Los Alamos AIRPORT

AIRPORT MASTER PLAN

FINAL

AIRPORT MASTER PLAN

for

Los Alamos Airport
Los Alamos, New Mexico

Prepared for

Los Alamos County

by

Coffman Associates, Inc.
in association with
Delta Airport Consultants, Inc.

Adopted by the Los Alamos County Council on May 10, 2013

FINAL PRINTING

June 2013

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INTRODUCTION

Introduction

The Federal Aviation Administration (FAA) recommends that airports update their long term planning documents every seven to 10 years, or as necessary to address local changes at the airport. The last Master Plan update for Los Alamos Airport was in 1994. An Airport Action Plan & Airport Layout Plan was completed in 2005. The Los Alamos Airport has received a grant from the FAA to update the Airport Master Plan. The FAA grant covers 95 percent of the fixed-fee project cost, with Los Alamos County providing a grant match of 2.5 percent and the New Mexico Department of Transportation - Aviation Division (NMDOT) providing the remaining 2.5 percent match.

Delta Airport Consultants, Inc., the consulting engineer of record for the Los Alamos Airport, contracted with Coffman Associates, Inc., a national airport consulting firm specializing in airport planning studies, to conduct the Master Plan. The study process was anticipated to take approximately 12-18 months to complete, followed by agency reviews and approvals. The structure of the master plan followed FAA and NMDOT guidelines. The FAA considered and approved the aviation forecasts and the airport layout plan (technical drawings of the current and planned airport layout) that resulted from the plan.

The study provides guidance for future development and provides updated justification for projects for which the airport may receive funding participation through federal and state airport improvement programs.

The *Airport Master Plan Update* was prepared in accordance with FAA requirements, including Advisory Circular (AC) 150/5300-13, *Airport Design* (as amended) and AC 150/5070-6B, *Airport Master Plans*. The scope of services, budget, and schedule was approved by Los Alamos County, following review by the FAA.

The Los Alamos Airport is a general aviation facility, as defined by the FAA, which is intended to serve the aviation needs of the community. The airport is included in the FAA's *National Plan of Integrated Airport Systems* (NPIAS). As such, the airport is eligible for federal development grants. Los Alamos County owns and operates the airport, which is located approximately one mile to the east of the central business district. The airport provides support to approximately 70 based aircraft. Services and facilities available include: hangar storage, tie-downs, aircraft rental, minor aircraft maintenance, and fueling. The airport encompasses approximately 89 acres of land.

The current runway system consists of Runway 9-27, a 6,000-foot by 120-foot asphalt runway with medium intensity edge lighting.

MASTER PLAN OBJECTIVES

The overall objective of the *Airport Master Plan Update* is to provide the sponsor with guidance for future development of the airport, meeting the needs of existing and future users, while also being compatible with the environment. This *Airport Master Plan Update* identifies and provides justification for new priorities. This plan was closely coordinated with other existing or on-going planning studies in the area, and with aviation plans developed by the FAA and the state. Specific objectives of the study included:

- Research factors likely to affect air transportation demand in the Los Alamos area over the next 20 years and develop new operational and basing forecasts.
- Determine projected needs of airport users, taking into consideration recent changes to FAA design standards, global positioning system (GPS) aircraft approach capability, and transitions in the type of aircraft flown by corporate and general aviation users.
- Develop forecasts of aviation demand for the airport, which includes potential commuter airline service.
- Recommend improvements which will enhance the airport's ability to satisfy future aviation needs.
- Establish a schedule of development priorities and a financial program for implementation of development, and analyze potential funding sources consistent with FAA planning.
- Provide specific recommendations for aviation and non-aviation (where feasible) related land uses on airport property and review existing or proposed land use, economic development, and zoning documents to ensure future compatibility with off-airport development.
- Develop active and productive public involvement throughout the planning process.

MASTER PLAN ELEMENTS AND PROCESS

To achieve the objectives described above, the *Airport Master Plan Update* was prepared in a systematic fashion pursuant to the scope of services that was coordinated with the airport sponsor and the FAA. The study has nine elements:

1.0 **Initiation/Study Design** - Development of the scope of services, budget, and schedule. In consultation with airport management, assemble a planning advisory committee (PAC) to review draft reports and provide a more comprehensive understanding of local issues.

2.0 **Inventory** - Inventory of physical facilities, operational data, wind data, environmental inventory, population and economic data, and airport financial data. All of the inventory data will be organized in a working paper which will be distributed to the PAC.

3.0 **Forecasts** - Forecasts for based aircraft, operations, and peaking characteristics of the airport over a 20-year period. The forecasts will be organized in a working paper which will be distributed to the PAC for review and comments and forwarded to the FAA for review and approval.

4.0 **Facility Requirements** - After establishing critical aircraft and physical planning criteria, facility needs assessments will be developed for airside and landside facilities. An evaluation of the circumstances, ability, and operational costs for operating the facility as a commercial service airport will also be included. The facility requirements will be organized in a working paper and distributed to the PAC.

5.0 **Airport Development Alternatives** - Potential airside and landside alternatives will be developed for meeting long-term needs. Each of the alternatives will be subjected to engineering and environmental analysis and summarized in a working paper. Following distribution of the working paper to PAC members, a review meeting will be held to discuss the alternatives and preliminary master plan concept.

6.0 **Recommended Master Plan Concept** – The consultant will develop a recommended development concept for the airport. A 20-year capital improvement program that is phased over time to align with various demand milestones will be included. Cost estimates for each project will be developed in current dollars. An environmental overview utilizing guidelines provided in the *National Environmental Policy Act* (NEPA) will be presented.

7.0 **Airport Layout Plans** - Airport layout plans (the technical drawings) will be developed to depict existing and proposed facilities. The drawings set will meet the requirements of the FAA Southwest Region. The ALP set will include the airport layout drawing, terminal area drawing, FAR Part 77 surface drawing, departure surface drawing, and the Exhibit A – Airport Property Map.

8.0 **Public Coordination and Communication** – Three meetings were held with the PAC to present initial findings of the draft working papers. Two public information workshops were scoped, and a dedicated project website was established. The address was: www.losalamos.airportstudy.com.

9.0 **Final Reports and Approvals –** A draft final report was be assembled that consolidated all comments/ edits/suggestions received from the PAC and public, as appropriate. The draft final document was substantially complete and was used in the local approval process. This is the final document which includes the ALP that was approved by the FAA in May 2013.

STUDY COORDINATION

The study process included local participation through the formation of a PAC. The PAC consisted of federal, state, and local agencies, airport tenants, and general public representatives. The sponsor determined the final makeup of the committee, with the assistance of the consultant. The study schedule called out three points in the study where the PAC convened to discuss draft working paper submittals. The first PAC meeting reviewed Inventory, Forecasts, and Facility Requirements. The second PAC meeting followed Alternatives. The final PAC meeting reviewed the Recommended Development Concept, Capital Improvement Program, and Airport Layout Plans.

Two "open house" workshops for the general public were held to present the preliminary findings and to solicit public comment. Draft working papers were available online for the duration of the study. **Exhibit IA** presents the key study elements, meeting intervals, project schedule, and documentation. The members of the PAC are listed below.

LOS ALAMOS AIRPORT MASTER PLAN - PLANNING ADVISORY COMMITTEE			
Last Name	**First Name**	**Title**	**Representing**
DIRECTLY RELATED STAKEHOLDERS			
Carroll	David	Representative	Aircraft Owners and Pilots Association
Egdorf	Skip	Representative	Experimental Aircraft Association
Erickson	Dan	Division Manager	Los Alamos County - Capital Projects
Fox	Will	Representative	Based Pilots
Guerrero	Summer	Civil Engineer	Federal Aviation Administration
Lucero	Jane	Airport Development Admin.	NMDOT-Aviation Division
Peters	Mark	Representative	Civil Air Patrol
Scott	Jeff	Hangar Owner	Hangar Owners
Wilson	J.P.	Airport Business Owner	Airport Business Owners
Zimmerman	Kyle	County Engineer	Los Alamos County
INDIRECTLY RELATED STAKEHOLDERS			
Brugger	Steve	Acting Community Development Director	Los Alamos County
Fox	Andy	General Manager	Local Business - C.B. Fox
Holsapple	Kevin	Executive Director	Los Alamos Commerce and Development Corporation
Jolly	David	General Manager	Local Business – Metzger's Hardware
Kendricks	Sam	Local Resident	Eastern Area
Marsden	Chandra	Local Resident	Eastern Area
Roberts	John	Manager	Local Business - Smith's Food and Drug
Taylor	Phil	Emergency Mgmt. Coordinator	Los Alamos County
Fisher	Greg	County Economic Vitality	Los Alamos County
Massey	Ramoncita		NNSA - Los Alamos National Lab

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Master Plan Process

INVENTORY
- Airport Facilities
- Airspace and Air Traffic Activity
- Area Socioeconomic Data
- Local Planning and Land Use
- Project Web Site
- Airport Access and Parking, Utilities, and Aerial Photography

FORECASTS
- Based Aircraft and Fleet Mix
- Annual Operations

2-27-12

PAC #1

FACILITY REQUIREMENTS
- Design Categories
- Runway Length and Strength
- Support Facilities
- Taxiways
- Hangar Facilities
- Terminal Building
- Aprons
- Navigational Aids

LOS ALAMOS PHASE I REPORT

PAC #2

AIRPORT ALTERNATIVES
- Evaluate Development Scenarios
  - Airside
  - Landside

LOS ALAMOS PHASE II REPORT

Public Information Workshop

6-20-12

RECOMMENDED DEVELOPMENT PLAN ENVIRONMENTAL OVERVIEW
- Detailed Master Plan Facility and Land Use Plans
- Review/Evaluation of NEPA Environmental Categories
- Noise Exposure

FINANCIAL PLAN / CAPITAL IMPROVEMENTS
- Airport Development Schedule
- Cost Estimates
- Funding Sources

PAC #3

AIRPORT LAYOUT PLANS
- Airport Layout Plan
- Landside Drawing
- Airspace/Approach Drawings
- On-Airport Land Use Plan
- Property Map

Public Information Workshop

12-4-12

LOS ALAMOS PHASE III REPORT

LOS ALAMOS DRAFT FINAL Master Plan Report — 1-2013

LOS ALAMOS FINAL Master Plan Report — 6-2013

LOS ALAMOS Master Plan/ ALP Approvals — 5-2013

COUNTY OF LOS ALAMOS NEW MEXICO

Exhibit IA
PROJECT WORK FLOW

SUMMARY FINDINGS

The *Los Alamos Airport Master Plan Update* progressed through three draft sets of working papers. The first set was presented to the PAC on February 27, 2012. The working papers presented information regarding an inventory of airport facilities, both airside and landside, forecast of future aviation demand including based aircraft and operations, and facility requirements necessary to meet the forecast growth.

The forecasts of aviation demand estimated that the number of based aircraft could grow from 70 in 2011 to 100 by 2032. Annual operations are forecast to grow from 15,100 in 2011 to 27,700 by 2032. The mix of aircraft based at the airport is anticipated to remain dominated by small single engine aircraft. Operationally, the airport is forecast to continue to experience periodic operations by larger turboprop and business jet aircraft. The forecasts were reviewed and approved by the FAA on April 11, 2012.

In the recent past, Los Alamos Airport has had regularly scheduled commuter aircraft service. In 2012, the airport was awarded a grant from the U.S. Department of Transportation in the amount of $272,000 to be used to re-establish commuter service to Albuquerque International Sunport. The service began in April of 2013. The forecasts include estimates of passenger boardings (enplanements). By 2017, it is estimated that the airport may experience up to 21,000 annual enplanements, and by 2032 this figure is forecast to grow to 36,000 annual enplanements. The facility requirements section of the master plan includes projects necessary to meet this potential demand.

The second PAC meeting was held on June 20, 2012 to review the second set of draft working papers. This set of papers included both airside and landside development alternatives. A public information workshop was conducted in the evening of the same day.

The third PAC meeting was held on December 4, 2012 to review the recommended master plan concept, an environmental overview, and the airport layout plan set, which are the technical drawings that reflect the current and planned future layout for the airport. The second public information workshop was held in the evening of the same day.

The recommended concept for the airport maintains the current critical design aircraft as being represented by small single engine aircraft. While larger aircraft do occasionally operate at the airport, the physical limitations of the airfield limit the potential to plan facilities to more restrictive design standards. Nonetheless, several elements of the airfield have been planned in order to provide an additional safety margin.

Overall, five specific development strategies have emerged from the master planning process:

1) Construct taxiway access to the Runway 9 threshold.

2) Remove/relocate the hangars adjacent to Taxiway F in order to facilitate taxiway access to the Runway 9 threshold and to increase hangar development space and airfield capacity.

3) The current terminal building location should be maintained for any fu-

ture terminal building expansion or construction.

4) Implement declared distances in order to meet runway design standards.

5) Maximize developable space for aviation-related development.

On May 10, 2013, Los Alamos County Council unanimously approved the Airport Master Plan.

Chapter One

INVENTORY

Inventory

The initial step in the preparation of the airport master plan for Los Alamos Airport is the collection of information that will provide a basis for the analysis to be completed in subsequent chapters. For the master plan, information is gathered regarding not only the airport, but also the community and the region it serves. This chapter will begin with background information related to the location and history of the airport, the area transportation network, and the regional climate. This will be followed by a discussion of current and future land uses in the airport area. An overview of the national aviation system for general aviation airports and the role of Los Alamos Airport in the national transportation system are also presented. Finally, an inventory of the existing facilities at the airport will be presented.

The information outlined in this chapter was obtained through on-site inspections of the airport and interviews with airport management, airport tenants, and representatives of various local and federal government agencies. Information was also obtained from relevant existing studies. Additional information and documents were provided by Los Alamos County, the Federal Aviation Administration (FAA), and the New Mexico Department of Transportation - Aviation Division (NMDOT). A list of primary document sources is provided at the end of this chapter.

BACKGROUND INFORMATION

It is important in any master plan to establish a baseline understanding of the airport setting including its location, geography, access to ground transportation, role in the national aviation system, climate, and administration.

LOCATION AND DEVELOPMENT

Los Alamos, New Mexico, is located in north central New Mexico, as depicted on **Exhibit 1A**. Los Alamos is a town site and census-designated place (CDP) in Los Alamos County, New Mexico. CDPs are a concentration of population identified by the U.S. Census Bureau for statistical purposes. CDPs include settled concentrations of population that are identifiable by name, but are not legally incorporated. Los Alamos County is the incorporated governmental entity which includes Los Alamos and White Rock. The CDP population from the 2010 U.S. Census was 12,019, and the county population was 17,950.

In 1917, the Los Alamos Ranch School was established by a Detroit businessman who opened the private boarding school for boys, offering a college preparatory curriculum with a rigorous outdoor life. In November 1942, the school and surrounding land were purchased by the U.S. Army's Manhattan Engineering district for use in the top-secret development of the first atomic bombs. The area was considered "closed" until 1957, when people not associated with the federal government were permitted to locate there.

The Los Alamos National Laboratory (or LANL, previously known at various times as Project Y, Los Alamos Laboratory, and Los Alamos Scientific Laboratory) is a U.S. Department of Energy (DOE) national laboratory located in Los Alamos. LANL is one of the largest science and technology institutions in the world and conducts multidisciplinary research in national security, space exploration, renewable energy, medicine, nanotechnology, and supercomputing. There are approximately 9,000 direct employees and 650 contractors at the site. The technical staff is comprised of physicists, engineers, chemists, mathematicians, and other scientific professionals.

The Los Alamos town site occupies several mesas comprising the Pajarito Plateau. The plateau, part of the Jemez Mountains, is bounded on the west by the Valles Caldera and on the east by the White Rock Canyon of the Rio Grande. Elevations range from 5,600 feet at the river to 7,800 feet where the plateau merges into the mountain range.

Los Alamos Airport occupies approximately 89 acres one mile east of the Los Alamos central business district. New Mexico State Road 502 parallels the airport on the south. At its closest point, NM 502 is approximately 210 feet from the runway, centerline to centerline, which bounds development of the south side on the airport. To the north of the airport is Pueblo Canyon, which bounds north side development. From the runway centerline, the distance to the beginning of the canyon ranges from approximately 500 feet at the west end of the airport to 225 feet at the east end. The west end of the airport is bounded by Airport Road and residential development. The closest residential property line is approximately 300 feet from the Runway 9 threshold. At the east end of the runway, the terrain begins to fall significantly from the mesa, approximately 300 feet from the Runway 27 end.

The Los Alamos Airport was constructed in 1947 to support the Atomic Energy Commission's military requirements at the Los Alamos Scientific Laboratory. In 1960, the airport first became available for public use by local aircraft owners; however, strict security was enforced. The airport would be closed to public use

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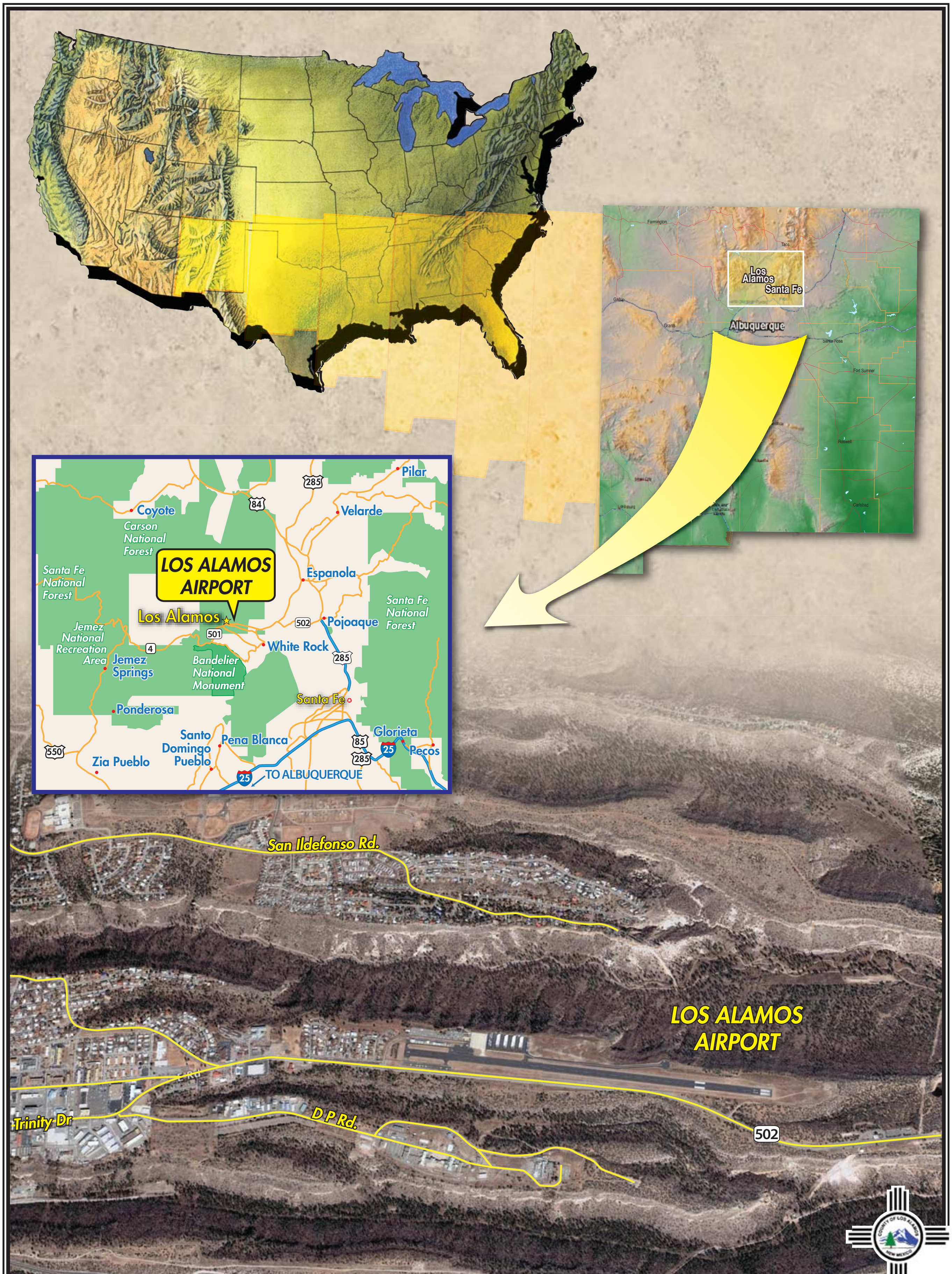

Exhibit 1A
LOCATION AND
VICINITY MAP

for indefinite periods when necessary by the DOE.

In October 1996, Los Alamos County assumed operating control of the airport from DOE. At this time, the airport officially changed to a public-use facility and was added to the FAA's National Plan of Integrated Airport Systems (NPIAS). The NPIAS identifies all airports in the country considered important to the National Airspace System and thereby eligible for federal development funds. In 2008, the airport property was deeded to the County as well.

Until 1996, capital improvements at the airport were funded by DOE/LANL. From 1996-2008, airport improvements were jointly funded by the County and DOE/LANL. Today, airport improvements are the responsibility of the County, which is eligible to receive FAA and state airport improvement grants. **Table 1A** presents the major capital projects over the last eight years.

TABLE 1A
Grant History
Los Alamos Airport

Year	Project Description	FAA	State	Local	Total
2004	Airport Action Plan	$0	$35,100	$900	$36,000
2005	Maintenance and Engineering	$0	$20,000	$20,000	$40,000
2006	Update Runway Lighting	$133,000	$0	$7,000	$140,000
2007	SWPP and Drainage Study	$84,475	$2,223	$2,223	$88,921
2008	Apron Rehab and Drainage Improvements	$111,415	$2,678	$2,678	$116,771
2008	Purchase Mower	$0	$5,718	$5,719	$11,437
2008	Sealcoat and Stripe Runway	$0	$46,763	$46,763	$93,526
2009	Repaint Rwy Centerline and Designation	$0	$1,447	$1,447	$2,894
2010	Airport Drainage and Pavement Repair	$473,988	$12,500	$12,500	$498,988
2010	Rehab Rwy and Extension Design	$513,000	$13,500	$13,500	$540,000
2011	Rehab/Extend Runway	$4,419,544	$116,304	$116,304	$4,652,152
2011	Airport Master Plan Update	$194,750	$5,125	$5,125	$205,000
TOTAL		**$5,930,172**	**$261,358**	**$234,159**	**$6,425,689**

SWPP: Storm Water Pollution Prevention Study
Source: Airport records

AIRPORT USERS

Today, the Los Alamos Airport is a general aviation airport serving a wide variety of users and providing a critical link to the National Airspace System. The primary users of the airport are recreational pilots, including a strong presence by those working on experimental aircraft. The airport also serves business people who utilize aircraft to save time and money on transportation costs. In the past, it has served as a commercial service airport. From 1948 to 1996, scheduled flights were available at the airport. From time to time, various entities have considered renewing passenger service at the airport. Visitors to LANL continue to utilize the airport for charter operations and delivery of mission critical material. The airport serves medical ambulance users as well. During firefighting season, the airport has been utilized as a base for fighting forest fires. Aircraft as large as the C-130 have utilized the airport in the past.

The presence of the airport provides a number of ancillary benefits. Los Alamos is a popular tourist destination with several attractions of national significance in the region, including Bandelier National Monument, the Valles Caldera National Preserve, the Los Alamos Ranch School Museum, LANL, and the Bradbury Science Museum. A wide variety of outdoor activities such as hunting, fishing, skiing, hiking, rock climbing, biking, swimming, and golf are available. The area is also known for its arts and entertainment activities. The presence of the airport invites aviation users to experience these and many other regional attractions.

The airport provides for business development (aviation and non-aviation), enhanced medical care, various charitable activities, regional fly-ins, education and training, law enforcement, and civil defense.

