Appendix F-2

LAX SPECIFIC PLAN AMENDMENT STUDY REPORT

North Runway Alternatives Simulation Analysis

July 2012

Prepared for:

Los Angeles World Airports
One World Way
Los Angeles, California 90045

Prepared by:

Ricondo & Associates, Inc.
1917 Palomar Oaks Way, Suite 350
Carlsbad, CA 92008

Table of Contents

List of Tables

List of Figures

This page intentionally left blank.

1. NORTH AIRFIELD ALTERNATIVES ANALYSIS

Los Angeles World Airports (LAWA) is studying alternative configurations for the north airfield at Los Angeles International Airport (LAX) as part of the LAX Specific Plan Amendment Study (SPAS). This Technical Report analyzes SPAS Alternatives 1 through 4.

For the purposes of developing detailed airside design assumptions that could be utilized in modeling a reasonable range of airfield configuration options, and do so in an efficient and cost-effective manner taking into account contract scope and budget considerations, the simulation analysis focused on only Alternatives 1 through 4. Based on the detailed information developed for those alternatives, the SPAS Environmental Team was able to estimate performance assumptions and projections for Alternatives 5 through 7, as utilized in the aircraft noise and air quality analyses. No simulation analysis was undertaken for Alternatives 8 or 9 because those alternatives do not include terminal or airfield improvements.

A 2009 existing conditions simulation was conducted to serve as the basis for comparison. The alternatives are described in Section 1.1 of this document.

The analysis described in this Technical Report was conducted using the Federal Aviation Administration's (FAA's) Airport and Airspace Simulation Model (SIMMOD) to determine the overall effect of proposed north airfield runway and taxiway reconfigurations on Airport operations. Specifically, overall delay and unimpeded taxiing times were analyzed.

SIMMOD[1] is a simulation software package designed for the analysis of en route air traffic, terminal area air traffic, and airfield operations. The model has been developed by a number of private and governmental entities over the past 30+ years. First released for public use on May 11, 1989, SIMMOD has been used to model some portion of the operations at most major airports in the United States.

The model uses a network of "links" and "nodes" to define the travel paths of aircraft throughout the ground and airspace of the area being simulated. The links essentially define the route of travel whereas the nodes can represent decision points, facilities, or logic changes along the way. Aircraft are allowed to transit from one link to another based on the link's attributes and rules applicable to the analysis.

1.1 Background

The purpose of this analysis was to calculate aircraft operations movement statistics to support the LAX SPAS Environmental Impact Report analyses. The simulations include a Baseline Scenario using a 2009 design day flight schedule (DDFS) and four future alternatives using a 2025 DDFS.

- 2009 Baseline Simulation: This simulation consists of the 2009 terminals and airfield at LAX and a 2009 DDFS. The Baseline Simulation 2009 DDFS is representative of the peak month, average day (PMAD) operations of 1,563 daily aircraft operations.
- 2025 SPAS Alternative 1, Runway 6L-24R Relocated 260 ft. North: In this alternative, Runway 6L-24R would be relocated 260 feet to the north and a parallel taxiway would be constructed between Runway 6L-24R and Runway 6R-24L. Additionally, Terminal 0, located to the east of Terminal 1, is included in this alternative. This alternative also includes the existing airfield and Central Terminal Area (CTA), with the addition of the West side of Tom Bradley International Terminal (TBIT) gating and the Midfield Satellite Concourse (MSC). Additional north/south taxiways adjacent to the MSC were incorporated in the model. Improvements to the Runway 7L Runway Safety Area (RSA) and an 850-foot extension to Runway 6R-24L were also included in the simulation. The 2025 DDFS consists of a total of 2,053 PMAD operations.
- 2025 SPAS Alternative 2, No Increase in Separation: This alternative would alter the north runway complex, eliminating the existing Taxiway Y and Z Runway 24R exits and adding two

[1] Simulations were conducted using ATAC SIMMOD Plus interface version 7.3.2

high speed exits further from the Runway 24R threshold. This configuration would allow for all Runway 24L crossings to occur on the latter two-thirds of Runway 24L. This alternative includes the existing airfield and CTA with the addition of the West side of TBIT gating and the MSC. Additional north/south taxiways adjacent to the MSC were incorporated in the model. Improvements to the Runway 7L RSA and an 850-foot extension to Runway 24L were also included in the simulation. The 2025 DDFS consists of a total of 2,053 PMAD operations.

- 2025 SPAS Alternative 3, No Project - Implement Existing Master Plan: This alternative consists of the 2004 *Final Master Plan* airfield and terminal layout with gating to accommodate the 2025 DDFS. The 2025 DDFS consists of a total of 2,053 PMAD operations.
- 2025 SPAS Alternative 4, Modified No Project - No Yellow Lights: This alternative includes the existing airfield and CTA with the addition of the West side of TBIT gating and the MSC. Additional north/south taxiways adjacent to the MSC were incorporated in the model. Improvements to the Runway 7L RSA and an 850-foot extension to Runway 24L were also included in the simulation. The 2025 DDFS consists of a total of 2,053 PMAD operations.

1.2 Document Organization

This document is organized to explain the methods, assumptions, and software used to conduct the airfield simulations. This document also examines the simulation results, beginning with the establishment of Baseline Scenario operating conditions. After the Baseline Scenario operating efficiency is determined for the simulation, future year simulations of the various alternatives are examined and compared to the Baseline Scenario.

1.3 Summary of Results

Measures of average all-weather unimpeded taxi time and average all-weather delay under 2009 operating conditions revealed an all-weather average Baseline Simulation delay of 2.38 minutes per operation and an average all-weather Baseline Simulation unimpeded time of 7.80 minutes per operation. The average all-weather throughput achieved in the 2009 Baseline Simulation was 105 operations per hour.

Measures of average all-weather delay revealed that the operating efficiency of the design alternatives ranges from a low of 5.20 minutes per operation for Alternative 1 and a high of 6.14 minutes per operation for Alternative 3. Alternative 2 resulted in an average all-weather delay of 5.38 minutes per operation and Alternative 4 resulted in an average all-weather delay of 5.98 minutes per operation.

The unimpeded taxi times associated with the alternatives ranged from 7.86 minutes per operation for Alternative 2 to 8.64 minutes per operation for Alternative 3. Alternatives 1 and 4 had average all-weather unimpeded times of 8.10 and 7.88 minutes per operation, respectively.

For a more detailed breakdown of results and accompanying explanations, refer to Section 5 of this document.

1.4 Approach

Computer simulation modeling is the analytical basis of the LAX SPAS airside demand/capacity analysis. The simulation models incorporate a description of the Airport's operating environment to simulate air traffic movements through the defined air and ground environments and provide as output data on the two critical measures used to determine airside capacity: throughput and delay.

Throughput refers to the number of aircraft operations processed by an airfield system given actual demand variability under a combination of specific operating conditions. For a given demand profile, throughput varies depending on the specific runway operating configuration and procedures. Computation of throughput is inherently more complex than computation of capacity because the demand inputs are not generalized; therefore, the computation is accomplished through computer simulation modeling techniques. At sufficiently high levels of activity, the highest throughput achieved while maintaining an acceptable level of delay is a good indicator of the capacity of the airspace and airfield systems.

Delay refers to the difference between the actual time it takes an aircraft to conduct an arrival or departure and the typical time it would take to conduct the same operation with no interference from other aircraft. Delay is a measure of a system's operating performance, indicating the efficiency with which throughput is achieved. Delay statistics generated by simulation models can be presented by hour, by user, and for different stages of an arrival or departure operation.

1.4.1 Simulation Model

SIMMOD was used for the LAX airside simulation analysis. SIMMOD was used in the LAX *Final Master Plan* analyses to simulate the movement of arriving aircraft from entry into LAX's terminal area airspace to the aircraft gate and of departing aircraft from the gate to the exit from the terminal area airspace.

SIMMOD is a planning tool used to recreate air traffic operations for the en route airspace, the terminal area airspace, and the airfield system. SIMMOD is a network-based model in which airspace and ground facilities and routes are described as a composite of nodes and links. Aircraft movements are conducted over the nodes and links that make up the airspace and ground networks. Travel time and delay information is recorded by SIMMOD as the input flights traverse the nodes and links. SIMMOD addresses the design and procedural aspects of air traffic operations and produces measures of runway throughput, aircraft travel time, and aircraft delay. Output from the simulation includes animation displays of aircraft movements over the airspace and ground-simulated networks.

Note that the simulation model is set up to account for real world conditions and variability (i.e., how pilots fly and air traffic controllers operate). Some model settings are statistically varied with each iteration. Statistical distributions allow for a range of settings to be randomly selected for any given iteration of the model. The simulation model is run for numerous iterations to account for natural variability that may occur in the system.

1.4.2 Simulation Process

The general process for quantifying the capacity and performance of LAX north airfield airside facilities using simulation modeling consisted of the following steps:

- Define the Airport's operating environment, consisting mainly of airside facilities, associated operating procedures, and aircraft activity. Airside facilities include the runway and taxiway systems and aircraft parking areas. Air traffic control operating procedures dictate runway use, aircraft taxi flows, aircraft airspace routes, and gate allocation. Aircraft activity consists of a 24-hour flight schedule representative of design day activity (the DDFS). The existing LAX operating environment is more fully described in Section 1.4.3.
- Calibrate the simulation model to ensure that the model adequately approximates actual operations at LAX. The LAX calibration compared simulated hourly operations and airfield travel times with actual performance data for March 29, 2005, collected from the airlines serving LAX.
- Simulate a set of runway operating configurations that represent annual operations at the Airport. Wind and weather conditions directly affect the use of the runway system and the operating procedures and, therefore, affect airside capacity. Runway use and procedures can also be influenced by noise abatement procedures. The DDFS is simulated independently for each modeled runway operating configuration. These configurations are described in Section 1.4.5.
- Compute annual weighted averages of aircraft delay, taxi time and throughput from the simulation results of each runway operating configuration at the same air traffic demand level. Each runway operating configuration was assigned an annual percentage use based on wind/weather analysis and noise abatement procedures to compute annual weighted

averages. The results of the Baseline Simulation LAX airside simulations for 2009 are presented in Section2 2.

1.4.3 LAX Operating Environment

The LAX operating environment for the purposes of this analysis does not include all of the operating elements in the Los Angeles Basin airspace, but instead is focused on the LAX airspace. Existing interactions between LAX and other facilities in the Los Angeles Basin airspace are taken into account in the form of in-trail restrictions used to coordinate air traffic in the Basin.

Understanding the airside operating environment at LAX is an integral element of the airside simulation analysis conducted for the LAX North Airfield Alternatives. Data describing airside operations were collected for input to the models with the following objectives:

- Understanding the key factors in the operation of the airside facilities
- Defining inputs to SIMMOD that provide performance results that are representative of existing conditions
- Establishing the basis against which future development will be evaluated

The airspace, airfield, and aircraft parking facilities and their associated operating procedures are the main Airport elements for which data were collected as input to the simulations. Characteristic wind and weather conditions are another significant element of the operating environment for which data were collected since they dictate the use of the runway system. Alternative uses of the runway system that result from variations in wind and weather conditions or noise abatement procedures were also defined. Assumptions made regarding the use of the runway system throughout the year can significantly affect performance results because airside capacity varies by airfield operating configuration. Finally, an understanding of the characteristics and volume of air traffic activity processed by the airside facilities at LAX was essential for estimating airside capacity.

The key factors of the existing airside operating environment are described under the following section headings:

- Annual Weather Conditions
- Runway Operating Configurations
- Noise Abatement Procedures
- Airspace Operating Assumptions
- Airfield Operating Assumptions

1.4.4 Annual Weather Conditions

Wind and weather conditions directly affect the use of an airport's runway system and air traffic control procedures and, therefore, affect airside capacity. For the purposes of this analysis, annual weather conditions were determined by analyzing FAA configurations taken from 8.5 years of FAA Daily Configuration by Hourly Reports from January 1, 2000, through June 30, 2008. Data were obtained from the FAA's Aviation System Performance Metrics (ASPM) Airport Efficiency module.

The direction and speed of the wind affect the direction in which aircraft operations are accommodated at an airport. Because the runways at LAX are oriented in an east-west direction, LAX operates in either west flow or east flow depending on wind conditions. Under calm wind conditions, the preferred direction is usually that which offers the most capacity and the fewest restrictions. The preferred operating flow at LAX is west flow. LAX operates in east flow when winds from the east exceed 10 knots.

Independent of the operating direction, ceiling and visibility conditions at an airport determine the air traffic control procedures in effect. Ceiling is the height above the earth's surface of the lowest layer of clouds or obscuring phenomena, which is reported as broken, overcast, and not classified as thin or partial. Visibility is the ability to see and identify prominent unlit objects by day and prominent lit objects by night. Ceiling and visibility vary with cloud conditions, fog, precipitation, and haze. The primary air traffic control procedures at LAX for various ceiling and visibility conditions are shown in **Table 1**.

Table 1

Weather Criteria – Airport Operating Configurations

Configuration	Weather Criteria
Visual Flight Rules (VFR)	Ceiling Height ≥ 5,000 ft and Visibility ≥ 3 mi
Instrument Landing System (ILS)	Ceiling Height ≥ 600 ft and < 5000 ft and Visibility ≥ 2 mi
Instrument Meteorological Conditions (IMC)	Ceiling Height < 600 ft or Visibility < 2 mi

Source: Federal Aviation Administration, Aviation System Performance Metrics, Airport Efficiency module.

1.4.5 Runway Operating Configurations

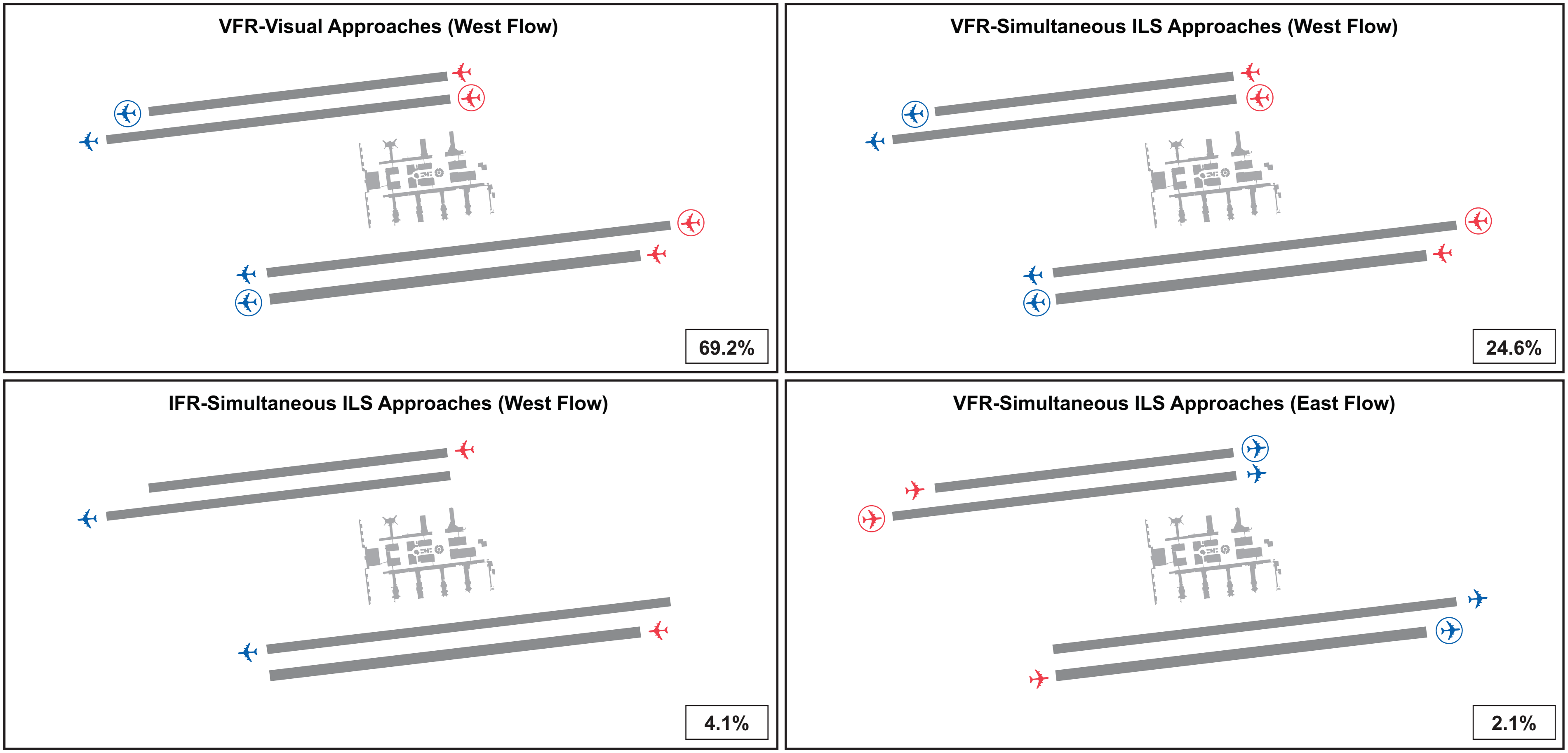
From the results of the weather analysis, four primary runway operating configurations were selected to represent existing operating conditions as LAX. The four runway operating configurations are illustrated on **Figure 1**.

The LAX FAA Airport Traffic Control Tower (ATCT) provides air traffic control for arriving and departing aircraft within approximately 5 nautical miles of the Airport and on the airfield. Runway assignment is initially determined by the route flown. During non-peak periods, ATCT staff can change the runway assignment to allow aircraft to land on the runway complex closest to their gate (pro-parking runway assignment).

LAX has a waiver to FAA Order 8400.9, *National Safety and Operational Criteria for Runway Use Programs*. This waiver permits operations with a tailwind component of up to 10 knots (the standard is 5 knots) and is applicable to wet and dry runways. Because of the consistent weather conditions in the Los Angeles Basin, and the use of this waiver, LAX is operated in the more efficient west flow arrival and departure configuration 97.9 percent of the time between 6:30 a.m. and 11:59 p.m. Standard operating procedures are in place at the ATCT and Southern California (SoCal) Terminal Radar Approach Control (TRACON), defining runway assignment criteria for arriving and departing aircraft and their Standard Terminal Approach Route (STAR) and Standard Instrument Departure (SID) route assignments. STARs and SIDs are the airspace routes aircraft follow between the terminal and the en route airspace when operating under instrument flight rules (IFR). Controllers can balance traffic demand by dynamically metering runway assignments.

The LAX main terminal complex is situated between two sets of dual parallel runways. The north runway complex consists of Runways 6L-24R and 6R-24L and includes the north gates at TBIT, the West Pad gates, and the Terminal 1, 2, and 3 gates. The south runway complex consists of Runways 7L/25R and 7R/25L and includes the American Eagle gates, the south gates at TBIT, and the Terminals 4, 5, 6, 7, and 8 gates. The cargo and general aviation (GA) parking areas south of Runway 7R/25L are not part of the CTA and do not serve commercial passenger operations. The airfield also has three designated holding areas for aircraft that are temporarily delayed upon arrival because their assigned gates are occupied and no alternate gates are available. The north complex holding area is west of TBIT and east of the West Pad. The south complex has two holding areas, one east of Taxiway AA on Taxiway C and the other north of Taxiway C4 on Taxiway C.

This page intentionally left blank.



Notes:
1/ Runway operating configurations reflect the primary runway uses between the hours of 7:00a.m. to 10:00 p.m.
2/ ILS= instrument landing system; VFR = visual flight rules

Legend

- Primary Arrivals
- Primary Departures
- Secondary Arrivals
- Secondary Departures

Not to Scale **north**

Sources: LAX Airport Layout Plan, February 2005; Aviation System Performance Metrics Efficiency Module (2000-2008), Accessed September 25, 2008.
Prepared by: Ricondo & Associates, Inc., March 2009.

LAX Specific Plan Amendment Study Report

Runway Operating Configurations

Figure 1

This page intentionally left blank.

Four runway operating configurations were modeled for each of the airfield alternatives. The primary arrival and departure runway assignments place arrivals on the outboard runways, 6L-24R and 7R/25L, and departures on the inboard runways, 6R-24L and 7L/25R. Weather conditions (ceiling height, visibility, and wind direction/speed) determine which configuration the FAA ATCT uses at a given time. The four modeled configurations and their annual percentage use are listed below.[2] See Figure 1 for illustrations of the four runway operating configurations:

- Visual flight rules (VFR) with visual approaches – West Flow (69.2%)
- VFR with simultaneous instrument landing system (ILS) approaches – West Flow (24.6%)
- IMC with instrument approaches – West Flow (4.1%)
- VFR with simultaneous ILS approaches – East Flow (2.1%)

1.4.6 Noise Abatement Procedures

LAX Air Traffic Control is responsible for implementing several noise abatement operating procedures and restrictions adopted by LAWA and the FAA. The noise abatement operating procedures contained in the LAX Rules and Regulations affect the use of existing airside facilities and, in some cases, restrict airside capacity. The LAX SPAS EIR airside demand/capacity analysis did not incorporate noise abatement procedures into the definition of the existing operating environment. All but the Over-Ocean runway operating configuration were modeled for each of the four major runway operating configurations. The Over-Ocean operating procedure is in effect between midnight and 6:30 a.m. It consists of departures on Runway 25R and arrivals on Runway 6R when weather permits safe operation.

The Over-Ocean runway operating configuration was not included in this analysis because the hours during which it is in effect do not typically involve a peak level of operations.

1.4.7 Airspace Operating Assumptions

This section describes arrival and departure procedures within the confines of the SoCal TRACON for aircraft arriving to and departing from LAX. Aircraft only transitioning through the TRACON's airspace were not considered in this analysis.

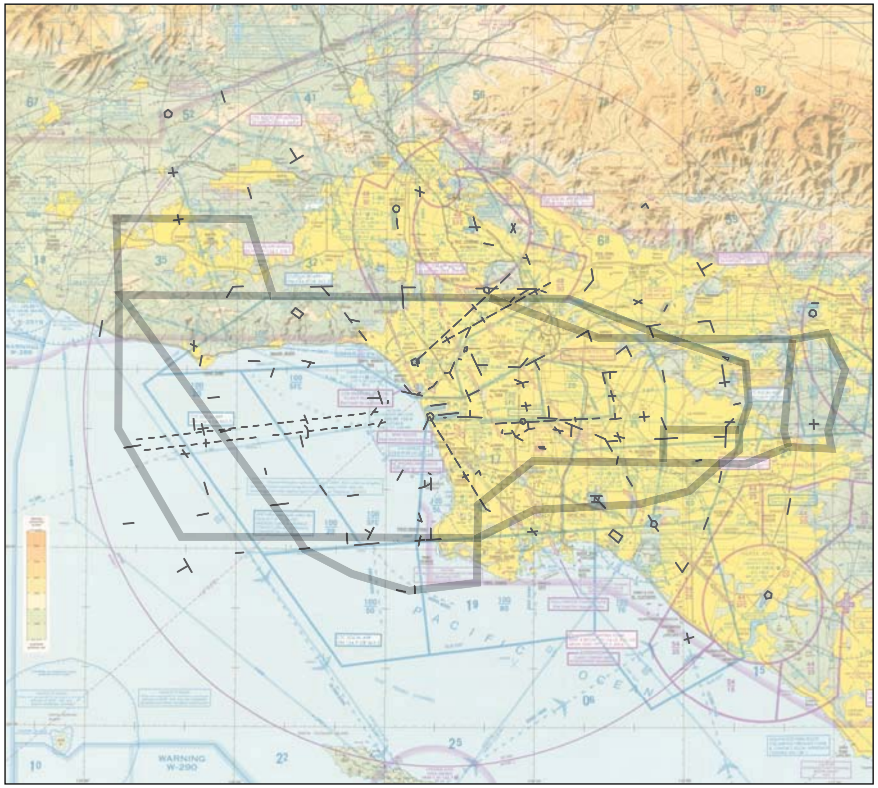
The airspace delegated to the TRACON by the Los Angeles Air Route Traffic Control Center (ARTCC) for the control of arrival and departure operations at LAX, depicted on **Figure 2**, is divided into nine sectors. Each sector is a vertically and horizontally defined volume of airspace managed by air traffic controllers. Each sector provides arrival, departure, or en route air traffic services. In some cases, these operations may coexist from the surface to 13,000 feet above mean sea level (MSL).

