Airport Master Plan Update

For The

Alamogordo-White Sands Regional Airport

Prepared For The

City of Alamogordo

Submitted By

URS Corporation

TECHNICAL REPORT

ALAMOGORDO-WHITE SANDS REGIONAL AIRPORT, AIRPORT MASTER PLAN UPDATE

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The contents of this report reflect the views of the author who is responsible for the facts and accuracy of the data presented herein. The contents of this report do not necessarily reflect the official views or policies of the U.S. Department of Transportation, Federal Aviation Administration, Federal Highway Administration, and the Aviation Division, New Mexico Department of Transportation.

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Alamogordo-White Sands Regional Airport

Chapter One

INVENTORY

CHAPTER ONE

INVENTORY

Purpose and Scope

This Airport Master Plan Update and accompanying plan set define a concept for airport development over the course of a 20-year period. This document is prepared in concert with State and Federal agencies, local officials, and interested airport users.

The primary goal of this study effort is to refine facility needs and evaluate development alternatives presented in the 1996 Airport Master Plan in order to provide a useful plan for airport development during the 20-year planning period. The plan will evaluate improvements in accordance with updated FAA criteria taking into consideration changes that have occurred in the City of Alamogordo, the Airport's service area, and at the Airport since completion of the previous Master Plan in 1992.

During this same period significant changes have occurred within the aviation industry. These changes include a significant shift in general aviation activity, both in Alamogordo and at airports throughout the country. This shift has resulted in increased use of general aviation as a transportation tool for businesses. The Federal Aviation Administration (FAA) has also implemented continuing changes to the Airport Design and Master Plan Advisory Circulars that affect the requirements of Airport Master Plans, Airport Layout Plans, and related planning documents.

Proposed facilities must adhere to standards that provide for safe aviation facilities while accommodating future aviation demand. This planning effort reviewed the current Airport Master Plan and the established Airport concept. The intent of this review is to adjust the Plan and concept relative to accomplishments of preceding years and address changes to FAA design criteria, and anticipated changes within the aviation industry and community. This update will address changes in aviation standards; accommodate changing local demographics; and reflect recent and on-going Airport improvements, and incorporate any future desired improvements.

The Airport Master Plan Update and Airport Layout Plan will focus on basic aeronautical forecasts, the need and justification for developments, and provide a staged plan for implementing recommended development. The staged plan typically looks at 0 - 5 year, 6 - 10 year, and 11 - 20 year planning horizons. The first phase should focus on correcting any existing facility deficiencies or deviations from standards that can and should be corrected within the near term. Subsequent phases typically address facilities needed to accommodate predicted growth based on reasonable assumptions.

The main objective of this Airport Master Plan Update is to produce an efficient and environmentally acceptable development program for the Airport. This plan must also meet the goals and needs of the city of Alamogordo and the surrounding communities by realistically addressing social issues that may influence Airport development. Finally, the plan must also satisfy federal and state guidelines for the development of Airport Master Plans and facilities while incorporating characteristics unique to the Alamogordo community

the Airport serves. Ultimately, this Airport Master Plan Update will provide Airport management with a comprehensive tool to accommodate growth and guide future development.

The Inventory chapter documents the condition of existing facilities at the Alamogordo-White Sands Regional Airport (ALM) in the year 2012. The physical condition of the Airport's facilities reflects their age, quality of original construction, and the quality of the maintenance the facilities have received. The physical condition inventory is a systematic and comprehensive data collection process used to provide an understanding of the aviation and airport related factors at ALM. The compiled information will be analyzed and used in developing the forecasts of aviation demand and in determining future airport facility requirements.

The physical condition inventory for this study was conducted during visits to ALM by the project team. During the site visits, a photographic survey of the site was undertaken together with a review of available drawings and maps, previous Airport studies, and available facility records. Meetings and discussions with the Airport Director, Airport Staff, Fixed Base Operators (FBOs), and other airport tenants and users of the facility were also conducted.

Every effort has been made to provide a comprehensive inventory of the facilities. This Inventory also includes the Airport history, description of Airport facilities and support services, and a brief overview of the Alamogordo-White Sands area. Additional information contained in this chapter was obtained from previous studies and available State and Federal documents in addition to the field survey data that was collected. Information contained in these documents has been updated as a result of the site visits, data research, and interviews and conversations with those involved with the Airport and its operations.

Appendix A provides a glossary of terms and acronyms used in this study for the readers' reference.

Background

Airport Location

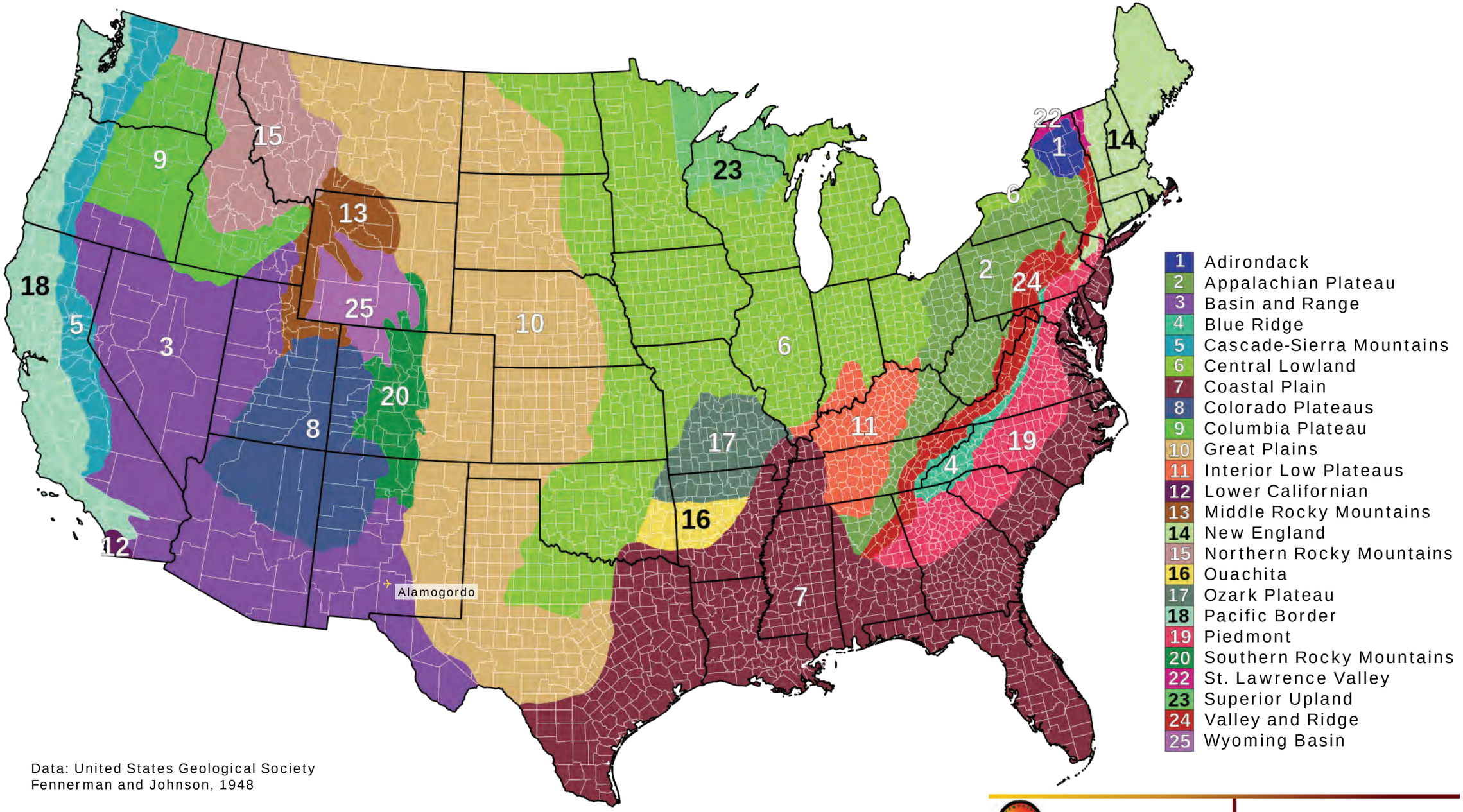
The City of Alamogordo is located in Otero County, New Mexico in the Tularosa Basin. The Tularosa Basin lies within the Sacramento section of the Basin and Range physiographic Province, which is located within the Intermontane Plateaus Division. Physiographic (or geomorphic) regions are broad geographic subdivisions categorized within the lower 48 United States. These physiographic regions are classified into Major Divisions, Provinces, and Sections that are based on the terrain texture, rock type, and geologic structure and history of the area. This part of southeastern New Mexico overlays the Permian Basin. Exhibit 1 depicts the physiographic map of the lower 48 US states.

The Sacramento Mountains form the eastern boundary of Alamogordo with peaks in excess of 12,000 feet above mean sea level while the White Sands National Monument (WSNM), White Sands Missile Range (WSMR), and Holloman Air Force Base (HAFB) define the western boundary. The city of Alamogordo is a desert town that was originally created in 1898 as a railroad town.[1] The town benefited from the availability of natural resources including timber harvested in the Sacramento Mountains and the availability of water from Alamo Canyon at the base of the mountains.

The city of Alamogordo is located approximately 89 miles north of El Paso, Texas via US Highway 54; 68 miles northeast of Las Cruces, NM via US Highway 70; and 209 miles south of Albuquerque, NM via Interstate Highway 25, US Highway 380, then US Highway 54. U.S. Highways 54 (oriented north-south), U.S. 70 (from the southwest), and U.S. Highway 82 (from the east) intersect in Alamogordo, providing

[1] Alamogordo Comprehensive Plan 2000, March 2003, page. 4.

Geophysical Provinces of the Conterminous United States



Data: United States Geological Society
Fennerman and Johnson, 1948

Alamogordo-White Sands Regional Airport

Exhibit 1
Geophysical Provinces

excellent highway access. ALM is located approximately four miles southwest of the city center. The airfield lies between U.S. Highway 70 and U.S. 54 with the primary access from Highway 70. **Exhibit 2** illustrates the regional location of the Airport and City of Alamogordo and **Exhibit 3** depicts the Airport vicinity.

The Airport is a city owned, public use facility located, as noted above, approximately four miles southwest of the city of Alamogordo's central business district. The airport was formerly known as the Alamogordo Municipal Airport.

Alamogordo's History

Alamogordo has been the beneficiary of government sector activity since its initial development with the establishment of Holloman Air Force Base (previously the Air Force Missile Development Center and Alamogordo Army Airfield, Bombing and Gunnery Range). HAFB currently supports missions including the 49th Fighter Wing and the 96th Test Group with overall personnel including active military and civilian workers, dependents and retirees totaling more than 21,000 individuals. The German Air Force has a training squadron based at Holloman as well, and most of these personnel and their families reside in the city of Alamogordo.

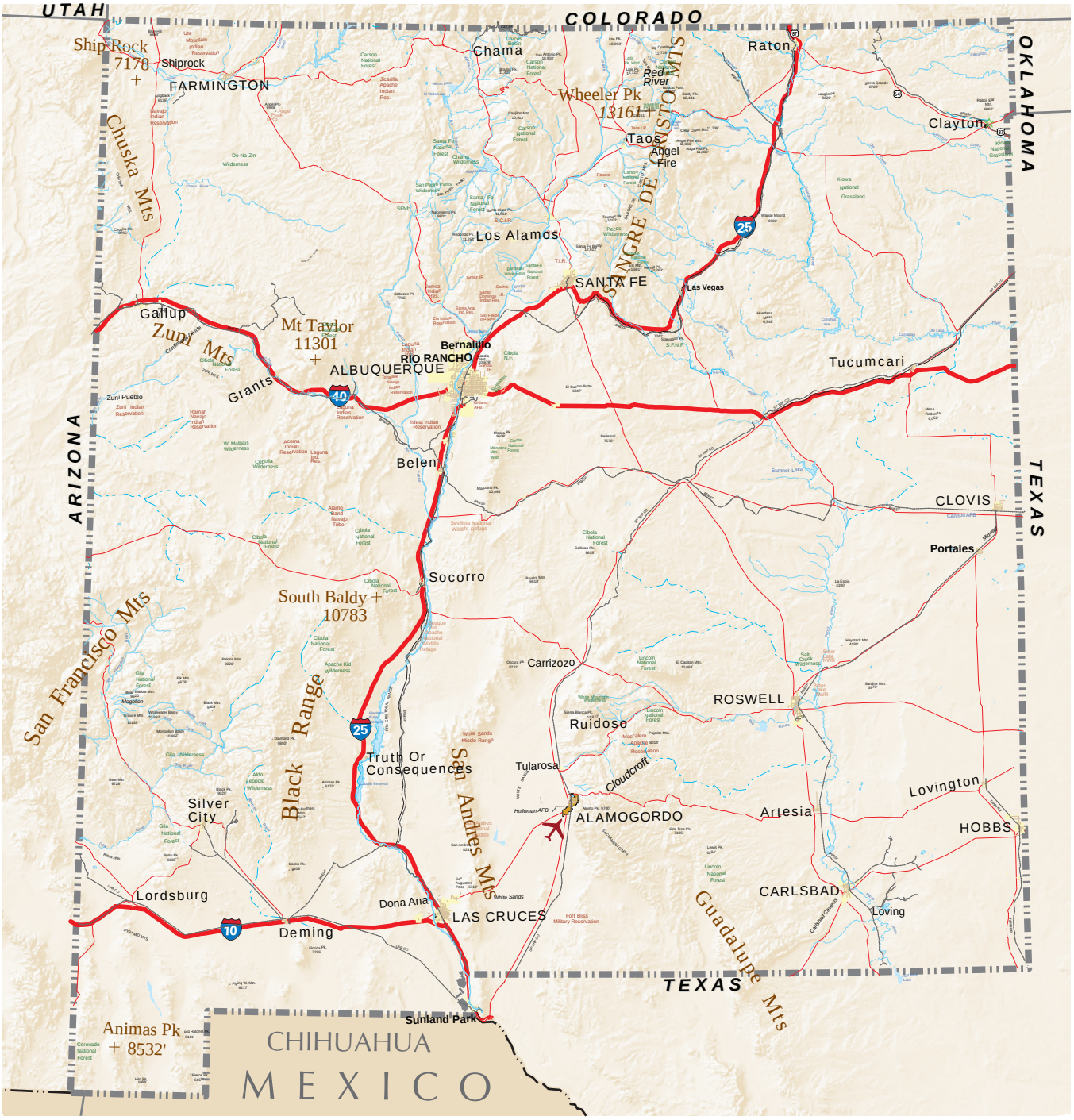
New Mexico State University has a branch campus in Alamogordo with approximately 3,500 full and part-time students. The city has also seen increasing growth in tourism resulting from its proximity to the White Sands National Monument, the Sacramento Mountains, Apache Point Observatory and Sunspot Solar Observatory, and a number of Indian Casinos, most notably the Inn of the Mountain Gods, a Casino and Resort located approximately 43 miles northeast of Alamogordo.

The area's affordable housing, pleasant climate, and quality of life have also resulted in the area's growth as a retirement location.

Airport History

Initial construction of Alamogordo-White Sands Regional Airport began in 1954, with a 7,005' by 150' asphalt runway. The Airport opened for public use in 1958 with commercial passenger service initiated by Continental Airlines. In 1959, Brandiger Aviation established an aircraft maintenance and repair service, which was followed in 1960 by a number of major construction projects. These projects included construction of the commercial passenger terminal building and vehicle parking lot, airport access roads, installation of airport site utility infrastructure, construction of a paved asphalt parallel taxiway to Runway 3-21 and an aircraft parking apron, construction of a 3,500' by 200' dirt crosswind runway (Runway 16-34) and installation of medium intensity runway lights (MIRL) on Runway 3-21, installation of a 36 inch rotating airport beacon, lighted wind cone and segmented circle, and installation of airport fencing.

Airport Beacon



Alamogordo-White Sands Regional Airport

Exhibit 2
Location Map

Alamogordo-White Sands
Regional Airport

Exhibit 3
Vicinity Map

During the years 1960 through 1969, a number of additional construction projects were completed, focusing on aircraft hangars and buildings to support airport operations. Continental Airlines discontinued commercial service in 1962 followed by the start of service by Frontier Airlines. Ed's Flying Service began operations as the Airport FBO in 1966.

In 1972, Black Hills Aviation began an aircraft parts and supplies operation and during 1973, Runway 3-21 was overlaid. During 1974, a heavy aircraft parking apron was constructed and the U.S. Forest Service (USFS) slurry station loading pits were constructed. The Runway 3-21 parallel taxiway and and commercial aircraft parking apron were also overlaid during 1974.

The Airport became known as Rio Grande Alamogordo-White Sands Regional Airport and the name was eventually shortened in 1975 to Alamogordo-White Sands Regional Airport. A very high frequency omni-directional range (VOR) instrument approach procedure was also established in 1975 and a taxi-apron project was completed. In 1977, the Airport was tied into the city of Alamogordo sewage treatment system. Airways of New Mexico began commercial passenger service in 1978 to El Paso, TX., and an Airport Master Plan was completed. During 1979, Frontier Airlines discontinued commercial service and ZIA Airways began service. Essential Air Service (EAS) subsidies were established for Alamogordo by the Department of Transportation (DOT) in 1979 as well. Additional hangar and Airport building construction was also undertaken during the 1970-1979 time period.

ZIA Airways discontinued commercial air service in 1980 while Air Midwest began air service. Installation of airport security lighting, access taxi-lanes, and access roads for the T-hangars was completed in 1981. Air Midwest discontinued service in 1983 and the commercial terminal building was expanded and Runway 3-21 overlaid with a porous friction course (PFC) in 1985. Airways of New Mexico discontinued air service in 1985 while Mesa Airlines and Continental Express began service - Continental Express to Denver, which it subsequently discontinued after two months. The Airport restaurant was renovated and remodeled in 1987.

The period from 1980 through 1989 saw a number of small airside and landside projects completed.

An Airport Master Plan Update was begun in 1991 as was installation of new medium intensity taxiway lights (MITL) and two new lighted wind cones at each end of Runway 3-21 and refurbishment of the airport rotating beacon. During 1992, Runway 3-21 and the parallel taxiway were overlaid.

As indicated by the preceding discussion, the Airport has a long history of providing commercial service, however, this service is not currently available having been suspended in April of 2012. Commercial passenger service was partially supported by the federal EAS program. When EAS funding was terminated New Mexico Airlines elected to end service.

Types of Airports

Public use airports that serve civil aviation are the only airports eligible for Airport Improvement Program (AIP) funding, which was established by the U.S. Congress to foster aviation. An airport also includes the area used or intended to be used for airport buildings, facilities, and rights of way together with those buildings and facilities.

Airports are further defined by categories that include commercial service, primary, cargo service, reliever, and general aviation airports. **Table 1** depicts the airport classifications, which are defined as follows:

a. *Commercial Service Airports* are publicly owned airports that have at least 2,500 passenger boardings each calendar year and receive scheduled passenger service. Passenger boardings refer to revenue passenger boardings on an aircraft in service in air commerce whether or not in scheduled service. The definition also includes passengers who continue on an aircraft in international flight that stops at an airport in any

TABLE 1
TYPES OF AIRPORTS

Airport Classifications		Percentage of Annual Passenger Boardings by Hub Type: §41731(a)(3)	Common Name
Commercial Service: publicly owned airports that have at least 2,500 passenger boardings each calendar year and receive scheduled passenger service §47102(7)	**Primary:** more than 10,000 passenger boardings each year §47102(11)	**Large:** 1% or more	**Large Hub**
		Medium: At least 0.25%, but less than 1%	**Medium Hub**
		Small: At least 0.05%, but less than 0.25%	**Small Hub**
		Nonhub: More than 10,000, but less than 0.05%	**Nonhub**
	Nonprimary	**Nonhub:** At least 2,500 and no more than 10,000	**Nonprimary Commercial Service**
Other than Passenger Classes		Not Applicable	**Cargo Service**
			Reliever
			General Aviation

of the 50 States for a non-traffic purpose, such as refueling or aircraft maintenance rather than passenger activity. Passenger boardings at airports that receive scheduled passenger service are also referred to as Enplanements.

(1) *Nonprimary Commercial Service Airports* are Commercial Service Airports that have at least 2,500 and no more than 10,000 passenger boardings each year (ALM's previous classification).

(2) *Primary Airports* are Commercial Service Airports that have more than 10,000 passenger boardings each year. Hub categories for Primary Airports are defined as a percentage of total passenger boardings in the most current calendar year ending before the start of the current fiscal year. For example, calendar year 2001 data are used for fiscal year 2003 since the fiscal year began 9 months after the end of that calendar year. The table below depicts the definition and formulae used for designating Primary Airports by Hub Type:

b. *Cargo Service Airports* are airports that, in addition to any other air transportation services that may be available, are served by aircraft providing air transportation of only cargo with a total annual landed weight of more than 100 million pounds. "Landed weight" means the weight of aircraft transporting only cargo in intrastate, interstate, and foreign air transportation. An airport may be both a commercial service and a cargo service airport.

c. ***Reliever Airports*** are airports designated by the FAA to relieve congestion at Commercial Service Airports and to provide improved general aviation access to the overall community. These may be publicly or privately-owned.

d. The Remaining Airports, while not specifically defined in Title 49 U.S.C., are referred to as General Aviation Airports and comprise the largest single group of airports in the U.S. airport system. This category also includes privately owned, public use airports that enplane 2500 or more passengers annually and receive scheduled airline service.

ALM is now classified as a General Aviation Airport with the loss of its commercial service in April of 2012.

Airport Management

The Alamogordo-White Sands Regional Airport is owned and operated by the city of Alamogordo and administered by the Community Services Department of the city.

Airport staff includes the Airport Coordinator who is aided by the Airport Maintenance staff members. The Airport Coordinator and Airport Maintenance staff oversee the Airport's security, administration, maintenance, operations, property management, and capital improvement administration.

A five member Airport Advisory Board has been established to provide advice concerning Airport issues.

Previous Studies

A variety of studies pertinent to this Master Plan Update have been prepared by various agencies over the years. The following studies were obtained from the City of Alamogordo, Airport Staff, and other sources during the inventory phase of this project. These documents were reviewed for valuable historic data and insight into the process of long-range planning at ALM.

- Alamogordo Municipal Airport Master Plan Update, 1992 – Muller Sirhall Associates, Inc.
- Alamogordo-White Sands Regional Airport, Airport Action Plan, May, 2003 – Armstrong Consultants, Inc.
- Alamogordo Comprehensive Plan 2000, March 2003 – Taschek Environmental Consulting.
- Final Environmental Assessment, Extend and Strengthen Runway 3-21 at Alamogordo-White Sands Regional Airport, December 2005.
- FAA Long Range Aerospace Forecasts Fiscal Years 2020, 2025, and 2030. Office of Aviation Policy and Plans, September 2007.
- Report to Congress: National Plan of Integrated Airport Systems (2011-2015), Federal Aviation Administration, U.S. Department of Transportation, September 2010.

Existing Airport Facilities

Alamogordo-White Sands Regional Airport, including the airfield, hangars, terminal building, and safety areas, encompasses approximately 1,465 acres. The official Airport Identifier for the Alamogordo-White Sands Regional Airport is ALM, which is the unique three letter designator assigned to the airport by the FAA. The Airport is located at an elevation of 4,199.8 feet above Mean Sea Level (AMSL) and the coordinates of the Airport Reference Point (ARP) are latitude 32°50'28.081"N and longitude 105°59'19.969"W.

Alamogordo-White Sands Regional Airport

Exhibit 4
Existing Airport Facilities

Airfield Facilities

This section of the inventory provides information/data for the runways, taxiways, and apron areas, airfield lighting, signage and fencing, and the navigation and landing aids associated with each runway. **Exhibit 4** depicts the current airfield layout for ALM.

Runways

Alamogordo-White Sands Regional Airport has one active paved runway, an unpaved crosswind runway, and an unpaved airstrip only used for glider activity parallel to Runway 3-21. The primary runway, Runway 3-21 and unpaved airstrip are oriented in a northeast - southwest alignment. Runway 16-34, the unpaved crosswind runway, is oriented in a generally north-south direction. The runways are identified based on their magnetic compass heading, to the closest tenth of a degree. The current magnetic compass heading of the runway determines designation of the runway ends; for example, 3 for 34 degrees, and 21 for 212 degrees. These designations indicate that aircraft take-off and land to the south or north on the primary runway. Aircraft take-off and land toward the southeast or northwest on the secondary runway.

Runway 3-21 is 7,003 feet long and 150 feet wide (the 7,003 runway length is based on 2012 survey data) with a pavement strength rated to accommodate aircraft with a single wheel loading of 54,000 pounds (lbs.) or less, a dual-wheel aircraft load rating of 74,000 lbs. or less, and a dual-wheel tandem aircraft load rating of 120,000 lbs. The runway is constructed of asphalt with a grooved surface and is in good condition. This runway is equipped with medium intensity runway lights (MIRL) and runway end identification lights (REILs) on both runway ends. Runway end 3 has a 4-light precision approach path indicator (PAPI) on the right and Runway end 21 has a 4-box visual approach slope indicator (VASI-4) on the left.

Runway 16-34 is 3,549 feet long and 190 feet wide. This runway is a dirt runway and is in fair condition.

An unpaved dirt emergency glider landing area that parallels Runway 3-21 is solely used for glider operations.

Declared Distances

Declared distances identify the portion of a runway suitable for aircraft take-offs and landings. Declared distances are only used when the runway safety area or runway protection area are non-standard, limiting the runway's functional distance for a particular direction of operation. To calculate the declared distances, the available runway length, runway safety area (RSA) and runway object free area (OFA) are needed. In addition, the location of any displaced thresholds and dimensions of clearways and stopways must also be known. The definitions of the required parameters are as follows:

- **Take-off Run Available** (TORA): runway length available and suitable to satisfy take-off run requirements.
- **Take-off Distance Available** (TODA): runway length plus clearway available and suitable to satisfy take-off distance requirements.
- **Accelerate Stop Distance Available** (ASDA): runway length plus stopway declared available and suitable for aircraft to accelerate to take-off decision speed from break release then decelerate to a stop.
- **Landing Distance Available** (LDA): runway length declared available and suitable to satisfy landing distance requirements.

- **Displaced Threshold**: a threshold located at other than the end of pavement that provides a clear aircraft approach path for landing. The portion of pavement behind the threshold may be available for take-off in either direction or landing from the opposite direction.
- **Clearway**: A cleared rectangular area extending beyond the runway end suitable for use in lieu of a runway to satisfy take-off distance requirements.
- **Stopway**: A prepared or suitable rectangular surface beyond the runway end that is capable of supporting an aircraft without causing structural damage to the airplane during an aborted take-off.

An assessment of declared distances at ALM has revealed that there are no existing limitations on the use of the available runways.

Taxiways/Taxilanes

The Alamogordo-White Sands Regional Airport has a full length 75 foot wide parallel taxiway that serves Runway 3-21 as well as additional access taxiways that provide access between the airfield and all areas of the surrounding landside facilities. The parallel taxiway is comprised of asphalt pavement and is equipped with medium intensity taxiway lighting (MITL).

Aprons

The principal terminal apron area is located adjacent to the Runway 3-21 parallel taxiway. The terminal apron area extends along the parallel taxiway from the T-hangar area in the northeast to an area adjacent to Ed's Flying Service in the southwest. This apron area encompasses approximately 61,000 square yards. The terminal building is generally centered along the northwest side of the terminal apron. The terminal apron is constructed of Hot Mix Asphaltic Concrete (HMAC).

This apron includes the itinerant aircraft and based aircraft parking ramps. This apron area is located immediately adjacent to the Exile Aviation fixed base operation and supports the general aviation activities at ALM.

Airfield Lighting

Airfield lighting provides visual indications of spatial areas and their location on the Airport during the evening hours or during low light conditions. As discussed previously, Runway 3-21 has medium intensity runway lights (MIRL) and the parallel taxiway has medium intensity taxiway lights (MITL).

NAVAIDS/Visual Approach Aids

Navigational aids (NAVAIDS) are electronic instruments that provide guidance or position information to aircraft in flight. The primary NAVAID serving ALM is a Very High Frequency Omni-directional Range with Distance Measuring Equipment (VOR-DME), and is described below.

Runways equipped with electronic aids are classified as instrument runways. Instrument runways are either classified as Precision or Non-Precision, based on the type of instrument approach procedure and navigational equipment available to that runway. Precision instrument approaches provide both horizontal and vertical position information while non-precision instrument approaches provide only horizontal position information.

Airport T-Hangars

Runway 3-21 is classified as a non-precision instrument approach runway. The VOR and VOR/DME provide horizontal guidance only to the Runway 3 end. The Alamogordo VOR-DME is located one NM southwest of the approach end of Runway 3.

There are two "straight-in" approaches into ALM using the Alamogordo VOR/DME and one RNAV (GPS) approach. All approaches are to the Runway 3 end. The approach plates are located in **Appendix B**.

There is a single published RNAV/Global Positioning System (GPS) approach to Runway 3 as well.

A 36" clear and green rotating beacon is located to the northeast of the terminal building, and provides visual guidance to the Airport for pilots. The Airport has a segmented circle and lighted windcone located east of Runway 3-21, slightly southward of the runway's mid-point. These visual aids assist pilots in verifying wind direction, runway use, and airport traffic patterns.

Landside Facilities

Landside facilities typically refer to all of the buildings and support facilities other than those directly associated with the airfield. These facilities include the terminal building, tenant buildings and facilities including hangar space, and storage and maintenance facilities, vehicle access and parking etc. The following sections of this report document the landside facilities at ALM.

Terminal Building and Airport Administration

The general aviation terminal building is located in the center of the terminal area and is directly accessible via the Airport Access Road. It is a single-story building with approximately 6,880 square feet of floor space. When air carrier services were active the building housed car rental offices, baggage claim, concessionaires, airline ticket counters, and Airport Administration offices. Currently the primary occupants are Airport Administration, a small café, and rental car operations.

Terminal Building

Automobile Parking and Access

Public parking is provided immediately adjacent to the terminal building and at additional locations around the Airport. Parking space is provided for approximately 125 vehicles adjacent to the terminal building. Additional tenant parking is provided adjacent to Ed's Flying Service and Exile Aviation as well as other tenant facilities located around the airport.

Fixed Base Operator Facilities

Exile Aviation is the only full service FBO located at ALM while Ed's Flying Service offers most services typically provided by FBO's other than aircraft fueling.

Exile Aviation offers:

- Aircraft parking (ramp or tiedown)
- 100LL and Jet A Fuel
- Passenger terminal and lounge
- Flight Training
- Aircraft maintenance
- Aircraft Rental
- Aircraft sales / leasing / brokerage
- Aircraft Maintenance
- Pilot supplies
- Daily, weekly & monthly hangar rental
- Public telephone
- Courtesy car
- Restrooms

Ed's Flying Service offers:

- Aircraft parking (ramp or tiedown)
- Passenger terminal and lounge
- Aircraft maintenance
- Aircraft sales / leasing / brokerage
- Pilot supplies
- Public telephone
- Restrooms

Lockheed P2V Neptune

Aircraft Maintenance Facilities

Typical maintenance services provided by FBOs include major/minor airframe repair, engine overhaul and repair, etc. Other facilities may include avionics, instrument and propeller shops. Exile Aviation provide facilities for major and minor aircraft repair.

Aircraft Storage

Aircraft storage ranges from tie-down spaces through T-hangars and conventional hangars. There are currently 16 corporate type hangars and 50 T-hangars available on the field. The apron can accommodate approximately 87 based and transient aircraft.

Aircraft Fueling Facilities

The Airport has a fuel farm located at the far southwest end of the airfield, behind the Exile Aviation hangar. This facility is operated by Exile Aviation and serves the general aviation operators as well as the Air Tanker Base. The fuel farm includes two above ground fuel storage tanks with a capacity for 12,000 gallons each of Aviation Gasoline (AVGAS) and Jet-A fuel.

Aircraft are fueled by mobile fuel trucks. Currently, the fueling fleet consists of the following: two trucks, each with 3,000 used for Jet A service, one 3,000 gallon capacity fueler dispensing 100LL and a 1,200 gallon fueler also dispensing 100LL.

BAe 146

Other Airport Facilities

Other major facilities on the airport include a United States Forest Service (USFS) air tanker base that provides a major fire suppression role for the southwestern United States.

USFS Air Tanker Base

The air tanker base at ALM is located adjacent to and northeast of the Exile Aviation FBO facility. The ALM air tanker base supports natural resource protection for the southwestern United States, which includes the majority of Arizona, all of New Mexico, and the western portion of Texas and the Oklahoma panhandle. The primary fire suppression aircraft is the Lockheed P2V Neptune. If all other air tankers are activated and further assistance is needed, the US Forest Service can request help from the US Air Force Modular Airborne Fire Fighting System (MAFFS), which includes a fleet of seven C-130 Hercules aircraft. The US Forest Service is ultimately planning to upgrade its fire suppression fleet to include the British Aerospace BAe 146 a 4-engine jet aircraft that will provide significantly faster response and turn-around times than either the P2V Neptunes or C-130 Hercules.

The United States Forest Service (USFS) uses contracted aircraft from Neptune Aviation (Neptune) and Minden Air Corp. and operates a sizeable air tanker operation for fighting fires in the south and southwestern United States. During traditional fire-fighting season, which runs from approximately March through August,

ALM is one of the main staging airports. Together with Roswell International Air Center (ROW), which is only open during fire-fighting season, the USFS in Alamogordo coordinates air tanker operations in the area. Though many of the operations are focused on nearby Lincoln National Forest, aircraft are commonly called in as far away as East Texas.

Currently, the primary aircraft used are Lockheed manufactured Korean War-era twin piston engine P2V Neptunes, which have retrofitted to provide a fire retardant tank capacity of approximately 2,700 gallons. Neptune Aviation currently operates a maintenance and training facility for the eight P2V aircraft in their fleet at the north end of the field. During the winter and spring months, Neptune participates in several hundred training and maintenance operations for their P2Vs.

As of August 2012, Neptune also owns three four-engine turbofan BAe-146 aircraft; with two more expected in the first half of 2013. These have a tank capacity of 3,000 gallons. As these aircraft enter service, space constraints at their Missoula, MT headquarters will necessitate relocation of the P2V fleet. As the only other Neptune site, ALM is expected to be the new maintenance base for the remaining P2Vs, according to Neptune employees. Much of the planned growth at the Alamogordo Neptune station is contingent on the acquisition of the Certified Repair Station certification for the P2Vs, which would allow heavy maintenance to be completed at ALM. As of August 2012, this has been submitted to the FAA, and is currently under review by two of their offices.

The USFS station at ALM has two 12,000 gallon slurry tanks, and three pits that can be used to fill aircraft tanks, as well as a regional dispatch and logistics coordination center. Due to a lack of metering equipment, only one pit is currently being used at a time. While this reduces the rate at which aircraft can be dispatched, there are no immediate infrastructure concerns for the USFS on-site base.

During the busiest days of fire-fighting season, close to 100 operations a day are not unheard of according to USFS staff, though the seasonal average is closer to 15 per day. The potential exists, after P2V fleet relocation, for the number of air tanker operations to increase considerably, particularly during the low season.

Based Aircraft

Based aircraft data has been problematic. The FAA 5010 indicates that in 2011, the base year, there were a total 24 fixed wing aircraft based at ALM. These aircraft included 21 single-engine piston aircraft, 2 multi-engine aircraft, and one jet aircraft. In addition, there were also five gliders and one ultralight based at the Airport. Subsequent information, which contradicts the 5010, indicates there are currently 95 based aircraft including two rotorcraft. This total does not include 12 gliders and two motor gliders.

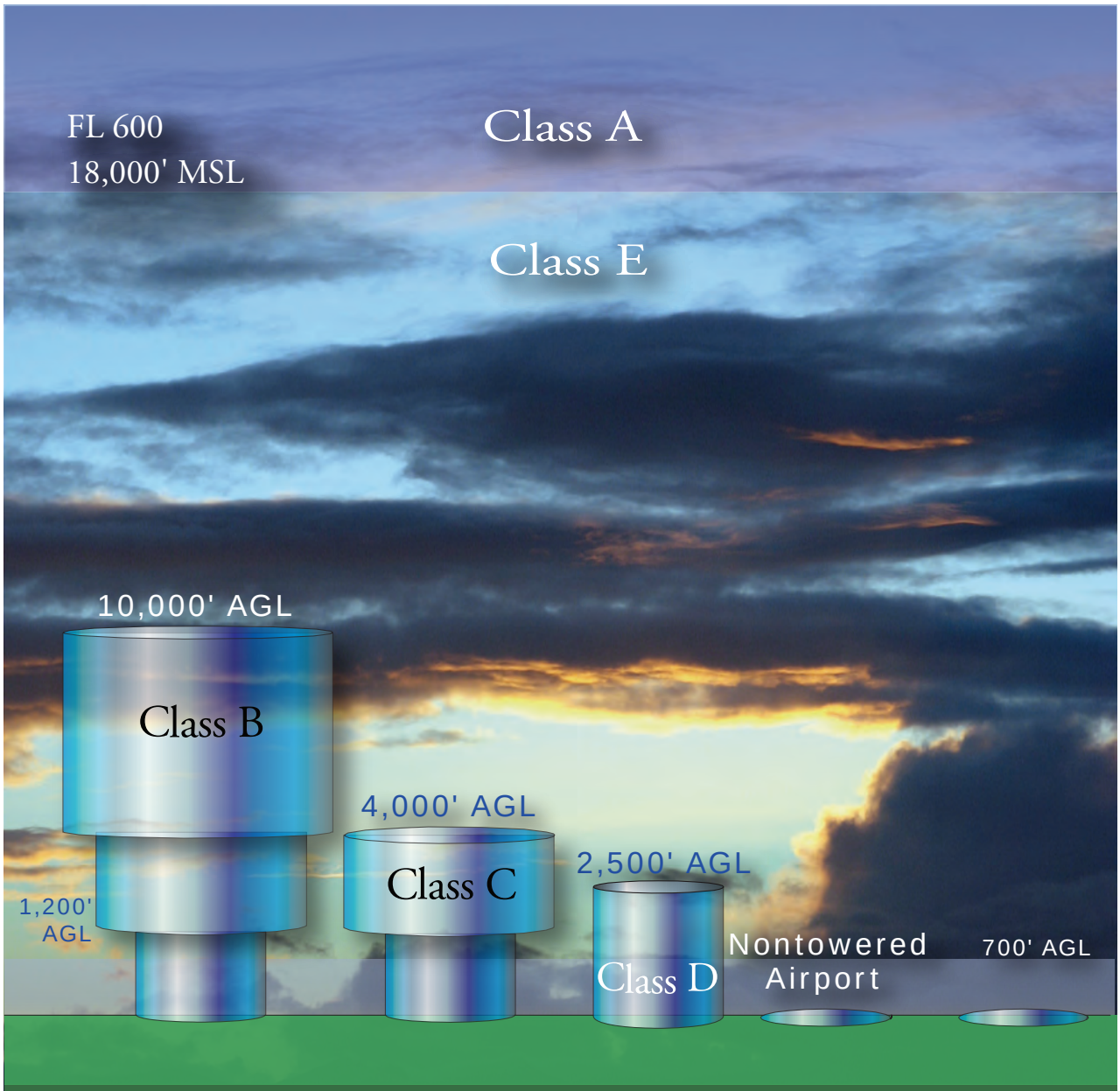
Airspace and Air Traffic Control

Airspace

Airspace in the United States is classified as controlled, uncontrolled, special use and other. A brief description of these categories and their application in the vicinity of ALM is provided in the following paragraphs.

Controlled Airspace

Controlled airspace is classified as A, B, C, D, and E. Each of these classes has different dimensions, purposes, and requirements. A generic view of these various classes and their relationship to each other is provided in **Exhibit 5**.



New Classification:

Class A
Class B
Class C
Class D
Class E
Class G

Old Classification:

Positive Control Area
Terminal Control Area (TCA)
Airport Radar Service Area (ARSA)
Control Zone with Tower, Airport Traffic Area
General Controlled Airspace
Uncontrolled Airspace

AGL = Above Ground Level
FL = Flight Level
MSL = Mean Sea Level

Alamogordo-White Sands Regional Airport

EXHIBIT 5
AIRSPACE CLASSIFICATIONS

Class A Airspace covers the United States and encompasses all airspace from 18,000 feet to 60,000 feet above mean sea level. Aircraft flying in Class A airspace must operate under IFR.

Class B Airspace is generally the airspace from the surface to 10,000 feet MSL and surrounds the nation's busiest airports in terms of airport operations or passenger enplanements. Class B airspace area is individually tailored to each airport and consists of a surface area and two or more layers (some Class B airspace resembles an upside-down wedding cake). The airspace is designed to contain all published instrument procedures. An air traffic control (ATC) clearance is required for all aircraft operating in Class B airspace and all aircraft receive separation services within the airspace.

Class C Airspace is generally, airspace from the surface to 4,000 feet MSL above the airport elevation surrounding airports that have an operational control tower, are serviced by a radar approach control, and have a certain number of IFR operations or passenger enplanements. Class C airspace is individually tailored but usually consists of a surface area with a 5 NM radius, an outer circle with a 10 NM radius that extends from 1,200 feet to 4,000 feet above the airport elevation and an outer area. Aircraft must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and maintain communications while within the airspace.

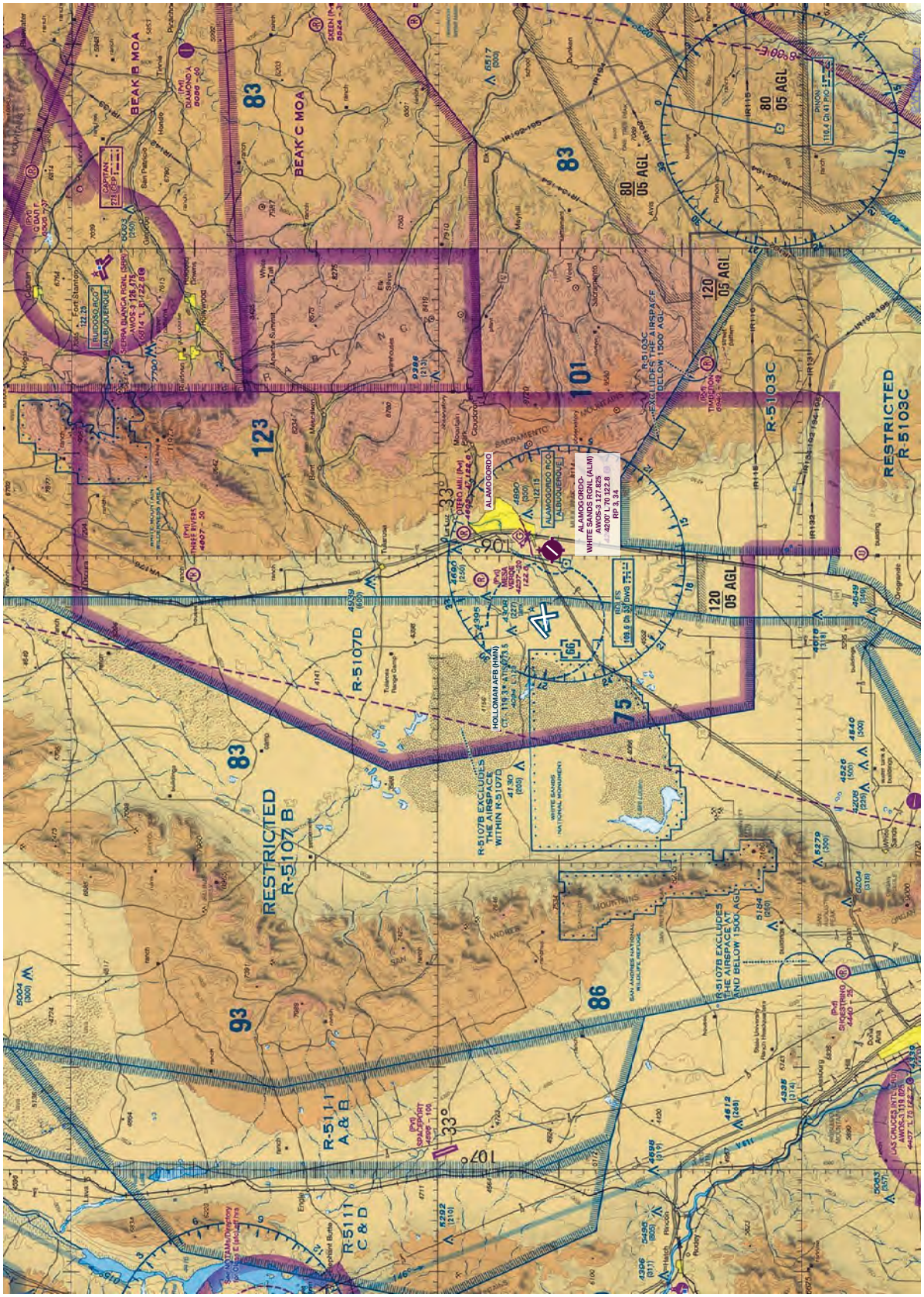
Class D Airspace is generally, the airspace from the surface to 2,500 feet MSL above the airport elevation surrounding airports that have an operational control tower. The configuration of each Class D airspace area is individually tailored and normally designed to contain any published instrument procedures. Arrival extensions for instrument approach procedures (IAPs) may be Class D or Class E airspace. All aircraft must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace unless otherwise authorized and maintain communications while in the airspace.

Class E Airspace is generally, all controlled airspace that is not Class A, B, C, or D. Class E airspace extends from either the surface or a designated altitude to the overlying or adjacent controlled airspace. When designated as a surface area, the airspace will be configured to contain all instrument procedures. Class E airspace also includes federal airways, airspace beginning at either 700 or 1,200 feet above ground level (AGL) used to transition to and from the terminal or en route environment, and en route domestic and offshore airspace areas designated below 18,000 feet MSL.

The airspace in the immediate Alamogordo vicinity is depicted in **Exhibit 6**.

The Airport is located in Class G Airspace, i.e., uncontrolled airspace, as depicted in Exhibit 6. Class G airspace, is not designated as Class A, B, C, D, or E. Class G airspace is essentially uncontrolled by ATC except when associated with a temporary control tower. There is no class B airspace in the vicinity of ALM; however, there is Class C and D airspace associated with Holloman Air Force Base.

Victor airways are air routes formed by selected radials from VOR transmitters and, like interstate highways, are numbered according to their general direction so that even numbered airways are oriented east/west, while odd numbered airways are oriented north/south. Victor airways generally have a floor of 1,200 feet Above Ground Level (AGL) or 3,000 feet above the base of a control area, and extend up to an altitude of 18,000 feet MSL. The standard width of airways is four NM on either side of the centerline, expanding at a 4.5 degree angle beginning 51 miles from the VOR transmitter because of decreasing accuracy of the received radio signal. There are no Victor airways serving ALM.



Alamogordo-White Sands Regional Airport

Exhibit 6
ALM Area Airspace

The jet route system is designed for aircraft that operate within 18,000 feet MSL to 45,000 feet MSL. These routes, known as flight levels, also operate using VOR ground navigation stations, but the system requires significantly fewer stations since line of sight operation gives the VOR substantially greater range when serving aircraft at high altitudes.

Special Use Airspace

Special use airspace consists of those areas where activities must be constricted because of their nature. Special Use Airspace includes Military Operations Areas (MOAs), Restricted Areas and Alert Areas. The special use airspace in the vicinity of ALM is defined below.

MOAs are established to separate military training activities from IFR traffic. There are a number of MOAs in the vicinity of ALM: BEAK A, B, and C, and Talon High West and High East and Talon Low, all to the north and east of ALM.

Restricted areas are designated airspace within which the flight of aircraft is subject to restrictions. Most restricted areas are designated to be joint VFR/IFR operations in the areas and may be authorized by the controlling ATCT facility when it is not being used by the governmental agency. There are a number of restricted airspace areas to the south and west of ALM associated with operations at Holloman Air Force Base and the White Sands Missile Range (WSMR).

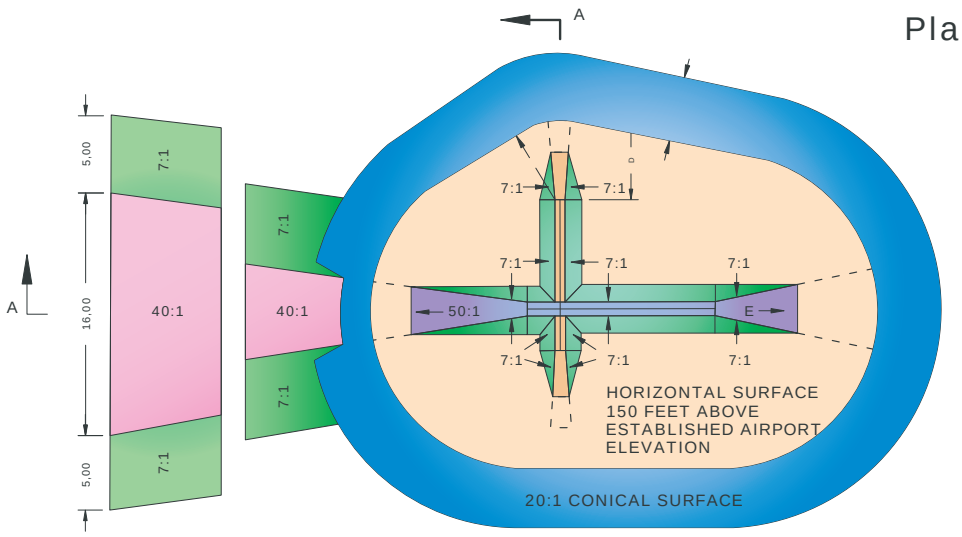
Alert areas are not restricted, although pilots are advised to exercise caution. The Cowboy alert area overlies the BEAK MOA northeast of Alamogordo while the Valmont alert area is located to the south of the Airport. Alert Areas are also associated with the Beak and Talon MOA's. The alert pertains to high level military jet training in the area. With the exception of the Cowboy alert area, all of the other alert areas extend from 18,000 feet and up. The Cowboy alert area extends from 23,000 feet and above.

14 CFR Part 77 Imaginary Surfaces

Ideally, airports are designed so the surrounding airspace is free and clear of obstructions that could be hazardous to aircraft on approach or departure paths. Regulations to protect airspace in the vicinity of airports are established by defining a set of imaginary airspace surfaces. Penetration of these surfaces represents an obstruction to air navigation.

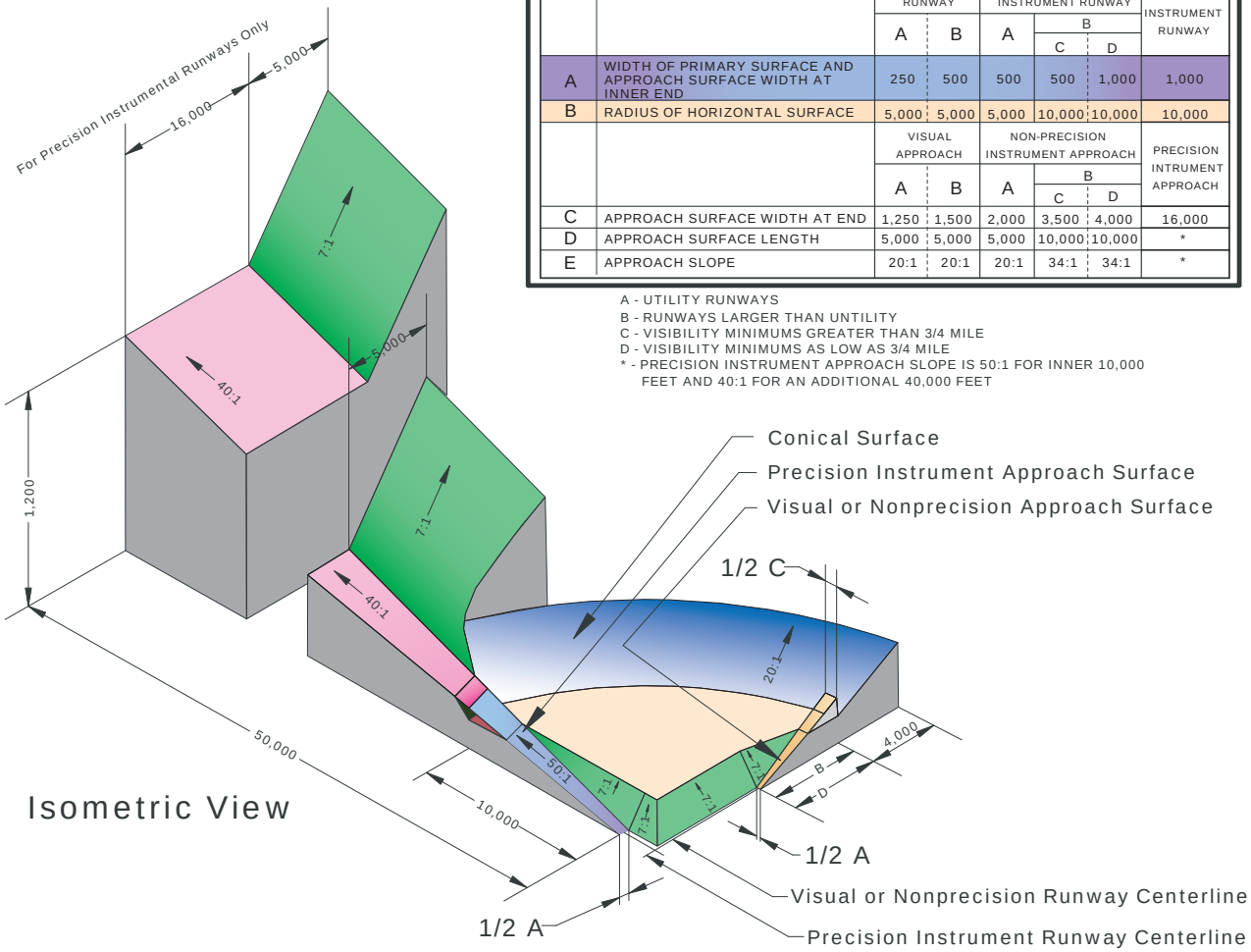
The geometry of the imaginary surfaces is governed by the type of approach available to the runways and the regulations set forth in Title 14 of the Code of Federal Regulations (14 CFR) Part 77, Objects Affecting Navigable Airspace. Part 77 keeps surrounding airspace free and clear of obstructions that could be hazardous to aircraft on approach or departure paths to the airport. An object that protrudes into or above the established imaginary surfaces of a runway is considered an obstruction of airspace. **Exhibit 7** depicts the general layout of imaginary surfaces under 14 CFR Part 77 and are defined below:

- **Primary Surface**: A surface that is longitudinally centered on the runway, extending 200 feet beyond the threshold in each direction.
- **Approach Surface**: An inclined slope or plane going outward and upward from the ends of the primary surfaces. The innermost portion of the approach slope overlaps with the Runway Protection Zone (RPZ).



DIM	ITEM	DIMENSIONAL STANDARDS (FEET)					
		VISUAL RUNWAY		NON-PRECISION INSTRUMENT RUNWAY			PRECISION INSTRUMENT RUNWAY
		A	B	A	B		
					C	D	
A	WIDTH OF PRIMARY SURFACE AND APPROACH SURFACE WIDTH AT INNER END	250	500	500	500	1,000	1,000
B	RADIUS OF HORIZONTAL SURFACE	5,000	5,000	5,000	10,000	10,000	10,000
		VISUAL APPROACH		NON-PRECISION INSTRUMENT APPROACH			PRECISION INTRUMENT APPROACH
		A	B	A	B		
					C	D	
C	APPROACH SURFACE WIDTH AT END	1,250	1,500	2,000	3,500	4,000	16,000
D	APPROACH SURFACE LENGTH	5,000	5,000	5,000	10,000	10,000	*
E	APPROACH SLOPE	20:1	20:1	20:1	34:1	34:1	*

A - UTILITY RUNWAYS
B - RUNWAYS LARGER THAN UNTILITY
C - VISIBILITY MINIMUMS GREATER THAN 3/4 MILE
D - VISIBILITY MINIMUMS AS LOW AS 3/4 MILE
* - PRECISION INSTRUMENT APPROACH SLOPE IS 50:1 FOR INNER 10,000 FEET AND 40:1 FOR AN ADDITIONAL 40,000 FEET



Alamogordo-White Sands Regional Airport

EXHIBIT 7
PART 77 SURFACES

- **Horizontal Surface**: A horizontal plane 150 feet above the established airport elevation. Arcs of specified dimensions set forth the plan dimensions of the horizontal surface from the extended runway centerline at the end of the primary surfaces, connected by tangents, and correspond with the approach surface lengths for each of the runway ends.
- **Transitional Surface**: An inclined plane with a slope of 7:1 extending upward and outward from the primary and approach surfaces, terminating at the point where they intersect with the horizontal surface or any other surface where more critical restrictions are intercepted.
- **Conical Surface**: An inclined plane at a slope of 20:1 extending upward and outward from the periphery of the horizontal surface for a distance of 4,000 feet.

There currently are no obstructions at ALM associated with the approaches to Runways 3-21 or 16-34.

Current FAA Design Standards

Current FAA standards and recommendations for the design of airports are defined in FAA Advisory Circular 150/5300-13A, "Airport Design." This Advisory Circular was issued on September 28, 2012 and replaces AC 150/5300-13 including all amendments. This AC outlines the design criteria recommended for use at airports certified to satisfy specific requirements of 14 CFR Part 139, "Airport Certification and Operations." The standards and recommendations outlined in these documents are mandatory for any airport projects receiving Federal grant-in-aid assistance. Unique local conditions may require modification to airport design standards and may be permissible if approved by the FAA.

Runway Design Code/Airport Reference Code

The Runway Design Code (RDC) is a new coding system developed by FAA. The RDC incorporates the "old" Airport Reference Code and adds the visibility minimums for each specific runway. The Airport Reference Code (ARC) is used to specifically relate airport design criteria to the operational and physical characteristics of the aircraft expected to operate at the airport. The ARC has two components associated with the design or critical aircraft. A letter depicts the first component and represents the aircraft approach category, which is associated with aircraft approach speed. A Roman Numeral depicts the second component and represents the aircraft design group, which is based on the aircraft wingspan (associated with the aircraft's physical characteristics).

Generally, the approach speed of an aircraft affects runway design criteria and runway-related facilities. An aircraft's wingspan is primarily related to separation criteria associated with taxiways and taxilanes. **Table 2** presents the description of both aircraft approach categories and aircraft design groups.

The RDC adds the Approach Visibility Minimums of the specific runway(s) expressed by runway visibility range (RVR) values in feet. The RVR represents the distance in feet a pilot can see down the runway. RVR values (in feet) are 1,200, 1,600, 2,400, and 4,000 (corresponding to lower than 1/4 mile (CAT-III Precision Approach - PA), lower than 1/2 mile but not lower than 1/4 mile (CAT-II PA), lower than 3/4 mile but not lower than 1/2 mile (CAT-I PA), and lower than 1 mile but not lower than 3/4 mile (Approach Visibility ≥ 3/4 but < 1 mile), respectively. For runways designed with visual approach use only the third RDC component should read "VIS".