ECONOMIC IMPACT

The New Mexico Airport System Plan 2009 included an analysis of the 51 public-use airports included in the study. The total economic benefit of aviation activity was quantified in terms of employment, payroll, and output (economic activity). Two rounds of benefits were considered: the first is from employees of on-airport businesses, indirect expenditures of visitors, and construction-related activity. The second round of benefits is the economic impacts that occur as first round impacts are circulated throughout the local and state economies. **Table 1B** summarizes the economic impact of Los Alamos Airport.

According to the study, the operation of the Los Alamos Airport generates 94 jobs in the area, with a combined payroll of more than $2.7 million. With secondary impacts included, the airport generates more than $6.5 million in annual economic activity for the region. The state aviation system as a whole generates more than $3 billion in economic activity.

TABLE 1B
Aviation Generated Economic Impact

Category	Los Alamos Airport	State Aviation System
Employment	94	48,795
Payroll	$2,744,100	$1,286,420,600
Output	$6,529,400	$3,196,781,100

Source: New Mexico Airport System Plan Update 2009

There are numerous ancillary benefits that an airport brings to a community. These include the stimulation of business activity both on the airport and in the community, providing access to recreational opportunities and tourist attractions, providing education and training, serving as a staging center for civil defense and emergencies (e.g. fighting forest fires), providing for enhanced medical care, typically through life flight operations.

In addition, aviation groups, such as the Experimental Aircraft Association (EAA) which has a chapter based at the Los Alamos Airport, organize numerous community aviation related events. These include fly-ins, community pancake breakfasts, various flight events, the Young Eagles program and a new program to provide aviation flights and education to adults.

AIRPORT ADMINISTRATION

Daily operations at the airport are supervised by an airport manager who is employed by Los Alamos County. The airport manager reports directly to the Assistant to the County Administrator. The airport manager is responsible for airport leases, maintenance, capital improvements, and obtaining development grants. Airport oversight is conducted by the County Council, which is comprised of seven at-large members elected to four-year terms.

REGIONAL CLIMATE

Weather conditions must be considered in the planning and development of an airport, as daily operations are affected by local weather patterns. Temperature is a significant factor in determining runway length needs, while local wind patterns (both direction and speed) dictate the optimal orientation of the runway.

Los Alamos, New Mexico experiences distinct seasonal temperature changes, from average highs in the 80s in the summer months and average lows well below freezing in the winter months. The mean maximum high temperature is 80 degrees, which occurs in July. Average precipitation is about 19 inches annually, and snowfall averages approximately 15 inches. A summary of climatic data is presented in **Table 1C**.

TABLE 1C
Climate Summary
Los Alamos, NM

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
High Temp. Avg.	38.4	42.9	49.7	57.9	67.2	77.7	80.0	77.2	71.4	60.8	47.6	39.6
Low Temp. Avg.	17.7	21.8	27.0	33.1	41.7	51.1	54.6	53.1	47.0	36.8	25.9	19.0
Precip. Avg. (in.)	0.96	0.75	1.28	1.05	1.43	1.44	2.97	3.32	2.08	1.54	1.19	0.92
Snowfall (in.)	2.9	2.5	2.6	1.3	0.4	0.0	0.0	0.0	0.0	0.6	1.7	3.2
Wind Speed (mph)	7.5	8.3	9.6	10.5	10.3	9.5	8.4	7.8	8.0	7.8	7.4	7.1
Sunshine (%)	72	72	73	76	78	83	75	76	78	79	76	71

Source: Climatography of the U.S. No .81 - Monthly Normals and www.city-data.com

AREA LAND USE

Land uses in the vicinity of the airport can have an impact on airport operations and growth potential. The following section identifies baseline information relating to both existing and future land uses in the vicinity of Los Alamos Airport. By understanding the land use issues surrounding the airport, more appropriate recommendations can be made for the future of the airport.

COMPATIBLE LAND USE

As depicted on **Exhibit 1B**, existing land uses adjacent to the airport include residential, commercial, and both federal and county public lands. To the immediate west of the airport is a residential subdivision of single family homes. The property line of the closest homes is approximately 300 feet from the Runway 9 end. The closer residential and other noise-sensitive facilities are to an airport, the more difficult it can be to protect the primary function of the airport. To the immediate east and southeast of the airport are commercial land uses and a complex of public lands which encompass county offices. To the south, approximately 900 feet from the airport boundary, are federal lands occupied by LANL.

Any airport that accepts FAA grants is obligated to meet various grant assurances. Grant Assurance 21, *Compatible Land Use*, implementing Title 49 United States Code (U.S.C.) § 47107 (a) (10), requires, in part, that the sponsor:

"…take appropriate action, to the extent reasonable, including the adoption of zoning laws, to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations, including landing and takeoff of aircraft."

Zoning has been the primary method used by Los Alamos County to protect the airport from land use encroachment. **Exhibit 1C** presents the current land use zoning for the airport environment. Other than the existing residential use, the planned future zoning surrounding the airport is compatible with airport operations. On the south side of NM 502, land is zoned for light industrial uses. To the east and southeast, all lands are zoned for commercial or public uses.

HEIGHT AND HAZARD MITIGATION

Grant Assurance 20 relates to an airport sponsor's obligation for hazard removal and mitigation to address potential obstructions to the airspace around the airport. Grant Assurance 20 states that the airport sponsor will:

"…take appropriate action to assure that such terminal airspace as is required to protect instrument and visual operations to the airport (including established minimum flight altitudes) will be adequately cleared and protected by removing, lowering, relocating, marking, or lighting or otherwise mitigating existing airport hazards and by preventing the establishment or creation of future airport hazards."

In addition to appropriate land use zoning, communities are responsible for protecting airports from obstruction to the airspace. Most communities develop height and hazard regulations surrounding airports. To date, Los Alamos County has not instituted height and hazard zoning/regulations in the immediate vicinity of the airport.

While there is guidance from the FAA regarding both land use compatibility and height and hazard standards, there are no national rules or regulations in this regard. It is the responsibility of the local jurisdiction to develop and enforce compatible land use and height and hazard standards surrounding airports.

AIRPORT INFLUENCE AREA

As part of the development of the *New Mexico Airport System Plan 2009*, NMDOT included a land use evaluation for airports in the study. A generic Airport Influence Area (AIA) was developed and applied to each airport. The coverage of the AIA reflects property that is most likely to have aircraft overflights, particularly on approach or departure. The AIA boundaries primarily consider FAA design standards for the Runway Protection Zone (RPZ), the Federal Aviation Regulations (FAR) Part 77 Approach Surface, and the FAR Part 77 Horizontal Surface.

The AIA boundary is centered on the runway midpoint, but varies at each airport based on the instrument approach capability and the airport reference code (ARC) for each airport. At Los Alamos Airport, there is a non-precision Global Positioning System (GPS) instrument approach to Runway 27. The airport reference code refers to the largest group of aircraft responsible for at least 500 annual operations (refer to Chapter Three – Facility Requirements for more detail). In

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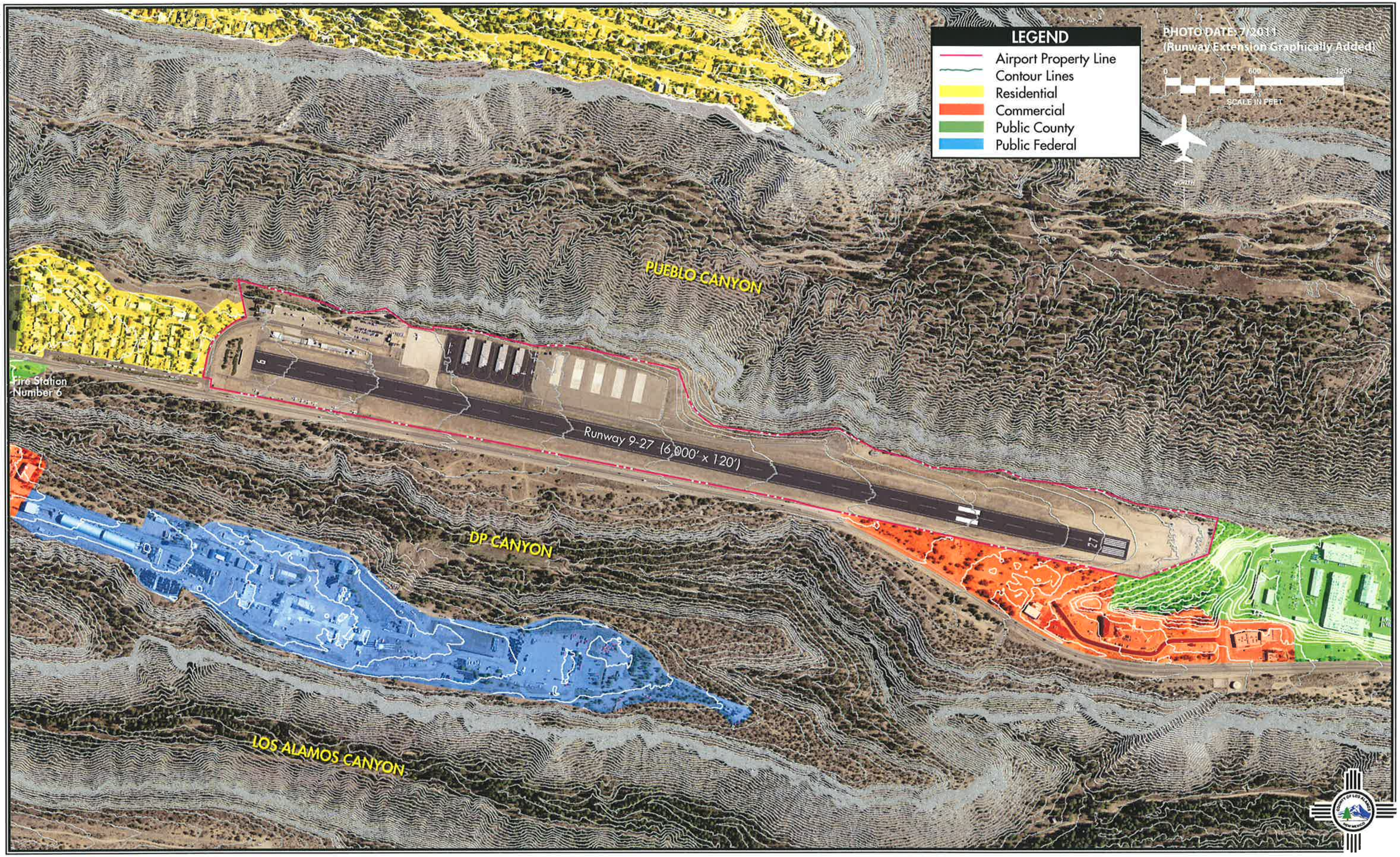

Exhibit 1B
EXISTING LAND USES

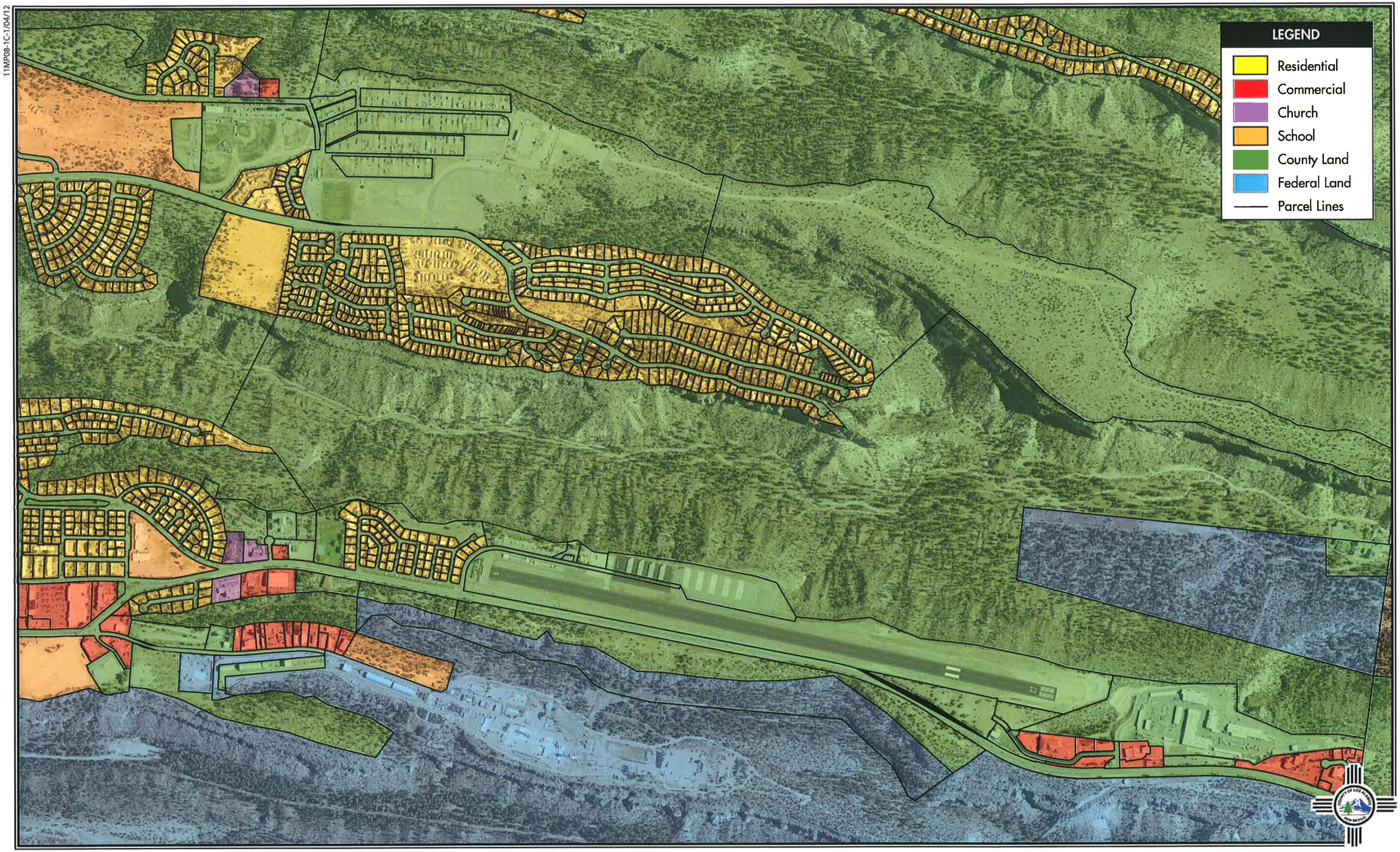

Exhibit 1C
AREA ZONING MAP

2009, the ARC applied was B-I (small aircraft exclusively) which includes most single engine piston and some twin engine aircraft. The boundary of the AIA for Los Alamos is suggested as a 10,000-foot buffer around the runway. **Table 1D** presents a summary of the dimensions of the suggested AIA.

TABLE 1D
Suggested NM Airport Influence Area Dimensions

Airport Influence Area	Approach Type		Dimension of AIA for Los Alamos*
	Visual	Non-Precision	
No Development	Length: Runway length + 2(200+RPZ length)	Length: Runway length + 2(200+RPZ length)	Length: 8,400'
	Width: Outer width of RPZ	Width: Outer width of RPZ	Width: 450'
Limited Development	Length: Runway length + 6,400'	Length: Runway length + 10,600'	Length: 16,600'
	Width: Equal to the longest runway length	Width: Equal to the longest runway length	Width: 6,000'
Controlled Development	Length: Part 77 Horizontal Surface limits (5,000' radius)	Length: Part 77 Horizontal Surface limits (10,000' radius)	Length: 10,000' radius

Note: Precision approaches have a Limited Development length equal to the runway length plus 15,400'; all other dimensions are the same as for visual and non-precision approaches.
*Dimensions adjusted to reflect 6,000' runway
Source: New Mexico Airport System Plan Update 2009, Appendix D.

Three suggested levels of land use controls are then presented with the following descriptions:

No Development Area: This area includes the land along each runway, where aircraft operate at relatively low heights. Development in this area should be strictly controlled and limited, to the greatest extent possible, to on-airport developments, and be closely coordinated with the airport sponsor, NMDOT, and the FAA. The height of any proposed development within this area should be reviewed through the Part 77 process to ensure existing and future Part 77 surfaces are not penetrated and to determine if airport operations would be negatively impacted. Noise-sensitive land uses, such as residences, churches, schools, or hospitals, should not be developed within this area. Thus, land uses would typically be industrial, commercial, or transportation-related. Additionally, land uses that are potential wildlife attractants or that have emissions that could be a visual hazard should be carefully screened to ensure they do not negatively affect operational safety for airport users. Avigation easements are strongly recommended within this area, should a community recommend a non-aviation development within this AIA.

Limited Development Area: Aircraft operations within the boundaries of the Limited Development Area include training routes and extended approach and departure paths. As such, this area is likely to experience overflights and the associated operational noise. Thus, for safety and quality of life reasons, developments that are noise-sensitive or accommodate significant groups of people should be limited within this area. Avigation easements are encouraged within this area; at a minimum, notification should be required of property owners or potential buyers that the property falls within this AIA. Tall structures should be submitted under the Part 77 airspace review process.

Controlled Development Area: The Controlled Development Area extends to the outer boundary of the Part 77 defined horizontal surface. Developments within this AIA are likely to experience aircraft overflights, but at heights greater than within the other AIA. As such, aircraft noise is less of a concern. Thus, all land use categories are allowable within this area with residential development having the lowest density possible. Notification of the property owner or potential buyers should be required, informing them that the property falls within this AIA. Tall structures should be submitted under the Part 77 airspace review process.

The AIA dimensions are only a guide for local governments with an airport in their jurisdiction. Recommended land use controls must be customized to each specific airport. This is especially true for Los Alamos Airport with its unique one-way-in/one-way-out operating procedure.

AIRPORT SYSTEM PLANNING ROLE

Airport planning can be accomplished on several levels: local, regional, state, and national. Each level has a different emphasis and purpose. An airport master plan is the primary local airport planning document. At the local level, administrators of the airport have engaged in various planning efforts to preserve the long term capability of the airport. In 1994, LANL funded an airport master plan. In 1996, Los Alamos County assumed operation of and responsibility for the airport. Initial county airport planning was undertaken by the Air Transportation Advisory Board. An Airport Action Plan and Airport Layout Plan were completed in June 2005. This master planning effort represents a timely and fresh examination of the aviation industry as it relates specifically to Los Alamos Airport. This master plan will provide a vision of both the airfield and landside facilities over the course of the next 20 years.

At the state level, the Los Alamos Airport is included in the *New Mexico Airport System Plan* (NMASP). The purpose of the NMASP is to ensure that the state has an adequate and efficient system of airports to serve its aviation needs. The NMASP defines the specific role of each airport in the state's aviation system and establishes funding needs. There are 52 New Mexico airports included in the NMASP, 51 of which are included in the FAA's NPIAS. Los Alamos Airport is one of the 47 general aviation facilities included in the study.

The NMASP presents a classification system for airports in the state. The six classifications are:

- Primary Commercial Service Airports
- Non-Primary Commercial Service Airports
- Limited Commercial Service Airports
- Regional General Aviation Airports
- Community General Aviation Airports
- Low Activity General Aviation Airports

Los Alamos Airport is considered a Regional General Aviation Airport. **Table 1E** presents the minimum recommended development objectives for this classification of airport.

On the national level, Los Alamos Airport is included in the NPIAS as a general aviation facility. This federal plan identifies 3,332 existing airports which are considered significant to the national air transportation system. The NPIAS is published and used by the FAA in administering the

Airport Improvement Program (AIP), which is the source of federal funds for airport improvement projects across the country. The AIP program is funded exclusively by user fees and user taxes, such as those on fuel and airline tickets. The 2011-2015 NPIAS estimates $52.2 billion is needed for airport development across the country over the next five years. An airport must be included in the NPIAS to be eligible for federal funding assistance through the AIP.

TABLE 1E
Minimum Facility Standards for Regional General Aviation Airports

Airport Criteria	Minimum Facility Standards for Regional General Aviation Airport
ARC	C-II or Greater
Runway Length	Accommodate 75 percent of large aircraft at 60 percent useful load
Runway Width	100'
Runway Strength	30,000 pounds (Single Wheel Gear)
Taxiway	Partial Parallel
Instrument Approach	Non-Precision Instrument Approach
Visual Aids	Beacon, Lighted Windsock, Segmented Circle, VGSI
Lighting	MIRL
Weather Reporting Facilities	Automated Weather Reporting (ASOS/AWOS)
Wind Coverage	Primary and Crosswind - Provide 95% Coverage
Services	Phones, Restrooms, FBO-Full Service, Courtesy Cars, Maintenance-Full Service, AvGas and Jet A Fuel, Perimeter Fencing.
Facilities	Terminal with Public Restrooms and Pilot Lounge; Limited Service Restaurant and/or Vending; Hangar Storage for 60% of Based Aircraft and 25% of Transient; Apron (Tie-Downs) for 40% of Based Fleet and 50% of Transient; Auto Parking; Emergency Response Plan

ARC: Airport Reference Code
ASOS: Automated Surface Observation System
AWOS: Automated Weather Observation System
VGSI: Visual Glideslope Indicator
MIRL: Medium Intensity Runway Lights
FBO: Fixed Base Operator
Source: New Mexico Airport System Plan Update 2009

The NPIAS supports the FAA's strategic goals for safety, system efficiency, and environmental compatibility by identifying specific airport improvements. The current issue of the NPIAS identifies approximately $3.6 million in development needs over the next five years for Los Alamos Airport. This figure is not a guarantee of federal funding; instead, it represents development needs as presented to the FAA by Los Alamos County in the annual airport capital improvement program.

Airports that apply for and accept AIP grants must adhere to various grant assurances. These assurances include maintaining the airport facility safely and efficiently in accordance with specific conditions. The duration of the assurances depends on the type of airport, the useful life of the facility being developed, and other factors. Typically, the useful life for an airport development project is a minimum of 20 years. Thus, when an airport accepts AIP grants, they are obligated to maintain that facility in accordance with FAA standards for at least that long.

Of the $52.2 billion in airport development needs nationally, approximately 28.6 percent is designated for 2,829 general aviation airports (includes reliever airports), as shown in **Table 1F**. General aviation airports average 31 based aircraft and account for 34.4 percent of the nation's general aviation fleet. Reliever general aviation airports average 186 based aircraft and account for 21.9 percent of the nation's based aircraft.

TABLE 1F NPIAS Distribution of Activity				
Number of Airports	**Airport Type**	**% of Enplanements**	**% of Based Aircraft**	**% NPIAS Costs**
29	Large Hub Primary Commercial	68.00	0.07	33.8
37	Medium Hub Primary Commercial	20.00	2.1	14.1
72	Small Hub Primary Commercial	8.00	4	8.6
244	Non-hub Primary Commercial	3.00	10.1	11.3
121	Non-primary Commercial	0.01	1.6	1.9
503	**Total Commercial Service Airports**	**99.01**	**17.87**	**69.70**
269	Relievers	0.00	21.9	7.2
2,560	General Aviation	0.00	34.4	21.4
3,332	**Existing NPIAS Airports**	**99.10**	**74.8**	**98.3**
16,402	**Non-NPIAS Airports**	**0.90**	**25.2**	**NA**
Source: 2011-2015 National Plan of Integrated Airport Systems (NPIAS)				

AIRSIDE FACILITIES

Airport facilities can be functionally classified into two broad categories: airside and landside. The airside category includes those facilities which are needed for the safe and efficient movement of aircraft, such as runways, taxiways, lighting, and navigational aids. The landside category includes those facilities necessary to provide a safe transition from surface-to-air transportation and to support aircraft servicing, storage, maintenance, and operational safety on the ground. Existing airport facilities are identified on **Exhibit 1D**.