The ARTCC and TRACON handle the transitions of arriving and departing aircraft through prescribed arrival and departure corridors, as depicted on **Figures 3** and **4** respectively. To ensure that aircraft remain within the confines of the appropriate arrival and departure sector, aircraft are assigned STARs and SIDs. These arrival and departure routes are published for pilots in graphic and text form. They provide precise routes and altitudes for pilots to follow into and out of terminal airspace. **Tables 2** and **3** identify the STARs and SIDs, respectively, in effect in 2009. Arriving traffic enters terminal airspace in five streams, which merge into three, then two, streams, one to the north runway complex and one to the south runway complex. Initially, aircraft are assigned to either the north or south runway complex based on the airspace fix over which they enter the LAX airspace. However, if necessary, all arrivals may be reassigned to an alternate runway complex to balance airfield operations. These decisions are made by Traffic Management Specialists at the LAX ATCT, SoCal TRACON, or Los Angeles ARTCC, depending on traffic demands and how responsibilities are allocated.

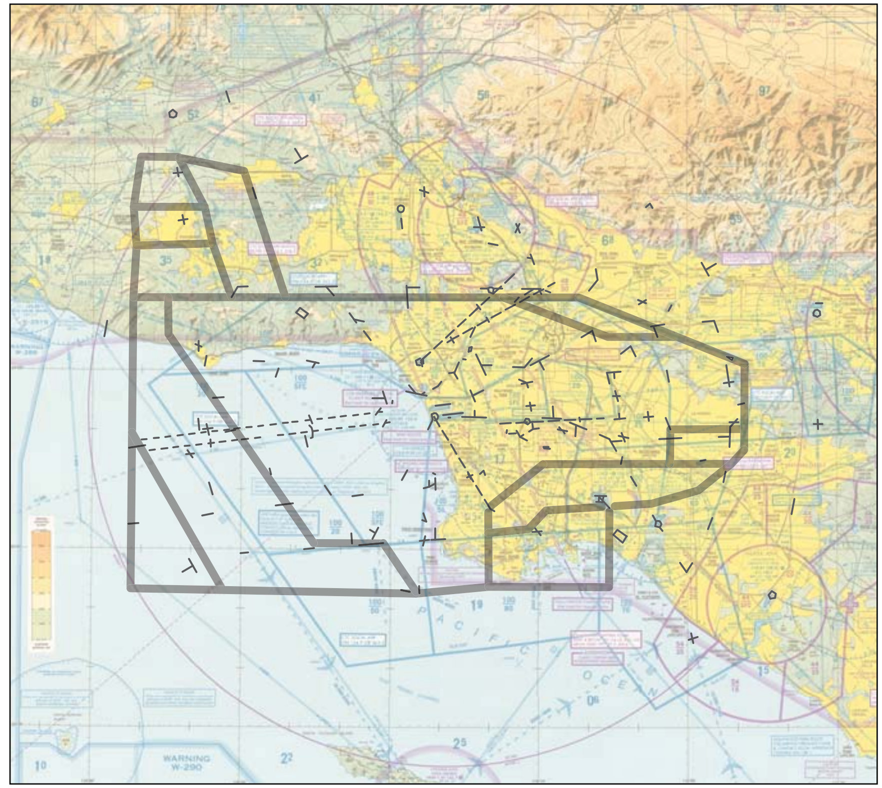
[2] Aviation System Performance Metrics, Airport Efficiency module (2000-2008), accessed September 25, 2008.

This page intentionally left blank.

West Flow LAX Airspace Sector Areas



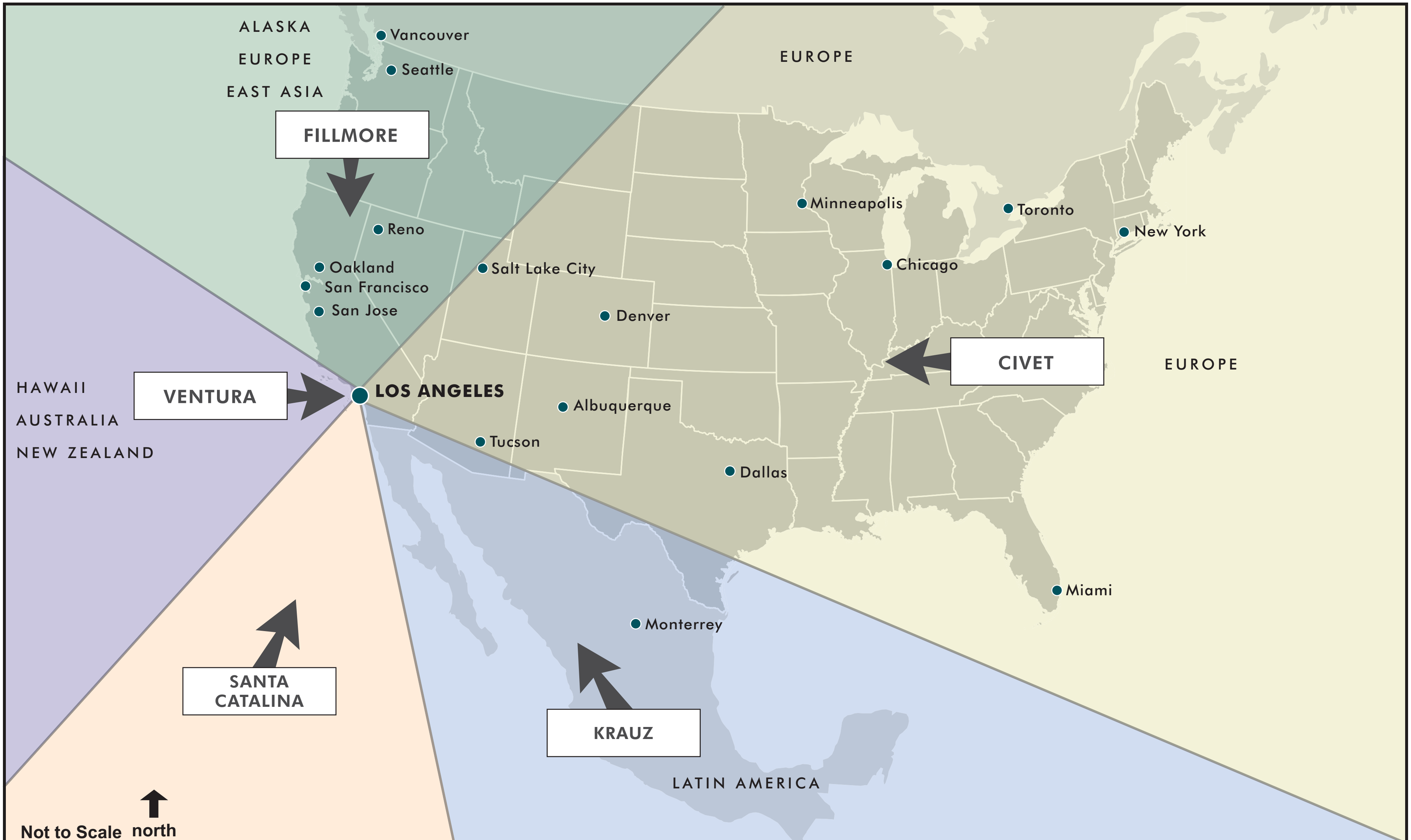
East Flow LAX Airspace Sector Areas



Not to Scale **north**

Sources: SoCal TRACON, February 22, 2007; LAX Airpot Traffic Control Tower, February 22, 2007.
Prepared by: Ricondo & Associates, Inc., March 2009.

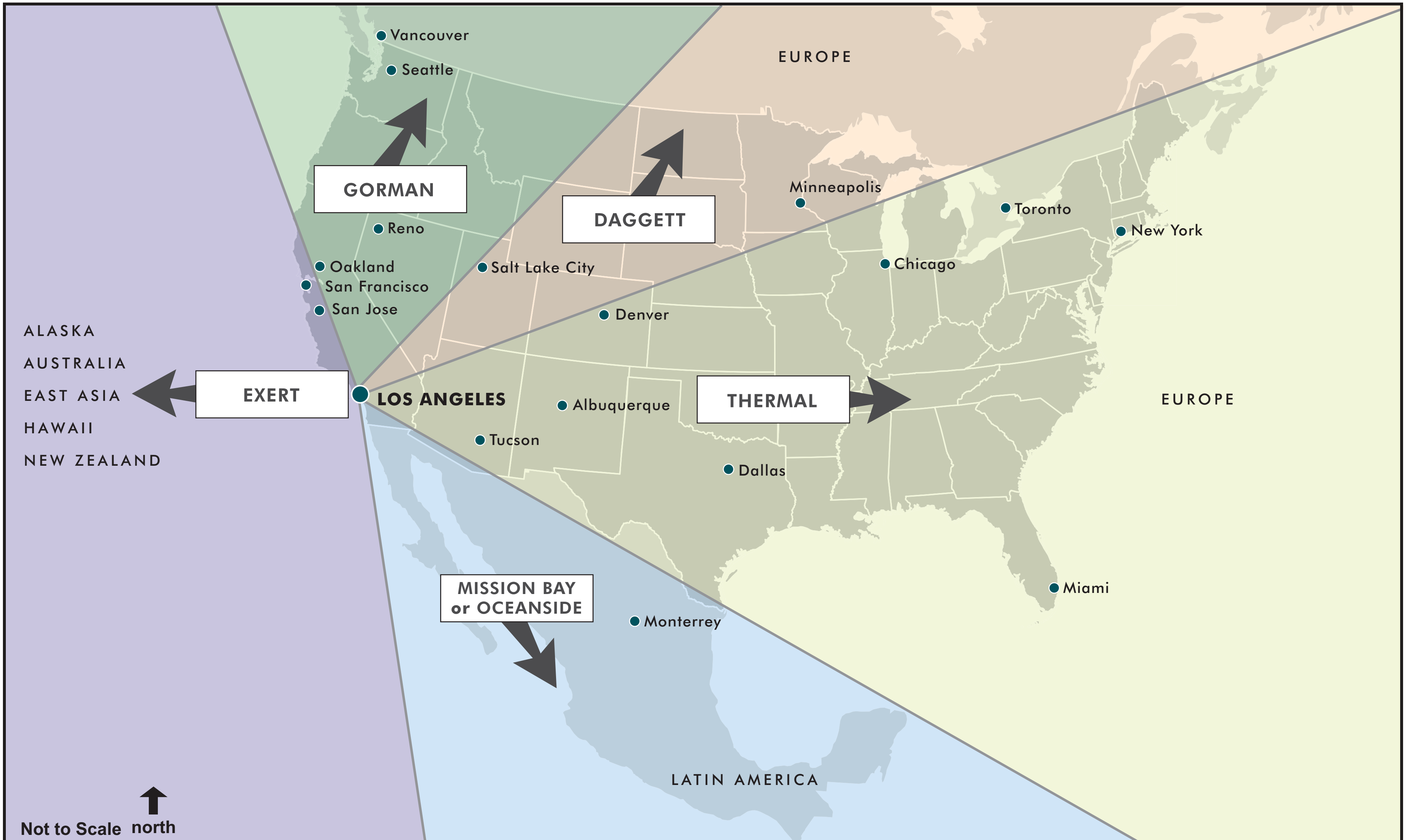
This page intentionally left blank.



Sources: SoCal TRACON, February 22, 2007; LAX Airport Traffic Control Tower, February 22, 2007; LAX Master Plan, Final Draft, Chapter II, April 19, 1996.
Prepared by: Ricondo & Associates, Inc., March 2009.

LAX Specific Plan Amendment Study Report	Arrival Corridors	Figure 3

This page intentionally left blank.



Sources: SoCal TRACON, February 22, 2007; LAX Airport Traffic Control Tower, February 22, 2007; LAX Master Plan, Final Draft, Chapter II, April 19, 1996.
Prepared by: Ricondo & Associates, Inc., March 2009.

LAX Specific Plan Amendment Study Report	Departure Corridors	Figure 4

This page intentionally left blank.

Table 2

Standard Terminal Arrival Routes

STAR	Flow	Runway	Corridor
Baset Three	East	6L/R 7L/R	Civet
Civet Five	West	24L/R 25L/R	Civet
Downe Four	East	6L/R 7L/R	Civet
Kimmo Two	West	24L/R 25L/R	Fillmore
Leena Four	West	25L	Fillmore
Mitts Two	West	24L/R 25L/R	Civet
Moorpark Three	East	6L/R 7L/R	Fillmore
Mudde Four	West	25R	Civet
Ocean Two	East	6L/R 7L/R	Krauz
Paradise Four	West	24L/R 25L/R	Civet
Redeye Two	East	6R	Civet
Reedr Three	East	6L/R 7L/R	Civet
Sadde Six	West	24R	Fillmore
Seavu One	West	24L/R 25L/R	Civet
Shive One	West	24L/R 25L/R	Santa Catalina/Krauz
Vista Two	West	24L/R 25L/R	Santa Catalina/Krauz

Source: Federal Aviation Administration, LAX Airport Traffic Control Tower, SoCal TRACON, February 22, 2007.

Table 3

Standard Instrument Departures

SID	Flow	Runway	Corridor
Catalina Five	East	All	Exert
Chaty Two	East	All	Exert
Gabre Five	East	All	Daggett
Gorman Four	East / West	All	Gorman
Holtz Seven	West	All	Thermal
Imper One	East		Thermal
Karvr One	West	All	Mission Bay Oceanside
Laxx Five	West	All	Thermal
Loop Four	West	All	Daggett
Oshnn One	West	All	Daggett
Perch Nine	East	All	Exert
San Diego Five	East	All	Mission Bay Oceanside
Seal Beach Five	East / West	All	Thermal
Sebby Four	West	All	Daggett
Ventura Five	East / West	All	Exert Gorman

Source: Federal Aviation Administration, LAX Airport Traffic Control Tower, SoCal TRACON, February 22, 2007.

ATCT personnel provide air traffic control services to the pilots of arriving and departing aircraft within approximately 5 nautical miles of the Airport and on the airfield.

1.4.7.1 Separation Standards

Separation standards define the minimum longitudinal (in front of or behind), lateral (side by side), or vertical (above or below) distances between aircraft. In the terminal radio detection and ranging ("radar" herein) environment, four forms of separation are most commonly applied:

- Vertical separation in the TRACON or ATCT airspace is 1,000 feet. As an example, altitude separation is applied between an arriving aircraft assigned to fly at 6,000 feet above MSL and a departing aircraft by assigning the departing aircraft to fly at 5,000 feet above MSL until the aircraft are clear of one another and can safely continue their descent or climb.
- Lateral separation in the TRACON or ATCT airspace is 3 nautical miles for radar separation within 40 nautical miles of the radar antenna.
- Longitudinal separation in the TRACON or ATCT airspace is applied to aircraft operating in-trail of each other, as described in **Table 4**.
  - Sequential arrivals are allowed to use a reduced separation on the final 2.5 nautical miles so long as wake turbulence separation restrictions are not violated. During visual meteorological conditions (VMC), the separation can be less than 2.5 nautical miles, but no less than 2.0 nautical miles. Sequential arrivals on both inboard runways during peak arrival periods operate with a 10- to 15-nautical mile in-trail interval over the arrival runway threshold. During instrument meteorological conditions (IMC), because departures are dependent on arrivals, sequential arrivals are required to maintain appropriate separation to facilitate sufficient departure throughput.
- Visual separation - there are two ways to effect this separation:
  - The ATCT controller sees the aircraft involved and issues instructions, as necessary, to ensure that the aircraft avoid each other.
  - A pilot sees another aircraft and, pending instructions from a controller, provides his/her own separation by maneuvering the aircraft as necessary to avoid the other aircraft. This process may require following another aircraft or keeping it in sight until it is no longer a factor.

Table 4

Separation Standards

	In-Trail Separations (nautical miles)				
	Trailing Aircraft				
Lead Aircraft	**Heavy**	**B-757**	**Large**	**Small+**	**Small**
Heavy	4	5	5	6	6
B-757	4	4	4	5	5
Large	3	3	3	4	4
Small+	3	3	3	3	3
Small	3	3	3	3	3

Note: Heavy (>255,000 pounds); Large (>41,000 pounds and ≤255,000 pounds); Small+ (>12,500 pounds and ≤41,000 pounds); Small (≤12,500 pounds). The shaded areas indicate those combinations of lead and trail aircraft for which the reduced separation on final approach criterion of 2.5 nautical miles is allowable within 10 nautical miles of the runway threshold. These separations are for aircraft operating directly behind, or directly behind and less than 1,000 feet below, or following an aircraft conducting an instrument approach. These separations apply to the wake turbulence for aircraft landing behind another aircraft on the same runway. Separations may be reduced under visual approach procedures when a pilot has the leading aircraft in sight and is instructed by ATC to maintain visual separation.

Source: Federal Aviation Administration, Order 7110.65, *Air Traffic Control*, February 16, 2006.

1.4.7.2 West Flow

Figure 5 depicts the generalized routes used during west flow operations. Simultaneous visual approaches between the north and south runway complexes were simulated in accordance with the TRACON's supplemental requirement to the requirements in FAA Order 7110.65, *Air Traffic Control,* which states:

> Provided aircraft flight paths do not intersect, visual approaches may be conducted to one complex while visual or instrument approaches are conducted simultaneously to the other complex provided standard separation is maintained (three [3] miles, 1000 feet, course divergence, or visual separation) until one of the aircraft has been issued and the pilot has acknowledged receipt of the visual approach clearance and the other aircraft is established on a heading which will intercept the extended centerline of the runway at an angle not greater than 30 degrees and the pilot has been instructed to join the localizer/final approach course.

Arriving aircraft were assigned to a STAR based on the location of the origin airport and the arrival corridor they use. See Table 2 for a listing of arrival routes. Departures were assigned to a SID based on the destination airport and the corresponding departure corridor. See Table 3 for a listing of instrument departures.

1.4.7.3 East Flow

Figure 6 depicts the routes used during east flow operations. Simultaneous operations are conducted in east flow but landings do not occur on Runway 7L. Arrivals and departures were assigned routes using the same logic as that applied in west flow.

1.4.8 Airfield Operating Assumptions

LAX has two sets of dual dependent parallel runways. The north runway complex consists of Runways 6R-24L and 6L-24R and the south runway complex consists of Runways 7R/25L and 7L/25R.

The LAX taxiway system is characterized by dual parallel taxiways that border the main terminal area from the northeast to the southeast ends of the terminal. On the south side, dual parallel Taxiway B and Taxilane C extend west from the terminal core beyond the Runway 7L end and east from the terminal core to the United Airlines maintenance area. In front of the United Airlines maintenance area, the taxiways have dual taxiing restrictions. Beyond the United Airlines maintenance area, Taxiway B extends to the Runway 25R end. On the north airfield, only Taxiway E extends west of the newly constructed Taxiway R to the Runway 6R end. The existing (2009) airfield is depicted on **Figure 7**.

The primary taxi routes used in the 2009 Baseline Scenario simulations for aircraft arrivals and departures taxiing between the runways and the gates or hangar areas are illustrated on **Figures 8** and **9**, respectively, for west flow operations and **Figures 10** and **11**, respectively, for east flow operations. The dual parallel taxiways surrounding the main terminal area were modeled in a single direction in both flows.

Taxiway B operations flow east and Taxilane C operations flow west in west flow. These directions are reversed in east flow except for the last segment of Taxiway B from Taxiway B-16 to Taxiway M, which is used to queue Runway 7L departures.

Taxiway E is bidirectional west of Taxiway Q in west flow to allow access to the West Pad gates. Aircraft primarily use Taxiways Q and S to taxi north and south between the runway complexes.

1.4.8.1 Runway Exit Distribution

SIMMOD randomly selects aircraft exits based on the probability distributions assigned to aircraft/runway exit combinations. If the first selected runway exit is occupied, the model assesses whether or not any other compatible exits are available. If none are available, the aircraft occupying the exit will be given priority to cross the inboard runway, allowing the trailing aircraft to land and use the runway exit.

The runway exit use distributions were obtained from observations on March 21 and 22, 2007.

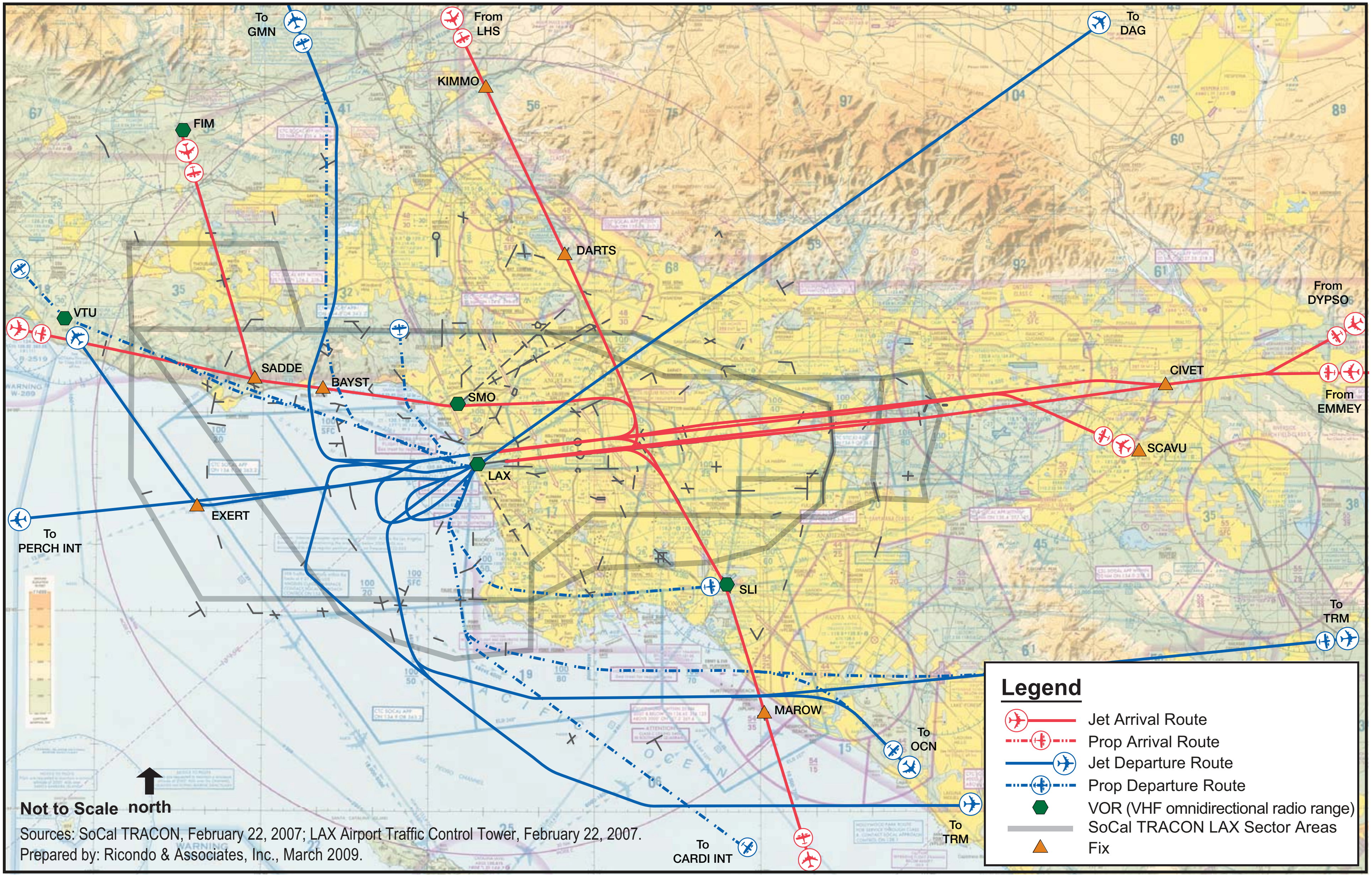
Additionally, discussions were held with LAX ATCT staff to ensure the accuracy of the simulated operating activity, including runway use and exit taxiways.