TABLE 2
AIRCRAFT APPROACH CATEGORY* AND DESIGN GROUPS**

Approach Category	Approach Speed	Design Group	Aircraft Wingspan
A	Less than 91 knots	I	Up to but not including 49 feet
B	91 knots or more but less than 121 knots	II	49 feet up to but not including 79 feet
C	121 knots or more but less than 141 knots	III	79 feet up to but not including 118 feet
D	141 knots or more but less than 166 knots	IV	118 feet up to but not including 171 feet
E	166 knots or more	V	171 feet up to but not including 214 feet
		VI	214 feet up to but not including 262 feet

* *Aircraft approach categories are groupings of aircraft based on an approach speed of 1.3 times the aircraft stall speed at the maximum certified landing weight.*

** *Aircraft design groups are categorized by aircraft wingspan. The aircraft design group concept associates airport dimensional standards with aircraft approach categories, aircraft design groups or to runway instrumentation configurations.*

The current approved Airport Layout Plan for the Airport designates the Airport with an ARC of B-II. Aircraft within this category will be considered the existing design aircraft for the Airport. The above referenced standards were used as a guide in describing existing conditions. Information developed as part of this section will be used to identify the future critical aircraft and develop facility requirements and the Capital Improvement Program (CIP).

ALM has an RDC of B-II-4,000 based on this new FAA classification. The RDC classifications do not adequately address the conditions at ALM since the Airport has existing approach visibility minimums of one mile. The new FAA classification is limited to approaches lower than one mile or visual. With the existing non-precision approaches, the VIS classification is not applicable to ALM and the 4,000 RVR classification represents the closest available classification.

The ultimate classification and design standards for the Alamogordo-White Sands Regional Airport will be determined based on the forecasts, developed in the following chapter of this study.

As noted above, the Airport Reference Code of Runways 3-21 and 16-34 is based on the critical aircraft using these runways. Runways 3-21 and 16-34 are classified with an ARC of B-II based on the design aircraft (P-2V Neptune), which establishes the associated airport facility design parameters. This ARC reflects the Aircraft Approach Category B - approach speeds of 91 knots or more but less than 141 knots, and Airplane Design Group II - wingspan of 49 up to but not including 79 feet. An RVR of 4,000 was used as it is the closest to the existing Airport conditions.

Table 3 highlights the design standards that apply to the airfield system at ALM. Chapter 3 - Demand/Capacity and Facility Requirements will determine the future Airport Reference Code and design standards.

Meteorology

Temperature and Precipitation

Temperature and precipitation conditions at ALM were analyzed using the National Oceanic and Atmospheric Administrations' "Climatography of the United States Report No. 81" for the State of New Mexico, which encompasses the 30-year period from 1971-2000 and the Cooperative Climatological Data Summaries for New Mexico for the period from 1909 through 2009.

Temperature extremes do occur at ALM, with the normal maximum average temperatures ranging from a low of 56.3 degrees Fahrenheit (°F) in January to 94.5 °F in June, the hottest month of the year. Therefore, the normal mean maximum temperature of the hottest month is 94.5 °F.

Precipitation varies throughout the year. April is the driest month with a normal rainfall of 0.36 inches, while August is the wettest month with a normal rainfall of 2.04 inches. The normal annual average precipitation at ALM is 10.95 inches.

Wind Data

Weather information obtained from the National Climatic Data center in Asheville, North Carolina covered 81,056 weather observations at Alamogordo for the 10-year period, 2000 to 2009. This data was analyzed for both wind direction/speed and ceiling/visibility. From this information, two standard wind roses were compiled. The wind rose in **Exhibit 8** depicts the percentage of wind speed by direction for All Weather Conditions. **Exhibit 9** depicts the wind rose for Instrument Meteorological Conditions (IMC). The following information describes the standard definitions of these weather conditions:

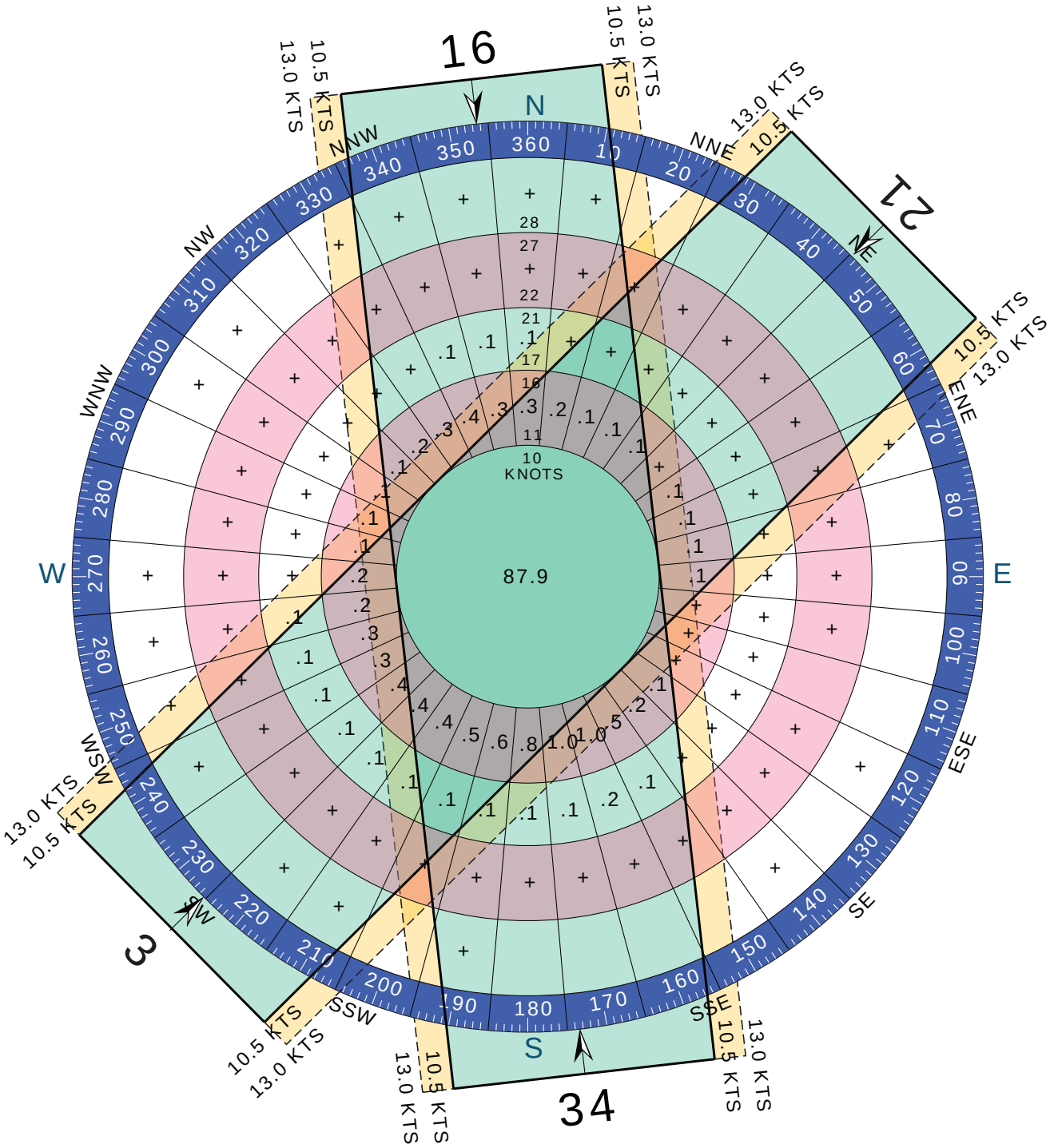
- VMC: The weather where the cloud base is equal to or greater than 1,000 feet AGL and visibility is equal to or greater than 3 statute miles.
- IMC: The weather where the cloud base is less than 1,000 feet, but more than 200 feet AGL and visibility is less than 3 statute miles, but more than ½ mile.
- Below IMC: Whenever the cloud ceiling or visibility is less than IMC, an airport is usually closed. A few larger airports have instrumentation allowing specially equipped aircraft to land in low ceiling/visibility conditions.

The analysis of the ceiling/visibility data revealed that VMC occur in the Alamogordo area 99.3 percent of the time, IMC occur 0.6 percent of the time, and 0.1 percent of the time the weather is below operating minimums.

An airport's primary runway should be oriented as closely as practical with the direction of the prevailing winds. Doing so provides the greatest wind coverage for a given maximum crosswind component. The crosswind component represents winds that travel at right angles to the runway. Runway wind coverage indicates the percentage of time during which operations can safely occur with acceptable crosswinds. Crosswind components of 10.5 and 13 knots were used for analyzing the combined runway wind coverage at ALM. The 10.5 and 13 knot crosswind components correspond to those allowable for the aircraft that currently use ALM's runways.

TABLE 3
RUNWAY DESIGN STANDARDS MATRIX, A/B – II - 4000

ITEM	VISIBILITY MINIMUMS			
	Visual	Not Lower than 1 mile	Not Lower than 3/4 mile	Lower than 3/4 mile
RUNWAY DESIGN				
Runway Length	Refer to paragraphs 302 and 304			
Runway Width	75 ft	75 ft	75 ft	100 ft
Shoulder Width	10 ft	10 ft	10 ft	10 ft
Blast Pad Width	95 ft	95 ft	95 ft	120 ft
Blast Pad Length	150 ft	150 ft	150 ft	150 ft
Crosswind Component	13 knots	13 knots	13 knots	13 knots
RUNWAY PROTECTION				
Runway Safety Area (RSA)				
Length beyond departure end	300 ft	300 ft	300 ft	600 ft
Length prior to threshold	300 ft	300 ft	300 ft	600 ft
Width	150 ft	150 ft	150 ft	300 ft
Runway Object Free Area (ROFA)				
Length beyond runway end	300 ft	300 ft	300 ft	600 ft
Length prior to threshold	300 ft	300 ft	300 ft	600 ft
Width	500 ft	500 ft	500 ft	800 ft
Runway Obstacle Free Zone (ROFZ)				
Length	Refer to paragraph 308			
Width	Refer to paragraph 308			
Precision Obstacle Free Zone (POFZ)				
Length	N/A	N/A	N/A	200 ft
Width	N/A	N/A	N/A	800 ft
Approach Runway Protection Zone (RPZ)				
Length	1,000 ft	1,000 ft	1,700 ft	2,500 ft
Inner Width	500 ft	500 ft	1,000 ft	1,000 ft
Outer Width	700 ft	700 ft	1,510 ft	1,750 ft
Acres	13.770	13.770	48.978	78.914
Departure Runway Protection Zone (RPZ)				
Length	1,000 ft	1,000 ft	1,000 ft	1,000 ft
Inner Width	500 ft	500 ft	500 ft	500 ft
Outer Width	700 ft	700 ft	700 ft	700 ft
Acres	13.770	13.770	13.770	13.770
RUNWAY SEPARATION				
Runway centerline to:				
Parallel runway centerline	Refer to paragraph 316			
Holding Position	200 ft	200 ft	200 ft	250 ft
Parallel taxiway/taxilane centerline	240 ft	240 ft	240 ft	300 ft
Aircraft parking area	250 ft	250 ft	250 ft	400 ft
Helicopter touchdown pad	Refer to AC 150/5390-2			

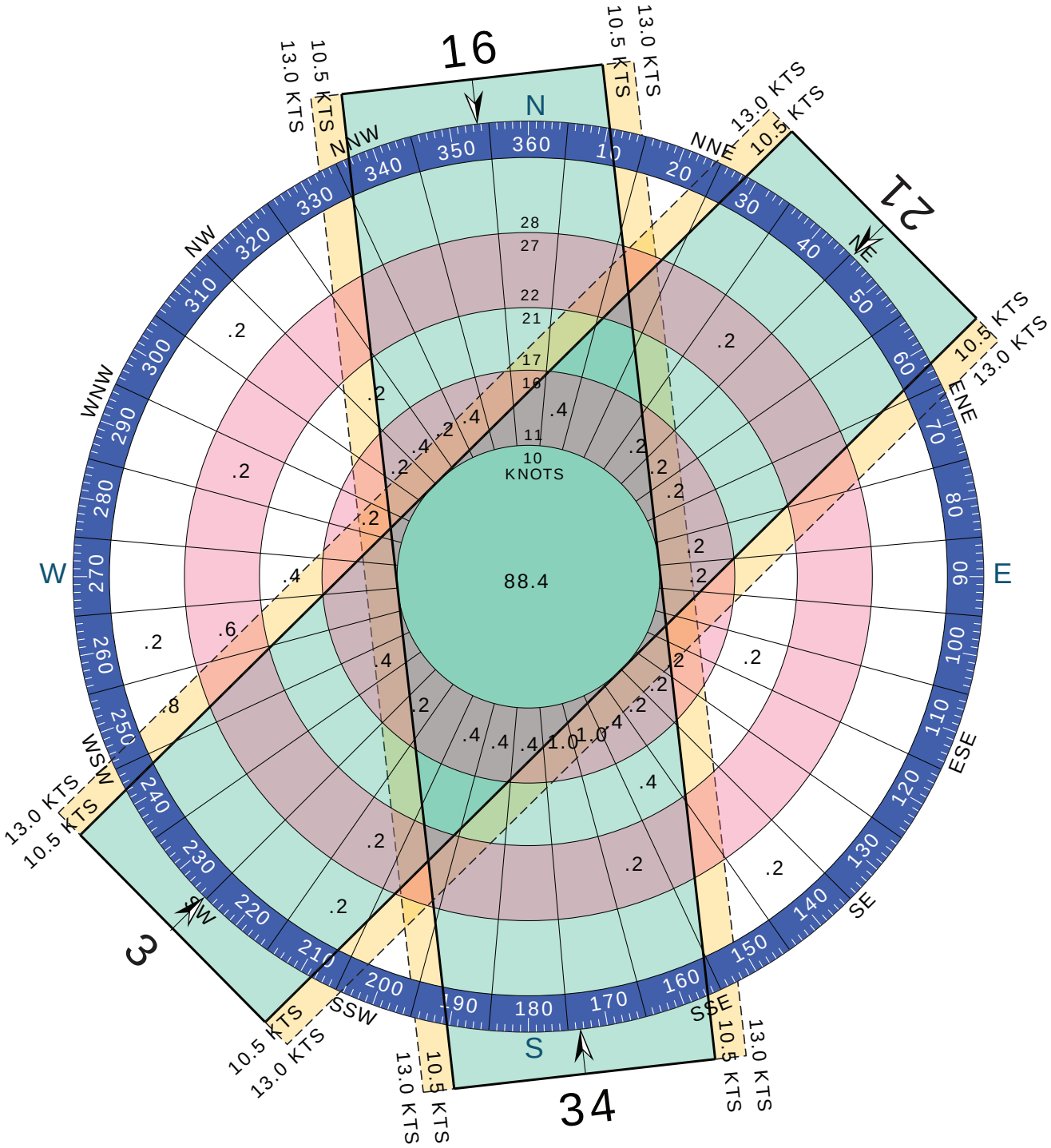


ALL WEATHER

12 MPH WIND COVERAGE: 99.21%
15 MPH WIND COVERAGE: 99.72%

Alamogordo-White Sands Regional Airport

Exhibit 8
All Weather Wind Rose



IFR

12 MPH WIND COVERAGE: 96.74%
15 MPH WIND COVERAGE: 97.81%

Alamogordo-White Sands Regional Airport

Exhibit 9
IFR Wind Rose

FAA criteria recommend that runways be oriented so as to allow aircraft to operate at least 95 percent of the time with an allowable crosswind component under either VMC or IMC. At ALM with a B-II ARC, crosswinds should not exceed 13 knots. FAA guidelines recommend construction of additional runways if wind coverage is less than 95 percent.

Table 4 illustrates that Runway 3-21 alone does not provide the recommended 95 percent wind coverage. However, the combination of Runway 3-21 and Runway 16-34 at ALM does provide sufficient wind coverage during all weather conditions.

TABLE 4
WIND COVERAGE

Weather Condition	Wind Component	
	10.5 Kts	13 Kts
Runways 3-21 and 16-34		
All Weather	99.21%	99.72%
IFR	96.74%	97.81%
Runway 3-21		
All Weather	94.45%	97.18%
IFR	92.57%	95.26%
Runway 16-34		
All Weather	96.76%	98.09%
IFR	94.98%	96.04%

Station: 72269 Alamogordo, NM
Period: 2000-2009
Total Number of Observations: 81,056
Source: 1. NOAA, NCDC, 2012.
2. URS Corporation Analysis, 2012.

Planning Context

Airport facilities can range from rural unpaved airstrips to large long-haul commercial service facilities. Because there is a large diversity in airport facilities, a means of systemizing them is needed. Currently, two classification systems apply at ALM. The first is the FAA designation that classifies the facility based on its service level and the role that it serves within the system. This is detailed in the FAA National Plan of Integrated Airport Systems (NPIAS). The second classification is the New Mexico Airport System Plan that is overseen by the Aviation Division of New Mexico Department of Transportation (NMDOT) to document airport and airport-related facilities required to meet the aviation needs of the state.

The National Plan of Integrated Airport Systems

The NPIAS is a national airport system plan developed by the FAA to indicate aviation facilities of national significance. NPIAS airports are eligible for federal grants for airport planning and various capital improvements. The NPIAS uses two categories, airport service level and airport role, as described below:

Service Level Classification

The service level of an airport reflects the type of public service the airport provides to the community. The service level also reflects the funding categories established by Congress to assist in airport development. The four categories are:

- Primary Service (PR): Primary Service airports are public use facilities with scheduled air carrier service and 10,000 or more enplaned passengers per year.
- Commercial Service (CM): Commercial Service airports are public use facilities which receive scheduled air carrier service and enplane between 2,500 and 9,999 passengers per year.

- General Aviation (GA): General Aviation airports are either public or private facilities that serve only GA users.
- Reliever (RL): Reliever airports are general aviation facilities that serve to relieve congestion at a Primary Service facility in the region and offer an alternative for access to the community.

ALM is currently classified as a General Aviation airport in the NPIAS for 2011-2015, which was published in September 2010.

Airport Role

An airport is designed to support its role within the national system. Role classifications for NPIAS airports are based on the types of aircraft the runway system can accommodate based on runway dimensions and pavement strength. NPIAS airports are classified into two general design types: Utility and Transport. Utility airports are designed and intended to serve general aviation, while the Transport category airports accommodate larger and heavier private and commercial size aircraft. Transport airports are further defined as Long, Medium, or Short Haul. ALM is classified as Transport, Short Haul airport providing service within a 500-mile radius.

New Mexico Airport System Plan

The New Mexico Airport System Plan (NMASP), as administered by the New Mexico Department of Transportation Aviation Division serves as an important coordination component between the State's goals and the FAA's NPIAS. The NMASP 2009 is an update of the original New Mexico Airport System Plan developed in 2003. The NMASP identifies the aeronautical role of existing and proposed airports and depicts plans for the development of air transportation facilities around the State of New Mexico.

The NMASP evaluated state airports based on 25 different factors, some aviation related and others that are community specific. These factors were chosen based on those determined to be most significant in establishing the role or function of an airport within New Mexico's system.

This quantitative evaluation process scored each airport relative to the 25 factors. Using these results, and a review of FAA's current NPIAS classifications, each of New Mexico's 51 public-use airports was assigned to one of the following role categories:

- Primary Commercial Service
- Non-Primary Commercial Service
- Limited Commercial Service
- Regional General Aviation
- Community General Aviation

As noted earlier in this chapter, Alamogordo had limited commercial service and was designated a "Limited Commercial Service" airport within the state system. This commercial service has since been discontinued and the Airport is now likely considered a "Regional General Aviation" facility.

Existing Land Use

Existing Land Use in the Alamogordo area is depicted in **Exhibit 10**. Single-family residential is the predominant land use within the City. The Alamogordo city limits extend north and east of ALM but do not encompass areas south and west of the Airport. The City is also bordered by federal lands of the Lincoln National Forest in the Sacramento Mountains to the east, and substantial BLM and State Land Office holdings to the north and south. The unincorporated community of Boles Acres is located south and east of ALM. Private lands extend north and south offering considerable expansion potential within and adjacent to the current city limits.

A very small pocket of multi-family land use is located north of the Airport with additional areas of residential land use located to the north and east of ALM. To the west, land use consists of open space with Holloman Air Force Base located approximately 5 miles west of the City.

Surface Transportation Network

Highways

U.S. Highway 54 (oriented north-south) is a four-lane highway that provides direct access to El Paso, Texas to the south. This is predominantly a divided highway for the vast majority of the distance from Alamogordo to El Paso. U.S. 70 (from the southwest) connects Alamogordo to Las Cruces, New Mexico. U.S. Highway 70 is also a four lane divided highway from Alamogordo to Las Cruces. U.S. Highway 82 is a two lane road that provides access to the mountain community of Cloudcroft, New Mexico and points east.

The City of Alamogordo has adopted airport zoning to prevent the creation of additional incompatible land uses and thereby protect the health, safety, and general welfare of the public in the vicinity of both ALM and the Holloman Air Force Base. The city's airport zoning incorporates a series of land use controls that address the allowable height of objects, as well as the compatibility of land uses in areas exposed to high noise levels. Holloman Air Force Base has an Air Installation Compatible Use Zone (AICUZ) study that sets forth the criteria for compatible land use planning in the vicinity of Holloman Air Force Base and areas deemed accident potential zones by the US Air Force. The latest amendment to the study was published in August 1999.

Rail

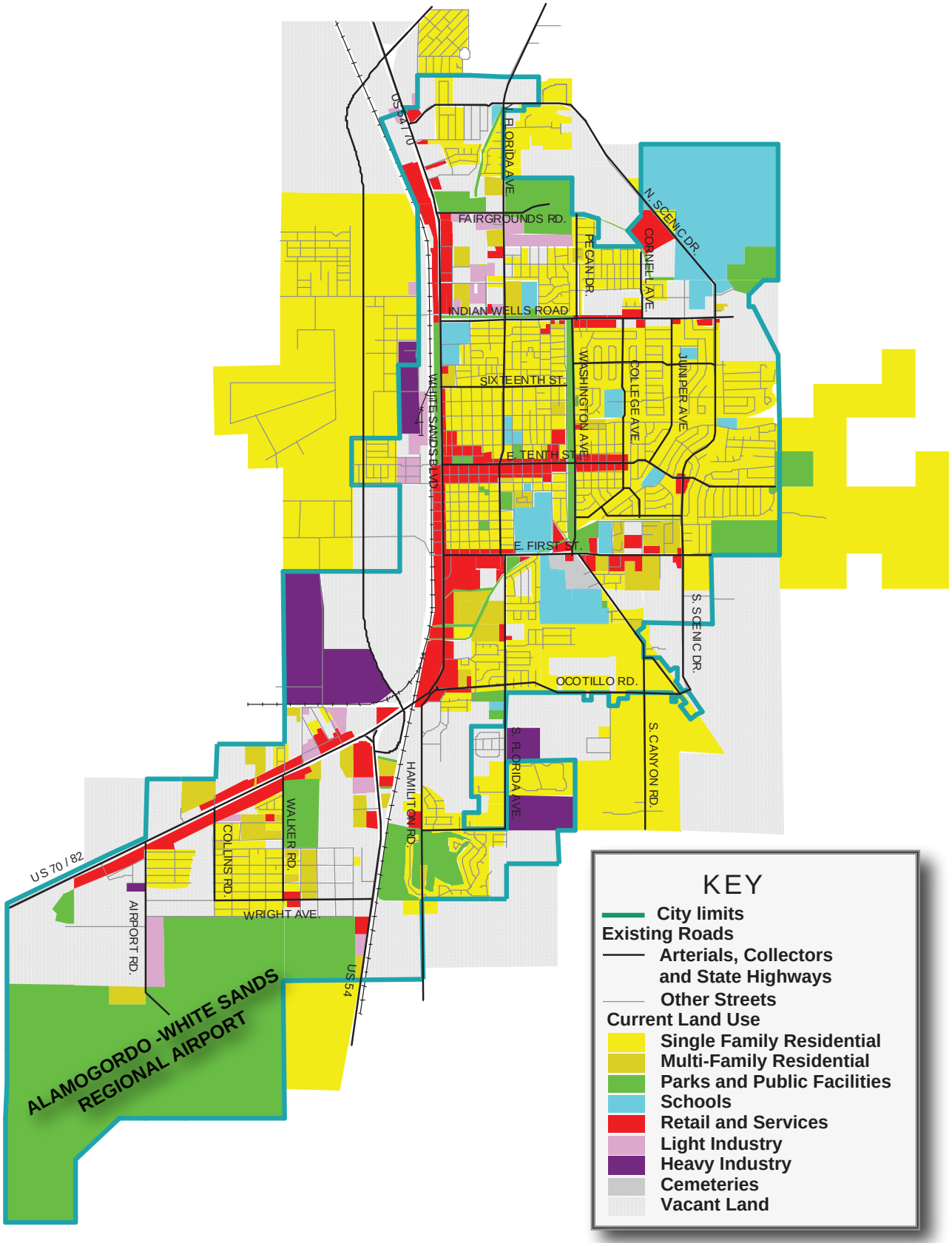
The Union Pacific Railroad has a north-south main line that runs from El Paso, Texas, generally paralleling U.S. Highway 54 through Alamogordo and continuing northeast to Amarillo, Texas and points beyond. There is no direct rail access to the Airport.

Air Freight

UPS and FedEx currently have daily, morning scheduled air freight operations at ALM.

Industrial Parks and Foreign Trade Zones

A long narrow area west of White Sands Boulevard is zoned for industrial use. The landfill site portion of this area is limited for redevelopment. However, the remaining land represents prime industrial acreage. Low impact industrial and manufacturing uses have been targeted for this area. The area north of and including the Alamogordo-White Sands Regional Airport is also considered a prime industrial area.



Alamogordo-White Sands
Regional Airport

Exhibit 10
ALM Area Land Use

Alamogordo-White Sands Regional Airport

Chapter Two

AVIATION DEMAND FORECASTS

CHAPTER TWO

AVIATION DEMAND FORECASTS

Introduction

An integral part of the Alamogordo-White Sands Regional Airport (ALM) Airport Master Plan Update is establishing the level of future aviation demand over the next twenty years. This Airport Master Plan Update will then evaluate options to best accommodate that projected aviation demand.

Identifying future aviation demand is a critical element in the overall planning process for an airport. The forecasting process establishes the demand, which ultimately defines an airport's ability or lack thereof to accommodate aircraft and operations and, thus determines the type, size, and timing of airside and landside facility development. Projections of aviation demand were prepared for the Alamogordo-White Sands Regional Airport Master Plan Update for the 20-year period through the year 2033.

The assumptions and historical data underlying these updated projections are documented in this chapter, which is organized as follows:

- Industry Trends
- Forecast Assumptions
- Socioeconomic Review
- Forecast Methodologies
- General Aviation Activity
- Aviation Peaking Characteristics
- Military ActivitInstrument Operations
- Commercial Air Service
- Summary of Forecast Aviation Demand

Industry Trends

Current and future trends within the general aviation industry may impact the demand for general aviation facilities and services, which represent the basic component of overall aviation demand at ALM. An understanding of these recent and current industry trends is helpful in identifying the future demand for this component of aviation activity. The changing patterns in the business use of general aviation aircraft is also an important element of general aviation trends.

This section presents trends for the U.S. and to the extent possible, for the New Mexico and Alamogordo area. These trends are intended to provide a general frame of reference. Their analysis provides an understanding of how aviation activity within the region compares to aviation activity throughout the country. This analysis also establishes a basis for predicting how aviation activity may be expected to develop in the future. This frame of reference is essential when identifying potential activity scenarios for the Airport.

National General Aviation Activity Trends

General aviation aircraft comprise all aircraft not flown by the airlines or the military. The general aviation industry experienced a decline that lasted throughout most of the 1980s and into the mid-1990s. The number of active aircraft, hours flown, and active pilots all experienced annual declines during this downturn. A drastic reduction in new aircraft production from almost 18,000 in 1978 to a low of 928 in 1994 also resulted in the loss of approximately 100,000 general aviation industry jobs.

Enactment of the General Aviation Revitalization Act of 1994 represented a turning point for general aviation. This legislation established an 18-year Statute of Repose on all general aviation aircraft and components. This Statute of Repose limited a manufacturer's potential liability for aircraft accidents to 18 years, where previously there was no time limit for liability. The legislation spurred manufacturers including Cessna, Piper Aircraft, and others to re-enter the domestic single-engine manufacturing sector with new aircraft.

The positive effects the Act has had on the general aviation industry are borne out in general aviation activity statistics since its passage. Activity data reflect an increase in general aviation activity at FAA air traffic facilities, an increase in the size of the active general aviation aircraft fleet, and growing shipments and billings for fixed-wing general aviation aircraft, all since the legislation's passage in 1994.

These upward trends were slowed by a recessionary U. S. economy after the turn of the century and the residual impacts of the terrorist attacks of September 11, 2001. Restrictions were imposed on general aviation activity following September 11th but have since been lifted. Business and corporate general aviation benefited from the heightened security measures implemented at all commercial service airports. New security measures at these airports spurred increased corporate use of general aviation. Businesses and corporations increasingly turned to corporate or fractional aircraft ownership and charter services to meet their air travel needs because of time savings and security concerns.

The impacts of recent new security requirements on general aviation activity imposed in the spring of 2009 have yet to be determined and may affect future demand.

General aviation activity trends identified in the ***FAA Aerospace Forecasts 2012-2032*** and identified by industry organizations are discussed in subsequent sections of this chapter. These trends reflect the number of aircraft shipments and billings, active aircraft and pilots, changes in the active aircraft fleet mix, and business use of general aviation aircraft.

Aircraft Shipments

The General Aviation Manufacturers Association (GAMA), a trade organization representing manufacturers within the aviation industry, tracks and reports total shipments and billings of general aviation aircraft. **Table 5** presents the historical breakdown of aircraft shipments for the period 2000-2011. **Exhibit 11** graphically depicts the trend in these general aviation aircraft shipments since the year 2000. These statistics and the associated exhibit reflect the fluctuations in general aviation aircraft shipments. From 2000 through 2002, aircraft shipments declined in association with the worldwide economic downturn during that period. From 2002 through 2007, general aviation aircraft shipments grew as the world economy began to recover. However, total general aviation aircraft shipments then declined from their high of 4,276 in 2007 to the most recent 2011 level of 1,865 or approximately 57.0 percent, reflecting the continuing effects of the worldwide economic slowdown that began in 2008.

TABLE 5
WORLDWIDE GENERAL AVIATION AIRCRAFT SHIPMENTS

Year	Piston Aircraft			Turbine			Grand Total	% Change
	Single-Engine	Multi-Engine	Total	Turbo-Prop	Turbojet/ Turbofan	Total		
2000	1,877	103	1,980	415	752	1,167	3,147	-
2001	1,645	147	1,792	422	784	1,206	2,998	- 4.7
2002	1,591	130	1,721	280	676	956	2,677	- 10.7
2003	1,825	71	1,896	272	518	790	2,686	0.3
2004	1,999	52	2,051	319	591	910	2,961	10.2
2005	2,326	139	2,465	375	750	1,125	3,590	21.2
2006	2,513	242	2,755	412	886	1,298	4,053	12.9
2007	2,417	258	2,675	465	1,136	1,601	4,276	5.5
2008	1,943	176	2,119	538	1,313	1,851	3,970	-7.2
2009	893	70	963	446	870	1,316	2,279	-42.6
2010	781	108	889	368	763	1,131	2,020	-11.4
2011	739	121	860	324	681	1,005	1,865	-7.7

Source: GAMA 2011 General Aviation Statistical Databook.
URS Corporation analysis, 2013.

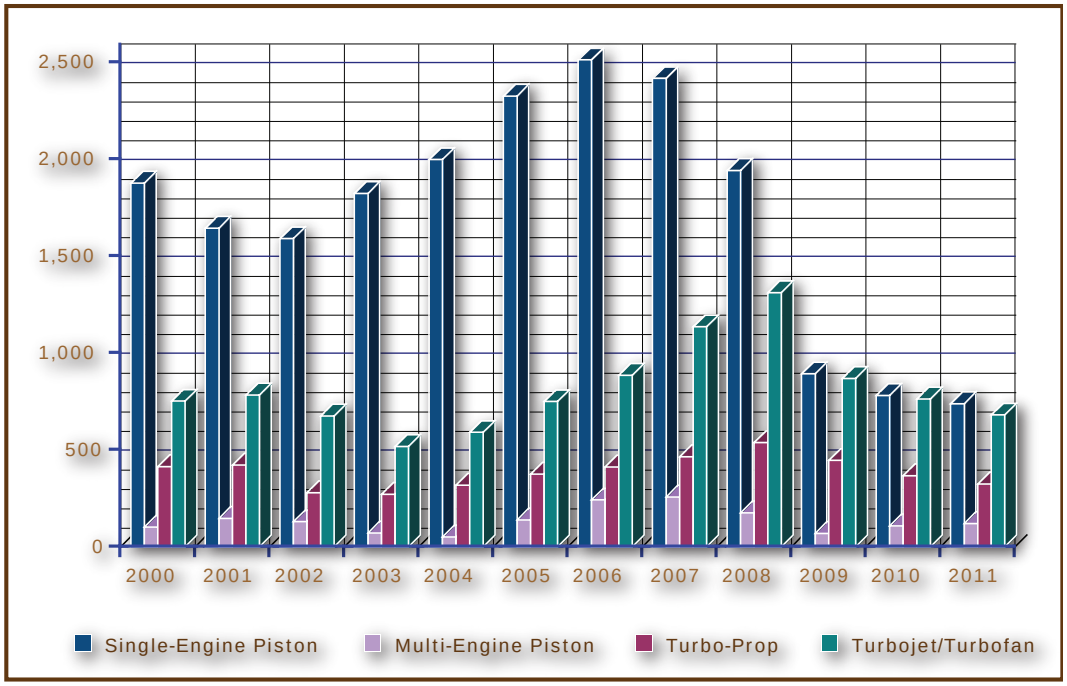


EXHIBIT 11
HISTORICAL AIRCRAFT SHIPMENTS

These GAMA data reflect the close correlation between aircraft shipments and worldwide economic conditions. A number of factors contribute to general aviation aircraft shipments in addition to economic conditions. These factors include the introduction of new aircraft, the general strength of the U.S. and world economies, the increasing number of fractional aircraft ownership arrangements, and increasing use and expansion of traditional corporate flight departments by businesses both in the U.S. and overseas.

Active Pilots

Table 6 presents the FAA's historical and forecast annual totals of the active pilot population from 2000 through 2030. Of the four major segments of the pilot population - student, private, commercial, and airline transport, all except Air Transport and Other pilots experienced declines in 2010. In July 2011, the FAA issued a rule that increased the duration of student pilot certificates validity for pilots under the age of 40 from 36 to 60 months. This resulted in the increase in active student pilots to 119,119 from 72,280 at the end of 2009. However, the FAA has projected that the number of active Student pilots will actually decrease through 2030. The number of Private pilots peaked at 251,561 in 2000 and has steadily declined through 2011. This trend is projected to continue through 2030. Commercial pilots peaked at 125,783 in 2009 and declined in 2010 and 2011. This downward trend is projected to continue through 2022 with marginal growth thereafter. Airline Transport pilots have increased only slightly since 2000, with marginal growth projected through 2030. Rotorcraft pilots have exhibited study growth in numbers since 2000, with this trend continuing through 2030. Other pilots (Sport, Recreational, etc.) have grown significantly since 2002 and will continue to do so through 2030

A variety of factors affect the number of active pilots. The overall aging of the U.S. population has had an impact on the number of pilots. The negative perception of the aviation industry as a career option and the increasing cost of obtaining a pilot's license due largely to the rising cost of fuel have also affected the active pilot population. Conversely, with the draw down of the troops in Iraq many qualified aviators could be entering the commercial pilot market.

The FAA has developed their forecasts of the future pilot population, by certificate type, based on both historic trends and anticipated future trends. The FAA forecasts project that the total active pilot population in the U.S. will increase from 617,128 in 2011 to 659,575 by 2030, representing an average annual growth rate of approximately 0.35 percent.

The rotor and other categories of pilots are forecast to experience the strongest growth over the forecast period with average annual growth rates of 2.96 and 1.64 percent each respectively. The populations of Private, Commercial, and Airline Transport category pilots are forecast to increase at an average annual rate ranging from 0.08 percent to 0.54 percent over the forecast period.

Exhibit 12 graphically compares the average annual growth rates forecast for each pilot type during the period 2012 to 2030. The data illustrated in this exhibit show negative growth for the Student pilot category with an average annual rate of decline of 0.14 percent and strong growth for Rotor pilots and the Other category, ranging from an average annual rate of 2.96 percent for rotorcraft and 1.64 percent for Other percent. The decline in growth anticipated in the student pilot category is important as this group will ultimately have the greatest overall impact on future general aviation activity. Student pilots ultimately become active private, commercial, airline transport, and/or rotor pilots, who will sustain the general aviation industry in the future.

U. S. General Aviation Aircraft Fleet

The FAA also tracks the number of active aircraft in the U.S. fleet. Active aircraft are those aircraft that have current registrations and are flown at least one hour during the year. The FAA is able to identify trends

TABLE 6
HISTORICAL AND FORECAST ACTIVE PILOTS

Year	Active Pilots						
	Students	Private	Commercial	Airline Transport	Rotor	Other	Total
HISTORIC							
2001	86,731	243,823	120,502	144,702	7,727	8,789	612,274
2002	85,991	245,230	125,920	144,708	7,770	22,143	631,762
2003	87,296	241,045	123,990	143,504	7,916	21,260	625,011
2004	87,910	235,994	122,592	142,160	8,586	21,391	618,633
2005	87,213	228,619	120,614	141,992	9,518	21,781	609,737
2006	84,866	219,233	117,610	141,935	10,690	22,775	597,109
2007	84,339	211,096	115,127	143,953	12,290	23,544	590,349
2008	80,989	222,596	124,746	146,838	14,647	23,930	613,746
2009	72,280	211,619	125,738	144,600	15,298	24,750	594,285
2010	119,119	202,020	123,705	142,198	15,377	25,169	627,588
2011	118,657	194,441	120,865	142,511	15,220	25,434	617,128
AAGR 2001-11	3.7%	-2.3%	0.0%	0.1%	6.5%	14.2%	-0.1%
FORECAST							
2012	117,340	193,000	119,200	142,500	15,225	26,195	613,460
2013	116,140	192,200	114,250	143,100	15,365	26,980	608,035
2014	115,050	191,300	118,600	143,700	15,630	27,300	611,580
2015	114,115	190,550	118,950	144,500	16,000	27,640	611,755
2016	113,335	189,800	119,000	145,200	16,445	28,005	611,785
2017	112,765	189,250	119,050	145,900	16,955	28,395	612,315
2018	112,370	188,850	119,200	146,600	17,550	28,780	613,350
2019	112,105	188,750	119,450	147,400	18,150	29,220	615,075
2020	111,950	188,800	119,750	148,100	18,800	29,635	617,035
2021	111,820	189,100	120,150	148,900	19,450	30,070	619,490
2022	111,860	189,600	120,650	149,800	20,100	30,505	622,515
2023	111,960	190,300	121,250	150,700	20,800	30,945	625,955
2024	112,225	191,250	122,000	151,600	21,550	31,410	630,035
2025	112,685	192,250	122,750	152,600	22,300	31,895	634,480
2026	113,230	193,250	123,550	153,600	23,100	32,430	639,160
2027	113,830	194,300	124,450	154,700	23,900	32,965	644,145
2028	114,430	195,400	125,450	155,700	24,750	33,500	649,230
2029	114,965	196,300	126,500	156,800	25,600	34,070	654,235
2030	115,520	197,350	127,600	158,000	26,450	34,655	659,575
AAGR 2012-30	-0.1%	0.1%	0.3%	0.5%	3.0%	1.6%	0.4%

Source: FAA U.S. Civil Airmen Statistics.
URS Corporation analysis, 2013.
Note: An active pilot is a person with a pilot certificate and a valid medical certificate.
AAGR = average annual growth rate
E = Estimate

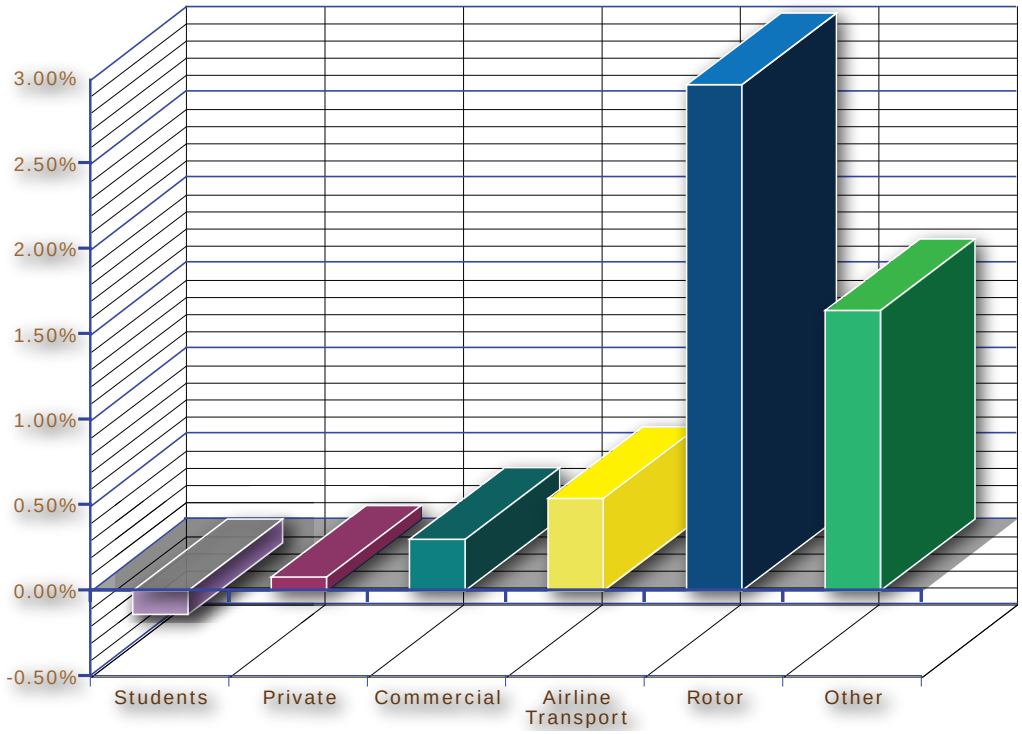


Exhibit 12
Average Annual Aircraft Growth Rate Comparison

in the total number of active aircraft and the types of aircraft operating in the active fleet by tracking this information. **Table 7** presents a summary of the historical (2005-2012) general aviation fleet and general aviation forecasts for the United States for the years 2013-2030. **Exhibit 13** presents a graphic depiction of the FAA's forecast average annual growth rates of the aircraft in the general aviation fleet during the 2012-2030 period.

This graphic illustrates that Turbojet and Rotorcraft aircraft are expected to experience the highest average annual growth rates of approximately 4.1 and 3.0 percent per year respectively. The Sport Aircraft, Piston Rotorcraft, and Experimental, and Turboprop aircraft categories are forecast to average 2.1, 2.0, 1.2, and 0.9 percent growth respectively. Single- and Multi-Engine Piston aircraft as well as Other aircraft are forecast to decline in numbers during the forecast period with negative growth rates of 0.1, 0.5, and 0.1 percent per year respectively

The total general aviation aircraft fleet declined during the period 2005-2011 as shown on Table 7 from more than 224,257 aircraft in 2005 to an estimated 222,520 aircraft in 2011. This table also shows the decline in the numbers of single and multi-engine piston aircraft since 2005.

Many of the single and multi-engine piston aircraft in the current fleet have been in service for a significant length of time. Single and multi-engine piston aircraft production has declined drastically since its peaks in the 1970s. As older piston engine aircraft are retired from the fleet, the numbers of new replacement aircraft entering the fleet have not kept pace. In addition, as the economies of countries overseas have developed, many existing and new aircraft have found their way into the export market, further reducing the size of the

TABLE 7
FAA HISTORICAL AND FORECAST GENERAL AVIATION AIRCRAFT FLEET

Year	Fixed Wing						Rotorcraft			Experimental	Sport Aircraft	Other	Total General Aviation Fleet
	Piston			Turbine									
	Single Engine	Multi-Engine	Total	Turbo Prop	Turbo Jet	Total	Piston	Turbine	Total				
Historic													
2005	148,101	19,412	167,513	7,942	9,823	17,765	3,039	5,689	8,728	23,627	170	6,454	224,257
2006	145,036	18,708	163,744	8,063	10,379	18,442	3,264	5,895	9,159	23,047	1,273	6,277	221,942
2007	147,569	19,337	166,906	9,514	10,385	19,899	2,769	6,798	9,567	23,228	6,066	5,940	231,606
2008	145,497	17,515	163,012	8,907	11,042	19,949	3,498	6,378	9,876	23,364	6,811	5,652	228,664
2009	140,649	16,474	157,123	9,055	11,268	20,323	3,499	6,485	9,984	24,419	6,547	5,480	223,876
2010	139,519	15,900	155,419	9,369	11,484	20,853	3,588	6,514	10,102	24,784	6,528	5,684	223,370
2011	138,560	15,810	154,370	9,430	11,760	21,190	3,685	6,725	10,410	24,225	6,645	5,680	222,520
AAGR 2001 - 2011	-0.44%	-1.28%	-0.54%	3.88%	4.33%	4.01%	5.70%	4.46%	4.56%	1.83%	n/a	-1.45%	0.54%
Forecast													
2012	137,600	15,735	153,335	9,505	12,050	21,555	3,780	6,940	10,720	24,480	6,930	5,670	222,690
2013	136,650	15,660	152,310	9,570	12,410	21,980	3,875	7,165	11,040	24,810	7,180	5,665	222,985
2014	135,790	15,615	151,405	9,645	12,835	22,480	3,975	7,415	11,390	25,170	7,365	5,655	223,465
2015	135,010	15,570	150,580	9,720	13,340	23,060	4,075	7,675	11,750	25,500	7,530	5,650	224,070
2016	134,285	15,500	149,785	9,795	13,880	23,675	4,165	7,930	12,095	25,835	7,690	5,640	224,720
2017	133,650	15,425	149,075	9,870	14,470	24,340	4,250	8,180	12,430	26,165	7,845	5,635	225,490
2018	133,090	15,340	148,430	9,950	15,060	25,010	4,335	8,435	12,770	26,500	8,000	5,630	226,340
2019	132,645	15,260	147,905	10,030	15,650	25,680	4,420	8,685	13,105	26,830	8,160	5,625	227,305
2020	132,335	15,175	147,510	10,120	16,265	26,385	4,505	8,940	13,445	27,160	8,315	5,615	228,430
2021	132,125	15,090	147,215	10,205	16,915	27,120	4,590	9,200	13,790	27,490	8,470	5,610	229,695
2022	132,010	15,010	147,020	10,300	17,620	27,920	4,680	9,465	14,145	27,825	8,630	5,605	231,145
2023	131,975	14,935	146,910	10,400	18,370	28,770	4,775	9,745	14,520	28,155	8,785	5,600	232,740
2024	132,015	14,875	146,890	10,515	19,170	29,685	4,875	10,040	14,915	28,490	8,940	5,590	234,510
2025	132,150	14,815	146,965	10,625	20,020	30,645	4,975	10,345	15,320	28,820	9,100	5,585	236,435
2026	132,370	14,745	147,115	10,740	20,865	31,605	5,075	10,650	15,725	29,150	9,255	5,580	238,430
2027	132,660	14,680	147,340	10,860	21,760	32,620	5,180	10,965	16,145	29,480	9,410	5,575	240,570
2028	133,020	14,610	147,630	10,975	22,700	33,675	5,285	11,275	16,560	29,815	9,570	5,570	242,820
2029	133,470	14,540	148,010	11,090	23,690	34,780	5,390	11,590	16,980	30,145	9,725	5,560	245,200
2030	134,000	14,470	148,470	11,205	24,730	35,935	5,495	11,905	17,400	30,480	9,880	5,555	247,720
AAGR 2012-2030	-0.12%	-0.47%	-0.15%	0.92%	4.09%	2.90%	2.09%	3.03%	2.71%	1.22%	1.97%	-0.11%	0.62%

Source: FAA Aerospace Forecasts, 2012-2030
Note: An active aircraft is one that has a current registration and was flown at least one hour during the calendar year.

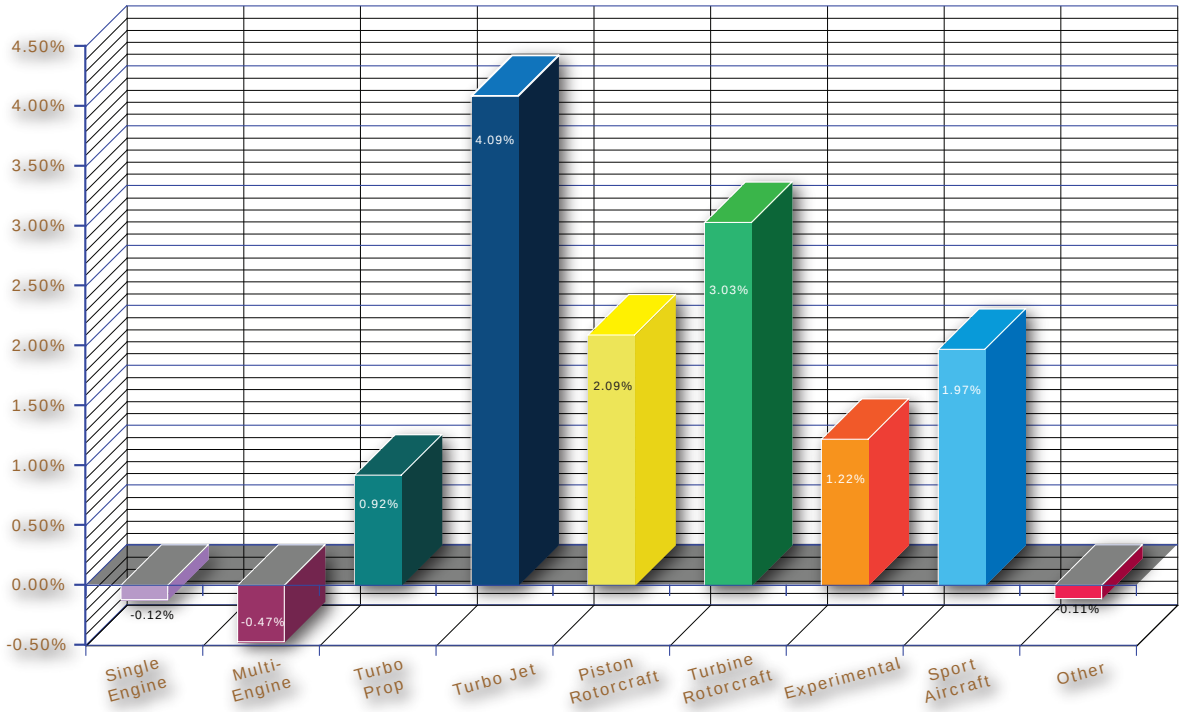


Exhibit 13
Average Annual Fleet Growth Rate Comparison

U.S. aircraft fleet. The increasing demand for general aviation aircraft worldwide has resulted in a significant increase in the value of older aircraft in the fleet.

The corporate aviation segment of general aviation has experienced a significant period of expansion, which became more pronounced after the events of September 2001. Single engine and multi-engine piston aircraft and rotorcraft in the corporate aviation segment of GA are typically used for travel over shorter distances. Many corporations have nationwide and worldwide operations that require aircraft capable of traveling longer distances in all weather conditions in the shortest period of time. Turbine aircraft provide the range, operational flexibility, and speed required by these organizations. Turbine aircraft ownership also represents a significant initial and on-going investment in terms of initial purchase price and ongoing operating and maintenance expenses. Therefore, only organizations and individuals with sufficient financial resources can afford to purchase and operate these aircraft.

The numbers of turbo-prop and turbo-jet aircraft, which are typically associated with the corporate aircraft market, have increased significantly during the 2005-2011 time frame. The number of turbo-prop aircraft increased from 7,942 in 2005 to an estimated 9,430 in 2011 while the number of turbo-jet aircraft increased from 9,823 in 2005 to an estimated 11,760 in 2011. The average annual rate of growth for turbo-prop and turbo-jet aircraft during the 2005-2011 period was 2.9 percent and 3.0 percent respectively.

Table 8 compares the estimated 2011 and forecast 2030 aircraft fleet mix for each aircraft type and the respective percentage each type represents of the existing and forecast fleet totals. Single-engine piston aircraft comprise the majority of active aircraft in the current fleet representing 62.3 percent of the 2011 fleet. In

the year 2030, it is anticipated that the percentage of single-engine piston aircraft will decline to approximately 54.8 percent of the active fleet. As older aircraft are retired it is anticipated they will be replaced with more demanding general aviation aircraft. **Exhibit 14** graphically illustrates the forecast aircraft fleet mix in the year 2030 as tabulated in Table 8.

TABLE 8
EXISTING AND FUTURE FLEET COMPARISON

Aircraft Category	2011		2030	
	Units	Percent	Units	Percent
Multi Engine Piston	15,810	7.1%	14,470	5.1%
Jet	11,760	5.3%	24,730	9.9%
Turboprop	9,430	4.2%	11,205	4.5%
Rotorcraft	10,410	4.7%	17,400	6.4%
Single Engine Piston	138,560	62.3%	134,000	54.8%
Experimental	24,225	10.9%	30,480	12.2%
Sport	6,645	3.0%	9,880	5.1%
Other	5,680	2.6%	5,555	2.0%
Total	222,520	100.0%	247,720	100.0%

Source: FAA Aerospace Forecast 2012-2030
URS Analysis 2012

The National Business Aircraft Association (NBAA) represents many of the nation's employers who use general aviation as a business tool. NBAA data show that approximately 70 percent of all Fortune 500 businesses operate general aviation aircraft while 90 percent of the Fortune 100 companies operate general aviation aircraft.

Business use of general aviation aircraft ranges from small, single-engine aircraft rental up to corporate aircraft fleets with multiple bases supported by dedicated flight crews and mechanics. General aviation aircraft enable employers to transport personnel and air cargo, link office locations, and reach existing and potential new customers. Smaller companies have expanded their use of business aircraft through a variety of options including: chartering, leasing, time-sharing; interchange agreements, partnerships, and management contracts.

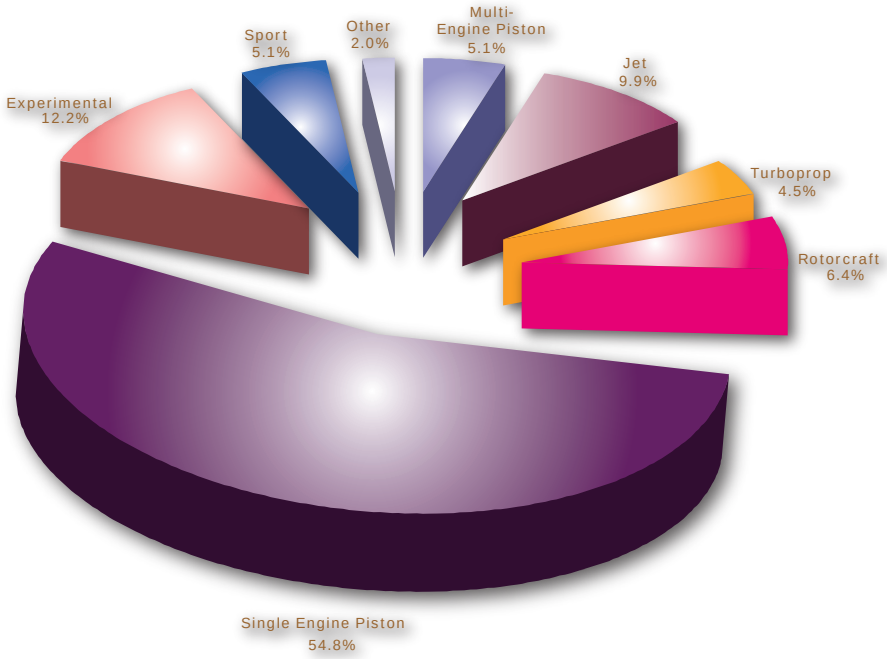


EXHIBIT 14
FUTURE GA FLEET COMPOSITION

New Mexico and Alamogordo Area Trends

Alamogordo-White Sands Regional Airport supports the local community by providing convenient air transportation to both businesses and individuals in the local community and surrounding areas. In addition to local and regional businesses, national and international businesses must be able to move people and products safely, quickly, and conveniently to remain competitive. ALM's location with respect to both the City of Alamogordo and Holloman Air Force Base combined with the range of facilities available, facilitates commerce between the regional area and communities throughout New Mexico and the U.S.

Aircraft manufacturers are introducing longer-range jet aircraft as increasing numbers of businesses rely on general aviation aircraft, with their flexibility and efficiency, to support domestic and international business operations. These aircraft require increasingly more sophisticated services and facilities to perform efficiently. ALM provides the services and facilities needed to accommodate these aircraft and their operators.

The close proximity of Holloman Air Force Base with a large and active military pilot population most likely has had a not insignificant influence on aviation activity at ALM. In addition, it has been noted that many military personnel who have been stationed at Holloman have returned to the Alamogordo area after retiring and many of these retirees have continued their aviation activities at ALM.

As noted in the Inventory chapter, the United States Forest Service contracts with a number of third party vendors who operate a sizeable air tanker operation for fighting fires in the south and southwestern United States. Aircraft used for fire-fighting activities are contracted from Neptune Aviation and Minden Air Corporation. During traditional fire-fighting season, which runs from approximately March through August, ALM is one of the main staging airports for USFS fire-fighting operations. The USFS in Alamogordo coordinates air tanker operations in the area together with Roswell International Air Center (ROW), which is only open during fire-fighting season. Though many of the operations are focused on the nearby Lincoln National Forest, aircraft are commonly called in to fight fires as far away as East Texas.

Minden Air Corporation owns and operates two P-2V Neptunes and two BAe-146 aircraft. These aircraft are based at the Minden-Tahoe Airport located in Minden, Nevada. The company plans to transition to the BAe-146 as their primary fire-fighting aircraft.

The primary aircraft currently used by Neptune Aviation are Korean War-era twin piston engine P-2V Neptunes, which have been rebuilt and have a retrofitted tank with a carrying capacity of 2,700 gallons. (The capacity of these tanks have been limited for fire-fighting purposes to 2,082 gallons of retardant.) Neptune Aviation currently operates a maintenance and training facility for the 8 P-2V aircraft in their fleet at the north end of ALM. During the winter and spring months Neptune participates in several hundred training and maintenance operations for their P-2Vs. These aircraft are not currently based at ALM.

Neptune Aviation also owns four BAe-146, four-engine turbofan aircraft (as of January 2013); with one more expected in the first half of 2013. The company plans to have a total of eleven BAe-146 aircraft in their fleet by 2016. These aircraft have a tank capacity of 3,000 gallons. As these aircraft enter service, space constraints at their Missoula, MT. headquarters will necessitate relocation of the P-2V fleet. ALM is expected to be the new maintenance base for the remaining P2Vs, since it is the only other P-2V facility operated by Neptune Aviation. Much of the planned growth at the Alamogordo Neptune station is contingent on the acquisition of the Certified Repair Station certification for the P-2Vs, which would allow heavy maintenance to be completed at ALM. As of August 2012, this application for certification has been submitted to the FAA, and is currently under review.

The USFS has two 12,000 gallon slurry tanks, and three pits that can be used to fill aircraft tanks, as well as a regional dispatch and logistics coordination center. Due to a lack of metering equipment, only one pit is currently being used at a time. While this reduces the rate at which aircraft can be dispatched, there are no immediate infrastructure concerns for the USFS on-site base.

According to USFS staff in Alamogordo, during the busiest days of the fire-fighting season, close to 100 operations a day are not unheard of, though the seasonal average is closer to 15. The potential exists, after P-2V fleet relocation, for the number of air tanker operations to increase considerably, particularly during the low season.

