

# **LOS ANGELES INTERNATIONAL AIRPORT**

## **North Airfield Assessment**

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EXECUTIVE SUMMARY

This study examines options for reconfiguring the North Airfield at Los Angeles International Airport (LAX) to address a variety of issues including airfield safety and the need to accommodate Design Group VI aircraft operations on the North Airfield. The need to address these issues is based upon a recurring and persistent problem with runway incursions that threaten the safety of aircraft operations and the impending arrival of Design Group VI aircraft operations such as the Airbus A-380 and the Boeing 747-800. These larger aircraft require wider taxiways and runways, as well as greater separations between runways and taxiways and between taxiways and parallel taxiways.

After applying the latest Federal Aviation Administration (FAA) design standards and developing a variety of airfield layouts, the study found that there is a potentially viable alternative to the airport’s current master plan alternative for the reconstruction of the North Airfield. This alternative, referred to as Alternative 2B, consists of maintaining the inboard runway in its present location and reconstructing the outboard runway 350 feet farther north of its present location to allow the construction of a center parallel taxiway between the runways.

The option of holding the outboard runway in its present location and rebuilding the inboard runway and associated taxiways toward the terminals was explored. However, it would not provide the ability to retain more of the concourse or gates in Terminal 1, 2, 3, and the Tom Bradley International Terminal than the LAX master plan’s Alternative D and; therefore, is not recommended.

Alternative 2B proposes the construction of the outboard runway to Design Group VI standards to allow it to accommodate takeoffs and landings of Design Group VI aircraft. The inboard runway would be restricted to the operations of Design Group V aircraft (i.e., 747-400) and smaller. In order to more fully accommodate Design Group VI aircraft operations to long-haul destinations, Alternative 2B also proposes lengthening Runway 6L/24R to a length of 11,000 feet by crossing over Pershing Drive on the west end and acquiring property in the vicinity of S. Sepulveda Boulevard and Westchester Parkway on the east end.

Alternative 2B would require the reconstruction of outboard runway, but would allow the inboard runway to remain in its existing location. This would eliminate the need to rebuild both runways as proposed by some other alternatives examined in this study. Considering the study objectives, operational efficiencies, and cost factors, Alternative 2B offers substantial advantage and is recommended. Additional study is required to assess the full range of environmental engineering and construction issues associated with this alternative.

1.0 INTRODUCTION

This study was undertaken by Los Angeles World Airports (LAWA) at the request of Mayor Antonio Villaraigosa in response to concerns of nearby residents regarding plans and options for reconstructing the North Airfield at LAX. The study examined options for reconfiguring the North Airfield at LAX to address a variety of issues including airfield safety related to runway incursions and the need to accommodate Design Group VI aircraft operations on the North Airfield.

Airfield safety, and especially the issue of runway incursions, has been an item of significant concern at LAX for many years. LAWA has been addressing this issue through a number of operational initiatives

including Aircraft Surface Detection Equipment (a type of radar that tracks the movement of aircraft and vehicles on the airport and warns air traffic controllers of potential runway incursions) and Runway Status Lights that will warn pilots through pavement lighting when it is not safe to cross a runway or begin a takeoff roll. However, even with the implementation of all possible operational controls, there is still a need for physical improvements to further reduce the potential for runway incursions and thereby increase airfield safety.

The existing airfield configuration at LAX, which consist of closely-spaced parallel runways, is no longer an efficient airfield configuration for modern airfield operations. Current FAA design standards require greater spacing between parallel runways and between runways and taxiways to safely and efficiently accommodate aircraft operations.

FAA design standards have evolved over the years as more demanding aircraft have entered the fleet. Although certain airfield design standards were grandfathered for existing infrastructure at LAX, this study applies the very latest FAA design standards to a variety of airfield development concepts. Current FAA design standards are more demanding than even the design standards previously applied in the LAX master plan.

This study addresses three questions regarding the North Airfield at LAX. The questions are as follows:

- 1. What is the need to separate the existing runways and provide a center parallel taxiway?
- 2. What is the need to accommodate Design Group VI aircraft, such as the Airbus A380 and Boeing 747-800, on the North Airfield?
- 3. What are potential layouts for separating the runways, providing a center parallel taxiway and accommodating Design Group VI aircraft on the North Airfield?

The following sections address each of these questions.

2.0 THE NEED TO SEPARATE EXISTING RUNWAYS AND PROVIDE A CENTER TAXIWAY

The need to separate the existing Runway 6L/24R and Runway 6R/24L is due to safety concerns related to recurring runway incursions and the inability of most large air carrier aircraft to land on Runway 6L/24R (i.e., the outboard runway) and hold short of Runway 6R/24L (i.e., the inboard runway) without violating clearance requirements established by the FAA to ensure the safe movement of aircraft on airports. Therefore, air traffic control personnel must carefully control and meter the movement of aircraft across the inboard runway to maintain compliance with the clearance requirements. The inability to hold certain large aircraft between the runways increases airfield delays and has led to instances of aircraft crossing the inboard runway without proper air traffic control clearances. Such occurrences are defined as runway incursion and are a serious safety issue.

The FAA defines a runway incursion as any occurrence at an airport involving an aircraft, vehicle, person, or object on the ground that creates a collision hazard or results in a loss of separation with an aircraft taking off, intending to takeoff, landing, or intending to land. Reducing runway incursions is one of the highest objectives of the FAA in its effort to reduce aircraft accidents. Each year the FAA sets forth its goals for the nation’s air transportation system in a document entitled “FAA Flight Plan.” The Number 3 objective in the

plan covering 2007 through 2011 is to “Reduce the Risk of Runway Incursions.” This high ranking is a reflection of the importance that the FAA places on reducing runway incursions to improve the safety of the nation’s air transportation system.

Currently, there is no center parallel taxiway between the North Airfield’s two parallel runways. The existing separation between the centerlines of Runway 6R/24L and Runway 6L/24R is 700 feet. Six exit taxiways connect these two runways (Taxiways V, W, Y, Z, AA, and BB). Taxiways V, W, and BB are 90 degree exit taxiways, while Taxiways Y, Z, and AA are angled/high speed exit taxiways as shown in **Figure 1**.

There are two types of operational constraints associated with the existing exit taxiways. The first constraint is the locations of Taxiway Z and Taxiway Y, which are too close to the landing thresholds for most large air carrier aircraft to slow enough to make turns onto these exits. Therefore, these exit taxiways are unsuitable for most landings by large air carriers. As shown in **Figure 1**, the distance from the landing threshold on Runway 24R to Taxiway Z is slightly more than 4,700 feet. Likewise, the distance from the landing threshold on Runway 6L to Taxiway Y is approximately 4,000 feet. The efficiency of the North Airfield would be improved if these exists were located approximately 5,500 to 6,000 feet from the landing threshold with additional exits located another 1,000 to 1,500 feet beyond the first exit.

The second operational constraint associated with the existing exit taxiways is the small distance between the hold lines on each exit taxiway. There are two sets of hold lines on each exit taxiway, one for aircraft holding short of Runway 6R/24L and a second for aircraft holding short of Runway 6L/24R. The distance between the hold lines on the 90 degree exit taxiways (V, W, and BB) are approximately 195 feet. The distance between the hold lines on the angled/high speed exit taxiways range from 197 feet on Taxiway Y to 278 feet on Taxiway Z.

**Table 1** presents a list of aircraft that currently or would likely operate at LAX, their lengths, and the existing distances between the hold lines to quantify operational constraints on the North Airfield. Aircraft lengths were obtained from Airbus and Boeing “Airplane Characteristics for Airport Planning” manuals.

Aircraft lengths were compared to the existing distance between the respective taxiway hold lines. Aircraft lengths that exceed the distance between the two taxiway hold lines result in the aircraft’s tail penetrating the outboard runway’s Runway Safety Area (RSA) as shown in **Figure 2**.

**Table 1** indicates there are 11 aircraft currently operating at LAX that penetrate the RSA when these aircraft hold short of Runway 6R/24L. (These penetrations are indicated by the red shaded cells in **Table 1**.) With the future introduction of the Airbus A380 and the Boeing 747-800 (passenger and freighter versions) a total of 14 aircraft would penetrate the RSA. These aircraft are typically wide-body Airbus and Boeing aircraft that serve long haul domestic and international markets.

The impacts of these large aircraft operations at LAX were quantified by analyzing the forecast Design Day activity levels outlined in the LAX Final Master Plan. **Table 2** lists the forecast Design Day aircraft operations at LAX for the years 2005, 2008, and 2015. These data were obtained from the Final LAX Master Plan, Appendix F, “Aircraft Operations and Passenger Activity Profiles,” Tables F-1, F-2, and F-3.

TABLE 1  
TAXIWAY HOLD LINE PENETRATIONS

Manufacturer	Large Air Carrier Aircraft	Overall Length	Distance Between Taxiway Hold Lines					
			90 Degree Exits			Angled/High Speed		
			V	W	BB	AA	Z	Y
			195'			233'	278'	197'
Airbus	A-300-B2/B4/C4	175' 6"						
	A 300-600	178' 8.1"						
	A 310	150' 6.7"						
	A 330-200	191' 5.5"						
	A 330-300	208' 11.5"						
	A 340-200	194' 11.4"						
	A 340-300	208' 11.5"						
	A 340-500	228.86'						
	A 340-600	247.25'						
	A 350	193' 0"						
Boeing	A 380-800	238.61'						
	B 747 SP	184' 9"						
	B 747-100	231' 10"						
	B 747-200/300	231' 10"						
	B 747-400	231' 10.25"						
	B 747-800	250' 8"						
	B 747-800F	250' 8"						
	B 757-200	155' 3"						
	B 757-300	178' 7"						
	B 777-200/LR	209' 1"						
	B 777-300/ER	242' 4"						
	B 767-200	159' 2"						
	B 767-300/ER	180' 3"						
	B 767-400	201' 4"						
	B 787-8	186' 1"						
Other	L 1011-100/200	177' 8"						
	DC 10-10	182' 3.1"						
	DC 10-30	181' 7.2"						
	DC 10-40	182' 2.6"						
	MD 11	202' 2"						

Indicates overall aircraft length exceeds or would exceed distance between existing hold lines.  
Indicates the taxiway is too close to the landing threshold to be used by most large air carrier arrivals.

Total air carrier aircraft operations are forecast to remain nearly constant at slightly more than 1,600 operations per day between 2005 and 2015. The aircraft types forecast for the respective horizon years were referenced to the aircraft listed in **Table 1**. This effort provided the opportunity to better gauge the potential impacts of forecast large aircraft operations at LAX. **Figure 3** illustrates the changing composition of the design day aircraft fleet mix forecast for LAX.



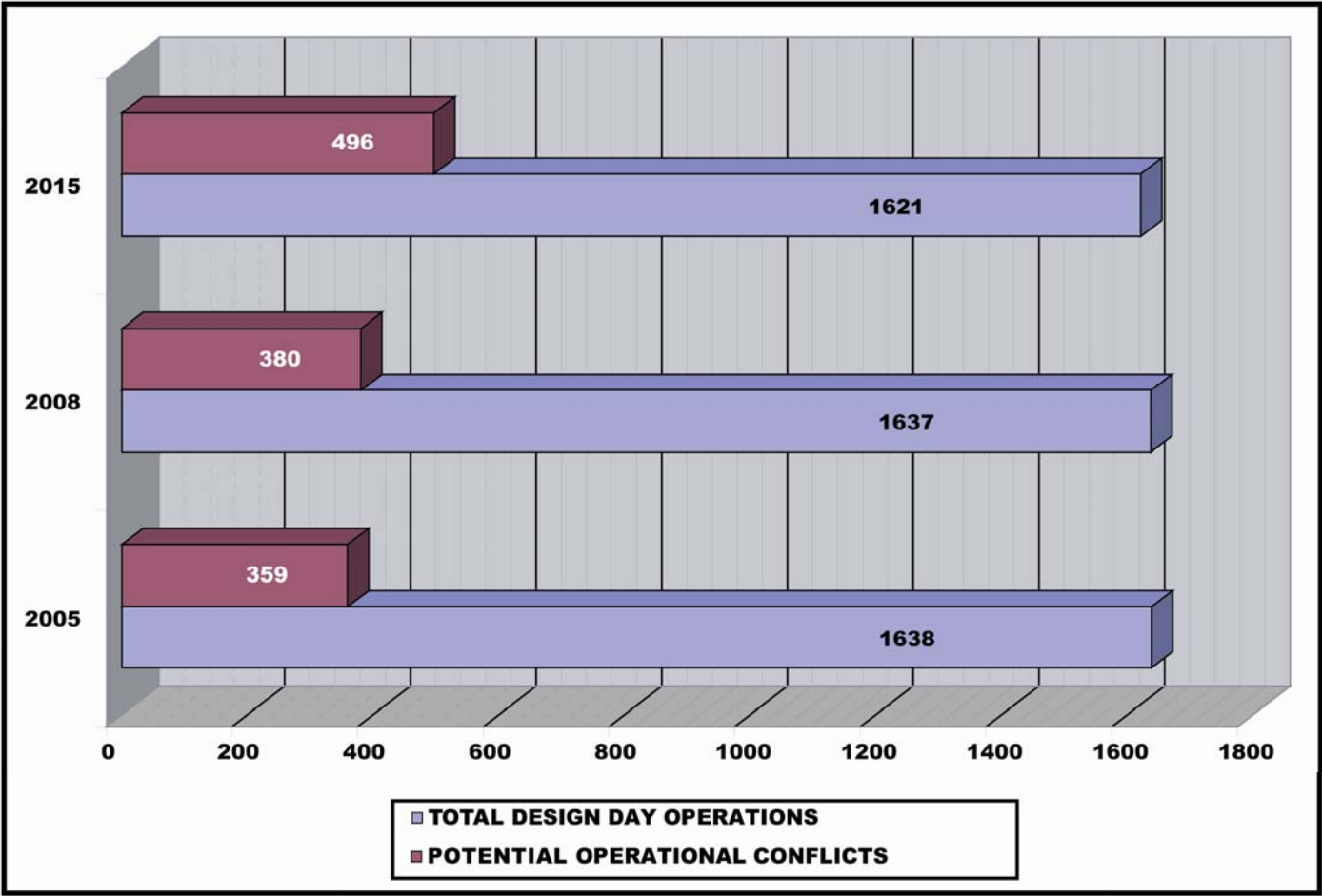
TABLE 2  
AIR CARRIER DESIGN DAY OPERATIONS BY AIRCRAFT TYPE

Aircraft Type	2005	2008	2015
100	8	7	4
300	5	5	5
310	20	20	21
319	5	5	3
320	59	59	50
330	16	17	21
340	20	22	19
72S	17	17	0
733	275	262	178
734	20	21	52
735	0	0	45
737	16	16	16
73S	81	75	22
744	104	108	135
747	48	48	22
74M	12	12	17
74X	0	6	27
757	324	330	394
763	37	38	73
767	89	93	83
777	43	44	55
AB3	58	60	116
D10	71	63	12
M11	74	80	105
M80	137	136	76
M87	8	8	2
M90	46	42	34
M95	23	21	34
D9S	1	1	0
ILU	2	2	0
L10	19	19	0
Total Air Carrier Operations	1,638	1,637	1,621
Large Air Carrier Operations with Holding Line Conflicts	359	380	496

Represents aircraft that could create conflicts, given the existing distances between North Airfield taxiway exit hold lines.

Source: LAX Final Master Plan, Appendix F, June 2003.

FIGURE 3  
DESIGN DAY AIR CARRIER OPERATIONS VERSUS  
POTENTIAL NORTH AIRFIELD OPERATIONAL CONFLICTS



For 2005, a total of 359 of the forecast 1,638 total design day air carrier operations at LAX were performed by large aircraft that generated potential North Airfield conflicts representing just over 22 percent of total air carrier operations. By the year 2008, operations by these larger aircraft would comprise 380 of the 1,637 total design day air carrier aircraft operations or just over 23 percent of the total. By the year 2015, large aircraft operations would total 496 of the forecast 1,621 total design day air carrier aircraft operations, an increase to more than 31 percent of the total forecast design day air carrier operations. Even though the majority of large air carrier aircraft operations presently occur on the South Airfield, the growth of these operations at LAX will result in increasing levels of delay unless an ability to hold these aircraft between the North Airfield’s parallel runways is achieved. This is because the outboard runway is closed to additional aircraft landings until the aircraft that penetrates the hold lines is cleared from between the runways. Construction of a center taxiway would eliminate this problem and would greatly assist in FAA operational efforts to reduce runway incursions by providing a taxiing route clear of both runways and their associated clearance requirements.

**3.0 THE NEED TO ACCOMMODATE DESIGN GROUP VI AIRCRAFT ON THE NORTH AIRFIELD**

The introduction of regularly scheduled Design Group VI aircraft operations at LAX should commence sometime within the next 10 to 14 months. Operations by the Airbus A380 were originally scheduled to begin at LAX during 2006. However, manufacturing delays have prevented airlines from initiating service. Deliveries of these aircraft to the airlines should begin in the latter half of 2007 with entrance into revenue service shortly thereafter if current schedules are met by Airbus. Based on recent announcements from Airbus, their inaugural flight to LAX is scheduled for later this year. Regarding future Airbus A380 activity, the LAWA has estimated that there will be 17 to 19 daily flights for a total of 34 to 38 daily operations by 2012. This estimate is used in this analysis.

