Chapter Four

AIRPORT DEVELOPMENT ALTERNATIVES

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The previous chapters have focused on the airport's available facilities, existing and potential future demand, and future levels and types of facilities that are needed to meet demand. Prior to defining the recommended development program for Lake Havasu City Municipal Airport, it is important to first consider development potential as well as constraints to future development at the airport. The purpose of this chapter is to formulate and examine reasonable airport development alternatives that address the planning horizon demand levels. Because there are a multitude of possibilities and combinations thereof, intuitive judgment is necessary to focus in on those opportunities which have the greatest potential for success.

Any development proposed by a Master Plan evolves from an analysis of projected needs. Though the needs were determined by the best methodology available, it cannot be assumed that future events will not change these needs. The master planning process attempts to develop a viable concept for meeting the needs caused by projected demands for the next 20 years. However, no plan of action should be developed which may be inconsistent with the future goals and objectives of Lake Havasu City and its citizens, who have a vested interest in the development and operation of the airport.

In this chapter, airport development alternatives are considered for the

airport, where applicable. The ultimate goal is to develop the underlying rationale which supports the final recommended Master Plan development concept. Through this process, an evaluation of the most realistic and best uses of airport property is made while considering local development goals, physical and environmental constraints, and appropriate federal airport design standards.

The development alternatives for Lake Havasu City Municipal Airport can be categorized into two functional areas: airside (runways, taxiways, navigational aids, etc.) and landside (general aviation hangars, aprons, terminal area, etc.). This Master Plan primarily focuses on the aviation-use development of existing and proposed property that will encompass the airport. Within each of these areas, specific facilities are required or desired. In addition, the utilization of the remaining airport property to provide revenue support for the airport and to benefit the economic development and well-being of the regional area must be considered.

Each functional area interrelates and affects the development potential of the others. Therefore, all areas must be examined individually, and then coordinated as a whole to ensure the final plan is functional, efficient, and cost-effective. The total impact of all these factors on the existing airport must be evaluated to determine if the investment in Lake Havasu City Municipal Airport will meet the needs of the community, both during and beyond the planning period.

The alternatives presented in this chapter have been developed to meet the overall program objectives for the airport in a balanced manner. Through coordination with the Planning Advisory Committee (PAC), Lake Havasu City, and the general public, the alternatives (or combination thereof) will be refined and modified as necessary to develop the recommended development concept. Therefore, the alternatives presented in this chapter can be considered a beginning point in the development of the recommended concept for the future development of Lake Havasu City Municipal Airport.

NO-BUILD ALTERNATIVE

In analyzing and comparing the advantages and disadvantages of various development alternatives, it is important to consider the consequences of no future development at Lake Havasu City Municipal Airport. The "no-build" or "do nothing" alternative essentially considers keeping the airport in its present condition, not providing any type of expansion or improvement to the existing facilities (other than general airfield and City-owned hangar and terminal building maintenance projects). The primary result of this alternative would be the inability of the airport to satisfy the projected aviation demands of the airport service area.

Lake Havasu City Municipal Airport is an important contributor to the economic development of the regional area. The airport is a transportation link to other regional and national economic centers. Not improving Lake

Havasu City Municipal Airport to meet commercial and general aviation needs could limit economic growth for the region.

The growth of activity at Lake Havasu City Municipal Airport can largely be attributed to the growing economy and population of Lake Havasu City and growth within the general aviation industry as a whole. The general aviation industry has experienced extended periods of decline and growth over the last 20 years. However, general aviation is now seen as a growth industry once more. While overall, general aviation growth will be steady but slow nationally, the demand for higher performance aircraft is experiencing the strongest growth rate. With heightened interest in commercial aviation security, corporate general aviation could expect demand for private aircraft to grow even more. This could be spurred by the new very light jet (VLJ) and expectations for true air taxi service at general aviation airports. As mentioned in previous chapters, Lake Havasu City Municipal Airport is well positioned to attract operations by VLJs with adequate runway length and forecasted growth in business opportunities in the airport service area.

The airport has also served commercial airline operations in the past and is actively partnered with local agencies to regain commercial airline service in the future. This is being done to ensure the community is provided an important transportation link to the region. It is often required for commercial service airports to make improvements to the airfield in order to provide the highest level of safety and efficiency for the traveling public.

Aviation demand forecasts and analysis of facility requirements indicated a potential need for improved facilities at Lake Havasu City Municipal Airport. Improvements recommended in the previous chapter include extending taxiways, improving instrument approach procedures, providing additional airfield lighting, constructing additional hangar facilities, improving navigational aids, improving lighting and marking aids, and expanding, replacing, or relocating the passenger terminal building. Without these improvements, regular users of the airport will be constrained from taking maximum advantage of the airport's air transportation capabilities.

The unavoidable consequence of the "no-build" alternative would involve the airport's inability to attract potential airport users and expand economic development in Lake Havasu City and the surrounding region. Corporate aviation and commercial air service play a major role in the transportation of business leaders and key employees. Also, recreational activities surrounding Lake Havasu City require general aviation and commercial air service support. If the airport does not have the capability to meet the terminal, hangar, apron, or airfield needs of potential users, the City's capability to attract the major sector businesses or recreational travelers that rely on air transportation could be diminished.

Following the "no-build" alternative would also not support the private businesses that have made investments at Lake Havasu City Municipal

Airport. As these businesses grow, the airport will need to be able to accommodate the infrastructure needs associated with their growth. Each of the businesses on the airport provides jobs for local residents, creates positive economic benefits for the community, and pays taxes for local government operations.

By owning and operating Lake Havasu City Municipal Airport, Lake Havasu City is charged with the responsibility of developing aviation facilities necessary to accommodate aviation demand and minimize operational constraints. Flexibility must be programmed into airport development to assure adequate capacity should market conditions change unexpectedly.

To propose no further development at Lake Havasu City Municipal Airport could adversely affect the long term viability of the airport, resulting in negative economic effects on Lake Havasu City and the region as a whole. The "no-build" alternative is also inconsistent with the long term goals of the Federal Aviation Administration (FAA) and Arizona Department of Transportation (ADOT) – Aeronautics Division, which are to enhance local and interstate commerce. Therefore, this alternative is not considered to be prudent or feasible and will no longer be considered in this study.

AIRPORT DEVELOPMENT OBJECTIVES

It is the overall objective of this effort to produce a balanced airside and landside complex to serve forecast aviation demands. However, before defining and evaluating specific alternatives, airport development objectives should be considered. The primary goal for the Master Plan is to define a development concept which allows for the airport to be marketed, developed, and safely operated for the betterment of the community and its users. With this in mind, the following development objectives have been defined for this planning effort:

- Maintain an attractive, efficient, and safe aviation facility in accordance with federal, state, and local regulations.

- Develop facilities necessary to efficiently and securely accommodate commercial airline service.

- Develop facilities to efficiently serve general aviation users and encourage increased use of the airport, including increased business and corporate use of the airport.

- Provide sufficient airside and landside capacity through additional facility improvements which will meet the long term planning horizon level of demand of the area.

- Identify any future land acquisition needs.

- Ensure that any recommended future development is environmentally compatible.

- Target local economic development through the development of available property.

- Identify opportunities for approved non-aeronautical use of certain areas on the airport to further diversify the airport's revenue-generat-ing potential.

The remainder of this chapter will describe various development alternatives for the airside and landside facilities. Within each of these areas, specific facilities are required or de-sired. Although each area is treated separately, planning must integrate the individual requirements so that they complement one another. **Exhibit 4A** presents both airside and landside planning issues that will be specifically addressed.

AIRSIDE PLANNING CONSIDERATIONS

Airfield elements such as the runway and taxiway system are, by nature, the focal point of the airport complex. Because of their primary role and the fact that they physically dominate airport land use, airfield facility needs are often the most critical factor in the determination of viable airport development alternatives. In particular, the runway system requires the greatest commitment of land area and often imparts the greatest influence on the identification and development of other airport facilities. Furthermore, aircraft operations dictate the FAA design criteria that must be considered when examining potential airfield improvements. These design standards can have a significant impact on the various alternatives intended to meet airfield needs.

Several airfield topics will be discussed in detail and then applied to the various airport development alternatives. In the next chapter, a recommended alternative will be presented which may be one of these alternatives as presented or may be a combination of elements from these alternatives.

AIRFIELD DESIGN STANDARDS

The design of airfield facilities is based, in part, on the physical and operational characteristics of aircraft using the airport. The FAA utilizes the Airport Reference Code (ARC) system to relate airport design requirements to the physical (wingspan and tail height) and operational (approach speed) characteristics of the largest and fastest aircraft conducting 500 or more operations annually at the airport. While this can at times be represented by one specific make and model of aircraft, most often the airport's ARC is represented by several different aircraft which collectively conduct more than 500 annual operations at the airport.

Analysis in the previous chapter indicated that the critical aircraft at Lake Havasu City Municipal Airport is currently ARC B-II. It is forecast, however, that during the course of the planning period, the critical aircraft will transition to ARC C/D-II. With this transition come changes in FAA design standards. Of primary concern are the runway safety area (RSA), object free area (OFA), and runway protection zone (RPZ). The existing and

future safety areas are presented on **Exhibit 4B**.

Runway Safety Area

The FAA defines the RSA as "a defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway." The RSA is an integral part of the runway environment. RSA dimensions are established in FAA Advisory Circular (AC) 150/5300-13, Change 13, *Airport Design*, and are based on the ARC of the critical design aircraft for the airport. The RSA is intended to provide a measure of safety in the event of an aircraft's excursion from the runway, by significantly reducing the extent of personal injury and aircraft damage during overruns, undershoots, and veer-offs. According to the AC, the RSA must be:

1) cleared and graded and have no potentially hazardous ruts, bumps, depressions, or other surface variations;

2) drained by grading or storm sewers to prevent water accumulation;

3) capable, under dry conditions, of supporting aircraft rescue and firefighting equipment, and the occasional passage of aircraft without causing structural damage to the aircraft; and

4) free of objects, except for objects that need to be located in the safety area because of their function.