Runway length is the one primary infrastructure concern that needs immediate attention. The BAe-146, with a Maximum Takeoff weight (MTOW) in July mean temperatures, requires in excess of 10,000 feet of runway. While aircraft on these types of missions seldom operate with full fuel loads, weather conditions and minimum fuel requirements, in conjunction with the current 7,002-foot runway length often result in a slurry capacity reduction. With this reduction, the operation's efficiency is also reduced, requiring more trips and/or more aircraft to deliver the same amount of slurry to the fires. Although the BAe-146 aircraft will not be based in Alamogordo (maintenance will be carried out in Missoula, MT), any aircraft can be dispatched to any fire. The BAe-146 has already seen action in Alamogordo, and will continue to do so on a regular basis. It should, therefore, be a priority of the airport to extend Runway 3-21 to accommodate the BAe-146 at its MTOW.

Forecast Assumptions

The development of aviation demand forecasts requires an awareness of those variables that affect the aviation industry including: stability within the economy, which provides consumer confidence to purchase goods and services and business confidence to invest and grow; economic recessions that tend to suppress consumer confidence and often reduce purchasing power and growth and development within the industry; and economic recoveries that result in increased purchasing power for the average consumer and confidence of businesses to invest in development.

The U. S. experienced economic expansion that began in mid 1991 and resulted in relative economic stability that continued through 1999. The rate of growth in discretionary purchases including air travel was a result of this economic expansion and subsequent stability. Rising corporate profits also resulted in higher levels of business travel, while improving the potential for increased business and corporate ownership of general aviation aircraft.

During 2000, the U. S. and world economy started to experience an economic slump, which was exacerbated by the aftermath of the September 11, 2001 terrorist attacks. The U.S. and world economies began a slow recovery that resulted in relative stability and even growth in the economy during 2003, which lasted until the latter part of 2006, when the effects of the boom in the U.S. housing market and problematic lending practices caused a slowdown in the national economy.

The impact of the financial downturn in 2008 and 2009 drastically curtailed consumer demand for everything, including air travel, both commercial and business/corporate. The financial climate and high fuel costs through 2010 resulted in airlines downsizing and re-thinking their routes and frequencies. Many smaller communities that previously were served by the commercial carriers, including Alamogordo, have lost service completely or seen their service drastically reduced. At the same time, businesses have reduced costs across the board to survive the uncertain market conditions. The reductions by commercial carriers has led to even greater use of corporate aviation as additional commercial routes have been eliminated or changed resulting

in fewer non-stop flights and decreased frequencies. On-going economic uncertainties must stabilize and then recover in order for general aviation to see a significant upturn in demand.

Assumptions and factors used in the development of the general aviation based aircraft forecasts for ALM include:

- The long-term relationships inherent in the models used to predict aviation demand before September 11, 2001 essentially have not changed.
- Passenger security concerns have affected mode of carriage choices and increased demand for corporate jet and on-demand charter services.
- Aviation fuel is expected to remain available throughout the 20-year study period and it is assumed the price of fuel will continue to increase over the forecast period.
- The production of general aviation aircraft is expected to continue growing over the planning period and a sufficient supply of these aircraft will be available to satisfy consumer demands.
- Private aircraft ownership will continue to slow due to the cost of owning and operating new aircraft resulting in higher utilization of existing aircraft and an overall increase in the level of operation for those aircraft.
- Corporate general aviation aircraft ownership is expected to continue increasing during the forecast period resulting from increased corporate aircraft ownership and growth in fractional jet aircraft ownership.
- Aircraft operational activity will remain consistent with projections stated in FAA regional forecasts and terminal area forecasts.
- Aircraft basing will initially be constrained by the loss of aircraft storage facilities, then return to levels consistent with projections stated in FAA regional forecasts and terminal area forecasts.
- The population, employment, income per capita, and household income for Alamogordo, and Otero County will continue to show positive gains in future years.

Socioeconomic Review

Local socioeconomic conditions, or demographics, play a considerable role in the demand for air transportation services. Therefore, an examination of local socioeconomic conditions was undertaken to determine whether current trends in social and economic indicators show a stronger or weaker demand for air transportation services in the future. Three key socioeconomic indicators were examined and include population, per capita personal income, and employment. Experience has shown that these indicators can provide insight into the financial strength and well-being of the local economy and historically correlate closely with the level of passenger activity and aircraft ownership at any given airport.

Population and employment statistics assist in understanding the number of people and their ability to fulfill the employable positions that exist with businesses in the area. Both of these socioeconomic indicators also give an indication of stability with respect to the cost of living, commerce, and industry. Per capita personal income reflects the average annual monetary wage per head of household. High per capita personal income in an area is usually a good indicator for greater aviation demand because higher income populations are more likely to own and fly aircraft.

The appropriate geographic area to examine socioeconomic conditions in the ALM service area is Otero County, New Mexico, which consists of the following cites/villages/census-designated places/communities: Alamogordo, Cloudcroft, Tularosa, Boles Acres, Holloman Air Force Base, La Luz, Mescalero, Timberon, High Rolls, Mountain Park, Newman, Sunspot, and Three Rivers. Data for population, per capita personal income, and employment are presented below.

Population

Aviation demand in a particular market can often be strongly correlated with population. Historical decennial census population data for Otero County, the City of Alamogordo and the State of New Mexico, from 1970 through 2010 are presented in **Table 9.** The University of New Mexico – Bureau of Business and Economic Research (BBER), Geospatial and Population Studies Group prepared the population projections out to the year 2040.

The population in Otero County and the City of Alamogordo experienced a significant increase from 1980 through 2000, and has slowed somewhat since. The state of New Mexico has experienced relatively high population growth since 1970, as a result of immigration and net in-migration from other states; placing it among the fastest growing states in the nation.

Over the next 30 years, both Otero County and the State of New Mexico are projected to grow at a slower rate compared to the previous 40 years. The BBER projections indicate that Otero County may experience a slight population decline by year 2040. (It should be noted that ANY projection or forecast beyond five years is generally considered less reliable than those for earlier years due to the dynamic nature of factors that ultimately dictate the forecast results.)

New Mexico's population growth rate is projected to slow over the next few decades.

Population growth in Otero County is projected to slow considerably over the next 30 years compared to the State of New Mexico. Unfortunately, the Bureau of Business and Economic Research does not prepare population projections for cities in the state.

TABLE 9
HISTORICAL AND PROJECTED POPULATION

Year	City of Alamogordo	Otero County	New Mexico
1970 [1]	23,035	41,097	1,016,000
1980 [1]	24,024	44,665	1,302,894
% change 1970 to 1980	*4.3%*	*8.7%*	*28.2%*
1990 [1]	27,596	51,928	1,515,069
% change 1980 to 1990	*14.9%*	*16.3%*	*16.3%*
2000 [1]	35,582	62,298	1,819,046
% change 1990 to 2000	*28.9%*	*20.0%*	*20.1%*
2010 [1]	40,933	63,797	2,059,179
% change 2000 to 2010	*15.0%*	*2.4%*	*13.2%*
2020 [2]	--	66,367	2,351,724
% change 2010 to 2020	*--*	*4.0%*	*14.2%*
2030 [2]	--	67,047	2,613,332
% change 2020 to 2030	*--*	*1.0%*	*11.1%*
2040 [2]	--	66,841	2,827,692
% change 2030 to 2040	*--*	*-0.3%*	*8.2%*

Sources: [1] U.S. Census Bureau, Decennial Census 1970 to 2010
[2] University of New Mexico – Bureau of Business and Economic Research, Geospatial and Population Studies Group – Population Projections for New Mexico and Counties. Updated 12-4-12.

Income

Income is another factor that can have a strong bearing on aviation demand. High income levels typically correlate with an increased propensity to use air travel. Per capita personal income for residents in Otero County, as well as the City of Alamogordo and the State of New Mexico, from 1970 through 2010 are presented in **Table 10**. Generally, income levels experienced a significant increase from 1970 through 1990, but then slowed over the last 20 years. However, the City of Alamogordo had a larger income increase compared to both Otero County and the State of New Mexico from year 2000 to year 2010.

TABLE 10
HISTORICAL PER CAPITA PERSONAL INCOME

Year	City of Alamogordo	Otero County	New Mexico
1970 [1]	--	2,438	2,437
1980 [1]	--	5,379	6,120
% change 1970 to 1980	--	*120.6%*	*151.1%*
1990 [2]	11,255	10,053	11,246
% change 1980 to 1990	--	*86.9%*	*83.8%*
2000 [2]	14,622	14,345	17,261
% change 1990 to 2000	*29.9%*	*42.7%*	*53.5%*
2010 [2]	22,414	20,067	23,537
% change 2000 to 2010	*53.3%*	*39.9%*	*36.4%*

Sources: [1] U.S. Census Bureau, USA Counties Censtats 1970 to 1980
[2] U.S. Census Bureau, Decennial Census 1990 to 2010

Per capita personal income for Otero County and the City of Alamogordo is generally lower than for the State of New Mexico. However, the historical growth rate has been similar to the state rate.

Employment

Employment levels in the airport service area can also provide valuable insight regarding the potential demand for aviation services. Historical employment levels from the U.S. Department of Labor, Bureau of Labor Statistics, Quarterly Census of Employment and Wages for the state of New Mexico, individual counties and Otero County, from 2001 through 2011 are presented in **Table 11**. An examination of the employment levels reveals a decline in employment levels in Otero County in 2006 that was followed by an increase in 2007. Since 2007, employment levels have experienced a steady decline within Otero county. This decline coincides with the downturn in the U.S. and New Mexico economy, resulting from the financial crisis that began in 2006. The State of New Mexico has experienced relatively more stable employment during this period compared to Otero County. This may be due to the relatively high and stable levels of employment within the government, educational, and medical fields, all of which have been growing as a percentage of total employment nationwide and traditionally show lower levels of fluctuation in employment levels.

The City of Alamogordo is the economic center of Otero County, with almost 65 percent of the Otero County population living within the city limits. Alamogordo is primarily supported by a service, retail, and tourism based economy, as well as the nearby Holloman Air Force Base. The City of Alamogordo is closely linked to Holloman Air Force Base and the White Sands Missile Range. These two facilities represent a combined military and civilian annual payroll of more than $200 million and an economic impact of more than $450 million to the local economy (http://www.alamogordo.com/military-information/). **Table 12** lists the top employers in the Alamogordo area. Holloman Air Force Base is the dominant employer. The next largest employers are concentrated in the educational, medical, and government sectors.

Employment data for Otero County and the City of Alamogordo suggests the area may be very susceptible to downturns in the national and local economy compared to the State of New Mexico. However, the largest

TABLE 11
HISTORICAL EMPLOYMENT

Area	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
New Mexico	729,422	737,418	745,935	760,449	778,233	807,063	821,484	825,736	791,509	781,694	781,226
Bernalillo	309,166	308,128	309,386	314,071	319,561	329,944	333,466	332,615	318,223	311,725	310,346
Catron	609	581	597	576	586	608	632	650	617	614	598
Chaves	20,962	20,989	21,087	20,671	21,098	22,136	22,314	22,246	21,964	21,348	21,307
Cibola	6,819	7,422	8,094	8,695	8,608	8,338	8,433	8,822	7,865	7,776	7,724
Colfax	5,580	5,607	5,704	5,584	5,438	5,280	5,323	5,351	5,135	5,044	5,065
Curry	14,015	14,601	15,169	15,607	16,034	16,449	16,702	16,830	16,845	16,764	16,748
De Baca	543	514	515	550	505	500	482	504	509	497	480
Dona Ana	57,675	59,841	61,405	62,552	65,191	66,860	67,818	69,105	67,759	69,187	69,109
Eddy	19,219	19,531	19,677	19,743	20,234	21,051	22,030	23,207	23,280	23,547	24,767
Grant	10,628	9,903	9,141	9,283	9,712	10,235	10,295	10,283	8,961	8,879	9,394
Guadalupe	1,266	1,262	1,236	1,276	1,296	1,458	1,383	1,314	1,337	1,276	1,280
Harding	157	169	176	175	161	158	176	191	183	174	175
Hidalgo	1,715	1,768	1,726	1,659	1,693	1,606	1,609	1,700	1,656	1,660	1,673
Lea	23,079	22,236	22,555	23,851	25,378	26,680	28,058	29,566	26,769	26,675	28,548
Lincoln	6,091	6,465	6,766	7,002	6,816	6,703	7,064	7,162	6,800	6,711	6,514
Los Alamos	8,637	8,978	9,159	9,160	8,916	14,589	18,016	16,989	16,753	17,073	16,686
Luna	7,172	7,502	7,988	7,901	8,332	8,141	8,147	8,030	7,543	7,584	7,669
McKinley	19,895	20,403	21,138	21,479	21,531	21,530	22,130	21,837	21,620	21,363	20,944
Mora	823	874	888	906	870	868	870	874	814	747	711
Otero	16,402	16,717	17,167	18,077	18,208	17,816	17,854	17,611	17,135	17,073	16,955
Quay	2,945	2,909	2,806	2,852	2,833	2,890	2,766	2,878	2,813	2,740	2,619
Rio Arriba	10,477	10,994	11,501	12,058	12,153	12,233	11,241	11,531	10,998	10,547	9,482
Roosevelt	5,690	6,314	6,633	6,718	6,688	6,723	6,876	6,975	6,309	6,447	6,265
Sandoval	25,978	25,132	24,677	25,886	27,114	29,243	29,350	29,843	29,221	29,114	29,239
San Juan	44,482	45,038	44,895	46,720	48,278	50,018	51,044	52,253	49,304	47,638	48,272
San Miguel	8,129	8,733	8,929	8,773	8,569	8,690	8,628	8,561	8,324	8,087	7,999
Santa Fe	57,987	58,731	60,201	61,038	62,857	63,898	65,908	65,710	61,775	60,538	60,477
Sierra	2,820	2,816	2,746	2,803	2,891	2,962	3,031	3,287	3,247	3,285	3,183
Socorro	4,560	4,869	4,998	5,134	5,420	5,435	5,512	5,635	5,527	5,403	5,355
Taos	9,995	10,653	10,697	10,677	10,885	11,218	11,374	11,258	10,817	10,449	10,295
Torrance	3,284	3,373	3,442	3,485	3,510	3,541	3,431	3,296	3,071	3,131	3,075
Union	1,318	1,358	1,368	1,335	1,336	1,356	1,338	1,427	1,343	1,264	1,284
Valencia	11,791	12,632	13,694	13,997	14,540	15,287	15,595	15,717	15,020	14,571	14,445

Source: U.S. Dept. of Labor, Bureau of Labor Statistics, Quarterly Census of Employment and Wages.
Table prepared by: Bureau of Business and Economic Research, University of New Mexico, December 2012.

employer (Holloman Air Force Base) has shown positive growth from the year 2000 to 2010, with an increase from 2,076 personnel to 3,054 personnel (U.S. Census Bureau 2000 and 2010).

TABLE 12
TOP EMPLOYERS NEAR ALAMOGORDO

Employer	Category
Holloman Air Force Base	Defense
White Sands Missile Range	Defense
German Air Force Flying Training Center	Defense
Alamogordo Public Schools	Education
Inn of the Mountain Gods	Mescalero Resort
Wal-Mart Super Center	Retail
Gerald Champion Regional Medical Center	Medical
ACS – Information Technology	Direct Line
City of Alamogordo	City Government
New Mexico State University-Alamogordo	Education
Otero County	County Government
NewTec	Defense
New Mexico School for the Blind and Visually Impaired	Education
Casa Arena Blanca	Nursing Home
Zia Therapy Center, Inc.	Community Services
Lowe's Grocery	Grocery Chain
Lowe's Home Improvement Warehouse	Retail
Home Depot	Retail
The Lodge at Cloudcroft	Cloudcroft Resort
First National Bank	Financial
Big K-Mart	Retail
PreCheck	Business Assistance

Source: *Otero County Economic Development Council (http://www.ocedc.com/leading-local-employers/)*

Summary

The socioeconomic data presented show that the Alamogordo and Otero County have experienced conservatively increasing socioeconomic characteristics since 2000. The study area is expected to maintain its economic base and should benefit from a relatively stable economic climate during the 20- year study period.

The study area, which has both a significant military component and a strong appeal to retirees, combined with the presence and expected growth of the U.S. Forest Service Fire-Fighting Base should be able to maintain current levels of general aviation activity with the potential for modest growth. Changes in aviation demand may also result from the relocation of new businesses to the area, the propensity of businesses and corporations to focus on corporate versus commercial flying, the cost of fuel, and the availability of facilities to accommodate future demand.

Forecast Methodologies

Aviation demand forecasts typically use a variety of statistical techniques that project demonstrated historical relationships between components of aviation demand and various socioeconomic characteristics of the study area and forecast or project those relationships into the future. These techniques include regression analysis, trend analysis, and market share analysis.

A number of intangible factors must also be considered in developing a final or "preferred" forecast, such as:

- Expected and anticipated changes in the local economic environment and the national economy;

- Impact of new local businesses; and
- Intended use of a particular forecast.

Forecasting of any type is not an exact science. Aviation demand forecasts rely on forecasts of the various socioeconomic variables and the relative accuracy of those forecasts. Forecast accuracy, as a general rule, tends to become less reliable beyond five years. Long-term forecasts beyond 5-10 years, provide general order-of-magnitude guidance and should be checked and updated to assess their continued relevance and to address any significant changes in the socioeconomic variables used in their formulation.

General Aviation Activity

General aviation activity at ALM has experienced relatively consistent growth in tandem with the local economy, various cost factors, consumer preferences, and regional, state, and national economic factors. The Airport can be expected to encounter periods of increasing and decreasing general aviation activity over the course of the 20-year study period. The forecasting process cannot realistically identify these inevitable fluctuations but it can establish reasonable overall trends in aviation activity.

Historical General Aviation Activity

Table 13 presents a summary of historical Airport activity at ALM since 2000. A review of Table 13, which was compiled from the 2012 FAA Terminal Area Forecast (TAF) reveals that general aviation operations have remained fairly consistent over the years, increasing somewhat since 2000. ALM had commercial service up until 2012, at which time that service ended. Commuter Enplanements declined during the period 2000 through 2012 when this service was terminated.

It should be noted that since ALM does not have an Airport Traffic Control Tower (ATCT) these airport activity data, other than for Commuter enplanements, are an estimate. Commuter aircraft enplanement data are more reliable since the commuter aircraft operators are required to maintain accurate records of their activity.

Aviation operations are divided into two categories classified as either local or itinerant operations. Local operations are those operations that occur in close proximity to the airport—typically within 20 nautical miles of the field. This generally means the airport remains within sight of the pilot or the aircraft is known to be departing to or arriving from a local flight training or practice area. Local operations are usually conducted by pilots in training or pilots working on their flying proficiency. Itinerant operations are those operations where the aircraft departs to or arrives from an airport outside the local area.

The split between Local and Itinerant operations has remained fairly consistent since 2000 with Itinerant operations showing a small decline during that period while Local operations have experienced a slight increase.

Based aircraft are those aircraft whose activities typically originate and terminate at ALM and the aircraft's primary place of storage is located at the Airport. The typical aircraft owner is an individual or business that resides or has a major operation or headquarters in the Alamogordo area near the Airport.

Detailed records of the historical number of based aircraft at ALM are limited. A variety of sources have been used to compile an overview of historical based aircraft, including previous airport planning studies, FAA 5010 Airport Master Records, FAA Regional Planning studies, the National Plan of Integrated Airport Systems (NPIAS), discussions with Airport management, as well as discussions with Exile Aviation, one of

TABLE 13
HISTORICAL AIRPORT OPERATIONS

Fiscal Year	Enplanements			AIRCRAFT OPERATIONS								Total Airport Operations
				Itinerant Operations					Local Operations			
	Air Carrier	Commuter	Total	Air Carrier	Air Taxi & Commuter	GA	Military	Total	Civil	Military	Total	
2000	0	2,202	2,202	0	2,900	10,000	800	13,700	20,000	0	20,000	33,700
2001	0	1,717	1,717	0	2,900	10,000	800	13,700	20,000	0	20,000	33,700
2002	0	1,126	1,126	2,400	500	10,000	800	13,700	20,000	0	20,000	33,700
2003	0	1,152	1,152	0	2,900	10,000	800	13,700	20,000	0	20,000	33,700
2004	0	602	602	0	2,900	10,000	800	13,700	20,000	0	20,000	33,700
2005	0	0	0	0	2,900	10,000	800	13,700	20,000	0	20,000	33,700
2006	0	0	0	0	2,900	10,000	800	13,700	20,000	0	20,000	33,700
2007	0	402	402	0	2,900	10,000	800	13,700	20,000	0	20,000	33,700
2008	0	256	256	0	2,900	10,000	800	13,700	20,000	0	20,000	33,700
2009	0	358	358	0	1,660	10,000	800	12,460	22,000	0	22,000	34,460
2010	0	406	406	0	1,660	10,000	800	12,460	22,000	0	22,000	34,460
2011	0	358	358	0	1,660	10,000	800	12,460	22,000	0	22,000	34,460
2012	0	260	260	0	1,660	10,000	800	12,460	22,000	0	22,000	34,460
2013	0	261	261	0	1,660	10,000	800	12,460	22,000	0	22,000	34,460

Source: FAA Terminal Area Forecast, 2012, URS Corporation Analysis, 2013.

the Fixed Base Operators at ALM. Currently (2013) there are seven multi-engine aircraft (four multi-engine piston and three multi-engine turbine) based at ALM, 85 single engine piston and one single engine turbine aircraft based at the Airport and two based helicopters for a total of 95 based aircraft. The number of aircraft based at ALM has experienced relatively steady growth over the years based on the historical compilation of based aircraft derived from the various sources noted previously. This growth is in contrast to many other small airports around the country where the numbers of based general aviation aircraft have remained stagnant or declined.

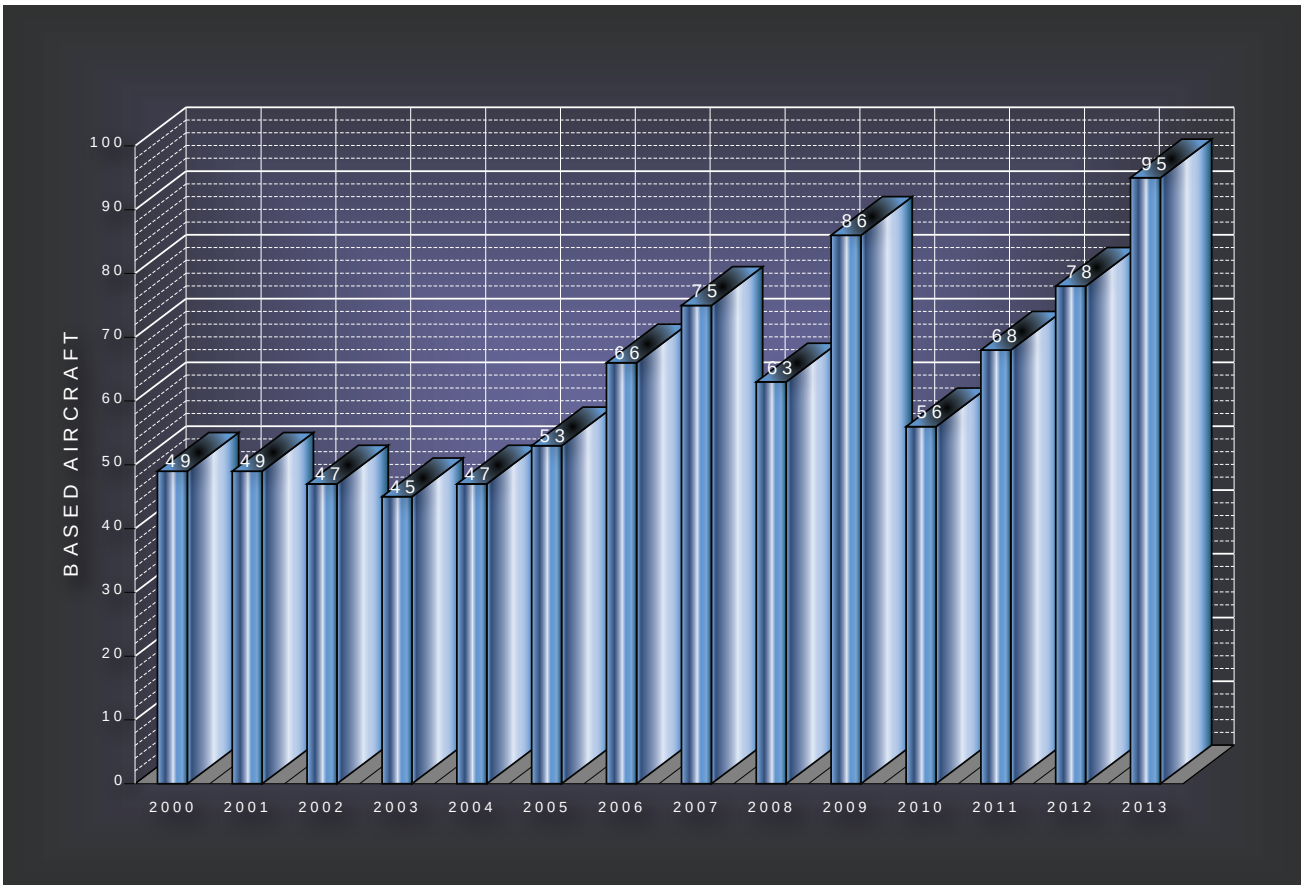
The number of based aircraft at ALM has ranged from the high of 95 in 2013 to a low of 45 in 2003. The accuracy of the historical based aircraft counts for ALM is subject to some question since the FAA 5010 - Airport Master Record indicates there were a total of only 24 based aircraft in 2013 while the current FAA Terminal Area Forecast database reflects a total of 79 based aircraft and Airport Management records indicate 95 based aircraft in 2013, not including 14 ultra-light aircraft.

The historical based aircraft data presented on **Table 14** reflect a composite compiled from sources including the FAA TAF, the 2003 ALM Action Plan, the New Mexico State Airport System Plan, the FAA Southwest Region GA Plan, and Airport Management records, which are based on a survey of based aircraft undertaken by ALM in 2013. The Composite Based Aircraft represent what are considered to be the most accurate record of historical based aircraft at ALM. The Composite Based Aircraft reflect the actual based aircraft totals, which were tabulated for each of the sources referenced previously. For those years where based aircraft information was not available from the referenced reports, the FAA TAF numbers were used, except for the years 2012 and 2013. For these two most recent years, the number of based aircraft reported by Airport management (78 in 2012 and 95 in 2013) were used. **Exhibit 15** graphically illustrates the historical based aircraft totals at ALM since 1990.

TABLE 14
HISTORICAL BASED AIRCRAFT

Year	BASED AIRCRAFT				
	TAF Aircraft	ALM Action Plan	New Mexico SASP	FAA Southwest Region GA Plan	Composite
2000	49	49	-	-	49
2001	49	-	-	-	49
2002	47	-	-	-	47
2003	45	-	-	-	45
2004	47	-	-	-	47
2005	47	53	-	-	53
2006	75	-	66	-	66
2007	75	-	-	-	75
2008	39	-	-	63	63
2009	86	-	-	-	86
2010	79	56	-	-	56
2011	79	-	68	-	68
2012	79	-	-	-	78
2013	79	-	-	-	95

Source: FAA Terminal Area Forecast, 2012, Alamogordo-White Sands Regional AIrport Action Plan, New Mexico State Airport System Plan, FAA Southwest Region GA Plan, URS Corporation Analysis, 2013.



Source: FAA Terminal Area Forecast 2008.
Air Traffic Activity Data System (ATADS) 2009.
URS Corporation analysis, 2009.

Exhibit 15
Historical Based Aircraft

Forecast General Aviation Activity

The specific components of general aviation demand to be forecast are based aircraft, based aircraft fleet mix, and aircraft operations.

Forecast Based Aircraft

Alamogordo-White Sands Regional Airport was the home base for approximately 95 aircraft in 2013. Of these aircraft, 85 were single-engine piston aircraft, four (4) were twin-engine piston aircraft, one (1) single engine and three (3) multi-engine turbine aircraft, and two (2) helicopters. In addition, a total of 14 gliders were based at ALM.

Regression analysis was explored in an effort to evaluate the potential growth in based aircraft over the planning period. The regression analysis focused on a range of socioeconomic (Independent) variables of Otero County including Population, Employment, and Per Capita Personal Income (PCPI). The regression analysis examined both single variables and a combination of multiple variables. Each of these analyses

resulted in correlation coefficients (r^2) indicating little if any correlation to the number of based aircraft. Therefore it was determined that regression analysis was not a viable approach for forecasting ALM based aircraft.

A second approach was developed based on the Airport's historical share of based aircraft within the state of New Mexico. The FAA Terminal Area Forecast was queried to determine the historical (since 1990) and forecast (through 2032) number of based aircraft for the state of New Mexico. The historical number of aircraft based at ALM since 2000 was divided by the historical number of based aircraft within the state of New Mexico for the same years, which provided ALM's historical share of the state's based aircraft. During this period, ALM's share of the state's based aircraft fluctuated from a low of 2.41 percent up to a high of 4.81 percent.

An average of the Airport's historical share of New Mexico based aircraft for a variety of "scenarios" was calculated. These "scenarios" included all years from 2000 through 2013, and additional scenarios for the years 2006 through 2013, 2009 through 2013, 2012 through 2013, and ALM's share of the state total for the year 2013.

In reviewing the Airport's share of New Mexico based aircraft for the period 2000 through 2013, it was apparent that ALM's share of state based aircraft for the years 2000 through 2005 was significantly lower and not consistent with the Airport's share of the state total in more recent years.

Table 15 tabulates ALM's share of New Mexico based aircraft for each of the "scenarios" discussed above. The results represent a broad range of based aircraft totals, with a high of 118 based aircraft assuming the current (2013) share of the state total to an unrealistic low of 85 assuming the average for the entire period from 2000 through 2013.

A third approach was developed based on a trend analysis of the Airport's historical based aircraft. Similar to the "share of New Mexico" approach, a number of scenarios were evaluated for the trend analysis. A trend analysis based on the years 2000 through 2013 resulted in a dramatic increase in the number of forecast based aircraft from 95 in 2013 to 155 in the year 2032. This scenario does not take into account the more recent slowdown in general aviation activity nationwide, which is expected to continue throughout the foreseeable future with some impact on ALM. It was determined that this scenario results in a forecast that is overly aggressive. Similar Trend Analyses were developed for the years 2005 through 2013 and 2006 through 2013.

Table 15 also includes the based aircraft totals derived using the Trend Analysis scenarios.

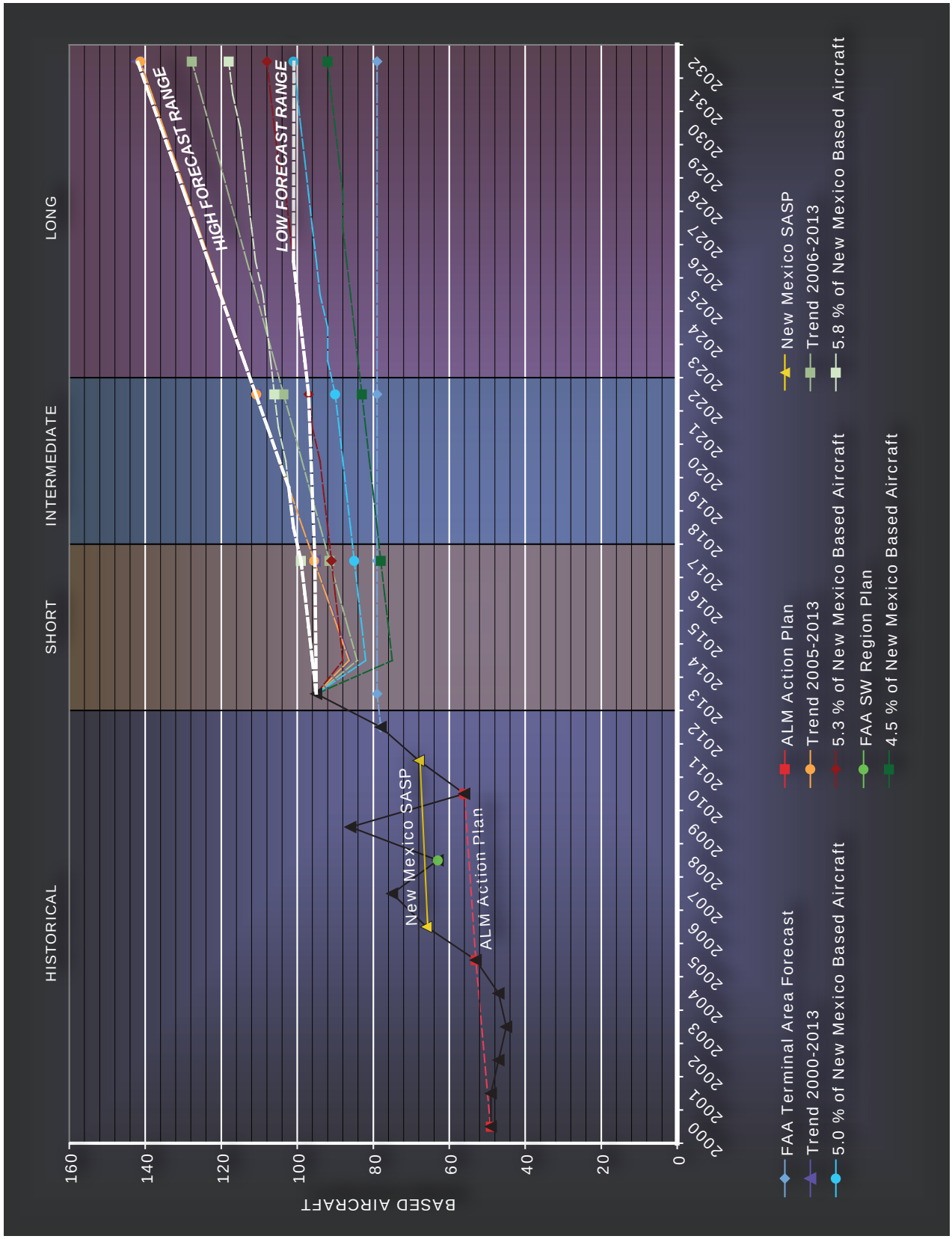
Exhibit 16 graphically depicts the historical based aircraft levels and illustrates the range of based aircraft forecast alternatives. After reviewing the alternative based aircraft forecasts, a Forecast Range was developed. This Forecast Range identified the Historical Trend of based aircraft from 2000 through 2013 as the high ceiling with a combination of ALM's historical share of total New Mexico based aircraft as the low level of based aircraft. The recommended based aircraft forecast at ALM was derived by calculating the average of the high and low based aircraft totals within the forecast range. This approach recognizes the relationship between the historical study area share of aircraft based at ALM relative to the total number of aircraft based in the state of New Mexico as well as taking into consideration the Airport's historical growth in based aircraft levels. The rate of based aircraft growth during the Short Range is expected to track more closely to the historical trend from 2000 through 2013. During the Intermediate and Long Range planning periods, it is expected that the rate of based aircraft growth will moderate, with the number of based aircraft trending toward the average between the forecast high and low based aircraft totals.

TABLE 15
BASED AIRCRAFT FORECAST SCENARIOS

Year	BASED AIRCRAFT									
	ALM Action Plan	SASP	FAA S/W Rgn. GA Plan	Trend 2000-2013	Trend 2005-2013	Trend 2006 -2013	% of New Mexico Total Based AC			
							4.5	5.0	5.3	5.8
2000	49			49			49	49	49	49
2001				49			49	49	49	49
2002				47			47	47	47	47
2003				45			45	45	45	45
2004				47			47	47	47	47
2005	53			53	53		53	53	53	53
2006		66		66	66	66	66	66	66	66
2007				75	75	75	75	75	75	75
2008			63	63	63	63	63	63	63	63
2009				86	86	86	86	86	86	86
2010	56			56	56	56	56	56	56	56
2011		68		68	68	68	68	68	68	68
2012				78	78	78	78	78	78	78
2013				95	95	95	95	95	95	95
2014				86	86	84	75	82	88	96
2015	60			89	89	87	76	83	89	97
2016		69		92	92	89	77	84	90	98
2017				**95**	**96**	**92**	**78**	**85**	**91**	**99**
2018				98	99	94	79	86	92	101
2019				102	102	96	80	87	93	102
2020	64			105	105	99	81	88	94	103
2021				108	108	101	82	89	96	104
2022				**111**	**111**	**104**	**83**	**90**	**97**	**106**
2023				114	114	106	84	92	98	107
2024				117	117	108	85	92	99	108
2025				120	120	111	86	94	100	109
2026		73		123	123	113	87	95	101	111
2027				**126**	**126**	**116**	**88**	**96**	**102**	**112**
2028				130	129	118	88	97	103	113
2029				133	132	121	89	98	105	114
2030				136	135	123	90	99	106	115
2031				139	138	125	91	100	107	117
2032				**142**	**141**	**128**	**92**	**101**	**108**	**118**
Average Annual Growth Rate				2.0%	2.0%	1.5%	-0.2%	0.3%	0.6%	1.1%

Source: URS Corporation Analysis, 2013.

The FAA TAF based aircraft forecast for ALM is considered inaccurate since the current number of aircraft based at ALM (95) significantly exceeds the total number of based aircraft forecast in the TAF for ALM (79) in the year 2032. The TAF forecast also does not take into consideration the historical growth in based aircraft



Alamogordo-White Sands Regional Airport

Exhibit 16
ALM Forecast Scenarios

levels at ALM nor does it reflect the influence of Holloman Air Force Base and the number of Air Force pilots living in the area who use ALM as a base for their personal flying. The recommended forecast derived using the averaging methodology previously described results in the number of aircraft based at the Airport in 2017 remaining constant at 95, then increasing to 100 in 2022 and 122 in 2032.

Forecast Based Aircraft Fleet Mix

Projections of based aircraft by type were developed taking into consideration the current based aircraft fleet mix and FAA forecast trends in the future aircraft fleet mix. **Table 16** provides a summary of the existing 2013 based aircraft fleet mix together with the forecast fleet mix throughout the planning period. Included is the percentage each aircraft category represents of the total airport fleet.

A review of Table 16 shows the changing composition of the ALM general aviation fleet. Single engine aircraft represented the predominant portion of the based aircraft fleet in 2013, accounting for roughly 90 percent of all based aircraft. Single engine aircraft are forecast to remain the predominant aircraft type throughout the planning period, decreasing somewhat to 86 percent by 2032. The number of multi-engine turbine powered aircraft are forecast to increase from just over four percent in 2013 to a little more than eight percent by 2032. By the end of the planning period, the Airport is expected be home to one Jet and five Rotorcraft.

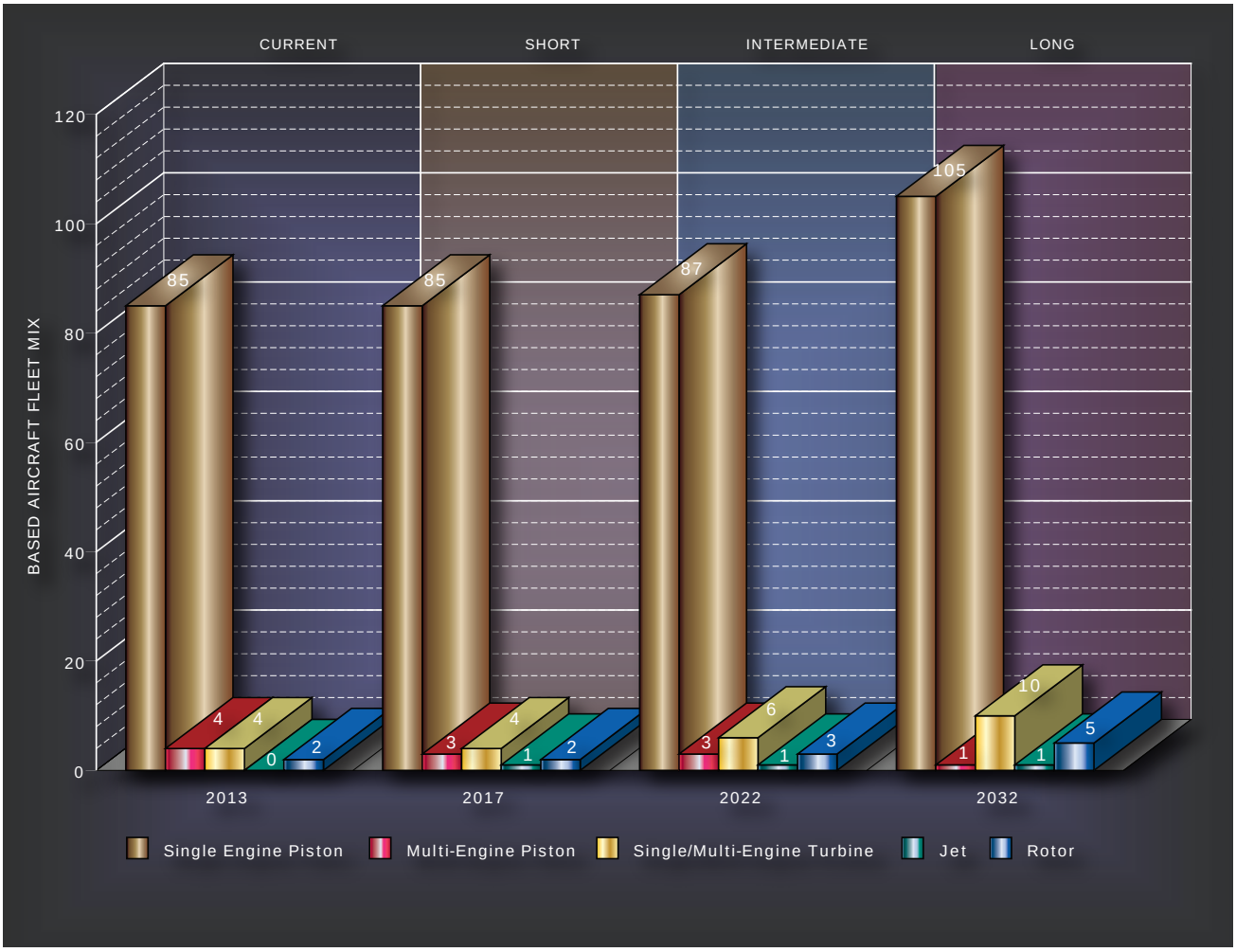
TABLE 16
FORECAST BASED AIRCRAFT BY TYPE

Year	Single-engine	Multi-engine		Jet	Rotor	Other	Total
		Piston	Turbine				
Historical [1]							
2013	85	4	4	-	2	14	95
Percent	89.5%	4.2%	4.2%	-	2.1%	-	100%
Forecast [2]							
2017	85	3	5	0	2	14	95
Percent	89.5%	3.2%	3.3%	-	2.1%	-	100%
2022	87	3	6	0	4	14	100
Percent	87.0%	3.0%	6.0%	-	4.0%	-	100%
2032	105	1	10	1	5	14	122
Percent	86.1%	0.8%	8.2%	0.8%	4.1%	-	100%

Source: [1] Airport records, 2013.
[2] URS Corporation analysis, 2013.

The small decline in the percentage of single engine piston aircraft reflects the national trend where these aircraft are often being replaced by more sophisticated, higher performance multi-engine turbine and jet aircraft that provide greater range, increased speed and comfort, and greater capacity. The addition of jet aircraft reflects ALM's role as a business and corporate hub for the surrounding community and the expectation that efforts by local businesses and the economic development agency to expand economic opportunities will support and encourage growth of this segment of the based aircraft fleet. The forecast basing of a jet aircraft is also consistent with FAA forecast trends within the GA fleet. This is further supported by the fact GAMA forecasts increasing business jet aircraft production. The National Business Aircraft Association (NBAA) statistical data show growing numbers of member organizations using general aviation to foster business growth and development. In summary, available data provide evidence that

multi-engine turbine and business jet aircraft will develop an expanding presence at ALM. **Exhibit 17** depicts the fleet mix at ALM in the forecast horizon years.



Source: URS Corporation analysis, 2013.

Exhibit 17
Forecast Fleet Mix

Forecast General Aviation Operations

General aviation activities at ALM are supported by Exile Aviation, a full service fixed base operator (FBO), and Ed's Flying Service. These two operations generate additional activity by providing aircraft servicing and support to non-based aircraft that may not have comparable services available at their home airport as well as providing services and facilities for transient operations.

Historical aviation activity at ALM is essentially limited to the estimates provided in the FAA TAF. Additional supporting data have been provided by the US Forest Service for operations performed in fire suppression, which is sub-contracted to Neptune Aviation, Minden Aviation, and Aero Union. Therefore, air traffic activity data is incomplete and/or extremely limited.

Given the constraints of limited historical aviation activity data at ALM, the approach for developing an Airport operations forecast relied on operations per based aircraft (OPBA). The number of aircraft operations within each category of local and itinerant activity was divided by the number of aircraft based at ALM in 2013 to establish the respective number of operations within each of these categories per based aircraft. The forecast number of general aviation based aircraft for each planning horizon year was then multiplied by the number of operations per based aircraft for each category of Local and Itinerant operations, resulting in an operations forecast for the 20-year planning period.

Table 17 presents the historical operations and forecast developed by applying the operations per based aircraft in 2013 to the forecast based aircraft throughout the planning period. This methodology results in total operations that are projected to increase to approximately 43,900 by 2032.

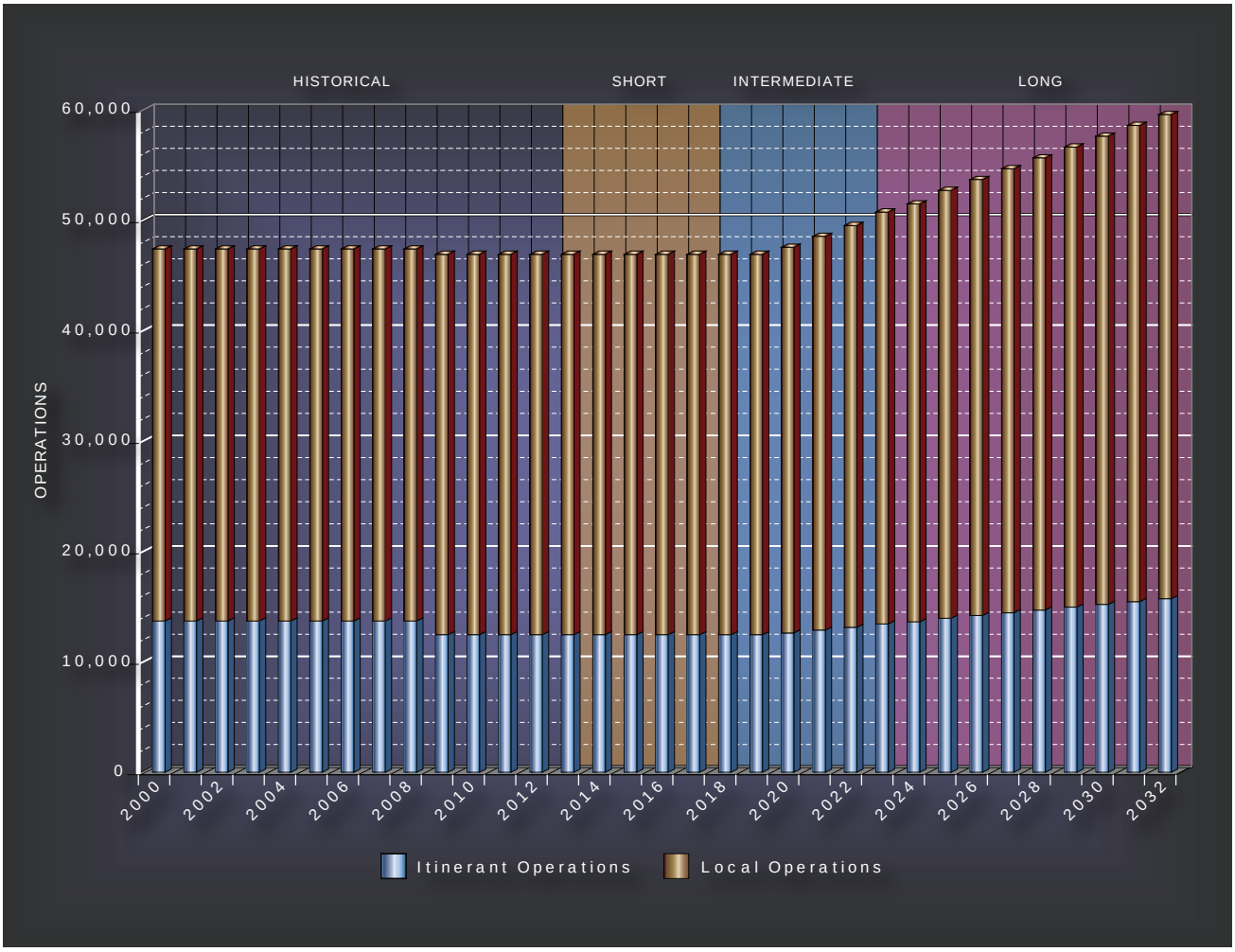
The split between itinerant and local operations reflects the proportion of itinerant operations versus local operations at ALM in 2013. Itinerant operations represented approximately 36.2 percent of total operations in 2013, the percentage share of itinerant operations is forecast to decline slightly to just over 36.0 percent by 2032.

TABLE 17
HISTORICAL AND FORECAST AIRCRAFT OPERATIONS

Year	Itinerant Operations					Local Operations			Total Operations
	Air Carrier	Air Taxi & Commuter	GA	Military	Total	Civil	Military	Total	
2000	0	2,900	10,000	800	13,700	20,000	0	20,000	33,700
2001	0	2,900	10,000	800	13,700	20,000	0	20,000	33,700
2002	2,400	500	10,000	800	13,700	20,000	0	20,000	33,700
2003	0	2,900	10,000	800	13,700	20,000	0	20,000	33,700
2004	0	2,900	10,000	800	13,700	20,000	0	20,000	33,700
2005	0	2,900	10,000	800	13,700	20,000	0	20,000	33,700
2006	0	2,900	10,000	800	13,700	20,000	0	20,000	33,700
2007	0	2,900	10,000	800	13,700	20,000	0	20,000	33,700
2008	0	2,900	10,000	800	13,700	20,000	0	20,000	33,700
2009	0	1,660	10,000	800	12,460	22,000	0	22,000	34,460
2010	0	1,660	10,000	800	12,460	22,000	0	22,000	34,460
2011	0	1,660	10,000	800	12,460	22,000	0	22,000	34,460
2012	0	1,660	10,000	800	12,460	22,000	0	22,000	34,460
2013	0	1,660	10,000	800	12,460	22,000	0	22,000	34,460
2017	0	1,660	10,000	800	12,460	22,000	0	22,000	34,460
2022	0	1,755	10,574	800	13,130	23,264	0	23,264	36,394
2027	0	1,944	11,710	800	14,454	25,762	0	25,762	40,215
2032	0	2,124	12,792	800	15,716	28,143	0	28,143	43,859

Source: URS Corporation analysis, 2013.

Exhibit 18 graphically illustrates the historical and forecast total general aviation operations, including local and itinerant operations, developed by applying the OPBA in 2013 to the forecast of based aircraft.



Source: URS Corporation analysis, 2013.

Exhibit 18
Historical and Forecast Local and Itinerant Operations

Peaking Characteristics

Projections were developed for peak month, average day, and peak hour operations since many facility needs are related to activity levels during peak demand periods. Operational peaking characteristics will be used to establish certain future facility requirements in subsequent chapters of this study. The peak month, average day peak month (ADPM), and design hour for local and itinerant operations were determined using industry planning standards.

Table 18 presents the forecast of general aviation peaking characteristics based on the information presented below.

- Aviation industry standards estimate that the summer months of July and August represent the typical peak months of aviation activity. The peak month typically represents approximately 10.0 percent of total annual operations. It is assumed this monthly peaking factor will remain constant throughout the planning period.
- The average day of the peak month for local and itinerant operations was calculated by dividing peak month operations by 31. Since the peak months of July and August each have 31 days, the average day of the peak month was calculated by dividing the peak month operations total by 31.
- To develop peak hour operations projections, an hourly peaking factor was applied to the number of average daily operations. Past studies have shown this factor to be approximately 20 percent for airports with activity levels comparable to those experienced by the Alamogordo-White Sands Regional Airport. A 20 percent hourly peaking factor accounts for brief periods of relatively heavy use, including periods when several aircraft are in the pattern performing touch-and-go operations.

TABLE 18
FORECAST PEAKING CHARACTERISTICS

Year	Operation	Aircraft Operations Forecast	Peak Month	ADPM	Peak Hour
2017	Itinerant	12,460	1,246	40	8
	Local	22,000	2,200	71	14
	Total	34,460	3,446	111	22
2022	Itinerant	13,130	1,313	42	8
	Local	23,264	2,326	75	15
	Total	36,394	3,639	117	23
2032	Itinerant	15,716	1,572	51	10
	Local	28,143	2,814	91	18
	Total	43,859	4,386	141	28

Source: URS Corporation analysis, 2013. Numbers may not total due to rounding.

Military Activity

The military operate a variety of aircraft at ALM including transport aircraft and rotorcraft. The number of military operations has remained consistent at around 800 per year since the year 2000. Military activity is inherently unpredictable and therefore a military operations forecast has not been developed for ALM. In light of the unpredictability of military activity, it was assumed the military will maintain its historical operational levels at ALM. **Table 19** presents the historic and forecast military activity levels.

Instrument Operations

The instrument operations forecast will aid in determining instrument approach requirements and air traffic control facility needs. An instrument operation is defined as any operation wherein the pilot conducts an operation using published instrument procedures, regardless of the weather conditions. Historical instrument operations data for 2012 was obtained from Flight Aware, an industry data clearing house.

Typically, air taxi/charter operators conduct their operations almost exclusively as instrument operations. General aviation and the military are less likely to conduct instrument operations unless conditions dictate. Therefore the instrument operations forecast was developed based on the 2012 ratio of instrument operations to total airport operations. This calculation determined that instrument operations as a percent of total airport operations was equal to approximately 5.4 percent of the total. This average was applied to the forecast of total airport operations to determine future instrument operations tabulated in **Table 20**.

TABLE 19
MILITARY OPERATIONS – HISTORIC AND FORECAST

Year	Itinerant	Local	Total
Historic [1]			
2010	800	0	800
2011	800	0	800
2012	800	0	800
2013	800	0	800
Forecast [2]			
2017	800	0	800
2022	800	0	800
2032	800	0	800

Source: [1] FAA TAF 2012.
[2] URS Corporation analysis, 2013.

Commercial Air Service Scenario

The Alamogordo-White Sands Regional Airport has had a long history of scheduled commercial air service. After airline deregulation in 1978 commercial air service was provided under the Essential Air Service (EAS) program. The EAS program is operated by the U. S. Department of Transportation and is intended to guarantee that small communities that were served by scheduled air carriers before airline deregulation in 1978 could maintain a minimal level of scheduled air service after deregulation. The program generally requires that airlines providing Essential Air Service perform at least two to four round trip flights per day with 19 seat aircraft to a major hub airport.

TABLE 20
INSTRUMENT OPERATIONS FORECAST

Year	Instrument Operations	Total Operations	Instrument/ Total
Historical [1]			
2012	1,860	34,460	5.4%
Forecast [2]			
2017	1,860	34,460	5.4%
2022	1,965	36,394	5.4%
2032	2,370	43,859	5.4%

Source: [1] FlightAware, 2012.
[2] URS Corporation analysis, 2013.

From 1994 up until 2002, the Airport had been served by 19 seat, twin-engine Beech 1900 aircraft operated by Mesa Airlines. In March of 2002 the DOT began consideration of the Airport's on-going EAS operations. Through communication with the city of Alamogordo and the Commander of Holloman Air Force Base (EAS at ALM was predicated on the demand generated by both the city of Alamogordo and personnel stationed at Holloman Air Force Base) it was determined that subsequent essential air service would be provided by New Mexico Airlines operating nine passenger, single-engine Cessna Caravan aircraft. DOT approval of the use of single engine aircraft with seating capacities of less than 15 passengers was required since the EAS program requires use of 15-passenger, twin-engine aircraft. With the exception of a short period in 2006 when Mesa resumed service with Beech 1900 aircraft, subsequent EAS operations were performed with single engine 9 passenger aircraft. These subsequent operations experienced numerous fits and starts, which most likely had a negative impact on passenger demand.

Ultimately, air service at ALM ended in April of 2012 when New Mexico Airlines ceased commercial service due to the high passenger subsidies required for its continued operations, which were prohibited by the new legislation passed by the U. S. Congress.

The Airport is currently attempting to attract new commercial air service under the Small Community Air Service Development Program (SCASDP). The Small Community Air Service Development Program is a grant program designed to help small communities address their specific air service and airfare issues.

In 2000, the Wendell H. Ford Aviation Investment and Reform Act for the 21st Century (AIR-21), Public Law 106-181, established a new pilot program among other things, designed to help smaller communities enhance their air service. Vision 100-Century of Aviation Reauthorization Act, P.L. 108-176 reauthorized this program and deleted its status as a "pilot" program. This law authorizes the Secretary of Transportation to issue a maximum of 40 grants each year to secure enhancements that will respond to a community's air transportation needs and "whose benefits can be expected to continue after the initial expenditures".

The SCASDP is differentiated from the EAS program in that the eligibility criteria are broader and the communities identify their air service needs and propose solutions appropriate to those needs. Among a variety of options available to the communities are: revenue guarantees; financial assistance for airline marketing programs; start-up costs for airline operations; and feasibility studies.

Grants to communities awarded under the SCASDP are determined by a prioritized list of criteria. Specifically, priority is given to communities where:

- Average air fares are higher than the air fares for all communities;
- A portion of the cost of the activity contemplated by the community is provided from local, non-airport-revenue sources;
- A public-private partnership has been or will be established to facilitate air carrier service to the public;
- Improved service will bring the material benefits of scheduled air transportation to a broad section of the traveling public, including businesses, educational institutions, and other enterprises whose access to the National air transportation system is limited;
- The assistance will be used in a timely fashion; and
- Multiple communities cooperate to submit a regional or multi-state application to consolidate air service into one regional airport.

The City of Alamogordo submitted a 2013 SCASDP grant application in the amount of $450,000. In addition, the City Commission approved provision of $450,000 in matching funds to match the $450,000 being sought from the SCASDP. This represents a total of $900,000 that would be used to attract and develop commercial air service for the community. The City and Airport have also had active discussions with airline and air service development representatives in an effort to obtain new air service. These discussions with the airline representative have been extremely encouraging to City and Airport representatives.

While the City did not receive a SCASDP grant in 2013, it is expected that a grant application will be submitted in 2014 with a similar commitment of matching funds from the City Commission. Therefore it is expected that new commercial air service will be initiated at ALM, based on the discussions with airline representatives and the proposed funding for air service development.

As noted previously, commercial air service from ALM was previously provided to the Albuquerque International Sunport (ABQ) where travelers could connect to additional flights to their ultimate destinations. The disadvantage of connecting at ABQ is the limited number of direct connections to alternative destinations that totaled approximately 35 cities. It is expected that new air service will be provided to Dallas-Fort Worth International Airport (DFW), which offers a significantly greater number of direct connections—approximately 125. The advantage of serving DFW as opposed to ABQ is that travelers will have the ability to get to their ultimate destinations faster than by connecting through ABQ. Travelers connecting through ABQ will require additional stops on their journey to the additional 90 nonstop destinations served through DFW. Therefore service from ALM to DFW enhances the potential for greater air travel.