RUNWAYS

Los Alamos Airport is served by a single runway. Runway 9-27 is oriented in an east/west manner. The runway is 6,000 feet long, 120 feet wide, and constructed of asphalt which is in good condition. The runway was extended from 5,550 feet to 6,000 feet in 2011. The pavement has been strength-rated at 43,000 pounds single wheel loading (S). Strength ratings refer to the configuration of the aircraft landing gear. For example, "S" indicates an aircraft with a single wheel on each landing gear. **Table 1G** summarizes airside facility data related to Runway 9-27.

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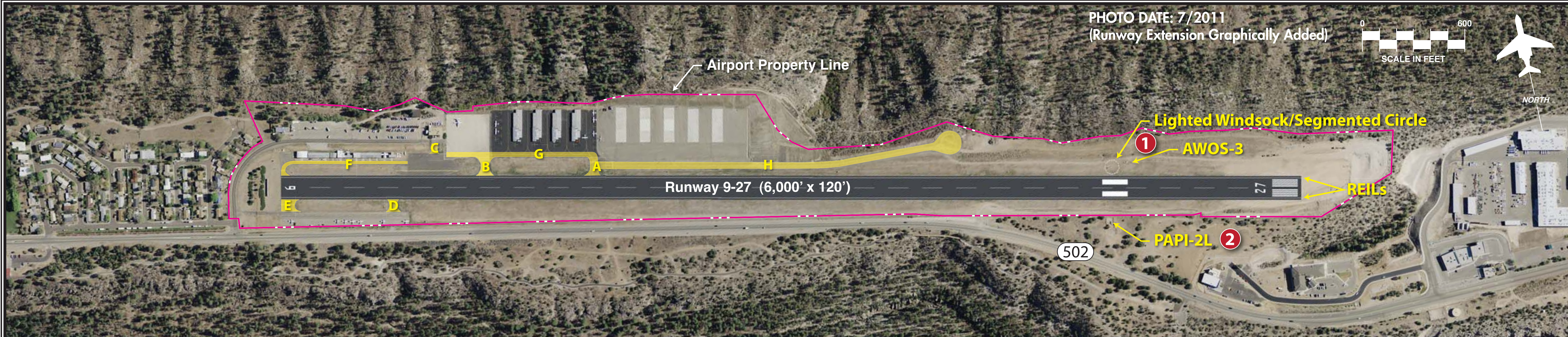


1 Lighted Windsock/ Segmented Circle, AWOS-3


2 PAPI-2L


3 Blast Fence


4 Hangars


5 Terminal Building, Beacon


6 T-Hangars, Tie-downs

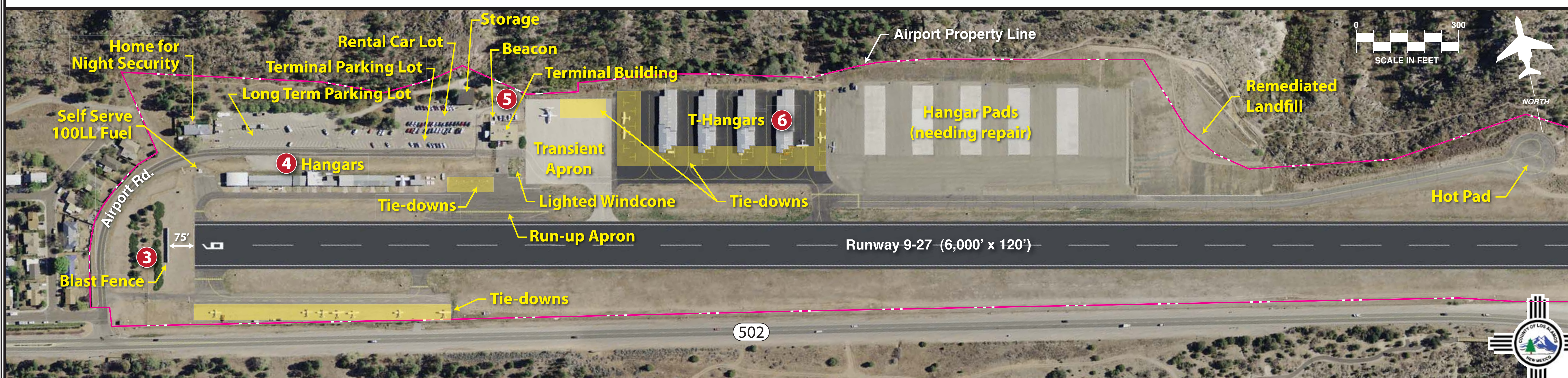

TABLE 1G Airside Facility Data Los Alamos Airport	RUNWAY 9-27
Runway Length (feet)	6,000
Runway Width (feet)	120
Runway Surface Material and Condition	Grooved Asphalt/Good Condition
Runway Markings and Condition	Non-precision (27)/Basic (9)/Good Condition
Runway Lighting	Medium Intensity Runway Lighting
Runway Load Bearing Strength (lbs.)	43,000 pounds (S)
Taxiway Lighting	No Taxiway Lighting
Taxiway Marking	Some Centerline and Edge Marking
Traffic Pattern	NA (9)/ Right (27)
Visual Approach Aids	PAPI-2L Rwy 27 REIL Rwy 27
Instrument Approach Aids	RNAV (GPS) Rwy 27
Weather and Navigational Aids	Automated Weather Observation System (AWOS-3) Lighted Wind Cone Airport Beacon Segmented Circle

GPS - Global Positioning System
RNAV - Area Navigation
PAPI - Precision Approach Path Indicator
REIL - Runway End Identifier Lights
S - Single Wheel Landing Gear

Source: Airport/Facility Directory - Southwest U.S. (October 21, 2011); Airport records.

TAXIWAYS

The airport has several designated taxiways. Taxiways A and B are 50 feet wide and extend from the runway to the east hangar areas. Taxiway C is adjacent to the terminal building, west of the lighted windsock, and is 30 feet wide. Taxiway C is a 350-foot wide expanse of pavement that also serves as an aircraft run-up area. Taxiway D is on the south side of the airport and is 35 feet wide. Taxiway E is 75 feet wide and serves as the Runway 9 threshold taxiway on the south side of the runway. Taxiway F is approximately 18 feet wide, serving as a taxilane to the northeast hangar area. While Taxiway F connects to the Runway 9 threshold, it is not utilized for this purpose due to its close proximity to the hangars and the runway. Taxiway G is 20 feet wide and extends along the front of the central T-hangar complex. Taxiway H is 35 feet wide and extends from the intersection with Taxiway A, east until it terminates at the designated "hot pad," which is a designated location on the airport for loading and unloading of hazardous materials. There is no direct access from Taxiway H to the runway.

PAVEMENT MARKINGS

Pavement markings aid in the movement of aircraft along airport surfaces and identify closed or hazardous areas on the airport. Runway 27 has non-precision markings that include the designation, threshold, touchdown zone, centerline, and edges. Runway 9 has basic markings that include the designation, centerline, and edges. The entire runway was remarked in 2011 in conjunction with the runway extension project.

Taxiways A and B have centerline markings and hold-line markings located 150 feet from the runway centerline. Taxiway C has no markings as it connects to the aircraft run-up area. The run-up apron has hold-line markings 100 feet from the runway centerline. Taxiway D has centerline markings and a hold-line marking 125 feet from the runway centerline. Taxiway E has centerline markings and a hold-line 100 feet from the runway centerline. Taxiway F has centerline markings and a hold-line located 100 feet from the Runway 9 threshold centerline. Taxiways G and H have centerline markings.

AIRFIELD LIGHTING

Airfield lighting systems extend an airport's usefulness into periods of darkness and/or poor visibility. A variety of lighting systems are installed at the airport for this purpose. These lighting systems, categorized by function, are summarized as follows:

Identification Lighting: The location of the airport at night is universally identified by a rotating beacon. The rotating beacon projects two beams of light, one white and one green, 180 degrees apart. The beacon is located on top of the airport terminal building.

The approach to Runway 27 is equipped with Runway End Identifier Lights (REILs). These strobe lights are set to the side of the runway landing threshold. Pilots are able to quickly identify the runway from a distance of up to 20 miles during the day or night.

Edge Lighting: Runway and taxiway lighting utilizes light fixtures placed near the edge of the pavement to define the lateral limits of the pavement. This lighting is essential for safe operations during night and/or times of low visibility in order to maintain safe and efficient access to and from the runway and aircraft parking areas.

The runway is equipped with medium intensity runway lighting (MIRL). Runway threshold lighting identifies each runway end. There is no taxiway lighting.

Visual Approach Lighting: Pilots approaching the Runway 27 end can visually interpret the Precision Approach Path Indicator Lights (PAPIs) to determine if they are on the correct glide path to the runway. The PAPIs at Los Alamos Airport provide two lights, each of which is either red or white depending on the elevation of the aircraft. One white and one red light indicate the aircraft is on the correct three-degree glide path. Two red lights indicate the aircraft is below the correct glide path and two white lights indicate the aircraft is above the correct glide path.

Airfield Signs: Airfield identification signs assist pilots in identifying their location on the airfield and direct them to their desired location. Airfield signs are located adjacent to the entrance/exit taxiways to identify the runway. These signs are lighted.

Distance-To-Go Markers: Set to the south side of the runway are distance-to-go markers. These signs are spaced every one thousand feet, with a single number on each representing the distance remaining until the end of the runway in thousands of feet.

Pilot-Controlled Lighting: The airfield lights (MIRL and REILs) turn on automatically at 5:30 a.m. and turn off at 8:30 a.m. They turn on automatically again at 4:30 p.m. and turn off at 11:00 p.m. Pilots are able to activate the MIRL and REILs through a series of clicks of their radio transmitter. Typically, the airfield lights turn off after approximately 15 minutes. The PAPIs are on 24 hours a day.

WEATHER AND COMMUNICATION AIDS

The Los Alamos Airport has two lighted windsocks. The windsocks provide information to pilots regarding wind conditions, such as direction and speed. One is located adjacent to the terminal building, and the other is located approximately 700 feet from the Runway 27 threshold on the north side of the runway. This windsock is located within a segmented circle. The segmented circle provides a centralized location for various airport condition indicators and signals, such as the windsock.

Los Alamos Airport is equipped with an Automated Weather Observation System (AWOS-3). The AWOS automatically records weather conditions such as wind speed, wind gust, wind direction, temperature, dew point, altimeter setting, visibility, fog/haze condition, precipitation, and cloud height. This information is then transmitted at regular intervals via radio frequency in the area. Aircraft in the vicinity can receive this information if they have their radio tuned to the correct frequency (124.175 MHz). In addition, pilots and individuals can call a published telephone number and receive the information via an automated voice recording.

Los Alamos Airport utilizes a common traffic advisory frequency (CTAF). This radio frequency (123.0 MHz) is used by pilots in the vicinity of the airport to communicate with each other about approaches or takeoffs from the airport. In addition, the CTAF frequency can be used as a UNICOM frequency where a pilot can communicate directly with the airport. Approach and Departure Clearance Service is provided by Albuquerque Air Route Traffic Control Center (ARTCC) and is available via frequency 132.8 MHz.

NAVIGATIONAL AIDS

Navigational aids are electronic devices that transmit radio frequencies, which pilots of properly equipped aircraft can translate into point-to-point guidance and position information. The types of electronic navigational aids available for aircraft flying in the vicinity of Los Alamos Airport are limited to a very high frequency omni-directional range (VOR) facility in Santa Fe and the GPS.

The VOR, in general, provides azimuth readings to pilots of properly equipped aircraft transmitting a radio signal at every degree to provide 360 individual navigational courses. Frequently, distance measuring equipment (DME) is combined with a VOR facility (VOR/DME) to provide distance, as well as direction, information to the pilot. Military tactical air navigation aids (TACANs) and civil VORs are commonly combined to form a VORTAC. The VORTAC provides distance and direction information to both civil and military pilots. The SANTA FE VORTAC is located in Santa Fe approximately 22.7 nautical miles to the southeast.

GPS is an additional navigational aid for pilots. GPS was initially developed by the United States Department of Defense for military navigation around the world.

GPS differs from a VOR in that pilots are not required to navigate using a specific ground-based facility. GPS uses satellites placed in orbit around the earth that transmit electronic radio signals, which pilots of properly equipped aircraft use to determine altitude, speed, and other navigational information. With GPS, pilots can navigate directly to any airport in the country and are not required to navigate using a ground-based navigational facility.

AREA AIRSPACE

The Federal Aviation Administration (FAA) Act of 1958 established the FAA as the responsible agency for the control and use of navigable airspace within the United States. The FAA has established the National Airspace System (NAS) to protect persons and property on the ground and to establish a safe environment for civil, commercial, and military aviation. The NAS is defined as the common network of U.S. airspace, including air navigational facilities; airports and landing areas; aeronautical charts; associated rules, regulations, and procedures; technical information; and personnel and materials. System components shared jointly with the military are also included as part of this system.

To ensure a safe and efficient airspace environment for all aspects of aviation, the FAA has established an airspace structure that regulates and establishes procedures for aircraft using the nation's airspace. The U.S. airspace structure provides for categories of airspace, controlled and uncontrolled, and identifies them as Classes A, B, C, D, E, and G as described below. **Exhibit 1E** generally illustrates each airspace type in three-dimensional form.

- Class A airspace is controlled airspace and includes all airspace from 18,000 feet mean sea level (MSL) to Flight Level 600 (approximately 60,000 feet MSL).

- Class B airspace is controlled airspace surrounding high-activity commercial service airports (i.e., Phoenix Sky Harbor International Airport).

- Class C airspace is controlled airspace surrounding lower-activity commercial service (i.e., Albuquerque International Sunport) and some military airports.

- Class D airspace is controlled airspace surrounding low-activity commercial service and general aviation airports with an airport traffic control tower (ATCT) (i.e., Roswell International Air Center Airport).

All aircraft operating within Classes A, B, C, and D airspace must be in constant contact with the air traffic control facility responsible for that particular airspace sector.

- Class E airspace is controlled airspace surrounding an airport that encompasses all instrument approach procedures and low-altitude federal airways. Only aircraft conducting instrument flights are required to be in contact with air traffic control when operating in Class E airspace. While aircraft conducting visual flights in Class E airspace are not required to be in radio contact with air traffic control facilities, visual flight can only be conducted if minimum visibility and cloud ceilings exist.

- Class G airspace is uncontrolled airspace that does not require communi-

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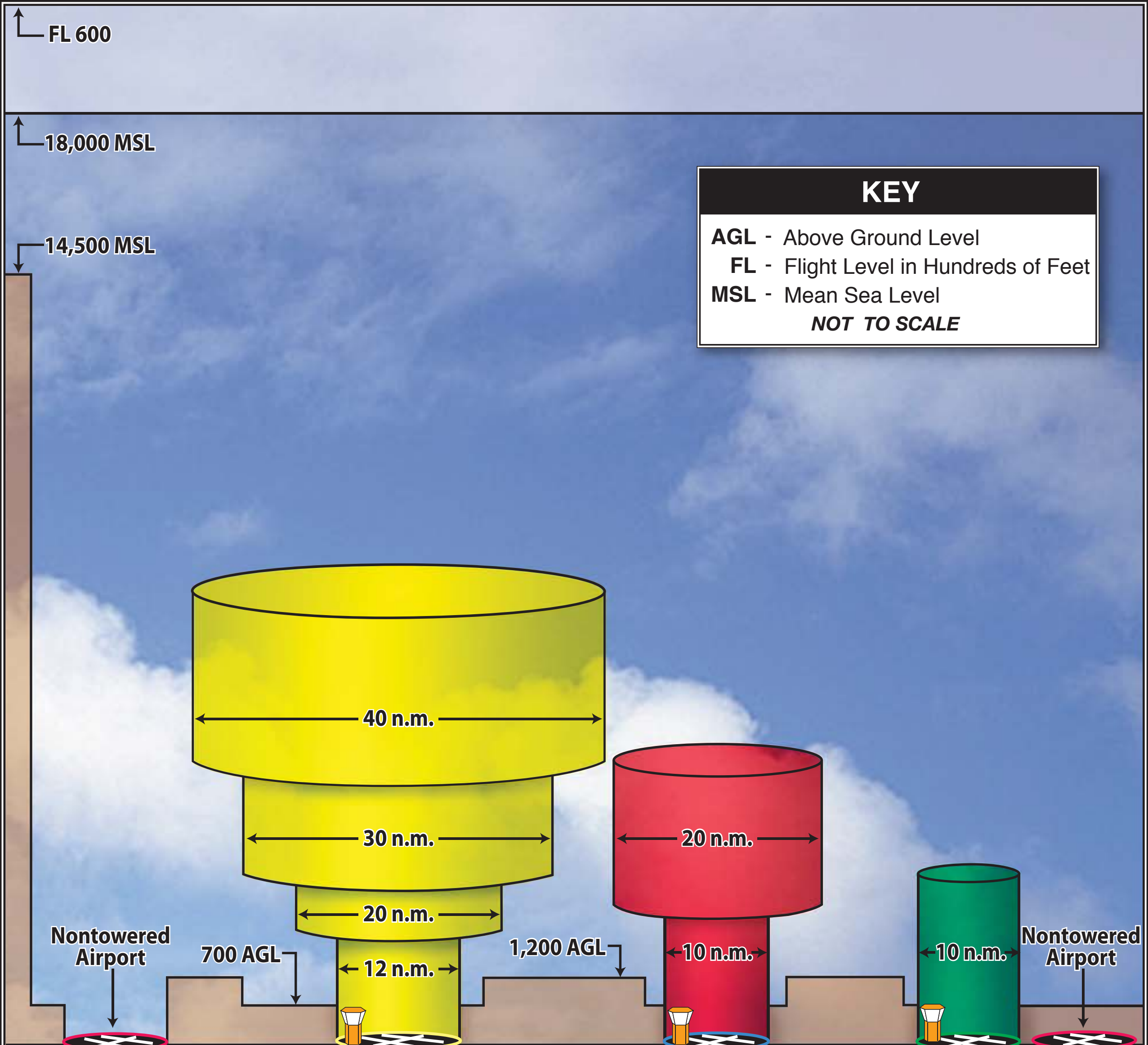

CLASSIFICATION	DEFINITION
CLASS A	Generally airspace above 18,000 feet MSL up to and including FL 600.
CLASS B	Generally multi-layered airspace from the surface up to 10,000 feet MSL surrounding the nation's busiest airports.
CLASS C	Generally airspace from the surface to 4,000 feet AGL surrounding towered airports with service by radar approach control.
CLASS D	Generally airspace from the surface to 2,500 feet AGL surrounding towered airports.
CLASS E	Generally controlled airspace that is not Class A, Class B, Class C, or Class D.
CLASS G	Generally uncontrolled airspace that is not Class A, Class B, Class C, Class D, or Class E.

Source: "Airspace Reclassification and Charting Changes for VFR Products," National Oceanic and Atmospheric Administration, National Ocean Service. Chart adapted by Coffman Associates from AOPA Pilot, January 1993.

Exhibit 1E
AIRSPACE CLASSIFICATION

cation with an air traffic control facility.

Airspace within the vicinity of Los Alamos Airport is depicted on the sectional chart presented on **Exhibit 1F**. The airport operates in Class G airspace from the ground to a ceiling of 700 feet above ground level (AGL). From 700 feet to 18,000 feet MSL, the airport is in Class E airspace.

Victor Airways

Victor Airways are designated navigational routes extending between VOR facilities. Victor Airways have a floor of 1,200 feet AGL and extend upward to an altitude of 18,000 feet MSL. Victor Airways are eight nautical miles wide. There are several Victor Airways in the region, including V-83 to the east and V-62-263 to the south.

Military Operations Areas (MOAs)

A Military Operations Area (MOA) is an area of airspace designated for military training use. This is not restricted airspace as civil pilots can use it. However, they should be on alert for the possibility of military traffic. A pilot may need to be aware that military aircraft can be found in high concentrations, conducting aerobatic maneuvers, and possibly operating at high speeds and lower elevations. The activity status of an MOA is advertised by a *Notice to Airmen* (NOTAM) and noted on sectional charts. The closest MOA is the MT DORA WEST HIGH AND LOW MOA located approximately 100 miles to the east.

Military Training Routes

A Military Training Route, or MTR, is a specified training route for military pilot proficiency. Aircraft operate on the MTR at speeds in excess of 250 knots and up to 10,000 feet MSL. Several MTRs are located to the north and west of Los Alamos Airport. General aviation pilots should be aware of the locations of the MTRs and exercise special caution if they need to cross them. Designated military training routes include VR1175 and IR137.

Restricted Areas

According to the FAA, "Restricted areas denote the existence of unusual, often invisible, hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Penetration of restricted areas without authorization from the using or controlling agency may be extremely hazardous to the aircraft and its occupants." The restricted area, designated R-5101, is immediately to the south of the airport and covers LANL. This area is restricted from the ground to an elevation of 12,000 feet. Pilots must avoid entering the restricted area to the south of the airport.

The Restricted Area is a significant limiting factor for the airport. Typical traffic patterns cannot be implemented at Los Alamos Airport as aircraft cannot circle to the south. The presence of the Restricted Area in conjunction with the terrain to the west and the implementation of one-way in/one-way-out operations, dictates that pilots leave the airport vicinity to the east or to the north shortly after take-off. The effect is that local operations in the airport vicinity are prohibited, which makes Los Alamos Airport unique in the National Airspace System.

INSTRUMENT APPROACH PROCEDURES

Instrument approach procedures are a series of predetermined maneuvers established by the FAA using electronic navigational aids to assist pilots in locating and landing at an airport during low visibility and cloud ceiling conditions. The capability of an instrument approach is defined by the visibility and cloud ceiling minimums associated with the approach. Visibility minimums define the horizontal distance that the pilot must be able to see to complete the approach. Cloud ceilings define the lowest level a cloud layer (defined in feet above the ground) can be situated for a pilot to complete the approach. If the observed visibility or cloud ceiling is below the minimums prescribed for the approach, the pilot cannot complete the instrument approach.

There are two instrument approaches that has been approved for Los Alamos Airport. The detail for the instrument approaches is presented in **Table 1H**. **Exhibit 1G** presents the instrument approach plate for Los Alamos Airport as of December 28, 2012.