Furthermore, the FAA has placed a higher significance on maintaining adequate RSAs at all airports due to recent aircraft accidents. Under Order 5200.8, the FAA established the *Runway Safety Area Program*. The Order states, "The goal of the Runway Safety Area Program is that all RSAs at federally-obligated airports and all RSAs at airports certificated under Title 14 of the Code of Federal Regulations (CFR) Part 139 shall conform to the standards contained in AC 150/5300-13, *Airport Design*, to the extent practicable." Under the Order, each Regional Airports Division of the FAA is obligated to collect and maintain data on the RSA for each runway at federally-obligated airports.

In late 2004, a notable change to AC 150/5300-13, *Airport Design*, pertained to RSAs. Previously, the FAA required the same RSA on both ends of the runway, based on ARC of the critical aircraft. The new change recognizes different RSA measurements for take-offs and landings. For ARC C/D-II aircraft, 600 feet of RSA is now required prior to the approach end of the runway, whereas 1,000 feet is still required beyond the far end of the runway. The intent of this change is to allow airports with significant physical constraints, such as a creek or highway off the runway end, to avoid shortening the runway. Even with the new standard, all airports should strive for the full RSA on both runway ends.

AIRSIDE CONSIDERATIONS

- *Evaluate Runway 14-32 for Airport Reference Code (ARC) C/D-II design standards*
- *Analysis of improved instrument approach procedures to the airport*
- *The installation of an approach lighting system on Runway 32*
- *Identify property off each runway end that may be needed for approach protection*
- *Evaluate impacts of safety area considerations*
- *Provide medium intensity taxiway lighting (MITL) on all active taxiways*
- *Extend Taxiway C to the south to provide access for potential aviation development on the airport*
- *The construction of a partial-length parallel taxiway on the east side of Runway 14-32 to allow for future aviation development*

LANDSIDE CONSIDERATIONS

- *Identify locations for additional hangar development to meet projected demand*
- *Analyze current and future terminal building needs and locations*
- *Identify locations dedicated to air cargo operations, transient business jet parking, and helicopter parking*
- *Identify potential locations for a future airport traffic control tower (ATCT)*
- *Identify locations suitable for a permanent airport maintenance building*
- *Analyze property on east side of airfield for future aviation use*
- *Consider alternatives for development in southwest area of the airport*
- *Identify property southwest of existing airport boundary for potential land acquisition to be utilized as aviation revenue support*
- *Identify locations for non-aviation development and revenue support methods*

LAKE HAVASU CITY, ARIZONA • MUNICIPAL AIRPORT •

Exhibit 4A
PLANNING CONSIDERATIONS

05MP08-4B-2/08/08

Existing ARC B-II Design Standards
Runway 14-32 not less than one mile minimums

Runway 14-32 8,001' x 100'

A6 A5 A4 A3 A2 A1

A B C

State Highway 95

LEGEND

- Airport Property Line
- Runway Safety Area
- Object Free Area
- Runway Protection Zone

Ultimate ARC C/D-II Design Standards
Runway 14 not less than one mile minimums
Runway 32 less than ¾ mile minimums

Runway 14-32 8,001' x 100'

A6 A5 A4 A3 A2 A1

A B C

State Highway 95

NORTH

0 1000 2000

SCALE IN FEET

Date of photo: 7/12/07

LAKE HAVASU CITY, ARIZONA MUNICIPAL AIRPORT

Exhibit 4B
EXISTING/ULTIMATE CONDITIONS

As previously mentioned, the airport's current critical aircraft falls in ARC B-II. With approach visibility minimums currently not lower than three-quarters of a mile, the required RSA for Runway 14-32 is 150 feet wide, extending 300 feet beyond each runway end. An upgrade to ARC C/D-II design standards increases both dimensions of this requirement. The ARC C/D-II standard for RSA increases to 500 feet in width extending 1,000 feet beyond each runway end.

The existing RSA for Runway 14-32 is adequate, considering ARC B-II aircraft design standards, as depicted at the top of **Exhibit 4B**. The bottom of **Exhibit 4B** depicts the safety areas when the airport progresses to ARC C/D-II design standards without other improvements being made. As depicted, the enlarged ARC C/D-II RSA would remain on airport property. The area in the enlarged RSA would need to be improved to meet standards as described above.

Object Free Area

The runway OFA is defined in FAA AC 150/5300-13, Change 13, *Airport Design*, as an area centered on the runway extending laterally and beyond each runway end, in accordance to the critical aircraft design category utilizing the runway. The OFA must provide clearance of all ground-based objects protruding above the RSA edge elevation, unless the object is fixed by function serving air or ground navigation. For ARC B-II design and approaches not lower than three-quarters of a mile, the OFA is 500 feet wide, extending 300 feet beyond each runway end.

As with RSA standards, the OFA increases significantly for ARC C/D-II aircraft. For ARC C/D-II aircraft design, the OFA should be 800 feet wide and extend 1,000 feet beyond the runway ends. It should be noted that, in some cases, the terrain encompassing the OFA may fall significantly below the RSA elevation. In those cases, objects can be in the OFA as long as they do not rise above the elevation of the RSA at any given lateral position.

Existing and future OFA for the south end of the runway fall within current airport bounds and are adequate to meet ARC design standards that apply. The existing OFA at the north end of Runway 14-32 currently meets ARC B-II standards; however, the northwest portion of the OFA that corresponds to future ARC C/D-II standards extends off airport property adjacent to Arizona State Highway 95. The alternatives section to follow will address the OFA at the north end of the airport.

Runway Protection Zone

The RPZ is a trapezoidal surface which begins 200 feet from the runway threshold. The RPZ is a designated area beyond the runway end that the FAA encourages airports to own or, in some fashion, maintain positive control over the types of land uses within the RPZ. The goal of the RPZ standard is to increase safety for both pilots and people on the ground. Unlike the RSA, the RPZ can have ob-

jects located within its boundaries, provided the objects are not obstructions under CFR Part 77, *Objects Affecting Navigable Airspace* or FAA Order 8260.3B, *Terminal Instrument Procedures* (TERPS). It should be noted, however, that the FAA places high priority on maintaining the RPZ free of items that attract groupings of people or permanent residences.

The FAA does not necessarily require the fee simple acquisition of the RPZ area, but highly recommends that the airport have positive control over development within the RPZ. It is preferred that the airport owns the property; however, avigation easements (ownership of airspace within the RPZ) can be pursued if fee simple purchase is not possible. It should be noted, however, that avigation easements can often cost as much as 80 percent of the full property value and may not adequately prohibit incompatible land uses from locating in the RPZ. An avigation easement would include the space below the approach surface and within the RPZ. For planning purposes, where feasible, alternatives will assume fee simple acquisition of the RPZ and land on either end of the runway not currently encompassed by the existing property line.

The northwest portion of the existing RPZ for Runway 14 extends beyond airport property, nearing State Highway 95, as shown on **Exhibit 4B**. When the airport transitions to ARC C/D-II design standards, the RPZ off each runway end will grow significantly. The RPZ for Runway 14 would extend farther north across State Highway 95 and encompass approximately 6.5 acres of land off current airport property. In conjunction with improved approach visibility minimums lower than three-quarters of a mile associated with a potential straight-in precision instrument approach on Runway 32, the proposed RPZ would expand off the south portion of airport property to include approximately 31.4 acres.

INSTRUMENT APPROACHES

This section will present information regarding the potential for improved instrument approach procedures. Where possible, approach minimums should be as low as possible considering safety and financial constraints. The best approach minimums possible will prevent aircraft from having to divert to another airport, which can cause financial hardship for the operator, on-airport businesses, and the City.

A key priority which needs to be considered is protecting the airport from the potential for flight obstructions. The FAA has established criteria aimed at protecting the airport from these flight obstructions. First, FAA criterion stipulates that obstructions not be placed too near the runway ends or parallel to the runway. The obstruction clearance requirements are based on the ARC and/or the weight of the critical aircraft, as well as the type of approaches established or planned for the airport. For visual approaches and/or approaches not lower than one mile visibility for ARC B-II aircraft, minimum obstruction

clearance is required. For ARC C/D-II aircraft with approach minimums lower than three-quarters of a mile visibility, however, the obstruction criterion is more protective.

The two primary resources for determining airspace obstructions are the FAA's Federal Aviation Regulation (F.A.R.) Part 77, *Objects Affecting Navigable Airspace* and *Terminal Instrument Procedures* (TERPS). Part 77 is more of a filter which identifies potential obstructions, whereas TERPS is the critical tool in determining actual flight obstructions. In fact, TERPS analysis is used to evaluate and develop instrument approach procedures including visibility minimums and cloud heights associated with approved approaches.

Analysis in the previous chapter indicated that the plan should consider improved instrument approach capabilities for Runway 14-32. The first step in identifying potential airspace obstructions is the evaluation of the appropriate threshold siting surfaces (TSS). TSS is an imaginary surface which represents the most critical approach area nearest the runway end. The TSS is defined by the visibility minimums of the approach and aircraft type utilizing the approach. At Lake Havasu City Municipal Airport, the lowest visibility minimum for aircraft in approach category A is one and one-quarter mile for a circling approach. Circling approaches for approach category B aircraft have a minimum of one and one-half mile. Circling approach minimums for approach categories C and D is three miles.

Lake Havasu City Municipal Airport should consider approval and implementation of approaches providing lower than three-quarters of a mile visibility minimums for Runway 14-32. Approaches providing lower than three-quarters of a mile minimums will allow operations at the airport, when in the past, aircraft may have had to divert to another airport for landing, or delay departure from their origination point awaiting weather improvements at Lake Havasu City. Further, the forecast increase in the operation of business jets at the airport and the pursuit of commercial service operations at the airport provide a need for improved instrument approach procedures.

