway Safety Areas. Localizers, by definition, are not fixed by function and are therefore precluded from the RSA. It is recommended that the declared distances for these runways be adjusted to reflect the lengths provided in Table 5.1-1 until such time that the localizers are relocated outside the full length RSA. **Exhibit 5.1-3, *Declared Distances Calculations for All Runways***, illustrates how the Declared Distances for all the runway were calculated.

Table 5.1-1
DECLARED DISTANCES FOR RUNWAYS 12L-30R AND 6-24
Lambert-St. Louis International Airport

RUNWAY	LENGTH (FT)	TORA (FT)	TODA (FT)	ASDA (FT)	LDA (FT)
Runway 6	7,602	7,602	7,602	7,348	7,348
Runway 24	7,602	7,602	7,602	7,602	7,602
Runway 12L	9,012	9,012	9,012	9,012	9,012
Runway 30R	9,012	9,012	9,012	8,947	8,947

Source: Landrum & Brown analysis

Exhibit 5.1-3
DECLARED DISTANCE CALCULATIONS FOR ALL RUNWAYS
Lambert-St. Louis International Airport



APPENDIX 14:
DECLARED DISTANCES

Takeoff Run Available (TORA) is the runway length declared available and suitable for the ground run of an airplane take off. The Departure Runway Protection Zone (DPRT-RPZ) at the end of runway controls the TORA. The TORA can not exceed Runway Length.

TORA = The distance between the start of takeoff and the start of RPZ minus 200 feet.

Takeoff Distance Available (TODA) is the TORA plus the length of any remaining runway or clearway (1.25%) beyond the far end of the TORA. The clearway is clearly defined area connected to and extending beyond the runway end available for completion of the take off operation of turbine-powered airplanes. According to the FAA standards the clearway must be at least 500 feet wide centered on the runway centerline. The TODA can not exceed the Runway Length plus 1,000 feet.

TODA = The distance between the start of takeoff and the end of runway plus clearway

Accelerate Stop Distance Available (ASDA) is the runway plus stopway length declared available and suitable for the acceleration and deceleration of an airplane aborting a takeoff. The stopway is an area beyond the takeoff runway centered on the extended runway centerline. The Runway Safety Area (RSA) length beyond the far end of runway controls the ASDA.

ASDA = The distance between the start of takeoff and the actual end of RSA or OFA (whichever is shorter) minus the recommended length of RSA or OFA (per FAA AC 150/5300-13) plus stopway

Landing Distance Available (LDA) is the runway length declared available and suitable for a landing airplane.

LDA = The distance between the displaced threshold and the actual end of RSA or OFA (whichever is shorter) minus the recommended length of RSA or OFA (per FAA AC 150/5300-13)

DECLARED DISTANCES

ITEM	RUNWAY 12L-30R (9,012')			
	12L		30R	
	EXISTING	*FUTURE*	EXISTING	*FUTURE*
TORA	9,012	9,012	9,012	9,012
TODA	9,012	9,012	9,012	9,012
ASDA	9,012	9,012	8,947 *2	9012 *1
LDA	9,012	9,012	8,947 *2	9012 *1

ITEM	RUNWAY 11-29 (9,000')			
	11		29	
	EXISTING	*FUTURE*	EXISTING	*FUTURE*
TORA	9,000	9,000	9,000	9,000
TODA	9,000	9,000	9,000	9,000
ASDA	9,000	9,000	9,000	9,000
LDA	9,000	9,000	9,000	9,000

ITEM	RUNWAY 6-24 (7,602')			
	6		24	
	EXISTING	*FUTURE*	EXISTING	*FUTURE*
TORA	7,602	7,602	7,602	7,602
TODA	7,602	7,602	7,602	7,602
ASDA	7348 *5	7602 *1	7,602	7,602
LDA	7348 *5	7602 *1	7,602	7,602

ITEM	RUNWAY 12R-30L (EXISTING 11,019') (FUTURE 11,600')			
	12R		30L	
	EXISTING	*FUTURE* *6	EXISTING	*FUTURE* *6
TORA	11,019	11,600	11,019	11,019
TODA	11,019	11,600	11,019	11,019
ASDA	11,019	11,600	11,019	11,600
LDA	10,552 *3	10552 *7	10,818 *4	11,399 *4

Declared Distance Notes

*1 LOCALIZER TO BE RELOCATED TO A MINIMUM OF 1000' FROM RUNWAY END
*2 R/W 12L RSA BEYOND R/W END IS 65' SHORT OF 1,000' STANDARD (LOCALIZER)
*3 R/W 12R HAS A 467' DISPLACED THRESHOLD
*4 R/W 30L HAS A 201' DISPLACED THRESHOLD
*5 R/W 24 RSA BEYOND R/W END IS 254' SHORT OF 1,000 STANDARD (LOCALIZER)
*6 R/W 12R HAS A 581' EXTENSION PLANNED INTENDED TO ENHANCE 12R DEPARTURES, NOT 30L DEPARTURES.
*7 R/W 12R HAS A 1048' DISPLACED THRESHOLD

Although mitigation by use of declared distances is acceptable, the extension of the RSA to full length and width where practicable is preferred. If providing a full length and width RSA is not possible, several options are available to the airport including installation of an Engineered Materials Arrestor System (EMAS), use of declared distances, and reduced dimensions of the RSA. These four alternatives were assessed in this analysis of the four deficient RSAs:

1. **Extension of RSA to full length and width**
2. **Installation of EMAS bed off the existing end of runway**
3. **Declared distances**
4. **Reduced dimensions**

As stated above, two of the eight runway ends at STL do not have the regulatory required RSA dimensions directly off the respective runway pavement edges. The four RSA design deficiencies are as follows:

1. **Runway 12L RSA – Length 935', Deficiency 65'**
2. **Runway 24 RSA – Length 746', Deficiency 254'**

5.1.4.4 Runway 24 Approach RSA Alternatives

In an effort to resolve the RSA deficiencies for Runway 6-24, four alternatives were identified and assessed in this analysis. Only one of the Runway 6-24 alternatives investigated involve the deployment of an EMAS on one existing runway end. The alternatives are as follows:

1. **Installation of a Standard 70-knot EMAS on the north end of Runway 6-24 with no shift in the runway alignment** – As shown in **Exhibit 5.1-4, *Runway 24 Approach – RSA with EMAS***, the EMAS bed dimensions are 600' long by 190' wide contained within the existing RSA dimensions (750' long by 500' wide). The alternative does not involve a relocation of the localizer or a relocation of Banshee Road in order to provide for a conforming RSA. This option eliminates the need for declared distances on Runway 6-24.
2. **Relocation of the localizer with RSA extension the extent possible without affecting adjacent roadway** – Construct a 1,000' long by 500' wide full length RSA in the approach to Runway 24. As shown in **Exhibit 5.1-5, *Runway 24 Approach – Full Width RSA***, the localizer is relocated to a point approximately 1,050 feet from the end of the runway. A small portion of the RSA (the northeastern most corner), located approximately 910 feet from the runway end, is excluded to permit the relocation of the service road along the perimeter fence; this will allow Banshee Road to remain in its current alignment. The application of declared distances would normally be required due to the penetration of the service road into the RSA. However, representatives of the FAA have indicated that due to the low utilization of the runway and the limited number of aircraft excursions that roll beyond 910 feet, they would be agreeable to a non-conforming RSA without use of declared distances (based on Figure A8-1

in FAA Airport Design AC 150/5300-13). The FAAs recognizes that the Airport would in fact be improving the existing condition to the extent practicable, given limited runway utilization and the extensive costs associated with relocating Banshee Road.

3. **Relocation of the localizer with RSA extension the extent possible with a 90-foot reduction in available runway** – Similar to Option 2 above, except the length of the RSA lost to the small portion in the Northeast corner would be mitigated with declared distances. The declared distances would reduce the runway length by approximately 90 feet.
4. **Declared distance** – This alternative utilizes the existing RSA dimensions (746' long by 500' wide) and utilizes declared distances to provide for a full RSA. This is the existing condition as shown in **Exhibit 5.1-6, *Runway 24 Approach – Declared Distances***.

Given the limited utilization of the runway, alternative 1 is not considered practical due to the significant costs associated with installing and maintaining an EMAS system. The short-term recommendation is to continue with the existing declared distances until money is available to relocate the localizer outside the RSA to permit the length to be extended to 910 feet as described in option 2 above. The current FAA plans indicate that the money will be available for this project in 2015.

Exhibit 5.1-4
RUNWAY 24 APPROACH – RSA WITH EMAS
Lambert-St. Louis International Airport

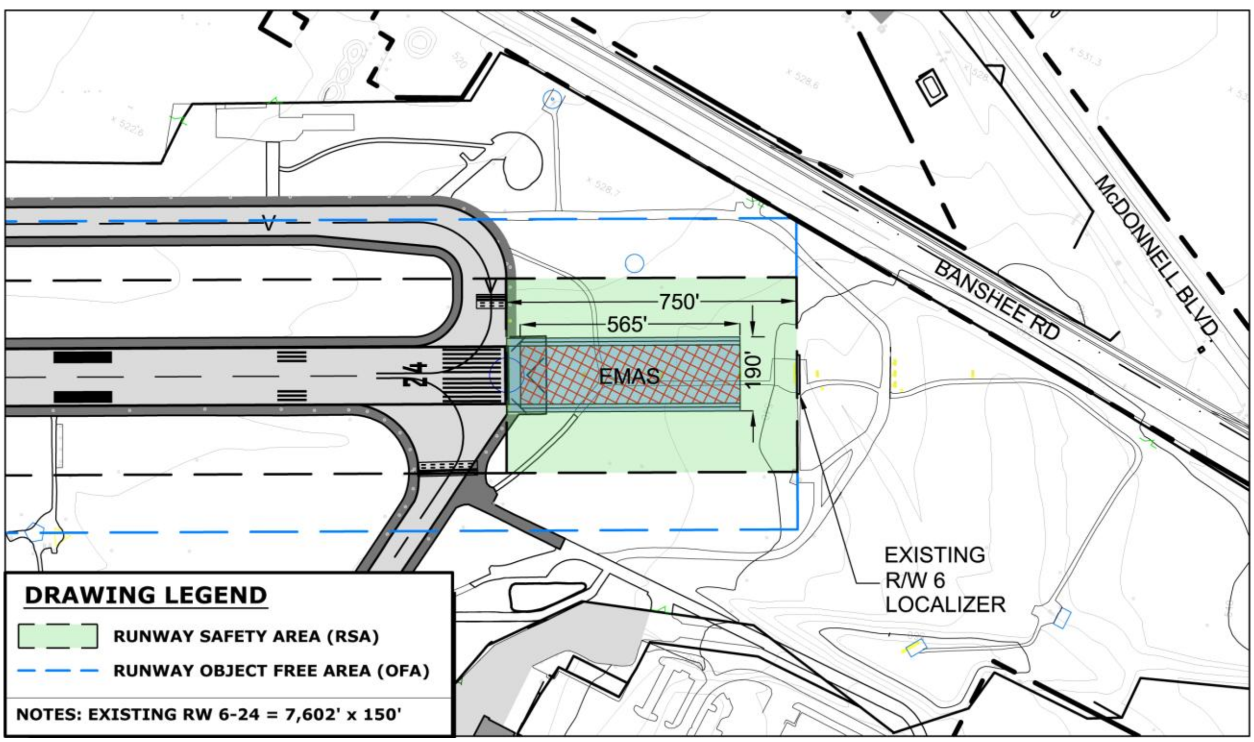


Exhibit 5.1-5
RUNWAY 24 APPROACH - FULL WIDTH RSA
Lambert-St. Louis International Airport

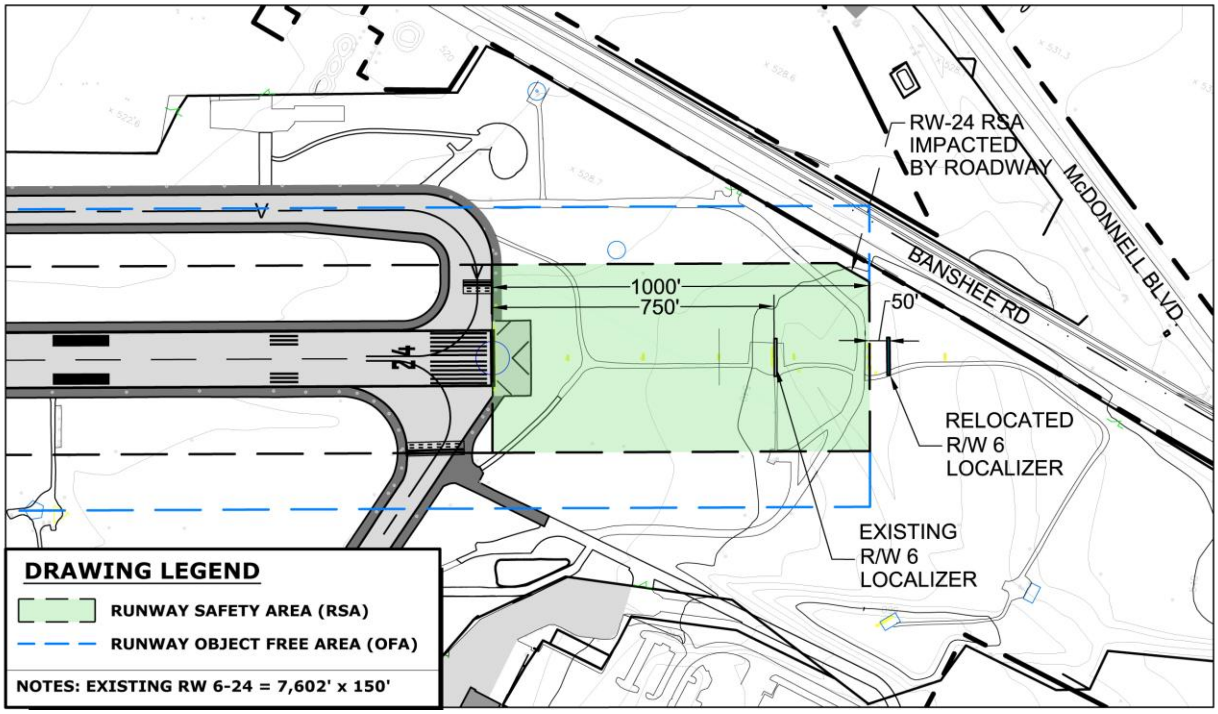
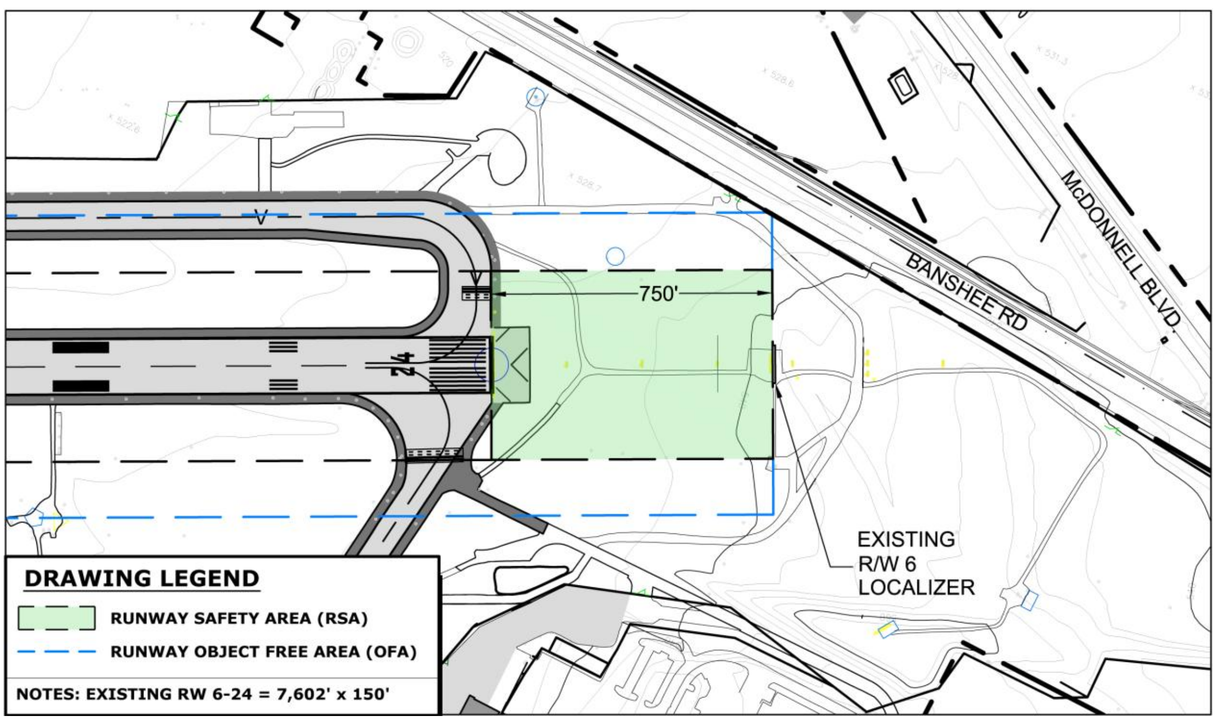


Exhibit 5.1-6
RUNWAY 24 APPROACH - DECLARED DISTANCES
Lambert-St. Louis International Airport



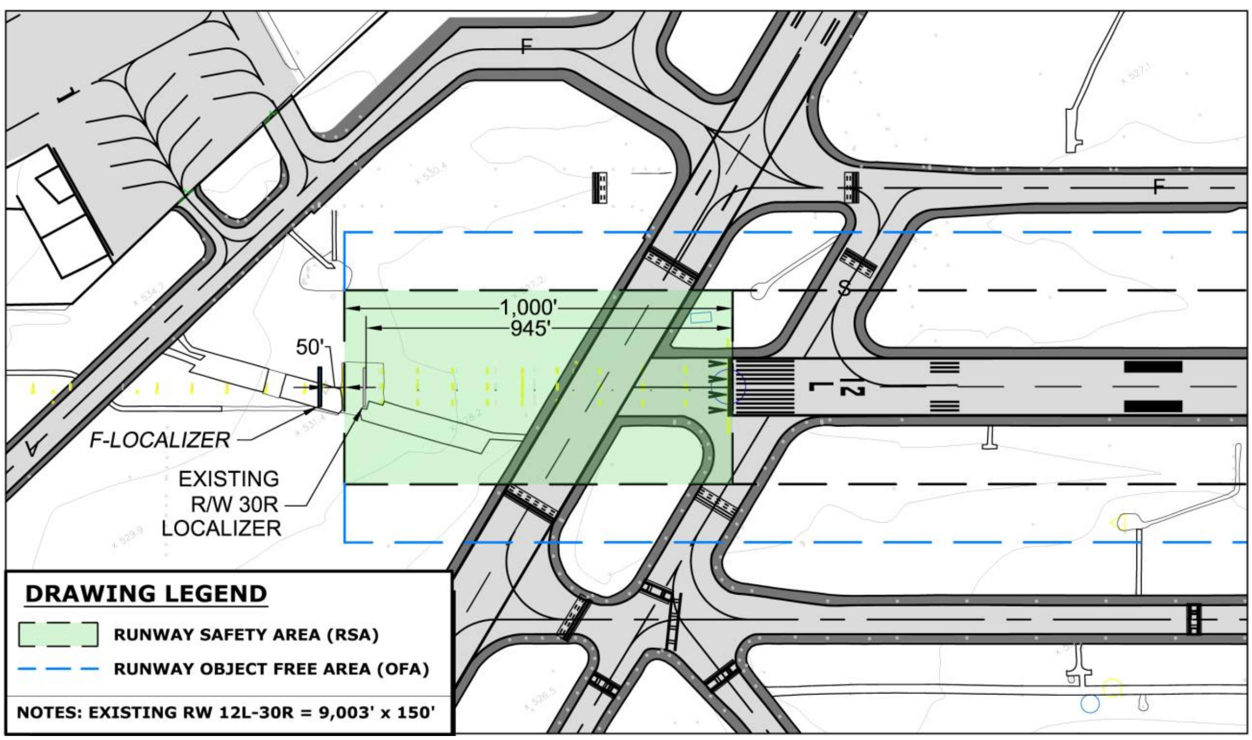
5.1.4.5 Runway 12L Approach RSA Alternatives

Similarly, for Runway 12L-30R, the two options evaluated to resolve the RSA deficiencies include extending to full length RSAs and declared distances. EMAS was not considered as a viable alternative due to the availability of land beyond the end of runway.

1. **Relocation of the localizer with RSA extension of full length with RSA extension of full width and reduced declared distances –** Construct 1,000' long by 500' wide full length RSA's off 12L approach end. As shown in **Exhibit 5.1-7, *Runway 30L Approach – Full Length and Width RSA***, this option relocates existing Runway 30R localizer west along extended runway centerline to a point 1050' beyond end of pavement. This option eliminates the need to utilize declared distances to mitigate the 55-foot deficiency.
2. **Declared distance –** This alternative utilizes the existing suitable RSA area off the runway and utilizes declared distances to provide the 65-feet for compliance on the Runway 12L Approach end of the runway.

The short-term recommendation is to continue with the existing declared distances until the money is available to relocate the localizer outside the RSA. Please note that the FAA ATO is currently evaluating the disposition of the Runway 30R localizer.

Exhibit 5.1-7
RUNWAY 12L APPROACH – FULL LENGTH AND WIDTH RSA
Lambert-St. Louis International Airport



Note: The FAA ATO is currently evaluating the disposition of the Runway 30R localizer.

5.1.5 TAXIWAY IMPROVEMENTS

Secondary to runway alternatives and improvements are taxiway improvements. An airport's taxiway system must complement and coordinate with its runway system to keep aircraft traffic flows moving smoothly and unconstrained on the ground. All existing runways at STL have a full-length parallel taxiway and in some places, there is a dual-parallel taxiway system with bypass capability at the runway departure ends. This type of taxiway system is important to provide adequate departure sequencing and queuing opportunities.

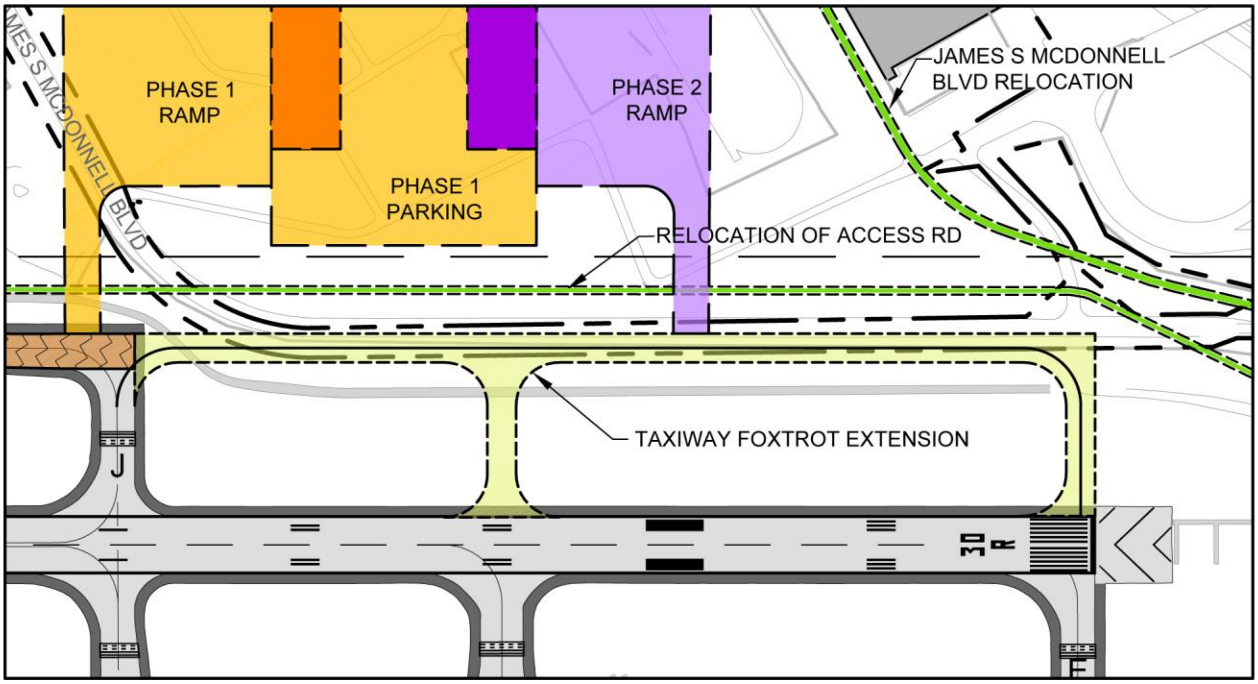
5.1.5.1 Taxiway Foxtrot Extension

As currently configured Runway 12L-30R has a single full length parallel taxiway to the south, Taxiway Echo, and a single taxiway to the north, Taxiway Foxtrot, that extends from the 12L approach end at Taxiway Sierra to the intersection with Taxiway Juliet. From Taxiway Juliet to the 30R Approach end, the runway has a single parallel taxiway, Taxiway Echo, and does not provide bypass capabilities. From an operational perspective, this situation can be problematic in both arrival and departure modes.

The first challenge is for aircraft arriving on Runway 12L taxiing to facilities north of the runway. Aircraft requiring more than 6,400 feet of runway length will not be able to make the 90-degree exit at Taxiway Juliet; and must then exit to Taxiway Echo and subsequently cross the runway to access the parking position at the FBO or one of the cargo facilities. Although the population of aircraft that regularly need more than 6,400 feet in landing length is limited, it does include most of the cargo aircraft utilizing the airfield and in limited operating scenarios, some of the larger corporate jets. The extension of Taxiway Foxtrot to the end of runway with a connecting taxiway aligned with Taxiway Hotel, as shown in **Exhibit 5.1-8, *Taxiway Foxtrot Extension***, would provide additional exits to the north, reducing the number of runway crossings and providing a safer operation with less opportunity for aircraft movement conflicts.

Extension of Taxiway Foxtrot to the end of the runway also permits the continued use of the entire length of Runway 12L-30R during scenarios where sections of Taxiway Echo in the midfield are under construction. In the current configuration, any construction on Taxiway Echo east of Taxiway Juliet would reduce the available runway length to 6,400-feet unless aircraft were permitted to back-taxi on the runway; back taxiing is not a desirable solution for a busy airfield. When interviewed, ATCT personnel indicated that while the additional taxiway was not necessary, it would be beneficial and provide additional flexibility to their operation. It is acknowledged that this project would not be undertaken until such time it could be fully justified by demand.

Exhibit 5.1-8
TAXIWAY FOXTROT EXTENSION
Lambert-St. Louis International Airport



5.1.5.2 Taxiway Victor Realignment

Runway end 12R has a single access/exit taxiway to the north, Taxiway Victor, that connects the north and east sides of the airport to the Runway 12R threshold. As currently configured, Taxiway Victor enters the Runway 12R end at an angle and if an aircraft intends to depart from the physical end of pavement it must cross over the threshold for Runway 12R and enter the runway from the south via Taxiways Delta or Charlie. From an operational perspective, this situation can be problematic in both arrival and departure modes.

Initial evaluations were conducted relative to the realignment of Taxiway Victor; this evaluation indicated the entire storm water detention structure would be eliminated as well as numerous impacts to access roads within the Airport Operations Area (AOA). This evaluation is presented below.

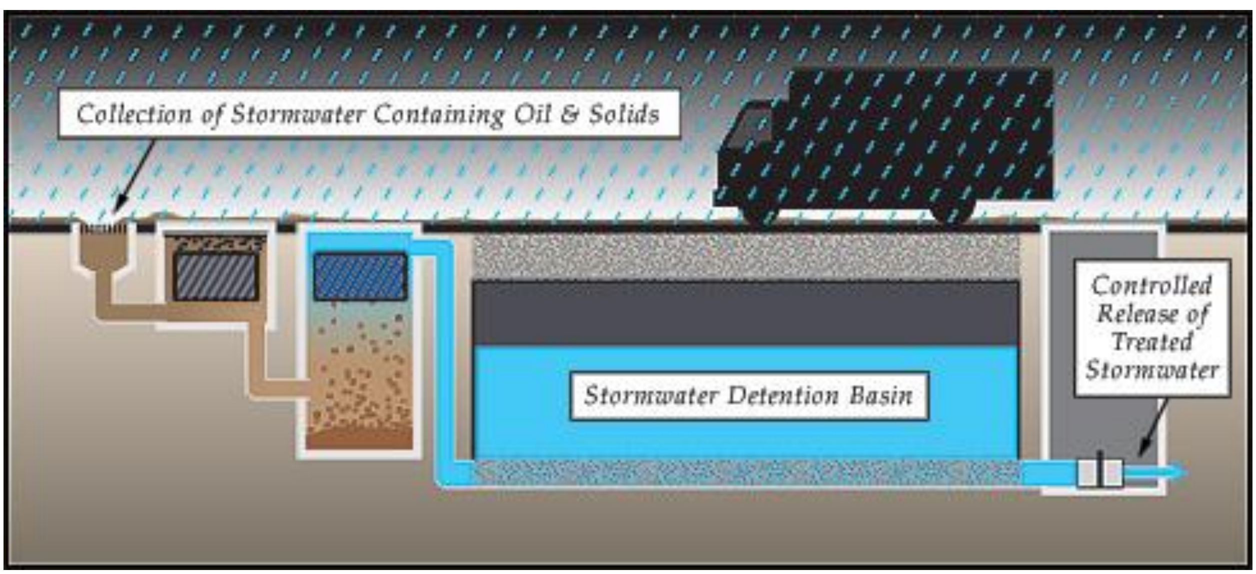
The detention basin located directly north of the Runway 12R Approach serves to capture water run-off from Lindbergh Boulevard. The roadway alignment was changed as part of the Airport expansion project associated with the addition of Runway 11-29 to the airfield. The newly aligned portion of Lindbergh Boulevard is depressed from the natural terrain from the intersection with Natural Bridge Road through the tunnel under Runway 11-29, adjacent to Fee Fee Road and Missouri Bottom Road. The road bed returns to the original elevation in the vicinity of Missouri Bottom Road.

Storm water run-off from the majority of the roadway north and east of the extended centerline of Runway 12L-30R is routed through the detention basin in question. To realign and extend Taxiway Victor parallel to Runway 12L-30R to the end of runway, a significant portion of the detention basin will need to be eliminated. Given the topography constraints in the area and the proximity to the Coldwater Creek culvert, options to relocate to other parts of the airfield are limited. Initial analysis has identified a few potential options to reclaim sufficient detention basin capacity should the Taxiway Victor extension and realignment proceed.

The first option is to reconfigure the existing basin by extending to the east into the paved area currently used to test airfield marking equipment and to store assorted construction materials, aggregate and soil. The resulting shape would be more elongated but appears to provide sufficient area to retain the necessary capacity.

The second option is to create/install subsurface storm water detention basins (see **Exhibit 5.1-9, *Subsurface Storm Water Detention Basin Alternative***) upstream of the current detention basin, potential north of and under Banshee Road to capture some of the capacity. Depending on timing and technology improvements, it may be possible to locate the subsurface detention basin under the taxiway; however, it is not known if systems suitable for supporting the weight of taxiing aircraft are currently available.

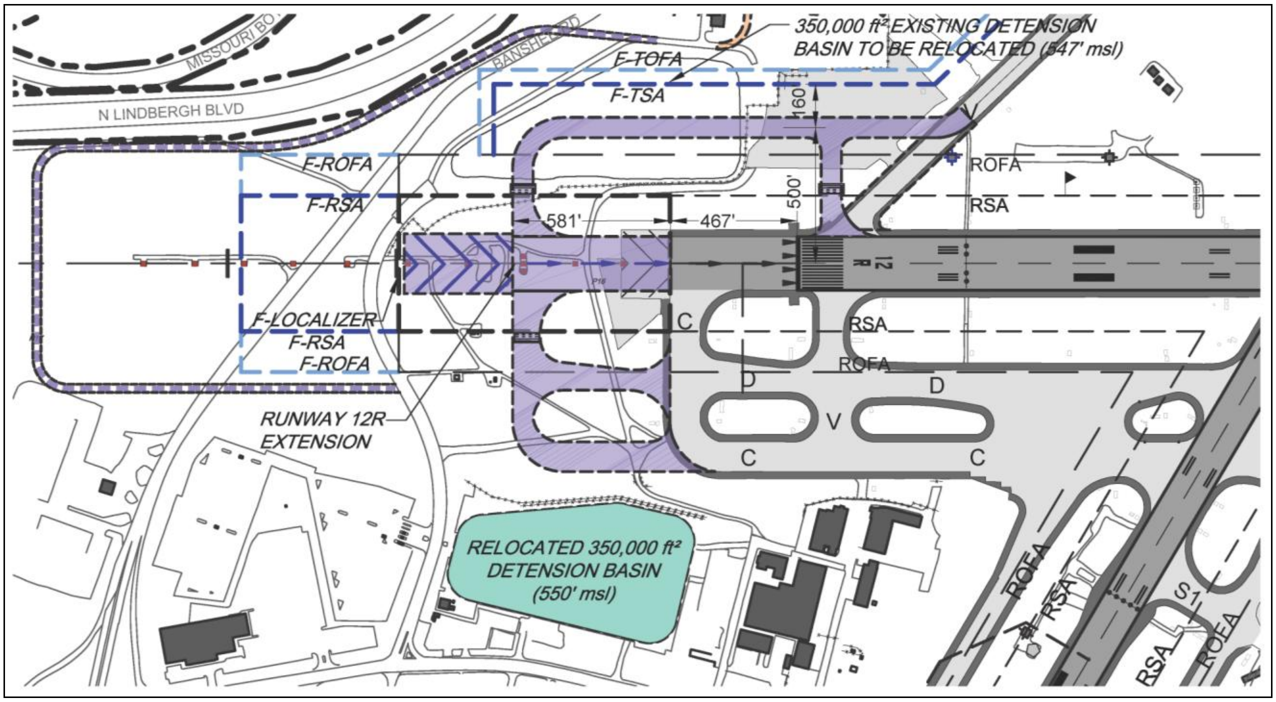
Exhibit 5.1-9
SUBSURFACE STORM WATER DETENTION BASIN ALTERNATIVE
Lambert-St. Louis International Airport



Source : http://www.brentwood-ind.com/water/stormwater.html

The third and preferred option (see **Exhibit 5.1-10, *Detention Basin Relocation Alternative***) is to relocate the detention basin to the area between the Airport Office and the Field Maintenance facilities. The unused parking lot provides an area with similar potential capacity. The site presents a few significant challenges including the proximity to Coldwater Creek and the distance from the low point on Lindbergh Boulevard.

Exhibit 5.1-10
DETENTION BASIN RELOCATION ALTERNATIVE
Lambert-St. Louis International Airport

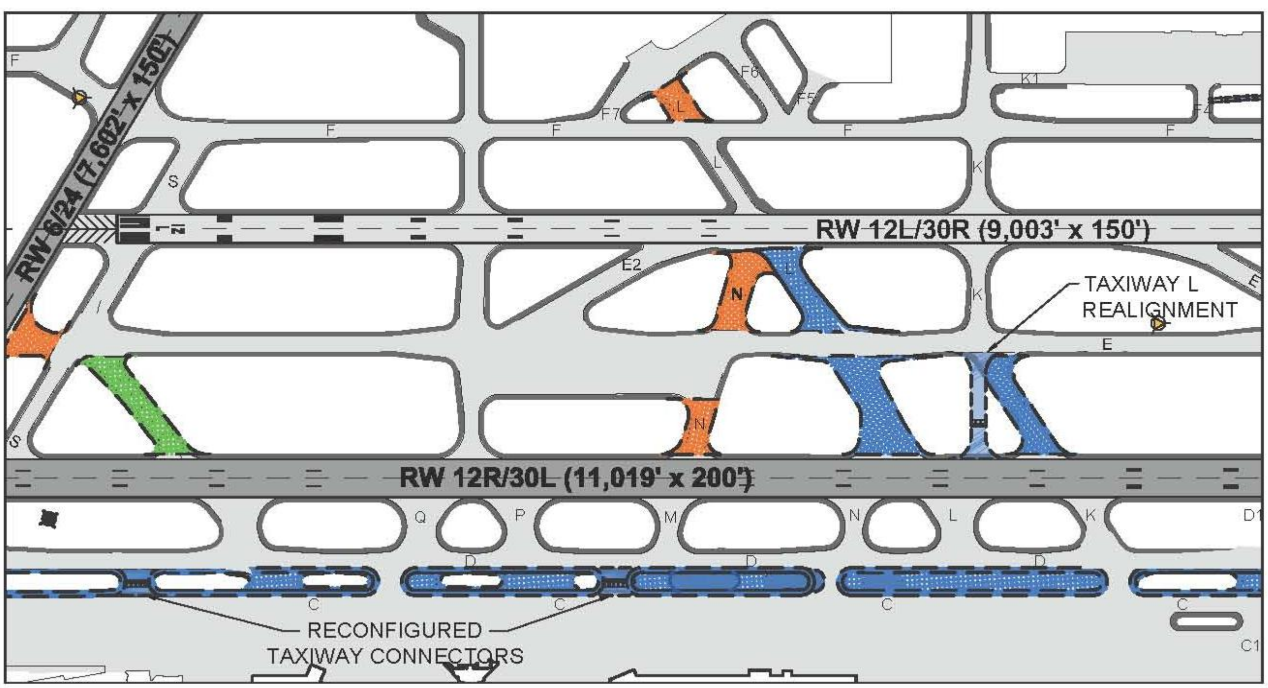


5.1.5.3 Runways 12L-30R and 12R-30L Taxiway Geometry

As with most large hub airports, the airfield at STL has gone through many expansion programs to provide additional capacity and capability. As demand grew, additional taxiways and runway exits were built to maximize the efficiency of the runways to provide the greatest possible throughput. Simultaneous to the expansion and capacity programs, the aircraft fleet was changing and the aircraft airfield performance abilities improved with the introduction of better technologies. Rarely do airport's look at the existing pavements to evaluate what pavement, if any, is superfluous. Typically, there is significant resistance to removing pavement from the airfield as it removes options for taxiing aircraft. However, the recurring cost to maintain the additional pavements are significant.

Exhibit 5.1-11, *Midfield Taxiway Geometry*, presents a future midfield taxiway geometry that retains airfield functionality while incrementally improving safety and efficiency. The majority of the work required to reach this airfield geometry involves removal of exiting pavement, illustrated with the tan hatch pattern, such as Taxiway Lima, the portion of Taxiway Kilo between TWY Echo and Runway 12R-30L and Taxiway November between the parallel runways. Also, note the pavement removal associated with the reconfiguration of the islands between TWY Charlie and TWY Delta.

Exhibit 5.1-11
MIDFIELD TAXIWAY GEOMETRY
Lambert-St. Louis International Airport



New pavement is illustrated in light yellow on Exhibit 5.1-11. Taxiway Kilo is realigned between Runway 12R-30L and Taxiway Echo to provide a straight taxiway from the north side of the airfield to the south side. Also, note the reconfigured taxiways between Taxiway Charlie and Delta. These connectors provide the necessary connection points between the two taxiways while eliminating additional pavement and minimizing the locations where aircraft could taxi directly from the ramp to the runway without making a turn.

Airfield geometry improvements for the taxiway complex (connecting the old airfield to the new runway) are presented in **Exhibit 5.1-12, *Taxiway Bravo Realignment***. As with the changes discussed above, these improvements are intended to incrementally increase the efficiency of the airfield without adding significant expense. Taxiway Bravo currently crosses Runway 6-24 at an odd angle. The recommended configuration realigns the intersection to a 90-degree intersection provides better spatial awareness for pilots when approaching the runway intersection.

Exhibit 5.1-12
TAXIWAY BRAVO REALIGNMENT
Lambert-St. Louis International Airport

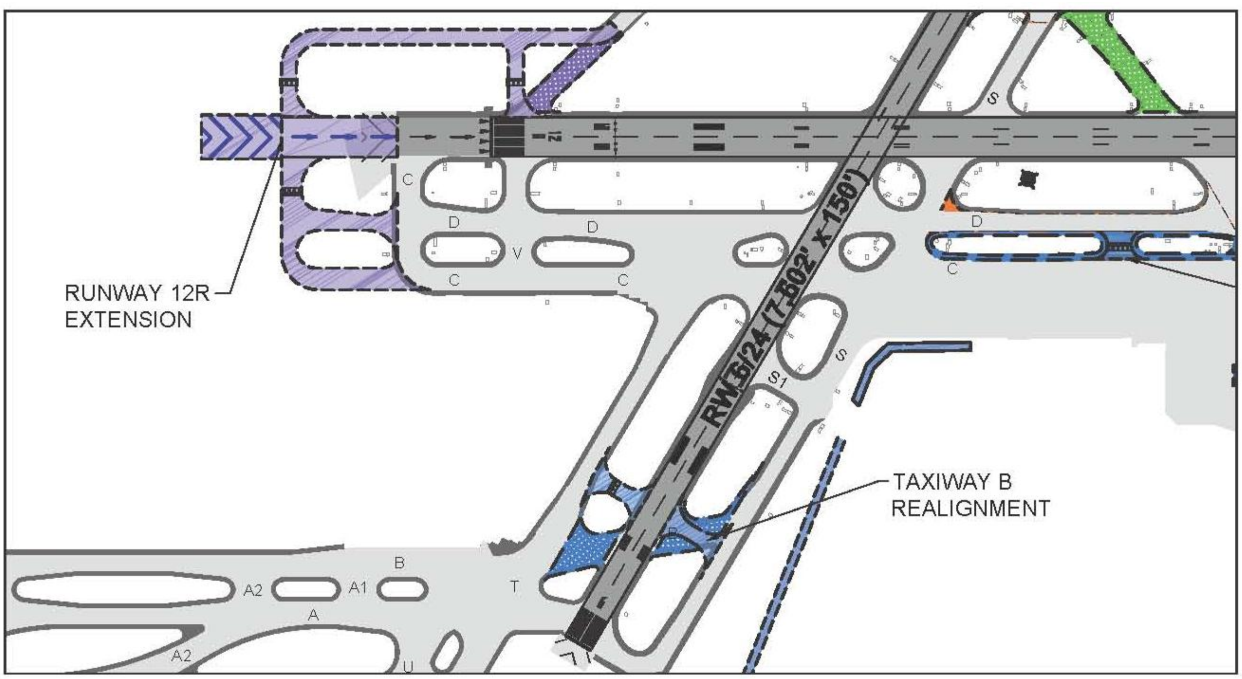
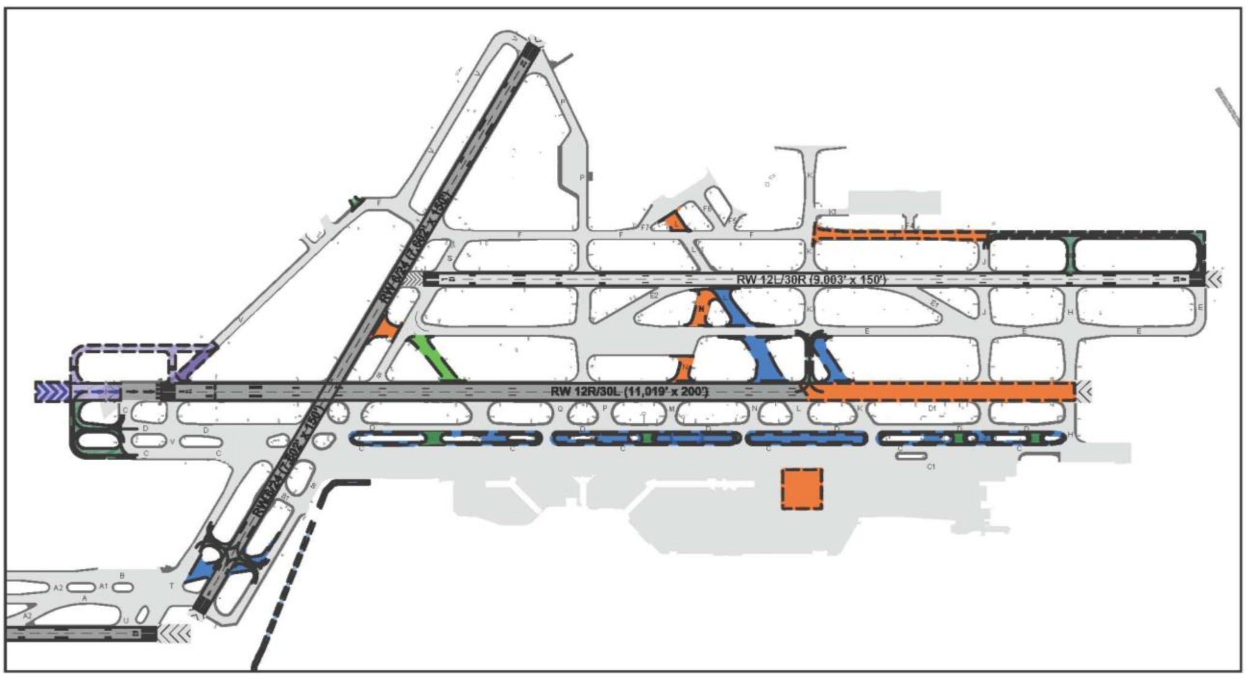


Exhibit 5.1-13, *Future Airfield Geometry*, shows the overall view of the future airfield configuration. Pavement removal should occur in line with the pavement management program and not removed as separate programs. For example, changes to Taxiway Bravo, as shown on the exhibit, utilize much of the existing pavement but require additional pavement on the west side of Runway 6-24. The work should not be conducted as a separate project rather it should be incorporated into the rehabilitation of Runway 6-24 or Taxiway Tango. Similarly, the removal of pavement and reconfiguration of the islands between Taxiways Charlie and Delta should be incorporated into pavement management projects associated with the ongoing maintenance of these pavement areas.

Exhibit 5.1-13
FUTURE AIRFIELD GEOMETRY
Lambert-St. Louis International Airport



5.2 TERMINAL ALTERNATIVES

5.2.1 INTRODUCTION

Chapter Five of the Master Plan Update Report investigates alternatives for providing capacity increases to future terminal facilities and their associated landside access, potential people mover systems and terminal support facilities within the context of the overall land use plan for the airport. The terminal concepts also incorporate potential ground access improvements and investigate phasing options for these facilities. The alternatives in this chapter depict the Airport's 20-year terminal area needs for new terminal facilities based on Chapter 4, *Demand/Capacity and Facility Requirements*. Additional information can be found in Appendix E.

Generally, master plans strive to maximize efficiency and improve user convenience for future facilities by increasing capacity and providing operational enhancements for airside, terminal, and landside components of the plan. As discussed in Chapter 4, the existing facilities at Lambert provide sufficient capacity throughout the planning period; therefore, this analysis is directed toward the optimization and enhancement of the facilities and configurations, which will ultimately provide a convenient and functional facility that supports user convenience and provides opportunities to maximize potential revenues. Additionally, terminal area plans endeavor to be flexible and responsive to changing operational scenarios that may emerge over time. In order to identify the best future terminal area plan, this study examined fourteen (14) concepts before selecting the single preferred terminal alternative. These concepts explored the potential for expanding and consolidating the existing terminals.

The following sections present an overview of the terminal alternatives analysis process and its findings. These sections are organized to describe the planning process, goals and objectives, terminal site envelope analysis, initial terminal alternatives, refined terminal alternatives, short-listed terminal alternatives, evaluation of short-listed alternatives, and the preferred terminal alternative.

5.2.2 PLANNING PROCESS

Ideas and concepts discussed with Airport staff and members of the advisory committees created the terminal development objectives, which guided the study. Understanding the wants and needs of the airport through these objectives, an initial set of terminal evaluation criteria were developed and reviewed with the Airport staff. These evaluation criteria assisted in selecting alternatives to be further refined. Additionally, where an initial alternative underperformed for a particular criterion this led to refinements of the alternatives or dropped from further evaluation.

The terminal evaluation criteria were then further refined and organized into a weighted matrix format by the consultant team. The matrix and the weightings for each criterion went through a review process with Airport staff prior to presentation to the CAC and TAC. This reviewed criteria and weighted matrix served as a tool to assist the Airport staff in selecting the preferred terminal alternative.

5.2.3 TERMINAL DEVELOPMENT OBJECTIVES

The terminal development objectives and key planning attributes identified in meetings with Airport staff and the advisory committees became the basis for developing and defining the evaluation criteria. The summarized terminal development objectives are presented below:

- **MEET NEEDS OF 20-YEAR PLANNING HORIZON AND BEYOND**
    - Provide adequate number and gauge of terminal gates to meet future demand effectively and efficiently.
    - Incorporate sufficient flexibility to expand to meet needs beyond planning horizon.
- **BUILD ON "AIRPORT EXPERIENCE PROGRAM"**
    - Improve passenger experience and airport operations
    - Provide pleasant, safe and customer-friendly facilities for passengers & tenants

5.2.4 KEY PLANNING ATTRIBUTES

The terminal development objectives have slightly different implications and applications for the three functional areas of the terminal facilities: airside, terminal and landside. Providing safe and efficient facilities that meet the needs of passengers, airlines and tenants requires a balancing of competing demands for space. The key planning attributes are as follows:

AIRSIDE

- Meets 20-year gate requirements
- Provides efficient airside access
- Accommodates dual taxilanes in the terminal area to reduce congestion and permit two way flow of taxiing aircraft
- Provide sufficient aircraft pushback zones to permit safe and efficient pushbacks with minimal aircraft maneuvering
- Maximize double-loaded concourses to reduce walking distances from gate to gate and security to gate
- Accommodate enhanced lateral movement (moving walkways)

TERMINAL

- Meets 20-year demand requirements
- Enhance passenger convenience
- Provide adequate space for new TSA security screening equipment and procedures
- Provide a centralized consolidated concessions core to maximize revenue generation potential
- Improve international passenger facility connections

LANDSIDE

- Meets 20-year curb and parking requirements
- Maintain convenient short-term covered parking with expansion capabilities
- Simplify terminal ingress/egress and access points

IMPLEMENTATION FEASIBILITY

- Ensure ability to effectively phase construction
- Minimize impact to existing operations
- Operational effectiveness of initial phase
- Safeguard sufficient envelope for future terminal expansion beyond 20-year planning horizon

5.2.5 TERMINAL SITE ENVELOPE ANALYSIS

The study examined several different site envelope possibilities for accommodating the future STL terminal complex within the existing runway configurations. The potential expansion sites for terminal facilities were examined in compliance with the operational planning criteria found in the FAA Advisory Circular 150/5300-13, *Airport Design*.

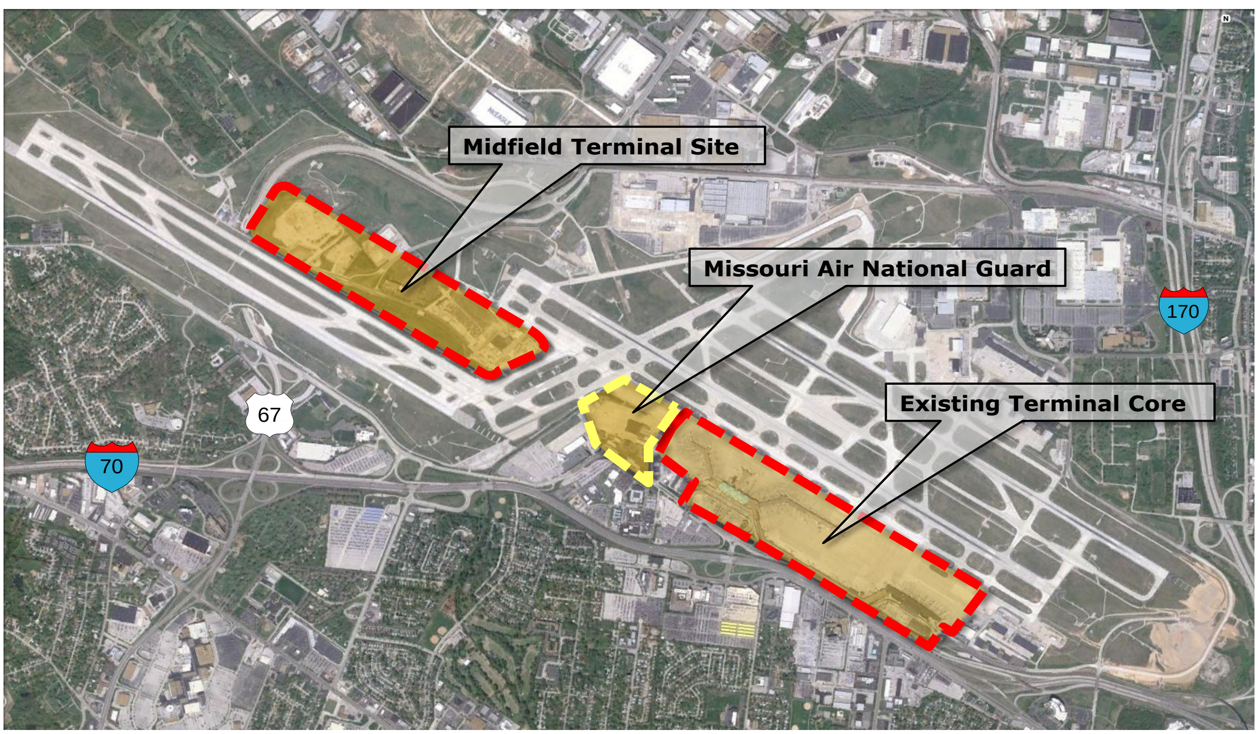
Early planning discussions during the study considered various options by which the present terminal configurations could be modified and the midfield site envelope for a new single consolidated terminal complex as presented in the previous ALP were explored. The three options shown on **Exhibit 5.2-1, *Proposed Terminal Land Envelopes***, include:

- **Existing Terminal Core** - the existing central core bounded to the north by Taxiway Charlie, Lambert International Boulevard to the south, Cargo City to the east, and the Missouri Air National Guard facility to the west
- **Missouri Air National Guard** – extension of the exiting terminal core to the west, extending to Taxiway Sierra
- **Midfield Terminal Site** - the area between existing Runway 11-29 and the extended centerline of Runway 12R-30L, west of Runway 6-24

An important factor when considering these site envelopes for terminal complex expansion included ground transportation issues such as connection to existing roadway infrastructures and incorporating the existing light rail system. Other key factors included impacts on existing facilities during phased construction, utilities and existing infrastructure access, existing terrain, [1]FAR Part 77 regulations, and taxi times to existing runways.

Initial analysis of the midfield terminal site revealed significant restrictions on the potential building envelope. The proximity to Runway 11-29 and Runway 12R-30L and their associated taxiways resulted in a relatively narrow development site. Setbacks from the taxiways and FAR Part 77 imaginary surfaces associated with the airspace restrictions limit the horizontal and vertical dimensions of the potential terminal facility. Multiple concepts were explored, however, the limited width of the site resulted in options with lengthy concourses and limited ability for dual taxilanes. Access to existing roadway infrastructure and a lengthy extension to the existing light rail were also assumed prohibitively expensive. Ultimately, the Midfield site was abandoned as an option because it fails to provide any additional development potential when compared to the existing terminal area core. Various terminal complex alternatives were analyzed for the remaining two envelopes as described in the following sections.

Exhibit 5.2-1
PROPOSED TERMINAL LAND ENVELOPES
Lambert-St. Louis International Airport



[1] FAR Part 77 Obstruction Standards contained in FAA Advisory Circular 150/5360 states: A number of imaginary surfaces relating to each runway have been established in order to provide a basis of judging whether an object or building presents an obstruction to air navigation. The size of the surface is determined by the category of each runway and by the approach system used.