1.4.8.2 Taxi Flows

Aircraft ground movements were simulated in consultation with LAWA and FAA ATCT representatives. The simulated routes are considered typical or standard. Routing may be altered depending on current traffic conditions, but such alterations are not frequent enough to be considered statistically significant and were not, therefore, captured in the simulation modeling. Figures 8 and 9 depict the standard ground movement assumptions for aircraft arriving and departing, respectively, in west flow. Figures 10 and 11 depict the standard ground movement assumptions for aircraft arriving and departing, respectively, in east flow.

Runway crossing start up times for arriving aircraft were simulated to vary between 40 seconds and 60 seconds. This range includes all time elapsed from when an arriving or departing aircraft passes the holding aircraft and a controller issues clearance to cross the runway to when the aircraft begins the runway crossing.

This page intentionally left blank.

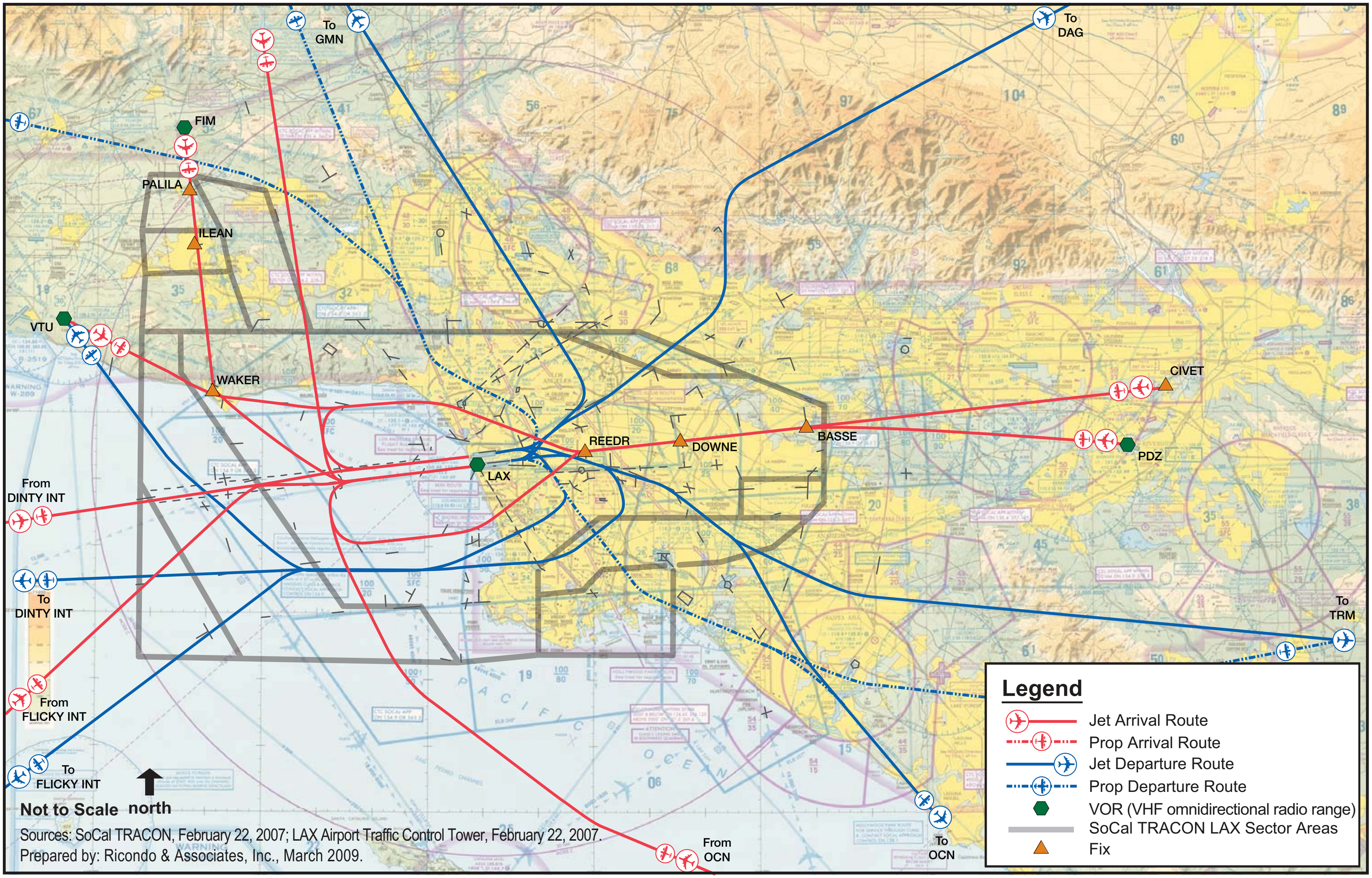


LAX Specific Plan Amendment Study Report

Generalized West Flow Airspace Routes

Figure 5

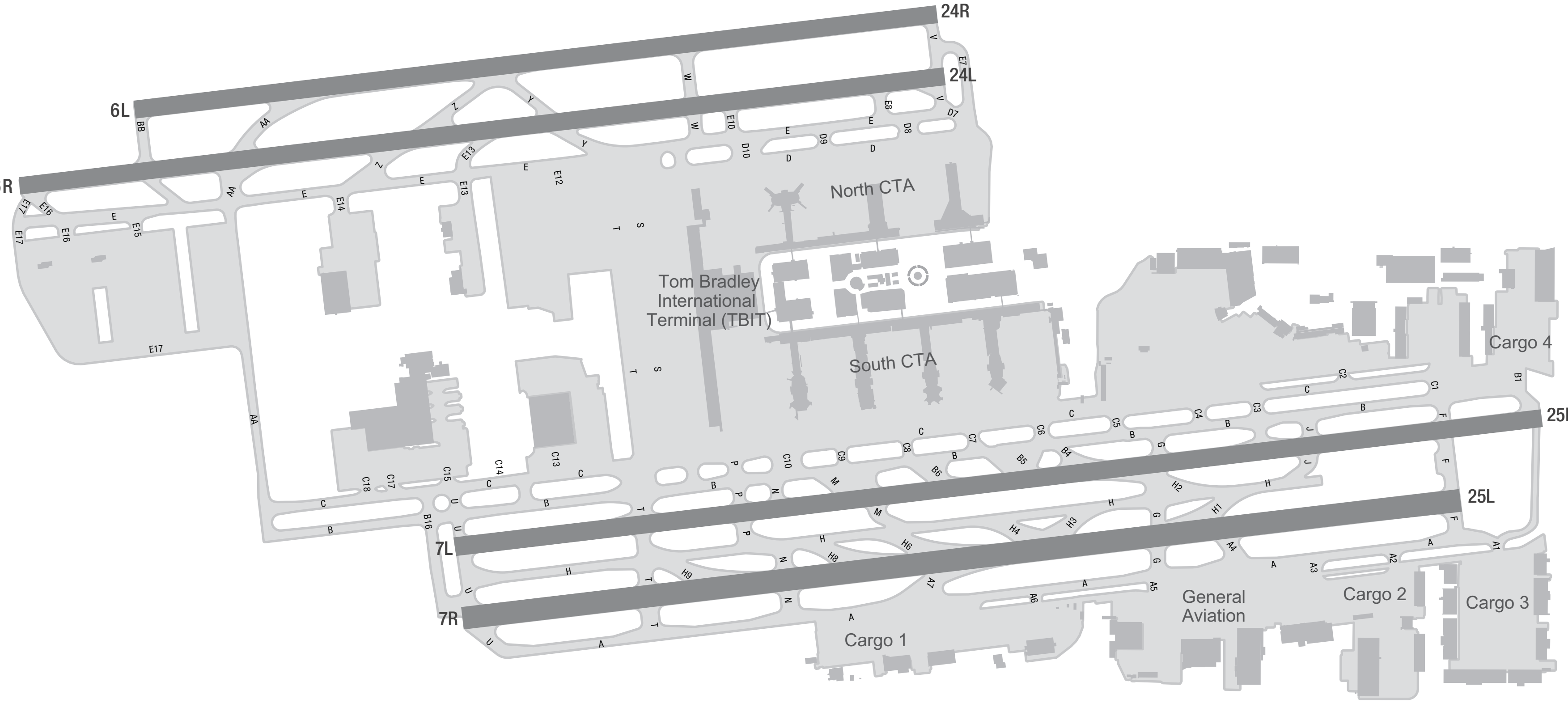
This page intentionally left blank.



Sources: SoCal TRACON, February 22, 2007; LAX Airport Traffic Control Tower, February 22, 2007.
Prepared by: Ricondo & Associates, Inc., March 2009.

LAX Specific Plan Amendment Study Report	Generalized East Flow Airspace Routes	Figure 6

This page intentionally left blank.

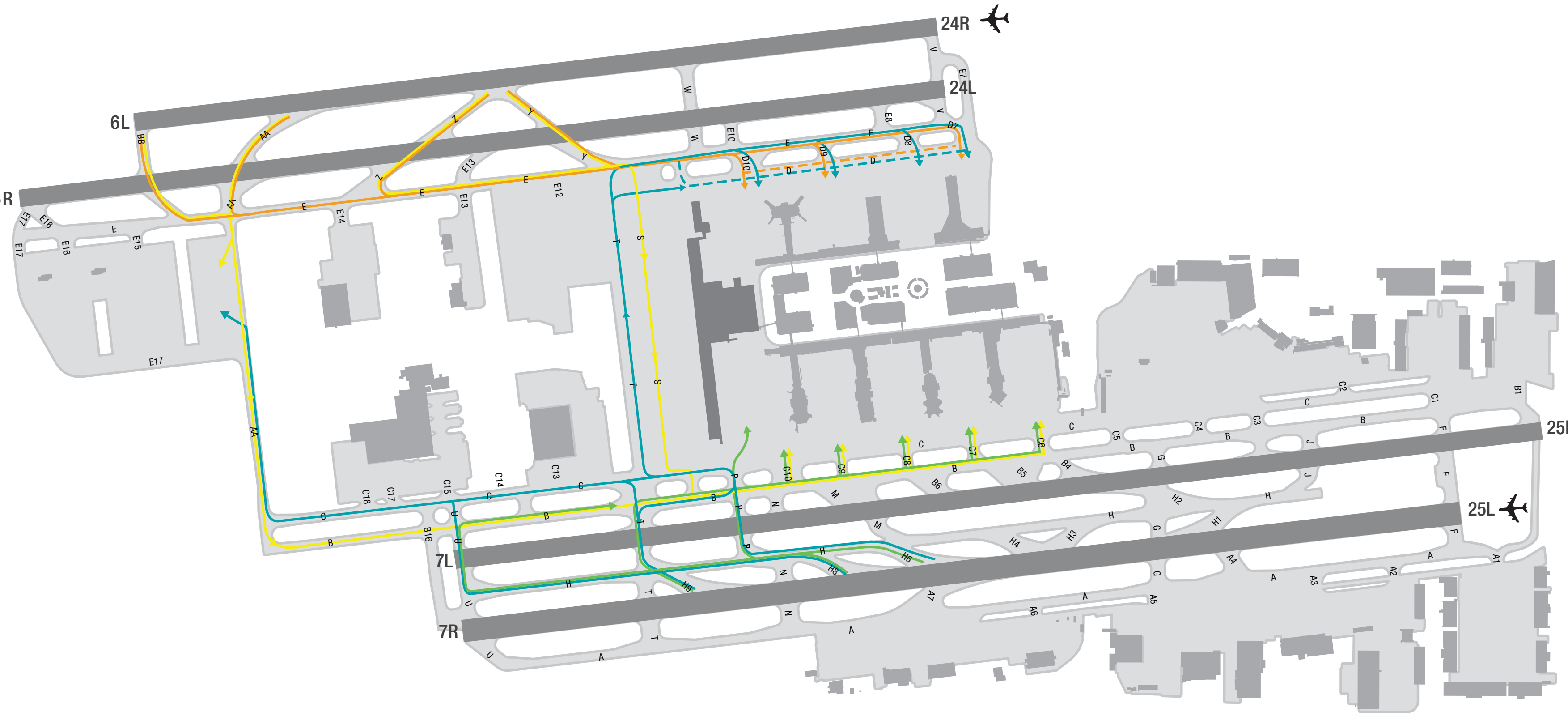


Not to Scale **north**

Source: LAWA, February 2005 (LAX Airport Layout Plan).
Prepared by: Ricondo & Associates, Inc., October 2010.

LAX Specific Plan Amendment Study Report	2009 Baseline Airfield	Figure 7

This page intentionally left blank.



Legend

- North Arrival to South CTA
- North Arrival to North CTA
- South Arrival to South CTA
- South Arrival to North CTA
- Alternate Route to North CTA
- Alternate Route to North CTA
- North Arrival to Cargo/GA
- South Arrival to Cargo/GA
- Primary Arrival

Notes: CTA = central terminal area; GA = general aviation.

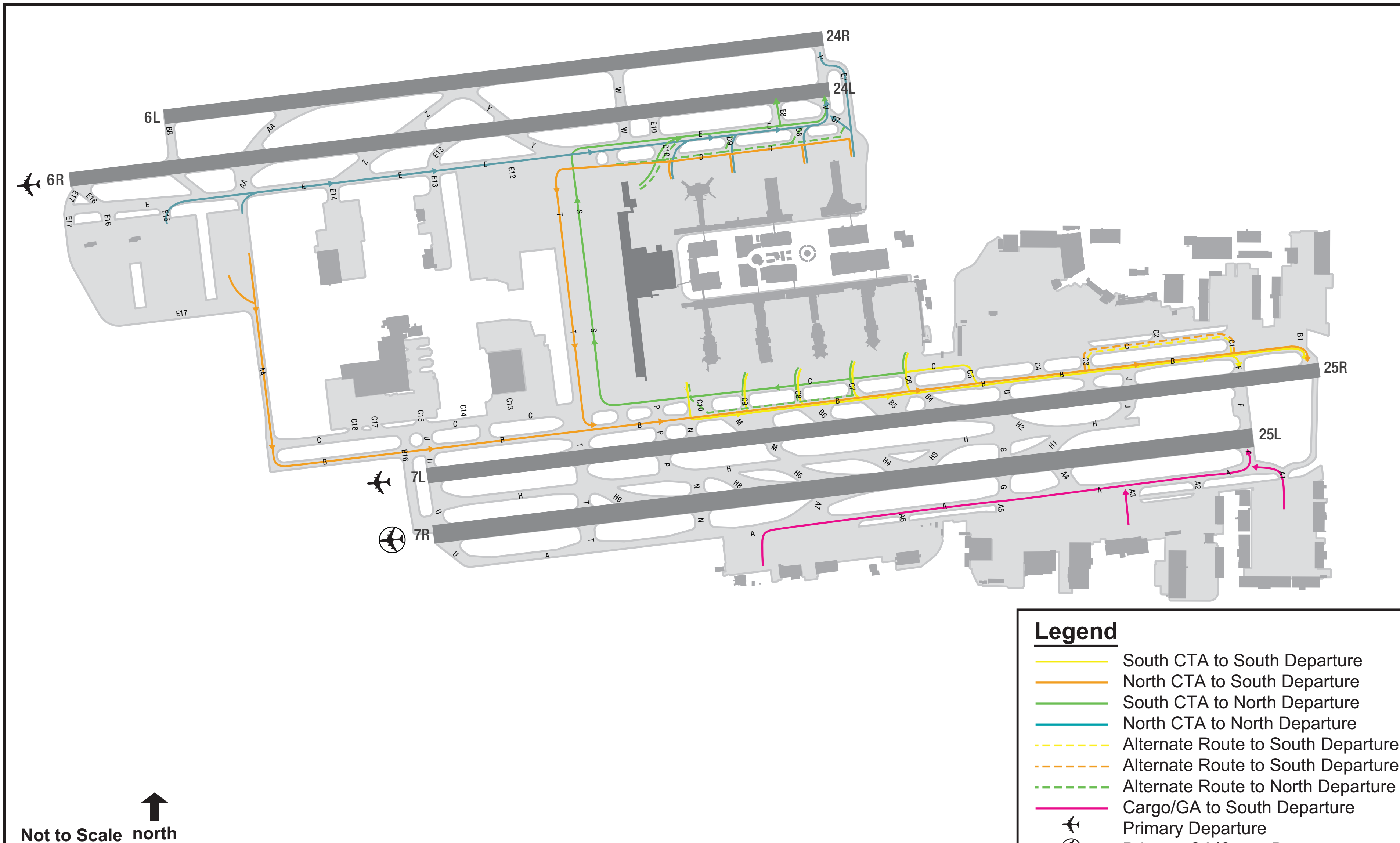
Not to Scale **north**

Sources: LAWA, February 2005 (LAX Airport Layout Plan); FAA ATCT, December 2008.
Prepared by: Ricondo & Associates, Inc., October 2010.

2009 Baseline Standard Arrival Taxipaths (West Flow)

Figure 8

This page intentionally left blank.



Sources: LAWA, February 2005 (LAX Airport Layout Plan); FAA ATCT, December 2008.
Prepared by: Ricondo & Associates, Inc., October 2010.

2009 Baseline Standard Departure Taxipaths (West Flow)

Figure 9

This page intentionally left blank.

Legend

- North Arrival to South CTA
- North Arrival to North CTA
- South Arrival to South CTA
- South Arrival to North CTA
- North Arrival to Cargo/GA
- South Arrival to Cargo/GA
- ✈ Primary Arrival

Notes: CTA = central terminal area; GA = general aviation.

Not to Scale **north**

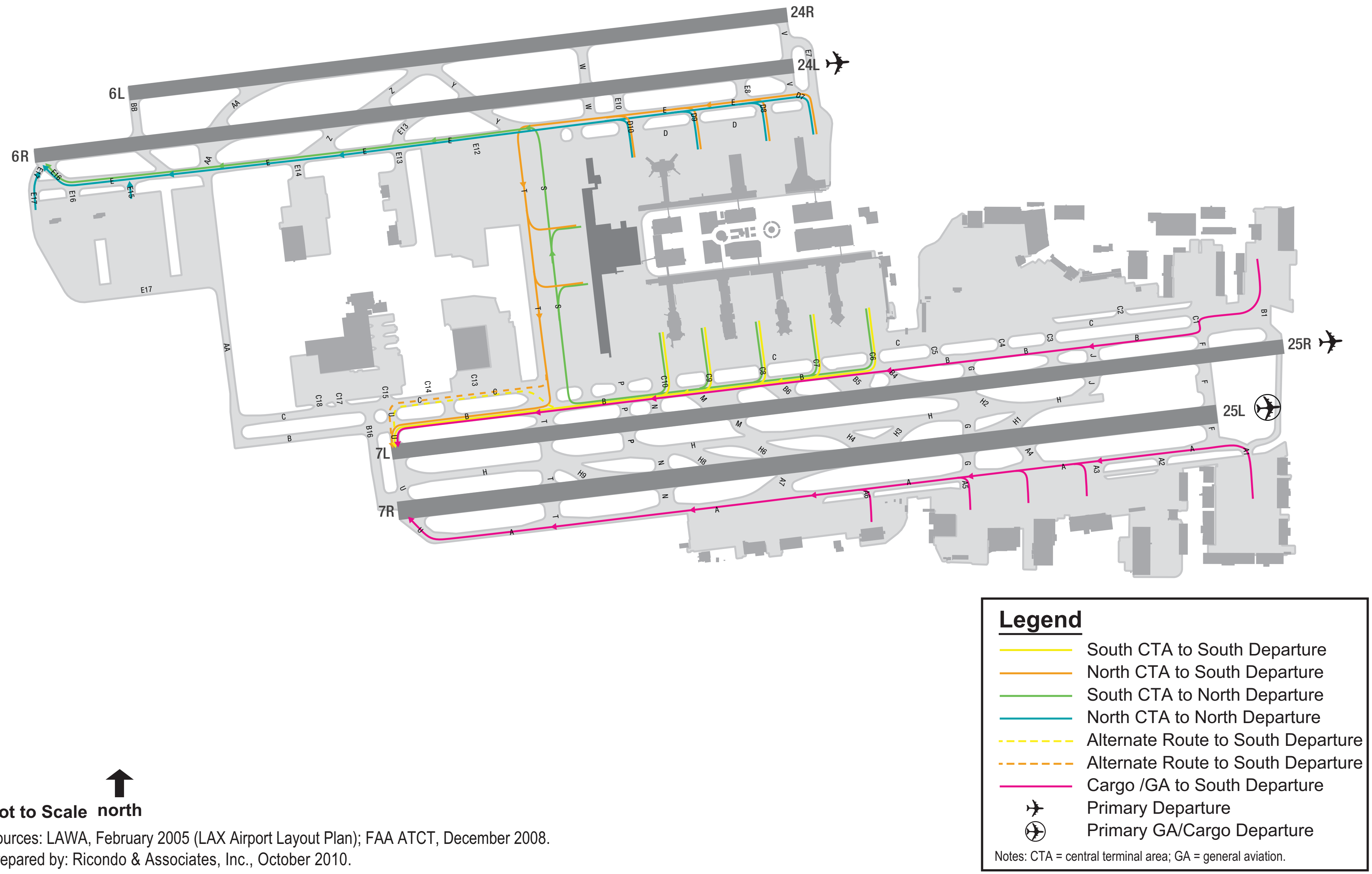
Sources: LAWA, February 2005 (LAX Airport Layout Plan); FAA ATCT, December 2008.
Prepared by: Ricondo & Associates, Inc., October 2010.

LAX Specific Plan Amendment Study Report

2009 Baseline Standard Arrival Taxipaths (East Flow)

Figure **10**

This page intentionally left blank.



Sources: LAWA, February 2005 (LAX Airport Layout Plan); FAA ATCT, December 2008.
Prepared by: Ricondo & Associates, Inc., October 2010.

LAX Specific Plan Amendment Study Report

2009 Baseline Standard DepartureTaxipaths (East Flow)

Figure
11

This page intentionally left blank.

All taxiing speeds were assumed to be 15 knots (approximately 17 miles per hour) unless the taxiway was defined as a high-speed exit, in which case the taxiing speed was assumed to be 35 knots (approximately 40 miles per hour). Departure queues were located at the departure threshold for all runways and, in west flow only, intersection departure queues were located at Taxiway E-8 for Runway 24L and at Taxiway F for Runway 25R. Airplane Design Group (ADG) VI (i.e., an Airbus 380 and a Boeing 747-800) departure queues were located on the adjacent parallel taxiways (prior to the aircraft turning to enter the runway) at the departure threshold, with the exception of the Runway 25L ADG VI departure queue, which was modeled on Taxiway A near the south cargo facilities.