TABLE 1H
Instrument Approach Data
Los Alamos Airport

	WEATHER MINIMUMS BY AIRCRAFT TYPE			
	Categories A & B		Category C	
	CH	VIS	CH	VIS
RNAV (GPS) Y RWY 27				
LP MDA	500'	1-mile	500'	1⅜-mile
LNAV MDA	560'	1-mile	560'	1⅝-mile
RNAV (GPS) Z Rwy 27				
LP MDA	500'	1-mile	500'	1⅜-mile
LNAV MDA	560'	1-mile	560'	1⅝-mile

Aircraft Categories are based on 1.3 times the stall speed in landing configuration as follows:
Category A: 0-90 knots (Cessna 172)
Category B: 91-120 knots (Beechcraft KingAir)
Category C: 121-140 knots (Canadair Challenger)
Category D: 141-166 knots (Gulfstream IV) – No procedures available for Category D aircraft

Abbreviations:
CH - Cloud Height (in feet above ground level)
VIS - Visibility Minimums (in miles)
LNAV - Lateral Navigation
RNAV - Area Navigation
LP - Lateral Precision
MDA - Minimum Decision Altitude

Source: U.S. Terminal Procedures, Southwest (Dec. 13, 2012)

There are two instrument approaches for pilots to consider using when landing at Los Alamos Airport. Both utilize GPS to provide locational information. These are

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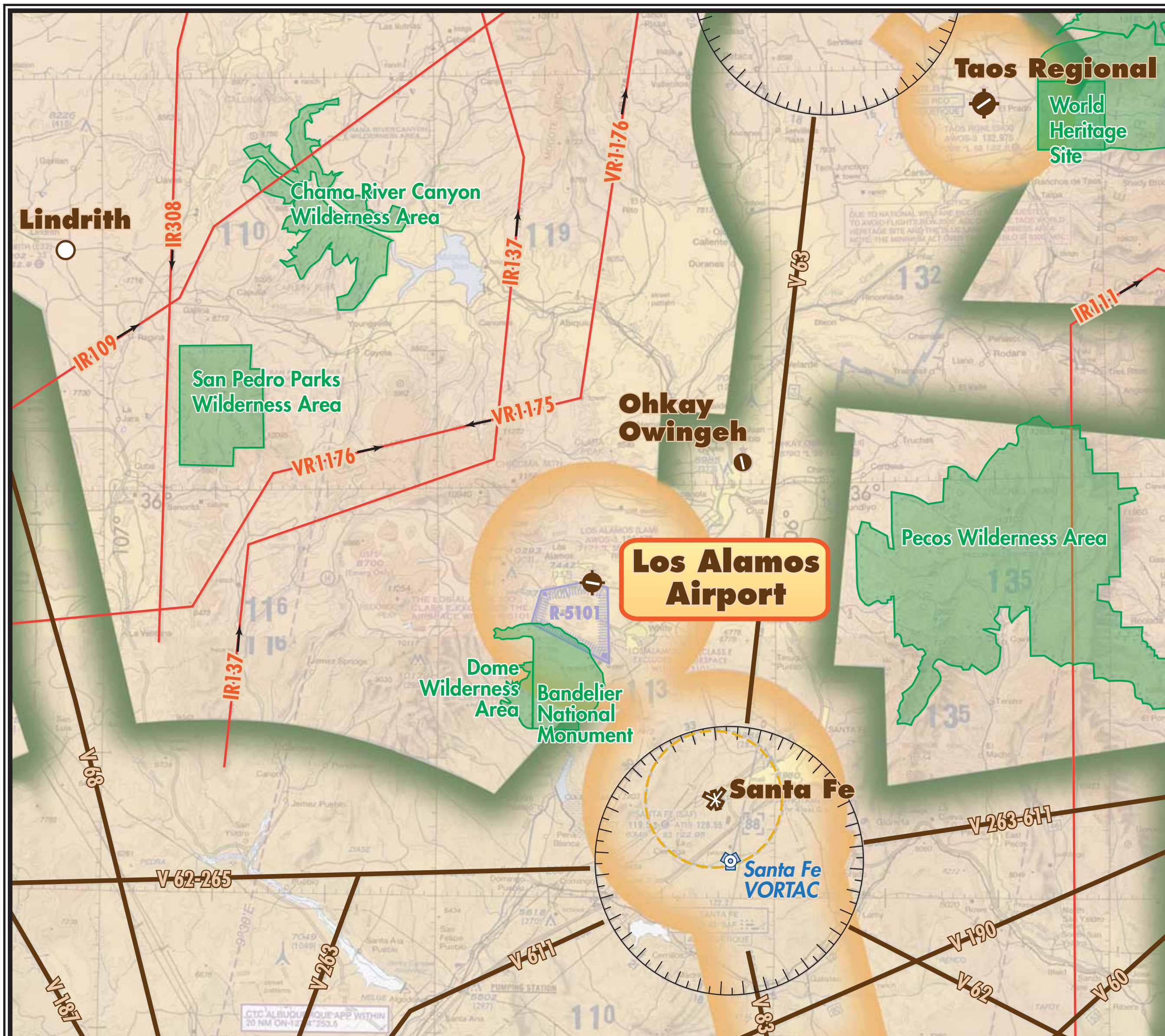


LEGEND

- Airport with other than hard-surfaced runways
- Airport with hard-surfaced runways 1,500' to 8,069' in length
- Airports with hard-surfaced runways greater than 8,069' or some multiple runways less than 8,069'
- VORTAC
- Compass Rose
- Prohibited, Restricted, Warning and Alert Areas
- Wilderness Areas
- Military Training Routes
- Victor Airways
- Class D Airspace
- Class E (sfc) Airspace with floor 1200 ft. or greater above surface that abuts Class G Airspace
- Class E Airspace with floor 700' above surface

N

NOT TO SCALE

Source: Albuquerque Sectional Chart, US Department of Commerce, National Oceanic and Atmospheric Administration, 5/5/2011 - 10/20/2011

Exhibit 1F
AIRSPACE MAP

LOS ALAMOS, NEW MEXICO AL-10276 (FAA) 12152

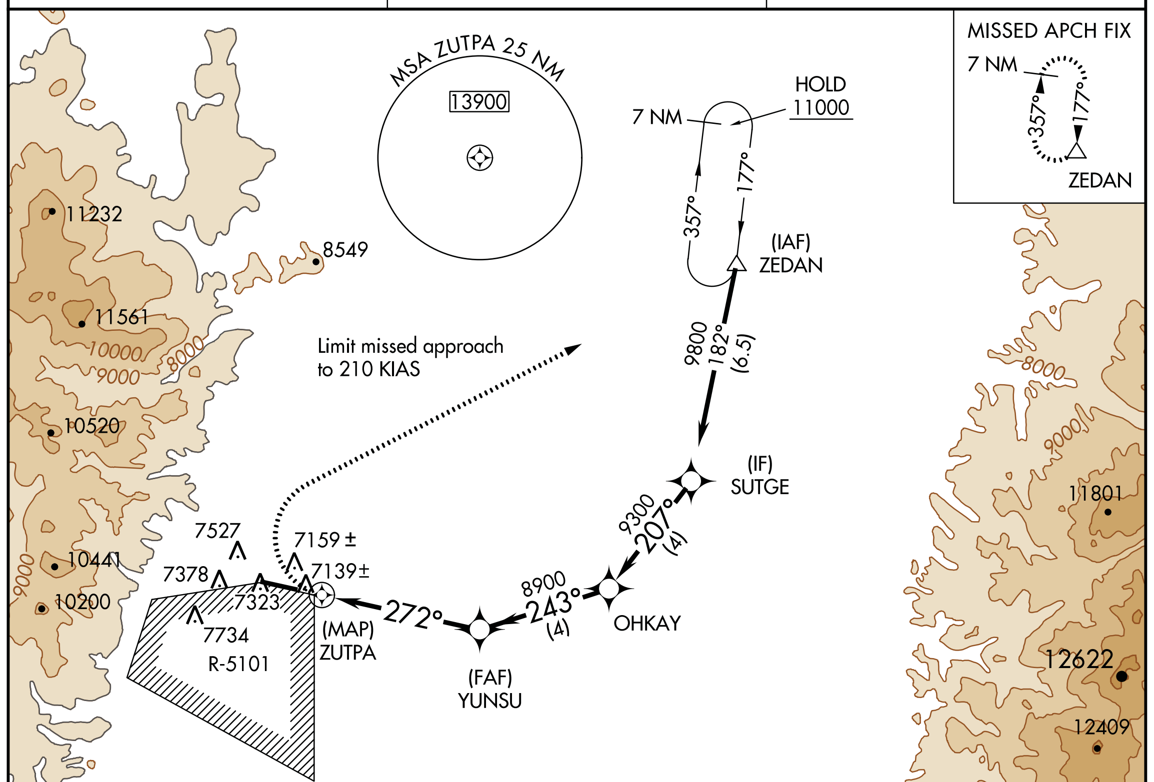
WAAS CH 56329 W27B	APP CRS 272°	Rwy Idg 6000 THRE 7080 Apt Elev 7171

RNAV (GPS) Z RWY 27
LOS ALAMOS (LAM)

When local altimeter setting not received, procedure NA. *LP and *LNAV missed approach requires a minimum climb of 280 feet per NM to 8500. DME/DME RNP-0.3 NA. Visibility reduction by helicopters NA.

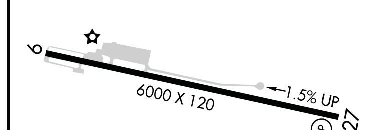
MISSED APPROACH: Climbing right turn to 11000 direct ZEDAN and hold.

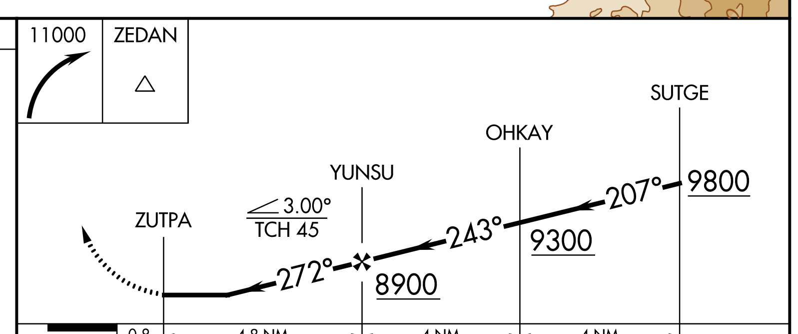
AWOS-3	ALBUQUERQUE CENTER	UNICOM
124.175	132.8 346.35	123.0 (CTAF)



SW-1, 10 JAN 2013 to 07 FEB 2013

ELEV 7171 | THRE 7080





CATEGORY	A	B	C	D
LP MDA*	7580-1	500 (500-1)	7580-1⅜ 500 (500-1⅜)	NA
LP MDA	7700-1	620 (600-1)	7700-1⅞ 620 (600-1⅞)	NA
LNAV MDA*	7640-1	560 (500-1)	7640-1⅝ 560 (500-1⅝)	NA
LNAV MDA	7880-1 800 (800-1)	7880-1¼ 800 (800-1¼)	7880-2½ 800 (800-2½)	NA
CIRCLING	NA			

REIL Rwy 27
MIRL Rwy 9-27

LOS ALAMOS, NEW MEXICO
Orig 31MAY12
35°53'N-106°16'W
LOS ALAMOS (LAM)
RNAV (GPS) Z RWY 27

SW-1, 10 JAN 2013 to 07 FEB 2013

LOS ALAMOS, NEW MEXICO AL-10276 (FAA) 12152

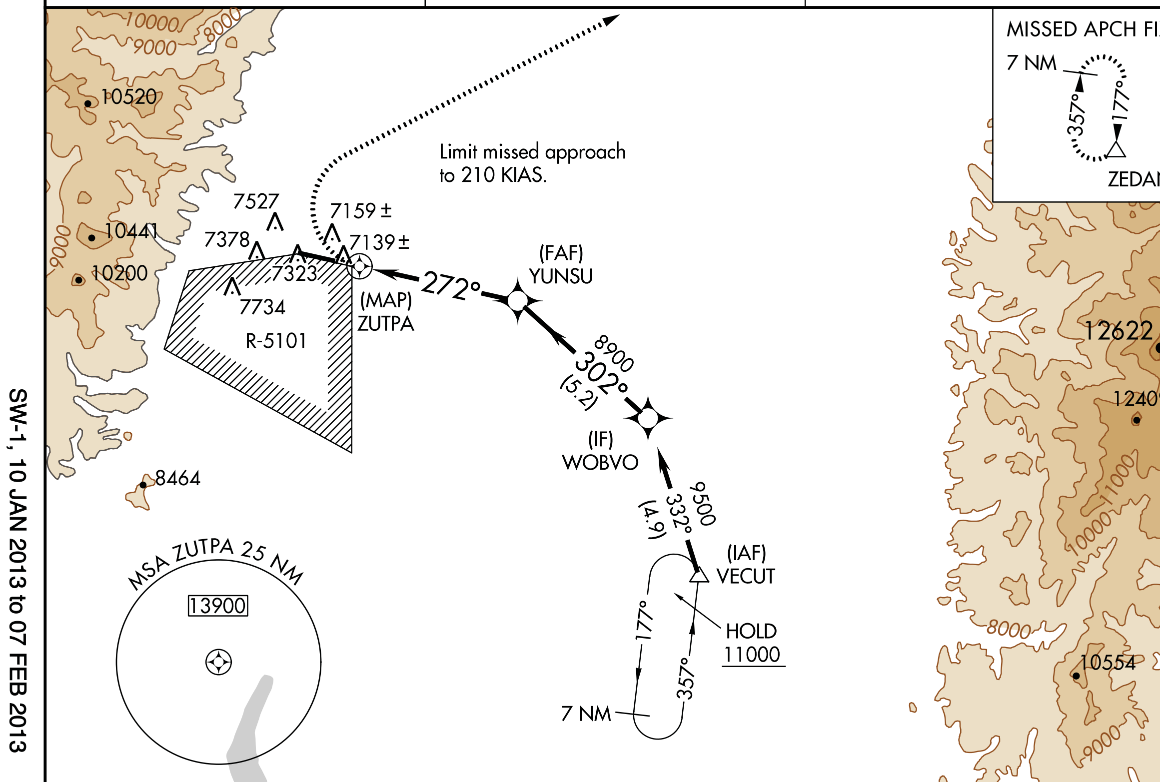
WAAS CH 82028 W27A	APP CRS 272°	Rwy Idg 6000 THRE 7080 Apt Elev 7171

RNAV (GPS) Y RWY 27
LOS ALAMOS (LAM)

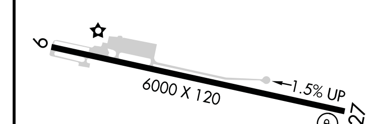
When local altimeter setting not received, procedure NA. *LP and *LNAV missed approach requires a minimum climb of 280 feet per NM to 8500. DME/DME RNP-0.3 NA. Visibility reduction by helicopters NA.

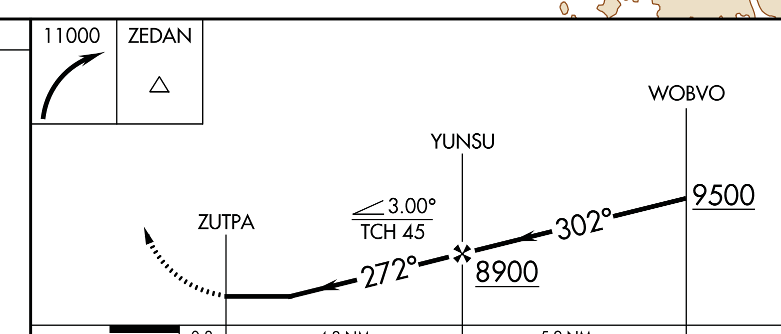
MISSED APPROACH: Climbing right turn to 11000 direct ZEDAN and hold.

AWOS-3	ALBUQUERQUE CENTER	UNICOM
124.175	132.8 346.35	123.0 (CTAF)



ELEV 7171 | THRE 7080





CATEGORY	A	B	C	D
LP MDA*	7580-1	500 (500-1)	7580-1⅜ 500 (500-1⅜)	NA
LP MDA	7700-1	620 (600-1)	7700-1⅞ 620 (600-1⅞)	NA
LNAV MDA*	7640-1	560 (500-1)	7640-1⅝ 560 (500-1⅝)	NA
LNAV MDA	7880-1 800 (800-1)	7880-1¼ 800 (800-1¼)	7880-2½ 800 (800-2½)	NA
CIRCLING	NA			

REIL Rwy 27
MIRL Rwy 9-27

LOS ALAMOS, NEW MEXICO
Amdt 1 31MAY12
35°53'N-106°16'W
LOS ALAMOS (LAM)
RNAV (GPS) Y RWY 27

SOURCE: U.S. Terminal Procedures, Southwest non-precision instrument approaches for consideration of various design standards and federal aviation regulations (FARs) For example, a non-precision instrument approach requires the application of a 500-foot wide primary surface (Title 14 CFR Part 77) surrounding the runway; however, at Los Alamos Airport, a 500-foot primary surface would effective eliminate both on airport and off-airport development.

After consultation with the FAA, both the airspace and airports lines of business, it was determined to assess any potential penetration of the primary surface individually because of the significant limitations for development on and adjacent the airport. In cases where there is a significant penetration, development would not be supported, where the penetration is limited (e.g. aircraft hangar), the development may be supported.

LOCAL OPERATING PROCEDURES

Los Alamos Airport has a unique one-way-in and one-way-out runway. All landings are from the east to Runway 27 and all takeoffs are to the east utilizing Runway 9. Only under extremely rare circumstances are takeoffs from Runway 27 allowed. For example, in the past, takeoffs from Runway 27 have been allowed for life flight emergencies. In recent history only one landing to Runway 9 has been allowed.

Los Alamos Airport is situated at 7,171 feet MSL. The missed approach procedure is to the north of the airport in order to avoid the Restricted Area to the south. Most airports will have a defined traffic pattern for local training operations where pilots circle the airport and perform practice or touch-and-go landings. Due to the unique operational nature of the runway there is no defined traffic pattern. In extremely rare circumstances, the airport manager may approve a landing to Runway 9 (e.g., Air ambulance emergency).

Runway use is dictated by the prevailing wind conditions. Ideally, it is desirable for aircraft to land directly into the wind. While not ideal, most aircraft can operate with a tailwind of six knots or less. Review of the wind data obtained from the on-airport AWOS-3 indicates that pilots are able to land on Runway 27 approximately 83 percent of the time. Departures on Runway 9 are manageable approximately 79 percent of the time. All other times the directional winds and/or crosswinds exceed a tailwind component of six knots. Pilots should use caution when operating in these conditions.

The FAA Airport/Facility Directory identifies several conditions for pilots to be aware of in the vicinity of the airport. Approximately 85 feet to the west of the Runway 9 threshold there is an eight-foot high steel blast deflection fence. There are numerous bushes and small trees behind the blast fence. The directory also identifies 60-foot tall trees approximately 324 feet to the west of Runway 9, which requires a 2:1 climb ratio to clear, if necessary.

In addition to those listed in the Facility Directory, pilots are advised to be aware of the following operating procedures:

- Taxiway F is not to be used to access the Runway 9 threshold; instead, pilots are requested to back-taxi on the runway.
- The runway has a 1.5 percent gradient rising to the west.

- Visual flight rules (VFR) landing traffic is requested to remain five miles to the east of the airport until turning for final approach to Runway 27 to avoid the Restricted Area to the south.
- Radio communication is required before entering the traffic pattern.
- Pilots should be aware of the potential for strong gusty crosswinds.
- Blast fence located 75 feet from the end of the runway.
- Touch-and-go operations are not allowed.
- On go-around or missed approach to Runway 27, pilots are instructed to make a right turn (north) to avoid the Restricted Area to the south.

LANDSIDE FACILITIES

Landside facilities are the ground-based facilities that support the aircraft and pilot/passenger handling functions. These facilities typically include the FBOs, aircraft storage hangars, aircraft maintenance hangars, aircraft parking aprons, and support facilities such as fuel storage, automobile parking, roadway access, and emergency response. Landside facilities were previously identified on **Exhibit 1D**.

AIRPORT BUSINESSES

Airports can attract a variety of businesses, both aviation and non-aviation related. Los Alamos Airport has five businesses operating at the airport. **Hertz Rental Car** is the primary business based at the airport. Hertz leases space in the terminal building and has a ready/return parking lot immediately to the west of the terminal building. **Coyote Aviation** is an aircraft rental company with two Cessna 172s in their fleet. **Los Alamos AvGas Association** is a consortium of pilots that lease space near the Runway 9 threshold where they have a self-serve AvGas fuel pump. **Los Alamos Aircraft Maintenance** is a small aircraft maintenance business. **Ron Hyer LLC** is another light aircraft maintenance business.

All aircraft hangars on the airport are privately owned. The owners of the hangars pay a ground lease to the airport.

AIRCRAFT PARKING APRON

Adjacent to the terminal building is the main transient apron encompassing approximately 6,900 square yards of pavement. There are two aircraft tie-down positions marked on the north edge of this pavement. Adjacent and to the east of the transient apron is a local tie-down apron encompassing approximately 2,800 square yards. There are nine aircraft tie-down positions marked, two of which are reserved for transient visitors.

There are two tie-down positions marked at the south end of each of the four T-hangar structures. Each of these tie-down areas is approximately 250 square yards, for a total of 1,000 square yards of tie-down apron. To the east of the T-hangars is another tie-down apron encompassing approximately 700 square yards, which is marked with six tie-down positions.

There is a large paved apron to the east of the T-hangars encompassing approximately 25,000 square yards of pavement. There are five pads within this pavement intended to accommodate future construction of T-hangars. This pavement serves to cap a former landfill that was remediated by the Department of Energy, as required, to transfer the airport to the county. This pavement is currently in an unusable condition as heaving/settlement has made it unsafe for aircraft to use the pavement.

To the south of the terminal building is a smaller local apron of approximately 3,500 square yards of pavement. This apron is used for aircraft run-ups and has three marked aircraft tie-down positions for visitors.

On the south side of the runway near the Runway 9 threshold there is a tie-down apron encompassing approximately 4,600 square yards. There are 16 aircraft tie-down positions marked on this apron.

In total, there are approximately 19,500 square yards of apron pavement available for use at the airport. This total does not include the landfill cap, which is currently not suitable for aircraft movements. Of this total, approximately 10,400 square yards are utilized for transient movements, transient parking, or aircraft run-ups. A total of seven transient parking positions for small aircraft are marked. The main apron can accommodate up to four positions for larger twin or small jet aircraft. The remaining 9,100 square yards of apron pavement are utilized for 37 local aircraft tie-down positions. Overall, there are parking positions for 37 local small aircraft, seven positions for transient small aircraft, and four positions for transient large aircraft.

AIRPORT HANGARS AND BUILDINGS

The Los Alamos Airport offers a limited supply of aircraft hangars. T-hangars are typically the smallest hangars, intended to house one small aircraft. These units are often "nested" to maximize building space. The T-hangars located east of the terminal building are nested. Box hangars provide open space for aircraft storage. Box hangars can be stand-alone units or "connected" so that several box hangars can be within a single structure. These hangars typically house a single aircraft, but they may accommodate a larger twin engine aircraft. Immediately to the north of Taxiway F, there are 14 hangar box positions (one is in the shape of a "T" but is considered a box hangar for this analysis). Another box hangar is utilized exclusively for aircraft building and does not have the capacity to store an aircraft. Conventional hangars are large open space hangars typically utilized for bulk aircraft storage and to house airport businesses. There are no conventional hangars at the airport. **Table 1J** presents a summary of the hangars available at the airport.

It is estimated that there is 52,300 square feet of aircraft hangar storage space available at the airport. The terminal building encompasses approximately 2,600 square feet of space. The adjacent storage building (former incinerator) is approximately 2,400 square feet. Approximately 1,800 square feet of space is estimated to be primarily used for non-storage activities such as aircraft maintenance.

All hangars at the airport were constructed by private individuals or partnerships. Some hangars are specifically utilized for airport maintenance activities or aircraft development and are not used to permanently store aircraft; therefore the estimate of positions available only reflects the potential storage capability of a hangar and not the actual usage of any individual hangar space. In fact, the EAA chapter hangar is specifically excluded from storage of an individual aircraft by owner's rules which are reflected in the lease with the airport.

TABLE 1J
Hangar/Building Facilities
Los Alamos Airport

Building Number	Structure Type	Hangar Space (Est.)	Office/ Maintenance Space (Est.)	Positions Available
1	Terminal Building	NA	2,600	NA
2	Storage (Former Incinerator)	NA	2,400	NA
3	Box Hangars	17,300	1,800	13
4	T-Hangars	8,750	NA	8
5	T-Hangars	8,750	NA	8
6	T-Hangars	8,750	NA	8
7	T-Hangars	8,750	NA	8
TOTAL		52,300	1,800	46

Source: Airport records.

AUTOMOBILE PARKING

The Los Alamos Airport has a significant amount of vehicle parking when compared to the level of aviation activity. Hertz leases 30 spaces near the terminal buildings for use as a ready/return lot. There are an additional 34 positions, including two handicap spots, near the terminal building for airport users. An intermediate lot, located to the west of the Hertz and terminal building lot, has 29 parking spots. A long term lot farther west has a total of 120 parking positions.

In total, there are 30 Hertz parking positions and 183 parking positions for the public and airport users. **Table 1K** summarizes available parking at the airport.