Many commercial service and general aviation airports have approved instrument approach procedures with visibility minimums as low as one-half mile with a 200-foot cloud height ceiling. This is referred to as a Category (CAT) I approach. CAT I approaches require an approach lighting system, a glide-slope antenna, and a localizer. In addition, certain criteria must be met, such as reaching a minimum threshold of annual instrument approaches or regular weather conditions that warrant an instrument landing system (ILS) approach.

As previously discussed in Chapter Three – Airport Facility Requirements, significant advancements continue to be made in global positioning system (GPS) navigation that can provide a more cost-effective and attractive means of obtaining CAT I instrument approaches. This includes the continued development of the Wide

Area Augmentation System (WAAS). WAAS provides for approaches with both course and vertical navigation. This capability was historically only provided by an ILS, which requires extensive on-airport facilities. The GPS-WAAS could allow for approach minimums to be lower than three-quarters of a mile visibility. For purposes of this study, the airside alternatives will consider approaches providing for lower than and not lower than three-quarters of a mile visibility minimums.

To achieve an approach providing less than one mile visibility minimums, the corresponding runway end will require the installation of an approach lighting system. Examples of approach lighting systems for approaches with not lower than three-quarters of a mile visibility minimums would include a medium intensity approach lighting system (MALS), omnidirectional approach lighting system (ODALS), or a lead-in light system (LDIN). For approaches with lower than three-quarters of a mile visibility minimums, a medium intensity approach lighting system with runway alignment indicator lights (MALSR) is required.

Preliminary Obstruction Analysis

Exhibits 4C and **4D** present an analysis of the TSS associated with ultimate instrument approach procedures for Runways 14 and 32, respectively. The top portions of the exhibits display the plan, or "overhead" view of each TSS. The bottom half of each exhibit depicts the profile view of the TSS conditions.

Exhibit 4C presents the airspace obstruction evaluation for Runway 14 considering a straight-in instrument approach with not lower than one mile visibility minimums. There are no identified obstructions to the 20:1 TSS slope for the planned approach to Runway 14.

Exhibit 4D presents airspace obstruction analysis for a CAT I approach on the Runway 32 end. There are no identified obstructions to the 34:1 TSS slope associated with a planned precision approach with lower than three-quarters of a mile visibility minimums on this runway end.

RUNWAY

Analysis in the previous chapter indicated that Runway 14-32 provides adequate length and width to satisfy the planning category of aircraft through the planning period. Currently, Runway 14-32 is 8,001 feet long by 100 feet wide, which meets the requirements of ARC C/D-II aircraft and provides length for longer haul flights than the minimum design consideration. This runway length is consistent with the FAA runway length requirements contained in FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*.

Also discussed in Chapter Three – Airport Facility Requirements was separation distances between aircraft on the runway and various areas on

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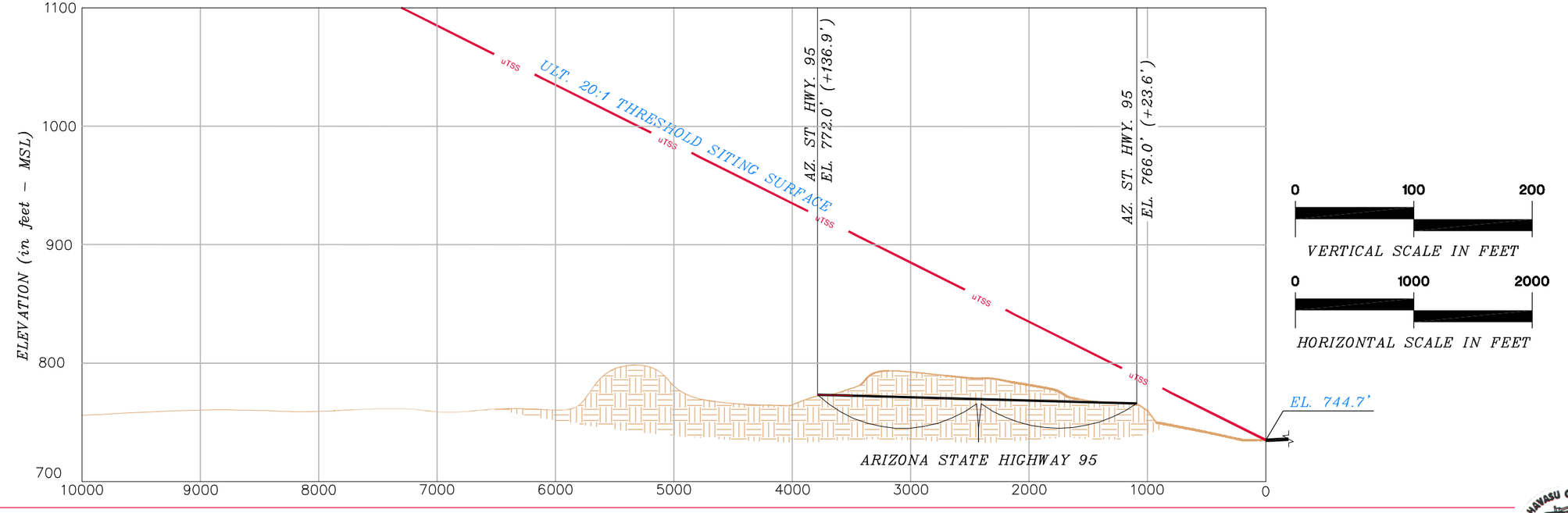

RUNWAY 14

NOTE: NO TRESHOLD SITING SURFACE PENETRATIONS

LAKE HAVASU CITY, ARIZONA MUNICIPAL AIRPORT

RUNWAY 14 THRESHOLD SITING SURFACE PLAN AND PROFILE
EXHIBIT 4C

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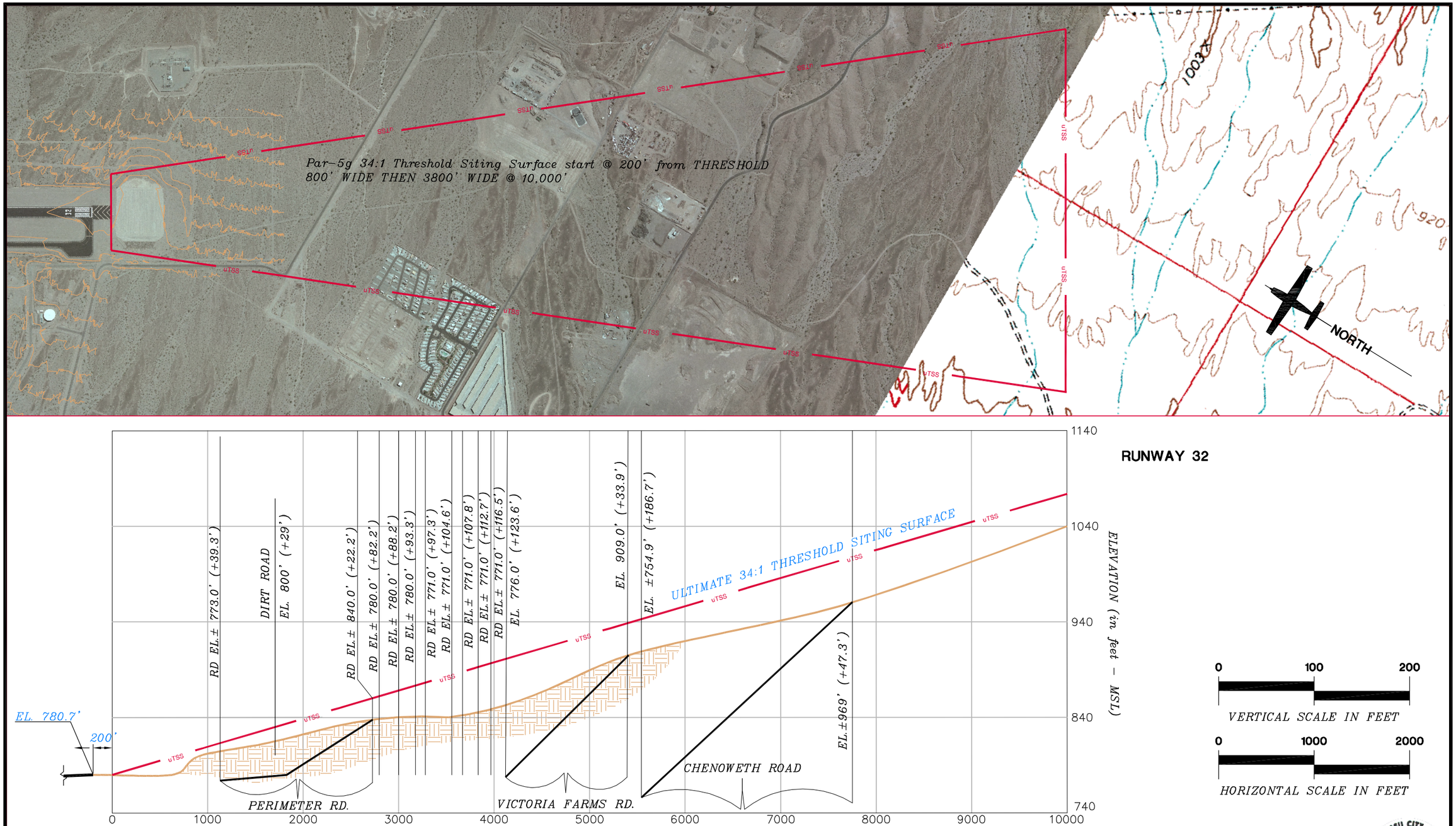

NOTE: NO TRESHOLD SITING SURFACE PENETRATIONS

RUNWAY 32 THRESHOLD SITING SURFACE PLAN AND PROFILE
EXHIBIT 4D

the airport. The separation distances are a function of the approaches approved for the airport and the runway's designated ARC. Under current conditions (ARC B-II, approaches not lower than three-quarters of a mile) parallel taxiways need to be at least 240 feet from the Runway 14-32 centerline. Aircraft parking areas are required to be at least 250 feet from the runway centerline.