1.4.8.3 Gate Positions

Figure 12 illustrates the gate positions for 2009. The 2009 gate positions and assumptions are described in Appendix F-1.

1.4.9 <u>Design Day Activity and Performance Measures</u>

1.4.9.1 Design Day Aircraft Operations

The 2009 DDFS is based on Official Airline Guides, Inc. (OAG) data and was forecast to represent a PMAD in 2009. The resulting design day aircraft operations are summarized in **Table 5**. The 2009 daily operations were forecast to number approximately 56 million annual passengers (MAP). Each flight was assigned to a "scheduled" gate for simulation purposes. For a detailed discussion of the methodology and assumptions used to develop the 2009 DDFS, refer to Appendix F-1.

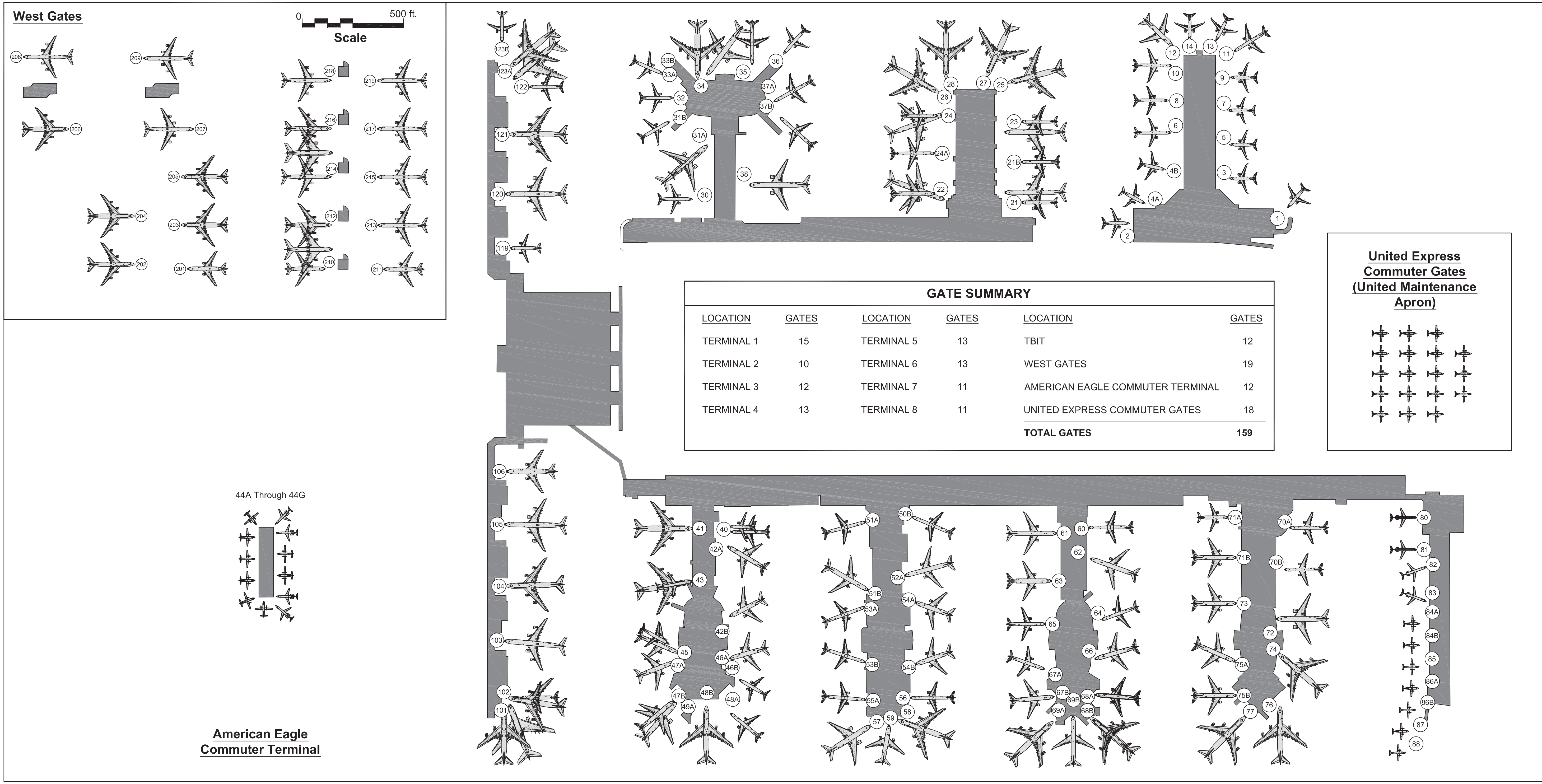
Table 5

2009 Design Day Aircraft Operations

Air Carrier	881
Commuter	248
Alaska/Hawaii	66
Total Domestic	**1,195**
International	243
Total Commercial	**1,438**
Cargo	58
General Aviation, Military, and Charter	67
TOTAL	**1,563**

Source: Ricondo & Associates, Inc., Appendix F-1, *LAX 2009-2025 Passenger Forecast and Design Day Flight Schedule Development*, July 2012.

This page intentionally left blank.



GATE SUMMARY

LOCATION	GATES	LOCATION	GATES	LOCATION	GATES
TERMINAL 1	15	TERMINAL 5	13	TBIT	12
TERMINAL 2	10	TERMINAL 6	13	WEST GATES	19
TERMINAL 3	12	TERMINAL 7	11	AMERICAN EAGLE COMMUTER TERMINAL	12
TERMINAL 4	13	TERMINAL 8	11	UNITED EXPRESS COMMUTER GATES	18
				TOTAL GATES	**159**

Notes: Aircraft parking positions are shown for illustrative purposes only; assuming flexibility in passenger loading bridge, fuel pit, terminal access and locations, and including some tow in/tow out and segmented pushback operations.

TBIT: Tom Bradley International Terminal

0 400 ft.
Scale north

Source: Los Angeles World Airports, 2010 (Current Gate Positions dated September 8, 2008, August 19, 2010 and various updates based on actual conditions in August 2009).
Prepared by: Ricondo & Associates, Inc., May 2012.

2009 Baseline Conditions
Gate Positions

Figure
12

This page intentionally left blank.

1.4.9.2 Definition of Performance Measures

Throughput and delay were defined as key metrics at the beginning of this Section. A more detailed description of the various statistics calculated from the SIMMOD output is provided below.

Throughput is reported in this analysis for peak 60-minute (rolling hour) periods throughout the simulation day. Peak hour throughput was ultimately used to estimate capacity and is reported as follows:

- **Peak Arrival Hour Throughput** - Number of arrival and departure operations occurring during the single 60-minute period with the largest number of aircraft arrivals.
- **Peak Departure Hour Throughput** - Number of arrival and departure operations occurring during the single 60-minute period with the largest number of aircraft departures.
- **Peak Operations Hour Throughput** - Number of arrival and departure operations occurring during the single 60-minute period with the largest number of total aircraft operations.

Peak hour arrivals, peak hour departures, and total peak hour operations are likely to occur in 3 different hours depending on the distribution of aircraft activity throughout the day.

Delay and travel times are reported for different phases of flight, thereby providing the ability to identify factors that are most constraining on the overall operation of the Airport. Delays used in assessing airside capacity are defined as follows:

- **Arrival Airspace Delay (per operation)** - Airborne arrival delay incurred at and inside the arrival airspace fix.
- **Arrival Ground Delay (per operation)** - Delay incurred between the runway exit and the gate as a result of airfield congestion, runway crossings, or waiting for a gate.
- **Arrival Unimpeded Taxi Time (per operation)** - Unrestricted travel time from the runway exit to the gate based on distance and speed.
- **Departure Unimpeded Taxi Time (per operation)** - Unrestricted travel time from the gate to the departure runway entrance based on distance and speed.
- **Departure Ground Delay (per operation)** - Delay incurred from the time an aircraft is ready to push back from the gate and the time it receives departure clearance. Airfield departure delay can be incurred during gate pushback, while waiting to cross a runway, amid general airfield congestion, and while waiting in a departure queue.

2. 2009 BASELINE SIMULATION ANALYSIS

The results associated with the 2009 Baseline simulations are described in this section. For the analysis of airfield operations, a full year's worth of data was considered necessary and appropriate to characterize existing baseline conditions. Airport operations data for the prior calendar year, which for purposes of the SPAS analysis is 2009, were used to define existing baseline conditions related to airfield operations.

All of the simulation results were calculated for an all-weather average based on runway operating conditions.

2.1 2009 Baseline Simulation

The 2009 Baseline Simulation consists of the existing (2009) terminals and airfield. These elements are described below and depicted on Figure 7. The average all-weather delay for the 2009 Baseline simulation was 2.38 minutes per operation. The average arrival delay was 3.13 minutes per operation and the corresponding average departure delay was 1.62 minutes per operation.

2.1.1 Airside Operating Assumptions

The information provided in this section was collected from various sources, including FAA Western-Pacific Region Airports Division personnel, FAA SoCal TRACON personnel, LAX ATCT personnel, LAWA staff, observations of actual operations at the Airport, weather data collected by the National Oceanic and Atmospheric Administration (NOAA), ASPM data, and various documents.

The airside facilities described in below include runways and taxiways, terminal gate facilities, aircraft overnight parking areas, and cargo and general aviation facilities. The 2009 facilities do not include facilities currently under construction at LAX or facilities proposed to be constructed.

2.1.1.1 Airfield

The description of airfield facilities focuses on the runway system, associated taxiways and aircraft terminal facilities.

The airfield has four runways: 6L-24R, 6R-24L, 7L-25R, and 7R-25L. Runways 6L-24R and 6R-24L are defined as the north runway complex; Runways 7L-25R and 7R-25L are defined as the south runway complex. No changes to runway dimensions or increases in the number of new runway entrances/exits, parallel taxiways, or runway crossings are associated with the 2009 airfield. As stated in FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay,* airport capacity is dependent upon several airport components, including, but not limited to, the runways, taxiways, and gate group (i.e. the number of gates located in the terminal complex). Capacity is defined by the FAA as a measure of the maximum number of aircraft operations which can be accommodated on the airport or airport component in an hour.

2.1.1.2 Terminal Gate Facilities

Figure 12 illustrates the gate positions. The CTA is made up of Terminals 1 through 8 and TBIT. A description of the 2009 gate positions is provided in Appendix F-1. The West Remote Gates and American Eagle gates are the only commercial gates located outside of the CTA. All ADG VI aircraft are gated at the TBIT, not the West Remote Gates. Of the total 159 gates assumed in use at LAX in 2009, 110 were located at the CTA, 12 were at the American Eagle terminal, 18 were United Express Commuter gates (United Express maintenance apron), and 19 were at the West Remote Gates.

2.1.1.3 Cargo/General Aviation Areas

Figure 7 depicts the locations of the Airport's four cargo facilities and one general aviation facility. Three cargo facilities are located south of Runway 7R/25L; the fourth cargo facility is located north of Runway 7L/25R and east of the CTA. The general aviation facility is located south of Runway 7R/25L.

2.1.2 Aircraft Delay and Taxi Time

The average delay and unimpeded taxi time for the 2009 Baseline simulations are provided in **Table 6**. The average delay was 2.38 minutes per operation, the average unimpeded taxi time was 7.80 minutes per operation, and the combined average delay and taxi time was 10.18 minutes per operation.

Table 6

Average Delay and Unimpeded Taxi Time – 2009 Baseline

		Average Delay (Minutes per Operation)													
		Arrivals					Departures					Average			
Configuration	Annual Use	Cancellations	Flow	Airspace	Ground	Total	Cancellations	Gatehold	Airspace	Ground	Total	Airspace	Total Ground	Taxi Only	Total
VFR Visual West Flow	69.2%	0	0	1.55	1.32	2.87	0	0	0.05	1.56	1.61	0.80	1.44	1.09	2.24
VFR ILS West Flow	24.6%	0	0	2.43	1.27	3.70	0	0	0.08	1.49	1.57	1.26	1.38	1.02	2.63
VFR ILS East Flow	2.1%	0	0	2.65	1.05	3.70	0	0	0.09	1.67	1.76	1.37	1.36	1.09	2.73
Average VFR	**95.9%**	**0**	**0**	**1.73**	**1.25**	**2.98**	**0**	**0**	**0.06**	**1.48**	**1.54**	**0.89**	**1.36**	**1.03**	**2.26**
IFR West Flow	4.1%	0	0	2.72	1.07	3.79	0	0	0.06	2.11	2.16	1.39	1.59	1.30	2.98
Average All Weather	**100.0%**	**0**	**0**	**1.84**	**1.29**	**3.13**	**0**	**0**	**0.06**	**1.57**	**1.62**	**0.95**	**1.43**	**1.08**	**2.38**
											Average Unimpeded Taxi Time (Minutes per Operation)				
											Arrivals		Departures		Average
VFR Visual West Flow	69.2%										6.78		8.76		7.77
VFR ILS West Flow	24.6%										6.82		8.75		7.79
VFR ILS East Flow	2.1%										6.75		10.92		8.84
Average VFR	**95.9%**										**6.51**		**8.45**		**7.48**
IFR West Flow	4.1%										7.08		8.76		7.92
Average All Weather	**100.0%**										**6.80**		**8.81**		**7.80**
											Average Delay and Unimpeded Taxi Time (Minutes per Operation)				
											Arrivals		Departures		Average
VFR Visual West Flow	69.2%										9.66		10.37		10.01
VFR ILS West Flow	24.6%										10.51		10.32		10.42
VFR ILS East Flow	2.1%										10.46		12.68		11.57
Average VFR	**95.9%**										**9.49**		**9.98**		**9.74**
IFR West Flow	4.1%										10.87		10.92		10.90
Average All Weather	**100.0%**										**9.93**		**10.43**		**10.18**

NOTE: Totals may not add due rounding.

Source: Ricondo& Associates, Inc., May 2011, based on SIMMOD simulation results (average delay and unimpeded taxi times).

This page intentionally left blank.

2.1.3 Peak Hour Throughput

Table 7 lists peak arrival hour, peak departure hour, and peak operating hour throughputs under the 2009 Baseline conditions.

Table 7

Peak Hour Throughput – 2009 Baseline

1,849 Daily Operations

		Throughput					
		Peak Arrivals		Peak Departures		Total Operations	
Configuration	Annual Use	Daily Total	Peak Throughput Hour	Daily Total	Peak Throughput Hour	Daily Total	Peak Throughput Hour
VFR with Visual Approaches – West Flow	69.2%	778	57	785	62	1,563	105
VFR with ILS Approaches – West Flow	24.6%	778	57	785	62	1,563	105
VFR with ILS Approaches – East Flow	2.1%	778	57	785	62	1,563	103
IMC with Instrument Approaches – West Flow	4.1%	778	55	785	62	1,563	103
Average All-Weather Throughput	100.0%	778	57	785	62	1,563	105

ILS = Instrument Landing System
IMC = Instrument Meteorological Conditions
VFR = Visual Flight Rules

Source: Ricondo& Associates, Inc., May 2011, based on SIMMOD simulation results (daily and hourly throughput operations).

3. 2025 SPAS EIR ALTERNATIVES SIMULATION ANALYSIS

The simulation results for the following alternatives are described in this section:

- 2025 SPAS Alternative 1 – Runway 6L-24R Relocated 260 ft. North
- 2025 SPAS Alternative 2 – No Increase In Separation
- 2025 SPAS Alternative 3 – No Project – Implement Existing Master Plan
- 2025 SPAS Alternative 4 – Modified No Project - No Yellow Lights

3.1 2025 SPAS Alternative 1

Figure 13 depicts the 2025 SPAS Alternative 1 airfield layout, with the relocation of Runway 6L-24R 260 feet to the north. This alternative includes the existing CTA, the TBIT reconfiguration, and the MSC and associated taxiways. The north runway complex would be altered under this alternative, while the south runway complex would remain unchanged. The 2025 DDFS consists of a total of 2,053 aircraft operations.

3.1.1 Terminal Assumptions

The terminal assumptions for the 2025 SPAS Alternative 1 include the existing CTA, the TBIT reconfiguration, and the MSC. Under this alternative, a new terminal, referred to as Terminal 0, would be added to the CTA, east of Terminal 1. Additionally, 10 commuter gates would be located east of Terminal 8. The west remote gates would not be used in this alternative. In total, 153 gates would be used to accommodate the 2025 DDFS in this alternative. **Figure 14** depicts the gating assumptions for 2025 SPAS Alternative 1. The 2025 SPAS gate positions are described in the *LAX 2025 Design Day Forecast Schedule Technical Report*.

3.1.2 Airfield/Airspace Assumptions

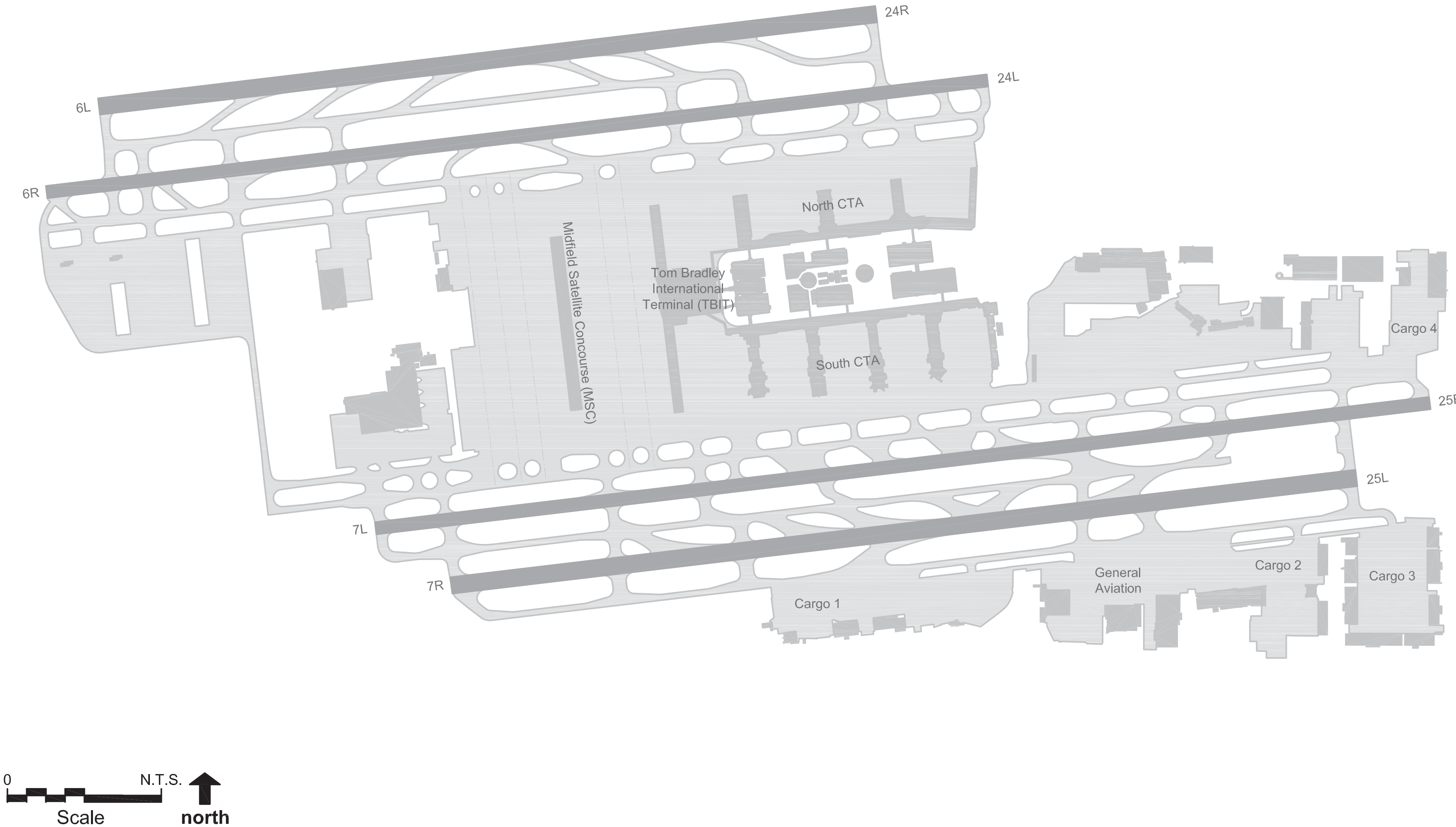
The airspace assumptions remain the same under Alternative 1 as in the 2009 Baseline Simulation analysis. The 2025 SPAS Alternative 1 airfield differs from the 2009 Baseline Simulation airfield with the northernmost runway (Runway 6L-24R) being relocated 260 feet to the north. The northward relocation would accommodate a new parallel taxiway between Runways 6L-24R and 6R-24L. Taxiway D would be extended westward, running parallel along the entire length of Runway 6R-24L. Taxiway Q would be removed to accommodate the TBIT reconfiguration and Taxiway S would be relocated. A new taxiway, Taxiway T, would be constructed adjacent to Taxiway S. Additionally, three taxiways would be placed adjacent to the MSC on the west side of the terminal. The north airfield would include an extension to Runway 6R-24L and Taxiways D and E would be lengthened westward to accommodate the runway extension. The south runway complex includes the RSA improvements currently planned for Runway 7L-25R. All other aspects of the south runway complex would remain unchanged. See Sections 1.4.7 and 1.4.8 for additional detail regarding the existing airfield. See Figure 13 for a depiction of the 2025 SPAS Alternative 1 airfield.

3.1.3 Aircraft Movement Assumptions

The aircraft movement assumptions are depicted on **Figures 15** and **16** for aircraft arrivals and departures, respectively, in west flow. The aircraft movement assumptions are depicted on **Figures 17** and **18** for arriving and departing aircraft, respectively, in east flow.

3.1.4 Design Day Activity

The 2025 DDFS consists of a total of 2,053 daily operations, equating to approximately 78.9 MAP. **Table 8** summarizes the 2025 DDFS operations. The schedule is based on OAG data and was developed to represent a PMAD. For a detailed discussion of the methodology and assumptions used to develop the 2025 DDFS, refer to Appendix F-1.



