# Chapter 3

## Facility Requirements



Image by Delta Airport Consultants

## 3|Section 1 - Introduction

This chapter identifies recommended facilities necessary to satisfy a 20-year forecast of aviation demand at the Las Cruces International Airport (LRU). It further identifies facilities that are needed to adhere to airfield design standards promulgated by the Federal Aviation Administration (FAA) and addresses the City's goals and objectives for the airport. All recommendations are made based on a twenty year planning period (2016-2035) with three phases; Phase I extends to year 5; Phase II encompasses years 6-10, and Phase III encompasses years 11-20.

For purposes of this analysis, LRU's facility needs are discussed based upon their role in serving LRU's airfield or landside facility functions. Airfield facility components include runways, taxiways, navigational aids, aircraft parking areas, airfield marking, signage and lighting, and facilities for special uses such as unmanned aerial systems. Landside facilities include hangars, the terminal building, airport access and automobile parking, fencing and security, and support facilities. Chapter Three is organized to provide:

- an overview of the criteria utilized to develop LRU's facility requirement recommendations for the planning period;
- an identification of existing non-standard FAA design conditions;
- a review of the airspace and airfield capacity of LRU;
- recommendations for specific airfield and terminal area improvements and/or facilities;

Potential options for providing required facilities are to be evaluated in the Alternatives Analysis located in Chapter Four.

# 3|Section 2 - Criteria for Facility Requirement Recommendations

The need for new or expanded facilities at LRU is based upon the following factors:

- Standards presented in FAA Advisory Circular 150/5300-13A (AC-13A), Airport Design
- Inventory of Existing Facilities (Chapter One)
- Forecasts of Aviation Demand for LRU (Chapter Two)
- Goals and objectives of the City of Las Cruces for LRU (Strategic Business Plan)

Pursuant to FAA AC 150/5300-13A (AC-13A), Airport Design, airports and their associated runways and taxiways are designed and constructed for the most demanding airplane (critical design airplane) currently using or projected to use the facility on a regular basis. The FAA has established airport design criteria based on the Runway Design Code (RDC) designation, which provides minimum safety standards in accordance with the performance characteristics of the family of aircraft represented by the airport's critical or design aircraft. This particular aircraft, as determined with respect to approach speed and wingspan, is within a design category or family of airplanes that conduct at least 500 annual itinerant operations (combination of landings and takeoffs) per year at the airport. The types of approach aids, lighting, and navigational equipment required at an airport are determined primarily by the level of annual activity, weather, terrain characteristics, and role of the airport in the national system of airports.

As discussed in previous chapters, LRU is currently designated as a general aviation airport with an Airport Reference Code (ARC) of C-II. As determined in Chapter Two, the critical aircraft for LRU for the planning period is ARC C-II while the RDCs for each respective runway at LRU are to be as follows:

**Table 3-1. Runway Design Codes**

| Runway | Design Code |
|---|---|
| 4-22 | B-II |
| 8-26 | C-II |
| 12-30 | C-II |

Accordingly, airfield components for Runways 8-26 and 12-30 as well as the airport's landside facilities for this planning period are to be designed to accommodate the following aircraft:

- Approach Category C Aircraft - Approach speeds of 121 knots up to, but not including 141 knots
- Design Group II Aircraft - Wingspans of 49 feet up to, but not including 79 feet

Airfield improvements and facility requirements specific to Runway 4-22 are to be designed to accommodate the following aircraft:

- Approach Category B Aircraft - Approach speeds of 91 knots up to, but not including 121 knots
- Design Group II Aircraft - Wingspans of 49 feet up to, but not including 79 feet

***It is recommended that LRU remain an ARC C-II airport throughout the planning period.***

As discussed in Chapter Two, all segments of aviation activity, with the exception of military operations, are forecast to experience an increase in operations during the 20-year planning period. As indicated in Chapter Two, Table 2-5, turbojet and rotorcraft activity are both forecast to double during the planning period. In order to accommodate this growth, airfield improvements and/or facility enhancements are necessary.

The goals and objectives of the City of Las Cruces also play a significant role in determining the future facility needs and development opportunities for LRU. Through interviews with airport management and City staffs, the following specific areas of emphasis were identified for evaluation:

- Apron Pavement Rehabilitation
- Runway System Needs
- Improved Terminal Building
- Aircraft Storage Hangars
- Special Use Needs

# 3|Section 3 - FAA Design Standards

LRU's airfield design and site layout has been determined by application of airport design standards as identified in FAA AC 150/5300-13A, Airport Design (AC-13A). These design standards provide the geometric requirements for various airfield components including the following:

- Runway/taxiway separation
- Surface grades and airspace slope
- Airfield safety surfaces (RSA,OFA,OFZ)
- NAVAID siting and safety areas

The most common non-standard condition identified in this evaluation is aircraft (wingtip) obstruction clearances for taxilanes (Taxilane Object Free Areas) located in the LRU hangar areas and around apron tie-downs. Taxilanes are depicted in **Figure 3-8** and geometric requirements are discussed in more detail later in this Chapter. Although the clearances vary, aircraft movements occur without incident. However, as facilities are updated or replaced (aircraft parking or hangars), new facilities should be developed to conform to appropriate FAA design standards. **Table 3-2** lists non-standard conditions for LRU.

**Table 3-2. Non-Standard Conditions**

| FAA Standard | Area of Concern | Action |
|---|---|---|
| Part 77 Surfaces | Taxiway C is higher than RW 12 end; is a penetration but not a hazard. | None |
| Taxilane Object Free Area | TL's 8,9,13 do not meet Group I TLOFA standards (79 feet) | None; aircraft speeds are minimal |
| Taxilane Object Free Area | TL 4 does not meet Group II TLOFA standards (115 feet) | Limit use to Group I aircraft |
| Apron Circulation | West Hangar, West, GA Terminal, and East Aprons all do not conform with Group II OFA circulation standards due to location of tie-downs | Re-configure apron tie-downs and taxi routes as needed during each apron's next rehabilitation |
| Taxilane Object Free Area | Aircraft tie-downs inside TLOFA along TL 6 | Remove tie-downs |

Detailed definitions of the standards utilized in this evaluation, their application at LRU, the nature of non-compliance with FAA standards are provided in the following sub-sections of this chapter and are to be considered in the Alternatives Analysis phase of this planning project.

# 3|Section 4 - Airfield and Airspace Capacity

*Section Overview*

3.4|Part 01 - Runway Capacity

3.4|Part 02 - Taxiway Standards

3.4|Part 03 - Airside Facilities

The ability of an airport to accommodate aviation activity is a function of the number of runways, the runway and taxiway configuration, and the mix of aircraft using the airport. The capacity of any runway is finite with respect to the number of hourly and annual operations it may ultimately accommodate. Moreover, capacity is expressed by two principle terms: annual service volume (ASV) and hourly capacities under Visual Flight Rules (VFR) and Instrument Flight Rules (IFR). These variables are used to provide a quantitative breakdown of the airport's ASV and hourly capabilities for both VFR and IFR conditions. The procedures used for this analysis are detailed in FAA AC 150/5060-5, Airport Capacity and Delay and FAA Airport Design Program, Version 4.2D.

## 3.4|Part 01 - Runway Capacity

Runway capacity is defined as a measure of the maximum number of aircraft operations which can be accommodated at that airport on an hourly and/or annual basis without compromising the safety of aircraft operations. This estimate accounts for differences in runway use, aircraft mix, and weather that may be encountered over the span of a typical year. A runway's ability to accommodate aircraft is largely determined by an aircraft's speed and weight. GA aircraft (lighter aircraft) typically have lower approach-to-landing speeds than commercial aircraft (passenger jets) which equates to a lower runway occupancy time. Conversely, larger and heavier aircraft typically operate at higher approach-to-landing speeds which require more deceleration time. This increased deceleration time results in a longer runway occupancy time which decreases runway capacity. The operational fleet mix for LRU was determined from airport records and the aviation forecasts presented in Chapter Two.

While operations are forecast to increase in all areas during the planning period, the mix of aircraft that utilize LRU is expected to change. Smaller single engine aircraft operations are forecast to make up a smaller portion of the overall aircraft operations at LRU in the future. The percentage of operations from larger aircraft (above 12,500 pounds) is forecast to increase by up to 50%.

Both VFR and IFR hourly runway capacities and the ASV were calculated for the existing runway system configuration at LRU. The following discussion adheres to the guidelines contained in the FAA AC 150/5060-5 Airport Capacity and Delay and the FAA Airport Design computer program version 4.2D.

These resources support development of a reasonable estimate of the airport's hourly and annual runway capacity. The estimates are then compared to the approved forecast to determine if the capacity of the runway is sufficient.

ASV is calculated based on the runway and taxiway configuration, percent of VFR/IFR traffic aircraft mix, lighting, instrumentation, the availability of terminal radar coverage and the level of air traffic control at an airport. For long-term planning purposes, the FAA estimates ASV for a single runway with no air carrier traffic is to be 230,000; hourly capacity is estimated to be 98 operations during VFR conditions and 59 operations during IFR conditions. Although these estimates assume optimal conditions (air traffic control, etc.), they provide a reasonable basis for approximating existing and future capacity at LRU:

***Existing LRU Capacity (2015): 79,880 Annual Operations / 230,000 ASV = 35 % (demand/capacity)***

***Future LRU Capacity (2035): 88,241 Annual Operations / 230,000 ASV = 38% (demand/capacity)***

The FAA recommends that airports proceed with planning to provide additional capacity when 60 percent of ASV is reached. As indicated in the updated aviation activity forecasts, peak hour activity for LRU is projected to increase from approximately 37 to 41 operations during the planning period. ***The level of operations at LRU is not anticipated to reach 60 percent of ASV during the current 20-year planning period; therefore, sufficient runway capacity exists to accommodate anticipated growth during this period.***

## 3.4|Part 02 - Taxiway Standards

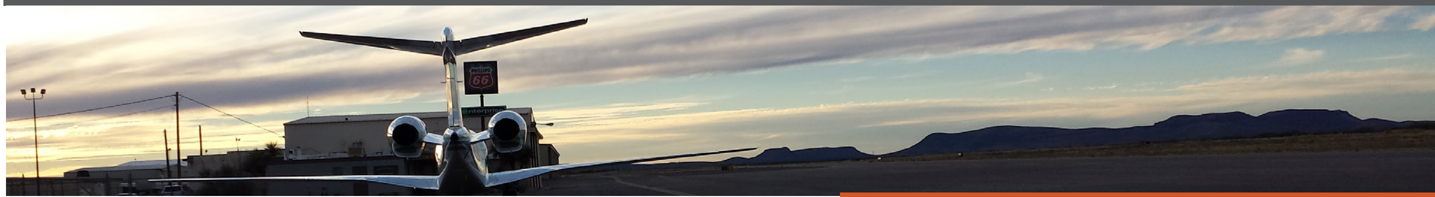
The location of the exit taxiways can also affect the overall capacity of an airport and contribute to the efficiency of aircraft circulation. Exit taxiway locations depend a great deal on the mix of aircraft, approach and touchdown speeds, point of touchdown, exit speed, rate of deceleration, condition of the pavement surface (i.e., wet or dry) and the number of exits. General design practices recommend placing exit taxiways at intervals of 1,500 feet to 2,000 feet for airports that handle a wide variety of aircraft.

AC-13A states that when design peak hour traffic is less than 30 operations, properly located right-angled exit taxiways achieve an efficient flow of traffic. None of the individual LRU runways are expected to have over 30 operations per hour during peak conditions. ***All LRU runways are served by a partial parallel taxiway system with right angled exits. This system meets the needs of LRU and should be maintained throughout the planning period.*** AC-13A also recommends bypass taxiways be considered to provide flexibility in runway use and notes that holding bays should be provided when runway operations reach a level of 30 per hour. ***All runway ends at LRU currently have holding bays located on the parallel taxiways and should be maintained during the planning period***.