5.2.6 INITIAL TERMINAL ALTERNATIVES

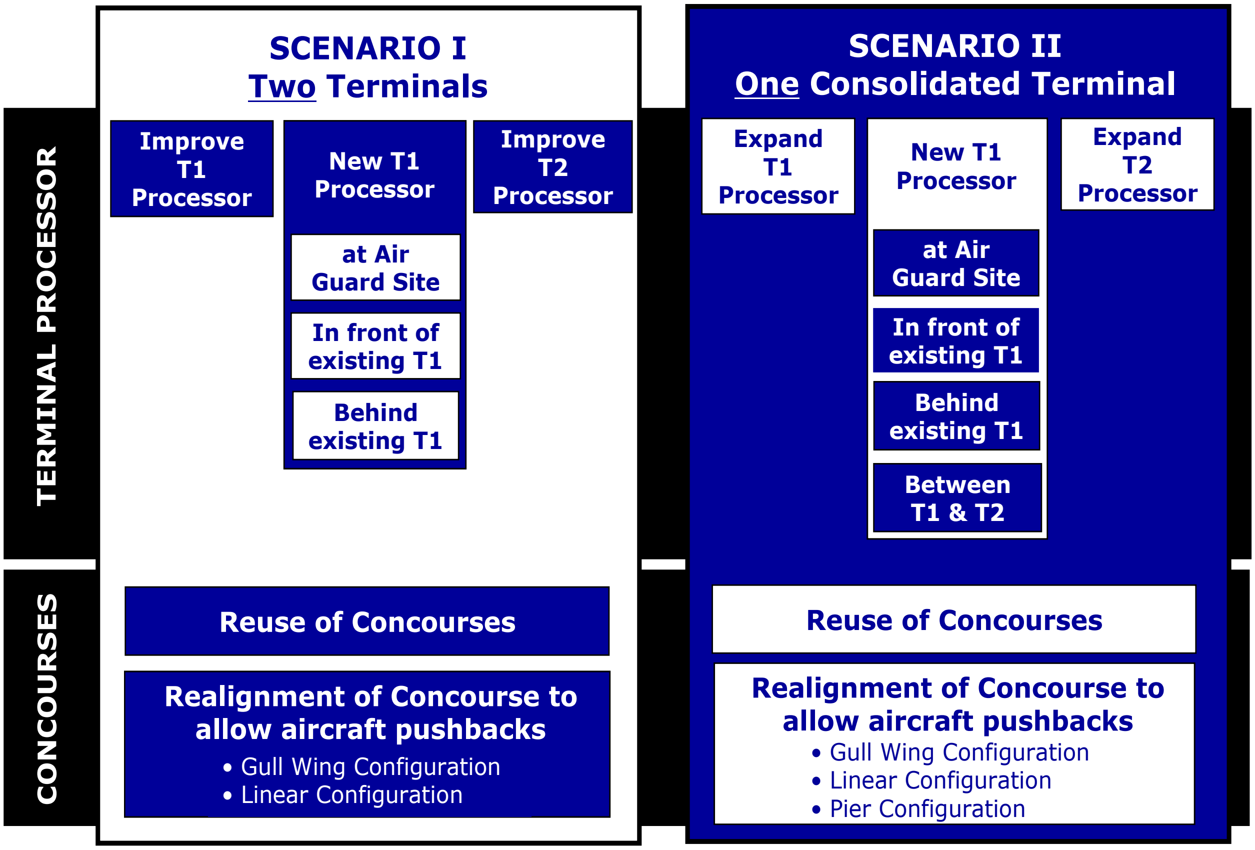
Throughout the terminal planning process, a common set of parameters was used in the development of terminal complex alternatives. All of the alternatives were developed using industry accepted planning criteria such as FAA's Advisory Circular 150/5300-13 relative to taxiway and taxilane design criteria, aircraft parking depth, wing-tip spacing, aircraft dimensional criteria, and concourse and terminal dimensioning based on the *Demand/Capacity and Facility Requirements* section of Chapter 4.

In addition to the previously described terminal development objectives, the following considerations were incorporated in the development of the terminal complex alternatives:

- Achieve a balance between airside, terminal, and landside capacities of the terminal area;
- Provide the flexibility for phased implementation with minimal impact to on-going operations;
- Minimize impact on other airport functions such as air cargo, maintenance support, and landside access;
- Build upon the ongoing airport experience program;
- Maintain and improve passenger convenience and amenities throughout all phases of the plan

Two overall terminal development strategies were taken into consideration to further define the direction of the terminal development process. These two strategies include maintaining two separate terminals and consolidation into one terminal. From these two scenarios, multiple concepts were developed based on the reuse of the existing terminals or replacement of the T1 processor and the configuration of concourses and passenger movement areas as shown in **Exhibit 5.2-2, *Terminal Development Strategies***. The terminal development process generated a total of 14 alternatives that are described below.

Exhibit 5.2-2
TERMINAL DEVELOPMENT STRATEGIES
Lambert-St. Louis International Airport



5.2.6.1 Scenario I – Two-Terminal Alternatives

Exhibit 5.2-3, *Scenario I–A-1 (Baseline)*, maintains the current two terminal airline operating alignment and reuses the existing terminal processors and concourses while closing Concourses B and D. The existing concourses A & C at Terminal 1 (T1) also have the potential for increased width allowing for additional hold room depth and passenger circulation. The staggered departures/arrival curb arrangement at T1 is retained with a new lowered arrivals curb. This alternative also introduces a potential short-term surface parking lot/ground transportation center between T1 and Terminal 2 (T2) in order to accommodate the temporary relocated traffic at Terminal 1 while the existing arrivals roadway is being lowered. This area also has the potential to become a long-term covered parking structure using existing Concourse D as the non-secure passenger link back to T1 or the use of shuttle busses. Additional parking expansion south of the existing T1 garage across Lambert International Boulevard (LIB) with future expansion potential is required to meet the 20-year parking demand.

Expansion of the T2 single-loaded concourse east into the area currently occupied by Cargo City is required in order to accommodate the future 20-year gate requirement. Baggage claim is also expanded to the west for additional capacity. An additional two level parking deck is constructed on the surface lot east of the existing T2 garage providing approximately 300 additional stalls. The current international processing functions in the Federal Inspection Services (FIS) area are also retained.

Exhibit 5.2-3
SCENARIO I-A-1 (Baseline)
Lambert-St. Louis International Airport

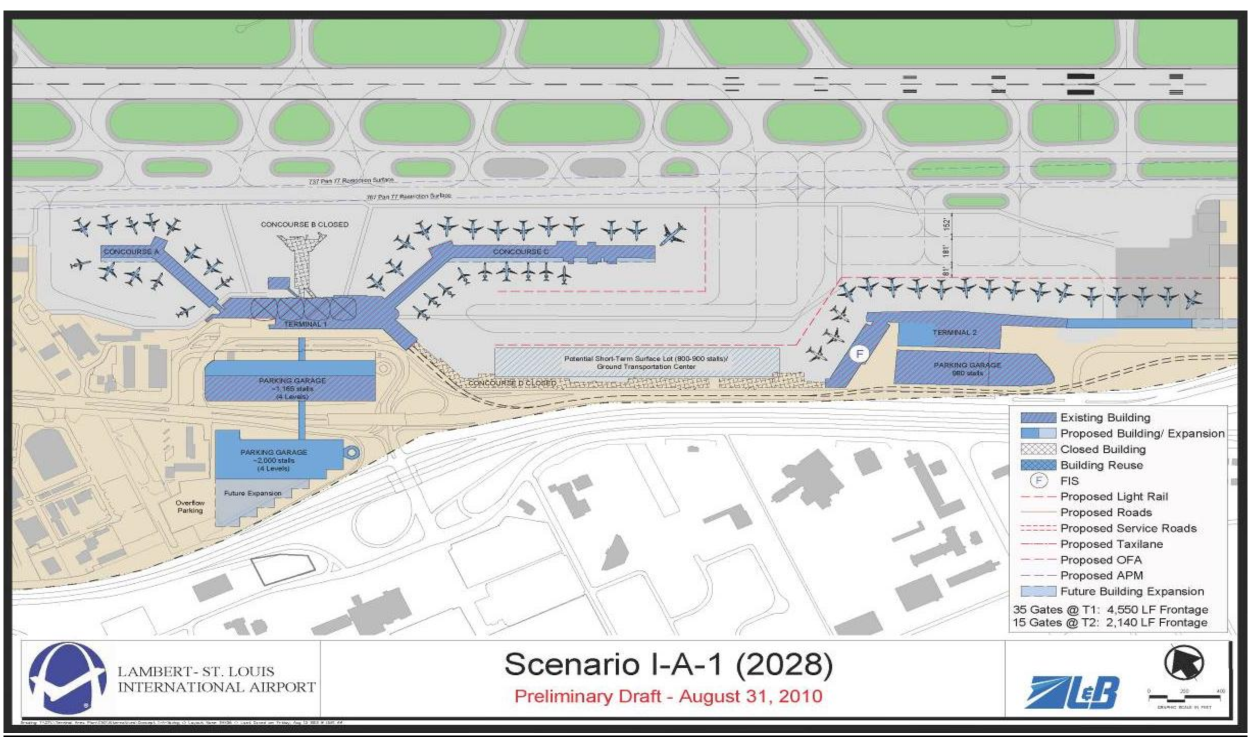


Exhibit 5.2-4, *Scenario I-B-1a*, maintains the current two terminal airline operating alignment, reuses existing terminal processors, and realigns and widens a portion of T1's concourse A and C "Gull-wing" alignment to provide area for increased aircraft parking depth and pushback zone. Concourses B and D are removed and closed respectively, and T1's staggered departures/arrival curb arrangement is retained with a new lowered arrivals curb.

International gates and FIS functions are relocated from T2 to T1 and expansion of T2's baggage claim is required to meet future demand. Both terminal parking garages are expanded to meet future demand. The existing maintenance shops and HOST flight kitchen require relocation.

Exhibit 5.2-4
SCENARIO I-B-1a
Lambert-St. Louis International Airport

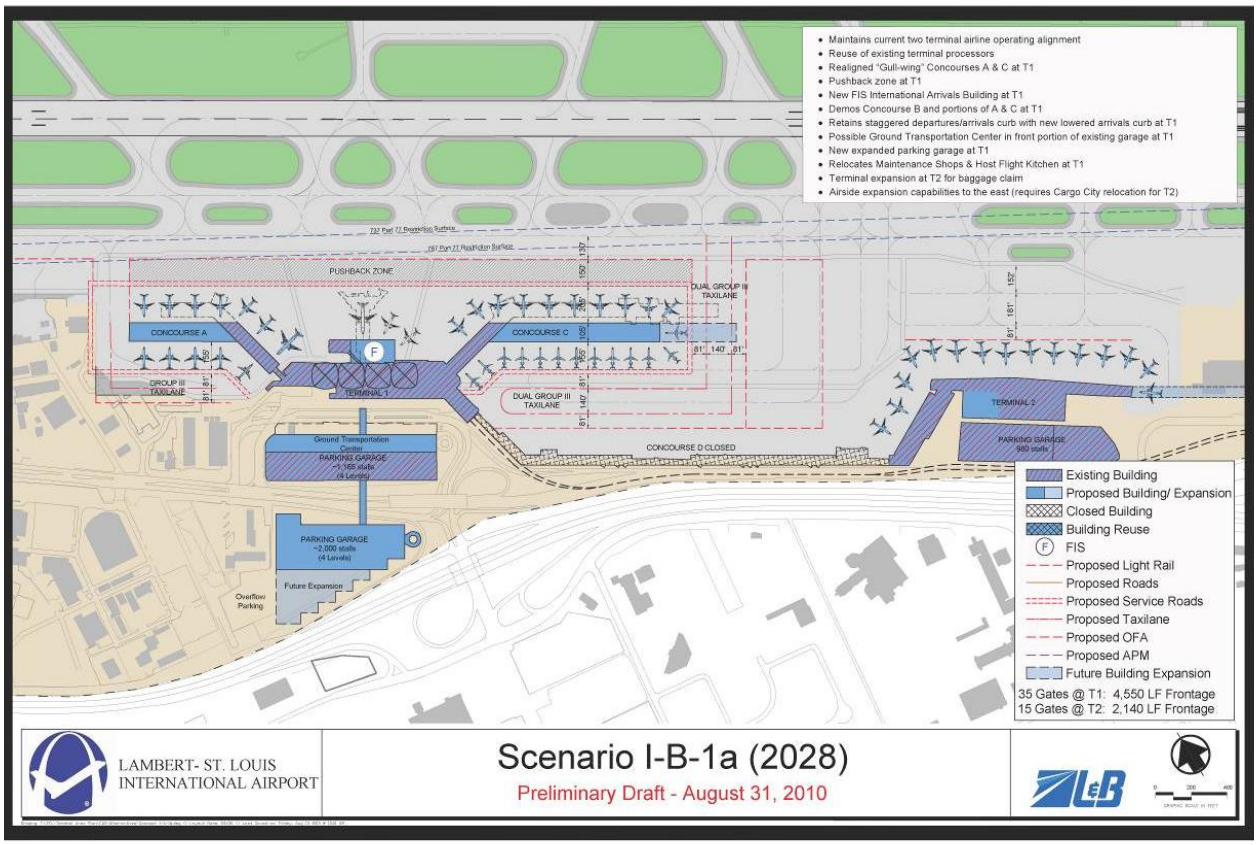


Exhibit 5.2-5, Scenario I-B-1b, maintains the current two terminal airline operating alignment while retaining both terminal processors. T1's concourse A and C "Gull-wing" alignment is demolished in order to construct a wider linear double-loaded concourse with increased aircraft parking depth and pushback zone and centrally located passenger security screening and concessions mall. Concourse B and D are removed and closed respectively. The staggered departures/arrival curb arrangement at T1 is retained with a new lowered arrivals curb.

International gates and FIS functions are relocated from T2 to T1 and expansion of T2's baggage claim is required to meet future demand. Both terminal parking garages are expanded to meet future demand. The existing maintenance shops and HOST flight kitchen require relocation.

Exhibit 5.2-5
SCENARIO I-B-1b
Lambert-St. Louis International Airport

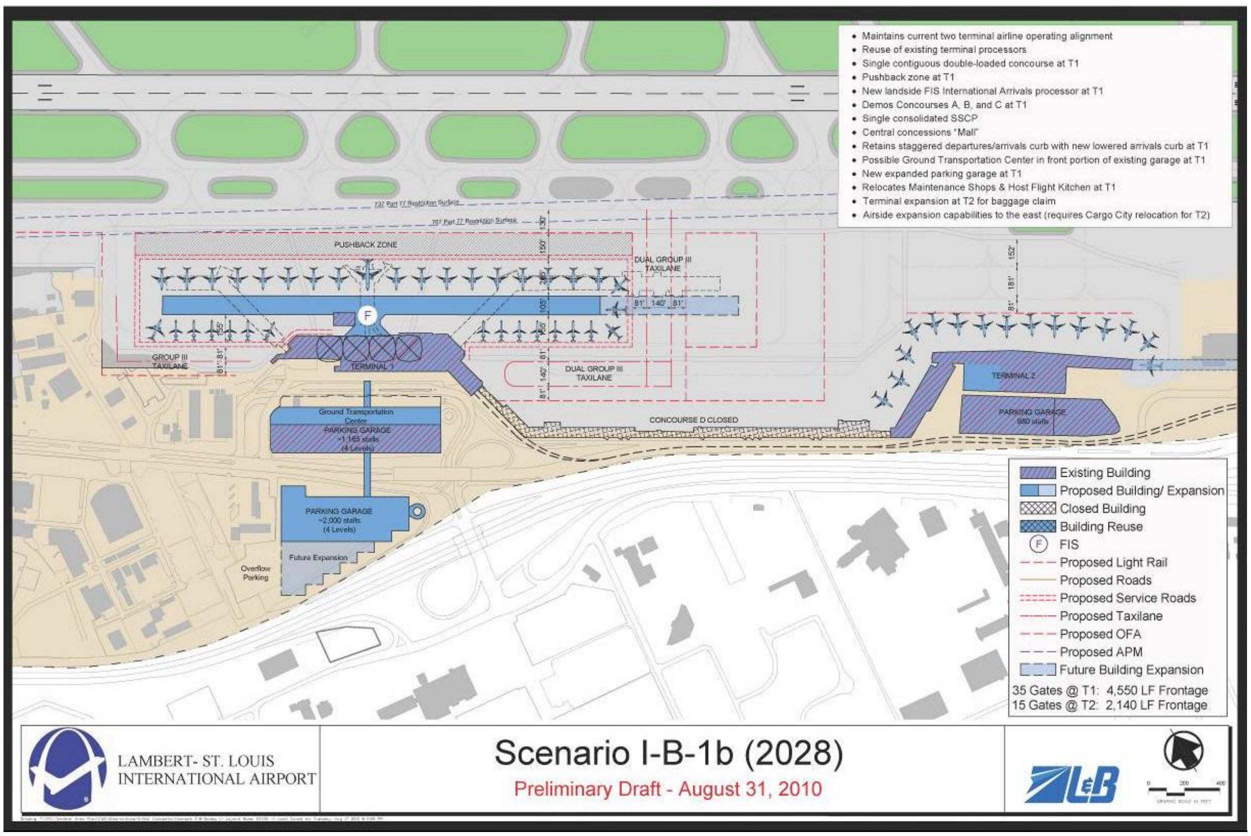


Exhibit 5.2-6, Scenario I-C-1, maintains the current two terminal airline operating alignment, reuses the existing T2 processor, and relocates T1 to the Missouri Air National Guard site. This provides area to construct a new double-loaded linear concourse alignment providing increased aircraft parking depth and pushback zone and centrally located passenger security screening and concessions mall. Existing T1 facilities are eliminated except for the parking garage.

International gates and FIS functions are relocated from T2 to T1 and expansion of T2's baggage claim is required to meet future demand. A new T1 parking garage is constructed and the T2 parking garage is expanded to meet future demand.

Lambert International Boulevard is realigned in order to accommodate the new T1 parking garage. The existing light rail alignment is extended to a new station at the T1 parking garage abandoning the existing station at the current T1 location. The existing Air Traffic Control Tower (ATCT) at T1 would require relocation as well as the maintenance shops, HOST flight kitchen, Main Power Plant, and cooling towers.

Exhibit 5.2-6
SCENARIO I-C-1
Lambert-St. Louis International Airport

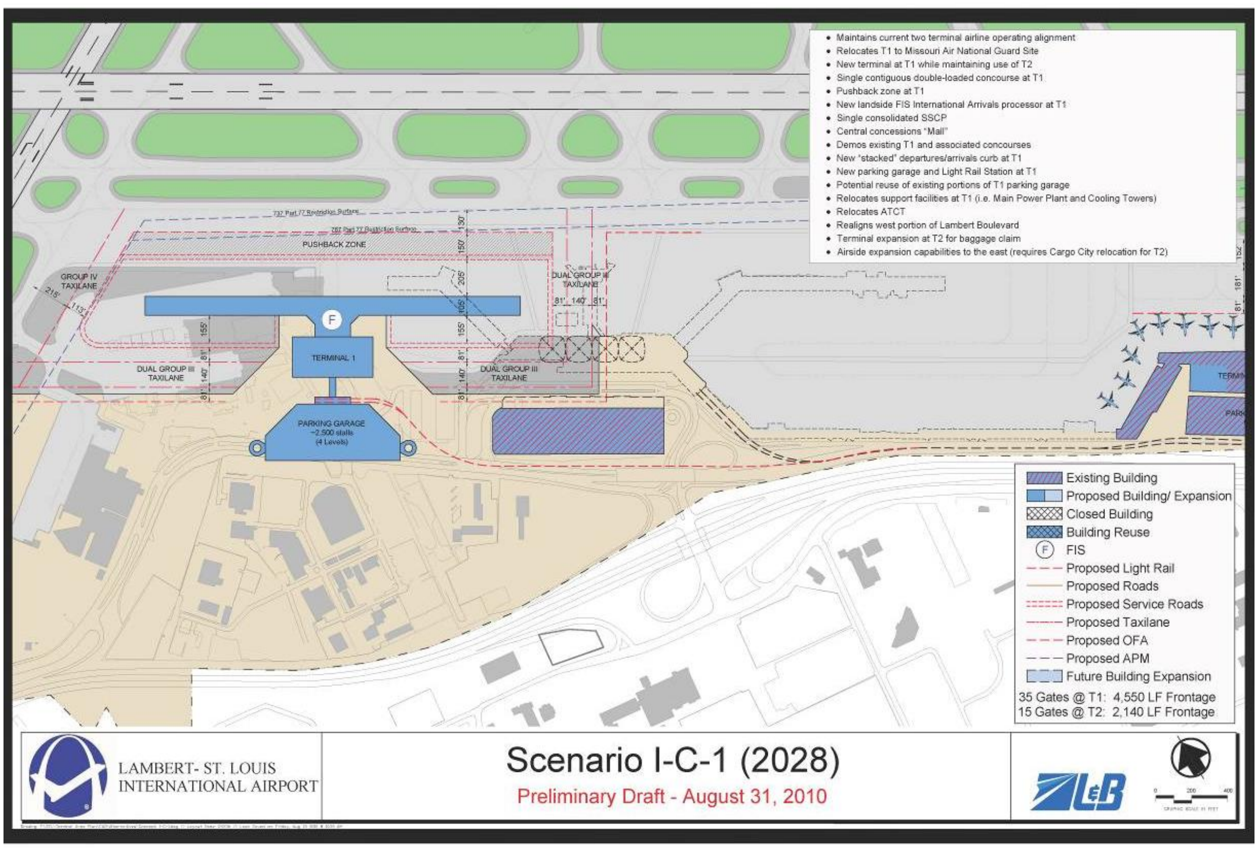


Exhibit 5.2-7, *Scenario I-D-1*, maintains the current two terminal airline operating alignment and reuses the existing T2 processor. T1 is replaced airside of the existing location providing a central consolidated passenger security screening area and concessions mall. The existing T1 "Gull-wing" concourse alignment is demolished in order to construct a new wider linear double-loaded concourse providing increased aircraft parking depth and pushback zone. Concourses B and D are also removed.

International gates and FIS functions are relocated from T2 to T1 and expansion of T2's baggage claim is required to meet future demand. A new T1 parking garage is constructed in the location of the existing and the T2 parking garage is expanded to meet future demand.

The existing light rail alignment is extended to a new station at the T1 parking garage abandoning the existing station at the current T1 location. The existing ATCT at T1 would require relocation as well as the maintenance shops, HOST flight kitchen, Main Power Plant, and cooling towers.

Exhibit 5.2-7
SCENARIO I-D-1
Lambert-St. Louis International Airport

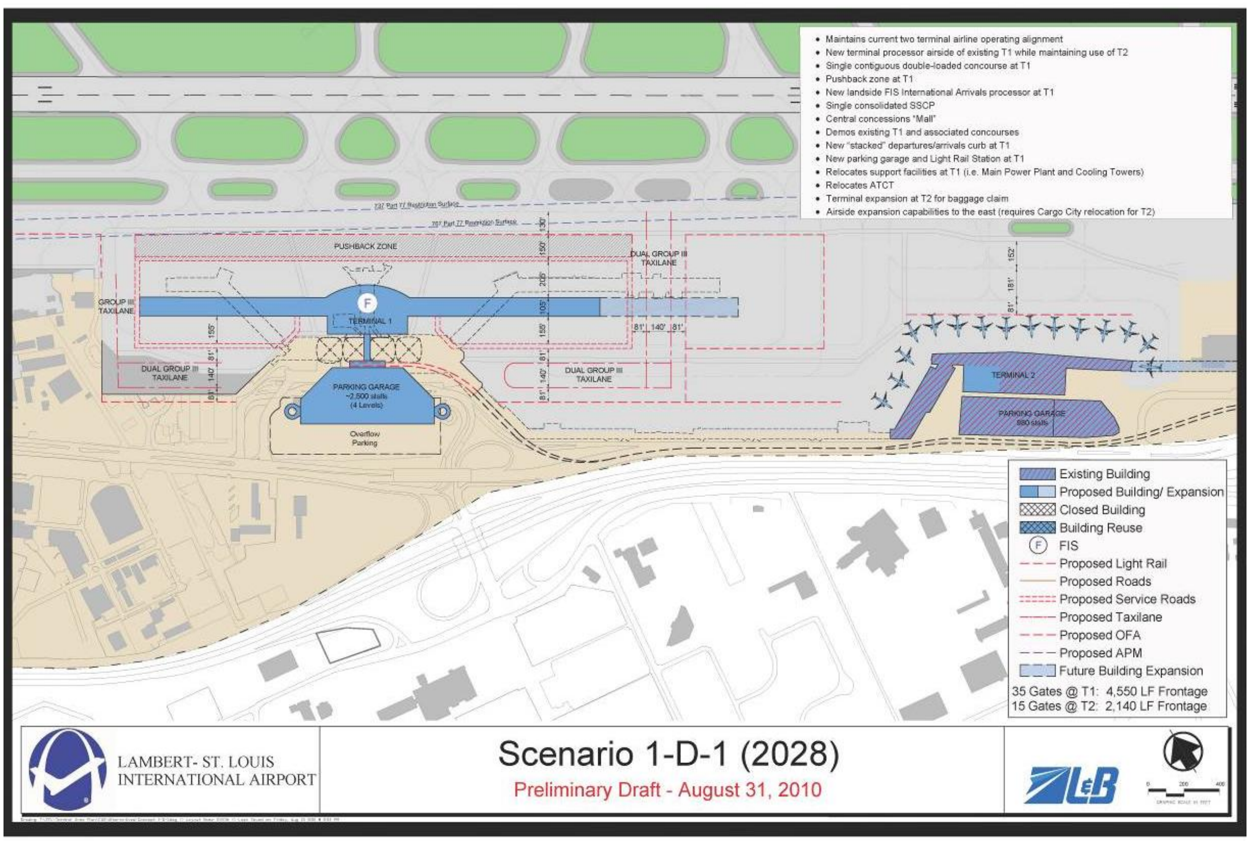


Exhibit 5.2-8, ***Scenario I-D-2a***, maintains the current two terminal airline operating alignment and reuses the existing T2 processor. A portion of the existing T1 garage is removed to allow for a new "stacked" departures/arrivals curb constructed south of the existing staggered curb. This also allows for a new T1 processor landside of the existing location providing a central consolidated passenger security screening area and concessions mall. Portions of the existing T1 "Gull-wing" concourse alignment are realigned and widened to provide increased aircraft parking depths and pushback zone. Concourses B and D are also removed and closed respectively.

International gates and FIS functions are relocated from T2 to T1 and expansion of T2's baggage claim is required to meet future demand. Both terminal parking garages are expanded to meet future demand. The existing maintenance shops and HOST flight kitchen require relocation.

Exhibit 5.2-8
SCENARIO I-D-2a
Lambert-St. Louis International Airport

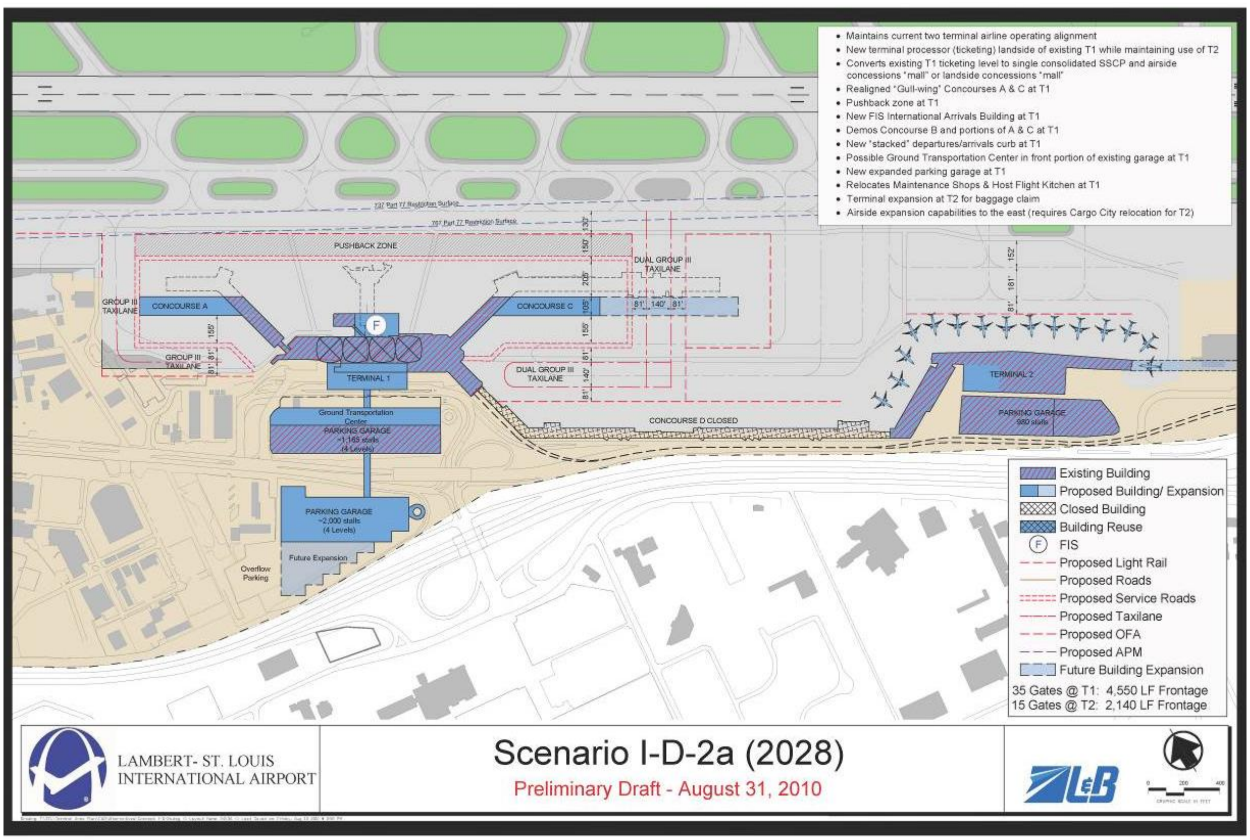
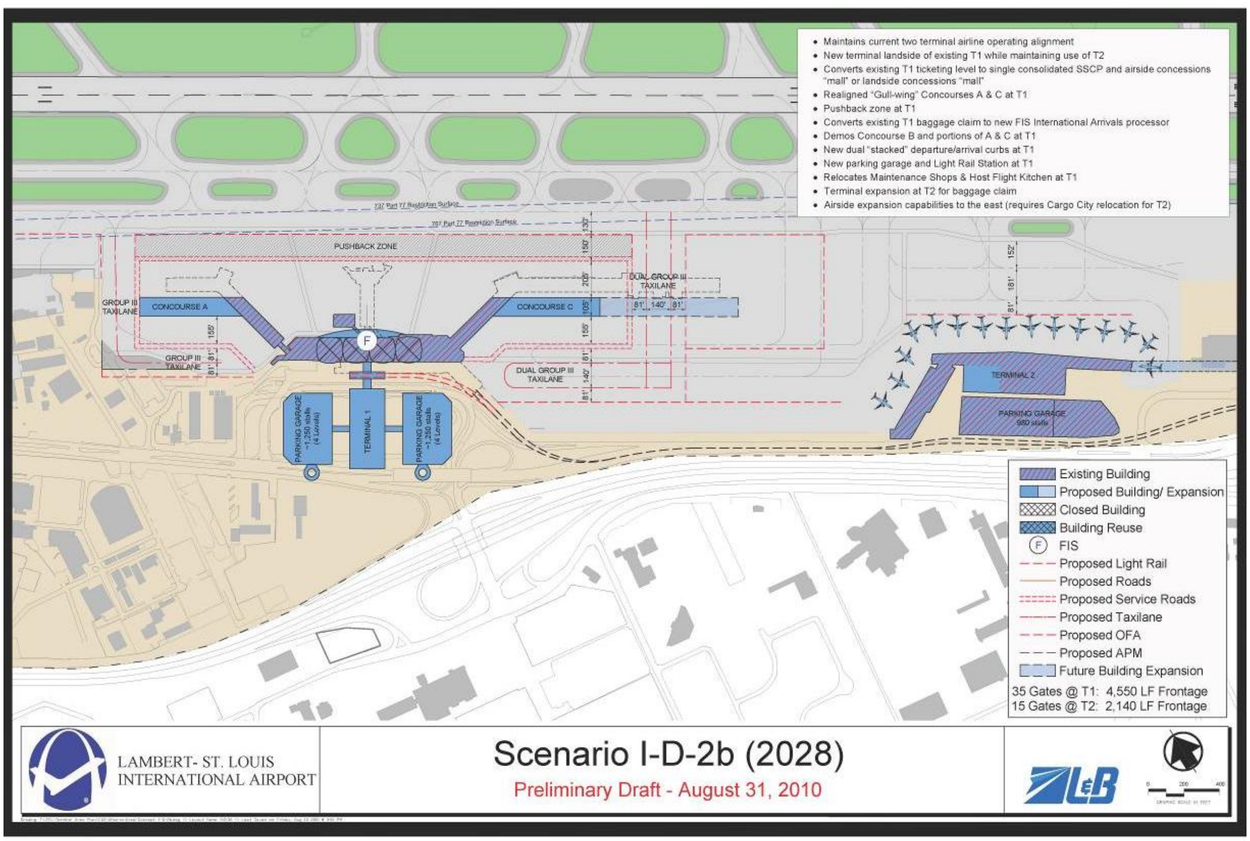


Exhibit 5.2-9, ***Scenario I-D-2b***, maintains the current two terminal airline operating alignment and reuses the existing T2 processor. A new dual-curb landside T1 processor is constructed between two new multi-decked parking structures in the location of the current garage. Existing T1 ticketing is reconfigured as a single consolidated passenger security screening area and concessions mall. Portions of the existing "Gull-wing" concourse alignment are realigned and widened to provide increased aircraft parking depths and pushback zone. Concourses B and D are also removed and closed respectively.

International gates and FIS functions are relocated from T2 to T1 and expansion of T2's baggage claim is required to meet future demand. The T2 parking garage is also expanded to meet future demand.

Lambert International Boulevard is realigned in order to accommodate the new T1 parking garage. The existing light rail alignment is extended to a new station at the T1 parking garage abandoning the existing station at the current T1 location. The existing maintenance shops and HOST flight kitchen require relocation.

Exhibit 5.2-9
SCENARIO I-D-2b
Lambert-St. Louis International Airport



5.2.6.2 Scenario II – Consolidated Terminal Alternatives

Exhibit 5.2-10, *Scenario II-B-1*, consolidates all operations at T1 into a wider linear double-loaded concourse providing increased aircraft parking depths and pushback zone with centrally located passenger security screening and concessions mall. The existing staggered departures/arrival curb is retained with expansion of curb front capabilities. Concourses B and D are also removed and closed respectively. An Automated People Mover (APM) system is provided to enhance passengers' level of service and decrease walking distances.

International gates and FIS functions are relocated from T2 to T1 and T2 is potentially reused for other development uses. The T1 parking garage is expanded to meet future demand and the T2 light rail station and garage are retained for potential remote parking capabilities. The existing maintenance shops and HOST flight kitchen require relocation.

Exhibit 5.2-10
SCENARIO II-B-1
Lambert-St. Louis International Airport

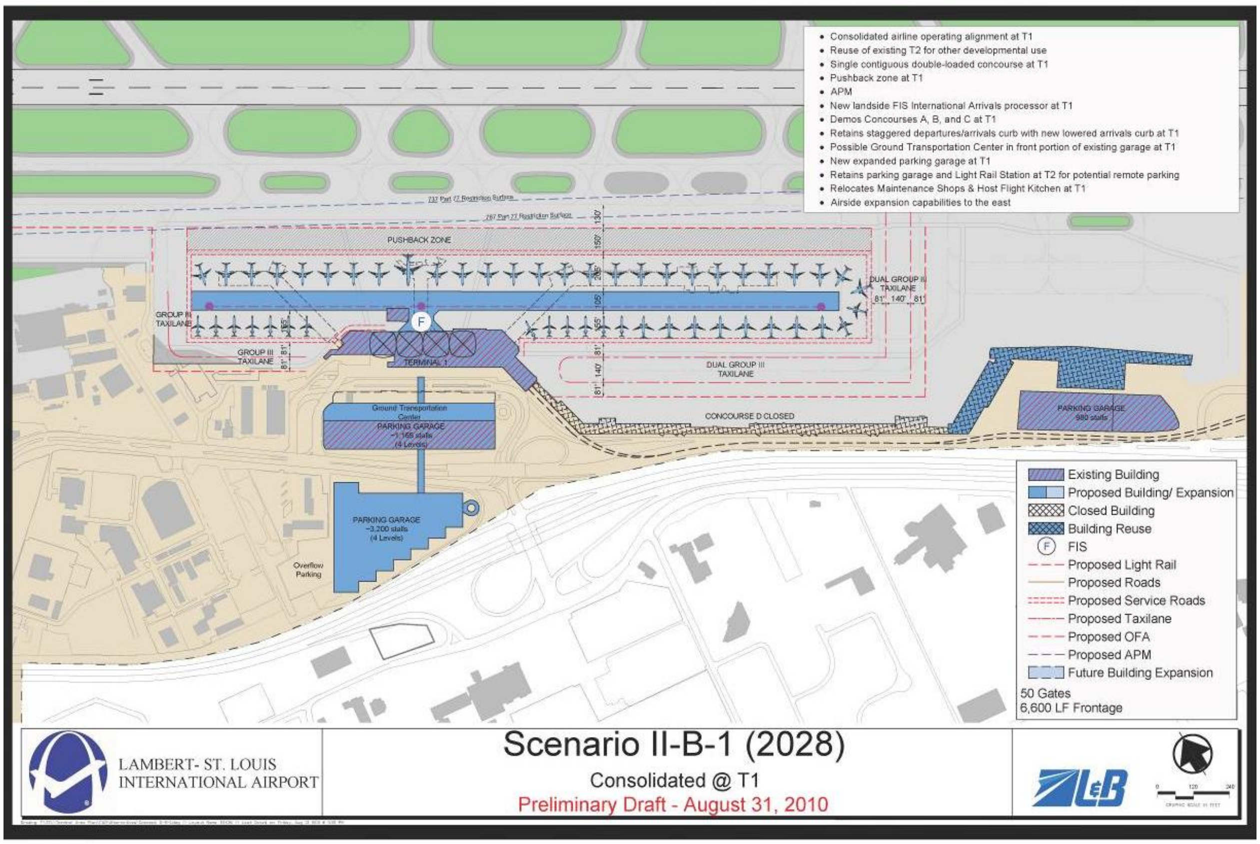


Exhibit 5.2-11, *Scenario II-B-2*, consolidates all operations at T2 into wider multiple double-loaded piers. Expansion of T2's ticketing and baggage claim allows for a centrally located passenger security screening area and concessions mall. A new centrally located FIS processing area is also constructed. The existing Cargo City to the east of the existing terminal is relocated to allow for airside concourse gate expansion. An APM system is provided to enhance passengers' level of service and decrease walking distances.

The existing "stacked" departures/arrival curb is retained with expansion of curb front capabilities. New egress access roadways are constructed and linked to LIB. The existing T2 parking garage is expanded to meet future demand requirements and the T1 garage and light rail station are retained for potential remote parking capabilities. The existing T1 concourses are removed with the processor retained for other development use. The existing ATCT at T1 is also retained.

Exhibit 5.2-11
SCENARIO II-B-2
Lambert-St. Louis International Airport

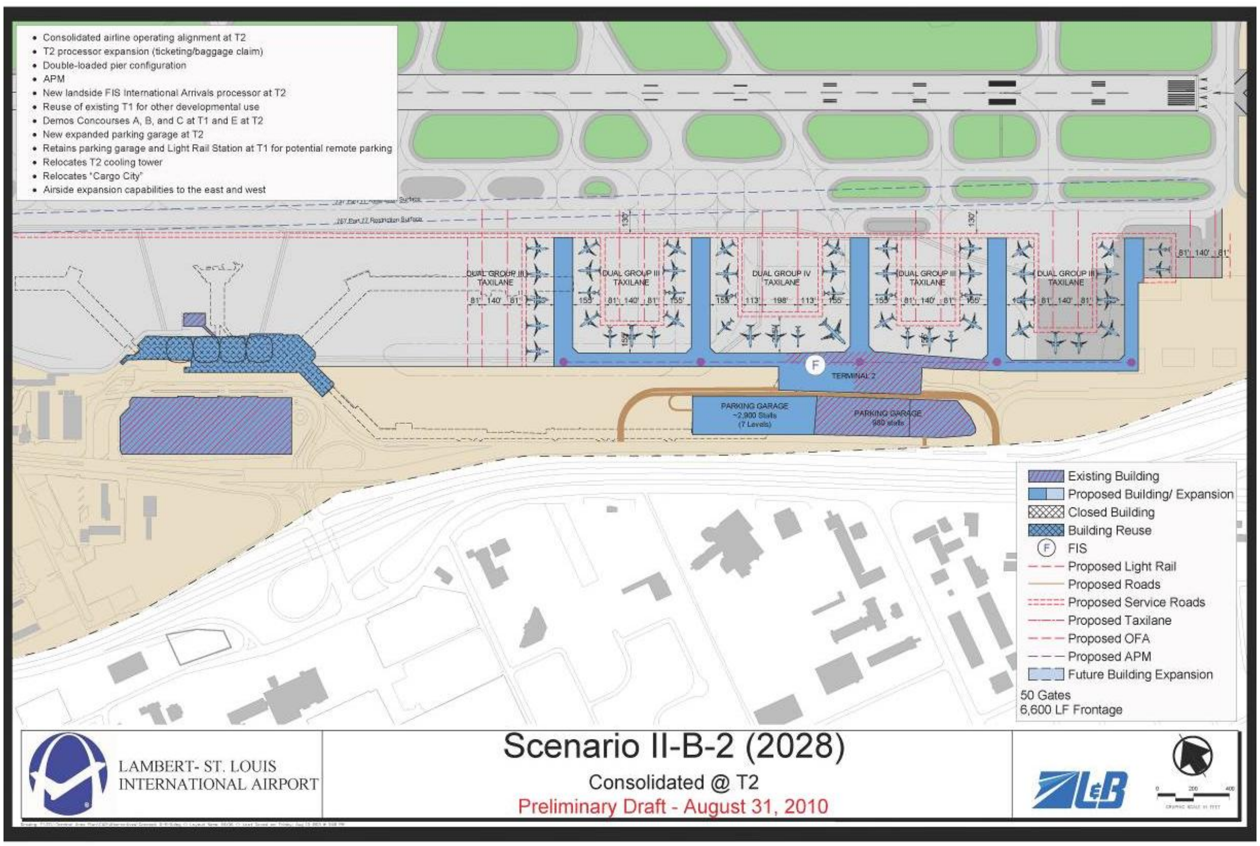


Exhibit 5.2-12, *Scenario II-C-1*, constructs a new consolidated terminal processor between T 1 and T 2. The exiting T1 single-loaded linear concourse is extended to meet a new double-loaded concourse along the existing T1 Concourse C alignment. Both concourses terminate into a new terminal processor with centrally located passenger security screening and concessions mall. A new landside international FIS processing area is also constructed near the centrally located international arrivals gates providing short walking distances. An APM system is provided to enhance passengers' level of service and decrease walking distances.

A new "stacked" departures/arrivals curb is constructed with new ingress/egress roadway access along with a new multi-decked parking garage and light rail station. Both existing parking garages are retained for potential remote parking capabilities. T1 and all existing concourses are removed and the existing T2 processor is retained for other development use. The existing ATCT at T1 is also retained.

Exhibit 5.2-12
SCENARIO II-C-1
Lambert-St. Louis International Airport

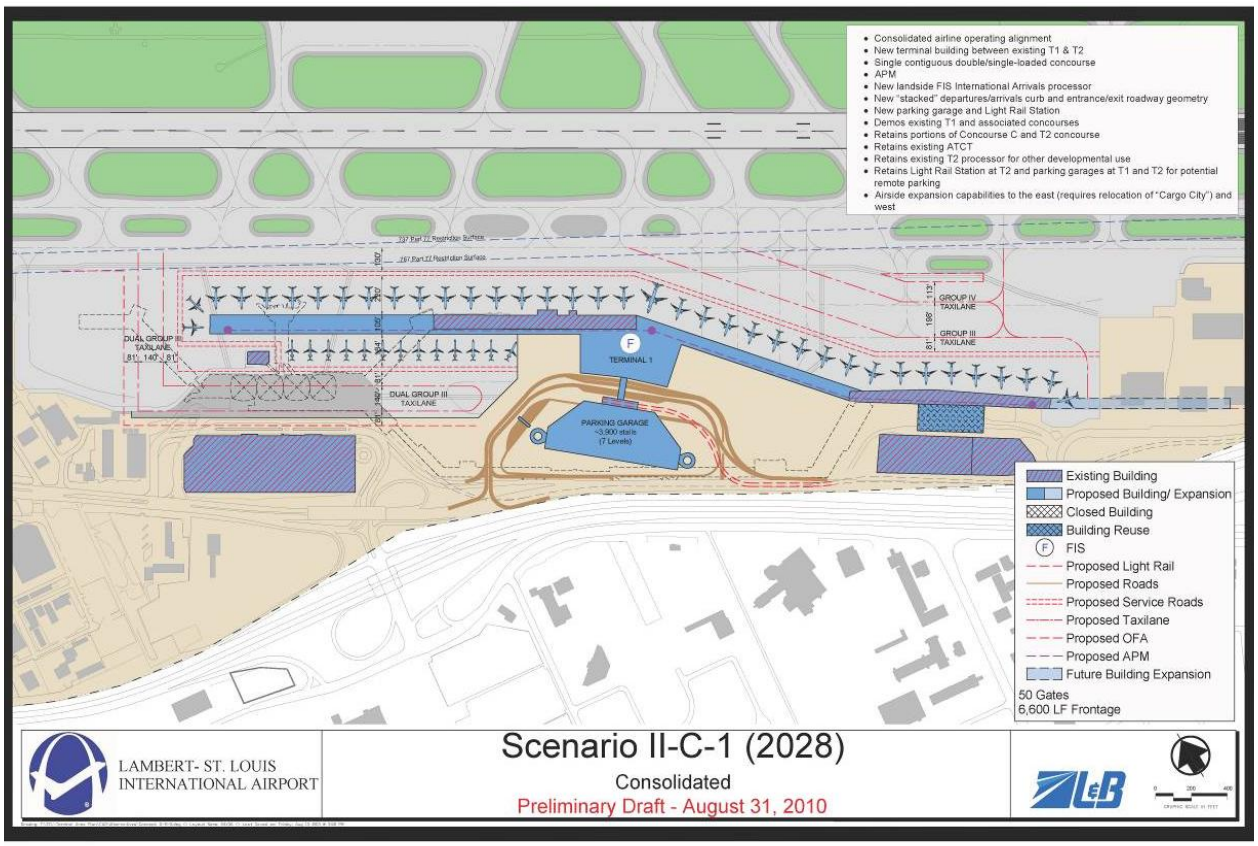


Exhibit 5.2-13, Scenario II-C-2, constructs a new consolidated terminal processor located on Missouri Air National Guard site. This provides area to construct a new double-loaded linear concourse alignment providing increased aircraft parking depth and pushback zone and centrally located passenger security screening and concessions mall. A new landside international FIS processing area is also constructed near the centrally located international arrivals gates providing short walking distances. An APM system is provided to enhance passengers' level of service and decrease walking distances. Existing T1 facilities are eliminated except for the parking garage and T2 is retained for other development use.

Lambert International Boulevard is realigned in order to accommodate the new T1 parking garage. The existing light rail alignment is extended to a new station at the new consolidated terminal parking garage, abandoning the existing station at the current T1 location. The existing T2 station and parking garage could be retained for remote parking capabilities. The existing ATCT would potentially require relocation along with the maintenance shops, HOST flight kitchen, Main Power Plant, and cooling towers.

Exhibit 5.2-13
SCENARIO II-C-2
Lambert-St. Louis International Airport

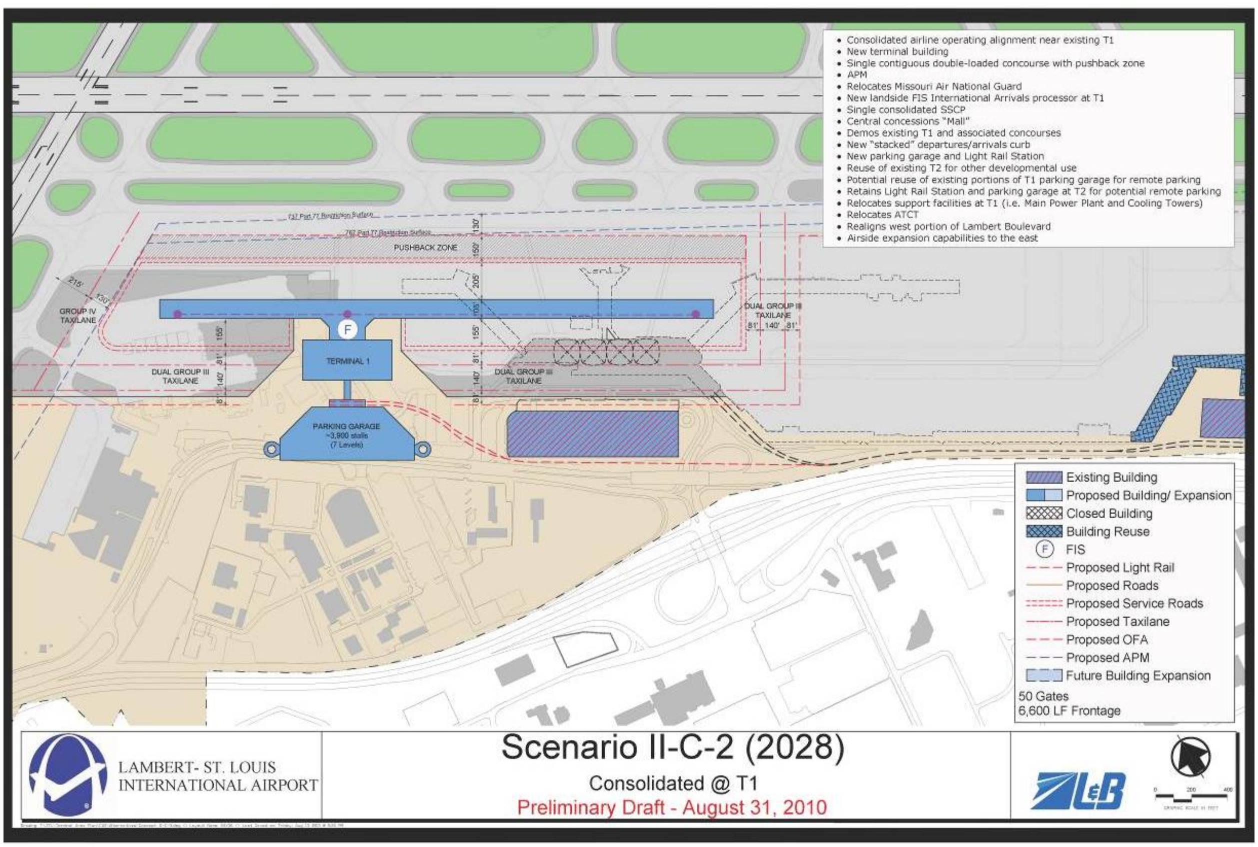


Exhibit 5.2-14, *Scenario II-D-1*, constructs a new consolidated terminal airside of the existing T1 processor. This provides for a centrally located passenger security screening area and concessions mall. The existing T1 "Gull-wing" concourse alignment is eliminated and a wider linear double-loaded concourse is constructed providing increased aircraft parking depth and pushback zone.

A new landside international FIS processing area is also constructed near the centrally located international arrivals gates providing short walking distances. An APM system is provided to enhance passengers' level of service and decrease walking distances. Existing T1 facilities are eliminated and T2 retained for other development use and potential remote parking capabilities.

The existing light rail alignment is extended to a new station at the T1 parking garage abandoning the existing station at the current T1 location. The existing ATCT would require relocation as well as the existing maintenance shops and HOST flight kitchen.

Exhibit 5.2-14
SCENARIO II-D-1
Lambert-St. Louis International Airport

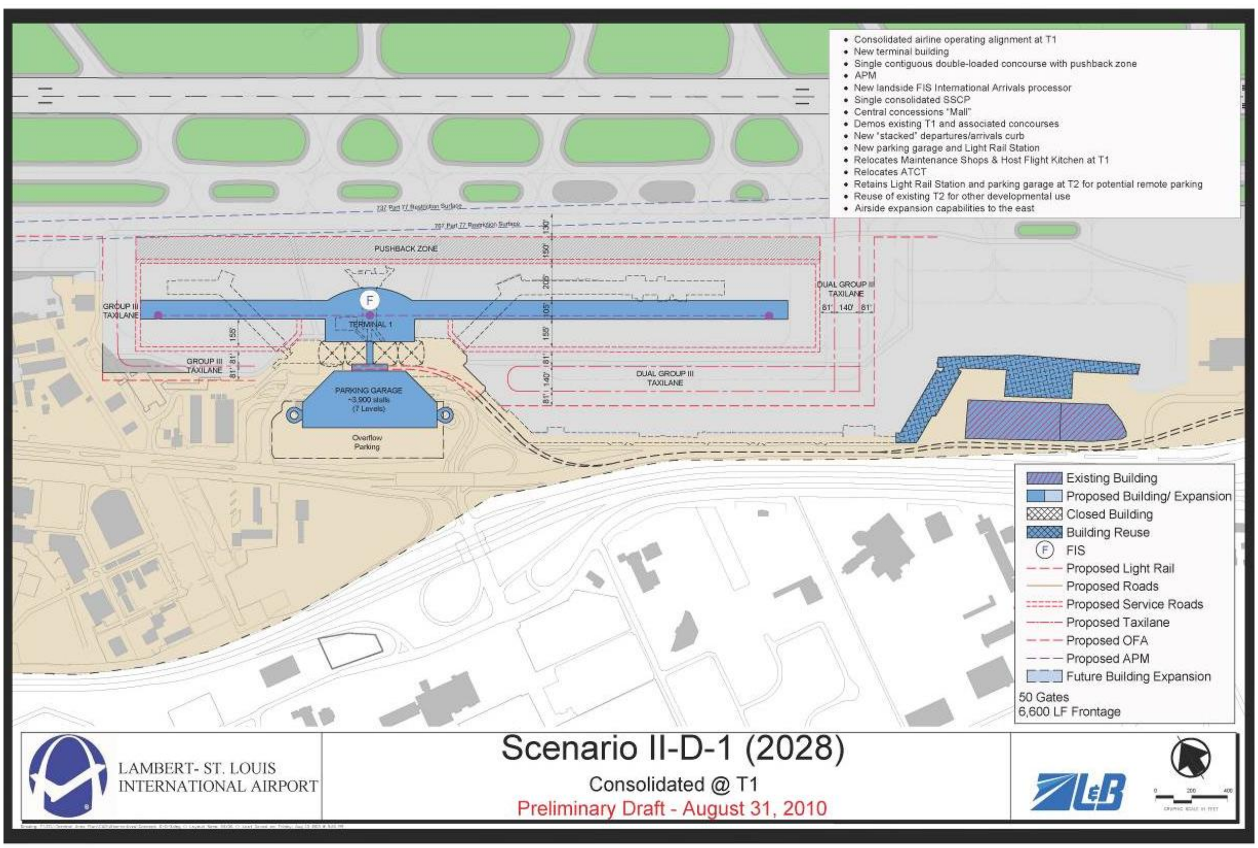


Exhibit 5.2-15, *Scenario II-D-2*, constructs a new consolidated terminal processor located landside of the existing T1 terminal processor. This provides for a centrally located passenger security screening area and concessions mall. Portions of the existing T1 "Gull-wing" concourse alignment are realigned and widened to provide increased aircraft parking depths and pushback zone. Concourses B and D are also removed. A new landside international FIS processing area is also constructed near the centrally located international arrivals gates providing short walking distances.

A portion of the existing T1 garage is removed to allow for a new "stacked" departures/arrivals curb constructed south of the existing staggered curb. The T1 parking garage is expanded to meet future demand and the T2 light rail station and garage are retained for potential remote parking capabilities. T2 is also retained for other development use. The existing maintenance shops and HOST flight kitchen require relocation.