LAWA previously undertook a study that investigated options to minimize runway incursions on the South Airfield and accommodate Design Group VI aircraft operations. The “Southside Airfield and New Large Aircraft (NLA) Study” recommended shifting Runway 7L/25R to the south to provide 800 feet of separation from Runway 7R/25L. By providing the 800-foot runway-to-runway centerline separation distance, a parallel center taxiway could be constructed between these two runways. This parallel center taxiway would provide a 400-foot separation from both runways, thereby meeting FAA design criteria for Design Group V aircraft operations. Construction of this center parallel taxiway was ultimately intended to help mitigate the potential for runway incursions on the South Airfield.

Runway 7R/25L was originally designated as the South Airfield runway for all Design Group VI aircraft operations, due to the runway’s width of 200 feet and available clearances from its parallel taxiways even though it does not meet all Design Group VI standards. Runway 7R/25L is currently the only runway at LAX with a 200-foot width required by FAA design criteria for Design Group VI aircraft operations. The runway’s takeoff length of 11,095 feet would also be capable of accommodating virtually all Design Group VI aircraft operations.

Taxiway A, which is parallel to and south of Runway 7R/25L, currently has a 500-foot centerline separation distance from Runway 7R/25L. However, the on-going relocation of Runway 7R/25L to the south will result in a slight reduction of the centerline separation distance to approximately 445 feet. This distance is less than the new FAA recommended separation distance of 550 feet on runways with CAT II/III

approaches and 500 feet for all other approaches when Design Group VI operations are occurring. Consequently, Design Group VI aircraft will be required to hold 4,000 feet west of the threshold of Runway 25L on Taxiway A during CAT II/III arrivals. Neither the proposed runway to taxiway separation distance between Runway 7R/25L and existing Taxiway A (445 feet) or the future center parallel taxiway (400 feet) will meet FAA design criteria between a runway and a parallel taxiway during operations by Design Group VI aircraft operations. Therefore, both of these parallel taxiways would have to be cleared of aircraft when Design Group VI aircraft operations occur on Runway 7R/25L. The need to clear these taxiways of aircraft when Design Group VI aircraft operations occur will cause significant delays to aircraft operations on the South Airfield unless provisions are made to accommodate Design Group VI aircraft on the North Airfield.

Development of the North Airfield with FAA recommended runway-to-taxiway separation distances of 500 feet for all operations other than during CAT II/III conditions and 550 feet during CAT II/III conditions will alleviate the potential for increased airfield delays by providing access to the North and South airfields by Design Group VI aircraft operations. Given the nature of international operations at LAX, wherein most arrivals occur during the mid-morning period and departures occur in the evening, it is likely that there could be a closely timed bank of both arrivals and departures, which could exacerbate airfield delays if Design Group VI aircraft operations are limited to the South Airfield with its taxiway clearance deficiencies and the associated restrictions on aircraft movements.

The proposed A380 taxi routes to and from the South Airfield (see **Figures 4 and 5**) will also impact airline operating costs as all departures to the west will require a significant taxi distance, particularly from the remote gates and the gates at the north end of Tom Bradley International Terminal and Terminal T-2. Development of the North Airfield to accommodate Design Group VI aircraft operations would result in a significant decrease of time and distance required for these aircraft to taxi to and from the runway.

**4.0 POTENTIAL NORTH AIRFIELD LAYOUTS**

The following section provides a brief description of airport design standards and, in particular, the issue of runway centerline to taxiway centerline separation requirements. This information will assist the reader in understanding the rationale for the North Airfield layouts presented in the subsequent section.

**4.1 Airport Design Standards**

This section provides a discussion of current FAA airport design standards and how they compare to the design standards developed in the LAX master plan. Current airport design standards are defined in FAA Advisory Circular 150/5300-13, “Airport Design,” Change 11, which was published on March 28, 2007. By comparison, the LAX master plan references the same FAA Advisory Circular through Change 4, which was published on November 11, 1994. Consequently, significant changes occurred to FAA airport design standards during the 13 years between the two publications. One of the most significant changes is the distance required between a runway centerline and a taxiway centerline when accommodating operations by Design Group VI aircraft.

At the time of the master plan’s preparation, the required distance between a runway centerline and a taxiway separation when accommodating Design Group VI aircraft was 600 feet. The current FAA standard for Design Group VI aircraft is a runway to taxiway separation of 500 feet to accommodate operations during CAT I conditions and 550 feet to accommodate operations during CAT II/III conditions. CAT I

conditions include weather minimums down to a 200-foot cloud ceiling height and 0.5 mile horizontal visibility. Category II/III conditions include weather minimums during periods with lower cloud ceilings and lower visibilities.

The LAX master plan examined options for providing a runway to taxiway separation less than the 600-foot requirement. The master plan focused on the fact that the required runway-to-taxiway separation distance is based on keeping all parts of an aircraft outside the runway’s Obstacle Free Zone (OFZ). The OFZ is a protected volume of airspace that must be kept clear of all obstructions to provide clearance protection for aircraft taking off, landing, or conducting a missed approach. The master plan concluded that a runway to taxiway separation of 520 feet would satisfy the OFZ requirement and proposed its use when planning future runway and taxiway systems at LAX.

Recent changes to FAA airport design standards, in particular the requirements associated with conducting missed approaches on runway’s accommodating CAT II/III landings, require runway-to-taxiway separations greater than the 520-foot standard proposed by the LAX master plan. A cross section of the 520-foot standard proposed by the LAX master plan is depicted in the upper left corner of **Figure 6**. The 520-foot clearance would provide proper separation from the runway’s CAT II/III OFZ. However, as shown in the upper right corner of **Figure 6** the 520 foot separation does not provide sufficient clearance from the missed approach surface associated with CAT II/III operations. This is because a Design Group VI aircraft’s tail would penetrate the missed approach surface by more than 3 feet. This missed approach surface has been changed by the FAA since the preparation of the master plan and would present an operational constraint with the proposed 520 foot separation. The operational constraint would consist of the inability to have a Design Group VI aircraft taxi on the parallel taxiway when conducting CAT II/III approaches on the parallel runway.

The cross section shown at the bottom of **Figure 6** shows that a runway-to-taxiway separation of 550 feet would allow a Design Group VI aircraft to taxi clear of the CAT II/III missed approach surface. This clearance is the basis for the current FAA design standard of a runway to taxiway separation of 550 feet for CAT II/III operations and 500 feet for CAT I operations. These design standards are applied in the proposed North Airfield layouts described in the following section.

A benchmarking exercise was conducted to determine how some other major airports in the United States are planning to accommodate operations by Design Group VI aircraft. Many of these airports are site constrained and; therefore, have requested a “Modifications of Standards” from the FAA. Some of the requested modifications have been approved, while others have been disapproved by the FAA. Appendix A summarizes these Modifications of Standards for the airports contacted.

Modification of standards are typically obtained when attempting to accommodate aircraft operations on existing or modified facilities. However, modification of standards are less common when building new facilities. New facilities are expected to meet FAA standards to maximize operational effectiveness.

**4.2 North Airfield Alternatives**

Potential North Airfield layouts were developed to provide proper separation between the inboard and outboard runway, a center taxiway, and proper runway geometrics and runway length to accommodate Design Group VI aircraft operations.

Two options were examined for developing airfield layouts. The first option is to maintain the outboard runway in its current location and shift taxiways and the inboard runway south toward existing terminal facilities. This approach requires the reconfiguration of existing terminal concourses and aircraft gates. The second option is to maintain the existing terminal concourses and gates in their current location and shift taxiways and runways to the north.

The LAX Master Plan’s, Alternative D, proposed the first option. A similar concept was examined in this assessment that maintained the outboard runway in its existing location and shifted all taxiways and the inboard runway south to attain the construction of a center taxiway between the runways and to enable the North Airfield to accommodate Design Group VI aircraft. **Figure 7** depicts the required separations to meet current FAA design standards. These separations assume the outboard runway would accommodate Design Group V aircraft, while the inboard runway would accommodate Design Group VI aircraft. The results of this layout indicate that a significant reconfiguration of the existing concourses and aircraft gates at Terminals 1, 2, 3, and at the Tom Bradley International Terminal would be required and; therefore, no significant improvement could be realized over the design proposed by Alternative D. Consequently, layouts were developed for the North Airfield that pursued a second option of maintaining existing terminal courses and gates and shifted existing runways and taxiways to the north.

These layouts, which are labeled Alternatives 1 through 5, explore a range of potential runway and taxiway separations that would provide various operational capabilities. Each alternative has been prepared with an “A” version and a “B” version. The “A” version limits each alternative to Pershing Drive to the west and the existing landing threshold of Runway 24R to the east. The “A” version of the alternatives assumes crossing Pershing Drive is not viable and any extension of the outboard runway is not viable east of the existing Runway 24R landing threshold. The “B” version of the alternatives assumes Pershing Drive could be crossed with a structure to provide the required RSA beyond the west ends of the runways. The “B” version also assumes whatever land use and roadway changes are needed at the east end of the runway to accommodate additional runway length could occur. Consequently, runway lengths are constrained with the “A” version of alternatives and are unconstrained with the “B” version of alternatives. Appendix B reveals that approximately 11,000 feet of runway is required to accommodate long-haul operations by Design Group VI aircraft without incurring payload penalties.

All of the alternatives require changes to surrounding roadway systems and land uses, particularly those in the vicinity of the intersection of South Sepulveda Boulevard and Westchester Parkway. The required changes become more extensive as the separation between the taxiways and runways increase and the outboard runway is shifted farther north.

**Alternative 1**

The purpose of Alternative 1 is to explore the amount of separation needed between the inboard runway and outboard runway to hold Design Group V aircraft between the runways and still comply with FAA clearance requirements during visual and instrument conditions. Alternative 1 would resolve existing operational problems associated with the inability to hold larger aircraft between the runways and would assist the effort to reduce the potential for runway incursions. However, it would not provide the ability to accommodate Design Group VI aircraft on the North Airfield. Alternative 1 would shift the outboard runway 300 feet north of its existing centerline.

Alternative 1A

Alternative 1A reveals that the existing runways must be separated by 1,000 feet to provide the ability to hold a 747-400 aircraft short of the inboard runway and attain the required clearances from the outboard runway associated with Category II/III weather conditions. **Figure 8** illustrates these clearance requirements with a cross-section drawing. Alternative 1A establishes the west end of the outboard runway so that the required RSA and Runway Object Free Area (ROFA) remain clear of Pershing Drive as depicted in **Figure 9**. The alternative establishes the east end of the runway perpendicular to the existing landing threshold for Runway 24R. The resulting runway length provides approximately 9,600 feet for takeoffs to the west and approximately 9,700 feet for takeoffs to the east. These runway length are adequate for most aircraft operations, but would not be adequate for long-haul international aircraft operations. The alternative requires the acquisition of property in the vicinity of South Sepulveda Boulevard and Westchester Parkway to provide the required approach lighting system on the east end of the outboard runway.

Alternative 1B

Alternative 1B provides the same separations as Alternative 1A, but provides a longer runway by assuming that the RSA and ROFA at the west end of the runway could cross over Pershing Drive with the construction of an appropriate bridge structure (see **Figure 10**). Alternative 1B also assumes that additional runway length could be attained on the east end by extending the runway for takeoffs to the west. Similar to Alternative 1A, this alternative would require the acquisition of additional property to provide the required approach lighting system on the east end of the runway. The resulting runway length with Alternative 1B would be 11,000 feet in each direction.

Alternative 2

The purpose of Alternative 2 is to provide proper separation between the inboard and outboard runway that would enable the construction of a center taxiway, provide the ability to hold aircraft between the runways, and accommodate Design Group VI aircraft on the outboard runway. **Figure 11** depicts a cross-section drawing of Alternatives 2A and 2B.

These alternatives would provide 550 feet of separation between the outboard runway and a center taxiway and an additional 500 feet of separation between the center taxiway and the existing inboard runway. These separations would allow Design Group VI aircraft to operate without restrictions on the outboard runway and comply with all FAA clearance requirements including those associated with CAT II/ III weather conditions. The net effect of this alternative would be that the outboard runway would shift 350 feet north of its existing location.

The overall strategy of Alternative 2 is to accommodate Design Group VI aircraft operations exclusively on the outboard runway, thereby eliminating the need to move or change the inboard runway or its parallel taxiways.

Alternative 2A

Alternative 2A sets the west end of the runway so that the required RSA and ROFA remain clear of Pershing Drive as depicted in **Figure 12**. The east end of the runway is set abeam the existing landing threshold for Runway 24R. The resulting runway length is approximately 9,600 feet for takeoffs to the west

and approximately 9,700 feet for takeoffs to the east. These lengths are not sufficient to accommodate Design Group VI aircraft operations without incurring payload limitations.

Alternative 2B

**Figure 13** depicts Alternative 2B. It provides the 11,000 feet of runway length required for Design Group VI aircraft operations at the same separations proposed by Alternative 2A. This is achieved by proposing that the RSA and ROFA on the west end of the runway cross over Pershing Drive with the construction of an appropriate bridge structure. The alternative also proposes the construction of additional runway east of the existing Runway 24R landing threshold. This additional runway could be used to increase takeoff lengths for departures on the outboard runway. This alternative requires the acquisition of property in the vicinity of South Sepulveda Boulevard and Westchester Parkway to provide the required approach lighting system on the east end of the runway.

Alternative 3

Alternative 3 proposes that Design Group VI aircraft operations be accommodated exclusively on the inboard runway and that approaches to both Runway 24L and Runway 24R be Category II/III capable. This would eliminate the need to provide Design Group VI clearances and facilities on the outboard runway, but would require that both runways be shifted to the north.

In an effort to further minimize the distance that the North Airfield would have to shift northward, this alternative also proposes that arrivals to Runway 24R be limited to Design Group IV and lower during CAT II/III conditions. During CAT I conditions Design Group V arrivals would be permitted on the outboard runway. This operating configuration would allow the separation between the outboard runway and the center taxiway to be limited to 400 feet. Alternative 3 would shift the outboard runway 390 feet north of its existing centerline.

**Figure 14** depicts a cross-section drawing of Alternatives 3A and 3B during CAT II/III weather conditions. Sufficient space would be provided to allow a Design Group IV aircraft to hold clear of the CAT II/III OFZ for both the inboard and outboard runway. The figure indicates that a separation of 500 feet would be provided between the center taxiway and the inboard runway and a separation of 550 feet would be provided between the inboard runway and the south parallel taxiway. These respective separations are required to keep Design Group V and VI aircraft clear of the CAT II/III missed approach surface for Runway 24L.

In addition to providing the required runway to taxiway separations, Alternative 3 also proposes that the centerline of Taxilane D be shifted 13 feet to the north of its present location to provide the required 138 feet clearance to the aircraft containment line. This would bring the majority of Taxiway D into conformance with the Design Group V standard for a Taxilane Object Free Area (OFA) except for the area near Concourse 1, which extends farther north than Terminals 2 and 3.

Alternative 3A

**Figure 15** depicts Alternative 3A. The west ends of the runways are placed to retain their respective RSAs and OFAs on the east side of Pershing Drive, thereby eliminating the need to bridge the roadway. The east end of the outboard runway is set abeam the existing threshold for the outboard runway. The east end of the inboard runway has two thresholds. The landing threshold is abeam the existing runway threshold.

However, the departure threshold is shifted eastward to maximize the takeoff distance for departures. The resulting distances for takeoffs on the inboard runway is approximately 10,400 feet. While this distance is adequate for most operations, it is somewhat short of the 11,000 feet previously noted as being required to accommodate long-haul operations.

**Alternative 3B**

**Figure 16** depicts Alternative 3B. This alternative establishes the east ends of the runways in the same location as proposed by Alternative 3A. However, the west ends of the runways are shifted farther west and require a bridge structure over Pershing Drive to provide the required RSAs. The net effect of this change is to provide a runway length of over 11,300 feet on the inboard runway and nearly 11,000 feet of the outboard runway. These runway lengths would be sufficient to accommodate long-haul operations by Design Groups V and VI aircraft.

**Alternative 4**

Alternative 4 expands on the concept of accommodating Design Group VI aircraft operations on the inboard runway established by Alternative 3, but goes one step further and allows up to Design Group V arrivals on the outboard runway, even during CAT II/III conditions. This is accomplished by increasing the separation between the outboard runway and the center taxiway to 500 feet from the 400 feet proposed by Alternative 3. **Figure 17** depicts the resulting cross section of runway and taxiway separations with Alternative 4. Impacts to surrounding roadways and land uses increase with Alternative 4 because of the larger taxiway separation, which results in the outboard runway moving 490 feet north of its existing location.

**Alternative 4A**

**Figure 18** depicts Alternative 4A. It proposes the same threshold locations and hence the same runway lengths proposed by Alternative 3A. This alternative also corrects the Taxilane D deficiency noted in Alternative 3. However, impacts to surrounding roadway systems and land use become more extensive with Alternative 4A. The ROFA on the north side of the outboard runway encompasses portions of Westchester Parkway. As with Alternative 3A and 3B, this alternative would require that all Design Group VI aircraft operations occur on the inboard runway.