No airspace capacity deficiencies were identified during this study

## 3.4|Part 03 - Airspace Capacity

As detailed in Chapter One, Class E airspace surrounds LRU. This airspace is a controlled area which includes airspace corridors identified as federal airways, or which accommodate jet traffic at low altitudes. No airspace capacity deficiencies were identified during this study.



# 3|Section 5 - Airside Facility Requirements

Section Overview

3.5|Part 01 - Runway Analysis

3.5|Part 02 - Taxiway and Taxilane Analysis

Airside facility requirements are based upon AC-13A, and are related to the current and future critical aircraft. As discussed previously, the critical aircraft determines the ARC from which the airside geometrics are evaluated.

## 3.5|Part 01 - Runway Analysis

This section evaluates LRU's runways and their associated orientation, length, width, safety areas, object free areas, visual zone, and pavement condition based on the existing and future aircraft expected to use the facility. The recommendations are based on FAA advisory circulars, specific manufacturers' aircraft performance data, and runway use limitations placed on operations such as 14 CFR Part 91K and Part 135.

Currently there are three runways at LRU: the primary runway, 12-30, which is 7,506 feet long and 100 feet wide; Runway 4-22, which is 7,501 feet long and 105 feet wide; and Runway 8-26, which is 6,069 feet long and 100 feet wide.

### Runway Orientation

Surface wind conditions affect both the orientation and functionality of LRU's runway system. When runways are not aligned to take advantage of prevailing winds at an airport, its capacity to operate in all weather conditions is impacted. During landing and taking off, aircraft are able to operate on a runway properly and safely as long as the wind velocity perpendicular to the direction of flight (crosswind) is not excessive. The determination of the appropriate crosswind component, which is achieved through an analysis of crosswind velocity data and direction for an airport, is presented in a "Wind Rose" diagram. The Wind Rose for LRU is depicted on the Airport Layout Plan drawing and the analysis of wind coverage at LRU is discussed in Chapter One and presented in Tables 1-7 and 1-8. FAA design standards stipulate that the maximum crosswind component for RDC C-II runways (Runways 8-26 and 12-30) should be a maximum of 16-knots while runways used solely by small aircraft such as Runway 4-22 should be a maximum of 10.5 knots.

The desirable wind coverage for an airport is 95 percent, which means that the runway systems should be oriented so that the maximum crosswind component is not exceeded more than 5 percent of the time annually. As noted in Chapter One, LRU's primary runway (Runway 12-30) provides 97.51 percent coverage under all-weather conditions for the 16 knot crosswind component but only 91.02 percent coverage under IFR conditions for the 16 knot crosswind component. This situation necessitates the use of a crosswind runway. Of the other two runways at LRU, the only combination that utilizes the primary runway and provides adequate wind coverage in both all-weather and IRF conditions for a 10.5 and 16 knot crosswind is the system comprised of Runways 12-30 and 8-26. Together, this system will provide wind coverage to both RDC C-II and A-I/B-I traffic in 10.5 and 16 knot crosswind conditions. As the system of runways comprised of Runways 12-30 and 8-26 provides sufficient wind coverage at LRU under all-weather and IFR conditions,

***it is recommended that Runways 12-30 and 8-26 be maintained throughout the planning period. Also, airport users indicate that pilots of small aircraft frequently use Runway 4-22 when the wind direction dictates the need. This is especially the case during the spring months. Therefore, airport and City staff have expressed a desire to keep Runway 4-22 open during the planning period***.

## Runway Magnetic Declination

Based upon an analysis of the LRU Runway designations contained in Chapter One, Table 1-9, ***it is recommended that Runway 12-30 be designated as Runway 13-31 during the next pavement rehabilitation project; and, Runway 4-22 be re-designated as Runway 5-23 during the next rehabilitation project***.

## Critical Design Aircraft

The critical design aircraft is defined as the aircraft or family of aircraft with the largest wingspan and highest approach to landing speed that uses the airport on a regular basis. The FAA defines regular basis as more than 500 itinerant operations per year. FAA Advisory Circular (AC) 150/5325-4B, Runway Length Requirements for Airport Design, defines the critical design aircraft as the listing of aircraft (or a single airplane) that results in the longest recommended runway length. As LRU serves many different types of aircraft of varying sizes and weights, the critical design aircraft is presented as a grouping or family of similar aircraft meant to best represent the aircraft that utilize the airport. This family of aircraft is referenced in this study as medium size business jets and included in this FAA guidance listing as part of the 75 percent national fleet of business jets. Research during this study resulted in the selection of the Hawker 800 as the representative aircraft for the family of similar aircraft. The Hawker 800 operates at LRU and is a Category C, Group II aircraft.

## Runway Length Analysis

This section evaluates the runway length based on the existing and future aircraft expected to use LRU. The recommendations are based on FAA advisory circulars (AC) and specific manufacturers' aircraft performance data. This section addresses the ability of LRU to meet forecasted growth and improve overall safety and efficiency.

The determination of runway length and width required for an airport is based on standards presented in Chapter Three of FAA AC 150/5300-13A (AC-13A), Airport Design and FAA AC 150/5325-4B. AC-13A notes that the runway should be long enough to accommodate arrival and departure requirements for the design aircraft. All aircraft operational considerations, to include the takeoff, landing, and accelerate stop distances, and obstacle clearance, need to be considered when determining runway length. Additional factors considered include the design aircraft approach speed, its maximum certificated take-off weight, useful load and length of haul, the airport's field elevation above sea level, the mean daily maximum temperature at the airfield, and runway surface conditions, such as wet and slippery.

## Service to National Fleet of Business Jets

The initial analysis of recommended runway length for LRU is based on performance curves developed from FAA-approved airplane flight manuals in accordance with Federal Aviation Regulations. Guidance on runway length analysis is provided in AC 150/5325-4B. **Table 3-1** of the AC is shown in **Figure 3-1** of this

Chapter and provides a listing of aircraft identified by the FAA comprised of 75 percent of the national fleet of business jets.

Many of the aircraft within the 75 percent fleet are served by LRU with frequent operations including the Cessna Citation Encore (Citation V), Falcon 50, and Learjet 31. As documented in Chapter One, a Learjet 31 is based at LRU.

Given the proportion of based and transient jets operating at LRU from Table 3-1 of AC-13A, the 75 percent fleet design curves identified in **Figure 3-1** should be used for determining baseline runway length requirements.

| Manufacturer | Model | Manufacturer | Model |
|---|---|---|---|
| Aerospatiale | Sn-601 Corvette | Dassault | Falcon 10 |
| Bae | 125-700 | Dassault | Falcon 20 |
| Beech Jet | 400A | Dassault | Falcon 50/50 EX |
| Beech Jet | Premier I | Dassault | Falcon 900/900B |
| Beech Jet | 2000 Starship | Israel Aircraft Industries (IAI) | Jet Commander 1121 |
| Bombardier | Challenger 300 | IAI | Westwind 1123/1124 |
| Cessna | 500 Citation/501Citation Sp | Learjet | 20 Series |
| Cessna | Citation I/II/III | Learjet | 31/31A/31A ER |
| Cessna | 525A Citation II (CJ-2) | Learjet | 35/35A/36/36A |
| Cessna | 550 Citation Bravo | Learjet | 40/45 |
| Cessna | 550 Citation II | Mitsubishi | Mu-300 Diamond |
| Cessna | 551 Citation II/Special | Raytheon | 390 Premier |
| Cessna | 552 Citation | Raytheon Hawker | 400/400 XP |
| Cessna | 560 Citation Encore | Raytheon Hawker | 600 |
| Cessna | 560/560 XL Citation Excel | Sabreliner | 40/60 |
| Cessna | 560 Citation V Ultra | Sabreliner | 75A |
| Cessna | 650 Citation VII | Sabreliner | 80 |
| Cessna | 680 Citation Sovereign | Sabreliner | T-39 |

**Figure 3-1. 75 Percent Fleet**
Source: FAA Advisory Circular 150/5325-4B Table 3-1

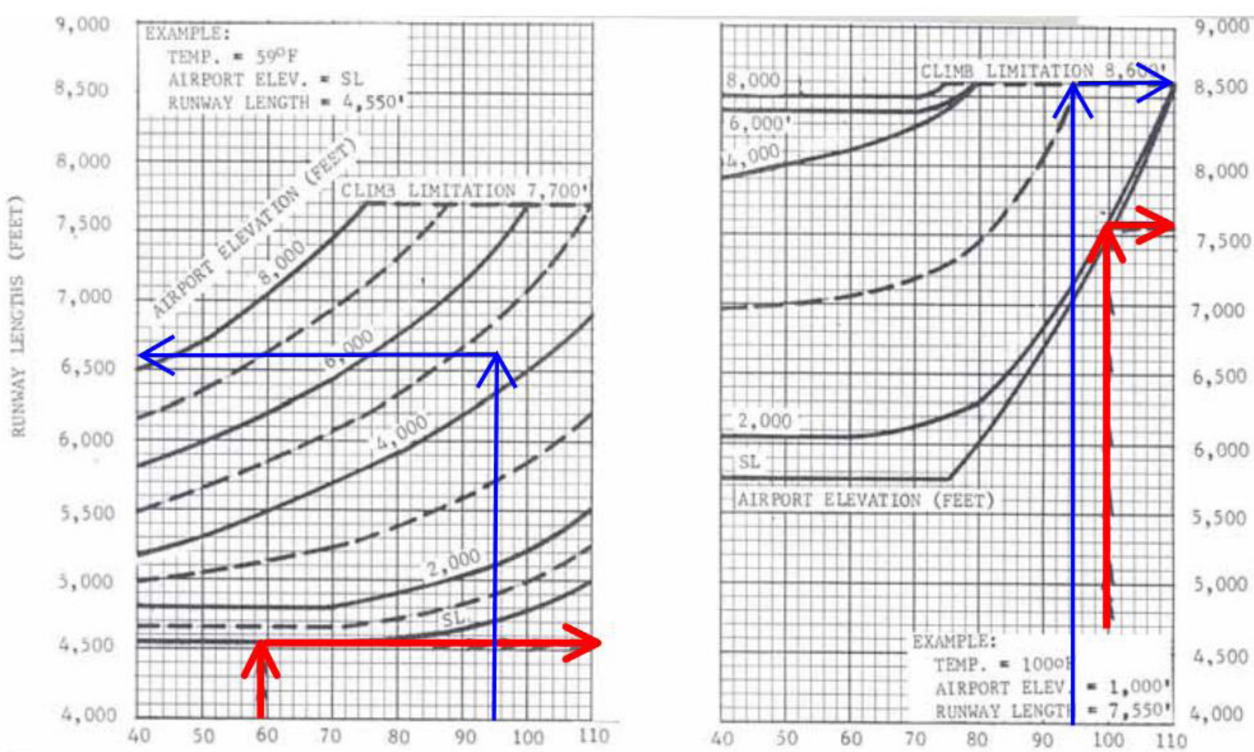
Runway length requirement of approximately 6,600 feet for the 60% useful load and approximately 8,600 feet for the 90%useful load

## FAA Runway Length Models

Having defined 75 percent of the national fleet as appropriate for the LRU analysis, the useful load factor of these aircraft is also considered. The mean daily maximum temperature (94.6°F) and the airfield elevation (4,456 MSL) are used in **Figure 3-2** to determine a runway length requirement of approximately 6,600 feet for the 60 percent useful load and approximately 8,600 feet for the 90 percent useful load.

For purposes of this analysis, the term useful load refers to the difference between the maximum allowable structural gross weight and the operating empty weight of the aircraft in question. FAA guidelines require the selection of either 60 percent or 90 percent useful load to be based on service needs of the family of critical design aircraft. The FAA guidance includes planning charts for either a 60 percent or a 90 percent useful load calculation for facility planning purposes. The FAA prefers that planning be conducted at the 60 percent useful load level. Actual operations, however, typically occur with greater loads than 60 percent and often reach or exceed the 90 percent useful load level.