Exhibit 5.2-15
SCENARIO II-D-2
Lambert-St. Louis International Airport

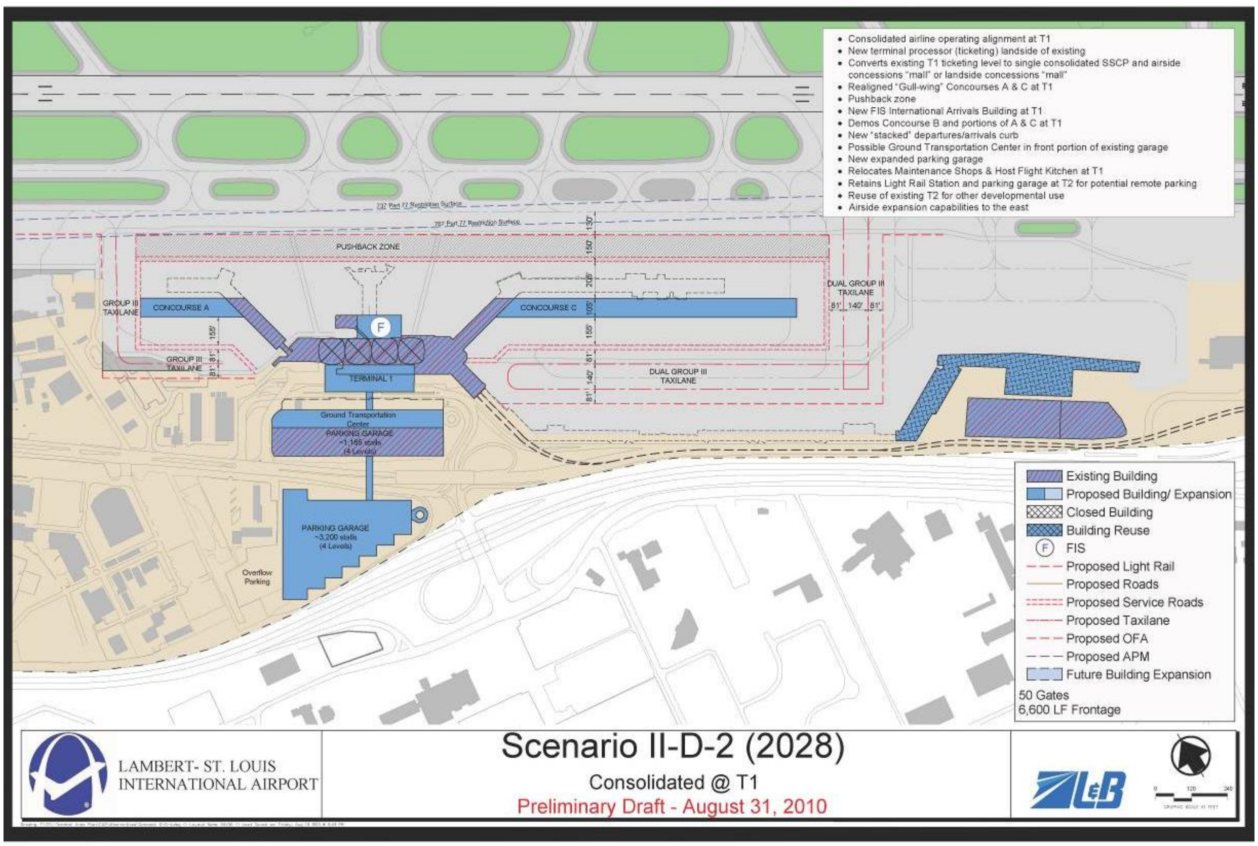
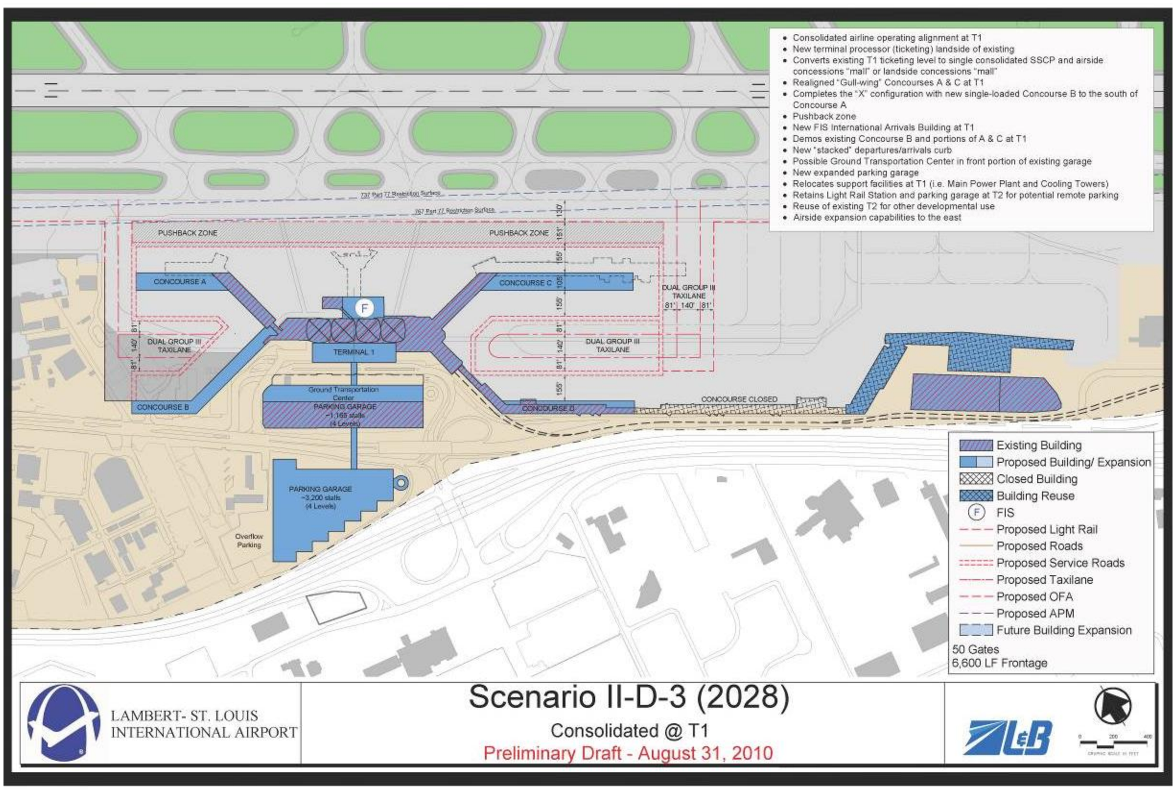


Exhibit 5.2-16, *Scenario II-D-3*, constructs a new consolidated terminal processor located landside of the existing T1 terminal processor. This provides for a centrally located passenger security screening area and concessions mall. Portions of the existing T1 "Gull-wing" concourse alignment are realigned and widened to provide increased aircraft parking depths and pushback zone. A portion of existing Concourse D remains and to complete the "X" gate configuration an additional single-loaded concourse on the west side of T1 is constructed. A new landside international FIS processing area is also constructed near the centrally located international arrivals gates providing short walking distances. Concourse B is removed and the remaining portion of Concourse D not used for passenger activity is closed.

A portion of the existing T1 garage is removed to allow for a new "stacked" departures/arrivals curb constructed south of the existing staggered curb. The T1 parking garage is expanded to meet future demand and the T2 light rail station and garage are retained for potential remote parking capabilities. T2 is also retained for other development use. The existing maintenance shops, HOST flight kitchen, Main Power Plant, and cooling towers require relocation.

Exhibit 5.2-16
SCENARIO II-D-3
Lambert-St. Louis International Airport



5.2.7 INITIAL TERMINAL ALTERNATIVES EVALUATION

Following the development of the 14 alternatives, an initial evaluation matrix shown in **Table 5.2-1, *Initial Terminal Alternative Comparisons***, was created using the key planning attributes previously described. A series of positive and negative attributes where then formulated in order to evaluate each of the alternatives one against another. A meeting was held with Airport staff to discuss and evaluate the alternatives based on the initial evaluation matrix. Alternatives that processed the most positive attributes were suggested as the best to move forward. At the conclusion of the meeting with Airport staff, five shortlist alternatives were selected for further investigation and evaluation.

Table 5.2-1
INITIAL TERMINAL ALTERNATIVE COMPARISONS
Lambert-St. Louis International Airport

	Scenario													
	I – Two Terminals							II – One Terminal						
	Current Airline Operating Alignment							Consolidated Airline Operating Alignment						
								@ or Near T1					T1&T2	@T2
Characteristics	I-A-1	I-B-1a	I-B-1b	I-C-1	I-D-1	I-D-2a	I-D-2b	II-B-1	II-C-2	II-D-1	II-D-2	II-D-3	II-C-1	II-B-2
Existing T1 A & C Concourse Alignement	✈													
Repositioned T1 A & C Concourse Alignement		✈	✈					✈						
Repositioned T1 A & C Concourse Alignment with Repositioned Curb and/or New Terminal														
Between T1 & T2													✈	
Missouri Air Guard Site				✈					✈					
Airside of Existing T1					✈					✈				
Landside of Existing T1						✈	✈				✈	✈		
"Gull-wing" Concourse	✈	✈									✈	✈		
Linear Concourse			✈	✈	✈	✈	✈	✈	✈	✈			✈	
Pier Concourse														✈
Staggered Arrivals/Departures Curb	✈	✈	✈					✈						
Stacked arrivals/departures curb				✈	✈	✈	✈		✈	✈	✈	✈	✈	✈
Positive Attributes														
Meets 2028 & Beyond Gate Requirements	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Fully Double-Loaded Concourses								√	√	√	√		√	√
Aircraft Pushback Zone		√	√	√	√	√	√	√	√	√	√	√		
Short O&D Pax Walking Distances	√	√	√	√	√	√		√	√	√		√	√	√
Single Consolidated SSCP			√	√	√	√	√	√	√	√	√	√	√	√
Central Concessions "Mall"			√	√	√	√	√	√	√	√	√	√	√	√
Favorable Phasing Ability														
Airside	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Landside				√					√				√	√
Minimal Landside Support Facility Relocation	√	√	√		√	√	√	√		√	√		√	√
Potential LEED New Construction Certification	√[1]	√	√	√	√	√	√	√	√	√	√	√	√	√
Negative Attributes														
Relocates ATCT				X	X				X	X				
Single Taxilanes	X	X	X			X	X	X		X	X	X		
Single-loaded Concourses	X	X	X	X	X	X	X					X	X	
Extensive walking distances requires APM System								X	X	X			X	X
Decentralized SSCP	X	X												
Decentralized Airside Concessions	X	X												X
Intl Bag Recheck due to Airside FIS	X													
Significant Landside Phasing Constraints					X	X	X			X	X			X
Requires Missouri Air National Guard site				X					X					
Extensive Landside Support Facilities Relocation				X	X				X			X		
Realigns or Extends Light Rail Station				X	X		X		X	X			X	
Major Roadway Realignment				X			X		X				X	X
Requires Major New Infrastructure				X	X	X	X		X	X	X	X	X	X
Significant Implementation & Phasing Issues					X	X	X	X		X	X	X		
Significant Cost Implications				X	X	X	X	X	X	X	X	X	X	X
Unweighted Score	0	2	6	-1	0	2	-1	5	1	1	3	1	3	3

Notes: 1 Could be considered under LEED New Construction if the project included major HVAC renovation, significant envelope modifications, and major interior rehabilitation.
Key: √ = +1, X = -1

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5.2.8 SHORT-LISTED TERMINAL ALTERNATIVES

The initial terminal development alternatives were created to cover a variety of feasible terminal area expansion options. These 14 alternatives were assessed against the initial planning criteria previously presented. These criteria were then used to eliminate alternatives that were considered less desirable or significantly deficient. The results of this initial assessment led to the selection of the five short-listed terminal alternatives shown in **Exhibit 5.2-17, *Short-Listed Terminal Alternatives Matrix***, and **5.2-18, *Short-Listed Terminal Alternatives***. To aid in the evaluation process pros and cons for each of the short-listed alternatives were developed and discussed prior to the development of the more detailed criterion which were established and defined as described in Section 5.2.9, *Evaluation of Short-Listed Alternatives*. Refinements to the plans were on-going and are presented below with their associated pros and cons.

Exhibit 5.2-17
SHORT-LISTED TERMINAL ALTERNATIVES MATRIX
Lambert-St. Louis International Airport

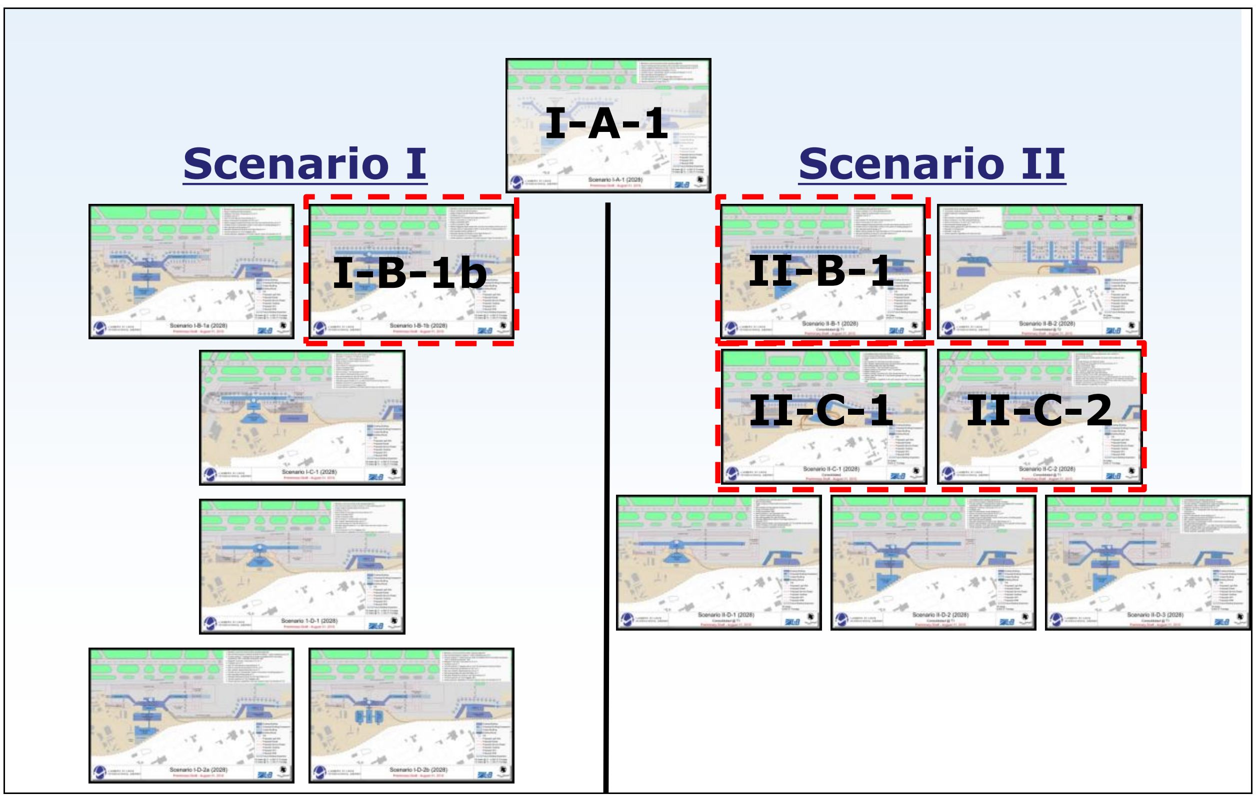
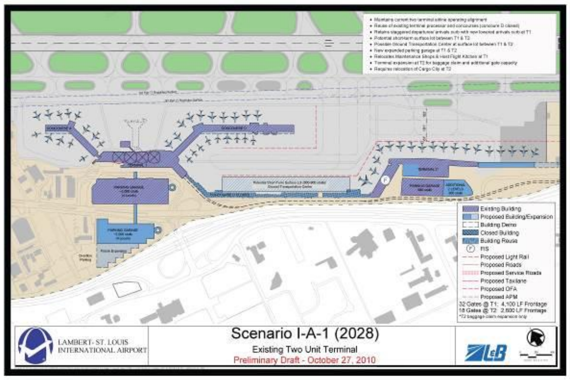
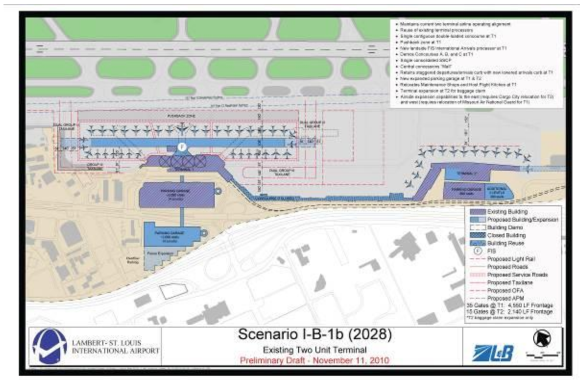


Exhibit 5.2-18
SHORT-LISTED TERMINAL ALTERNATIVES
Lambert-St. Louis International Airport

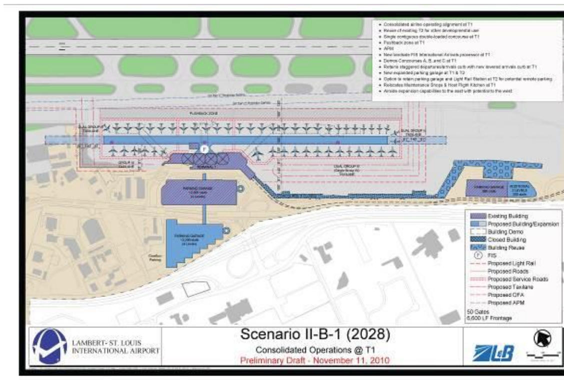
SCENARIO I-A-1



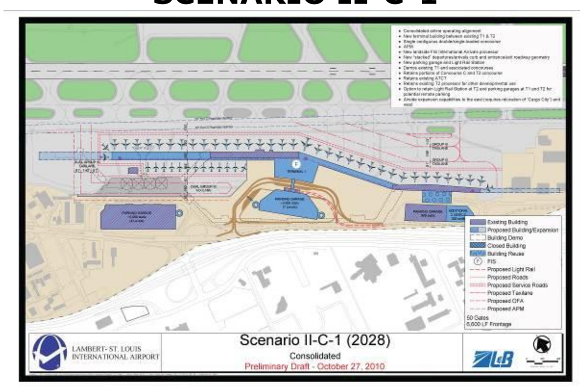
SCENARIO I-B-1b



SCENARIO II-B-1



SCENARIO II-C-1



SCENARIO II-C-2

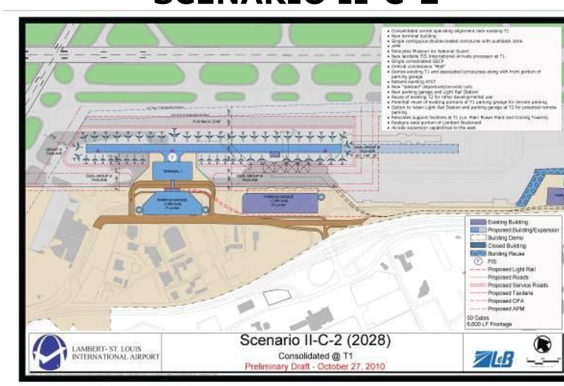


Exhibit 5.2-19, *Scenario I-A-1 (Baseline)*, as previously described, maintains the current two terminal airline operating alignment and reuses the exiting terminal processors. This alternative represents a "minimum" build condition to which the remaining alternatives were compared.

PROS:

Airside

- Meets MP 2028 gate capacity
- Provides ability to expand concourse/gate capacity incrementally
- Reuse of existing apron and taxi infrastructure
- Retains existing Air Traffic Control Tower (ATCT) at T1
- Maintains short O&D passenger walking distances from security screening checkpoints (SSCP)

Terminal

- Reuse of existing terminals and concessions with ability to grow into existing capacity
- Retains double loaded concourses at T1
- Potential for concourse circulation expansion (width) at T1
- Minimal apron rehabilitation/expansion

Landside

- Reuse of some of the existing entrance roadway infrastructure
- Maintains existing light rail stations at terminals
- Convenience of close-in covered parking
- New lowered arrivals level roadway at T1
- New parking garage expansion at T1 and T2

CONS:

Airside

- Aircraft pushback operations onto active taxiway Charlie at T1
- Single taxilane along the south Concourse A gates at T1 limit efficient aircraft movements if expansion occurs
- Missouri Air National Guard limits expansion to the west beyond 2028 MP horizon

Terminal

- No moving walkways in concourses at T1 without circulation expansion which impacts on-going operations
- Decentralized concessions program at T1 post security resulting from the splitting of passenger flows; inability to develop a primary secure airside concessions hall with exposure to all passengers thereby limiting concession choices and revenues performance
- Requires baggage claim expansion at T2 to meet future demand
- Cost to maintain existing T1 infrastructure which is 40-50 plus years old today and 70 plus by 2028
- Cost to maintain multiple unit terminals and operations
- Limited existing T1 Concourse A expansion ability to the west in event mainline carriers grow and would require realignment of airlines between Concourse A and C
- Existing airside international arrivals processing facility

Landside

- Challenge of maintaining existing operations while building new terminal roadway infrastructure at T1
- Retains existing departures curb over baggage claim at T1
- Tight landside envelope at both terminals
- Limited close-in parking expansion capabilities at T2 (see Section 5.3.8)
- Limited arrivals curb expansion opportunities beyond existing capacity at T2
- Challenge of increasing departures curb capacity while maintaining existing operations at T2

Implementation

- Complexity of building new T1 arrivals roadway infrastructure while maintaining existing roadway operations
- Landside phasing ability
- Cost and difficulty
- Consideration of possible security issues, Foreign Object Debris (FOD) containment, and blast deflection requirements

Environmental

- Keeping existing terminals potentially limits the applicability of new LEED sustainable design approaches, more efficient Mechanical, Electrical and Plumbing (MEP) systems and environmentally friendly materials

Exhibit 5.2-19
SCENARIO I-A-1 (BASELINE)
Lambert-St. Louis International Airport

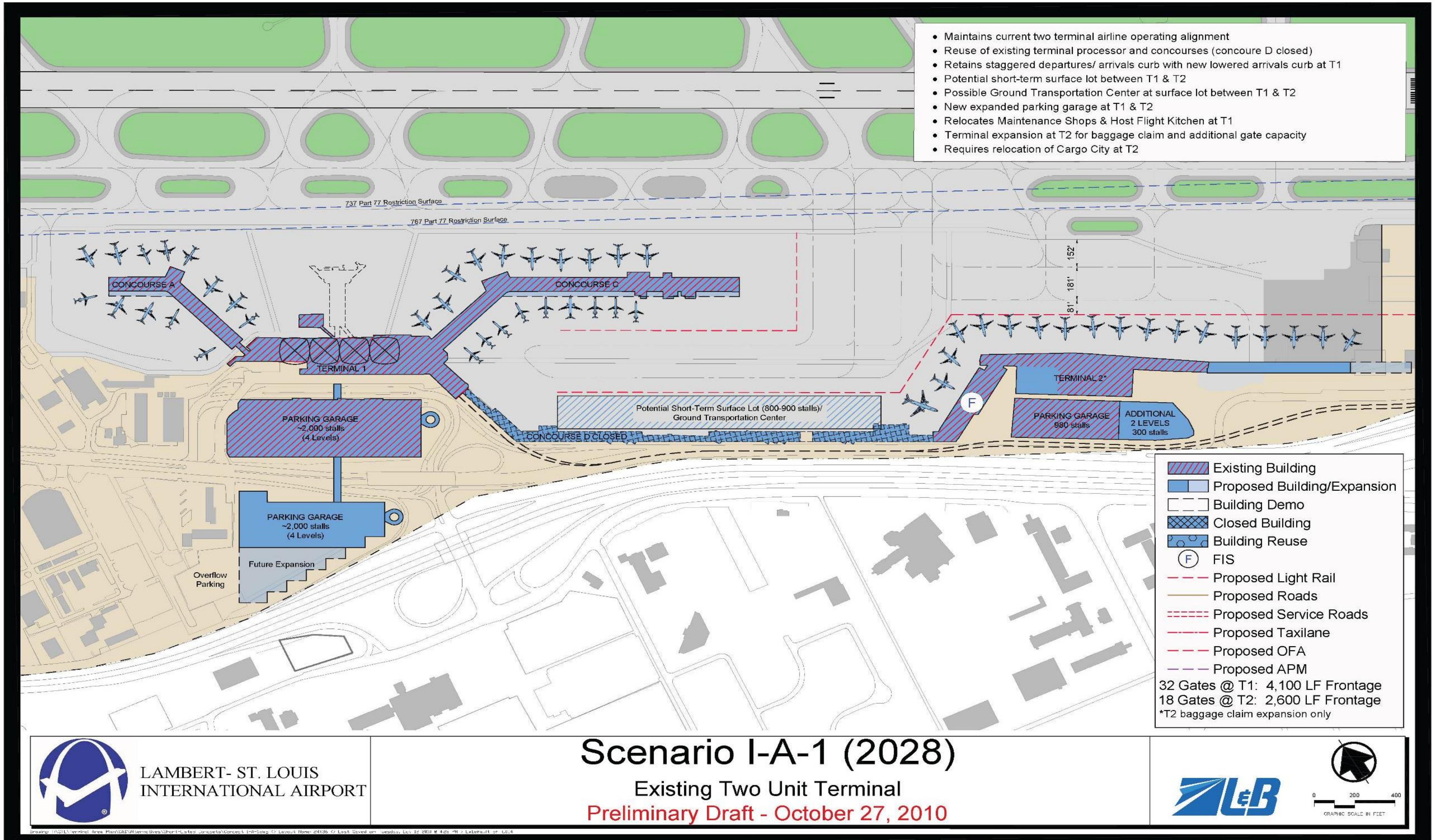


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Exhibit 5.2-20, Scenario I-B-1b, as previously described, maintains the current two terminal airline operating alignment and reuses the existing terminal processors.

PROS:

Airside

- Meets MP 2028 aircraft gate capacity in single contiguous flight line with incremental gate expansion potential
- Realigned concourse alignment at T1 allows for pushback zone to increase airside taxi flow efficiency
- Potential for dual taxilanes at both terminals
- Retains existing ATCT
- Minimal apron rehabilitation/expansion

Terminal

- Reuse of existing terminals and concessions with ability to grow into existing capacity
- Efficient wider double-loaded concourses at T1
- Centralized security for more efficient operation which flows all outbound passengers past a primary concession hall and allows enhanced product variety and revenue performance
- Landside "walk to" international arrivals processing facility at T1

Landside

- Reuse of some of the existing entrance roadway infrastructure
- Maintains existing light rail stations at terminals
- Convenience of close-in covered parking
- New lowered arrivals level roadway at T1
- New parking garage expansion at T1 and T2

Environmental

- Partial new construction offers opportunity to incorporate LEED sustainability design principles and materials

CONS:

Airside

- T1 westward concourse construction requires relocation of some landside support facilities
- Missouri Air National Guard limits expansion to the west beyond 2028 MP horizon
- Longer walking distances to furthest gates at T1

Terminal

- Requires baggage claim expansion at T2 to meet future demand
- Cost to maintain existing T1 infrastructure which is 40-50 plus years old today and 70 plus by 2028
- Cost to maintain multiple unit terminals and operations

Landside

- Challenge of maintaining existing operations while building new terminal roadway infrastructure at T1
- Retains existing departures curb over baggage claim T1
- Tight landside envelope at both terminals
- Limited close-in parking expansion capabilities at T2
- Limited arrivals curb expansion opportunities beyond existing capacity at T2
- Challenge of increasing departures curb capacity while maintaining existing operations at T2
- Requires relocation of existing maintenance shops and HOST flight kitchen

Implementation

- Complexity of building new T1 arrivals roadway infrastructure while maintaining existing roadway operations
- Landside phasing ability
- Cost and difficulty

Environmental

- Keeping existing terminals potentially limits the applicability of new LEED sustainable design approaches, more efficient Mechanical, Electrical and Plumbing (MEP) systems and environmentally friendly materials

Exhibit 5.2-20
SCENARIO I-B-1b
Lambert-St. Louis International Airport

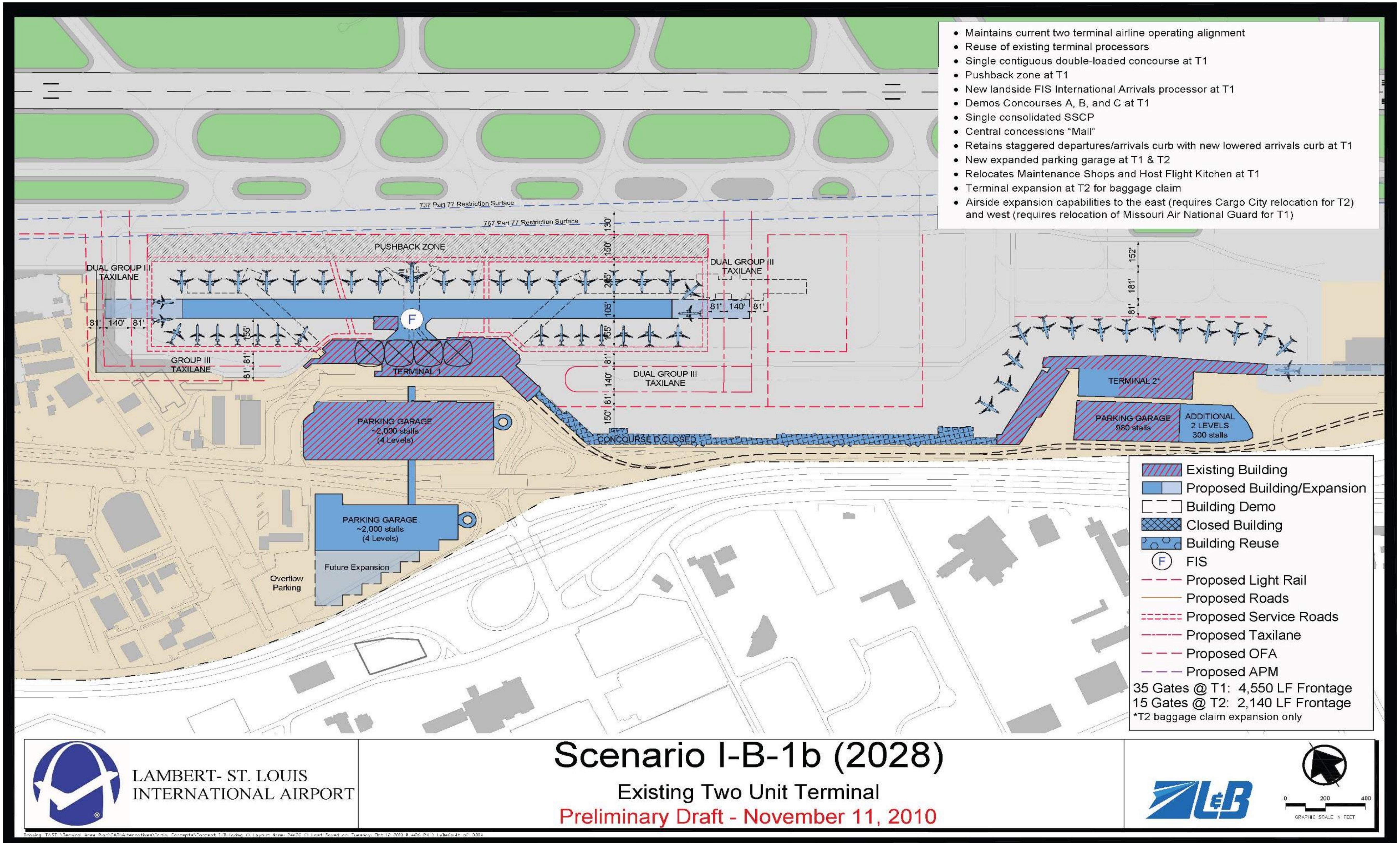

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Exhibit 5.2-21, *Scenario II-B-1*, as previously described, consolidates all passenger operations at T1 and constructs a new linear double-loaded concourse alignment.

PROS:

Airside

- Meets MP 2028 aircraft gate capacity in single contiguous flight line with incremental gate expansion potential
- Realigned concourse alignment at T1 allows for pushback zone to increase airside taxi flow efficiency
- Potential for dual taxilanes
- Retains existing ATCT
- Minimal apron rehabilitation/expansion

Terminal

- Consolidated terminal operations at T1
- Reuse of existing terminals and concessions with ability to grow into existing capacity (some additional area required in baggage make-up area of T1)
- Efficient wider double-loaded concourses
- Automated People Mover (APM)
- Centralized security for more efficient operation which flows all outbound passengers past a primary concession hall and allows enhanced product variety and revenue performance
- Landside "walk to" international arrivals processing facility

Landside

- Reuse of some of the existing entrance roadway infrastructure
- Maintains existing "Metrolink" light rail station
- Convenience of close-in covered parking
- New lowered arrivals level roadway
- New parking garage expansion

Environmental

- Partial new construction offers opportunity to incorporate LEED sustainability design principles and materials

CONS:

Airside

- T1 westward concourse construction requires relocation of some landside support facilities
- Missouri Air National Guard limits expansion to the west beyond 2028 MP horizon
- Longer walking distances to furthest gates at T1
- Requires some type of assisted people mover device (APM)

Terminal

- Cost to maintain existing T1 infrastructure which is 40-50 plus years old today and 70 plus by 2028

Landside

- Challenge of maintaining existing operations while building new terminal roadway infrastructure at T1
- Retains existing departures curb over baggage claim T1
- Requires relocation of existing maintenance shops and HOST flight kitchen

Implementation

- Complexity of building new T1 arrivals roadway infrastructure while maintaining existing roadway operations
- Landside phasing ability
- Cost and difficulty

Environmental

- Keeping existing terminals potentially limits the applicability of new LEED sustainable design approaches, more efficient Mechanical, Electrical and Plumbing (MEP) systems and environmentally friendly materials

Exhibit 5-2.21
SCENARIO II-B-1
Lambert-St. Louis International Airport

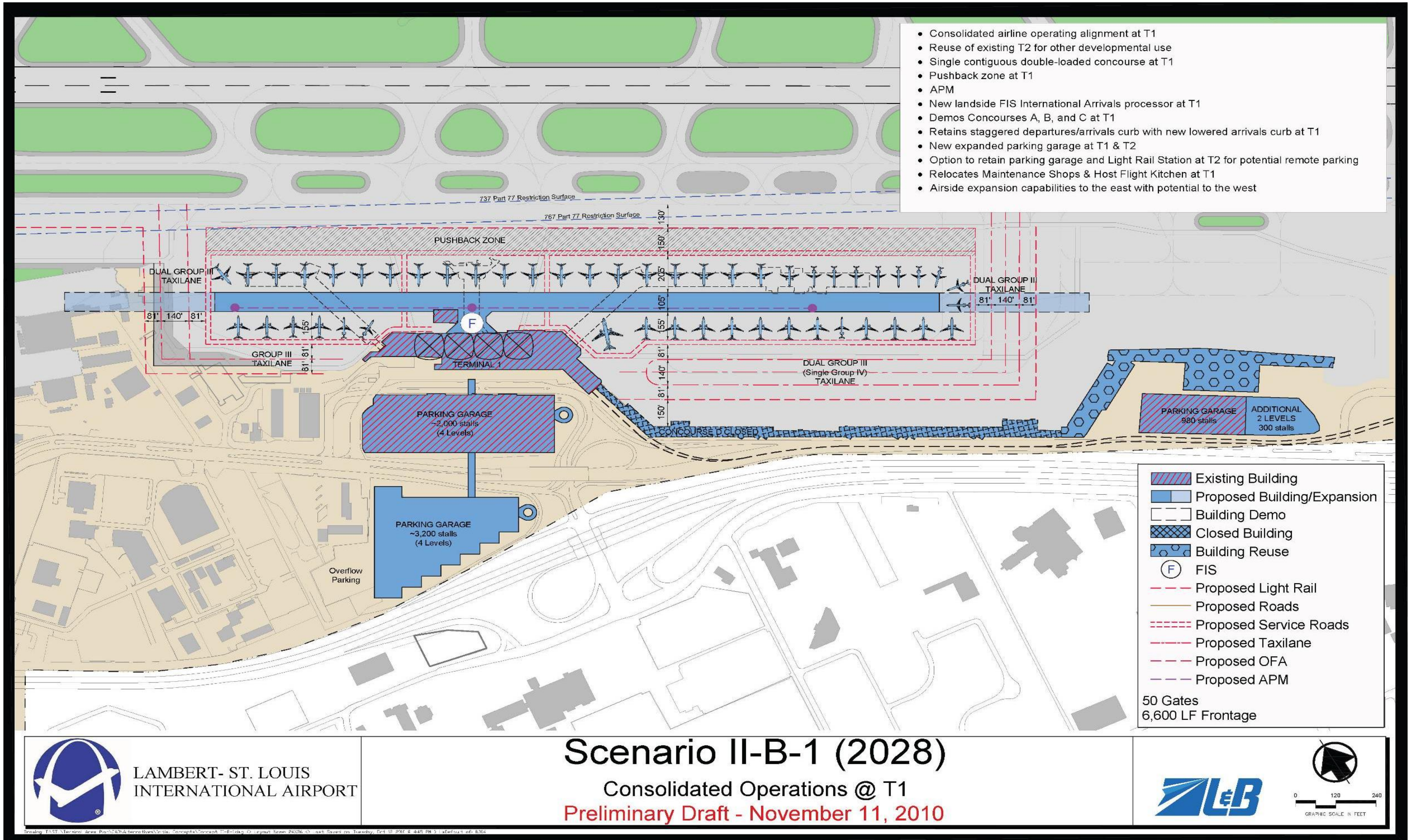

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Exhibit 5.2-22, Scenario II-C-1, as previously described, consolidates all passenger operations into a new terminal processor between existing T1 and T2 while utilizing portions of the existing terminal concourses. New ingress and egress access roadway infrastructure is also constructed.

PROS:

Airside

- ✈ Meets MP 2028 aircraft gate capacity with incremental gate expansion potential
- ✈ Partial dual taxilanes
- ✈ Retains existing ATCT

Terminal

- ✈ Consolidated terminal operations into new centralized terminal location between T1 and T2 with incremental expansion capabilities
- ✈ Reutilizes existing Concourse C and Terminal 2 concourse infrastructure
- ✈ Efficient double-loaded concourses to the west
- ✈ Centralized security for more efficient operation which flows all outbound passengers past a primary concession hall and allows enhanced product variety and revenue performance
- ✈ Landside "walk to" international arrivals processing facility

Landside

- ✈ Convenience of close-in covered parking
- ✈ New multi-level parking garage

Environmental

- ✈ Partial new construction offers opportunity to incorporate LEED sustainability design principles and materials

CONS:

Airside

- Aircraft pushback operations onto active taxiway Charlie at existing Concourse C
- Half the contact gates are on single loaded concourse creating longer walking distances
- Longer walking distances to furthest east gates
- Requires some type of assisted people mover device (APM)

Terminal

- Requires new infrastructure

Landside

- Challenge of maintaining existing operations while building new consolidated terminal and roadway infrastructure
- Long narrow site
- Requires new light rail station and alignment to terminal

Implementation

- Airside/Landside phasing ability while maintaining existing operations
- Cost and difficulty

Exhibit 5.2-22
SCENARIO II-C-1
Lambert-St. Louis International Airport

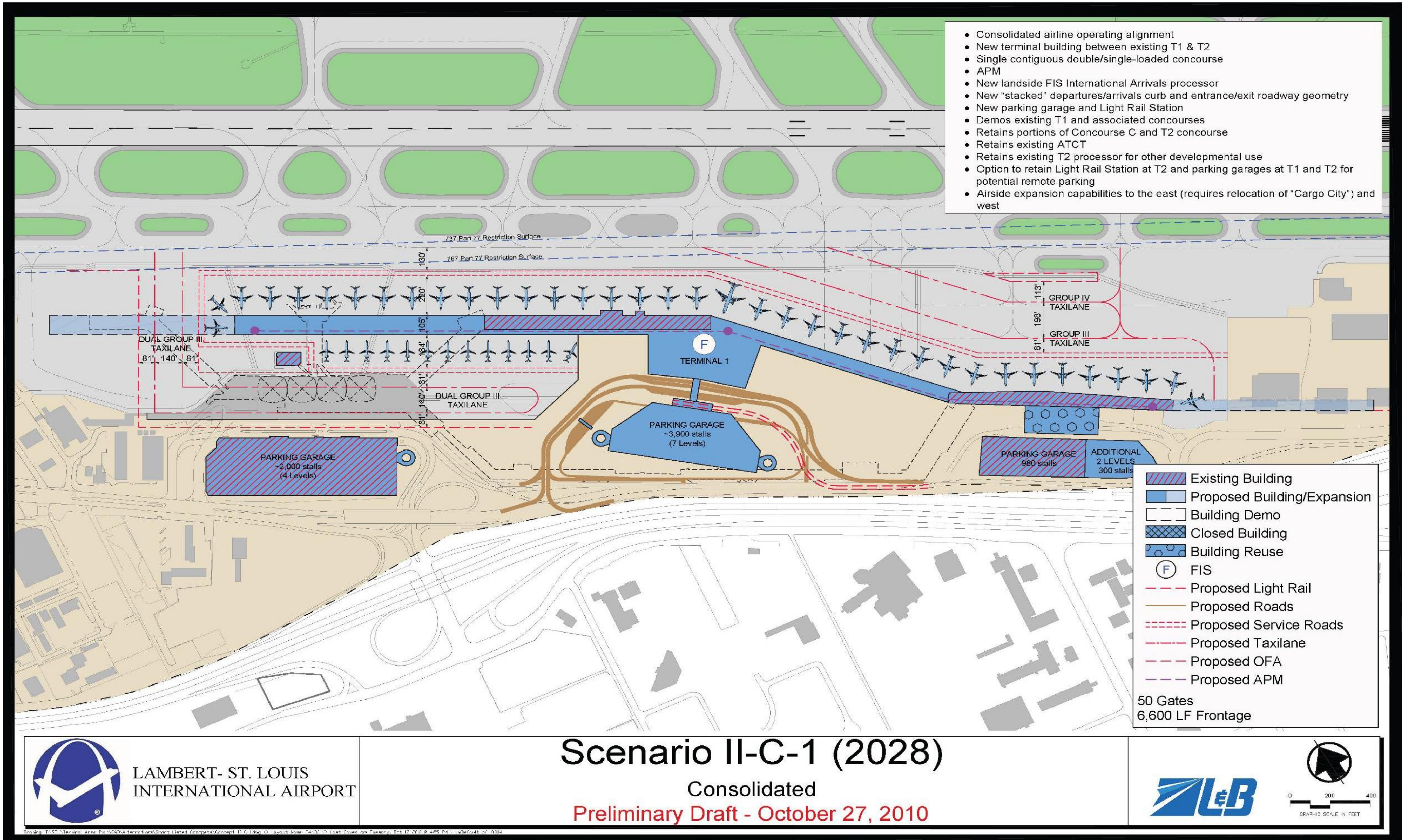

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Exhibit 5.2-23, Scenario II-C-2, as previously described, consolidates all passenger operations into a new terminal at the existing Missouri Air National Guard site. New ingress and egress access roadway infrastructure is also constructed.

PROS:

Airside

- Meets MP 2028 aircraft gate capacity in single contiguous flight line with incremental gate expansion potential to the east
- Realigned concourse alignment at T1 allows for pushback zone to increase airside taxi flow efficiency
- Dual taxilanes
- Retains existing ATCT

Terminal

- Consolidated terminal operations into new single terminal near existing T1 location
- New processor provides capacity to meet 2028 demand and beyond with incremental expansion capabilities
- Efficient wider double-loaded concourses
- Centralized security for more efficient operation which flows all outbound passengers past a primary concession hall and allows enhanced product variety and revenue performance
- Landside “walk to” international arrivals processing facility

Landside

- Provides new entrance/exit roadway infrastructure
- New “stacked” departures/arrivals curb
- Convenience of close-in covered parking
- New multi-level parking garage

Implementation

- Allows easier construction implementation and phasing while maintaining current operations

Environmental

- Completely new terminal construction maximizes opportunity to incorporate LEED sustainability design principles and materials at T1

CONS:

Airside

- ✈ Extensive apron rehabilitation/expansion and taxi infrastructure
- ✈ No gate expansion potential to the west
- ✈ Longer walking distances to furthest east gates
- ✈ Requires some type of assisted people mover device (APM)

Terminal

- ✈ Part 77 surface limitations and Runway 6/24 taxiway obstacle free areas (OFA) limit gate expansion at T1
- ✈ Non-centralized terminal processor to airside concourse

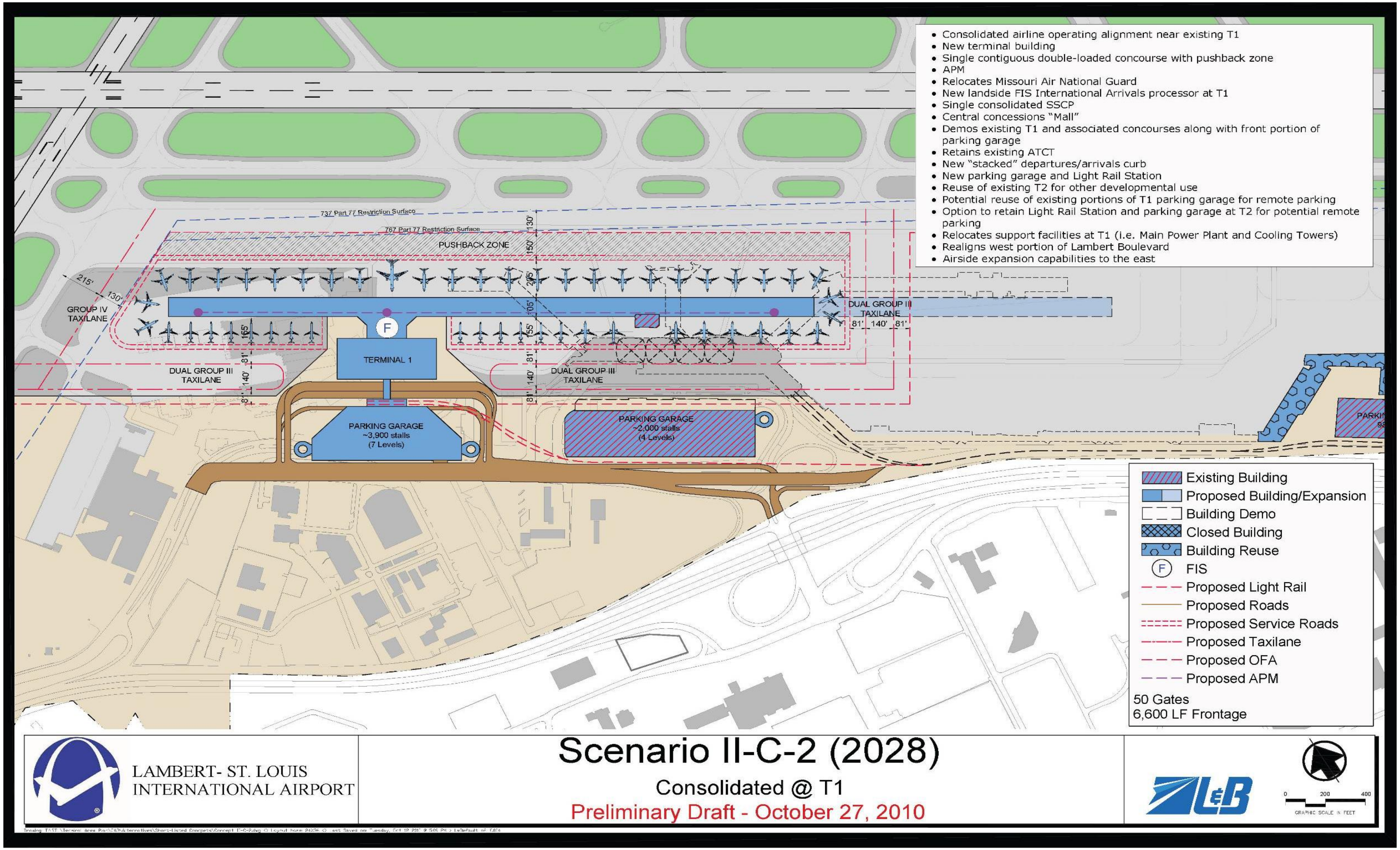
Landside

- ✈ Requires relocation of some landside support facilities along with Missouri Air National Guard
- ✈ Requires new landside access and infrastructure
- ✈ Requires realignment of Lambert Boulevard
- ✈ Requires new light rail station and alignment to terminal
- ✈ Requires relocation of existing maintenance shops, HOST flight kitchen, Main Power Plant, and cooling towers

Implementation

- Site requires entirely new terminal complex infrastructure

Exhibit 5.2-23
SCENARIO II-C-2
Lambert-St. Louis International Airport



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5.2.9 EVALUATION OF SHORT-LISTED ALTERNATIVES

The weightings and evaluation criterion shown in Table 5.2-3 were prepared for review and then presented to Airport staff during a working session held in October of 2010. Based on comments received from the Airport staff during the session the weightings and criteria were then refined and scores revised. Each Major Category of criteria and, secondarily, each individual criterion were assigned a relative weighted percentage as compared to each of the other evaluation criteria. The individual criteria weightings and definitions are described in **Table 5.2-2, *Terminal Alternative Evaluation Criteria Weighting***, and **Table 5.2-3, *Terminal Alternative Evaluation Criteria Definitions***, respectively. **Table 5.2-4, *Terminal Short-List Alternatives Evaluation Matrix Summary***, shows the matrix scoring results of the short-listed alternatives.

Table 5.2-2
TERMINAL ALTERNATIVE EVALUATION CRITERIA WEIGHTING
Lambert-St. Louis International Airport

EVALUATION CRITERIA WEIGHTINGS			
Criteria Categories		**Importance (Weightings)**	
		Major Category	Secondary Category
1. AIRSIDE	1.1 Meets Required Aircraft Parking Capacity 1.2 Aircraft Gate Use Flexibility 1.3 Apron/Taxilane Efficiency 1.4 Taxi Distance to Runway Ends and Exits	20%	30% 25% 25% 20%
2. TERMINAL	2.1 Meets Required Terminal Capacity 2.2 Maximizes Flexibility for Potential Operational Changes 2.3 Ability to Meet Primary Stakeholder Missions (airlines) 2.4 Passenger Convenience and Comfort *2.4.1. Origin and Destination Traffic* *2.4.2. Connecting Traffic* 2.5 Security Efficiency 2.6 Passenger Orientation to Processing 2.7 Connectivity to Other Key Facilities 2.8 Concessions Revenue Potential	20%	20% 5% 15% 30% *20%* *10%* 15% 5% 5% 5%
3. LANDSIDE	3.1 Meets Required Curb Capacity and Adequate LOS 3.2 Effectiveness of Access/Egress Roads 3.3 Ease of Passenger Orientation to Roads 3.4 Provides Easy Access to Future Mass Transit	20%	30% 30% 30% 10%
4. IMPLEMENTATION FEASABILITY	4.1 Ability to Phase Construction/Modifications *4.4.1. Airside/Terminal* *4.4.2. Landside* 4.2 Operational Effectiveness of Initial Phase *4.2.1. Airside/Terminal* *4.2.2. Landside*	10%	50% *25%* 25% 50% *25%* 25%
5. ENVIRONMENTAL ISSUES	5.1 Air and Water Quality 5.2 Sustainability	5%	50% 50%
6. LAND USE	6.1 Effective Utilization of Land for Aviation Needs 6.2 Potential Collateral Development Options 6.3 Safeguards Future Long Range Terminal Expansion	5%	25% 25% 50%
7. CAPITAL COST	7.1 Order of Magnitude Costs	20%	100%
TOTAL TERMINAL ALTERNATIVE		100%	

Table 5.2-3
TERMINAL ALTERNATIVE EVALUATION CRITERIA DEFINITIONS
Lambert-St. Louis International Airport

EVALUATION CRITERIA DEFINITIONS	
CRITERIA CATEGORIES	**CRITERIA DEFINITIONS**
1.1 Meets Required Aircraft Parking Capacity	Provides required net gain in aircraft parking, gates and fleet mix size for 2028
1.2 Aircraft Gate Use Flexibility	Ability of the concept to provide flexibility of use in aircraft gates, apron and supporting taxilane system for potential fleet mix changes and airline operations
1.3 Apron/Taxilane Efficiency	Improves taxiway/taxilane flows and minimizes pushback conflicts
1.4 Taxi Distance to Runway Ends and Exits	Concept maintains reasonable taxiing distance to and from runways to terminal gates
2.1 Meets Required Terminal Capacity	Terminal footprint provides sufficient depth and width to meet future demand requirements
2.2 Maximizes Flexibility for Potential Operational Changes	Adaptability of terminal plan to accommodate Code Shares and allow changing missions of airlines throughout the planning period
2.3 Ability to Meet Primary Stakeholder Missions	Accommodates the primary airline operations and missions operating from STL
2.4 Passenger Convenience and Comfort	Improves spatial LOS, minimizes travel times, walking distances and vertical level changes
2.5 Security Efficiency	Accommodates new security procedures and technologies and minimizes the number of security screening checkpoints.
2.6 Passenger Orientation to Processing	Intuitive way finding, clarity of O&D and connecting passengers to easily find their way through the terminal
2.7 Connectivity to Other Key Facilities	The ability of the concept to provide conveniently situated support facilities to the terminal
2.8 Concessions Revenue Potential	The ability of the concept to provide passenger exposure to majority of concessions
3.1 Meets Required Curb Capacity and Adequate LOS	Concept meets or exceeds curb requirement in linear frontage (single or double level) & LOS
3.2 Effectiveness of Access/Egress Roads	Concept meets operational efficiency standards (weave distances, min radius curves, sight lines)
3.3 Ease of Passenger Orientation to Roads	Concept provides for simple roadway decisions with sufficient distances between decision points
3.4 Provides Easy Access to Future Mass Transit	Includes ability to conveniently connect to future on and off-airport transit systems
4.1 Ability to Phase Construction/Modifications	Provides a feasible approach to construction phasing while maintaining existing operational capability (no loss of gates, services or utilities)
4.2 Operational Effectiveness of Initial Phase	Concept's ability to deliver an initial stage of construction that provides needed gate and terminal capacity that can be practically achieved
5.1 Air and Water Quality	Ability of concept to minimize air and water quality impacts (also during demolition and construction)
5.2 Sustainability	Development of new buildings and rehabilitation of existing facilities that meet sustainability goals
6.1 Effective Utilization of Land for Aviation Needs	The concept demonstrates a prudent utilization of the Airport's land and facilities for future aviation needs
6.2 Potential Collateral Development Options	The utilization of land for potential non-aviation revenue development
6.3 Safeguards Future Long Range Terminal Expansion	Concept provides and ultimate Terminal Area Master Plan expansion path well beyond the 2028 Master Plan forecast horizon that is achievable with minimal impacts
7.1 Order of Magnitude Costs	Minimizes development costs relative to benefits

Table 5.2-4
TERMINAL SHORT-LIST ALTERNATIVES EVALUATION MATRIX SUMMARY
Lambert-St. Louis International Airport

Criteria Categories	Importance[1] Major Category Weighting	Importance[1] Secondary Category Weighting	Concept I-A-1 Baseline - Existing Two Terminal/ Minimal Build RAW	Concept I-A-1 WEIGHTED	Concept I-B-1b Existing Two Terminal Operating Alignment RAW	Concept I-B-1b WEIGHTED	Concept II-B-1 Consolidated Terminal @ T1 RAW	Concept II-B-1 WEIGHTED	Concept II-C-1 Consolidated Terminal between T1 & T2 RAW	Concept II-C-1 WEIGHTED	Concept II-C-2 Consolidated Terminal @ Air Guard Site RAW	Concept II-C-2 WEIGHTED
			STL Airport Master Plan Terminal Development Concpets - Evaluation Matrix									
1 AIRSIDE	20%	100%	0.50	0.75	3.25	3.50	3.75	3.95	3.50	3.65	4.75	4.80
2 TERMINAL	20%	100%	1.75	2.55	3.06	3.80	4.50	4.45	3.81	3.60	4.44	4.60
3 LANDSIDE	20%	100%	2.50	2.00	2.50	2.00	3.50	3.20	4.50	4.40	5.00	5.00
4 IMPLEMENTATION FEASIBILITY	10%	100%	2.50	2.50	1.50	1.50	1.50	1.50	0.75	0.75	-0.75	-0.75
5 ENVIRONMENTAL ISSUES	5%	100%	1.00	1.00	1.00	1.00	1.50	1.50	2.00	2.00	1.50	1.50
6 LAND USE	5%	100%	0.00	0.00	2.00	2.25	4.00	4.25	3.33	3.25	4.67	4.75
7 CAPITAL COST	20%	100%	5.00	5.00	3.00	3.00	2.00	2.00	-4.00	-4.00	-5.00	-5.00
TOTAL TERMINAL CONCEPT	100%		1.89	2.36	2.33	2.77	2.96	3.16	1.99	1.87	2.09	2.12
		RANK		3		2		1		5		4

<u>Weighted Scoring Scale:</u>
Highest Score = 5.0
Lowest Score = -5.0
<u>Color Scoring Scale:</u>
Green: 5.0 to 2.0 = Good
Yellow: -1.99 to -1.99 = Average
Red: -2.0 to -5.0 = Poor

Note: 1 Each criteria category is weighted (major and secondary) based on its overall importance. Values are based on the consultant's previous project experience with input from the STL client.

Source: Landrum & Brown Analysis

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5.2.10 FINAL SHORT-LISTED TERMINAL ALTERNATIVES

Throughout the planning process, the short-listed terminal alternatives were constantly evolving and updated to address comments and concerns, which arose from the on-going stakeholder presentations and internal Team meetings.

Prior to selection of the preferred terminal plan rough order-of-magnitude costs were developed for each of the five short-listed alternatives and the two top scoring alternatives **Scenarios I-B-1b** and **II-B-1** were further delineated and conceptual phasing plans were developed. These 20-year phasing plans were developed to determine if they were feasible from a construction standpoint. The configuration of each phase was driven by the forecast gate requirements for each planning activity level. Larger layouts can be found in Appendix E.

An additional option was developed for both Scenarios I-B-1b and II-B-1 which looked at additional apron and taxi capabilities along the backside of Concourse A at T1. The intent of the planning exercise was to twofold:

1. Identify those facilities which may be lost if the pushback zone was retained and;
2. Attempt to minimize disruption to existing airside support buildings beyond the facilities that were required to make the single Group III taxilane infrastructure operate if the pushback zone were reduced.

However, further analysis showed no additional facilities would be impacted by a dual Group III taxilane system along the backside of the realigned west concourse at T1. The obstacle free area was set just north of the existing Cooling Towers and Main Power Plant. This resulted in a decreased pushback zone along taxiway Charlie limiting operations to Group III aircraft. These additional layouts are shown in **Exhibit 5.2-24, *Scenario I-B-1b – Option B***, and **Exhibit 5.2-25, *Scenario II–B-1 - Option B***.