**Alternative 4B**

**Figure 19** depicts Alternative 4B. This proposes the same threshold locations and hence the same runway lengths proposed by Alternative 3B. Hence, this alternative provides the ability to accommodate long range Design Group VI aircraft operations similar to Alternative 3B.

**Alternative 5**

Alternative 5 is similar to Alternative 4; however, it allows Design Group VI aircraft operations on both the inboard runway and the outboard runway. This would allow the North Airfield to operate in the same manner as it presently does with all takeoffs occurring on the inboard runway and all landings occurring on the outboard runway. This method of operation would simplify air traffic control procedures because aircraft departures on the inboard runway would not need to be metered to allow landings by Design Group VI aircraft.

Alternative 5 results in the same total distance (1,550 feet) between the inboard parallel taxiway and the outboard runway centerline as proposed by Alternative 4. However, the larger runway-to-taxiway separation of 550 feet is provided between the center taxiway and the outboard runway instead of between the inboard runway and its south parallel taxiway. This is because the larger separation of 550 feet is only required on the runway where CAT II/III landings are conducted. Alternative 5 would result in the outboard runway’s centerline being 490 feet north of the existing outboard runway. **Figure 20** provides a cross-section drawing of this alternative and shows the ability to hold a Design Group VI aircraft short of inboard runway while also remaining clear of the CAT II/III OFZ for the outboard runway.

**Alternative 5A**

**Figure 21** depicts Alternative 5A. This alternative has the same threshold locations on the east and west end of the runway as proposed by Alternative 4A. Thus, it provides the same runway lengths. Runway lengths are limited to approximately 10,400 feet for takeoffs and approximately 9,500 feet for landings. The alternative avoids any impacts to Pershing Drive to the west, but does impact roadway and other land uses to the east.

**Alternative 5B**

**Figure 22** depicts Alternative 5B. This alternative is essentially the same as Alternative 5A except that it assumes the RSAs on the west will cross over Pershing Drive. This would allow for longer runway lengths and require a bridge structure to be constructed over Pershing Drive. The resulting runways lengths would be approximately 10,200 feet on the outboard runway and approximately 11,000 feet on the inboard runway. This alternative would provide the required runway length for takeoffs of Design Group VI aircraft to long-haul destinations.

**4.3 Review of LAX Master Plan Alternative D**

The LAX master plan’s recommended layout for the North Airfield is contained in Alternative D as depicted in **Figure 23**. That plan used modified Design Group VI standards and significant changes to passenger terminal facilities to provide a center taxiway between the inboard and outboard runways and accommodate Design Group VI aircraft on the North Airfield. The alternative would maintain the existing outboard runway’s centerline in its existing location and would rebuild all other North Airfield taxiways and runways by moving them south.

The alternative proposes a separation of 520 feet between the outboard runway and the center taxiway and another 520 feet between the center taxiway and the inboard runway. A separation of 400 feet is proposed between the inboard runway and the parallel taxiway to the south (Taxiway E). Finally, a separation of 369 feet is proposed between Taxiway E and the parallel Taxiway D.

This concept proposes that all landings, including those by Design Group VI aircraft, occur on the outboard runway and all takeoffs, including those by Design Group VI aircraft, occur on the inboard runway. The alternative also assumes that operational controls are put into effect by air traffic control that would allow Design Group VI aircraft to takeoff on the inboard runway even though the proposed separation of 400 feet to the south parallel taxiway is 100 feet less than the current FAA design standard of 500 feet. The proposed operational control would consist of clearing all aircraft from the parallel taxiway (Taxiway E) when a Design Group VI aircraft takes off from the inboard runway.



This concept would achieve the objective of providing a center taxiway between the runways and; therefore, would improve the safety and efficiency of North Airfield operations. It would also enable Design Group VI aircraft operations to use the North Airfield thereby improving efficiency and reducing aircraft delay on the South Airfield. However, Alternative D does not provide the required separation between the inboard runway and the parallel taxiway to the south (Taxiway E). Consequently, all aircraft would have to be cleared from Taxiway E when a Design Group VI aircraft takes off from the inboard runway. This is a significant constraint that would require air traffic control procedures be developed to accommodate this mode of operation. Aircraft delay would increase due to this constraint and would increase in significance with increasing numbers of operations by Design Group VI aircraft on the North Airfield.

5.0 RECOMMENDATION

The alternatives presented in the preceding section explore a range of solutions for providing a center taxiway and accommodating Design Group VI aircraft on the North Airfield. Each alternative has advantages and disadvantages in terms of operational, land use, and other factors. **Table 3** provides a brief comparison of the alternatives on the basis of some key physical characteristics and operational criteria.

TABLE 3  
NORTH AIRFIELD ALTERNATIVES COMPARISON

Alternative	Shifts Outboard Runway	Runway Takeoff Length	Accommodates Design Group VI Aircraft	Rebuilds
Option 1	No	10,700'	On Inboard	Runway 6R/24L
1A	300' North	9,580'	No	Runway 6L/24R
1B	300' North	11,000'	No	Runway 6L/24R
2A	350' North	9,621'	On Outboard	Runway 6L/24R
2B	350' North	11,000'	On Outboard	Runway 6L/24R
3A	390' North	10,416'	On Inboard	Both Runways
3B	390' North	11,000'	On Inboard	Both Runways
4A	490' North	10,416'	On Inboard	Both Runways
4B	490' North	10,976'	On Inboard	Both Runways
5A	490' North	10,416'	On Both	Both Runways
5B	490' North	10,976'	On Both	Both Runways

Source: URS Corporation, 2007.

As noted at the beginning of Section 4.2, airfield layouts began with an assessment of holding the outboard runway’s centerline in its existing location and rebuilding the inboard runway and taxiway to the south (i.e., Option 1). The assessment revealed that Option 1 would not provide the ability to retain more of the concourses or gates in Terminals 1, 2, 3, and the Tom Bradley International Terminal than the proposed LAX master plan Alternative D. Therefore, Option 1 was not examined further and is not recommended.

The second option was to examine alternatives that shift the runway system northward from its existing location. These alternatives are labeled 1 through 5 and were developed with A and B versions that varied runway lengths.

Alternative 1 would move the outboard runway 300 feet north and would provide the ability to construct a center taxiway between the runways. This would enable aircraft up to and including Design Group V to hold between the runways and remain clear of the OFZs from both runways. This alternative would help address the problem of runway incursions and would improve airfield efficiency, but it would not accommodate Design Group VI aircraft operations. The mode of operation with Alternative 1 (i.e., landings on the outboard runway and takeoffs on the inboard runway) would remain the same as with the existing North Airfield. Alternative 1 is not recommended because it does not provide the ability to accommodate Design Group VI aircraft operations on the North Airfield. This would force all Design Group VI aircraft operations to occur on the South Airfield and would result in significant delays due to the numerous constraints described in Section 3.0.

As indicated in the far right column of **Table 3**, Alternatives 3, 4, and 5 would require rebuilding the entire North Airfield (i.e., both the inboard and outboard runway and all associated taxiways) and consequently would have substantially higher construction costs. Of these alternatives, Alternative 5 would have the highest construction cost due to the need to provide taxiways and runways that meet Design Group VI standards on both the inboard runway and the outboard runway. The ROFAs associated with Alternatives 4 and 5 would encompass portions of Westchester Parkway and; therefore, may require modifications to that roadway in addition to Lincoln Boulevard. Considering the higher cost, impacts and disruption to airfield operations Alternative 3, 4, and 5 are not recommended.

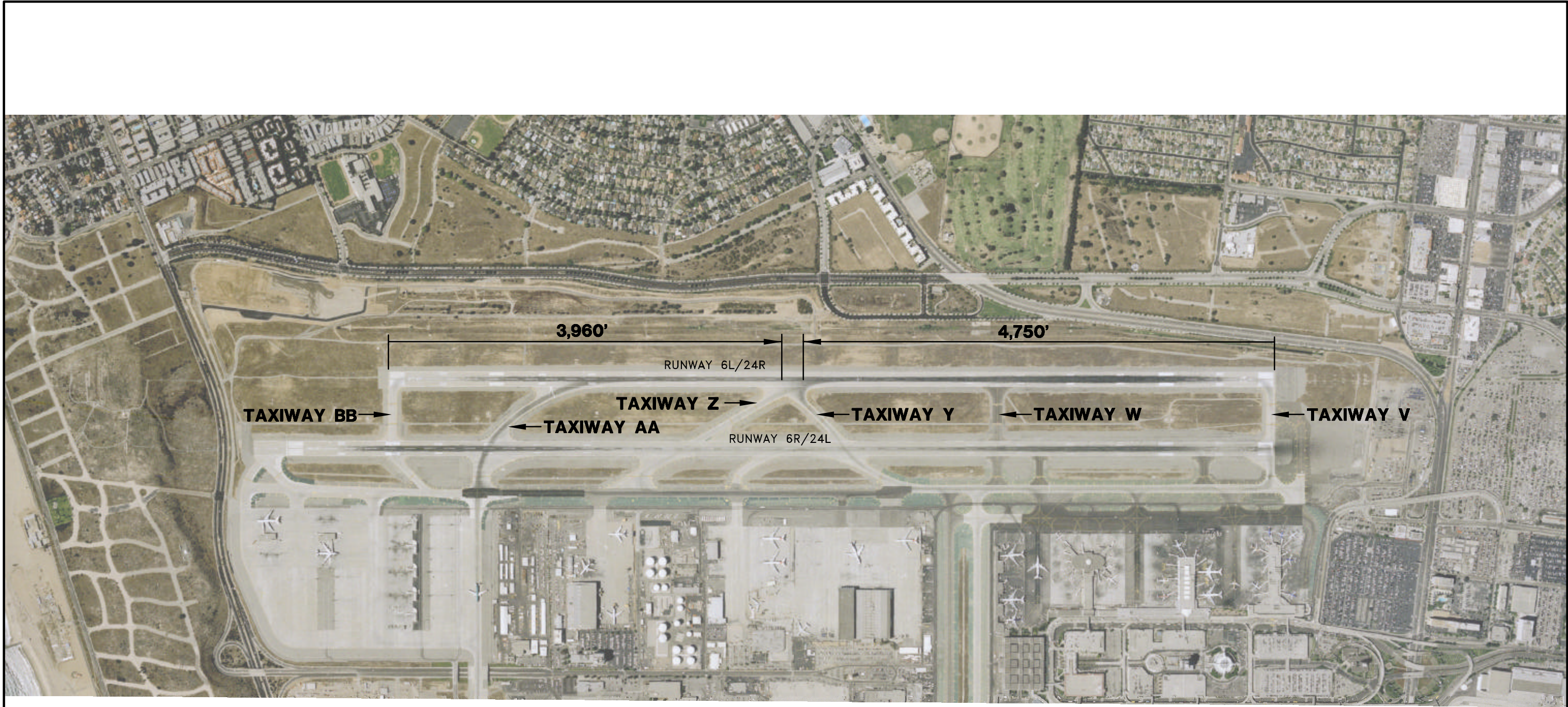
Alternative 2 would provide a center taxiway and would accommodate Design Group VI aircraft operations with minimal disruption by allowing Design Group VI aircraft operations to taxi along the center taxiway. A disadvantage of Alternative 2 is that it would change the current mode of operations at the airport by requiring Design Group VI aircraft to takeoff from the outboard runway. However, all other aircraft takeoffs could continue to occur on the inboard runway. Air traffic control would need to coordinate the taxiing of Design Group VI aircraft along the center taxiway so that they do not conflict with arrivals on the outboard runway.

The B version of Alternative 2 would provide sufficient runway length (i.e., 11,000 feet) to accommodate long-haul flights by Design Group VI aircraft. The A version of Alternative 2 is limited to a runway length of approximately 9,600 feet. This length would not be sufficient to accommodate long-haul operations and; therefore, is not recommended.

Alternative 2B would move the outboard runway 350 feet north of its present location and would require crossing Pershing Boulevard with structure to provide sufficient RSA at the runway’s west end. However, the northward shift of this runway would place the portion of the RSA that crosses Pershing Boulevard north of the Blue Butterfly Preserve that exists on the west side of Pershing Drive.

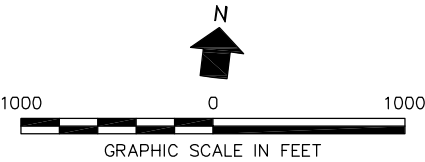
Considering the study objectives, operational efficiencies, and cost factors, Alternative 2B offers substantial advantages and is; therefore, recommended. Additional study is required to assess the full range of advantages and disadvantages associated with this alternative including engineering, construction, and environmental impacts.





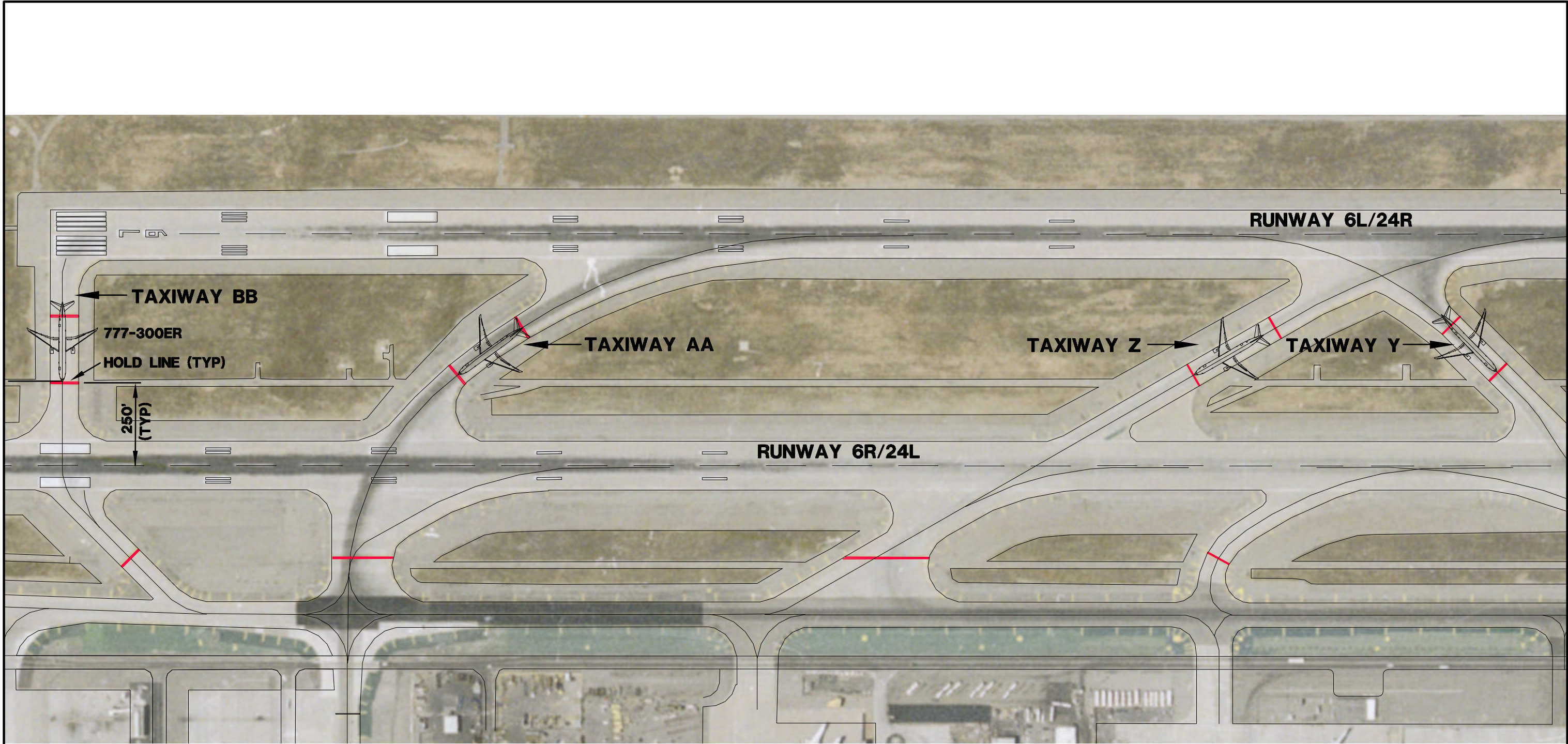
**TAXIWAY NAMES & LOCATIONS**

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**North Airfield Assessment**