In reviewing the runway length requirements produced from the FAA performance charts, ***the existing usable runway length of 7,500± feet was found to be inadequate to accommodate the airplane fleet operating at LRU when the useful load exceeds 60 percent***. Only Runways 12-30 and 4-22 provide at least 6,600 feet of runway length; Runway 8-26 does not meet this requirement.




**Mean Daily Maximum Temperature of Hottest Month of the Year in Degrees Fahrenheit**

**75 percent of feet at 60 percent useful load** | **75 percent of feet at 90 percent useful load**

FAA Sample Calculation →

Actual LRU Calculation →

**Figure 3-2. Runway Length Required**

Source: FAA Advisory Circular 150/5325-4B Figure 3-2

## Runway Length Adjustments

The runway length obtained from **Figure 3-2** is based on no wind, a dry runway surface, and a zero effective runway gradient. As stated in FAA AC 150/4325-4B, the obtained runway length is to be increased to account for (1) takeoff operations when the effective runway gradient is other than zero and (2) landing operations of turbojet powered airplanes under wet and slippery runway surface conditions. The increase is not cumulative since the first length adjustment applies to takeoffs and the latter to landings. After both adjustments have been independently applied, the greatest resultant length becomes the recommended runway length.

In consideration of wet and slippery conditions during landing operations, AC 150/5325-4B requires the runway length for turbojet-powered airplanes obtained from the 60 percent useful load curve to be increased by 15 percent, or up to 5,500 feet, whichever is less. Similarly, the guidance requires the runway length for turbojet-powered airplanes obtained from the 90 percent useful load curves to be increased by 15 percent or up to 7,000 feet, whichever is less. In the case of LRU, no adjustment to the runway length recommendation is needed as the lengths for both the 60 and 90 percent useful loads exceed the adjustment limits.

## Charter Aircraft Analysis

New Mexico State University has expressed interest in using the Airport for occasional aircraft charters for both its athletic department and visiting universities. An example of a typical large charter aircraft anticipated to occasionally use LRU is the Boeing 737-800, a D-III aircraft. Usage would be minimal and not frequent enough to be the critical aircraft as defined by FAA.

Boeing 737-800 charter operations could be significantly weight-restricted with the existing 7,506 feet offered by the primary runway, Runway 12-30, depending on temperature and density altitude. According to aircraft performance charts, operating with only 7,500 feet of usable runway length would require the Boeing 737-800 to operate at 149,000 pounds, 85 percent of its maximum takeoff weight. See **Figure 3-3**. This analysis is based on a dry runway with zero wind, zero runway gradient, the air-conditioning in the aircraft off, optimum flap setting, and a 59 degree day. Extension of Runway 12-30 to 8,600 feet as recommended above to meet 90 percent useful load of the 75% fleet of general aviation aircraft, will enable charter aircraft to operate at more desirable loads.

## ISA Conditions 59°F

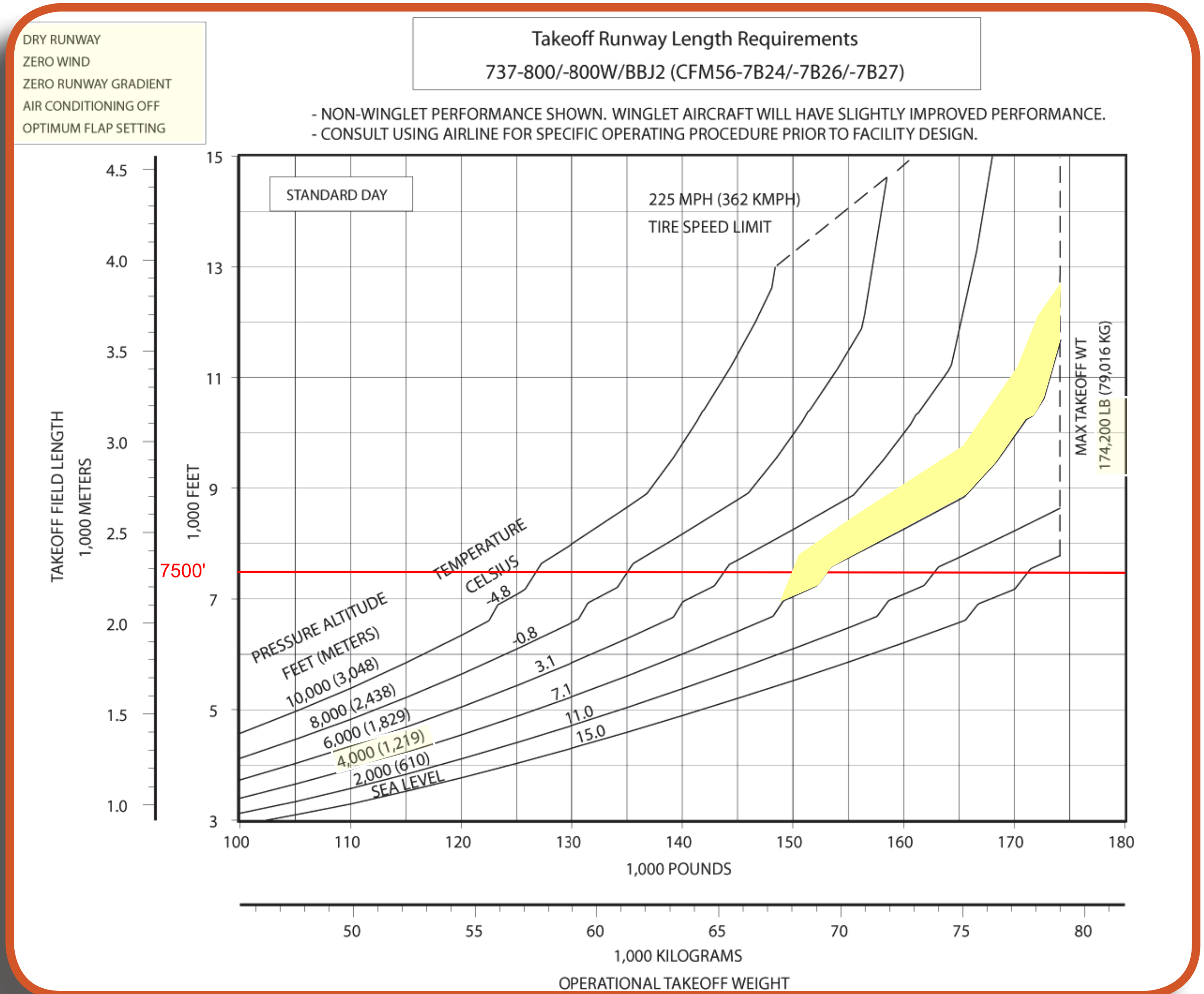



**Figure 3-3. Sample Performance Chart - Boeing 737-800**
Source: Virginia Tech / Delta Airport Consultants, Inc.

## Instrument Approach Procedures

As noted in Chapter One, there are three instrument approaches at LRU. Runway 12-30 has a published Category I Instrument Landing System (ILS) approach. The ILS approach is designed to provide lateral and vertical guidance to an aircraft approaching Runway 30. Runways 12 and 30 also have published GPS approaches, providing aircraft equipped with GPS receivers lateral and vertical navigational guidance quite similar to the ILS.

Existing approaches offered for Runway 12-30 provide excellent all-weather operating capability

The ILS approach to Runway 30 provides minimums as low as 200 feet above the threshold and ½ mile visibility (see Figure 1-18). These represent the best minimums available for a Category I ILS approach.

There is also currently an RNAV (GPS) instrument approach to Runway 30 with established LPV minima of 4,694 MSL (250 feet AGL) and ½ mile visibility. The RNAV (GPS) instrument approach to Runway 12 has established LPV minima of 4,707 MSL (250 feet AGL) and ¾- mile visibility.

The existing approaches offered for Runway 12-30 provide excellent all-weather operating capability and are adequate to safely and efficiently serve the traveling public over the planning horizon.

***It is also recommended that FAA evaluate the possibility of establishing RNAV/GPS approaches for Runways 8 and 26***.

## Runway Width and Runway-Taxiway Separation

Runway width is specified within FAA AC 150/5300-13A based on the Runway Design Code (RDC). The design standard width for a C-II runway is 100 feet for all specified visibility minimums, and thus **a width of 100 feet should be provided for C-II Runways 12-30 and 8-26 throughout the planning period**. Runway 4-22, a B-II runway, is 100 feet wide which exceeds the design standard of 75 feet.

Taxiway A is a full parallel taxiway to Runway 8-26, with a 300 feet separation distance between the runway and taxiway centerline. This separation meets FAA design standards for a C-II runway with a visual approach. Taxiway C is a partial parallel taxiway which serves Runway 12-30; the separation distance between Taxiway C and Runway 12-30 is 502 feet, which exceeds the 400 feet separation standard for a C-II runway with approach minimums lower than ¾ mile. Taxiway D is a partial parallel taxiway serving Runway 4-22, with a separation distance of 600 feet; this exceeds the 300 feet separation standard for a B-II runway with a visual approach. **No improvements in runway centerline to taxiway centerline separation distances are needed as the existing separations either satisfy or exceed FAA design standards**.

## Runway Length Conclusions and Recommendations

In conclusion, this section has demonstrated the need to provide a runway length at LRU of 8,600 feet consistent with FAA guidance. This need is supported by identification of the "family of medium size business jets" as the critical design aircraft (represented by the Hawker 800) as well as several other factors including service to the 75 percent fleet of U.S. business jets and runway length determination for the 75 percent fleet.

***Based on this analysis, it is recommended that a 1,100 foot extension to Runway 12-30 be completed during Phase III.***

While there is no current need for a runway longer than 8,600 feet within the planning period, it is recommended that an additional extension of 2,000 feet to Runway 12-30 be shown on the Airport Layout Plan for a total ultimate (beyond the 20 year planning period) length of 10,600 feet. This length of runway would be required to accommodate future cargo, heavy aircraft maintenance, or commercial service at the airport. Concurrent with an extension to 10,600 feet, Runway 12-30 would be widened to 150 feet as appropriate for the larger aircraft. Identifying this ultimate extension will help the Airport, City, and community focus on the potential environmental and economic impacts of the extension and prepare accordingly to protect the area around the airport should the extension become necessary.

A total ultimate length of 10,600 feet would be required to accommodate future cargo, heavy aircraft maintenance, or commercial service

***It is also recommended that an extension of Runway 8-26 to 7,000 feet be considered within the planning horizon to help provide redundancy and to be available during times when the operating conditions warrant the use of a longer Runway 8-26***.

## Runway Configuration

There are airfield changes recommended for consideration. The current coupled runway intersection of Runway ends 26 and 30 creates a potential for runway incursions. ***It is recommended that Runway 8-26 be shifted west away from Runway 12-30 to remove the runway intersection and improve safety. An extension will occur concurrently on the Runway 8 end to maintain the recommended runway length; and if timing is appropriate, an extension to 7,000 feet would take place at the same time***.

## Runway Safety Areas (RSA)

The FAA defines a runway safety area (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."* RSAs are most commonly used by aircraft that inadvertently leave (or miss) the runway during landing or takeoff.

Pursuant to the FAA design standards, a runway safety area "shall be:

- cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations;
- drained by grading or storm sewers to prevent water accumulation;
- capable, under dry conditions, of supporting snow removal equipment (not applicable to LRU), aircraft rescue and firefighting equipment, and the occasional passage of aircraft without causing structural damage to the aircraft; and
- free of objects, except for objects that need to be located in the runway safety area because of their function. Objects higher than 3 inches above grade should be constructed on low impact resistant supports (frangible mounted structures) of the lowest practical height with the frangible point no higher than 3 inches. Other objects such as manholes, should be constructed at grade. In no case should their height exceed 3 inches."