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Exhibit 5.2-24
SCENARIO I-B-1b – OPTION B
Lambert-St. Louis International Airport

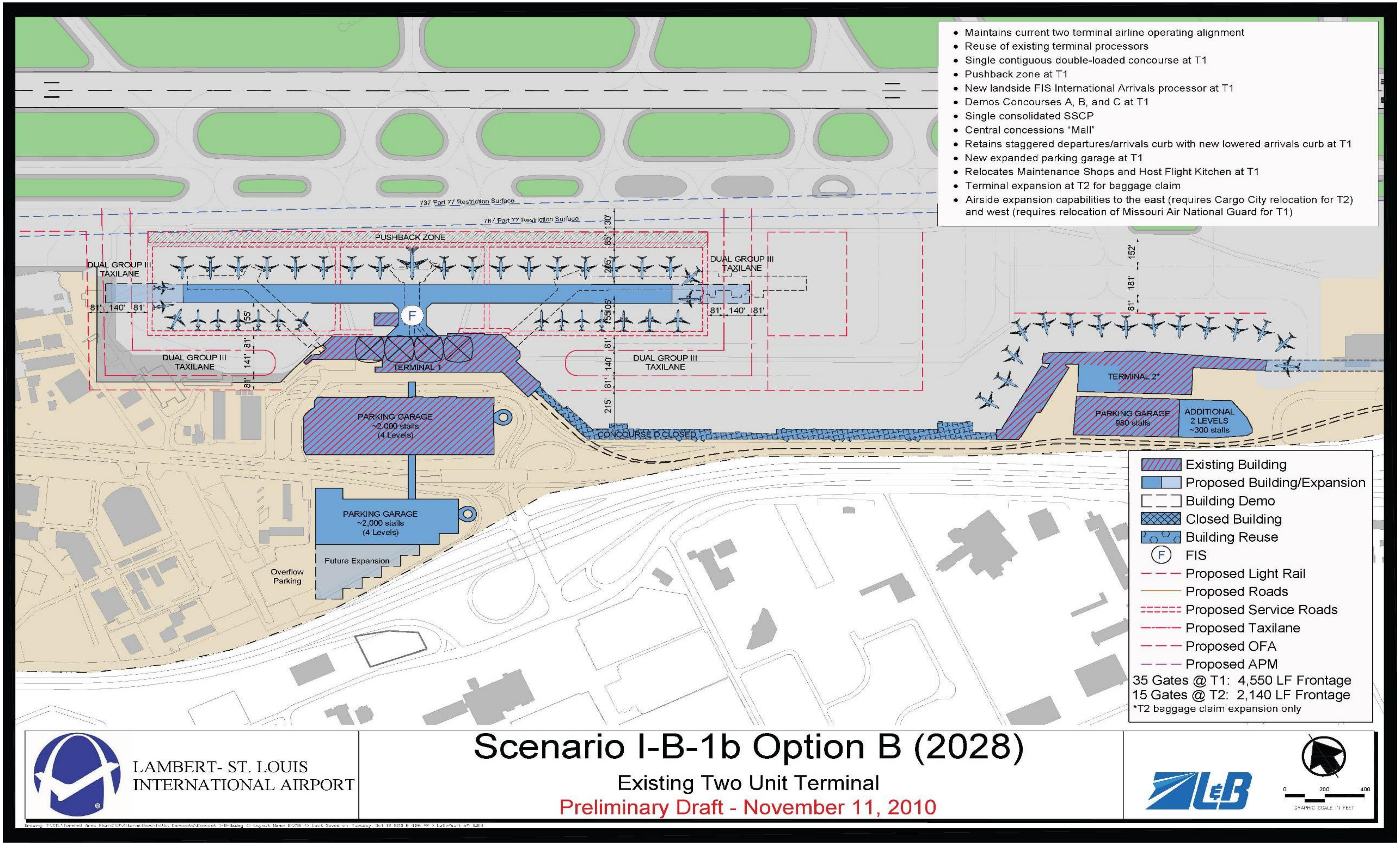

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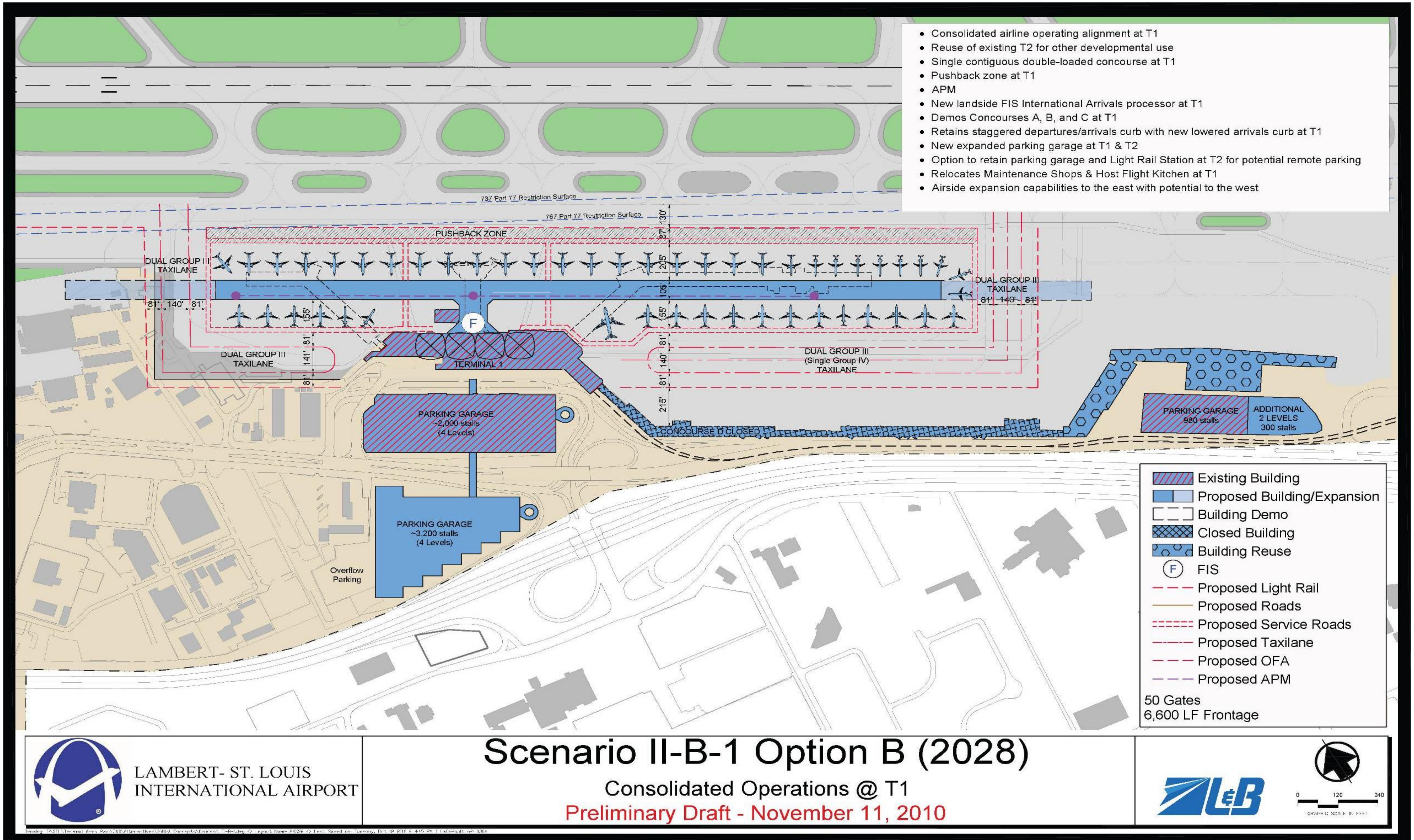
Exhibit 5.2-25
SCENARIO II-B-1 – OPTION B
Lambert-St. Louis International Airport



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5.2.11 PREFERRED TERMINAL ALTERNATIVE

The fourteen alternatives explored represent a continuous progression of refined terminal concepts that evolved throughout the planning process. The previous sections described the selection process of the short-listed alternatives, which ultimately lead to the selection of the preferred Scenario II-B-1 for the Master Plan study. The recommended plan takes advantage of existing T1 and its parking infrastructure and addresses operational challenges on the airside. Additionally, this alternative consolidates the operations into a single terminal and permits the airport to expand to the ultimate configuration or, should conditions require a less ambitious program, move toward a configuration consistent with Scenario I-B-1b, which does not include the closure of T2.

5.2.11.1 Transition Phasing

While the preferred scenario is II-B-1 (see Exhibit 5.2-21), the Airport recognizes that Scenario I-B-1b (see Exhibit 5.2-20) will be the interim path, with airline expansion happening at T2 during the interim years. Thereafter, the terminal area will transform into Scenario II-B-1. Refer to Appendix E for an understanding of how Scenario II-B-1B could evolve into Scenario II-B-1.

In the short-term horizon, both existing T1 and T2 would remain in operation until the point at which additional infrastructure and gates could be constructed to accommodate the existing gate capacity at T2. Initially T1 gate expansion would be phased in such a manner that would provide minimal disruption to existing operations as possible. With the closure of Concourse B and the existing gate capacity at Concourse C, an initial nine-gate linear concourse in-fill would be constructed between existing Concourses A and C. This would require the relocation of three gates each at Concourses A and C. This initial gate expansion creates a new centrally located security screening area, concessions mall, and three gate FIS international arrivals processing facility. Subsequent airside phasing could happen to the east or west along the backside of existing Concourses A and C. On the landside the existing T1 arrivals curb would need to be lowered from its original configuration in order to address its life expectancy issues. This would require the relocation of the existing rental car and baggage claim offices from their current locations under the existing arrivals curb. A temporary arrivals pick-up area would need to be constructed while the new arrivals curb is being constructed.

5.2.11.2 Terminal Processor

Throughout the planning process, it became apparent that the terminal alternatives that based processing passengers through a single terminal processor performed much better than alternatives with multiple terminal processors. The centralized security process, way-finding, and convenience factors for connecting and O&D passengers along with their visitors are greatly simplified when all passengers are directed to a single terminal building. Accommodating all airlines into a single processing building provides the operational flexibility for the ever-changing alliances of airlines. Code-sharing airlines typically prefer to occupy facilities in close proximity to one another.

Multiple terminals require the replication of many of the terminal functions typically associated under a single terminal design. Creating a single terminal processor eliminates the need for this duplication thereby reducing the total required area. This makes for a more efficient operation and reduces the costs for the Airport and airlines, particularly in a time when cost reductions are essential in maintaining a viable airport operation.

This single terminal processor also provides the capacity to meet future demand by providing the ability to incrementally expand the terminal and concourses in a phased approach. These expansions can be triggered, as future demand will start to exceed capacity. Protecting areas for expansion allows this incremental phased approach to occur.

The existing T1 ticketing level has additional check-in capacity that would allow for the consolidation of the passenger activity and preferential use airlines from T2. Building on the Airport Experience Program and the original vision of the architect the south side central ticketing would be removed and the existing stand-a-alone Explosive Detection System (EDS) machines are being relocated to the bag makeup area to allow for increased passenger circulation and views to the outside. New vertical circulation cores are planned with additional void space to allow natural light to flood the baggage claim level below. Additional space would become available by relocating the current American Airlines Admirals Club to the secure airside concourse location should American decide to maintain such a passenger amenity. This would free up approximately 12,000 square feet of additional space for other potential use such as area for the relocated USO. This additional capacity is shown in **Exhibit 5.2-26, *Scenario II-B-1 – Consolidated Ticketing Level***.

In order to accommodate the consolidation of the T2 claim requirements the T1 departures/claim level would require renovation and expansion. An additional two claim devices would be required to meet future demand. This area would be configured where the existing US Post Office, City Space, and USO currently reside. Additionally the existing baggage services offices (BSO) and rental car counters would require relocation in order for the existing arrivals curb to be lowered. Potential areas for relocation are depicted in **Exhibit 5.2-27, *Scenario II-B-1 – Consolidated Departures/Claim Level***.

A consolidated baggage make-up area also requires some renovation of existing areas and expansion for new construction in order to meet future demand. An additional 10,200 square feet of new space accommodates two input devices and its associated circulation along with approximately 19,100 square feet of additional baggage make-up area. This area also includes the new planned two-zone in-line baggage screening area. These areas are depicted in **Exhibit 5.2-28, *Scenario II-B-1 – Consolidated Apron Level***.

Exhibit 5.2-26
SCENARIO II-B-1 – CONSOLIDATED TICKETING LEVEL
Lambert-St. Louis International Airport

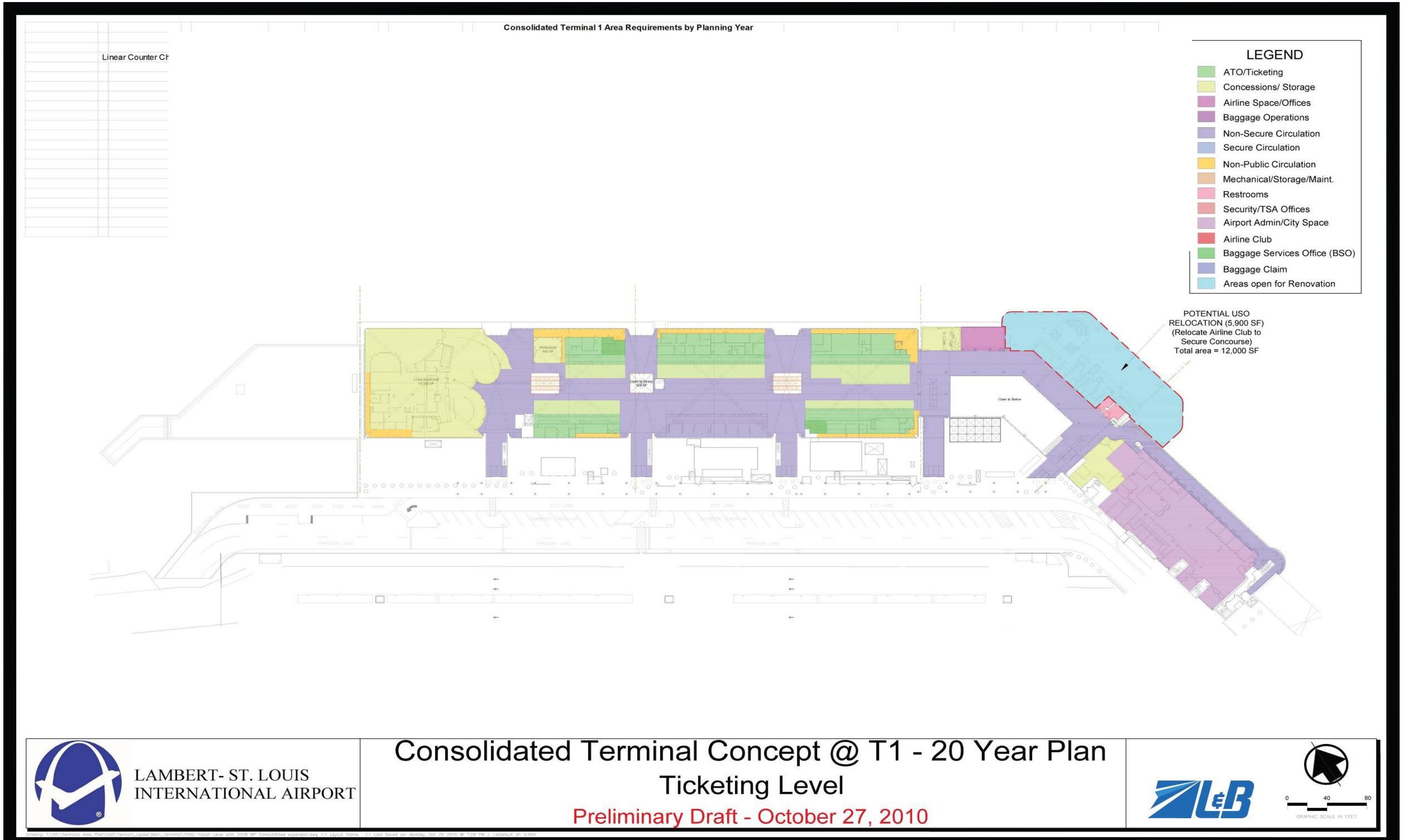

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Exhibit 5.2-27
SCENARIO II-B-1 – CONSOLIDATED DEPARTURES/CLAIM LEVEL
Lambert-St. Louis International Airport

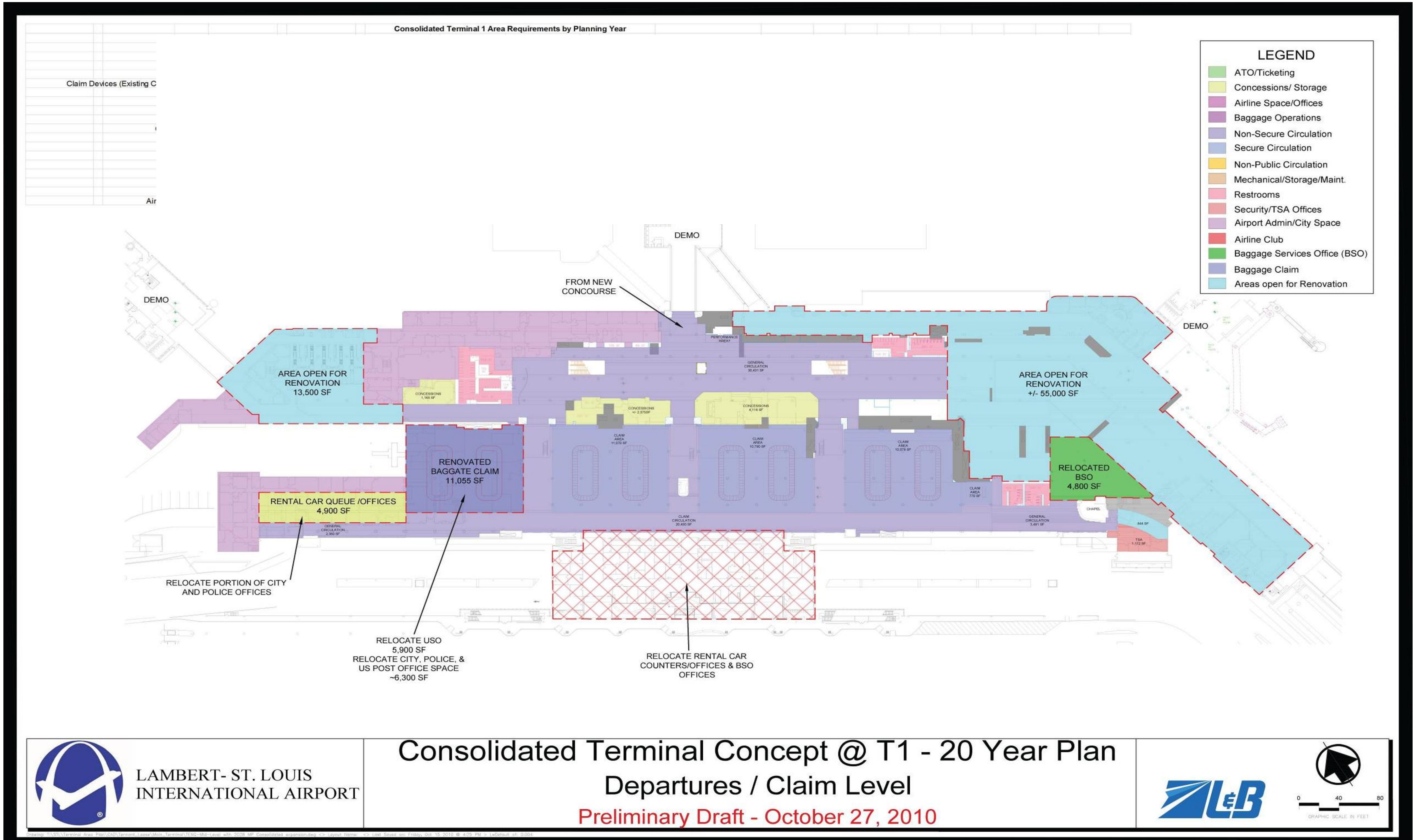

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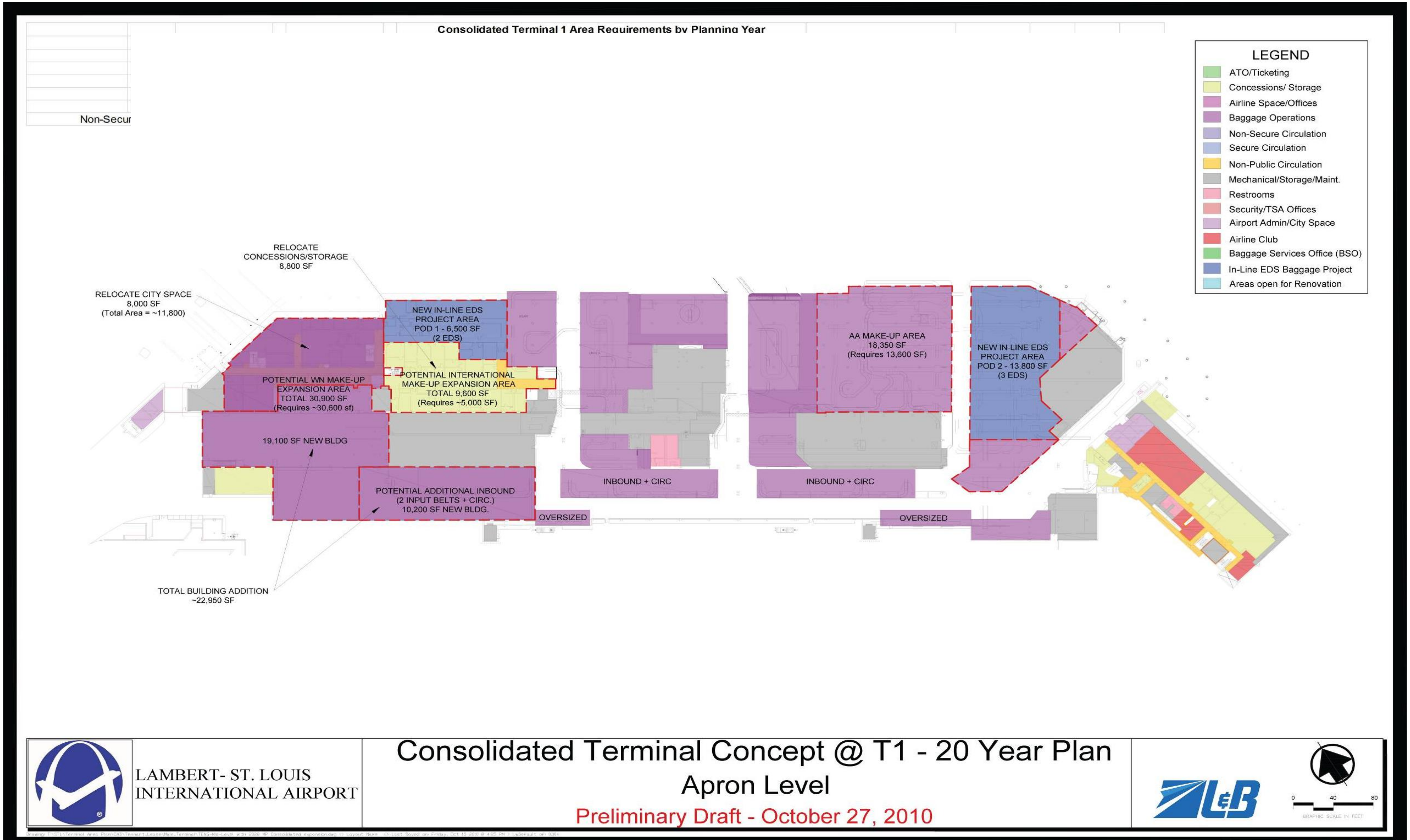
Exhibit 5.2-28
SCENARIO II-B-1 – CONSOLIDATED APRON LEVEL
Lambert-St. Louis International Airport



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In order to improve passenger accessibility, convenience and operational efficiencies, a long-range planning objective relocates the existing international FIS arriving processing functions to a landside three-gate configuration at T1 shown in **Exhibit 5.2-29**, ***Location of International Gates***. This location is conveniently located near the majority of domestic airline activity with potential passenger connections to and from international flights. Efficient, direct domestic connections to and from international operations can assist in spurring both domestic and international flight services. The central location also allows for short "walk-in" direct access from the international gates to the arrival processing functions. This area can either be configured as a single level processing function on the third (ticketing) level or apron level. An alternative layout could process all passengers on the third level just above what would become the security screening and concessions area and escalate them down to the apron/claim level for baggage claim and secondary processing functions. This would conveniently place the FIS exit out into a new meter/greeter lobby located in the area that is now the landside concessions and circulation area in T1. These potential FIS locations are illustrated in **Exhibit 5.2-30, *FIS International Arrivals Processing***.

Exhibit 5.2-29
LOCATION OF INTERNATIONAL GATES
Lambert-St. Louis International Airport

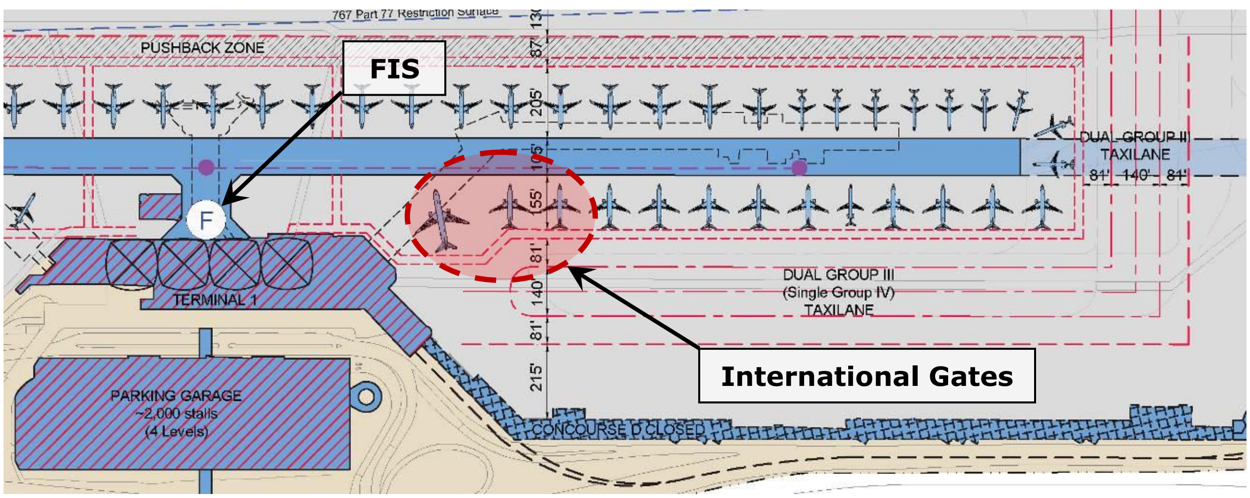
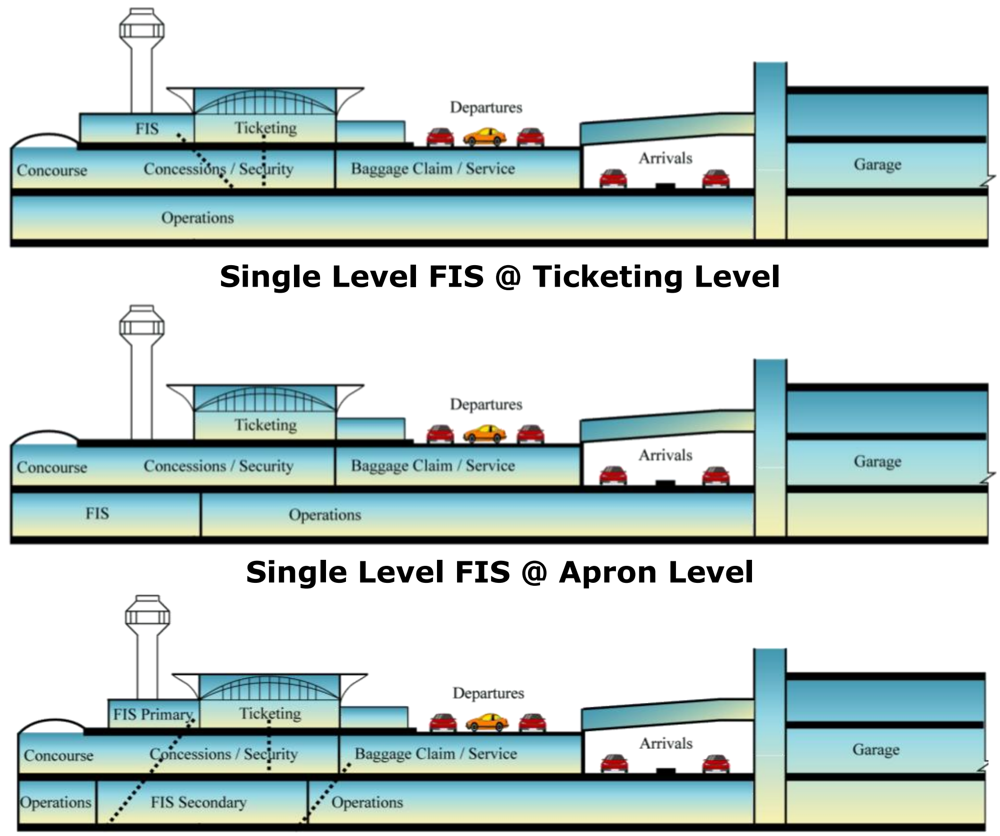


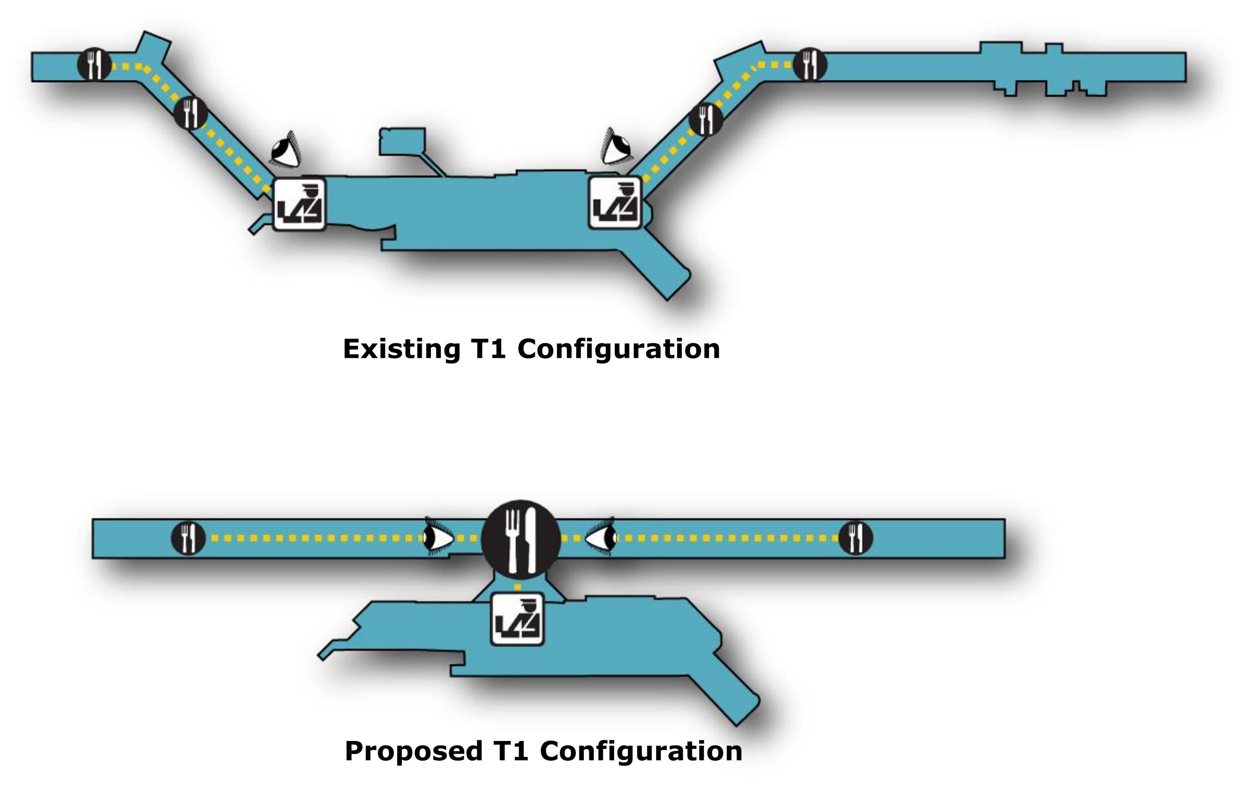
Exhibit 5.2-30
FIS INTERNATIONAL ARRIVALS PROCESSING
Lambert-St. Louis International Airport



5.2.11.3 Concessions

The existing gull-wing geometry of T1 Concourses A and C create line-of-sight issues concerning passengers being aware of and locating the concessions areas. Creating a single concourse plan that flows all outbound passengers past a primary concession mall provides enhanced concession revenue performance (see **Exhibit 5.2-31, *Central Versus Multiple SSCP & Concessions***). This large concession area also enables the potential reduction of some hold room requirements adjacent to this space by placing some of the seating capacity requirements within this area. The existing generous T1 landside concessions areas on the ticketing and baggage claim levels remain for the ticketed passengers and their meters and greeters.

Exhibit 5.2-31
CENTRAL VERSUS MULTIPLE SSCP & CONCESSIONS
Lambert-St. Louis International Airport



5.2.11.4 Passenger Connectivity and Security Screening

One of the critical factors in facilitating the connectivity of passengers between the and the terminal and aircraft parking positions is the security screening check points (SSCP) currently operating in a de-centralized arrangement amongst the two operating concourse at T1. This is the primary point of flow from the terminal to all aircraft gate positions. In order to meet the changing security dynamics that are requiring larger footprints, the preferred terminal alternative provides a single centralized security portal thereby improving security functions and efficiency.

Patterns of usage have also changed due to post 9/11; only air travelers with valid boarding passes can pass the security screening points. This operational change has created the need for areas before security where meeters/greeters can gather in anticipation of arriving passengers. The exit points from the current security screening areas typically serve as the point at which the meter/greeter functions reside. The consolidation of the new SSCP screening functions on either the existing ticketing level or the departures/claim level frees up the area that currently serves the SSCP functions for increased passenger circulation and other terminal or tenant functions. A large central meet and greet area could potentially be integrated near the existing landside concession areas.

5.2.11.5 Airside

In order to meet the ultimate 50 gate or approximate 6,600 lineal feet of frontage for 2028, a linear double loaded concourse with increased hold room depth and passenger circulation is constructed just south of the existing Concourse A and C alignments. This new layout shown in Exhibit 5.2-25 allows second-level loading of passengers through jet bridges from typical individual or shared hold rooms. This flexibility enables the building to adapt to potential changes in aircraft gauge. Small commuter aircraft operations which are typically ground loaded can either be served from second-level hold room areas or located on the apron level served via escalators from the main concourse level much like what exists today in Concourse C for Cape Air. International capable gates are allocated along the backside of the east concourse conveniently located near the Customs and Boarder Protection (CBP) or FIS area as illustrated in Exhibit 5.2-29. This minimizes the length of the sterile corridors required for separating international arriving passengers from the general traveling public.

Should the Missouri Air National Guard decide to relocate additional gate expansion could be accommodated to the west thereby balancing walking distances from the terminal processor. However, additional gate expansion would be available to the east as well. This increased gate expansion would allow for an additional 21 gates, for a total of 71, to meet the high forecast gate scenario as described in Chapter 4, *Demand/Capacity and Facility Requirements*.

Additionally a future mezzanine level APM system could be constructed along the south face of the linear spine offering shorter walking distances and improving the passengers travel experience and level of service.

Dual Group III Taxilane capable flow and increased aircraft apron parking depth and pushback zone will provide greater operational capacity and efficiency. A single group IV taxilane running between the Dual Group III taxilanes on the backside of the east concourse is also provided for increased aircraft taxi capabilities shown in Exhibit 5.2-29. This would allow for the single Group IV international capable gate.

5.3 AIRPORT SUPPORT FACILITY DEVELOPMENT

5.3.1 INTRODUCTION

This section investigates alternatives for providing capacity and capability enhancement of the support facilities as they relate to the long-term development plan for STL. As discussed in Chapter 4, many of the airport support facilities at Lambert provide sufficient capacity and capability to meet the demands of the forecast operations owing to the significant growth that occurred at the airport in the 1980s and 1990s. Much of this analysis is therefore focuses on refinement of the existing support facilities and, where necessary, replacement.

The following sections present an overview of the airport support facilities identified for expansion and or replacement through the inventory and demand capacity analysis previously presented.

5.3.2 AIR CARGO

Using the planning ratios found in IATA's Airport Development Reference Manual, 9th edition, the cargo facilities were found to be of adequate size to meet forecast demand. However as noted the facilities are not optimally configured to meet the needs of potential cargo tenants. There are three general areas on the airfield that are suitable for future on-airport aviation related expansion including the land area north of Runway 11-29, the Northern Tract, and the Brownleigh Site. Of these three areas, the latter two are appropriate for future cargo development. **Exhibit 5.3-1, *Cargo Concept on Brownleigh Site***, and **Exhibit 5.3-2, *Northern Tract Development Site***, illustrate potential layouts for cargo facilities on each of these sites. Expansion would likely require relocation of James S. McDonnell Blvd. As shown in Exhibit 5.3-2, a cargo development on the Brownleigh site could be accomplished in two phases. The second phase requires the extension of Taxiway Foxtrot.

Exhibit 5.3-1
CARGO CONCEPT ON BROWNLEIGH SITE
Lambert-St. Louis International Airport

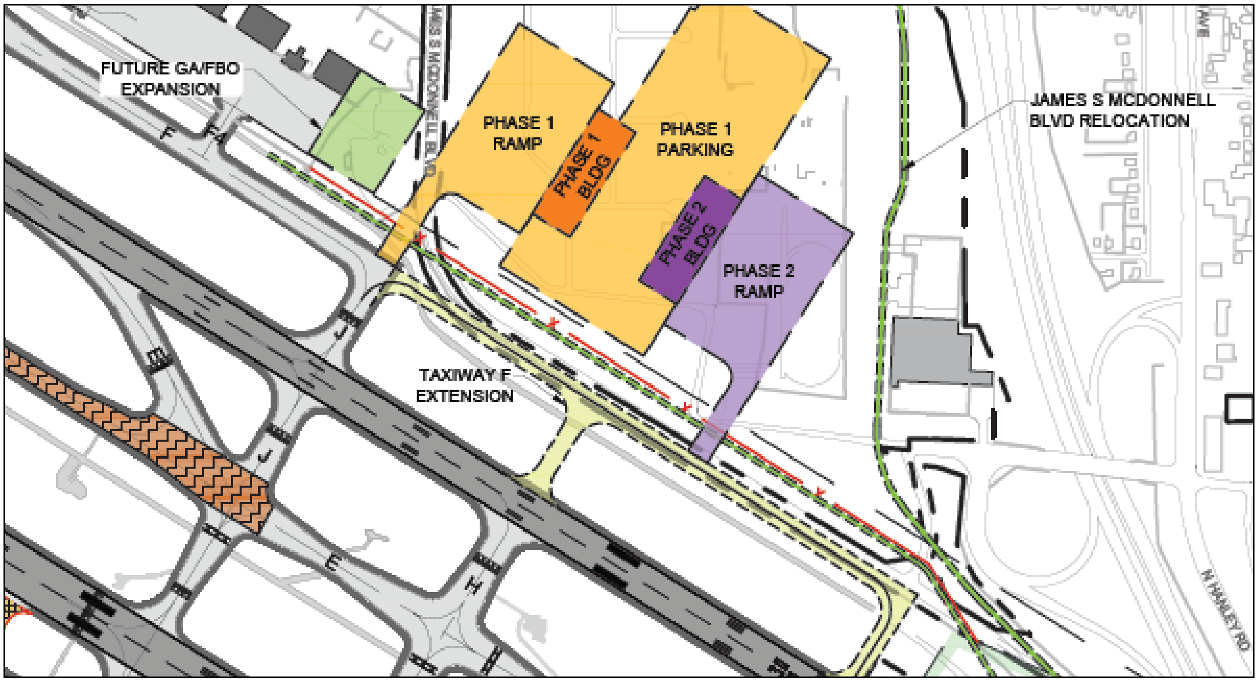
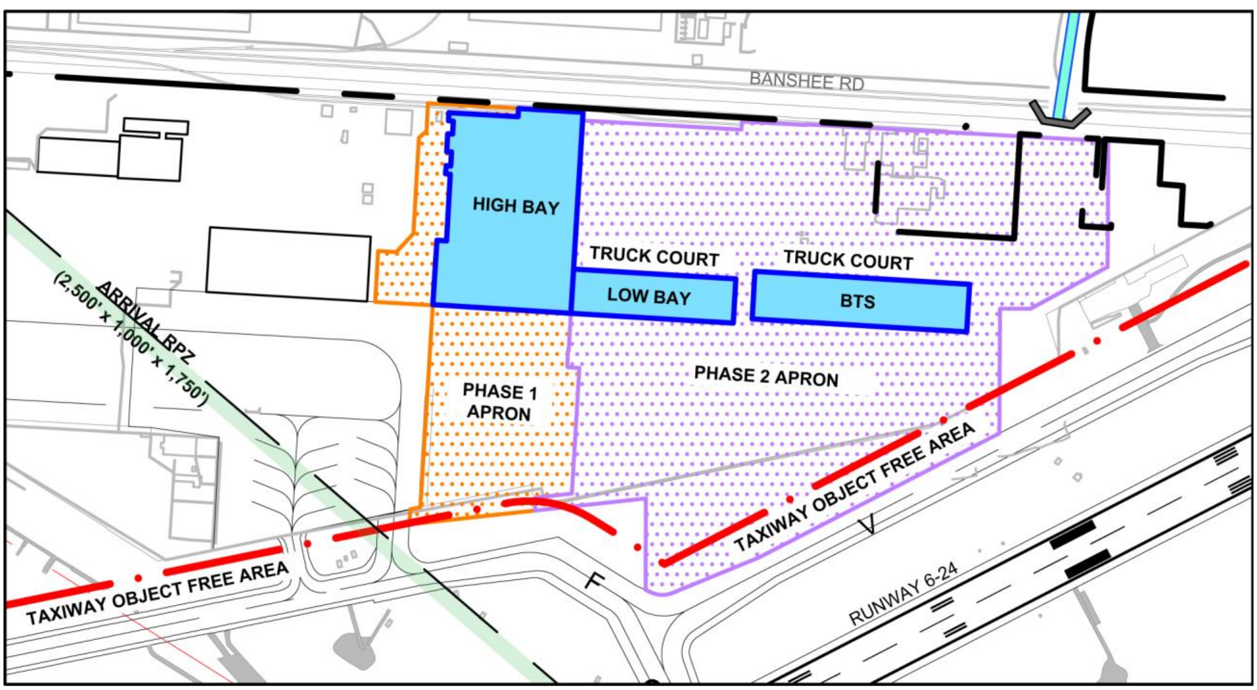


Exhibit 5.3-2
NORTHERN TRACT DEVELOPMENT SITE
Lambert-St. Louis International Airport



5.3.3 GENERAL AVIATION (GA)

The existing General Aviation (GA) complex operated by Signature Flight support was found to have sufficient total land area but split between hangars, ramp, administration and parking is not allocated correctly. The demand for hangar space outpaces supply over the planning horizon and additional facilities are required. It is possible for Signature to expand to the East as shown on Exhibit 5.3-1; however, any future FBO would need to be located along the north side of Runway 11-29 and land in that area should continue to be protected for aviation uses.

5.3.4 FUEL STORAGE

The Commercial Aviation Fuel Storage Facility currently has a total capacity of 1.3 million gallons of Jet A. A standard inventory of commercial aviation fuel is a three to four-day supply based on peak day activity levels. Using this range as a standard, the storage capacity at the airport will be nearing but not exceeding the demand by the end of the planning. Sufficient land does not exist within the existing fuel farm lease boundaries to accommodate expansion of the Commercial Fuel Storage Facility and efforts should be made to acquire adjacent lands to accommodate long-term expansion. Should the expansion and decking of Lot C proceed at indicated in Section 5.2.10, relocation of the fuel storage facility would be required. The preferred location for a replacement facility is on the MOANG airside property. Without access to this site, suitable space is available in the area currently occupied by Concourse D. A replacement facility design should accommodate a four-day supply of fuel for the 2028 demand level, 1.6 million gallons, with expansion capabilities and the ability to accommodate hybrid fuels.

5.3.5 FUELING SERVICES MAINTENANCE

Development of terminal alternative II-B-1 would require the relocation of the fueling services maintenance buildings located west of Terminal 1. As discussed in Chapter 4, Demand/Capacity and Facility Requirements, the existing facilities are appropriately sized to meet current and future demand. Both buildings and associated parking areas, which consist of 7,090 square feet of maintenance space, 3,240 square feet of office an administration space and approximately 75,000 square feet of parking, would need to be relocated within close proximity to the new facility. Assuming the inability to utilize space in the MOANG facility or the current American Airlines Maintenance property, relocation to an area near Terminal 2 or Cargo City would be preferred. However, further consideration should be given to the location of these facilities at a future date when the decision to move forward with terminal expansion is considered as opportunities to develop the facilities at the MOANG may be available.

5.3.6 FLIGHT KITCHENS

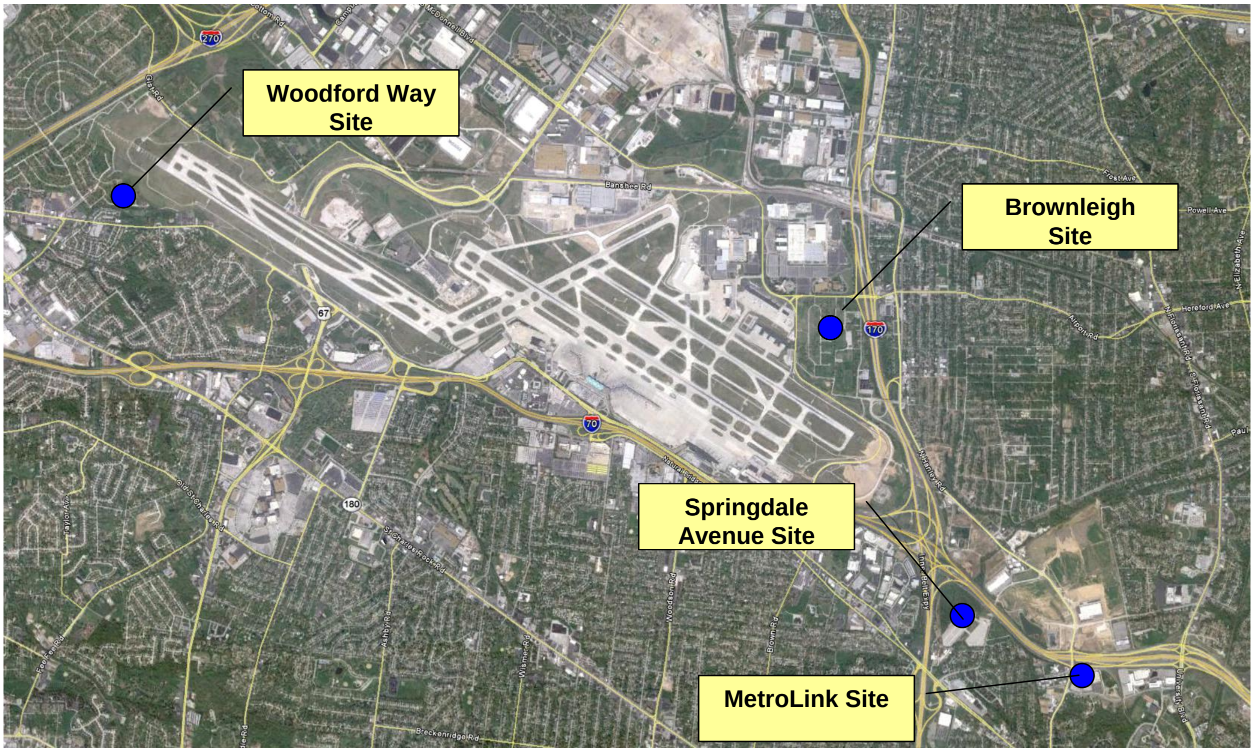
In addition to the loss of the fueling service maintenance facility, the development of terminal alternative II-B-1 would eliminate the HMS Host flight kitchen. A replacement facility is not needed due to the lack of utilization of the current facility and the ability of HMS Host to accommodate any in-flight meal requirements in the other concession facilities in the terminal.

5.3.7 RENTAL CAR FACILITIES

Although the existing rental car facilities supporting the airport are located in separate off-site facilities, consideration for an on-airport or off-airport consolidated rental car facility in the long term development of the airport is necessary. With increasing recognition of environmental impacts and the inefficiency associated with separate parking shuttles serving each rental car provider, airports have increasingly looked to consolidated rental car facilities to provide a higher level of service. The advantages of the consolidated rental car facility include reduction in traffic on roadways due to fewer shuttle bus operations, customer convenience, reduction in terminal space requirements, improved way-finding and reduced curb-front demand. There are also disadvantages with providing a consolidated rental car facility, for the airport there is an additional capital demand that may pull monies from other projects and the local communities would lose tax revenues associated with the rental car operations.

The location of a consolidated rental car facility should be within close proximity to the terminal and sufficient land area should be available for surface or preferably a structured parking facility. Transportation from terminal to the consolidated rental car facility can be accomplished through shuttle busing operations or light rail. For many airports, the light rail option is not feasible due to significant infrastructure cost; however, the existing light rail stations at the Airport provide STL with the option to explore this potential connection. Although many sites were evaluated, four sites, as shown on **Exhibit 5.3-3, *Potential Consolidated Rental Car Facility Sites***, were identified as potential areas for a CONRAC facility. These four sites included: the vacant property southwest of Runway 11-29 on Woodford Way, the Brownleigh site north of Runway 12L-30R, the former parking lot on Springdale Avenue, and, finally, a facility collocated with and existing Metrolink property.

Exhibit 5.3-3
POTENTIAL CONSOLIDATED RENTAL CAR FACILITY SITES
Lambert-St. Louis International Airport



5.3.8 TERMINAL 2 AUTOMOBILE PARKING

In addition to the expansion of the Terminal 2 Parking Garage identified in the terminal concepts, three additional surface parking options are available as shown in **Exhibit 5.3-4, *Automobile Parking***. One option is to provide a small surface lot east of Cargo City with relatively close access to Terminal 2 although limited in size to approximately 200 spaces. The second option is in the Brownleigh area. While not providing the same level of convenience as the other parking options, the Brownleigh site does provide a significant area for parking in relatively close proximity to Terminal 2 that would be competitive with other off-airport parking providers. In total, the Brownleigh site can accommodate up to 10,000 surface spaces and can be developed in phases at minimal cost and easily modified, should demand for property with direct airfield access materialize in the future. The third option is the Concourse D apron parking facility. Additional consideration will be necessary with regard to Security, FOD containment and blast deflection. Traffic routing would consist of an at grade signalized intersection providing in/out access to Lambert International Boulevard through an access point created by cutting through the existing Concourse D structure. Passenger movement could be routed through Concourse D or a shuttle bus may be utilized. Portions of the Concourse D Apron were reconstructed with AIP proceeds issued in 1989 and 1990, respectively, which should be fully amortized.

Exhibit 5.3-4
AUTOMOBILE PARKING
Lambert-St. Louis International Airport

5.3.9 AIRFIELD MAINTENANCE

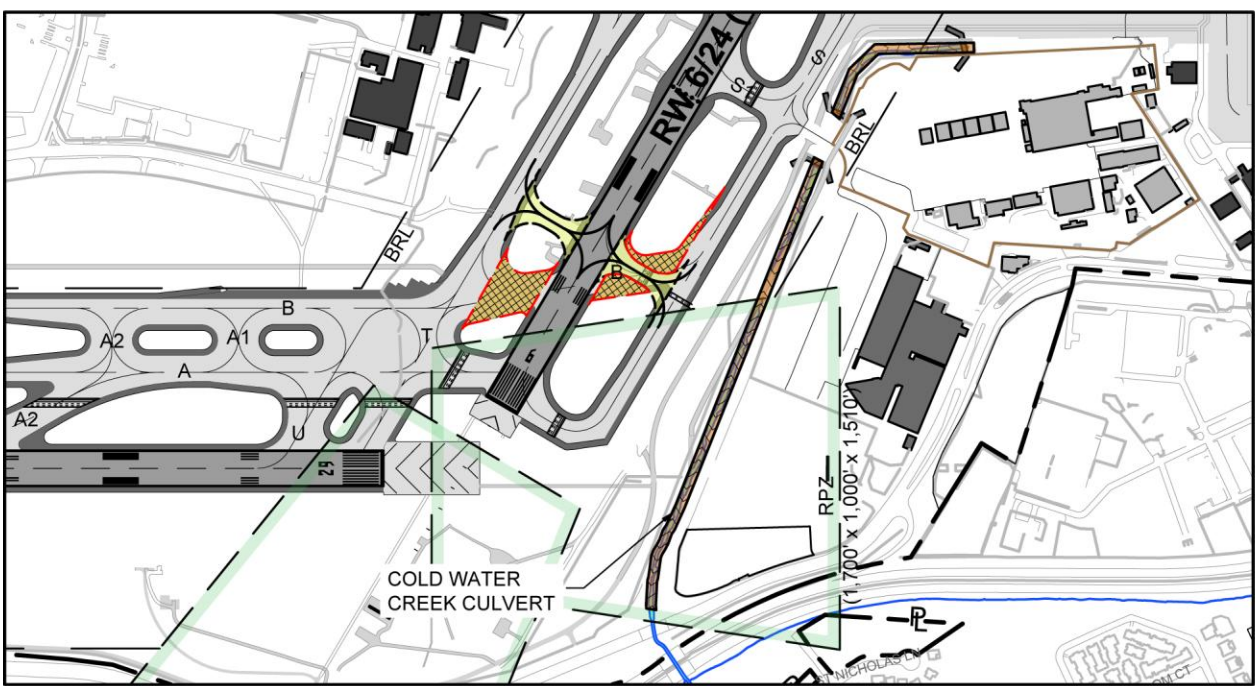
The existing airfield maintenance facility and central stores have exceeded useful life and are less than adequate to function properly. Prior to the initiation of this Master Plan, a replacement facility was designed and put on the CIP. The project has been pushed back and the existing facilities are repaired as necessary to maintain functionality. The plan should remain in the CIP and efforts should be made toward completing the project in a timely manner.

5.3.10 COLDWATER CREEK INLET RECONFIGURATION

Coldwater Creek is a critical component of the airfield drainage and efficient flowage is critical. The course of the creek on the south side of the airfield, south of Taxiway Charlie and East of Taxiway Sierra, places it within the taxiway safety area for Taxiway Sierra. To mitigate grading issues associated with the creek location adjacent to the taxiways, it is recommended that the Cold Water Creek culvert, which currently extends from South of Taxiway C to the outfall west of Banshee Road near the Runway 6 Approach be extended to the south. Extending the culvert permits grading of the ground to provide an appropriate taxiway safety area and further permits the relocation of fences and other structures outside the safety area above the culvert.

In addition to the penetration of the taxiway safety area, the creek is prone to overflows during extreme weather events with significant precipitation over short periods of time. The Metropolitan Sewer District has plans to install a detention tank upstream from the Airport, on the south side of I-70. The 6.0 million gallon tank, which will be in place by 2014, will reduce the frequency of overflows by accommodating high volumes of water and slowly discharging after the peak flow. While it is anticipated that the detention tank will alleviate the overflow problems it is recommended that the culvert be extended to the south to a point at the south end of the Runway 29 approach RPZ as illustrated in **Exhibit 5.3.5, *Coldwater Creek Culvert Extension***. Close coordination with local jurisdictions will be necessary to ensure effective control of storm run off.

Exhibit 5.3-5
COLDWATER CREEK CULVERT EXTENSION
Lambert-St. Louis International Airport



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CHAPTER SIX
ENVIRONMENTAL OVERVIEW

INTRODUCTION

This chapter provides a preliminary review of the environmental conditions surrounding the Lambert-St. Louis International Airport (Lambert Airport or STL) to identify potential environmental impacts associated with the recommended development projects discussed in Chapter 5, *Airport Concept Development and Evaluation*. The existing Airport layout is shown in **Exhibit 6.1-1, *Existing Airport Layout***.

6.1 ENVIRONMENTAL REQUIREMENTS

The National Environmental Policy Act (NEPA)[1] significantly affects airport planning by requiring that environmental impacts of proposed airport development be considered early and throughout the planning process. Environmental feasibility is as important as economic or engineering feasibility in determining how an airport will be developed. This Environmental Overview identifies the potential impacts that may occur with the development of the recommended Master Plan projects. This information serves to support the decision-making process and to aid future NEPA reviews. The analysis of environmental impacts would be prepared pursuant to Federal Aviation Administration (FAA) Order 1050.1E, *Environmental Impacts: Policies and Procedures*[2]; and FAA Order 5050.4B, *NEPA Implementing Instructions for Airport Actions*[3].