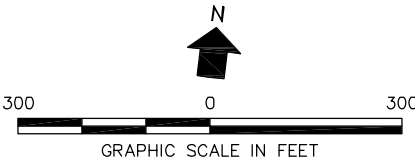
**FIGURE 1**





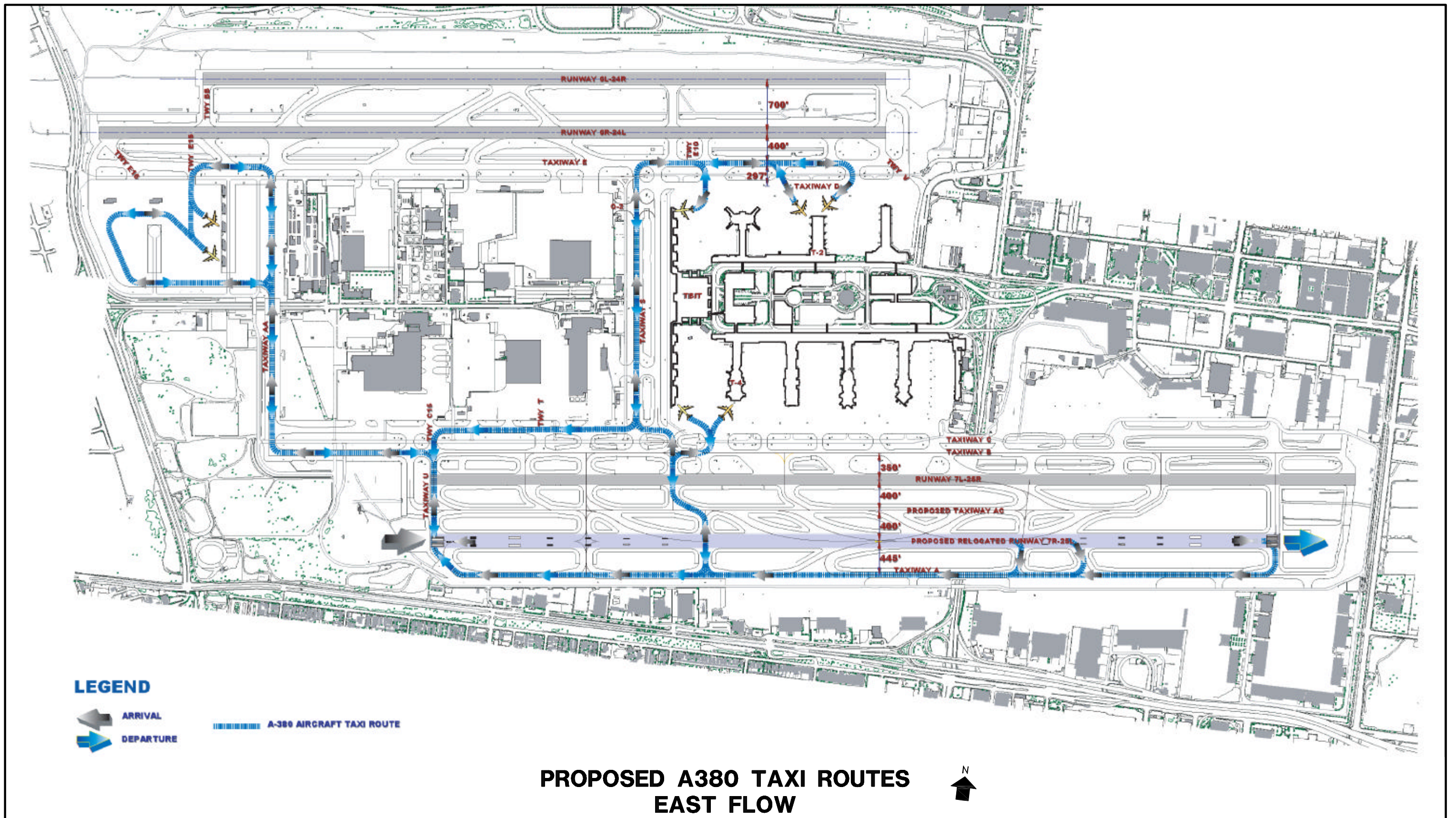
**TAXIWAY HOLD LINE PENETRATIONS**

**LOS ANGELES INTERNATIONAL AIRPORT**  
**North Airfield Assessment**



**FIGURE 2**

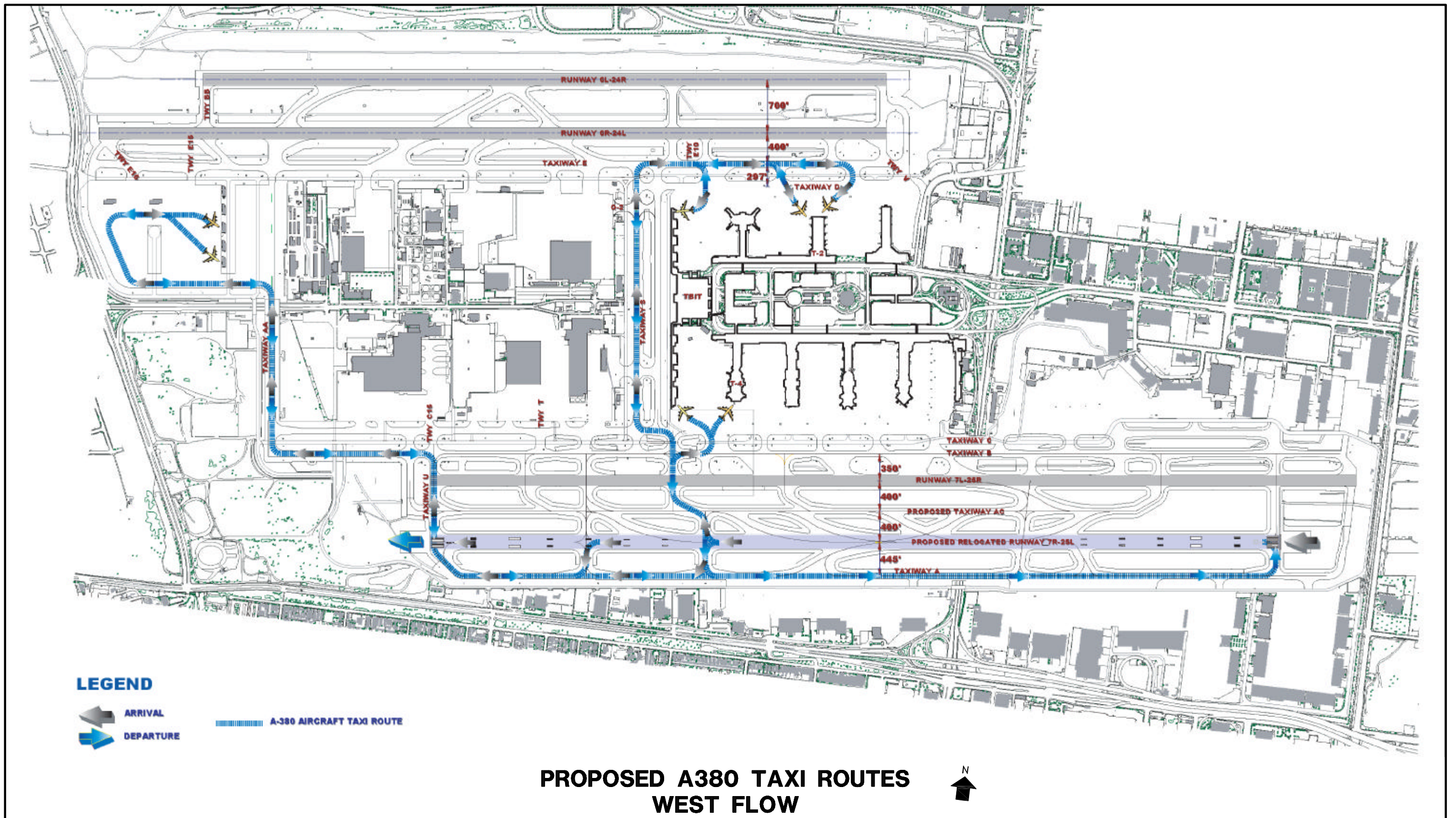




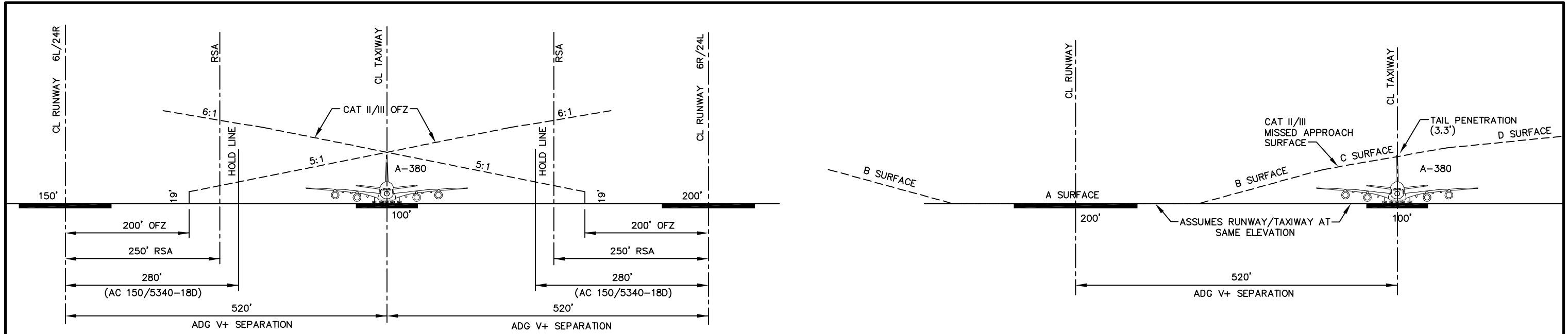
# LOS ANGELES INTERNATIONAL AIRPORT

## North Airfield Assessment



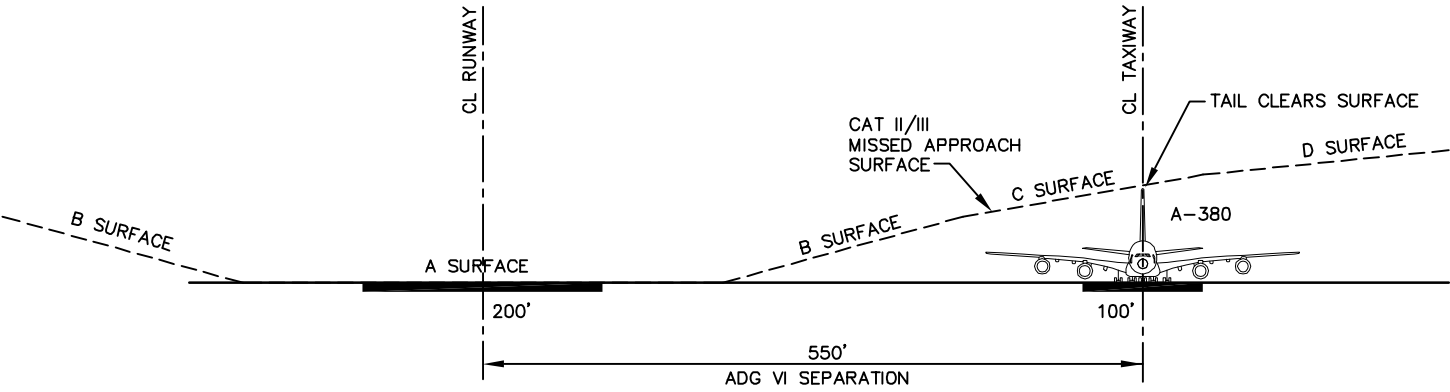






LAX MASTER PLAN MODIFIED GROUP VI DESIGN STANDARD

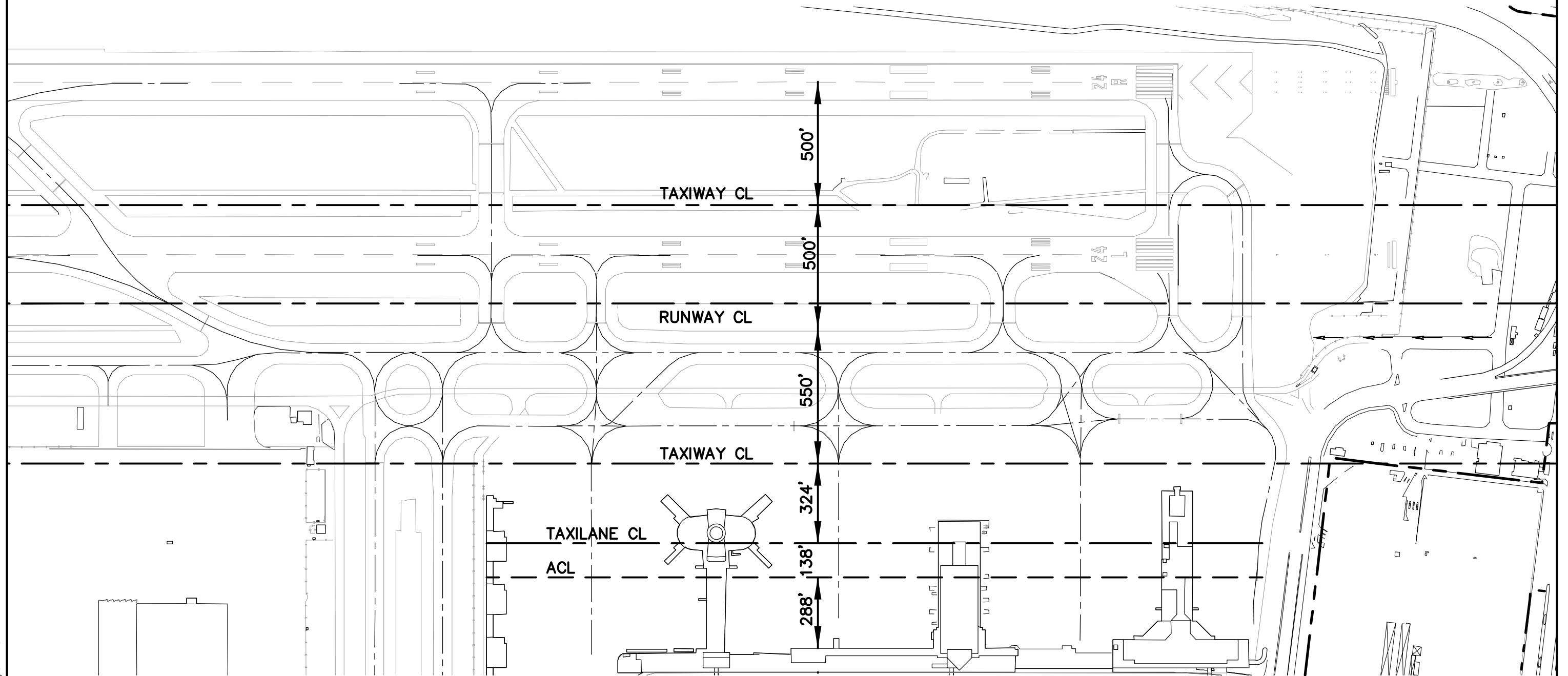
LAX MASTER PLAN MODIFIED GROUP VI DESIGN STANDARD  
WITH CAT II/III MISSED APPROACH SURFACE



CURRENT FAA DESIGN STANDARD  
WITH CAT II/III MISSED APPROACH SURFACE

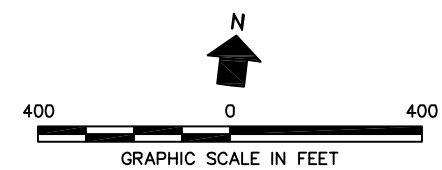
# AIRPORT DESIGN STANDARDS

J:\LAX\LAX NORTH AIRFIELD\EXHIBITS\FIG 7.DWG 03/07/07 16:17



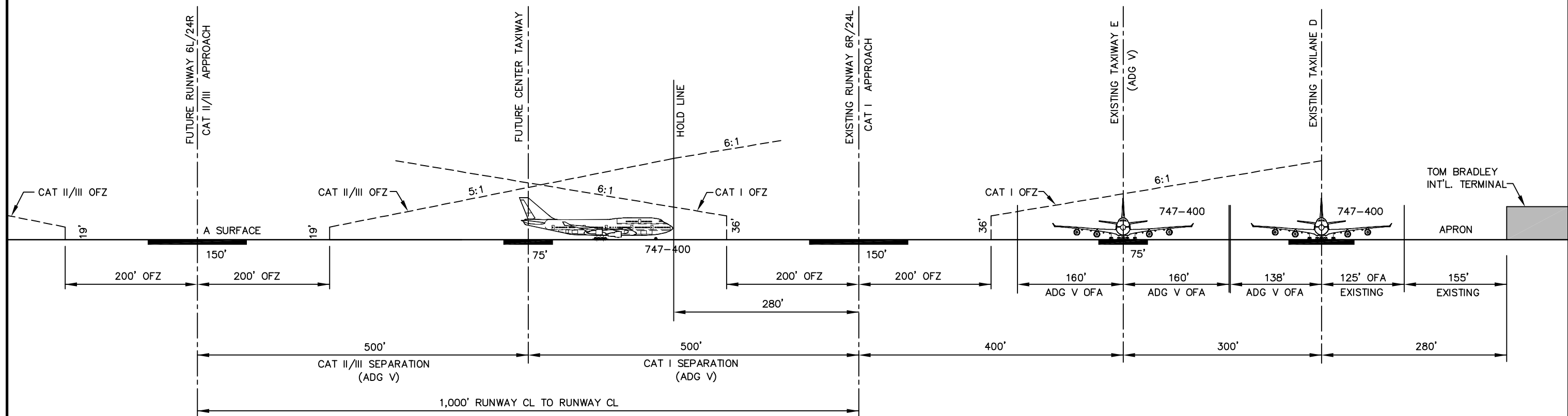
## OPTION 1

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**North Airfield Assessment**