In addition to the added benefits of connecting through DFW, 50 passenger regional jet aircraft are expected to provide service between ALM and DFW.

Most recently, and as noted previously small, single engine propeller aircraft have provided commercial service at ALM. Numerous studies have shown that passengers prefer to travel via jet aircraft. Not only are they larger and typically more comfortable than the single engine aircraft that previously served ALM, they are significantly faster (a factor that would not be as significant with service to ABQ as opposed to DFW) and also provide the capability to avoid adverse weather conditions. Those same adverse weather conditions could cause cancellation of flights by the single engine propeller aircraft that must fly at lower altitudes and do not have as great a capability to avoid adverse weather conditions. These jet aircraft are also perceived to be safer than their propeller driven counterparts, which further increase their attractiveness to the flying public.

It is expected that initial commercial service will be provided with twice daily flights using 50 passenger regional jets to and from DFW with one departure and arrival in the morning and a second departure and arrival in the evening.

Load factor, which represents the number of passengers on each flight, is initially expected to be in the range of 70 percent or approximately 35 passengers per departure. By 2017, the load factor is expected to grow to approximately 75 percent, which represents 37-38 passengers per departure.

The airline industry is constantly undergoing major shifts and the smaller 50 passenger regional jets are being replaced throughout the industry by larger 65 to 90 passenger regional jets. This pattern is expected to affect ALM by the year 2022 when the 50 passenger regional jets are projected to be replaced by 65 passenger aircraft. At that time, the load factor is expected to fall to approximately 62 percent, which represents roughly 40 passengers per departure and then slowly rise to 65 percent by the end of the planning period or 42 plus passengers per departure.

Table 21 presents the projections of commercial airline enplaned passengers and commercial airline operations for ALM throughout the planning period.

TABLE 21
COMMERCIAL AIR SERVICE FORECAST

Category	2012	2017	2022	2027	2032
Aircraft Size - seats	N.A.	50	65	65	65
Departures	N.A.	2	2	2	2
Load Factor	N.A.	75%	62%	65%	70%
Enplanements	N.A.	27,000	29,016	30,420	32,760
Departures	N.A.	720	720	720	720

Source: URS Corporation analysis, 2013.

Summary of Forecast Aviation Demand

Aviation demand at ALM is expected to experience modest growth as the Alamogordo and Otero county area recover from the effects of the economic downturn. The further development and expansion of the Neptune Aviation air tanker base and supporting facilities also supports growth in aviation demand at ALM. While occasional declines in activity are likely to occur, in the long-term growth is expected to remain positive. Growth in corporate activity and fractional aircraft ownership may also generate additional general aviation demand. The availability of facilities and services for the general aviation community and the pool of active pilots within Otero County and in particular at the Holloman Air Force Base will also have a strong influence on future growth in aviation activity.

Table 22 summarizes the annual aviation demand developed in this Chapter and **Table 23** presents a comparison with the 2012 FAA TAF.

The master plan operations forecast ranges from four to 31 percent higher than the 2012 TAF. The Short and Intermediate Range operations are within the FAA acceptable range of ten to fifteen percent of the TAF. While the Long Range operations level exceeds the FAA range, it is important to note the significant discrepancy in the existing number of based aircraft at ALM versus the number FAA has identified. This discrepancy will likely impact the activity levels going forward. Therefore, the recommended forecasts presented in this chapter are considered reasonable and realistic.

TABLE 22
SUMMARY OF AVIATION DEMAND

Category	2012	2017	2022	2032
Commercial				
Air Carrier	-	1,440	1,440	1,440
Air Taxi	1,660	1,660	1,755	2,124
Enplanements	-	27,000	29,016	32,760
General Aviation				
Local	22,000	22,000	23,264	28,143
Itinerant	10,000	10,000	10,574	12,792
Total	32,000	32,000	33,215	35,241
Military				
Local	0	0	0	0
Itinerant	800	800	800	800
Total Military	800	800	800	800
Total Operations	34,460	35,900	37,834	45,299
Peak Operations				
Peak Month	3,460	3,460	3,639	4,386
ADPM	111	111	117	141
Peak Hour	22	22	23	28

Source: Tables 17, 18, 19, 20, and 21.
URS Corporation analysis, 2013.

TABLE 23
MASTER PLAN AND TAF FORECAST COMPARISON

Year	Total Operations			Enplanements		
	Master Plan Forecast [1]	TAF 2012 [2]	MP/TAF (%Difference) [3]	Master Plan Forecast [1]	TAF 2012[2]	MP/TAF (%Difference) [3]
2012	34,460	34,460	N.A.	-	260	N.A.
2017	35,900	34,460	104.2%	27,000	266	10,050%
2022	37,834	34,460	109.8%	29,016	273	10,528%
2032	43,859	34,460	131.5%	32,760	291	11,157%

Source: [1] Table 22.
[2] FAA TAF 2012.
[3] URS Corporation analysis, 2013.

Alamogordo-White Sands Regional Airport

Chapter Three

DEMAND CAPACITY / FACILITY REQUIREMENTS

CHAPTER THREE

DEMAND CAPACITY/FACILITY REQUIREMENTS

Introduction

This chapter of the Airport Master Plan Update assesses the relationship between demand and facility needs based on the 20 year forecasts presented in Chapter Two, ***Aviation Demand Forecasts***. Operational areas will be evaluated to determine existing and future facility requirements. These include:

- Airspace; navigational classifications
- Airfield; weather conditions, Annual Service Volume (ASV), hourly airfield capacity, and runway length requirements
- Terminal Facilities; analysis of terminal/administration building, based aircraft, apron, and hangar requirements
- Aviation Support Facilities, including fuel farms, Airport Rescue and Fire Fighting (ARFF) facilities, and other general aviation facilities
- Airport Access and Parking; including on-airport roadways, surrounding roads, and automobile parking

The capacity of existing airport facilities (runways, taxiways, etc.), was determined based on criteria set forth in FAA Advisory Circular 150/5060-5, "Airport Capacity and Delay." The forecast aviation demand for each planning horizon was evaluated against available capacity to determine any additional facilities needed within each planning period. Recommendations for facility improvements were then developed to alleviate existing or projected deficiencies.

A recommended alternative will be developed in Chapter Four, as appropriate, to accommodate projected facility needs, based on identified facility deficiencies. The Airport Layout Plan will incorporate recommended facilities, as required. Identification of the Critical Aircraft is the initial step necessary in order to determine Facility Requirements.

Critical Aircraft

The criteria required for planning and design of an airport is determined by the airport's role, level of operations, and the "critical" aircraft using the airport. The critical or design aircraft, is defined as the most demanding aircraft operating at an airport on a regular basis. The design or critical aircraft (or type of aircraft) must perform 500 itinerant operations annually to be considered the critical aircraft.

The FAA provides guidance for planning and design of airport facilities through FAA Advisory Circulars (ACs). Information from FAA AC 150/5300-13, "Airport Design," was used to determine the Airport Reference Code (ARC) of the critical aircraft for the Airport. The ARC is a coding system used by the FAA to

relate airport design criteria to the operational and physical characteristics of the most demanding aircraft or family of aircraft (Critical Aircraft) operating at an airport.

The ARC has two primary components relative to the critical aircraft. The first, depicted by a letter, is the aircraft approach category, determined by the aircraft approach speed. The second, depicted by a Roman numeral, is the airplane design group, determined by the critical aircraft's wingspan. Generally, aircraft approach speed applies to runways and runway-related facilities, wingspan primarily affects taxiway and taxilane separation. **Table 24** lists the respective Aircraft Approach Categories and Design Groups.

TABLE 24
AIRCRAFT APPROACH CATEGORIES* AND DESIGN GROUPS**

Approach Category	Approach Speed	Design Group	Aircraft Wingspan
A	Less than 91 knots	I	Up to but not including 49 feet
B	91 knots or more but less than 121 knots	II	49 feet up to but not including 79 feet
C	121 knots or more but less than 141 knots	III	79 feet up to but not including 118 feet
D	141 knots or more but less than 166 knots	IV	118 feet up to but not including 171 feet
E	166 knots or more	V	171 feet up to but not including 214 feet
		VI	214 feet up to but not including 262 feet

* *Aircraft approach categories are groupings of aircraft based on an approach speed of 1.3 times the aircraft stall speed at the maximum certified landing weight.*

** *Aircraft design groups are categorized by aircraft wingspan. The aircraft design group concept associates airport dimensional standards with aircraft approach categories, aircraft design groups or to runway instrumentation configurations.*

Aircraft Approach Category: The FAA groups aircraft based on their approach speed and maximum certificated landing weight. Approach speed equals ⅓ Vso, where Vso is aircraft stall speed. The certificating authority of the Country of Registry establishes the stall speed and maximum certificated landing weight.

Airplane Design Group: The FAA establishes Airplane Design Groups based on physical characteristics of aircraft. Design Groups link airport dimensional standards and separation criteria to an aircraft's wingspan.

A sizable number of the aircraft operating at The Alamogordo-White Sands Regional Airport are small, single-engine aircraft weighing less than 12,500 pounds. There are also a significant number of larger, business/corporate aircraft operating at the Airport, primarily twin engine turbine prop aircraft.

The USFS air tanker base generates a significant volume of activity by Lockheed P2V Neptune aircraft fighting fires in Arizona, New Mexico, Texas, and Oklahoma. The P2V aircraft have an Airport Reference Code of B-III. These aircraft performed more than 950 operations in 2012 and therefore represent the current Critical Aircraft.

Within the next 5-7 years the Neptune P2V aircraft will be replaced by four engine BAe-146 turbofan aircraft. These jet aircraft have approach speeds of approximately 125 knots and wingspans of 86 feet, which represents Airport Reference Code C-III. With the eventual retirement of the P2V air tankers and their replacement by

the new BAe-146 aircraft that will take over the P2V's current fire suppression role (representing more than 900 annual itinerant operations), the BAe-146 will become ALM's Critical Aircraft. Therefore, the current ***Airport Reference Code*** (ARC) for The Alamogordo-White Sands Regional Airport is ***B-III and the future ARC will be C-III.***

Airspace

As discussed in Chapter One, airspace in the United States is categorized into six different classifications (see Exhibit 5 for a graphical depiction); Class A, Class B, Class C, Class D, Class E, and Class G. Class A airspace extends from 18,000 feet MSL up to and including 60,000 feet MSL over the United States and within 12 nautical miles (nm) of the coast line. In order to enter Class A airspace, the flight must be filed under an Instrument Flight Rules (IFR) flight plan. An IFR flight plan guarantees positive Air Traffic Control (ATC) guidance through the airspace. Class B airspace is primarily located around major air carrier airports. The limits extend from the surface to 10,000 feet MSL. The dimensions of Class B airspace are staggered and resemble an upside-down wedding cake. The dimensions are tailored to an individual airport and consist of a surface area and two or more layers designed to contain all published instrument approach procedures. ATC clearance is required to enter Class B airspace.

Class C airspaces extends from the surface to 4,000 feet MSL above the airport elevation surrounding airports having an airport traffic control tower (ATCT), served by radar approach control, and having a certain number of IFR operations or passenger enplanements. Class C is also layered, like Class B, but the layers are not as large. A 5 nm radius core extends from the surface to 4,000 feet above the airport elevation and a 10 nm radius ring extends from 1,200 feet to 4,000 feet MSL above the airport elevation. Two-way radio communications and an operating transponder with mode-c capabilities, which automatically reports altitude is required to enter this airspace. Class D includes the airspace from the surface to 2,500 feet above the airport elevation surrounding airports with an operational ATCT. The airspace dimensions are individually tailored and will encompass any published instrument approach procedures to the airport. Two-way radio communication with ATC is required to enter Class D airspace. Class E includes any controlled airspace that is not designated Class A through Class D. Class G airspace is any airspace that is uncontrolled.

The airspace around the Alamogordo-White Sands Regional Airport (ALM), is extremely complex and constrained. The proximity of Holloman Air Force Base and the White Sands Missile Range (WSMR) impose significant constraints to the surrounding airspace.

There are some unavoidable capacity constraints given the surrounding airspace classifications. Airspace capacity is limited due to the restrictions imposed by the military Restricted Areas, MOA's, and the Class C and D airspace associated with Holloman Air Force Base immediately west of ALM whose airspace abuts ALM's. Also, the altitude and headings departing and arriving VFR aircraft have to fly into and out of ALM are limited.

Airfield

This section presents an assessment of the capacity of existing runways and taxiways to support the projected demand throughout the planning period. In order to fully understand the fundamentals involved in demand/capacity analysis, it is necessary to first describe the factors that contribute to either increasing or decreasing capacity. These factors include weather conditions and airfield geometry.

Weather Conditions

Weather plays a vital role in the capacity of the runway system. A large number of aircraft delays are attributable to inclement weather. Care must be taken to include local weather phenomena in design calculations.

Two weather conditions affect airport operations, Visual Meteorological Conditions (VMC) and Instrument Meteorological Conditions (IMC). VMC allows a pilot to operate the aircraft in visual conditions as long as they can maintain established cloud separation and visibility requirements. These requirements vary depending on the airspace one is flying in. For ALM, which is Class D, aircraft operating visually are required to maintain at least 3 statute miles of visibility and remain no closer than 500 feet below, 1,000 feet above, and 2,000 feet horizontal distance from clouds. IMC describes the weather conditions that require pilots to fly the aircraft solely by reference to instruments as opposed to visually. Conditions are considered to be IMC when overall visibility is less than 3 statute miles and clouds are below a 1,000 foot ceiling. When an airport is in IMC, arrivals and departures are normally limited to a specific runway capable of accommodating approaches by reference to instruments only. This can include precision instrument approaches (those that give horizontal and vertical guidance) and non-precision instrument approaches (those that give only vertical guidance).

At ALM, Runway 16-34 is for use in VMC only. Approaches to Runway 21 are also only available during VMC. Of the four runway approaches, only Runway 3 with RNAV (GPS), VOR, and VOR/DME published approaches is available during IMC. This can affect the capacity of the airfield, as weather conditions fall to IMC, only Runway 3 is available for instrument approaches to the airport. Adverse weather is typically not a major factor in airport operations in the Alamogordo area due to the climatological conditions.

Wind Coverage

Wind also plays an important role in the capacity of a runway system, primarily for small, single-engine general aviation aircraft. Runways should be oriented in the direction of the prevailing wind to achieve maximum lift for takeoff. Most general aviation aircraft are not permitted to take off or land if the crosswind component is greater than the aircraft manufacturer's specifications. For this reason, FAA specifies that the runway orientation(s) should provide at least 95% wind coverage. In order to determine wind coverage wind roses were constructed from historical weather observations and climatology data. These data and the wind roses were used to calculate the percentage of wind coverage offered by the individual runways as well as the combined runways. Exhibits 8 & 9 in the Inventory chapter depict the wind roses for ALM. Wind represents the primary meteorological condition that will affect ALM airport operations. The current runway configuration provides greater than 95 percent wind coverage for all aircraft during all-weather, VMC and IMC conditions based on the data compiled in these wind roses.

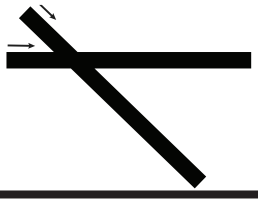
Annual Service Volume (ASV)

The initial step in developing a Demand/Capacity Analysis, is to conduct a preliminary assessment of the forecast demand levels relative to existing airfield capacity. This analysis determines whether demand is approaching the airfield's capacity or Annual Service Volume (ASV) and, if so, whether a detailed capacity calculation is warranted. Calculating the ASV takes into account Runway Use Configuration and Fleet Mix among other variables.

Chapter 2 from the Airport Capacity and Delay Advisory Circular (AC 150/5060-5) details the procedure for calculating capacity and delay for long range planning. This circular provides various typical runway

configurations at airports throughout the United States. The first step in calculating the ASV is to select the configuration that most closely reflects the airfield configuration at the study airport. As discussed in the Inventory chapter, The Alamogordo-White Sands Regional has two active runways; Runway 3-21 is the primary runway and is equipped with a non-precision instrument approach to the Runway 3 end. Runway 16-34 is a crosswind runway that intersects Runway 3-21 near the Runway 21 end. The runway use diagrams in AC 150/5060-5 assume there is at least one runway equipped with a precision instrument approach. The runway use configuration that best represents the combined primary and intersecting runway layout at ALM is number 9 (see **Table 25**).

TABLE 25
ANNUAL SERVICE VOLUME AND HOURLY CAPACITY ANALYSIS

Runway Configuration #9	Mix Index %(C+3D)	Hourly Capacity OPS/HR		Annual Service Volume OPS/HOUR
		VFR	IFR	
	0 to 20	98	59	230,000
	21-50	77	57	200,000
	51-80	77	56	215,000
	81-120	76	59	225,000
	121-180	72	60	265,000

Source: FAA - AC 150/5060-5

The second component needed to calculate the ASV is the fleet mix, or mix index. This is the percentage of aircraft operations by multi-engine aircraft in Aircraft Class C (maximum certificated takeoff weights between 12,500 pounds and 300,000 pounds) and Aircraft Class D (maximum certificated takeoff weights greater than 300,000 pounds). The formula for determining aircraft mix is the percentage of Class C aircraft plus three times the percentage of Class D aircraft or % (C+3D). The larger and heavier Class D aircraft have a greater impact on airfield capacity because the wake turbulence they generate can affect trailing aircraft requiring increased separation during operations, which reduces capacity.

Some assumptions were made using Table 16, Forecast Based Aircraft by Type, from the Forecast chapter of this report and data compiled from FlightAware for operations with filed flight plans into and out of ALM in 2012 to determine the mix index.

Since the current Airport Reference Code for ALM is B-III and the future ARC will be C-III, the assumption can be made that aircraft larger than C-III will not typically use the airport. This essentially eliminates any Class D, or heavy, aircraft from the fleet mix. Another assumption is that all single-engine aircraft weigh less than 12,500 pounds and are therefore grouped into Class A. The multi-engine turbine and jet aircraft operating at ALM, based on the FlightAware data, are in Class B. While the P2V aircraft currently operating at ALM are in Class B, the BAe-146 aircraft that will replace the P2V aircraft are in Class C and will represent the preponderance of Class C aircraft in the future. The resulting fleet mix percentages based on these assumptions for the 2032 forecast horizon yields a mix index calculation of less than five percent.

The Annual Service Volume, as identified in AC 150/5060-5, using runway-use configuration number 9 (the primary and intersecting runway grouping) with a Mix Index of less than five percent is approximately 230,000 annual operations (see Table 24). Projected demand at the Alamogordo-White Sands Regional

Airport by 2032 is estimated to be 43,859 annual operations. This is approximately 19 percent of the estimated ultimate capacity of 230,000 annual operations. Therefore, existing airfield capacity will be adequate to accommodate projected demand throughout the planning period.

Hourly Airfield Capacity

The hourly capacity of the airfield is a measure of the maximum number of aircraft operations that can be accommodated during a given hour of the day. This calculation identifies whether the airport can sufficiently accommodate the forecast hourly demand within the planning period.

This analysis continues with the procedure identified in AC 150/5060-5. Estimated VFR and IFR hourly capacities were determined based on the mix index of less than five percent that resulted in an ultimate airfield capacity of 230,000 annual operations. Based on these parameters, the VFR capacity at ALM is approximately 98 operations per hour and IFR capacity totals approximately 59 operations per hour. The peak hour VFR demand at ALM is projected to total 28 operations by 2032 which represents 29 percent of the hourly VFR capacity. Peak hour IFR demand was not specifically quantified in the forecast; however, this value would not exceed peak hour VFR demand. Therefore, the hourly IFR demand would at most be approximately 47 percent of the IFR capacity. These calculations show that airfield capacity will be adequate to accommodate projected VFR and IFR demand throughout the planning period.

FAA guidelines suggest that when annual operations reach 60 percent of Annual Service Volume, planning should be undertaken for facility improvements to increase operational capacity. The calculated estimates of ASV and hourly capacity indicate that the Airport will not reach this level within the forecast horizon and therefore, runway development for capacity purposes is not anticipated.

Runway Length Requirements

An analysis of runway length is based on airport elevation, the mean maximum temperature of the hottest month, runway gradient, types of aircraft expected to use the runway, their stage length, and other operational factors. All of these affect the lift of a departing aircraft. The current and future airport role also affects runway length requirements. ALM is projected to serve Short Haul (<1,000 mile) routes and accommodate Airport Reference Code C-III aircraft.

Table 26 presents the runway length requirements based on an Airport elevation of 4,199.8 feet above mean sea

TABLE 26
RUNWAY LENGTH REQUIREMENTS

Airport and Runway Data for Length Analysis	
Airport Elevation (MSL)	4,199.8 feet
Mean maximum temperature of the hottest month	94.9 F
Maximum difference in runway centerline elevation	0.7 feet
Length of haul for airplanes of more than 60,000 lbs	1,000 miles
Runway Lengths Recommended for Airport Design	
Small Airplanes with less than 10 passenger seats:	
95% of these small airplanes	5,450 feet
100% of these small airplanes	5,790 feet
Small airplanes with 10 or more passengers	5,790 feet
Large Airplanes of 60,000 pounds or less:	
75% of these large airplanes at 60 percent useful load	6,500 feet
75% of these large airplanes at 90 percent useful load	8,500 feet
100% of these large airplanes at 60 percent useful load	9,700 feet
100% of these large aircraft at 90% useful load	10,800 feet
Airplanes of more than 60,000 pounds	10,800 feet

Source: A/C 150/5325-4B

level (AMSL) and a mean maximum temperature of 94.9 degrees Fahrenheit for the hottest month of the year. The runway length requirement based on these parameters is 5,790 feet for all small aircraft (maximum takeoff weights of 12,500 pounds or less) as illustrated in **Exhibit 19**. For large aircraft of 60,000 pounds or less, the runway length required ranges from 6,550 feet to 10,800 feet as illustrated in **Exhibit 20**.

Runway 3-21 at 7,003 feet by 150 feet will accommodate 100 percent of all small aircraft with 10 or more passenger seats and 75 percent of large aircraft of 60,000 pounds or less at 60 percent useful load. A runway length of 10,800 feet would be required to accommodate 100 percent of large aircraft with maximum takeoff weights of 60,000 pounds or less at 90 percent useful load as illustrated in **Exhibit 21**.

The majority of forecast operations at ALM will be general aviation. Commercial activity, which has been provided in the past and may return at some point in the future has always been provided by aircraft of less than 60,000 pounds and these can be accommodated on the existing runway at it's present length. However, the upcoming replacement of the current P2V air tanker aircraft by upgraded BAe-146 air tankers that have a maximum gross takeoff weight in excess of 90,000 pounds cannot

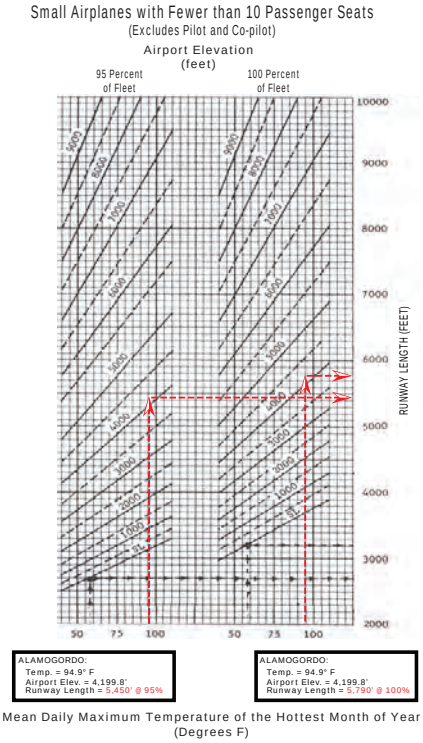
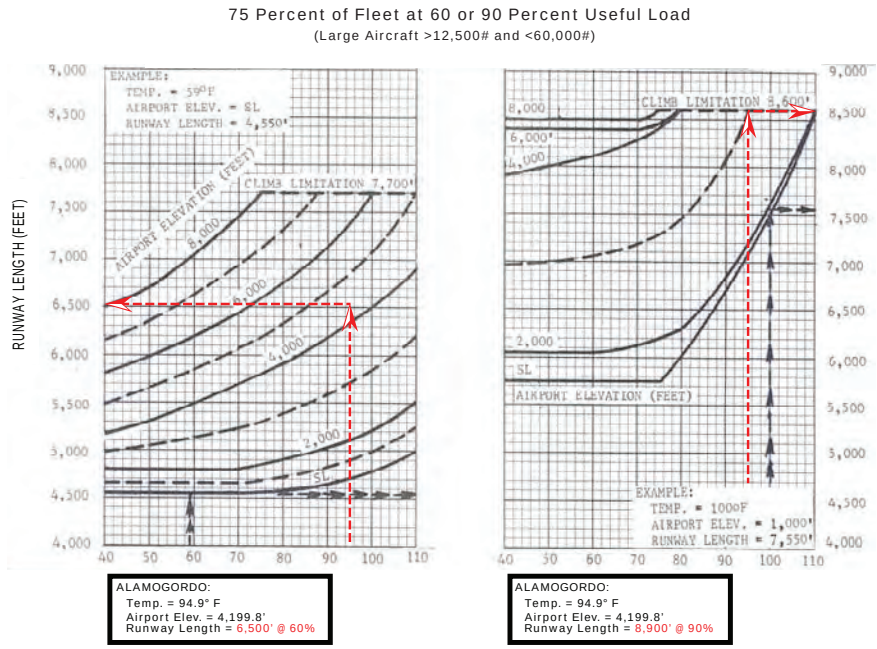


Exhibit 19
Runway Length Requirements for Small Airplanes

Exhibit 20
Runway Length Requirements for 75% of Airplanes



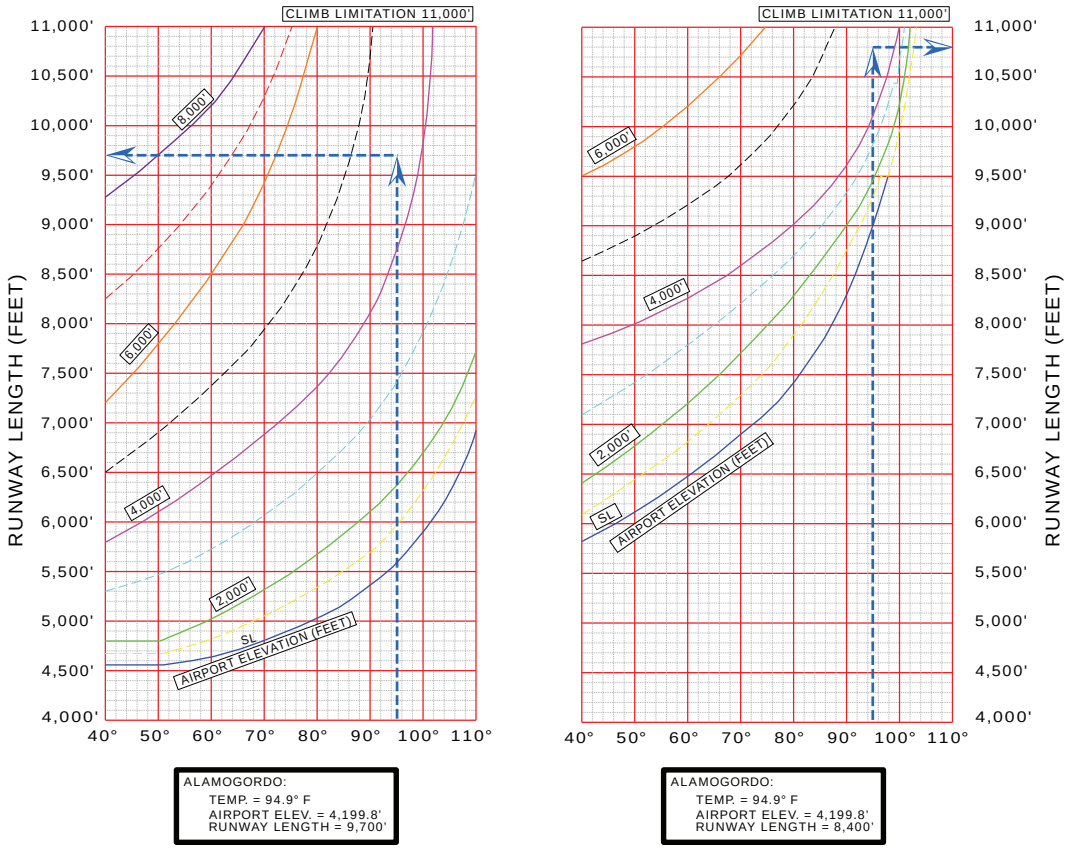


Exhibit 21

Runway Length Requirements for 100% of Airplanes

be accommodated on the existing 7,003 feet of runway. Data provided by the BAe-146 operators show that a runway length of 10,750 feet would be required to accommodate their operations with optimum fire retardant loads. Therefore, the existing runway length will need to be extended to adequately serve airport operations throughout the planning period.

It should be noted that the USFS has a number of contracts with third-party vendors who are contracted to engage in fire-fighting activities for the Forest Service throughout the country. These contractors operate a wide variety of aircraft that range from helicopters up to the Boeing/McDonnell-Douglas DC-10. The USFS Alamogordo Air Tanker Base, "Pavement and Foundation Design Recommendations" published March 14, 2001, identified the P2V as the critical aircraft for pavement strength at ALM. Although the P2V is not the heaviest aircraft operating in the current firefighting fleet, nor does it require the longest runway, the wheel configuration of this aircraft combined with its weight, imposes the greatest demands for pavement strength.

As noted previously, the current firefighting fleet includes Boeing/McDonnell-Douglas DC 10 aircraft, currently operated by 10 Tanker, one of the third party vendors under contract with the U.S. Forest Service.

10 Tanker currently operates a single DC 10-10 and a single DC 10-30 aircraft, which have maximum gross takeoff weights (MGTOW) of 433,000 and 558,000 pounds respectively. These aircraft represent the most demanding in the current firefighting fleet, with regard to airfield separations and maximum gross takeoff weights. (10 Tanker has noted that their two aircraft can typically operate at takeoff weights 40 percent less than their MGTOW's.) However, based on the projected operating weight of these DC 10 aircraft for firefighting purposes, the BAe-146 requires a greater takeoff runway length. In addition, ALM is not currently approved by the USFS for DC 10 operations.

Similarly, four Airlift Wings of the Air National Guard operate a fleet of C-130 Hercules aircraft in their Modular Airborne Firefighting Systems (MAFFS) program. This program was created by Congress to provide emergency firefighting support throughout the country. The original MAFFS program aircraft had a fire retardant tank capacity of 2,700 gallons. MAFFS II, the next generation Airborne Firefighting System has an improved, 3,000 gallon retardant capacity. However, regional foresters only request MAFFS activation once they have determined all available commercial air tankers are assigned or committed to on-going incidents. Therefore, MAFFS operations out of ALM would only occur in an emergency situation when all other commercial options had been exhausted (ALM is not a currently approved MAFFS facility).

In that regard, the USFS Air Tanker Base study indicated a minimal level of activity by C-130 aircraft at ALM, representing a projected total of twenty annual departures or forty total operations. While this minimal level of projected C-130 activity may be extremely conservative given the current and forecast extreme levels of fire activity and the age of this document, ALM would have to be approved for MAFFS operations and even then, it is problematic whether emergency operations by C-130 aircraft would reach the 250 annual itinerant operations required by FAA to be deemed the Airport's critical aircraft.

Runway 16-34, the unpaved crosswind runway, is currently used primarily by small general aviation aircraft during periods of high crosswinds on Runway 3-21. Runway 16-34 provides greater wind coverage for these small general aviation aircraft during periods of high crosswinds than does Runway 3-21. The availability of Runway 16-34 as a dirt runway provides some relief during periods of high crosswinds. However, a dirt runway can be problematic with greater potential of encountering blowing debris, damaging ruts - particularly during periods of heavy rain, and the additional maintenance and associated costs required to maintain the runway in optimum condition throughout the year. In addition, since Runway 16-34 is unlighted its utility during periods of low visibility would be limited if not non-existent.

Given these issues and the greater safety afforded by a paved runway, it is strongly recommended that Runway 16-34 be paved and lengthened to accommodate at a minimum 95% of the small GA fleet, which would result in an initial runway length of 5,500 feet, a pavement width of 150 feet, and a weight bearing capacity of 12,500 pounds, single wheel loading.

Runway 16-34 should also ultimately be upgraded to serve the P2V and BAe-146 air tankers as well since any closure of Runway 3-21 would effectively close ALM to operations from the air tanker base. Closure of the airport for any reason, particularly during the fire-fighting season could have a devastating effect on the communities the air tanker base serves.

Airfield Pavement Strength

The primary runway pavement strength is 54,000 pounds single wheel and 74,000 pounds dual wheel. This pavement will accommodate the vast majority of general aviation aircraft operations throughout the planning period. However, this pavement is inadequate with regard to accommodating operations by the P2V and

BAe-146. The USFS Air Tanker Base study referenced previously, indicated a pavement strength requirement of 80,000 pounds single wheel loading to accommodate the Neptune P2V, the current critical aircraft. Once Neptune Aviation relocates their P2V's from their current Missoula, MT., base to ALM, this upgrade in pavement strength will be even more important to safe and efficient air tanker operations. Therefore, the pavement strength of Runway 3-21 should be upgraded to accommodate operations by the both the P2V and BAe-146.

Runway 16-34, assuming initial development to a length of 5,500 feet and a pavement strength of 12,500 pounds, would be unable to adequately accommodate BAe-146 operations should Runway 3-21 become unavailable. Airport management should therefore pursue a program to strengthen and lengthen both Runway 3-21 and Runway 16-34 to accommodate P2V as well as significantly expanded future BAe-146 operations. Airport management should also continue to monitor the condition of the pavement due to the effects of weathering and oxidation and establish a Pavement Condition Index (PCI) program to maintain these pavements.

Runway Width Requirements

The runway width requirement is based on the Airport Reference Code and the design category for the specific runway. The FAA Advisory Circular on Airport Design (AC 150/5300-13a) specifies a runway width of 150 feet for ARC C-III. Primary Runway 3-21 at 150 feet in width meets the FAA runway width design criteria. Runway 16-34 is a 190 foot wide dirt runway with visual approaches. This runway will need to be upgraded with a paved surface 150 feet in width with a pavement strength of 80,000 pounds single wheel loading capable of supporting P2V and BAe-146 operations in order to meet FAA design standards.

Taxiway Requirements

An efficient taxiway system improves an airport's ability to handle arriving and departing aircraft by expediting movements to and from the runway system. With the release of the updated "Airport Design" Advisory Circular 150/5300-13a, FAA has initiated a new procedure for establishing taxiway requirements based on the Taxiway Design Group (TDG). Previously, FAA based taxiway design solely on Airplane Design Groups (ADG). ADGs are based on the aircraft wingspan and tail height, but do not take into consideration the dimensions of the aircraft landing gear. Landing gear configuration must be taken into consideration in designing taxiway fillets. AC 150/5300-13a provides guidance for determining TDGs, based on the overall Main Gear Width (MGW) and the Cockpit to Main Gear (CMG) distance. The updated AC provides the cockpit to main gear distance for a number of aircraft, however this information is not provided for the Neptune P2V. The BAe-146 is listed as TDG 3.

Runway 3-21 currently has a full-length parallel taxiway (Taxiway "A") located 250 feet from the runway centerline. The 250 foot separation distance does not meet FAA recommended design standards for TDG 3. The parallel taxiway should therefore be relocated to meet the FAA recommended TDG 3 separation distance of 400 feet.

The existing parallel taxiway is 75 feet wide, which exceeds the FAA recommended width for TDG 3 of 50 feet. At the time the parallel taxiway is relocated to a point 400 feet from the runway centerline, it should be constructed to a width of 50 feet to meet FAA design criteria. All of the connector taxiways will need to be constructed to a 50 foot width at the time the parallel taxiway is relocated as well.

FAA airport design guidelines recommend a 20 foot shoulder width for taxiways serving TDG 3 aircraft. It is therefore recommended that all taxiways be provided with the appropriate shoulders reflective of their design aircraft.

At the time Runway 16-34 is paved and lengthened, all taxiways serving the runway should be constructed to TDG 3 standards as well.

Airfield Instrumentation and Lighting

Runway 3-21 is equipped with Medium Intensity Runway Lights (MIRL) and runway end identification lights (REIL) with precision approach path indicators (PAPI) on Runway 3 and visual approach slope indicators (VASI) on Runway 21. Runway 16-34 is unlighted and has no approach aids.

The MIRL for Runway 3-21 was installed in 1991 and is in good condition but will likely need rehabilitation in the near term due to its age. Parallel Taxiway "A" is equipped with Medium Intensity Taxiway Lights (MITL) that were also installed in 1991 and these lights are in good condition. However, relocation of the parallel taxiway 400 feet off the Runway 3-21 centerline will require installation of new taxiway lighting. MITL systems will be sufficient throughout the planning period.

The Airport has three lighted windsocks. The primary windsock is located near the midpoint of Runway 3-21 on the east side and consists of a windsock and segmented circle. Two additional lighted windsocks are located near the Runway 3 and Runway 21 ends and are in good condition. The Airport has a 36 inch clear and green airport beacon located on a 50-foot tower. The beacon was refurbished in 1991 and will likely need another refurbishment in the near term.

Runway Design Standards

Table 27 lists the runway design standards for a C-III Airport Reference Code with a precision approach providing visibility minimums down to 1/2 mile. The updated AC 150/5300-13a refers to this as the Runway Design Code (RDC). These standards will be applied to determine airfield safety areas for both Runway 3-21 and the Future Runway 16-34.

Runway Protection Zones

Runway protection zones are trapezoidal in shape and centered on the extended runway centerline (see **Exhibit 22**). Table 26 lists the RPZ dimensions. The RPZ enhances the protection of people and property on the ground. The RPZ begins 200 feet beyond the usable end of the runway pavement. Displacing the landing or takeoff threshold does not change the beginning point of the RPZ. The RPZ location remains at the 200-foot standard if runway pavement is used for either takeoffs or landings. The actual RPZ length and width depend on the size of the aircraft using the runway and type of approach available. Generally, as aircraft size increases and the approach minimums become more precise, the dimensions of the RPZ increase.

The RPZ contains two sub-areas, the runway object free area (OFA) and the controlled activity area, discussed in the following sections.

- **Central Portion of the RPZ**

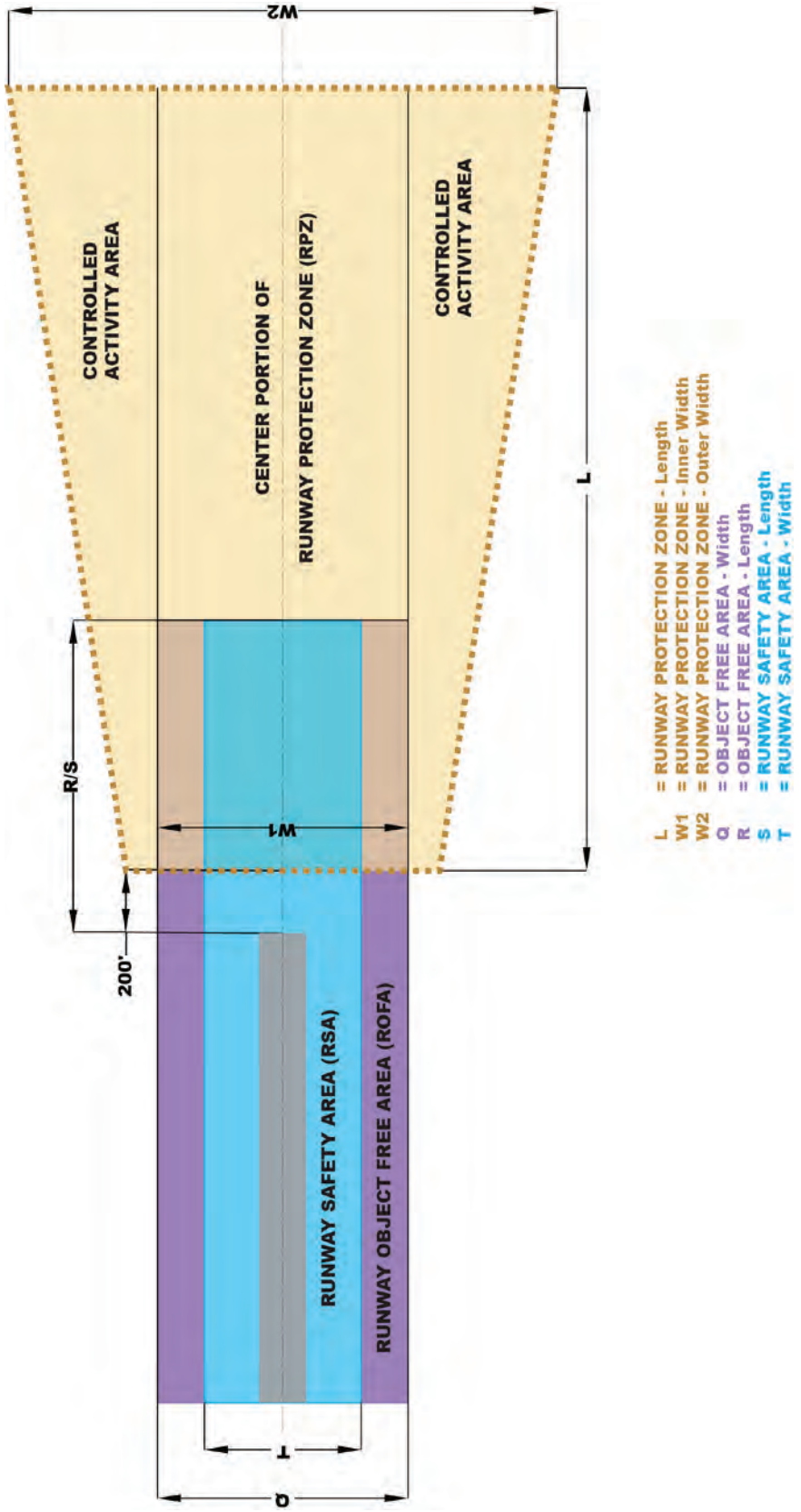
  The central portion of the RPZ extends from the beginning to the end of the RPZ and is centered on the extended runway centerline. Its width is equal to the width of the runway OFA. Existing and future OFA dimensions for all runways are presented in **Table 28**.

- **Controlled Activity Area**

  The controlled activity area is the portion of the RPZ on either side of the central portion of the RPZ. The airport should maintain control of this area through fee simple ownership. The controlled

TABLE 27
RUNWAY DESIGN STANDARDS MATRIX, C–III - 2400

ITEM	VISIBILITY MINIMUMS			
	Visual	Not Lower than 1 mile	Not Lower than 3/4 mile	Lower than 3/4 mile
RUNWAY DESIGN				
Runway Length	Refer to paragraphs 302 and 304			
Runway Width	150 ft	150 ft	150 ft	150 ft
Shoulder Width	25 ft	25 ft	25 ft	25 ft
Blast Pad Width	200 ft	200 ft	200 ft	200 ft
Blast Pad Length	200 ft	200 ft	200 ft	200 ft
Crosswind Component	16 knots	16 knots	16 knots	16 knots
RUNWAY PROTECTION				
Runway Safety Area (RSA)				
Length beyond departure end	1,000 ft	1,000 ft	1,000 ft	1,000 ft
Length prior to threshold	600 ft	600 ft	600 ft	600 ft
Width	500 ft	500 ft	500 ft	500 ft
Runway Object Free Area (ROFA)				
Length beyond runway end	1,000 ft	1,000 ft	1,000 ft	1,000 ft
Length prior to threshold	600 ft	600 ft	600 ft	600 ft
Width	800 ft	800 ft	800 ft	800 ft
Runway Obstacle Free Zone (ROFZ)				
Length	Refer to paragraph 308			
Width	Refer to paragraph 308			
Precision Obstacle Free Zone (POFZ)				
Length	N/A	N/A	N/A	200 ft
Width	N/A	N/A	N/A	800 ft
Approach Runway Protection Zone (RPZ)				
Length	1,700 ft	1,700 ft	1,700 ft	2,500 ft
Inner Width	500 ft	500 ft	1,000 ft	1,000 ft
Outer Width	1,010 ft	1,010 ft	1,510 ft	1,750 ft
Acres	29.465	29.465	48.978	78.914
Departure Runway Protection Zone (RPZ)				
Length	1,700 ft	1,700 ft	1,700 ft	1,700 ft
Inner Width	500 ft	500 ft	500 ft	500 ft
Outer Width	1,010 ft	1,010 ft	1,010 ft.	1,010 ft
Acres	29.465	29.465	29.465	29.465
RUNWAY SEPARATION				
Runway centerline to:				
Parallel runway centerline	Refer to paragraph 316			
Holding Position	250 ft	250 ft	250 ft	250 ft
Parallel taxiway/taxilane centerline	400 ft	400 ft	400 ft	400 ft
Aircraft parking area	500 ft	500 ft	500 ft	500 ft
Helicopter touchdown pad	Refer to AC 150/5390-2			



Alamogordo-White Sands Regional Airport

Exhibit 22
Airfield Safety Areas

TABLE 28
AIRFIELD SAFETY AREAS

Runway	AIRFIELD SAFETY AREAS													
	Existing RPZ			Future RPZ*			OFA				RSA			
							Existing		Future		Existing		Future	
							B-III		C-III		B-III		C-III	
	L	W[1]	W[2]	L	W[1]	W[2]	Q	R	Q	R	P	C	P	C
3	1,000	500	700	2,500	1,000	1,750	600	800	800	1,000	300	600	500	1,000
21	1,000	500	700	1,700	1,000	1,510	600	800	800	1,000	300	600	500	1,000
	Existing RPZ			Future RPZ			B-II		C-III		B-II		C-III	
16	1,000	500	700	1,700	500	1,010	300	500	800	1,000	150	300	500	1,000
34	1,000	500	700	1,700	500	1,010	300	500	800	1,000	150	300	500	1,000

L =	Runway Protection Zone - Length	Q =	Object Free Area - Width
W1 =	Runway Protection Zone - Inner Width	R =	Object Free Area - Length
W2 =	Runway Protection Zone - Outer Width	P =	Runway Safety Area - Width
		C =	Runway Safety Area - Length

Source: FAA - AC 150/5300-13a - see Figure 19.
[a] Assumes implementation of a precision approach.
URS Corporation Analysis.

activity area should be free of land uses that create glare and smoke as well as residences. Fuel-handling facilities, churches, schools, and offices are not recommended in the RPZ's controlled activity area. Roads are also typically not recommended within the RPZ.

The following land uses are permitted within the RPZ without additional evaluation:

(1) Farming that complies with specific buffer areas identified in AC 150/5300-13a;

(2) Irrigation channels that do not attract birds;

(3) Airport service roads, that are not public roads and are directly controlled by the airport;

(4) Underground facilities that meet design criteria, such as applicable RSA requirements; and

(5) NAVAIDs and facilities including equipment for airport facilities considered fixed-by-function in the RPZ.

Runway Safety Areas

FAA criteria state that the Runway Safety Areas (RSA) should be:

(1) cleared and graded with no potentially hazardous ruts, humps, depressions, or other surface variations;

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

(3) capable, under dry conditions, of supporting snow removal equipment, 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 needed in the runway safety area because of their function. Objects higher than 3 inches above grade must be constructed, as practical, on frangibly mounted structures of the lowest practical height with the frangible point no higher than 3 inches above grade.

All ALM runways currently meet FAA RSA design standards. Transition from the Neptune P2V, which is a B-III ARC to the BAe-146, which is a C-III ARC will result in a corresponding upgrade to the RSA standards. This upgrade will require RSA's for all runway ends that are 500 feet in width and 1,000 feet in length.

Runway Object Free Areas

FAA criteria state that the Runway Object Free Areas (OFA) should be clear of above-ground objects protruding above the nearest point of the RSA. Objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes can protrude above the nearest point of the RSA except where precluded by other clearing standards. Aircraft can also taxi and hold in the OFA. To the extent practicable, objects in the ROFA should meet the same frangibility requirements as the RSA. All existing OFA's at ALM meet the FAA design standards, however, as with the RSA, the shift to the BAe-146 will result in an upgrade to the OFA's that increase their size to 800 feet in width and 1,000 feet in length.

Runway Alignment and Numbering

FAA criteria recommend a minimum 95 percent wind coverage for airports accommodating small aircraft (less than 12,500 lbs.) in approach categories A and B, for a 12 mph (10.5 knot) crosswind component, which represent the majority of aircraft and operations at ALM. Tabulations of wind coverage were identified in the Inventory Chapter and are based on the All Weather Wind Rose for ALM. These tabulations show that the Runway 3-21 and 16-34 combined alignments provides 99.2 percent coverage for Category A and B aircraft with a 10.5 knot crosswind component and 99.7 percent coverage for larger aircraft. The Runway 3-21 alignment provides 94.5 percent coverage for Category A and B aircraft with a 10.5 knot crosswind component and 97.18 percent coverage for larger aircraft. Therefore, the existing runway system provides the FAA recommended minimum 95 percent coverage.

A review of the true runway bearings relative to the magnetic declination for the Alamogordo area reveals the need to change the current airfield numbering as illustrated in **Table 29**. Runway 3-21 would need to be re-numbered as Runway 4-22 and Runway 16-34 would need to be re-numbered as Runway 17-35.

TABLE 29
RUNWAY NUMBERING

	Runway 3-21	Runway 16-34
True Runway Bearing	N45°-33'-28"E	N06°-06'-36"W
Magnetic Declination	8°-52'-36"E	8°-52'-36"E
Magnetic Bearing	N36°-40'-52"E	N14°-59'-12"W
Updated Runway Designation	4-22	17-35

Source: URS analysis, 2013.

Terminal Facilities

This section examines the demands that forecast activity levels will place on existing terminal facilities. Through this comparison the future needs for the terminal building, based aircraft apron, transient apron, and hangar space can be determined.

Commercial and GA Terminal/Administration Building

ALM has a single level passenger terminal building that previously served commercial aircraft operations. The building contains 6,880 square feet of floor space and is in good condition, currently accommodating Airport administration and a small cafe.

The Airport and local community are in the process of trying to re-establish commercial air service through the Small Community Air Service Development Program (SCASDP). The SCASDP is a grant program designed to help small communities address air service and airfare issues.

SCASDP would enable ALM to identify its air service deficiencies and propose a solution appropriate to the local communities's needs. This Program can involve a number of options including revenue guarantees, financial assistance for marketing programs, start-up costs and air service development studies.

The existing passenger terminal should be adequate to accommodate renewed passenger service should ALM be successful in obtaining an SCASDP grant and subsequent air service. In addition, Airports that serve scheduled air carriers using aircraft with ten (10) or more seats must hold a Part 139 certification. Alamogordo-White Sands Regional Airport is not currently Part 139 certified. A detailed analysis of the Part 139 requirements and ALM's existing ability to meet those requirements as well as any needed improvements is being completed under a separate study.

Exile Aviation provides general aviation terminal facilities within their FBO operation with a pilot lounge, flight planning room, restrooms, and meeting space.

The Exile Aviation terminal facilities should adequately accommodate the general aviation terminal building requirements at ALM throughout the planning period.

Based Aircraft Apron

There currently are 61 aircraft tie-down spaces provided for based aircraft at ALM. However, actual based aircraft tiedown apron requirements are minimal. Discussions with the FBO and data provided by the Airport indicate that only six aircraft are currently tied down on the ramp. Given the high investment value of aircraft and the extreme temperatures that can be encountered at ALM, the vast majority of based aircraft are either stored in T-hangars, community hangars, or corporate hangars. Therefore with 55 open tiedown spaces available, the existing aircraft apron will be capable of accommodating all based aircraft tie-down needs throughout the planning period.

Transient Apron

Transient apron is the apron area required for aircraft that are not based at ALM, but fly into the airport and need temporary storage. Transient aircraft operations are a subset of itinerant operations. An itinerant operation is any operation that isn't local. Local operations are those that stay within the control area of the airport or depart to go to a known training area and return to the originating airport. Aircraft performing local operations are typically based at the originating airport. To perform this calculation, several assumptions were made. The forecast of average day-peak month itinerant operations from Chapter 3 of this report, was increased by 10 percent to calculate busy day-peak month itinerant operations.

Transient operations are assumed to represent 70 percent of busy-day itinerant operations. The number of transient aircraft total 50 percent of the busy-day transient operations. Space on the transient ramp should be provided for 80 percent of the busy-day transient aircraft. Single-engine aircraft and multi-engine aircraft

represent 66 and 34 percent of transient aircraft respectively. In 2032, 16 total transient spaces will be required; 11 for single-engine aircraft and 5 for multi-engine aircraft.

Overall apron space requirements are determined by applying established rules of thumb for transient apron areas. Typically, 360 square yards of apron space is adequate for transient single-engine aircraft and 600 square yards for transient multi-engine aircraft. An additional 20 percent is added to account for the area used by based aircraft for fueling, loading, and other activities. **Table 30** summarizes these assumptions and provides an overall transient apron calculation throughout the planning period.

By 2032, 16 transient spaces totaling approximately 8,500 square yards of apron will be required for transient aircraft. The airport currently has 14 transient spaces. However, there is adequate available tie-down space to support the forecast demand throughout the planning period.

TABLE 30
TRANSIENT APRON REQUIREMENTS

Transient Apron Space Requirements		2017	2022	2032
Peak Month Itinerant Operations		1,246	1,313	1,572
ADPM Itinerant Operations		40	42	51
Busy-Day PM Itinerant Operations	10%	44	46	56
Transient Operations	70%	31	32	39
Transient Aircraft	50%	15	16	20
Transient Aircraft Spaces	80%	12	13	16
Single-Engine Aircraft	66%	8	9	11
Multi-Engine Aircraft	34%	4	4	5
Aircraft Apron Space Requirements		**2013**	**2018**	**2028**
Transient Single-Engine	360	2,800 sy	3,240 sy	3,960 sy
Transient Multi-Engine	600	2,400 sy	2,400 sy	3,000 sy
Miscellaneous	20%	1,040 sy	1,128 sy	1,512 sy
Total		6,240 sy	6,768 sy	8,472 sy

Source: *URS Corporation Analysis, 2013.*
ADPM - Average Day Peak Month
PM - Peak Month.

Hangars and Hangar Apron

To determine hangar requirements, several assumptions were developed to distribute based aircraft through discussions with the FBO and data provided by the Airport. Based on this information, it was assumed that 95 percent of based single-engine aircraft will have the need for hangar space. Of that 95 percent, 60 percent will require T-hangars, and 40 percent will require conventional hangars. All of the multi-engine piston aircraft will require hangar space. Of those aircraft, 50 percent will require conventional hangars and 50 percent will require T-hangars.

Neptune Aviation bases two Neptune P2V's on the heavy aircraft ramp. Neptune also has a hangar capable of accommodating two P2Vs and has expressed interest in constructing an additional hangar and apron when they relocate all of their existing P2V fleet to ALM. Therefore, it was assumed that other than Neptune's P2Vs, all based multi-engine turbine and future jet aircraft will require conventional or corporate hangar space and all based aircraft in the "other" category will require T-hangars. It was also assumed that in the future all but the one rotor aircraft currently located on the ramp, will require conventional hangar storage.

With regard to the "Other" aircraft, it was assumed that 50 percent would be located in conventional hangars and 50 percent in T-hangars.

Conventional hangar space was based on a standard of 1,200 square feet for a single-engine aircraft and rotorcraft, 1,400 square feet for a multi-engine aircraft, and 1,800 square feet for all multi-engine turbine and jet aircraft. All T-hangar units were based on an area of 1,400 square feet. All jet aircraft were assumed to require 2,400 square feet of corporate/conventional storage space. The area calculations were then applied to the assumptions of based aircraft distribution to determine overall hangar area requirements. (See **Table 31** for the breakdown.)

Since conventional hangars vary in size as do the number of aircraft stored in them, only the required area is listed. T-hangars store only one aircraft and the dimensions of the hangars are generally consistent. In all, the total required hangar area is 135,800 square feet in 2017, 140,000 square feet in 2022, and 169,600 square feet in 2032.

TABLE 31
CONVENTIONAL AND T-HANGAR REQUIREMENTS

Hangar	Area (SF)	2017		2022		2032	
		Aircraft	Area	Aircraft	Area	Aircraft	Area
Conventional Hangars	**Area/Aircraft**						
Single-engine	1,200	33	39,600	33	39,600	40	48,000
Multi-engine Piston	1,400	1	1,400	1	1,400	1	1,400
Multi-engine Turbine	1,800	3	5,400	4	7,200	6	10,800
Jet	2,400	0	0	0	0	1	2,400
Rotorcraft	1,200	1	1,200	3	3,600	4	4,800
Other	1,000	7	7,000	7	7,000	7	7,000
	Subtotal	**45**	**54,600**	**48**	**58,800**	**59**	**74,400**
Hangar	**Space**	**2017**		**2022**		**2032**	
		Aircraft	**Area**	**Aircraft**	**Area**	**Aircraft**	**Area**
T-Hangars	**Area/Aircraft**						
Single-engine	1,400	50	70,000	50	70,000	60	84,000
Multi-engine Piston	1,400	1	1,400	1	1,400	1	1,400
Multi-engine Turbine	N.A.	0	0	0	0	0	0
Jet	N.A.	0	0	0	0	0	0
Rotorcraft	N.A.	0	0	0	0	0	0
Other	1,400	7	9,800	7	9,800	7	9,800
	Subtotal	**58**	**81,200**	**58**	**81,200**	**68**	**95,200**
Total - All Hangars		**103**	**135,800**	**106**	**140,000**	**127**	**169,600**
Conventional Hangar Apron		**45**	**54,600**	**48**	**58,800**	**59**	**74,400**

Source: URS Corporation Analysis, 2013.

Expansion of the Neptune hangar and associated facilities are not specifically detailed in this report as they are private facilities whose size, location, and timing are subject to the specific operational requirements of Neptune Aviation. However, it is extremely important that the Airport maintain flexibility within the airport layout in order to accommodate any expansion of Neptune's operations.

There are presently five unoccupied T-hangars at ALM, which will be sufficient to accommodate demand through the 2022 planning horizon. However, by 2032 an additional five T-hangars will be needed. Additional conventional hangar space will be needed both in 2022 and 2032.

Exile Aviation currently has plans to construct up to four additional conventional aircraft storage hangars at ALM, which should accommodate forecast demand through the planning period.

A difference between a T-hangar and a corporate hangar is that a corporate hangar is typically larger in size and, depending upon the lease agreement, commercial activities can be conducted within these hangars.

It should be noted that there have been discussions with potential airport tenants that could significantly impact future facility needs. Significantly larger aircraft including the DC 10 air tanker and surplus Air Force C-130's could potentially relocate to ALM. Based on the outcome of these discussions and decisions by the Air Force regarding surplus C-130 Aircraft, the Airport should continually review Airport activity and facility needs to ensure adequate facilities are available to accommodate unforeseen demand.

Conventional hangars usually require hangar apron equal to the area of the hangar itself. T-hangars do not require aprons as they can be accessed using the adjacent taxiways. The conventional hangar apron demand is identical to the physical area of the conventional hangars. In 2017, conventional hangars will require an apron area of approximately 54,600 square feet, 58,800 square feet in 2022, and 74,400 square feet in 2032.

Aviation Support Facilities

Aviation support facilities are those required to support the daily operation of the airport. Support facilities include fuel storage facilities (also known as fuel farms), the Airport Rescue and Firefighting Facility (ARFF), and any airport maintenance facilities. The analysis in this section evaluates each support facility to determine its capability to adequately accommodate the projected demand.