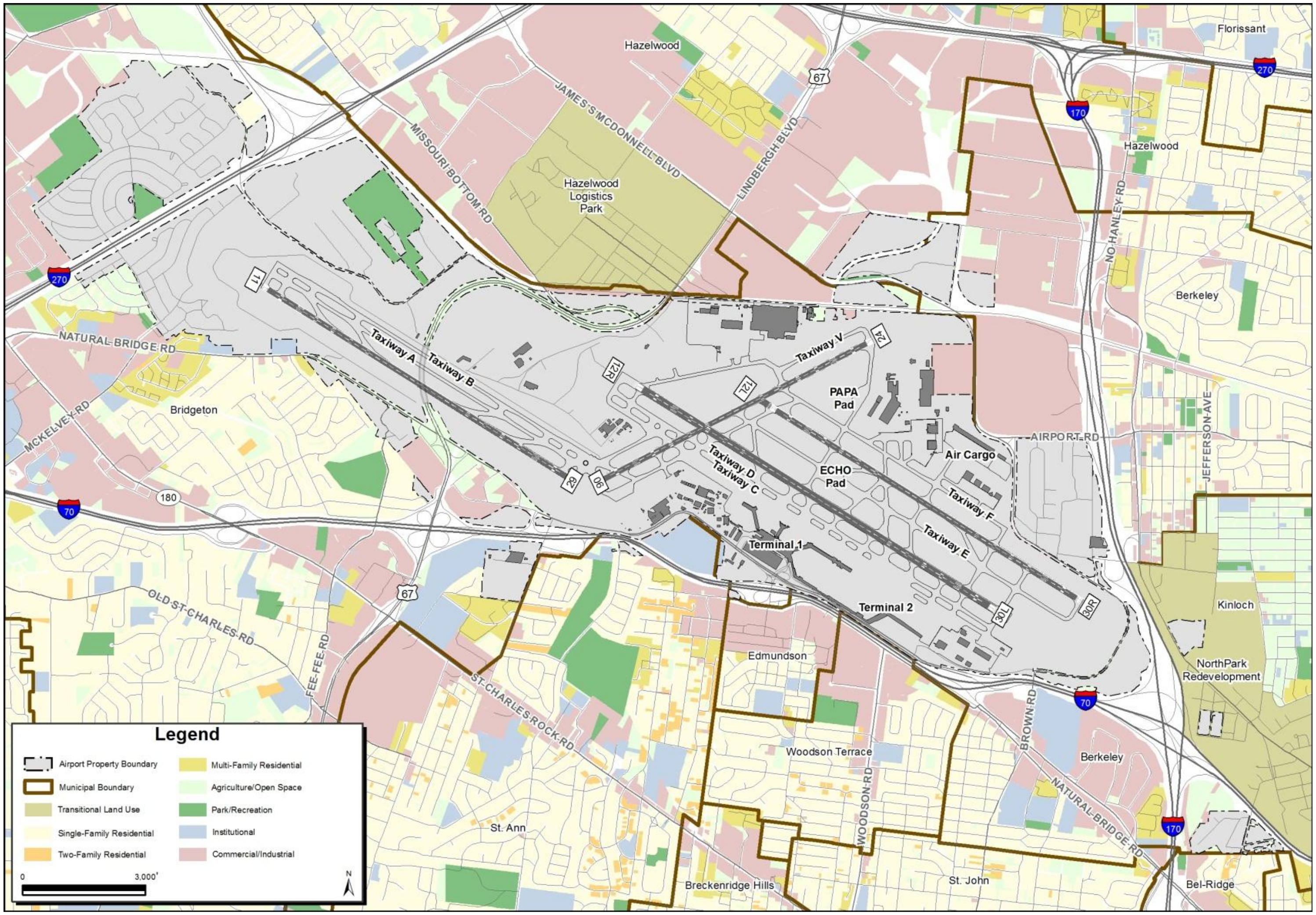
FAA Order 1050.1E states that, "Unless otherwise exempted by the Council on Environmental Quality (CEQ) regulations, all formal actions taken by FAA officials are subject to NEPA review unless statutory law applicable to the FAA's operations expressly prohibits or makes compliance impossible. Actions covered by NEPA review include grants, loans, contracts, leases, construction, research activities, rulemaking and regulatory actions, certifications, licensing, permits, plans submitted to the FAA which require FAA approval, and legislation proposed by the FAA."[4] As such, the development projects recommended in this Master Plan Update would be required to undergo an environmental review in accordance with NEPA prior to implementation.

1 42 U.S.C. 4321-4347.
2 FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures*, March 20, 2006.
3 FAA Order 5050.4b, *NEPA Implementing Instructions for Airport Actions*, April 28, 2006.
4 FAA Order 1050.1E *Environmental Impacts: Policies and Procedures*. Chapter 2 NEPA Planning and Integration, 200e Applicability of NEPA Procedures to FAA Actions, (3) FAA Actions Subject to NEPA Review. March 20, 2006.

Federal regulations outline three major levels of NEPA review relevant to airport development.

- Categorical Exclusion – applies to those actions that have been found (under normal circumstances) to have no potential for significant environmental impact.
- Environmental Assessment (EA) – applies to those actions that have been found by experience to sometimes have significant environmental impacts. The list of actions normally requiring an EA can be found in Chapter Four of FAA Order 1050.1E. The purpose of an EA is to determine whether the proposed project will have significant impacts. Upon review of the EA findings, the FAA either issues project approval in the form of a Finding of No Significant Impact (FONSI) or directs the preparation of an Environmental Impact Statement (EIS) to further investigate potential environmental impacts in detail before project approval can be granted.
- Environmental Impact Statement (EIS) – applies to those actions that have been found by experience to usually have significant environmental impacts. The FAA may issue a Record of Decision (ROD) after the Final EIS has been released.

Exhibit 6.1-1
EXISTING AIRPORT LAYOUT
Lambert-St. Louis International Airport



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6.2 PURPOSE AND NEED

Each proposed project within the Master Plan must have an acceptable "purpose and need," for the FAA to issue an environmental finding. The City of St. Louis, Missouri, through the St. Louis Airport Authority (STLAA), must continue to provide for the development of infrastructure to support the economic growth of the region. Lambert Airport has been and continues to be a major factor in attracting businesses and development to the region.

The Master Plan development projects described in Chapter 5, *Airport Concept Development and Evaluation,* have been developed to meet the following needs:

- The need to provide sufficient terminal capacity to accommodate projected operating levels;
- The need to provide sufficient parking capacity to accommodate projected passenger levels;
- The need to improve the safety and efficiency of the airfield;
- The need to encourage economic development on unused or underutilized property at Lambert Airport; and
- The need to maintain a safe and healthy workplace environment, operating Lambert Airport facilities in an environmentally sound manner, and promoting programs that support environmental stewardship, which include economic, operational, and social initiatives related to pollution prevention, best management practices, air quality, water quality and usage efficiency, recycling programs, energy management, procurement, wildlife management, and noise management.

6.3 ENVIRONMENTAL IMPACT CATEGORIES

This preliminary review identifies potential environmental impacts associated with the development alternatives that are recommended in this Master Plan Update study. The FAA examines the NEPA environmental impact categories to determine applicability for its actions. As identified in FAA Order 1050.1E, the NEPA environmental impact categories are:

- Air Quality
- Coastal Resources (Coastal Barriers and Coastal Zones)
- Compatible Land Use
- Construction Impacts
- Department of Transportation Act Section 4(f)
- Farmlands
- Fish, Wildlife, and Plants
- Floodplains
- Hazardous Materials, Pollution Prevention, and Solid Waste
- Historical, Architectural, Archeological, and Cultural Resources
- Light Emissions and Visual Impacts
- Natural Resources and Energy Supply
- Noise
- Secondary (Induced) Impacts
- Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks
- Water Quality
- Wetlands
- Wild and Scenic Rivers

MASTER PLAN AREA OF INVESTIGATION

An area of investigation was identified for each of the applicable environmental categories listed above. The Master Plan Area of Investigation provides a geographic area within which the environmental features that potentially could be impacted by airport actions are identified. The Master Plan Area of Investigation does not confirm that impacts will occur to an environmental resource rather that the potential for impacts from airport actions exists. In some cases, the Master Plan Area of Investigation differed, as noted, for each environmental category. For most environmental resources, the Area of Investigation was restricted to Airport property. For those resources in which the potential for indirect impacts exists, the Area of Investigation was expanded to sufficiently assess the resource.

6.3.1 AIR QUALITY

Two primary laws apply to air quality: NEPA and the Clean Air Act (CAA)[5] including the 1990 Amendments. An air quality assessment prepared in support of a NEPA environmental document should include an analysis and conclusions of a proposed action's impacts on air quality.

EXISTING CONDITIONS

The Airport is located in St. Louis County, Missouri, which the U.S. Environmental Protection Agency (USEPA) has designated as a non-attainment area for the average eight-hour concentration of ozone and for emissions of fine particulate matter.[6] Therefore, the pollutants of concern are the ozone precursor pollutants, nitrogen oxides (NO_x) and volatile organic compounds (VOCs); and sources of particulate matter emissions. St. Louis County was determined to be compliant with all other federally-regulated air quality standards in effect at the time of the preparation of this document. The standards are referred to as the National Ambient Air Quality Standards (NAAQS), and were established to define the maximum healthful concentrations of the criteria pollutants: carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), coarse particulate matter (PM_{10})[7], fine particulate matter ($PM_{2.5}$), and lead (Pb)[8] in the ambient air.

SUMMARY OF AIR QUALITY CONSIDERATIONS FOR ALL ALTERNATIVES

To determine the net emissions resulting from construction and operation of proposed Master Plan development projects, an emissions inventory would need to be prepared for each alternative, including the no-build alternative. A General Conformity evaluation would be required to determine net emissions from construction and implementation. The emissions inventory would be compared to the relevant *de minimis* thresholds for the pollutants of concern. In addition, the activity levels (aircraft operations and passengers) at Lambert Airport exceed the FAA thresholds; therefore, dispersion analysis may be required for the air quality assessment of any of the Master Plan Update study alternatives at Lambert Airport. Additional coordination with the FAA would be required.

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5 42 U.S.C. §7401 et seq.

6 U.S. Environmental Protection Agency, *Nonattainment Status for Each County by Year for Missouri,* http://www.epa.gov/air/oaqps/greenbk/anay_mo.html (website accessed on June 21, 2010).

7 Particulate matter emissions are categorized by size. Coarse particles are defined as having a diameter of 10 micrometers or less and are referred to as PM_{10}; fine particles are defined as having a diameter of 2.5 micrometers or less and are referred to as $PM_{2.5}$.

8 Airborne lead in urban areas is primarily emitted by vehicles using leaded fuels. The chief source of lead emissions at airports would be the combustion of leaded aviation gasoline in small piston-engine general aviation aircraft.

Any assessment of air quality associated with a Federal action would need to be prepared in accordance with the guidelines provided in the FAA's *Air Quality Procedures for Civilian Airports & Air Force Bases,*[9] and pursuant to FAA Order 5050.4B and FAA Order 1050.1E. An air quality assessment prepared pursuant to these orders and guidelines would be compliant with all the relevant provisions of NEPA, the CAA, and the Missouri State Implementation Plan (SIP).

6.3.2 COASTAL RESOURCES

According to FAA Order 1050.1E*,* the activities potentially affecting coastal barrier resources and coastal zones are assessed. The *Coastal Zone Management Act of 1972* established the Federal Coastal Zone Management Program to encourage and assist states in preparing and implementing management programs to "preserve, protect, develop, and, where possible, to restore or enhance the resources of the nation's coastal zone." The *Coastal Barrier Resources Act of 1982* requires that no new Federal expenditures or financial assistance may be made available for construction projects within the boundaries of the Coastal Barriers Resource System. Under Executive Order 13089, *Coral Reef Protection,* U.S. coral reef ecosystems are defined to mean those species, habitats, and other natural resources associated with coral reefs in all maritime areas and zones subject to the jurisdiction or control of the United States.

EXISTING CONDITIONS

The state of Missouri is landlocked, there are no areas designated as being protected by the Coastal Zone Management Act or the Coastal Barrier Resources Act.

SUMMARY OF COASTAL RESOURCE CONSIDERATIONS FOR ALL ALTERNATIVES

Because of the location of Lambert Airport, no significant adverse coastal resource impacts are expected with the construction and implementation of any of the Master Plan alternatives.

6.3.3 COMPATIBLE LAND USE

The compatibility of existing and planned land uses in the vicinity of an airport is usually associated with the extent of the airport's noise impacts. The FAA has identified land use compatibility guidelines relating types of land use to airport sound levels. These guidelines, which are codified in 14 Code of Federal Regulations (CFR) Part 150, as reproduced in **Table 6.3-1**, ***Land Use Compatibility Guidelines – 14 CFR Part 150***, show the compatibility parameters for residential, public (schools, churches, nursing homes, hospitals, and libraries), commercial, manufacturing and production, and recreational land uses. All land uses within areas below 65 Day-Night Average Sound Level (DNL) are considered compatible with airport operations.

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[9] FAA and USAF, Air Quality Procedures for Civilian Airports & Air Force Bases, April 1997.

Table 6.3-1
LAND USE COMPATIBILITY GUIDELINES – 14 CFR PART 150
Lambert-St. Louis International Airport

LAND USE YEARLY DAY – NIGHT AVERAGE SOUND – LEVEL (DNL) IN DECIBLES	Below 65	65-70	70-75	75-80	80-85	Over 85
RESIDENTIAL						
Residential, other than mobile homes and transient lodgings	Y	N[1]	N[1]	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N[1]	N[1]	N[1]	N	N
PUBLIC USE						
Schools, hospitals, nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Governmental services	Y	Y	25	30	N	N
Transportation	Y	Y	Y[2]	Y[3]	Y[4]	N[4]
Parking	Y	Y	Y[2]	Y[3]	Y[4]	N
COMMERCIAL USE						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail -- building materials, Hardware, and farm equipment	Y	Y	Y[2]	Y[3]	Y[4]	N
Retail trade, general	Y	Y	25	30	N	N
Utilities	Y	Y	Y[2]	Y[3]	Y[4]	N
Communication	Y	Y	25	30	N	N
MANUFACTURING AND PRODUCTION						
Manufacturing, general	Y	Y	Y[2]	Y[3]	Y[4]	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y[6]	Y[7]	Y[8]	Y[8]	Y[8]
Livestock farming and breeding	Y	Y[6]	Y[7]	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
RECREATIONAL						
Outdoor sports arenas and spectator sports	Y	Y	Y[5]	N[5]	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

The designations contained in this table do not constitute a Federal determination that any use of land covered by the program is acceptable under Federal, State, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses.

Key to Table 6.3-1

Y (Yes) Land Use and related structures compatible without restrictions.
N (No) Land Use and related structures are not compatible and should be prohibited.
NLR Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure
25/30/35 Land Use and related structures generally compatible; measures to achieve or NLR of 25, 30, or 35dB must be incorporated into design and construction of structure.

Table 6.3-1 ***(Continued)***
LAND USE COMPATIBILITY GUIDELINES – 14 CFR PART 150
Notes for Table 6.3-1

1. Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25dB and 30dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR or 20dB, thus, the reduction requirements are often stated as five, ten, or 15dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.
2. Measures to achieve NLR of 25dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.
3. Measures to achieve NLR of 30dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.
4. Measures to achieve NLR of 35dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.
5. Land use compatible provided special sound reinforcement systems are installed.
6. Residential buildings require a NLR of 25.
7. Residential buildings require a NLR of 30.
8. Residential buildings not permitted.

Source: *14 CFR Part 150 Airport Noise Compatibility Planning*, Appendix A, Table 1.

EXISTING CONDITIONS

Lambert Airport is located in a highly urbanized area and is immediately surrounded by commercial, industrial, and residential land uses. The land areas proposed for development in the Master Plan study are owned by the STLAA and are currently developed or have been previously developed.

SUMMARY OF COMPATIBLE LAND USE CONSIDERATIONS FOR ALL ALTERNATIVES

No changes to noise exposure patterns, runway use, or flight procedures are anticipated as a result of implementing any of the Master Plan development projects; therefore, no noise new impacts would occur and it is unlikely that the Master Plan alternatives would have a significant adverse impact on compatible land use.

While the STLAA has no jurisdiction over the adoption or enforcement of local zoning regulations, as the Airport Sponsor/Owner it is required to provide written assurance to the FAA that appropriate action has been or will be taken to the extent reasonable to restrict the use of land adjacent to, or in the immediate vicinity of the Airport, to activities and purposes compatible with normal airport operations, including landing and takeoff of aircraft.[10] Land use and zoning for land use compatibility is the responsibility of the local jurisdictions around Lambert Airport

[10] FAA Order 1050.1E Environmental Impacts: Policies and Procedures. Appendix A, *Analysis of Environmental Impact Categories*, Section 4.1b, March 20, 2006; as set forth in the Aviation Safety and Noise Abatement Act of 1979, as amended (49 U.S.C. 47501-47507).

and the STLAA has undertaken all efforts to ensure that these local jurisdictions will undertake such actions to the extent reasonable, as documented in its 14 CFR Part 150 Noise Compatibility Program for Lambert Airport.

6.3.4 CONSTRUCTION IMPACTS

In accordance with FAA Orders 5050.4B and 1050.1E, the impacts to the environment due to construction activities must be assessed. Construction impacts are commonly short-term and temporary in nature. Typical impacts resulting from airport construction include noise, soil erosion and water pollution, and air pollution. Furthermore, the construction materials used could affect the supply of local resources. The environmental analysis should assess the consumption of energy and natural resources such as water, electricity, wood, metal, and concrete. In addition, surface transportation traffic patterns may be altered during construction. The assessment of surface traffic alterations should be disclosed in the NEPA document.

FAA Order 5050.4B references FAA Advisory Circular (AC) 150/5370-10E, *Standards for Specifying Construction of Airports*, Item P-156 *Temporary Air and Water Pollution, Soil Erosion, and Siltation Control*, which should be used by Lambert's contractors for the temporary control of erosion and sediment, as well as all air and water pollution control measures. It is assumed that any construction associated with the Master Plan alternatives would involve the use of typical construction vehicles and consume typical construction materials. The number and type of vehicles and amount of resources would vary due to project timing, funding, budget constraints, weather, scope of work, and other unforeseen factors.

SUMMARY OF CONSTRUCTION CONSIDERATIONS FOR ALL ALTERNATIVES

According to FAA Order 1050.1E "construction impacts alone are rarely significant pursuant to NEPA."[11] Construction impacts are typically minor and temporary, and are often addressed in other environmental categories, such as air quality and water quality. Construction impacts resulting from the implementation of any of the Master Plan Update study alternatives are not anticipated to be permanent or significant. Furthermore, best management practices (BMPs), such as erosion control measures, emissions reduction measures, and construction traffic management, can be employed to reduce impacts due to constructions. As projects are identified for development, the specific construction impacts along with BMPs should be identified in the NEPA review.

6.3.5 DEPARTMENT OF TRANSPORTATION ACT SECTION 4(f)

The Federal statute that governs impacts in this category is commonly known as the Department of Transportation (DOT) Act of 1966, Section 4(f) provisions. Section 4(f) of the DOT Act was recodified and renumbered as Section 303(c) of U.S. Code Title 49 (49 USC). FAA Orders 5050.4B and 1050.1E continue to refer to

[11] FAA Order 1050.1E Environmental Impacts: Policies and Procedures. Appendix A, Analysis of Environmental Impact Categories, Section 5.3, March 20, 2006.

this statute as Section 4(f) to avoid confusion. Section 4(f) provides that the "Secretary of Transportation will not approve any program or project that requires the use of any publicly-owned land such as a public park, recreation area, or wildlife/waterfowl refuge of national, state, or local significance or land from an historic site of national, state, or local significance as determined by the officials having jurisdiction thereof, unless there is no feasible and prudent alternative to the use of such land and such program, and the project includes all possible planning to minimize harm resulting from the use."[12] A direct taking of land occurs when land from a 4(f) site is permanently incorporated into a transportation facility. A constructive taking occurs when proximity impacts of a project on a 4(f) property are so severe that the activities, features, or attributes that qualify the property or resources for protection under Section 4(f) are substantially impaired.

Section 6(f) of the Land and Water Conservation Act (LWCA) is also pertinent to Section 4(f) lands. Section 6(f) prohibits recreational facilities funded under the LWCA from being converted to non-recreational use unless approval is received from the director of the grantor agency.

EXISTING CONDITIONS

A review of past environmental studies, including the 1997 Final Environmental Impact Statement (1997 FEIS), and local government websites was conducted to identify Section 4(f) and 6(f) properties within the vicinity of Lambert Airport. Within the Master Plan Area of Investigation for 4(f)/6(f) resources, a total of 67 properties were identified. These sites are shown on **Exhibit 6.3-1**, ***Section 4(f) and 6(f) Properties****,* and are listed in **Table 6.3-2**, ***List of Section 4(f) And 6(f) Properties***. Historic properties, which are also protected under Section 4(f), are discussed later in this chapter in Section 6.3.10, *Historical, Architectural, Archeological, and Cultural Resources*.

SUMMARY OF SECTION 4(f) CONSIDERATIONS FOR ALL ALTERNATIVES

It is anticipated that no direct use or taking of land from any Section 4(f) or 6(f) resources would occur with the implementation of the Master Plan development projects; and no changes to noise exposure patterns, runway use, or flight procedures are anticipated. No parks or outdoor sports facilities, which are compatible with noise levels of up to 75 DNL, were identified within the 75 DNL noise contours. No outdoor nature exhibits or zoos, which are compatible with noise levels up to 70 DNL, were identified within the 70 DNL noise contours. No outdoor music shells or amphitheaters, which are compatible with noise levels up to 65 DNL, were identified within the 65 DNL noise contour. Therefore, it is anticipated that no direct impacts or constructive use of any Section 4(f) or 6(f) resources would result from any of the Master Plan alternatives.

[12] FAA Order 1050.1E Environmental Impacts: Policies and Procedures. Appendix A, Analysis of Environmental Impact Categories, Section 6.1a, March 20, 2006.

Exhibit 6.3-1
SECTION 4(f) AND 6(f) PROPERTIES
Lambert-St. Louis International Airport

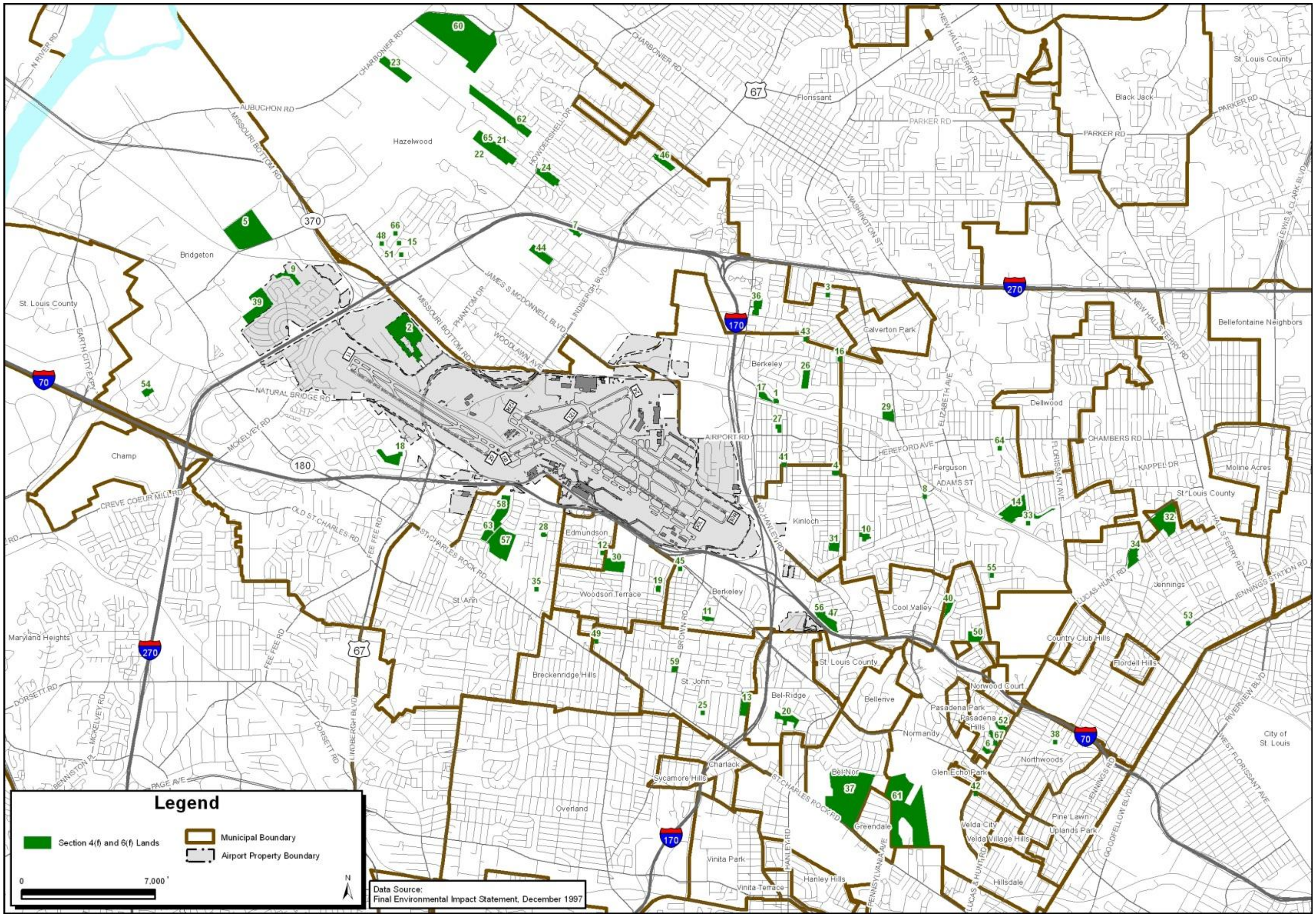

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TABLE 6.3-2
LIST OF SECTION 4(f) AND 6(f) PROPERTIES
Lambert-St. Louis International Airport

MAP ID	SITE	MAP ID	SITE
1	Berkeley Municipal Pool	35	Livingston & Wright Park
2	Berry Hill Golf Course	36	Musick Park
3	Birchwood Park	37	Normandy Golf Course
4	Boyd O'Guinn Park	38	Northwoods Ball Field
5	Bridgeton Athletic Complex	39	O'Connor Park
6	Bristol Park	40	Parchester Park
7	Brookes Park	41	Park at Corner of Jefferson & 4th
8	Caboose Park	42	Park on Edison Road
9	Carrollton Buffer Zone	43	Park on Midwood Road
10	Dade Park	44	Pershall Park
11	Edgewood Park	45	Preston Park
12	Edmundson City Park	46	Queen Anne Park
13	Endicott Park	47	Ramona Lake
14	Forestwood Park	48	Red Bud Park
15	Friendship Park	49	Reed Park
16	Frost Park	50	Robert Hoelzel Memorial Park
17	Frostwood Park	51	Rock Pointe Park
18	Gentry Park	52	Roland Park
19	Guthrie Avenue Playground	53	Sievers Park
20	Gutknecht-Arrowhead Park	54	Spanish Village Park
21	Hazelwood Aquatic Center	55	Spring Valley Park
22	Hazelwood Community Center	56	Springdale Park
23	Hazelwood Sports Complex	57	St. Ann Golf Course
24	Howdershell Park	58	St. Ann Park
25	Hume Heights Park	59	St. John City Park
26	Independence Park	60	St. Stanislaus Conservation Area
27	Jackson Park	61	St. Vincent County Park
28	Jane Park	62	Truman Park
29	January Wabash Lake Park	63	Vatterott Fields
30	John L. Brown Park	64	Wayside Park
31	Kinloch County Park	65	White Birch Park
32	Koeneman Park	66	Wildlife Park
33	Lang-Royce Park	67	Winchester Park
34	Lions Park		

Source: *1997 Final Environmental Impact Statement (FEIS)*, Table 4.5 and Figure 4.9 (CAD file 6_Parks.dwg). Data from the FEIS was verified through aerial imagery and data from local jurisdictions websites.

6.3.6 FARMLANDS

The Farmland Protection Policy Act of 1981 (FPPA)[13] was enacted to minimize the extent to which Federal actions and programs contribute to unnecessary and irreversible conversion of farmland to non-agricultural uses. As defined in the FPPA, land is not considered prime farmland if it has been committed to urban development.

EXISTING CONDITIONS

Lambert Airport is located within in a highly urbanized area. There are no areas on airport property currently being used for agriculture and the land making up the airfield and terminal area has been highly disturbed by past development activity. Some of the soils in and around Lambert Airport have been characterized as prime or of statewide importance.[14]

SUMMARY OF FARMLAND CONSIDERATIONS FOR ALL ALTERNATIVES

Since Lambert Airport is within a highly urbanized area and no Airport property is currently being used as farmland, no impacts to prime or unique farmland are expected to occur under any of the Master Plan alternatives. For any proposed projects that include development on unpaved surfaces, in particular the former Brownleigh Subdivision, the FAA may require coordination with the U.S. Department of Agriculture (USDA) National Resources Conservation Service (NRCS).[15] As part of this agency coordination, Form AD-1006 "Farmland Conversion Impact Rating" may be required to document that no impacts to prime or unique farmland will occur.

6.3.7 FISH, WILDLIFE, AND PLANTS

This category describes the potential impacts to fish, wildlife, and plants including the destruction or alteration of habitat and the disturbance or elimination of biotic communities due to the Master Plan Update alternatives. A biotic community is an assemblage of living things residing together, including both plants and animals. The Endangered Species Act of 1973 (ESA),[16] as amended, provides for the protection of certain plants and animals, as well as the habitats in which they are found. In compliance with the ESA, agencies overseeing Federally-funded projects are required to obtain from the U.S. Fish and Wildlife Service (USFWS) information concerning any species listed, or proposed to be listed, which may be present in the area of the proposed projects. A significant impact to Federally-listed threatened and endangered species would occur when the USFWS or National Marine Fisheries

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[13] Public Law 97-98, 7 U.S. Code Section 4201
[14] Lambert-St. Louis International Airport, Environmental Assessment of Proposed Master Plan Development, January 1993;
[15] District Conservationist, Natural Resource Conservation Service, Platte County Field Office, 1209 Branch Street, Platte City, Missouri, 64079-1220.
[16] 16 U.S.C. §1531 et seq. (1973).

Service (NMFS) determines that the proposed action would be likely to jeopardize the continued existence of the species of concern, or would result in the destruction or adverse modification of Federally-designated critical habitat in the affected area.

EXISTING CONDITIONS

According to the USFWS,[17] there are 26 Federal and state listed species of plants and animals found in St. Louis County as shown in **Table 6.3-3, *List of Threatened, Endangered and Candidate Species***. It should be noted that the bald eagle is no longer protected under the ESA; however, the species remains protected under the Bald and Golden Eagle Protection Act, which prohibits the disturbance of a bald or golden eagle or its nest. Information collected for the 1997 EIS indicated that no designated critical habitats for threatened/endangered species was known to exist in the airport area and there was no record of listed species occurring in the vicinity of the airport and none were sighted during field reviews.

Pursuant to 14 CFR Part 139.337(e), the STLAA developed a Wildlife Hazard Management Plan (WHMP) in cooperation with the USDA Wildlife Services program. The WHMP was approved by the FAA in October 2010.[18]

The WHMP establishes the responsibilities, policies, resources, and procedures to reduce wildlife hazards at Lambert Airport. Implementation of the WHMP can be effectively accomplished only with the collective efforts of many individuals and several agencies. The Airport Operations Supervisor is responsible for all wildlife management activities at Lambert Airport. Two full time USDA Wildlife Services Specialists are also under contract with the STLAA on an annual basis. The specialists could assist with wildlife issues as needed for the development of the Master Plan proposed projects.

The WHMP provides habitat management plans, which are the most effective long-term remedial measures for reducing wildlife hazards on, or near, airports. Habitat management includes, but is not limited to, the removal of food sources attractive to birds or wildlife; the removal of brush, woodlands and undergrowth where possible; and even physical removal of birds and waterfowl from the airfield and terminal areas. The ultimate goal is to make the environment fairly uniform and unattractive to the species that are considered the greatest hazard to aviation. Airport planning plays an important role in bird strike and other wildlife hazard reduction. Proper planning of an airport can help to recognize land uses on or near the airport site that can potentially attract wildlife. By controlling these land uses wildlife hazards can be reduced.

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[17] U.S. Fish & Wildlife Service Website. Missouri - County Distribution of Federally-Listed Threatened, Endangered, Proposed, and Candidate Species, http://www.fws.gov/midwest/Endangered/lists/missouri-cty.html. Revised November 2009 (website accessed in June 2010).

[18] St. Louis Airport Authority. *Section 139.337 Wildlife Hazard Management Plan*. Approved by the FAA on October 8, 2010. (14 CFR Part 139, Section 139.337 – Wildlife hazard management.)

SUMMARY OF FISH, WILDLIFE, AND PLANT CONSIDERATIONS FOR ALL ALTERNATIVES

Coordination with the USFWS and the Missouri Department of Conservation should be initiated upon the commencement of any environmental review to confirm that no records of rare or endangered species or their habitat occur within the boundaries of the proposed Master Plan development projects.[19] Impacts to endangered species is unlikely since all Master Plan alternatives will occur on previously disturbed land, and efforts will be employed to limit stormwater runoff during construction that could impact aquatic species.

In addition, the Master Plan alternatives are not expected to create permanent standing water or any new attractive wildlife habitat. Therefore, it is expected that all the Master Plan alternatives would conform to the existing WHMP and FAA guidelines including FAA AC 150-5200-33B, *Hazardous Wildlife Attractants on or Near Airports.*[20]

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[19] Field Supervisor, U.S. Fish and Wildlife Service, 101 Park De Ville Drive, Suite A Columbia, Missouri, 65203 and Missouri Department of Conservation, Policy Coordination Unit, 2901 W. Truman Boulevard Jefferson City, Missouri, 65102.

[20] Federal Aviation Administration. Advisory Circular 150/5200-33B *Hazardous Wildlife Attractants on or Near Airports*. May 1, 1997.

TABLE 6.3-3
LIST OF THREATENED, ENDANGERED AND CANDIDATE SPECIES
Lambert-St. Louis International Airport

SPECIES	CLASSIFICATION*	HABITAT
American Bittern (Botaurus Lentiginosus)	SE	Occur in marshes, wet meadows and sloughs with emergent vegetation and permanent water 8-13 inches deep.
Bachman's Sparrow (Aimophila Aestivalis Illinoensis)	SE	Inhabits glades, open pinewoods, early successional stage old fields and oak-hickory or shortleaf pine regeneration with canopy cover less than 30 percent. Bare ground and well-developed herbaceous layer are important.
Crystal Darter (Crystallaria Asprella)	SE	Occur in streams and ditches with slow current, clear water, and sand or pebble bottom.
Decurrent false aster (Boltonia decurrens)	FT	Disturbed alluvial soils
Eastern Hellbender (Cryptobranchus Alleganiensis)	SE	Inhabit riffles in streams with gravel or rubble bottoms. Usually in water less than 1.3 m deep. Lay eggs under large flat rocks.
Eastern Massasauga (Sistrurus catenatus catenatus)	FC, SE	Inhabit marshy areas, wet prairies, sloughs, rank vegetation around marshes and lakes, and floodplains of major rivers. Prefer areas with cattails, sedge, bluegrass, dogwood and hawthorn.
Ebonyshell (Fusconaia Ebena)	SE	Usually found in rivers with swift current and a substrate of fine gravel to cobble.
Elephantear (Elliptio Crassidens)	SE	Found in creeks to large rivers in substrates of fine gravel to cobble/boulder.
Flathead Chub (Platygobio Gracilis)	SE	Occurs in diverse habitats. May be found in pools of small creeks with moderately clear water over gravel and bedrock bottom, or in large, turbid rivers with swift current and bottom of fine sand and gravel.
Gray bat (Myotis grisescens)	FE	Caves
Indiana bat (Myotis sodalis)	FE	Hibernacula: Caves and mines; Maternity and foraging habitat: small stream corridors with well developed riparian woods; upland forests
Interior Least Tern (Sternula Antillarum Athalassos)	SE	Occur on sand or gravel bars of streams, ponds, lakes or reservoirs. Nest in areas where vegetation is sparse or absent.
Lake Sturgeon (Acipenser Fulvescens)	SE	In Missouri, occurs in large rivers over firm sand, gravel, or rocky bottom.
Mead's milkweed (Asclepias meadii)	FT	Virgin prairies

TABLE 6.3-3, *continued*
LIST OF THREATENED, ENDANGERED AND CANDIDATE SPECIES
Lambert-St. Louis International Airport

SPECIES	CLASSIFICATION*	HABITAT
Northern Harrier (Circus Cyaneus)	SE	Inhabit open fields, prairies, native grass plantings and shallow marshes. Herbaceous vegetation should be dense with nearly 100 percent canopy cover and reach height of 10 feet by mid-May.
Pallid sturgeon (Scaphirhynchus albus)	FE	Mississippi and Missouri Rivers
Peregrine Falcon (Falco Peregrinus Tundrius)	SE	Require open country for hunting. Use open woodlands. Historically nested on cliffs. Tall buildings with nest sites free of human disturbance are also suitable.
Pink mucket (Lampsilis abrupta)	FE, SE	Usually found in rivers with cobble-gravel bottom in water 1-10 feet deep.
Plains Skunk Spotted (Spilogale Putorius)	SE	Inhabit fencerows, vegetated gullies and brushy borders with logs, brushpiles, snags, rocky outcrops, open prairies, and riparian woodland areas.
Running buffalo clover (*Trifolium stolonifereum*)	FE	Disturbed bottomland meadows
Scaleshell (Leptodea leptodon)	FE, SE	Occurs in clear, nonpolluted riffles with moderate current and firm gravel, cobble or sand substrates.
Sheepnose (Plethobasus cyphyus)	FC, SE	Found in medium to large rivers with gravel or mixed sand and gravel substrate.
Snowy Egret (Egretta Thula Thula)	SE	Inhabit marshes, swamps and lowland forests with shrubs and robust emergent vegetation. Prefer vegetation average 3.92 m tall and nest trees averaging 6.77 cm diameter breast height.
Snuffbox (Epioblasma Triquetra)	SE	Occurs in medium to large rivers with clear water and gravel riffles.
Spectaclecase (*Cumberlandia monodonta*)	FC	Meramec River
Swainson's Warbler (Limnothlypis Swainsonii)	SE	Inhabit bottomland forests with a dense understory of giant cane. Will use sapling to mature forest size classes where overstory tree height is greater than 25 feet.

* Classification: FC = Federal Candidate FE = Federal Endangered
FT = Federal Threatened SE = State Endangered.

Source: U.S. Fish & Wildlife Service website. *Missouri – County Distribution of Federally-Listed Threatened, Endangered, Proposed, and Candidate Species*, http://www.fws.gov/midwest/Endangered/lists/missouri-cty.html. Revised November 2009 (website accessed in June 2010). Missouri Fish and Wildlife Information System, available online at: http://mdc4.mdc.mo.gov/applications/mofwis/Mofwis_Search1.aspx (website accessed in June 2010).

6.3.8 FLOODPLAINS

Floodplains are defined by Executive Order 11988, *Floodplain Management*,[21] as "the lowland and relatively flat areas adjoining inland and coastal waters including flood-prone areas of offshore islands, including at a minimum, that area subject to a one-percent or greater chance of flooding in any given year" (i.e., area inundated by a 100-year flood).[22] U.S. Department of Transportation Order 5650.2 defines the beneficial values served by floodplains to include "natural moderation of floods, water quality maintenance, groundwater recharge, fish, wildlife, plants, open space, natural beauty, scientific study, outdoor recreation, agriculture, aquaculture, and forestry." Federal Emergency Management Agency (FEMA) maps are the primary reference for determining the extent of the base floodplain.

EXISTING CONDITIONS

As shown in **Exhibit 6.3-2, *Floodplains***, areas of 100-year floodplains occur on or adjacent to airport property, including to the east of Lambert Airport, along Maline Creek, to the north and south along Coldwater Creek, and to the west along Cowmire Creek.[23]

The Metropolitan St. Louis Sewer District is funding a $1.2 million wet weather detention facility at Coldwater Creek south of I-70 in the City of St. Ann. This detention facility, which is expected to be completed in 2011, will detain stormwater and meter flow into the Coldwater Creek culvert at Lambert Airport and alleviate flooding within the Coldwater Creek watershed.

SUMMARY OF FLOODPLAIN CONSIDERATIONS FOR ALL ALTERNATIVES

None of the Master Plan proposed projects or its alternatives encroach upon a mapped floodplain. Floodplain impacts would only be considered significant relative to NEPA if a proposed Federal action results in one or more of the following impacts:

- A high likelihood of loss of human life;
- Substantial encroachment-associated costs or damage, including adversely affecting safe airport operations or interrupting aircraft services (e.g., interrupting runway or taxiway use, placing another facility such as a NAVAID out of service, placing utilities out of service, etc.); or
- A notable adverse impact on the floodplain's natural and beneficial floodplain values.

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21 Code of Federal Regulations, Title 43, Part 6030 (43 CFR 6030),

22 FAA Order 5050.4B, *NEPA Implementing Instructions for Airport Actions*, April 28, 2006.

23 Federal Emergency Management Agency Q3 Flood Data based on Flood Insurance Rate Maps (FIRMs) panels obtained from the Missouri Spatial Data Information Service (MSDIS) online at: http://msdis.missouri.edu/datasearch/ThemeList.jsp (website accessed in March 2009).

6.3.9 HAZARDOUS MATERIALS, POLLUTION PREVENTION, AND SOLID WASTE

The potential impacts resulting from hazardous materials, solid waste collection, control, and disposal due to airport projects must be assessed. The following four primary laws govern the handling and disposal of hazardous materials, chemicals, substances, and wastes:

- Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), (as amended by the Superfund Amendments and Reauthorization Act of 1986 and the Community Environmental Response Facilitation Act of 1992);[24]
- Pollution Prevention Act of 1990;[25]
- Toxic Substances Control Act of 1976, as amended (TSCA);[26] and
- Resource Conservation and Recovery Act of 1976 (RCRA), (as amended by the Superfund Amendments and Reauthorization Act of 1986 and the Community Environmental Response Facilitation Act of 1992).[27]

The two statutes of most importance to the FAA for actions to construct and operate airport facilities and navigational aids are RCRA and CERCLA. RCRA governs the generation, treatment, storage, and disposal of hazardous wastes. CERCLA provides for consultation with natural resources' trustees and cleanup of any release of a hazardous substance (excluding petroleum) into the environment.

EXISTING CONDITIONS

Due to past hazardous waste generating activities at and around Lambert Airport, it is necessary to evaluate the potential hazardous waste impacts from any of the proposed Master Plan development projects, including the potential to disturb contaminated soil or existing underground storage tasks (USTs). Known hazardous waste sites and USTs at Lambert Airport are shown on **Exhibit 6.3-3, *Hazardous Materials***, and listed in **Table 6.3-4, *Hazardous Waste Sites***, and **Table 6.3-5, *Known Underground Storage Tanks***. The area of investigation for hazardous waste sites/USTs was restricted to airport property or immediately adjacent property. As noted in Table 6.3-4, many of the listed sites have been or are being remediated and the sources of contamination have been removed. Lambert Airport staff reports that these clean-up activities have eliminated the hazardous waste sites and all property is managed per applicable compliance requirements

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24 42 U.S.C. 9601-9675.
25 42 U.S.C. 1310-1319.
26 15 U.S.C. 2601-2692
27 42 U.S.C. 6901-6992(k)

Exhibit 6.3-2
FLOODPLAINS
Lambert-St. Louis International Airport

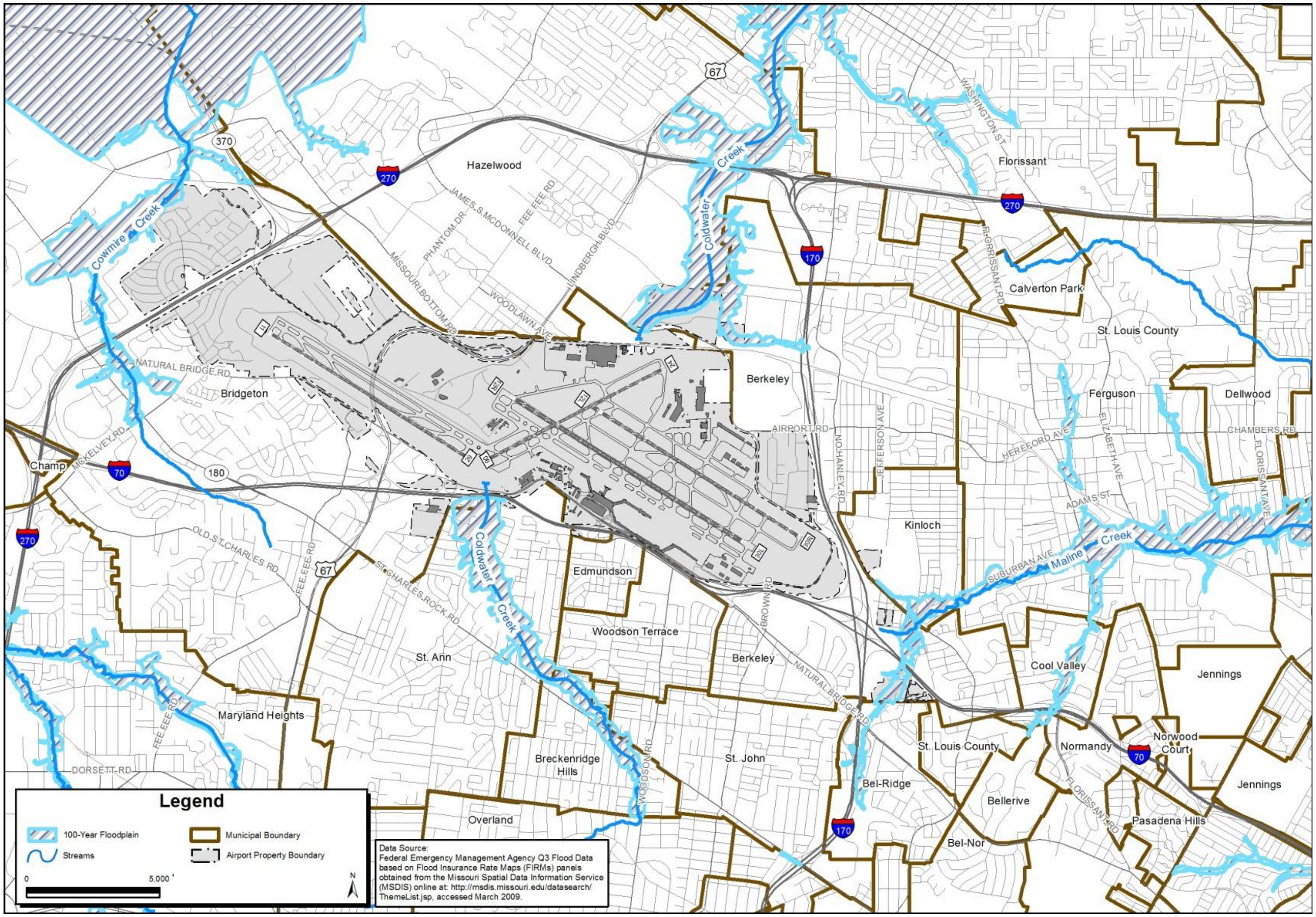

Exhibit 6.3-3
HAZARDOUS MATERIALS
Lambert-St. Louis International Airport

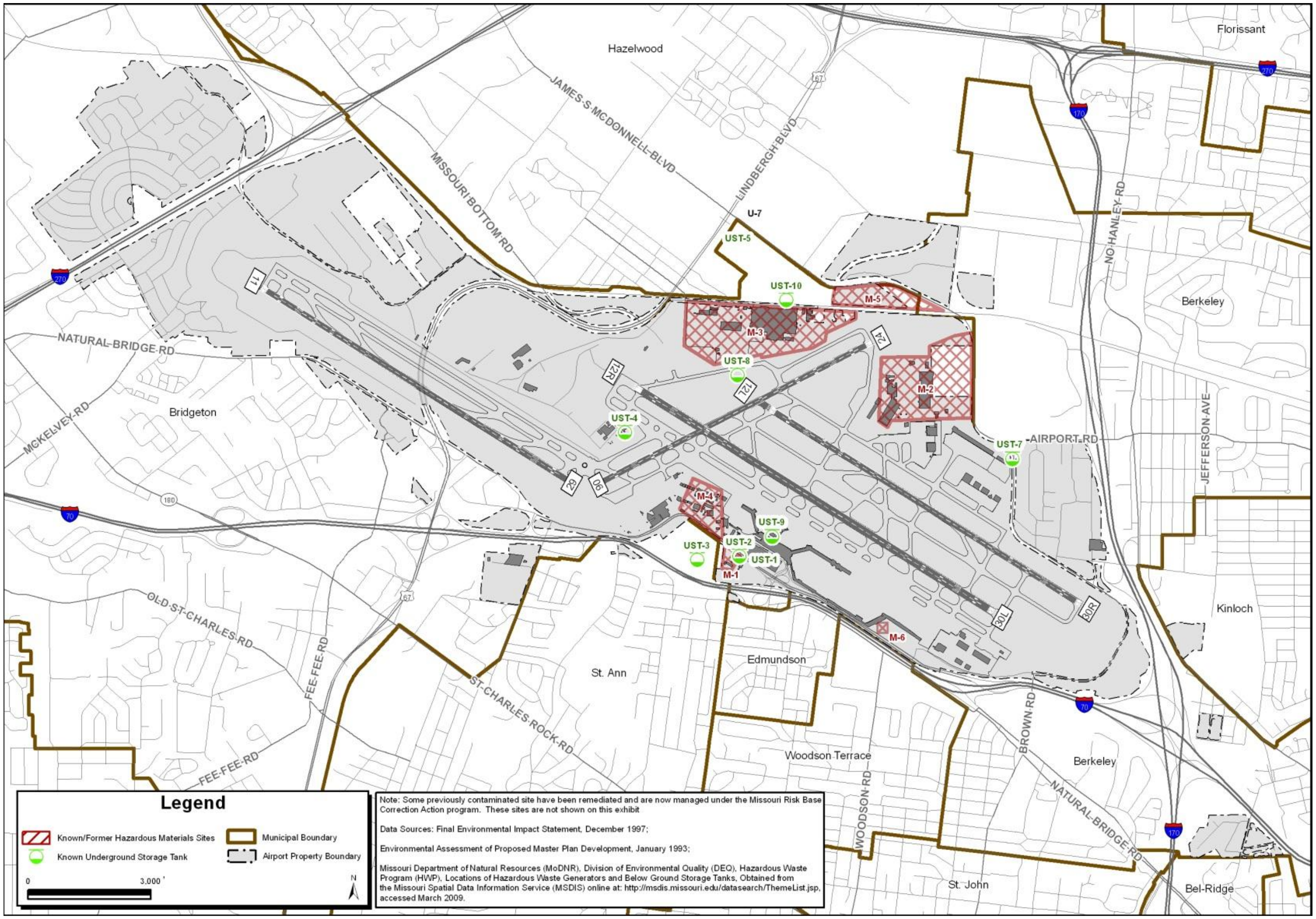

Table 6.3-4
HAZARDOUS WASTE SITES
Lambert-St. Louis International Airport

MAP ID	SITE NAME	LOCATION	DESCRIPTION	STATUS
M-1	Allied Aviation Fueling Site	Southwest of Terminal 1	Site contains fuel tanks	Ongoing activities associated with storage of aircraft fuel ongoing.
M-2	Boeing	East of Runway 24	Hazardous waste generator registered with MDNR	Ongoing activities associated with Boeing aircraft manufacturing.
M-3	Northern Tract	Northwest of Runway 24	Site in MDNR database for contamination associated with leaking storage tank(s)	Site remediation underway per MDNR standards.
M-4	Missouri Air National Guard Base	West of Terminal 1	Hazardous waste generator registered with MDNR	Ongoing activities associated with military facility.
M-5	St. Louis Airport Site (SLAPS)	Between Runway 24 and McDonnell Boulevard	Site formerly used to store residues from uranium processing.	Site remediation being conducted by USACE.
M-6	Lambert Terminal 2	East of Terminal 2	Petroleum-contaminated groundwater discovered during UST removal	UST was removed. According to 1997 FEIS, potential for significant impact was moderate.

Abbreviations used in Table 6.3-4:
FEIS = Final Environmental Impact Statement;
MDNR = Missouri Department of Natural Resources
USACE = U.S. Army Corps of Engineers
UST = Underground Storage Tank

Sources: Final Environmental Impact Statement, December 1997;
Environmental Assessment of Proposed Master Plan Development, January 1993;
Lambert-St. Louis International Airport Expansion Program Environmental Mitigation Activities During Construction and Grading Activities, August 30, 2006;
Airport Expansion Area Risk Evaluation, Lambert-St. Louis International Airport, June 2006;
Missouri Department of Natural Resources (MDNR), Division of Environmental Quality (DEQ), Hazardous Waste Program (HWP), Locations of Hazardous Waste Generators; Obtained from the Missouri Spatial Data Information Service (MSDIS) online at: http://msdis.missouri.edu/datasearch/ThemeList.jsp (website accessed in March 2009);
U.S. Environmental Protection Agency, *Envirofacts Warehouse*, Superfund (CERCLIS) & Facility Registry System (FRS); Available online at: http://www.epa.gov/envirofw/ (website accessed in September 2009).

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Table 6.3-5
KNOWN UNDERGROUND STORAGE TANKS
Lambert-St. Louis International Airport

MAP ID	NAME/OWNER	LOCATION
UST-1	Allied Aviation	10922 Natural Bridge Road
UST-2	Allied Aviation	10922 Natural Bridge Road
UST-3	Missouri Air National Guard	10800 Lambert International Boulevard
UST-4	Lambert Airport Field Maintenance	4800 St. Thomas Lane
UST-5	Boeing	McDonnell Boulevard, Bldg 28
UST-6	Federal Aviation Administration	10789 Lambert International Boulevard
UST-7	Signature Flight Support	5995 N McDonnell Boulevard
UST-8	Federal Aviation Administration	10789 Lambert Intl Boulevard
UST-9	Federal Aviation Administration	10789 Lambert Intl Boulevard
UST-10	Boeing	153 McDonnell Boulevard

Source: Missouri Department of Natural Resources (MDNR), Division of Environmental Quality (DEQ), Hazardous Waste Program (HWP), BLW_GRD_TANKS; Obtained from the Missouri Spatial Data Information Service (MSDIS) online at: http://msdis.missouri.edu/datasearch/ThemeList.jsp (website accessed March 2009).

SUMMARY OF HAZARDOUS MATERIALS, POLLUTION PREVENTION, AND SOLID WASTE CONSIDERATIONS FOR ALL ALTERNATIVES

The potential impacts from hazardous materials would be evaluated as part of the environmental documentation preparation process for each of the specific development projects. Additional analysis for the proposed development areas such as environmental due diligence audits or environmental site assessments may need to be performed due to the potential to disturb any possible soil contaminants from past uses. Coordination with the Missouri Department of Natural Resources (MDNR) and other agencies may be necessary prior to design of the Master Plan development projects.

Some of the Master Plan development projects also include demolition activities. Demolition activities will likely require coordination with the MDNR[28] and St. Louis County to ensure proper assessments are conducted and abatement practices are followed if necessary prior to demolition.

It is not anticipated that the Master Plan development projects would generate an unmanageable volume of solid waste or affect the STLAA's existing solid waste management program.

28 Hazardous Waste Program Director, P.O. Box 176, Jefferson City, MO 65102.

6.3.10 HISTORICAL, ARCHITECTURAL, ARCHEOLOGICAL, AND CULTURAL RESOURCES

The *National Historic Preservation Act* of 1966 (NHPA)[29] and the *Archeological and Historic Preservation Act* of 1974[30] are primary Federal laws governing the preservation of historic and prehistoric resources, encompassing art, architecture, archaeological, and other cultural resources. Section 106 of the NHPA requires that, prior to approval of a Federal or Federally-assisted project, or before the issuance of a license, permit, or other similar approval, Federal agencies take into account the effect of the project on properties that are on or eligible for listing on the National Register of Historic Places (NRHP).

The NRHP has established criteria for determining historic significance. These criteria require a property to have integrity of location, design, setting, materials, workmanship, feeling, and association. Additionally, properties must be at least 50 years old, remain fairly unaltered, and meet one or more of the following National Register criteria for significance, identified as Criterion A through D:

A. Property is associated with events that have made a significant contribution to the broad patterns of our history.

B. Property is associated with the lives of persons significant in our past.

C. Property embodies the distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.

D. Property has yielded, or is likely to yield, information on prehistory or history.

DETERMINATION OF AREA OF POTENTIAL EFFECT

As described in 36 CFR 800.4(a)(1) and in 36 CFR 800.16(d) the Area of Potential Effect (APE) for historic resources, including structures and archaeological sites, is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist."

ASSESSMENT OF EFFECT FOR THE PROPOSED ACTION

An assessment would be included in the environmental documentation on whether the Master Plan development projects would physically destroy or alter any historic properties; require removal of any properties from its historic location; introduce an atmospheric, audible or visual feature to the area that would diminish the integrity of any property's setting; or through transfer, sale, or lease, diminish the long-term

[29] Public Law 89-665; 16 U.S.C. 470 et seq.
[30] Public Law 86-523, 16 U.S.C. 469-469c-2

preservation of any property's historic significance that Federal ownership or control would otherwise ensure. A determination in accordance with 36 CFR 800.4 and 36 CFR 800.5 would need to be included in the environmental documentation.

EXISTING CONDITIONS

A review of NRHP records maintained by the National Park Service, past Lambert Airport environmental studies, including the 1997 Final Environmental Impact Statement (1997 FEIS), the 2011 Draft EA for Implementation of Base Realignment and Closure (BRAC) Commission Recommendations, Redistribution of F-15 Aircraft and Relocation of the 157th Air Operations Group and the 218th Engineering Installation Squadron (2011 Draft BRAC EA), and local government websites was conducted to identify historic properties. Properties that are currently included on or eligible for inclusion on the NRHP are shown on **Exhibit 6.3-4, *Historical, Architectural, Archeological, and Cultural Resources within the Master Plan Area of Investigation***, and listed in **Table 6.3-6, *Historical, Architectural, Archeological, and Cultural Resources Within the Master Plan Area of Investigation***.