**FIGURE 7**

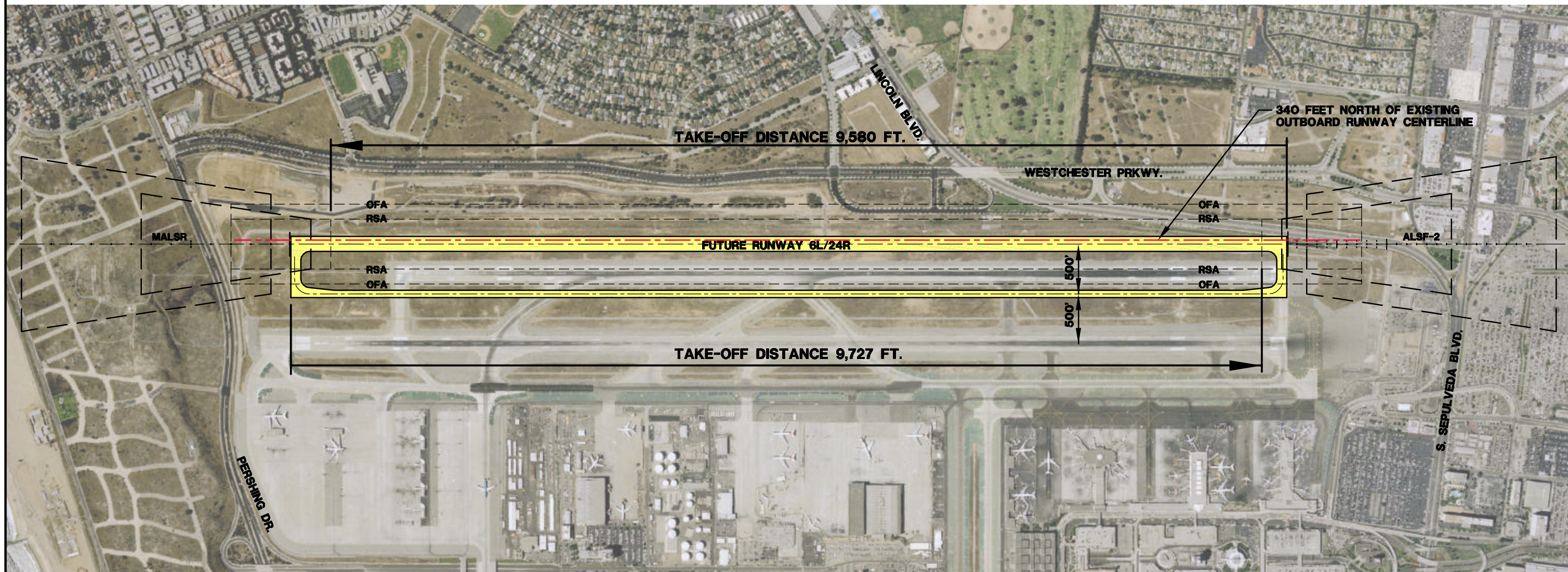
J:\LAX\LAX NORTH AIRFIELD\EXHIBITS\FIG 8.DWG 04/12/07 10:39



**ALTERNATIVES 1A & 1B CROSS-SECTION VIEW**  
(AIRPLANE DESIGN GROUP V SEPARATIONS)

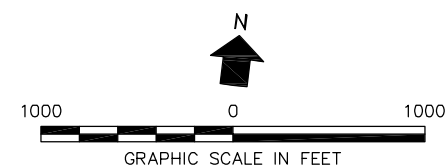


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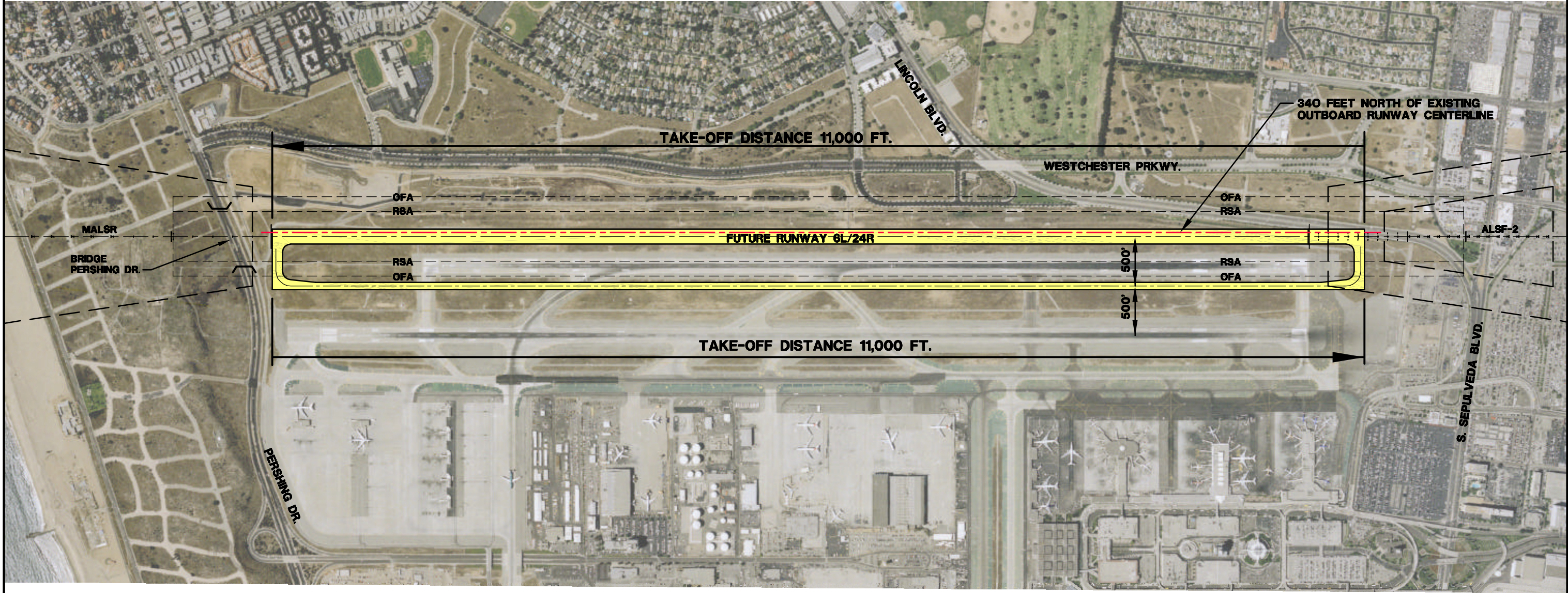
## ALTERNATIVE 1A

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**North Airfield Assessment**



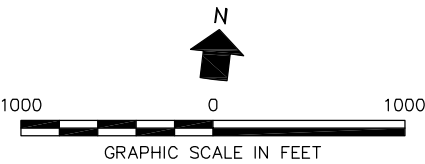
**FIGURE 9**





**ALTERNATIVE 1B**

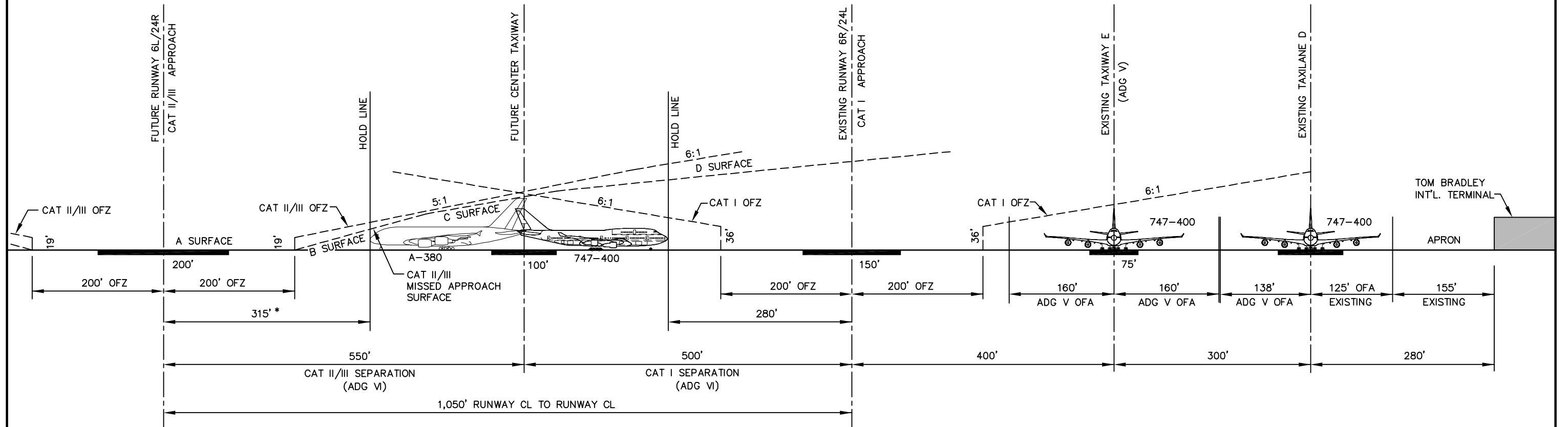
**LOS ANGELES INTERNATIONAL AIRPORT**  
**North Airfield Assessment**



**FIGURE 10**



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## ALTERNATIVES 2A & 2B CROSS-SECTION VIEW (AIRPLANE DESIGN GROUP V & VI SEPARATIONS)

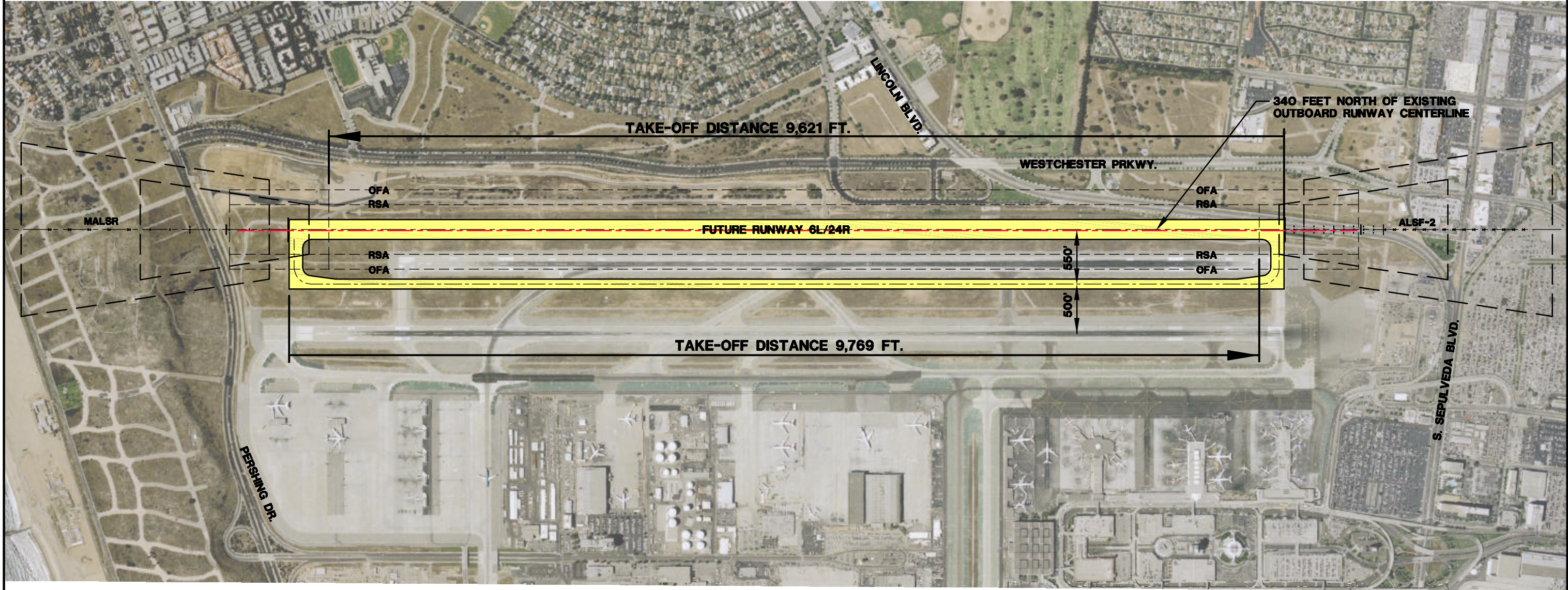
\* NON-STANDARD HOLD LINE DIMENSION OF 315'  
REQUIRED TO KEEP DESIGN GROUP VI AIRCRAFT  
CLEAR OF OFZ & CAT II/III MISSED APPROACH SURFACE