In order to meet ARC C/D-II standards with approaches not lower than three-quarters of a mile, parallel taxiways need to be at least 300 feet from the runway centerline, and aircraft parking areas are required to be at least 400 feet from the runway centerline. For ARC C/D-II runways with an approach lower than three-quarters of a mile, parallel taxiways need to be at least 400 feet from the runway centerline, and aircraft parking areas are required to be at least 500 feet from the runway centerline.

Currently, parallel Taxiway A located on the west side of Runway 14-32 is located 340 feet from the runway centerline. The aircraft parking apron is located approximately 500 feet from the runway centerline. The alternatives section to follow will address the existing Runway 14-32 and parallel Taxiway A separation associated with different approach visibility minimum criteria.

The capacity analysis presented in the previous chapter indicated that projected long term annual aircraft operations will account for approximately 40 percent of the airport's annual service volume (ASV). The FAA suggests that airports should plan for capacity improvements once annual aircraft operations reach 60 percent of the ASV. Thus, additional airfield capacity enhancements are not required.

TAXIWAYS

Taxiways are the primary transport surfaces linked with the runway and its operation. Such surfaces include a parallel taxiway, entrance/exit taxiways, and connecting taxiways.

Taxilanes are those surfaces that would typically realize a lower level of aircraft activity because the taxilanes provide direct ingress/egress to a specific location or airport facility. An example of a taxilane would be the surface which links to a box hangar complex, as not all aircraft will use the surface but only those traversing to and from the box hangar.

FAA AC 150/5300-13, Change 13, *Airport Design*, provides standards for taxiway object free areas (OFAs) surrounding the taxiway system. As discussed in the previous chapter, the taxiway OFA is based on the critical aircraft design group which will frequent that particular taxiway. Design standards for airplane design group (ADG) II, aircraft with wingspans ranging from 49 feet to 79 feet, require the taxiway OFA to be 131 feet wide. The taxilane OFA required for ADG II aircraft is 115 feet wide. Analysis of existing and future taxiway OFA will be provided in the airside alternatives to follow.

The current layout of the taxiway system at Lake Havasu City Municipal

Airport is adequate from a functional standpoint. Runway 14-32 is supported by a full length parallel taxiway and six entrance/exit taxiways. Two of these taxiways provide high-speed exits from the runway system which improves the overall capacity of the airport. Parallel Taxiway A is 50 feet wide and the six entrance/exit taxiways range from 50 feet to 65 feet in width. Further removed from the runway, Taxiways B and C range from 35 feet to 70 feet in width. FAA design criteria call for taxiways serving critical aircraft in ADG II to be at least 35 feet wide.

Additional taxiways should be constructed as development and demand warrant. The alternatives to follow show additional taxiways. These taxiways are based on continued development of the airport. During the course of the planning period, medium intensity taxiway lighting (MITL) should be applied to all taxiways.

SEGMENTED CIRCLE/ LIGHTED WIND CONE

The airport is currently equipped with a segmented circle and lighted wind cone on the east side of the airfield to aid pilots in determining appropriate traffic patterns, wind direction, and speed. Once the ARC design standards are upgraded to C/D-II, the safety areas of the airport will widen, causing the segmented circle and wind cone to be located within the runway OFA. It is defined in FAA AC 150/5300-13, *Airport Design*, that the OFA should be cleared of objects protruding above the runway safety area edge elevation. Therefore, the segmented circle and wind cone should be relocated farther to the east so that it lies completely outside the OFA.

AIRSIDE DEVELOPMENT ALTERNATIVES

The following section describes three airside development alternatives. Within these alternatives are two scenarios regarding the entrance/exit taxiways extending from Runway 14-32. Also considered are other taxiway improvements to include a partial-length parallel taxiway on the east side of Runway 14-32, extension of existing taxiways, options for improved instrument approach procedures and approach lighting aids, and land acquisition on the south side of the airport.

AIRSIDE ALTERNATIVE A

Airside Alternative A, depicted on **Exhibit 4E**, considers the implementation of a straight-in instrument approach with not lower than three-quarters of a mile visibility on Runway 32. As previously discussed, airport management monitors the airport's UNICOM frequency and has traditionally logged airport operations at the airport. According to their records, approximately 65 percent of aircraft utilize Runway 32 during the hours in which they are present. Also, during times when poor weather conditions exist that may warrant the use of a straight-in instrument approach, it is most likely that wind conditions would favor the use of Runway 32. As

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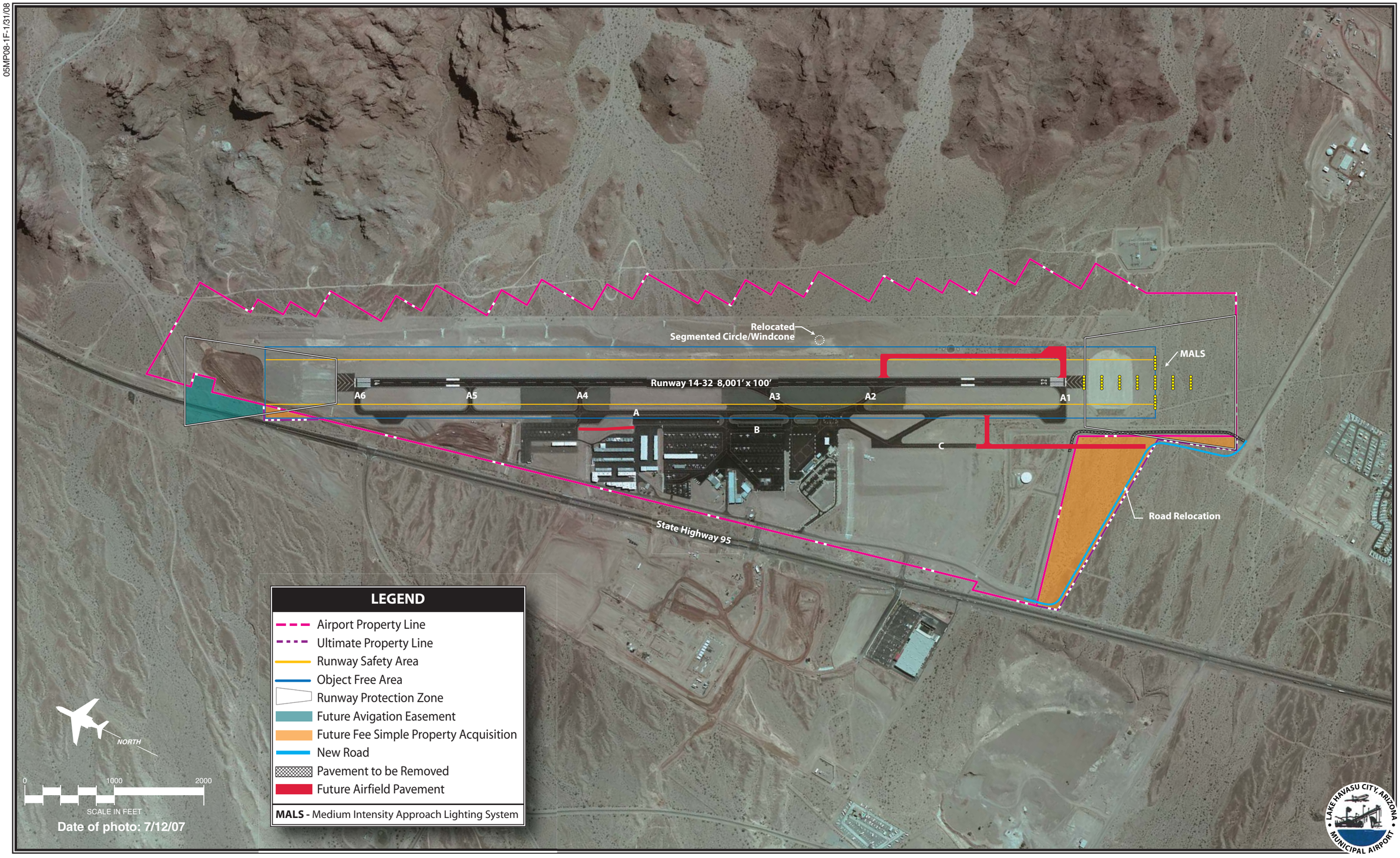

Exhibit 4E
AIRSIDE ALTERNATIVE A

depicted on **Exhibit 4E**, a medium intensity approach lighting system (MALS) is proposed since the runway would provide for less than one mile visibility minimums. The MALS lights begin approximately 200 feet from the runway threshold and are spaced to a maximum distance of 1,400 feet. It should be noted that an approach lighting system is depicted on all airside alternative exhibits to provide a general layout of what the system may look like. Further engineering analysis, separate from this Master Plan, would determine the exact location of the approach lighting system.

With the onset of improved instrument approach procedures to Runway 32, the proposed RPZ will further expand to include areas outside existing airport property. The FAA places a high priority on maintaining an RPZ with little or no development and/or congestion. The expanded RPZ would include portions of the perimeter road on the southwest side of the airport. Although the road could pass through the RPZ, as long as it didn't then constitute an obstruction to the TSS, it is recommended that the road be relocated completely outside the RPZ. Although the FAA does not require the fee simple acquisition of areas within the RPZ, it is recommended that the airport have positive control over the use of this property. Approximately 1.5 acres of land fall outside the southwest portion of the expanded RPZ. Due to the current nature of the property and proposed development further to the south of the airport in the future, it is recommended that this portion of property be acquired through fee simple acquisition.