The recommended transverse grade for the RSA located along the sides of a runway ranges between 1½ and 5 percent from runway shoulder edges. The recommended longitudinal grade for the first 200 feet of RSA beyond the runway end is 0 to 3 percent. The remainder of the RSA must remain below the runway approach surface slope. The maximum negative grade is 5 percent. Limits on longitudinal grade changes are plus or minus 2 percent per 100 feet within the RSA. The RSAs at LRU are detailed in **Table 3-3** and shown in **Figure 3-4**.

**Table 3-3. Airport Runway Safety Areas**

| | Existing (Width x Length Beyond Threshhold) | | Future |
|---|---|---|---|
| Runway | Actual | Standard | Standard/Proposed |
| 4-22 | 150′ x 300′ | 150′ x 300′ | Same |
| 8-26 | 500′ x 1,000′ | 500′ x 1,000′ | Same |
| 12-30 | 500′ x 1,000′ | 500′ x 1,000′ | Same |

Source: FAA Advisory Circular 150/5300-13A, Airport Design (AC-13A)

All existing RSAs for LRU meet FAA design standards. ***It is recommended that these areas be maintained and cleared of all obstructions throughout the planning period***.

## Runway Object Free Area (ROFA)

The ROFA is defined by FAA as a two dimensional surface centered on the runway centerline. It is provided to enhance the safety of aircraft operations by having the area free of objects except for those that need to be located within the ROFA for air navigation or aircraft ground maneuvering purposes and to taxi and hold aircraft. The FAA ROFA clearing standard requires clearing all non-navigation objects protruding above ground level within the ROFA.

The existing ROFAs at LRU meet FAA design size standards. Runway 12-30 and 8-26 have ROFAs 800 feet wide and extend 1,000 feet beyond the end of each runway while Runway 4-22 has a ROFA 500 feet wide and extending 300 feet beyond the end of the runway (see **Figure 3-4**). ***It is recommended that these areas be maintained and kept clear of all obstructions throughout the planning period***.

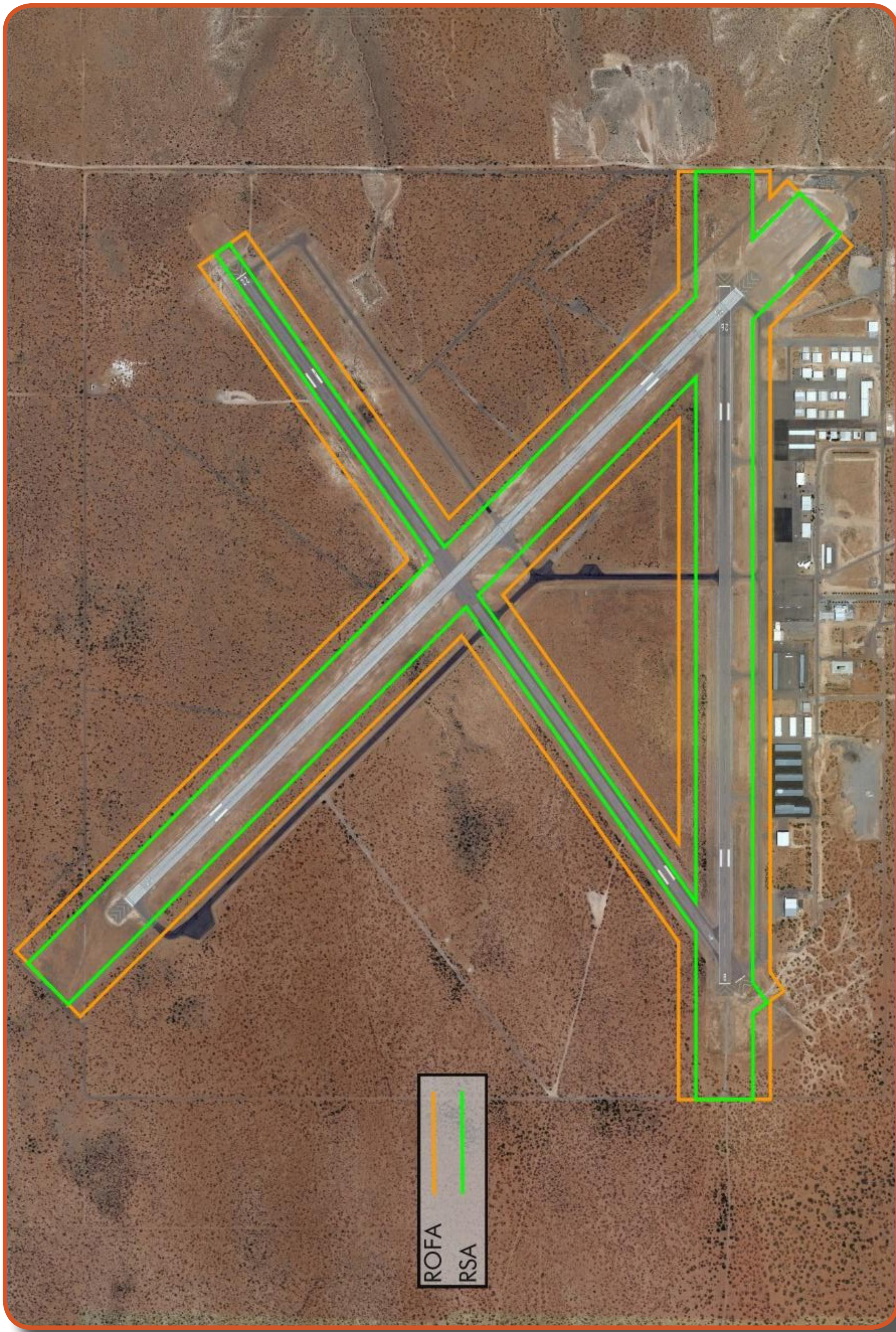



Figure 3-4. Runway Safety Areas (RSA) and Runway Object Free Areas (ROFA)

## Runway Obstacle Free Zone (OFZ)

Consistent with FAA standards, an OFZ represents the volume of airspace centered above the runway centerline. It is required to be clear of all objects, except for frangible NAVAIDs. Certain NAVAIDs may need to be located in the OFZ because of their function to assist pilots landing or taking off from the runway, and for missed instrument approaches, where applicable. The OFZ is subdivided as follows:

**Runway OFZ** is defined as the airspace above the runway surface centered on the runway centerline. The elevation of the OFZ at any point is the same as the elevation of the nearest point on the runway centerline. The OFZ extends 200 feet beyond each runway end; however, the width may vary depending on the runway classification. See **Figure 3-5** for more details.

- For Runway 4-22, the OFZ width is 400 feet.
- For Runway 8-26, the OFZ width is 400 feet.
- For Runway 12-30, the OFZ width is 400 feet.

**Inner-Approach OFZ** – This zone represents the volume of airspace centered on the approach area, and applies only to runways with an approach lighting system (ALS), such as Runway 30.

**Inner-Transitional OFZ** – represents the volume of airspace along the sides of the runway OFZ and the inner-approach OFZ, and applies only to runways with approach visibility minimums lower than three-quarter statute miles, such as Runway 30.

All ROFZs for LRU comply with FAA standards

Based on the above analysis, all ROFZs for LRU comply with FAA standards. ***It is recommended that these areas be maintained and kept clear of all obstructions throughout the planning period***.

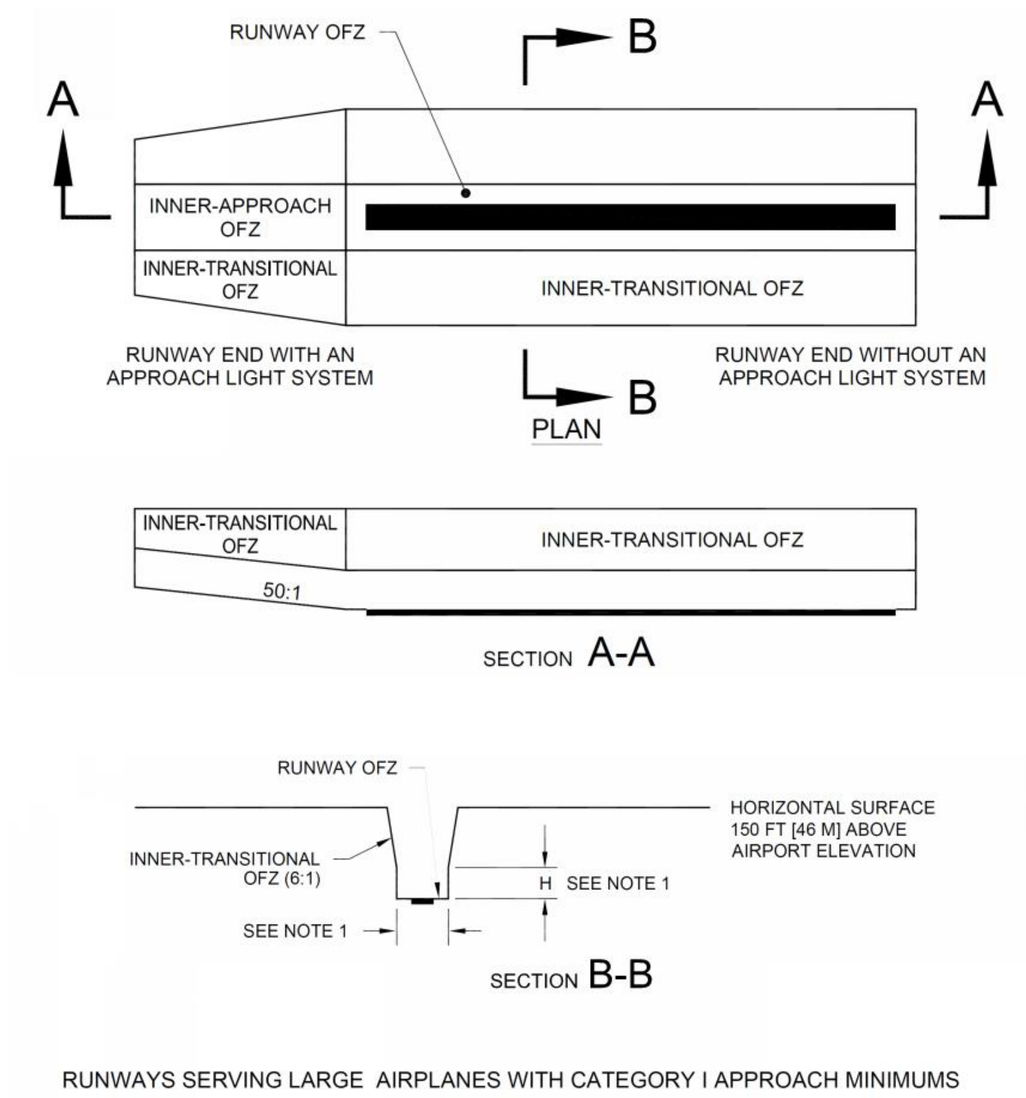



Figure 3-5. Obstacle Free Zone (OFZ)

## Runway Protection Zones (RPZs)

In accordance with FAA standards, RPZs are trapezoidal in shape, centered on the extended runway centerline, and typically begin 200 feet beyond the end of the area usable for take-off and landing. The function of an RPZ is to enhance the protection of people and property on the ground, which is achieved through airport owner control over these land areas. Such control includes clearing RPZ areas (and maintaining them clear) of incompatible objects and activities. An RPZ is subdivided as follows:

**Central Portion of the RPZ** – This area extends from the beginning to the end of the RPZ, centered on the extended runway centerline. Its width is equal to the width of the runway OFA.

**Controlled Activity Area** – This area is the remaining area of the RPZ on either side of the central portion of the RPZ.

RPZs at LRU are shown in **Figure 3-6** and the dimensions are provided in Chapter One, **Table 1-10**.

FAA Order 5090.3C Field Formulation of the National Plan of Integrated Airport Systems (NPIAS) indicates that an airport should control land as appropriate for airfield development, building area, RPZs, approach aids and compatible land use in accordance with current FAA criteria. The FAA prefers the airport owner control the defined RPZ area in fee simple, to enhance protection of people and property on the ground.