The 2011 Draft BRAC EA identified eight buildings on the north parcel and the pedestrian tunnel as collectively eligible to be nominated to the NRHP for designation as a historic district. As of 2011, none of these locations had not been nominated for listing on the NRHP, nor were efforts underway to nominate these locations. Additional properties may be eligible for inclusion on the NRHP within the vicinity of Lambert Airport that are not shown on Exhibit 6.3-4 or listed in Table 6.3-6. The cities of Bridgeton and Ferguson, and St. Louis County each maintain listings of historic properties within their jurisdictions that are updated periodically as properties are nominated. These lists should be reviewed when conducting environmental analysis for any of the recommended Master Plan development projects.

SUMMARY OF HISTORICAL, ARCHITECTURAL, ARCHEOLOGICAL, AND CULTURAL RESOURCES CONSIDERATIONS FOR ALL ALTERNATIVES

There are no known archaeological resources that would be directly impacted by any of the Master Plan Alternatives. Furthermore, none of the Master Plan alternatives would directly or indirectly impact any structures listed on the NRHP. It may be necessary to make a determination of NRHP eligibility for any structures that would be impacted that are greater than 50 years old, particularly Lambert's Terminal One building. Coordination with the State Historic Preservation Officer (SHPO) would be required to confirm a finding of no historic properties affected.[31]

[31] State Historic Preservation Officer, State of Missouri, 1101 Riverside Drive Jefferson City, Missouri, 65102.

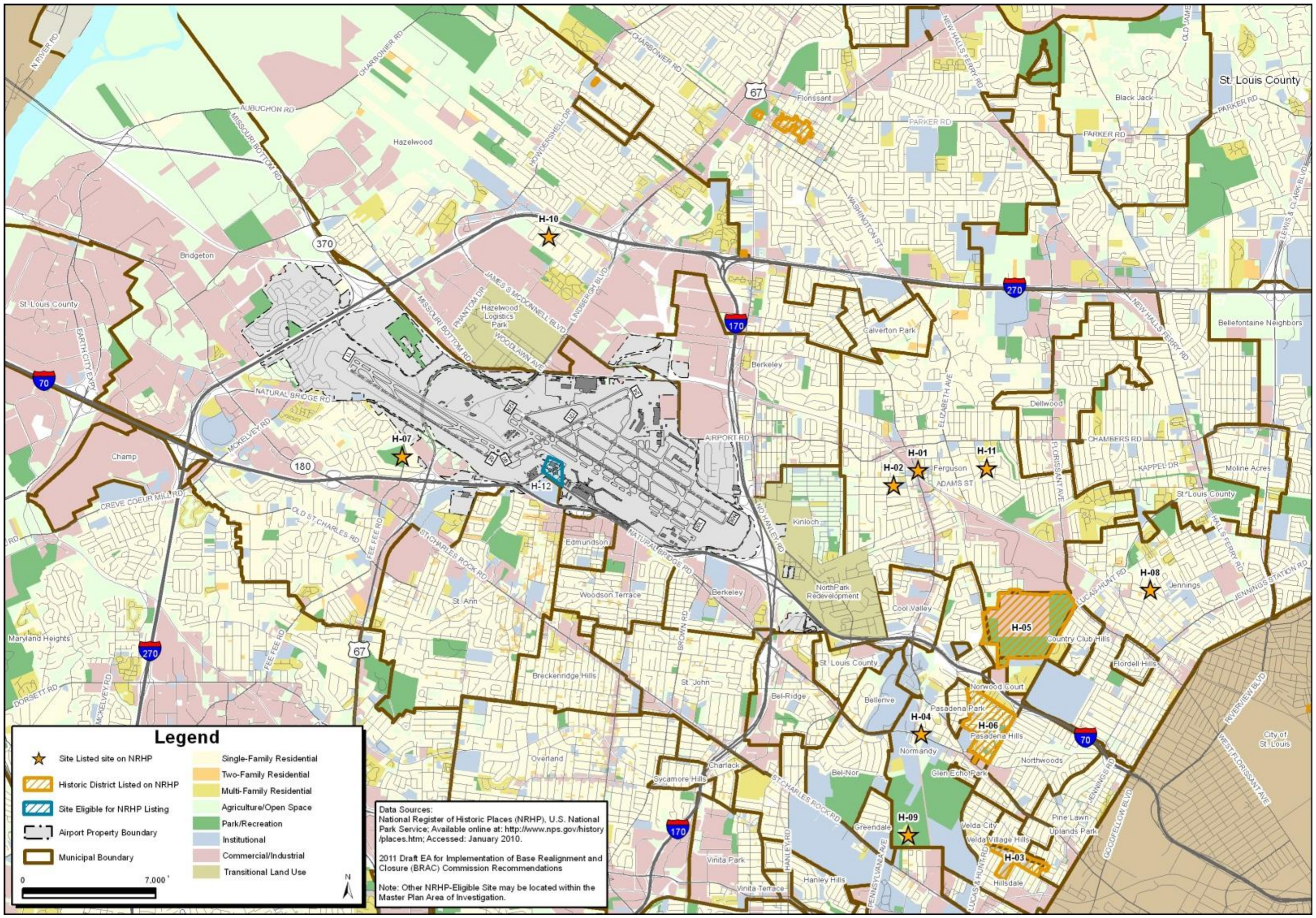
Table 6.3-6
HISTORICAL, ARCHITECTURAL, ARCHEOLOGICAL, AND CULTURAL RESOURCES WITHIN THE MASTER PLAN AREA OF INVESTIGATION
Lambert-St. Louis International Airport

MAP ID	NAME	CURRENT USE	LOCATION
H-01	Church Street Commercial District	Commercial District	Ferguson
H-02	Ferguson Central Elementary School	School	Ferguson
H-03	Greenwood Cemetery	Cemetery	Hillsdale
H-04	Hunt, Wilson Price, House	Commercial office	Normandy
H-05	Norwood Hills Country Club	Country club	Jennings
H-06	Pasadena Hills	Residential neighborhood	Pasadena Hills
H-07	Payne-Gentry House	Commercial office	Bridgeton
H-08	Seed, Miles A., Carriage House	Barn	Jennings
H-09	St. Vincent Hospital	Multi-family residential	Normandy
H-10	Utz-Tesson House	Vacant	Hazelwood
H-11	Wildwood House	Single-family residential	Ferguson
H-12	Missouri Air National Guard Properties	Military facility	St. Louis County

Source: National Register of Historic Places (NRHP), U.S. National Park Service; Available online at: http://www.nps.gov/history/places.htm (website accessed in January 2010).

Draft EA for Implementation of Base Realignment and Closure (BRAC) Commission Recommendations, Redistribution of F-15 Aircraft and Relocation of the 157th Air Operations Group and the 218th Engineering Installation Squadron (2011 Draft BRAC EA), July 2011.

Exhibit 6.3-4
HISTORICAL, ARCHITECTURAL, ARCHEOLOGICAL, AND CULTURAL RESOURCES WITHIN THE MASTER PLAN AREA OF INVESTIGATION
Lambert-St. Louis International Airport



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6.3.11 LIGHT EMISSIONS AND VISUAL IMPACTS

According to FAA Order 1050.1E, "light emissions impacts are unlikely to have an adverse impact on human activity or the use or characteristics of the protected properties."[32] Only in unusual circumstances would the impact of light emissions be considered sufficient to warrant special study and a more detailed examination. Examples of unusual circumstances would be when high-intensity strobe lights would shine directly into residences, or when overhead apron, parking, or street lights create glare that would affect pilots and air traffic controllers.

As stated in FAA Order 1050.1E, "(v)isual, or aesthetic, impacts are inherently more difficult to define because of the subjectivity involved."[33] When analyzing visual impacts of airport projects public involvement and consultation with appropriate Federal, State, and local agencies may help determine the extent of any impacts.

EXISTING CONDITIONS

Lambert Airport is currently illuminated by various types of lighting on the airfield and for landside facilities. Lighting that emanates from the airfield includes runway, apron, and navigational lighting such as, hold position lights, stop-bar lights, and runway and taxiway signage. Airfield lighting is located along taxiways and ramps for guidance during periods of low visibility, and to assist aircraft movement on the airfield. Aircraft lighting, such as landing lights, position and navigation lights, beacon lights, and vehicle lighting are other types of light sources on the airfield. Lights for landside facilities include buildings, roadways, and parking facilities. Lambert Airport is located in a highly urbanized area which is comprised of other development that is also lighted and contributes to the overall light emissions in the area.

SUMMARY OF LIGHT EMISSIONS AND VISUAL IMPACT CONSIDERATIONS FOR ALL ALTERNATIVES

Because of the relatively low levels of light intensity compared to background levels associated with most air navigation facilities and other airport development actions, and the lighting from other non-airport development, light emissions impacts are unlikely to have a significant adverse impact on human activity or on the use or characteristics of any protected properties. Due to the density of development surrounding Lambert Airport, the visual impacts of any Master Plan alternatives is also unlikely to be significant.

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[32] FAA Order 1050.1E Environmental Impacts: Policies and Procedures. Appendix A, Analysis of Environmental Impact Categories, Section 12.2a, March 20, 2006.

[33] FAA Order 1050.1E Environmental Impacts: Policies and Procedures. Appendix A, Analysis of Environmental Impact Categories, Section 12.2b, March 20, 2006.

6.3.12 NATURAL RESOURCES AND ENERGY SUPPLY

FAA Order 1050.1E directs that the "use of natural resources other than for fuel need be examined only if the action involves a need for unusual materials or those in short supply."[34] For most airport actions, changes in energy or other natural resource consumption will not result in significant adverse impacts. Executive Order (E.O.) 13123, *Greening the Government through Efficient Energy Management*,[35] encourages each Federal agency to expand the use of renewable energy within its facilities and in its activities. E.O. 13123 also requires each Federal agency to reduce petroleum use, total energy use and associated air emissions, and water consumption in its facilities.

EXISTING CONDITIONS

The Airport is located within a highly urbanized area with adequate access to natural resources and energy for construction projects.

SUMMARY OF NATURAL RESOURCES AND ENERGY SUPPLY CONSIDERATIONS FOR ALL ALTERNATIVES

The Master Plan alternatives would increase the demand for energy supply in order to power new facilities. It is unlikely that the Master Plan alternatives would have a significant adverse impact to natural resources and energy supply. The Master Plan alternatives are not likely to cause a substantial demand for natural resources or energy that cannot be met by the local supply. It is not anticipated that scarce or unusual materials would be required to construct any of the Master Plan alternatives.

6.3.13 NOISE

Noise may be defined as unwanted sound. Sound is measured by its pressure, or energy, in terms of decibels (dB). Because of the enormous range of sound pressures to which the human ear is sensitive, the raw sound pressure measurement is converted to the dB scale for purposes of description, comparison, and analysis. The dB scale is logarithmic. A 10 dB increase in sound is perceived as a doubling of sound (or twice as loud) by the human ear. DNL is a noise measure used to describe the average sound level over a 24-hour period, typically an average day over the course of a year. In computing DNL, an extra weight of 10 dB is assigned to noise occurring at night between the hours of 10:00 p.m. and 7:00 a.m. to account for increased annoyance when ambient noise levels are lower and people are trying to sleep. DNL may be determined for individual locations or expressed in noise contours shown on a map.

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[34] FAA Order 1050.1E Environmental Impacts: Policies and Procedures. Appendix A, Analysis of Environmental Impact Categories, Section 13.2a, March 20, 2006.

[35] 64 FR 30851, June 8, 1999

EXISTING CONDITIONS

The existing conditions noise exposure contours are assumed to be the same as the Existing (2010) Baseline noise exposure contours prepared for the Lambert Airport Part 150 Noise Compatibility Update Study,[36] which was prepared concurrently with this Master Plan Update Study. The Existing (2010) Baseline noise exposure contours were based on aircraft operations occurring during calendar year 2009. Data representative of an average annual day of operations came from STLAA records, Air Traffic Control Tower (ATCT) counts, and a detailed assessment of radar data for four separate months of the year.

During 2009, FAA records indicate that 209,313 annual aircraft operations occurred. To better reflect 2010 conditions, this number was adjusted downward to account for the fact that the 131st Fighter Wing of the Missouri Air National Guard operations at Lambert Airport ceased in June of 2009. Therefore, a total of 208,861 annual operations were identified to represent the Existing (2010) Baseline condition. These noise levels were computed using Version 7.0b of the Integrated Noise Model (INM).

Exhibit 6.3-5, ***Existing (2010) Baseline Noise Exposure Contours***, depicts the average-annual day noise exposure pattern present at Lambert Airport for the existing condition, reflective of typical operating conditions at the Airport. **Table 6.3-7, *Area (in Square Miles) Within Noise Contour Bands*** summarizes the area within each noise contour level. The noise exposure contours do not represent the noise levels present on any specific day, but rather, represent the daily energy average of all 365 days of operation during the year. The noise contour pattern extends from the Airport along each extended runway centerline, reflective of the flight tracks used by all aircraft. The relative distance of the contours from the airport along each route is a function of the frequency of the use of each runway for total arrivals and departures, as well as its use at night, and the number and type of aircraft assigned to it.

The shape of the noise contours is primarily a function of the combination of flight tracks, time of operations, and runway use at Lambert Airport. The shape of the noise contours to the east and west of the Airport reflects the predominant east/west use of Runways 12L-30R and 12R-30L and the occasional east/west traffic on Runway 11-29. Contour size is approximately equal to the east and west of the Airport reflecting approximately equal usage of east and west traffic flow patterns. The minimal usage of Runway 6-24 is apparent from the lack of contour pattern emanating from its endpoints.

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[36] *Lambert-St. Louis International Airport 14 CFR Part 150 Noise Exposure Map Update and Noise Compatibility Program Update – Final Report*, November 2010. Prepared for the St. Louis Airport Authority. Prepared by Landrum & Brown.

Table 6.3-7
AREA (IN SQUARE MILES) WITHIN NOISE CONTOUR BANDS
EXISTING (2010) BASELINE NOISE EXPOSURE CONTOURS
Lambert-St. Louis International Airport

CONTOUR RANGE	CONTOUR AREA (SQ. MILES)
65-70 DNL	2.75
70-75 DNL	0.99
75+ DNL	1.13
TOTAL – 65+ DNL	4.87

Note: Figures are rounded to the nearest tenth of a square mile. Total area of 65+ DNL noise exposure contour may not equal sum of individual contour bands due to rounding.

Source: Landrum & Brown, 2010.

EXISTING (2010) BASELINE AIRCRAFT NOISE IMPACTS

Identifying and evaluating all land uses within the airport environs is necessary to quantify residential and other noise-sensitive land uses impacted by aircraft noise. As discussed in Section 6.3.3 *Compatible Land Use*, the FAA has developed land use compatibility guidelines relating types of land use to airport sound levels.

Table 6.3-8, *Residences, Populations and Noise-Sensitive Facilities within the Existing (2010) Baseline Noise Exposure Contours* summarizes the estimated population, residences, and number of noise-sensitive public facilities within the 65 DNL noise exposure contour for Existing (2010) Baseline conditions. There are 83 housing units and an estimated population of 228 people located within the 65 DNL of the Existing (2010) Baseline noise exposure contour. These housing units are located within the jurisdictions of Cool Valley, Ferguson, and Kinloch. Of those housing units, 12 received, or are in the process of receiving sound insulation. Another three units met sound attenuation requirements and the owners granted avigation easements. Twenty-eight housing units are considered ineligible for the sound insulation program because they either received a court settlement[37] or were purchased after the date the previous NEMs were approved by the FAA (January 10, 1997). The owners of the remaining 40 housing units either did not respond to or refused previous offers for mitigation.[38] Thirty-eight of these 40 units are within a multi-family housing complex within Kinloch for which voluntary acquisition was previously offered to the complex owner and refused. Because each of these housing units is within an existing program area, or was ineligible for the existing program, each of these housing units is considered to be mitigated. There are three churches located within the 65 DNL of the Existing (2010) Baseline noise exposure contour.

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37 St. Louis County Courts, Cause #615579, March, 1994.

38 The STLAA sent letters to the property owners of all remaining properties that were eligible for sound insulation under the previous program in January 2009 requesting they indicate their intent to participate in the program by March 31, 2009. The previous sound insulation program will continue for those property owners who responded.

Exhibit 6.3-5
EXISTING (2010) BASELINE NOISE EXPOSURE CONTOURS
Lambert-St. Louis International Airport

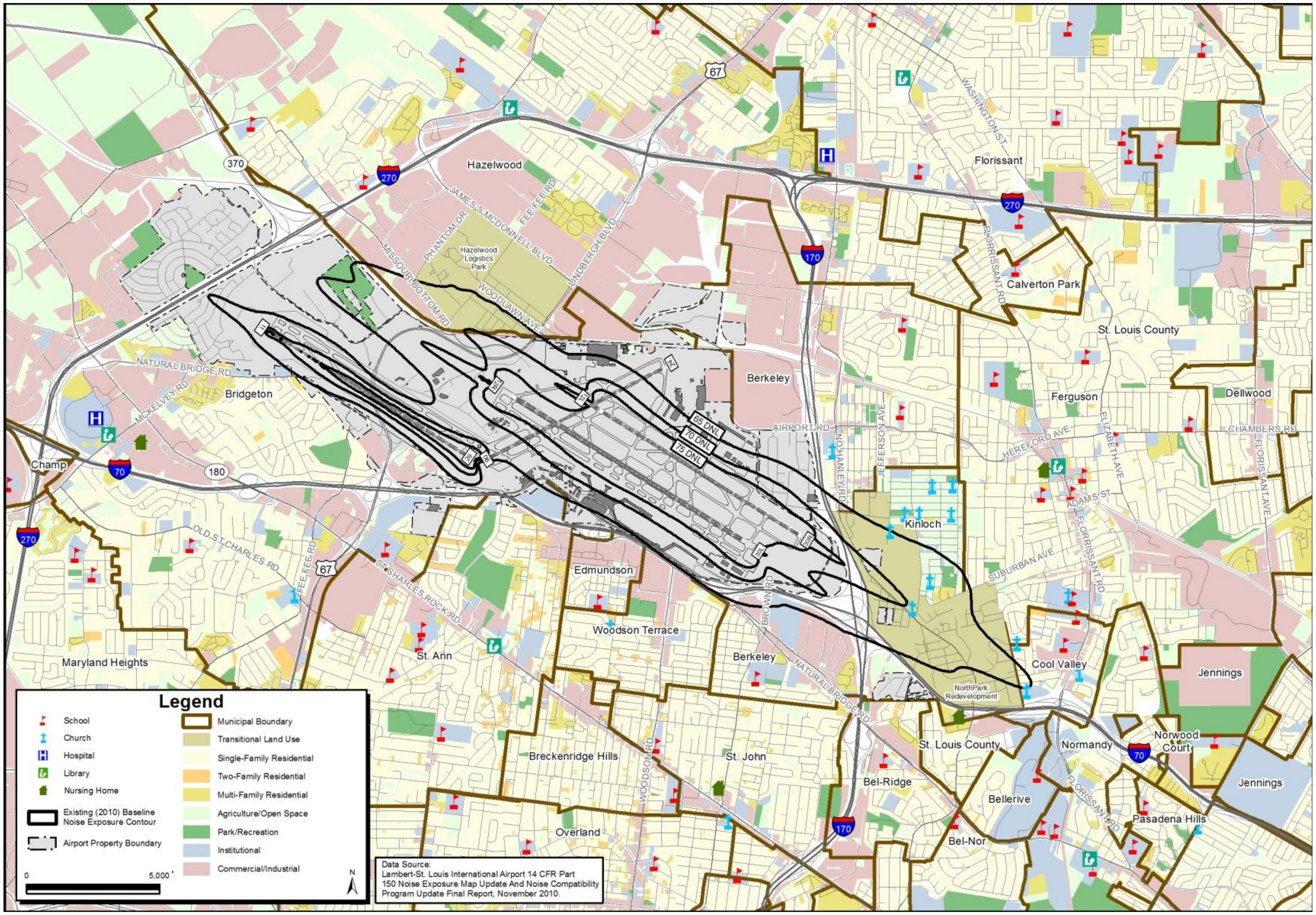

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Table 6.3-8
RESIDENCES, POPULATION, AND NOISE-SENSITIVE FACILITIES WITHIN THE EXISTING (2010) BASELINE NOISE EXPOSURE CONTOUR
Lambert-St. Louis International Airport

	65-70 DNL	70-75 DNL	75+ DNL	65+ DNL
Housing Units	**83**	**0**	**0**	**83**
Participated in Sound Insulation Program	12	0	0	12
Participated in Limited Avigation Easement Program	3	0	0	3
Ineligible for Sound Insulation Program*	28	0	0	28
Did not respond or declined to participate in any program	40	0	0	40
Estimated Population	**228**	**0**	**0**	**228**
Participated in Sound Insulation Program	32	0	0	32
Participated in Limited Avigation Easement Program	8	0	0	8
Ineligible for Sound Insulation Program*	74	0	0	74
Did not respond or declined to participate in any program	114	0	0	114
Noise-Sensitive Facilities	**3**	**0**	**0**	**3**
Schools	0	0	0	0
Churches	3	0	0	3
Libraries	0	0	0	0
Hospitals	0	0	0	0
Nursing Homes	0	0	0	0

Notes: The numbers of housing units were verified through aerial photography and field verification. Population numbers were estimated by multiplying the number of impacted housing units by the average population per residence for each U.S. Census Block in 2000, rounded to the nearest whole number.

* Properties that are ineligible for mitigation include those that were in litigation with the STLAA and received a court settlement and those that were purchased after the date of the FAA Record of Approval on the previous NCP, January 10, 1997.

Source: Landrum & Brown, 2010

SUMMARY OF NOISE CONSIDERATIONS FOR ALL ALTERNATIVES

No alternatives are being recommended that would cause a change in the number of aircraft operations, fleet mix, runway use, flight corridors, or flight profiles. Therefore, the future (2020) noise contours with the Master Plan proposed development projects would be the same as the Future (2020) Baseline conditions. The future noise associated with operations at Lambert Airport were projected for the 2020 condition based on a Forecast of Aviation Activity prepared for this Master Plan Update and concurrent Part 150 Noise Compatibility Study Update.

The information is presented in five-increment DNL noise levels (65, 70, and 75). **Exhibit 6.3-6, *Future (2020) Noise Exposure Contours* presents the Future *2020 Noise Exposure Pattern*.** **Table 6.3-9, *Area (in Square Miles) Within Noise Contour Bands*** summarizes the area within each noise contour level.

Table 6.3-9
AREA (IN SQUARE MILES) WITHIN NOISE CONTOUR BANDS
FUTURE (2020) NOISE EXPOSURE PATTERN
Lambert-St. Louis International Airport

CONTOUR RANGE	CONTOUR AREA (SQ. MILES)
65-70 DNL	2.75
70-75 DNL	0.96
75+ DNL	1.08
TOTAL – 65+ DNL	4.80

Note: Figures are rounded to the nearest tenth of a square mile. Total area of 65+ DNL noise exposure contour may not equal sum of individual contour bands due to rounding.

Source: Landrum & Brown, 2010.

The Future (2020) noise exposure contour retains the same general shape as the Existing (2010) Baseline noise exposure contour. When compared to the Existing (2010) Baseline noise exposure contour, the 65 DNL of the Future (2020) noise exposure contour is larger in size in some areas, notably the approaches to Runways 12L-30R and 12R-30L, due to the projected increase in total operations yet smaller in other areas, notably along the 100-degree departure heading, due to the continued transition to newer and generally quieter aircraft at Lambert that reduces departure noise.

Summaries of the residential population, housing units, and noise-sensitive public facilities affected by noise levels exceeding 65 DNL for the Future (2020) noise exposure contour is provided in **Table 6.3-10, *Residences, Population, and Noise-Sensitive Facilities Within the Future* (2020) *Noise Exposure Contours***.

Exhibit 6.3-6
FUTURE (2020) NOISE EXPOSURE CONTOURS
Lambert-St. Louis International Airport

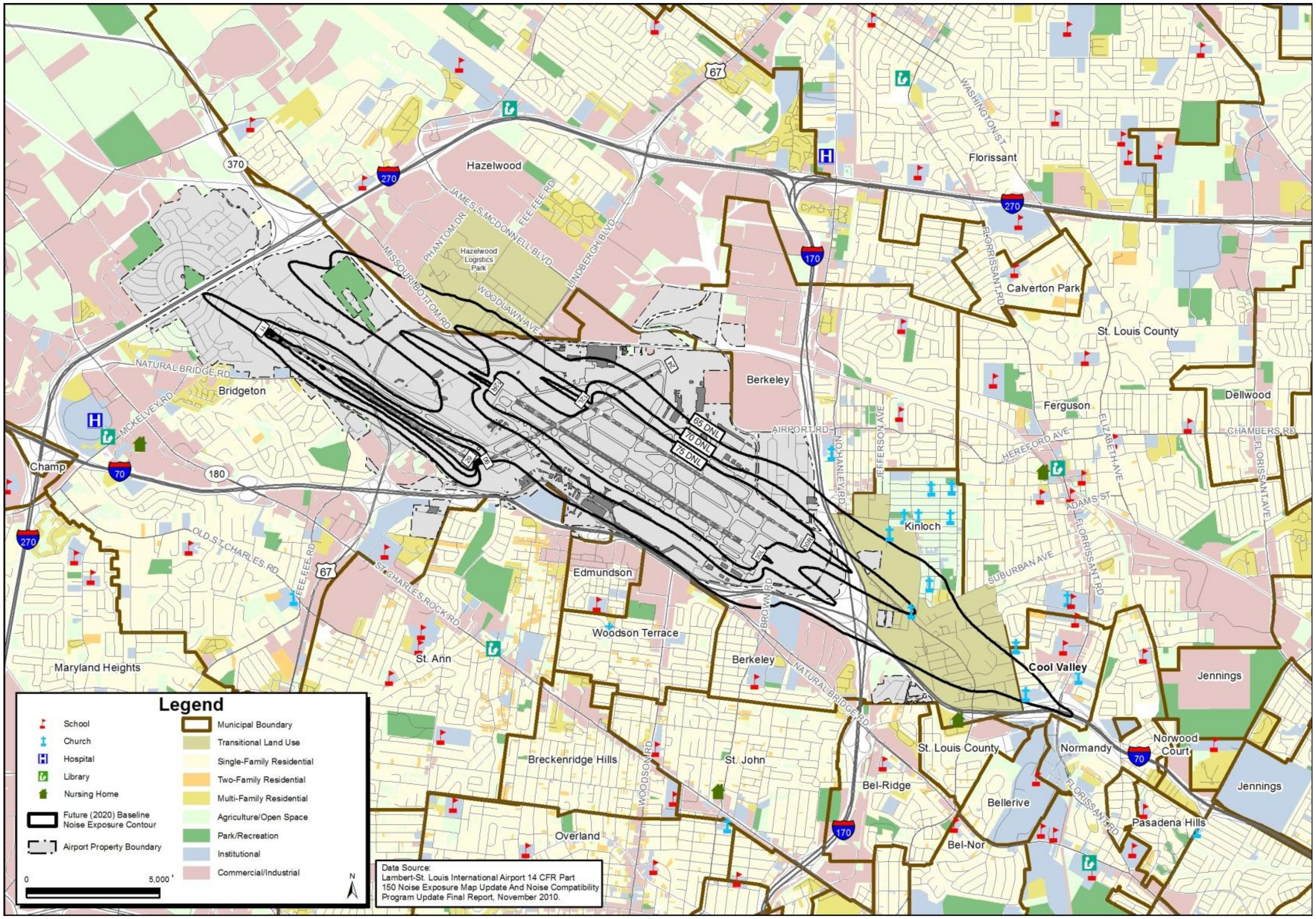

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Table 6.3-10
RESIDENCES, POPULATION, AND NOISE-SENSITIVE FACILITIES WITHIN THE FUTURE (2020) NOISE EXPOSURE CONTOURS
Lambert St. Louis International Airport

	65-70 DNL	70-75 DNL	75+ DNL	65+ DNL
Housing Units	**117**	**0**	**0**	**117**
Participated in Sound Insulation Program	19	0	0	19
Participated in Limited Avigation Easement Program	3	0	0	3
Ineligible for Sound Insulation Program*	56	0	0	56
Did not respond or declined to participate in any program	39	0	0	39
Estimated Population	**314**	**0**	**0**	**314**
Participated in Sound Insulation Program	50	0	0	50
Participated in Limited Avigation Easement Program	8	0	0	8
Ineligible for Sound Insulation Program*	148	0	0	148
Did not respond or declined to participate in any program	108	0	0	108
Noise-Sensitive Facilities	**3**	**0**	**0**	**3**
Schools	0	0	0	0
Churches	3	0	0	3
Libraries	0	0	0	0
Hospitals	0	0	0	0
Nursing Homes	0	0	0	0

Notes: The numbers of housing units were verified through aerial photography and field verification. Population numbers were estimated by multiplying the number of impacted housing units by the average population per residence for each U.S. Census Block in 2000, rounded to the nearest whole number.

* Properties that are ineligible for mitigation include those that were in litigation with the STLAA and received a court settlement and those that were purchased after the date of the FAA Record of Approval on the previous NCP, January 10, 1997.

Source: Landrum & Brown, 2010

There are 107 housing units and an estimated population of 314 people located within the 65 DNL of the Future (2020) noise exposure contour. These housing units are located within the jurisdictions of Cool Valley and Kinloch. Of those housing units, 19 have received, or are in the process of receiving sound insulation. Another three units met sound attenuation requirements and the owners granted avigation easements. Fifty-six housing units are considered ineligible for the sound insulation program because they either were in litigation with Lambert Airport and received a court settlement[39] or were purchased after the date the *1997 Part 150 Study Update* NEMs were approved by the FAA (January 10, 1997). The owners of the remaining 39 housing units either did not respond to or refused previous offers

[39] St. Louis County Courts, Cause #615579, March, 1994.

for mitigation.[40] Thirty-six of these 39 units are within a multi-family housing complex within Kinloch for which voluntary acquisition was previously offered to the complex owner and refused. Because these housing units are within an existing program area, or were ineligible for the existing program, these housing units are considered to be mitigated. There are three churches located within the 65 DNL of the Future (2020) noise exposure contour. These churches are not considered eligible for sound insulation due to the difficulty in sound insulating such structures.

6.3.14 SECONDARY (INDUCED) IMPACTS

Major airport development proposals often involve the potential for induced or secondary impacts on surrounding communities. Examples of potential secondary impacts include shifts in patterns of population movement and growth; public service demands; and changes in business and economic activity to the extent influenced by the Airport development. Induced impacts will normally not be significant except where there are also significant impacts in other categories, especially noise, land use, or direct social impacts.

EXISTING CONDITIONS

Lambert Airport is surrounded mostly by commercial, industrial, and residential development. A large redevelopment project known as the NorthPark development is occurring to the east of Lambert Airport in the jurisdictions of Berkeley, Ferguson, Kinloch, and St. Louis County. The development includes commercial and industrial uses and would provide jobs and tax benefits to the local jurisdictions. Other land surrounding Lambert Airport is also available for redevelopment including the Hazelwood Logistics Park and the Aviator Business Park in Hazelwood.

SUMMARY OF SECONDARY (INDUCED) IMPACT CONSIDERATIONS FOR ALL ALTERNATIVES

The Master Plan development projects include construction of new terminal facilities, parking facilities, airfield modifications and other potential development within the airport property. These changes would cause a temporary increase in employment during construction. Any new development is likely to produce positive socioeconomic benefits associated with new jobs and increased tax revenues. Due to the location within a highly urbanized area, it is anticipated that any demands for new public services as a result of new development could easily be met.

None of the Master Plan development projects are expected to cause permanent impacts to public roadways, although some construction may be necessary to provide/upgrade roadway access to certain development areas. Any such impacts

[40] The STLAA sent letters to the property owners of all remaining properties that were eligible for sound insulation under the previous program in January 2009 requesting they indicate their intent to participate in the program by March 31, 2009. The previous sound insulation program will continue for those property owners who responded.

are expected to be temporary and minimal in nature. It is not expected that any of the Master Plan alternatives will cause a major shift in population and/or employment within the St. Louis region.

6.3.15 SOCIOECONOMIC IMPACTS, ENVIRONMENTAL JUSTICE, AND CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISKS

Significant thresholds for socioeconomic impacts, environmental justice, and children's environmental health and safety risks are determined by the following:

- Extensive relocation of residents is required, but sufficient replacement housing is unavailable.
- Extensive relocation of community businesses that would create severe economic hardship for the affected communities.
- Disruptions of local traffic patterns that substantially reduce the levels of service of the roads serving the Airport and its surrounding communities.
- A substantial loss in community tax base.
- Disproportionate health and safety risks to children may represent a significant impact.

EXISTING CONDITIONS

St. Louis County, Missouri has a diverse population and economy. Lambert Airport has been, and continues to be a major factor in attracting businesses and development in the area. As previously stated, large tracts of land available for commercial and/or industrial development are within the vicinity of Lambert Airport. Any new development is likely to produce positive socioeconomic benefits associated with new jobs and increased tax revenues.

SUMMARY OF SOCIOECONOMIC IMPACTS, ENVIRONMENTAL JUSTICE, AND CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISKS CONSIDERATIONS FOR ALL ALTERNATIVES

The Master Plan study alternatives are not expected to exceed any of the significance thresholds outlined above, specifically:

- There would be no relocation of residents;
- No relocation of existing businesses;
- No substantial disruptions in traffic patterns;
- No substantial reduction to the local tax base; and
- It is unlikely that disproportionately high and adverse human health or environmental effects would occur to minority and low-income populations or children.

6.3.16 WATER QUALITY

The Federal *Water Pollution Control Act,* as amended (commonly referred to as the Clean Water Act (CWA)),[41] provides the authority to establish water quality standards, control discharges, develop waste treatment management plans and practices, prevent or minimize the loss of wetlands location with regard to an aquifer or sensitive ecological area such as a wetlands area, and regulate other issues concerning water quality.

EXISTING CONDITIONS

Lambert Airport is located approximately 12 miles southwest from the confluence of the Missouri and Mississippi Rivers. There are several ponds, creeks, and streams on or in the vicinity of airport property, including Cowmire Creek, which is located to the west of Lambert Airport and generally flows south to north into the Missouri River; Coldwater Creek, which is diverted through manmade channels and tunnels on the west side of the airfield and generally flows south to north into the Missouri River; and Maline Creek, which is located just east of airport property and generally flows west to east to the Mississippi River.

SUMMARY OF WATER QUALITY CONSIDERATIONS FOR ALL ALTERNATIVES

Potential future water quality impacts are associated with the creation of impervious surfaces due to the construction and use of the Master Plan study alternatives, such as new facilities, new or extended taxiways, Runway 12R-30L extension, terminal expansions, and new pavement areas for aircraft and parking for automobiles. Several permits, approvals, or certifications associated with water quality may be required prior to development of the Master Plan study:

<u>National Pollutant Discharge Elimination System (NPDES) Permit</u> - Under the CWA, construction that disturbs one or more acres requires a Section 402 NPDES permit to minimize impacts from stormwater runoff. The Master Plan study alternatives have the potential to impact more than one acre due to construction, and therefore would require a permit. The process includes submittal of a Notice of Intent to be covered under the construction general permit and the development of a stormwater pollution prevention plan indicating the procedures used to reduce or eliminate the potential impacts on water quality from construction activities.

<u>Section 404 Dredge and Fill Permit</u> - CWA Section 404, under the jurisdiction of the Army Corps of Engineers (USACE), requires a permit be obtained for dredge and fill activities involving Waters of the U.S. Permitting may be accomplished under either a general permit or an individual permit. Decisions on the type of permit required will depend on the Master Plan development project and the extent of impact from construction activities on effected waters of the U.S. It is recommended that proposed construction activities be discussed with the USACE to determine actual permit requirements. The need for certification would be determined in the environmental phase.

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41 33 U.S.C. §1251 et seq.

Water quality regulations and issuance of permits will normally identify the information necessary for the environmental regulatory agencies to make judgments on the significance of water quality impacts. If the environmental documentation and early consultation with the MDNR[42] show that there is a potential for exceeding water quality standards, identify water quality problems that cannot be avoided or satisfactorily mitigated, or indicate difficulties in obtaining required permits, an EIS may be required.

6.3.17 WETLANDS

The USACE and the USEPA define wetlands as: "areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."[43] Executive Order 11990, Order DOT 5660.1A, the Rivers and Harbors Act of 1899, and the CWA address activities in wetlands. Executive Order 11990 requires Federal agencies to ensure their actions minimize the destruction, loss, or degradation of wetlands. It also assures the protection, preservation, and enhancement of the nation's wetlands to the fullest extent practicable during the planning, construction, funding, and operation of transportation facilities and projects."

EXISTING CONDITIONS

As depicted on **Exhibit 6.3-7, *Existing Wetlands***, there are potential jurisdictional wetlands and streams on or adjacent to Lambert Airport property. Wetland and stream data was obtained from the MDNR.[44] Wetland and streams are shown for the full extent of the area shown on Exhibit 6-8 to illustrate the continuity of the resources; however, few of the wetlands and streams are located within the boundary of airport property. Many of the streams on Airport property have been channeled over time, including Coldwater Creek, which was channeled and flows underneath the central airfield.

SUMMARY OF WETLAND AND STREAM CONSIDERATIONS FOR ALL ALTERNATIVES

Prior to commencing any development for the Master Plan alternatives, a wetland delineation may need to be performed to specifically identify if any wetlands exist in the area of disturbance and the connection of the run-off drainages to jurisdictional streams (connection to jurisdictional "Waters of the U.S." needs to be determined in the wetland delineation). If wetlands and/or streams are connected to jurisdictional waters, they would be regulated by the USACE. If not, they would likely constitute isolated wetlands and would fall under the regulation of the MDNR. The USACE will make the ultimate decision as to their status.

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42 Missouri Department of Natural Resources, Division of Environmental Quality, P.O. Box 176, Jefferson City, MO 65102

43 U.S. Army Corps of Engineers, *Wetlands Delineation Manual*, January 1987.

44 U.S. Fish & Wildlife Service, National Wetlands Inventory; Available online at: http://www.fws.gov/wetlands/data/DataDownload.html (website accessed in July 2010).

It is unlikely that the Master Plan alternatives would impact any of the known jurisdictional wetlands or streams. In the event that new on-airport development would impact jurisdictional waters, including any modifications to the stormwater channels connected to Coldwater Creek, the specific impacts would need to be delineated and coordinated with the appropriate regulatory agencies, USACE and/or MDNR.

6.3.18 WILD AND SCENIC RIVERS

The *Wild and Scenic Rivers Act* of 1968[45] provides protection for certain free-flowing rivers, which have "outstanding or remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values." The 1979 Environmental Message Directive on Wild and Scenic Rivers (August 2, 1979) from the President, directs Federal agencies to avoid or mitigate adverse effects on rivers identified in the Nationwide Rivers Inventory (NRI) as having potential for designation under the Wild and Scenic Rivers Act. The NRI is a listing of more than 3,400 free-flowing river segments that are believed to possess one or more outstanding remarkable natural or cultural values judged to be of more than local or regional significance.

EXISTING CONDITIONS

According to the NRI database accessed on the U.S. Department of the Interior, National Park Service website, there are no NRI river segments or rivers designated as part of the National Wild and Scenic River System within St. Louis County.[46]

SUMMARY OF WILD AND SCENIC RIVER CONSIDERATIONS FOR ALL ALTERNATIVES

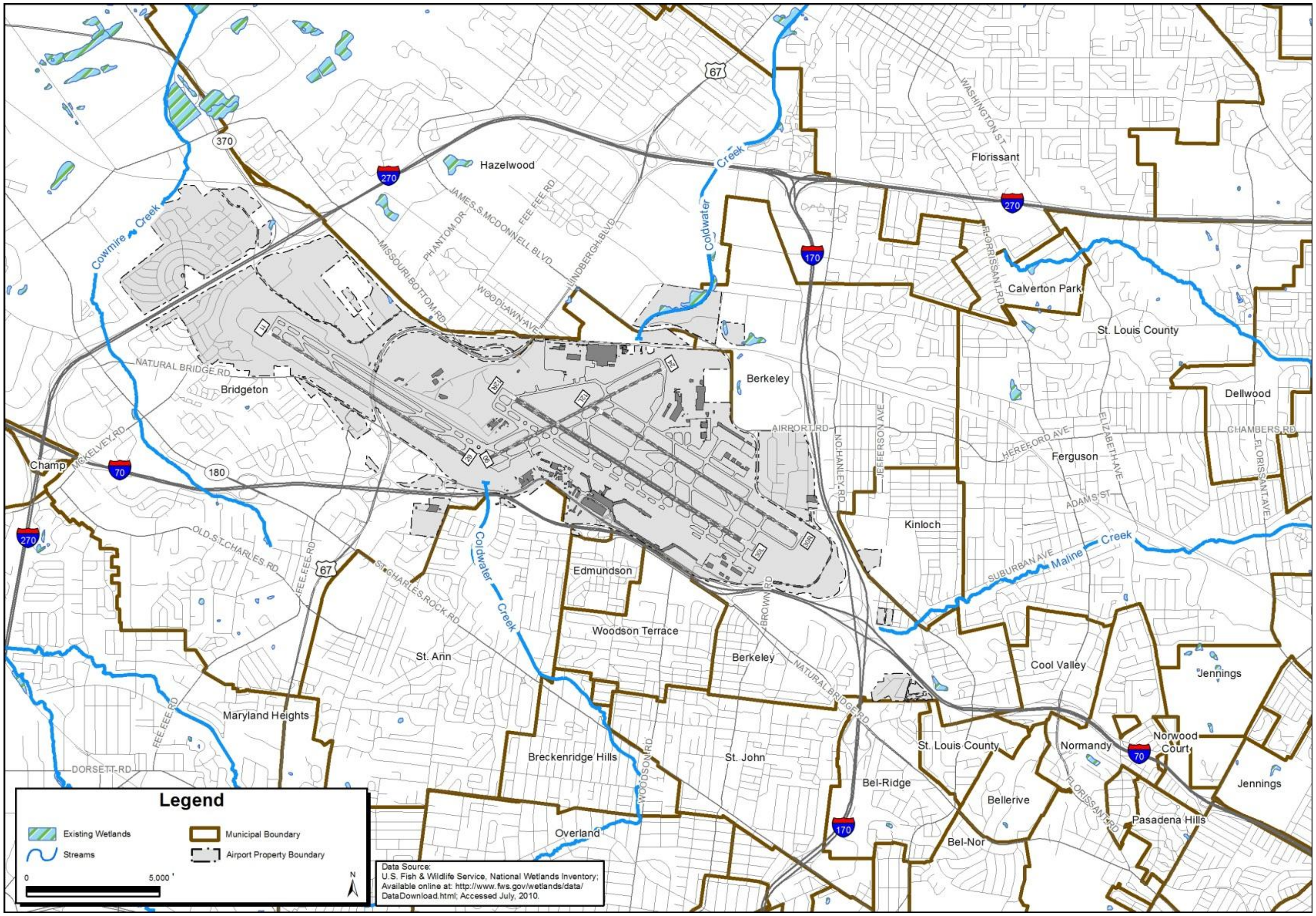
Construction and use of the Master Plan alternatives would not impact a Wild and Scenic River, or river segment under study for inclusion in the Wild and Scenic River System, an NRI river segment, or an otherwise eligible river.

6.3.19 CUMULATIVE IMPACTS

According to CEQ regulations,[47] a cumulative impact is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. According to FAA Order 5050.4B, an EA or an EIS should address cumulative actions which, when viewed with other proposed actions, could have cumulatively significant impacts. When preparing the environmental review for any of the recommended Master Plan projects, the environmental cumulative impacts when combined with any past, present, or reasonably foreseeable future actions, including off-airport projects, must be considered and disclosed in the environmental review.

[45] Public Law 90-542; 16 U.S.C. 1271 et seq.
[46] U.S. Department of the Interior, National Park Service, *Nationwide Rivers Inventory*, http://www.nps.gov/ncrc/programs/rtca/nri (website accessed on June 21, 2010).
[47] Code of Federal Regulations, Title 40, § 1508.7, *Cumulative Impact.*

Exhibit 6.3-7
EXISTING WETLANDS
Lambert-St. Louis International Airport



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6.4 SAFETY RISK MANAGEMENT CONSIDERATIONS

FAA Order 5200.11[48] states, Safety Risk Management (SRM) is a formalized approach to safety. It ensures sound safety decisions by identifying and examining hazards early and lays the groundwork for effective risk mitigations based on well-documented data. Safety Risk Management supports:

- A positive safety culture,
- Thorough documentation of safety decisions,
- Improved coordination with stakeholders who have operational responsibilities, and
- System-wide communication of documented hazards and mitigations.

SRM applies to FAA Airports Office (ARP) produced airport standards and project-specific approvals that could impact aviation safety, including the safety of air traffic or airfield operations. Specific projects and approvals subject to SRM include:

- Development of and updates to airport planning, environmental, engineering, construction, operations, and maintenance standards published in Advisory Circulars.
- FAA review of new or revised Airport Layout Plans (ALPs).
- Construction project coordination, review, or approval for federally obligated airports, including Construction Safety and Phasing Plans.
- Approval of Part 150 Noise Compatibility Program measures that could affect aviation safety (such as noise abatement departure procedures).
- Approval of requests for project-specific Modifications of Standards (excludes AC 150/5370-10, Standards for Specifying Construction of Airports).
- Non-construction changes, including runway and taxiway designations, airfield pavement marking and signage (excluding normal maintenance), runway categories (design aircraft), and in coordination with other LOBs for planned approach or departure procedure changes.
- Modification or update to any action that could represent a material change from a previous SRM review or Safety Assessment.
- FAA decisions on operational or safety-related issues (complex airfield projects, complex planning study alternative analysis, etc.).

Therefore, any such approvals that are necessary for the implementation of any recommendation projects in this Master Plan Update would be subject to SRM requirements.

[48] FAA Order 5200.11, *FAA Airports (ARP) Safety Management System*. Effective Date 08/30/2010.

6.5 FINDINGS AND ENVIRONMENTAL STRATEGY

FAA Advisory Circular 150/5070-6b[49] states, "The purpose of considering environmental factors in airport master planning is to help the sponsor thoroughly evaluate airport development alternatives and to provide information that will help expedite subsequent environmental processing. By using existing maps of the airport area, prior environmental documents, and the Internet, planners and environmental specialists can get an excellent overview of sensitive environmental resources in and around the airport."

Based on this environmental overview, a NEPA environmental review document would be required prior to the development of the Master Plan's ALP in order to identify and quantify the potential adverse environmental impacts. The determination of purpose and need and potential environmental impacts would need to be disclosed for each project and coordination with the FAA will determine the appropriate type of environmental documentation as required by NEPA. The potential mitigation requirements and permitting would be identified through coordination with the appropriate environmental regulatory agencies, i.e. the USEPA, the USFWS, the USACE, and the MDNR.

6.5.1 MAJOR ENVIRONMENTAL PERMITTING REQUIREMENTS

The environmental categories that may require environmental surveys, approvals, and permitting are listed below. Coordination with appropriate environmental regulatory agencies would also need to take place.

AIR QUALITY:

- General Conformity Determination
- Coordination with the USEPA, Region 7
- Appropriate measures recommended to reduce construction air quality impacts on surrounding communities

FISH WILDLIFE AND PLANTS:

- Coordination with the USFWS and MDNR to determine impacts to threatened and endangered species

HAZARDOUS WASTE:

- Coordination with the MDNR to ensure proper assessments are conducted and abatement practices are followed if necessary

[49] FAA Advisory Circular 150 5070-6b, Change 1, *Airport Master Plans*, Chapter 5 Environmental Considerations, 501 General (a). May 1, 2007.

WATER QUALITY:

- Update current NPDES Permit.
- Section 404 Dredge and Fill Permit required for dredge and fill activities involving Waters of the U.S.
- Coordination with the USACE and the MDNR

WETLANDS:

- Wetland Use Permit and mitigation could be required for construction; however, it is unlikely due to the minimal amount of wetlands and streams that are located on airport property and the low potential of either being impacted by the development of any of the Master Plan alternatives.

As described in Chapter Seven, *Capital Development Phasing Summary,* the proposed future airport development program recommends that proposed Master Plan projects be undertaken in a phased approach.

Initiating a formal coordination process with the FAA Central Region Office will determine which type of environmental documentation would be required for each project.[50] Each project would need to demonstrate independent utility according to the regulatory requirements under NEPA prior to processing. It is recommended that Airport staff discuss the individual development projects with the FAA as early as possible to make certain there is sufficient time to obtain the necessary environmental approval(s) and permit(s) before construction needs to begin.

6.5.2 EROSION PREVENTION AND SEDIMENT CONTROL

Temporary impacts from dust, noise, and erosion are likely as a result of constructing the development alternatives. Best Management Practices would need to be implemented in order to avoid and minimize these temporary impacts. Temporary control measures will be specifically identified through the application of an erosion control plan prepared during the project's design stage as identified in FAA AC 150/5370-10C, *Standards for Specifying Construction of Airports*, Item P-156, "*Temporary Air and Water Pollution, Soil Erosion, and Siltation Control.*"[51] Temporary and permanent erosion controls include, but are not limited to: exposing the minimum area of erodible earth; applying temporary mulch with or without seeding; use of temporary crossing protection of watercourses; and temporary slope drains, benches, dikes, dams, sediment basins, and filter fabric/silt fencing.

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50 *See* FAA Order 5050.4B *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions* (April 28, 2006). Paragraph 700. *The Environmental Assessment (EA);* and Paragraph 903. *Airport Actions Normally Requiring and EIS*.

51 FAA Advisory Circular *Standards for Specifying Construction of Airports* (AC 150/5370-10E) Item P-156, *Temporary Air and Water Pollution, Soil Erosion, and Siltation Control* (September 30, 2009).

In addition, the following BMPs should be implemented in an effort to minimize impacts on water quality and surface water if practicable.

- Silt fencing and/or sediment traps would be used during construction to prevent erosion and storm water run-off.
- The Lambert Airport Storm Water Pollution Prevention Plan (SWPPP) would be updated as necessary to identify all potential sources of pollution which may reasonably be expected to affect the quality of storm water discharges from the site, describe the practices to be used to reduce pollutants in storm water discharges, and would assist with overall compliance with the terms and conditions of the permits obtained for any of the development projects.
- Construction equipment would be in good repair without visible leaks of oil, grease, or hydraulic fluids.
- External vehicle washing would use only water (no detergents).
- Water quality impacts would be controlled during construction by compliance with the NPDES – Construction General Permit requirements. All construction activities would be expected to comply with current BMPs as detailed in the existing SWPPP.
- Any hazardous materials would be handled using approved methods and shipped off-site to approved disposal sites. Sanitary wastes generated during site construction would be handled by portable systems until the domestic sanitary sewage system is available for site use. An adequate number of these portable systems would be provided.

6.5.3 GREEN INITIATIVES AND ENVIRONMENTAL STEWARDSHIP

Lambert Airport has established and continually updates an Environmental Management System (EMS)[52] and has implemented various environmental initiatives. It is the policy of the STLAA and Lambert-St. Louis International Airport to comply with all environmental laws and regulations, prevent pollution, and continually improve Lambert's environmental performance.

The development of the Master Plan projects offers the opportunity to promote the use of sustainable airport design and construction practices. These practices can save both time and money while also creating positive environmental impacts. Lambert Airport can enhance their leadership position of environmental stewardship and provide educational opportunities for local and regional stakeholders, as well as strengthen relationships with neighboring communities. The ongoing success of the environmental program at Lambert Airport is outlined in the Lambert-St. Louis International Airport Environmental Report.[53] The following four categories demonstrate Lambert Airport's existing efforts and potential for further environmental stewardship.

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[52] Lambert-St. Louis International Airport Program Management Office. Environmental Management System (EMS) Manual. Volume I and II.

[53] Lambert-St. Louis International Airport. Environmental Report. 2010.

Recycling Efforts

Lambert Airport has conducted various recycling initiatives such as the sorting and recycling of all consumer wastes and employee electronic waste as well as implementation of a construction material recycling plan. Through the implementation of these recycling programs Lambert Airport has decreased waste disposal and transportation fees and generated cost savings. Any additional opportunities for recycling with the development of the Master Plan projects would be considered for potential implementation.

Air Quality Emission Reductions

The STLAA has made a commitment to air quality pollution prevention as stated in their environmental policy.[54] Lambert Airport recognizes that establishing targets to further reduce emissions related to diesel engines, smog producing chemicals, and fuel combustion is critical to protecting the overall health of the Airport and the regional community. Lambert Airport is currently involved in several initiatives such as the creation of a cell phone lot to reduce driving times, additional use of alternative fueled vehicles, and dust control measures in an effort to reduce their impact on air quality within the region.[55]

In addition, measures for controlling fugitive dust on paved roads associated with the construction of any potential Master Plan project could focus on either preventing materials from being deposited on the roads, or removal of any material from the lanes of travel. The methods commonly used to prevent the deposit of dust include: covering loads in trucks or wetting the material being hauled; cleaning vehicles before they exit the construction site; using bump strips, rumble strips, or grates to shake dust from the vehicles; and paving the construction site access roads nearest to the paved roads. Methods to minimize fugitive dust on unpaved roads and inactive portions of the potential construction site include watering or chemically stabilizing inactive areas. Another measure frequently used in the suppression of dust is the placement of seeding and mulching as construction areas are completed. The actual techniques used would be determined based on the type of construction and the conditions present at the time of construction.

Energy Conservation

Lambert Airport has implemented proven energy conservation measures such as installation of energy efficient lighting and solar panels to reduce waste and maximize the efficiency of energy consumption.

To the extent possible and feasible, construction planning for the Master Plan development projects would meet FAA policy recommendations that facility development include principles of sustainability in design. The FAA encourages the consideration of energy reduction measures in the planning and design of airport improvement projects. These principles are consistent with FAA policy that requires

[54] Lambert-St. Louis International Airport Environmental Policy. Rhonda Hamm-Niebruegge, Director of Airports, August 12, 2010.
[55] Lambert-St. Louis International Airport. Environmental Report. 2010.

the use of a "systematic interdisciplinary approach, which will ensure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision-making."[56] Potential integration of energy conservation into Master Plan projects such as the application of LEED principles would not only help to conserve energy but to also reduce operating costs.

Use of Best Management Practices

Lambert Airport will continue to develop and implement best management practices that contribute to sustainable operations while collaborating with airlines, tenants, and the community to identify cost-effective solutions to environmental challenges.

During the construction of any potential Master Plan projects, the STLAA would ensure that the construction contractor adheres to the best management practice recommendations in FAA Standards for Specifying Construction of Airports, which includes the temporary control measures to prevent temporary air and water pollution, soil erosion, and siltation.[57] *See* Section 6.5.2 *Erosion Prevention and Sediment Control Assessment.*

[56] FAA, Order 1050.1E, *Environmental Impacts: Policies and Procedures* (including Change 1*)*, Appendix A, Section 13, *Natural Resources and Energy Supply*, March 20, 2006.

[57] FAA Advisory Circular 150/5370-10E, *Standards for Specifying Construction of Airports*, Item P-156, *Temporary Air and Water Pollution, Soil Erosion, and Siltation Control*, September 30, 2008.

CHAPTER SEVEN
IMPLEMENTATION PLAN

INTRODUCTION

The preceding chapters presented a description of the short-term and long-term requirements, analysis of alternatives, and the recommended development projects necessary to accommodate projected aviation needs at Lambert St. Louis International Airport. This chapter provides a description and sequence of the recommended projects associated with each development phase.

In practice, airport improvement projects will be undertaken only when demand warrants, rather than in accordance with a projected schedule developed in advance. Factors that can trigger the need to proceed with a particular airport development project can range from tenant demands for landside and support facilities, to airside and terminal capacity requirements. The need for each development project will materialize as the associated demand level that triggers the need for the improvement increases.

7.1 2017 IMPROVEMENTS PROGRAM (2012 – 2017)

The 2017 Improvements Program consists of high priority projects scheduled to be completed within the short-term planning horizon. **Exhibit 7.1-1, *2017 Improvements Program (2012 – 2017)***, illustrates the proposed projects for the current improvements program.