Fuel Storage

The existing storage capacity of the fuel farm was discussed in detail in the Inventory chapter. The fuel storage facility provides two above ground storage tanks with a capacity of 12,000 gallons of Aviation Gasoline (AVGAS) and 12,000 gallons of Jet-A fuel. The fuel flowage at ALM for 2012 was approximately 225,000 of Jet-A and 213,000 gallons of 100LL AvGas.

Since detailed aircraft operations data are not available, the average number of gallons of fuel usage per aircraft departures was calculated, in order to estimate future fuel consumption rates for both Jet-A and 100LL AvGas. For Jet-A, this calculation yielded a ratio of 13.1 gallons of fuel consumed per aircraft departure. Similarly, the average number of gallons of 100LL AvGas per aircraft departure was calculated. In 2012, approximately 12.4 gallons of AvGas was dispensed per aircraft departure.

The ratio for Jet-A fuel usage was increased by 2.5 percent during each five-year period to reflect the increased aircraft size and utilization projected for the aircraft operators during the study period. The projected fuel usage per departure was then applied to the forecast of average daily aircraft departures to determine the estimated total average daily fuel usage. A five-day fuel supply is a typical guide for planning purposes. The

average daily demand was multiplied by five to arrive at the 5-day fuel storage requirement. Projected 5-day Jet-A fuel storage requirements for the planning period are provided in **Table 32**.

The existing 12,000 gallons of Jet-A fuel storage provides the recommended 5-day supply of fuel, based on current and projected usage throughout the planning period. However, it should be noted that at the time the BAe-146 aircraft replace the current P2V operations, the Jet-A fuel usage and storage requirements will dramatically increase since the P2V's currently use 100LL AvGas as their primary fuel source. Since no operational data is available for the BAe-146 at ALM, the Airport should review the Jet-A fuel storage requirements once those aircraft replace the P2Vs. Additional Jet-A fuel storage capacity will likely be required some time during the Intermediate Range planning period to ensure that adequate capacity is available to support ongoing Airport operations.

The ratio of gallons of AvGas used per general aviation departure was similarly increased by 2.5 percent during each five-year period to reflect the increasing usage of GA aircraft for corporate activity during the study period. As with Jet-A, the projected fuel usage per departure was then applied to the forecast of average daily aircraft departures to determine the estimated total average daily 100LL Avgas fuel usage. A seven-day fuel supply is a typical guide for planning purposes. The average daily demand was therefore multiplied by seven to arrive at the 7-day fuel storage requirement. Projected 7-day 100LL AvGas fuel storage requirements for the planning period are provided in **Table 33**.

The existing 12,000 gallons of 100LL AvGas fuel storage provides the recommended 7-day supply of fuel, based on current and projected usage throughout the planning period.

TABLE 32
PROJECTED JET A FUEL STORAGE REQUIREMENT

Year	Average Daily Departures	Gallons/ Departure	Jet-A Fuel Usage	Existing Jet-A Storage	5-Day Total	Storage Deficiency
2012	22	13.1	287	12,000	1,436	-
2017	22	13.1	287		1,436	-
2022	23	13.4	308		1,539	-
2032	28	14.1	394		1,969	-

Source: URS analysis.

TABLE 33
100 LL AVGAS FUEL STORAGE REQUIREMENT

Year	Average Daily Departures	Gallons/ Departure	AvGas Usage (Gallons)	Existing AvGas Storage	7-day supply (Gallons)	Storage Deficiency
2012	22	12.4	272	12,000	1,904	-
2017	22	12.4	272		1,904	-
2022	23	12.7	291		2,040	-
2032	28	13.3	373		2,609	-

Source: URS analysis.

Airport Rescue and Firefighting Facilities (ARFF)

Airports certified under Federal Aviation Regulation (FAR) Part 139 (Certification of Airports) must comply with specific operational requirements for ARFF. The primary requirements include complying with response time regulations and equipment and agent materials. The FAA and the International Civil Aviation Organization (ICAO) developed criteria for classifying these regulations into five different indexes. The applicable index is determined by the length of the longest aircraft operated by an air carrier performing a specific number of scheduled departures per day (calculated on an annual basis).

Table 34 tabulates the five ARFF Indexes and details the specific requirements for an airport to meet each Index.

ALM is currently not certificated under Part 139 of the regulations; however, if the airport does obtain commercial air service, Part 139 Certification will be required. The Airport has previously operated under Part 139 with ARFF facilities per the guidance for an Index 'A' airport. Index A applies to airports serving aircraft less than 90 feet in length with more than one operation per day. New Mexico airlines served ALM with the Cessna Caravan 208B aircraft, which had an overall length of a little over 37-½ feet and a seating capacity of eight passengers. Should ALM's current efforts to restore air service be successful the aircraft providing that service would most likely fall within ARFF Index A.

Index 'A' establishes the following criteria for equipment and agents:

- One vehicle carrying at least 500 pounds of sodium-based dry chemical, halon 1211, or 450 pounds of dry chemical and 100 gallons of water.

Fire Station #3

The Alamogordo Fire Department currently operates a "sub-station" at the Alamogordo/White Sands Regional Airport. This Fire Station "sub-station" is located at 3500 Airport Road on Airport property situated on the north side of the taxiway. This location enables fire station equipment and personnel to respond to ARFF emergencies within three (3) minutes. The denotation of "sub-station" indicates that this station is

TABLE 34
ARFF INDEX CLASSIFICATIONS

Airport Index	Required No. of Vehicles	Aircraft Length	Scheduled Departures*	Agent + Water for Foam
A	1	<90'	> 1	500# DC or HALON 1211 or 450# DC + 100 Gal H2O.
B	1 or 2	≥ 90', < 126' ≥ 126', <159'	< 5	Index A + 1,500 Gel H_2O
C	2 or 3	≥ 126', < 159' ≥159', <200'	≥ 5 < 5	Index A + 3,000 Gel H_2O
D	3	≥159', <200' >200'	≥ 5 < 5	Index A + 4,000 Gel H_2O
E	3	≥ 200'	≥ 5	Index A + 6,000 Gel H_2O

Source: URS analysis.
** daily departures*

not a manned station 24/7 as are our other stations; however, the station is staffed for standbys during times where fire suppression at the airport is needed. This station is certified by the New Mexico State Fire Marshal's Office as a substation, and was approved by the FAA in 2006 as an Airport Rescue and Fire-Fighting (ARFF) station. The station is heated and equipped with its own 30 gallon air compressor, and is assessable twenty four (24) hours a day by all Fire Department personnel. This Fire Station is clearly marked as a Fire Station and identifiable as a Fire Station. This station comprises approximately 800 square feet and is capable of housing one (1) ARFF fire apparatus.

ARFF Apparatus

The Alamogordo Fire Department currently has one ARFF response apparatus, a 2008 Ford F-550 ARFF vehicle. This vehicle is based on a Ford F-550 4X4 XLT platform and meets all FAA Index One requirements. The vehicle is capable of carrying four (4) firefighters with gear. The vehicle was designed and is maintained to carry all necessary rescue equipment needed for a rapid response and quick knockdown for an emergency. This vehicle is designed to meet all FAA AC 150/5220-19 specifications, and can be used to meet FAA Part 139 certification requirements for ARFF Index One, which includes aircraft shorter than 90 feet in length.

This vehicle is equipped with the following tools and equipment, and meets the following requirements:

Two Mobile Radios -

> One (1) Leom IC-A110-0S–760 channel aviation frequency mobile transceiver unit complete and installed with microphone, antennas and 7.S watt external speaker.
>
> One (1) Motorola C300V 16 channel, 45 watt, mobile emergency transceiver utilizing a VHF mobile radio with a band split of 136 to 174 MHz. This radio is capability of switching to the public address system.

Suppression Pump Specifications

The fire pump is a diesel driven pump mounted transversely within the apparatus pump module. It meets or exceeds all FAA requirements in accordance with AC 150/5220-19. It is equipped with a 34 Horsepower Briggs & Stratton, water cooled diesel driven pump engine combination and mechanical seal.

Water/Foam Tank

This apparatus is equipped with a 300 gallon water tank, and an integral 40 gallon polypropylene foam tank.

Booster Hose Reel

This apparatus is equipped with a twin agent electric rewind booster reel with an electric motor provided for reel rewind and includes an adjustable rake or drag mechanism. The reel is equipped with 150 feet of 1" hose.

Bumper Turret & Nozzle

The vehicle is equipped with an electric remote controlled "Fire Fox" bumper turret located on the front bumper. The bumper turret and nozzle are remote controlled from inside the cab using the cab console. A joystick style controller operates functions of left-right and up-down sweep as well as pattern control. A Williams 150 gpm Hydro-Chem nozzle assembly is installed on this apparatus for the bumper turret. The brass nozzle allows the foam or water stream to be electrically adjustable from full fog to straight stream. The nozzle permits flows of 150 gpm at 100 psi with a simultaneous dry chemical flow of up to sixteen (16) pounds per second from a separate dry chemical system. The dry chemical is introduced into the center of the master stream. The dry chemical system is electronically activated from a switch located in the cab.

A piggy back nozzle is provided for dry chemical. The halotron discharge is incorporated with the water foam nozzle. The dry chemical pressure vessel is equipped with 500 lbs of dry chemical.

Nitrogen Bottle

The vehicle is equipped with a 400 cubic ft. nitrogen cylinder with sufficient capacity to discharge the agent and purge the system. The relief pressure valve is set to limit pressure to a maximum of 3,360 PSI.

Halotron System

The Halotron system pressure vessel holds 150 lbs. of Halotron 1 chemical agent. The vessel includes a highly visible pressure indicating gauge. The cylinder is DOT approved per specification 4BW240 and is equipped with chrome plated brass valve assemblies. The system meets ANSI standard 1093 and UL standard 711. Cylinder test pressure is 480 psi. The propellant used for the agent is provided by an internally pressurized Argon gas system, pre-charged to 125 psi.

The vehicle is also equipped with a 100 ft hand line with smooth bore tip nozzle for discharging the halotron.

Auxiliary ARFF Required Equipment Maintained on the Apparatus_

Two (2) Self Contained Breathing Systems
MSA Firehawk Breathing Apparatus, complete with
Mask, regulator, built in alarm and two (2) 30 minute cylinders
Two (2) wheel chocks, medium 4”
150 ft rope line
Two (2) small wedging crash axes
One (1) fire resistant blanket
One (1) 36” crow bar
One (1) 24” bolt cutter
Four (4) SL-45 flashlights with chargers
Four (4) pair of wristlet type aluminized gloves
Two (2) harness knives
One (1) grappling hook
One (1) hacksaw with blade assortment
One (1) first responder medical kit
Four (4) PBI/Kevlar proximity suits including coat, pants, suspenders
Four (4) Bullard FX helmets with aluminized neck protectors, Nomex hoods, and 4” clear face shields
Four (4) pair firefighter knee boots
One (1) pair 7” side cutting pliers
One (1) pneumatic air chisel with working cylinder and spring retainer
One (1) screw driver set
One (1) pair of aviation snippers
One (1) adjustable wrench
One (1) 8” x I” cold chisel
One (1) 41b. hammer

Suppression Agent Inventory Maintained at Station #3

19- Five (5) gallon buckets of PKW dry chemical, (1026LBS)
9- One (1) gallon buckets of Chem guard 3% AFFF

11- Five (5) gallon buckets of 3% AFFF
12- Five (5) gallon buckets of Class A foam
1- Fifty five (55) gallon drum of 3% AFFF
1- Cylinder for PKW system
1- Hand transfer pump for foam
2- Large PKW funnels

Should the Airport obtain regional jet service by aircraft such as the Canadair Regional Jet (CRJ-100/200) or Embraer ERJ 135, both of these aircraft fall within the Index A classification. Therefore, the existing ARFF facilities will meet the Index A requirements.

Automobile Parking

Automobile parking space requirements vary depending on the specific needs of the individual airport. The general aviation parking requirements are based on FAA criteria that estimate a total of 2.34 spaces per peak hour general aviation operation, tabulated in **Table 35**. The airport currently has a single employee. Over the course of the planning period it is estimated that additional employees will be hired. Therefore, the combined parking space requirement for pilots, passengers, and employees in 2032 is 206 as tabulated in Table 34. Using a planning standard of 40 square yards per vehicle space results in a total of 2,880 square yards of parking in 2032.

Vehicle parking required adjacent to aircraft hangars is calculated at a planning standard of 1.5 spaces per based aircraft. By 2032, 183 spaces will be required near hangars. At 40 square yards per space, this equals 7,320 square yards.

ALM currently has paved and unpaved vehicle parking located throughout the airport. Over the course of the planning period it is likely that additional parking will be needed primarily for based aircraft.

TABLE 35
PEAK PARKING SPACE DEMAND

Automobile Parking	2017	2022	2032
General Aviation Parking			
Average Day Peak Month Operations:	111	117	141
Peak Hour Operations:	22	23	28
Peak Parking Spaces Required:	51	54	66
Peak Parking Area Required:	2,040 S.Y.	2,160 S.Y.	2,640 S.Y.
Employee Parking			
Number of Employees:	1	2	4
Employee Spaces Required @ 80 percent:	1	2	3
Parking Area Required:	40 S.Y.	80 S.Y.	120 S.Y.
Hangar Parking	143	150	183
Total Parking Spaces Required	195	206	252

Source: URS Corporation Analysis, 2013.

USFS Air Tanker Base

The USFS Air Tanker Base (ATB) is located on the west side of the airfield on 6 acres of property leased from the Airport and employs approximately 20 people. The ATB is co-located, but in a separate building from the Lincoln Forest Dispatch Center - both office buildings are relatively new. The Inter-Agency Dispatch Office is located in the adjoining building and is responsible for coordinating the firefighting efforts of the Bureau of Indian Affairs (BIA), the National Park Service (NPS), the Bureau of Land Management (BLM), and the U.S. Forest Service (USFS). The offices of the ATB provides a panoramic view of both the operations area and airfield. In addition to these two primary office buildings, facilities include additional support structures, approximately one acre for vehicle parking, and a heavy aircraft ramp totaling approximately 22,500 square yards of asphalt pavement that can accommodate eight heavy air tankers. Additional support facilities include a mixing plant, tanks for storage of retardant, and a small building above the retardant tanks - all of which are in good condition.

The base has a wet retardant storage capacity of 24,000 gallons contained in two 12,000 gallon tanks with an additional 12,000 gallon water tank and a 3,000 gallon off-load tank. These tanks can be isolated for recirculation. Covered storage is provided for 94 bins of retardant. The ATB has three retardant loading pits, two of which can pump simultaneously.

The Forest Service pays an annual lease for the property in addition to charges associated with aircraft landing overweight, fuel flowage, and overnight aircraft parking located off the leased ramp space.

All buildings and all related facilities are owned, maintained, and operated by the Forest Service. The asphalt ramp surfaces are in need of repair and resurfacing. Use of metal plates is currently necessary in order to park aircraft and avoid rutting caused by the high temperatures.

A 2011 study prepared by the USFS indicated that the airfield is capable of accommodating light fixed wing aircraft and large air tankers, but not C-130s and larger aircraft. This study noted that air tanker refueling is sometimes a problem as the existing fuel storage capacity can be over-taxed during periods of peak firefighting operations.

The USFS has designed new slurry mixing tanks and tanker loading pits with plans to update the existing facilities at ALM, based on the availability of funding. Due to the projected increase in Forest Service aerial firefighting requirements an additional 10,000 square yards of heavy aircraft parking apron should be provided and the existing aircraft parking apron should be reconstructed/upgraded in order to adequately accommodate existing firefighting activities.

Land Acquisition

The facility development identified in this chapter will result in the need for acquisition of additional land. Land acquisition will be required for the ultimate extension of Runway 3-21 and could also be a necessity for future Runway 16-34 development. Specific land acquisition requirements will be determined once the recommended alternative has been identified. Chapter Four will focus on alternative development.

Summary of Airport Facility Requirements

The Alamogordo-White Sands Regional Airport supports a substantial volume of aviation activity, particularly for a community of its size, which is largely a result of its proximity to Holloman Air Force Base.

The level of aviation activity and based aircraft has continued to grow in the face of the overall economic recession throughout the U.S. and New Mexico economy. The USFS Air Tanker Base represents a significant part of Airport operations, employment and Airport income and every effort should be made to provide the facilities necessary to sustain existing and accommodate potential future air tanker operations at ALM. This is particularly critical since Roswell represents a potential threat to future air tanker operations at ALM.

Critical facilities required to support Air Tanker operations include the extension of Runway 3-21 to an ultimate length as close to 10,800 feet as possible and relocation of the parallel taxiway.

The Airport is forecast to undergo significant changes as new facilities are constructed and existing facilities are expanded and upgraded. The level of activity is forecast to increase both in the number of total Airport operations and the number of based aircraft. Existing airfield facilities do not provide the capability to accommodate the projected demand and therefore will require major modifications and expansion. In addition, maintenance and repairs will be ongoing. The airfield will need to be significantly upgraded to accommodate basing of the P2Vs and increasing operations by the BAe-146s. Should basing of DC 10 tankers be implemented, further facility development will be required above and beyond the facilities currently identified in this study.

Landside facilities will also require future facility development as the level of activity and the number of based aircraft increases and facilities to accommodate those aircraft are constructed.

With respect to facilities critical to the needs of the immediate local aviation communities operations, development of Runway 16-34 as a paved runway with instrument approach capabilities will significantly enhance airfield safety for operations by smaller general aviation aircraft, particularly during periods of high crosswinds on Runway 3-21.

Alamogordo-White Sands Regional Airport

Chapter Four

ALTERNATIVES

CHAPTER FOUR

ALTERNATIVES

Introduction

The purpose of this chapter is to examine ways to provide Alamogordo-White Sands Regional Airport (ALM) with an approach to meet the aviation demand forecasts presented in Chapter 2 as well as the demand capacity/facility requirements identified in Chapter 3. This information was used in the development of various alternative concepts. The concepts were developed through a process that identifies ways to meet facility requirements, determine which best satisfies the need, and selects a preferred development plan based on the evaluation. Recommended improvement projects for the short-term (2014 to 2020) and long-term (2020 and beyond) planning periods are discussed. Implementation of the selected alternative is defined in a subsequent chapter.

ALM's major functional areas must be considered in the formulation of alternatives, and include the airfield, terminal facilities, and aviation support facilities. The interrelationships of these functional areas require that they be evaluated both separately and as a whole to ensure the most functionally efficient, cost-effective, and environmentally compatible alternative is derived. With this information, as well as the input from government agencies, airport users, and other local stakeholders, an alternative concept can evolve into a realistic development plan.

ALM's Role

Within the Federal Aviation Administration's (FAA) *National Plan of Integrated Airport Systems (NPIAS)* for 2011-2015, ALM is classified as a "general aviation (GA)" airport. ALM is classified as short haul airport providing service within a 500-mile radius. Additionally, ALM is likely considered a "Regional General Aviation" facility according to the New Mexico Airport System Plan (NMASP). As a general aviation facility, ALM serves the needs of the small aircraft operators in the City of Alamogordo and the surrounding region.

Inclusion in the NPIAS, as well as being part of the state airport system, means that ALM is eligible for development assistance through federal and state airport improvement grants. FAA Order 5190.6A, Airport Compliance Requirements, outlines the contractual obligations of airports accepting and receiving federal grant funds. The basic objective of these regulations and compliance requirements is to ensure safe and properly maintained airports that are operated in a manner which protects the public's interest and investment.

ALM provides a valuable service in its role as a GA airport. Not only does it provide for local/regional operators, it also serves the needs of the U.S. Forest Service and to a lesser extend the U.S. Military. Future planning should consider the continued role of ALM to meet the GA demands of local/regional aircraft owners/operators, the U.S. Forest Service, and the potential for re-establishing commercial passenger service.

Evaluation Criteria

The goal of the concept alternatives analysis was to identify the appropriate development that best satisfies the following criteria:

- **Long Term Aviation Needs.** Conceptual alternatives must address the 20-year facility requirements identified in Chapter 3.
- **FAA Design Standards.** Conceptual alternatives should meet current FAA planning and design criteria if feasible, particularly those that enhance the safety of air operations.
- **Land Use and Environmental Compatibility.** Conceptual alternatives must be sensitive to the environment and compatible with the surrounding land uses.
- **Community Development Goals.** Conceptual alternatives should support community and economic development goals.
- **Flexibility to Accommodate Change.** Conceptual alternatives must be flexible enough to accommodate changing needs that cannot be anticipated now.

The ALM alternative concepts discussed below were prepared with the objective of satisfying these criteria.

Alternative Concepts

Alternative concepts address the airfield, terminal facilities, and aviation support facilities described in Chapter 3. Improvements considered in the alternatives analysis include an extension of existing Runway 3-21 and associated taxiway work; construction of new Runway 16-34 and associated taxiway work; 63,000 square feet of GA hangar storage and associated aircraft access; additional fuel storage facilities; and additional vehicular parking facilities. The development concepts (Alternatives B, C, and D) are structured to meet all FAA design standards.

The runway length analysis, outlined in Chapter 3, concluded that extension of Runway 3-21 to its ultimate length of 10,200 feet may not be justified at this time. However, based on current need, planning and design are underway to extend the runway by 2,200 feet to an interim length of 9,205 feet. While the ultimate extension will not be included in the 10-year capital improvement plan, it is be shown on the Airport Layout Plan (ALP) as an ultimate development. This will ensure protection of the future airspace from incompatible development. The ALP is shown in Appendix C.

Alternative Concept A – Retain Existing Facilities

Under Alternative A, no improvements to the airfield, terminal facilities, and aviation support facilities would be made other than necessary and/or routine maintenance activities. In the environmental analysis, this alternative will be evaluated against the development concepts.

Advantages of this alternative are:

- Less improvement costs at ALM.

Disadvantages of this alternative are:

- Benefits of extended Runway 3-21 and new Runway 16-34, such as enhanced safety of aircraft operations and the additional flexibility in aircraft type using ALM, would not be achieved.
- Benefits of relocated Taxiway A would not be achieved.
- Demand for additional apron space would be unmet
- Demand for future hangar space would be unmet.
- Demand for future vehicular parking could be unmet.
- U.S. Forest Service needs, such as basing additional or larger aircraft at ALM and additional aircraft parking, would not be achieved.
- Decreased aircraft operational flexibility.

Alternative Concept B – Proposed Action

Alternative B identifies certain projects for improving ALM's ability to meet future demand and facility requirements during the next 20 years. Note this alternative is considered to be the configuration of ALM in year 2032 as shown on the ALP. Improvements under Alternative B include the following:

Airfield Improvements

- Extend existing Runway 3-21 from 7,005 feet to an interim length of 9,205 feet.
- Abandon existing Taxiway A.
- Construct new Taxiway A , 9,200 feet in length and 75 feet wide.
- Abandon existing Runway 16-34 of 3,549 feet.
- Construct new Runway 16-34 of 8,000 feet long and 150 feet wide.
- Construct new Taxiway B 6,000 feet long and 75 feet wide.
- Construct new Taxiway C 8,000 feet long and 75 feet wide.
- Utility improvements as required for runway/taxiway modifications.

Terminal Facility Improvements

- Add 63,000 square feet of GA hangar storage.
- Add GA apron area and taxiway access to hangar storage.
- Utility improvements as required for hangar storage.

Aviation Support Facility Improvements

- Construct additional vehicular parking.
- Construct 18,000 square yard heavy aircraft parking apron for use during fire fighting events.
- Rehabilitate existing U.S. Forest Service apron area.

Advantages of this alternative are:

- Benefits of extended Runway 3-21 and new Runway 16-34, such as enhanced safety of aircraft operations and the additional flexibility in aircraft type using ALM, would be achieved.
- The extended Runway 3-21 will allow greater capability for aircraft to depart ALM, particularly on hot days, by reducing payload weight limitations.
- Benefits of relocated Taxiway A would be conformance with current runway taxiway separation requirements and potentially lower IFR minima.
- Demand for future hangar space would be met.
- Demand for future vehicular parking could be met.
- U.S. Forest Service needs, such as basing additional or larger aircraft at ALM and additional aircraft parking, would be achieved.

Disadvantages of this alternative are:

- Increased improvement costs at ALM.

Alternative Concept C – Reduced Scale

Alternative C identifies certain projects for improving ALM's ability to meet future demand and facility requirements during the next 20 years. Note this alternative is considered to be the future configuration of ALM in 2022 as shown on the ALP, and is reduced in scale from Alternative B regarding the lengths of Runway 3-21 and Runway 16-34. Improvements under Alternative C include the following:

Airfield Improvements

- Extend existing Runway 3-21 from 7,005 feet to 9,205 feet.
- Abandon existing Taxiway A.
- Construct new Taxiway A , 9,203 feet in length and 75 wide.
- Abandon existing Runway 16-34 of 3,549 feet.
- Construct new Runway 16-34 of 5,500 feet long and 150 feet wide.
- Construct new Taxiway B 6,000 feet long and 75 feet wide.
- Construct new Taxiway C 5,500 feet long and 75 feet wide.
- Utility improvements as required for runway/taxiway modifications.

Terminal Facility Improvements

- 18,000 square feet of GA hangar storage.
- GA apron area and taxiway access to hangar storage.
- Utility improvements as required for hangar storage.

Aviation Support Facility Improvements

- Construct additional vehicular parking.
- Construct 18,000 square yard heavy aircraft parking apron for U.S. Forest Service.
- Rehabilitate existing U.S. Forest Service apron area.

Advantages of this alternative are:

- Benefits of extended Runway 3-21 and new Runway 16-34, such as enhanced safety of aircraft operations and the additional flexibility in aircraft type using ALM, would be achieved but reduced as compared to Alternative B.
- The extended Runway 3-21 will allow greater capability for aircraft to depart ALM, particularly on hot days, by reducing payload weight limitations.
- Benefits of relocated Taxiway A would not be achieved.
- Demand for future hangar space would be met.
- Demand for future fuel storage could be met.
- Demand for future vehicular parking could be met.
- U.S. Forest Service needs, such as basing additional or larger aircraft at ALM and additional aircraft parking, would be achieved.

Disadvantages of this alternative are:

- Increased improvement costs at ALM but reduced as compared to Alternative B.

Alternative Concept D – Compact Scale

Alternative D identifies certain projects for improving ALM's ability to meet future demand and facility requirements during the next 20 years. Note this alternative is not shown on the ALP, but is reduced in scale from Alternative Concepts B and C. Improvements under Alternative D include the following:

Airfield Improvements

- Extend existing Runway 3-21 from 7,005 feet to 9,205 feet.
- Abandon existing Taxiway A.
- Construct new Taxiway A, 9,205 feet long and 75 feet wide.
- Utility improvements as required for runway/taxiway modifications.

Terminal Facility Improvements

- 18,000 square feet of GA hangar storage.
- GA apron area and taxiway access to hangar storage.
- Utility improvements as required for hangar storage.

Advantages of this alternative are:

- The extended Runway 3-21 will allow greater capability for aircraft to depart ALM, particularly on hot days, by reducing payload weight limitations.
- Demand for interim hangar space would be met.
- This alternative would be the least costly of the development concepts.

Disadvantages of this alternative are:

- Increased improvement costs at ALM but reduced as compared to Alternative B and C.
- The length of the Runway 3-21 is marginal for much of the activity conducted at ALM today.
- Existing Runway 16-34 does not provide a long-term viable cross-wind runway.
- Demand for future vehicular parking would not be met.
- U.S. Forest Service needs, such as basing additional or larger aircraft at ALM and additional aircraft parking, would not be achieved.

Summary of Alternative Concepts

The alternative concepts were evaluated according to the criteria described at the beginning of this chapter. A summary evaluation matrix is presented as **Table 36**. Alternatives are rated as excellent, good, fair, or poor with respect to each criterion. Alternative Concept B – Proposed Action is judged to be superior to other alternatives considered and is recommended as the basis for the master plan.

TABLE 36
SUMMARY OF EVALUATION OF ALTERNATIVE CONCEPTS

Criterion	Alternative Concept A – Retain Existing Facilities	Alternative Concept B – Proposed Action	Alternative Concept C – Reduced Scale	Alternative Concept D – Compact Scale
Long Term Aviation Needs	Poor – Runway 3-21 length would accommodate 75% of large airplanes at 60% useful load	Excellent – Runway 3-21 length would accommodate 100% of large airplanes at 60% useful load	Good – Runway 3-21 length would accommodate 75% of large airplanes at 90% useful load	Good – Runway 3-21 length would accommodate 75% of large airplanes at 90% useful load
FAA Design Standards	Excellent – Meets all FAA design standards	Excellent – All FAA design standards would be met	Excellent – All FAA design standards would be met	Excellent – All FAA design standards would be met
Land Use and Environmental Compatibility	Excellent – Does not significantly impact land uses or the environment	Good – Runway 16-34 would require land acquisition that has minimal impacts on land uses and the environment	Good – Runway 16-34 would require land acquisition that has minimal impacts on land uses and the environment	Excellent – Does not significantly impact land uses or the environment

Community Development Goals	Fair – Not consistent with community development goals but maintains existing economic development	Excellent – Consistent with community development goals and longer Runway 3-21 would encourage economic development	Excellent – Consistent with community and economic development goals	Good – Consistent with community development goals but the lack of Runway 16-34 does not promote development
Flexibility to Accommodate Change	Fair – Constrains future development	Excellent – Would not constrain future development	Excellent – Would not constrain future development	Good – Would not constrain future development

Alamogordo-White Sands Regional Airport

Chapter Five

ENVIRONMENTAL OVERVIEW

CHAPTER FIVE

ENVIRONMENTAL OVERVIEW

Introduction

The purpose of this chapter is to discuss potential environmental impacts that may result from implementation of the recommendations made in Chapter 3. This environmental overview provides federal, state, and local officials and the public with an understanding of the potential environmental impacts of the Proposed Action(s) which is defined herein as all improvements recommended in Chapter 3 of Airport master Plan Update and shown on the associated Airport Layout Plan set The overview presented in this chapter is modeled after the format of an Environmental Assessment (EA) described in FAA Orders 1050.1E, Change 1 (Environmental Impacts Policies and Procedures from March 20, 2006) and 5050.4B (National Environmental Policy Act [NEPA] Implementing Instructions for Airport Actions from April 28, 2006).

It is emphasized the information included in this chapter is not a formal EA or Environmental Impact Statement (EIS) as referred to in NEPA or the Airport and Airway Improvement Act (1982). However, this environmental overview highlights those areas that may be potentially impacted by the Proposed Action at ALM from the Master Planning process, and that may require further environmental study before implementation.

Environmental Process

Airport improvement projects that are considered to be federal actions or receive federal funding must be assessed from an environmental standpoint in order to comply with NEPA, the Airport and Airway Improvement Act, and other pertinent laws/regulations. For any airport improvement project, the FAA performs an initial environmental determination that considers type of action and its potential effect upon the environment. The result of the determination is usually the selection of one of the three following processes:

- An EIS is prepared for major federal actions that are generally known to have the potential for significant environmental impacts. Actions that normally require an EIS include: (1) initial ALP or airport location approval and (2) federal financial participation in or airport layout approval for a new runway capable of handling air carrier aircraft at a commercial service airport. An EIS involves thorough evaluation and documentation of the action's purpose and need, alternatives, affected environment, and environmental consequences.
- An EA is prepared for actions with minor or uncertain environmental impact potential. An EA requires similar analysis and documentation as an EIS, but with less detail and coordination. If certain environmental thresholds of significance are not exceeded an EA will lead to a Finding of No Significant Impact (FONSI), or otherwise require the preparation of an EIS.
- A Categorical Exclusion (CE) applies when an action does not result in significant environmental impacts for which an EA or EIS would be required. The CE requires brief documentation of the action and environmental impact potential.

Proposed Action

The Proposed Action at ALM identifies certain projects for improving the airport's ability to meet future demand and facility requirements during the next decade. As described in Chapter 3, proposed improvements include:

- Extend existing Runway 3-21 from 7,005 feet to 9,205 feet in the interim and to 10,203 feet ultimately.
- Abandon existing Taxiway A.
- Construct new Taxiway A to an ultimate length of 10,203 feet and 75 feet wide.
- Abandon existing Runway 16-34
- Construct new Runway 16-34 of 8,000 feet long and 150 feet wide.
- Construct new Taxiway B 6,000 feet long and 75 feet wide.
- Construct new Taxiway C 8,000 feet long and 75 feet wide.
- Utility improvements as required for runway/taxiway modifications
- 33,800 square feet of general aviation hangar storage
- Apron area and taxiway access to hangar storage
- Utility improvements as required for hangar storage
- Redesignate Runway 3-21 as Runway 4-22 and update signage

Environmental Impact Categories

The following provides a brief overview of the potential environmental impacts associated with the Proposed Action(s) at ALM. Much of the information below is based on the Extend and Strengthen Runway 3-21 Final Environmental Assessment from December 2005. It should be noted that this analysis does not constitute a formal NEPA submittal for FAA decision-making purposes.

Air Quality

The National Ambient Air Quality Standards (NAAQS), established by the U.S. Environmental Protection Agency (USEPA), and adopted by the New Mexico Environment Department, define the maximum allowable concentrations of pollutants that may be reached but not exceeded within a given time period. These pollutants are: ozone (O3), carbon monoxide (CO), nitrogen dioxide (NO2), sulfur dioxide (SO2), particulate matter (PM10 and PM2.5), and lead (Pb). PM10 is particulate matter with a mass median aerodynamic diameter less than 10 microns. PM2.5 is particulate matter with a mass median aerodynamic diameter less than 2.5 microns. **Table 37** presents the current NAAQS and the New Mexico Ambient Air Quality Standards (AAQS) for the six criteria pollutants and three additional pollutants regulated by New Mexico, including Total Suspended Particles, Total Reduced Sulfur, and Hydrogen Sulfides.

ALM lies within the El Paso-Las Cruces- Alamogordo Air Quality Control Region. ALM and Otero County are in attainment for all criteria pollutants (USEPA, 2005). New Mexico does not require any air quality permits for temporary construction that does not include stationary sources (Schooley, 2004). Otero County does not have a permitting requirement for fugitive dust from grading.

TABLE 37
NAAQS AND NEW MEXICO AAQS

Pollutant	Averaging Time	NAAQS (µg/m³ [ppm]) [a]		New Mexico AAQS
		Primary [b]	Secondary [c]	
O_3	1 hour 8 hour	235 (0.12) [d] 157 (0.08)	Same	Same
CO	1 hour 8 hour	40,000 (35) 10,000 (9)	None	13.1 ppm 8.7 ppm
NO_2	24 hours AAM [e]	None 100 (0.053)	Same	0.10 ppm 0.05 ppm
SO_2	3 hour 24 hour AAM	None 365 (0.14) 80 (0.03)	1,300 (0.5) None None	None 0.10 ppm 0.02 ppm
PM_{10}	AAM 24 hour	50 150	Same	Same
$PM_{2.5}$	AAM 24 hour	65 15	Same	Same
Pb	¼ year	1.5	Same	Same
Total Suspended Particles	24 hours 7 days 30 days AGM [f]	None	None	150 µg/m³ 110 µg/m³ 90 µg/m³ 60 µg/m³
Total Reduced Sulfur	½ hour	None	None	0.003 ppm
Hydrogen Sulfides	1 hour	None	None	0.010 ppm

Notes:

a. µg/m³ – micrograms per cubic meter; ppm – parts per million

b. National Primary Standards establish the level of air quality necessary to protect the public health from any known or anticipated adverse effects of a pollutant, allowing a margin of safety to protect sensitive members of the population.

c. National Secondary Standards establish the level of air quality necessary to protect the public welfare by preventing injury to agricultural crops and livestock, deterioration of materials and property, and adverse impacts on the environment.

d. The U S EPA designated areas for attainment status for the eight-hour ozone standard on April 15, 2004. These designations are effective June 15, 2004.

e. AAM – Annual Arithmetic Mean

f. AGM – Annual Geometric Mean

Sources: 40 Code of Federal Regulations (CFR) 50; New Mexico Administrative Code Title 20 Chapter 2 Part 3

There would be increased emissions from the use of heavy equipment and worker vehicles during construction activities. Earthmoving operations would generate fugitive dust (measured as PM10) during grading for the runway, taxiway, and hangar work. Heavy construction equipment would generate the most emissions, with CO, NOx, and volatile organic compounds as the main constituents of exhaust during paving for the runway and taxiway work. The types of construction equipment likely to be used include scrapers, bulldozers, dump trucks, graders, rollers, backhoe/loaders, asphalt pavers and other paving equipment, and water trucks. Emissions would also be generated by operation of heavy trucks on paved and unpaved roads hauling aggregate for the base and sub-base (i.e., fill material) for new pavement and for transporting asphalt for paving. For the air quality evaluation, it was assumed that aggregate and asphalt would be transported to ALM from several sites producing asphalt in the Alamogordo area (LABAT, 2005).

Best Management Practices (BMPs) to reduce fugitive dust emissions would be implemented to the maximum extent possible to reduce the amount of these emissions. BMPs could include replacing ground cover in disturbed areas as quickly as possible, installation of sediment barriers in applicable areas, and daily watering of disturbed ground (LABAT, 2005).

Indirect emissions from increased electricity generation would be minimal, due to the slight increase in electricity usage for additional lighting.

According to the guidelines set forth in FAA Order 5050.4B, an air quality analysis may be required if an action involves the airport location (new airport site), runway development, or other physical airside and/or landside improvements which increase airport capacity.

Coastal Resources

ALM is located in New Mexico's interior, and is not in the vicinity of coastal water. Therefore, any action would have no impact on coastal zone areas and would not be subject to the Coastal Zone Management Program, the Federal Coastal Barriers Resource Act of 1982, or the Coastal Barrier Improvement Act of 1990.

Compatible Land Use

The FAA has established guidelines for land use compatibility around airports. ALM is situated at the southwest edge of the City of Alamogordo, about 2 miles south of U.S. Highway 70 and about 2 miles west of U.S. Highway 54. There are residential areas adjacent to ALM to the north and east. Areas to the south, west, and southwest are mostly undeveloped. A manufactured housing site is located at the west edge of ALM, but all other areas to the west are undeveloped. Other than residential areas, the closest sensitive receptors are the county jail (0.8 miles northwest) and a church (about 1.2 miles north) (LABAT, 2005).

The compatibility of existing or future land uses in the vicinity of an airport is primarily associated with noise impacts related to that airport, as well as the height of objects including natural features and man-made structures. With respect to noise, there are no incompatible land uses surrounding ALM because the existing day-night average sound level (DNL) 65 A-weighted decibels (dBA) noise contour is contained within ALM's property (LABAT, 2005).

With respect to the height of objects, federal regulations (14 CFR 77) establish standards for determining obstructions to navigable airspace within the vicinity of airports. The standards define four surfaces which restrict the height of structures.

- The Primary Surface includes the runways and an area 200 feet beyond the end of the runway. No obstructions to aircraft are allowed in this area. The Runway Protection Zones (RPZs) for each end

of the runway extend out from the Primary Surface and must be graded and free of obstructions. Regarding Runway 3-21 and proposed Runway 16-34, there are no obstructions in the existing or proposed RPZs. Regarding existing Runway 16-34, there are six residential structures at the far northern edge of the RPZ.

- The Approach Surface begins at each end of the runway and increases in elevation at a rate of 1 foot for every 34 feet of horizontal distance to a distance of 10,000 feet from the end of the runway. Any obstruction into the Approach Surface must be removed if possible, or clearly marked and lighted. Regarding Runway 3-21 and existing Runway 16-34, there are several residential structures to the northeast and north in the Approach Surface, respectively. Regarding proposed Runway 16-34, there are no obstructions in the Approach Surface to the south but there are there are several obstructions to the north in the existing water treatment plant area.
- Transitional Surfaces extend out from the sides of the primary surface to a height of 150 feet above an airport's elevation, increasing one foot in height for every 7 feet of horizontal distance. This area must be free of obstructions unless the obstruction is granted a waiver and clearly marked and lighted. Regarding Runway 3-21, existing Runway 16-34, and proposed Runway 16-34 there are no obstructions in the existing or proposed Transitional Surfaces.
- The Horizontal Surface is located 150 feet above an airport's elevation of 4,200 feet. The boundaries of the Horizontal Surface are delineated by 10,000-foot arcs radiating out from the ends of the runway and connected by lines tangent to the arcs. Obstructions are limited within this area for safe navigable airspace for planes operating at an airport. Regarding Runway 3-21, there are two obstructions in the existing or proposed Horizontal Surface. These include a hill nearly 10,000 feet southeast of Runway 3-21 and a pole about 10,000 feet east southeast of Runway 3-21 (LABAT, 2005). Regarding existing Runway 16-34, there are no obstructions in the Horizontal Surface to the south but there are there are several obstructions to the north in the existing residential area. Regarding proposed Runway 16-34, there are no obstructions in the Horizontal Surface to the south but there are there are several obstructions to the north in the existing water treatment plant area.

The City of Alamogordo controls the height of buildings and other structures in areas near ALM with easements. These easements apply to all land impacted by the aircraft approach slope and transitional surfaces and extends to successors until ALM ceases operations.

Implementation of the Proposed Action(s) at ALM would expand the Primary Surface and move the location of the Approach Zone for Runway 3-21 about 3,200 feet to the southwest. The Horizontal Surface and Conical Surface would also expand about 3,200 feet to the southwest. Additionally, the proposed Runway 16- 34 would create a new Primary Surface, Approach Surface, Transitional Surfaces, and Horizontal Surface in the vicinity of the existing water treatment plant area. These zones would expand into an area that is currently used for ranching and is not populated. Areas to the north and northeast of ALM would not be affected by the Proposed Action (s). The extension of Runway 3-21 and construction of proposed Runway 16-34 would be compatible with the surrounding land use, and would not result in any incompatible land use in the area. Any construction would take place on ALM property.

Construction Impacts

Historical land use development near ALM occurred about 5 miles to the northeast on the east side of U.S. Highway 54, with more recent land use development straddling the east and west sides of U.S. Highway 54 closer to the Airport. The closest residential areas to ALM are 0.5 to 1 mile to the northeast.

Community response to construction noise is not based on a single event, but on a series of events over the day. Factors that have been found to affect the subjective assessment of the daily noise environment include the noise levels of individual events, the number of events per day, and the time of day at which the events occur. Construction activities would generate noise from equipment during earthwork and paving operations. Regarding Runway 3-21, construction activity would occur over a 12 to 24 month period, and the noise generated would be a short-term, intermittent impact. Regarding Runway 16-34, construction activity would occur over a separate 12 month period, and the noise generated would be a short-term, intermittent impact. In general, construction activity would be limited to daytime weekday hours. Given the types of equipment likely to be used in construction (e.g., bulldozers, dump trucks, etc.), and the noise levels of the equipment, typical noise levels at 50 feet from multiple pieces of construction equipment would be primarily isolated to ALM property. Noise impacts to other receptors near the construction would not be not significant due to their short-term nature, attenuation by buildings and other structures, and other noise sources in the vicinity (such as aircraft operations, and noise generated by traffic on U.S. Highways 54 and 70 and nearby railroad tracks).

The topography in the vicinity of ALM is nearly flat to gently sloping near the base of alluvial fans in the vicinity of the Sacramento Mountains. Elevations at ALM range from approximately 4,100 to 4,200 feet. The surface soils are subject to wind erosion and water erosion from occasional heavy rain events (LABAT, 2005). Soils can be classified according to their potential suitability for use in construction in accordance with the Unified Soil Classification system. This system divides soils according to texture and other physical properties. Another important property of soil for potential aviation construction is soil strength, the ability of a soil to support a load of weight. The construction limitations of the soils at ALM are summarized in **Table 38**.

CL soils are rated by the FAA as not suitable for base material as they have a low weight bearing strength. A high gypsum content and a moderate shrink-swell also limit the usefulness of these soils for construction

TABLE 38
CONSTRUCTION LIMITATIONS OF SOILS

Soil series	Unified Classification	Flooding	Construction Limits
Gypsum Land [a]	Not rated	None	Low strength, dissolves when wet
Reeves very fine sandy loam	CL [b]	None	Low strength, shrink-swell, gypsum at 20 to 40 inches
Tome silt loam	CL [b]	Occasional, brief, June to September	Low strength, flooding, shrink-swell

Notes:

[a] Gypsum land is not a true soil, but a mapping unit for gypsum deposits. It is included in this table for comparative purposes only.

[b] CL soils consist of inorganic, sandy clays, or silty clays of low to medium plasticity.

Sources: USDA, 2002; USDA, 1981

material. Soils at ALM would need to be modified with other material, or fill material would be used to elevate the surface in and around the Proposed Action(s) above the base flood elevation. The amount of each of fill material would be determined during engineering studies prior to commencing construction. Also, engineering studies would need to be conducted for the area where the proposed RPZs would be located to determine if the soil meets the requirements for supporting snow removal equipment, fire and rescue vehicles, and the occasional passage of aircraft without structural damage. If needed, the soil would be modified by the addition of fill material to increase soil strength and other physical properties.

ALM is located in an area of low seismic activity. There is a 10 percent chance of a seismic event with a peak ground acceleration of 5.1 percent of gravity in the next 50 years (USGS, 2002).

Department of Transportation Act Section 4(f)

The Proposed Action(s) would not impact any public parks, wildlife areas, or historic lands. The proposed purchase of land would not include any public lands or parks. The slight increase in noise generated by the Proposed Action(s) would not impact any parks or public land.

Farmlands

None of the land associated with the Proposed Action(s) is considered to be prime farmland (USDA, 2002). Much of this land has been owned by ALM since 1959, and is committed for urban development.

Fish, Wildlife, and Plants

Wildlife species expected to inhabit the ALM area are typical residents of desert scrub plant communities. Watercourses in and around ALM are ephemeral and do not support fish communities. Most of the area where Runway 3-21 would be extended was previously disturbed during construction of ALM. Small parts of this area are relatively undisturbed. The area for the proposed RPZ expansion associated with Runway 3-21 is a mixture of previously disturbed and relatively undisturbed land (LABAT, 2005). Regarding the area around proposed Runway 16-34, much of this area are relatively undisturbed. All of these areas are dominated by vegetation representative of a Chihuahuan desert scrub plant community.

There are no known designated or proposed critical habitat of federally listed species at or near ALM. There are 12 listed wildlife species (threatened, endangered, sensitive, or species of concern) in Otero County (10 federal and 2 state). Many of these species are found in limited areas and would not likely inhabit or visit the ALM vicinity. Additionally, there are 49 listed plant species (threatened, endangered, sensitive, or species of concern) in Otero County (10 federal and 39 state). Most of these species are in the Sacramento or Guadalupe Mountains at elevations between 5,000 and 11,000 feet. Three species are rare in Otero County, but could potentially visit the vicinity of ALM (based on distribution patterns, sitings, and habitat requirements), and include the American peregrine falcon, Baird's sparrow, and the northern aplomado falcon (LABAT, 2005).

The desert scrub plant community, which would be altered by the Proposed Action(s) is not considered important wildlife habitat in the vicinity of ALM. This was classified as medium to low value habitat by the U.S. Fish and Wildlife Service (USACE, 1998). The Proposed Action(s) would not affect land in or near any designated or proposed critical habitat of federally or state listed species.

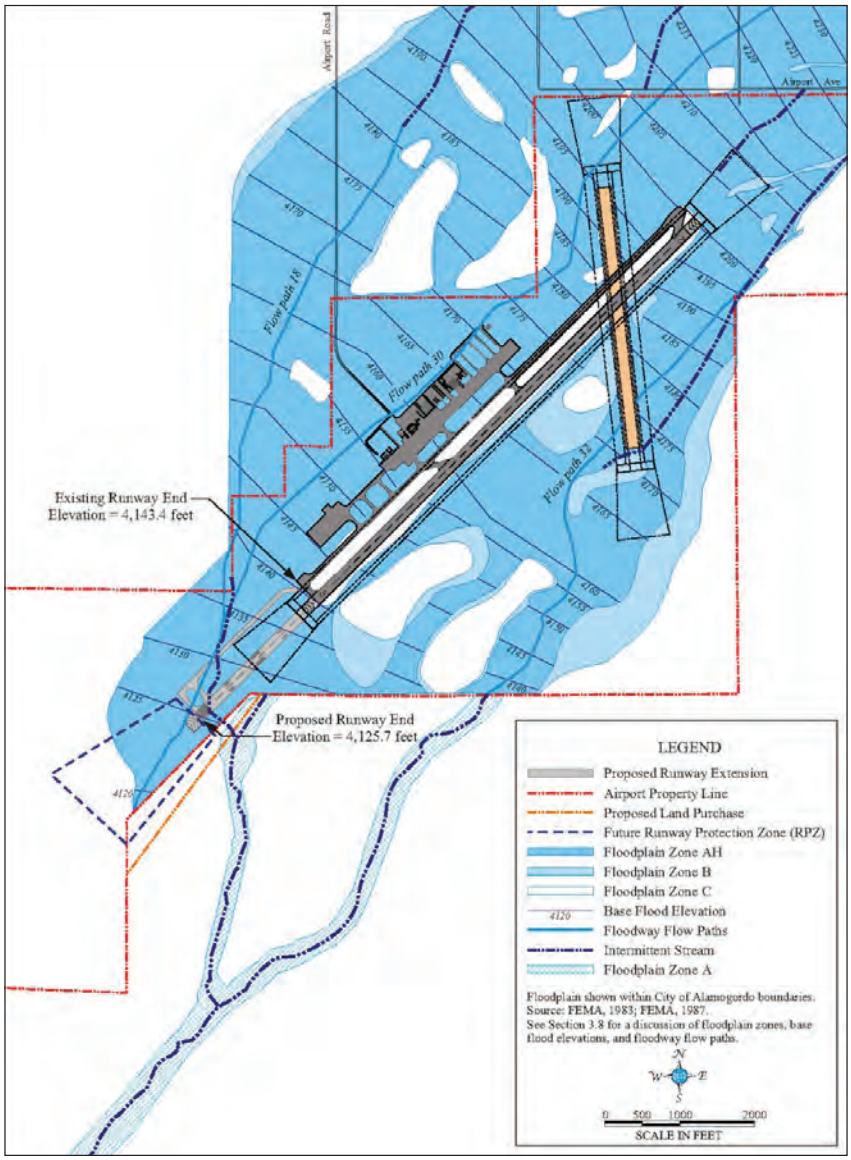
Small mammals, reptiles, and some bird species could be temporarily displaced as part of the Proposed Action(s) during construction. Once construction is complete, disturbed areas would be reseeded with native vegetation to the extent possible. The wildlife species previously displaced could return to the area. Impacts to wildlife species would not be significant, and no long-term impacts to wildlife would occur due to their abundance and ability to seek similar habitat in the surrounding area.

Migratory bird species are protected by the Migratory Bird Treaty Act of 1918 from harm or take during the nesting season. Many such bird species migrate through the Alamogordo area and may establish nests there during the nesting season from April 1 through August 15. Vegetation suitable for nesting is sparse on ALM. The Proposed Action(s) are unlikely to, but could impact nesting migratory birds. The USFWS recommends construction activities occur outside the general migratory bird nesting season of March through August, or that areas proposed for construction during the nesting season be surveyed, and when occupied, avoided until nesting is complete (LABAT, 2005).

Floodplains

During and after storm events, surface water runoff is conveyed from the Sacramento Mountains to the vicinity of the ALM. Drainage in the vicinity of ALM is comprised of intermittent and ephemeral streams which are discontinuous and influent (i.e., streams which lose most of their flow to the ground below them, except in times of heavy rainfall). During heavy rainfall events (typically between June and September), occasional brief flooding occurs at and near ALM (LABAT, 2005). Federal Emergency Management Agency (FEMA) flood hazard boundary maps indicate that most of ALM, with the exception of Runway 3-21, is within the 500 and 100-year flood zones (see **Exhibit 23**). Existing Runway 3-21, the area between Runway 3-21 and Taxiway A, a small area just west of Runway 16-34, and two areas southeast of Runway 3-21 are not in the 100-year floodplain. Potential development in the floodplain is subject to the provisions of Executive Order 11988, Floodplain Management, which requires federal agencies to look at all practical alternatives to avoid impacts to floodplains.

Exhibit 23
Flood Zones in the Vicinity of ALM



Source: LABAT, 2005

The FAA implements the provisions of Executive Order 11988 through U.S. Department of Transportation Order 5650.2.

The area where the proposed Runway 3-21 extension is located is within the 100-year floodplain, and designated by FEMA as Zone AH (LABAT, 2005). It is reasonably expected that proposed Runway 16-34 is also located within the 100-year floodplain, and designated by FEMA as Zone AH, but would need to be confirmed. The placement of fill material to construct the Proposed Action(s) would not be a significant encroachment on the floodplain because the area of the floodplain which would be impacted is uninhabited and undeveloped, would not substantially raise the risk of flood damage to ALM facilities nearby, and would not adversely affect natural and beneficial floodplain values. The Proposed Action(s) would minimally impact the floodplain by slightly extending the floodplain to the west into an undeveloped area currently owned by the City of Alamogordo and slightly extend the floodplain to the south (LABAT, 2005). Because the Proposed Action(s) would be constructed within the floodplain, a Finding of No Practicable Alternative would need to be prepared in accordance with Executive Order 11988.

Hazardous Materials, Pollution Prevention, and Solid Waste

Hazardous materials are substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present a substantial danger to public health or the environment if released. Hazardous materials are substances which can significantly affect human health and safety and the environment when improperly stored, transported, or otherwise managed. They are designated as hazardous under 40 CFR 302 due to physical properties, such as explosivity, radioactivity, corrosivity, flammability, or toxicity. Hazardous materials are typically used at ALM for refueling, routine operations and maintenance of aircraft, and vehicle maintenance. Aviation fuel, deicers, cleaning solvents, oils, lubricants, and fire retardants are used as required at ALM. Additionally, the U.S. Forest Service is currently using Phos-Chek D-75 (which includes diammonium sulfate, monoammonium phosphate, and diammonium phosphate) (LABAT, 2005).

The use of hazardous materials typically generates hazardous waste. Management of hazardous wastes consists of the collection, storage, transportation, and disposal. Typically, Hazardous wastes generated include fuels, lubricants, oils, and other wastes from aircraft and vehicle maintenance. Hazardous materials such as solvents, paints, thinners, and sealants may be used during the construction activities, but would be controlled under 40 CFR 260-280 and standard safety and handling procedures.

Although the Proposed Action(s) could temporarily increase the use of hazardous materials and the amount of hazardous waste generated, standard safety procedures would be required (e.g., following federal, state, and local regulations for the use of hazardous materials and disposal of hazardous waste). Any hazardous waste generated would be transported in accordance with 49 CFR 171-199 and disposed of in an approved landfill in accordance with 40 CFR 260-280 and other applicable federal, state, and local regulations.

At the time this Environmental Overview was written, the ALM Hazardous Waste Management Plan or similar document was not available for review. This plan generally identifies the responsibilities and procedures for managing hazardous waste, used petroleum products, polychlorinated biphenyls, and other wastes. In addition, a Spill Prevention and Response Plan, which usually details what hazardous materials are used at a facility, was not available for review.

The Spill Prevention and Response Plan typically identifies spill prevention practices and site-specific contingency plans in case a spill occurs.

Solid wastes include all waste materials that are neither hazardous nor toxic, and which are normally disposed of by landfilling or incineration, or are recycled or recovered. Solid waste at ALM is removed by a contractor and disposed of at the Otero-Lincoln County Regional Landfill, located on U.S. Highway 54, about 24 miles south of Alamogordo (LABAT, 2005). The Proposed Action would generate a temporary increase in solid waste from construction debris. All solid waste generated by construction would be disposed of at the Otero-Lincoln County Regional Landfill.

Historic, Architectural, Archaeological, and Cultural Resources

Cultural resources are archaeological, historical, and Native American items, places, or events considered important to a culture, community, tradition, religion, or science. Archaeological and historic resources are locations where human activity measurably altered the earth or left deposits of physical or biological remains. A cultural resources survey was conducted in November 2005 in the Runway 3-21 extension area and no known historic, architectural, archeological, or cultural resources were found (LABAT, 2005). It is reasonably expected that proposed Runway 16-34 area also has no known historic, architectural, archeological, or cultural resources but would need to be confirmed. Since the Proposed Action(s) would classify as a federal undertaking, consultation with the New Mexico Historic Preservation Division and federally recognized Native American Tribes would be required. Additionally, an updated cultural resources survey would need to be conducted to identify historic sites/properties as required under Section 106 of the National Historic Preservation Act prior to any ground disturbing activities.

Light Emissions and Visual Impacts

The visual setting on ALM includes aircraft, various concrete and steel buildings, roadways, parking facilities, and aircraft support facilities. Runway 3-21 is equipped with a medium intensity runway light system, a precision approach path indicator on Runway 3 (southwestern portion of ALM), runway end identifier lights, and 4-box visual approach slope indicators. Taxiway A is also equipped with a medium intensity taxiway light system. Additionally, ALM is equipped with a rotating airport beacon. Currently, existing Runway 16-34 does not have a lighting system. To date, there have been no complaints from surrounding areas regarding light emissions from existing airfield sources (LABAT, 2005).

As part of the Proposed Action, the medium intensity runway light system would be extended to the southwest along Runway 3-21 and Taxiway A. Additionally, the precision approach path indicator, runway end identifier lights, and visual approach slope indicator systems would be moved about initially about 2,200 feet and ultimately 3,200 feet to the southwest. It is anticipated that a medium intensity runway light system and approach lights would ultimately be installed with proposed Runway 16-34. Finally, 33,800 square feet of general aviation hangar storage would be constructed near the existing terminal building. The visual changes would be compatible with current ALM environs and would not substantially change from existing conditions. Visual changes in the context of the greater Alamogordo community would be minor and the Proposed Action(s) would extend out in undeveloped land away from existing residential areas.

Natural Resources, Energy Supply, and Sustainable Design

Most of ALM consists of previously disturbed land with buildings, paved surfaces, and mowed grasses. There are no major natural resources located on ALM or at the site for the Proposed Action.

Texas-New Mexico Power Company supplies electric power for the City of Alamogordo and ALM. Energy consumption at ALM generally falls into two categories: (1) energy demands for fixed facilities such as airfield lighting and buildings as well as (2) fuel consumption by aircraft and ground vehicles. Electricity demand

would increase slightly with increased lighting under the Proposed Action(s), but would not exceed the capability of Texas-New Mexico Power Company. Additionally, there may be a short-term increase in fuel consumption during the construction period under the Proposed Action (LABAT, 2005).

The City of Alamogordo supplies water to ALM. Sources for the water supply include surface water and groundwater derived from subsurface wells. During the summer, the City Alamogordo encourages people to conserve water because of the potential for a shortage of potable water. Contractors are required to use effluent water instead of potable water for construction (LABAT, 2005). It is anticipated that a minimal amount of water would be used in construction of the Proposed Action(s). The City's requirement for contractors to use effluent water during construction would not substantially affect the demand for water in the Alamogordo area.

Noise

Noise is defined as any unwanted sound that interferes with normal activities or in some way reduces the quality of the environment. Ambient noise levels vary greatly in magnitude and character from one location to another, depending on the normal activities conducted in the area. In general, noise levels around airports result primarily from aircraft operations.

The extent of existing and future aircraft noise levels are described through the use of the day-night average sound level (DNL or Ldn), which is the metric adopted by the FAA in 1978. DNL values are expressed in terms of A-weighted decibels (dBA). **Table 39** presents the land use compatibility with yearly day-night average sound levels table from FAA Order 1050.1E. This table describes compatible land use information for several land uses as a function of yearly DNL values. The ranges of DNL values in Table 39 reflect the statistical variability for the responses of large groups of people to noise. Any particular level might not, therefore, accurately assess an individual's perception of an actual noise environment. Compatible or non-compatible land use is determined by comparing the predicted or measured DNL values at a site with the values given. As the table shows, all land use types are considered compatible at exposure levels less than 65 dBA.