***No changes to LRU's RPZs are being proposed for the planning period; therefore, it is recommended that the RPZs be maintained and kept clear of all obstructions throughout the planning period***.

## Runway Visibility Zone (RVZ)

RVZ and line of sight standards provide pilots the ability to observe runway and taxiway surfaces for assurance that they are clear of aircraft, vehicles, wildlife, and other hazardous objects. Because LRU has intersecting runways, FAA longitudinal line of sight standards stipulate that any point five feet above runway centerline and in the RVZ must be mutually visible with any other point five feet above the centerline of the crossing runway and inside the runway visibility zone. The RVZ is defined as the area formed by imaginary lines connecting the runway visibility points. The LRU RVZ is located between Runway 4-22, 8-26, and 12-30 and is depicted on **Figure 3-7**. ***It is recommended that the RVZ be maintained and kept clear of all obstructions throughout the planning period***.


Figure 3-6. Runway Protection Zone (RPZ)

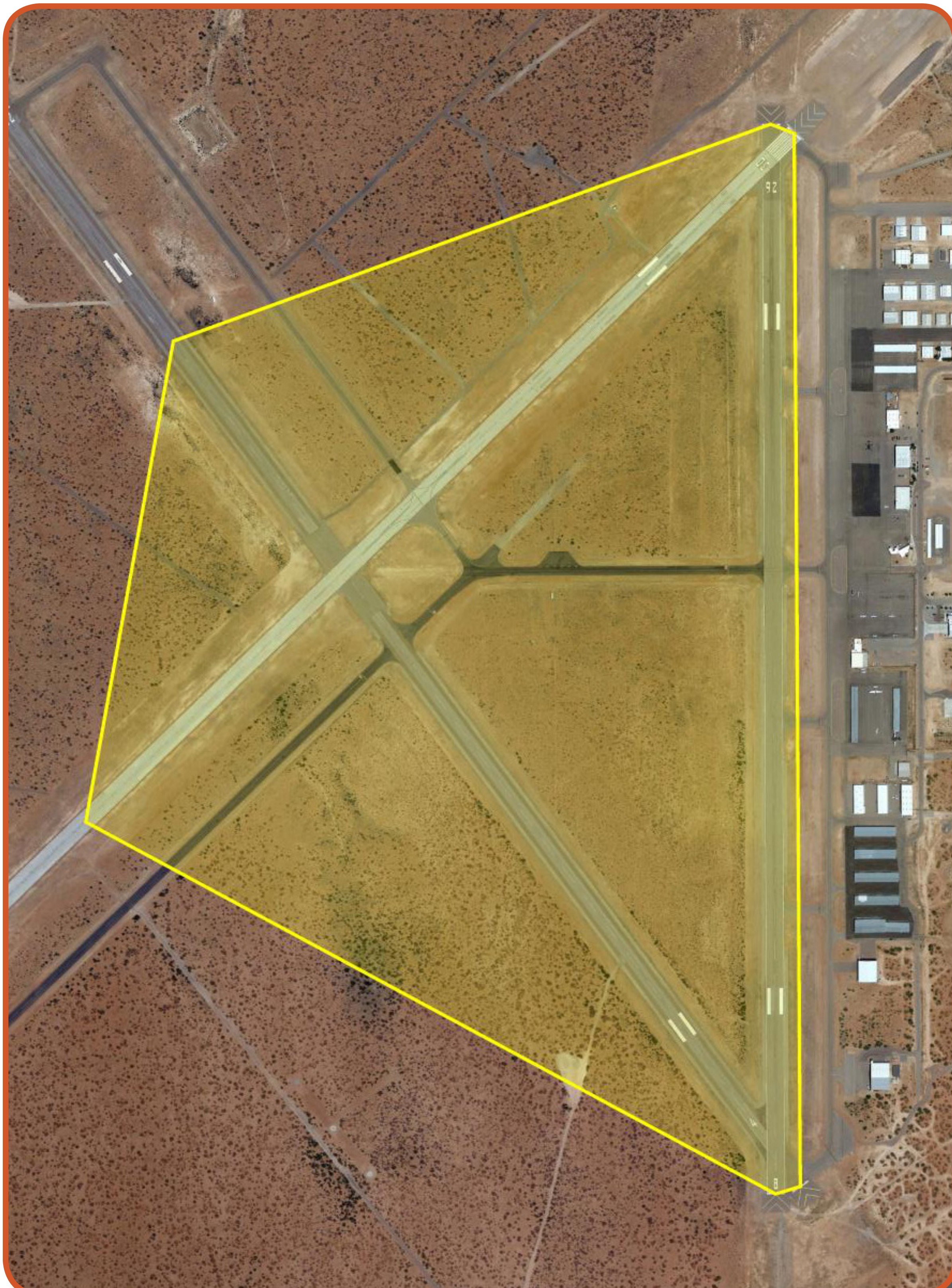


Figure 3-7. Runway Visibility Zone (RVZ)

## Runway Pavement Strength and Condition

The airfield pavement at LRU is maintained in accordance with the established Pavement Management Plan that was developed for the NMDOT – Aviation Division (NMAD) in 2014. Excerpts of the pavement condition report are provided in Chapter One.

As previously noted, the Airport Reference Code for LRU is C-II with maximum gross take-off weight of less than 60,000 pounds. The current rating on Runways 8-26 and 12-30 are 70,000 pounds single wheel gear loading (SWL) and 120,000 dual wheel loading (DWL). Runway 4-22 has been constructed to a strength rating of 30,000 pounds SWL. All pavement surfaces at LRU are bituminous asphalt with the exception of Runway 12-30 which is Portland cement concrete.

Runway 4-22 is rated between Poor and Fair

Current Pavement Condition Index (PCI) values for LRU show a range of runway pavement conditions. Runway 4-22 is rated between "Poor" and "Fair", while Runways 8-26 and 12-30 are both top rated "Good".

***It is recommended that Runways 8-26 and 12-30 both be preserved using regular maintenance practices throughout the planning period and that 8-26 be rehabilitated during Phase III. It is also recommended that Runway 4-22 be reconstructed and maintained during the planning period, consistent with the City's desire to keep this runway open***.

## 3.5|Part 02 - Taxiway and Taxilane Analysis

AC -13A presents design standards for taxiway and taxilane development. A taxiway is defined as a path established for the taxiing of aircraft from one part of the airport to another. A taxilane is defined as the portion of the aircraft parking area used for the access between taxiways and aircraft parking positions.

Additions or improvements to an airport taxiway system are typically undertaken to increase airport capacity, enhance operational efficiency or improve safety. An efficient taxiway system will increase an airport's ability to handle arriving and departing aircraft, as well as expedite ground movements between the runway and terminal areas.

### Taxiways

The existing LRU taxiway system is depicted on **Figure 3-8** and consists of one full length taxiway (A), two partial parallel taxiways (C and D), and four connector taxiways (B, E, F, and G).

The previous edition of AC-13A based taxiway design on Airplane Design Groups (ADG) according to aircraft wingspan and tail height. The runway to taxiway separation distance at LRU was designed and constructed based on the ADG; however, the current edition of AC-13A bases taxiway design on Taxiway Design Groups (TDG). The TDG takes into account the overall Main Gear Width (MGW) and Cockpit to Main Gear Distance (CMG) of the airplane. Taxiway width and fillet sizes are now based on TDG standards. Taxiways are designed for "cockpit over centerline" taxiing with pavement being sufficiently wide to allow a certain amount of deviation from the centerline markings. All taxiways at LRU meet or exceed TDG II standards with widths of at least 35 feet. Taxiways A, D through G are all 35 feet in width while Taxiways B and C are 50 feet in width. ***It is recommended that the widths of taxiways over 35 feet be evaluated at the time of scheduled pavement rehabilitation***.

Taxiways A and B currently meet FAA design standards for runway/taxiway separation

Taxiway A currently meets FAA design standards for runway/taxiway separation. The ARC for Runway 8-26 is currently C-II based on the design aircraft for the runway. Standard separation for an ARC C-II facility with visibility minima not lower than ¾ mile is 300 feet. The existing separation between Runway 8-26 and Taxiway A is 300 feet which meets the separation requirements for an ARC C-II facility.

Taxiway B currently meets FAA design standards for runway/taxiway separation.

The ARC for Runway 12-30 is C-II. Standard separation for an ARC C-II facility with an instrument approach procedure and visibility minima not lower than ¾ mile is 300 feet. Standard separation with minima as low as ½ mile is 400 feet. Runway 30 has a precision instrument approach with ½ mile minima. The existing separation between Runway 12-30 and Taxiway C is 400 feet which meets the separation requirements for an ARC C-II facility.

Standard separation for an ARC B-II facility with visual approach procedures is 240 feet. The existing separation between Runway 4-22 and Taxiway D is 575 feet which exceeds current and proposed requirements.

The 2014 NMAD Pavement Management Study indicates that PCI values for the LRU Taxiway system range from "Fair" (Taxiway D) to "Satisfactory" (Taxiways C and B) to "Good" (Taxiway A and connector taxiways E, F, and G). Given these results, some elements of the taxiway system may be in need of major rehabilitation during the planning period. ***It is recommended that the method of rehabilitation be decided based on a full geotechnical evaluation of the pavement and base material. If the base material is found to be in satisfactory condition, the rehabilitation may be able to be accomplished through a mill and overlay of the pavement. A seal coat is recommended on all new pavement***.

Taxiways B, E, F, and G are perpendicular to Runway 8-26 across Taxiway A and are currently separated from the aircraft parking apron by painted islands. In order to reduce the possibility of inadvertent runway incursions, AC-13A does not recommend direct, straight line access from runways to aircraft aprons and encourages airport operators to locate taxiways in such a manner as to preclude this type of access. ***It is recommended these painted islands be maintained throughout the planning period and preserved during the next apron project to prevent aircraft from taxiing directly from the apron to Runway 8-26***.

In order to provide a shorter taxi route for the large number of corporate hangars on the east side of the terminal area, to reduce traffic through parking apron areas, and to provide a full parallel taxiway to the primary runway, ***it is recommended that the partial parallel Taxiway C along Runway 12-30 be extended to run the full length of the runway during Phase II***.


Figure 3-8. Runways, Taxiways, and Taxilanes

## Taxiway Object Free Area (TOFA)

Similar to a runway, taxiways also have object free areas. The TOFA clearing standards prohibit service vehicle roads, parked airplanes, and above ground objects, except for objects that need to be located in the TOFA for air navigation or aircraft ground maneuvering purposes. The TOFA is centered on the taxiway, and for TDG II aircraft, the TOFA is 131 feet wide. ***The existing TOFAs at LRU meet design standards for ADG II aircraft and should be maintained throughout the planning period***.

## Taxilanes

Taxilanes provide access to aircraft parking areas, fueling areas, and hangars and have less restrictive object free area standards than taxiways. For TDG I aircraft, the standard taxilane object free area (TLOFA) width is 79 feet, and for TDG II the width is 115 feet. Existing taxilanes at LRU are located primarily on the west side of the 'West Hangar Apron' and around the hangars south of the 'East Apron' and are utilized by both ADG I and II aircraft (See **Figure 3-8**). As indicated earlier in this Chapter, some of the taxilanes in the hangar areas do not meet the TLOFA standards for Group I aircraft and some do not meet it for Group II. Aircraft move slowly in these areas and in some cases, no Group II aircraft may typically enter the areas.