Also depicted on Airside Alternative A are extensions of Taxiway B to the north and Taxiway C to the south. Extending Taxiway B to the north would allow direct access to the main aircraft apron for smaller aircraft on the north apron. In doing so, this would create a bypass helping to alleviate aircraft taxiing on parallel Taxiway A. Farther to the south, a 1,900-foot extension to Taxiway C is depicted that would open up additional areas for potential aviation development. Approximately 23 acres of land is shown in this area as being purchased by the airport to be used for aviation development. The existing entrance/exit taxiways extending west of Runway 14-32 would be maintained in their current location on this alternative.

On the north side of Runway 14-32, an expanded RPZ to accommodate ARC C/D-II aircraft with the potential for a straight-in instrument approach with not lower than one mile visibility is depicted. The proposed OFA and RPZ would extend beyond the current property boundary, necessitating land acquisition to the north. The total area of land outside the property line but within the OFA and RPZ is approximately 7.3 acres. At a minimum, the airport would need to acquire the OFA areas outside the property line. Due to the nature and location of the property adjacent to State Highway 95, it may not be prudent or feasible to purchase this property. In the event that this property cannot be acquired,

an easement over this area should be pursued giving the airport control over what can be done in this area. Farther to the north, the proposed RPZ extends outside existing airport property and crosses Highway 95. Due to the nature of the land use, it may not be financially feasible or reasonable to purchase the land via fee simple acquisition. At the very least, the airport should have positive control over what can be developed within this area. Methods of gaining control could include an avigation easement, letter of agreement, or memorandum of understanding.

Finally, Airside Alternative A depicts a partial parallel taxiway on the east side of Runway 14-32. This taxiway measures approximately 2,000 feet in length and is located 300 feet from the runway centerline, satisfying runway-to-parallel taxiway separation for an instrument approach providing not lower than three-quarters of a mile visibility. This taxiway would provide access to future aviation development on the southeast side of the airport. In order to satisfy ultimate safety design standards and accommodate potential development in this area, the segmented circle and wind cone would be relocated farther north and east, outside the OFA. It should be mentioned that preliminary plans are in place for the realignment of State Highway 95 on the east side of the airport, thus, opening up this area to automobile access. Due to the physical layout of land on the east side of the airport, future analysis will determine the feasibility and justification of future development in this area. Further, forecast aviation demand through the long term planning horizon of this Master Plan can be accommodated on property to the west of Runway 14-32 that is already provided with taxiway access and better suited for automobile access.

AIRSIDE ALTERNATIVE B

A second option for accommodating airside needs is depicted on **Exhibit 4F**. In this alternative, the high-speed exit taxiways extending west off Runway 14-32 would be relocated to provide a more efficient taxiing network from the runway system and improve operational capacity in doing so. The high-speed exits were originally constructed to accommodate a 5,500-foot runway. Since the runway has been extended to 8,000 feet, analysis shows that the high-speed exit taxiways would better accommodate larger jet aircraft if they were located further north of their current location. In addition, two right-angled taxiways are depicted farther south to allow for additional runway exits.

As in the previous alternative, the OFA and RPZ would both extend beyond the current property line to the north of the airport. The total area of land outside the property line that encompasses the OFA and RPZ is 7.3 acres, similar to what is shown on the previous exhibit. It is recommended that the airport gain control of areas within the OFA and RPZ to the extent practicable.

The improved instrument approach for Runway 32 is also considered on Alternative B. A MALS is implemented that would enable the runway to ob-

05MP08-4F-3/01/08

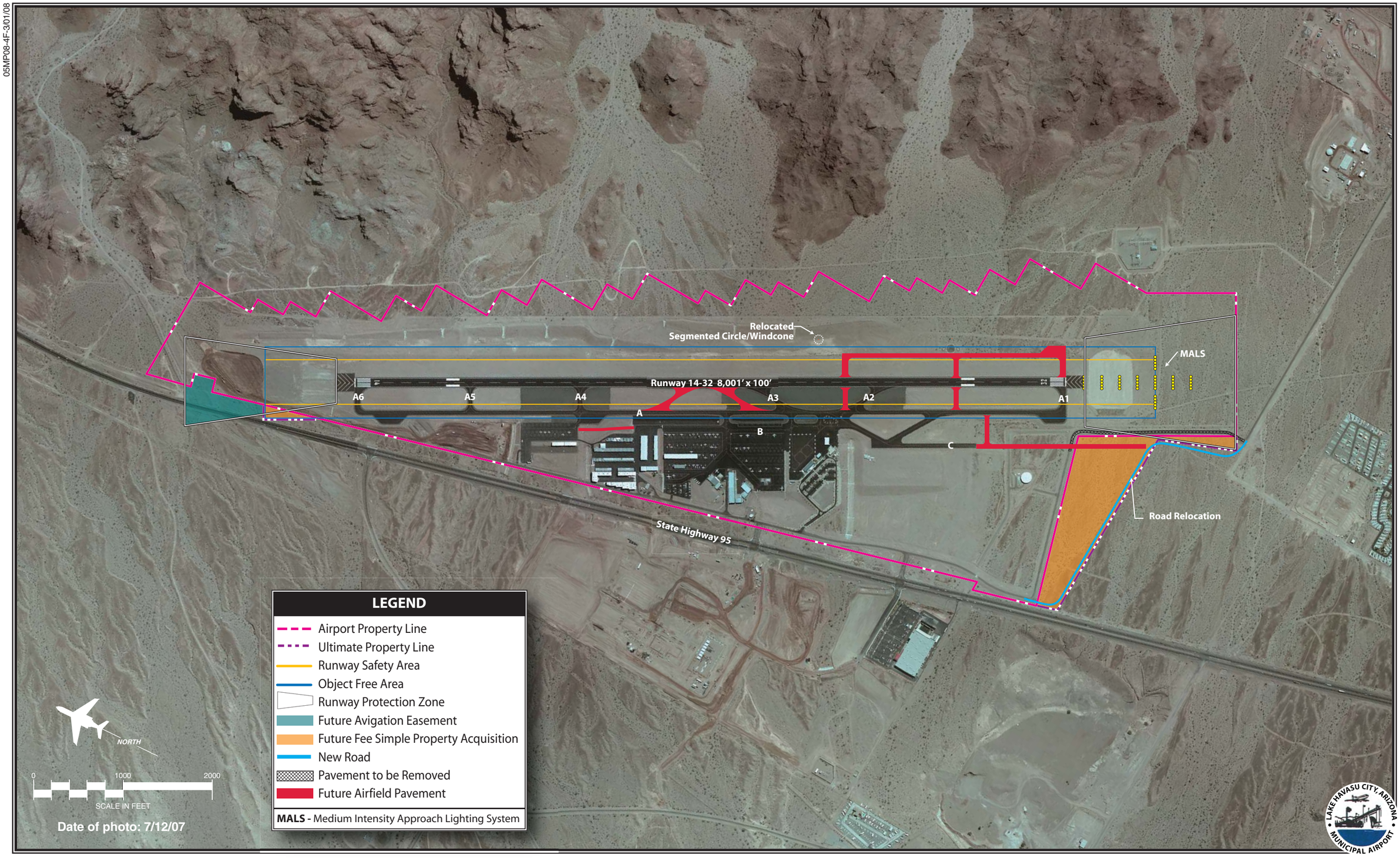

Exhibit 4F
AIRSIDE ALTERNATIVE B

tain a straight-in approach with not lower than three-quarters of a mile visibility minimums. As proposed, Runway 14 could support a non-precision approach with visibility minimums not lower than one mile.

As shown in Alternative A, Taxiway B and Taxiway C would be extended to support future aviation development on the west side of the airport. The extension of Taxiway C would lead to an area on the southwest side of the airport that is considered for fee simple property acquisition to meet the needs of future aviation demand. On the east side of Runway 14-32, a 2,400-foot partial parallel taxiway is depicted 300 feet from the runway centerline that would provide for future aviation development most likely beyond the planning horizon of this Master Plan. In doing so, the segmented circle and wind cone would be relocated farther north and east of their current location so as not to interfere with safety areas and future development.

AIRSIDE ALTERNATIVE C

Airside Alternative C depicts a precision instrument approach on Runway 32. As shown on **Exhibit 4G**, the proposed RPZ will expand further south as a result of CAT I visibility minimums. A medium intensity approach lighting system with runway alignment indicator lights (MALSR) will be required to obtain approach visibility minimums lower than three-quarters of a mile. The MALSR lights begin approximately 200 feet from the runway threshold and are spaced to a maximum distance of 2,400 feet, as indicated on the exhibit. The FAA requires that the airport own property within 100 feet on either side of the MALSR extending 200 feet from the end. With this being said, the proposed MALSR would extend approximately 500 feet beyond airport property, necessitating the need for property acquisition.

The proposed RPZ associated with a precision CAT I approach encompasses approximately 31.4 acres outside airport property. As previously mentioned, the FAA strongly encourages having positive control of the RPZ through the use of fee simple property acquisition with little or no development and/or congestion within it. Discussions with airport and City staff point to the fact that areas adjacent to the south side of the airport are currently dedicated for future business and industrial park development. Analysis of preliminary plans depicts a significant area extending farther south of the runway that is kept undeveloped to accommodate potential airport safety areas. As a result, the expanded RPZ should encompass an area that is not originally shown for business and industrial park development. This alternative shows the relocation of the perimeter road to keep it out of the RPZ in order to better accommodate the proposed CAT I approach.