Existing and future noise contours were generated for ALM using the FAA's Integrated Noise Model version 6.1. Noise contours generated by the FAA's Integrated Noise Model do not depict a strict demarcation of where the noise levels end or begin. Their purpose is to describe the generally expected noise exposure. These contours are a visual display of noise levels experienced at various points on the ground in the vicinity of ALM. The contours were based on 2004 annual operations of 25,000 (all takeoffs and landings). The entire existing 65 DNL is within ALM property (see **Exhibit 24**).

A noise sensitive receptor is commonly defined as the occupants of any facility where a state of quiet is a basis for use, such as a residence, hospital, school, or church. There are residential areas adjacent to ALM to the north and east. Areas to the south, west, and southwest of ALM are mostly undeveloped. A manufactured housing area is located at the west edge of ALM, but all other areas to the west of ALM are undeveloped. Other than residential areas, the closest sensitive receptors are the county jail (0.8 miles northwest) and a church (about 1.2 miles north) (see Exhibit 24). Both of these sites are more than 1 mile outside of the 65 DNL existing noise contour.

The analysis of future noise impacts was based on the assessment of the estimated noise levels generated from the Proposed Action and a comparison with ambient noise levels. The analysis included identification of any sensitive receptors near areas impacted by noise generated from aircraft operating at ALM. The number of future aircraft operations is not expected to increase as a result of the Runway 3-21 extension, and a similar

TABLE 39

FEDERAL AVIATION REGULATION PART 150 LAND USE COMPATIBILITY GUIDELINES

Standard Land Use Coding Manual	Yearly Day-Night Average Sound Level (DNL)					
	Below 65 Decibels	65-70 Decibels	70-75 Decibels	75-80 Decibels	80-85 Decibels	Over 85 Decibels
Residential						
Residential (other than mobile homes and transient lodges)	Y	N1	N1	N	N	N
Mobile Home Parks	Y	N	N	N	N	N
Transient Lodging	Y	N1	N1	N1	N	N
Public Use						
Schools	Y	N1	N1	N	N	N
Hospitals, Nursing Homes	Y	25	30	N	N	N
Churches, Auditoriums, Concert Halls	Y	25	30	N	N	N
Governmental Services	Y	Y	25	30	N	N
Transportation	Y	Y	Y2	Y3	Y4	Y4
Parking	Y	Y	Y2	Y3	Y4	N
Commercial Use						
Offices, Business & Professiona	Y	Y	25	30	N	N
Wholesale & Retail Building Materials, Hardware and Farm Equipment	Y	Y	Y2	Y3	Y4	N
Retail Trade – General	Y	Y	25	30	N	N
Utilities	Y	Y	Y2	Y3	Y4	N
Communications	Y	Y	25	30	N	N
Manufacturing and Production						
Manufacturing General	Y	Y	Y2	Y3	Y4	N
Photographic and Optical	Y	Y	25	30	N	N
Agriculture (Except Livestock) and Forestry	Y	Y6	Y7	Y8	Y8	Y8
Livestock Farming & Breeding	Y	Y6	Y7	N	N	N
Mining and Fishing, Resource Production and Extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor Sports Arenas, Spectator Sports	Y	Y5	Y5	N	N	N
Outdoor Music Shells, Amphitheaters	Y	N	N	N	N	N
Nature Exhibits and Zoos	Y	Y	N	N	N	N
Amusement, Parks, Resorts, Camps	Y	Y	Y	N	N	N
Golf Courses, Riding Stables, Water Recreation	Y	Y	25	30	N	N

Note: The designations contained in this table do not constitute a federal determination that any use of land covered by the program is acceptable or unacceptable under federal, State, or local law. The responsibility for determining the acceptable and permissible land use remains with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land use for those determined to be appropriate by local authorities in response to locally-determined needs and values in achieving noise-compatible land uses.

Keys to Table:

Y (Yes)	Land use and related structures compatible without restrictions.
N (No)	Land use and related structures are not compatible and should be prohibited.
NLR	Noise level reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into design and construction of the structure.
25, 30, or 35	Land use and related structures generally compatible; measures to achieve noise level reduction of 25, 30, or 35 must be incorporated in design and construction of structure.

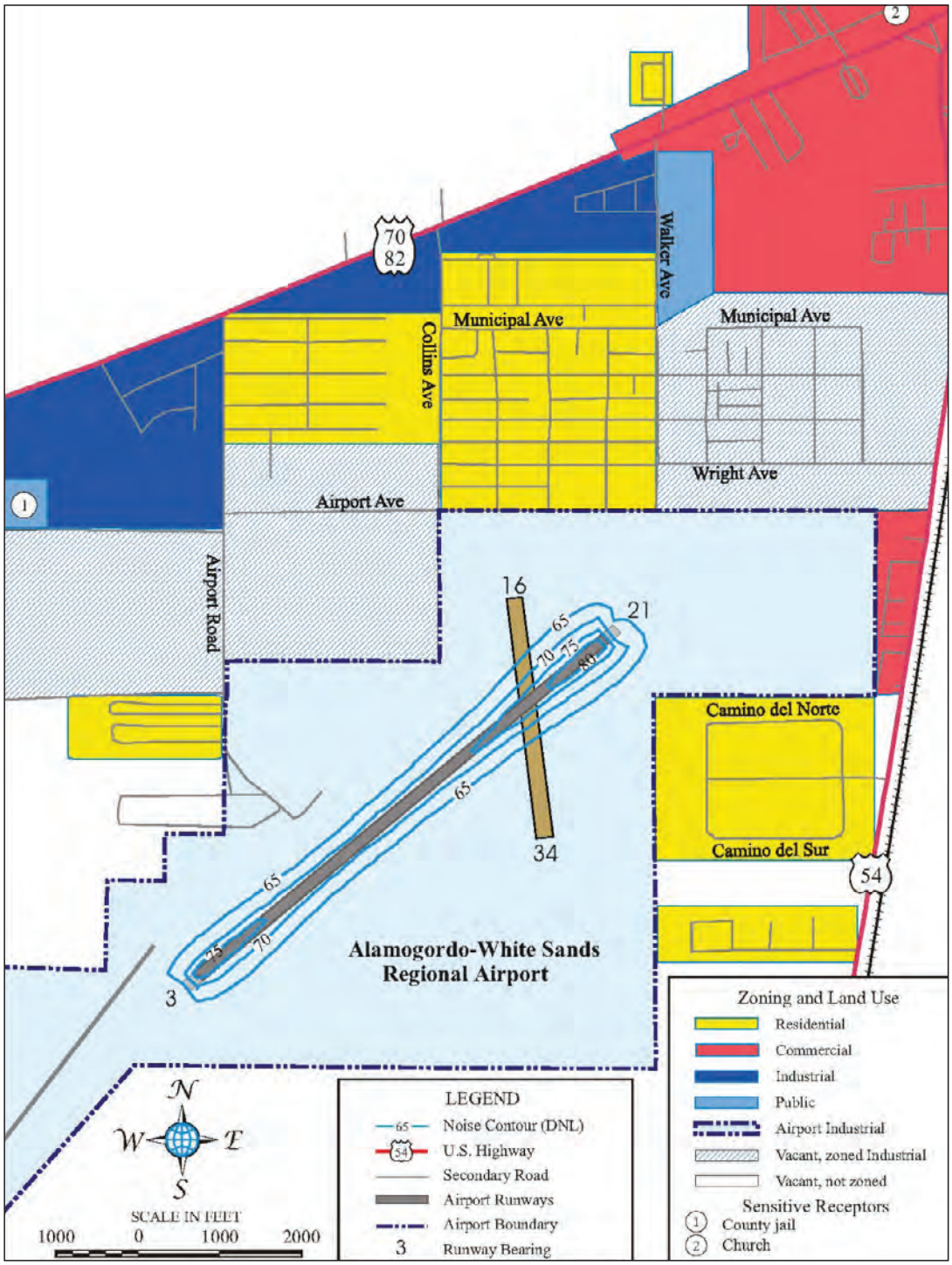
1. Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor NLR of at least 25 decibels (dB) and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal construction can be expected to provide a NLR of 20 dB. Thus, the reduction requirements are often stated as 5, 10 or 15 dB over standard construction and normally assumes mechanical ventilation and closed windows year round. However, the use of NLR criteria would not eliminate outdoor noise problems.
2. Measures to achieve NLR of 25 must be incorporated into the design and construction of portions of the buildings where the public is received, office areas, noise-sensitive areas or where the normal noise level is low.
3. Measures to achieve NLR of 30 must be incorporated into the design and construction of portions of the buildings where the public is received, office areas, noise-sensitive areas or where the normal noise level is low.
4. Measures to achieve NLR of 35 must be incorporated into the design and construction of portions of the buildings where the public is received, office areas, noise-sensitive areas or where the normal noise level is low.
5. Land use compatible provided special sound reinforcement systems are installed.
6. Residential buildings require a NLR of 25.
7. Residential buildings require a NLR of 30.
8. Residential buildings not permitted.

Incompatible Land Uses

number of operations were used for the existing and future contours. Flight paths were assumed to remain the same, with the exception of a longer wider path on the Runway 3-21 for larger aircraft or aircraft with heavier loads. Noise levels from aircraft operations would increase at the southwest end of Runway 3-21, but the entire future 65 DNL is within ALM property (see **Exhibit 25**). The 65 DNL contour would extend an additional 3,200 feet to the southwest. The 70, 75, and 80 DNL contours would also move about 3,200 feet to the southwest. The area into which these contours would extend is ALM property. There are no residences or other sensitive receptors in or close to the proposed Runway 3-21 extension. Noise levels would not substantially change at the northeast end of Runway 3-21. Noise levels at sensitive receptors (including the county jail and a church about 1.2 miles north of ALM) would not change. The impacts of increased noise at the southwest end of the runway would not be significant because this area is within airport boundaries and is uninhabited.

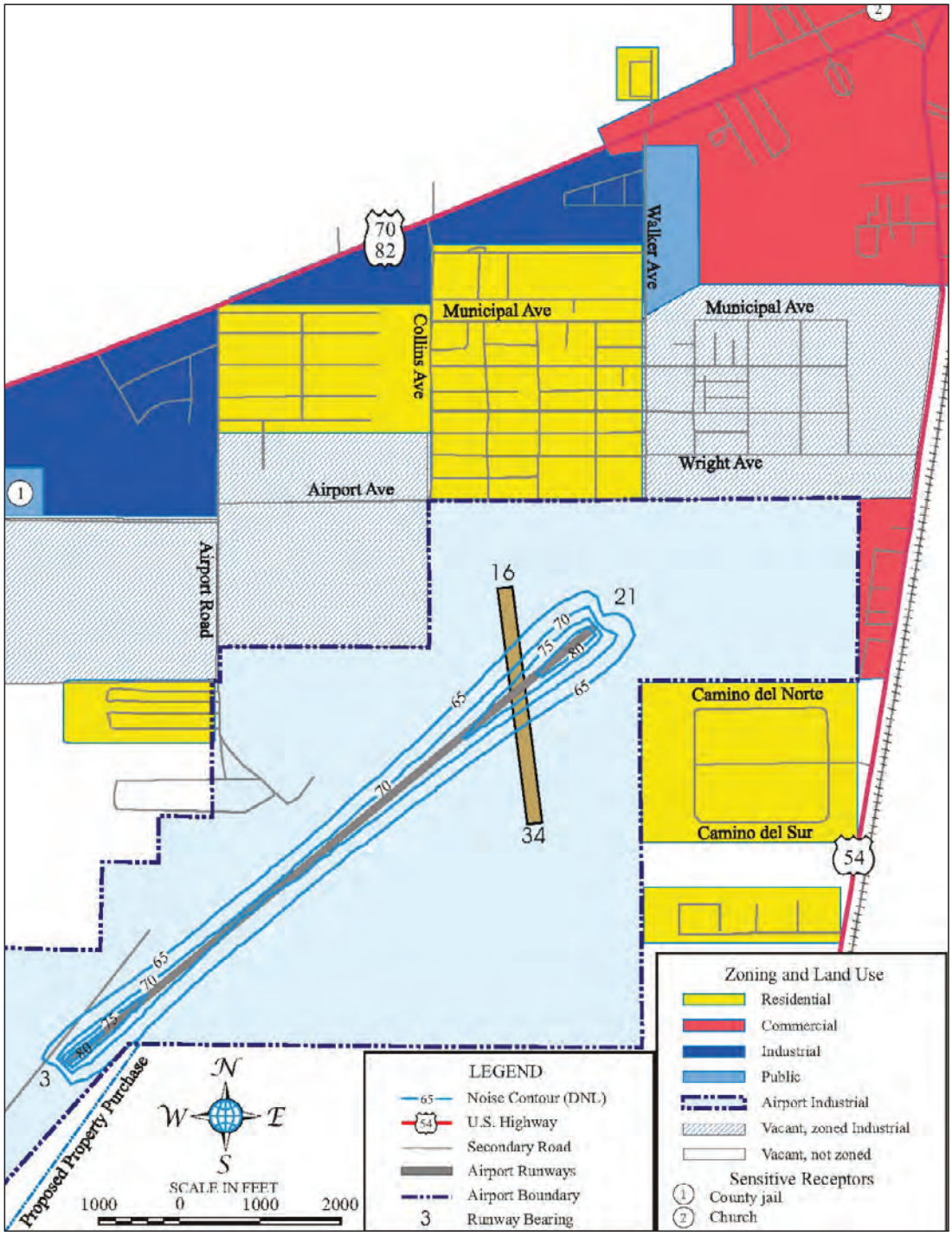
It is reasonably expected that proposed Runway 16-34 would also have similar noise contours to Runway 3-21 given the level of anticipated aircraft activity in the future, but would need to be confirmed with the FAA's Integrated Noise Model.

Exhibit 24
ALM Existing Noise Contours



Source: LABAT, 2005

Exhibit 25
ALM Future Noise Contours



Source: LABAT, 2005

Secondary (Induced) Impacts

Secondary impacts can be indirectly caused by airport development. Examples would include shifts in public service demands, population growth or movement, and business and economic activity. Alamogordo's Population is growing in areas to the north of ALM and decreasing in areas east and southeast. Businesses have also been developing along U.S. Highways 54 and 70 to the east and north of ALM, respectively (LABAT, 2005). The Proposed Action(s) would result in no residences or businesses being displaced. However, existing ranching land would be converted to aviation-related uses, but this would have minimal impacts on overall ranching activity in the Alamogordo vicinity. Finally, it is anticipated the demand for public services would not substantially change from current levels and population growth patterns in the vicinity of ALM would not be impacted by the Proposed Action(s).

There are approximately 34,000 current aircraft operations (all takeoffs and landings) per year at ALM, for an average of about 93 per day. Operations have been stable for the last 10 to 12 years, but are projected to slightly increase over the next 20 years. The U.S. Forest Service operates an air tanker base at ALM and other tenants/operators include federal and state agencies, commercial services, and private operators of small aircraft (LABAT, 2005). The number of aircraft operations would not change substantially as a result of the Proposed Action(s). Instead, planes would be able to take off with heavier loads. Therefore, noise levels would not change significantly from current levels.

Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks

Founded in 1898 and incorporated in 1912, the year of New Mexico's statehood, the City of Alamogordo had a population of 2,363 in the 1920 Census. It grew gradually until the 1940s and 1950s, when nearby military installations (then Alamogordo Army Air Field and Fort Bliss) were established to support World War II. The city's population went from 3,950 in 1940 to 21,723 in 1960. Since then, the continued military presence, tourism, and migration to the Sunbelt have contributed to steady population increases (LABAT, 2005). As discussed in **Chapter 2**, the population in Otero County and the City of Alamogordo experienced a significant increase from 1980 through 2000, but has slowed somewhat since. The state of New Mexico has experienced relatively high population growth since 1970, as a result of immigration and net in-migration from other states; placing it among the fastest growing states in the nation. **Table 40** provides selected socioeconomic data near ALM based on year 2012 estimates from the U.S. Census Bureau data.

An action is judged to have significant social impacts if it involves: (1) the relocation of residences or businesses; (2) the alteration of surface transportation patterns; (3) the disruption established communities; (4) the division or disruption of orderly planned development; or (5) the creation of an appreciable change in employment.

The Proposed Action does not result in any changes to the aforementioned social impact categories as activities would occur in undeveloped areas. Induced or secondary social impacts to surrounding communities may be evident in shifts in patterns of population movement or growth, public service demands, and changes in business and economic activity to the extent influenced by an airport's development. Induced impacts are normally not significant unless there are significant impacts in other categories such as noise, land use, or direct social impacts. The Proposed Action(s) are not expected to cause shifts in population growth since residential and business areas are not being displaced. It is also anticipated that public services such as police, fire, and emergency services would also not be significantly impacted. On the other hand, the construction

TABLE 40
SELECTED SOCIOECONOMIC DATA

U.S. Census Data	New Mexico	Otero County	Alamogordo
Population [a]	2,055,287	64,176	30,544
Racial Data			
White [a]	72.6%	96.9%	96.2%
Black/African American [a]	2.0%	3.9%	5.6%
American Indian and Alaska Native [a]	9.2%	6.9%	1.7%
Asian [a]	1.3%	1.4%	2.5%
Native Hawaiian and Other Pacific Islander [a]	0.1%	0.1%	0.1%
Two or more races [a]	3.1%	3.1%	3.8%
Hispanic/Latino [a]	46.3%	34.7%	32.7%
Income Data			
% Unemployed [b]	9.1%	11.4%	10.7%
Major Employment Industry [b]	Educational services, and health care and social assistance (24.8%)	Educational services, and health care and social assistance (24.1%)	Educational services, and health care and social assistance (28.0%)
Median household income [b]	$44,886	$39,054	$42,969
Per Capita Income [b]	$23,749	$19,834	$22,872
% Below Poverty Level [b]	19.5%	20.7%	15.9%

Notes:

People who identify their origin as Hispanic or Latino may be of any race. Thus, the percent Hispanic or Latino should not be added to the race as percentage of population categories.

Source:

[a] 2008-2012 American Community Survey 5-Year Estimates, Table DP05, U.S. Census Bureau, 2014

[b] 2008-2012 American Community Survey 5-Year Estimates, Table DP03, U.S. Census Bureau, 2014

expenditures associated with the Proposed Action(s) would provide small short-term economic benefits to employment and income.

The USEPA defines environmental justice as "the fair treatment and meaningful involvement of all people, regardless of race, ethnicity, culture, income, or education level with respect to development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that racial, ethnic, or socioeconomic groups should not bear a disproportionate share of negative environmental consequences resulting from industrial, municipal, and commercial operations, or from the execution of federal, state, and local laws, regulations, and policies" (USEPA, 1998). Executive Order 12898, Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations (White House, 1994), requires that each federal agency address disproportionately high and adverse health or environmental effects of its programs, policies, and activities on minority and low-income populations. Executive Order 12898

supplemented Title VI of the Civil Rights Act of 1964. In addition, Executive Order 12898 is supplemented by more than 30 federal statutes, regulations, executive orders, and directives regarding non-discrimination. An analysis of the area's socioeconomic composition based on the data presented in Table 40 and the Proposed Action(s) at ALM did not identify any disproportionately high and adverse human health or environmental effects on minority or low-income populations.

Environmental Justice also takes into consideration Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks, which requires that each federal agency identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on children, who are more at risk because of developing body systems, comparatively higher consumption-to-weight ratios, behaviors that may expose them to more risks and hazards than adults, and less ability than adults to protect themselves from harm. An analysis of the Proposed Action(s) at ALM did not identify any disproportionately high and adverse human health or environmental effects on children.

Water Quality

Water resources include surface and groundwater sources, quantity, and quality. The hydrologic cycle results in the transport of water into various media such as the air, the ground surface, and subsurface. Natural and human-induced factors determine the quality of water resources. Surface and groundwater flow in the Alamogordo area is typically is to the southwest.

Alamogordo and ALM are situated in the Tularosa Basin near the foothills of the Sacramento Mountains. Basin fill, consisting of alluvial and windblown sediment, comprises the surficial aquifer. This surface sediment is between 200 and 500 feet deep. Underlying the surficial sediment is the Santa Fe Group, consisting of sand, gravel, and cobble at least 2,500 feet thick. These two layers comprise the basin fill aquifer, the source of the majority of groundwater used in the area. Recharge occurs as runoff enters these sediments at the base of the Sacramento Mountains. The depth to water is typically about 40 to 150 feet within 4 miles of the base of the mountains. Water quality in the basin fill aquifer in the vicinity of ALM is good. The basin fill aquifer is used as a source of groundwater by Alamogordo and Holloman Air Force Base, as well as private domestic and irrigation wells (LABAT, 2005).

ALM is located within the Tularosa drainage basin (U.S. Geological Survey cataloging unit 13050003). The Tularosa Basin is a closed basin, where surface water does not drain to an outlet. Surface water runoff originates from the Sacramento Mountains around the perimeter of the basin, recharges the bedrock and basin fill aquifers, and the remainder flows toward the basin center where it evaporates. During and after storm events, surface water runoff is conveyed to the Alamogordo vicinity and ALM. Drainage at and in the vicinity of ALM is comprised of intermittent and ephemeral streams which are discontinuous and influent (streams which lose most of their flow to the ground below them, except in times of heavy rainfall). Intermittent streams flow for several months of the year in response to precipitation, snow melt, and groundwater discharge. Ephemeral streams flow only in response to rainfall, usually for a few hours or days at a time (LABAT, 2005).

Three intermittent streams flow west toward U.S. Highway 54 and ALM from the Sacramento Mountains. The northernmost of these streams flows through residential areas north of ALM to about 1,800 feet north of Runway 3-21. The middle channel flows to a point about 1,000 feet east of Runway 3-21 and then parallels the runway to a point about 1,800 feet southwest of existing Runway 16-34. The most southern of these three streams flows southeast of ALM. Stormwater is sometimes carried by ephemeral streams north and south of

Runway 3-21 (see Exhibit 23). Surface water (intermittent and ephemeral streams) in the vicinity of ALM are not used for drinking water (LABAT, 2005).

Waters of the U.S. include navigable waters and their tributaries; all waters used, or which could be used, for interstate commerce; or waters used by migratory bird or threatened and endangered species. Waters of the U.S. include perennial, intermittent and ephemeral streams; playas; lakes; arroyos; and various types of wetlands meeting the above definitions (40 CFR 122.2; 33 CFR 328). The intermittent streams and their ephemeral tributaries in the vicinity of ALM are waters of the U.S. based on the intermittent character of the stream and their use and potential use by migratory bird and threatened and endangered species in the area (LABAT, 2005).

Under Section 402 of the Clean Water Act, discharge of pollutants into waters of the U.S. requires a National Pollutant Discharge Elimination System (NPDES) permit from the USEPA. USEPA requires NPDES Construction General Permit coverage for stormwater discharges from construction projects that would result in the disturbance or re-disturbance of one or more acres, which the Proposed Action(s) could affect. NPDES Stormwater Multi-sector General Permit coverage is required for operation of airports, to control the discharge of pollutants during industrial activities, such as aircraft and ground vehicle maintenance and washing and runway maintenance. ALM has existing coverage under NPDES permit NMR05B065 (LABAT, 2005).

Waters of the U.S. are also subject to regulation by the U.S. Army Corps of Engineers under the Clean Water Act. Under Section 404 of the Clean Water Act, a permit is required for placement of fill material in waters of the U.S. Activities with limited impacts to waters of the U.S. are authorized under nationwide permits. Nationwide Permit 14 applies to linear transportation projects, such as airport runway extensions, which would cause the loss of less than one-half acre of waters of the U.S., which the Proposed Action(s) could affect (LABAT, 2005). Construction of the Proposed Action(s) would intercept an intermittent stream about 1,890 feet out from end of the existing Runway 3-21. The Taxiway A extension would intercept this intermittent stream about 1,550 feet from the end of the existing taxiway. The stream would be redirected along the northern edge of the taxiway extension for a distance of at least 650 feet. This stream is considered waters of the U.S. and is subject to the Clean Water Act. It is reasonably expected that proposed Runway 16-34 could affect this intermittent stream as well but would need to be confirmed. Under Section 404, dredging and filling the stream is subject to regulation and an individual permit would be required for channelization of the stream. Due to the length of the stream that would be impacted, this project would not qualify for a Nationwide Permit or Regional Permit 2001 00315 (LABAT, 2005).

As part of the U.S. Army Corps of Engineers permit process, under Section 401 of the Clean Water Act, water quality certification must be obtained from the State of New Mexico Surface Water Quality Bureau prior to construction of the Proposed Action(s) at ALM. NPDES permits would be required for ALM and for the contractor for discharge of pollutants into waters of the U.S. Implementation of permit requirements, including BMPs, would be required to obtain Clean Water Act Section 401 water quality certification under the Proposed Action.

Paving of the runway and taxiways would increase impermeable surfaces, resulting in increased stormwater runoff in the area. The stormwater pollution prevention plan for ALM would need to be updated with changes in pavement and areas where pollutants generated during ALM activities (such as tire rubber, oil and grease, paint chips, deicing chemicals, fuel, and chemicals from runway maintenance) could potentially enter waters of the U.S. The stormwater pollution prevention plan would also address methods of preventing runoff containing pollutants from being discharged into waters of the U.S.

Extensive grading would be needed to prepare the existing ground for the Proposed Action. No excavation would be required. BMPs implemented for the NPDES permit would limit the amount of oil and grease potentially leaking from construction equipment from reaching areas where it could potentially infiltrate into the ground and impact groundwater.

The Albuquerque District Office of the U.S. Army Corps of Engineers, as part of regional conditions in the State of New Mexico, incorporated designated critical resource waters to protect endangered species. None of the waters in the vicinity of ALM are designated critical resource waters (USACE, 2002).

Wetlands

Wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances support a prevalence of vegetation typically adapted for life in saturated soil conditions. Currently, the U.S. Fish and Wildlife Service National Wetland Inventory has not finalized wetland mapping in the project area (USFWS, 2004). No hydric soils or adequate wetland hydrology occur on ALM. Based on the upland characterization of dominant plant species, absence of hydric soils, lack of wetland hydrology, and field observations, there are no wetlands in the area (LABAT, 2005). According to the FAA Order 5050.4B, if an activity would affect a wetlands area, and if there is a practicable alternative, which avoids the wetlands impact, this should become the Proposed Action(s). A wetland delineation and assessment is required to further define potential impacts to wetlands associated with the Proposed Action(s).

Wild and Scenic Rivers

Under the Wild and Scenic Rivers Act protection is provided to river systems which qualify for the National Inventory. ALM does not fall in proximity to a designated Wild and Scenic river (LABAT, 2005).

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Alamogordo-White Sands Regional Airport

Chapter Six

FINANCIAL IMPLEMENTATION ANALYSIS

CHAPTER SIX

FINANCIAL IMPLEMENTATION ANALYSIS

Financial Analysis Objectives

The purpose of this analysis is to evaluate the City of Alamogordo's capability to fund the Alamogordo-White Sands Airport's (ALM) Master Plan Capital Improvement Program (CIP) and finance normal airport operations. Tables of projections for the capital program, operating expenses, operating revenues and cash flow are provided in this chapter

Overall Approach

Our overall approach for conducting the Financial Implementation Analysis included the following steps:

- Gathering and reviewing available Airport documents related to historical financial results, capital improvement plans, operating budgets, regulatory requirements and Airport policies;
- Interviewing key City and Airport management personnel to gain an understanding of the existing operating and financial environment and overall financial management philosophy;
- Reviewing the aviation traffic forecast developed in the Master Plan;
- Reviewing the Master Plan CIP and development schedule anticipated for the planning period and projecting the overall financial requirements for the program;
- Reviewing available information relative to sources and timing of capital funds available to meet the financial requirements for funding the capital program;
- Reviewing available historical and budgeted operating expenses, developing operations and maintenance expense projections and projecting future operating costs for the planning period;
- Reviewing available historical and budgeted revenue sources, developing revenue growth projections, and projecting future revenues for the planning period; and
- Provide conclusions regarding the Airport's capability to finance the planned capital improvement program.

Capital Funding Sources

The development of the Master Plan CIP is anticipated to be funded primarily from local resources, State funds and Federal funds from the FAA. These sources include Non-Primary Airport Entitlement Grants, Airport Improvement Program (AIP) grants, state aviation grants, capital contributed by the City of Alamogordo and, other funds and cash flow generated from the operating net revenues of the Airport. Each of these sources of funds is described in the following paragraphs.

New Mexico Department of Aviation (NMDOT) Aviation Division

The NMDOT Aviation Division assists owners of public use airports such as the City of Alamogordo with the financing of certain Capital Improvements such as the planned runway extension, apron expansion, and taxiway relocation. The Aviation Division also assists with the provision of air carrier service in New Mexico's smaller communities.

In addition to capital improvements NMDOT provides grants for maintenance thus aiding various airport in buying equipment and supplies necessary to sustain the operational safety and efficiency of the airport.

Federal Aviation Administration (FAA) Grants

The Airport receives Airport Improvement Program (AIP) grants from the Federal Aviation Administration (FAA) to fund the eligible costs of capital improvements. Over the past five years FAA grant amounts have averaged $179,175 annually with the greatest amount being $235,773 in FY 12. With the ongoing progress of the current runway lengthening and strengthening project the annual contribution from FAA grants is anticipated to increase significantly.

In addition to the grants from the FAA, as noted above the NMDOT Aviation Division provides grants for needed Capital Improvement projects.

AIP Passenger Entitlement Grants

ALM is not currently eligible for AIP Passenger Entitlement grants but might be at some point in the future if passenger Air Service is reinstated.

City Capital Contributions

The Airport does not currently generate sufficient net revenues to provide local match funding for most of the identified AIP eligible projects. Consequently, capital funding support will be needed from the City to leverage AIP grant funding to implement a portion of the Master Plan CIP. This analysis assumes that the City will provide capital contributions totaling $393,900 in Near Term (2013 to 2017), $50,950 in the Mid-Term (2017 to 2022) and $23,500 in Long Term (2022 to 2032) for a total of about $680,000 throughout the twenty-year planning period.

Airport Operating Net Cash Flow

The Airport currently generates a very limited amount of net revenues from operations. The CIP includes the development of new hangar facilities throughout the planning period that will provide additional revenues that can be used to support operations and provide some capital funding. The implementation analysis assumes that positive net revenues will be generated from hangar rental revenues during Phase II and will increase during Phase III as aviation activity growth continues in the latter portion of the planning period.

Financial Analysis And Implementation Plan For The Master Plan Cip

This analysis provides the results of evaluating the financial reasonableness of implementing the Master Plan Capital Improvement Program during the planning period from 2013 through 2032.

Estimated Project Costs and Development Schedule

The estimated project costs and development schedule is derived from previous results of the Master Plan development analysis. The program for capital expansion and improvement projects is projected for the Near Term planning period from fiscal years ending 2013 through 2017, for the Mid-Term period from fiscal years ending 2018 through 2022, and for the Long Term period from fiscal years ending 2019 through 2032. For each of these planning periods, Table 41 presents the capital program for the identified projects. The estimated timing and costs are presented in this Table along with the amounts and timing of the projected funding sources. As shown in **Table 41**, the total estimated cost of capital projects is $24,510,000 in 2013 dollars. The estimated costs for projects scheduled during the period 2015 through 2032 are adjusted by an assumed 1.5% rate of annual inflation. The resulting total escalated costs are $27,183,000.

TABLE 41

SUMMARY OF BASE YEAR AND ESCALATED COSTS FOR THE CAPITAL PROGRAM

Planning Period	2013 Base Year Costs	Total Escalated Costs
Near Term Projects (2013 -2017)	$15,150,000	$15,725,000
Mid-Term Projects (2018-2022)	$1,860,000	$2,083,000
Long term Projects (2019-2032)	$7,500,000	$9,375,000
Total Project Costs	**$24,510,000**	**$27,183,000**

Source: NMDOT CIP and URS

As shown in Table 41, a substantial amount of funding will be needed from federal sources to meet the projected Capital Improvement program. It is anticipated that Federal Grants will support 95% of project costs and State funding will provide 2½% the total. The remaining 2½% is projected to be supplied from City resources. City funding was assumed in cases where local match money was needed to leverage a significant amount of federal grant funding.

Projected Operations & Maintenance Expenses

Operating & maintenance expense projections for the Near Term (2013 to 2017), the Mid-Term (2018 to 2022) and the Long Term (2019 to 2032) planning periods are based on the Airport's current budget, the anticipated impacts of inflation, aviation traffic increases, facility improvements and the recent experience of other similarly sized airports. Expenses for 2014 reflect the City's budgeted amounts.

Operations and Maintenance Expense Projection

Operations and maintenance (O&M) expense growth projections as reflected in **Table 42**, were developed to project the Airport's operating expenses during the planning period. A review of the available information, primarily from the City of Alamogordo's budgeting information provided no clear picture in the change in this metric over time. Accordingly, the following projections were made on the basis of estimated growth in Based Aircraft population as presented in other sections of the Master Plan. The Based Aircraft population is estimated to increase from the current 95 to a total of 122 in 2032. This represents an annual growth rate

of 1.03%. Projected annual O&M for the Near Term, Mid Term, and Long term periods are as shown in Table 42.

TABLE 42
PROJECTED O&M EXPENSES

	Operating Expenses
FY 08/09	$320,356
FY 09/10	$303,482
FY 10/11	$321,910
FY 11/12	$337,129
FY 12/13	$264,450
FY 13/14[1]	$398,196
Near Term	$428,736
Mid Term	$461,618
Long Term	$535,142

[1] Budget

Projected Operating Revenues

Table 43 presents actual, budgeted and estimated operating revenues for the Airport from year 2013 through 2032. Actual amounts are shown for FY 2010 through 2013, a budgeted amount is provided for FY 2014, and estimated amounts are shown for the period beyond 2014.

Operating Revenue Projections

The following is a list of revenue categories currently used for ALM

- Facility Rental
- Gasoline Sales
- Base Operator
- Application Fees
- Landing Fees
- Café Rental
- City Lease Commitments
- Building Rental/Royalties
- Lease of Land
- Permanent Aircraft Parking
- Reserved Auto Parking
- Overnight Aircraft Parking
- Vending Pool

During the period FY 2010 to FY 2013 the rental and lease income including City Lease Commitments, Building Rental/ Royalties, and Lease of Land have been the largest revenue source, constituting an annual average of approximately 75% of operating revenues. The next largest income producer has been Fuel Flowage Fees at an annual average of just over 18% of operating revenues.

TABLE 43
PROJECTED O&M REVENUES

	Operating Revenues
FY 08/09	$145,590
FY 09/10	$226,917
FY 10/11	$229,623
FY 11/12	$222,442
FY 12/13	$321,255
FY 13/14[1]	$287,673
Near Term	$298,582
Mid Term	$309,906
Long Term	$333,856

[1] Budget

The projection of operating revenues is provided in Table 43.

As shown in Table 43, total revenues are expected to grow from $287,673 in FY 2014 to $333,856 at the end of the 20 year planning period.

Financial Plan Summary

The Financial Plan Summary is presented in **Table 44** which includes a comparison of operating expenses to operating revenues. This comparison illustrates the conclusion that without major changes in the financial

picture for the Airport, such as might occur with the reinstatement of Air Carrier Service, the City's share of major Capital Improvement costs must be supported with general City funds.

TABLE 44
COMPARISON OF OPERATING EXPENSES TO OPERATING REVENUES

	Operating Expenses	Operating Revenues	% Operating Expenses to Revenues
FY 08/09	$320,356	$145,590	220.04%
FY 09/10	$303,482	$226,917	133.74%
FY 10/11	$321,910	$229,623	140.19%
FY 11/12	$337,129	$222,442	151.56%
FY 12/13	$264,450	$321,255	82.32%
FY 13/14[1]	$398,196	$287,673	138.42%
Near Term	$428,736	$298,582	143.59%
Mid Term	$461,618	$309,906	148.95%
Long Term	$535,142	$333,856	160.29%

[1] Budget

It should be noted that implementation of the Master Development Program is dependent on achievement of forecast aviation activity. Actual aviation traffic may temporarily vary from the projected levels of activity without a significant adverse impact on the capital program. If decreased traffic levels occur and persist, implementation of all the proposed projects may not be financially feasible. It should also be noted, however, that if the forecast activity levels are not met, then a number of the planned capital improvements may not be necessary.

Alamogordo-White Sands Regional Airport

Appendix A

ABBREVIATIONS AND GLOSSARY

GLOSSARY

A

Access Taxiway: A taxiway that provides access to a particular location or area.

Active Based Aircraft: Aircraft that have a current airworthiness certificate and are based at an airport.

Actual Runway Length: The length of full width, usable runway from end to end or full strength pavement where those runways are paved.

Administration Building: A building or buildings accommodating airport administration activity and public facilities for itinerant and local flying, usually associated with general aviation fixed base operations.

Administration Space: The space including, but not limited to, space for offices, cafeterias, conference rooms, lobbies, waiting rooms, garages, parking lots.

Advisory Circular: A series of FAA publications consisting of all non-regulatory material of a policy, guidance, and informational nature.

Aeronautical Chart: A map representing a portion of the earth – made especially for use in air navigation.

Air Cargo: All commercial air express and air freight except air mail and air parcel post.

Air Carrier Airport: An airport (or runway) designated by design and/or use for air carrier operations.

Air Carrier – All Cargo: A certificated route air carrier authorized to perform scheduled air freight, express, and mail transportation service as well as the conduct of nonscheduled operations (which may include passengers over specified routes).

Air Carrier – Certificated Route: An air carrier holding a Certificate of Public Convenience and Necessity issued to conduct scheduled services over specified routes and a limited amount of nonscheduled operations.

Air Carrier – Commuter: An air taxi operator which: (1) performs at least five round trips per week between two or more points and publishes flight schedules that specify the times, days of the week, and places between which such flights are performed; or (2) transports mail by air under a current contract with the U.S. Postal Service.

Air Carrier – Intrastate: An air carrier licensed by a state to operate wholly within its borders but not permitted to carry interline passengers from out of state.

Aircraft Approach Category: A grouping of aircraft based on 1.3 times their stall speed in their landing configuration at their maximum certificated landing weight.

Aircraft Design Group (ADG): A grouping of airplanes based on wingspan.

Aircraft Operations: The airborne movement (landing or taking off) of aircraft. There are two types of operations – local and itinerant.

1. Local operations are performed by aircraft that:
   a. Operate in the local traffic pattern or within sight of the airport.
   b. Are known to be departing for, or arriving from, flight in local practice areas within a 20-mile radius of the airport.
   c. Execute simulated instrument approaches or low passes at the airport.
2. Itinerant operations are all aircraft operations other than local operations.

Aircraft Tiedown: Positions on the ground surface that are available for securing aircraft.

Air Freight: A system or service set up for the carrying of freight by air.

Airman's Meteorological Information (AIRMET): An in-flight weather advisory concerning weather phenomena of less severity than that covered by SIGMETs, which are potentially hazardous to certain aircraft, e.g., those having limited equipment, instrumentation, or pilot qualifications. These advisories cover moderate icing and turbulence, winds of 40 knots or more within 2,000 feet of the surface, and the initial onset of visibilities less than 2 miles or ceilings less than 1,000 feet.

Air Navigation Facility (NAVAID): Any facility used or designed for use as an aid to air navigation.

Airport: An area of land or water that is used or intended to be used for the landing and takeoff of aircraft, including its buildings and facilities. (FAR Part 1)

Airport Advisory Service (AAS): A service provided by flight service stations at airports not served by a control tower. This service consists of providing information to landing and departing aircraft concerning wind direction and velocity, favored runway, altimeter setting, pertinent known traffic, pertinent known field conditions, airport taxi routes and traffic patterns, and authorized instrument approach procedures.

Airport Beacon: A navigational aid emitting alternating white and green flashes to indicate a lighted airport or white flashes only for an unlighted airport.

Airport Elevation: The highest point on an airport's usable runways expressed in feet above mean sea level (MSL).

Airport Imaginary Surfaces: Imaginary surfaces established at an airport for obstruction determination purposes.

Airport Layout Plan (ALP): The plan for an airport showing the layout of existing and proposed airport facilities and structures.

Airport Master Plan: Appropriate documents and drawings concerning the development of a specific airport from a physical, economic, social, and political jurisdictional perspective. The airport layout plan is a part of this plan.

Airport Operation: A landing or a takeoff at an airport. (A low approach below traffic pattern altitude or a touch-and-go operation are counted as both a landing and a takeoff; i.e., two operations.)

Airport Reference Point (ARP): The airport reference point is the latitude and longitude of a point that is the approximate center of all existing and proposed landing and takeoff areas.

Airport Sponsor: A public agency or tax-supported organization such as an airport authority, that is authorized to own and operate an airport, obtain property interests, obtain funds, and be legally, financially, and otherwise able to meet all applicable requirements of current laws and regulations.

Airport System Planning: The development of information and guidance to determine the extent, type, nature, location, and timing of airport development needed to establish a viable and balanced system of public airports.

Airports Closed to the Public: An airport not available to the public without permission from the owner.

Airports Open to the Public: An airport open to the public without prior permission and without restrictions within the physical capacities of available facilities.

Air Route: Navigable airspace between two points which is identifiable.

Air Route Surveillance Radar (ASR): A remote radar facility connected to an air route traffic control center and used to detect and display the azimuth and range of enroute aircraft operating between terminal areas, enabling the ATC controller to provide air traffic control services in the air route traffic control system.

Air Route Traffic Control Center (ARTCC): A facility that provides air traffic control service to aircraft operating on an IFR flight plan within controlled airspace.

Airspace: Space in the air above the surface of the earth or a particular portion of such space, usually defined by the boundaries of an area on the surface projected upward.

Air Traffic: Aircraft operating in the air or on an airport surface, exclusive of loading ramps and parking areas. (FAR Part 1)

Air Traffic Control (ATC): A service operated by appropriate authority to promote the safe, orderly, and expeditious flow of air traffic. (FAR Part 1)

Airway: A path through navigable airspace within which air traffic service is provided.

Alignment (Azimuth): The azimuth or actual magnetic bearing of a course.

Alignment (Elevation): The actual angle above a horizontal plane, originating at a specific point of a course used for altitude guidance.

Alternate Airport: An airport where an aircraft may land if a landing at the intended airport becomes inadvisable. (FAR Part 1)

Approach Area: The defined area over which landing and takeoff operations are made.

Approach Clearance: Authorization issued by air traffic control to the pilot of an aircraft for an approach for landing under Instrument Flight Rules.

Approach Control Facility: A terminal air traffic control facility (TRACON, CST, RAPCON, RATCF, Tower, etc.) providing approach control service.

Approach Fix: The fix from or over which final approach (IFR) to an airport is executed.

Approach Gate: That point on the final approach course which is one mile from the approach fix on the side away from the airport or five miles from the landing threshold, whichever is farther from the landing threshold.

Approach Lighting System (ALS): An airport lighting facility that emits radiating light beams in a directional pattern by which the pilot aligns the aircraft with the runway on his final approach and landing.

Approach Path: A specific flight course laid out in the vicinity of an airport and designed to bring aircraft in to safe landings; usually delineated by navigational aids.

Approach Slope Ratio: The ratio of horizontal to vertical distance indicating the degree of inclination of the approach surface.

Approach Sequence: The order in which aircraft are positioned while awaiting approach clearance or while on approach.

Approach Surface: An imaginary surface longitudinally centered on the extended centerline of the runway, beginning at the end of the primary surface and rising outward and upward to a specified height above the established airport elevation.

Area Navigation (RNAV): A method of navigation that permits aircraft operations on any course within the coverage of available navigation signals or within the limits of self contained-system capability. (FAR Part 1)

Area Navigation Low Route: Means an area navigation route within the airspace extending upward from 1,200 feet above the surface of the earth to, but not including 18,000 feet MSL. (FAR Part 1)

Area Navigation High Route: Means an area navigation route within the airspace extending upward from, and including 18,000 feet MSL to flight level 450. (FAR Part 1)

Automated Radar Terminal Systems (ARTS): Computer-aided radar display capable of associating alphanumeric data with radar returns.

Automatic Direction Finder (ADF): A radio device that uses radio transmissions from ground stations to automatically indicate the bearing of an aircraft in relation to the ground transmitter.

Automatic Terminal Information Service (ATIS): The repetitive transmission of recorded non-controlling information in selected high activity terminal areas.

B

Base Leg: A flight path in the traffic pattern at right angles to the landing runway off the approach end and extending from the downwind leg of the extended runway centerline.

Bearing: The horizontal direction of an object or point, measured as an angle, usually clockwise, from true or magnetic north through 360 degrees.

Blast Fence: A barrier used to divert or dissipate jet blast or propeller wash.

Building Restriction Line (BRL): A line shown on the airport layout plan beyond which airport buildings must not be positioned in order to limit their proximity to aircraft movement areas and impact on airport imaginary surfaces.

Bypass Taxiway: A taxiway located adjacent to an area that accommodates moving or parked aircraft specifically designed to achieve efficient aircraft passing movements.

C

Category II Operations: An aircraft operation using a straight-in ILS approach to the runway of an airport under a Category II ILS instrument approach procedure. (FAR Part 1)

Ceiling: Means the height above the surface of the earth of the lowest layer of clouds or obscuring phenomena that is reported as "broken," "overcast," or "obscuration." (FAR Part 1)

Circling Approach Area: An area in which aircraft circle to land under visual conditions after completing an instrument approach.

Co-Location: To place coaxially oriented components such as in a VOR and a TACAN one above the other or a VOR/DME combination.

Compass Calibration Pad: An airport facility for calibrating an aircraft compass.

Conical Surface: A surface extending from the periphery of the horizontal surface outward and upward at a slope of 20:1 as prescribed by FAR Part 77.

Continental Control Area: The continental control area consists of the airspace of the 48 contiguous states; the District of Columbia and Alaska, excluding the Alaska peninsula west of Longitude 160 degrees 00' 00" W., at and above 14,500 feet MSL, but does not include:

a. The airspace less than 1,500 feet above the surface of the earth; or

b. Prohibited and restricted areas, other than the restricted areas listed in FAR Part 71 Subpart D.

Controlled Airspace: Airspace within which aircraft may be subject to air traffic control. (FAR Part 1)

Control Zone: Airspace extending upward from the surface of the earth which may include one or more airports and is normally a circular area of five statute miles in radius with extensions where necessary to include instrument approach and departure paths.

Coverage: The designated volume of airspace within which reliable information is produced by a facility.

Crosswind: A wind blowing across the line of flight of an aircraft.

Crosswind Runway: A runway that provides for wind coverage not adequately provided by the primary runways.

D

Decision Height (DH): The height at which a decision must be made, during an ILS or PAR instrument approach, to either continue the approach or to execute a missed approach. (FAR Part 1)

Designated Instrument Runway: A runway that has been selected as being suitable for the installation of a precision approach aid such as an ILS, for which there is an existing or forecast need.

DF Fix: The geographical location of an aircraft obtained by the direction finder.

Direction Finder (DF, VDF, UVDF): A radio receiver equipped with a directional sensing antenna used to take bearings on a radio transmitter.

Displaced Threshold: A threshold that is located at a point on the runway other than the beginning.

Distance Measuring Equipment (DME): Electronic equipment used to measure, in nautical miles, the slant range of the aircraft from a navigation aid.

DME Fix: A geographical position determined by reference to a navigational aid which provides distance and azimuth information as defined by a specified distance in nautical miles and a radial in degrees magnetic from that aid.

DME Separation: Spacing of aircraft in terms of distance (miles) determined by reference to distance measuring equipment. (DME).

E

En Route Air Traffic Control Service: Air traffic control service provided aircraft on an IFR flight plan when these aircraft are operating between departure and destination terminal areas.

Exit Taxiway: A taxiway used as an exit from a runway to another runway, apron, or other aircraft operating area.

F

Final Approach Area(s): Areas of defined dimensions protected for aircraft executing instrument approaches.

Final Approach (IFR): The flight path of an aircraft that is inbound to the airport on an approved final instrument approach course, beginning at the final approach fix or point.

Final Approach (VFR): A flight path of a landing aircraft in the direction of landing along the extended runway centerline.

G

General Aviation: That portion of civil aviation that encompasses all aviation except air carriers and large aircraft commercial operators.

Glide Slope (GS): An ILS navigation facility providing vertical guidance for aircraft during approach and landing.

Ground Controlled Approach (GCA): A radar landing system operated from the ground by air traffic control personnel transmitting instructions to the pilot by radio.

H

Handoff: Passing control of an aircraft from one controller to another.

Holding Apron: (see holding bay)

Holding Bay: An area where aircraft can be held, or bypassed, to facilitate efficient ground traffic movement.

Holding Point: A designated point or location, identifiable by the pilot by visual reference to the ground or by NAVAIDs, near which he maneuvers his aircraft while awaiting further clearance.

I

IFR Airport: An airport with an authorized approach procedure.

IFR Conditions: Weather conditions below the minimums for flight under visual flight rules. (FAR Part 1)

ILS Category I: An ILS that provides acceptable guidance information from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a height of 100 feet above the horizontal plane containing the runway threshold. A Category I ILS supports landing minimums as low as 200 feet, HAT and 1800 RVR.

ILS Category II: An ILS that provides acceptable guidance information from the coverage limits if the ILS to the point at which the localizer course line intersects the glide path at a height of 50 feet above the horizontal plane containing the runway threshold. A category II ILS supports landing minimums as low as 100 feet, HAT and 1200 RVR.

ILS Category III: An ILS that provides acceptable guidance information from the coverage limits if the ILS with no decision height specified above the horizontal plane containing the runway threshold. (See ILS-CAT III A operations.)

ILS-CAT III A Operations: Operation, with no decision height limitation, to and along the surface of the runway with a runway visual range not less than 700 feet.

Inner marker (IM): An ILS navigational facility that indicates to the pilot, both aurally and visually, that he is directly over the facility at an altitude of 100 feet on final ILS approach, providing he is on the glide path.

Instrument Approach: An approach to an airport, with intent to land, when the visibility is less than 3 miles and/or when the ceiling is at or below the minimum initial altitude.

Instrument Approach Runway: A runway served by an electronic aid providing directional guidance adequate for a straight-in approach.

Instrument Approach System: An air navigation system used to guide aircraft to a safe landing beginning at an initial-approach point and ending at a point near enough to the ground to permit a visual landing.

Instrument Flight Rules (IFR): FAR rules that govern the procedures for conducting instrument flight. (FAR Part 91)

Instrument Landing System (ILS): A system that provides the lateral, longitudinal, and vertical guidance necessary for a landing.

Instrument Operation: An aircraft operation in accordance with an IFR flight plan or an operation where IFR separation between aircraft is provided by a terminal control facility or air route traffic control center.

Instrument Runway: A runway equipped with electronic and visual navigation aids and for which a straight-in (precision or non-precision) approach procedure has been approved or is planned.

L

Large Airplane: An airplane of more than 12,500 pounds maximum certificated takeoff weight.

Localizer (LOC): An ILS navigation facility providing horizontal guidance to the runway centerline during approach and landing.

Localizer Type Directional Aid (LDA): A facility of comparable utility and accuracy to a localizer that is not aligned with the runway having an angle of divergence exceeding 3 degrees but not exceeding 30 degrees.

Longitudinal Separation: The longitudinal spacing of aircraft at the same altitude by a minimum distance expressed in units of time or miles.

Low Altitude Airway Structure: The airways serving aircraft operations up to but not including 18,000 feet MSL.

M

Minimum Descent Altitude (MDA): Means the lowest altitude, expressed in feet above mean sea level, to which descent is authorized on final approach or during circle-to-land maneuvering. (FAR Part 1)

Missed Approach: An instrument approach not completed by landing due to: (1) visual contact not established at authorized minimums; or (2) landing not completed due to other reasons; or (3) instructions from air traffic control.

Missed Approach Procedure (MAP): Flight procedures prescribed when an aircraft fails to land after completing an instrument approach.

N

NAVAID: Any facility used in aid of air navigation, including lights, equipment for disseminating weather information, for signaling, for radio direction finding, or for radio or other electronic communication, and any other structure or mechanism having a similar purpose for guiding or controlling flight in the air or the landing or take-off of aircraft.

Non-precision Instrument Runway: A runway having only horizontal navigation guidance for which a straight-in, non-precision instrument approach procedure has been approved.

O

Obstacle Free Area (OFA): A two dimensional ground area surrounding runways, taxiways, and taxilanes which is clear of objects except for objects whose location is fixed by function.

Obstacle Free Zone (OFZ): The airspace centered about the runway that is clear of object penetrations other than frangible NAVAIDS.

Outer Marker (OM): An ILS navigation facility located four to seven miles from the runway edge on the extended centerline which indicates both aurally and visually, that the aircraft is passing over the facility and can begin its final approach.

P

Precision Approach Procedure: A standard instrument approach procedure in which an electronic glide slope is provided, such as ILS or PAR. (FAR Part 1)

Precision Approach Radar (PAR): A radar facility used to detect and display azimuth, range, and elevation of an aircraft on the final approach to a runway.

Primary Surface: A rectangular surface longitudinally centered about a runway. Its width is a variable dimension and it usually extends 200 feet beyond each end of the runway. The elevation of any point on this surface coincides with the elevation of its nearest perpendicular point on the runway centerline or extended runway centerline.

R

Radar Approach Control (RAPCON): A joint use air traffic control facility, located at a U.S. Air Force Base, utilizing surveillance and precision approach radar equipment in conjunction with air/ground communication equipment.

Reliever Airport: An airport to serve general aviation aircraft that might otherwise use a congested airport served by air carriers.

RNAV Way Point (W/P): A predetermined geographical position used for route or instrument approach definition or progress reporting procedures that is relative to a VORTAC station position (FAR Part 1).

Runway Alignment Indicator Light (RAIL): An airport lighting facility consisting of five or more sequenced flashing lights installed on the extended centerline of the runway.

Runway End Identification Lights (REIL): An airport lighting facility consisting of a single flashing high intensity white light installed at each approach end corner of a runway and directed toward the approach zone, enabling the pilot to identify the threshold of a usable runway.

Runway Gradient (effective): The average difference in elevation of the two ends of the runway divided by the runway length if no intervening point lies more than five feet above or below a straight line joining the two ends of the runway. If the criteria are not met the runway profile will be segmented and aircraft data will be applied for each segment separately.

Runway Orientation: The magnetic bearing of the centerline of the runway.

Runway Protection Zone (RPZ): An area (formerly referred to as the clear zone) used to enhance the safety of aircraft operations.

Runway Safety Area (RSA): A defined surface surrounding the runway prepared or suitable for reducing risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.

Runway Strength: The ability of a runway to support aircraft of a designated gross weight for single wheel, dual wheel, and dual tandem wheel gear types.

Runway Visual Range (RVR): The horizontal distance a pilot can see down the runway from the approach end; based on the sighting of either high intensity runway lights or the visual contrast of other targets, whichever yields the greater visual range.

S

Segmented Circle: A basic marking device used to aid pilots in locating airports.

Separation: The spacing of aircraft to achieve safe and orderly movement in flight and while landing and taking off.

Separation Minima: The minimum longitudinal, lateral, or vertical distances by which aircraft are spaced through the application of air traffic control procedures.

Small Airplane: An airplane of 12,500 pounds or less maximum certificated takeoff weight.

Special VFR Operations: Aircraft operating in accordance with clearances within certain control zones in weather conditions less than the basic VFR weather minimums.

Standard Terminal Arrival Route (STAR): A pre-planned coded air traffic control IFR arrival routing.

Statute Mile: A statute mile equals 5,280 feet.

Straight-In Approach: An instrument approach wherein the final approach is commenced without first having executed a procedure turn (not necessarily completed with a straight-in landing.)

T

Tactical Air Navigation (TACAN): A radio transponder facility utilized by airborne equipment to compute bearing and distance relative to the facility.

Taxilane: The portion of the aircraft parking area used for access between taxiways and aircraft parking positions.

Taxiway: A defined path established for the taxiing of aircraft from one part of the airport to another.

Terminal Radar Approach Control (TRACON): A terminal air traffic control facility co-located with an Airport Traffic Control Tower.

Terminal Radar Service Area (TRSA): A specified area around a terminal in which participating VFR pilots are provided separation from other participating VFR aircraft and IFR aircraft.

Terminal VOR (TVOR): Very high frequency terminal omnirange station (located on or near an airport and used as an approach aid).

Threshold: The designated beginning of the runway that is available and suitable for the landing of aircraft. When the threshold is located at a point other than at the beginning of the pavement, it is referred to as either a displaced threshold or a relocated threshold depending on how the pavement behind the threshold may be used.

Transport Airport: An airport designed, constructed, and maintained to serve airplanes in Aircraft Approach Category C and D.

U

Unicom: Frequencies authorized for aeronautical advisory services to private aircraft.

Utility Airport: An airport designed, constructed, and maintained to serve airplanes in Aircraft Approach Category A and B.

V

VFR Airport: An airport without an authorized or planned instrument approach procedure.

Victor Airway: Phonetic designation of VOR airways.

Visual Approach: An approach wherein an aircraft having an air traffic control authorization may deviate from the prescribed instrument approach procedure and proceed to the airport of destination, served by an operational control tower, by visual reference to the ground.

Visual Approach Slope Indicator (VASI): An airport lighting facility that provides vertical visual guidance to aircraft during approach and landing, by radiating a directional pattern of high intensity red and white focused light beams.

Visual Flight Rules (VFR): Rules that govern the procedures for conducting flight under visual conditions (FAR Part 91).

VOR/DME: A VOR to which a specific kind of distance measuring device has been added. (See VORTAC.)

W

Waypoint (w/p): A predetermined geographical position used for route definition and/or progress reporting purposes that is defined relative to a VORTAC station position.

Wind Cone: A free rotating fabric cone that indicates wind direction and wind force.

Wind Rose: A diagram for a given location showing relative frequency and velocity of wind from all compass directions.

Wind Tee: A tee-shaped free rotating device that indicates wind direction.