Airfield projects in the 2017 Improvements Program are focused on rehabilitating high priority existing pavements identified in the Pavement Management Plan and providing improved taxiway access to the Northern Tract. The projects include:

- Taxiway D – Reconstruction from Taxiway S to Taxiway R
- Taxiway E – Reconstruction from Taxiway S to Taxiway P; pavement from Taxiway S to Runway 6-24 will be removed as part of this project
- Taxiway E – Reconstruction from Taxiway P to Taxiway J
- North Apron Reconstruction (Phase II)
- Terminal 2 Glycol Recovery Modifications (not depicted on exhibit)
- Rehabilitate Runway 12R-30L Touchdown Zones

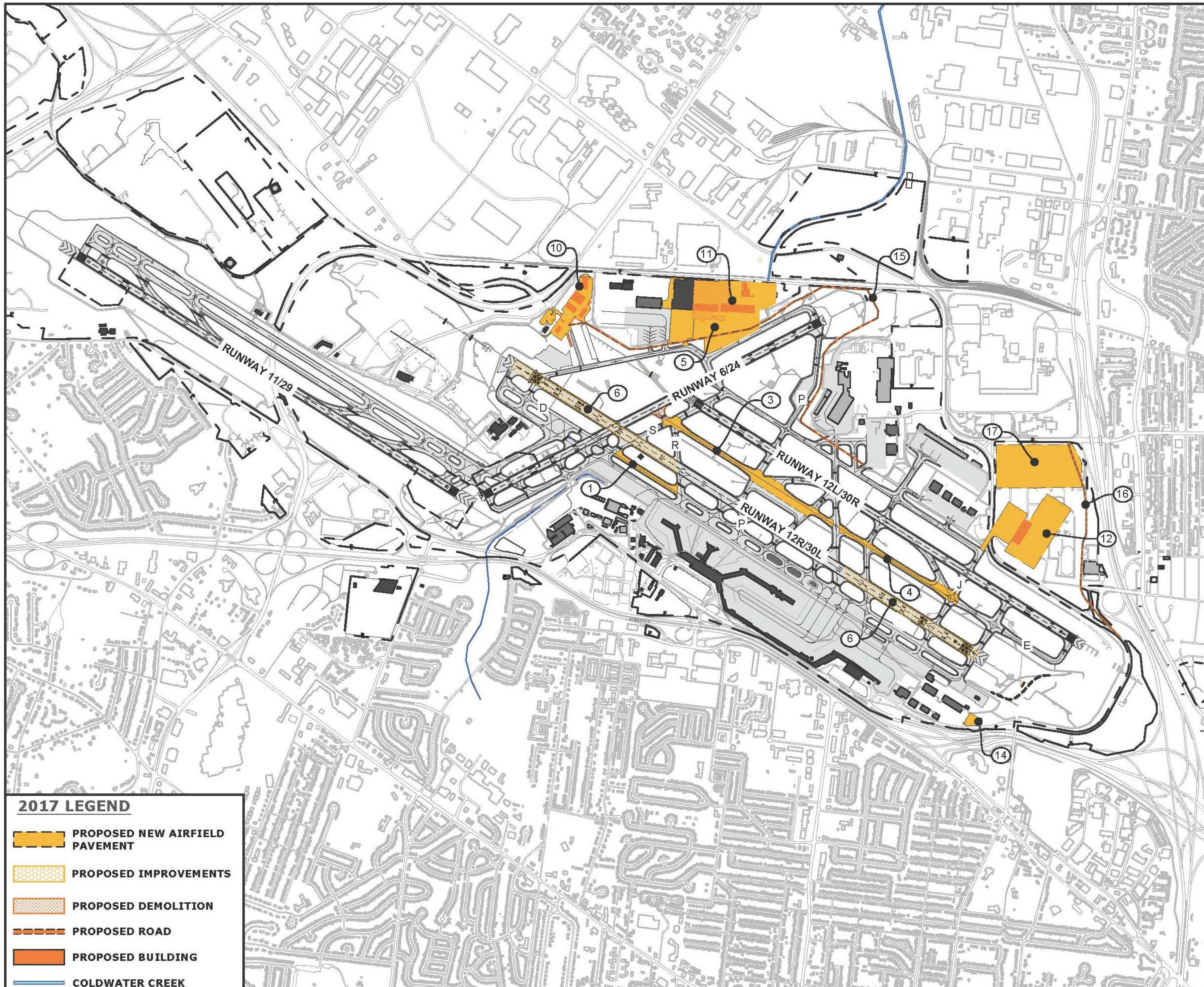
Terminal elements in the 2017 Improvements Program include a continuation of the Airport Experience Program with additional projects focused on the interior of Terminal 1, Concourses A and Concourse C. The projects include:

- Improvement to the out-bound baggage system including the addition of an in-line EDS in support of the on-going Transportation Security Administration initiative
- Replacement of sections of the fire sprinkler lines in the Terminal 1 complex to enhance life safety code compliance
- On-going Interior improvements including restroom improvements, updated wall, floor and ceiling surfaces, updates to security screening areas and improvements to passenger circulation

The **Landside/Support Facility** elements in the 2017 Improvement Program are focused on high priority projects to address deficiencies identified in support facilities as well as several incremental projects to continue on-going improvements. The projects include:

- North Tract Development (Aeroterm development of Northern Tract; entrance taxiway reconfiguration)
- Bag Claim Drive Reconstruction
- Construction of Airfield Maintenance and Central Stores replacement facility
- Surface parking lot east of Cargo City
- Perimeter Road – Reconstruction of perimeter roadway adjacent to Runway 24 Approach; replacing loose aggregate surface with permanent paved surface
- McDonnell Blvd Relocation Phase III
- Brownleigh Cargo Phase I; Phase One of cargo development east of current FBO
- Brownleigh Long-Term Surface Parking Lot

Exhibit 7.1-1
2017 IMPROVEMENTS PROGRAM (2012 - 2017)
Lambert-St. Louis International Airport



PROJECTS LEGEND

NO.	PROJECT DESCRIPTION
1	TW D Reconstruction (TW S to TW R)
2	Terminal 2 Glycol Recovery Modifications (not shown)
3	TW E Reconstruction (TW S to TW P) ; remove pavement from TW S to RW 6-24
4	TW E Reconstruction (TW P to TW J)
5	North Apron Reconstruction
6	Rehabilitate RW 12R-30L Touchdown Zones
7	Outbound Bagage in-line EDS (not shown)
8	Terminal 1 Fire Sprinkle Line Section Replacement (not shown)
9	Airport Experience Program (not shown)
10	Airfield Maintenance and Central Stores
11	North Tract Development
12	Brownleigh Cargo Phase I
13	Bag Claim Drive Reconstruction (not shown)
14	Surface Parking Lot East of Cargo City
15	Reconstruction of Perimeter Roadway
16	McDonnell Blvd Relocation Phase III
17	Brownleigh Long-term Surface Parking Lot

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7.2 PHASE I PROGRAM (2018 – 2023)

Phase I improvements include those that are scheduled to become operational in the 2018 to 2023 period. While the 2017 Improvements Program is focused on maintaining existing airfield and terminal building infrastructure, parking capacity issues at Terminal 2 approach a critical stage in the Phase I Program. Therefore, in addition to continuing the overall strategy of the 2017 Improvements Program, capacity-related projects begin to be included in this phase. **Exhibit 7.2-1, *Phase I Program (2018 – 2023)***, illustrates the proposed projects for the Phase I Program.

With completion of several taxiway rehabilitation projects by the end of the 2017 Improvements Program, **Airfield Projects** in the Phase I Program continue the focus on rehabilitation outlined in the pavement management plan and begin to add additional airfield improvement elements to support development of additional support facilities with direct airfield access. These elements include:

- Relocation of Perimeter Fence
- Perimeter road realignment around future Runway 12R Approach
- Realignment of Perimeter Road
- Runway 12R-30L extension to 11,600 feet total
- Taxiway F extension to approach end of Runway 30R
- Relocation of 12R localizer

Terminal projects in the Phase I Program provide improvements to the parking deficiencies at Terminal 2 by expanding the parking garage to the east providing additional decked parking capacity.

Landside/Support Facility projects in the Phase I Program include incremental long-term parking expansion to support the forecast increase in traffic operating out of Terminal 2 and expansion of the General Aviation and Cargo. The projects include:

- Banshee Road realignment
- Brownleigh Cargo Phase II; Phase Two of cargo development east of current FBO
- FBO Expansion; general aviation terminal building and parking expansion

7.3 PHASE II PROGRAM (2023 – 2028)

With the majority of pavement maintenance program begun in the 2017 and Phase I Programs, Phase II focuses on continuing improvement of Runway Safety Areas and refinement of the airfield geometry. The Phase II program also includes elements associated with the terminal replacement project. **Exhibit 7.3-1, *Phase II Program (2023 – 2028)***, illustrates the proposed projects for the Phase II Program.

Airfield projects in the Phase II program focus on providing incremental improvements to the Runway Safety areas and continued refinement of the airfield geometry. These projects include:

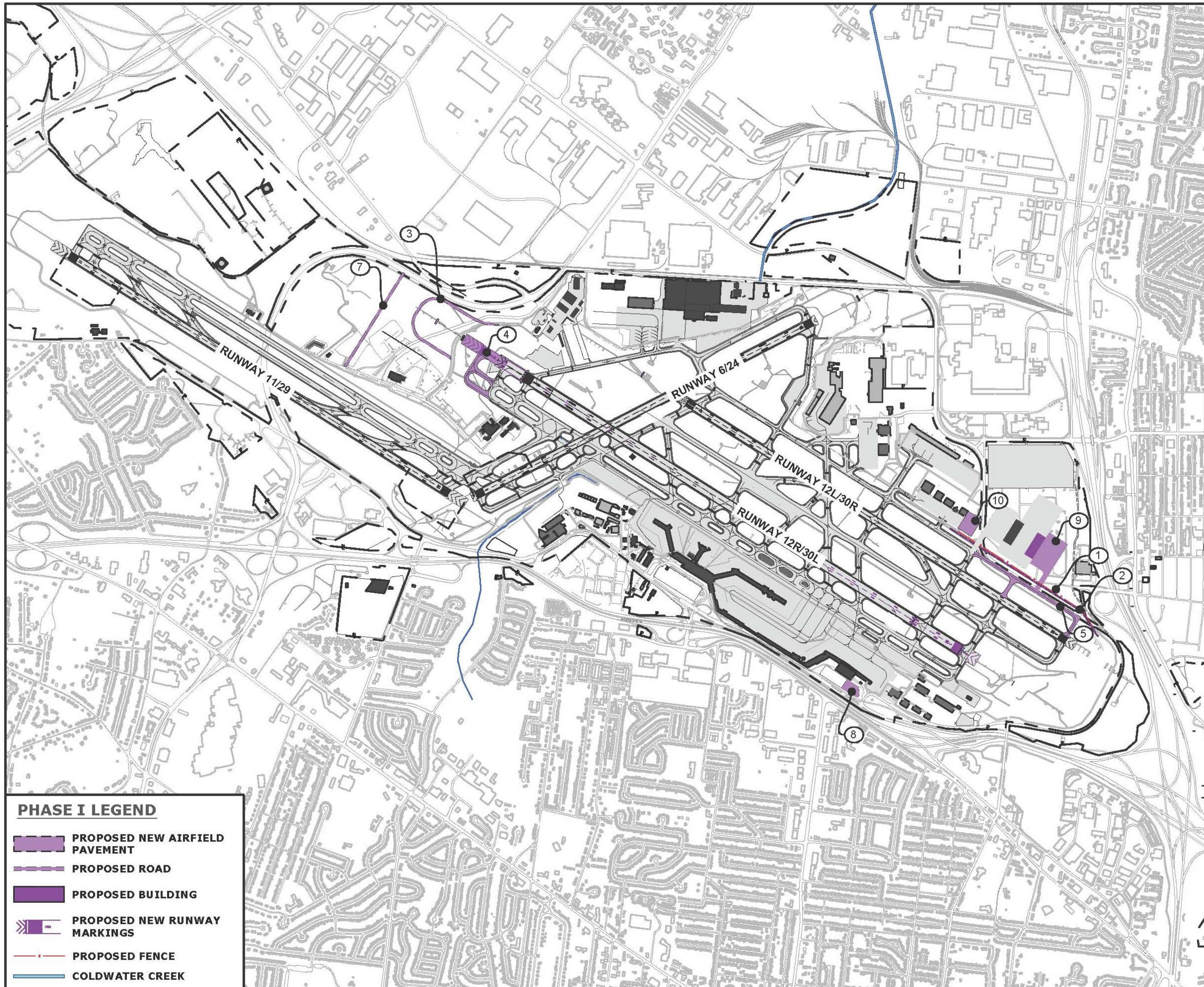
- Realignment of Taxiway B from Taxiway S to Taxiway T
- Realignment of Taxiway K
- Removal of Taxiway L between Runways 12R-30L and 12L-30R
- Removal of Taxiway N between Runways 12R-30L and 12L-30R
- Reconfiguration of Taxiway Islands between Taxiway C and Taxiway D
- Relocation of Runway 6 Localizer

Terminal projects in the Phase II program include the initial phases of the terminal and concourse replacement projects. The Terminal projects include:

- Demolition of Concourse B
- Construction of single loaded infill between Concourse A and C
- Concourse D apron surface parking lot
- T1 Parking Garage Expansion (Super Park Lot A)

Phase II **Landside/Support Facility** projects include extensive reconfiguration of the Coldwater Creek culvert and provisions for second GA facility (FBO) east of Terminal 2. The culvert currently extends from south of Taxiway C below the airfield to an outfall north of the northern Tract. This project will extend the culvert to the southern edge of the Runway 29 RPZ. The culvert extension project will be completed at the beginning of Phase III.

Exhibit 7.2-1
PHASE I PROGRAM (2018 – 2023)
Lambert-St. Louis International Airport



PROJECTS LEGEND

NO.	PROJECT DESCRIPTION
1	Relocation of Perimeter Fence
2	Realignment of Perimeter Road
3	Perimeter Road Realignment
4	Runway 12R-30L Extension
5	TWF Extension
6	Relocation of 12R Localizer (not shown)
7	Banshee Road Realignment
8	Terminal 2 Parking Garage Expansion
9	Brownleigh Cargo Phase II
10	FBO Expansion

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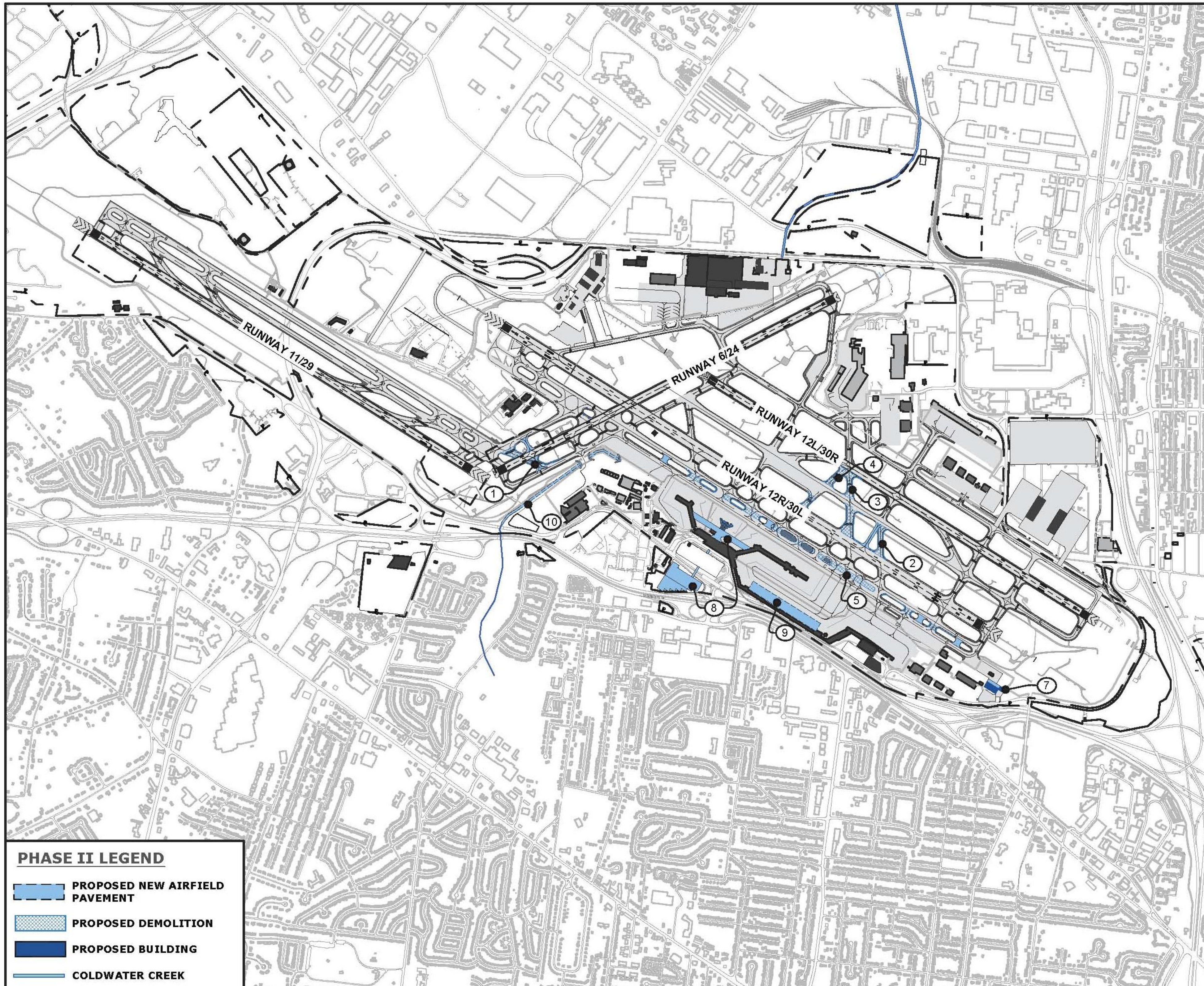
Exhibit 7.3-1
PHASE II PROGRAM (2023 – 2028)
Lambert-St. Louis International Airport



PROJECTS LEGEND

NO.	PROJECT DESCRIPTION
1	TW B Realignment between TW S & TW T
2	Taxiway K Realignment
3	TW L Removal between RW 12R-30L & 12L-30R
4	TW N Removal between RW 12R-30L & 12L-30R
5	Reconfigure Islands between TW C and TW D
6	Relocation of Runway 6 Localizer (not shown)
7	FBO Development East of Terminal 2
8	Terminal Redevelopment Phase I
9	Concourse D Apron Surface Parking Lot
10	Coldwater Creek Culvert Extension

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7.4 PHASE III PROGRAM (2028 – ULTIMATE)

The Phase III Program includes projects needed to accommodate the continued replacement of the Terminal 1 Concourses. Airfield projects will include continued pavement maintenance with airfield geometry refinement. As these projects are the furthest out on the planning horizon, actual implementation dates are subject to a high degree of variability based on how demand and project funding actually materialize over time. **Exhibit 7.4-1**, ***Phase III Program (2028 – Ultimate)***, illustrates the proposed projects for the Phase III Program.

Phase III **Airfield improvements** are primarily focused on ongoing airfield geometry refinement and pavement maintenance. Because the airfield will have undergone significant rehabilitation in the preceding years, only one pavement rehabilitation project has been identified for this phase:

- Taxiway R Realignment between Taxiway C and Taxiway D

Terminal development elements of Phase III include multiple projects to reach the ultimate layout of the terminal complex. The projects include:

- Demolition of Concourse C
- Demolition of Concourse A
- Continued development of linear concourse at Terminal 1
- Demolition of Concourse D
- Terminal 2 Extension to East

The option for a single Terminal concept remains in place upon completion of the Terminal 1 reconfiguration.

Landside/Support Facility projects during Phase III include roadway circulation and parking improvements associated with the development of the Terminal 1 reconfiguration and the completion of the Coldwater Creek culvert extension.

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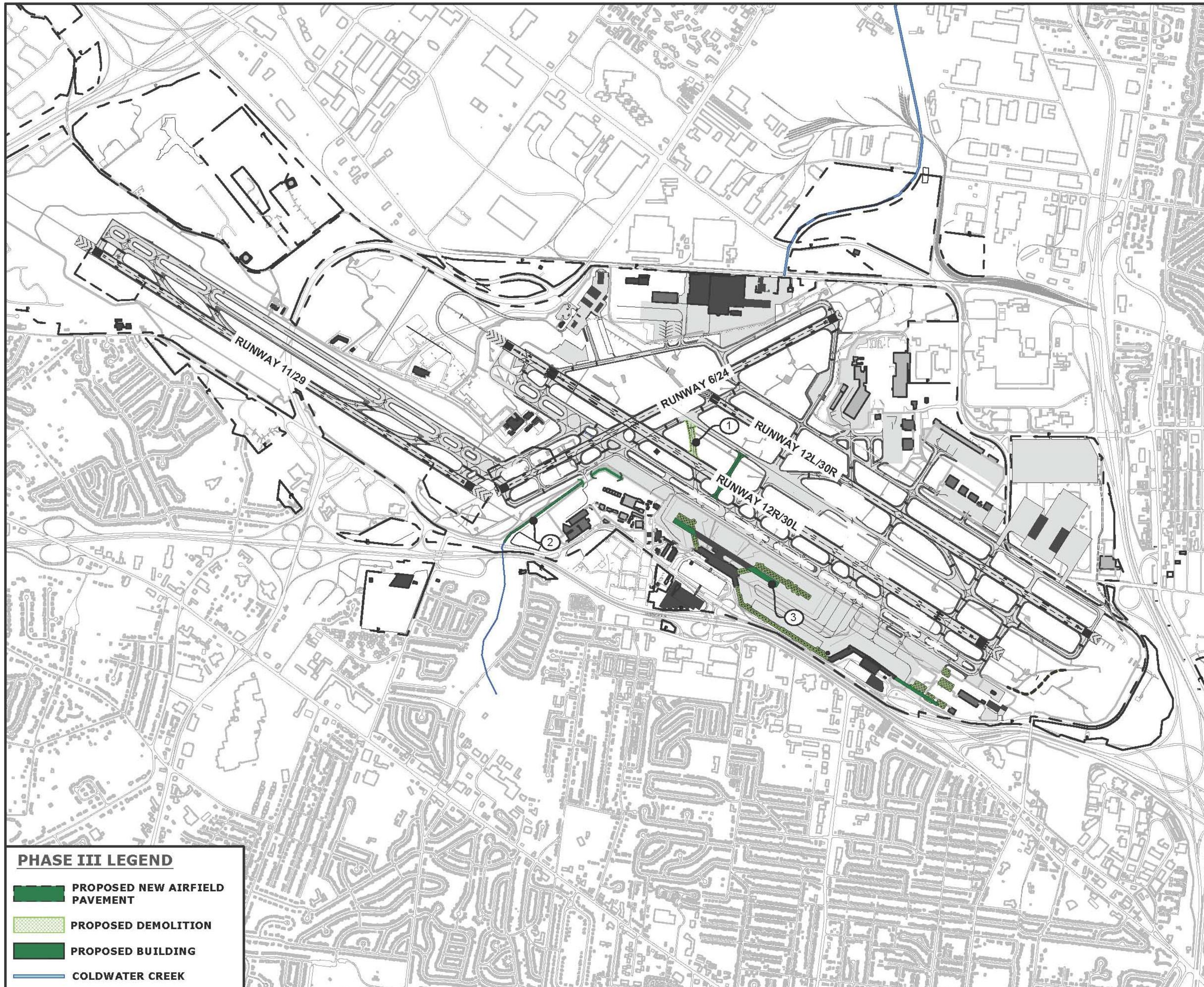
Exhibit 7.4-1
PHASE III PROGRAM (2028 – ULTIMATE)
Lambert-St. Louis International Airport



PROJECTS LEGEND

NO.	PROJECT DESCRIPTION
1	TW R Realignment between TW C & TW D
2	Coldwater Creek Culvert Extension
3	Terminal Redevelopment Phase II

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CHAPTER EIGHT
FINANCIAL PLAN

INTRODUCTION

This chapter presents a financial analysis of the Master Plan projects and includes a proposed funding plan. The Airport financial framework, including the airline rates and charges methodology pursuant to the new Airline Use Agreement, is described in the next sub-section. The chapter also includes an analysis of the Airport's historical Revenues and Operation and Maintenance (O&M) Expenses as defined in the Indenture. The Master Plan project costs are anticipated to be incurred through FY 2030. However, the financial projections were carried out to FY 2031 in order to reflect the financial impact of the first full fiscal year of operations following the completion of all the Master Plan projects.

The financial projections contained in this chapter reflect the anticipated effects of funding the Master Plan projects. The funding plan assumes the use of federal grants and other federal programs, airport equity funds, General Airport Revenue Bonds, and other debt financings including special facility bonds. The financial analysis utilizes the air traffic activity forecast contained in Chapter Three of this report.

The estimated costs of the Master Plan projects were developed by Landrum & Brown and summarized on **Table 8-1, *Estimated Master Plan Project Costs***. The estimated project costs were escalated to the mid-point of construction to account for the impact of projected inflation. The proposed funding plan, presented on **Table 8-2, *Proposed Funding Plan***, includes the following funding sources:

- Airport Improvement Program (AIP) grants
- Passenger Facility Charge (PFC) revenue (both *"Pay-As-You-Go"* PFC revenue and PFC revenue leveraged through the issuance of PFC-backed bonds)
- Transportation Security Administration (TSA) funding
- Monies in the Airport Development Fund (ADF)
- General Airport Revenue Bonds (GARBs)
- Other debt financing including special facility bonds

Table 8-1
ESTIMATED MASTER PLAN PROJECT COSTS
Lambert-St. Louis International Airport

(in thousands)

	Total Costs [1]	*Fiscal Years Ending June 30* 2012-2017	2018-2022	2023-2027	2028-2030
Airfield Projects:					
TW D Reconstruction (TW S to TW R)	$7,414	$7,414	$0	$0	$0
Terminal 2 Glycol Recovery Modifications	2,751	2,751	0	0	0
TW E Reconstruction (TW S to TW P) Design	864	864	0	0	0
TW E Reconstruction (TW P to TW L)	6,030	6,030	0	0	0
North Apron Reconstruction Phase II Design	607	607	0	0	0
TW E Reconstruction (TW S to TW P) Construction	7,925	7,925	0	0	0
North Apron Reconstruction Phase II	5,566	5,566	0	0	0
Rehabilitate RW 12R-30L Touchdown Zones	14,778	14,778	0	0	0
Relocation of Perimeter Fence	388	0	388	0	0
Realignment of Perimeter Road	2,053	0	2,053	0	0
Perimeter Road Realignemnt	4,185	0	4,185	0	0
Runway 12R-30L Extension	9,329	0	9,329	0	0
TW F Extension	24,323	0	24,323	0	0
Relocation of 12R Localizer	845	0	845	0	0
TW B Realignment between TW S & TW T	5,188	0	0	5,188	0
Taxiway K Realignment	2,627	0	0	2,627	0
TW L Removal between RW 12R-30L & 12L-30R	6,706	0	0	6,706	0
TW N Removal between RW 12R-30L & 12L-30R	3,223	0	0	3,223	0
Reconfigure Islands between TW C and TW D	4,284	0	0	4,284	0
Relocation of Runway 6 Localizer	911	0	0	911	0
TW R Realignment between TW C & TW D	2,780	0	0	0	2,780
TOTAL AIRFIELD PROJECTS	**$112,778**	**$45,935**	**$41,123**	**$22,939**	**$2,780**
Terminal Projects:					
Outbound Baggage in-line EDS	25,503	25,503	0	0	0
Terminal 1 Fire Sprinkle Line Section Replacement	102	102	0	0	0
Airport Experience Program	37,000	37,000	0	0	0
Airport Experience Program	10,554	10,554	0	0	0
Terminal Redevelopment Phase I	283,829	0	0	283,829	0
Terminal Redevelopment Phase II	437,655	0	0	0	437,655
TOTAL TERMINAL PROJECTS	**$794,643**	**$73,159**	**$0**	**$283,829**	**$437,655**
Parking and Roadways:					
Bag Claim Drive Reconstruction	10,190	10,190	0	0	0
Surface Parking Lot East of Cargo City	1,978	1,978	0	0	0
Reconstruction of Perimeter Roadway	4,960	4,960	0	0	0
McDonnell Blvd Relocation Phase III	2,503	2,503	0	0	0
Banshee Road Realignment	2,817	0	2,817	0	0
Terminal 2 Parking Garage Expansion	3,697	0	3,697	0	0
Brownleigh Long-term Surface Parking Lot	48,701	48,701	0	0	0
Concourse D Apron Surface Parking Lot	3,868	0	0	3,868	0
Coldwater Creek Culvert Extension	5,518	0	0	2,733	2,785
TOTAL PARKING AND ROADWAYS	**$84,231**	**$68,332**	**$6,513**	**$6,601**	**$2,785**
Hangar & Other:					
Airfield Maintenance and Central Stores	29,219	29,219	0	0	0
FBO Development East of Terminal 2	16,217	0	0	16,217	0
North Tract Development	51,162	51,162	0	0	0
Brownleigh Cargo Phase I & Phase II	53,360	30,678	22,682	0	0
FBO Expansion	2,014	0	2,014	0	0
TOTAL HANGAR & OTHER	**$151,972**	**$111,060**	**$24,696**	**$16,217**	**$0**
TOTAL MASTER PLAN PROJECTS	**$1,143,625**	**$298,485**	**$72,332**	**$329,586**	**$443,221**

[1] Project costs escalated based on the projections for CPI from the FY12 Budget of the U.S. Government.

Table 8-2
PROPOSED FUNDING PLAN
Lambert-St. Louis International Airport

(in thousands)

		AIP Grants [1]		PAYGO		PFC			Other Federal
	Total	Entitlements	Discretionary	PFC	GARBs	Bonds	ADF [2]	Other Debt Financing [3]	Funds [4]
Airfield Projects:									
TW D Reconstruction (TW S to TW R)	$7,414	$2,393	$3,168	$1,854					
Terminal 2 Glycol Recovery Modifications	2,751			2,751					
TW E Reconstruction (TW S to TW P) Design	864	327	321	216					
TW E Reconstruction (TW P to TW J)	6,030			6,030					
North Apron Reconstruction Phase II Design	607			607					
TW E Reconstruction (TW S to TW P) Construction	7,925	4,648	1,295	1,981					
North Apron Reconstruction Phase II	5,566		2,107	3,459					
Rehabilitate RW 12R-30L Touchdown Zones	14,778		8,705	6,073					
Relocation of Perimeter Fence	388	291		97					
Realignment of Perimeter Road	2,053	1,540	513						
Perimeter Road Realignemnt	4,185	3,139		1,046					
Runway 12R-30L Extension	9,328	6,317	678	2,332					
TW F Extension	24,323	3,254	14,989	3,012			3,069		
Relocation of 12R Localizer	845								845
TW B Realignment between TW S & TW T	5,188	3,891		1,297					
Taxiway K Realignment	2,628	1,971		657					
TW L Removal between RW 12R-30L & 12L-30R	6,706	4,895	135	1,677					
TW N Removal between RW 12R-30L & 12L-30R	3,223	1,220	1,197	806					
Reconfigure Islands between TW C and TW D	4,284	3,213		1,071					
Relocation of Runway 6 Localizer	911								911
TW R Realignment between TW C & TW D	2,780	2,085		695					
TOTAL AIRFIELD PROJECTS	**$112,778**	**$39,184**	**$33,109**	**$35,660**	**$0**	**$0**	**$3,069**	**$0**	**$1,756**
Terminal Projects:									
Outbound Baggage in-line EDS	25,503			5,101					20,402
Terminal 1 Fire Sprinkle Line Section Replacement	102						102		
Airport Experience Program	37,000				19,500	17,500			
Airport Experience Program	10,554				10,554				
Terminal Redevelopment Phase I	283,829	3,564		138,351	131,915		10,000		
Terminal Redevelopment Phase II	437,655	5,337			221,663	191,608	19,048		
TOTAL TERMINAL PROJECTS	**$794,643**	**$8,901**	**$0**	**$143,451**	**$383,632**	**$209,108**	**$29,149**	**$0**	**$20,402**
Parking and Roadways:									
Bag Claim Drive Reconstruction	10,190						10,190		
Surface Parking Lot East of Cargo City	1,978						1,978		
Reconstruction of Perimeter Roadway	4,960	2,591		2,368					
McDonnell Blvd Relocation Phase III	2,503	948	930	626					
Banshee Road Realignment	2,817	1,046	1,066	704					
Terminal 2 Parking Garage Expansion	3,697						3,697		
Brownleigh Long-term Surface Parking Lot	48,701				48,701				
Concourse D Apron Surface Parking Lot	3,868						3,868		
Coldwater Creek Culvert Extension	5,518	1,272	817	1,380			2,050		
TOTAL PARKING AND ROADWAYS	**$84,231**	**$5,857**	**$2,813**	**$5,078**	**$48,701**	**$0**	**$21,782**	**$0**	**$0**
Hangar & Other:									
Airfield Maintenance and Central Stores	29,219						29,219		
FBO Development East of Terminal 2	16,217							16,217	
North Tract Development	51,162							51,162	
Brownleigh Cargo Phase I	30,678							30,678	
FBO expansion	2,014						2,014		
Brownleigh Cargo Phase II	22,682							22,682	
TOTAL HANGAR & OTHER	**$151,972**	**$0**	**$0**	**$0**	**$0**	**$0**	**$31,233**	**$120,739**	**$0**
TOTAL MASTER PLAN PROJECTS	**$1,143,625**	**$53,942**	**$35,922**	**$184,189**	**$432,332**	**$209,108**	**$85,234**	**$120,739**	**$22,158**

[1] AIP funding shown here represents estimated amounts, based on annual AIP-eligible project costs. There is no guarantee of AIP funding in the future.

[2] It is assumed that Airport management will seek and obtain MII approval for project costs that result in the ADF balance being less than $20 million.

[3] Third party funding is assumed for specialized projects that are anticipated to be built as demand develops. Third party funding could include special facility bonds, with debt service paid from facility lease revenues.

[4] Other federal funding includes FAA Air Traffic Organization (ATO) funding for the localizer relocation costs and TSA funding for the outbound baggange in-line EDS project.

In developing the proposed funding plan, the funding eligibility of each Master Plan project was established. The funding sources were evaluated against project eligibility to determine the best use of each funding source, as described below.

- AIP Funding was estimated by project and year. The Airport's annual AIP entitlement grants throughout the forecast period were projected based on the annual enplanement forecast, and matched against the anticipated annual AIP-eligible project costs. Annual AIP-eligible costs in excess of projected annual AIP entitlement funds were considered for AIP discretionary funding, based on the nature of each project. The proposed funding plan assumes the Airport will receive approximately $53.9 million in AIP entitlement funds and $35.9 million in discretionary funds during the planning horizon. The majority of the AIP funding included in the funding plan is assumed for airfield projects ($39.2 million in Entitlement funds and $33.1 million in discretionary funds). In some years, AIP entitlements were assumed for projects that are considered lower priority projects by the FAA, if no higher priority AIP eligible projects are planned for those years. AIP funding was assumed for some roadway project costs, such as the McDonnell Boulevard relocation project, which will allow for the extension of Taxiway Foxtrot to the end of the runway, and the Banshee Road re-alignment project, which will permit the extension to Runway 12R-30L. AIP entitlement funds were assumed for a portion of the costs of the perimeter roadway adjacent to Runway 24 because no higher priority eligible projects are planned for that year (2015). AIP entitlement funding was also assumed for certain terminal costs, in years when no higher priority AIP-eligible work is planned. Terminal development costs in non-revenue producing, public- use areas of a passenger terminal are eligible for passenger apportionment funds if the costs are directly related to the movement of passengers and baggage in air commerce within the airport.[1] PFC funding was assumed to fund the required local match for those projects funded with AIP grants, as well as other PFC-eligible project costs, such as a portion of passenger terminal project costs. The financial analysis assumes that the Airport will continue to collect a PFC of $4.50 per enplaned passenger throughout the forecast period. The projected level of annual PFC revenues was matched against the timing of PFC-eligible project costs to determine whether it would be best to fund eligible costs with *"Pay-As-You-Go"* PFCs or PFC-backed bonds.

- Transportation Security Administration (TSA) funding was assumed for 75 percent of the Outbound Baggage In-line EDS project costs.

[1] Such areas include the footprint of the passenger screening areas, corridors in the concourses, and public lobby areas.

- ADF funds, to the extent available, are assumed to fund certain project costs. The ADF balance is assumed to include the existing fund balance and the projected future deposits into the ADF.
- GARB funding of certain project costs was assumed. The analysis considers the Airport's capacity to issue GARBs and the projected effect of incremental debt service on key financial ratios, such as airline cost per enplanement. However, no GARB issues are assumed before FY 2017 because under the current airline use and lease agreement, which expires at the end of FY 2016, the Airport agreed not to issue any new bonds for the remainder of the agreement term.
- Certain projects were assumed to be funded from other FAA sources. Based on feedback from the FAA, the costs of the localizer relocation projects were assumed to be funded by the FAA Air Traffic Organization (ATO).

Several specialized projects (North Tract Redevelopment and Brownleigh Cargo Phase 1 and Phase 2) are anticipated to be built only when there is demand for such facilities. The projects were assumed to be funded with third-party or special facility financing. It was further assumed that the debt service payments on such special facility bonds would be paid from the lease revenues of those facilities, and will not be obligations of the Airport.

The funding plan is based on the estimated availability of the various funding sources. It should be noted that the amount of funding assumed from the sources are estimates, and there are no guarantees that the amounts assumed will be available as reflected in the funding plan. The detailed funding plan is pres*ented in Append*ix G.

The Airport maintains a Noise Land[2] Fund, which is an escrow account into which has been deposited the proceeds from past sales of land that had been acquired for noise mitigation purposes with federal funds. The majority of the proceeds of the land sales, which have totaled approximately $13.3 million, have been applied to expenditures of the Residential Sound Insulation Program (RSIP). The remaining moneys in the Noise Land Fund have been assigned to the RSIP project closeout. Therefore, the moneys remaining in the Noise Land Fund are not included as a funding source for the Master Plan projects. The Noise Land Reuse Plan addresses the future disposition of noise land. Moneys that will be generated from future noise land sales will likely be either paid to the FAA as reimbursement for past noise grants, or deposited into the Noise Land Fund for potential future noise

[2] Noise Land is land that has been acquired by an airport owner/sponsor to remove or prevent a use that is incompatible with aircraft noise.

monitoring system costs[3] Future sales of potentially surplus noise land are considered to be outside the purview of the Master Plan. The financial model used for this analysis replicates the financial structure and operations of the Airport. It incorporates the capital requirements of the Master Plan and includes financial projections for the duration of the Master Plan planning horizon.

The analysis performed for this chapter develops the basis for a number of relevant key financial factors, including: O&M expenses, annual debt service requirements, nonairline revenues, airline revenues and financial ratios by which the industry measures airport performance. The financial projections are based on recent historical trends and anticipated future changes that are expected to affect certain types of O&M expenses and revenues, including the effects of the Master Plan projects. As described later in this chapter, the financial projections reflect the airline rates and charges methodology incorporated into the new Airline Use Agreement that became effective July 1, 2011.

[3] FAA Program Guidance Letter 08-02, *Management of Acquired Noise Land: Inventory, Reuse, Disposal*, dated February 1, 2008.
Land acquired under airport noise compatibility programs is unique. When this land, also known as noise land, is acquired with Airport Improvement Program (AIP) grant funds, it is subject to Grant Assurance 31, *Written Assurances on Acquiring Land*. The purpose of the assurance, which is based on 49 USC §47107(c)(2)(A), is to assure that optimal use is made of the federal share of the proceeds from the disposal of noise land (disposal proceeds). The assurance requires that when noise land is no longer needed for noise compatibility, the land will be disposed of and that the federal share of the disposal proceeds will be either paid to the *Airport and Airway Trust Fund* or will be used for another noise compatibility project. "Disposal" of noise land does not mean that an airport must sell the property to another. Whether unneeded noise land is sold, kept by the airport and leased, or exchanged is the airport's decision.

8.1 AIRPORT FINANCIAL FRAMEWORK

The City operates the Airport as an Enterprise Fund in accordance with generally accepted accounting principles (GAAP) applicable to governmental entities. Financial statements for the Airport are prepared each fiscal year based on GAAP and audited by independent certified public accountants. The Airport also maintains internal financial statements containing detailed itemization of revenues and expenses.

Airport management has implemented a cost/revenue accounting system to facilitate the monitoring of revenues and operating expenses and the calculation of Airport rates and charges. The following are cost/revenue centers established by the airline use and lease agreement:

- Airfield
- Terminals
- Cargo
- Hangar and Other Buildings
- Parking
- Roads and Grounds

Revenues are accounted for by cost/revenue center and type. O&M expenses are accounted for by object classification and assigned or allocated to cost/revenue centers. Overhead expenses are allocated to cost/revenue centers based on the "direct expense method[4]."

The City of St. Louis (the City) on behalf of the Airport negotiated a new Airline Use and Lease Agreement (AUA) with the Airlines for the five-year period beginning July 1, 2011 and ending June 30, 2016. The new AUA contains a modified residual rate making methodology, as described on pages 8-7 and 8-8.

The financial analysis in this chapter assumes the current airline rates and charges methodology will be maintained after the expiration of the existing AUA (June 30, 2016) and through the remainder of the forecast period, with three modifications. First, under the current methodology, an annual amount is transferred from the Debt Service Stabilization Fund as a credit to the airline requirement in order to mitigate a portion of the airline rates and charges. This provision will expire upon the expiration of the existing AUA. Second, the analysis assumes that beginning in FY 2017, and throughout the remainder of the forecast period, in any fiscal year that Airport Revenues are insufficient to meet the annual coverage requirement, the airline requirement will be increased to ensure that the 1.25 debt service coverage requirement is met. Finally, in FY 2031, following the completion of the second phase of the terminal redevelopment, the rates and charges are assumed to be calculated on a cost center basis. The airline

[4] Direct expense method refers to the method used to allocate indirect costs to the direct cost centers. This method allocates indirect costs to direct cost centers based on each direct cost center's proportionate share of total costs.

revenues projected for FY 2031 assume that the consolidated terminal option is developed for the terminal redevelopment project in the last phase of the Master Plan.

The following pages describe the procedures for calculating the airline rates and charges.

8.1.1 SIGNATORY LANDING FEE RATE

The *Initial Airfield Requirement* is calculated as the sum of the following allocated Airfield Costs:

> Direct and indirect Operating and Maintenance (O&M) Expenses, amortization charges, debt service, and/or depreciation charges (as appropriate) allocable to the Airfield Cost Center; any replenishment or rebate of the Debt Service Reserve Account required by the Trust Indenture and allocated to the Airfield Cost Center; (vi) any replenishment of the Renewal and Replacement Fund required by the Trust Indenture as a result of an expenditure made in, or allocable to, the Airfield Cost Center; and the share of the Debt Service Stabilization Fund Contribution allocated to the Airfield Cost Center;
>
> Minus the following items: Non-signatory Airline landing fees; general aviation landing fees; military use fees; fuel flowage fees; rent paid by to the City by the airline consortium leasing the fuel farm; and Rate Mitigation Program credits available for that Fiscal Year, as allocated to the Airfield Cost Center.

The *Initial Airfield Requirement* plus the *Additional Airline Requirement* (allocable to the Airfield Cost Center) divided by the aggregate signatory landed weight, results in the Signatory Landing Fee Rate. A non-signatory landing fee equal to 125 percent of the Signatory Landing Fee Rate is charged to all non-signatory airlines that have signed an airline operating agreement.

The *Additional Airline Requirement* attributable to the Airfield Cost Center means 50 percent of the *difference between*: (i) the sum of the annual O&M Expenses, annual Debt Service, the annual amounts required pursuant to the Trust Indenture, the annual amount of the Debt Service Stabilization Fund Contribution, and the annual ADF Deposit; and (ii) the sum of the Initial Requirement, the annual Non-Airline Revenues, Other Airline Revenues, the annual Interest Income, the annual Pledged PFC Revenues, and the annual amount of Rate Mitigation Program credits.

8.1.2 TERMINAL RENTAL RATE

The Initial Terminal Rental Rate applicable to each of the Terminal Cost Centers is calculated by dividing the net costs attributable to each Terminal Cost Center by the Usable Space in each of the respective Terminal Buildings. The net cost for each Terminal Cost Center is calculated as follows:

First, the total cost attributable to each Terminal Cost Center is calculated as the sum of the following items: direct and indirect O&M Expenses allocable to each Terminal Cost Center; 50% of the Terminal Roadways Cost Center costs allocated to each Terminal Cost Center based on the percentage that results from dividing the Useable Space in each of the respective Terminal Buildings by the aggregate Usable Space in both Terminal Buildings; amortization, debt service, and/or depreciation charges (as appropriate) allocated to each Terminal Cost Center; any replenishment or rebate of the Debt Service Reserve Account required by the Trust Indenture and allocated between each Terminal Cost Center; any replenishment of the Renewal and Replacement Fund required by the Trust Indenture as a result of an expenditure made in, or allocable to, each Terminal Cost Center; and the share of the Debt Service Stabilization Fund Contribution allocated to each Terminal Cost Center.

The net costs attributable to each Terminal Cost Center shall then be calculated by subtracting the following amounts from the total cost attributable to each: the aggregate rent payable for Apron-Level Unenclosed Space by all Signatory Airlines at each Terminal Building, Non-signatory Terminal Rents from each Terminal Building and Rate Mitigation Program credits available for that Fiscal Year, as allocated to each Terminal Cost Center.

The *Total Terminal Rental Rate* for each Terminal Cost Center is then calculated by adding the *Initial Terminal Rental Rate* and the *Additional Terminal Rental Rate* for each Terminal Cost Center. The *Initial Terminal Rental Rate* for each Terminal Cost Center is calculated as the net cost of each Terminal Cost Center divided by its usable space. The *Additional Terminal Rental Rate* is calculated as the allocated Additional Airline Requirement for each Terminal Cost Center divided by its rented space.

The Additional Airline Requirement attributable to the Terminal Cost Centers means 50 percent of the *difference between:* (i) the sum of the annual O&M Expenses, annual Debt Service, the annual amounts required pursuant to the Trust Indenture, the annual amount of the Debt Service Stabilization Fund Contribution, and the annual ADF Deposit; and (ii) the sum of the Initial Requirement, the annual Non-Airline Revenues, Other Airline Revenues, the annual Interest Income, the annual Pledged PFC Revenues, and the annual amount of Rate Mitigation Program credits, the sum of which is allocated to each Terminal Cost Center based on the rented space for each Terminal Cost Center.

8.1.3 PASSENGER LOADING BRIDGE CHARGE

The total cost of the Passenger Loading Bridges Cost Center is calculated by adding together the following: direct and indirect O&M Expenses, if any, allocable to the Passenger Loading Bridges Cost Center; and the Depreciation Charge or Debt Service, as the case may be, of each new passenger loading bridge acquired by the City throughout the Term as a result of the City's passenger loading bridge program. The annual Passenger Loading Bridge Charge applicable to each new passenger loading bridge will then be calculated by dividing the total cost and charges allocable to the Passenger Loading Bridges Cost Center by the total number of passenger loading bridges available for use as a result of the City's passenger loading bridge program, which will be divided by 12 to determine the monthly charge.

8.2 REVENUES

Under the Indenture, Revenues consist of GARB Revenues, Pledged PFC Revenues, and any other available moneys deposited in the Revenue Fund, and any other amounts, including investment income, on deposit in the Debt Service Stabilization Fund. GARB Revenues include Signatory Airline fees, concession fees, other operating revenues, the asset use charges, and interest income.

Table 8.2-1, *Historical Airport Revenues*, presents a summary of historical revenues for the period FY 2004 through FY 2010. During this period GARB Revenues increased at an average annual rate of 1.6%, or $12.6 million. The increase consisted of higher Signatory Airline fees and concession fees, which totaled $33.7 million that were partially offset by declines in the discontinuance of the TWA Asset Use Charges ($7.8 million) and a reduction in Other Operating Income ($9.9 million) during the 7-year period. The increases primarily resulted from higher airline revenues resulting from the amortization of the new runway, which became operational in April 2006, and increases in concession revenues through FY 2008, from public parking, car rentals and terminal concessions. Concession revenues decreased in FY 2009 as a result of declining air traffic at the Airport, but remained above the FY 2004 – FY 2005 level. The offsets were due to the elimination of the TWA Asset Use Charges, which expired at the end of the previous AUA and a decline in Other Operating Revenues primarily due to the end of the Boeing lease facility rental that expired at the end of FY 2004.

Pledged PFC revenues increased $8.4 million during this period to $27.1 million. This increase was due to scheduled changes for the PFC portion of the annual debt service payments. The increase in the Pledged PFC Revenues and the aforementioned increase in GARB Revenues resulted in an increase in total Revenues of $20.9 million during this period or an average annual growth of 2.3%.

Table 8.2-2, *Projected Airport Revenues*, presents the forecast of Revenues for the Master Plan forecast period. Total Revenues are projected to increase from $164.5 million in FY 2010 to $274.5 million in FY 2031 or at an average annual growth rate of 2.5 percent. The components of the major revenue accounts and the underlying assumptions for the forecast are discussed below.

Table 8.2-1
HISTORICAL AIRPORT REVENUES
Lambert-St. Louis International Airport

For Fiscal Years Ending June 30
(in thousands)

	Avg. Annual Growth Rate FY 2004-2010	Historical [1]						
		2004	2005	2006	2007	2008	2009	2010
Signatory Airlines Fees								
Airfield Landing Fees	10.2%	$36,585	$34,188	$42,083	$54,541	$62,053	$63,923	$65,700
Terminal Rents	-2.9%	20,846	20,317	19,547	17,424	17,665	18,939	17,453
Total	6.4%	$57,431	$54,505	$61,630	$71,965	$79,718	$82,862	$83,153
Concession Fees								
Terminal Concessions	4.5%	6,256	7,006	7,320	8,685	9,201	8,105	8,170
Public Parking	10.2%	9,595	11,754	12,981	14,390	18,184	15,428	17,147
Car Rentals	2.5%	9,184	9,360	10,971	10,873	12,045	11,271	10,644
Space Rental	23.8%	396	632	722	1,012	1,247	1,369	1,430
In-Flight Catering	-13.5%	806	396	489	489	604	437	338
Other	-23.6%	4,296	1,173	1,398	1,509	1,317	826	855
Total	4.0%	$30,533	$30,321	$33,881	$36,959	$42,597	$37,438	$38,583
Other								
Non-Signatory Landing Fees	-5.3%	5,818	7,120	6,042	6,376	3,587	4,936	4,204
Non-Signatory Airlines-Terminal	8.4%	706	356	667	1,181	1,034	949	1,148
Total	-3.2%	$6,524	$7,476	$6,709	$7,558	$4,621	$5,885	$5,352
Airline Revenue Mitigation [2]	n/a	0	0	0	6,000	5,000	0	0
Cargo	-11.5%	1,878	1,847	1,365	741	673	798	901
Hangars and Other Buildings	-38.8%	7,080	584	356	350	362	370	371
Tenant Improvement Surcharge	10.6%	916	1,749	1,159	1,668	1,672	1,671	1,674
Employee Lot	n/a	575	572	141	0	0	0	0
Other Miscellaneous	-3.6%	6,629	5,860	6,690	6,528	4,961	5,425	5,328
Total Other-Operating	-8.7%	$23,603	$18,089	$16,420	$22,843	$17,289	$14,150	$13,626
TWA Asset Use Charges	n/a	7,773	7,607	3,804	0	0	0	0
Total Operating Revenue	2.1%	$119,340	$110,522	$115,735	$131,767	$139,605	$134,449	$135,362
Interest Income [3]	-15.2%	5,443	6,179	5,451	6,296	5,715	2,952	2,026
Total GARB Revenues	1.6%	$124,783	$116,702	$121,186	$138,062	$145,320	$137,401	$137,389
PFC Pledged Revenue	6.3%	18,766	18,766	18,493	25,884	25,555	24,096	27,135
Total Revenues	2.3%	$143,549	$135,468	$139,683	$163,947	$170,875	$161,498	$164,524

[1] Based on audited financial statements and Airport records.
[2] Airlines earned 50% of the of the available rate mitigation moneys.
[3] Operating Interest income only.

Table 8.2-2
PROJECTED AIRPORT REVENUES
Lambert-St. Louis International Airport

Fiscal years Ending June 30
(in thousands)

AIRPORT REVENUES	Avg. Annual Growth Rate FY 2010-2031	Actual 2010	Projected 2011	2015	2020	2025	2030	2031
Signatory Airlines								
Airfield Landing Fees	0.4%	$65,700	$63,325	$68,429	$66,200	$63,243	$64,206	$71,605
Terminal Rents	3.6%	17,453	18,361	24,097	19,526	15,941	19,361	36,710
Total	1.3%	$83,153	$81,686	$92,526	$85,726	$79,185	$83,568	$108,316
Concession Fees								
Terminal Concessions	4.3%	8,170	9,622	10,893	13,144	15,870	19,182	19,925
Public Parking	4.9%	17,147	21,482	22,607	29,021	35,758	45,942	46,742
Car Rentals	3.9%	10,644	11,363	12,768	15,506	18,829	22,868	23,768
Space Rental	1.6%	1,430	1,451	1,430	1,586	1,760	1,953	1,994
In-Flight Catering	2.2%	338	344	387	429	476	528	539
Other	1.8%	855	926	1,003	1,068	1,139	1,218	1,234
Total	4.3%	$38,583	$45,188	$49,088	$60,755	$73,831	$91,690	$94,202
Other								
Non-Signatory Landing Fees	-0.1%	4,204	3,243	3,731	3,674	3,621	3,766	4,140
Non-Signatory Airlines-Terminal	-12.3%	1,148	1,150	52	42	34	41	73
Total	-1.1%	$5,352	$4,393	$3,783	$3,717	$3,655	$3,807	$4,213
Rate Mitigation Proceeds	n/a	0	0	13,728	0	0	0	0
Cargo	-0.3%	901	794	849	849	849	849	849
Hangars and Other Buildings	2.0%	371	377	408	450	498	552	563
Tenant Improvement Surcharge	n/a	1,674	1,548	1,548	1,548	1,548	767	767
Other Miscellaneous	3.2%	5,328	5,958	6,833	7,766	8,852	10,111	10,385
Total Other-Operating	1.0%	$13,626	$13,070	$27,149	$14,330	$15,402	$16,086	$16,777
Total Operating Revenue	2.3%	135,362	139,944	168,764	160,811	168,418	191,343	219,295
Interest Income	1.7%	2,026	2,083	1,685	1,494	1,411	3,110	2,885
Total GARB Revenues	2.3%	$137,389	$142,028	$170,449	$162,305	$169,829	$194,453	$222,180
PFC Pledged Revenue	3.2%	27,135	27,195	28,166	28,925	28,926	52,309	52,302
Total Revenues	2.5%	$164,524	$169,223	$198,615	$191,230	$198,755	$246,762	$274,482

[1] Projections based on forecasted Master Plan air traffic activity.

8.2.1 SIGNATORY AIRLINE FEES

Signatory Airline fees consist of landing fees and terminal building space rentals received from the Signatory Airlines under the provisions of the AUA. Signatory Airline fees increased from $57.4 million in FY 2004 to $83.2 million in FY 2010, or an average annual rate of 6.4 percent. Signatory Airline Revenues decreased slightly in FY 2005, primarily due to a decrease in O&M expenses initiated by Airport management in response to the American Airlines' service cutbacks started in late FY 2004. Airfield revenues increased beginning in FY 2006, with the completion of the new runway in April 2006, which resulted in the rate based cost being amortized in the landing fee for a full year staring in FY 2007. The increase in airfield revenues was partially offset by the declines in terminal rents resulting from American Airlines' decision to release unneeded terminal space at the expiration of a previous airline agreement term in December 2005.

Projected Signatory Airline revenues for the Master Plan forecast period in **Table 8.2-3, *Projected Signatory Airline Revenues and Costs per Enplanement***, are based on the rate methodology in the new AUA, as discussed earlier in this section. However, the Rate Mitigation Program that is part of the new AUA is included through the end of the lease period (FY 2016), since the City committed to this provision for five years. Signatory Airline revenues are projected to increase from $83.2 million in FY 2010 to $108.3 million in FY 2031. The projections reflect the anticipated effects of Airport management's on-going cost containment related to O&M Expenses and the funding plan for the on-going CIP and the Master Plan, which includes AIP grant funding and PFC funding for eligible project costs, as well as the use of monies in the ADF and future GARB issues. The Airfield Landing Fee revenue projections anticipate a modest increase over the forecast period primarily due to the continued cost control over O&M expenses and limited airline funding required for Master Plan airfield projects during the period. The Terminal Rent revenue projections reflect the anticipated effects of the scheduled completion of Phase I of the AEP program and both phases of the Terminal Redevelopment project. The resulting impact of the increase in Signatory Airline revenues on the airlines cost per enplanement (CPE) is shown on Table 8.2-3. The CPE is forecasted to decrease from $13.70 in FY 2011 to $8.55 in FY 2030 and increase to $10.89 in FY 2031. The forecasted increase in FY 2031 is due to the additional debt service requirements in that year projected to result from the GARBs anticipated to be issued to fund the Terminal Redevelopment project in the last phase of the Master Plan. The landing fee rate is projected to decrease from $8.76 in FY 2011 to $4.83 in FY 2030 and increase to $5.30 in FY 2031. The average terminal rental rate is projected to increase to $109.74 in FY 2031, due to the additional debt service charged to the terminal cost center after the Terminal Redevelopment project is completed.