TABLE 1K
Existing Airport Vehicle Parking
Los Alamos Airport

	Terminal Lot	Intermediate Lot	Long Term Lot	Rental Car Lot	Totals
Spaces	34	29	120	30	213
Parking Area (s.f.)	8,000	6,400	25,600	7,400	47,400
Circulation Area (s.f.)	10,200	2,100	14,000	10,800	37,100
Total Parking Lot Area (s.f.)	18,200	8,500	39,600	18,200	84,500

Source: Coffman Associates analysis

AIRPORT FENCING

The airport has full perimeter fencing. The fencing is eight-foot high chain link in the terminal area. Fencing adjacent to East Road (NM 502) and around the west end of the airport is eight-foot high field fence. There are three personnel gates:

- One next to the fuel farm
- One on the north side of the terminal building
- One on the north side of the east aircraft apron, adjacent to the third concrete pad.

There are five vehicle gates:

- One on the south side of the terminal
- One on the north side of the terminal
- One on Airport Road
- One on Route 502 leading to the south apron (for emergency vehicles)
- One on Route 502 near bend in the road (for construction vehicles

AIRCRAFT RESCUE AND FIREFIGHTING (ARFF)

As a general aviation airport, Los Alamos Airport is not required to have on-airport emergency response. In case of emergency, the Los Alamos County Fire Department will respond. Fire Station No. 6 is the closest to the airport and is located at 457 East Road, approximately ¼-mile to the west of the airport entrance road.

Station No. 6 houses an engine, an Oshkosh Crash and Fire Rescue (CFR) vehicle, an ambulance, a Mini-Tender, and a Tender (summer months only). **Table 1L** presents a summary of the equipment available at Station No. 6 for first response to any emergencies at the airport.

TABLE 1L
Emergency Response Equipment
Station No. 6 Los Alamos Fire Department

Vehicle Type	Description
Engine	1,500 gallons of water 50 gallons of Aqueous Film-Forming Foam (AFFF)
E-One Oshkosh Titan - Crash and Fire Rescue (CFR)	2,000 gallons of water 400 gallons of AFFF 700 gallons of potassium-based dry chemical (Purple-K) Roof turret, bumper turret, FLIR/Infrared camera system
Ambulance	Medical transport
E-One Tender (Summer Months Only)	2,200 gallons of water 75 gallons of AFFF Bumper turret, FLIR/Infrared camera system
Mini-Tender (Grass-Rig)	250 gallons of water

Source: Los Alamos Fire Department/ Airport records

All fire fighters are EMT certified. The fire department has plans to provide formal Airport Rescue and Fire Fighting (ARFF) training for most fire fighters in 2012. Two fire fighters are currently ARFF certified.

In addition to formal fire fighter response, there are three 125-pounds Halon fire bottles located at the transient apron, the fuel farm, and at the south ramp. There are also nine fire hydrants on the airport, eight on the airside and one near the terminal building on the landside.

AIRPORT MAINTENANCE

The airport does not have a dedicated maintenance building. Equipment is stored in the former incinerator building adjacent to the terminal building. The Los Alamos County Public Works Department performs most routine maintenance at the airport, including grass mowing and snow removal. The airport is currently in the process of acquiring a new snow plow with a 22-foot rubber blade (to protect the grooved runway) that would be dedicated for airport uses. Future plans include acquiring various snow removal equipment, such as a snow blower and a broom.

UTILITIES

The Los Alamos Department of Public Utilities provides water, sanitary sewer, natural gas, and electricity to the Los Alamos community, including the airport. Potable water is available at the terminal building only. None of the hangars have running water service. Sanitary sewer is available at the terminal building, but not the hangars. A portable toilet is located near the self-serve fuel facility for times when the terminal building is closed. The terminal building is heated with natural gas. It is the only structure with natural gas at the airport. Several telephone and telecommunications providers are available in the Los Alamos area. **Exhibit 1H** presents a map of the location of utility lines serving the airport, as provided by the Los Alamos County GIS department.

FUEL FACILITIES

A consortium of pilots operates the fuel concession at the airport. Los Alamos AvGas Association maintains a ground lease of approximately 1,700 square feet, near the Runway 9 threshold where a self-serve fuel pump is located. An underground tank with a 10,000-gallon capacity is located in this area. The AvGas Association pays an annual ground lease of $300 and a fuel flowage fee of $0.07 per gallon of fuel sold. Jet A fuel is not currently available on the airport.

TERMINAL BUILDING

The airport terminal building was constructed in 1970 and encompasses approximately 2,600 square feet. A portion of the facility is leased by Hertz for rental car operations. Another office is used by the civil air patrol. A small room is used for administrative functions. The flight planning station is located in a former closet and is not large enough to accommodate two pilots at once. There are limited food options with a single soda machine.

REGIONAL AIRPORTS AND SERVICE AREA

The proximity of other airports is largely the defining factor when describing an airport's service area. A review of public-use airports in the region was made to identify and distinguish the types of air facilities and services provided in the region. Information pertaining to each airport was obtained from FAA Form 5010, *Airport Master Record*, as well as the website www.airnav.com.

It is important to consider the capabilities and limitations of other airports when planning for future changes or improvements at Los Alamos Airport. The following are those public-use airports with asphalt or concrete runways that can serve general aviation aircraft. These airports are listed by their proximity to Los Alamos Airport. **Table 1M** identifies the major characteristics of each airport.

11MP08-1H-11/16/11

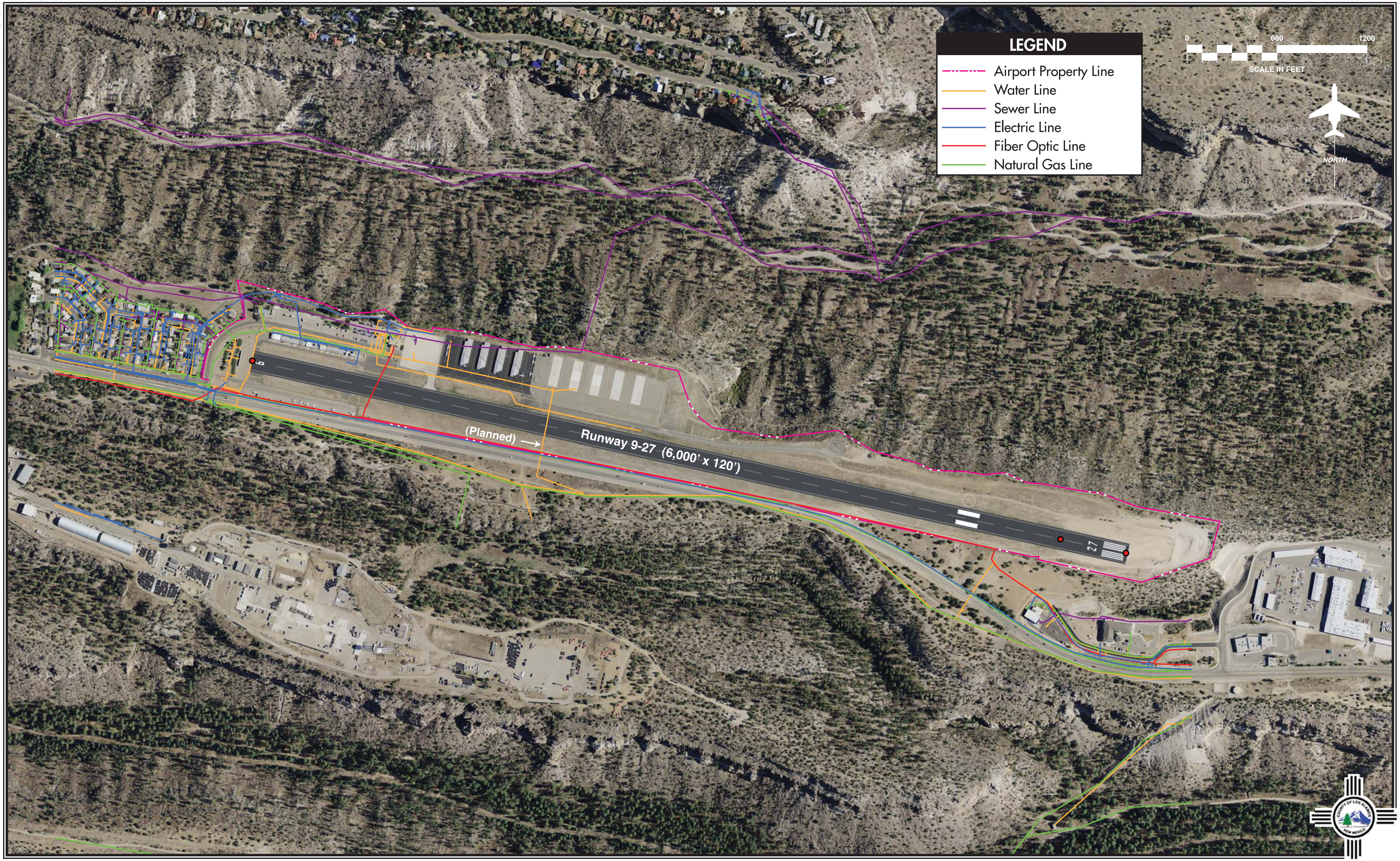


Exhibit 1H
AIRPORT UTILITIES

TABLE 1M
Public-Use Airports Near Los Alamos Airport

Airport Name	Distance (mi)	Type	Longest Runway	Based Aircraft	Annual Operations	Instrument Approaches
Ohkay Owingeh Airport (E14)	16 NE	GA	5,007	2	1,000	No
Santa Fe Municipal (SAF)	21 SSE	GA	8,342	181	78,500	Yes
Taos Regional Airport (SKX)	52 mi NE	GA	5,830	43	15,700	Yes

GA: General Aviation
Source: FAA Form 5010, www.airnav.com

Ohkay Owingeh Airport (E14) is a public-use airport located approximately 16 miles to the northeast of Los Alamos. This airport is located outside the City of Espanola and provides a single runway measuring 5,007 feet in length. Both Jet A and 100LL fuel are available. There are no instrument approaches and only two based single engine aircraft.

Santa Fe Municipal (SAF) is a commercial service airport located 21 miles to the southeast of Los Alamos Airport. The airport has three runways, the longest being 8,342 feet long. Several instrument approaches are available, including an ILS approach to Runway 2. Instrument approaches are also available to Runways 15, 20, 28, and 33. There are 181 based aircraft, including 19 jets, 24 multi-engine pistons, three helicopters, and 11 military aircraft. American Eagle Airlines is currently providing four daily flights to and from Dallas (DFW) and one daily flight to Los Angeles (LAX). Full FBO services are available.

Taos Regional Airport (SKX) is a public-use airport located 52 miles to the northeast of Los Alamos. Runway 4-22 is 5,803 feet long and paved with asphalt. Runway 4 has a GPS instrument approach available. It is estimated that there are 43 based aircraft, two of which are twin engine piston aircraft and the remaining being single-engine piston aircraft.

AIRPORT SERVICE AREA

The service area is loosely defined as a baseline geographical area from which future aviation demand (particularly based aircraft) is most likely to originate. The service area should relate to existing geographical areas, such as a county or city boundary, in order to facilitate correlation with known socioeconomic data. With this relationship, forecasts of aviation demand can be made.

Most pilots who chose to base their aircraft at an airport do so because of the convenience of the airport to their residence or place of business. With that said, some aircraft owners may have other priorities, such as runway length, specific services, or hangar availability.

The airport maintains a database of the aircraft based at the airport. Analysis of this data shows that there are currently 70 based aircraft as of November 2011. Of this total, 57 have primary addresses in Los Alamos (81 percent). Of the remaining 13 based aircraft, 11 have addresses in New Mexico (five in Jemez Springs, three in Albuquerque, one in Santa Fe, one in Edgewood, and one in Rio Rancho). The two remaining based aircraft have primary addresses that are out-of-state. Therefore, 68 of the 70 based aircraft have a primary mailing address in New Mexico, within proximity of Los Alamos.

Los Alamos is clearly the area where the vast majority of based aircraft owners are located. As a result, the primary service area for the airport will be considered Los Alamos County.

AIRPORT ACTIVITY

At airports primarily serving general aviation activity, the number of based aircraft and the total annual operations (takeoffs and landings) are the primary indicators of aeronautical activity. These indicators will be used in subsequent analyses in this master plan update to project future aeronautical activity and determine future facility needs.

ANNUAL OPERATIONS

Aircraft operations are classified as local or itinerant. Local operations consist mostly of aircraft training operations conducted within the airport traffic pattern and touch-and-go and stop-and-go operations. Itinerant operations are arriving or departing aircraft which are not conducting operations within the airport traffic pattern.

Aircraft operations are further classified in three general categories: air taxi, general aviation, and military. Air taxi operations normally consist of the use of general aviation type aircraft for the "on-demand" commercial transport of persons and property in accordance with 14 CFR Part 135 and Subchapter K of 14 CFR Part 91. General aviation operations include a wide range of aircraft use ranging from personal to business and corporate uses. General aviation operations comprise the majority of operations at Los Alamos Airport. Military use of the airport is limited.

Los Alamos Airport does not have an airport traffic control tower (ATCT), so exact operational figures are not available. Several sources do provide an estimate of current year forecasts. The FAA publishes in the *Terminal Area Forecast* (TAF) an estimate of annual operations. For Los Alamos Airport, the FAA estimates 13,000 annual operations, with 2,170 being itinerant in nature and 10,830 being local. The FAA Form 5010 also reflects an estimate of 13,000 annual operations. The New Mexico Aviation System Plan (2002) shows an estimate of 13,590 annual operations for 2012.

BASED AIRCRAFT

Identifying the current number of based aircraft is important to master plan analysis, yet it can be challenging because of the transient nature of aircraft storage. In fact, until recently, the FAA has not required that airports maintain an inventory of currently based aircraft. For the past seven years, Los Alamos Airport has maintained a list of based aircraft, which is shown in **Table 1N**.

TABLE 1N
Historical Based Aircraft
Los Alamos Airport

Year	Based Aircraft
2005	72
2006	71
2007	70
2008	69
2009	77
2010	63
2011	70

Source: Airport records

CURRENT CAPITAL IMPROVEMENT PROGRAM (CIP)

On an annual basis, the Los Alamos Airport submits a long range capital improvement program (CIP) that includes capital projects for which the airport will be considered for both federal and state funding. **Table 1P** presents the most recent CIP (2011) submitted to the state.

TABLE 1P
2011 Capital Improvement Plan
Los Alamos Airport

Year	Project Description	FAA	State	Local	Total
2012	Airport Master Plan	$205,642	$5,412	$5,412	$216,466
2012	Install AWOS/UNICOM Monitor	$0	$2,200	$2,200	$4,400
2013	Replacement Security Fence	$308,750	$8,125	$8,125	$325,000
2013	Airport Access Road – Design	$76,000	$2,000	$2,000	$80,000
2013	Shade Hangars	$0	$0	$300,000	$300,000
2014	Construct T-hangars on East Apron	$0	$0	$650,000	$650,000
2014	Airport Access Road – Construction	$285,000	$7,500	$7,500	$300,000
2015	Construct Hangars - East Apron	$0	$0	$750,000	$750,000
2015	Rehab Concrete Apron and Twy B	$1,662,500	$43,750	$43,750	$1,750,000
2015	Remove Hangars on West Apron	$308,750	$8,125	$8,125	$325,000
2015	Terminal Apron	$665,000	$17,500	$17,500	$700,000
2016	Terminal Building	$0	$0	$2,000,000	$2,000,000
2017	Construct Hangars - East Apron	$0	$0	$750,000	$750,000
TOTAL		**$3,511,642**	**$94,612**	**$4,544,612**	**$8,150,866**

Source: Airport records

Several projects stand out, including the desire to relocate the airport access road, remove the hangars facing Taxiway F, construct new hangars, and construct a replacement terminal building. The need and timeframe for undertaking these capital projects will be analyzed in this master plan. This master plan document will include a revised CIP that may contain many of these projects, as well as any others that emerge from the master planning process.

HISTORIC SOCIOECONOMIC DATA

Socioeconomic information related to the approximate airport service area is an important consideration in the master planning process. Several sources were examined for demographic data, including the U.S. Census Bureau, the Bureau of Business and Economic Research - University of New Mexico, and Woods & Poole Economics. The historic trend in elements such as population, employment, and income provides insight into the long term socioeconomic condition of the region. **Table 1Q** presents the historic population data from the Bureau of Business and Economic Research - University of New Mexico.

The population of Los Alamos County in 2000 was 18,347. In 2010, the population was 17,950, which represents a declining growth rate. As a point of comparison, the State of New Mexico saw a population increase of more than 240,000 people for an annual growth rate of 1.25 percent.

TABLE 1Q Historical Population		
Year	Los Alamos County	State of New Mexico
2000	18,347	1,819,017
2001	17,610	1,831,690
2002	18,060	1,855,309
2003	18,408	1,877,574
2004	18,416	1,903,808
2005	18,407	1,932,274
2006	18,477	1,962,137
2007	18,281	1,990,070
2008	17,924	2,010,662
2009	17,742	2,036,802
2010	17,950	2,059,179
AAGR	-0.22%	1.25%
% Change	-2.16%	13.20%

AAGR: Average annual growth rate
Source: Bureau of Business and Economic Research University of New Mexico

Demographic data available from Woods & Poole Economics, an independent firm specializing in long term demographic projections for U.S. states, counties, and statistical areas, provides comprehensive historical and forecast data. The data is published annually and previous years are updated as necessary. Use of Woods & Poole data for airport planning is specifically approved by the FAA. **Table 1R** presents the historical employment and income for Los Alamos County and the State of New Mexico.

TABLE 1R Historical Employment and Income Data				
Year	Los Alamos County	AAGR	State of New Mexico	AAGR
Employment				
2000	19,695	NA	964,683	NA
2005	21,505	1.77%	1,046,749	1.65%
2010	20,012	-0.72%	1,072,062	0.48%
Income - Per Capita Personal Income ($2005)				
2000	$47,617	NA	$25,342	NA
2005	$57,268	3.76%	$28,876	2.65%
2010	$56,334	-0.33%	$29,979	0.75%

AAGR: Average annual growth rate in 5-year increments
Source: Woods & Poole Economics - Complete Economic Demographic Data Source (CEDDS-2011);

Of particular note is the high level of employment in Los Alamos County as compared to the total population. There are more jobs in the county than there are residents. Clearly, there is a large portion of the employment base that commutes to Los Alamos for work. Also of note is the per capita personal income (PCPI) for the county. In 2010, it is estimated that each resident earned more than $56,000 annually. In the State of New Mexico, the PCPI in 2010 was slightly below $30,000 annually. Los Alamos County has the highest

PCPI in the state and ranks 18th in the country.

DOCUMENT SOURCES

A variety of sources were utilized in the inventory process. These sources include official websites, various studies and publications, personal interviews, and various reference materials. The following is a list of the primary document sources.

Airport/Facility Directory, Southwest, U.S. Department of Transportation, Federal Aviation Administration, National Aeronautical Charting Office, effective October 20, 2011.

Albuquerque Sectional Aeronautical Chart, U.S. Department of Transportation, Federal Aviation Administration, National Aeronautical Charting Office, effective October 20, 2011.

National Plan of Integrated Airport Systems (NPIAS), U.S. Department of Transportation, Federal Aviation Administration, 2011-2015.

U.S. Terminal Procedures, Southwest, U.S. Department of Transportation, Federal Aviation Administration, National Aeronautical Charting Office, effective October 20, 2011.

New Mexico Airport System Plan Update 2009. Prepared by Wilbur Smith Associates.

A number of internet websites were also used to collect information for the inventory chapter. These include the following:

U.S. Census Bureau
http://www.census.gov

U.S. Bureau of Labor Statistics
http://www.bls.gov

Bureau of Economic Analysis, U.S. Department of Commerce
http://www.bea.gov

FAA 5010 Data:
http://www.airnav.com
http://www.gcr1.com/5010Web

Los Alamos County
http://www.losalamosnm.us

Los Alamos National Lab
http://www.lanl.gov

New Mexico Department of Transportation – Aviation Division
http://nmshtd.state.nm.us/main.asp?secid=10871

Chapter Two

FORECASTS

Forecasts

An important factor when planning the future needs of an airport involves a definition of aviation demand that may reasonably be expected to occur in both the near term (five years) and long term (20 years). For a general aviation airport such as Los Alamos Airport (LAM), forecasts of based aircraft and operations (takeoffs and landings) serve as the basis for facility planning.

The Federal Aviation Administration (FAA) has oversight responsibility to review and approve aviation forecasts developed in conjunction with airport planning studies. The FAA reviews such forecasts with the objective of comparing them to the FAA *Terminal Area Forecast* (TAF) and the *National Plan of Integrated Airport Systems* (NPIAS). In addition, aviation activity forecasts are an important input to the benefit-cost analyses associated with some airport development projects.

FAA Order 5090.3C, Field Formulation of the *National Plan of Integrated Airport Systems*, dated December 4, 2004, states that forecasts should be:

- Realistic
- Based on the latest available data
- Reflective of current conditions at the airport
- Supported by information in the study
- Able to provide adequate justification for airport planning and development

The forecast process for an airport master plan consists of a series of basic steps that vary depending upon the issues to be addressed and the level of effort required to develop the forecast. The steps include a review of previous forecasts, determination of data needs, identification of data sources, collection of data, selection of forecast methods, preparation of the forecasts, and evaluation and documentation of the results.

FAA Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*, outlines seven standard steps involved in the forecast process, including:

1) **Identify Aviation Activity Measures**: The level and type of aviation activities likely to impact facility needs. For general aviation, this typically includes based aircraft and operations.

2) **Review Previous Airport Forecasts**: May include the FAA *Terminal Area Forecast*, state or regional system plans, and previous master plans.

3) **Gather Data**: Determine what data are required to prepare the forecasts, identify data sources, and collect historical and forecast data.

4) **Select Forecast Methods**: There are several appropriate methodologies and techniques available, including regression analysis, trend analysis, market share or ratio analysis, exponential smoothing, econometric modeling, comparison with other airports, survey techniques, cohort analysis, choice and distribution models, range projections, and professional judgment.

5) **Apply Forecast Methods and Evaluate Results**: Prepare the actual forecasts and evaluate for reasonableness.

6) **Summarize and Document Results**: Provide supporting text and tables as necessary.

7) **Compare Forecast Results with FAA's TAF**: Follow guidance in FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems*. In part, the Order indicates that forecasts should not vary significantly (more than 10 percent) from the TAF. When there is a greater than 10 percent variance, supporting documentation should be supplied to the FAA.

The aviation demand forecasts are then submitted to the FAA for their approval. Master plan forecasts for operations and based aircraft for general aviation airports are considered to be consistent with the TAF if they meet the following criteria:

Where the 5- or 10-year forecasts exceed 100,000 total annual operations or 100 based aircraft:

a) Forecasts differ by less than 10 percent in the 5-year forecast and 15 percent in the 10-year period, or
b) Forecasts do not affect the timing or scale of an airport project, or
c) Forecasts do not affect the role of the airport as defined in the current version of FAA Order 5090.3C.

Aviation activity can be affected by many influences on the local, regional, and national levels, making it virtually impossible to predict year-to-year fluctuations of activity over 20 years with any certainty. Therefore, it is important to remember that forecasts are to serve only as guidelines, and planning must remain flexible enough to respond to a range of unforeseen developments.

The following forecast analysis for Los Alamos Airport was produced following these basic guidelines. Existing forecasts are examined and compared against current and historic activity. The historical aviation activity is then examined along with other factors and trends that can affect demand. The intent is to provide an updated set of aviation-demand projections for Los Alamos Airport that will permit airport management to make planning adjustments as necessary to maintain a viable, efficient, and cost-effective facility.

SOCIOECONOMIC CHARACTERISTICS

A variety of historical and forecast socioeconomic data has been collected for use in various elements of this master plan. This data provides essential background information for use in determining aviation service level requirements. Aviation forecasts are related to socioeconomic indicators such as population, employment, and income, as well as the economic strength of the region; therefore, it is necessary to have an understanding of the socioeconomic outlook for the airport service area.