ABBREVIATIONS

A

AAAE – American Airport and Airline Executives
AAD – Average Annual Delay
AAGR – Average Annual Growth Rate
A/C – Aircraft
AC – Advisory Circular
ACAIS – Air Carrier Activity Information System
ACDO – Air Carrier District Office
ACFT – Aircraft
ACI – Airports Council International
ADF – Automatic Direction Finding
ADG – Airplane Design Group
ADP – Automated Data Processing
AF – Airway Facilities
AFS – Airway Facilities Sector
AFSS – Automated Flight Service Station
AGL – Above Ground Level
AIM – Airman's Information Manual
AIP – Airport Improvement Program
AIRMET – Airmen's Meteorological Information
AIS – Aeronautical Information Service
ALP – Airport Layout Plan
ALS – Approach Lighting System
ALSF-1 – ALS with Sequenced Flashers I
ALSF-2 – ALS with Sequenced Flashers II
AMP – Airport Master Plan
ANG – Air National Guard
ANSI – American National Standards Group
ARC – Airport Reference Code
ARFF – Airport Rescue and Firefighting
ARP – Airport Reference Point
ARSA – Airport Radar Service Area
ARSR – Air Route Surveillance Radar
ARTCC – Air Route Traffic Control Center
ARTS – Automated Radar Terminal System
ASDA – Accelerate Stop Distance Available
ASDE – Airport Surface Detection Equipment
ASM – Available Seat Mile
ASOS – Automated Surface Observation System
ASR – Airport Surveillance Radar
ASV – Annual Service Volume
AT – Air Traffic
ATA – Air Transport Association of America
ATAS – Airspace and Traffic Advisory Service
ATC – Air Traffic Control
ATCT – Airport Traffic Control Tower
ATIS – Automated Terminal Information Service
ATS – Air Traffic Service
AWIS – Airport Weather Information
AWOS – Automated Weather Observation System

B

BCA – Benefit/Cost Analysis
BCR – Benefit/Cost Ratio
BEA – Bureau of Economic Analysis
BGP – Burbank, Glendale, Pasadena Airport
BLM – Department of Interior, Bureau of Land Management
BRITE – Bright Radar Indicator Terminal Equipment
BRL – Building Restriction Line

C

CAT – Category or Clear Air Turbulence
CEQ – Council on Environmental Quality
CIP – Capital Improvement Plan
CM – Commercial Service Airport
CONUS – Continental United States
CTA – Central Terminal Area
CTAF – Common Traffic Advisory Frequency
CVFR – Controlled Visual Flight Rules
CWY – Clearway

D

dBA – Decibels A-weighted
DEIS – Draft Environmental Impact Statement
DEP – Departure
DF – Direction Finder
DGPS – Differential Global Positioning Satellite (System)
DH – Decision Height
DME – Distance Measuring Equipment
DME/P – Precision Distance Measuring Equipment
DNL – Day-Night Equivalent Sound Level (Also called Ldn)
DOD – Department of Defense
DOI – Department of Interior
DOT – Department of Transportation

E

EFIS – Electronic Flight Information Systems
EIS – Environmental Impact Statement
ELT – Emergency Locator Transmitter
EPA – Environmental Protection Agency
ETA – Estimated Time of Arrival

F

FAA – Federal Aviation Administration
F&E – Facilities and Equipment
FAAAC – FAA Aeronautical Center
FAF – Final Approach Fix
FAP – Final Approach Point
FAR – Federal Aviation Regulation
FBO – Fixed Base Operator
FCC – Federal Communications Commission
FED – Federal
FEIS – Final Environmental Impact Statement
FIFO – Flight Inspection Field Office
FL – Flight Level
FMS – Flight management System
FSDO – Flight Standards District Office
FSS – Flight Service Station
FTS – Federal Telecommunications System

G

GA – General Aviation
GADO – General Aviation District Office
GAMA – General Aviation Manufacturers Association
GCA – Ground Control Approach
GDP – Gross Domestic Product
GIS – Geographic Information System
GNSS – Global Navigation Satellite System
GOES – Geostationary Operational Environmental Satellite
gpm – Gallons Per Minute
GPS – Global Positioning Satellite
GPWS – Ground Proximity Warning System
GSI – Glide Slope Indicator
GSA – General Services Administration
GSE – Ground Support Equipment

H

HAA – Height Above Airport
HAL – Height Above Landing
HAT – Height Above Touchdown
HAZMAT – Hazardous Materials
HF – High Frequency
HI-EFAS – High Altitude EFAS
HIRL – High Intensity Runway Lighting
HITL – High Intensity Taxiway Lighting
HOV – High Occupancy Vehicle
HSI – Horizontal Situation Indicators
HUD – Housing and Urban Development
Hz – HERTZ

I

IAF – Initial Approach Fix
IAP – Instrument Approach Procedures
IATA – International Air Transport Association
ICAO – International Civil Aviation Organization
IFR – Instrument Flight Rules
IFSS – International Flight Service Station
ILS – Instrument Landing System
IM – Inner Marker
IMC – Instrument Meteorological Conditions
INM – Integrated Noise Model
INS – Inertial Navigation System
ISDN – Integrated Services Digital Network
ISTEA – Intermodal Surface Transportation Efficiency Act

K

Kbps – Kilobits Per Second
Khz – Kilohertz
KIAS – Knots Indicated Air Speed

L

LAA – Local Airport Advisory
LAAS – Low Altitude Alert System
LAHSO – Land and Hold Short Operation
LAN – Local Area Network
LAWRS – Limited Aviation Weather Reporting System
LDA – Localizer Directional Aid or Landing Directional Aid
LDIN – Lead-in Lights
LLWAS – Low Level Wind Shear Alert System
LOC – Localizer
LOCID – Location Identifier
LOI – Letter of Intent
LOM – Compass Locator at Outer Marker
LORAN – Long Range Aid to Navigation

M

MALS – Medium Intensity Approach Lighting System
MALSF – MALS with Sequenced Flashers
MALSR – MALS with Runway Alignment Indicator Lights
MAP – Military Airport Program or Million Annual Passengers
Mbps – Megabits Per Second
MCAS – Marine Corps Air Station
MDA – Minimum Descent Altitude
MEA – Minimum En Route Altitude

MGTOW – Maximum Gross Takeoff Weight
Mhz – MegHERTZ
MISC – Miscellaneous
MIRL – Medium Intensity Runway Lighting
MITL – Medium Intensity Taxiway Lighting
MSL – Mean Sea Level
MM – Middle Marker
MNPS – Minimum Navigation Performance Specification
MOA – Military Operations Area
MOU – Memorandum of Understanding
MOS – Modification of Standards
MPO – Metropolitan Planning Organization
MP – Master Plan
MSA – Minimum Safe Altitude
MSL – Mean Sea Level

N

NAAQS – National Ambient Air Quality Standards
NAS – National Airspace System or Naval Air Station
NASA – National Aeronautics and Space Administration
NASP – National Airspace System Plan
NAVAID – Navigation Aid
NBAA – National Business Aircraft Association
NCAR – National Center for Atmospheric Research; Boulder, CO
NDB – Non-Directional Radio Homing Beacon
NEPA – National Environmental Policy Act
NEXRAD – Next Generation Weather Radar
NFDC – National Flight Data Center
NLA – New Large Aircraft
NM – Nautical Mile
NOAA – National Oceanic and Atmospheric Administration
NOTAM – Notice to Airmen
NPDES – National Pollutant Discharge Elimination System
NPIAS – National Plan of Integrated Airport Systems
NTSB – National Transportation Safety Board
NTZ – No Transgression Zone
NWS – National Weather Service
NXRD – Advanced Weather Radar System

O

O&D – Origination and Destination
OAG – Official Airline Guide
ODAL – Omnidirectional Approach Lighting System
OFA – Object Free Area
OFZ – Obstacle Free Zone
OM – Outer Marker
OMB – Office of Management and Budget
OPBA – Operations Per Based Aircraft

P

PAPI – Precision Approach Path Indicator
PAR – Precision Approach Radar or Preferential Arrival Route
PBX – Private Branch Exchange
PCA – Positive Control Airspace
PCM – Pulse Code Modulation
PCN – Pavement Classification Number
PFC – Passenger Facility Charge
PIREP – Pilot Weather Report
PMS – Program Management System
PR – Primary Commercial Service Airport
PRM – Precision Runway Monitor
PUB – Publication

R

RAIL – Runway Alignment Indicator Lights
RAPCON – Radar Approach Control (FAA)
RATCC – Radar Air Traffic Control Center
RCF – Remote Communication Facility
RCL – Radio Communications Link
RCO – Remote Communications Outlet
REIL – Runway End Identification Lights
RF – Radio Frequency
RI – Runway Incursion
RL – General Aviation Reliever Airport
RNAV – Area Navigation
RNP – Required Navigation Performance
ROD – Record of Decision
ROT – Runway Occupancy Time
RPZ – Runway Protection Zone
RSA – Runway Safety Area
RT – Remote Transmitter
RTR – Remote Transmitter/Receiver
RVR – Runway Visual Range
RW – Runway

S

SALS – Short Approach Lighting System
SATCOM – Satellite Communications
SAWRS – Supplementary Aviation Weather Reporting System
SDF – Simplified Direction Finding
SEL – Single Event Level/Sound Exposure Level
SHPO – State Historic Preservation Officer
SID – Station Identifier or Standard Instrument Departure

SIGMET – Significant Meteorological Information
SIMMOD – Airport and Airspace Simulation Model
SIP – State Implementation Plan
SM – Statute Miles
SMGCS – Surface Movement Ground Control System
SNR – Signal-to-Noise Ratio, also: S/N
SSALF – SSALS with Sequenced Flashers
SSALR – Simplified Short Approach Lighting System
STAR – Standard Terminal Arrival Route
STD – Standard
STOL – Short Takeoff and Landing
SVFR – Special Visual Flight Rules

T

TACAN – Tactical Aircraft Control and Navigation
TAF – Terminal Area Forecast
TARS – Terminal Automated Radar Service
TAS – True Air Speed
TCA – Traffic Control Area or Terminal Control Area
TCAS – Traffic Alert And Collision Avoidance System
TEA-21 – Transportation Equity Act for the 21st Century
TELCO – Telephone Company
TERPS – Terminal Instrument Procedures
TH – Threshold
TL – Taxilane
TMS – Traffic Management System
TODA – Takeoff Distance Available
TORA – Take-off Run Available
TRACON – Terminal Radar Approach Control Facility
TSA – Transportation Security Administration or Taxiway Safety Area
TTY – Teletype
TVOR – Terminal VHF Omnidirectional Range
TW – Taxiway
TWEB – Transcribed WeatherBroadcast
TWR – Tower (non-controlled)

U

UHF – Ultra High Frequency
USAF – United States Air Force
USOC – Uniform Service Order Code

V

VASI – Visual Approach Slope Indicator
VDME – VOR with Distance Measuring Equipment
VFR – Visual Flight Rules
VGSI – Visual Guide Slope Indicator
VHF – Very High Frequency
VLF – Very Low Frequency
VMC – Visual Meteorological Conditions
VNAV – Visual Navigational Aids
VOR – VHF Omnidirectional Range
VOR/DME – VHF Omnidirectional Range/ Distance Measuring Equipment
VORTAC – VOR collocated with TACAN

W

WAAS – Wide Area Augmentation System
WAN – Wide Area Network
WESCOM – Western Electric Satellite Communications
WSFO – Weather Service Forecast Office
WSMO – Weather Service Meteorological Observatory
WSO – Weather Service Office
WTHR – "Weather"
WX – Weather

Alamogordo-White Sands Regional Airport

Appendix B

INSTRUMENT APPROACH PLATES

ALAMOGORDO, NEW MEXICO

AL-5130 (FAA)

APP CRS	Rwy ldg	7005
035°	TDZE	4167
	Apt Elev	4200

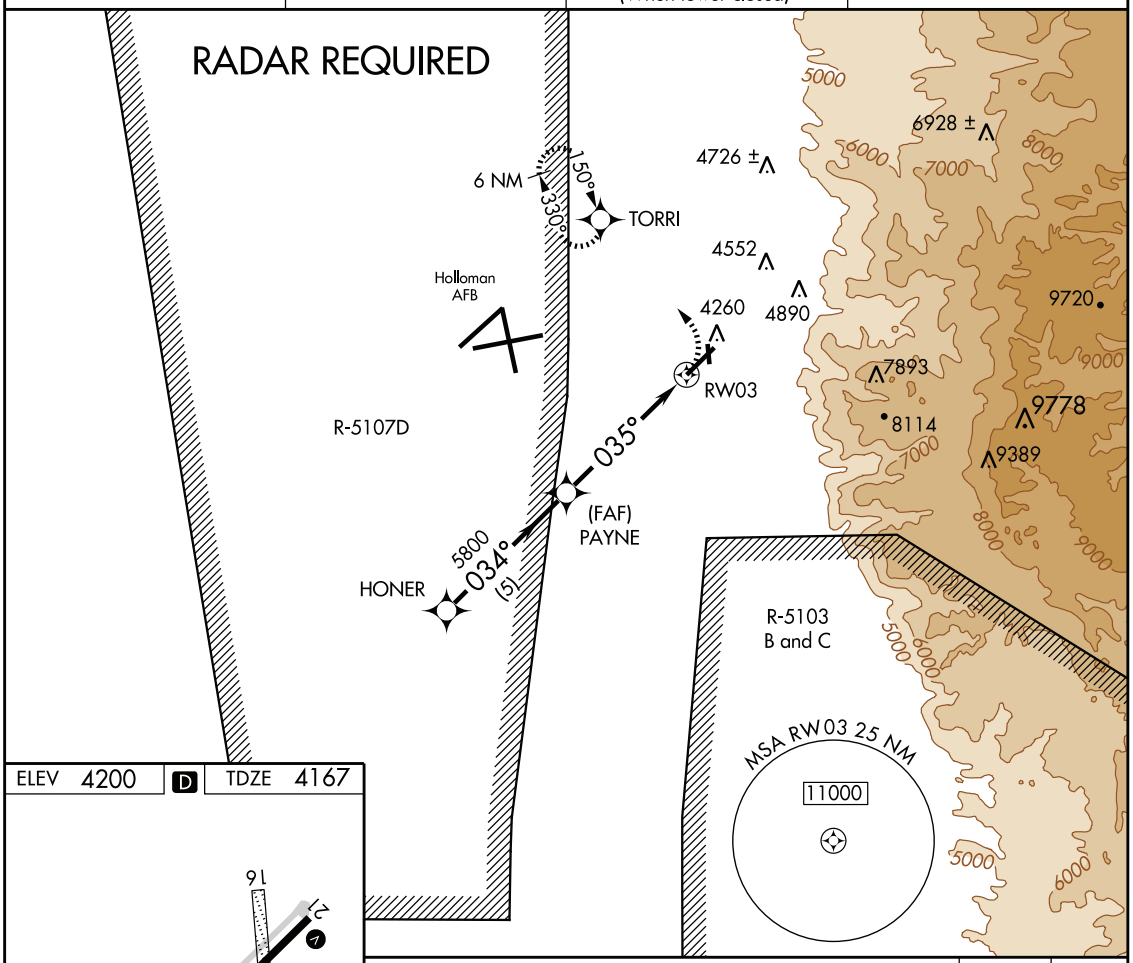
RNAV (GPS) RWY 3

ALAMOGORDO-WHITE SANDS RGNL (ALM)

All civil aircraft require ATC clearance prior to entering Restricted Area 5107D.
Circling NA southeast of Rwy 3-21.
GPS or RNP- 0.3 required. DME/DME RNP- 0.3 NA.
Not authorized when Holloman Approach Control closed.

MISSED APPROACH: Climbing left turn to 6000 direct TORRI WP and hold.

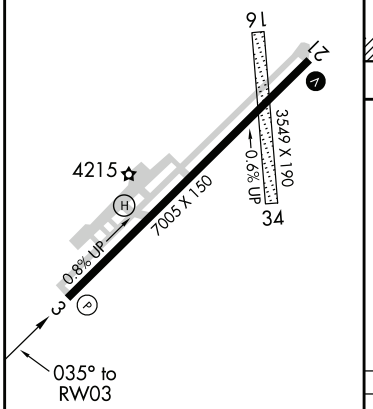
AWOS-3	HOLLOMAN APP CON ★	ALBUQUERQUE CENTER	UNICOM
127.825	120.6 269.225	132.65 257.6 (When tower closed)	122.8 (CTAF) L

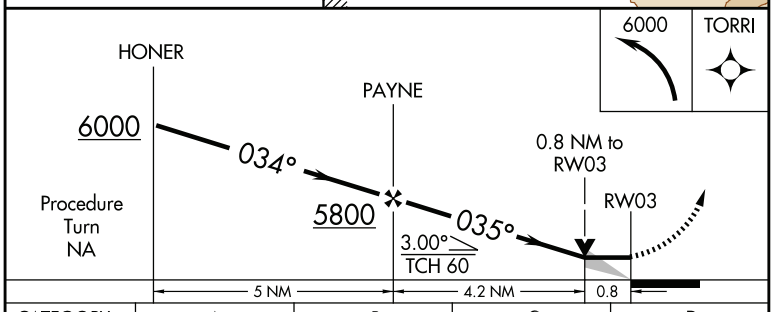


SW-1, 15 NOV 2012 to 13 DEC 2012

SW-1, 15 NOV 2012 to 13 DEC 2012

ELEV 4200 D TDZE 4167





CATEGORY	A	B	C	D
LNAV MDA	4460-1 293 (300-1)			
CIRCLING	4660-1 460 (500-1)	4720-1 520 (600-1)	4720-1½ 520 (600-1½)	4760-2 560 (600-2)

REIL Rwys 3 and 21
MIRL Rwy 3-21 L

ALAMOGORDO, NEW MEXICO
Orig-A 12264

32°50'N-105°59'W

ALAMOGORDO-WHITE SANDS RGNL (ALM)

RNAV (GPS) RWY 3

ALAMOGORDO, NEW MEXICO

AL-5130 (FAA)

VOR/DME BWS	APP CRS	Rwy ldg 7005
109.6	035°	TDZE 4167
Chan 33		Apt Elev 4200

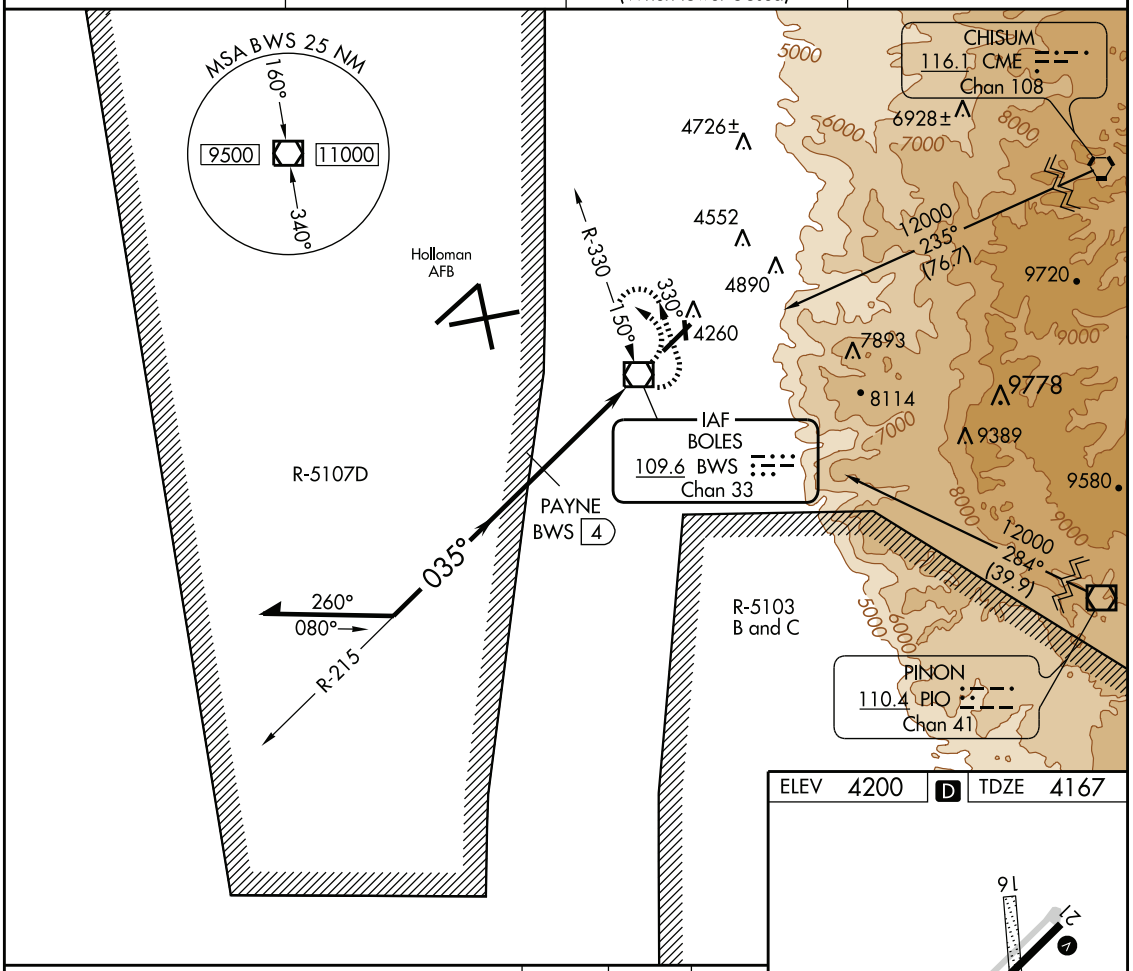
VOR/DME RWY 3

ALAMOGORDO-WHITE SANDS RGNL (ALM)

T NA All civil aircraft require ATC clearance prior to entering Restricted Area 5107D. Circling NA southeast of Rwy 3-21.Arrivals over BOLES VOR/DME above 12000 descend in the holding patternto 12000 before commencing approach. Not authorized when Holloman Approach Control closed.

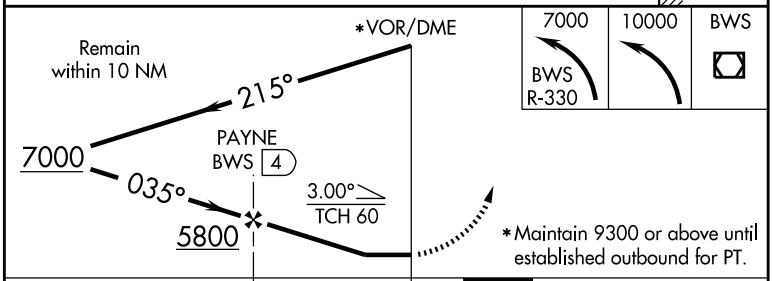
MISSED APPROACH: Climbing left turn to 7000 via BWS R-330 then climbing left turn to 10000 direct BWS VOR/DME and hold.

AWOS-3	HOLLOMAN APP CON ★	ALBUQUERQUE CENTER	UNICOM
127.825	120.6 269.225	132.65 257.6 (When tower closed)	122.8 (CTAF) L

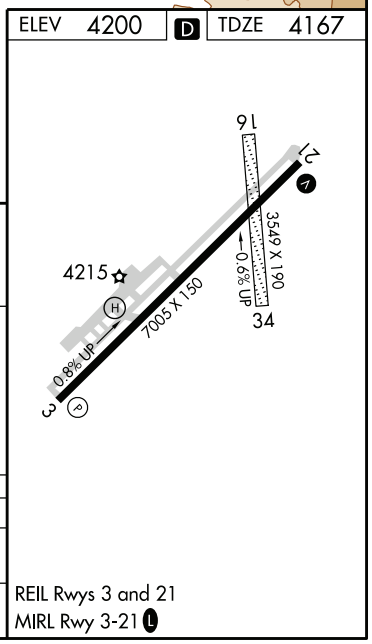


SW-1, 15 NOV 2012 to 13 DEC 2012

SW-1, 15 NOV 2012 to 13 DEC 2012



CATEGORY	A	B	C	D
S-3	4460-1¼ 293 (300-1¼)			
CIRCLING	4660-1¼ 460 (500-1¼)	4720-1¼ 520 (600-1¼)	4720-1½ 520 (600-1½)	4760-2 560 (600-2)



REIL Rwys 3 and 21
MIRL Rwy 3-21 L

ALAMOGORDO, NEW MEXICO
Orig-A 12264

32°50'N-105°59'W

ALAMOGORDO-WHITE SANDS RGNL (ALM)
VOR/DME RWY 3

ALAMOGORDO, NEW MEXICO

AL-5130 (FAA)

VOR/DME BWS	APP CRS	Rwy ldg	7005
109.6	035°	TDZE	4167
Chan 33		Apt Elev	4200

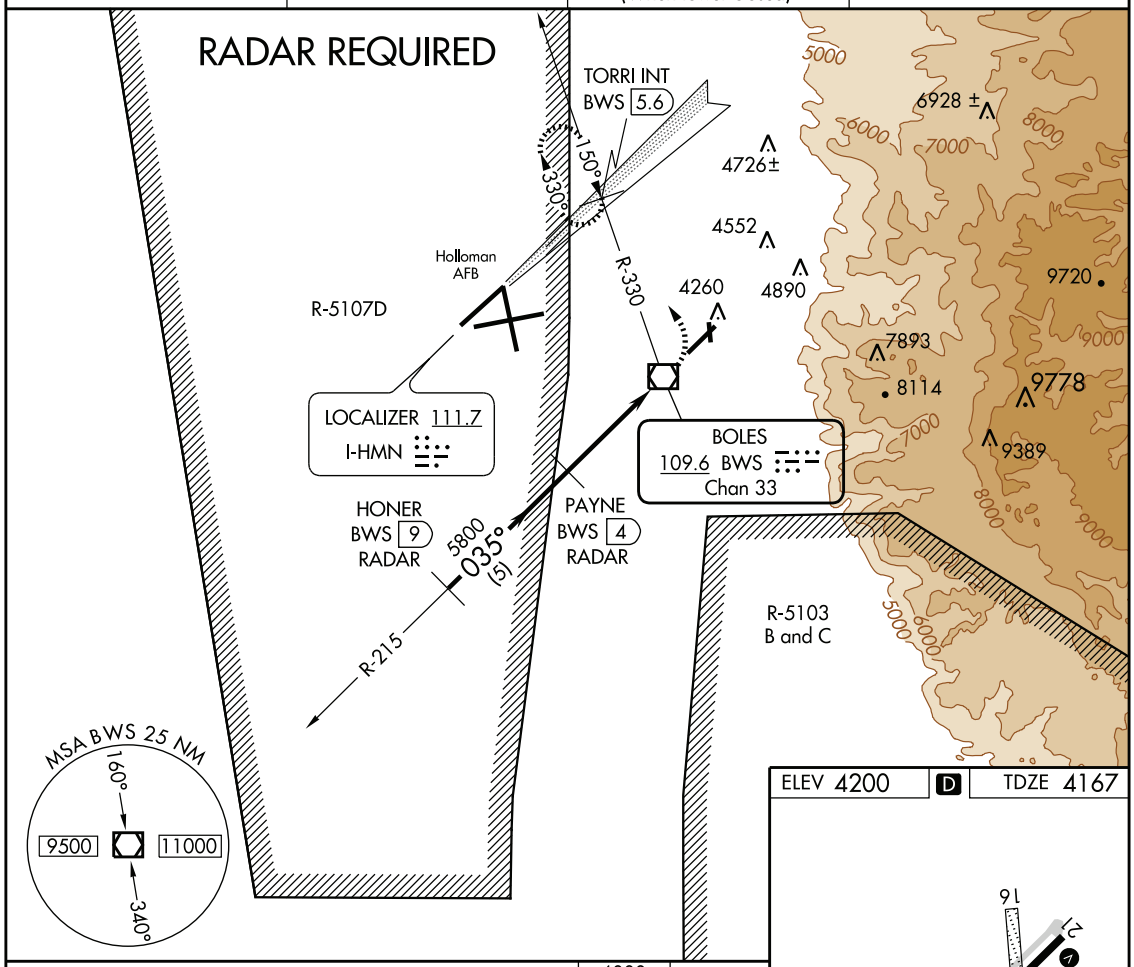
VOR RWY 3

ALAMOGORDO-WHITE SANDS RGNL (ALM)

All civil aircraft require ATC clearance prior to entering Restricted Area 5107D.
Circling NA southeast of Rwy 3-21.
RADAR or DME required.
Not authorized when Holloman Approach Control closed.

MISSED APPROACH: Climbing left turn to 6000 via BWS R-330 to TORRI Int/BWS 5.6 DME and hold.

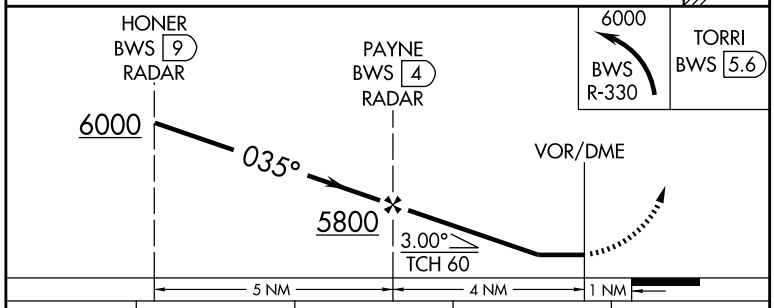
AWOS-3	HOLLOMAN APP CON ★	ALBUQUERQUE CENTER	UNICOM
127.825	120.6 269.225	132.65 257.6 (When tower closed)	122.8 (CTAF) L

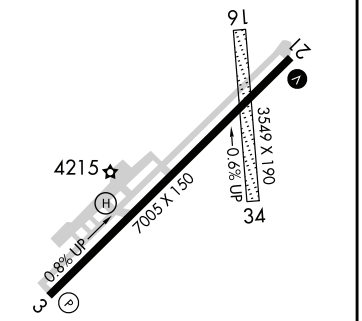


SW-1, 15 NOV 2012 to 13 DEC 2012

SW-1, 15 NOV 2012 to 13 DEC 2012

ELEV 4200 | D | TDZE 4167





CATEGORY	A	B	C	D
S-3	4460-1¼ 293 (300-1¼)			
CIRCLING	4660-1¼ 460 (500-1¼)	4720-1¼ 520 (600-1¼)	4720-1½ 520 (600-1½)	4760-2 560 (600-2)

REIL Rwys 3 and 21
MIRL Rwy 3-21 L

ALAMOGORDO, NEW MEXICO
Amdt 2A 12264

32°50′N-105°59′W

ALAMOGORDO-WHITE SANDS RGNL (ALM)
VOR RWY 3

Alamogordo-White Sands Regional Airport

Appendix C

AIRPORT LAYOUT PLAN

AIRPORT LAYOUT PLAN (ALP) DRAWING SET

Development recommended for the Airport over the 20-year planning period is exhibited in a graphic manner within the Airport Layout Plan set. The ALP was generated with the use of aerial photography and associated topographic information provided by the City. The ALP set was updated in accordance with the most recent ALP standards provided by the FAA-ADO at the time the contract was executed. Preparation of the ALP was based on the findings of the previous elements and includes the following individual drawing sheets:

- **Cover Sheet** – Computer generated drawing created by URS.
- **Airport Layout Plan (ALP)** – The primary plan sheet in the set graphically depicting the existing conditions and phased development of the Airport and associated setbacks/safety boundaries. The final plan will ultimately be approved and signed by the FAA. Also shown on the ALP are Airport wind rose and wind data table, location and vicinity maps, plan notes, and source information.

  The ALP also includes the Airport Data table which is a tabular description of the information depicted graphically on the ALP sheet.
- **Airspace Plans Sheet(s)** – Map depicting C.F.R. 14 Part 77 surfaces superimposed on a USGS quadrangle map at 1"= 2,000' scale. This sheet depicts objects which penetrate FAR Part 77 surfaces that have not been identified on the ALP or approach sheets. Top elevation of each obstruction (if known) is listed in a table.
- **Terminal Area Plan** – A sheet depicting specific building areas at a larger scale with more detail (e.g., individual parking positions, taxilane object free areas and setbacks, etc.) than can be provided on the ALP sheet. This plan shows all new and future development in the hangar/apron areas, GA terminal area, FBO development, and other aeronautical use areas.
- **Runway Approach Plans** – Approach drawings depicting the inner approach area, the extents of which are generally defined as being the extent of the Runway Protection Zone (RPZ) for that runway end or the area encompassed by that portion of the approach surface present below the horizontal surface, whichever is greater. The plans are prepared using up-to-date contour line drawings generated through the use of new aerial photography. The locations of all objects in plan and profile, which exceed FAR Part 77 surfaces and threshold siting surfaces (existing and future), are shown. Plan views are superimposed on aerial photos or on a detailed line drawing. Part 77 surfaces for existing, future, and ultimate approaches are shown in addition to existing and future threshold siting surfaces. Inner Approach Surface drawings are provided for Runway 3, existing and extended, Runway 21, Existing Runway 16-34, and Future Runway 16-34.
- **On-Airport Land Use Drawing** – A drawing depicting the land uses within the airport property boundary.
- **Off-Airport Land Use Drawing** – A drawing depicting land uses and zoning in the area around the airport.

ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT

ALAMOGORDO, NEW MEXICO

AIRPORT LAYOUT PLAN

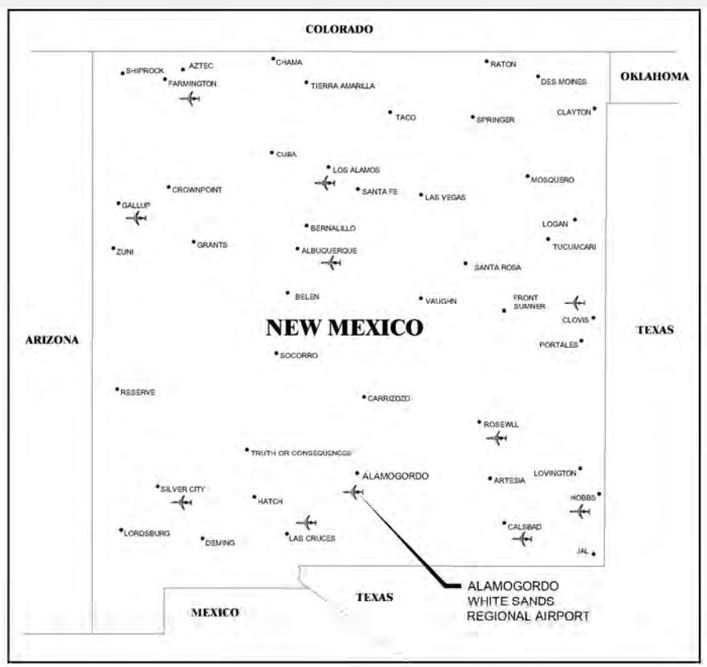
PREPARED BY:

URS CORPORATION

A.C.I. PROJECT NO. XXXXXX

DATE: August, 2013

VICINITY MAP



PROJECT LOCATION MAP

INDEX OF SHEET

SHEET NO.	DESCRIPTION
01	COVER SHEET
02	AIRPORT LAYOUT PLAN
03	PART "77" AIRSPACE
04	PART "77" AIRSPACE
05	TERMINAL AREA PLAN
06	RUNWAY 3 INNER APPROACH
07	RUNWAY 21 INNER APPROACH
08	RUNWAY 16-34 INNER APPROACH
09	FUTURE RUNWAY 16 INNER APPROACH
10	FUTURE/ULTIMATE RUNWAY 34 INNER APPROACH
11	ON AIRPORT LAND USE
12	OFF AIRPORT LAND USE

URS CORPORATION
9400 AMBERGLEN BLVD
AUSTIN, TX 78729
Phone: 512-454-4797
TX FIRM NO. 3162

APPROVED DATE

AIRPORT DATA

CITY: ALAMOGORDO COUNTY: OTERO STATE: NEW MEXICO

DESCRIPTION		EXISTING	FUTURE	ULTIMATE
SERVICE LEVEL (N.P.I.A.S.)		COMMERCIAL	COMMERCIAL	COMMERCIAL
AIRPORT REFERENCE CODE (ARC)		B-III	C-III	C-III
CRITICAL AIRCRAFT		P2V-NEPTUNE	BAE 146	BAE 146
AIRCRAFT TAIL HEIGHT		29'	29'	29'
AIRPORT ELEVATION (AMSL)		4199.8'	4199.8'	4199.8'
MEAN MAX. TEMP. (HOTTEST MONTH)		94.9°	N/A	N/A
AIRPORT REFERENCE POINT (NAD83)	LATITUDE	32° 50' 28.60" N	32° 50' 00.138" N	32° 49' 49.957" N
	LONGITUDE	105° 59' 19.90" W	106° 00' 04.085" W	106° 00' 11.526" W
MAGNETIC DECLINATION (EPOCH YR. JAN. 1, 2010)		7.1° W PER YEAR	N/A	N/A
AIRPORT IDENTIFIER		KALM	KALM	KALM

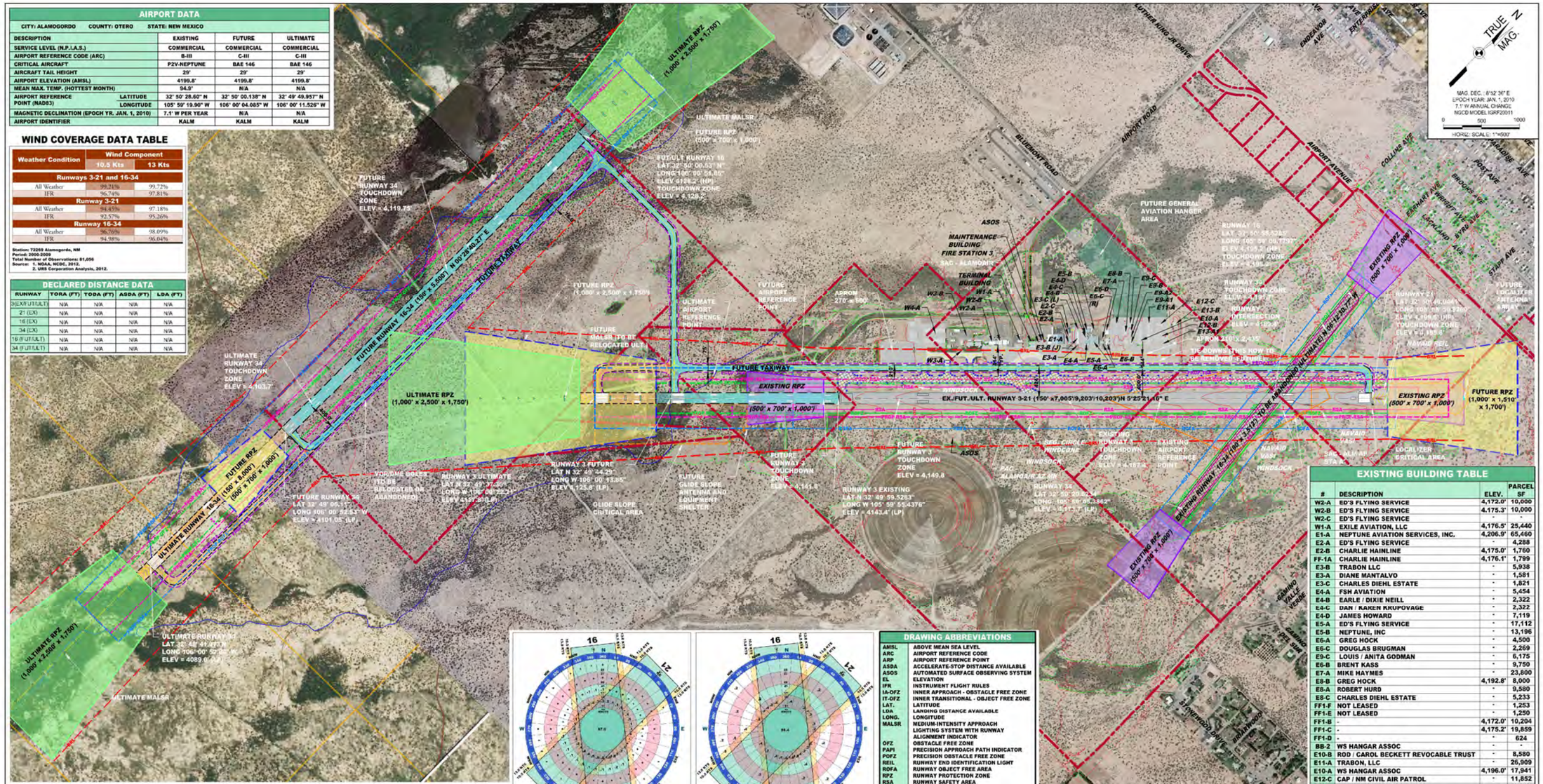
WIND COVERAGE DATA TABLE

Weather Condition	Wind Component 10.5 Kts	Wind Component 13 Kts
Runways 3-21 and 16-34		
All Weather	99.21%	99.72%
IFR	96.74%	97.81%
Runway 3-21		
All Weather	94.45%	97.18%
IFR	92.57%	95.26%
Runway 16-34		
All Weather	96.76%	98.09%
IFR	94.98%	96.04%

Station: 72269 Alamogordo, NM
Period: 2005-2009
Total Number of Observations: 81,056
Source: 1. NOAA, NCDC, 2012.
2. URS Corporation Analysis, 2012.

DECLARED DISTANCE DATA

RUNWAY	TORA (FT)	TODA (FT)	ASDA (FT)	LDA (FT)
3(EX/FUT/ULT)	N/A	N/A	N/A	N/A
21 (EX)	N/A	N/A	N/A	N/A
16 (EX)	N/A	N/A	N/A	N/A
34 (EX)	N/A	N/A	N/A	N/A
16 (FUT/ULT)	N/A	N/A	N/A	N/A
34 (FUT/ULT)	N/A	N/A	N/A	N/A



EXISTING BUILDING TABLE

#	DESCRIPTION	ELEV.	PARCEL SF
W2-A	ED'S FLYING SERVICE	4,172.0'	10,000
W2-B	ED'S FLYING SERVICE	4,175.3'	10,000
W2-C	ED'S FLYING SERVICE	-	-
W1-A	EXILE AVIATION, LLC	4,176.5'	25,440
E1-A	NEPTUNE AVIATION SERVICES, INC.	4,206.9'	65,460
E2-A	ED'S FLYING SERVICE	-	4,288
E2-B	CHARLIE HAINLINE	4,175.0'	1,760
FF-1A	CHARLIE HAINLINE	4,176.1'	1,799
E3-B	TRABON LLC	-	5,938
E3-A	DIANE MANTALVO	-	1,581
E3-C	CHARLES DIEHL ESTATE	-	1,821
E4-A	FSH AVIATION	-	5,454
E4-B	EARLE / DIXIE NEILL	-	2,322
E4-C	DAN / KAREN KRUPOVAGE	-	2,322
E4-D	JAMES HOWARD	-	7,119
E5-A	ED'S FLYING SERVICE	-	17,112
E5-B	NEPTUNE, INC	-	13,196
E6-A	GREG HOCK	-	4,500
E6-C	DOUGLAS BRUGMAN	-	2,269
E9-C	LOUIS / ANITA GODMAN	-	6,175
E6-B	BRENT KASS	-	9,750
E7-A	MIKE HAYMES	-	23,800
E8-B	GREG HOCK	4,192.8'	8,000
E8-A	ROBERT HURD	-	9,580
E8-C	CHARLES DIEHL ESTATE	-	5,233
FF1-F	NOT LEASED	-	1,253
FF1-E	NOT LEASED	-	1,250
FF1-B	-	4,172.0'	10,204
FF1-C	-	4,175.2'	19,859
FF1-D	-	-	624
BB-2	WS HANGAR ASSOC	-	-
E10-B	ROD / CAROL BECKETT REVOCABLE TRUST	-	8,580
E11-A	TRABON, LLC	-	26,909
E10-A	WS HANGAR ASSOC	4,196.0'	17,941
E12-C	CAP / NM CIVIL AIR PATROL	-	11,852
E9-B	BARRY BURKE	-	4,550
W3-A	USFS / LINCOLN NAT'L FOREST	-	202,491
W3-B	USFS / LINCOLN NAT'L FOREST	4,176.6'	140,150
W4-A	JUDY / JEFF RABON	4,178.7'	249,386
E12-A	MIKE / LYNN RICE	4,188.0'	12,332
E6-D	SKYLINE AVIATION, LLC	-	12,650
E12-B	DUNSHEE LIMITED, LLC	4,185.1	29,836
E9-A2	JOHN LAVIN	-	4,550
E2-C	ERNEST / DEBBIE MARTINEZ	4,186.7	2,528
E13-B	DARRELL LATHAM	-	9,018
E9-A1	JAMES HOWARD	-	6,825
E13-A1	NEW MEXICO SKIES	4,195.6'	12,859
E13-A3		-	15,002

TAXIWAY DATA

	EXISTING	FUTURE/ULTIMATE
TAXIWAY DESIGN GROUP	3	3
TAXIWAY WIDTH	75'	75'
TAXIWAY SAFETY AREA DIMENSION (TSA)	118'	118'
TAXIWAY OBJECT FREE AREA (TOFA)	186'	186'
TAXIWAY LIGHTING	MITL	MITL

DRAWING ABBREVIATIONS

AMSL	ABOVE MEAN SEA LEVEL
ARC	AIRPORT REFERENCE CODE
ARP	AIRPORT REFERENCE POINT
ASDA	ACCELERATE-STOP DISTANCE AVAILABLE
ASOS	AUTOMATED SURFACE OBSERVING SYSTEM
EL	ELEVATION
IFR	INSTRUMENT FLIGHT RULES
IA-OFZ	INNER APPROACH - OBSTACLE FREE ZONE
IT-OFZ	INNER TRANSITIONAL - OBJECT FREE ZONE
LAT.	LATITUDE
LDA	LANDING DISTANCE AVAILABLE
LONG.	LONGITUDE
MALSR	MEDIUM-INTENSITY APPROACH LIGHTING SYSTEM WITH RUNWAY ALIGNMENT INDICATOR
OFZ	OBSTACLE FREE ZONE
PAPI	PRECISION APPROACH PATH INDICATOR
POFZ	PRECISION OBSTACLE FREE ZONE
REIL	RUNWAY END IDENTIFICATION LIGHT
ROFA	RUNWAY OBJECT FREE AREA
RPZ	RUNWAY PROTECTION ZONE
RSA	RUNWAY SAFETY AREA
RWY	RUNWAY
TOFA	TAXIWAY OBJECT FREE AREA
TODA	TAKEOFF DISTANCE AVAILABLE
TORA	TAKEOFF RUNWAY AVAILABLE
TSA	TAXIWAY SAFETY AREA
TWY	TAXIWAY
VASI	VISUAL APPROACH SLOPE INDICATOR
VFR	VISUAL FLIGHT RULES
VOR	VERY HIGH FREQUENCY OMNIDIRECTIONAL RANGE

FUTURE / ULTIMATE RUNWAY DATA

	FUTURE RUNWAY 3-21		FUTURE RUNWAY 16-34		ULTIMATE RUNWAY 16-34		ULTIMATE RUNWAY 3-21	
RUNWAY	3	21	16	34	16	34	3	21
RUNWAY LENGTH AND WIDTH	9,203' x 150'		5,500' x 150'		8,000' x 150'		10,203' x 150'	
PAVEMENT TYPE	ASPHALT		ASPHALT		ASPHALT		ASPHALT	
PAVEMENT LOADING	80,000 LBS S.W. / 120,000 LBS D.W.		12,500 LBS S.W.G.		80,000 LBS S.W. / 120,000 LBS D.W.		80,000 LBS S.W. / 120,000 LBS D.W.	
RUNWAY LIGHTING	MIRL		NONE		NONE		MIRL	
RUNWAY MARKINGS	PRECISION	NONPRECISION	NONPRECISION	NONPRECISION	PRECISION	PRECISION	PRECISION	NONPRECISION
AIRCRAFT APPROACH CATEGORY	C	C	B	B	C	C	C	C
AIRCRAFT DESIGN GROUP	III	III	II	II	III	III	III	III
CRITICAL AIRCRAFT/TAIL HEIGHT	BAE 146/29'		BEECH KING AIR B200/15'		BAE 146/29'		BAE 146/29'	
EFFECTIVE GRADIENT	0.80 %	-0.80 %	0.49%	-0.49%	0.49%	-0.49%	0.80 %	-0.80 %
TOUCHDOWN ZONE ELEVATION	4,149.8'	4,199.8'	4,128.20'	4,119.75'	4,128.20'	4,103.7'	4,141.8'	4,199.8'
INSTRUMENT APPROACH AIDS	ILS/VOR/NDB/GPS (LPV)	GPS	NONE	NONE	WAAS	WAAS	ILS/VOR/NDB/GPS (LPV)	GPS
APPROACH VISIBILITY MINIMUMS	1/2 MILE	1 MILE	1 MILE	1 MILE	1/2 MILE	1/2 MILE	1 MILE	1 MILE
PART 77 APPROACH CATEGORY	PRECISION	NONPRECISION	NONPRECISION	NONPRECISION	PRECISION	PRECISION	PRECISION	NONPRECISION
APPROACH SLOPE	50:1	34:1	34:1	34:1	50:1	50:1	50:1	34:1
VISUAL APPROACH AIDS	MALSR/PAPI4	REIL/PAPI4	REIL/PAPI2	REIL/PAPI2	MALSR/PAPI4	MALSR/PAPI4	MALSR/PAPI4	REIL/PAPI4
OBJECT FREE AREA (OFA) WIDTH x LENGTH	800' x 1,000'	800' x 1,000'	500' x 300'	500' x 300'	800' x 1,000'	800' x 1,000'	800' x 1,000'	800' x 1,000'
OFA LENGTH PRIOR TO THRESHOLD	600'	600'	300'	300'	600'	600'	600'	600'
RUNWAY SAFETY AREA (RSA) WIDTH x LENGTH	500' x 1,000'	500' x 1,000'	150' x 300'	150' x 300'	500' x 1,000'	500' x 1,000'	500' x 1,000'	500' x 1,000'
RSA LENGTH PRIOR TO THRESHOLD	600'	600'	300'	300'	600'	600'	600'	600'
OBSTACLE FREE ZONE (OFZ) WIDTH	400'	400'	250'	250'	400'	400'	400'	400'
OFZ LENGTH BEYOND RUNWAY END	200'	200'	200'	200'	200'	200'	200'	200'
RUNWAY END (NAD 83) LATITUDE	32°49' 44.29" N	32° 50' 48.04" N	32° 50' 00.53" N	32° 48' 05.11" N	32° 50' 00.53" N	32° 48' 41.37" N	32°49' 37.36" N	32° 50' 48.04" N
LONGITUDE	106° 00' 13.85" W	105° 58' 56.83" W	106° 00' 51.85" W	106° 00' 32.53" W	106° 00' 51.85" W	106° 00' 52.84" W	106° 00' 22.21" W	105° 58' 56.83" W
ELEVATION	4,125.8'	4,199.8'	4,128.2'	4,101.05'	4,128.2'	4,080.0'	4,117.8'	4,199.8'
RUNWAY PROTECTION ZONE (RPZ) DIMENSIONS	1,000' x 2,500' x 1,750'	1,000' x 1,510' x 1,700'	500' x 700' x 1,000'	500' x 700' x 1,000'	500' x 1,010' x 1,700'	500' x 1,010 x 1,700'	1,000' x 2,500' x 1,750'	1,000' x 1,510' x 1,700'

EXISTING RUNWAY DATA

	RUNWAY 3-21		RUNWAY 16-34	
RUNWAY	3	21	16	34
RUNWAY LENGTH AND WIDTH	7003' x 150'		3547' x 190'	
PAVEMENT TYPE	ASPHALT		DIRT	
PAVEMENT LOADING	54,000 LBS. S.W.G. 74,000 LBS. D.W.O. 120,000 LBS. D.W.G.		NONE	
RUNWAY LIGHTING	MIRL		NONE	
RUNWAY MARKINGS	NONPRECISION	NONPRECISION	NONE	NONE
AIRCRAFT APPROACH CATEGORY	B	B	B	B
AIRCRAFT DESIGN GROUP	III	III	II	II
CRITICAL AIRCRAFT/TAIL HEIGHT	P-2V NEPTUNE/29'		BEECH KING AIR C90/15'	
EFFECTIVE GRADIENT	0.80 %	-0.80 %	-0.60 %	0.60 %
TOUCHDOWN ZONE ELEVATION	4,167.4'	4,199.8'	4,195.2'	4,191.7'
INSTRUMENT APPROACH AIDS	VOR/NDB/GPS	NONE	NONE	NONE
APPROACH VISIBILITY MINIMUMS	1 MILE	1 MILE	VISUAL	VISUAL
PART 77 APPROACH CATEGORY	NONPRECISION	VISUAL	VISUAL	VISUAL
APPROACH SLOPE	34:1	20:1	20:1	20:1
VISUAL APPROACH AIDS	REIL/PAPI4	REIL/VASI2	NONE	NONE
OBJECT FREE AREA (OFA) WIDTH x LENGTH	800' x 600'	800' x 600'	500' x 300'	500' x 300'
OFA LENGTH PRIOR TO THRESHOLD	600'	600'	300'	300'
RUNWAY SAFETY AREA (RSA) WIDTH x LENGTH	300' x 600'	300' x 600'	150' x 300'	150' x 300'
RSA LENGTH PRIOR TO THRESHOLD	600'	600'	300'	300'
OBSTACLE FREE ZONE (OFZ) WIDTH	400'	400'	250'	250'
OFZ LENGTH BEYOND RUNWAY END	200'	200'	200'	200'
RUNWAY END (NAD 83) LATITUDE	32°49' 59.5283" N	32° 50' 48.0441" N	32° 50' 55.5285" N	32° 50' 20.6234" N
LONGITUDE	105° 59' 55.4376" W	105° 58' 56.8260" W	105° 59' 09.8473" W	105° 50' 05.3862" W
ELEVATION	4143.4'	4195.8'	4195.2'	4173.2'
RUNWAY PROTECTION ZONE (RPZ) DIMENSIONS	500' x 700' x 1,000'	500' x 700' x 1,000'	500' x 700' x 1,000'	500' x 700' x 1,000'

LEGEND

DESCRIPTION	EXISTING	FUTURE	ULTIMATE
AIRPORT BEACON		N/A	N/A
AIRFIELD PAVEMENT			
AIRFIELD PAVEMENT SHOULDER			SAME
AIRPORT PROPERTY LINE			SAME
AIRPORT REFERENCE POINT (ARP)			
BUILDING RESTRICTION LINE (BRL)	BRL		SAME
RUNWAY PAVEMENT REMOVAL	N/A		SAME
DRAINAGE CREEK		N/A	N/A
CRITICAL AREA (LOC, GS)	N/A		N/A
FENCING		N/A	N/A
GLIDE SLOPE ANTENNA AND EQUIP. SHELTER			N/A
LOCALIZER ANTENNA			N/A
OBJECT FREE AREA			SAME
OBSTACLE FREE ZONE			SAME
PRECISION APPROACH PATH INDICATOR (PAPI)		PROPOSED PAPI	RELOCATED PAPI
RUNWAY EDGE LIGHT			SAME
RUNWAY END IDENTIFICATION LIGHT (REIL)		PROPOSED REIL	RELOCATED REIL
RUNWAY PROTECTION ZONE			
RUNWAY SAFETY AREA			SAME
RUNWAY THRESHOLD LIGHTS		SAME	SAME
SIGNIFIED DIRECTIONAL INDICATOR		SAME	SAME
TAXIWAY EDGE LIGHT		SAME	SAME
TAXIWAY SAFETY AREA			SAME
TOPOGRAPHIC CONTOURS		SAME	SAME
TREES / SHRUBS		N/A	N/A
VISUAL APPROACH SLOPE INDICATOR (VASI)		SAME	SAME
WINDCONE		SAME	SAME
MALSR	N/A		SAME
RUNWAY VISIBILITY ZONE (RVZ)	N/A		SAME
GENERAL AVIATION HANGER AREA	N/A		N/A

APPROVALS

FAA

Name: _____ Date: _____

ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT

Name: _____ Date: _____

REVISIONS	DESCRIPTION	DATE

ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT
ALAMOGORDO, NEW MEXICO

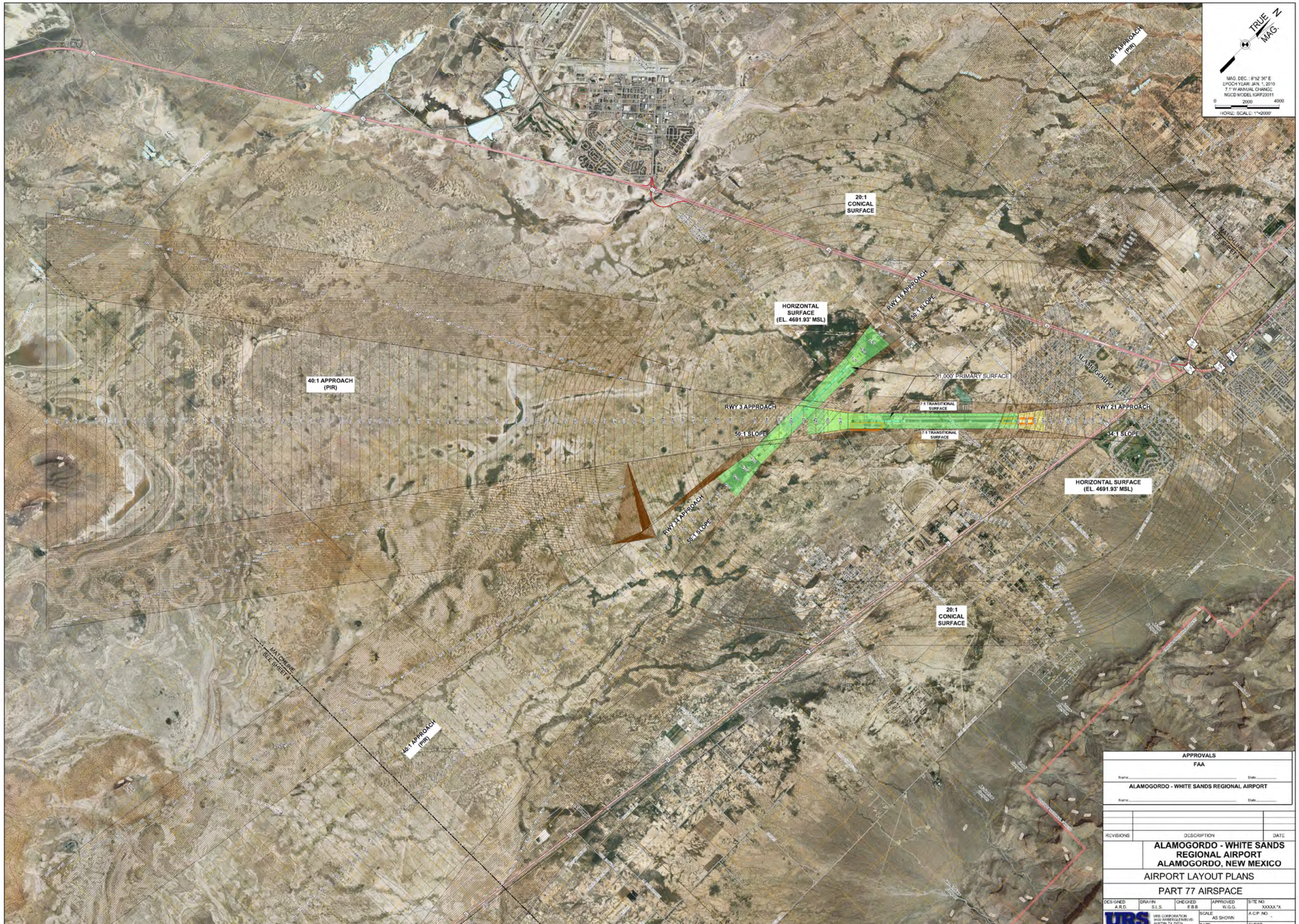
AIRPORT LAYOUT PLANS

AIRPORT LAYOUT PLAN

DESIGNED	DRAWN	CHECKED	APPROVED	SITE NO.
A.R.D.	S.L.S.	E.B.B.	W.G.G.	XXXXX "A"

URS CORPORATION
9400 BROADMOOR BLVD
ADDITIONS
Phone: 505-828-2000

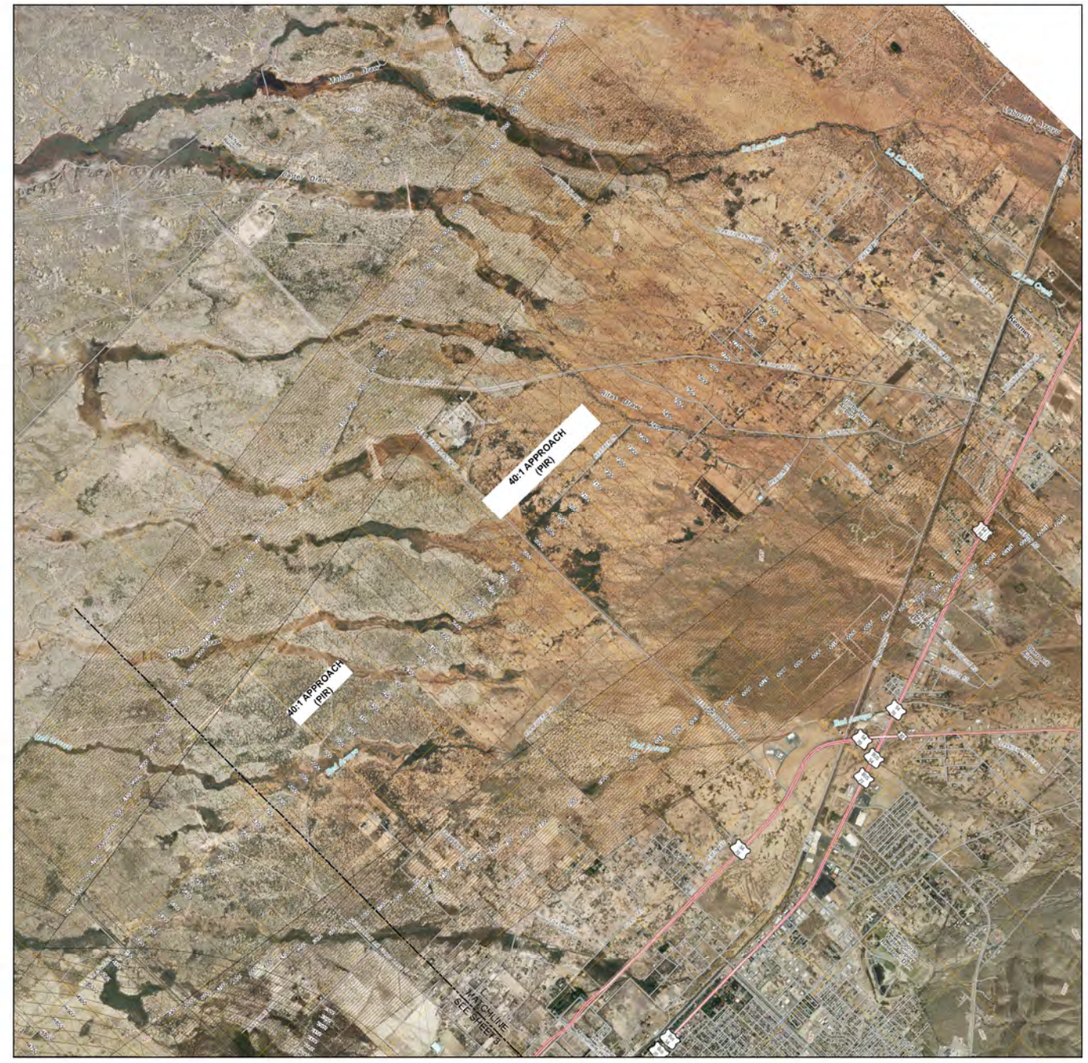
SCALE: AS SHOWN | A.I.P. NO.: | DATE: AUGUST 2013 | SHEET 2


TRUE N
MAG.
MAG. DEC. : 8°52' 36" E
EPOCH YEAR: JAN. 1, 2010
7.1' W ANNUAL CHANGE
NGDD MODEL: IGRF20011
0 2000 4000
HORIZ. SCALE: 1"=2000'
40:1 APPROACH (PIR)
20:1 CONICAL SURFACE
HORIZONTAL SURFACE (EL. 4691.93' MSL)
RWY 15 APPROACH
50:1 SLOPE
1,000' PRIMARY SURFACE
ALAMOGORDO
7:1 TRANSITIONAL SURFACE
RWY 3 APPROACH
RWY 21 APPROACH
34:1 SLOPE
HORIZONTAL SURFACE (EL. 4691.93' MSL)
RWY 33 APPROACH
50:1 SLOPE
20:1 CONICAL SURFACE
MATCHLINE SEE SHEET 4
40:1 APPROACH (PIR)
MATCHLINE SEE SHEET 4
APPROVALS
FAA
Name Date
ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT
Name Date
REVISIONS
DESCRIPTION
DATE
ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT
ALAMOGORDO, NEW MEXICO
AIRPORT LAYOUT PLANS
PART 77 AIRSPACE
DESIGNED A.R.D.
DRAWN S.L.S.
CHECKED E.B.B.
APPROVED W.G.G.
SITE NO. XXXXX.*X
URS CORPORATION
9400 AMBERGLEN BLVD
AUSTIN, TX 78729
Phone: 512-454-4797
SCALE AS SHOWN
A.C.P. NO. -
DATE AUGUST 2013
SHEET 3

TRUE N
MAG.