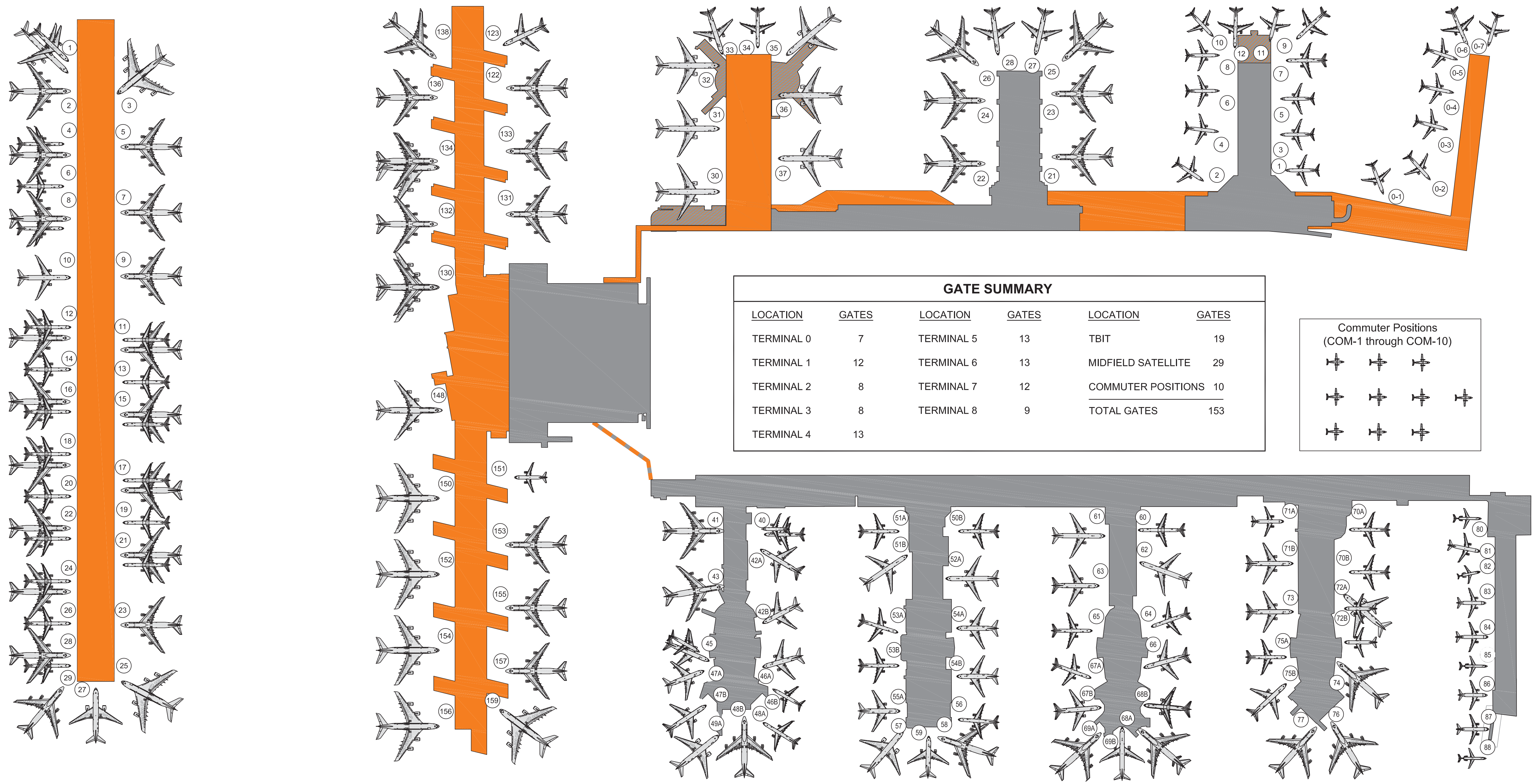
Source: HNTB Corp., Los Angeles International Airport Layout Plan, August 2010. Ricondo & Associates, Inc., November 2011.

Prepared by: Ricondo & Associates, Inc., November 2011.

2025 SPAS Alternative 1

Figure 13

This page intentionally left blank.



GATE SUMMARY

LOCATION	GATES	LOCATION	GATES	LOCATION	GATES
TERMINAL 0	7	TERMINAL 5	13	TBIT	19
TERMINAL 1	12	TERMINAL 6	13	MIDFIELD SATELLITE	29
TERMINAL 2	8	TERMINAL 7	12	COMMUTER POSITIONS	10
TERMINAL 3	8	TERMINAL 8	9	TOTAL GATES	153
TERMINAL 4	13				

Notes: Aircraft parking positions are shown for illustrative purposes only; assuming flexibility in passenger loading bridge, fuel pit, terminal access and locations, and including some tow in/tow out and segmented pushback operations.

TBIT: Tom Bradley International Terminal

0 400 ft.
Scale north

Sources: Los Angeles World Airports, May 2011 (T0 through T8 gate positions); Hatch Mott MacDonald, February 2010 (Bradley West Modernization Project, TBIT gate positions); Ricondo & Associates, Inc., May 2011 (Midfield Satellite Concourse conceptual gate layout).
Prepared by: Ricondo & Associates, Inc., May 2012.

SPAS Alternatives 1 and 2
Gate Positions

Figure
14

This page intentionally left blank.

Source: HNTB Corp., Los Angeles International Airport Layout Plan, August 2010. Ricondo & Associates, Inc., November 2011.

Prepared by: Ricondo & Associates, Inc., November 2011.

LAX Specific Plan Amendment Study Report

2025 Future Arrival Taxipaths (West Flow)
SPAS Alternative 1

Figure
15

This page intentionally left blank.

Legend

- South Parking to South Departure
- North Parking to South Departure
- South Parking to North Departure
- North Parking to North Departure
- Alternate Route to South Departure
- Alternate Route to South Departure
- Alternate Route to North Departure
- Alternate Route to North Departure
- Cargo/GA to South Departure

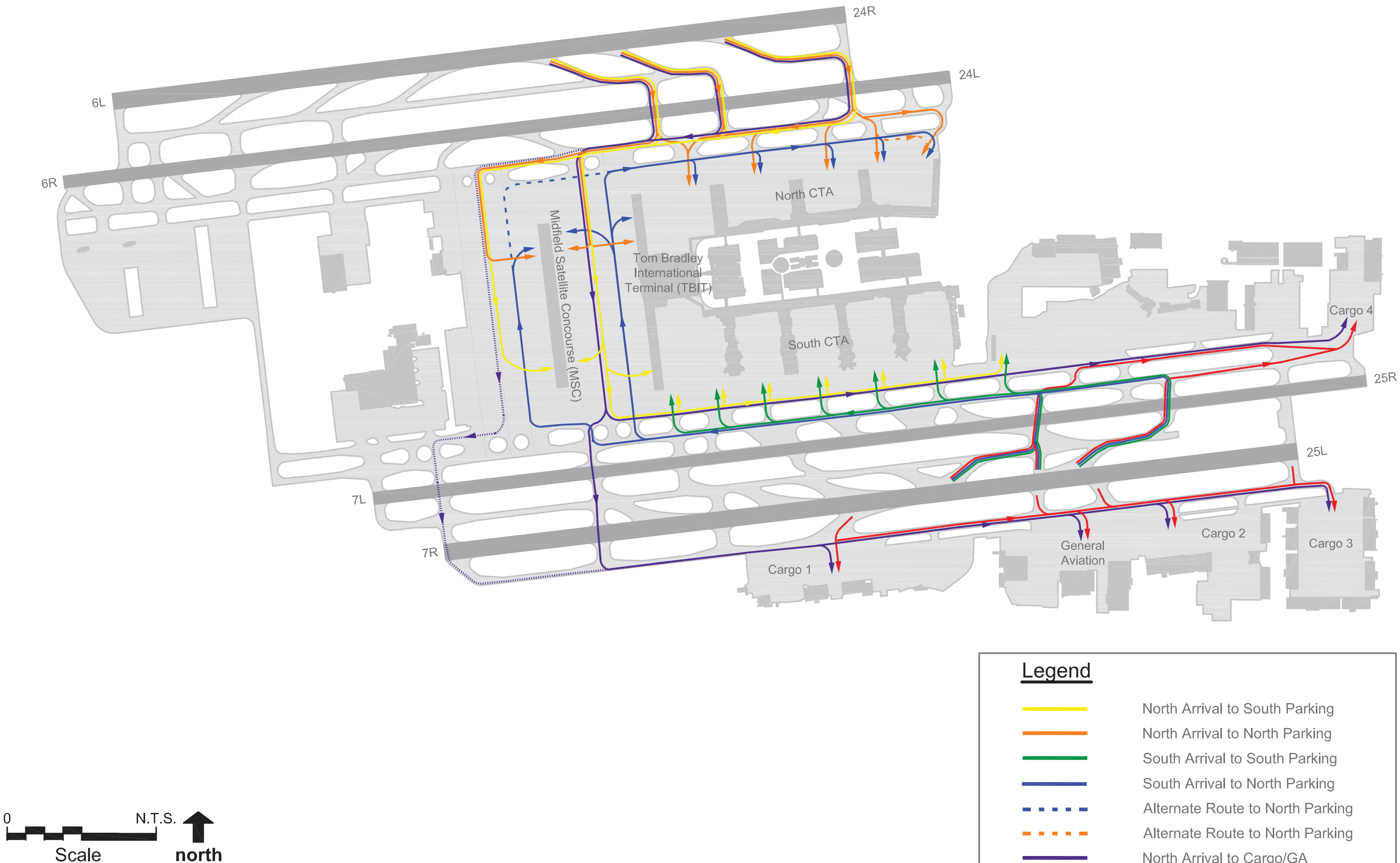
0 N.T.S.
Scale north

Source: HNTB Corp., Los Angeles International Airport Layout Plan, August 2010. Ricondo & Associates, Inc., November 2011.
Prepared by: Ricondo & Associates, Inc., November 2011.

2025 Future Departure Taxipaths (West Flow)
SPAS Alternative 1

Figure
16

This page intentionally left blank.



Legend

- North Arrival to South Parking
- North Arrival to North Parking
- South Arrival to South Parking
- South Arrival to North Parking
- Alternate Route to North Parking
- Alternate Route to North Parking
- North Arrival to Cargo/GA
- South Arrival to Cargo/GA

Source: HNTB Corp., Los Angeles International Airport Layout Plan, August 2010. Ricondo & Associates, Inc., November 2011.

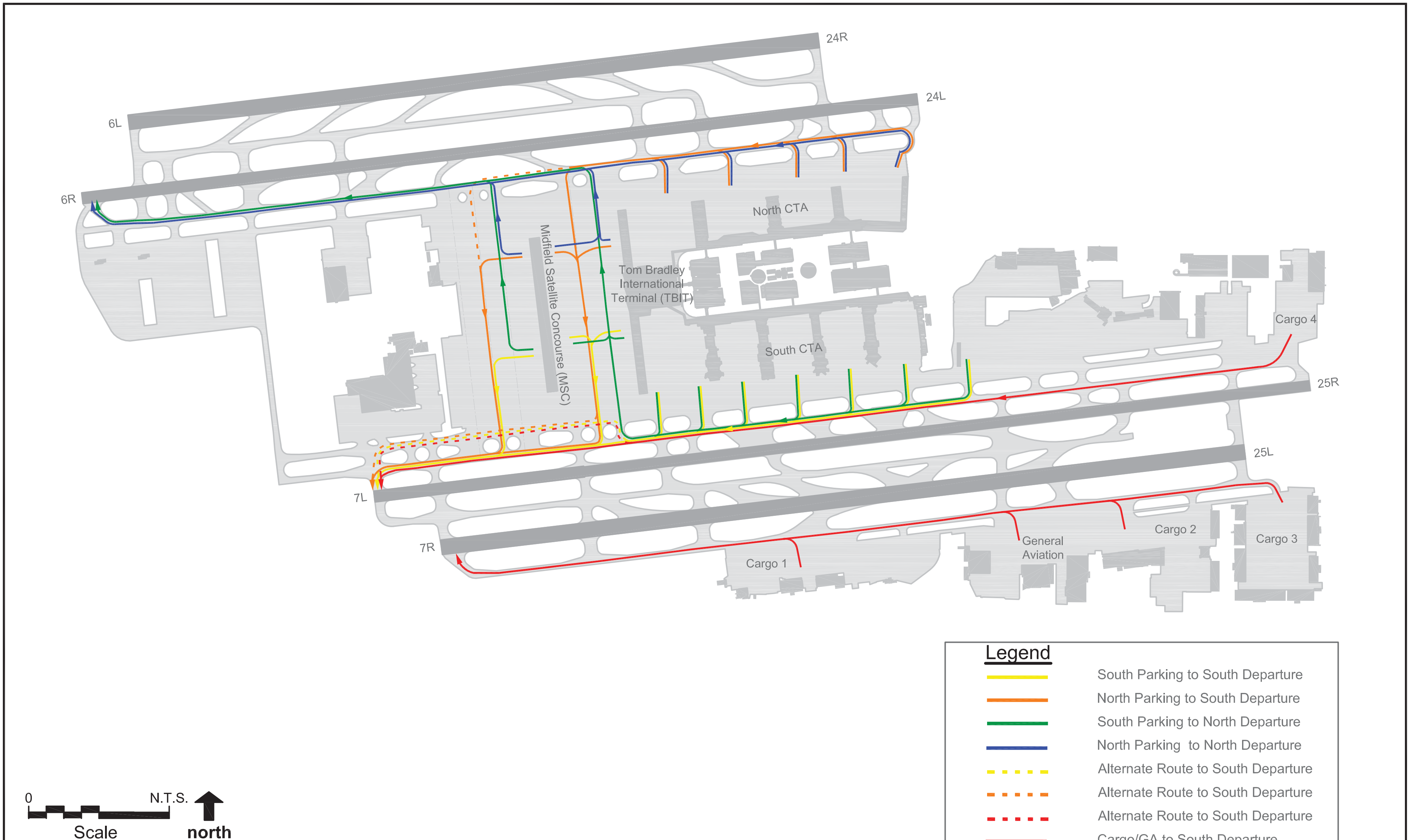
Prepared by: Ricondo & Associates, Inc., November 2011.

LAX Specific Plan Amendment Study Report

2025 Future Arrival Taxipaths (East Flow)
SPAS Alternative 1

Figure
17

This page intentionally left blank.



Source: HNTB Corp., Los Angeles International Airport Layout Plan, August 2010. Ricondo & Associates, Inc., November 2011.
Prepared by: Ricondo & Associates, Inc., November 2011.

LAX Specific Plan Amendment Study Report	2025 Future Departure Taxipaths (East Flow) SPAS Alternative 1	Figure 18

This page intentionally left blank.

Table 8

2025 Design Day Aircraft Operations

Air Carrier	1278
Commuter[1]	220
Alaska/Hawaii	78
Total Domestic	**1,576**
International	334
Total Commercial	**1,910**
Cargo	70
General Aviation, Charter, and Military	73
TOTAL	**2,053**

Note: Commuter aircraft are designated as Airplane Design Group II and smaller.
Source: Ricondo & Associates, Inc., Appendix F-1, *LAX 2009-2025 Passenger Forecast and Design Day Flight Schedule Development*, July 2012.

3.1.5 Average Delay and Unimpeded Taxi Time

The simulation modeling results for 2025 SPAS Alternative 1 yielded annualized average delay of 5.20 minutes per operation, average unimpeded taxi time of 8.10 minutes per operation, and a combined average delay and taxi time of 13.29 minutes per operation. **Table 9** summarizes the results. **Table 10** summarizes throughput results for the Alternative 1 simulations. Note that due to rounding, the combined average delay and taxi times listed in the following sections may not add to the displayed amount.

3.1.5.1 West Flow

The following summarizes delay results by airfield configuration. The definition and annual use of each configuration remains consistent with those assumed for the 2009 Baseline Scenario.

VFR – Visual Approaches

For visual approaches under VFR conditions, the average simulated delay was 4.15 minutes per operation, the average unimpeded taxi time was 8.05 minutes per operation, and the combined average delay and taxi time was 12.21 minutes per operation.

VFR – ILS

For ILS approaches under VFR conditions, the average simulated delay was 5.14 minutes per operation, the average unimpeded taxi time was 8.05 minutes per operation, and the combined average delay and taxi time was 13.20 minutes per operation.

IFR

Under IFR conditions, the average delay was 22.46 minutes per operation, the average unimpeded taxi time was 8.62 minutes per operation, and the combined average delay and taxi time was 31.08 minutes per operation.

3.1.5.2 East Flow

The definition and annual use of the east flow configuration remain consistent with those assumed for the 2009 Baseline Scenario.

This page intentionally left blank.

Table 9

Average Delay and Unimpeded Taxi Time – 2025 SPAS Alternative 1

		Average Delay (Minutes per Operation)													
		Arrivals					Departures					Average			
Configuration	Annual Use	Cancellations	Flow	Airspace	Ground	Total	Cancellations	Gatehold	Airspace	Ground	Total	Airspace	Total Ground	Taxi Only	Total
VFR Visual West Flow	69.2%	0	0	2.57	2.47	5.03	0	0	0.07	3.21	3.28	1.31	2.84	2.06	4.15
VFR ILS West Flow	24.6%	0	0	4.33	2.50	6.83	0	0	0.10	3.37	3.47	2.21	2.94	2.14	5.14
VFR ILS East Flow	2.1%	0	0	7.91	2.17	10.08	0	0	0.06	2.74	2.80	3.97	2.46	1.77	6.43
Average VFR	**95.9%**	**0**	**0**	**3.14**	**2.47**	**5.61**	**0**	**0**	**0.08**	**3.24**	**3.32**	**1.60**	**2.86**	**2.07**	**4.46**
IFR West Flow	4.1%	0	0	36.75	1.38	38.14	0	0	0.06	6.86	6.92	18.33	4.13	3.69	22.46
Average All Weather	**100.0%**	**0**	**0**	**4.52**	**2.42**	**6.94**	**0**	**0**	**0.08**	**3.39**	**3.47**	**2.29**	**2.91**	**2.14**	**5.20**

		Average Unimpeded Taxi Time (Minutes per Operation)		
		Arrivals	Departures	Average
VFR Visual West Flow	69.2%	7.26	8.83	8.05
VFR ILS West Flow	24.6%	7.26	8.84	8.05
VFR ILS East Flow	2.1%	7.51	10.57	9.05
Average VFR	**95.9%**	**7.27**	**8.87**	**8.07**
IFR West Flow	4.1%	8.28	8.96	8.62
Average All Weather	**100.0%**	**7.31**	**8.87**	**8.10**

		Average Delay and Unimpeded Taxi Time (Minutes per Operation)		
		Arrivals	Departures	Average
VFR Visual West Flow	69.2%	12.30	12.11	12.21
VFR ILS West Flow	24.6%	14.09	12.31	13.20
VFR ILS East Flow	2.1%	17.59	13.37	15.47
Average VFR	**95.9%**	**12.88**	**11.69**	**12.28**
IFR West Flow	4.1%	46.42	15.88	31.08
Average All Weather	**100.0%**	**14.25**	**12.34**	**13.29**

NOTE: Totals may not add due rounding.

Source: Ricondo& Associates, Inc., October 2011, based on SIMMOD simulation results (average delay and unimpeded taxi times).

This page intentionally left blank.

VFR – ILS

For ILS approaches under VFR conditions, the average delay was 6.43 minutes per operation, the average unimpeded taxi time was 9.05 minutes per operation, and combined average delay and taxi time was 15.47 minutes per operation.

3.1.6 Peak Hour Throughput

Table 10 lists peak arrival hour, peak departure hour, and peak operating hour throughput for each of the configurations simulated under SPAS Alternative 1.

Table 10

Peak Hour Throughput – 2025 SPAS Alternative 1

2,053 Daily Operations

		Throughput					
		Peak Arrivals		Peak Departures		Peak Operations	
Configuration	Annual Use	Daily Total	Peak Throughput Hour	Daily Total	Peak Throughput Hour	Daily Total	Peak Throughput Hour
VFR with Visual Approaches – West Flow	69.2%	1,022	73	1,031	76	2,053	135
VFR with ILS Approaches – West Flow	24.6%	1,022	72	1,031	77	2,053	135
VFR with ILS Approaches – East Flow	2.1%	1,022	70	1,031	78	2,053	138
IMC with Instrument Approaches – West Flow	4.1%	1,022	61	1,031	69	2,053	125
Average All-Weather Throughput	100.0%	1,022	72	1,031	76	2,053	134

ILS = Instrument Landing System
IMC = Instrument Meteorological Conditions
VFR = Visual Flight Rules

Source: Ricondo& Associates, Inc., October 2011, based on SIMMOD simulation results (daily and hourly throughput operations).

3.2 2025 SPAS Alternative 2

Figure 19 depicts the 2025 SPAS Alternative 2 airfield layout, with no increase in runway separation. This alternative includes the existing CTA, the TBIT reconfiguration, and the MSC and associated taxiways. The north runway complex would be altered under this alternative, while the south runway complex would remain unchanged. The 2025 DDFS consists of a total of 2,053 operations.

3.2.1 Terminal Assumptions

The terminal assumptions for 2025 SPAS Alternative 2 include the existing CTA, the TBIT reconfiguration, and the MSC. A new terminal, referred to as Terminal 0, would be added to the CTA, east of Terminal 1. Additionally, 10 commuter gates would be located east of Terminal 8. The west remote gates would not be used in this alternative. In total, 153 gates would be used to accommodate the 2025 DDFS. Figure 14 depicts the gating positions for this alternative. The 2025 SPAS gate assignments are described in Appendix F-1.

3.2.2 Airfield/Airspace Assumptions

The airspace assumptions under this alternative remain the same as under the 2009 Baseline Scenario. The 2025 SPAS Alternative 2 airfield would differs from the 2009 Baseline Simulation airfield, with two of the Runway 6L-24R exits relocated to the west to allow for crossing of the inboard runway (Runway 6R-24L) only on the latter two-thirds of the runway. The exit taxiways, Taxiway Y and Z, located at the first two-thirds of Runway 6R-24L, would be relocated. Relocation of the runway exits is intended to improve airfield safety by reducing the potential for a runway incursion caused by an arriving aircraft taxiing across the inboard runway without authorization/clearance. Taxiway D would be extended westward, running parallel along the entire length of Runway 6R-24L. Taxiway Q would be removed to accommodate the TBIT reconfiguration and Taxiway S would be relocated. A new taxiway, Taxiway T would be constructed adjacent to Taxiway S. Additionally, three taxiways would be located adjacent to the MSC on the west side of the terminal. The north airfield would include an extension to Runway 6R-24L and Taxiways D and E would be lengthened westward to accommodate the runway extension. The south runway complex includes the RSA improvements currently planned for Runway 7L-25R. All other aspects of the south runway complex would remain unchanged. Refer to Sections 1.4.7 and 1.4.8 for additional detail regarding the existing airfield. See Figure 19 for a depiction of the Alternative 2 airfield.

3.2.3 Aircraft Movement Assumptions

The aircraft movement assumptions for aircraft not categorized as New Large Aircraft (NLA) are depicted on **Figures 20** and **21** for arrivals in west flow and east flow, respectively. The general ground movement pattern is the same as for Alternative 1, but under Alternative 2, the north runway complex would not include a parallel taxiway between the runways, requiring arriving aircraft on the outboard runway to cross the inboard runway directly after exiting the outboard runway. The types of aircraft that would be able use the new runway exit taxiways are less constrained in this alternative than in the 2009 Baseline Simulation based on the increased distance from the landing threshold. Figures 16 and 18 depict taxipaths for departing aircraft as these remain unchanged from the SPAS Alternative 1.