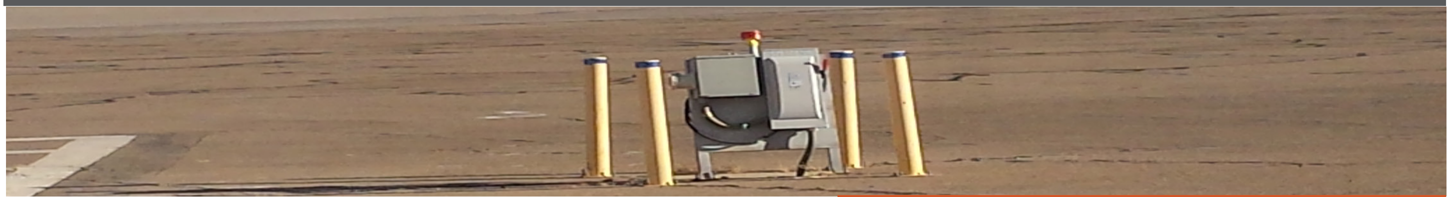
The 2014 NMAD Pavement Management Study indicates that PCI values for the LRU taxilane system range from "Good" to "Very Poor", as shown below in **Table 3-4**. Given these results, it is recommended that taxilane rehabilitation occur in all three Phases of the planning period. The phasing for each Taxilane section rehabilitation is detailed below.

**Table 3-4. Taxilane PCI**

| Taxilanes | 2014 PCI Value | Condition | Action |
|---|---|---|---|
| 1 | 75 | Satisfactory | Rehabilitate Phase III |
| 2 | 63 | Fair | Rehabilitate Phase II |
| 3 | 85 | Good | Rehabilitate Phase III |
| 4, 5, 6 | 39 | Very Poor | Rehabilitate Phase I |
| 7, 8, 9 | 72 | Satisfactory | Rehabilitate Phase III |
| 10, 11, 12, 13, 14, 15 | 47 | Poor | Rehabilitate Phase I |

Source: 2014 NMAD Pavement Management Study

It is recommended that the method of rehabilitation be decided based on a full geotechnical evaluation of the pavement and base material. If the base material is found to be in satisfactory condition, the rehabilitation may be able to be accomplished through a mill and overlay of the pavement.



# 3|Section 6 - NAVAIDs

Section Overview



Navigational Aids (NAVAIDs) are a system of electronic and visual aids that assist pilots with navigating their aircraft in a safe and orderly manner during take-off, approach, and landings. While most NAVAIDs are ground based equipment that are installed on an airfield, satellite-based equipment that provides signals to properly equipped aircraft is becoming more prevalent. With the advent of Global Positioning Systems (GPS), air navigation is now an economic and efficient system that can allow every airport in the country to have a navigational aid without requiring ground based equipment. The Wide Area Augmentation System (WAAS) is an expansion and enhancement of GPS that includes integrity broadcasts, differential corrections, and additional ranging signals. Recommendations related to the pursuit of additional navigational support at LRU are presented in the following sections.

## 3.6|Part 01 - Airfield Lighting System and Visual Approach Aids

### Airport Beacon

A rotating beacon is installed at an airport to indicate its location to aircraft pilots at night. It is typically mounted on top of a tower structure and sometimes atop a control tower if one exists or other buildings of an airport. It produces flashes not unlike that of a lighthouse. LRU's rotating beacon is mounted atop a tower located south of the mid-point of Runway 8-26. The beacon is operational and in good condition. It is recommended that routine and preventative maintenance measures be completed for the airport beacon and that it be maintained throughout the planning period.

### Runway and Taxiway Lighting

Runway 12-30 is equipped with High Intensity Runway Lights (HIRLs) while Runways 4-22 and 8-26 are equipped with standard Medium Intensity Runway Lights (MIRLs). All taxiways other than a portion of Taxiway D have Medium Intensity Taxiway Lights (MITLs). Taxiway D north of Runway 12-30 is equipped with retro reflective markers. The runway and taxiway lighting systems are in good condition. It is recommended that LRU's lighting systems be upgraded during Phase II with FAA-approved LED fixtures to lower operation and maintenance costs.

### Visual Approach Aids

Runway 22 is equipped with a four-box Visual Approach Slope Indicator (VASI) unit while the outdated and inoperable two-unit VASI systems on Runways 8 and 26 each were replaced in early 2016 with Precision Approach Path Indicator systems, a more desirable and effective visual aid. It is recommended that the new PAPIs on 8-26 be maintained throughout the planning period. ***It is also recommended that 4-box PAPIs be installed on Runways 12-30 during Phase I to account for the jet and turbo aircraft that utilize that runway and the ILS system***.

### Runway End Identification Lights (REILs)

Runway 12 REIL is in good condition

Runway 12 is equipped with Runway End Identification Lights (REILs) which are omni-directional, powered from the Runway 12-30 lighting circuit, and operate sunset to sunrise. The Runway 12 REIL is in good condition and should be maintained throughout the planning period. ***It is recommended that LED REILs be installed on Runway 8-26 during Phase III when the runway is shifted***.

### Segmented Circle and Wind Cones

Segmented circle and wind cones are in good condition

A lighted wind cone and segmented circle are installed on the airport on the north side of Runway 8-26 at the midpoint of the runway. There are four lighted supplemental wind cones located at the approach ends of Runway 8, Runway 26, Runway 12, and Runway 22. ***The segmented circle and wind cones are in good condition and should be maintained throughout the planning period***.

### Distance Measuring Equipment (DME)

As there is no NDB or DME currently in place at LRU, ***it is recommended that a DME be installed on the existing localizer in Phase II to improve pilot situational awareness and to help establish a final approach fix to the Airport***.

### Airfield Signs

The lighted airfield signs (location, mandatory, directional, and destination) installed at LRU are internally illuminated and were installed in 1991 and 1994. Most were updated and upgraded in 2006, while the signage for Runway 12-30 was upgraded in 2009. ***It is recommended that when these signs are next upgraded, they be replaced with FAA-approved LED signs to lower operation and maintenance costs***.

Runway distance remaining signs are used to provide distance remaining information to pilots during takeoff and landing operations. These signs are located along the side(s) of a runway to indicate the runway distance remaining in increments of 1,000 feet. These signs were installed along Runway 12-30 in 2009 and are in good condition. ***It is recommended that these signs be maintained throughout the planning period***.

### Airfield Markings

All markings are in good condition

The type of approach procedure used for each runway determines how runways are marked. Runway 30 has precision markings. Runway 12 has non-precision instrument markings. Non-precision runways over 4,000 feet long are required to have aiming points. Since Runway 12 is over 4,000 feet, it has aiming points. Runways 8-26 and 4-22 have basic visual markings. All markings are in good condition and should be maintained throughout the planning period. ***As previously noted, when the pavement serving Runway 12-30 and 4-22 is rehabilitated, the designations for these runways should be changed to 13-31 and 5-23 respectively to reflect the current magnetic declination***.

## Airfield Electrical Vault

The electrical control equipment for the LRU airfield lighting system is housed in an electrical vault located near the intersection of Crawford Boulevard and Gasoline Alley. The building is approximately 100 square feet in size and is equipped with an emergency generator. Based upon a visual inspection of this facility, it appears that it may not meet current electrical code and is not air conditioned. In addition, the constant current regulators are close to exceeding their useful life. ***It is recommended that the LRU electrical vault be expanded and upgraded during Phase I to comply with existing electrical code. It is further recommended that the electrical regulators and control equipment be evaluated and inadequate equipment be replaced***.

# 3.6|Part 02 - General Aviation Aircraft Apron

General aviation aircraft parking requirements vary widely at airports such as LRU and are dependent upon the number of transient aircraft using the airport, as well as the number of based and seasonal based aircraft owners who choose to tie down their aircraft on the ramp in lieu of leasing hangar space. **Figure 3-9** details the various apron areas at LRU.

## Transient Aircraft Parking Requirements

Transient aircraft parking requirements typically comprise the largest demand for apron space requirements. Transient aircraft are defined as those aircraft not based at the facility. For the purpose of this analysis, peak day operations from Chapter Two were used to determine apron space requirements.

On-site observations during this planning process, reviews of service records, and interviews with airport management documented current transient operational activity. **Table 3-5** details the anticipated transient aircraft activity for the planning period. This table is derived from data contained in Table 2-8 which provides the forecast of Peak Day operations for LRU during the planning period. For purposes of arriving at a forecast of transient aircraft per peak day (Itinerant OPS/Peak Day), the number of Peak Day Operations was factored by the percentage of GA itinerant operations that are anticipated to be transient versus local traffic (60%). The resulting breakdown of aircraft types was derived by taking the calculation for Transient Aircraft per Peak Day and factoring by the forecast of aircraft operations by type of aircraft (Table 2-5).

**Table 3-5. Transient Aircraft Activity**

| | Base 2015 | Phase I 2020 | Phase II 2025 | Phase III 2035 |
|---|---|---|---|---|
| Transient OPS/Busy Day | 27 | 27 | 29 | 31 |
| Transient Aircraft/Busy Day | 14 | 14 | 14 | 15 |
| Single Engine Piston | 4 | 4 | 4 | 4 |
| Multi-Engine Piston | 2 | 2 | 2 | 2 |
| Turbo/Jet | 6 | 6 | 7 | 7 |
| Rotorcraft | 2 | 2 | 2 | 3 |

Source: Delta Airport Consultants, Inc. Analysis

Apron space allocations for the footprint of typical transient aircraft at LRU are estimated at 250 square yards (sq. yds.) for single engine aircraft, 500 sq. yds. for multi-engine (piston)/turbo-prop aircraft, 900 sq. yds. for turbo-jet aircraft and 200 sq. yds. for other aircraft (rotorcraft); these allocations do not include the Group II circulation space required for taxiing to, from, and around the parking area. For the purpose of this analysis, it is assumed that as specified in AC-13A, 50 percent of the daily transient aircraft will be on the apron simultaneously during a busy day. **Table 3-6** presents the apron requirements for transient aircraft for the 20-year planning horizon.

**Table 3-6. Transient Aircraft Apron Requirements**

| Aircraft Types | 2015 (No.) (SY) | 2020 (No.) (SY) | 2025 (No.) (SY) | 2035 (No.) (SY) |
|---|---|---|---|---|
| Single Engine | (2) 500 | (2) 500 | (2) 500 | (2) 500 |
| Multi-Engine Piston | (1) 500 | (1) 500 | (1) 500 | (1) 500 |
| Turbo-Jet | (3) 2700 | (3) 2700 | (3) 2700 | (3) 2700 |
| Rotorcraft | (1) 200 | (1) 200 | (1) 200 | (2) 200 |
| **Total Requirements** | **(7) 3900** | **(7) 3900** | **(7) 3900** | **(8) 4100** |

Source: Delta Airport Consultants, Inc. Analysis

## Based Aircraft Apron Parking Requirements

Based aircraft, as opposed to transient aircraft, are permanently stored at the airport. For those owners not requiring hangar storage, adequate space for parking and storage of these aircraft on the apron should be provided. These based aircraft storage spaces are part of the total apron tie-down area. Historically, based aircraft types which are routinely stored or parked on the apron are the less expensive, single engine aircraft types. The larger and more expensive aircraft, such as the multi-engine aircraft types, are normally stored in hangars. The square yardage (SY) per based aircraft used for this analysis is the same as the transient aircraft formula and does not include Group II circulation requirements. Based on industry standards it is estimated that approximately 5 percent of the based single engine aircraft will require apron tie-down space. Utilizing the based aircraft forecast and the projected fleet mix in Chapter Two, based aircraft tie-down requirements were forecasted for the planning period. These requirements are represented in **Table 3-7**.

**Table 3-7. Based Aircraft Apron Tie-down Requirements**

| | 2015 | 2020 | 2025 | 2035 |
|---|---|---|---|---|
| Single Engine (spaces) | 6 | 6 | 6 | 6 |
| Tie Down Requirement (SY) | 1,500 | 1,500 | 1,500 | 1,500 |

Source: Delta Airport Consultants, Inc. Analysis

## Total General Aviation Apron Space Requirements

The preceding discussions have identified the total demand for both based and transient aircraft apron space for the planning period based upon the Forecast of Aviation Demand presented in Chapter Two. **Table 3-8** presents the apron requirements for the planning period based on these forecasts. ***The analysis indicates that the number of based and transient parking spaces is adequate to meet the demand generated by existing based and transient aircraft. Because the layout of these parking and tie-down areas do not meet FAA design standards for tie-downs and TLOFAs, it is recommended that the existing layout be reconfigured during the next apron project to meet FAA standards and provide adequate parking positions***.