Table 8.2-3
PROJECTED SIGNATORY AIRLINE REVENUES AND COST PER ENPLANEMENT
Lambert-St. Louis International Airport

For Fiscal Years Ending June 30
(in thousands)

	Projected					
	2011	**2015**	**2020**	**2025**	**2030**	**2031**
INITIAL AIRLINE REQUIREMENTS		`				
Landing Fees	$63,325	$58,128	$61,798	$63,221	$64,112	$71,605
Terminal [1]	12,894	7,761	8,412	8,666	10,787	26,372
EDS common use - Terminal [1]		1,281	1,450	1,640	1,856	1,895
Terminal [2]	5,468	3,472	3,813	3,974	4,768	0
EDS common use - Terminal [2]		1,281	1,450	1,640	1,856	1,895
	$81,686	$71,924	$76,922	$79,141	$83,379	$101,766
TOTAL SIGNATORY AIRLINE REQUIREMENTS						
Initial Requirement	$81,686	$71,924	$76,922	$79,141	$83,379	$101,766
Additional Airline Requirement	-	20,602	8,804	44	189	6,550
	$81,686	$92,526	$85,726	$79,185	$83,568	$108,316
Signatory airline enplaned passengers	6,572	7,479	8,176	8,936	9,768	9,944
Signatory Airline CPE post Mitigation	**$13.70**	**$12.37**	**$10.48**	**$8.86**	**$8.55**	**$10.89**
Debt Service Coverage Ratio [1]	**1.25**	**1.36**	**1.25**	**1.28**	**1.28**	**1.25**
Landing Fee Rate (per 1,000 pounds)	**$8.76**	**$6.66**	**$5.85**	**$5.15**	**$4.83**	**$5.30**
Average Airline Terminal Building Rental Rate	**$40.05**	**$71.64**	**$55.71**	**$42.84**	**$52.61**	**$109.74**

[1] The financial projections assume that the current airline rates and charges methodology will be maintained after the expiration of the existing airline agreement (on June 30, 2016) and through the remainder of the forecast period, with one modification. Under the current methodology, an annual amount is transferred from the Debt Service Stabilization Fund as a credit to the airline requirement in order to mitigate a portion of the airline rates and charges. The projections assume that this provision will expire upon the expiration of the exisiting airline use and lease agreement. It is further assumed that beginning in FY 2017, and throughout the remainder of the forecast period, in any fiscal year that Airport Revenues are insufficient to meet the annual coverage requirement, the airline requirement will be increased to ensure that the 1.25 debt service coverage requirement is met.

8.2.2 CONCESSION FEES

Concession Fees include terminal concessions (food and beverage, news and gifts, and coin devices), public parking, car rentals, ground transportation, space rental, in-flight catering, as well as utility reimbursements and advertising. Total Concession Fees increased approximately $12.1 million or an average annual rate of 8.7 percent, from FY 2004 through FY 2008. The increase was primarily due to growth in public parking, car rental and terminal concessions. The public parking increase of approximately $8.6 million was due to an increase in parking durations and a parking rate increases in August 2007, April 2009 and September 2009. The remainder of the increase in Concession Fees was due to increases in terminal concessions and rental cars resulting from increases in O&D passenger traffic. Concession Fees decreased in FY 2009, due to decreased passenger traffic resulting from the economic downturn and the reduction in flights implemented by American Airlines. For the entire period of FY 2004 through FY 2010, Concession Fees increased approximately $8.0 million, at an average annual rate of 4.0 percent.

Concession fees are forecasted to increase from $38.6 million in FY 2010 to $94.2 million in FY 2031, which represents an average annual growth rate of 4.3 percent. This growth is based on the following assumptions:

- Projected modest parking rate increases in the long-term parking daily rates in FY 2014, and additional increases every five years thereafter to keep pace with projected inflation, for the short-term and long-term parking rates. The analysis assumes that off-site parking rates will also increase as on-Airport parking rates are increased. Therefore, the pricing differentials between parking alternatives are assumed to remain relatively constant over time.
- Projected increases in various food and beverage concession revenues following the completion of Phase I of the AEP program and following completion of the Terminal Redevelopment project.
- Increases in enplanements, as forecasted in the Master Plan.
- An applied inflation/consumption factor rate ranging from approximately 2.2 percent to 3.0 percent during the forecast period.

8.2.3 OTHER OPERATING REVENUES

Other Operating Revenues consist of non-signatory airline fees, cargo area rentals and fees, rents for hangars and other buildings, tenant improvement surcharges, and other miscellaneous revenues. From FY 2004 through FY 2010, Other Operating Revenues decreased $10.0 million, from $23.6 million to $13.6 million. The decline was primarily due to (1) a significant decrease in non-signatory airline revenues in FY 2008 resulting a shift in operations, in which of most of the regional airlines (who were non-signatory airlines) became regional partners with the signatory airlines; and (2) a significant decrease in FY 2005 in hangar and building rents following the end of Boeing's land lease. Other Operating Revenues are projected to increase from $13.6 million in FY 2010 to $16.8 million in FY 2031.

8.2.4 INTEREST INCOME

Interest income on all operating funds and accounts, other than the Construction Fund (bond proceeds) and the PFC Fund, are classified as Revenues under the Indenture. Interest income during the period from FY 2004 through FY 2010 decreased approximately $3.4 million or an average annual rate of 15.2 percent. This decline was mainly a result of the economic recession starting in late 2008, which drastically lowered the interest yields earned on Airport funds. The Interest income forecast is based on projected balances in each fund and account assuming average annual interest yields of 3.0 percent on the Debt Service and Debt Service Reserve Accounts and 2 percent for all other funds held during the forecast period.

8.2.5 PLEDGED PFC REVENUES

The Pledged PFC Revenues are projected to increase from $27.1 million in FY 2010 to $52.3 million in FY 2031, as a result of the additional PFC funded debt service assumed to fund the terminal redevelopment costs during the last phase of the Master Plan. The annual amount shown for PFC Pledged Revenues follows the requirements as further defined in the Indenture.

8.3 OPERATION AND MAINTENANCE EXPENSES

Table 8.3-1, *Historical O&M Expenses*, summarizes the historical Operation & Maintenance (O&M) Expenses for the period of FY 2004 through FY 2010. The major categories are: personnel services, which are comprised of salaries, fringe benefits and overtime; supplies, materials and equipment; and contractual services. O&M Expenses increased $15.0 million or an average annual growth rate of 3.4 percent. The growth was comprised of increases in contractual services of approximately $8 million, supplies, materials and equipment of $1.4 million and personnel services totaling $5.6 totaling million, as further described in the following sub-sections.

Table 8.3-1
HISTORICAL O&M EXPENSES
Lambert-St. Louis International Airport
For Fiscal Years Ending June 30
(in thousands)

	Avg. Annual Growth Rate	Historical [1]						
	FY 2004-2010	2004	2005	2006	2007	2008	2009	2010
Personnel Services								
Salaries & Wages	0.5%	$29,224	$27,747	$29,886	$30,652	$31,655	$31,654	$30,179
Fringe Benefits	8.7%	7,162	7,968	8,013	9,114	11,621	12,153	11,790
	2.4%	$36,386	$35,716	$37,899	$39,766	$43,277	$43,807	$41,969
Supplies, Materials & Equipment								
Deicing & Misc. Supplies	-3.1%	2,051	919	1,065	1,606	2,488	856	1,702
Other	8.4%	2,744	3,426	4,437	4,640	8,276	5,672	4,463
	4.3%	$4,794	$4,345	$5,503	$6,247	$10,763	$6,528	$6,165
Contractual Services								
Utilities	3.8%	5,432	5,030	6,365	7,364	7,174	7,508	6,793
Rental Equipment - Snow Removal	-1.5%	1,787	985	844	3,425	4,235	1,485	1,632
Rental Equipment - Land Maintenance	-18.7%	426	479	27	1,909	386	228	123
Cleaning Services	0.6%	2,651	3,037	3,304	3,225	3,264	2,866	2,755
Reimbursement for City Services	0.9%	1,598	1,294	1,392	1,246	963	1,384	1,685
Shuttle, Misc.	-28.1%	1,477	1,393	297	462	473	256	204
Acoustical Treatment	n/a	0	0	0	0	0	0	3,907
Legal	-7.6%	759	721	517	820	1,673	(666)	471
Security Service	-0.3%	5,039	4,995	5,086	6,238	6,197	5,404	4,950
Insurance	0.6%	1,979	2,005	2,404	2,563	2,455	2,281	2,050
Other	11.0%	5,284	7,640	6,693	8,053	7,448	11,468	9,908
	4.5%	$26,432	$27,579	$26,928	$35,304	$34,268	$32,214	$34,478
Total O&M Expenses [2]	3.4%	$67,612	$67,640	$70,330	$81,317	$88,308	$82,549	$82,612

[1] Based on audited financial statements and airport records.
[2] Excludes 5% gross receipts tax, which is excluded from calculation of debt service coverage.

8.3.1 PERSONNEL SERVICES

Personnel services are the largest category of O&M Expenses, representing 50.8 percent of total O&M Expenses in FY 2010. This category includes salaries and wages, and fringe benefits paid to Airport employees. The average annual growth rate from FY 2004 through FY 2010 was 2.4 percent, which was primarily due to the growth in fringe benefits of approximately $4.6 million to address the Airport's under-funded pension liability for employees and to properly fund the Airport's Firemen's Retirement Fund. The salaries and wages component of this category increased at a very low average annual rate of 0.5 percent from FY 2004 through FY 2010 as a result of Airport management's initiative to reduce staff and eliminate salary increases in response to declining revenues in FY 2009 and FY 2010.

8.3.2 SUPPLIES, MATERIALS, AND EQUIPMENT

Supplies, Materials and Equipment expenses consist of de-icing fluids, office supplies, laundry and cleaning materials, gasoline, tools and other miscellaneous supplies. The average annual increase for this category from FY 2004 through FY 2010 was 4.3 percent. This category increased 13.5 percent in FY 2007 and 72.3 percent in FY 2008 due to changes in the accounting treatment of capital assets under the provisions of the airline agreement that became effective January 1, 2006. The expense threshold increased from $10,000 to $100,000 for all capital asset expenditures, resulting in more costs being expensed, rather than capitalized. However, this category decreased from $10.8 million in FY 2008 to $6.5 million in FY 2009 and $6.2 million in FY 2010 due to Airport management's initiative to decrease expenses in response to declining revenues.

8.3.3 CONTRACTUAL SERVICES

Contractual Services represent the cost of services provided to the Airport by vendors, independent contractors, consultants and the City. The primary services include utilities, rental and lease of equipment (primarily snow removal equipment), snow removal, airport security, cleaning services, reimbursement for City-provided services, repair and maintenance of equipment (such as elevators and escalators, communications equipment, etc.) and other miscellaneous services. This category increased significantly in FY 2007 (from $26.9 million in FY 2006 to $35.3 million in FY 2007) due to increases in snow removal services caused by heavy snow and ice conditions and unusual legal expenses related to the noise monitoring program. As a result of Airport management's cost containment initiatives in FY 2009 and FY 2010, this expense category was only slightly higher in FY 2010 than in FY 2008. For the entire period of FY 2004 through FY 2010, Contractual Services increased at an average annual growth rate of 4.5 percent.

Table 8.3-2, *Summary of Projected Operation and Maintenance Expenses*, presents projected O&M Expenses for the Master Plan forecast period. O&M Expenses are forecasted to increase from $82.6 million in FY 2010 to $130.4 million in FY 2030. Total O&M Expenses are projected to decrease to $121.8 million in FY 2031 because after the terminal redevelopment project, the terminal complex is expected to have less square feet, and to be more efficient. The forecast is based on the proposed FY 2011 operating budget provided by Airport management and historical trends in O&M expense growth, and inflation factors between 2.3 percent and 3 percent. In addition, certain parts of the forecast were developed based on judgments from Airport management and industry trends.

Table 8.3-2
SUMMARY OF PROJECTED OPERATION AND MAINTENANCE EXPENSES
Lambert-St. Louis International Airport

Fiscal Years Ending June 30
(in thousands)

	Avg. Annual Growth Rate FY 2010-2031	Actual 2010	Budget 2011	Projected 2015	2020	2025	2030	2031
Personal Services								
Salaries & Wages	1.6%	$30,179	$28,911	$30,553	$34,737	$39,302	$44,466	$41,848
Fringe Benefits	2.8%	11,790	13,888	15,304	17,399	19,686	22,273	20,961
	1.9%	$41,969	$42,799	$45,857	$52,136	$58,988	$66,739	$62,809
Supplies, Materials & Equipment								
Deicing & Misc. Supplies	0.9%	$1,702	$1,429	$1,529	$1,723	$1,949	$2,205	$2,075
Other	4.0%	4,463	7,168	7,423	8,381	9,483	10,729	10,097
	3.3%	$6,165	$8,596	$8,952	$10,104	$11,432	$12,934	$12,173
Contractual Services								
Utilities	2.8%	$6,793	$7,814	$8,757	$10,053	$11,374	$12,869	$12,111
Rental & Lease of Equipment - Snow Removal	2.6%	1,632	1,928	2,064	2,331	2,637	2,984	2,808
Rental & Lease of Equipment - Land Maintenance	3.0%	123	245	168	189	214	243	228
Cleaning Services	1.2%	2,755	3,334	2,596	2,931	3,316	3,752	3,531
Reimbursement for City Services	0.4%	1,685	1,313	1,348	1,522	1,722	1,949	1,834
Shuttle, Misc., Acoustical	1.4%	204	202	200	226	256	289	272
Acoustical Treatment	n/a	3,907						
Legal	2.6%	471	651	595	672	761	861	810
Security Service	2.0%	4,950	5,271	5,539	6,255	7,077	8,006	7,535
Insurance	1.5%	2,050	2,036	2,071	2,338	2,646	2,993	2,817
Other	2.0%	9,908	9,099	12,039	13,376	14,951	16,766	14,869
	1.5%	$34,478	$31,893	$35,378	$39,895	$44,955	$50,711	$46,816
Total O&M Expenses [1]	1.9%	$82,612	$83,287	$90,187	$102,135	$115,374	$130,385	$121,797

[1] Excludes 5% gross receipts tax, which is excluded from calculation of debt service coverage.

8.4 REVENUES AND O&M EXPENSES PER ENPLANEMENT

The trends in GARB Revenues and O&M Expenses described above are reflected on a per-enplanement basis, as shown on **Exhibit 8.4-1, *Historical GARB Revenues and O&M Expenses per Enplanement***. The large decrease in GARB revenues per enplanement in FY 2005 (from $18.60 in FY 2004 to $16.57 in FY 2005) was mainly due to the ending of the Boeing land lease payments, as described above. The large increase in GARB Revenues per enplanement in FY 2007 (from $15.90 in FY 2006 to $18.33 in FY 2007), when Landing Fee revenue increased significantly due to the additional charges added to the airline rate base as a result of the completion of the new runway. GARB Revenue per enplanement increased 8 percent in FY 2009 and 6 percent in FY 2010 as a result of public parking rate increases and as enplanements decreased in those years, mainly due to the residual nature of the airline landing fee rate methodology, which ensures that the Airport receives sufficient revenues to meet its financial obligations.

The largest annual increase in O&M Expenses per enplanement (18.8 percent) occurred in FY 2007 (from $9.08 in FY 2006 to $10.79 in FY 2007), mainly due to (1) the increase in Personnel Services to fund the Airport's pension liability and retirement fund for the Airport Firemen; and (2) the change in accounting treatment for capital expenditures, which increased the amount of items expensed rather than capitalized.

Projected GARB Revenues and O&M Expenses on a per-enplanement basis are summarized on **Exhibit 8.4-2, *Projected GARB Revenues and O&M Expenses per Enplanement***. GARB Revenues per enplanement are projected to decrease from $20.53 in FY 2011 to $19.76 in FY 2031. O&M Expenses per enplanement are projected to increase from $12.04 in FY 2011 to $12.68 in FY 2030 and decrease to $10.83 in FY 2031.

Exhibit 8.4-1
HISTORICAL GARB REVENUES AND O&M EXPENSES PER ENPLANEMENT
Lambert-St. Louis International Airport

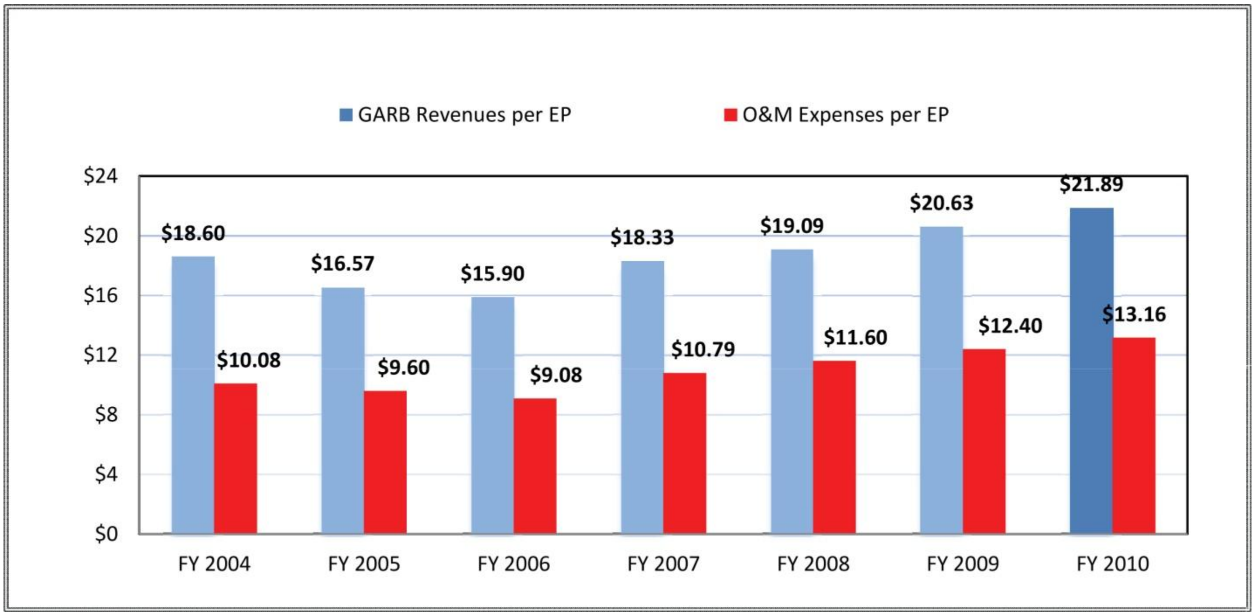
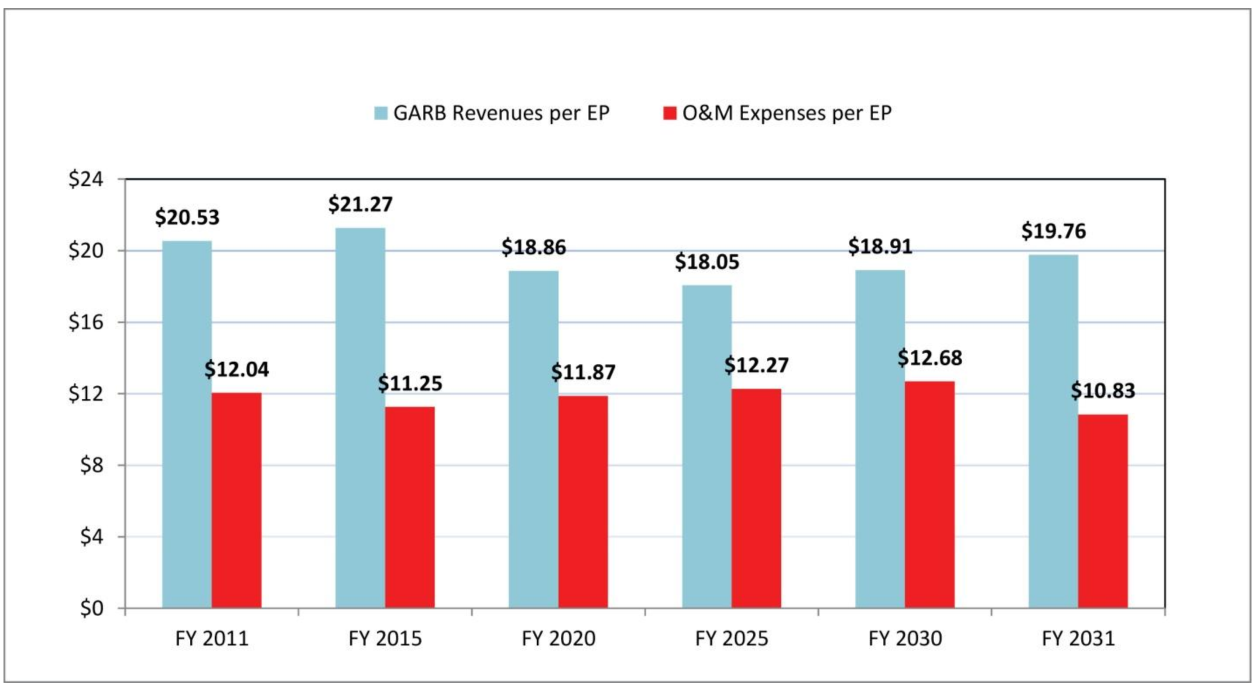


Exhibit 8.4-2
PROJECTED GARB REVENUES AND O&M EXPENSES PER ENPLANEMENT
Lambert-St. Louis International Airport



8.5 FEDERAL GRANT AND PFC FUNDING

AIP entitlement funds are apportioned by formula each year to individual airports or types of airports. AIP discretionary funds are awarded by the FAA based on eligible projects' priority as determined by the FAA through the application of its National Priority System (NPS). The NPS uses a combination of quantitative and qualitative factors to evaluate projects with highest priority given to projects to enhance airport safety and security. The funding plan for the Master Plan incorporates approximately $89.8 million in AIP entitlement and discretionary funds.

As shown in **Table 8.5-1, *Open AIP Grant Projects as of November 2011***, the Airport has 12 active AIP grants to fund various capital improvement projects. During the FY 2005 through FY 2010 period, the Airport used $26.0 million of AIP grants (**Exhibit 8.5-1, *Historical AIP Grant Drawdowns***). Any AIP cash grant balance remaining after a project is completed may revert back to the FAA. Because the Part 150 Study/Master Plan is nearly complete, there may be AIP funds reverting to the FAA. The W-1W Land Acquisition project is being closed out, so the $2.4 million remaining AIP grant balance will likely revert to the FAA. The largest amount of AIP grant funding occurred in FY 2005 ($20 million for Noise Land Acquisition), and in FY 2008 ($11 million for the design and construction of a new parallel runway). The new runway development and taxiway rehabilitation projects accounted for 48.5 percent and 26 percent, respectively, of total AIP grants from FY 2005 through FY 2010, as depicted in **Exhibit 8.5-2, *Historical AIP Grant Use by Category***. The proposed funding plan for the Master Plan assumes that the Airport will receive approximately $53.9 million in AIP entitlement funds and $35.9 million in AIP discretionary funds throughout the planning period. The majority of the AIP funding included in the funding plan is assumed for airfield projects ($39.2 million in Entitlement funds and $33.1 million in discretionary funds). As explained earlier in this chapter, in some years, AIP entitlements were assumed for projects that are considered lower priority projects by the FAA, if no higher priority AIP eligible projects are planned for those years. It should be noted that there is no guarantee of future AIP funding.

PFC revenues decreased from a peak of $32 million in FY 2008 to $25 million in FY 2010. The decrease was a result of STL enplaned passengers declining by 12.5 percent in FY 2009, and an additional 5.7 percent reduction in FY 2010. As of the end of FY 2010, the Airport had collected approximately $648.0 million in PFCs, of which $610.0 million had been expended on various approved PFC projects. **Exhibit 8.5-3, *Historical PFC Use for Six Largest Projects*,** depicts PFC spending on the six largest projects as of the end of FY 2010. **Table 8.5-2, *Outstanding PFC Projects as of End of FY 2011*** lists the outstanding PFC approved projects and the amount of unexpended PFC funds (the remaining available balance on each project), as of the end of FY 2011.

This financial analysis assumes that the Airport will continue to collect a PFC of $4.50 per enplaned passenger throughout the forecast period. The analysis further assumes that the Airport will use approximately $178.2 million in PFCs on a Pay-As-You-Go basis for eligible Master Plan project costs, and will leverage $215.1 million in PFCs through the issuance of PFC-backed bonds, the proceeds of which will be used to pay for PFC-eligible Master Plan project costs.

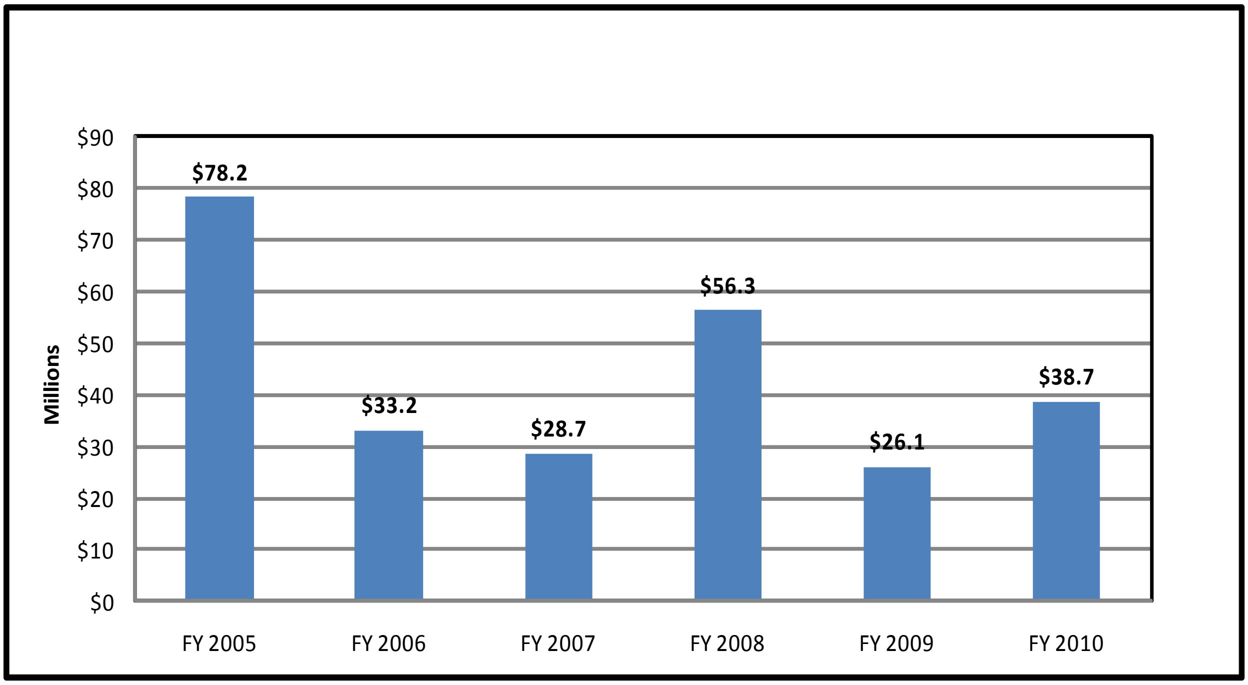
Table 8.5-1
OPEN AIP GRANT PROJECTS AS OF NOVEMBER 2011
Lambert-St. Louis International Airport

Grant Number	Project Name	AIP Grant Amount	Reimburse-ment Received	Grant Cash Balance	Reimburse-ment Requests in Process	Net Grant Balance Remaining [1]
103	14 CFR Part 150 Noise Compatibility Study/ Master Plan Update (Phase 2)	$4,800,000	$3,476,447	$1,323,553	$0	$1,323,553
106	Security Enahancement - Perimeter Fencing	3,800,828	3,013,391	787,437	0	787,437
108	Replacement of Runway 12L/30R Keel Section	3,207,011	2,812,620	394,391	0	394,391
109	Improve Runway Safety Area 12L/30R (Phase 2)	1,849,701	1,838,092	11,609	0	11,609
115	Rehabilitate Taxiway S (Runway 6 to Taxiway D) - Part A	2,016,213	1,810,415	205,798	0	205,798
118	Reconstruction of Taxiway V from Taxiway F to Runway 24 (Phase 1) and Taxiway F from Taxiway V to Runway 6/24	6,734,144	6,106,730	627,414	0	627,414
122	Environmental Management System	1,125,000	147,729	977,271	65,670	911,601
125	Rehabilitate Runway 12R/30L (Keel Sections from Taxiway C to Taxiway R and from Taxiway H to Taxiway L) Phase 1	817,122	539,388	277,734	0	277,734
126	Reconstruct Taxiway D (from Taxiway K to Taxiway J) Phase 1 - Design Only	277,330	211,646	65,684	0	65,684
127	Reconstruct Taxiway E (from Taxiway L to Taxiway J) Phase 1 - Design Only	632,086	302,814	329,272	0	329,272
128	Acquire Safety Equipment (Part 139 Interactive Training System)	423,000	0	423,000	0	423,000
130	Reconstruct Taxiway D from Taxiway K to Taxiway J (Phase 2); Reconstruct Taxiway E from Taxiway L to Taxiway J (Phase 2)	7,318,112	0	7,318,112	0	7,318,112
	TOTALS	$33,000,547	$20,259,272	$12,741,275	$65,670	$12,675,605

Source: Schedule prepared by Lambert-St. Louis International Airport staff, titled "Summary of Open Grants," printed on 11/17/11.

[1] Any AIP grant balance remaining when a project is completed may revert to the FAA. The Part 150/Master Plan is nearly complete; therefore, the remaining cash balance on that project may revert to the FAA.

Exhibit 8.5-1
HISTORICAL AIP GRANT DRAWDOWNS
Lambert-St. Louis International Airport



* *Drawdowns in a given year include 2000 LOI grant and may cover costs incurred in that yr and prior yrs.*

Exhibit 8.5-2
HISTORICAL AIP GRANT USE BY CATEGORY
Lambert-St. Louis International Airport

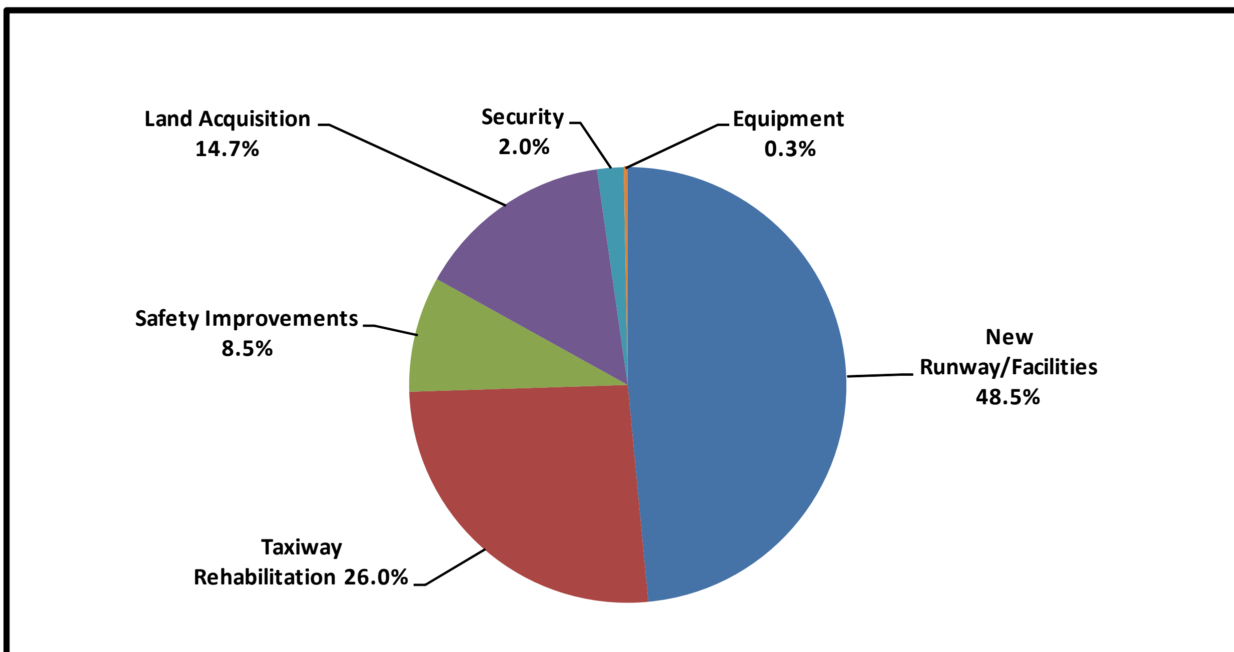


Exhibit 8.5-3
HISTORICAL PFC USE FOR SIX LARGEST PROJECTS
Lambert-St. Louis International Airport

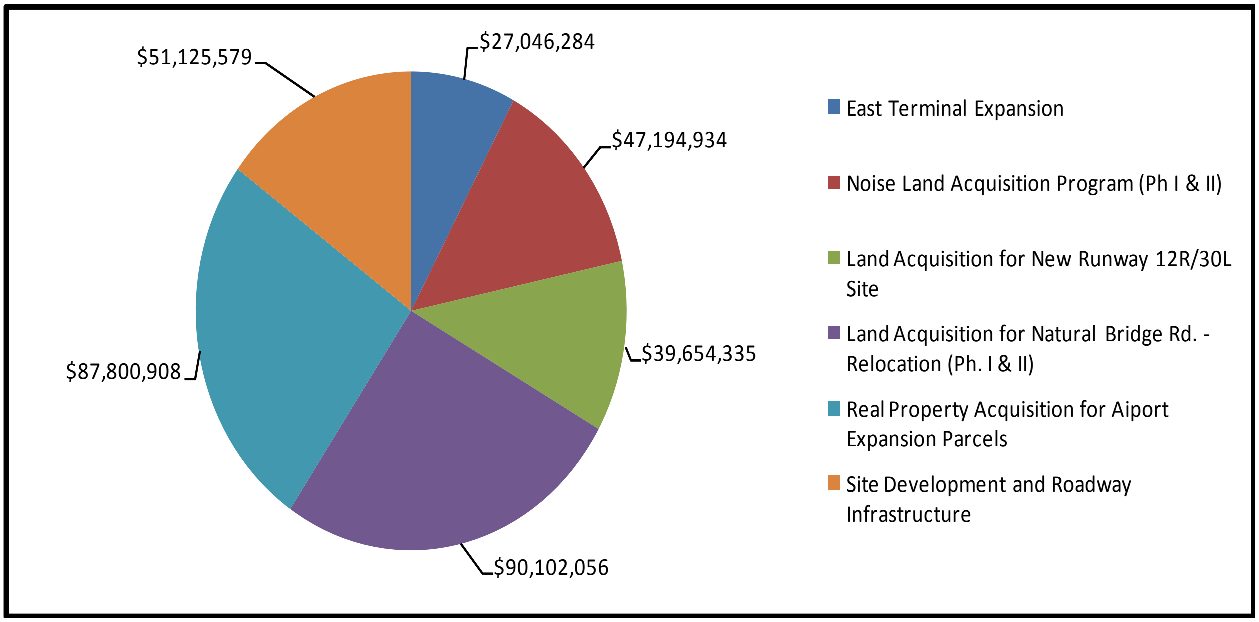


Table 8.5-2
OUTSTANDING PFC PROJECTS AS OF END OF FY 2011
Lambert-St. Louis International Airport

FY 2011 Outstanding PFC Fund Projects			
Project	**PFC Approved Amount**	**PFC Funds Expended**	**PFC Funds Remaining**
Balance of Real Property Acquisition for Airport Expansion	$218,474,166	$94,695,107	$123,779,059
Carrollton Schools Replacement	28,107,289	9,832,093	18,275,196
Program Management	200,097,588	74,365,094	125,732,494
Site Development & Roadway Infrastructure	169,817,374	57,229,565	112,587,809
New Runway, Perimeter Road, Security Fences	50,050,707	44,584,742	5,465,965
New West ARFF Building	4,149,046	4,095,853	53,193
Terminal Improvements (FIS)	6,300,000	5,469,382	830,618
Taxiway Delta Improvements	4,325,000	4,136,423	188,577
Terminal Improvement Program	67,124,624	2,480,220	64,644,404
Emergency Generators	12,199,500	0	12,199,500
Runway 12R/30L & 12L/30R Centerline Panels	3,500,000	1,228,523	2,271,477
Taxiway Reconstruction (D and S)	5,300,000	4,448,744	851,256
FAR Part 150 Study	600,000	462,764	137,236
Master Plan Update - Phase 2	800,000	628,004	171,996
Perimeter Security Fence	1,150,000	1,073,763	76,237
Noise Monitoring System Upgrade	100,000	0	100,000
Taxiway Reconstruction (F and V)	6,488,607	6,247,884	240,723
Totals	$781,583,901	$313,978,161	$467,605,740

8.6 SUMMARY OF OUTSTANDING DEBT

From FY 2005 through FY 2011, the City sold GARBs in four issues totaling approximately $759 million to finance and/or refinance various Airport capital expenditures. Two of the three GARB issues were refunding bonds totaling $599 million. Besides the refunding of previous issues, Airport debt financed capital improvement projects, such as design and construction of terminal and parking garage improvements, roof replacement on concourses, and the Airport Experience Project (AEP) which consists of restoring facilities and improving the functionality of the Main Terminal.

The Airport's total outstanding debt increased in FY 2010 with the issuance of the Series 2009 Bonds to fund the Airport Experience Program and other capital improvements. As of the end of FY 2011, the Airport's outstanding GARB debt amounted to approximately $855.1 million.

The proposed funding plan for the Master Plan assumes that the City will issue approximately $432.2 million in GARBs to fund project costs. The analysis assumes that each GARB issue will be amortized over 30 years, and will include a capitalized interest period to coincide with the design and construction of the projects funded with each bond issue.

8.7 APPLICATION OF REVENUES

Table 8.7-1, *Projected Deposits to the Airport Development Fund*, shows the Application of Revenues forecast to fund accounts under provisions of the Indenture for the Master Plan forecast period. Under the provisions of the Indenture, Revenues are first applied to pay O&M Expenses and then to pay Debt Service on Bonds. Remaining Revenues are then applied to: restore any deficiencies in the Debt Service Reserve Account in the Bond Fund, pay any subordinate debt outstanding, restore any deficiencies in the Renewal and Replacement Fund, to pay the City (the 5 percent “gross receipts tax”), and then to fund the Debt Service Stabilization Fund in the required amounts. All remaining Revenues are then deposited in the ADF or the PFC Account.

As of June 30, 2011, the unaudited unappropriated balance in the Airport’s ADF was approximately $47.9 million. This balance, coupled with the projected transfers to the ADF are projected to provide adequate resources to meet various obligations of the Airport such as equipment replacement, major maintenance and small capital projects to fund the Master Plan project costs indicated in the proposed funding plan during the forecast period.

Table 8.7-1
PROJECTED DEPOSITS TO THE AIRPORT DEVELOPMENT FUND
Lambert-St. Louis International Airport
For Fiscal years Ending June 30
(in thousands)

	Projected					
	2011	**2015**	**2020**	**2025**	**2030**	**2031**
Revenues						
GARB Revenues						
Airline revenues (Initial Requirement)	$81,686	$71,924	$76,922	$79,141	$83,379	$101,766
Additional Airline Requirement [1]	-	20,602	8,804	44	189	6,550
Rate Mitigation Program proceeds	-	13,728	0	0	0	0
Non-airline revenues and Other Airline Charges	58,258	62,510	75,084	89,233	107,776	110,979
Interest income	2,083	1,685	1,494	1,411	3,110	2,885
Pledged PFC Revenues	27,195	28,166	28,925	28,926	52,309	52,302
	$169,223	$198,615	$191,230	$198,755	$246,762	$274,482
Application of Revenues						
Operating and Maintenance Expenses	$83,289	$90,187	$102,135	$115,374	$130,385	$121,797
Debt Service Account (Annual Debt Service)						
Outstanding Bonds	$64,705	$72,393	$56,437	$50,137	$39,268	$39,877
Total Series 2009 and Future Bonds	1,986	7,191	14,832	14,832	51,920	82,266
	$66,691	$79,584	$71,270	$64,969	$91,187	$122,143
Debt Stabilization Fund (reserve) [2]	$4,376	-	-	-	-	-
Debt Service Reserve Account	798	-	-	-	-	-
PFC Debt Service Coverage	5,439	5,633	5,785	5,785	10,462	10,460
Payment to City (5% of Revenues)	6,111	6,693	7,558	8,551	9,675	9,878
Subtotal net of Contribution from DSSF	$166,703	$182,098	$186,748	$194,680	$241,709	$264,278
Amount Available for Deposit to ADF	**2,520**	**$16,517**	**$4,482**	**$4,075**	**$5,054**	**$10,204**
Amount due Airlines at Settlement	**-**	**(13,728)**	**-**	**-**	**-**	**-**
Amount Available for Deposit to ADF post Settlement [3]	**2,520**	**$2,789**	**$4,482**	**$4,075**	**$5,054**	**$10,204**

[1] Includes Airport Development Fund Deposits in the following amounts: $1.03 million in FY 2012; $2.59 million in FY 2013; $2.70 million in FY 2014; $2.92 million in FY 2015; and $2.98 million in FY 2016.
[2] Reflects a Current Adjusted FY 2011 deposit of $4,376 million, $0.619 million lower than Bond Ordinance required deposit of $4,995 million.
[3] Beginning in FY 2012, equivalent to 6 percent of Eligible Nonairline Revenue. FY 2012 Deposit to ADF reflects a negative adjustment of $1.5 million.

8.8 DEBT SERVICE COVERAGE

Annual debt service is projected to increase from $66.7 million in FY 2011 to $122.1 million in FY 2031 due to the future GARB issues anticipated in the proposed funding plan. Debt service coverage is projected to range between 1.36 in FY 2015 and 1.25 in FY 2031 (**Table 8.8-1, *Calculation of Annual Debt Service Coverage***).

The financial forecasts presented in this section are based on information and assumptions that have been provided by Airport management, or developed by Unison and reviewed with and confirmed by Airport management. Based upon our review, we believe the information to be accurate and that the assumptions made provide a reasonable basis for the forecasts. However, due to unforeseen events and circumstances actual results may vary from the forecasts and such variations may be material.

Table 8.8-1
CALCULATION OF ANNUAL DEBT SERVICE COVERAGE
Lambert-St. Louis International Airport

For Fiscal years Ending June 30
(in thousands)

	Projected					
	2011	2015	2020	2025	2030	2031
Total Revenues (incl DSSF Contr & Add'l Requirement)	$169,223	$198,615	$191,230	$198,755	$246,762	$274,482
less: Operation and Maintenance Expenses	83,289	90,187	102,135	115,374	130,385	121,797
Net Revenues	$85,934	$108,428	$89,094	$83,380	$116,378	$152,685
Debt Service						
Outstanding Bonds	$64,705	72,393	56,437	50,137	39,268	39,877
Series 2009 and Future Bonds	1,986	7,191	14,832	14,832	51,920	82,266
	$66,691	$79,584	$71,270	$64,969	$91,187	$122,143
Debt service coverage ratio	**1.29**	**1.36**	**1.25**	**1.28**	**1.28**	**1.25**

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CHAPTER NINE
AIRPORT PLAN DRAWINGS

INTRODUCTION

This chapter presents a set of plans, referred to as the Airport Layout Plan (ALP), which has been prepared to graphically depict the recommendations for airfield layout, terminal development, disposition of obstructions, and future use of land on the airport. This set of plans includes the following drawings, which are presented in reduced format at the end of this chapter:

- Sheet 1 – Cover Sheet
- Sheet 2 – Existing Airport Layout Plan
- Sheet 3 – Future Airport Layout Plan
- Sheet 4 – Future Airport Sub Layout Plan-Runway 11/29
- Sheet 5 – Future Airport Sub Layout Plan-Runway 6/24
- Sheet 6 – Future Airport Sub Layout Plan-Runway 12/30
- Sheet 7 – Airport Data Sheet
- Sheet 8 – Airport Data Sheet (Continued)
- Sheet 9 – Part 77 Airspace Plan (1:3000 Scale)
- Sheet 10 – Part 77 Airspace Plan (1:800 Scale)
- Sheet 11 – Part 77 Airspace Obstruction Data
- Sheet 12 – Part 77 Airspace Obstruction Data (Continued)
- Sheet 13 – Part 77 Airspace Obstruction Data (Continued)
- Sheet 14 – Part 77 Approach Plan & Runway Profiles
- Sheet 15 – Part 77 Approach Plan & Runway Profiles
- Sheet 16 – Part 77 Approach Plan & Runway Profiles
- Sheet 17 – Part 77 Approach Plan & Runway Profiles
- Sheet 18 – Inner Portion of the Approach-Runway 11
- Sheet 19 – Inner Portion of the Approach-Runway 29
- Sheet 20 – Inner Portion of the Approach Data-Runway 29
- Sheet 21 – Inner Portion of the Approach-Runway 6
- Sheet 22 - Inner Portion of the Approach-Runway 24
- Sheet 23 – Inner Portion of the Approach Data-Runway 6/24
- Sheet 24 – Inner Portion of the Approach-Runway 12L
- Sheet 25 – Inner Portion of the Approach-Runway 30R
- Sheet 26 – Inner Portion of the Approach-Runway 12R
- Sheet 27 – Inner Portion of the Approach-Runway 30L

- Sheet 28 – Inner Portion of the Approach Data-Runway 12R/30L
- Sheet 29 – Departure Surfaces Runway 11/29 & 6/24
- Sheet 30 – Departure Surface Data-Runways 11/29 & 6/24
- Sheet 31 – Departure Surfaces Runway 12L/30R & 12R/30L
- Sheet 32 – Departure Surface Data-Runways 12L/30R & 12R/30L
- Sheet 33 – Terminal Area
- Sheet 34 – Cargo Area
- Sheet 35 – On-Airport Land Use
- Sheet 36 – Off-Airport Land Use
- Sheet 37 – Property Map (Exhibit A Cover Sheet)

The ALP set has been prepared on a computer-aided drafting (CAD) system for future ease of use. This set of plans has been prepared in accordance with Federal Aviation Administration (FAA) Advisory Circulars (AC) 150/5070-6B, *Airport Master Plans*, AC 150/5300-13, *Airport Design*, and the FAA Central Region ALP Drawing Checklist.

In preparation of the ALP set, a coordinate system was applied to define the Airport's specific position on the earth's surface, known as a geodetic datum. Geodetic datum utilizes both horizontal and vertical datum orientations. Horizontal datum refers to the latitude and longitude of specific points, and vertical datum measures the elevations. For this ALP set, the Airport has a horizontal datum of a modified Missouri East Zone State Plane Coordinate System (SPCS) known as the Lambert International Airport Modified State Plane Coordinate System (LIAMSPCS) and the vertical datum is the North American Vertical Datum of 1988 (NAVD88).

9.1 AIRPORT DESIGN STANDARDS

The FAA AC 150/5300-13 outlines recommended design standards for airports. These design standards are based upon the airplane characteristics that the airport is expected to serve on a regular basis (500 annual operations).

Most critical to airport design are the weight, wingspan, and approach speed of the design aircraft. An airport's reference code (ARC) is based upon a combination of the aircraft approach category and the airplane design group (ADG).

The aircraft approach category is a grouping of aircraft based upon 1.3 times their stall speed in their landing configuration at their maximum certificated landing weight. The categories are as follows:

- Category A: Speed less than 91 knots
- Category B: Speed 91 knots or more, but less than 121 knots
- Category C: Speed 121 knots or more, but less than 141 knots
- Category D: Speed 141 knots or more, but less than 166 knots
- Category E: Speed 166 knots or more

The ADG is a grouping of airplanes based on wingspans. The groups are as follows:

- Group I: Up to but not including 49 feet
- Group II: 49 feet, up to but not including 79 feet
- Group III: 79 feet, up to but not including 118 feet
- Group IV: 118 feet, up to but not including 171 feet
- Group V: 171 feet, up to but not including 214 feet
- Group VI: 214 feet, up to but not including 262 feet

The existing/current critical design aircraft is the McDonnell Douglas CD 10/MD-10, which is designated as ARC D-IV. The critical design aircraft for future planning purposes of this Master Plan is the Boeing 747-400, which is designated as ARC D-V. **Table 9.1-1, *Recommended FAA Airfield Design Standards (ARC D-IV & D-V)*** lists the applicable recommended airfield design standards for ARC D-IV and ARC D-V.

Table 9.1-1
RECOMMENDED FAA AIRFIELD DESIGN STANDARDS (ARC D-IV & D-V)
Lambert-St. Louis International Airport

DESIGN ELEMENT	DESIGN STANDARD ARC D-IV (ft.)	DESIGN STANDARD ARC D-V (ft.)
• Runway Width	150	150
Runway Centerline To: • Parallel Taxiway Centerline (CAT I) • Parallel Taxiway Centerline (CAT II/III)	 400 500	 400 500
• Runway Object Free Area Width	800	800
• Runway Safety Area Width	500	500
• Taxiway Width	75	75
Taxiway Centerline To: • Parallel Taxiway/Taxilane Centerline • Fixed or Moveable Object	 215 129.5	 267 160
Taxilane Centerline To: • Parallel Taxilane Centerline • Fixed or Moveable Object	 198 112.5	 245 138

Source: FAA Advisory Circular 150/5300-13, Change 13

9.2 AIRPORT LAYOUT PLAN (ALP) DRAWINGS

The following section provides a general description of the major components of the ALP drawings. The ALP is a planning tool for the FAA in its review of airport development grant applications under the Airport Improvement Program (AIP). The FAA refers to the ALP in its review of proposed construction projects that may affect navigable airspace. The ALP also serves as a planning tool for use by surrounding jurisdictions in addressing land use, zoning, and resource planning issues.

9.2.1 AIRPORT LAYOUT PLAN (ALP)

The ALP drawing graphically presents the existing and future airport layout. It depicts the recommended improvements which will enable the airport to meet the planning horizon demand levels.

Immediately following the Cover Sheet (Sheet 1), the Existing ALP Sheet (Sheet 2) is a base drawing that solely depicts the existing airport facilities with their dimensional criteria. The Future ALP (Sheet 3) depicts the proposed airport improvements associated with both the airside and landside areas. Due to the layout of the airfield/orientation of the runways, and the drawing scale that result from attempting to depict the entire airfield on one drawing, three additional sheets were added to the plan set. Sheets 4-6 depict the three runway orientations (12-30, 11-29, and 6-24) at a smaller scale (therefore look larger) so that the drawing details (required by the FAA) are legible/readable.

9.2.2 AIRPORT DATA SHEET

The detailed airport and runway data are provided on Sheet 7 and 8 to facilitate the interpretation of the Master Plan Update facility and design recommendations. All weather and Instrument Flight Rules wind coverage is provided, along with a location map, runway protection zone data, and a legend of terms used on the ALP drawings.

9.2.3 FEDERAL AVIATION REGULATION (FAR) PART 77 AIRSPACE PLANS

Federal Aviation Regulation (FAR) Part 77, *Objects Affecting Navigable Airspace*, prescribes airspace standards which establish criteria for evaluating navigable airspace around airports. This section presents a discussion of FAR Part 77 standards and their relationship to the physical features and terrain on and around Lambert. The FAR Part 77 surfaces and limiting heights and elevations for future development adjacent to the Airport are shown on Sheets 9 and 10. Detailed information about the obstructions are provided on Sheet 11, Part 77, Airspace Obstruction Data, and continue to Sheet 13.

FAR Part 77 has been established to protect the airspace and approaches to each runway from hazards which could affect the safe and efficient operation of aircraft. These federal criteria have also been established for use by local jurisdictions in controlling the height of objects in the vicinity of the airport. For example, FAR Part 77 can be utilized in zoning ordinances to enhance area land use compatibility.

The Part 77 Airspace Plan (1:3000 Scale), Part 77 Airspace Plan (1:1500 Scale), and Part 77 Airspace Obstruction Data drawings are also used to indicate potential obstructions which are located within the imaginary surfaces of the airport. Ideally, an obstruction should be removed or lowered beneath the imaginary Part 77 surfaces. In some cases, it is appropriate to mark and light the obstruction in accordance with Advisory Circular 70/7460-1, *Obstruction Marking and Lighting*. All obstructions must be reviewed by the FAA to determine if it is a hazard to air navigation and which course of action is appropriate.

The FAR Part 77 imaginary surfaces are established relative to the airport and runway system. The size of each imaginary surface is based on the runway approach category (visual, non-precision or precision). Each of the Part 77 surfaces is described in the following subsection.

- **Primary Surface** – The primary surface is located closest to the runway environment. It is a rectangular area symmetrically located about the runway centerline and extending a distance of 200 feet beyond each runway threshold. Its elevation is the same as the runway centerline at a point perpendicular to the runway centerline. The width of the primary surface depends on the type of runway approach capability (visual, non-precision, or precision). All runways at Lambert have precision approach capability and will have a 1,000-foot wide primary surface.

  The primary surface must remain clear of most objects in order to allow unobstructed passage of aircraft. Objects are only permitted if they are no taller than two feet above the ground, and if they are constructed on frangible (breakaway) mounts. The only exception to this rule is for objects whose location is "fixed by function" such as navigational and visual aid facilities (glide slope, precision approach path indicator, windsock, etc.).

  Analysis indicates that there are several facilities located within the primary surface of each runway. However, these objects are considered "fixed by function" and can remain in their current location.

- **Approach Surface** – An approach surface is also established for each runway end. The approach surface has the same inner width as the primary surface, and then flares (gets wider) as it rises upward and outward along the extended runway centerline. The approach surface starts 200 feet beyond the runway end. The slope of the rise and the length of the approach surface is dictated by the type of approach available to the runway (visual, non-precision or precision), and by the approach category of the aircraft for which the runway is designed.

  Although the design aircraft for the Airport is Group IV, all runways at Lambert have precision instrument approach capability designed to accommodate Group V aircraft.

- **Transitional Surface** – Each runway has a transitional surface that begins at the outside edge of the primary surface, and at the same elevation as the runway centerline. There are three transitional surfaces. The first is off the sides of the primary surface; the second is off the sides of the approach surface, and the third is outside the conical surface and pertains to precision runways only. The transitional surface rises at a slope of one-foot vertically for each seven feet of horizontal distance (7:1) up to a height which is 150 feet above the highest runway elevation.
- **Conical Surface** – The conical surface begins at the outer edge of the horizontal surface. The conical surface continues for a distance of 4,000 feet horizontally at a slope of one-foot rise for each 20 feet of horizontal distance (20:1). The height of the conical surface outer edge is 350 feet above the airport elevation.
- **Horizontal Surface** – The horizontal surface is established at 150 feet above the published airport elevation. This is an oval-shaped flat surface that connects the transitional and approach surfaces to the conical surface at a distance of 10,000 feet from the primary surface.

Obstruction data were provided by surveys conducted by Engineering Design Source, Inc. (EDSI) and Kowelman Engineering, Inc. (KEI) with final data provided by Lambert-St. Louis International Airport. Obstruction coordinate data from 1996 and 2005 was provided by National Geodetic Survey (NGS).

9.2.4 RUNWAY APPROACH PLANS AND PROFILES

The Runway Approach Plan and Profiles (Sheets 14 through 17) show both plan and profile views of the approaches to each of the existing and future runways. The plan and profile views facilitate identification of obstructions that are located within areas that should be void of objects that may endanger the safe flight of aircraft during landing.

The plan and profiles for each runway illustrate various Part 77 and Terminal Instrument Procedures (TERPS) surfaces and slopes that are used to determine obstructions. These surfaces include:

- FAR Part 77 Approach Surface (50:1 slope)
- TERPS Precision Obstacle Clearance Surfaces (W-34:1, X-1:4, Y-1:7)

Lambert has precision approach capability on all runway ends. Analysis of the plan and profile views extends a distance of 7,000 feet from each precision runway end.

9.2.5 INNER APPROACH PLANS AND DATA

The Inner Approach Plans and Data Sheets (Sheets 18 through 28) show both plan and profile views of the inner approach surfaces for each of the runways and a tabular listing of all surface penetrations. The drawings depict the obstacle identification approach surfaces contained in 14 CFR Part 77, *Objects Affecting Navigable Airspace*. The drawings also depict other approach surfaces, including the threshold-siting surface and those surfaces associated with United States Standards for Instrument Procedures (TERPS). The extent of the approach surface and the number of airspace obstructions shown restrict each sheet to only one runway end or approach. The plan and profile views facilitate identification of obstructions that are located within areas that should be void of objects that may endanger the safe flight of aircraft during departure operations.

9.2.6 DEPARTURE SURFACES DRAWINGS

The Runway Departure Surface Plan and Profiles (Sheets 29 through 32) show both plan and profile views of the departure surfaces for each of the runways. The plan and profile views facilitate identification of obstructions that are located within areas that should be void of objects that may endanger the safe flight of aircraft during departure operations.

9.2.7 TERMINAL AREA

The Terminal Area Plan (Sheet 33) shows additional detail of the proposed new terminal complex development that includes the following major projects:

- Terminal building
- Realigned concourse
- Aircraft parking apron
- Taxiway/taxilanes
- Auto parking garages
- Light rail line
- Support facilities

9.2.8 CARGO AREA

The Cargo Area Plan (Sheet 34) shows additional detail of the proposed improvements to the three cargo area complexes that includes the following major projects:

- Redevelopment of the North Tract Cargo Area
- FBO expansion and additional cargo facilities in the north Cargo Area
- Additional FBO in the area of Cargo City

9.2.9 LAND USE PLANS

The purpose of developing an on-airport land use plan is to achieve an arrangement of land uses within the airport's boundary that best utilizes available property for existing and future airport needs, as well as compatibility with the surrounding environment. The future On-Airport Land Use Plan (Sheet 35) provides adequate growth for all airport functions and provides for the potential to develop non-aviation related development that can generate additional revenue for the Airport.

In collaboration with Part 150 study the off-airport land use plan was developed to portray the land uses immediately outside the airport's boundary. The Off-Airport Land Use Plan (Sheet 36) is based on the existing and, where available, future plans identified by the neighboring communities.

9.2.10 EXHIBIT A PROPERTY MAP

The purpose of an Exhibit A Airport Property Inventory Map (Sheet 37) is to represent all real property currently owned and previously owned by the Airport. Specific data is maintained for each numbered parcel presented on the Exhibit A. The data includes physical description of parcel, grantee information, type of interest acquired and public land record references. The Exhibit A also includes information specific to FAA funded projects such as project number, purpose of acquisition and percentage of purchase price funded by FAA grant monies. The Exhibit A is maintained by the Airport and must be provided to the FAA to receive funding for airport projects.

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