3.2.4 Design Day Activity

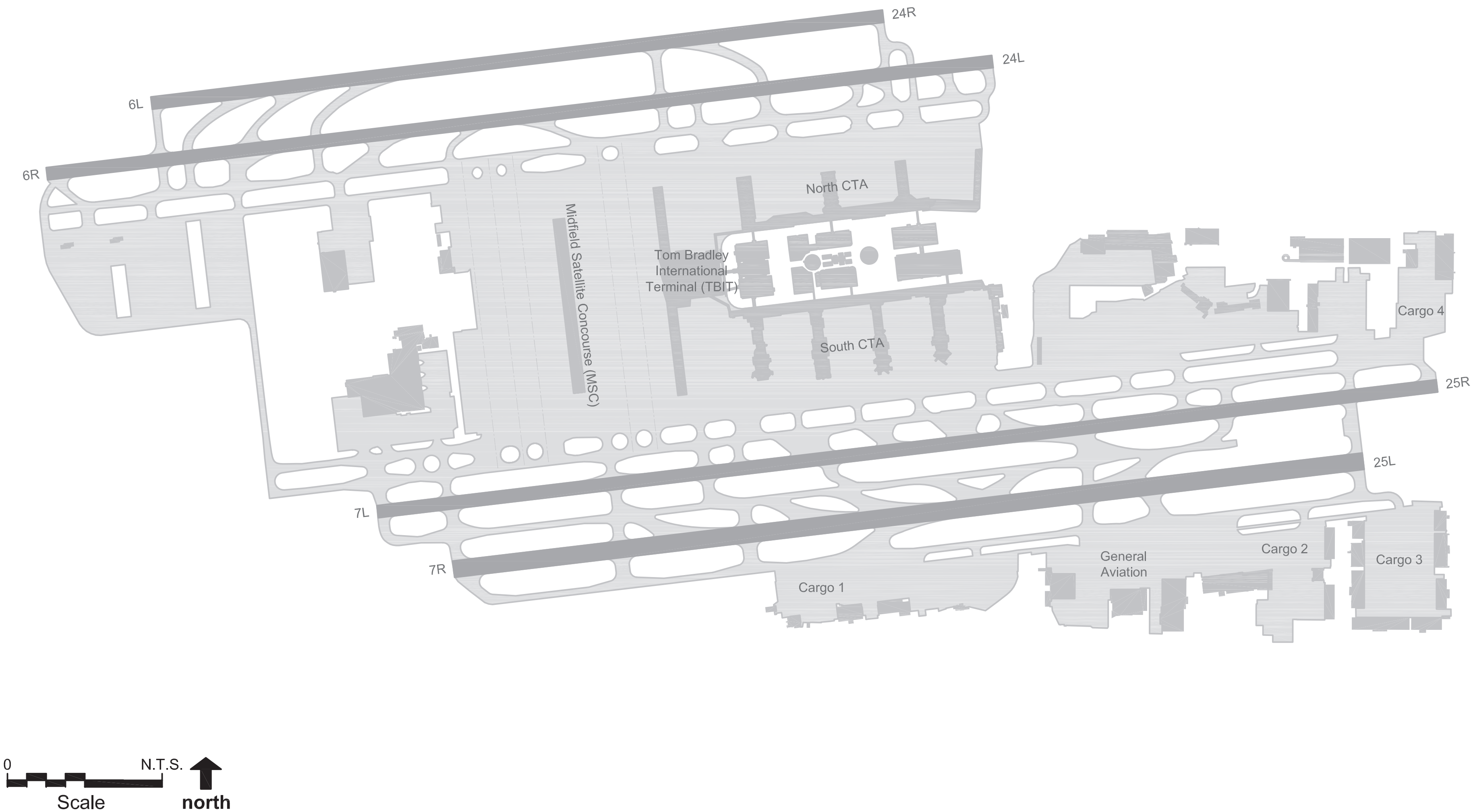
The 2025 DDFS is discussed in Section 3.1.4. Table 8 summarizes the DDFS operations assumed in the 2025 alternative simulations.

3.2.5 Average Delay and Unimpeded Taxi Time

The average delay statistics for the 2025 SPAS Alternative 2 simulations are described below. The simulation modeling results for 2025 SPAS Alternative 2 yielded annualized average delay of 5.38 minutes per operation, average unimpeded taxi time of 7.86 minutes per operation, and a combined average delay and taxi time of 13.24 minutes. **Table 11** summarizes the results. **Table 12** summarizes throughput results for the Alternative 2 simulations. Note that due to rounding, the combined average delay and taxi times listed in the following sections may not add to the displayed amount.

3.2.5.1 West Flow

The following summarizes the simulated delay results for Alternative 2 by runway configuration. The definition and annual use of each configuration remains consistent with those assumed for the 2009 Baseline simulation.



Source: HNTB Corp., Los Angeles International Airport Layout Plan, August 2010. Ricondo & Associates, Inc., November 2011.

Prepared by: Ricondo & Associates, Inc., November 2011.

LAX Specific Plan Amendment Study Report	2025 SPAS Alternative 2	Figure 19

This page intentionally left blank.

Source: HNTB Corp., Los Angeles International Airport Layout Plan, August 2010. Ricondo & Associates, Inc., November 2011.

Prepared by: Ricondo & Associates, Inc., November 2011.

LAX Specific Plan Amendment Study Report

2025 Future Arrival Taxipaths (West Flow)
SPAS Alternative 2

Figure
20

This page intentionally left blank.

Legend

- North Arrival to South Parking
- North Arrival to North Parking
- South Arrival to South Parking
- South Arrival to North Parking
- Alternate Route to North Parking
- Alternate Route to North Parking
- Alternate Route to Cargo/GA
- North Arrival to Cargo/GA
- South Arrival to Cargo/GA

0 N.T.S.
Scale
north

Source: HNTB Corp., Los Angeles International Airport Layout Plan, August 2010. Ricondo & Associates, Inc., November 2011.
Prepared by: Ricondo & Associates, Inc., November 2011.

LAX Specific Plan Amendment Study Report

2025 Future Arrival Taxipaths (East Flow)
SPAS Alternative 2

Figure
21

This page intentionally left blank.

Table 11

Average Delay and Unimpeded Taxi Time – 2025 SPAS Alternative 2

		Average Delay (Minutes per Operation)													
		Arrivals					Departures					Average			
Configuration	Annual Use	Cancellations	Flow	Airspace	Ground	Total	Cancellations	Gatehold	Airspace	Ground	Total	Airspace	Total Ground	Taxi Only	Total
VFR Visual West Flow	69.2%	0	0	2.62	2.14	4.76	0	0	0.07	3.73	3.80	1.34	2.94	2.24	4.28
VFR ILS West Flow	24.6%	0	0	4.31	2.16	6.48	0	0	0.10	4.15	4.24	2.19	3.16	2.44	5.35
VFR ILS East Flow	2.1%	0	0	7.62	1.74	9.36	0	0	0.05	2.84	2.90	3.82	2.29	1.66	6.11
Average VFR	**95.9%**	**0**	**0**	**3.17**	**2.14**	**5.30**	**0**	**0**	**0.07**	**3.82**	**3.89**	**1.61**	**2.98**	**2.28**	**4.59**
IFR West Flow	4.1%	0	0	37.43	1.53	38.96	0	0	0.06	8.86	8.92	18.66	5.21	4.75	23.87
Average All Weather	**100.0%**	**0**	**0**	**4.57**	**2.11**	**6.68**	**0**	**0**	**0.07**	**4.02**	**4.10**	**2.31**	**3.07**	**2.38**	**5.38**

		Average Unimpeded Taxi Time (Minutes per Operation)		
		Arrivals	Departures	Average
VFR Visual West Flow	69.2%	6.88	8.74	7.81
VFR ILS West Flow	24.6%	6.90	8.74	7.82
VFR ILS East Flow	2.1%	7.16	10.46	8.81
Average VFR	**95.9%**	**6.89**	**8.78**	**7.84**
IFR West Flow	4.1%	7.79	8.89	8.34
Average All Weather	**100.0%**	**6.93**	**8.78**	**7.86**

		Average Delay and Unimpeded Taxi Time (Minutes per Operation)		
		Arrivals	Departures	Average
VFR Visual West Flow	69.2%	11.64	12.54	12.09
VFR ILS West Flow	24.6%	13.37	12.98	13.18
VFR ILS East Flow	2.1%	16.51	13.36	14.93
Average VFR	**95.9%**	**12.19**	**12.15**	**12.17**
IFR West Flow	4.1%	46.75	17.81	32.22
Average All Weather	**100.0%**	**13.61**	**12.88**	**13.24**

NOTE: Totals may not add due rounding.

Source: Ricondo& Associates, Inc., October 2011, based on SIMMOD simulation results (average delay and unimpeded taxi times).

This page intentionally left blank.

VFR – Visual Approaches

For visual approaches under VFR conditions, the average simulated delay was 4.28 minutes per operation, the average unimpeded taxi time was 7.81 minutes per operation, and the combined average delay and taxi time was 12.09 minutes per operation.

VFR – ILS

For ILS approaches under VFR conditions, the average simulated delay was 5.35 minutes per operation, the average unimpeded taxi time was 7.82 minutes per operation, and the combined average delay and taxi time was 13.18 minutes per operation.

IFR

Under IFR conditions, the average simulated delay was 23.87 minutes per operation, the average unimpeded taxi time was 8.34 minutes per operation, and the combined average delay and taxi time was 32.22 minutes per operation.

3.2.5.2 East Flow

The definition and annual use of the east flow configuration remain consistent with those assumed for the 2009 Baseline Simulation.

VFR – ILS

For ILS approaches under VFR conditions, the average simulated delay was 7.62 minutes per operation, the average unimpeded taxi time was 8.81 minutes per operation, and the combined average delay and taxi time was 14.93 minutes per operation.

3.2.6 Peak Hour Throughput

Table 12 lists peak arrival hour, peak departure hour, and peak operating hour throughput for each of the configurations simulated under SPAS Alternative 2.

Table 12

Peak Hour Throughput – 2025 SPAS Alternative 2

2,053 Daily Operations

		Throughput					
		Peak Arrivals		Peak Departures		Peak Operations	
Configuration	Annual Use	Daily Total	Peak Throughput Hour	Daily Total	Peak Throughput Hour	Daily Total	Peak Throughput Hour
VFR with Visual Approaches – West Flow	69.2%	1,022	72	1,031	75	2,053	134
VFR with ILS Approaches – West Flow	24.6%	1,022	73	1,031	76	2,053	134
VFR with ILS Approaches – East Flow	2.1%	1,022	71	1,031	79	2,053	137
IMC with Instrument Approaches – West Flow	4.1%	1,022	61	1,031	67	2,053	123
Average All-Weather Throughput	100.0%	1,022	72	1,031	75	2,053	134

ILS = Instrument Landing System
IMC = Instrument Meteorological Conditions
VFR = Visual Flight Rules

Source: Ricondo& Associates, Inc., October 2011, based on SIMMOD simulation results (daily and hourly throughput operations).

3.3 2025 SPAS Alternative 3

Figure 22 depicts the 2025 SPAS Alternative 3 airfield layout. The basis for the 2025 SPAS Alternative 3 airfield is the existing LAX Master Plan. Alternative 3 includes the existing South CTA, the South TBIT reconfiguration, and the MSC and associated taxiways. The 2025 DDFS consists of a total of 2,053 operations.

3.3.1 Terminal Assumptions

The terminal assumptions for 2025 SPAS Alternative 3 include modifying the existing CTA, replacing the north terminals (Terminals 1 - 3) with a linear concourse, a modified TBIT reconfiguration, and a modified MSC. TBIT and the MSC would be modified to accommodate relocated taxiways on the north side of the airfield. Additionally, 10 commuter gates would be located east of Terminal 8. The west remote gates would not be used under this alternative. **Figure 23** depicts the gate Positions for this alternative. The 2025 SPAS gate assignments are described in the *LAX 2025 Design Day Forecast Schedule Technical Report*.

3.3.2 Airfield/Airspace Assumptions

The airspace assumptions under 2025 SPAS Alternative 3 remain unchanged from the assumptions underlying the 2009 Baseline Simulation. The airfield would be altered to accommodate ADG VI aircraft by removing the north terminals, and relocating Taxiways D and E to the south. Additionally, Runway 6R-24L would be relocated to the south to accommodate a parallel taxiway between the two north runways. North/south taxiways adjacent to the MSC would be added. The south runway complex remains unchanged from the 2009 Baseline Simulation with the exception of the Runway 7L-25R RSA improvements. See Sections 1.4.7 and 1.4.8 for additional detail.

3.3.3 Aircraft Movement Assumptions

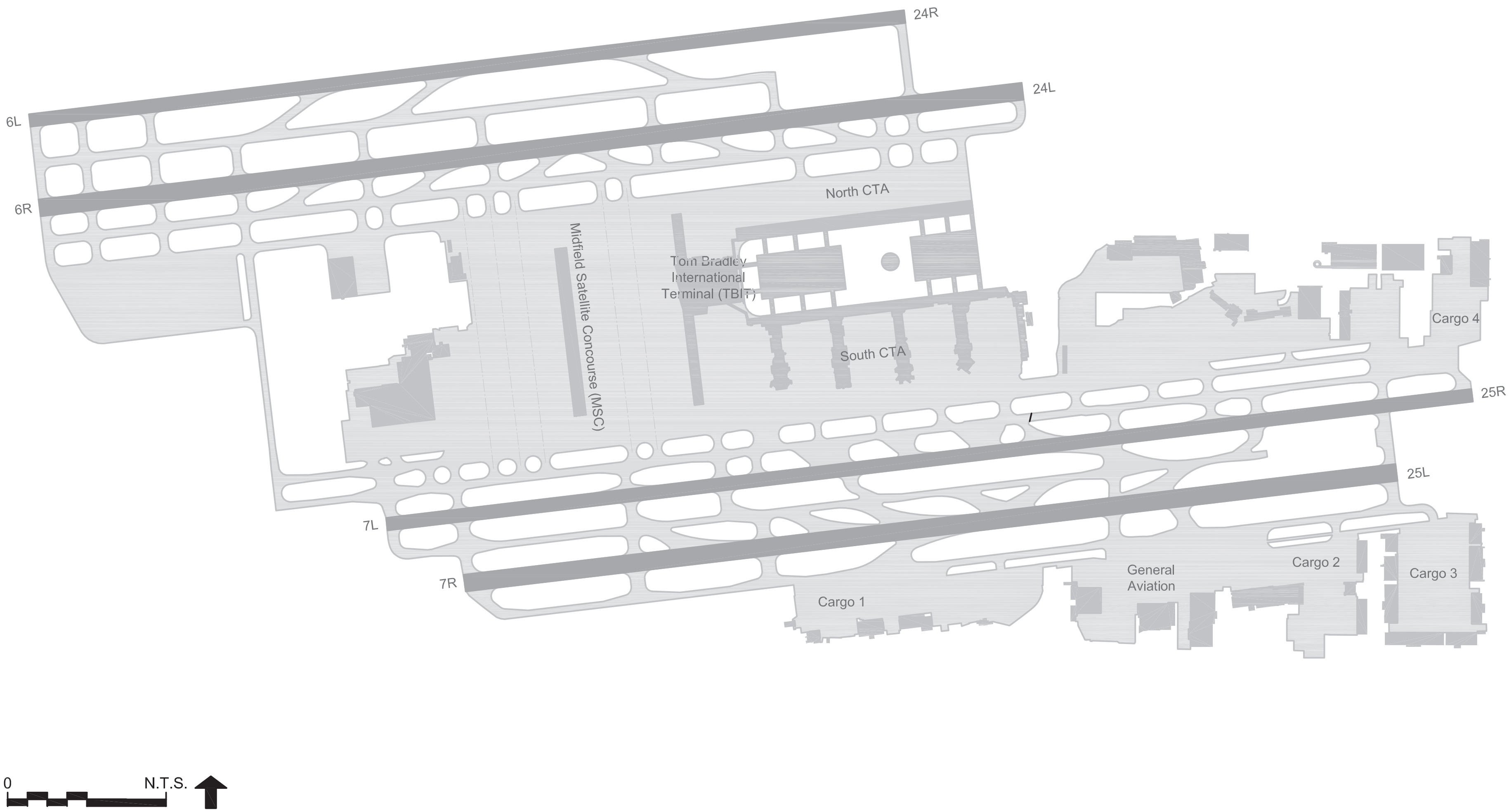
The aircraft movement assumptions for non-NLA arriving aircraft under Alternative 3 are depicted on **Figure 24** and **Figure 25** for west flow arrivals and departures, respectively. **Figure 26** and **Figure 27** depict the movement assumptions for non-NLA east flow arrivals and departures, respectively, under Alternative 3. The general ground movement pattern would be the same as for Alternative 1. The primary difference with Alternative 3 is the ability for aircraft to hold between the runways in the north runway complex.

3.3.4 Design Day Activity

The 2025 DDFS is discussed in Section 3.1.4. Table 8 summarizes the DDFS operations assumed in the 2025 alternative simulations.

3.3.5 Average Delay and Unimpeded Taxi Time

The average delay statistics for the 2025 SPAS Alternative 3 simulations are described in this section. The simulation modeling results for 2025 SPAS Alternative 3 yielded annualized average delay of 6.14 minutes per operation, average unimpeded taxi time of 8.64 minutes per operation, and a combined average delay and taxi time of 14.78 minutes per operation. Note that due to rounding, the combined average delay and taxi times listed in the following sections may not add to the displayed amount.



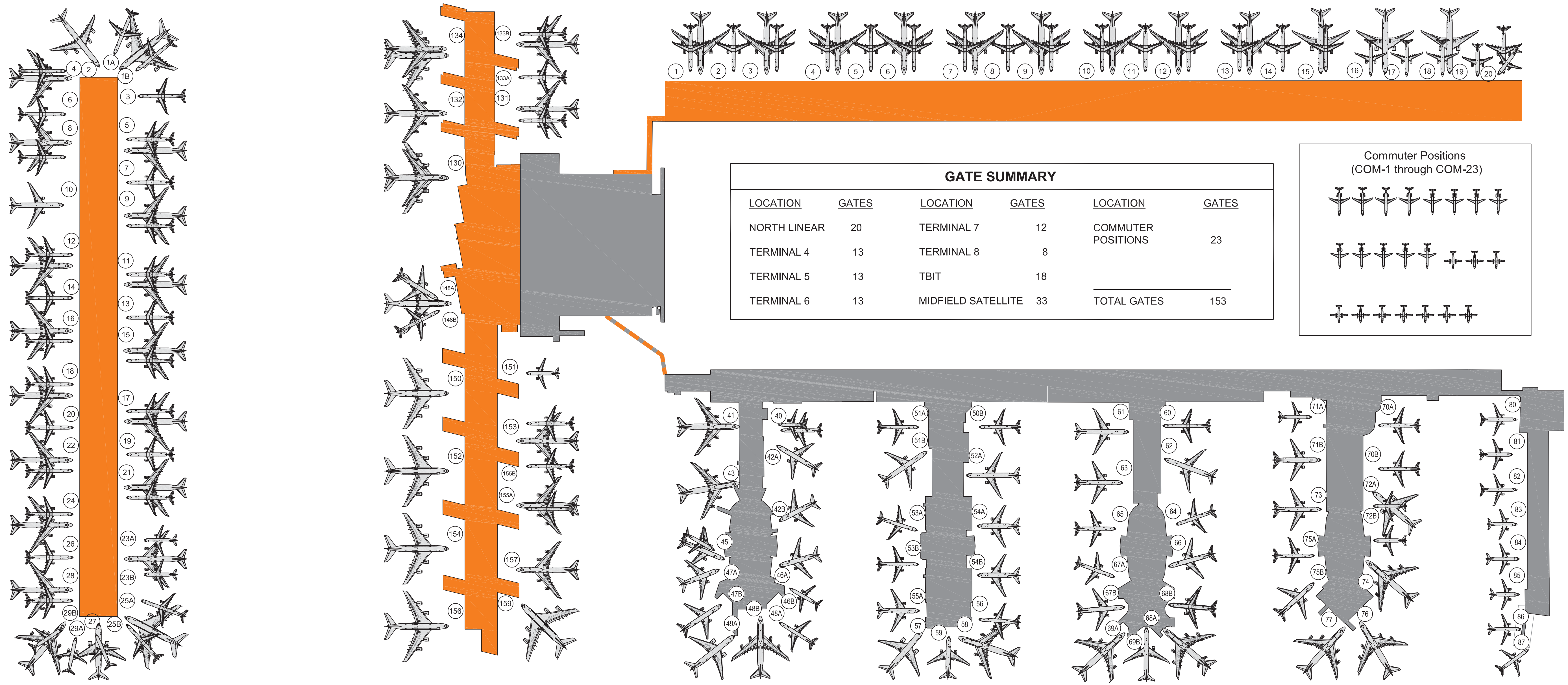
Source: HNTB Corp., Los Angeles International Airport Layout Plan, August 2010. Ricondo & Associates, Inc., November 2011.

Prepared by: Ricondo & Associates, Inc., November 2011.

2025 SPAS Alternative 3

Figure 22

This page intentionally left blank.



GATE SUMMARY

LOCATION	GATES	LOCATION	GATES	LOCATION	GATES
NORTH LINEAR	20	TERMINAL 7	12	COMMUTER POSITIONS	23
TERMINAL 4	13	TERMINAL 8	8		
TERMINAL 5	13	TBIT	18		
TERMINAL 6	13	MIDFIELD SATELLITE	33	TOTAL GATES	153

Notes: Aircraft parking positions are shown for illustrative purposes only; assuming flexibility in passenger loading bridge, fuel pit, terminal access and locations, and including some tow in/tow out and segmented pushback operations.

TBIT: Tom Bradley International Terminal

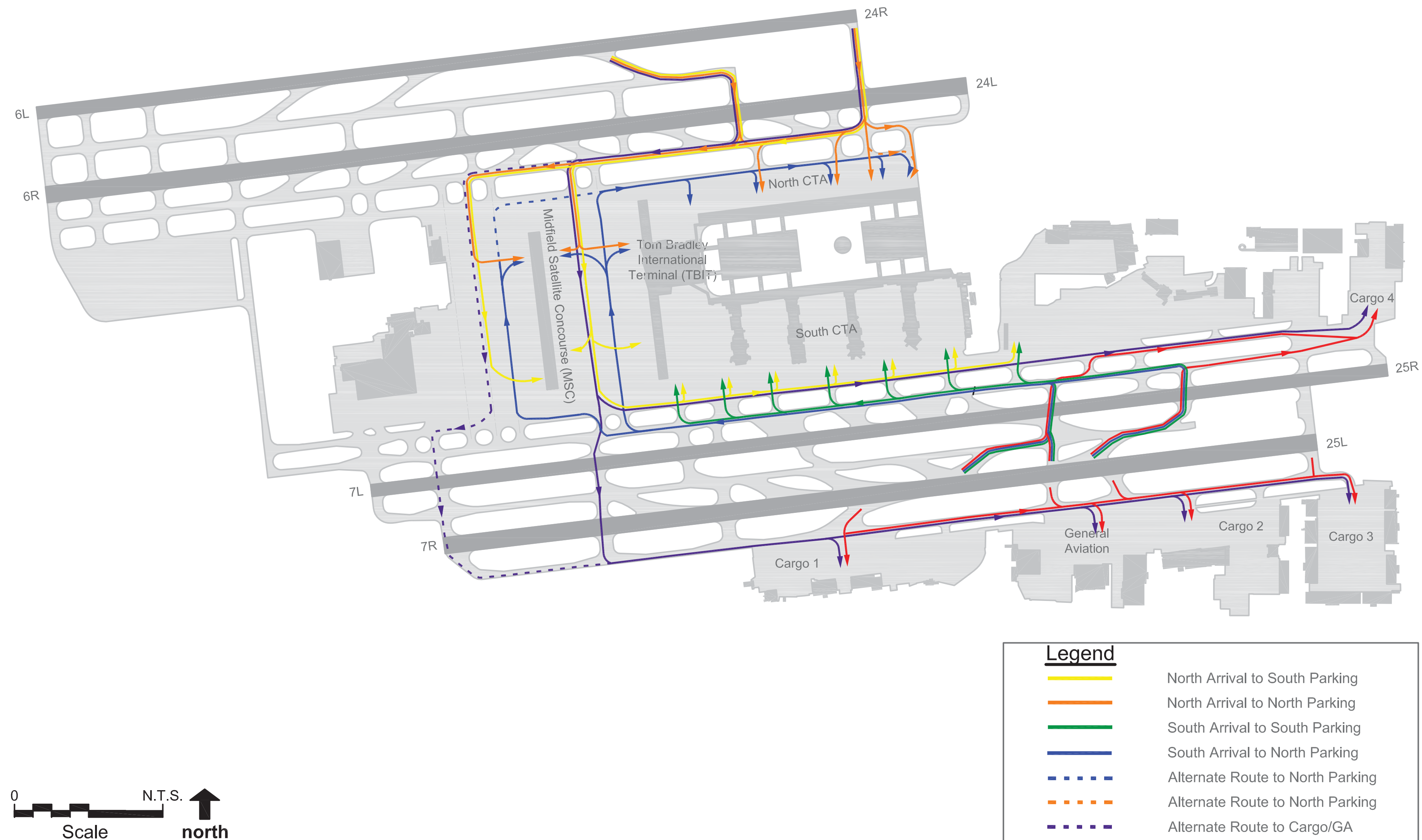
0 400 ft.
Scale north

Sources: Los Angeles World Airports, August 2010 (LAX Current Gate Positions for Terminals 4 through 7); Hatch Mott MacDonald, February 2010 (Bradley West Modernization Project, TBIT gates); Ricondo & Associates, Inc., June 2011 (conceptual gate layouts for MSC, North Linear, northside of TBIT, Terminal 8 and commuter positions).
Prepared by: Ricondo & Associates, Inc., May 2012.