NOTE: DESIGN GROUP VI AIRCRAFT RESTRICTED  
TO TAXIING ALONG CENTER TAXIWAY

**LOS ANGELES INTERNATIONAL AIRPORT**  
**North Airfield Assessment**

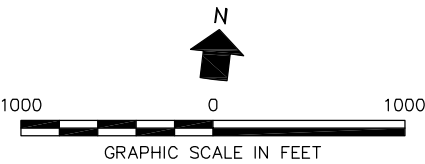
**FIGURE 11**





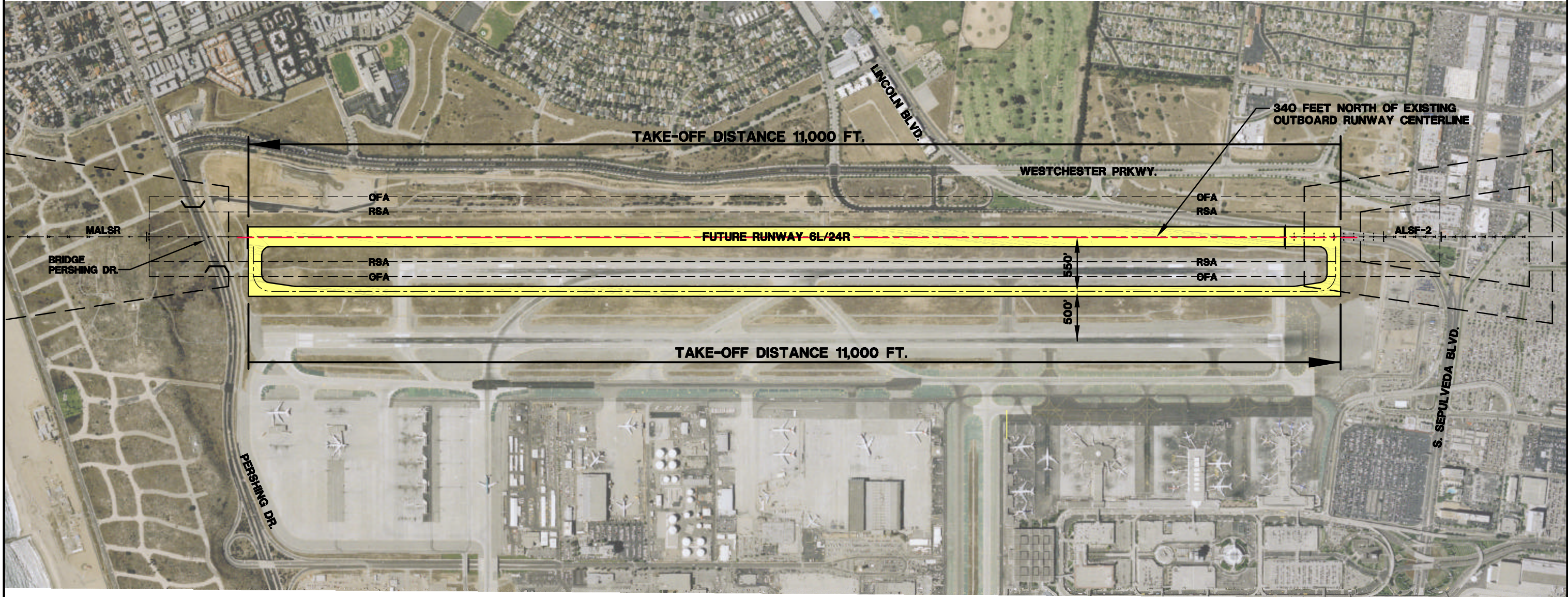
**ALTERNATIVE 2A**

**LOS ANGELES INTERNATIONAL AIRPORT**  
**North Airfield Assessment**

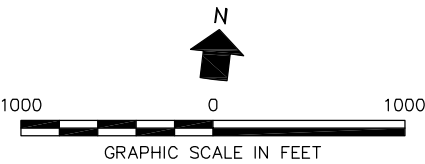


**FIGURE 12**

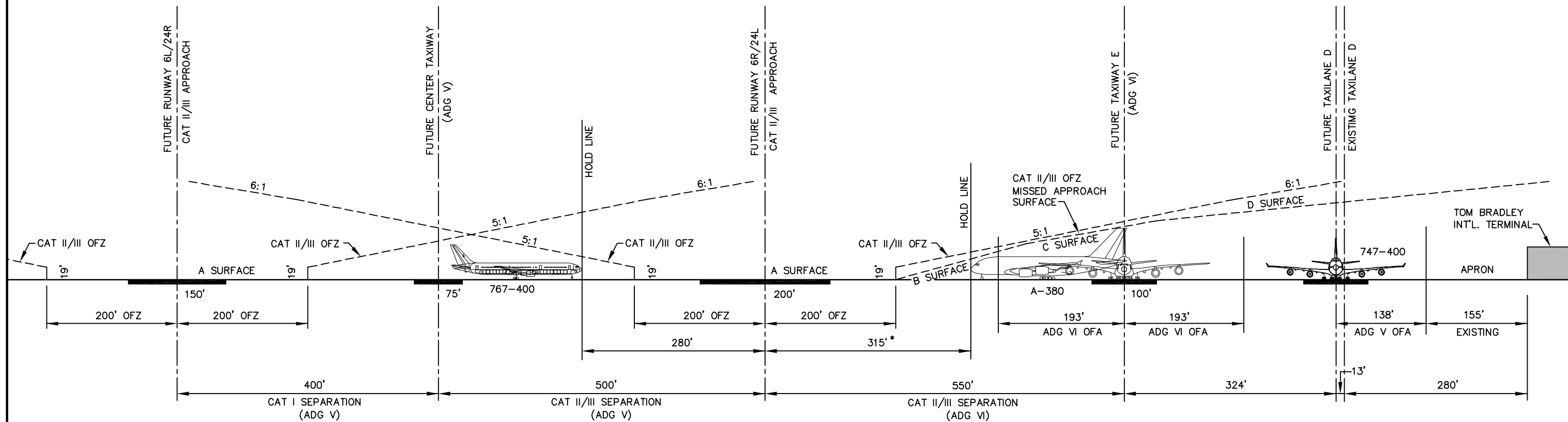




ALTERNATIVE 2B



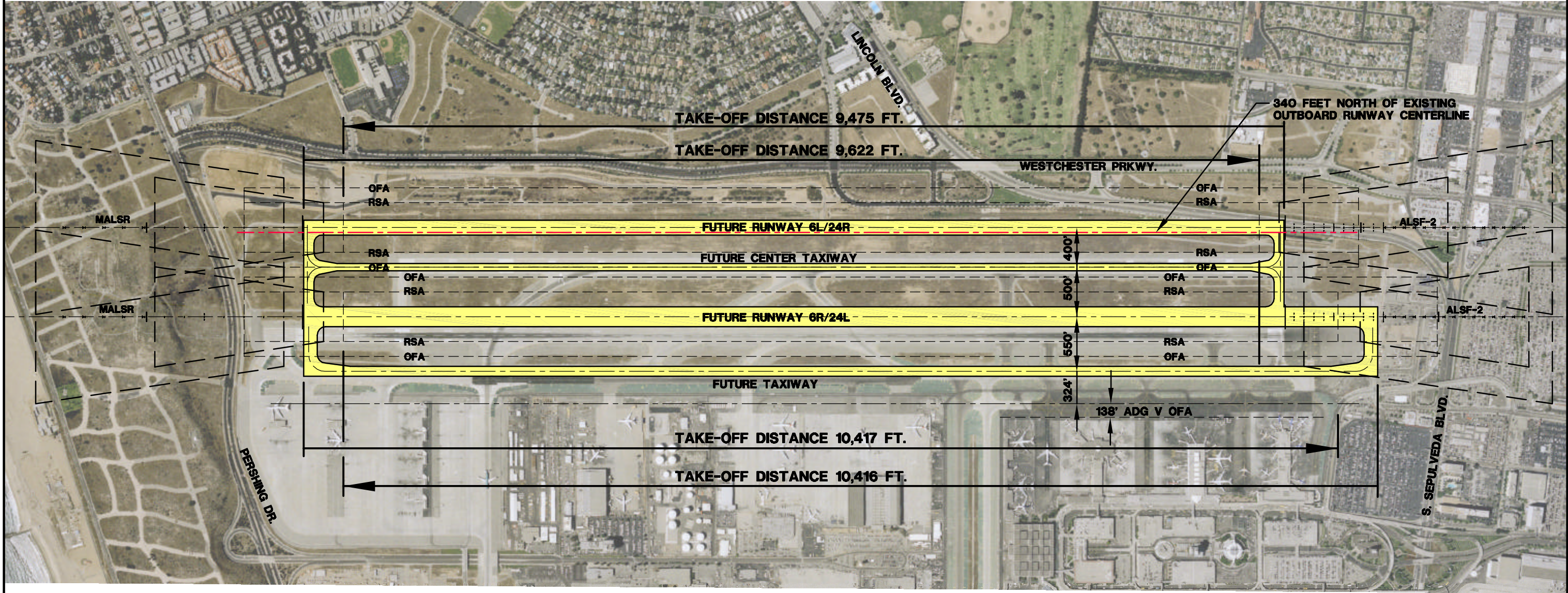




**ALTERNATIVES 3A & 3B CROSS-SECTION VIEW**  
(AIRPLANE DESIGN GROUP V & VI SEPARATIONS)

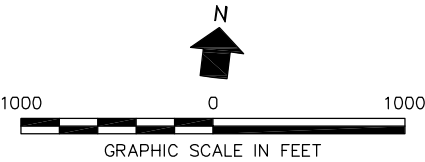
\* NON-STANDARD HOLD LINE DIMENSION OF 315'  
REQUIRED TO KEEP DESIGN GROUP V & VI AIRCRAFT  
CLEAR OF OFZ & CAT II/III MISSED APPROACH SURFACE





**ALTERNATIVE 3A**

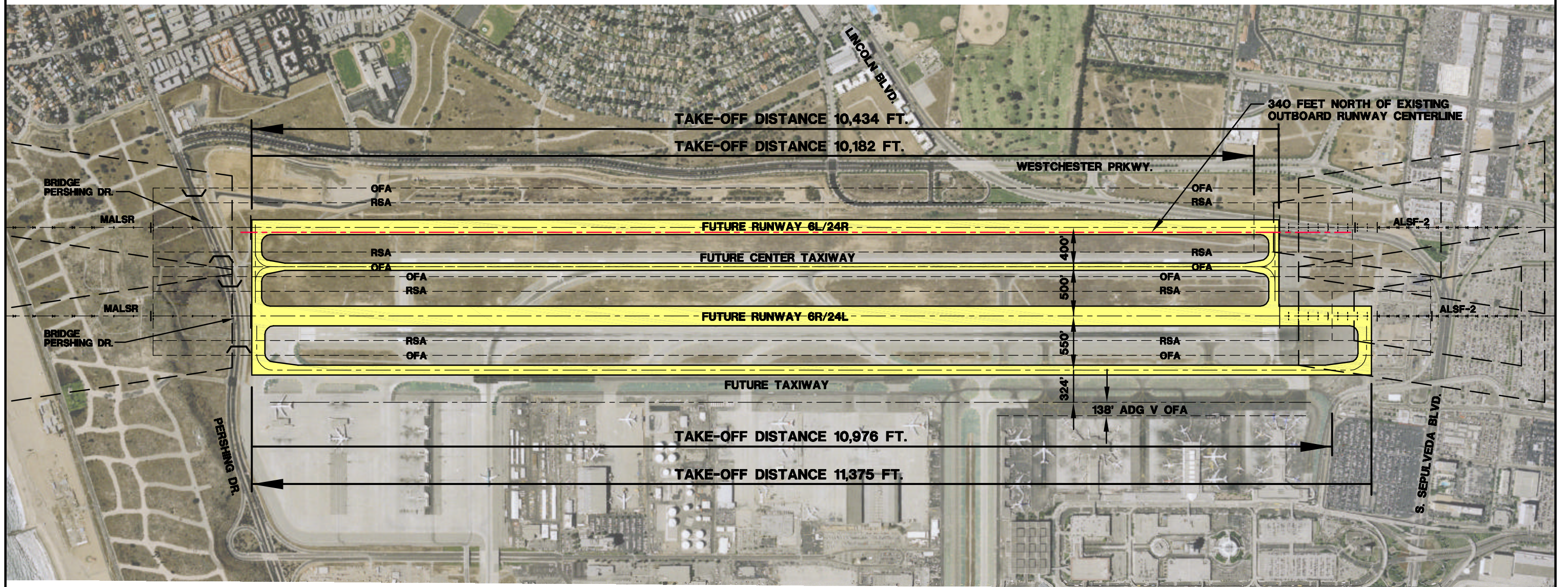
**LOS ANGELES INTERNATIONAL AIRPORT**  
**North Airfield Assessment**



**FIGURE 15**

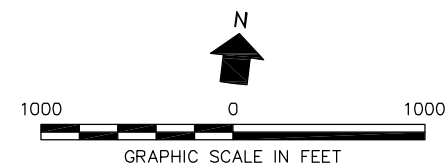


J:\LAX\LAX NORTH AIRFIELD\EXHIBITS\FIG 16.DWG 03/07/07 16:12



## ALTERNATIVE 3B

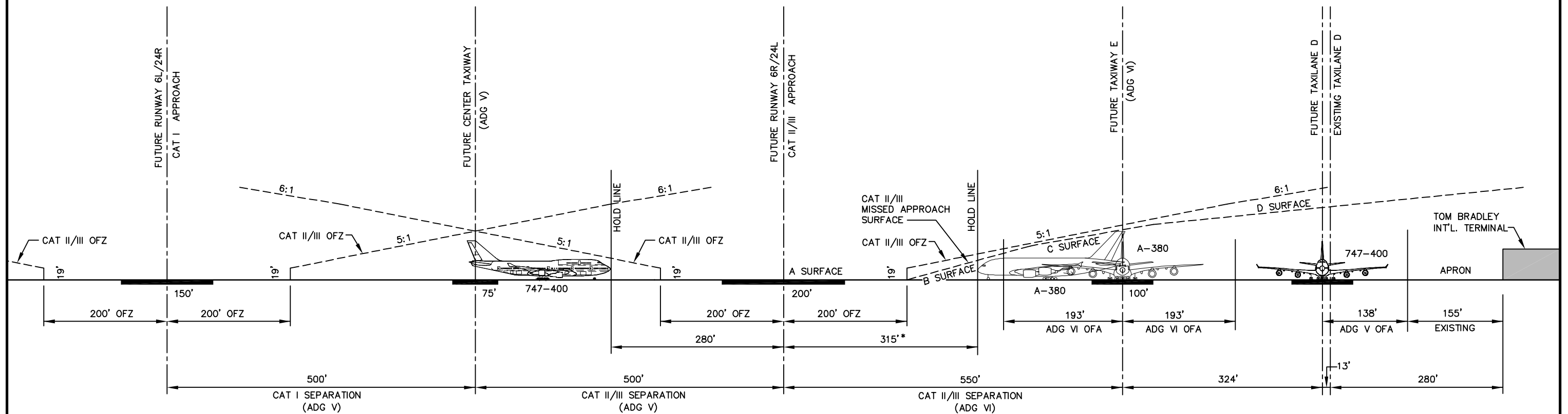
**LOS ANGELES INTERNATIONAL AIRPORT**  
**North Airfield Assessment**



**FIGURE 16**



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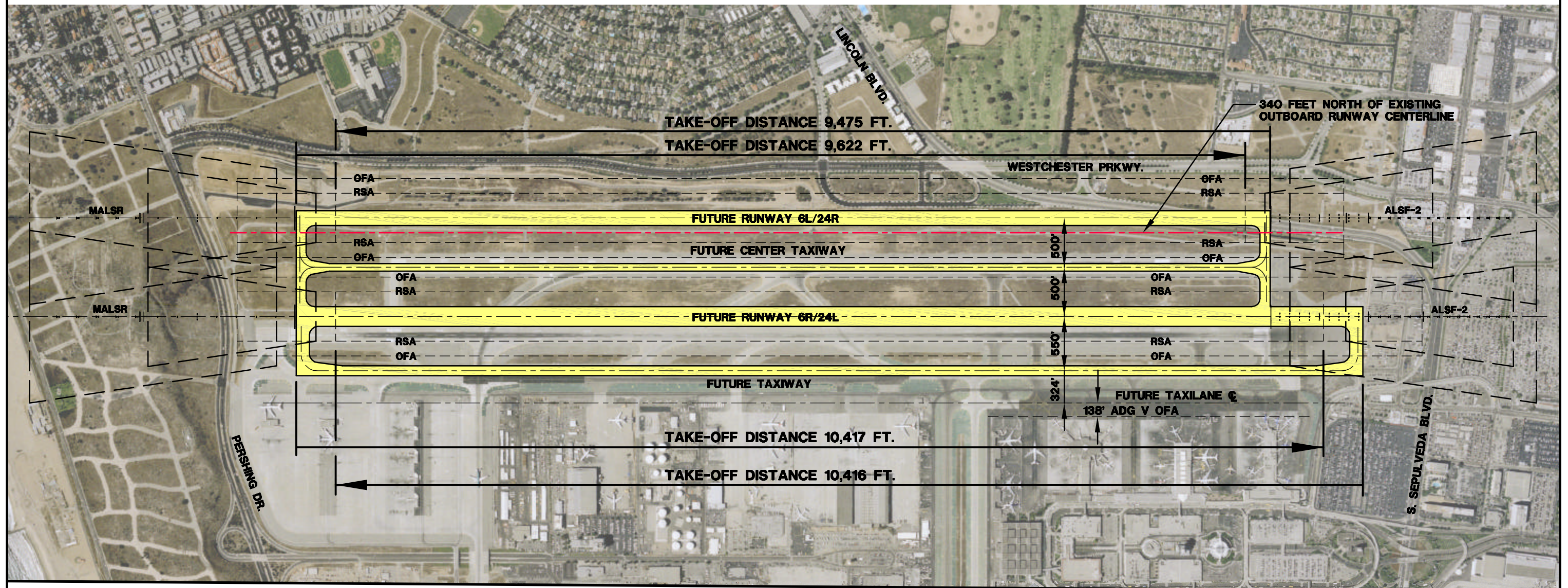


## ALTERNATIVES 4A & 4B CROSS-SECTION VIEW (AIRPLANE DESIGN GROUP V & VI SEPARATIONS)

\* NON-STANDARD HOLD LINE DIMENSION OF 315'  
REQUIRED TO KEEP DESIGN GROUP V & VI AIRCRAFT  
CLEAR OF OFZ & CAT II/III MISSED APPROACH SURFACE

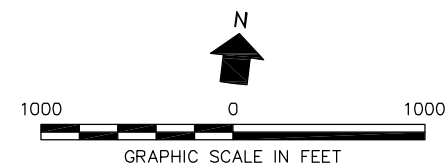


J:\LAX\LAX NORTH AIRFIELD\EXHIBITS\FIG 18.DWG 03/07/07 16:12



## ALTERNATIVE 4A

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**North Airfield Assessment**