MAG. DEC.: 8°52' 36" E
EPOCH YEAR: JAN. 1, 2010
7.1' W ANNUAL CHANGE
NGDD MODEL IGRF20011

0 2000 4000
HORIZ. SCALE: 1"=2000'



APPROVALS
FAA
ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT

REVISIONS	DESCRIPTION	DATE

ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT
ALAMOGORDO, NEW MEXICO

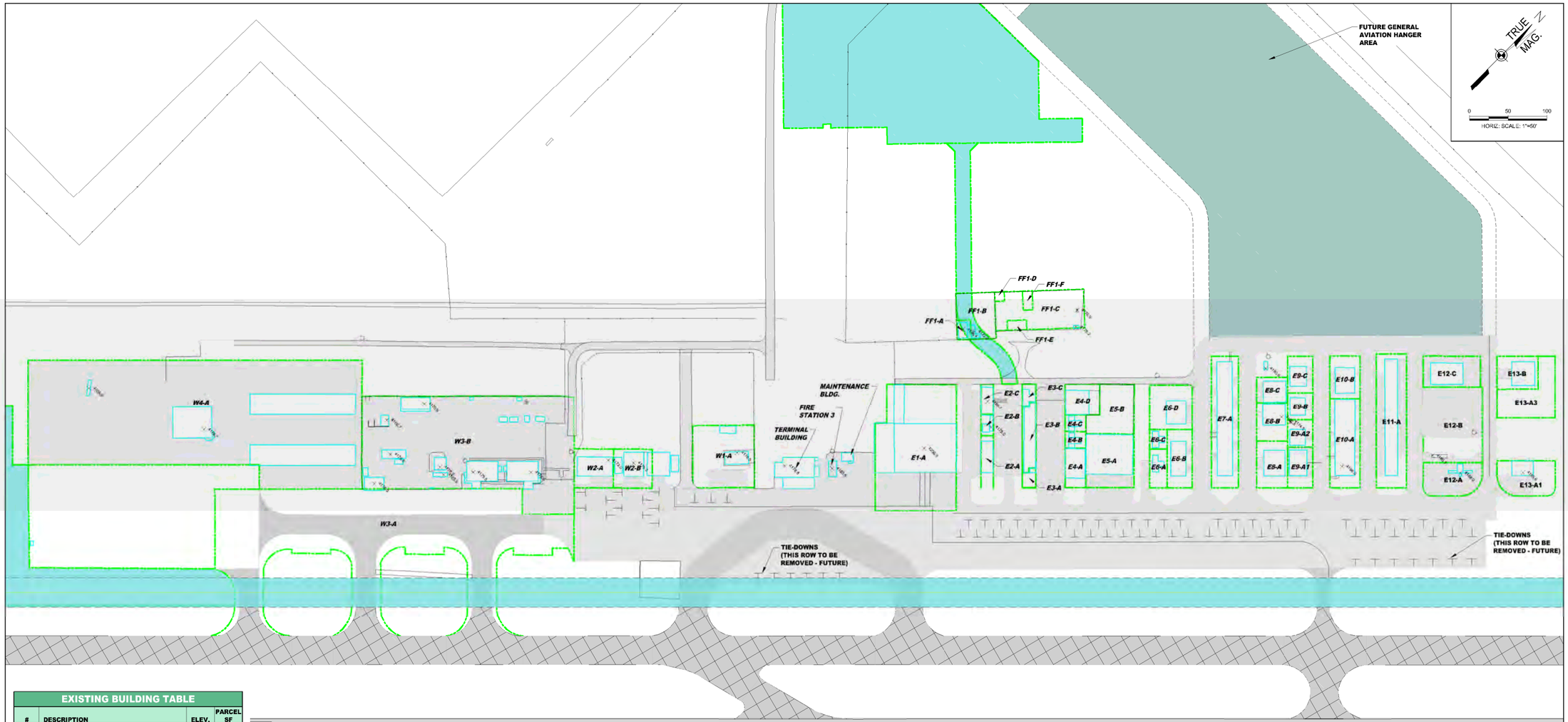
AIRPORT LAYOUT PLANS

PART 77 AIRSPACE

DESIGNED	DRAWN	CHECKED	APPROVED	SITE NO.
A.R.D.	S.L.S.	E.B.P.	W.G.G.	XXXXX.X

URS CORPORATION
9400 AMBER GLEN BLVD
AUSTIN, TX 78729
Phone: 512-454-4797

SCALE	A.C.I.P. NO.
AS SHOWN	
DATE AUGUST 2011	SHEET 4



EXISTING BUILDING TABLE

#	DESCRIPTION	ELEV.	PARCEL SF
W2-A	ED'S FLYING SERVICE	4,172.0'	10,000
W2-B	ED'S FLYING SERVICE	4,175.3'	10,000
W2-C	ED'S FLYING SERVICE	-	-
W1-A	EXILE AVIATION, LLC	4,176.5'	25,440
E1-A	NEPTUNE AVIATION SERVICES, INC.	4,206.9'	65,460
E2-A	ED'S FLYING SERVICE	-	4,288
E2-B	CHARLIE HAINLINE	4,175.0'	1,760
FF-1A	CHARLIE HAINLINE	4,176.1'	1,799
E3-B	TRABON LLC	-	5,938
E3-A	DIANE MANTALVO	-	1,581
E3-C	CHARLES DIEHL ESTATE	-	1,821
E4-A	FSH AVIATION	-	5,454
E4-B	EARLE / DIXIE NEILL	-	2,322
E4-C	DAN / KAREN KRUPOVAGE	-	2,322
E4-D	JAMES HOWARD	-	7,119
E5-A	ED'S FLYING SERVICE	-	17,112
E5-B	NEPTUNE, INC	-	13,196
E6-A	GREG HOCK	-	4,500
E6-C	DOUGLAS BRUGMAN	-	2,269
E9-C	LOUIS / ANITA GODMAN	-	6,175
E6-B	BRENT KASS	-	9,750
E7-A	MIKE HAYMES	-	23,800
E8-B	GREG HOCK	4,192.8'	8,000
E8-A	ROBERT HURD	-	9,580
E8-C	CHARLES DIEHL ESTATE	-	5,233
FF1-F	NOT LEASED	-	1,253
FF1-E	NOT LEASED	-	1,250
FF1-B	-	4,172.0'	10,204
FF1-C	-	4,175.2'	19,859
FF1-D	-	-	624
BB-2	WS HANGAR ASSOC	-	-
E10-B	ROD / CAROL BECKETT REVOCABLE TRUST	-	8,580
E11-A	TRABON, LLC	-	26,909
E10-A	WS HANGAR ASSOC	4,196.0'	17,941
E12-C	CAP / NM CIVIL AIR PATROL	-	11,852
E9-B	BARRY BURKE	-	4,550
W3-A	USFS / LINCOLN NAT'L FOREST	-	202,491
W3-B	USFS / LINCOLN NAT'L FOREST	4,176.6'	140,156
W4-A	JUDY / JEFF RABON	4,178.7'	249,388
E12-A	MIKE / LYNN RICE	4,188.0'	12,332
E6-D	SKYLINE AVIATION, LLC	-	12,650
E12-B	DUNSHEE LIMITED, LLC	4,185.1'	29,836
E9-A2	JOHN LAVIN	-	4,550
E2-C	ERNEST / DEBBIE MARTINEZ	4,186.7'	2,528
E13-B	DARRELL LATHAM	-	9,018
E9-A1	JAMES HOWARD	-	6,825
E13-A1	NEW MEXICO SKIES	4,195.6'	12,859
E13-A3		-	15,002

LEGEND

DESCRIPTION	EXISTING	FUTURE	ULTIMATE
LEASE LINE		N.A.	N.A.
AIRPORT BEACON		N.A.	N.A.
AIRFIELD PAVEMENT			
AIRFIELD PAVEMENT SHOULDER			SAME
AIRPORT PROPERTY LINE			SAME
AIRPORT REFERENCE POINT (ARP)			
BUILDING RESTRICTION LINE (BRL)	BRL		SAME
RUNWAY PAVEMENT REMOVAL	N.A.		SAME
DRAINAGE CHECK		N.A.	N.A.
CRITICAL AREA (LOC ISS)	N.A.		N.A.
FENCING		N.A.	N.A.
GLIDE SLOPE ANTENNA AND EQUIP. SHELTER			N.A.
LOCALIZER ANTENNA			N.A.
OBJECT FREE AREA	OFA	OFA	SAME
OBSTACLE FREE ZONE			SAME
PRECISION APPROACH PATH INDICATOR (PAPI)		PROPOSED PAPI	RELOCATED PAPI
RUNWAY EDGE LIGHT			SAME
RUNWAY END IDENTIFICATION LIGHT (REIL)		PROPOSED REIL	RELOCATED REIL
RUNWAY PROTECTION ZONE			
RUNWAY SAFETY AREA	RSA	RSA	SAME
RUNWAY THRESHOLD LIGHTS		SAME	SAME
SEGMENTED CIRCLE/WIND INDICATOR		SAME	SAME
TAXIWAY EDGE LIGHT		SAME	SAME
TAXIWAY SAFETY AREA		TSA	SAME
TOPOGRAPHIC CONTOURS		SAME	SAME
TREES / SHRUBS		N.A.	N.A.
VISUAL APPROACH SLOPE INDICATOR (VASI)		SAME	SAME
WINDCONE		SAME	SAME
WALSR	N.A.		SAME
RUNWAY VISIBILITY ZONE (RVZ)	N.A.		SAME
GENERAL AVIATION HANGER AREA	N.A.		N.A.

APPROVALS
FAA
Name: Date:
ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT
Name: Date:

REVISIONS	DESCRIPTION	DATE

ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT
ALAMOGORDO, NEW MEXICO

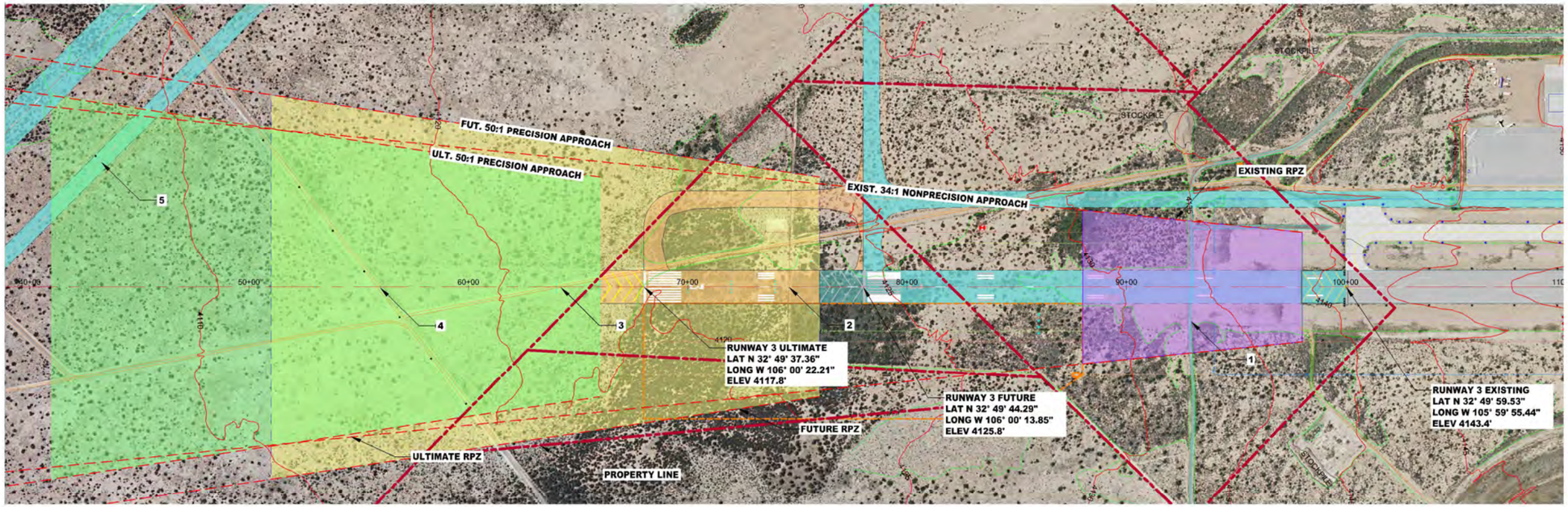
AIRPORT LAYOUT PLANS

TERMINAL AREA

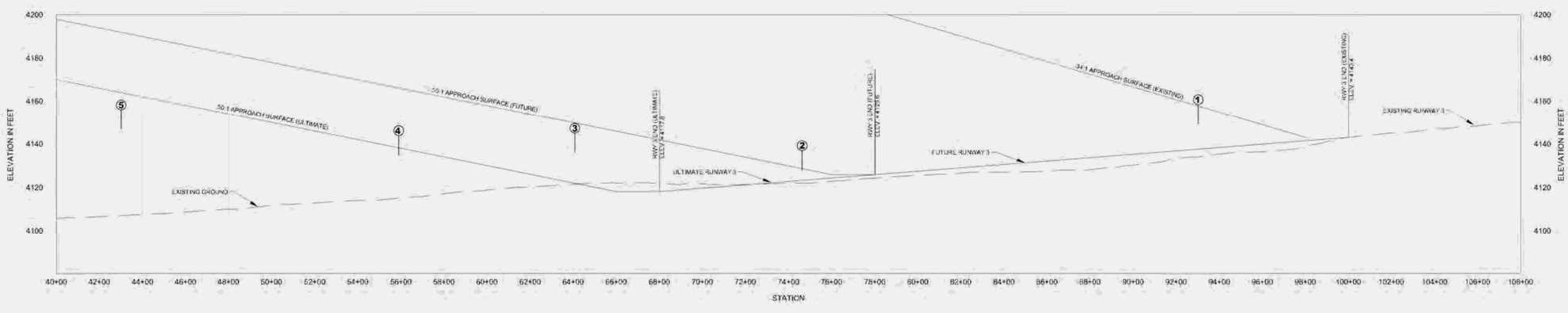
DESIGNED	DRAWN	CHECKED	APPROVED	SITE NO.
A.R.D.	S.L.S.	E.B.B.	W.G.G.	XXXXX.X

URS CORPORATION
9400 AMBERGLEN BLVD
AUSTIN, TX 78729
Phone: 512-454-4797

SCALE	A.C.P. NO.
AS SHOWN	
DATE: AUGUST 2013	SHEET 5



RUNWAY 3 PLAN



RUNWAY 3 PROFILE

OBJECTS WITHIN RUNWAY INNER APPROACH				
OBJECT	TOP ELEV.	AMOUNT OF PENETRATION 34:1 APPROACH SURFACE (E)	50:1 APPRACH SURFACE (F) (U)	PROPOSED ACTION
1 DIRT ROAD @ C/L	4150'	-8' (E)	N/A (F)	N/A (U)	TO BE CLOSED
2 FENCE @ C/L	4128'	-84' (E)	-1' (F)	N/A (U)	TO BE RELOCATED
3 DIRT ROAD @ C/L	4137'	-109' (E)	-13' (F)	N/A (U)	TO BE CLOSED
4 DIRT ROAD @ C/L	4135'	-132' (E)	-31' (F)	-3' (U)	TO BE CLOSED
4 FUT. TXWY @ C/L	4147'	N/A (E)	N/A' (F)	-17' (U)	TO BE CLOSED

APPROVALS

FAA

Name _____ Date _____

ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT

Name _____ Date _____

REVISIONS	DESCRIPTION	DATE

ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT
ALAMOGORDO, NEW MEXICO

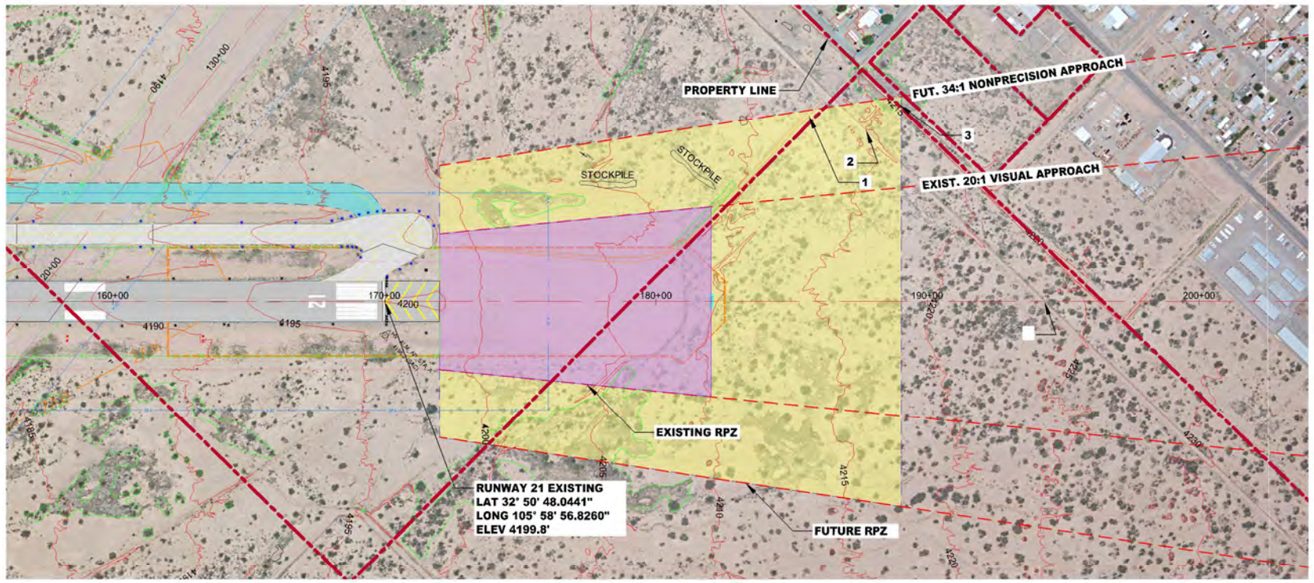
AIRPORT LAYOUT PLANS

RUNWAY 3 INNER APPROACH

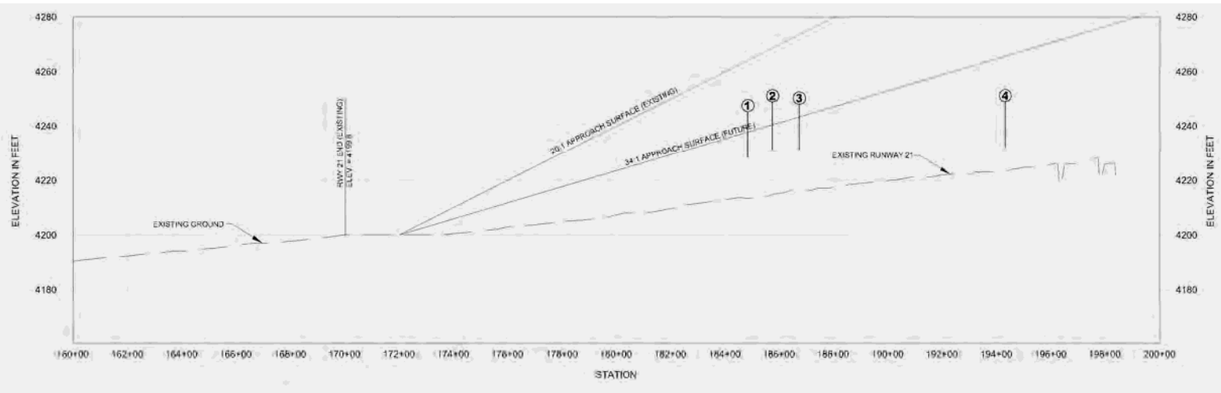
DESIGNED	DRAWN	CHECKED	APPROVED	SITE NO.
A.R.D.	S.L.S.	E.B.B.	W.G.G.	100XX'A

URS CORPORATION
9400 INTERSTATE 35 NORTH
SAN ANTONIO, TX 78233
Phone: 210-545-5770

SCALE	A.I.P. NO.
AS SHOWN	
DATE AUGUST 2010	SHEET 6



RUNWAY 21 PLAN



RUNWAY 21 PROFILE

OBJECTS WITHIN RUNWAY INNER APPROACH				
OBJECT	TOP ELEV.	AMOUNT OF PENETRATION 20:1 APPROACH SURFACE (E)	34:1 APPRACH SURFACE (F)	PROPOSED ACTION
1 DIRT ROAD ± C/L	4228'	-36' (E)	-10' (F)	N/A
2 DIRT ROAD ± C/L	4230'	-39' (E)	-10' (F)	N/A
3 DIRT ROAD ± C/L	4230'	-44' (E)	-13' (F)	N/A
4 PERIMITER FENCE ± C/L	4231'	-80' (E)	-35' (F)	N/A

APPROVALS

FAA

Name _____ Date _____

ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT

Name _____ Date _____

REVISIONS	DESCRIPTION	DATE

ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT
ALAMOGORDO, NEW MEXICO

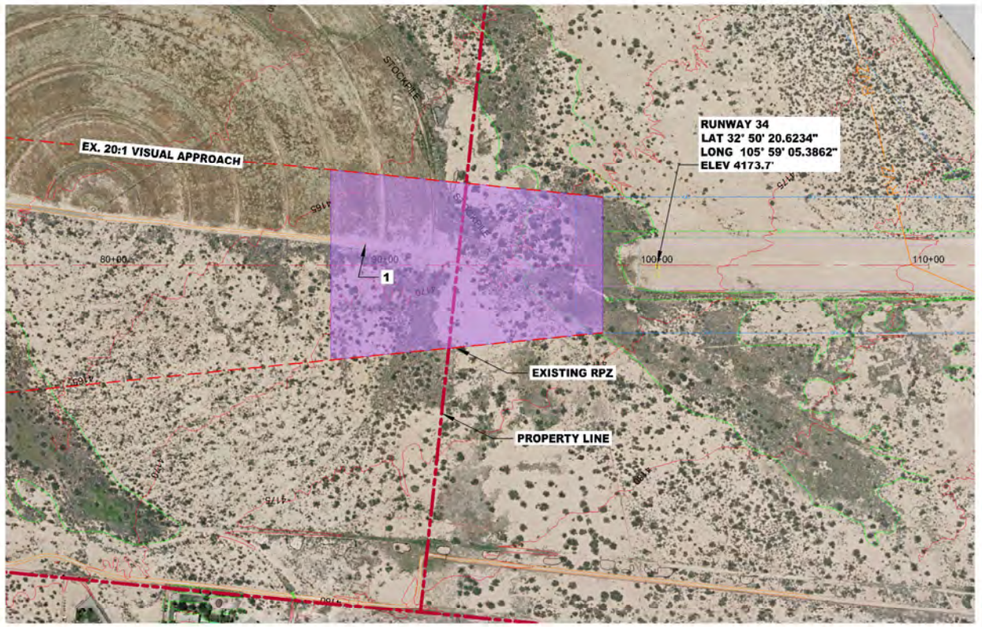
AIRPORT LAYOUT PLANS

RUNWAY 21 INNER APPROACH

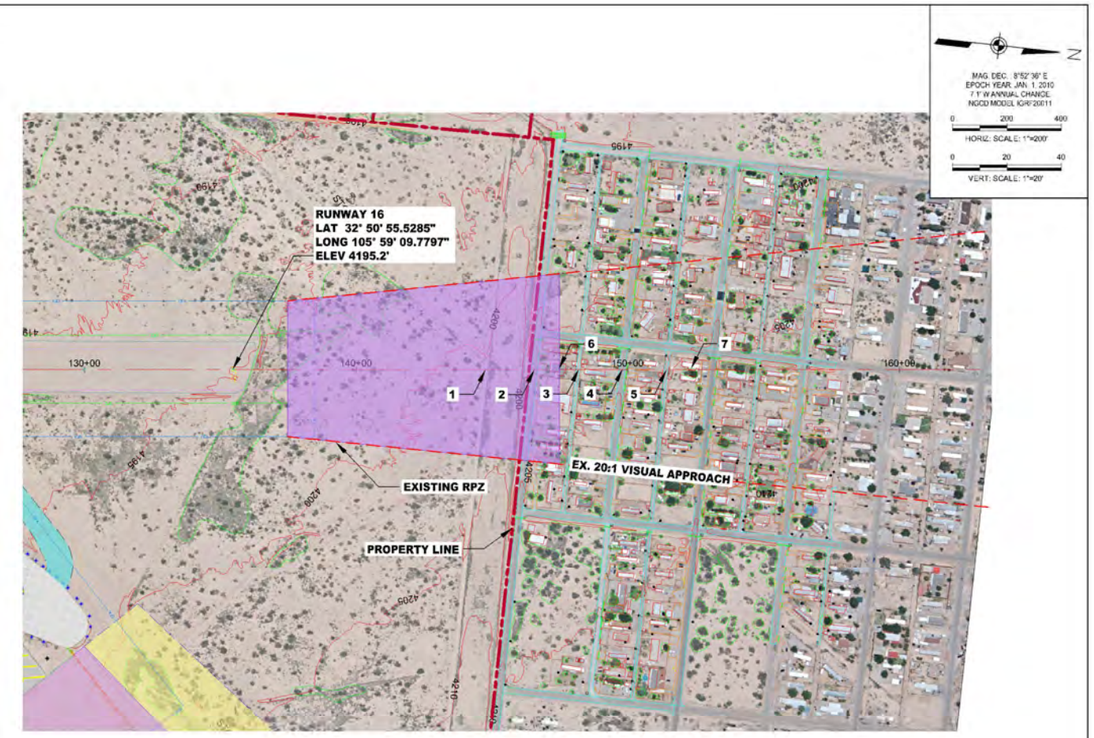
DESIGNED	DRAWN	CHECKED	APPROVED	SITE NO.
A.R.D.	S.L.S.	E.B.B.	W.G.G.	XXXXX'A

WBS CORPORATION
9000 AMBERGLEN BLVD
AUSTIN, TX 78729
Phone: 512/343-2779

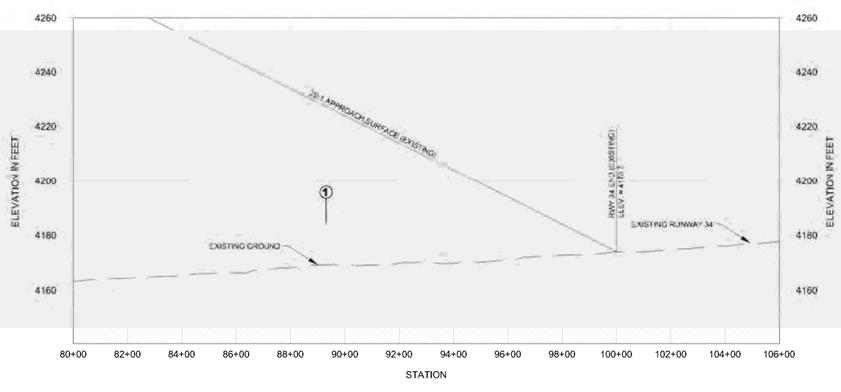
SCALE	A.I.P. NO.
AS SHOWN	
DATE	SHEET
AUGUST 2013	7



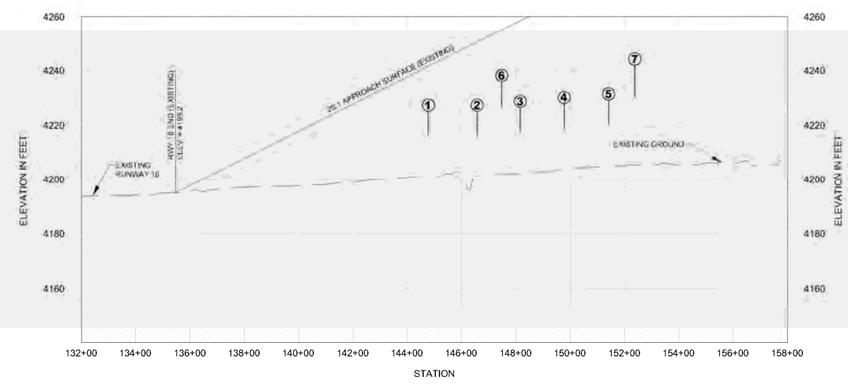
EXISTING RUNWAY 34 PLAN



EXISTING RUNWAY 16 PLAN



EXISTING RUNWAY 34 PROFILE



EXISTING RUNWAY 16 PROFILE

OBJECTS WITHIN RUNWAY 34 INNER APPROACH			
OBJECT	TOP ELEV.	AMOUNT OF PENETRATION 20:1 APPROACH SURFACE (E)	PROPOSED ACTION
1 DIRT ROAD @ C/L	4184'	-43'	N/A

OBJECTS WITHIN RUNWAY 16 INNER APPROACH			
OBJECT	TOP ELEV.	AMOUNT OF PENETRATION 20:1 APPROACH SURFACE (E)	PROPOSED ACTION
1 DIRT ROAD @ C/L	4216'	-25'	N/A
2 AIRPORT AVE @ C/L	4216'	-34'	N/A
3 LACKLAND AVE @ C/L	4217'	-41'	N/A
4 WRIGHT AVE @ C/L	4219'	-47'	N/A
5 BROOKS AVE @ C/L	4220'	-55'	N/A
6 BUILDING @ C/L	4227'	-28'	N/A
7 BUILDING @ C/L	4230'	-49'	N/A

NOTE: BUILDING HEIGHTS OF 25' ARE ESTIMATED

APPROVALS
FAA
Name _____ Date _____
ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT
Name _____ Date _____

REVISIONS	DESCRIPTION	DATE

ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT
ALAMOGORDO, NEW MEXICO

AIRPORT LAYOUT PLANS

RUNWAY 16-34 INNER APPROACH

DESIGNED	DRAWN	CHECKED	APPROVED	SITE NO.
A.R.D.	S.L.S.	E.B.B.	W.G.G.	100XX "A"

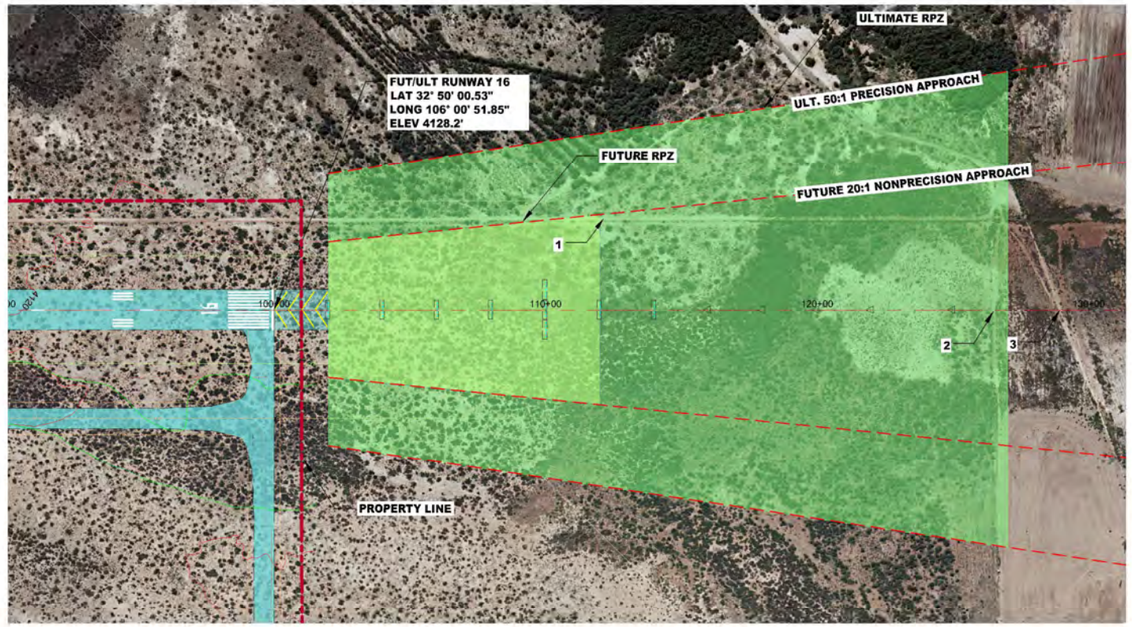
URS — URS CORPORATION, 9400 AMBERGLEN BLVD, AUSTIN, TX 78729, Phone: 512/454-8711

SCALE	A.I.P. NO.
AS SHOWN	
DATE: AUGUST 2013	SHEET 8

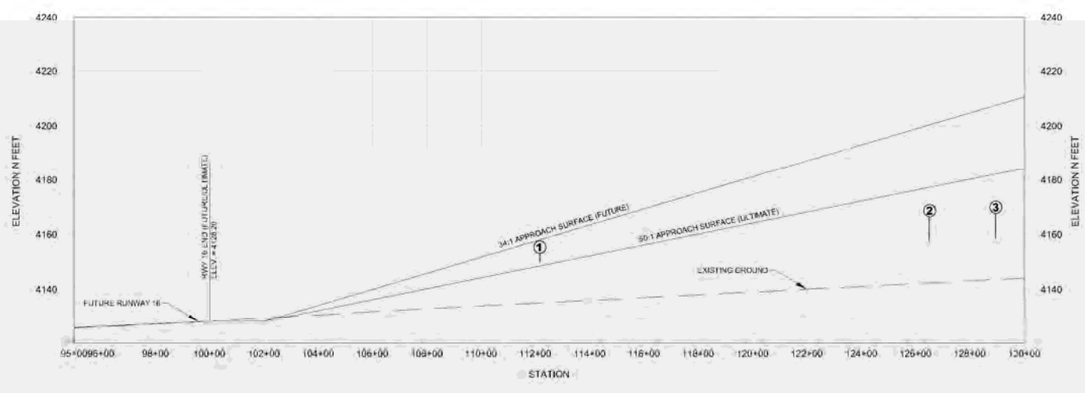
MAG. DEC.: 8°52' 38" E
EPOCH YEAR: JAN. 1, 2010
T.Y.N. ANNUAL CHANGE
NGDC MODEL IGRF2011

0 200 400
HORIZ. SCALE: 1"=200'

0 20 40
VERT. SCALE: 1"=20'



FUTURE RUNWAY 16 PLAN



FUTURE RUNWAY 16 PROFILE

OBJECTS WITHIN RUNWAY INNER APPROACH				
OBJECT	TOP ELEV.	AMOUNT OF PENETRATION 34:1 APPROACH SURFACE (F)	50:1 APPRACH SURFACE (U)	PROPOSED ACTION
1 DIRT ROAD @ C/L	4150'	-8' (F)	7' (U)	TO BE REMOVED
2 DIRT ROAD @ C/L	4157'	-43' (F)	-20' (U)	N/A
3 DIRT ROAD @ C/L	4155'	-48' (F)	-23' (U)	N/A

APPROVALS
FAA
Name _____ Date _____
ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT
Name _____ Date _____

REVISIONS	DESCRIPTION	DATE

ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT
ALAMOGORDO, NEW MEXICO

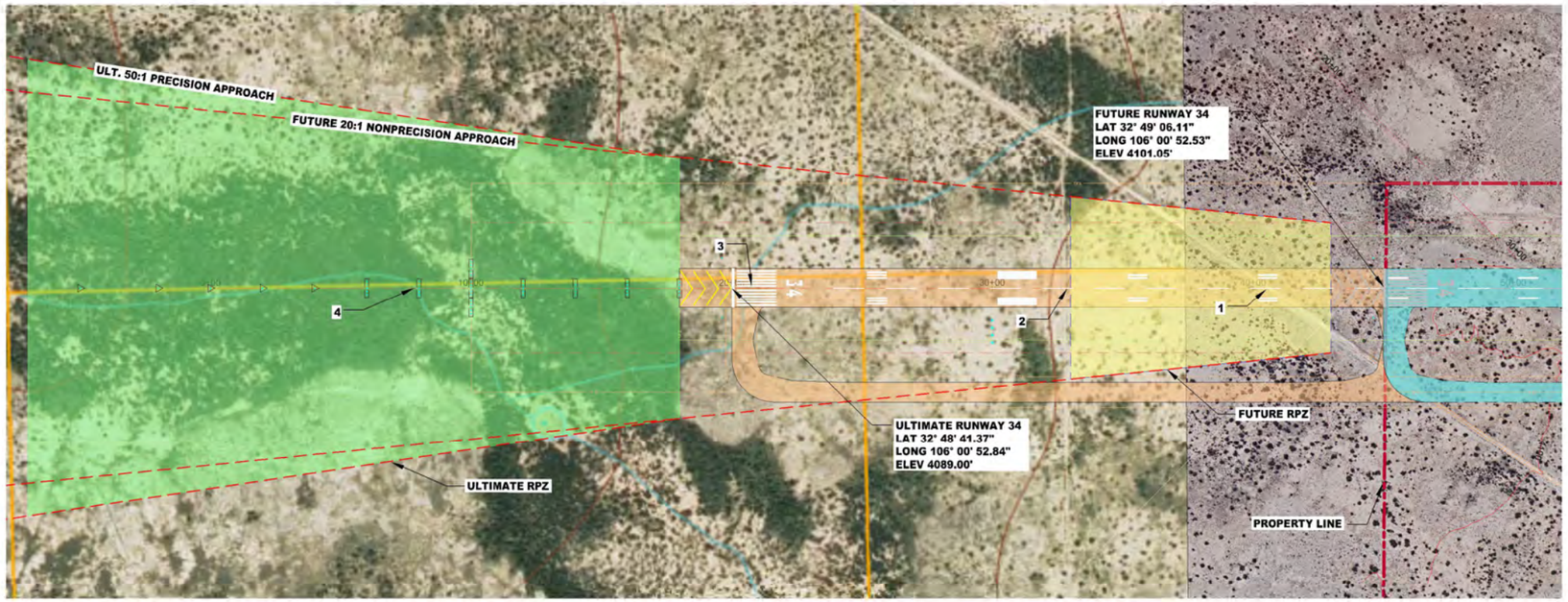
AIRPORT LAYOUT PLANS

FUTURE RUNWAY 16 INNER APPROACH

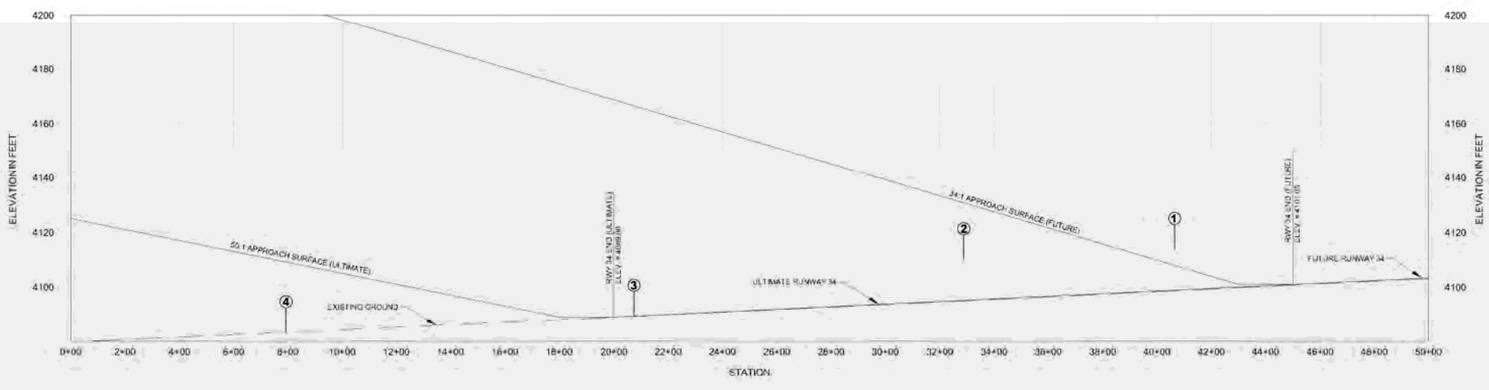
DESIGNED	DRAWN	CHECKED	APPROVED	SITE NO.
A.R.D.	S.L.S.	E.B.B.	W.G.G.	XXXXX"A

URS CORPORATION
9400 INTERSECTION BLVD
AUSTIN, TX 78744
Phone: 512/454-8711

SCALE	A.I.P. NO.
AS SHOWN	
DATE AUGUST 2013	SHEET 9



FUTURE/ULTIMATE RUNWAY 34 PLAN



FUTURE/ULTIMATE RUNWAY 34 PROFILE

OBJECTS WITHIN RUNWAY INNER APPROACH				
OBJECT	TOP ELEV.	AMOUNT OF PENETRATION 20:1 APPROACH SURFACE (F)	50:1 APPRACH SURFACE (U)	PROPOSED ACTION
1 DIRT ROAD @ C/L	4114'	+6' (F)	N/A (U)	TO BE RELOCATED
2 DIRT ROAD @ C/L	4110'	-21' (F)	N/A (U)	TO BE RELOCATED
3 STREAM @ C/L	4089'	-78' (F)	N/A (U)	CULVERT
4 STREAM @ C/L	4083'	-121' (F)	-26' (U)	N/A

APPROVALS

FAA

Name _____ Date _____

ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT

Name _____ Date _____

REVISIONS	DESCRIPTION	DATE

ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT
ALAMOGORDO, NEW MEXICO

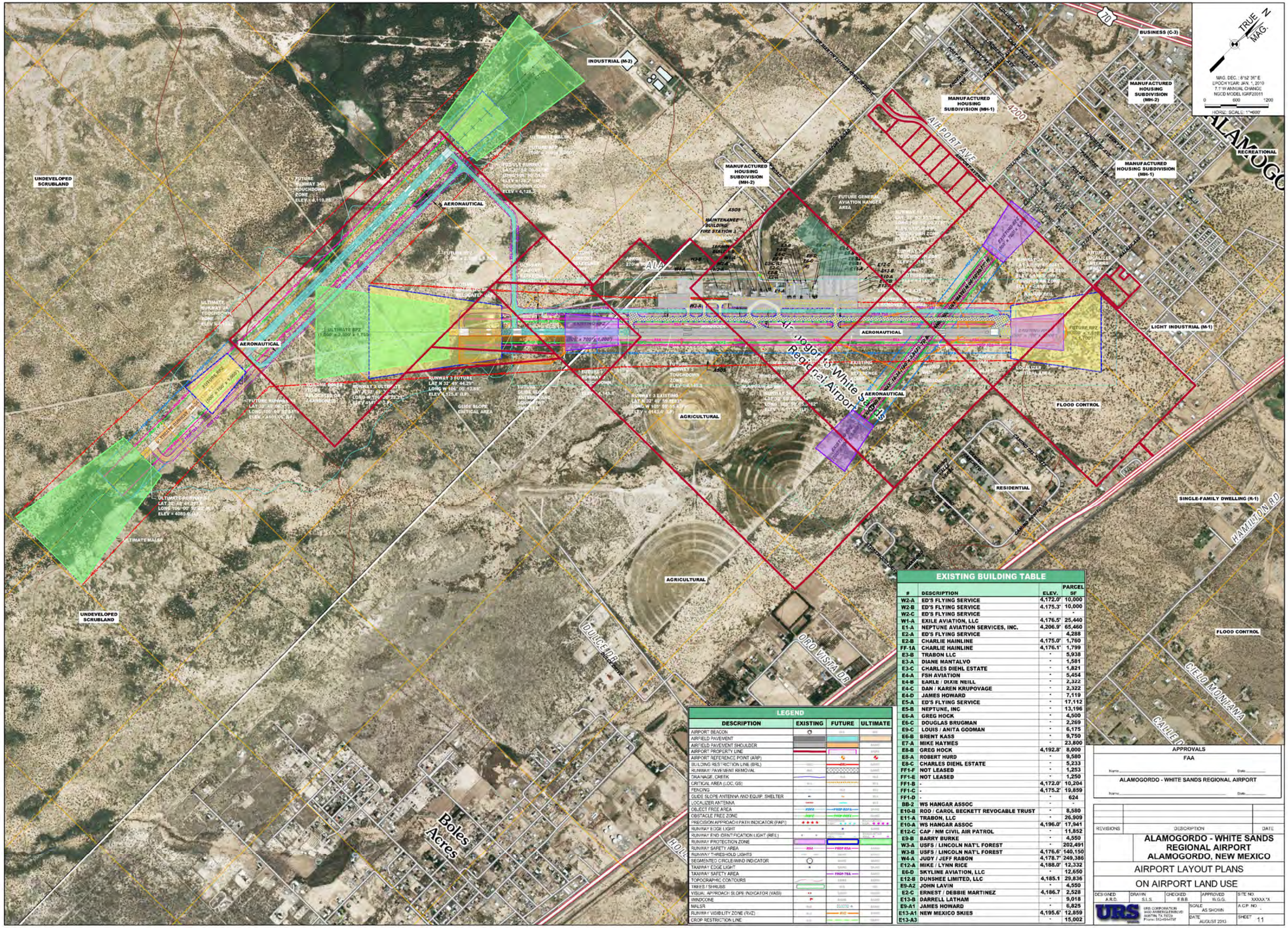
AIRPORT LAYOUT PLANS

FUTURE/ULTIMATE RUNWAY 34 INNER APPROACH

DESIGNED	DRAWN	CHECKED	APPROVED	SITE NO.
A.R.D.	S.L.S.	E.B.B.	W.G.G.	XXXXX.X

URS CORPORATION
9400 AMBERGLEN BLVD
AUSTIN, TX 78729
Phone: 512/419-1779

SCALE	A.C.IP. NO.
AS SHOWN	
DATE	SHEET
AUGUST 2010	10



EXISTING BUILDING TABLE

#	DESCRIPTION	ELEV.	PARCEL SF
W2-A	ED'S FLYING SERVICE	4,172.0'	10,000
W2-B	ED'S FLYING SERVICE	4,175.3'	10,000
W2-C	ED'S FLYING SERVICE	-	-
W1-A	EXILE AVIATION, LLC	4,176.5'	25,440
E1-A	NEPTUNE AVIATION SERVICES, INC.	4,206.9'	65,460
E2-A	ED'S FLYING SERVICE	-	4,288
E2-B	CHARLIE HAINLINE	4,175.0'	1,760
FF-1A	CHARLIE HAINLINE	4,176.1'	1,799
E3-B	TRABON LLC	-	5,938
E3-A	DIANE MANTALVO	-	1,581
E3-C	CHARLES DIEHL ESTATE	-	1,821
E4-A	FSH AVIATION	-	5,454
E4-B	EARLE / DIXIE NEILL	-	2,322
E4-C	DAN / KAREN KRUPOVAGE	-	2,322
E4-D	JAMES HOWARD	-	7,119
E5-A	ED'S FLYING SERVICE	-	17,112
E5-B	NEPTUNE, INC	-	13,196
E6-A	GREG HOCK	-	4,500
E6-C	DOUGLAS BRUGMAN	-	2,269
E9-C	LOUIS / ANITA GODMAN	-	6,175
E6-B	BRENT KASS	-	9,750
E7-A	MIKE HAYMES	-	23,800
E8-B	GREG HOCK	4,192.8'	8,000
E8-A	ROBERT HURD	-	9,580
E8-C	CHARLES DIEHL ESTATE	-	5,233
FF1-F	NOT LEASED	-	1,253
FF1-E	NOT LEASED	-	1,250
FF1-B	-	4,172.0'	10,204
FF1-C	-	4,175.2'	19,859
FF1-D	-	-	624
BB-2	WS HANGAR ASSOC	-	-
E10-B	ROD / CAROL BECKETT REVOCABLE TRUST	-	8,580
E11-A	TRABON, LLC	-	26,909
E10-A	WS HANGAR ASSOC	4,196.0'	17,941
E12-C	CAP / NM CIVIL AIR PATROL	-	11,852
E9-B	BARRY BURKE	-	4,550
W3-A	USFS / LINCOLN NAT'L FOREST	-	202,491
W3-B	USFS / LINCOLN NAT'L FOREST	4,176.6'	140,150
W4-A	JUDY / JEFF RABON	4,178.7'	249,386
E12-A	MIKE / LYNN RICE	4,188.0'	12,332
E6-D	SKYLINE AVIATION, LLC	-	12,650
E12-B	DUNSHEE LIMITED, LLC	4,185.1	29,836
E9-A2	JOHN LAVIN	-	4,550
E2-C	ERNEST / DEBBIE MARTINEZ	4,186.7	2,528
E13-B	DARRELL LATHAM	-	9,018
E9-A1	JAMES HOWARD	-	6,825
E13-A1	NEW MEXICO SKIES	4,195.6'	12,859
E13-A3		-	15,002

LEGEND

DESCRIPTION	EXISTING	FUTURE	ULTIMATE
AIRPORT BEACON			
AIRFIELD PAVEMENT			
AIRFIELD PAVEMENT SHOULDER			
AIRPORT PROPERTY LINE			
AIRPORT REFERENCE POINT (ARP)			
BUILDING RESTRICTION LINE (BRL)			
RUNWAY PAVEMENT REMOVAL			
DRAINAGE, CREEK			
CRITICAL AREA (LOC, GS)			
FENCING			
GLIDE SLOPE ANTENNA AND EQUIP. SHELTER			
LOCALIZER ANTENNA			
OBJECT FREE AREA			
OBSTACLE FREE ZONE			
PRECISION APPROACH PATH INDICATOR (PAPI)			
RUNWAY EDGE LIGHT			
RUNWAY END IDENTIFICATION LIGHT (REIL)			
RUNWAY PROTECTION ZONE			
RUNWAY SAFETY AREA			
RUNWAY THRESHOLD LIGHTS			
SEGMENTED CIRCLE/WIND INDICATOR			
TAXIWAY EDGE LIGHT			
TAXIWAY SAFETY AREA			
TOPOGRAPHIC CONTOURS			
TREES / SHRUBS			
VISUAL APPROACH SLOPE INDICATOR (VASI)			
WINDCONE			
MALSR			
RUNWAY VISIBILITY ZONE (RVZ)			
CROP RESTRICTION LINE			

APPROVALS

FAA

Name _____ Date _____

ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT

Name _____ Date _____

REVISIONS	DESCRIPTION	DATE

ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT
ALAMOGORDO, NEW MEXICO

AIRPORT LAYOUT PLANS

ON AIRPORT LAND USE

DESIGNED	DRAWN	CHECKED	APPROVED	SITE NO.
A.R.D.	S.L.S.	E.B.B.	W.G.G.	XXXXX.*A

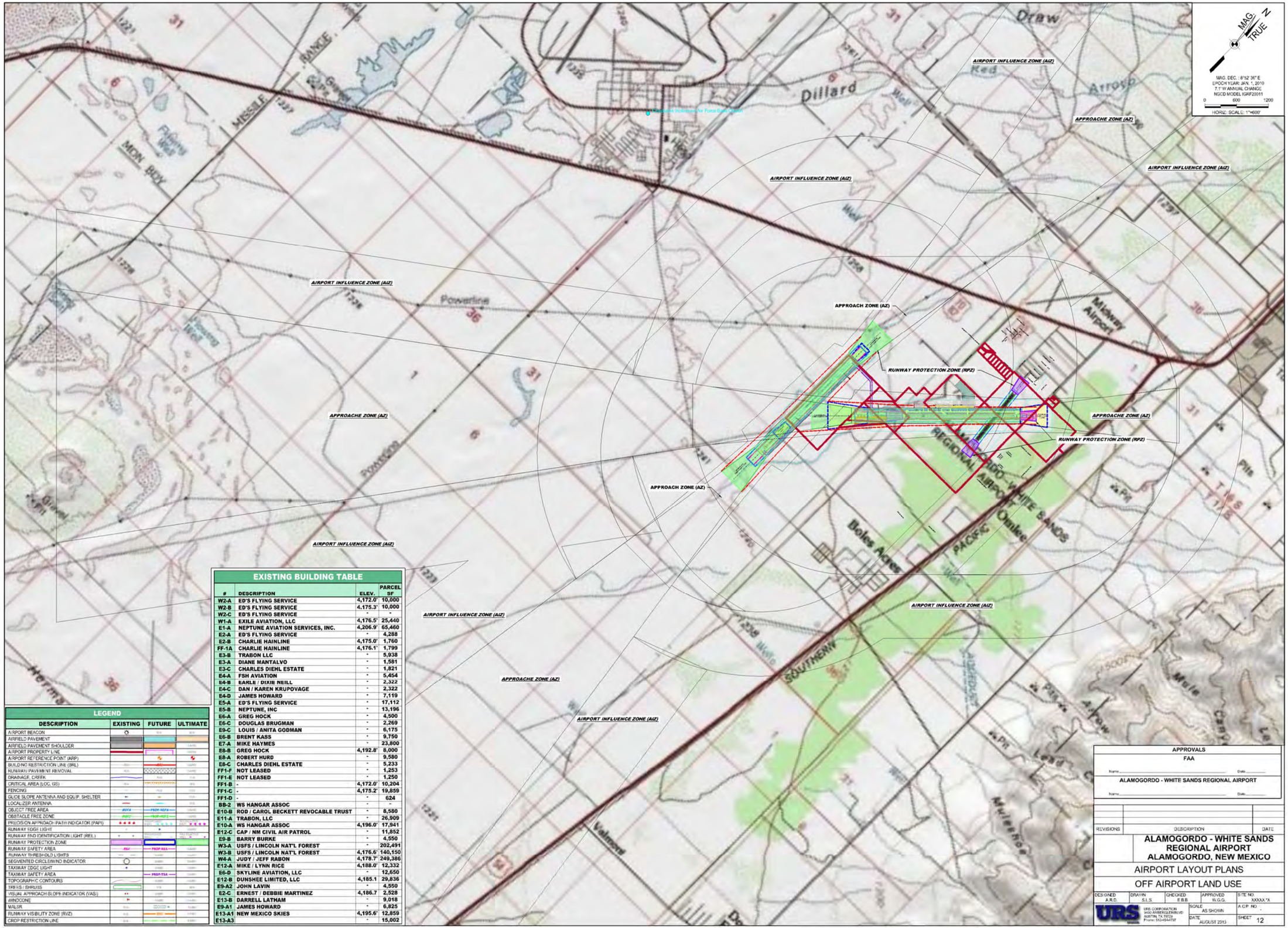
URS CORPORATION
9400 AMBERGLEN BLVD
AUSTIN, TX 78729
Phone: 512-419-6400

SCALE: AS SHOWN

A.C.P. NO.

DATE: AUGUST 2013

SHEET 11



EXISTING BUILDING TABLE

#	DESCRIPTION	ELEV.	PARCEL SF
W2-A	ED'S FLYING SERVICE	4,172.0'	10,000
W2-B	ED'S FLYING SERVICE	4,175.3'	10,000
W2-C	ED'S FLYING SERVICE	-	-
W1-A	EXILE AVIATION, LLC	4,176.5'	25,440
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APPROVALS
FAA
Name: Date:
ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT
Name: Date:

REVISIONS	DESCRIPTION	DATE

ALAMOGORDO - WHITE SANDS REGIONAL AIRPORT
ALAMOGORDO, NEW MEXICO

AIRPORT LAYOUT PLANS

OFF AIRPORT LAND USE

DESIGNED	DRAWN	CHECKED	APPROVED	SITE NO.
A.R.D.	S.L.S.	E.B.B.	W.G.G.	XXXXX.*X

URS CORPORATION
9400 ANDERSON BLVD
AUSTIN, TX 78729
Phone: 512-454-4797

SCALE	A.C.P. NO.
AS SHOWN	-
DATE AUGUST 2013	SHEET 12