SPAS Alternative 3
Gate Positions

Figure
23

This page intentionally left blank.



Source: HNTB Corp., Los Angeles International Airport Layout Plan, August 2010. Ricondo & Associates, Inc., November 2011.

Prepared by: Ricondo & Associates, Inc, November 2011.

LAX Specific Plan Amendment Study Report

2025 Future Arrival Taxipaths (West Flow)
SPAS Alternative 3

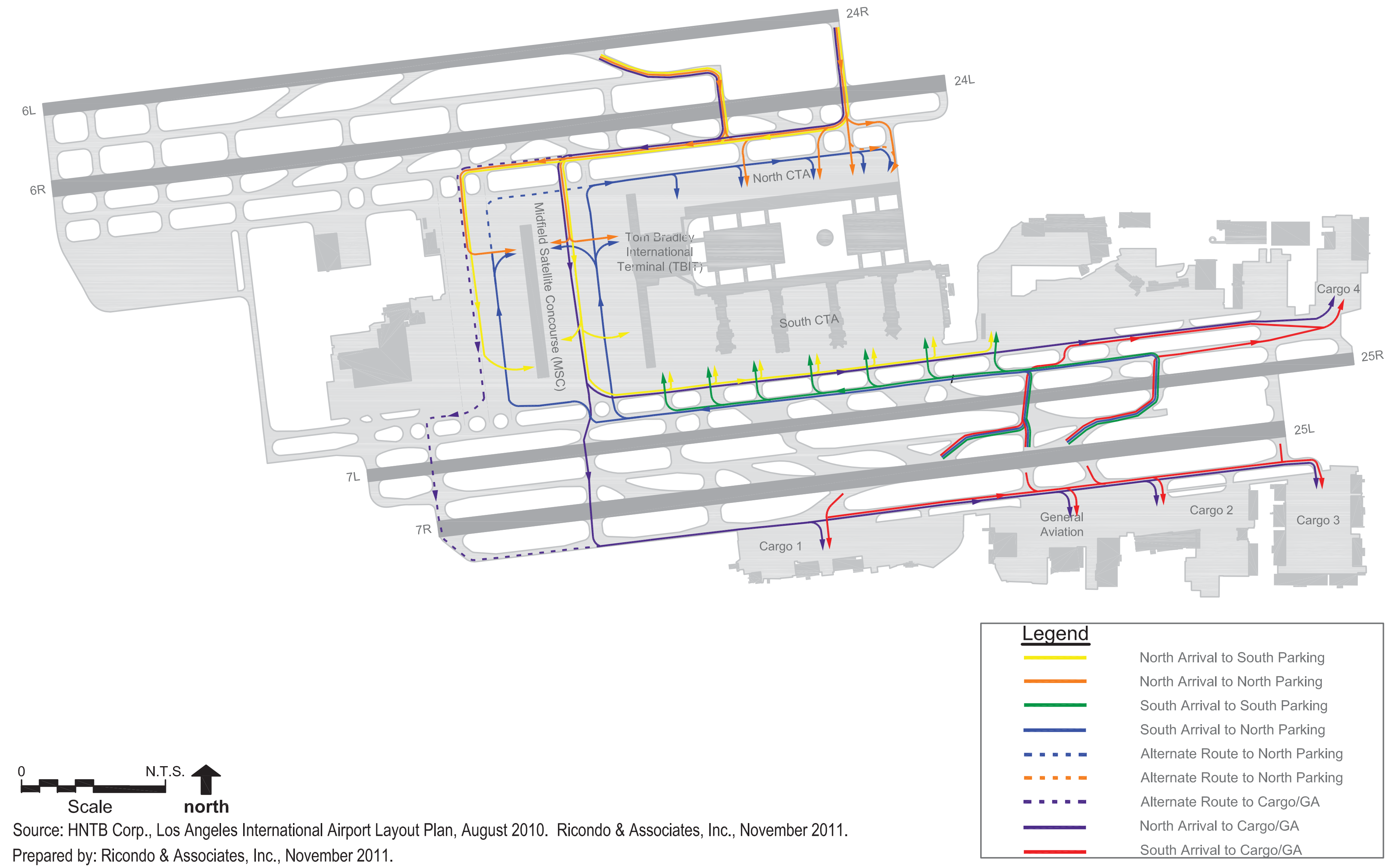
Figure **24**

This page intentionally left blank.

Source: HNTB Corp., Los Angeles International Airport Layout Plan, August 2010. Ricondo & Associates, Inc., November 2011.
Prepared by: Ricondo & Associates, Inc., November 2011.

LAX Specific Plan Amendment Study Report	2025 Future Departure Taxipaths (West Flow) SPAS Alternative 3	Figure 25

This page intentionally left blank.



Source: HNTB Corp., Los Angeles International Airport Layout Plan, August 2010. Ricondo & Associates, Inc., November 2011.

Prepared by: Ricondo & Associates, Inc., November 2011.

LAX Specific Plan Amendment Study Report

2025 Future Arrival Taxipaths (East Flow)
SPAS Alternative 3

Figure
26

This page intentionally left blank.

Source: HNTB Corp., Los Angeles International Airport Layout Plan, August 2010. Ricondo & Associates, Inc., November 2011.
Prepared by: Ricondo & Associates, Inc., November 2011.

LAX Specific Plan Amendment Study Report	2025 Future Departure Taxipaths (East Flow) SPAS Alternative 3	Figure 27

This page intentionally left blank.

Table 13 summarizes the results of the Alternative 3 simulation modeling. **Table 14** summarizes the throughput results for the simulations.

3.3.5.1 West Flow

The simulation delay results by configuration are summarized below. The definition and annual use of each configuration remains consistent with those assumed for the 2009 Baseline Scenario.

VFR – Visual Approaches

For visual approaches under VFR conditions, the average simulated delay was 4.89 minutes per operation, the average unimpeded taxi time was 8.61 minutes per operation, and the combined average delay and taxi time was 13.49 minutes per operation.

VFR – ILS

For ILS approaches under VFR conditions, the average simulated delay was 5.86 minutes per operation, the average unimpeded taxi time was 8.61 minutes per operation, and the combined average delay and taxi time was 14.47 minutes per operation.

IFR

Under IFR conditions, the average simulated delay was 27.62 minutes per operation, the average unimpeded taxi time was 9.09 minutes per operation, and the combined average delay and taxi time was 36.71 minutes per operation.

3.3.5.2 East Flow

The definition and annual use of the east flow configuration remains consistent with those assumed for the 2009 Baseline Simulation.

VFR – ILS

For ILS approaches under VFR conditions, the average simulated delay was 8.91 minutes per operation, the average unimpeded taxi time was 9.23 minutes per operation, and the combined average delay and taxi time was 18.14 minutes per operation.

3.3.6 Peak Hour Throughput

Table 14 lists peak arrival hour, peak departure hour, and peak operating hour throughput for each of the configurations simulated under SPAS Alternative 3.

This page intentionally left blank.

Table 13

Average Delay and Unimpeded Taxi Time – 2025 SPAS Alternative 3

		Average Delay (Minutes per Operation)														
		Arrivals					Departures					Average				
Configuration	**Annual Use**	**Cancellations**	**Flow**	**Airspace**	**Ground**	**Total**	**Cancellations**	**Gatehold**	**Airspace**	**Ground**	**Total**	**Airspace**	**Total Ground**	**Taxi Only**	**Total**
VFR Visual West Flow	69.2%	0	0	2.74	3.22	5.96	0	0	0.08	3.74	3.82	1.40	3.48	2.64	4.89
VFR ILS West Flow	24.6%	0	0	4.26	3.32	7.58	0	0	0.11	4.05	4.16	2.17	3.69	2.79	5.86
VFR ILS East Flow	2.1%	0	0	11.01	2.30	13.32	0	0	0.09	4.46	4.55	5.53	3.39	2.76	8.91
Average VFR	**95.9%**	**0**	**0**	**3.31**	**3.23**	**6.54**	**0**	**0**	**0.09**	**3.84**	**3.92**	**1.69**	**3.53**	**2.68**	**5.22**
IFR West Flow	4.1%	0	0	44.88	1.32	46.20	0	0	0.07	9.14	9.21	22.38	5.25	4.76	27.62
Average All Weather	**100.0%**	**0**	**0**	**5.01**	**3.15**	**8.16**	**0**	**0**	**0.08**	**4.05**	**4.14**	**2.54**	**3.60**	**2.76**	**6.14**
											Average Unimpeded Taxi Time (Minutes per Operation)				
											Arrivals		Departures		Average
VFR Visual West Flow	69.2%										7.66		9.55		8.61
VFR ILS West Flow	24.6%										7.68		9.54		8.61
VFR ILS East Flow	2.1%										7.43		11.00		9.23
Average VFR	**95.9%**										**7.66**		**9.58**		**8.62**
IFR West Flow	4.1%										8.39		9.78		9.09
Average All Weather	**100.0%**										**7.69**		**9.59**		**8.64**
											Average Delay and Unimpeded Taxi Time (Minutes per Operation)				
											Arrivals		Departures		Average
VFR Visual West Flow	69.2%										13.62		13.37		13.49
VFR ILS West Flow	24.6%										15.26		13.70		14.47
VFR ILS East Flow	2.1%										20.75		15.55		18.14
Average VFR	**95.9%**										**14.19**		**12.95**		**13.57**
IFR West Flow	4.1%										54.59		18.99		36.71
Average All Weather	**100.0%**										**15.85**		**13.72**		**14.78**

NOTE: Totals may not add due rounding.

Source: Ricondo& Associates, Inc., October 2011, based on SIMMOD simulation results (average delay and unimpeded taxi times).

This page intentionally left blank.

Table 14

Peak Hour Throughput – 2025 SPAS Alternative 3

2,053 Daily Operations							
		Throughput					
		Peak Arrivals		**Peak Departures**		**Peak Operations**	
Configuration	**Annual Use**	**Daily Total**	**Peak Throughput Hour**	**Daily Total**	**Peak Throughput Hour**	**Daily Total**	**Peak Throughput Hour**
VFR with Visual Approaches – West Flow	69.2%	1,022	72	1,031	75	2,053	134
VFR with ILS Approaches – West Flow	24.6%	1,022	72	1,031	74	2,053	133
VFR with ILS Approaches – East Flow	2.1%	1,022	68	1,031	73	2,053	137
IMC with Instrument Approaches – West Flow	4.1%	1,022	62	1,031	67	2,053	122
Average All-Weather Throughput	100.0%	1,022	72	1,031	75	2,053	133

ILS = Instrument Landing System
IMC = Instrument Meteorological Conditions
VFR = Visual Flight Rules

Source: Ricondo& Associates, Inc., October 2011, based on SIMMOD simulation results (daily and hourly throughput operations).

3.4 2025 SPAS Alternative 4

Figure 28 depicts the 2025 SPAS Alternative 4 airfield layout with the existing airfield as it was in 2009. The only improvements would be the extension to Runway 6L-24R and the RSA improvements to Runway 7L-25R. Alternative 4 includes the existing CTA, the TBIT reconfiguration, and the MSC and associated taxiways. The 2025 DDFS consists of a total of 2,053 operations. The alternative, referred to as the No Project – No Yellow Lights alternative is in reference to the SPAS Agreement which categorized certain projects that need different approval procedures as “Yellow Light Projects”.

3.4.1 Terminal Assumptions

The terminal assumptions for 2025 SPAS Alternative 4 include the existing CTA, the TBIT reconfiguration, and the MSC. The west remote gates would not be used under this alternative. **Figure 29** depicts the gate positions simulated for this alternative. The 2025 SPAS gate assignments are described in the *LAX 2025 Design Day Forecast Schedule Technical Report*.

3.4.2 Airfield/Airspace Assumptions

The airspace and airfield assumptions under Alternative 4 remain the same as those under the 2009 Baseline Simulation with the exception of the addition of the Runway 24L extension and the Runway 7L RSA improvements to Alternative 4. See Sections 1.4.7 and 1.4.8 for additional detail.

3.4.3 Aircraft Movement Assumptions

The aircraft movement assumptions for non-NLA aircraft are depicted on **Figure 30** and **Figure 31** for west flow arrivals and departures, respectively. **Figure 32** and **Figure 33** depict the non-NLA movement assumptions for arrivals and departures, respectively, in east flow. The general ground movement pattern is the same as under the 2009 Baseline Simulation with the exception of aircraft taxiing to and from the MSC and the west side of TBIT under Alternative 4.

3.4.4 Design Day Activity

The 2025 DDFS is discussed in Section 3.1.4. Table 8 summarizes the DDFS operations assumed in the 2025 simulations.

3.4.5 Average Delay and Unimpeded Taxi Time

The average delay statistics for the 2025 SPAS Alternative 4 simulation are described in this section. The annualized average simulated delay under this alternative was 5.98 minutes per operation, the average unimpeded taxi time was 7.88 minutes per operation, and the combined average delay and taxi time was 13.86 minutes per operation. Note that due to rounding, the combined average delay and taxi times listed in the following sections may not add to the displayed amount.

Table 15 summarizes the simulation results delay and taxi times simulation results for 2025 SPAS Alternative 4. **Table 16** summarizes the throughput results for the simulations.

3.4.5.1 West Flow

The following summarizes the delay results by configuration. The definition and annual use of each configuration under Alternative 4 remains consistent with those assumed for the 2009 Baseline Scenario.

VFR – Visual Approaches

For visual approaches under VFR conditions, the average simulated delay was 4.74 minutes per operation, the average unimpeded taxi time was 7.83 minutes per operation, and the combined average delay and taxi time was 12.57 minutes per operation.

VFR – ILS

For ILS approaches under VFR conditions, the average simulated delay was 5.75 minutes per operation, the average unimpeded taxi time was 7.86 minutes per operation, and the combined average delay and taxi time was 13.61 minutes per operation.

IFR

Under IFR conditions, the average simulated delay was 27.78 minutes per operation, the average unimpeded taxi time was 8.44 minutes per operation, and the combined average delay and taxi time was 36.22 minutes per operation.

3.4.5.2 East Flow

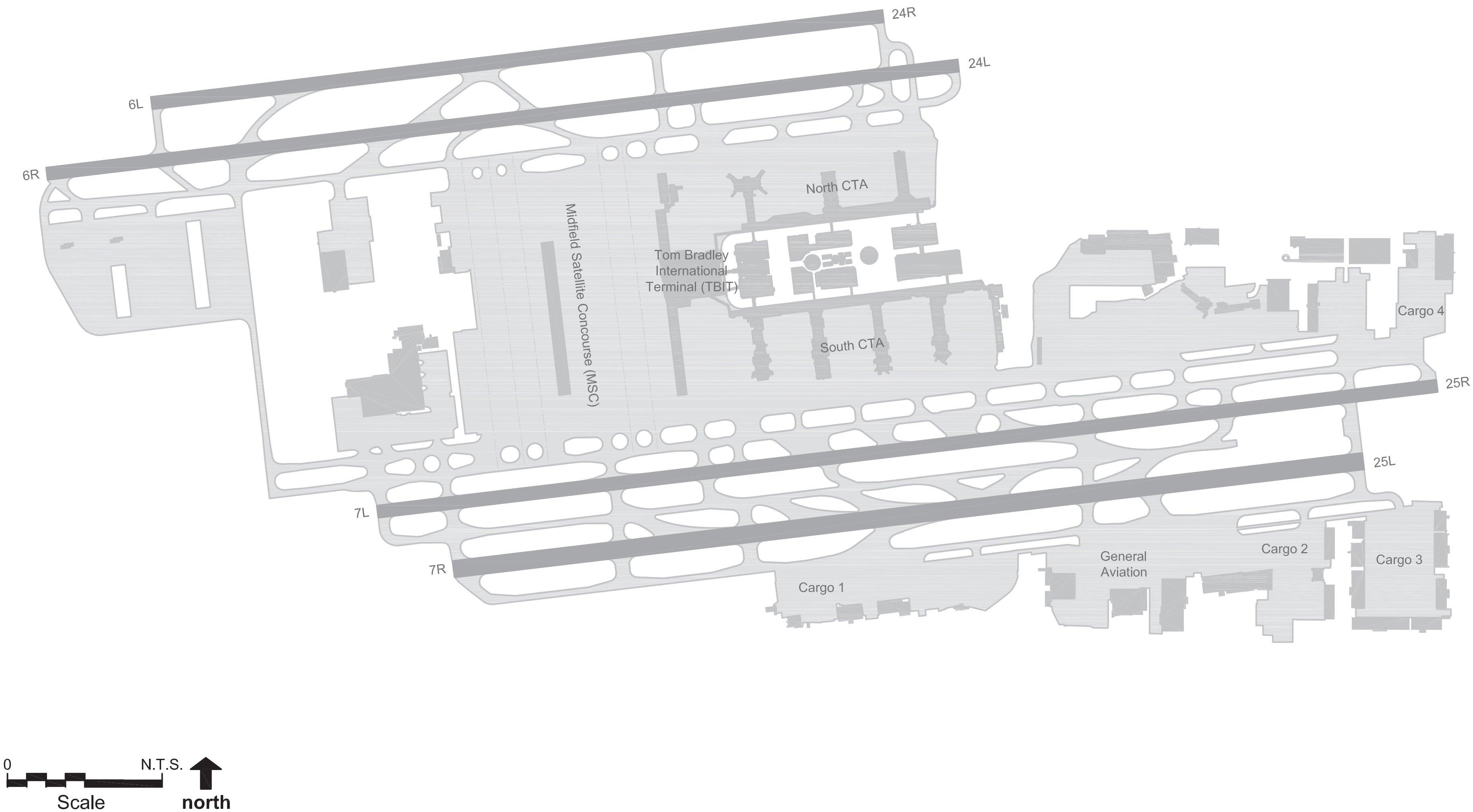
The definition of and annual use of the east flow configuration remains consistent with those assumed for the 2009 Baseline Scenario.

VFR – ILS

For ILS approaches under VFR conditions in east flow, the average delay was 6.95 minutes per operation, the average unimpeded taxi time was 8.90 minutes per operation, and the combined average delay and taxi time was 15.85 minutes per operation.

3.4.6 Peak Hour Throughput

Table 16 lists peak arrival hour, peak departure hour, and peak operating hour throughput for each of the configurations simulated under SPAS Alternative 4.

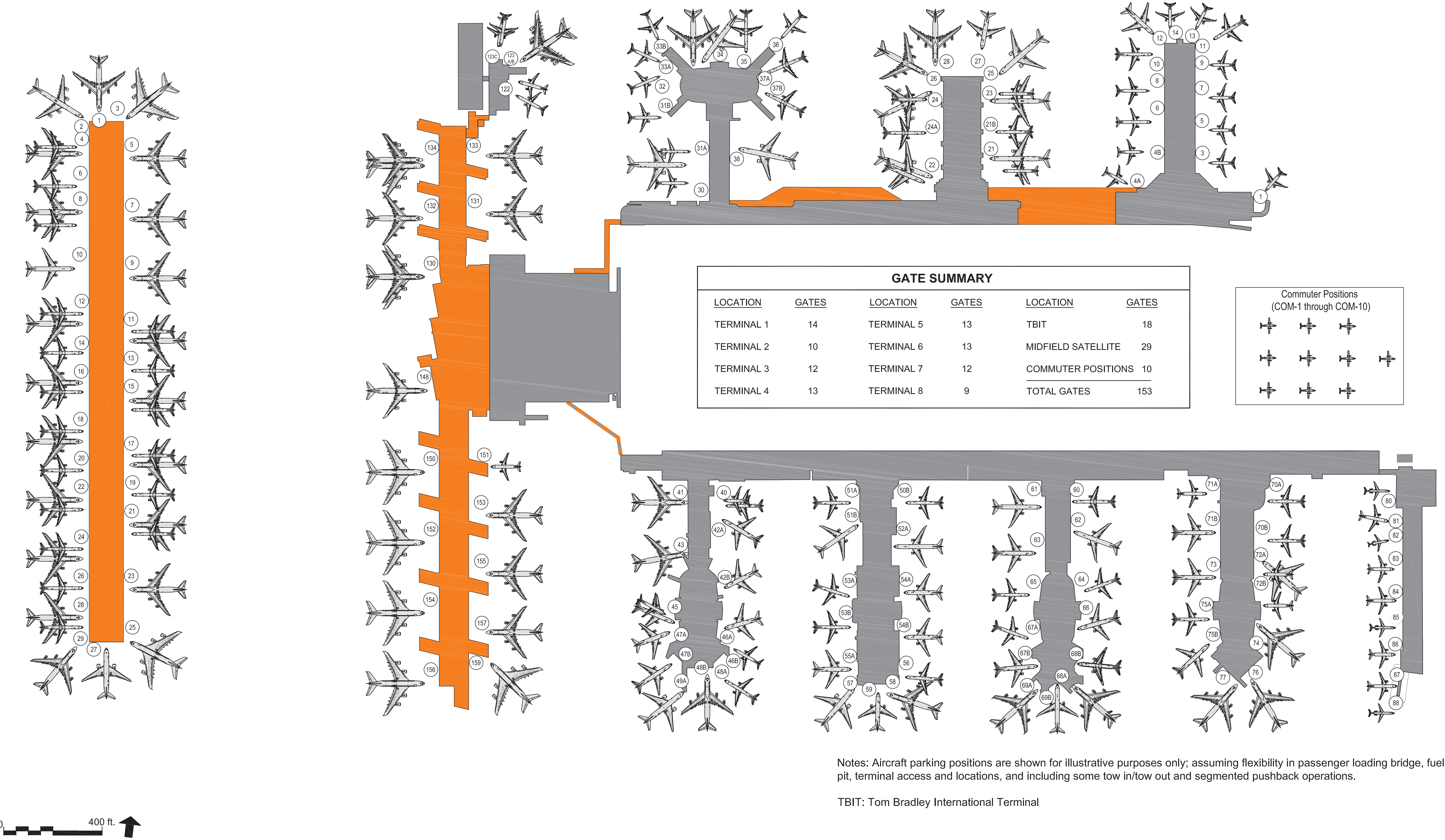


Source: HNTB Corp., Los Angeles International Airport Layout Plan, August 2010. Ricondo & Associates, Inc., November 2011.

Prepared by: Ricondo & Associates, Inc., November 2011.

LAX Specific Plan Amendment Study Report	2025 SPAS Alternative 4	Figure 28

This page intentionally left blank.