**Table 3-8. Airport General Aviation Apron Requirements**

| Aircraft Types | 2015 (No.) (SY) | 2020 (No.) (SY) | 2025 (No.) (SY) | 2035 (No.) (SY) |
|---|---|---|---|---|
| **Transient Aircraft** | | | | |
| Single Engine | (2) 500 | (2) 500 | (2) 500 | (2) 500 |
| Multi-Engine | (1) 500 | (1) 500 | (1) 500 | (1) 500 |
| Turbo-Jet | (3) 2700 | (3) 2700 | (3) 2700 | (3) 2700 |
| Rotorcraft | (1) 200 | (1) 200 | (1) 200 | (2) 200 |
| Sub-Total | **(7) 3900** | **(7) 3900** | **(7) 3900** | **(8) 4100** |
| **Based Aircraft** | | | | |
| Single Engine | (6) 1,500 | (6) 1,500 | (6) 1,500 | (6) 1,500 |
| **Total Apron Parking Area Requirements (SY)** | 5,400 | 5,400 | 5,400 | 5,600 |
| **Existing Apron Parking Area (SY)** | 18,000 | 18,000 | 18,000 | 18,000 |
| **Deficiency (-)/Capacity (+)** | **+12,600** | **+12,600** | **+12,600** | **+12,400** |

Note: () = Number of Aircraft Spaces
Source: Delta Airport Consultants, Inc. Analysis

It is assumed, for the purposes of determining the necessary apron parking area, an equivalency exists between the amounts of space needed to park varying sizes of aircraft. Everything is measured in standard (Small Piston Engine) tie-downs, which differ from parking positions in that larger aircraft may take up multiple tie-down positions. One position is equivalent to the space needed to park a single engine aircraft. Multi-engine aircraft will require 2½ positions, Jets will require 3, and Rotorcraft will require 2. **Table 3-9** details the conversion and deficiency of needed parking positions.

**Table 3-9. General Aviation Apron Parking Position Equivalency**

| Aircraft Types | 2015 | 2020 | 2025 | 2035 |
|---|---|---|---|---|
| Single Engine* | 8 (8) | 8 (8) | 8 (8) | 8 (8) |
| Multi-Engine Piston | 1 (3) | 1 (3) | 1 (3) | 1 (3) |
| Turbo-Jet | 3 (9) | 3 (9) | 3 (9) | 3 (9) |
| Sub-Total (Parking Positions) | 12 | 12 | 12 | 12 |
| | | | | |
| Total Equivalent Tie-Down Positions | 20 | 20 | 20 | 20 |
| Existing Tie-Down Positions | 25 | 25 | 25 | 25 |
| **Deficiencies (-)/Capacity (+)** | **+5** | **+5** | **+5** | **+5** |

Note: *Single Engine counts include based aircraft.
(##) Represents Number of Equivalent Tie-Downs
Source: Delta Airport Consultants, Inc. Analysis

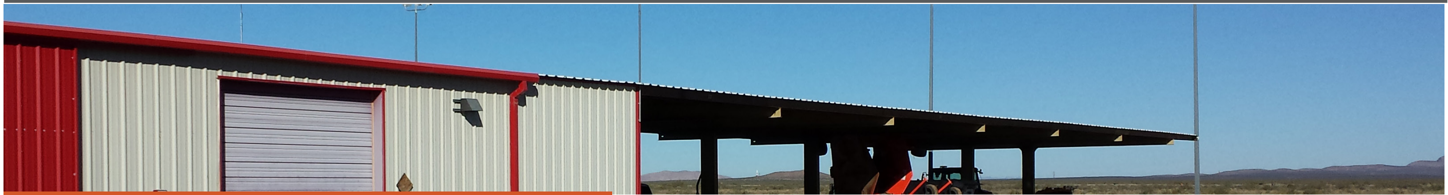
Layout and geometrics of the LRU apron area for tie-downs and taxilanes west of the terminal area do not meet the TLOFA requirements

Although the above analysis does not forecast the need for additional apron area for tie-downs, the layout and geometrics of the LRU apron area for tie-downs as well as taxilanes serving the hangars to the west of the terminal area do not meet the TLOFA requirements specified in AC-13A for aircraft stored in these areas. ***It is recommended that the taxilanes be reconfigured and upgraded to meet current taxilane TLOFA standards for the ADG aircraft utilizing these areas during the next pavement rehabilitation project for each section***. The existing tiedowns located on the main apron penetrate the Group II TLOFA of the main apron. ***It is recommended that the main apron be reconfigured to meet Group II TLOFA standards during the apron rehabilitation in Phase I***.

## Apron Pavement Condition

The 2014 NMAD Pavement Management Study indicates that PCI values for the LRU Apron system range from "Fair" to "Poor". The lowest reported pavement condition on the entire airport is the aircraft parking apron and taxilanes above the two eastern shade hangars. The existing tie-downs located on the main apron penetrate the Group II TLOFA of the main apron. While not warranted due solely to demand, in order to prevent further deterioration and FOD buildup, ***it is recommended that the West, GA Terminal, East, and West Hangar Aprons all be rehabilitated during Phase I and reconfigured to meet Group II taxilane OFA standards surrounding tie-downs***. See **Figure 3-9** for the location of each apron area as described above.


Figure 3-9. Apron Areas



Section Overview



# 3|Section 7 - Landside Facility Requirements

Landside facilities include airport buildings, fuel farm, passenger and general aviation terminal building, hangar space, automobile parking, and fencing. The landside facility requirements were developed from a review of Chapters One and Two of this study, consistent with FAA and industry guidelines.

## 3.7|Part 01 - Terminal Building

For general aviation airports such as LRU, the terminal building serves as the focal point of activity and a source of connectedness with the greater community. Modern, appropriately-sized, and comfortable amenities offered through these facilities provide a convenient connecting point for passengers, meeters/greeters, pilots, and other airport users. Terminal buildings serve as the "front-door" of a region providing a means for guests and visitors to develop positive first and last impressions of a community and spur opportunities for further travel/tourism or business activity. On a more fundamental level, efficient and modern terminal building space affords greater opportunity for air commerce and aviation activity to occur in a more productive manner.

In considering the appropriate location for GA terminal buildings the following planning elements and principles are generally considered:

- Provide maximum visibility from the runway and/or parallel taxiway for arriving aircraft
- Provide good visibility of the airfield from the Terminal Building
- Provide safe and efficient access from primary roadways
- Be close to an adequate apron for based and transient aircraft
- Provide adequate automobile parking
- Do not conflict with the expansion or construction of other airfield facilities
- Provide room for future expansion of the building and associated parking
- Allow easy access to utilities or areas for well water and/or a septic system

Absent guidance from the FAA on space allocation standards for general aviation terminal buildings, it is typical for the industry to arrive at recommendations for such space through use of the following formula:

***Recommended Building Size = (Peak hour operations) x (2.5) x (125 square feet)***

In this calculation, 2.5 represents the average number of passengers and pilots per GA flight while 125 square feet is the amount of space determined to be appropriate per passenger to accommodate their circulation through the building, and provide support amenities including restrooms, waiting area, customer service functions, flight planning, a pilot's lounge, airport administration functions, vending/concession space, conference room, and mechanical/electrical/plumbing support space. The results of this formula for LRU are depicted in **Table 3-10**.

**Table 3-10. General Aviation Terminal Building Minimum Space Requirements**

| | 2015 | 2020 | 2025 | 2035 |
|---|---|---|---|---|
| Peak Hour Operations | 11 | 11 | 11 | 11 |
| Peak Hour Pilots/Passengers | 28 | 28 | 28 | 28 |
| Total Building Area (SF) | 3,500 | 3,500 | 3,500 | 3,500 |
| Existing Building (SF) | 6,300 | 6,300 | 6,300 | 6,300 |
| **Deficiencies (-)/Capacity (+)** | +2,800 | +2,800 | +2,800 | +2,800 |

Source: Delta Airport Consultants, Inc.

LRU's existing terminal building was constructed to serve as a commercial service terminal, with ticketing counters and rental car services. LRU is not currently anticipating the addition of commercial service operations and as such, the configuration of the current terminal is not functional for the needs of the airport and its users. The existing terminal building is owned by the City and is currently being used by the City for airport administration and a portion of the building is leased to Francis Aviation, an FBO. ***It is recommended that a new, dedicated GA terminal building be constructed that is more functional and efficient in order to meet the needs of airport users, visitors, and guests during Phase I and that the existing terminal be re-purposed and eventually demolished***.

## 3.7|Part 02 - Airport Access and Automobile Parking

### Airport Access

LRU is situated directly off of US Interstate 10 on the West Mesa of the City of Las Cruces approximately 8 miles west of City's Central Business District. Crawford Boulevard and Harry Burrell Boulevard are configured in a north/south direction and link the airport to Interstate 10 and Frontage Road respectively. A series of intersecting roads provides access to various LRU facilities. Gasoline Alley provides access to the airfield lighting vault, fuel farm area and hangars to the east of the terminal area. Wingspan Drive and Zia Boulevard provide access to the general aviation terminal, National Guard hangar, Southwest Aviation facilities, hangars and t-hangars, and the New Mexico State University hangar. ***Crawford Boulevard, Harry Burrell Boulevard, and the existing associated network of roads have sufficient capacity to provide adequate ground transportation to LRU throughout the planning period. The roadway pavement is in fair to good condition and should be maintained throughout the planning period***.

## Automobile Parking

The existing parking lot is located across from the general aviation terminal adjacent to Harry Burrell Boulevard and Wingspan Drive. Additional parallel parking and handicap stalls are located along Wingspan Drive adjacent to the terminal building. While the parking lot is close to the terminal building, it does require that drivers and passengers cross Wingspan Drive in order to go from their cars to the terminal building. The parking lot contains 46 covered and paved parking spaces including two designated handicapped parking. One parallel parking space along Wingspan Drive is designated for handicapped parking.

For planning purposes, the number of automobile parking spaces required for LRU equals the number of peak hour operations factored by 2.5 which represents the average number of passengers and pilots per general aviation flight. The results shown in **Table 3-11** indicate that the number of public automobile parking spaces is sufficient for current and future demand.

The existing parking area has not been modified since originally constructed and the pavement is heavily

**Table 3-11. Public Automobile Parking Requirements**

| | 2015 | 2020 | 2025 | 2035 |
|---|---|---|---|---|
| Peak Hour Operations | 11 | 11 | 11 | 11 |
| Total Spaces Required | 28 | 28 | 28 | 28 |
| Total Existing Spaces | 46 | 46 | 46 | 46 |
| **Deficiencies (-)/Capacity (+)** | **+18** | **+18** | **+18** | **+18** |

Source: Delta Airport Consultants, Inc.

oxidized and markings severely faded. The pavement is also heavily cracked in many locations and shows signs of severe deterioration.

As these parking spaces are located immediately in front of the terminal, it is important for the City from an airport marketing standpoint, to maintain them structurally and visually. It is unlikely that seal coating and crack sealing alone will accomplish this given the age, condition, and frequent use of this pavement. As such, ***a full rehabilitation of the parking lot pavement should be completed during Phase I, possibly concurrent with the project involving work on the terminal building***. If, in the future, a new terminal building is constructed in a different location with a new parking lot, this parking area could still serve effectively as a long term parking lot. Therefore, the rehabilitation of this parking area is recommended regardless of any possible decision to relocate the terminal building.