As discussed in the previous chapter, the primary service area for the airport is Los Alamos County. An examination of the contact information for owners of based aircraft confirms that the vast majority have a primary mailing address in Los Alamos County. There are 70 based aircraft, 57 of which have a primary mailing address in Los Alamos County (81 percent). Eleven of the remaining 13 based aircraft are registered in New Mexico, and two have an address that is out of state.

When preparing aviation forecasts, it is helpful to utilize the most recent consistent and comprehensive socioeconomic data. Woods & Poole publishes socioeconomic data annually, and they update the previous several years as necessary. They also provide both historical and forecast data, including yearly data through 2040. The most recent population forecasts from the Bureau of Business and Economic Research – University of New Mexico is from 2008, making it somewhat more dated than the Woods & Poole Economics data. Therefore, forecast socioeconomic data is sourced from Woods & Poole Economics. **Table 2A** presents historical and forecast data for population, employment, and income for Los Alamos County and New Mexico. This data will be utilized in forecasting analyses later in the chapter.

TABLE 2A
Demographic Trends and Forecast

	HISTORIC		FORECAST			
	2000	**2010**	**2017**	**2022**	**2032**	**AAGR 2010-2032**
Los Alamos County						
Population	18,343	17,950	19,379	20,201	21,835	0.89%
Employment	19,695	20,012	24,257	27,609	35,763	2.67%
Income (PCPI)	$47,617	$56,334	$60,145	$63,021	$69,216	0.94%
New Mexico						
Population	1,819,046	2,059,179	2,263,683	2,425,803	2,756,107	1.33%
Employment	964,683	1,072,062	1,204,998	1,295,953	1,495,851	1.53%
Income (PCPI)	$25,342	$29,979	$32,444	$34,670	$39,989	1.32%
United States						
Income (PCPI)	$33,770	$35,336	$38,478	$40,958	$46,713	1.28%

AAGR: Average annual growth rate
PCPI - Per Capita Personal Income ($2005)

Source: Woods & Poole Economics - Complete Economic Demographic Data Source (CEDDS-2011); Historical population from the Bureau of Business and Economic Research – University of New Mexico.

AVIATION TRENDS

The forecasts developed for the airport must also consider national, regional, and local aviation trends. The following section describes the trends in aviation. This information is utilized both in statistical analysis and to aid the forecast preparer in making any manual adjustments to the forecasts as necessary.

NATIONAL TRENDS

Each year, the FAA publishes its national aviation forecast. Included in this publication are forecasts for large air carriers, regional air carriers, general aviation, and FAA workload measures. The forecasts are prepared to meet budgeting and planning needs of the constituent units of the FAA and to provide information that can be used by state and local authorities, the aviation industry, and the general public. The current edition, FAA *Aerospace Forecasts - Fiscal Years 2011-2031*, has been utilized in the generation of the aviation demand forecasts to follow. Aviation trends tend to closely follow the state of the economy.

Over the past decade, the aviation industry has experienced a series of setbacks. Following the devastating impact of the terrorist attacks of September 11, 2001, the industry rebounded for a time, only to then experience a spike in oil and fuel prices in 2004-2005. In late 2007, the country entered the most significant economic recession since the Great Depression of the 1930s. The recovery from the recession has been slow to date. Nonetheless, the FAA has "cautious optimism that the industry has transformed from one of a boom-to-bust cycle to one of sustainable profits."

The current and forecast state of the U.S. and World economies contribute to the FAA forecasts. Officially, the recession ended in the third quarter of 2009 and each quarter since has shown growth in Gross Domestic Product (GDP). In 2010, GDP grew by 4.2 percent after declining by 2.5 percent in 2009. From 2012 through 2016, GDP is forecast at 3.0 percent annually. In the subsequent years, annual GDP is forecast at 2.7 percent annually.

GENERAL AVIATION TRENDS

The passage of the *General Aviation Revitalization Act of 1994* (Act) (federal legislation which limits the liability on general aviation aircraft to 18 years from the date of manufacture) successfully infused new life into the general aviation industry after many years of decline. This legislation sparked an interest to renew the manufacturing of general aviation aircraft due to the reduction in product liability, as well as renewed optimism for the industry. After the passage of this legislation, annual shipments of new aircraft rose every year between 1994 and 2000. The industry then stagnated in the aftermath of 9/11, but recovered to new production highs from 2005 through 2007.

The economic recession beginning in late 2007 has had a negative impact on general aviation aircraft production, and the industry has been slow to recover. Aircraft manufacturing declined for three straight years from 2008 through 2010. Since 2008, manufacturing is down more than 61 percent. General aviation billings were down 21 percent from 2008 to 2009, but showed growth in 2010. **Table 2B** presents historical data related to aircraft shipments.

TABLE 2B
Annual General Aviation Airplane Shipments
Manufactured Worldwide and Factory Net Billings

Year	Total	SEP	MEP	TP	J	Net Billings ($millions)
1994	1,132	544	77	233	278	3,749
1995	1,251	605	61	285	300	4,294
1996	1,437	731	70	320	316	4,936
1997	1,840	1043	80	279	438	7,170
1998	2,457	1508	98	336	515	8,604
1999	2,808	1689	112	340	667	11,560
2000	3,147	1,877	103	415	752	13,496
2001	2,998	1,645	147	422	784	13,868
2002	2,677	1,591	130	280	676	11,778
2003	2,686	1,825	71	272	518	9,998
2004	2,961	1,999	52	319	591	11,918
2005	3,590	2,326	139	375	750	15,156
2006	4,053	2,513	242	412	886	18,815
2007	4,270	2,417	258	459	1,136	21,826
2008	3,967	1,943	176	535	1,313	24,766
2009	2,274	893	70	441	870	19,465
2010	2,015	781	108	363	763	19,705

SEP - Single Engine Piston; MEP - Multi-Engine Piston; TP - Turboprop; J - Turbofan/Turbojet
Source: General Aviation Manufacturers Association 2011 Statbook

Worldwide shipments of general aviation airplanes fell for the second year in a row in 2010. A total of 2,015 units were delivered around the globe, as compared to 2,274 units in 2009, an 11.4 percent decline. Worldwide general aviation billings, nevertheless, rose by 1.2 percent in 2010 to $19.7 billion. This increase in billings, as compared to the reduction in shipments, is in large part due to deliveries of large-cabin, long-range aircraft remaining relatively stable during the recession and their delivery rates increasing in 2010.

Business Jets: The business jet sector declined for the second year in a row. Manufacturers shipped 763 units, as compared to 870 jets in 2009. This is a 12.3 percent decline. Light business jets were impacted most, due in part to higher dependence on third-party financing, which became more difficult to secure in the economic downturn. This segment of business jets typically has more exposure to the fractional market.

Turboprops: There were 363 turboprop airplane deliveries in 2010, a 17.7 percent decline from 441 units shipped in 2009. The total value of turboprop deliveries in 2010 was $1.3 billion.

Pistons: In years past, the piston market has reacted positively to an improving economy ahead of the other two sectors. It is too early to determine if this will hold true for the current economic downturn, but the piston segment continued to suffer in 2010. Shipments totaled 889 units, a 7.7 percent decrease from 963 units in 2009.

Throughout the first decade of the 2000s, many capable general aviation airports have seen an upward trend in activity by business jets. There are numerous factors that have led to this trend, including the growth of fractional aircraft ownership and a desire by frequent travelers to save time by avoiding commercial service airports. **Table 2C** presents growth trends in fractional aircraft ownership.

TABLE 2C
Fractional Shares and Number of Aircraft in Use

Year	Number of Shares	Number of Aircraft
1986	3	NA
1987	5	NA
1988	26	NA
1989	51	NA
1990	57	NA
1991	71	NA
1992	84	NA
1993	110	NA
1994	158	NA
1995	285	NA
1996	548	NA
1997	957	NA
1998	1,551	NA
1999	2,607	NA
2000	2,810	574
2001	3,601	689
2002	4,244	780
2003	4,516	826
2004	4,765	870
2005	4,828	945
2006	4,863	984
2007	5,168	1,030
2008	5,179	1,094
2009	4,881	1,037
2010	4,862	1,027

Source: GAMA/JETNET LLC

As with most sectors of general aviation, there was a decline in the number of fractional shares and fractional aircraft in operation in 2010. At the same time, the table gives evidence that the concept of fractional ownership is popular and is likely to continue to grow as the economy improves.

Most industry observers believe that the general aviation market, particularly the business aviation market, is in a position for sustained growth. Industry net orders are back to positive and most leading indicators continue to improve. According to *Bombardiers Market Forecast 2010-2011*, "All long-term market fundamentals remain positive: business jet utilization, backlogs, the pre-owned aircraft market, new aircraft programs, fractional and branded charter demand, business jet penetration in Growth Markets, and aircraft retirements." The business jet market should experience strong growth over the 2011-2030 time periods with 24,000 total deliveries worth $626 billion in revenues. The worldwide business jet fleet is expected to grow from 14,700 in 2010 to 30,900 by 2030, net of retirements. The large jet category of the market is expected to expand faster than the other categories.

FAA GENERAL AVIATION FORECASTS

Each year, the FAA updates and publishes a national aviation forecast. Included in this publication are forecasts for the large air carriers, regional/commuter air carriers, general aviation, and FAA workload measures. The forecasts are prepared to meet budget and planning needs of the constituent units of the FAA and to provide information that can be used by state and local authorities, the aviation industry, and the general public. The current edition when this chapter was prepared was FAA *Aerospace Forecasts-Fiscal Years 2011-2031*, published in March 2011. The FAA primarily uses the economic performance of the United States as an indicator of future aviation industry growth. Similar economic analyses are applied to the outlook for aviation growth in international markets

The FAA forecasts the active fleet mix and hours flown for single-engine piston aircraft, multi-engine piston, turboprops, business jets, piston and turbine helicopters, light sport, experimental, and others (gliders and balloons). The FAA forecasts "active aircraft," not total aircraft. An active aircraft is one that is flown at least one hour during the year. **Exhibit 2A** presents the historical and forecast figures of U.S. active general aviation aircraft.

After growing rapidly for most of the decade, the demand for business jet aircraft has slowed over the past two years as the industry has been hard hit by the economic recession. Nonetheless, the FAA forecast calls for robust growth in the long-term, driven by higher corporate profits and continued concerns about safety, security, and flight delays. Overall, business aviation is projected to outpace personal/recreational use.

The total active general aviation fleet is projected to increase at an average annual rate of 0.9 percent over the FAA forecast period, growing from 224,172 in 2009 to 270,920 in 2031.

ACTIVE AIRCRAFT FLEET MIX

The FAA forecasts the general aviation active fleet for piston-powered aircraft, turboprops, business jets, helicopters, light sport aircraft, and others (experimental, gliders, and lighter than air). An active aircraft is one that is flown at least one hour during the year. The FAA primarily uses estimates from the General Aviation and Part 135 Activity Survey (GA Survey) as baseline figures upon which assumed growth rates are applied. The results of the annual survey are not published until the following year; therefore, 2009 is the most recent statistical year, with 2010 showing only estimates.

Piston-Powered Fixed-Wing Aircraft

Single engine piston-powered aircraft are forecast to show a modest growth of 0.3 percent annually from 2010-2031. The total single engine piston fleet in 2010 was 139,818 and is forecast to grow to 147,960 by 2031.

Multi-engine piston-powered aircraft has been experiencing a continuous decline in total numbers for more than a decade. In 2000, there were 21,091 multi-engine piston-powered aircraft. By 2010, it is estimated there were 16,322. This trend is forecast to continue to 13,590 aircraft in 2031. This equates to an annual decline of 0.9 percent.

The combined total of single and multi-engine piston fixed-wing aircraft is forecast to grow from 156,140 in 2010 to 161,550 in 2031, an annual growth rate of 0.2 percent.

Turboprops

Turboprop aircraft have been showing steady historical growth. From 2000 to 2010, the turboprop fleet increased from 5,762 to 9,225, an average annual growth rate of 4.8 percent. By 2031, 12,280 turboprops are forecast for an average annual growth rate from 2010 through 2031 of 1.4 percent.

Business Jets

The use of business jets has led the growth in the general aviation industry. In 2000, there were just over 7,000 business jets in the fleet. In 2010, it is estimated that there were 11,568 business jets, for an annual growth rate of 5.2 percent. As shown previously, fractional ownership programs became very popular during this period. Corporate safety/security concerns, combined with increasing flight delays at some U.S. airports, have made these programs practical alternatives to commercial travel. In addition, new product offerings, the addition of very light jets, and increasing foreign demand has also contributed to this growth. By 2031, the FAA forecasts there will be 27,395 business jets in the fleet. This represents an annual growth rate of 4.2 percent from 2010 through 2031.

With the advent of relatively inexpensive very light jets (VLJs), many questions have arisen as to the future impact they may have. Several years ago, it was thought that the lower acquisition and operating costs could revolutionize the business jet market, particularly by being able to sustain a true on-demand air-taxi service. While initial FAA forecasts called for over 400 VLJs to be delivered annually, events such as the recession and eventual bankruptcy of Eclipse and DayJet have led to lower expectations. New entries such as the Embraer Phenom 100 have stabilized the VLJ market, but the continuing recession has led the FAA to forecast 216 new VLJs annually for the balance of the forecast; these are included within the total business jet fleet.

Light Sport Aircraft

Starting in 2005, a new category of aircraft was created: "light sport" aircraft. At the end of 2010, a total of 6,996 light sport aircraft were estimated to be in this category. By 2030, a total of 13,870 light sport aircraft are projected to be in the fleet. The average annual growth from 2010 through 2031 is forecast at 3.3 percent for this category.

Helicopters

Helicopter usage has seen growth over the last 10 years. This category includes both piston-powered and turbine helicopters, with the turbine representing more than 62 percent of the fleet. In 2000, the fleet consisted of 7,150 helicopters. By 2010, it is estimated there were 10,165 helicopters, representing an average annual growth rate of 3.6 percent. This growth trend is forecast to continue with an average annual growth rate from 2010-2031 of 2.6 percent, bringing the total helicopter fleet to 17,410.

Experimental Aircraft

Experimental aircraft include homebuilt planes, vintage aircraft, vintage military aircraft, ultralights, and aerobatic planes, to name a few. In 2000, the FAA estimated there were 20,407 experimental aircraft and by 2010, there were 24,591 aircraft. This represents an annual growth rate of 1.9 percent. Continued growth is forecast in this category at 1.4 percent annually through 2031, with a total of 33,010 experimental aircraft.

General Aviation Fleet Summary

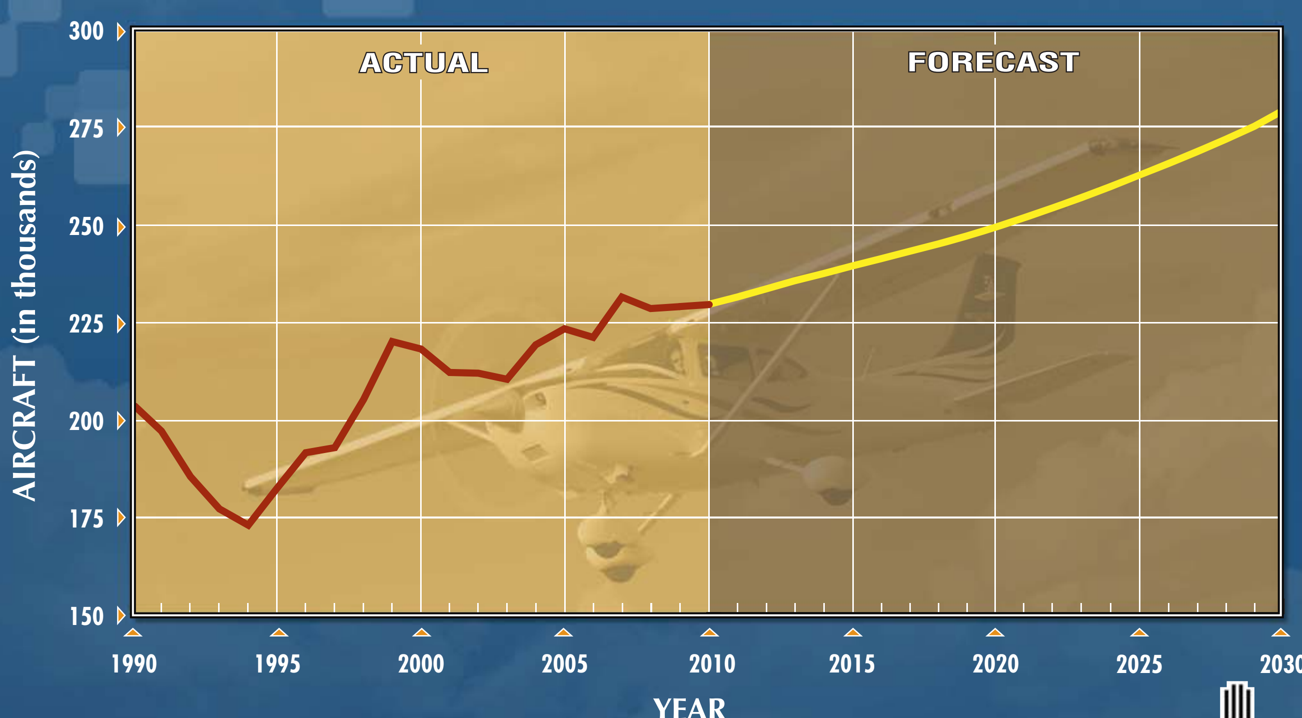
In 2010, the general aviation fleet consisted of 159,720 piston-powered aircraft, including piston helicopters. In the short term, piston aircraft are forecast to decline in numbers until 2019, when a modest growth trend is forecast to begin. Overall, through the 21-year FAA forecast, piston-powered aircraft are forecast to grow 0.2 percent annually, bringing the total number to 168,140 by 2031.

11MP08-2A-1/11/12

U.S. ACTIVE GENERAL AVIATION AIRCRAFT

(in thousands)

	2010	2016	2021	2026	2031
FIXED WING					
PISTON					
Single Engine	139.8	136.5	137.3	141.2	147.7
Multi-Engine	16.3	15.5	14.8	14.2	13.6
TURBINE					
Turboprop	9.2	10.0	10.7	11.4	12.3
Turbojet	11.7	14.7	18.2	22.4	27.4
ROTORCRAFT					
Piston	3.6	4.3	5.0	5.8	6.6
Turbine	6.6	7.6	8.6	9.7	10.8
EXPERIMENTAL	24.6	27.2	29.1	31.1	33.0
SPORT AIRCRAFT	7.0	9.4	10.9	12.4	13.9
OTHER	5.5	5.5	5.4	5.4	5.4
TOTAL	224.2	230.7	240.4	253.5	270.9



Source: FAA Aerospace Forecasts, Fiscal Years 2011-2031.

Notes: An active aircraft is one that has a current registration and was flown at least one hour during the calendar year.

Exhibit 2A
U.S. ACTIVE GENERAL AVIATION
AIRCRAFT FORECASTS

Turbine aircraft, including turbine helicopters, have been the stalwart category and are forecast to continue to grow from 27,378 in 2010 to 50,495 in 2031. This represents an average annual growth rate of 3.0 percent. While this growth rate is substantial, it does lag slightly behind the growth rate of 4.7 percent experienced from 2000-2010.

Overall, the FAA is forecasting the next few years will be ones of slow or stagnant growth while the economy struggles to recover from the recession. Ultimately, the FAA is forecasting a return to a consistent growth pattern for general aviation aircraft.

OPERATIONS

The FAA forecasts operations for air carriers, air taxi/commuter, general aviation, and military. FAA forecasts of general aviation operations (takeoffs and landings) are categorized as local and itinerant, with local operations being those within the traffic pattern airspace of an airport, and itinerant being those by aircraft with a destination away from the airport. General aviation activity at FAA air traffic facilities (including FAA contract towers) has been consistently on the decline across all categories since 2000.
In 2010, there were 14.86 million itinerant general aviation operations. This represented an average annual decline of 4.2 percent since 2000, when there were 22.84 million itinerant operations. Growth is forecast to return in 2011, and by 2031, 18.39 million itinerant operations are forecast. This is an average annual growth rate of 1.0 percent from 2010 through 2031.

Local operations have followed a similar trend, declining by 4.2 percent annually from 2000-2010. Growth is forecast to return in 2011, and through 2031 the annual growth rate is forecast at 1.0 percent. In 2000, there were 22.84 million local operations, and by 2031, it is forecast there will be 18.39 million operations.

Air taxi operations have also seen a decline from 2000, when there were 10.76 million operations. In 2010, this figure was estimated at 9.41 million. The number of air taxi operations is forecast to reverse trend in 2011, exceeding year 2000 levels in 2018 and ultimately reaching 13.25 million in 2031 for an overall annual growth rate of 1.6 percent.

AVIATION FORECAST METHODOLOGY

The development of aviation forecasts proceeds through both analytical and judgmental processes. A series of mathematical relationships is tested to establish statistical logic and rationale for projected growth. However, the judgment of the forecast analyst, based upon professional experience, knowledge of the aviation industry, and assessment of the local situation, is important in the final determination of the preferred forecast.

Beyond five years, the predictive reliability of the forecasts can diminish. Therefore, it is prudent for the airport to update the forecasts, reassess the assumptions originally made, and revise the forecasts based on the current airport and industry conditions. Facility and financial planning usually require at least a 10-year planning window, since it often takes several years to complete a major facility development program. However, it is important to use forecasts which do not overestimate revenue-generating capabilities or under-state demand for facilities needed to meet public (user) needs.

A wide range of factors are known to influence the aviation industry and can have significant impacts on the extent and nature of activity occurring in both the local and national markets. Technological advances in aviation have historically altered and will continue to change the growth rates in aviation demand over time. A recent example is the substantial growth in the production and delivery of business jet aircraft, which resulted in a growth rate that far exceeded expectations. Such changes are difficult to predict, but over time reasonable growth trends can be identified. Using a broad spectrum of demographic, economic, and industry data, forecasts for Los Alamos Airport have been developed. Several standard statistical methods have been employed to generate various projections of aviation demand.

Trend series projections are probably the simplest and most familiar of the forecasting techniques. By fitting growth curves to historical demand data and then extending them into the future, a basic trend line projection is produced. A basic assumption of this technique is that outside factors will continue to affect aviation demand in much the same manner as in the past. As broad as this assumption may be, the trend line projection does serve as a reliable benchmark for comparing other projections.

Correlation analysis provides a measure of a direct relationship between two separate sets of historic data. Should there be a reasonable correlation between the data, further evaluation using regression analysis may be employed.

Regression analysis measures the statistical relationship between dependent and independent variables, yielding a "correlation coefficient." The correlation coefficient (Pearson's "r") measures the association between changes in a dependent variable and independent variable(s). If the r-squared (r^2) value (coefficient determination) is greater than 0.90, it indicates good predictive reliability. A value below 0.90 may be used with the understanding that the predictive reliability is lower.

Historical growth analysis is a simple forecasting method in which the historical average annual growth rate is identified and then extended out to forecast years. This analysis method assumes that factors that impacted growth in the past will continue into the future.

Market share analysis involves a historical review of airport activity as a percentage, or share, of a larger regional, state, or national aviation market. A historical market share trend is determined providing an expected market share for the future. These shares are then multiplied by the forecasts of the larger geographical area to produce a market share projection. This method has the same limitations as trend line projections, but can provide a useful check on the validity of other forecasting techniques.

Utilizing these statistical methods, available existing forecasts, and analyst expertise, forecasts of aviation demand for Los Alamos Airport have been developed. The remainder of this chapter presents the aviation demand forecasts and includes activity in two broad categories: based aircraft and annual operations.

COMMERCIAL AVIATION FORECASTS

Los Alamos Airport has at times had some level of commuter airline service. From 1948 to 1970, Carco Air Service provided passenger service and Ross Aviation continued service from 1970 to 1996. Since 2000, there has been no formal commuter airline service at the airport. Historical documentation of passenger activity is inconsistent. FAA documentation shows that the airport had measurable enplanements, or passengers boarding, throughout the 1980s to the mid-1990s. In 1995, the FAA shows 7,080 enplanements at Los Alamos Airport. Currently, airport management is actively pursuing the possibility of renewed commuter airline service. The following section presents forecasts of future commuter airline operations and enplanements.