GATE SUMMARY

LOCATION	GATES	LOCATION	GATES	LOCATION	GATES
TERMINAL 1	14	TERMINAL 5	13	TBIT	18
TERMINAL 2	10	TERMINAL 6	13	MIDFIELD SATELLITE	29
TERMINAL 3	12	TERMINAL 7	12	COMMUTER POSITIONS	10
TERMINAL 4	13	TERMINAL 8	9	TOTAL GATES	153

Notes: Aircraft parking positions are shown for illustrative purposes only; assuming flexibility in passenger loading bridge, fuel pit, terminal access and locations, and including some tow in/tow out and segmented pushback operations.

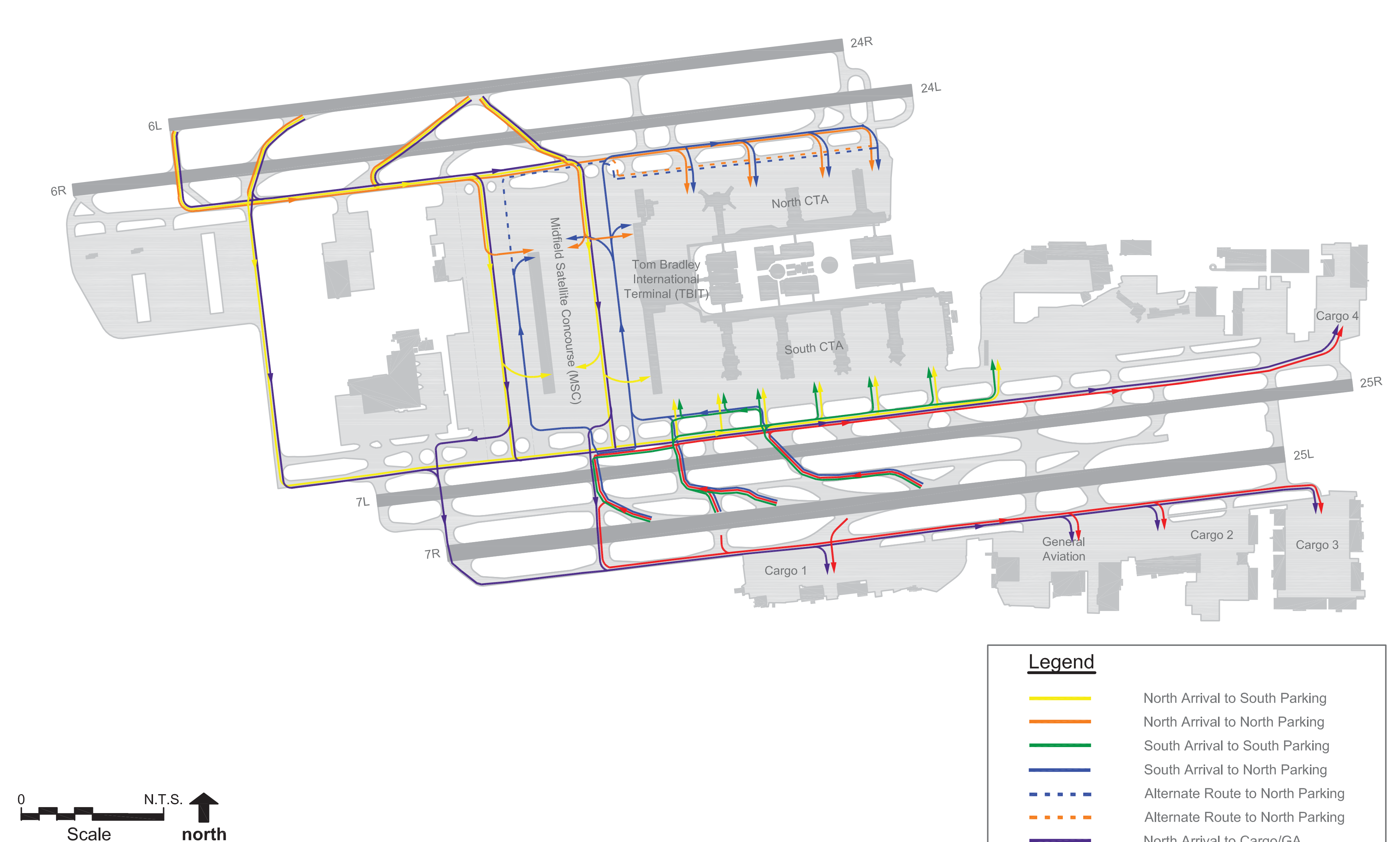
TBIT: Tom Bradley International Terminal

Sources: Los Angeles World Airports, August 2010 (LAX Current Gate Positions for Central Terminal Area gates); Hatch Mott MacDonald, February 2010 (Bradley West Modernization Project, TBIT gates); Ricondo & Associates, Inc., September 2010 (Midfield Satellite Concourse conceptual gate layout).
Prepared by: Ricondo & Associates, Inc., May 2012.

SPAS Alternative 4
Gate Positions

Figure
29

This page intentionally left blank.



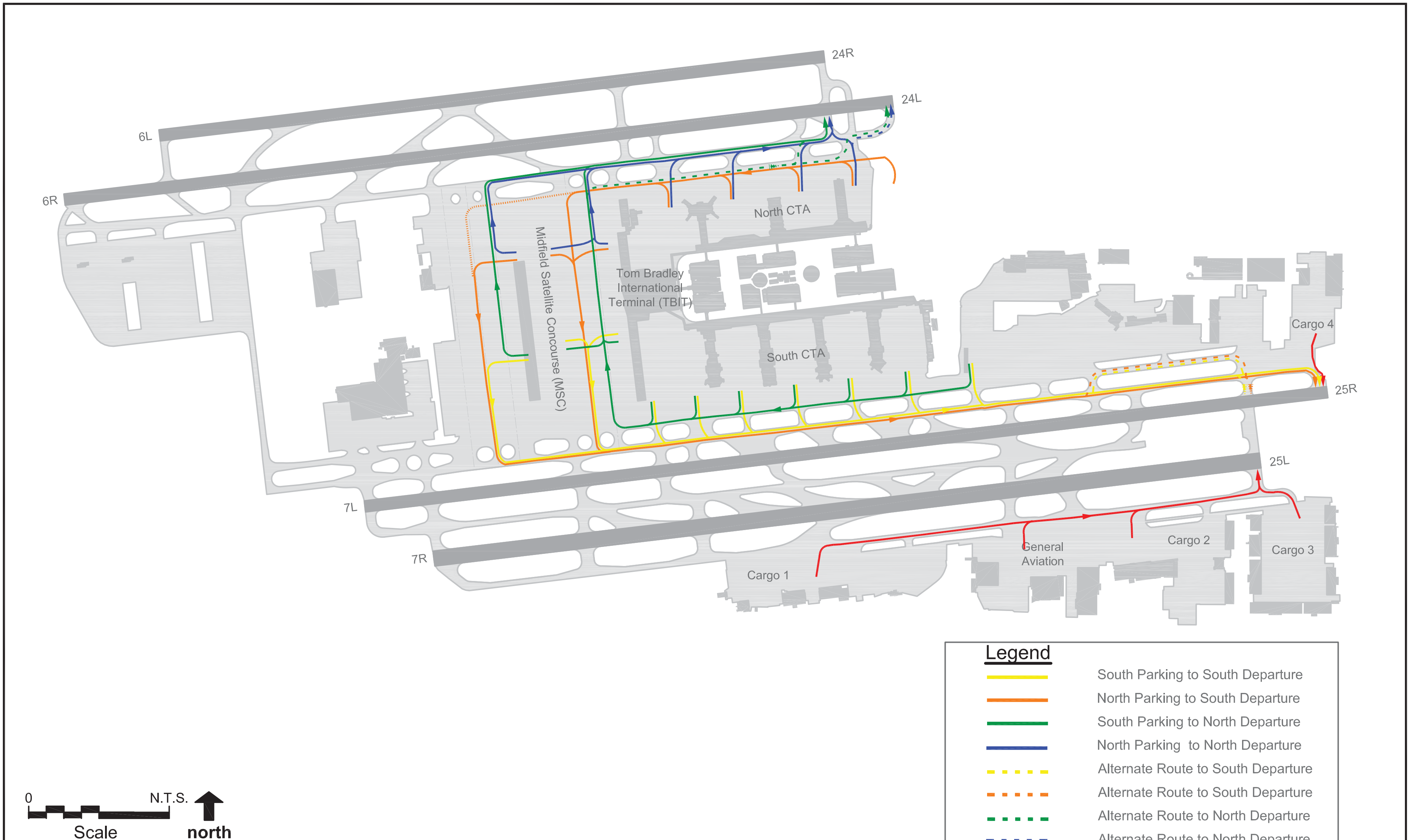
Source: HNTB Corp., Los Angeles International Airport Layout Plan, August 2010. Ricondo & Associates, Inc., November 2011.

Prepared by: Ricondo & Associates, Inc., November 2011.

2025 Future Arrival Taxipaths (West Flow)
SPAS Alternative 4

Figure
30

This page intentionally left blank.



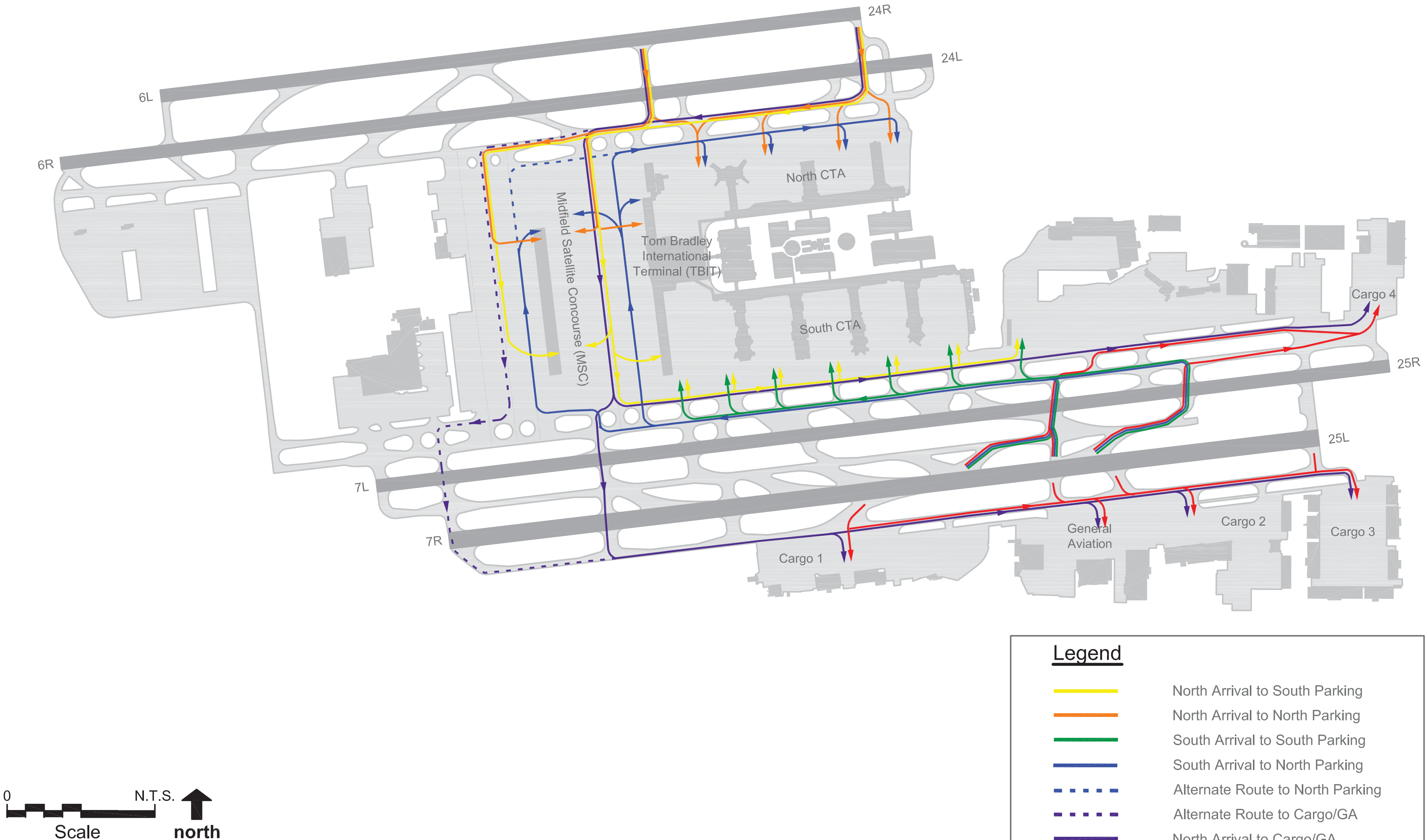
Source: HNTB Corp., Los Angeles International Airport Layout Plan, August 2010. Ricondo & Associates, Inc., November 2011.

Prepared by: Ricondo & Associates, Inc., November 2011.

2025 Future Departure Taxipaths (West Flow)
SPAS Alternative 4

Figure 31

This page intentionally left blank.



Source: HNTB Corp., Los Angeles International Airport Layout Plan, August 2010. Ricondo & Associates, Inc., November 2011.

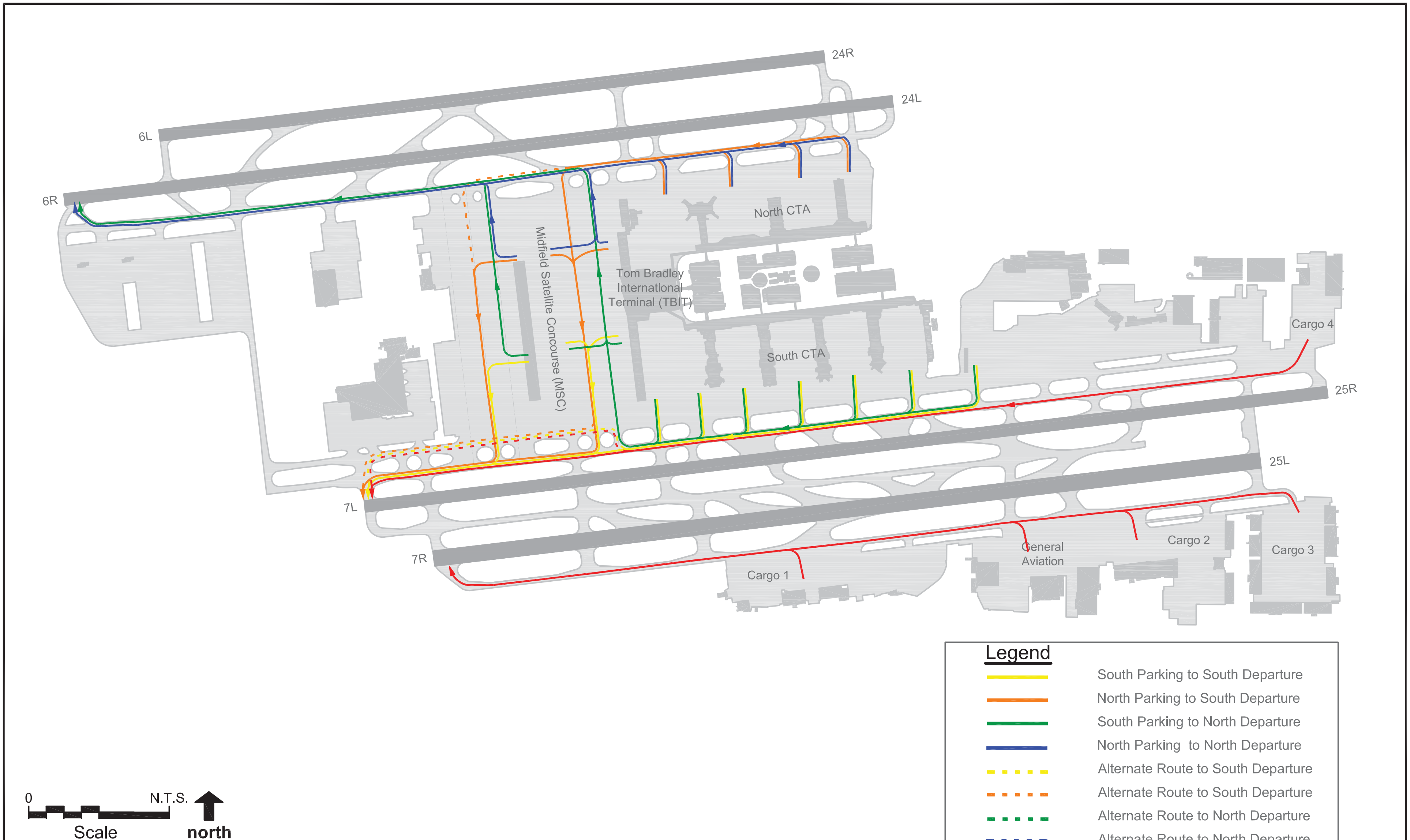
Prepared by: Ricondo & Associates, Inc., November 2011.

LAX Specific Plan Amendment Study Report

2025 Future Arrival Taxipaths (East Flow)
SPAS Alternative 4

Figure
32

This page intentionally left blank.



Source: HNTB Corp., Los Angeles International Airport Layout Plan, August 2010. Ricondo & Associates, Inc., November 2011.

Prepared by: Ricondo & Associates, Inc., November 2011.

LAX Specific Plan Amendment Study Report	2025 Future Departure Taxipaths (East Flow) SPAS Alternative 4	Figure 33

This page intentionally left blank.

Table 15

Average Delay and Unimpeded Taxi Time – 2025 SPAS Alternative 4

		Average Delay (Minutes per Operation)													
		Arrivals					Departures					Average			
Configuration	Annual Use	Cancellations	Flow	Airspace	Ground	Total	Cancellations	Gatehold	Airspace	Ground	Total	Airspace	Total Ground	Taxi Only	Total
VFR Visual West Flow	69.2%	0	0	2.65	2.33	4.98	0	0	0.07	4.43	4.50	1.35	3.39	2.69	4.74
VFR ILS West Flow	24.6%	0	0	4.26	2.35	6.62	0	0	0.09	4.80	4.89	2.17	3.58	2.86	5.75
VFR ILS East Flow	2.1%	0	0	8.77	1.87	10.64	0	0	0.06	3.23	3.29	4.40	2.55	1.90	6.95
Average VFR	**95.9%**	**0**	**0**	**3.20**	**2.33**	**5.52**	**0**	**0**	**0.07**	**4.50**	**4.57**	**1.63**	**3.42**	**2.71**	**5.05**
IFR West Flow	4.1%	0	0	42.61	1.69	44.30	0	0	0.06	11.34	11.41	21.24	6.54	6.07	27.78
Average All Weather	**100.0%**	**0**	**0**	**4.81**	**2.30**	**7.11**	**0**	**0**	**0.07**	**4.78**	**4.85**	**2.43**	**3.55**	**2.85**	**5.98**

		Average Unimpeded Taxi Time (Minutes per Operation)		
Configuration	Annual Use	Arrivals	Departures	Average
VFR Visual West Flow	69.2%	6.66	8.99	7.83
VFR ILS West Flow	24.6%	6.71	9.00	7.86
VFR ILS East Flow	2.1%	7.12	10.67	8.90
Average VFR	**95.9%**	**6.68**	**9.03**	**7.86**
IFR West Flow	4.1%	7.72	9.15	8.44
Average All Weather	**100.0%**	**6.72**	**9.03**	**7.88**

		Average Delay and Unimpeded Taxi Time (Minutes per Operation)		
Configuration	Annual Use	Arrivals	Departures	Average
VFR Visual West Flow	69.2%	11.64	13.49	12.57
VFR ILS West Flow	24.6%	13.32	13.89	13.61
VFR ILS East Flow	2.1%	17.76	13.96	15.85
Average VFR	**95.9%**	**12.20**	**13.04**	**12.62**
IFR West Flow	4.1%	52.02	20.56	36.22
Average All Weather	**100.0%**	**13.84**	**13.89**	**13.86**

NOTE: Totals may not add due rounding.

Source: Ricondo& Associates, Inc., October 2011, based on SIMMOD simulation results (average delay and unimpeded taxi times).

This page intentionally left blank.

Table 16

Peak Hour Throughput – 2025 SPAS Alternative 4

2,053 Daily Operations

		Throughput					
		Peak Arrivals		Peak Departures		Peak Operations	
Configuration	**Annual Use**	**Daily Total**	**Peak Throughput Hour**	**Daily Total**	**Peak Throughput Hour**	**Daily Total**	**Peak Throughput Hour**
VFR Visual West Flow	69.2%	1,022	72	1,031	74	2,285	148
VFR ILS West Flow	24.6%	1,022	72	1,031	73	2,285	144
VFR ILS East Flow	2.1%	1,022	69	1,031	78	2,285	134
IFR West Flow	4.1%	1,022	61	1,031	66	2,285	123
Average All-Weather Throughput	100.0%	1,022	72	1,031	73	2,053	133

ILS = Instrument Landing System
IMC = Instrument Meteorological Conditions
VFR = Visual Flight Rules

Source: Ricondo& Associates, Inc., October 2011, based on SIMMOD simulation results (daily and hourly throughput operations).

4. CONCLUSIONS

The variation in average all-weather unimpeded taxi times and delays between the 2009 Baseline Scenario operating conditions and each of the four 2025 alternatives is listed in **Table 17**.

Compared to the Baseline Scenario, all alternatives would result in higher delays, which would be attributable to the increase in the number of operations per day.

SPAS Alternative 1 would result in the lowest delay (5.20 minutes of delay per operation) while SPAS Alternative 3 would result in the highest delay (6.14 minutes of delay per operation). SPAS Alternative 2 would yield the lowest unimpeded taxi times of the four alternatives (7.86 minutes per operations).

Based on the activity level selected for the analysis, none of the alternatives is expected to result in significant operating efficiency gains. SPAS Alternative 1 would result in the least departure delay, as arriving aircraft may hold on the parallel taxiway between the outer arrival runway and the inner departure runway; this ability to hold would lead to fewer runway crossings during peak departure times.

While under SPAS Alternative 3, a parallel taxiway would be located between the north runways, the imbalance of gates would result in many aircraft parked on the south CTA to depart from the north, leading to congestion on the north/south taxiways and reducing the benefits associated with the parallel taxiway. SPAS Alternative 2 would yield better results than SPAS Alternative 4, as additional exits would be provided for arriving ADG IV, V, and VI (heavy) aircraft. Under SPAS Alternative 4, the existing airfield exits would allow for only one high speed exit for heavy aircraft, while under SPAS Alternative 2, three high speed exits may be used by heavy aircraft. The simulated unimpeded taxi time is slightly higher for the alternatives with a center parallel taxiway on the north runway complex, as pilots are required to taxi on the taxiway prior to crossing the inboard runway, whereas under the alternatives without a center parallel taxiway, aircraft would be allowed to cross the inboard runway directly.

Table 17

Average All-Weather Delays, Unimpeded Taxi Times and Variations from 2009 Baseline

	Average All Weather (Minutes per Operation)			Variation from Baseline (Minutes per Operation)		
Alternative	**Delay**	**Unimpeded Taxi Time**	**Totals**	**Delay Variation**	**Unimpeded Taxi Time Variation**	**Totals**
Baseline	2.38	7.80	10.18	-	-	-
Alternative 1	5.20	8.10	13.29	2.82	0.30	3.12
Alternative 2	5.38	7.86	13.24	3.00	0.06	3.06
Alternative 3	6.14	8.64	14.78	3.76	0.84	4.60
Alternative 4	5.98	7.88	13.86	3.60	0.08	3.68

Note: Totals may not add due rounding.

Source: Ricondo& Associates, Inc., May 2012, based on SIMMOD simulation results (average all weather delay and unimpeded taxi times).