In order to meet safety design standards for a precision instrument approach with visibility minimums lower than three-quarters of a mile, the runway-to-parallel taxiway separation is required to be 400 feet for ARC C/D-

II runways. As previously discussed, the separation from Runway 14-32 to parallel Taxiway A is 340 feet. Future planning should consider one of two options in addressing future design standards so that a precision instrument approach can be implemented on Runway 32. First, Lake Havasu City Municipal Airport could submit a request for modification to airport design standards as per FAA AC 150/5300, *Airport Design*. The FAA would then determine if the current separation warrants a precision approach. The second option would be to consider the relocation of Taxiway A approximately 60 feet to the west to meet the 400-foot separation criteria.

The other airside improvements proposed on Alternative C are similar to those depicted on Alternative A. The partial parallel taxiway on the east side of Runway 14-32 is located 400 feet from the runway centerline in order to satisfy the proper separation requirements for a precision instrument approach, as discussed in the previous paragraph.

LANDSIDE PLANNING CONSIDERATIONS

The purpose of this section is to identify and evaluate viable landside alternatives at Lake Havasu City Municipal Airport to meet program requirements set forth in Chapter Three. While the airfield is comprised of facilities where aircraft movement occurs (runway, taxiways, etc.), other "landside" functions occur outside this area. The primary aviation functions to be accomplished landside at Lake Havasu City Municipal Airport include aircraft storage hangars, aircraft parking aprons, a passenger terminal building, and automobile parking and access. The interrelationship of these functions is important to defining a long-range landside layout for commercial and general aviation uses at the airport. Due to the amount of land available at the airport, careful consideration will also be given to parcels of land that could be considered for non-aviation related uses that can provide additional revenue support to the airport and support economic development for the region.

The orderly development of the airport terminal area, those areas along the flight line parallel to the runway, can be the most critical, and often times the most difficult to control on the airport. A development approach of taking the path of least resistance can have a significant effect on the long-term viability of an airport. Allowing development without regard to a functional plan could result in a haphazard array of buildings and small apron areas, which will eventually preclude the most efficient use of valuable space along the flight line.

Activity in the terminal area should be divided into high, medium, and low intensity levels at the airport. The high-activity area should be planned and developed to provide aviation services on the airport. An example of the high-activity area is the airport terminal building and adjoining aircraft parking apron, which provides tiedown locations and circulation for aircraft. In addition, large conventional hangars used for fixed base op-

05MP08-4G-3/11/08

Relocated
Segmented Circle/Windcone

MALSR

Runway 14-32 8,001' x 100'

A6 A5 A4 A3 A2 A1

A

B

C

Per FAA Advisory Circular 150/5300-13 Change 12, a 400-foot separation from runway centerline to parallel taxiway centerline is required for ARC C/D-II runways with less than three-quarters of a mile approach visibility minimums. Runway 14-32 and Taxiway A currently have a 340-foot separation. Future planning should consider the airport sponsor submitting a request for a modification to airport design standards or the relocation of Taxiway A.

State Highway 95

Road Relocation

LEGEND

- Airport Property Line
- Ultimate Property Line
- Runway Safety Area
- Object Free Area
- Runway Protection Zone
- Future Avigation Easement
- Future Fee Simple Property Acquisition
- New Road
- Pavement to be Removed
- Future Airfield Pavement

MALSR - Medium Intensity Approach Lighting System with Runway Alignment Indicators

NORTH

0 1000 2000

SCALE IN FEET

Date of photo: 7/12/07

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Exhibit 4G
AIRSIDE ALTERNATIVE C

erators (FBOs), corporate aviation departments, or storing a large number of aircraft would be considered a high-activity use area. The best location for high-activity areas is along the flight line near midfield, for ease of access to all areas of the airfield.

The medium-activity use category defines the next level of airport use and primarily includes smaller corporate aircraft that may desire their own executive hangar storage on the airport. The best location for medium-activity use is off the immediate flight line, but still readily accessible to aircraft including corporate jets. Due to an airport's layout and other existing conditions, if this area is to be located along the flight line, it is best to keep it out of the midfield area of the airport, so as to not cause congestion with transient aircraft utilizing the airport. Parking and utilities such as water and sewer should also be provided in this area.

The low-activity use category defines the area for storage of smaller single and multi-engine aircraft. Low-activity users are personal or small business aircraft owners who prefer individual space in T-hangars or shade hangars. Low-activity areas should be located in less conspicuous areas. This use category will require electricity, but generally does not require water or sewer utilities.

Ideally, terminal area facilities at airports should follow a linear configuration parallel to the primary runway. The linear configuration allows for maximizing available space, while providing ease of access to terminal facilities from the airfield. Landside alternatives will address development in specific areas on the airport. Separation of activity levels and efficiency of layout will be discussed as well.

In addition to the functional compatibility of the terminal area, the proposed development concept should provide a first-class appearance for Lake Havasu City Municipal Airport. As previously mentioned, Lake Havasu City serves as a very important link to the entire region whether it is for business or pleasure. Consideration to aesthetics should be given high priority in all public areas, as the airport can serve as the first impression a visitor may have of the community.

Lake Havasu City Municipal Airport is located on approximately 646 acres. In order to allow for maximum development of the airport while keeping with FAA mandated safety design standards, it is very important to devise a plan that allows for the orderly development of airport facilities. Typically, airports will reserve the first 1,000 feet parallel to the runway for aviation-related activity exclusively. This distance will allow for the location of taxiways, apron, and hangars.

In those circumstances where ultimate demand levels fall short of the ultimate build-out need, some airports will encourage non-aviation commercial or industrial development. The potential of non-aviation development on airport property can provide an additional revenue source in the form of long-term land leases for the airport. Aviation-related growth is forecasted to be very strong at Lake Havasu City Municipal Airport throughout the planning period, thus, the majority of

property on the airport will be dedicated for aviation use.

The alternatives to be presented are not the only options for development. In some cases, a portion of one alternative could be intermixed with another. Also, some development concepts could be replaced with others. The final recommended plan only serves as a guide for the City. Many times, airport operators change their plan to meet the needs of specific users. The goal in analyzing landside development alternatives is to focus future development so that airport property can be maximized.

Landside planning considerations were summarized previously on **Exhibit 4A**. The following briefly describes proposed landside facility improvements.

AIRCRAFT HANGAR DEVELOPMENT

The facility requirements indicated a need for the development of more aircraft storage hangars at Lake Havasu City Municipal Airport. Hangar development takes on a variety of sizes corresponding with several different uses.

Commercial general aviation activities are essential to providing the necessary services needed on an airport. This includes businesses involved with, but not limited to, aircraft rental and flight training, aircraft charters, aircraft maintenance, line service, and aircraft fueling. These types of operations are commonly referred to as FBOs. The facilities associated with businesses such as these include large conventional type hangars that hold several aircraft. High levels of activity often characterize these operations, with a need for apron space for the storage and circulation of aircraft. These facilities are best placed along ample apron frontage with good visibility from the runway system for transient aircraft. Utility services are needed for these types of facilities, as well as automobile parking areas.

The mix of aircraft using Lake Havasu City Municipal Airport is expected to change to include more business class aircraft which have larger wingspans. These larger aircraft require greater separation distances between facilities, larger apron areas for parking and circulation, and larger hangar facilities.

Another need indicated was additional space for the storage of smaller aircraft. This primarily involves T-hangars and shade hangars. Since storage hangars often have lower levels of activity, these types of facilities can be located away from the primary apron areas, in more remote locations of the airport. Limited utility services are needed for these areas. Typically, this involves electricity, but may also include water and sanitary sewer.

Other types of hangar development can include clearspan hangars for accommodating several aircraft simultaneously. Typically, these types of hangars are used by corporations with company-owned aircraft or by an individual or group of individuals with

several aircraft. These hangar areas require all utilities and segregated roadway access.

PASSENGER TERMINAL BUILDING

Analysis in the previous chapter indicated that additional commercial terminal building space is needed through the planning period. The current terminal building totals approximately 5,700 square feet and houses airport administration, two rental car agencies, and commercial airline service amenities that include passenger waiting areas, a baggage claim area, a vending area, and a ticket counter. In the event that Lake Havasu City Municipal Airport regains commercial airline service, which it is actively pursuing, projected passenger enplanement levels justify a need for additional terminal area space.

An airport passenger terminal is similar in many respects to other transportation terminals, but has some distinctly different characteristics. For example, the ground time of an aircraft is minimized; therefore, airport passenger terminals must be able to accommodate condensed peak passengers and baggage situations. In addition, airports place a greater reliance on the use of private automobiles for access to and from the airport, creating a need for adequate roadway and parking facilities.

The passenger terminal building is the first impression air travelers have of the community. A functional and attractive terminal facility is needed to secure and build air travelers' favorable opinion of a community, particularly business leaders who may be investing in the community.

Terminal Building Location

FAA AC 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities*, identifies a number of basic considerations that affect the location of a terminal building. The primary considerations include the following:

1. **Runway configuration:** The terminal should be located to minimize aircraft taxiing distances and times and the number of runway crossings.

2. **Access to transportation network:** The terminal should be located to provide the most direct/shortest routing to the regional roadway network.

3. **Expansion potential:** The long term viability of the terminal is dependent upon the ability of the site to accommodate expansion of the terminal beyond forecast requirements.

4. **FAA Geometric Design Standards:** The terminal location needs to assure adequate distance from present and future aircraft operational areas.

A review of each of these factors is listed below.

Runway configuration: The existing terminal is situated west of Runway 14-32 near midfield. Taxiway A serves the apron adjacent to the terminal building. Due to the single runway orientation at the airport, there are no additional runways that are crossed.

Access to transportation network: The existing terminal building is located adjacent to Airport Centre Boulevard, which provides circular, one-way access to Patton Drive. Patton Drive connects directly with State Highway 95 west of the terminal building. State Highway 95 extends directly to Lake Havasu City's central business district and points beyond.