## 3.7|Part 03 - Hangar Facilities

Hangar space requirements include demand generated by based aircraft, seasonal based aircraft, normal fixed base operations, and corporate use. The following assumptions were made to determine hangar space requirements for based and seasonal based aircraft at LRU:

- 95 percent of all single engine aircraft will require hangar space through the planning period
- 100 percent of all multi-engine aircraft will require hangar space
- 100 percent of all turbojet aircraft will require hangar space
- 100 percent of all others (i.e., rotorcraft) will require hangar space

LRU currently has two shade hangars with 10 stalls each, nine T-hangar structures, four 10-unit, one 9-unit, three 7-unit, and one 1-unit as well as thirty-three conventional hangars. Two of the shade hangars are available for public use while the other is used for airfield equipment storage. All private use conventional hangars and T-hangars were included in the calculation of existing available hangar space. Planning ratios for each type of aircraft were based on discussions with the airport management, and are illustrated in **Table 3-12**.

### Table 3-12. Las Cruces International Airport Hangar Planning Ratios

| Aircraft Types | Conventional Hangars | T-Hangars/Shade Hangars |
|---|---|---|
| Single Engine | 35% | 65% |
| Multi-Engine Piston | 75% | 25% |
| Turbo-Prop | 100% | 0% |
| Business Jet | 100% | 0% |
| Rotorcraft | 100% | 0% |

Source: Delta Airport Consultants, Inc.

The conventional hangar space standards that were used for each of the aircraft type to determine the required hangar space are shown in **Table 3-13**. These space standards represent the optimum space required for aircraft maneuvering. They do not include additional spacing required for related hangar operations or aircraft circulation.

### Table 3-13. Hangar Space Standards

| Aircraft Types | Conventional Hangars (SF) |
|---|---|
| Single Engine | 1,200 |
| Multi-Engine Piston | 1,400 |
| Turbo-Prop | 2,400 |
| Business Jet | 3,600 |
| Rotorcraft | 1,200 |

Source: Delta Airport Consultants, Inc.

The total hangar requirements are highlighted in **Table 3-14**.

### Table 3-14. Total Hangar Requirements

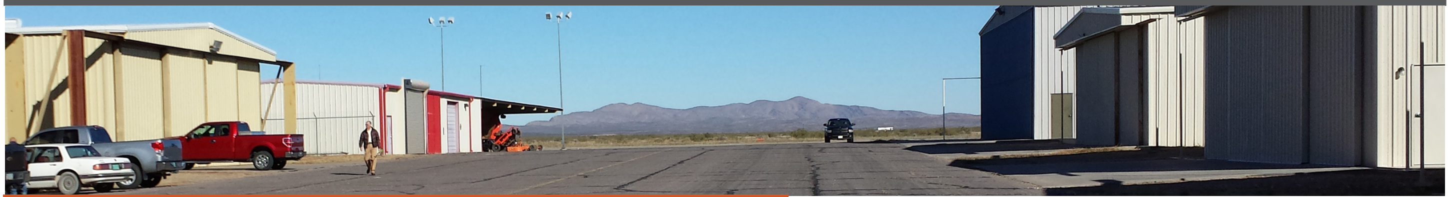
| T-Hangar (Units) | 2015 | 2020 | 2025 | 2035 |
|---|---|---|---|---|
| T-Hangar Demand | 89 | 90 | 91 | 94 |
| Existing T-Hangars Units | 71 | 71 | 71 | 71 |
| **Deficiencies (-)/Capacity (+)** | **-18** | **-19** | **-20** | **-23** |
| **Conventional Hangar Area (SF)** | | | | |
| Single Engine | 44,400 | 45,600 | 45,600 | 46,800 |
| Multi-Engine Piston | 4,200 | 4,200 | 4,200 | 4,200 |
| Turbo-Prop | 9,600 | 9,600 | 12,000 | 14,400 |
| Business Jet | 3,600 | 7,200 | 14,400 | 21,600 |
| Other (Rotorcraft, Ultralights, gliders) | 6,000 | 7,200 | 8,400 | 10,800 |
| Total SF Required | 61,800 | 73,800 | 77,400 | 87,000 |
| Existing Space | 207,400 | 207,400 | 207,400 | 207,400 |
| **Deficiencies (-)/Capacity (+)** | **+145,600** | **+133,600** | **+122,800** | **+98,800** |

Source: Delta Airport Consultants, Inc.

Based upon the above analysis, a deficiency in T-hangar space and a surplus in conventional hangar space exists at LRU. This table shows a deficiency of 18 T-hangars currently exists with an ultimate deficiency of 23 T-Hangars. It is possible that many small aircraft are currently based in conventional hangars due to the T-hangar deficit. Also, some small aircraft are using the existing 20 shade hangars. As previously noted in the aircraft parking apron section of this chapter, the location of some existing conventional and T-hangar units do not comply with AC-13A relative to clearance requirements for TLOFAs. ***Based on the existing deficit of T-hangars, it is recommended that additional T-hangars be considered during Phase I or II to meet existing/future demand and to achieve compliance with FAA standards; and, the existing conventional hangars be monitored and maintained throughout the planning period. As new hangars are needed or existing hangars outlive their useful facility life, it is recommended that new hangar areas be developed that provide efficient maneuvering space, consistent with FAA geometric standards***.

## 3.7|Part 04 - Perimeter Fencing

A chain link fence with access control via a series of vehicle gates is currently in place throughout the terminal and hangar areas and is in fair to good condition. The fence is eight feet tall throughout the general aviation terminal area and Southwest Aviation leasehold. The access control system is approaching the end of its useful life. The remaining perimeter of the airport is served by a 4 foot tall barbed wire fence. ***Based upon the age and condition of the access control system and vehicular access gates, it is recommended that this system be replaced during Phase I. It is further recommended that the airfield perimeter fence system be upgraded to 8 foot security fencing with strategically placed gates in conjunction with the Airport's FAA-required Wildlife Hazard program. It is recommended that this be undertaken in smaller projects throughout the planning period beginning near the terminal area and working outward***.



Section Overview



# 3|Section 8 - Support Facilities

Support facilities play a vital role in the operation of LRU. The sizing, location, and phasing of these facilities must provide flexibility to accommodate the dynamic aviation industry.

## 3.8|Part 01 - Aviation Fuel Storage

The LRU fuel farm is located on the southeast side of the airport on Gasoline Alley. There are four above ground storage tanks within the fenced fuel farm. Two of the tanks (one 12,000 gallon 100LL and one 12,000 gallon Jet A) are owned by Southwest Aviation and were installed in 2015. The City built two new tanks in 2014 (one 12,000 gallon 100LL and one 12,000 gallon Jet A) and leases the use of these tanks to Francis Aviation. Francis Aviation owns the fuel in these tanks. ***The LRU fuel storage area is in excellent condition, has sufficient capacity to meet aviation demand, and should be maintained throughout the planning period. It is recommended that dedicated fuel truck parking bays be constructed in Phase II to help extend the useful life of fuel trucks***.

## 3.8|Part 02 - ARFF Building

14 CFR Part 139 establishes levels (or indexes) of firefighting protection for certified commercial service airports. LRU is an Index A airport based on the fact that it was served by commercial service aircraft with a wingspan of less than 90 feet. The City's Fire Station No. 7 located near the intersection of Crawford Boulevard and Gasoline Alley (on airport property) provides a 24-hour ARFF response for LRU. This two bay facility was built in 2014 to assist with both the West Mesa Industrial Park and the Airport, is in excellent condition, and meets the current and future needs of the airport. LRU maintains one ARFF vehicles on site and the City firefighting staff is certified to operate the equipment and respond to emergencies at the airport. A Rosenbauer ARFF vehicle was purchased in 2006 and is in good condition.

## 3.8|Part 03 - Airfield Maintenance Building

Airfield maintenance equipment and operations occupies a row of shade hangars and portions of vacant hangar buildings. The fleet includes fifteen pieces of equipment and lighted airfield signs plus miscellaneous small tools and accessories. Given the location of this facility and the fact that buildings better suited for aeronautical purposes are being used to store airfield equipment, ***it is recommended that a dedicated airport maintenance equipment storage building be constructed during Phase II***.

## 3.8|Part 04 - Automated Weather Observing System (AWOS)

LRU has an Automated Weather Observation System (AWOS III P/T). The system reports current altimeter settings, wind data, temperature, dew point, density altitude, visibility, cloud/ceiling data, and type of precipitation and lightning detection. The system provides detailed data to pilots via a recorded message accessed by a specified radio frequency or telephone contact. The LRU AWOS frequency is 119.025 and the system is located northeast of Runway 30. The AWOS system was upgraded in 2010. ***It is recommended that the AWOS-3 be maintained throughout the planning period***.

## 3.8|Part 05 - Air Traffic Control Tower (ATCT)

A project was undertaken in 2010 to site, design, and construct an Air Traffic Control Tower for LRU. This project, funded as a part of the FAA Contract Tower (FCT) Program, included the design of an access road, parking lot, utilities, and the tower itself. The environmental assessment, geotechnical study, and design report analyzed and recommended potential sites for the tower around the airport. The construction project was put on hold due to lack of funding. Though not justified within the planning period, ***it is recommended that the original plans and site be preserved for potential future construction***.

## 3.8|Part 06 - Unmanned Aerial Systems (UAS)

The UAS infrastructure needs on an airport are driven by the type of UAS, purpose, and the support services required. The New Mexico State University UAS Flight Test Center activities require a storage/office facility, use of airfield taxiways/runway(s), and a staging area to base ground support equipment needed during the operation of aircraft. The current facilities used by NMSU are a hangar/office on the west side of the airport near Runway 8, a staging area near Runway 22, and use of Runway 4-22 for aircraft operations. These facilities appear to be adequate for the planning period as the UAS testing is not anticipated to increase significantly over its current activity level of 10-20 operations per month. Since the City intends to keep Runway 4-22 operational, ***it is recommended that the existing location for UAS ground support equipment continue at its current location. If Runway 4-22 is ever closed, it is recommended the City consider maintaining a 3,000 foot by 50 foot portion of it on the southwest side to be used exclusively for UAS activities.***

# 3|Section 9 - Facility Requirements Summary

This chapter presented the facility requirements for the continued development of LRU. Facility requirements were predicated on the existing and forecasted aviation demand developed in Chapter Two. These requirements are needed to satisfy the short and long range aviation needs of the community. Recommendations contained herein are intended to optimize the operational efficiency, effectiveness, flexibility, and safety of the airport. Chapter Five, Alternatives Analysis, will discuss and illustrate the optimum size and timing of the facility development that is most appropriate to accommodate the facility requirements. Prior to construction, projects will require an environmental evaluation per the National Environmental Policy Act (NEPA) regulations. Initial phasing for each recommended project is described in **Table 3-15**.

**Table 3-15. Project Phasing**

| Project Description | Phase I (2015-2019) | Phase II (2020-2025) | Phase III (2026-2035) |
|---|---|---|---|
| Rehabilitate GA Terminal Apron | ✓ | | |
| Rehabilitate West Hangar Apron | ✓ | | |
| Rehabilitate East Apron | ✓ | | |
| Rehabilitate West Apron | ✓ | | |
| Install RW 12-30 PAPIs | ✓ | | |
| Rehabilitate RW 4-22 | ✓ | | |
| Expand Airfield Electrical Vault | ✓ | | |
| Rehabilitate Taxilanes 4,5,6,10,11,12,13,14, & 15 | ✓ | | |
| Construct New Terminal Building | ✓ | | |
| Install Perimeter Fencing | ✓ | ✓ | ✓ |
| Rehabilitate Taxilane 2 | | ✓ | |
| Construct T-Hangars | ✓ | ✓ | |
| Install RW 8-26 REILs | | ✓ | |
| Extend Parallel TW C Along RW 12-30 | | ✓ | |
| Upgrade Airfield Lighting | | ✓ | |
| Construct Fuel Truck Parking | | ✓ | |
| Construct MES Building | | ✓ | |
| Extend RW 12-30 1,100 feet | | ✓ | |
| Rehabilitate Taxilanes 1, 3, 7, 8, & 9 | | | ✓ |
| Rehabilitate Runway 8-26 | | ✓ | |
| Decouple, Shift Extend Runway 8-26 | | | ✓ |

Source: Delta Airport Consultants, Inc.