**FIGURE 18**



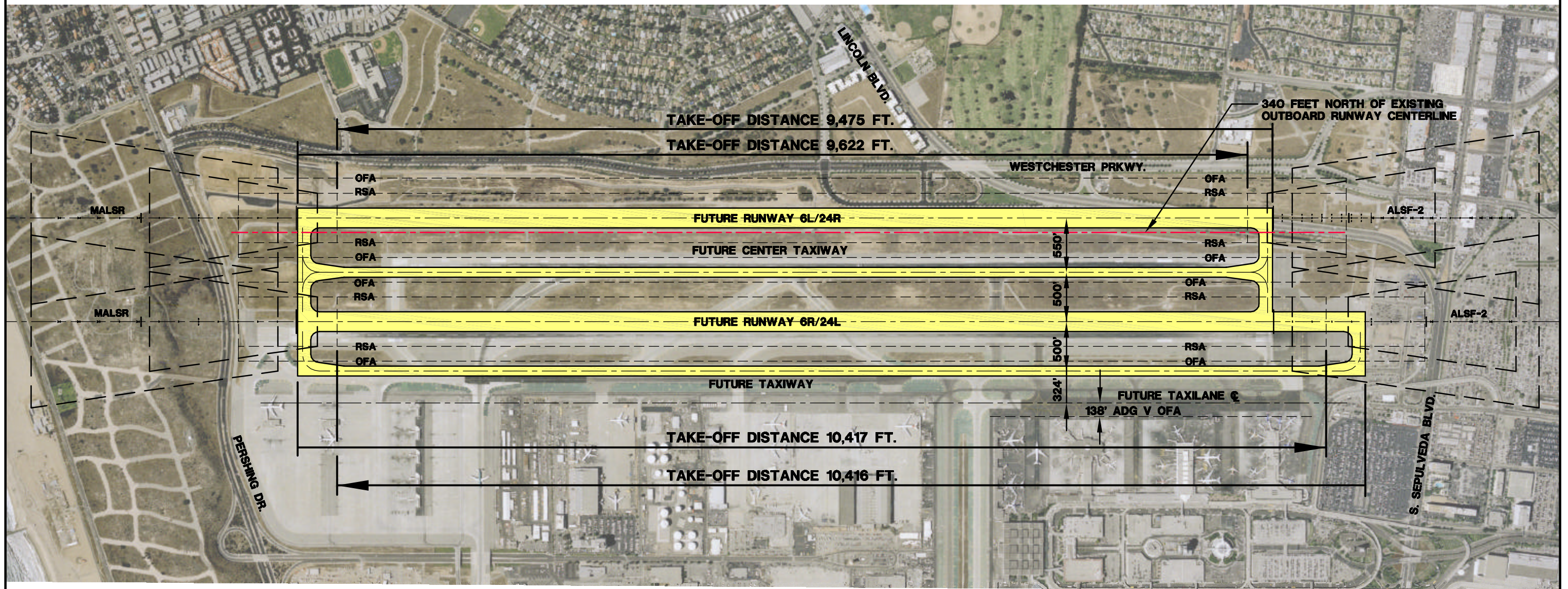






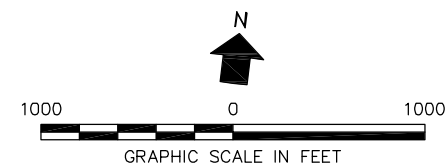


J:\LAX\LAX NORTH AIRFIELD\EXHIBITS\FIG 21.DWG 03/07/07 16:14



## ALTERNATIVE 5A

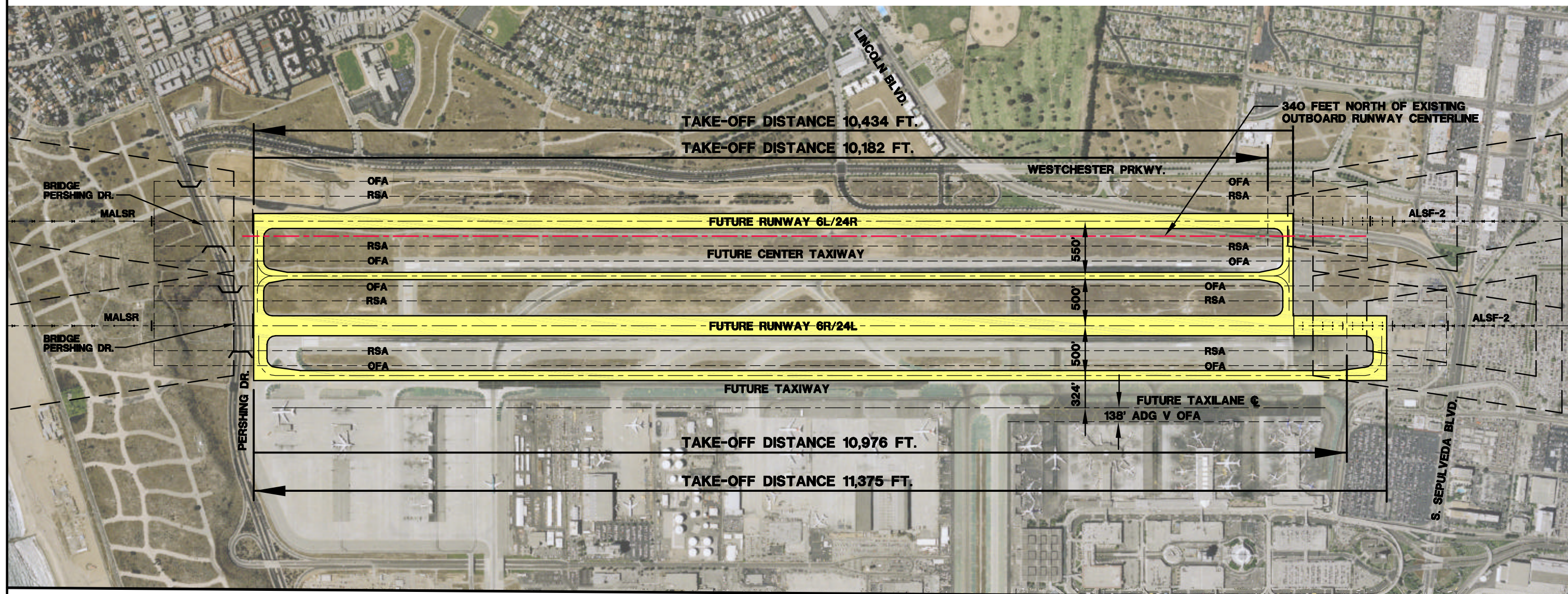
**LOS ANGELES INTERNATIONAL AIRPORT**  
**North Airfield Assessment**



**FIGURE 21**

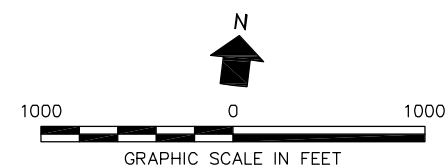


J:\LAX\LAX NORTH AIRFIELD\EXHIBITS\FIG 22.DWG 03/07/07 16:15



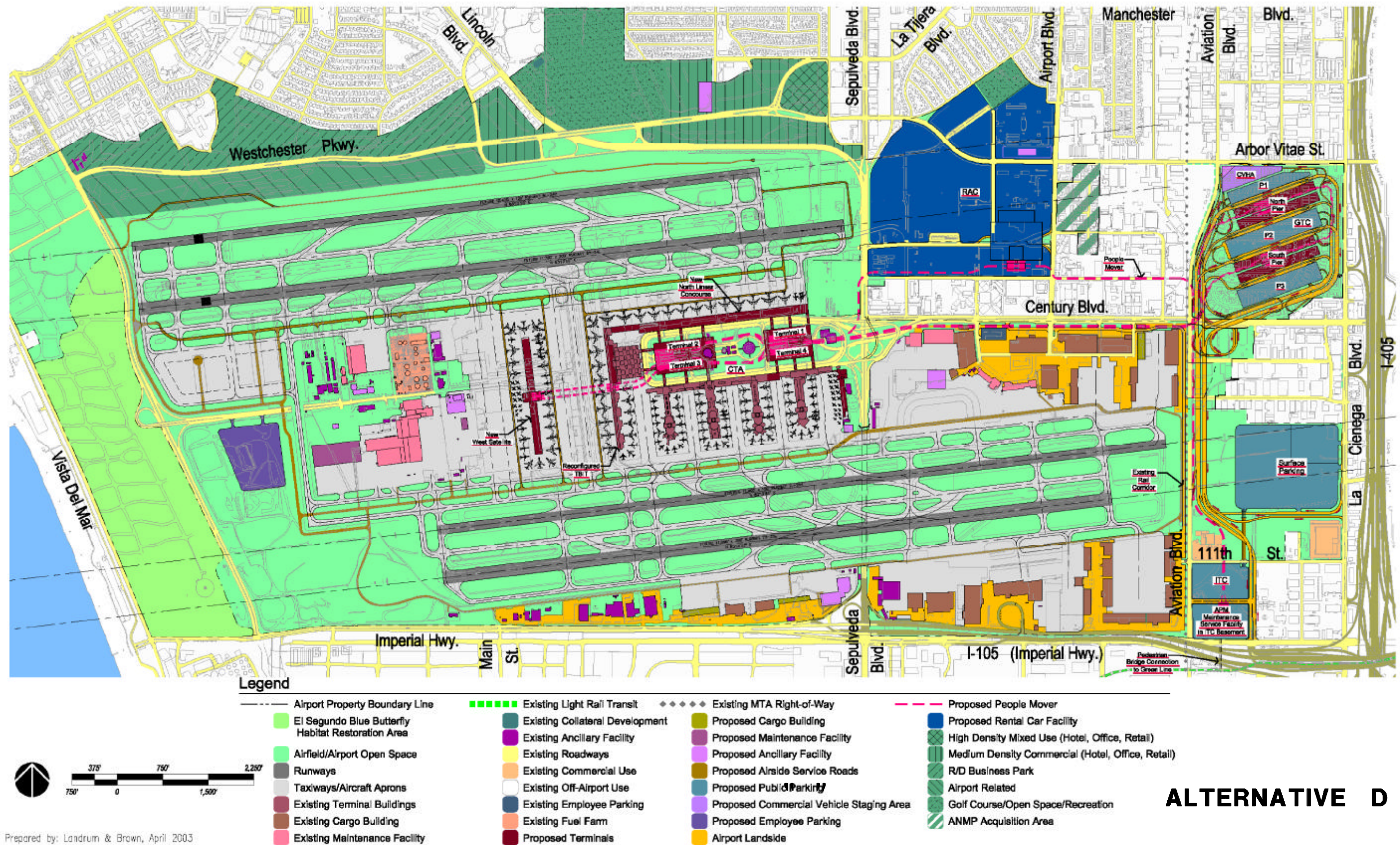
## ALTERNATIVE 5B

**LOS ANGELES INTERNATIONAL AIRPORT**  
**North Airfield Assessment**



**FIGURE 22**





**ALTERNATIVE D**

**LOS ANGELES INTERNATIONAL AIRPORT**  
**North Airfield Assessment**

**FIGURE 23**



## **APPENDIX A**

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### **Modification of Standards**

AIRPORT MODIFICATION OF STANDARDS (MOSs) TO USING A380 AIRCRAFT

A brief benchmarking exercise was conducted to investigate airfield design modifications to accommodate A380 aircraft at other major airports in the United States. This exercise was conducted through a literature search and telephone consultations with the FAA. Cases of airport-specific modifications to current FAA Design Group VI airfield standards that have been conditionally approved by FAA for the use of the A380 aircraft were investigated by contacting selected individual airports.

In order to accommodate A-380 aircraft a number of airports have requested modifications of Design Group VI airfield standards. The MOS are for the A-380 aircraft only and not the entire Design Group VI fleet of aircraft. The 747-800 and any other future Design Group VI aircraft would have to go through the same review/wavier process. The following is a description of selected airports that have requested A380 MOSs:

Los Angeles – LAX

LAWA requested 5 MOSs for the Airbus A380 aircraft to operate at LAX. On April 8, 2004 FAA Conditionally Approved MOSs 1, 2, and 3 and on April 27, 2004 FAA Conditionally Approved MOS’s 4 and 5.

LAX A380 Conditionally Approved MOSs are:

Modification 1, Taxiway CL to Fixed/Movable Object Separation

To allow the A380 to operate on a Taxiway centerline with the distance to a fixed or movable object is of 146.5 feet in lieu of the 193 feet for Airport Design Group VI aircraft. (Conditionally Approved)

Modification 2, Parallel Taxiway CL to Taxiway CL Separation

To allow the A380 to operate on Parallel Taxiways with a 280.5 foot separation in lieu of the 324 feet for Airport Design Group VI aircraft. (Conditionally Approved)

Modification 3, Taxiway Width

To allow the A380 to operate on 75-foot non-standard Taxiway width, with 60-foot paved shoulders. Modification will be in accordance with Airport Engineering Brief # 63, Use of Non-standard 75-foot wide Straight Taxiing Sections for the A380 Taxing operations. (Conditionally Approved)

Modification 4, Runway CL to Parallel Taxiway CL Separation

To allow the use of the existing Runway 7R/25L centerline to Taxiway “A” centerline separation of 500 feet, in lieu of the 600 feet for Airport Design Group VI aircraft. (Conditionally Approved)

Modification 5, Runway Width

To allow the use of the existing 150-foot Runway 6L/24R width with 65-foot paved shoulders (280 feet of paved surface), in lieu of the 200-foot Runway 6L/24R for Airport Design Group VI aircraft. Modification will be in accordance with Airport Engineering Brief # 65, Minimum Requirements to widen Existing 150-foot wide runway for the A380 Operation. (Conditionally Approved)

New York- JFK

JKF has received conditional approval for four MOSs for the use of the A-380 at JFK. At least one other MOSs is still under review.

JFK A-380 Approved MOSs are:

Modification 1, Taxiway width 75’

To allow the A380 to operate on non-standard 75-foot–wide straight taxiway sections. (Conditionally Approved on a 5 year Interim basis)

Modification 2, Taxiways “B” & “A” separation

To allow the A380 to operate on taxiways with non-standard taxiway centerline to taxiway centerline separations distance. Request MOSs for taxiway to taxiway parallel separation of 284 feet on Taxiway’s A, B, P, and Q. (Conditionally Approved)

Modification 3, Taxiway “B” OFA (service road within the OFA)

To allow the A380 to operate on taxiways with non-standard taxiway centerline to taxiway centerline to fixed or movable object separation distance. Request MOSs for taxiway centerline to fixed or movable object of 146 feet on Taxiway’s A, B, P, and Q. (Conditionally Approved)

Modification 4, Runway OFZ

This is a modification that will be conditionally approved. This MOSs will allow the A380 to operate on runways with non standard OFZs. Description of non standard areas have been requested.

JFK A-380 MOSs still under review is:

**Requested Modification, 200’ Runway width** Runway 13R/31L is 14,572’ X 200’ and meets ADG VI runway width criteria. A MOSs has been requested on the 150-foot-wide criteria for: Runway 13L-31R, Runway 4L-22R, and Runway 4R-22L.

Note: Lufthansa A380 is scheduled for a test flight into JFK March 17, 2007.

Miami- MIA

MIA submitted 32 individual MOSs in support of the A380 operations. It was stated that anticipated A380 operations will not take place for 5-6 years. Some of the requested and conditionally approved MOSs will be reconstructed over the next several years to comply with ADG VI criteria. In summary and as presented by MIA officials the MOSs are grouped into three categories: Runway Width, Taxiway Width, and Lateral Separations.

Modification 1, Operate A380 on 150-foot runway pavement

Not Approved; Modifications will be made in accordance with Airports Engineering Brief #65 Minimum requirements to widen existing 150-foot-wide Runways for Airbus A380 Operations. Affected Runways 9-27(pavement width, shoulders), 8R-26-L Shoulders and Blast pad).

**Modification 2, Operate on 75-foot wide taxiways**

Modifications will be made in accordance with Airports Engineering Brief #63. Interim Conditional Approval; Affected Taxiways with widths of 75 feet: S, P, N, Z, JJ, and K; Affected taxiways with connectors/ fillet design: S, S & T, N, Y & Z, and K7.

**Modification 3, Lateral separations**

Runway to parallel taxiway, taxiway to taxiway, taxiway to service roads including taxiway fillets received. Conditional Approval Affected runways 9-27 to Taxiway Q and T; Runway 8R-26L to Taxiway L and K; Taxiway to taxiways; Q to P (237’), S to T (300’), M to N (300’), N to MD11 (245’), Y to HH (300’), Y to W (300’), JJ to HH (300’); and Taxiways S and K to service road (170’ and 160’ respectively).

**San Francisco- SFO**

SFO submitted requests for 4 MOSs: All four were conditionally approved.

**Modification 1, Runway to Taxiway separation of 500 feet.**

Allow the A380 to operate on Runway 10L/28R centerline with Parallel Taxiway “C” centerline separation of 500 feet, and Runway 1R/19L centerline with parallel Taxiway “L” centerline separation of 500 feet. In lieu of the ADG VI aircraft separation of 600 feet. Conditionally Approved

**Modification 2, Allow A380 to operate on 75-foot non-standard Taxiway width, with 60-foot paved shoulders; Conditionally Approved.**

**Modification 3, Allow the A380 to operate on Parallel Taxiways with 280.5-foot separation; Conditionally Approved.**

**Modification 4, Allow the A380 to operate on Taxiway centerlines with a distance to a fixed or movable object is 146.5 feet. Conditionally Approved.**

**Memphis- MEM**

MEM submitted requests for 5 MOSs. Four were approved and one not approved.

**Modification 1, Operate on 75-foot-wide taxiways, with total paved width of at least 180-foot; Approved**

**Modification 2, Permission to count up to 9 feet of existing shoulder as part of the required 20-foot safety margin on taxiways; Approved.**

(MEM ran NDT strength tests on all likely shoulders to be part of the A380 system, and got good results. The shoulders were originally detailed to accommodate an underdrain system and were inherently stronger than the typical minimum construction would be)

**Modification 3, Service road located within the 193-foot OFA; Approved at 163 feet,**  
This is based on JFK having gotten approval of similar roadway at 146 feet. MEM also could demonstrate a vertical difference in our favor.

**Modification 4, Runway-Taxiway Separation of 550 feet, and 527 feet with restrictions. Approved for 550 feet,**

Not Approved for 527 feet with MEM stated restrictions.

**Modification 5, Operate A380F on 150ft runway pavement. Not Approved;**

Must follow Engineering Brief #65 if we want to proceed with preparations before a final decision on runway width is made by the FAA. MEM elected to proceed with Engineering Brief #65 for the center runway, and wait for a final FAA decision before proceeding with East runway. Moot point for us now that the FedEx order has been cancelled. In ten years or so we may have to revisit the issue if/when FedEx places a new A380F order.

**Orlando-MCO**

MCO submitted a request for two MOSs. Conditional Approved and one Interim Conditional Approved.

**Modification 1, Parallel Taxiway CL to CL separation.**

Parallel Taxiways E and F are separated at 300 feet. Standard group VI parallel separation is 324 feet. A 300-foot separation has been Conditionally Approved.

**Modification 2, Taxiway Width.**

MOSs will be in accordance with Engineering Brief #63 Use of Non-Standard 75-foot wide Straight Taxing Sections for the A-380 Taxiing Operations (Taxiways: B, B-1, B-10, C, between B-1 and F, E-5, and F). Interim Conditional Approval.

**Washington Dulles- IAD**

IAD submitted a request for eight MOSs. All eight MOSs are under review.

**Modification 1, Runway 1R-19L Width;**

1a. AC 150/5300-13, Chapter 3 – Runway Design – Paragraph 302, Runway Width: Request approval to modify standards to operate an Airbus A-380 aircraft on 150-foot-wide Runway 1R/19L. Enclosures provided herein demonstrate that the first 25 feet of existing shoulder pavement provide the necessary strength to satisfy Engineering Brief #65 as equivalent useable runway pavement on an interim basis. However, the Authority does not propose to convert or identify these shoulder sections as useable runway.