Airports providing commercial passenger service must comply with the regulations contained in Title 14, Code of Federal Regulations (CFR) Part 139. CFR Part 139 does not apply to airports served by scheduled air carrier aircraft with nine seats or less and/or unscheduled air carrier aircraft with 30 seats or less. **Appendix B** presents a summary of the major requirements for an airport to obtain and maintain an Airport Operating Certificate (AOC) under CFR Part 139.

Los Alamos Airport had an AOC as recently as the year 1996 but it was allowed to lapse since there was no commercial service. Existing constraints at the airport may make obtaining a new AOC challenging, potentially requiring several waivers. Therefore, short term commuter activity forecasts are undertaken with the assumption that only commuter aircraft with nine or fewer seats would operate. The long term will consider the potential for the airport to obtain an AOC, thus permitting scheduled commuter aircraft with more than nine passenger seats.

The primary driver of passenger enplanements would be employees of LANL. Airport management contacted LANL and obtained generalized travel information from two primary sources. The first source is data from Rio Grande Travel, which is an outside travel agency that LANL uses. Rio Grande Travel provides travel arrangements for those airlines that issue tickets through agencies (i.e. legacy carriers). The second source is the LANL travel office, which provided figures of flights for LANL employees utilizing discount carriers that do not issue tickets through travel agencies. In this case, the LANL travel office provided figures for LANL employees utilizing Southwest Airlines, the primary discount carrier operating out of Albuquerque. A third generator of airline activity is LANL personnel who book flights on their own. There is no current data regarding these LANL generated passengers.

For a 12-month period between 2009 and 2010, LANL indicated their personnel represented 21,844 airline passengers. Of this total, 6,480 (29.7 percent) were booked on "legacy carriers" through Rio Grande Travel. The remaining 15,364 (70.3 percent) passengers utilized a discount carrier, primarily Southwest Airlines.

Current planning for commuter service at Los Alamos Airport considers developing a schedule that will take advantage of the flight schedules out of Albuquerque International Sunport. Of particular interest is providing connections for flights to Washington, D.C. It is estimated that 18 percent of the LANL generated airline passengers had a final destination in the

Washington D.C. area. To maximize the flight connections in Albuquerque, airport management is considering nine daily round trip flights to Albuquerque, Monday through Friday, and three daily round trips on Saturdays and Sundays. This activity potential is considered within the first five years of the initiation of service. At the beginning there may be fewer flights, but as travelers become aware of the service more flights would be made available.

Airport management is also working to secure direct flights to Denver International Airport. This service would allow for a single connection point to most final destinations for passengers originating in Los Alamos. A larger aircraft with a longer range would be necessary, such as the 19-seat Beech 1900 or the 34-seat Saab 340B. Planning for this additional service is considered as a longer term proposition.

Planning for commuter or air carrier service that does not currently exist can be challenging because of the numerous variables that can come into play. A forecast that is overly aggressive can lead to excessive expenditures on facilities and a forecast that is too conservative can lead to inadequate facilities. **Table 2D** presents a summary of the planning milestones for commuter operations and enplanements, which will be used to determine various airport facility needs.

TABLE 2D
Commuter Operations and Enplanements
Los Alamos Airport

	Operations	Enplanements
Short (years 1-5)	5,300	21,000
Intermediate (years 6-10)	5,300	24,000
Long (years 11-20)	8,200	36,000

GENERAL AVIATION FORECASTS

Several aviation demand indicators must be forecast to determine the future needs of the airport. As a general aviation airport, the most important demand indicators are based aircraft and operations. The following sections will present forecasts of these and other demand indicators following guidelines from the FAA and accepted statistical methods. It should be noted that for many of the demand indicators, several forecasting methods are utilized in order to create a planning envelope. From there, a single forecast is selected based on the reliability of the statistical method employed and upon the judgment of the forecast analyst.

HISTORICAL AIRCRAFT OWNERSHIP

The number of based aircraft is the most basic indicator of general aviation demand. One method of forecasting based aircraft for an airport is to first examine historical local aircraft ownership, or aircraft registrations in the airport's service area. Since the primary airport service area is Los Alamos County, an examination of registered aircraft in the county has been undertaken.

Any serviceable aircraft is required to be registered with the FAA, and an N-number is assigned. The FAA maintains a database of registered aircraft which includes the resident location by county for each certificated aircraft in the United

States. An initial analysis of the history of registered aircraft in Los Alamos County was conducted to obtain an understanding of local aviation ownership trends. **Table 2E** presents the history of registered aircraft in Los Alamos County.

TABLE 2E
Registered Aircraft Fleet Mix in Los Alamos County, NM

Year	Single Engine Piston	Multi-Engine Piston	Jet	Turboprop	Helicopter	Other	Total
1994	59	3	-	-	-	4	66
1995	57	3	-	-	-	5	65
1996	59	4	-	-	-	4	67
1997	64	5	-	-	-	4	73
1998	62	5	-	-	-	3	70
1999	63	5	-	-	-	6	74
2000	60	4	-	-	-	6	70
2001	57	4	-	-	-	10	71
2002	58	4	-	-	-	10	72
2003	66	2	-	2	-	11	81
2004	69	2	-	3	-	9	83
2005	71	2	-	3	-	9	85
2006	66	1	-	-	-	16	83
2007	64	1	1	-	-	15	81
2008	67	1	-	-	1	11	80
2009	66	1	-	-	1	10	78
2010	62	2	-	-	1	11	76
2011	66	2	1	-	-	10	79
Average Annual Growth Rate from 1994 to 2011:							1.06%

Note: "Other" includes gliders and balloons.
Source: FAA Aircraft Registry Database; FAA Census of U.S. Civil Aircraft

Los Alamos County has realized an increase in registered aircraft from 66 in 1994 to 79 in 2011. This represents an average annual growth rate of 1.06 percent. Single engine piston-powered aircraft represent approximately 85 percent of the registered aircraft. As of 2011, there were two multi-engine piston and one jet aircraft registered. The remaining registrations for 2011 were represented by balloons, gliders, and experimental aircraft.

REGISTERED AIRCRAFT FORECASTS

Now that the history of aircraft ownership in Los Alamos County has been established, projections of future ownership, as defined by registered aircraft, can be made. A multitude of statistical methods has been employed to forecast registered aircraft growth.

Regression Analysis

Two regression techniques were utilized to develop forecasts of registered aircraft. These include a simple time-series analysis, as well as regression analyses comparing historical registered aircraft with various socioeconomic factors. The results of these methods are presented in **Table 2F**.

The first statistical measure presented is the time-series analysis. A time-series is a sequence of data points measured at successive times spaced at uniform time intervals. Time-series forecasting is the use of a statistical model to forecast future events based on known past events: to predict data points before they are measured. The time-series presented in the table considers the yearly aircraft registrations for Los Alamos County from 1994 to 2011. The plotted line is then continued into the future; in this case, to the year 2032. This analysis results in registered aircraft increasing from 79 in 2011 to 89 in 2017, 93 in 2022, and 102 in 2032.

TABLE 2F
Los Alamos County Analytical Analysis
Time-Series and Regression

		FORECAST		
	r^2	2017	2022	2032
TIME-SERIES				
Year – Time-Series	0.603	89	93	102
REGRESSION VARIABLES				
Year, Active Aircraft, Pop., Emp., PCPI	0.893	95	107	137
Active Aircraft, Pop., Emp., PCPI	0.892	96	111	144
Year, Active Aircraft, Pop., PCPI	0.890	91	100	121
Year, Active Aircraft, Pop., Emp.	0.887	100	118	160
Year, Pop., Emp., PCPI	0.879	99	115	153
Year, Pop., Emp.	0.877	102	120	163
Active Aircraft, Pop., PCPI	0.876	93	104	126
Pop., Emp., PCPI	0.876	96	109	139
Active Aircraft, Pop., Emp.,	0.874	98	116	159
Year, Active Aircraft, Emp., PCPI	0.873	101	121	167
Year, Active Aircraft, Emp.	0.870	98	114	154
Year, Emp., PCPI	0.870	103	122	169
Year, Emp.	0.867	99	116	157
Year, Pop., PCPI	0.865	92	101	119
Active Aircraft, Emp., PCPI	0.863	96	111	148
Pop., PCPI	0.861	93	103	122
Active Aircraft, Emp.	0.861	97	113	154
Emp., PCPI	0.852	95	110	144
Sub-Total Average	**0.874**	**97**	**112**	**146**
Pop., Emp.	0.821	99	119	166
Emp.	0.821	100	119	167
Year, Active Aircraft, PCPI	0.777	82	84	89
Year, PCPI	0.767	83	85	90
Year, Active Aircraft, Pop.	0.762	95	106	132
Active Aircraft, PCPI	0.762	84	87	94
PCPI	0.758	85	87	93
Active Aircraft, Pop.	0.718	90	101	126
Year, Pop.	0.694	97	108	131
Year, Active Aircraft	0.645	86	90	100
Active Aircraft	0.602	81	84	94
Pop.	0.003	76	77	79
Total Average	**0.789**	**93**	**105**	**132**

PCPI: Per Capita Personal Income ($2005)
Source: Coffman Associates Analysis

A measure of the statistical reliability of the forecast is Pearson's "r." When r^2 equals 0.90 or higher, the statistical reliability is considered high. The time-series projection results in an r^2 value of 0.60, indicating the statistical reliability is limited.

Next, a series of single and multiple variable correlation analyses were run to examine the relationship between historic registered aircraft and up to four independent variables. The independent variables considered were U.S. active general aviation aircraft, population, employment and income (as measured by per capita personal income). All of the regression analyses resulted in an r^2 value below 0.90, although 18 of 30 regressions had r^2 values above 0.85. The average of the 18 regressions is shown in the table along with the overall average of all regressions and the time-series analysis. While the r^2 value of the average is slightly lower than desired (r^2=0.874), for statistical reliability the result will serve as one of several inputs into the formula to arrive at a long term registered aircraft forecast. The registered aircraft forecast utilizing various independent variables results in 97 registered aircraft in 2017, 112 in 2022, and 146 in 2032. This represents the high end of the planning envelope.

Historical Growth Projection

From 2000 to 2011, registered aircraft in the county grew from 70 to 79, for an average annual growth rate of 1.06 percent. The high year for registrations was 2005, with 85 aircraft registered in the county. By extrapolating the overall annual growth rate through 2032, a forecast can be made. The result is 84 registered aircraft in 2017, 89 in 2022, and 99 in 2032.

Market Share Projections

Two market share projections have been developed: one that compares historical population to registered aircraft, and one that compares the U.S. active general aviation aircraft fleet to historical registered aircraft. Utilizing population, two forecasts were developed. The first considers the ratio of registered aircraft to every 1,000 people in the county. As of 2011, there were 4.2942 aircraft per 1,000 people. By maintaining this ratio as a constant, in 2032, 94 registered aircraft are forecast, as shown in **Exhibit 2B**. (The exhibit also shows the other forecasting methods utilized.)

Typically, the ratio of population to U.S. active aircraft declines as population increases, meaning there is not typically a one-to-one correlation between population growth and registered aircraft. Los Alamos County has seen an increase in this ratio, realizing an increase in the number of registered aircraft as a share of the population.

The next market share forecast utilizing population and registered aircraft considers an increasing market share scenario, one that is more reflective of the historical trend. From 2000 to 2011, the ratio increased from 3.8162 to 4.2942 registered aircraft per 1,000 people. By extrapolating the difference through 2032, a forecast is developed. This results in a 2032 forecast of 114 registered aircraft in Los Alamos County.

The second set of market share forecasts considers the relationship between historic registered aircraft in the county and the U.S. active general aviation fleet. The first considers the county maintaining a constant market share (0.352 percent) of U.S. active aircraft. This forecast results in 96 registered aircraft by 2032.

The second forecast utilizing U.S. active aircraft considers an increasing share. In 2000, the county represented 0.322 percent of the U.S. active general aviation fleet. By 2011, this ratio had increased to 0.352 percent. Once again, the increase in market share from 2000 to 2011 was extrapolated out to the long term planning year of 2032. This results in a 2032 forecast of 112 registered aircraft.

Selected Registered Aircraft Forecast

The forecasts of registered aircraft presented consider the major factors that can influence aircraft ownership in Los Alamos County. Local socioeconomic measures such as population, employment, and income have also been considered. Additional population measures are analyzed in the market share forecasts. Historical growth trends have also been considered, and national aircraft ownership is also considered based on the FAA forecasts.

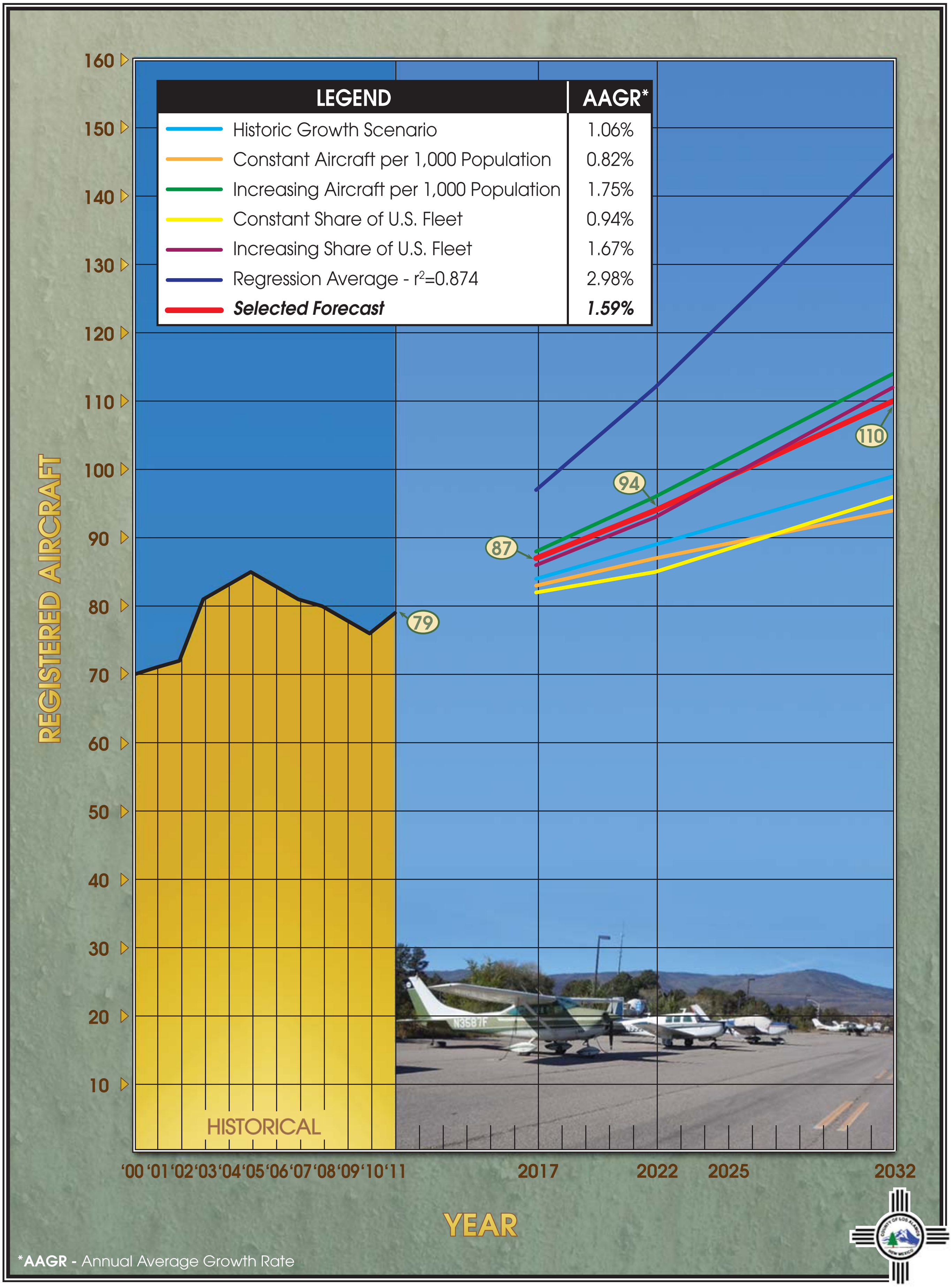
The six different forecasts of registered aircraft present a reasonable planning envelope. There does not appear to be any obvious outliers in the results. The selected forecast represents an average of the six different forecasts generated for this analysis. By 2017, it is forecast there will be 87 registered aircraft in the county. In 2022, there are 94 registered aircraft forecast, and by 2032, it is forecast that there will be 110 registered aircraft. With an established registered aircraft forecast, a forecast of future based aircraft at Los Alamos Airport can be made. **Table 2G** presents the registered aircraft forecasts in tabular format, and **Exhibit 2B** reflects a graphic presentation of registered aircraft forecasts.

TABLE 2G
Los Alamos County Registered Aircraft Forecast

Year	County Registrations[1]	U.S. Active Aircraft[2]	Percent of U.S. Active Aircraft	County Population[3]	Aircraft Per 1,000 Population
2000	70	217533	0.0322%	18,343	3.8162
2001	71	211,446	0.0336%	17,661	4.0202
2002	72	211,244	0.0341%	18,148	3.9674
2003	81	209,606	0.0386%	18,524	4.3727
2004	83	219,319	0.0378%	18,573	4.4689
2005	85	224,350	0.0379%	18,594	4.5714
2006	83	221,939	0.0374%	18,703	4.4378
2007	81	231,606	0.0350%	18,546	4.3675
2008	80	228,668	0.0350%	18,240	4.3860
2009	78	223,920	0.0348%	18,074	4.3156
2010	76	224,172	0.0339%	17,950	4.2340
2011	79	224,475	0.0352%	18,397	4.2942
Historic Growth Scenario 1994-2010 (AAGR = 1.06%)					
2017	84	232,205	0.0363%	19,379	4.3436
2022	89	242,425	0.0366%	20,201	4.3932
2032	99	273,375	0.0361%	21,835	4.5178
Constant Aircraft Per 1,000 Population (AAGR= 0.82%)					
2017	83	232,205	0.0358%	19,379	4.2942
2022	87	242,425	0.0358%	20,201	4.2942
2032	94	273,375	0.0343%	21,835	4.2942
Increasing Aircraft Per 1,000 Population (AAGR = 1.75%)					
2017	88	232,205	0.0380%	19,379	4.5549
2022	96	242,425	0.0398%	20,201	4.7722
2032	114	273,375	0.0416%	21,835	5.2067
Constant Share of U.S. Fleet (AAGR = 0.94%)					
2017	82	232,205	0.0352%	19,379	4.2170
2022	85	242,425	0.0352%	20,201	4.2234
2032	96	273,375	0.0352%	21,835	4.4062
Increasing Share of U.S. Fleet (AAGR = 1.67%)					
2017	86	232,205	0.0368%	19,379	4.4140
2022	93	242,425	0.0382%	20,201	4.5851
2032	112	273,375	0.0409%	21,835	5.1267
Regression Average - r^2=0.874 (AAGR = 2.98%)					
2017	97	232,205	0.0417%	19,379	5.0020
2022	112	242,425	0.0461%	20,201	5.5312
2032	146	273,375	0.0535%	21,835	6.6993
Selected Forecast - Average (AAGR = 1.26%)					
2017	87	232,205	0.0373%	19,379	4.4709
2022	94	242,425	0.0386%	20,201	4.6332
2032	110	273,375	0.0403%	21,835	5.0418

[1]FAA Aircraft Registration Database
[2]FAA Aerospace Forecasts Fiscal Years 2011-2031
[3]Woods & Poole Economics 2011; U.S. Census Bureau for 2000 and 2010.

Source: Coffman Associates analysis.



Source: Coffman Associates Analysis

Exhibit 2B
REGISTERED AIRCRAFT FORECAST

BASED AIRCRAFT FORECAST

The based aircraft forecast for Los Alamos Airport is a function of the registered aircraft forecast completed in the previous section. In the registered aircraft forecast, socioeconomic elements such as population, employment, income, and national aircraft forecasts from the FAA were utilized. Several market share forecasts of registered aircraft were presented which provided a planning envelope. The selected registered aircraft forecast was an average of the forecasting techniques.

The FAA has recently requested that airports provide detailed information regarding based aircraft at all NPIAS airports. This task has been completed by the airport administration for Los Alamos Airport. There are a total of 70 aircraft currently based at the airport.

Two market share forecasts of registered aircraft have been developed for based aircraft and are presented in **Table 2H**. The first market share forecast considers the airport maintaining its 2011 share of the registered aircraft in the county (88.61 percent). This forecast results in 77 based aircraft in 2017, 84 in 2022, and 97 in 2032.

TABLE 2H
Based Aircraft Forecasts
Los Alamos Airport

Year	County Registered Aircraft	Percent Based at LAM	Number Based at LAM*
2000	70	94.29%	66
2001	71	94.37%	67
2002	72	100.00%	72
2003	81	88.89%	72
2004	83	86.75%	72
2005	85	84.71%	72
2006	83	85.54%	71
2007	81	86.42%	70
2008	80	86.25%	69
2009	78	98.72%	77
2010	76	82.89%	63
2011	79	88.61%	70
Average Annual Growth Rate 2000-2011:			0.54%
Constant Share of Registered Aircraft			
2017	87	88.61%	77
2022	94	88.61%	84
2032	110	88.61%	97
Average Annual Growth Rate 2011-2032:			1.57%
Increasing Share of Registered Aircraft			
2017	87	89.50%	78
2022	94	91.50%	86
2032	110	94.00%	103
Average Annual Growth Rate 2011-2032:			1.88%
Selected Forecast - Average			
2017	87	89.05%	**77**
2022	94	90.62%	**85**
2032	110	91.06%	**100**
Average Annual Growth Rate 2011-2032:			1.72%

*2000-2004 figures from 2004 ALP & Action Plan; 2005-2011 Airport Records

Source: Coffman Associates Analysis

The based aircraft forecast considers an increasing market share of registered aircraft. There are three primary reasons why consideration of an increasing share is undertaken. First, in the recent past, the airport has been able to capture 100 percent of registered aircraft as based aircraft.

Second, as documented in the inventory chapter, the airport includes construction of new hangar facilities in its current capital improvement program. Several preparatory steps will need to be completed, including repair of the east apron prior to construction of these hangars. Nonetheless, when these hangars are constructed, the airport anticipates an influx of new based aircraft. While some aircraft owners currently utilizing outside tie-down positions will desire to lease a hangar space, some new based aircraft to the airport could be anticipated.

A third reason to consider an increasing market share is that there are no other comparable general aviation airports in the vicinity. The closest comparable facility is Ohkay Owingeh Airport (E14) located approximately 20 driving miles to the northeast in Espanola. The next closest is Santa Fe Municipal Airport, approximately 25 driving miles to the southeast.

The results of the increasing market share forecast is 78 based aircraft in 2017, 86 based aircraft in 2022, and 103 in 2032. This is an annual average growth rate of 1.88 percent.

The selected forecast is an average of the two market share forecasts presented. The subsequent chapters of this master plan will utilize the selected forecast of 77 based aircraft by 2017, 85 based aircraft by 2022, and 100 based aircraft by 2032. The average annual growth rate of this forecast is 1.72 percent.

Comparative Based Aircraft Forecasts

There are several forecasts of based aircraft for Los Alamos Airport that were completed in previous studies and reports. These are presented in **Table 2J** and have been interpolated and extrapolated to the plan years of this master plan. The first to be considered is the FAA *Terminal Area Forecast*. The current TAF estimates there were 75 based aircraft at the airport in 2011. By 2023, the TAF estimates 80 based aircraft with zero growth thereafter. The TAF average annual growth rate from 2011 to 2023 is 0.54 percent, and from 2011 to 2032 is 0.31 percent.