Expansion potential: Space is available to the north and south of the terminal for building expansion. Approximately 150 feet to the northwest of the terminal building is a temporary facility that houses Transportation Security Administration (TSA) functions. Approximately 80 feet to the south is a covered parking area for airport operations vehicles. Additional automobile parking could be obtained farther west of the existing parking lots associated with the terminal building.

FAA Geometric Design Standards: The existing terminal is located approximately 1,000 feet west of the Runway 14-32 centerline. This is well outside any area obstruction clearance area and does not impact any design standards.

As shown, the existing terminal building site meets the general recommendations of the FAA utilizing this criterion. Therefore, retention of the terminal in its existing location will be considered in one of the landside alternatives to follow. However, for planning purposes, a new terminal location will also be explored.

REVENUE SUPPORT LAND USES

Due to the physical terrain and layout of certain portions of airport property, the landside alternatives to follow consider options for Lake Havasu City to utilize portions of the airport for non-aeronautical purposes such as commercial, industrial, or office park development. It should be noted that the City does not have the approval to use airport property for non-aeronautical purposes at this time. This requires specific approval from the FAA. The Master Plan does not gain approval for non-aeronautical uses, even if these uses are ultimately shown in the Master Plan. A separate request justifying the use of airport property for non-aeronautical uses will be required once the Master Plan is complete. The Master Plan can be a source for developing that justification.

Federal law obligates an airport sponsor to use all property shown on an Airport Layout Plan (ALP) and/or Property Map for public airport purposes. A distinction is generally not made between property acquired locally and property acquired with federal assistance. However, property acquired with federal assistance or transferred surplus property from the federal government may have specific

covenants or restrictions on its use different from property acquired locally.

These obligations will require that the City formally request from the FAA a release from the terms, conditions, reservations, and restrictions contained in any conveyance deeds and assurances in previous grant agreements. A release is required even if the airport desires to continue to own the land and only lease the land for development. The obligations relate to the use of the land just as much as they do to the ownership of the land.

U.S. Code 47153 authorizes the FAA to release airport land when it is convincingly clear that:

a. Airport property no longer serves the purpose for which it was conveyed. In other words, the airport does not need the land now or in the future because it has no airport-related or aeronautical use, nor does it serve as approach protection, a compatible land use, or a noise buffer zone.

b. The release will not prevent the airport from carrying out the purpose for which the land was conveyed. In other words, the airport will not experience any negative impacts from relinquishing the land.

c. The release is actually necessary to advance civil aviation interests of the counters. In other words, there is a measurable and tangible benefit for the airport or the airport system.

Ultimately, the ability of the City to use airport property for non-aeronautical revenue production will rest upon a determination by the FAA that portions of airport property are no longer needed for airport-related or aeronautical uses. To prove that land is not needed for aeronautical purposes, an assessment and determination of the area that will be required for aeronautical purposes will be needed. The Master Plan provides this analysis.

A formal request to the FAA for a release from federal obligations will have several distinct elements. The major elements of the request will include:

1. A description of the obligating conveyance instrument or grant.

2. A complete property description including a legal description of the land to be released.

3. A description of the property condition.

4. A description of federal obligations.

5. The kind of release requested. (lease or sale)

6. Purpose of the release.

7. Justification for the release.

8. Disposition and market value of the released land.

9. Reinvestment agreement. A commitment by the City to reinvest any lease revenues exclusive-

ly for the improvement, operation, and maintenance of the airport.

10. Draft instrument of release.

An environmental determination will also be required. While FAA Order 1050.1E, *Environmental Policies and Procedures*, states that a release of an airport sponsor from federal obligations is normally categorically excluded and would not normally require an Environmental Assessment, the issuance of a categorical exclusion is not automatic and the FAA must determine that no extraordinary circumstances exist at the airport. Extraordinary circumstances would include a significant environmental impact to any of the environmental resources governed by federal law. An Environmental Assessment may be required if there are extraordinary circumstances.

AIRPORT TRAFFIC CONTROL TOWER

There is currently no airport traffic control tower (ATCT) at the airport. Facility planning in Chapter Three indicated that a location should be reserved for the development of an ATCT, should future justification support one.

The ATCT is the focal point for controlling flight operations within the airport's designated airspace and all aircraft and vehicle movement on the airport's runways and taxiways. Site selection involves certain mandatory requirements concerning the ultimate planned development of the airport.

The following operational and spatial requirements are identified in FAA Order 6480.4, *Airport Traffic Control Tower Siting Criteria*.

Mandatory Siting Requirements

- There must be maximum visibility of airport traffic patterns.
- There must be a clear, unobstructed, and direct view of the approaches to all runways or landing areas and to all runway and taxiway surfaces.
- The proposed site must be large enough to accommodate current and future building needs including employee parking spaces.
- The proposed tower must not violate F.A.R. Part 77 surfaces unless it is absolutely necessary.
- The proposed tower must not derogate the signal generated by any existing or planned electronic navigational aid.

Nonmandatory Siting Requirements

- To assure adequate depth perception, the line-of-sight to aircraft movement areas should be perpendicular to the direction of aircraft travel.

- The tower cab should be oriented to face north or alternatively to the east, south, or west. Every effort should be made to prevent an aircraft approach from being aligned with the rising or setting sun.

- The controller's visibility should not be impaired by direct or indirect external lighting sources.

- All aircraft movement areas including parking aprons, tie-down spaces, run-up pads, etc., should be visible from the ATCT.

- Consideration must be given to local weather phenomena to preclude restriction to visibility due to fog or ground haze.

- Exterior noise should be at a minimum and sites should be evaluated for expected noise levels.

- Access to the site should not require controllers to cross a runway or taxiway.

- Consideration should be given to planned airport expansion, especially for the construction of buildings, hangars, runway/taxiway extensions, etc. to preclude the relocation of the ATCT at a later date.

The landside alternatives will consider potential areas for siting an ATCT. Final site locations and the height of the ATCT cab will be completed by the FAA in a separate study outside the Master Plan. It should be noted that current and projected aircraft operational counts will not fully fund the construction and operation of an ATCT; thus, future justification of such a facility may not be warranted during the planning period of this Master Plan. The purpose of this analysis is only to reserve an area for the future development of an ATCT in the future should justification support one.

LANDSIDE DEVELOPMENT ALTERNATIVES

A series of landside alternatives have been examined for the west side of the airport. These alternatives consider commercial and general aviation facility development providing for separation of activity levels. The goal of this analysis is to indicate development potentials which would provide Lake Havasu City Municipal Airport with a specific goal for future development. The resultant plan will aid the City in strategic marketing of available airport properties.

LANDSIDE ALTERNATIVE A

Landside Alternative A, depicted on **Exhibit 4H**, considers the acquisition of approximately 23 acres of land on the southwest side of the airport for future aviation development. The principal philosophy followed is to group facilities supporting similar activity levels together.

This alternative proposes keeping the existing terminal building in the current location and expanding it in size. As mentioned earlier, Lake Havasu City Municipal Airport can expect an increase in passenger enplanements through the planning period in the

event that it regains commercial service. Analysis in the previous chapter indicated that the terminal building will need to provide approximately 10,000 square feet in order to accommodate the functions associated with commercial airline service by the long term planning period. There is sufficient room on either side of the facility to accommodate an expansion. The existing automobile access roads and parking areas are capable of handling an increase in passenger service demand.

Immediately to the northwest of the terminal building is an area designated for a future ATCT. This area is currently being occupied by a TSA trailer. It is assumed that a future terminal expansion would allow TSA offices and personnel to relocate inside the facility; thus, allowing the area immediately north of the terminal to be used for another function. In this case, the ATCT would be provided a desirable midfield location with clear line-of-sight to the runway and taxiway systems on the airfield.

This alternative also proposes changes to be made on the main aircraft parking apron. It is important to keep different aircraft activity levels separated in order to provide a safe and efficient environment for landside activity. Currently, a designated air cargo area is located immediately east of the leased automobile parking lot. Larger turboprop aircraft are typically utilized for transferring air cargo to and from Lake Havasu City Municipal Airport and would be better served in a location that provides more convenient access to the taxiway system. A temporary air cargo area is depicted farther to the east adjacent to Taxiway B. In the future, as development occurs further south adjacent to Taxiway C, a permanent air cargo area is depicted that would provide a more secure location for the screening of cargo and vehicles as they enter the airfield environment.

Marked helicopter hardstands are depicted immediately north of the temporary air cargo area. Providing these markings would better segregate helicopters from fixed-wing aircraft and would eliminate the need for the designated helicopter parking area to the east of Taxiway B. A portion of the main aircraft parking apron also shows dedicated large aircraft parking to accommodate transient business jet operations. An area of vacant land immediately south of the leased automobile parking lot also provides for future aviation development.

To the north of the main aircraft parking apron is an area designated for additional aircraft storage in the form of five T-hangars. Immediately north of this area is land that is currently being developed for aviation use to support an FBO.

In keeping with the philosophy of grouping similar activity levels together, this alternative proposes hangar development in the form of conventional, executive, and T-hangars on the southwest side of the airport in areas between Taxiway C and Patton Drive. Large conventional hangar facilities are depicted that could support FBO-type operations, with smaller executive hangars to the south that will accommodate corporate flight departments. Farther south are several T-

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Runway 14-32 8,001'x 100'

14

32

A6

A5

A4

A3

A2

A1

A

B

C

Temporary Air Cargo Area

Parking Spaces to be Removed

Helicopter Hardstands

Compass Rose

Permanent Air Cargo Area

Wash Rack

Large Aircraft Parking

Terminal Expansion

ATCT

Maintenance Building

Private Aviation Development Under Construction

State Highway 95

Airport Centre Blvd.

Patton Dr.

Leased Automobile Parking

Retail Centre Blvd.