1b. Engineering Brief #65, Section C – Specific Condition, Subpart 3 – Grading, Marking, Lighting, and Overall Width: Request approval to modify standards to leave Runway 1R-19L marked and lighted as a 150-foot-wide runway. Existing runway edge lines are offset by 85 feet from the runway centerline.

**Modification 2, Runway 1R-19L Shoulders;**

2a. AC 150/5300-13, Chapter 3 – Runway Design – Paragraph 303, Runway Shoulders: Request approval to modify standards to operate an Airbus A-380 aircraft on Runway 1R- 19L with 35-foot wide shoulders.

2b. Engineering Brief #65, Section C – Specific Condition, Subpart 3 – Grading, Marking, Lighting, and Overall Width: Request approval to modify standards to leave the overall pavement width (runway and shoulders combined) at 220 feet.

**Modification 3, Runway 1R-19L Blast Pads;**

AC 150/5300-13, Chapter 3 – Runway Design – Paragraph 303 Runway Blast Pads: Request approval to modify standards to operate an Airbus A-380 with existing conditions of 150-foot-wide by 380-foot in length on Runway 19L, and 220-foot-wide by 35-foot in length on Runway 1R.

**Modification 4, Taxiway J, K Width;**

AC 150/5300-13, Chapter 4 – Taxiway Design – Paragraph 401, Dimensional Standards: Request approval to modify standards to operate –the Airbus A-380 aircraft on a 75-foot-wide taxiway with speeds limited to a maximum of 15 miles per hour (mph).

**Modification 5, Radius of Taxiway K Turns and Intersections with Connecting Taxiways;**

AC 150/5300-13, Chapter 4 – Taxiway Design – Paragraph 401: Request approval to operate the Airbus A-380 with existing 150-foot intersection turn radii on Taxiway K at turns or at intersections with Taxiways D, J, K1, K2, K7, and K8 as shown in the operating plans.

**Modification 6, Taxiway Shoulder Width;**

6a. AC 150/5300-13, Chapter 14 – Taxiway Shoulders: Request approval to modify standards to operate an Airbus A-380 aircraft on taxiways indicated in the operating plans with 35-foot wide shoulders.

6b. Engineering Brief #63, Section D – Specific Condition, Subpart 5 – Overall Taxiway Width: Request approval to modify standards to leave the overall pavement width of Taxiway K (taxiway and shoulders combined) at 145 feet.

**Modification 7, Taxiway OFA Guidance signs;**

AC/150/5340-18, Chapter 1 – Taxiway Guidance Signs: Request approval to leave taxiway guidance signs at 160 feet from the intersecting taxiway Centerlines along the Airbus A-380 routes indicated on the enclosed operating plans.

**Modification 8, Taxiway OFA Mobile Lounge Road;**

AC/150/5300-13, Chapter 2 – Airport Geometry, Paragraph 206 - : Request approval to leave the Mobile Lounge Road at east end of Concourse C at 163 feet from centerline of Taxiway J, or within the OFA for a Group VI aircraft on Taxiway J.



## **APPENDIX B**

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### **Runway Length Requirements for the Airbus A380 and Boeing 747-800**

# RUNWAY LENGTH REQUIREMENTS FOR THE AIRBUS A380 AND BOEING 747-800

Runway takeoff and landing length requirements for the Airbus A380 and Boeing 747-800 aircraft were derived by referencing aircraft performance curves presented in the *Airplane Characteristics For Airport Planning* publication for each respective aircraft. The performance curves consider the airfield elevation, takeoff weight and landing weight. Runway length performance curves representing estimates for "Hot Day" conditions were available for the Airbus A380 (July 2002) and the Boeing 747-8F (November 2005).

Information provided in these publications is presented in a standardized format for use in general airport planning. Since operational practices vary among airlines, the aircraft- or airline-specific performance requirements will vary. Accordingly, information derived from each Airplane Characteristic publication should be considered preliminary and used as general planning information.

A review of the performance curves for each aircraft revealed that the freighter derivatives have the greatest runway takeoff length requirements. Accordingly, the freighter models were considered to represent the "critical" design aircraft when determining runway length requirements.


## Runway Length Requirements for Takeoff

The runway length requirement for takeoff of the A380-863F Model was determined to be 10,050 feet at maximum takeoff weight. The Boeing 747-8F Freighter was determined to have a takeoff length requirement of 10,700 feet at maximum takeoff weight.

## Runway Length Requirements for Landing

The landing length requirement for the Airbus A380 was determined to be 6,750 feet. The Boeing 747-8F Freighter was determined to have landing length requirement of 7,850 feet. The landing distance performance curves do not reflect additional landing distances that are typically required during wet runway conditions or other operational adjustments.

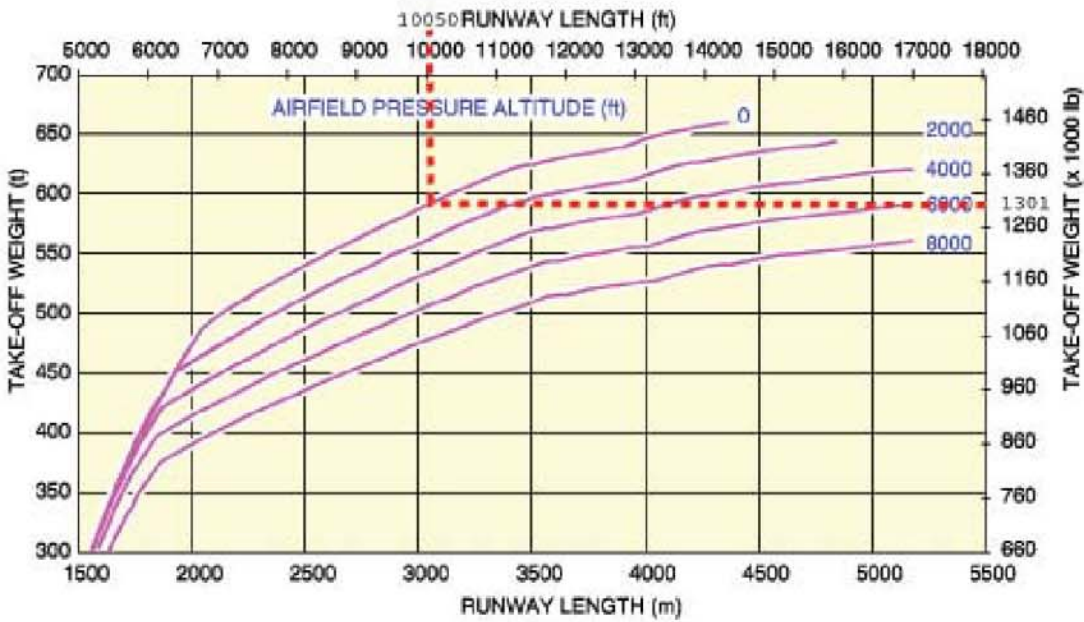




# A380

## AIRPLANE CHARACTERISTICS

**NOTE:** THESE CURVES ARE GIVEN FOR INFORMATION ONLY.  
THE APPROVED VALUES ARE STATED IN THE "OPERATING MANUALS"  
SPECIFIC TO THE AIRLINE OPERATING THE AIRCRAFT.




Take-Off Weight Limitation  
ISA + 15 °C (59 °F) - GP 7277 Engines  
A380-863F Model

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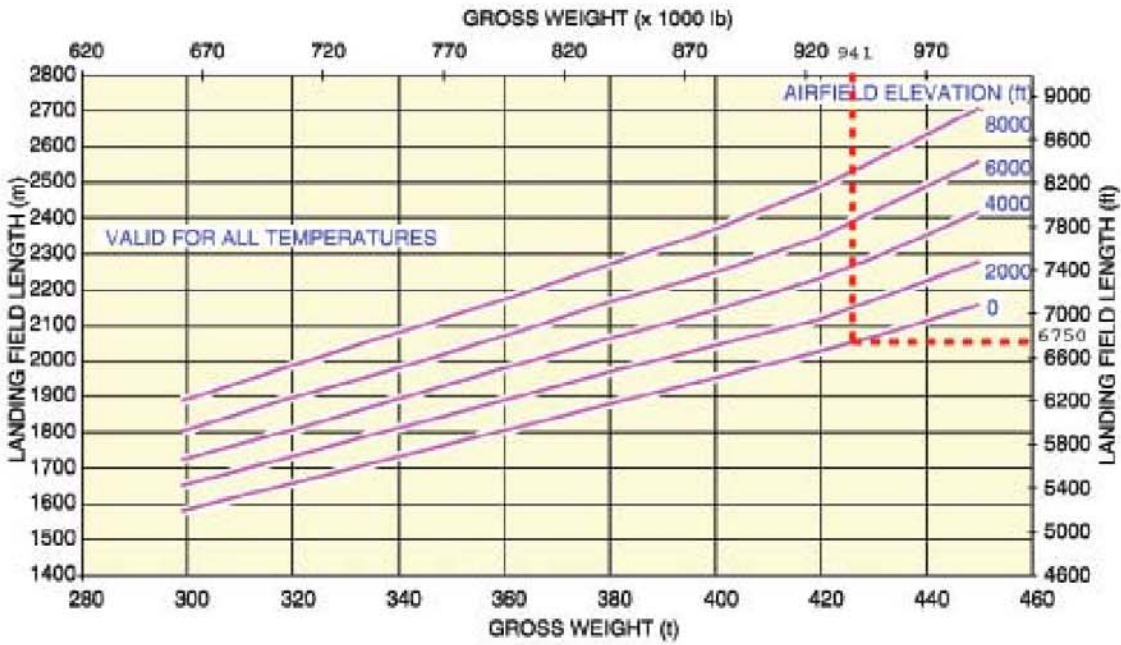
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# A380

## AIRPLANE CHARACTERISTICS

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Landing Field Length  
All Engines  
A380-800F Models

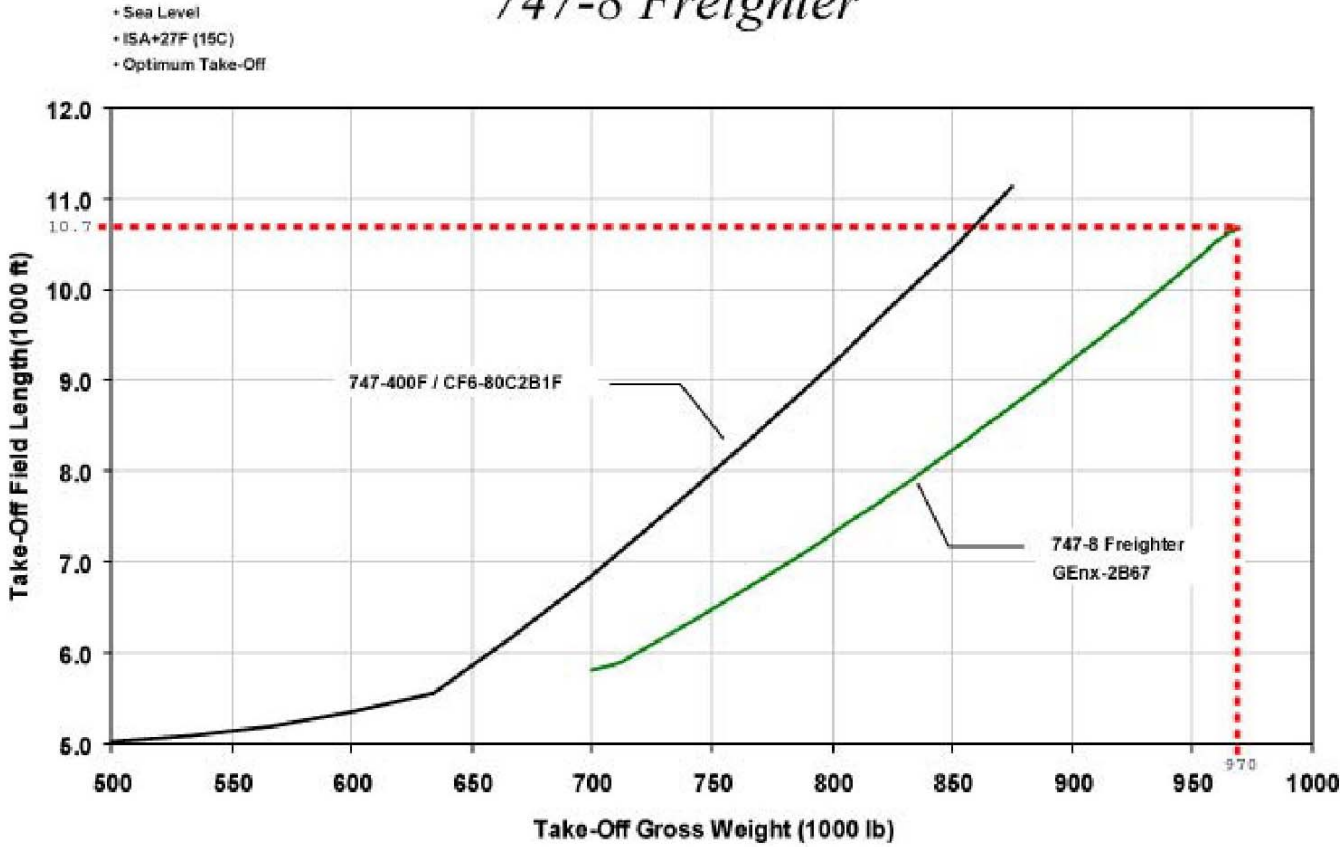
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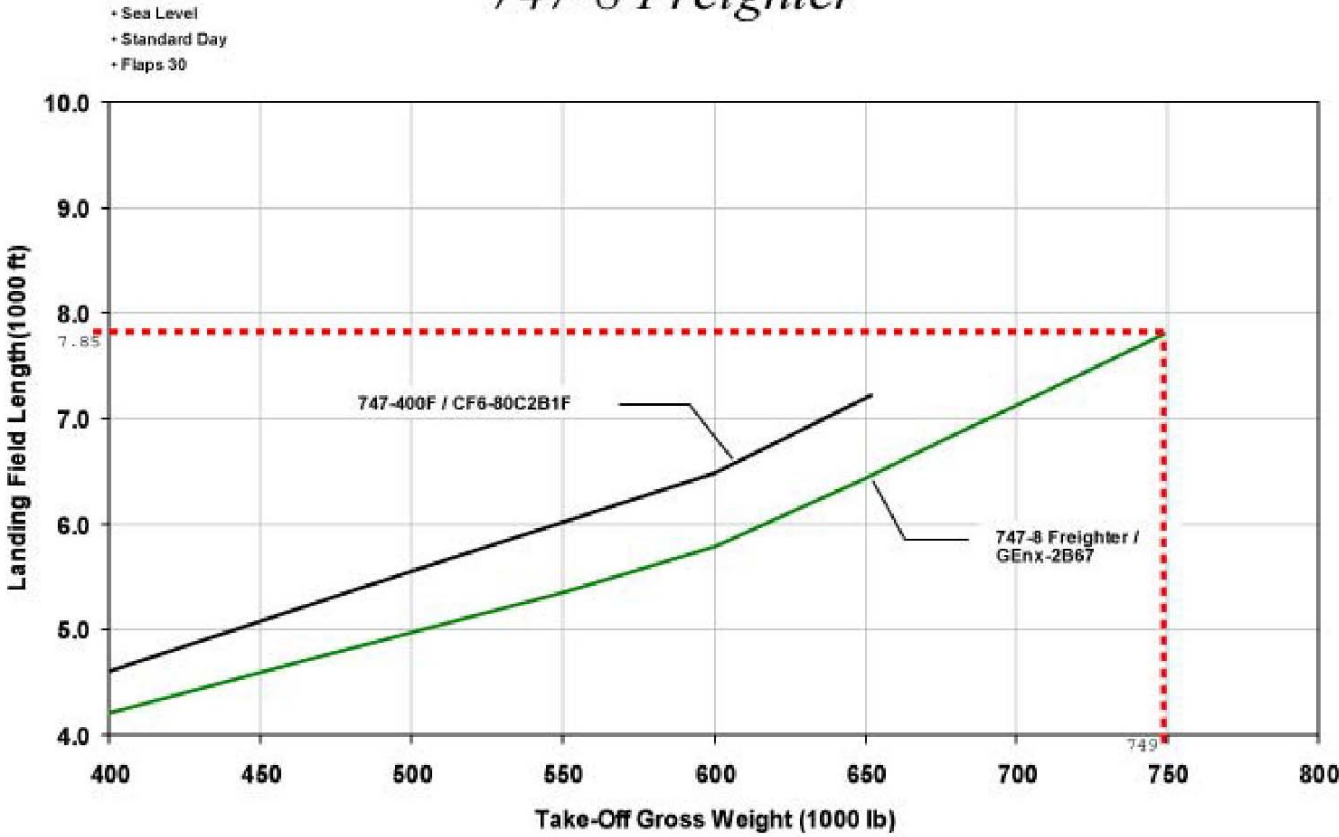
# Take-off Field Length 747-8 Freighter



PRELIMINARY

PRELIMINARY

# Landing Field Length 747-8 Freighter



PRELIMINARY