LEGEND

- Airport Property Line
- Ultimate Property Line
- Runway Safety Area (RSA)
- Object Free Area (OFA)
- Runway Protection Zone (RPZ)
- New Road/Parking
- Future Airfield Pavement
- Ultimate Building
- Non-Aviation Development
- Future Aviation Development
- Aviation Access Revenue Support Parcels
- Pavement to be Removed

NORTH

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SCALE IN FEET

Date of photo: 7/12/07

LAKE HAVASU CITY, ARIZONA • MUNICIPAL AIRPORT •

Exhibit 4H
LANDSIDE ALTERNATIVE A

hangar complexes to accommodate smaller aircraft storage. These facilities can be accessed by roadways extending east from Patton Drive.

An airport maintenance building is depicted on the south side of the water storage tank that would allow for the storage of airport equipment, while also enhancing the productivity of airport maintenance staff. Currently, airport maintenance personnel utilize an existing hangar and other outside locations for equipment storage. A dedicated maintenance building in this location would provide for public vehicle access without the need to cross aircraft operational areas and allow for aircraft storage in the hangar currently being used for equipment storage.

A 1,900-foot southerly extension to Taxiway C would allow for additional aviation development on existing and future airport property. To the east of the existing water storage tank is an area dedicated to future air cargo operations as well as a wash rack. Several aviation access revenue support parcels ranging in size from one-half to two acres are depicted that would be provided aircraft access by taxiways extending west of Taxiway C.

Landside Alternative A also dedicates three separate parcels of land on the east side of Patton Drive for non-aviation development. These parcels could accommodate commercial and/or industrial activity that does not require airfield access, as the function and physical terrain in adjacent areas do not readily accommodate aircraft. As previously discussed, specific approval would need to be granted by the FAA for non-aviation use in these areas.

The above describes maximum development potential on the west side of the airport to include approximately 23 acres of land acquisition. In order to fully utilize all areas on the airport, analysis was also conducted on the east side of the airport as well. Preliminary plans implementing proposed automobile access on the east side of the airport could open up areas for future aviation development. It is likely that any development on the east side of Runway 14-32 would extend beyond the planning horizon of this Master Plan. As depicted on **Exhibit 4H**, an area of land on the southeast side of existing airport property is designated for future aviation development that is provided aircraft access by a partial parallel taxiway on the east side of the runway.

The proposed development areas discussed in this alternative will need to be analyzed and studied in more detail before ever coming to fruition. As with any development, these areas will have to take into account specific site preparation methods regarding grading and drainage.

LANDSIDE ALTERNATIVE B

Landside Alternative B considers relocating the terminal building farther south of its current location. As depicted on **Exhibit 4J**, a new terminal area would be implemented adjacent to Taxiway C facing east. Four conventional hangars are proposed directly north and south of the terminal

building, with apron space out front to support commercial and general aviation aircraft. Access to the terminal area would be provided by a new roadway extending east from Retail Centre Boulevard. Directly west of the terminal building is adequate automobile parking for passengers utilizing the facility as well as an area designated for non-aviation development.

Additional aviation support facilities located between the proposed terminal area and Patton Drive include an aircraft wash rack and five T-hangar complexes. Positioning these low-activity levels away from the flight line is desired. The current leased automobile parking lot would be relocated to this area. To the south are several executive hangars that would be provided with airfield access via two taxiways extending west of Taxiway C. The existing perimeter road that traverses the south side of airport property would be relocated farther south to accommodate aviation access to revenue support parcels ranging in size from one-half to three acres.

Farther to the north, air cargo operations would be relocated adjacent to the existing terminal building. This facility could house air cargo screening as well as other commercial business operations. It should be noted that in order to accommodate larger vehicles associated with the ground movement of cargo, the roadway leading to this area would most likely need to be realigned to eliminate the near 90 degree turns that may disable large transport trucks from utilizing the facility. A proposed ATCT location is shown directly south of this location. This is a desirable midfield location providing good visibility to the runway and taxiways on the airport. The airport maintenance building is proposed to be built on the northwest corner of the existing terminal apron. Marked helicopter parking areas are located on the apron to the east, providing even greater separation from fixed-wing aircraft than on the previous alternative.

Large aircraft parking is proposed on the main aircraft parking apron. The leased automobile parking lot is dedicated for aviation development as is the area immediately south of it. Additional aircraft storage hangars in the form of T-hangars or shade hangars are also depicted on the main apron area.

A slightly different approach was taken in analyzing the north aircraft parking apron area. This alternative shows seven aircraft storage hangars aligned parallel to Runway 14-32, possibly providing more storage space than what is shown on Landside Alternative A.

As previously depicted, the southeast corner of airport property is proposed for aviation development that will likely exceed the long term planning period. As stated earlier, future automobile access and other physical constraints will dictate the potential for aviation development in this area.

LANDSIDE ALTERNATIVE C

Exhibit 4K depicts Landside Alternative C. This alternative relocates the terminal building approximately 500

05MP08-4J-3/11/08

Runway 14-32 8,001' x 100'

14

32

A6

A5

A4

A3

A2

A1

A

B

C

Parking Spaces to be Removed

Large Aircraft Parking

Helicopter Hardstands

Airport Traffic Control Tower

Relocated Terminal Building

Commercial Aircraft Parking

Large Aircraft Parking

Air Cargo Area

Compass Rose

Maintenance Building

Wash Rack

Private Aviation Development Under Construction

State Highway 95

Airport Centre Blvd.

Patton Dr.

Relocated Leased Automobile Parking

Retail Centre Blvd.

LEGEND

- Airport Property Line
- Ultimate Property Line
- Runway Safety Area (RSA)
- Object Free Area (OFA)
- Runway Protection Zone (RPZ)
- New Road/Parking
- Future Airfield Pavement
- Ultimate Building
- Non-Aviation Development
- Future Aviation Development
- Aviation Access Revenue Support Parcels
- Pavement to be Removed

NORTH

0 600 1200

SCALE IN FEET

Date of photo: 7/12/07

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Exhibit 4J
LANDSIDE ALTERNATIVE B

05MP08-4K-3/11/08

Runway 14-32 8,001' x 100'

14

32

A6

A5

A4

A3

A2

A1

A

B

C

Parking Spaces to be Removed

Helicopter Hardstands

Commercial Aircraft Parking

Maintenance Building

Air Cargo Area

Large Aircraft Parking

Large Aircraft Parking

Compass Rose

Relocated Shade Hangars

Wash Rack

Private Aviation Development Under Construction

Auto Parking

Airport Traffic Control Tower

State Highway 95

Patton Dr.

Airport Centre Blvd.

Relocated Leased Automobile Parking

Relocated Terminal Building

Retail Centre Blvd.

LEGEND

- Airport Property Line
- Ultimate Property Line
- Runway Safety Area (RSA)
- Object Free Area (OFA)
- Runway Protection Zone (RPZ)
- New Road/Parking
- Future Airfield Pavement
- Ultimate Building
- Non-Aviation Development
- Future Aviation Development
- Aviation Access Revenue Support Parcels
- Pavement to be Removed

NORTH

0 600 1200

SCALE IN FEET

Date of photo: 7/12/07

LAKE HAVASU CITY, ARIZONA • MUNICIPAL AIRPORT •

Exhibit 4K
LANDSIDE ALTERNATIVE C

feet north of the proposed location on Landside Alternative B. In this alternative, a separate terminal apron is dedicated to commercial aviation operations. A maintenance building is depicted on the south side of this apron and an ATCT is proposed north of the terminal building. This location is farther south and west, and would not provide the desired center field location as in the previous alternatives. A separate siting study would determine the line-of-sight and height requirements for an ATCT in this location. Directly behind the proposed terminal building is a large automobile parking area. The northern quadrant of this parking area is dedicated for leased automobile parking. Between the parking area and Patton Drive is an area depicted as non-aviation development.

South of the proposed terminal area is a second aircraft apron that would accommodate general aviation operations. Three large conventional hangars are proposed adjacent to the apron which would lend themselves well to FBO operations and large corporate flight departments. To the west of these hangars are several T-hangar complexes that would allow for ample aircraft storage for smaller single and multi-engine aircraft.

A third aircraft parking apron is depicted east of the water storage tank that would be provided airfield access with a southerly extension on Taxiway C. Similar to Landside Alternative A, air cargo operations are depicted in this area. Several executive hangars are proposed in areas to the west and are provided automobile access by the perimeter road that extends along the current airport property line. Four aviation access revenue support parcels are depicted on the proposed 23 acres of future airport property acquisition.

This alternative proposes three conventional hangars atop the existing terminal building. Helicopter hardstands and large aircraft parking are shown, similar to previous exhibits. The existing shade hangars located on the north side of the main aircraft parking apron are shown to be replaced by an aircraft wash rack. The shade hangars would be relocated to the north aircraft parking apron; thus, making available more aircraft parking space near the existing FBOs on the airport.

Additional areas designated for aviation and non-aviation development are shown on this alternative that would generate additional revenue for the airport in the form of land leases. As in the previous landside alternatives, an area on the east side of Runway 14-32 is shown as aviation development that considers the maximum use of airport property for future development.

SUMMARY

The process utilized in assessing the airside and landside development alternatives involved a detailed analysis of short and long term requirements, as well as future growth potential. Current and future airport design standards were considered at every stage in the analysis. Safety, both in the air and on the ground, was given a

high priority in the analysis of alternatives.

After review and input from the Planning Advisory Committee (PAC), City officials, and the public, a recommended concept will be developed by the consultant. The resultant plan will represent an airside facility that fulfills the safety design standards and a landside complex that can be developed as demand dictates. The development plan for Lake Havasu City Municipal Airport must represent a means by which the airport can evolve in a balanced manner, both on the airside and landside, to accommodate the forecast demand. In addition, the plan must provide flexibility to meet activity growth beyond the long range planning horizon.

The following chapters will be dedicated to refining the basic concept into final plan, with recommendations to ensure proper implementation and timing for a demand-based program.