TABLE 2J
Based Aircraft Forecast Summary
Los Alamos Airport

	2011 (Base Year)	2017	2022	2032	AAGR 2011-2032
Comparison Projections*					
2010 FAA Terminal Area Forecast	75	77	79	80	0.31%
2005 Action Plan and ALP	92	109	125	165	2.82%
2009 New Mexico Aviation System Plan	75	77	79	83	0.52%
SELECTED FORECAST	**70**	**77**	**85**	**100**	**1.72%**

* Figures interpolated and extrapolated to plan years.

Source: Coffman Associates analysis

The next comparative forecast is from the 2004 *Airport Action Plan and ALP Report*. This study estimated 77 based aircraft in 2005 and 103 in 2015 for an average annual growth rate of 2.82 percent. When extrapolated to the long term plan year, 165 based aircraft are forecast.

The 2009 *New Mexico Airport System Plan* (NMASP) had a base year of 2007 and an annual growth rate of 0.52 percent. The NMASP had a long term based aircraft estimate of 81 by 2027.

Based Aircraft Summary

A forecast of based aircraft has been presented. As of 2011, there were 70 based aircraft at Los Alamos Airport. By 2032, the long term planning period for this master plan, 100 based aircraft are estimated. The based aircraft forecasts have been compared with several other existing forecasts. These forecasts assume that as demand dictates, more aircraft storage will be made available. If new hangar construction is not undertaken, forecast growth could be slowed.

The master plan will consider the need for facilities to accommodate the addition of 30 based aircraft over the next 21 years. **Exhibit 2C** shows the based aircraft forecast scenarios and the selected forecast.

BASED AIRCRAFT FLEET MIX PROJECTIONS

Forecasting the aircraft fleet mix expected to utilize the airport is necessary to properly plan facilities that will best serve the level and type of activity occurring at the airport. As detailed previously, the growth areas in the general aviation fleet nationally are in turboprop and jet aircraft, as well as helicopters. Single engine piston-powered aircraft are forecast to grow slightly, while multi-engine piston aircraft are forecast to decrease slightly. Growth within each based aircraft category at the airport has been determined, in part, by comparison with national projections and consideration of local conditions.

There were 70 aircraft based at the airport in 2011. Of this total, 69 are single engine piston-powered aircraft and one is a multi-engine piston aircraft.

Table 2K presents the forecast fleet mix for the 20-year planning horizon of the master plan. Single engine piston-powered aircraft will continue to account for the vast majority of based aircraft at the airport. A total of three multi-engine piston aircraft are forecast by the long term. The airport could accommodate smaller turboprop or business jets. A turboprop is forecast to be introduced in the intermediate term, and a jet is forecast in the short term. By the long term, two turboprops and two jets are forecast. It should be noted that there is an IAI Westwind business jet registered in Los Alamos County currently. In the short term, a based helicopter is possible, particularly an air ambulance helicopter.

There is a significant presence at the airport of experimental aircraft owners and aviation hobbyists. It is estimated that there are eight aircraft that would fall in the experimental category. These aircraft are forecast to grow to 16 in total through the long term planning period.

TABLE 2K Based Aircraft Fleet Mix Los Alamos Airport								
Aircraft Type	**2011**	**Percent**	**2017**	**Percent**	**2022**	**Percent**	**2032**	**Percent**
Single Engine Piston	61	87.14%	63	81.86%	67	78.78%	76	76.06%
Multi-Engine Piston	1	1.43%	2	2.59%	3	3.54%	3	2.99%
Turboprop	0	0.00%	0	0.00%	1	1.18%	2	2.00%
Jet	0	0.00%	1	1.30%	1	1.18%	1	1.00%
Helicopters	0	0.00%	1	1.30%	1	1.18%	2	2.00%
Other/Experimental	8	11.43%	10	12.96%	12	14.15%	16	15.96%
Total	**70**	**100.00%**	**77**	**100.00%**	**85**	**100.00%**	**100**	**100.00%**

Source: Coffman Associates analysis

ANNUAL OPERATIONS

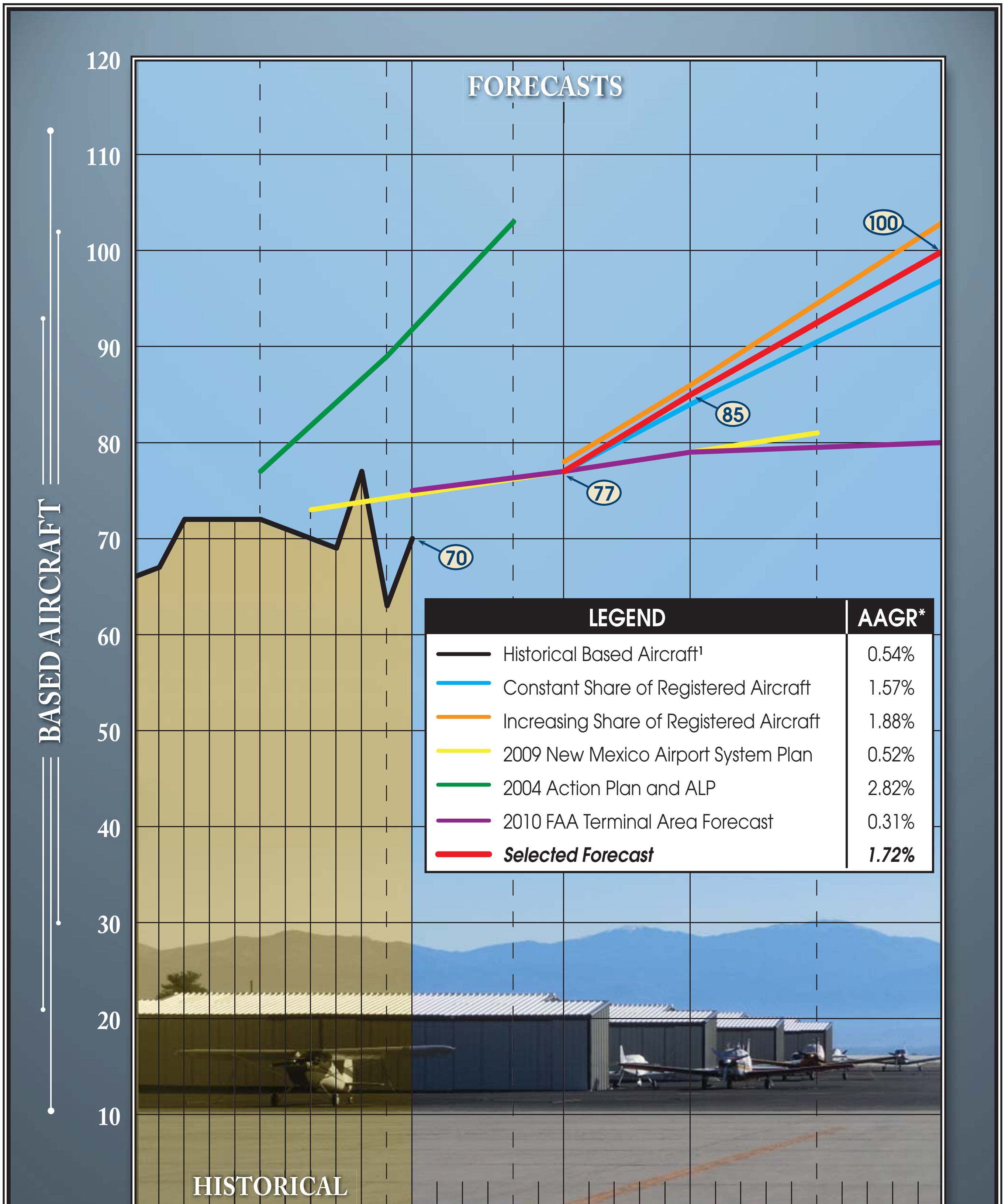
Airport operations can be characterized as local or itinerant. A local operation is a takeoff or landing performed by an aircraft that operates within sight of the airport or which executes simulated approaches or touch-and-go operations at the airport. Itinerant operations are those performed by aircraft with a specific origin or destination away from the airport. Generally, local operations are characterized by training operations.

Touch-and-go operations are prohibited at Los Alamos Airport due to terrain and noise concerns. Theoretically, there may not be any local operations; however, some aircraft may perform a missed approach and circle around and others may operate in the vicinity airspace. As a result, it is estimated that five percent or less of the operations could be classified as local in nature.

Operations at an airport are further classified as general aviation, air taxi, air carrier, or military. Air taxi is generally considered on-demand service that includes charter and fractional activity. Operations by air cargo and air ambulance operators would be considered air taxi and are itinerant in nature. Air carrier activity is scheduled passenger operations, which is not currently available at Los Alamos Airport. Military activity does occur at general aviation airports and can include both local and itinerant. Military activity at Los Alamos Airport is minimal, as documented by the airport administration. Typically, itinerant operations increase with business and commercial use as business aircraft are used primarily to transport people from one location to another.

Existing Operations Forecasts

Los Alamos Airport is a non-towered facility, which means that actual operations counts are not available. Therefore, estimates must be made based on interviews with airport operators and management and from historical documentation and studies. **Table 2L** presents three sets of total operations forecasts obtained from existing sources. Each of the datasets have been interpolated and extrapolated to the plan years of this master plan.



LEGEND	AAGR*
Historical Based Aircraft[1]	0.54%
Constant Share of Registered Aircraft	1.57%
Increasing Share of Registered Aircraft	1.88%
2009 New Mexico Airport System Plan	0.52%
2004 Action Plan and ALP	2.82%
2010 FAA Terminal Area Forecast	0.31%
Selected Forecast	***1.72%***

* **AAGR -** Average Annual Growth Rate

[1] 2000-2004 Figures From 2004 ALP & Action Plan; 2005-2011 Airport Records

Source: Coffman Associates Analysis

Exhibit 2C
BASED AIRCRAFT FORECAST

TABLE 2L Existing Total Operations Forecasts Los Alamos Airport			
Year	**2004 ALP & Action Plan[1]**	**2009 NMASP[2]**	**2010 TAF[3]**
2011	23,551	13,471	13,000
2017	27,601	13,890	13,000
2022	31,503	14,248	13,000
2032	41,042	14,997	13,000
AAGR 2011-2032	2.68%	0.51%	0.00%

[1]2004 Action Plan & ALP - Interpolated and Extrapolated to Plan Years
[2]2009 New Mexico Airport System Plan - Interpolated and Extrapolated to Plan Years
[3]TAF - FAA Terminal Area Forecast
AAGR: Average Annual Growth Rate

Source: Coffman Associates analysis.

The oldest operational forecast examined is from the 2004 *Action Plan & ALP Report*. The history and base year (2004) for this forecast utilized the FAA TAF at the time. The long term forecast year is 2015. These forecasts were extrapolated to the plan years of this forecasting effort.

The next operational forecast presented is from the 2009 *New Mexico Airport System Plan* (NMASP-2009). The NMASP-2009 utilized a base year of 2007, as established in the FAA TAF. The last forecast year is 2027, so they were extrapolated to the plan years of this forecast.

The third operational forecast is the current (2010) FAA TAF. The TAF estimated there were 13,000 operations in 2011. Each subsequent forecast year of the TAF considers 13,000 operations. Therefore, the TAF uses a flat-line for operations forecasts. This type of forecast by the FAA is not unusual for lower activity level general aviation airports.

New General Aviation Operations Forecasts

An effort has been undertaken to develop new operations forecasts for Los Alamos Airport. Two models were employed, neither of which utilizes the FAA TAF as a baseline.

The first utilizes a statistical regression model approved by the FAA to estimate operations at non-towered airports. The report, entitled *Model for Estimating General Aviation Operations at Non-Towered Airports Using Towered and Non-Towered Airport Data (GRA, Inc. 2001)*, presents the methodology and formula for the model. Independent variables used in the model include various airport characteristics, demographics, and geographic features. The model was derived using a combined data set for small towered and non-towered GA airports and incorporates a dummy variable to distinguish the two airport types. Specifically, the model utilizes the following variables:

- Based aircraft;
- Percent of aircraft based at the airport among general aviation airports within 100 miles;
- Number of FAR Part 141 flight training schools at the airport;
- Population within 100 miles;
- Ratio of population within 25 miles and within 100 miles.

The model factors each of these variables so that both local and national factors are considered when estimating operations. The model estimates a baseline of 22,700 annual operations. By 2032, a total of 29,500 annual operations are forecast. The model results in an annual growth rate of 1.45 percent for Los Alamos Airport.

The second methodology, sourced from FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems*, provides a general formula for estimating operations at non-towered general aviation airports as a function of the number of based aircraft. For general aviation airports a range between 250 and 450 operations per based aircraft can be used as a guideline. Utilizing an average of 350 operations per based aircraft, results, in a current year operations estimate of 24,500. By applying this factor to the forecast of based aircraft, a long term estimate of operations is 35,100. The average annual growth rate is 1.73 percent.

Primarily due to the unique operating characteristics at Los Alamos Airport, both non-towered operations formula and the NPIAS rule-of-thumb operations estimates are considered high. A primary characteristic is the prohibition of local operations at the airport. As a result neither of these estimates will be considered in the operations forecast.

The last physical count of operations at the airport was taken in 2009. At this time, the airport manager installed an acoustical counter at the airport for a 30 day period. When extrapolating the 30 day operations count over a 12 month period, a total of 13,100 operations were estimated. Additional evidence obtained from several operators at the airport indicates this figure may be slightly low.

To establish a baseline of operations at the airport a variation of the NPIAS rule-of-thumb formula was utilized. By estimating that there are 215 annual operations per based aircraft a 2011 baseline of general aviation operations of 15,100 is established. A forecast of future operations is also presented, with a long term estimate of 21,600 operations. The 2011 baseline of 15,100 operations is then utilized to develop additional forecasts that will be utilized to create a reasonable planning envelope for operations.

The next forecast applies the FAA's estimate of growth in general aviation operations across the country (1.00%) to the established 2011 baseline of 15,100 operations. This forecast results in a long term forecast (2032) of 18,609 operations.

FAA Order 5090.3C suggests another methodology for estimating operations at non-towered general aviation airports by applying the statewide forecast growth rate from the FAA TAF. In New Mexico, general aviation operations are forecast to grow from an estimate of 787,000 in 2011 to 932,000 in 2030, for an average annual growth rate of 0.89 percent. This annual growth rate was then applied to the estimated base year operations figures.

Table 2M presents a summary of the three new general aviation operations forecasts for Los Alamos Airport. The 2011 baseline is the NPIAS formula for considering operations as a share of based aircraft, in this case 215 annual operations per based aircraft. The selected forecast of operations is the average of the three new forecasts. In 2011, it was estimated that the airport experienced approximately 15,100 operations. By 2017, this total is anticipated to increase to 16,200 annual operations. By the long term planning period, a total of 19,500 operations are forecast. The average annual growth rate of the selected general aviation operations forecast is 1.23 percent. The new forecasts of general aviation operations are presented in **Exhibit 2D** along with the selected forecast.

TABLE 2M
New General Aviation Operations Forecasts
Los Alamos Airport

Year	FAA National Growth Rate[1]	Statewide TAF Growth Rate[2]	Adjusted NPIAS Formula[3]	Selected Forecast
2011	15,100	15,100	15,100	15,100
2017	16,029	15,924	16,600	16,200
2022	16,847	16,646	18,200	17,200
2032	18,609	18,188	21,600	19,500
AAGR 2011-2032	1.00%	0.89%	1.72%	1.23%

[1]FAA National GA Forecast Growth Rate with Estimated 2011 Baseline
[2]State TAF Growth Rate with Estimated 2011 Baseline
[3]Adjusted NPIAS Formula: 215 Operations Per Based Aircraft
AAGR: Average Annual Growth Rate

Source: Coffman Associates analysis

Air Taxi Operations

The air taxi category includes aircraft involved in on-demand passenger service (charter and fractional), small parcel transport (cargo), and air ambulance activity. The FAA TAF estimates that the airport experiences approximately 60 air taxi operations annually. A modest growth in air taxi operations is considered for this master planning effort. By 2032, a total of 360 air taxi operations are estimated.

Military Operations

At some general aviation airports, military operations can be common. Los Alamos Airport does not experience regular military operations. The FAA TAF forecasts 10 itinerant military operations annually from 2011 through 2030. Forecasts of military operations are complicated by the lack of actual operational data (primarily for national security reasons) and the fact that the mission for military posts can change quickly. Anecdotal evidence from airport users suggests the military operations are slightly above the FAA estimate. Therefore, for planning purposes, this master plan will include 50 military itinerant operations for each of the plan years.

Total Operations Summary

Table 2N presents the selected operations forecast for Los Alamos Airport. It is estimated that the airport experienced 15,100 operations in 2011. A "planning envelope" was created by developing several forecasts of general aviation operations. The forecasts for the plan years are an average of the three forecasts developed. Intermediate operations increase to 21,500 operations as commuter service is introduced to the airport. Long term, total operations are estimated at 27,700 annual operations. Local operations are rare at Los Alamos Airport and are estimated at approximately five percent of the total operations. The average annual growth rate without consideration of new commuter operations is 1.23 percent. When including new commuter operations, the average annual growth rate is 2.93 percent.

TABLE 2N
Total Operations Forecast
Los Alamos Airport

Year	Local General Aviation Operations	Itinerant General Aviation Operations	Air-Taxi (Itin.)	Military (Itin.)	Commuter (Itin.)	Total Operations
2011	755	14,235	60	50	0	15,100
2017	810	15,240	100	50	5,300	21,500
2022	860	16,110	180	50	5,300	22,500
2032	975	18,115	360	50	8,200	27,700
AAGR Without Commuter Operations: 1.23%						
AAGR With Operations: 2.93%						

Source: Coffman Associates analysis

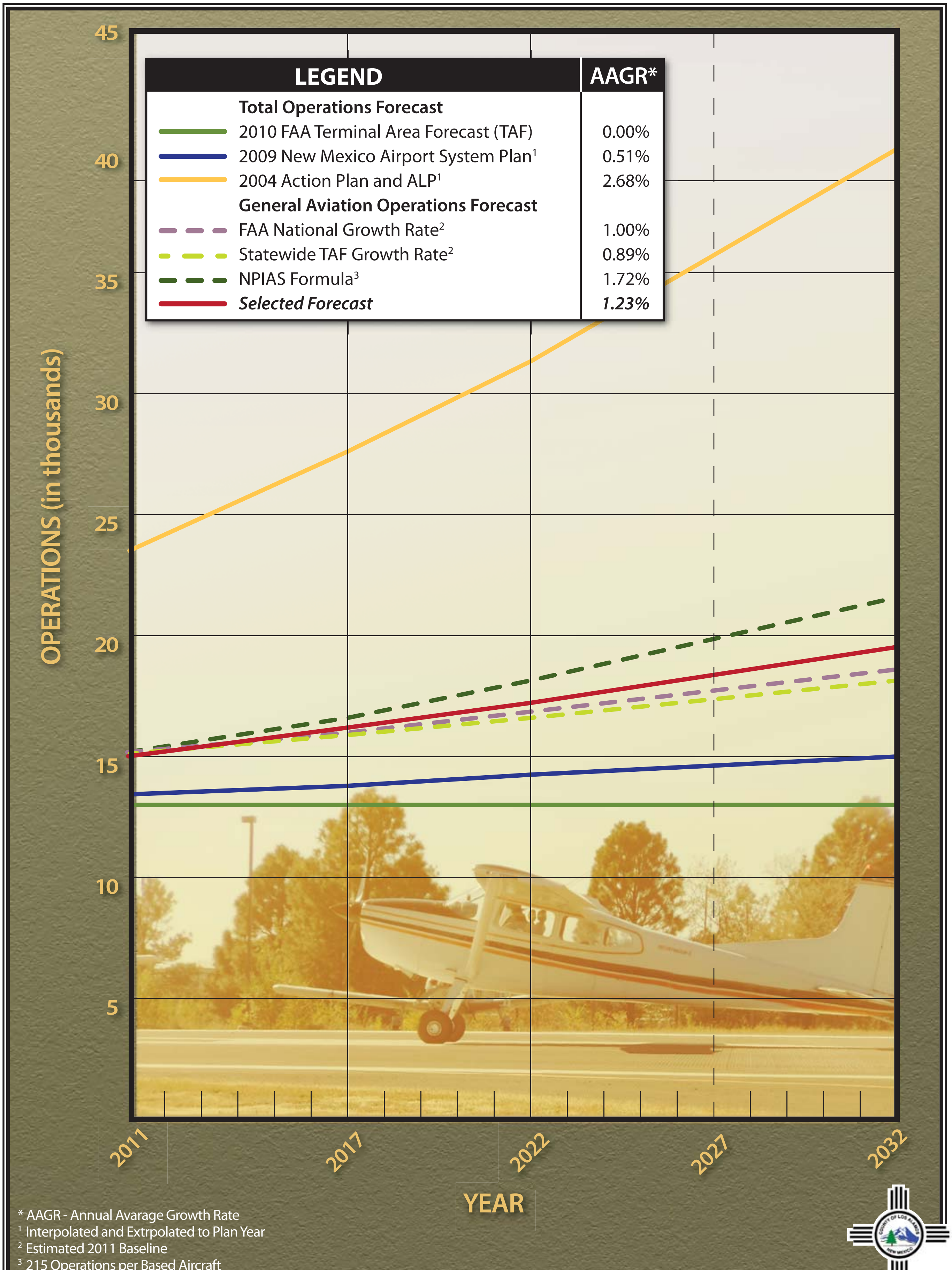
OPERATIONS FLEET MIX

Estimating the number of operations by aircraft type helps to identify facility requirements and various environmental impacts. Operations by multi-engine, turboprop, and business jet aircraft are generally considered itinerant in nature.

Table 2P presents the forecast operations activity by aircraft type. General assumptions based on typical aircraft utilization have been made and are applied to the fleet mix at Los Alamos Airport. Multi-engine piston activity is estimated at 200 operations per based aircraft, turboprop at 250 operations per based aircraft, jet activity at 300 operations per based aircraft, and helicopters at 400 operations per based aircraft. Commuter airline operations are assumed to utilize a Cessna Caravan turboprop. These operations estimates account for all activity by that aircraft type and are not estimates of the actual number of operations attributable to a particular based aircraft.

TABLE 2P
Fleet Mix Operations Forecast
Los Alamos Airport

	2011	%	2017	%	2022	%	2032	%
Local Operations								
Piston	755	100.00%	770	95.06%	820	95.35%	895	91.79%
Helicopter	0	0.00%	40	4.94%	40	4.65%	80	8.21%
Total Local	755	100.00%	810	100.00%	860	100.00%	975	100.00%
Itinerant Operations								
Single Piston	13,845	96.51%	14,180	68.54%	14,830	68.53%	16,405	61.38%
Multi-Piston	200	1.39%	400	1.93%	600	2.77%	600	2.25%
Turboprop	100	0.70%	5,450	26.34%	5,550	25.65%	8,700	32.55%
Jet	50	0.35%	300	1.45%	300	1.39%	300	1.12%
Helicopters	150	1.05%	360	1.74%	360	1.66%	720	2.69%
Total Itinerant	14,345	100.00%	20,690	100.00%	21,640	100.00%	26,725	100.00%
Total Operations	15,100		21,500		22,500		27,700	



Source: Coffman Associates Analysis

Exhibit 2D
OPERATIONS FORECASTS

ANNUAL INSTRUMENT APPROACHES

An instrument approach, as defined by the FAA, is "an approach to an airport with the intent to land by an aircraft in accordance with an Instrument Flight Rule (IFR) flight plan, when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude." To qualify as an instrument approach, aircraft must land at the airport after following one of the published instrument approach procedures in less than visual conditions. Forecasts of annual instrument approaches (AIAs) provide guidance in determining an airport's requirements for navigational aid facilities such as an instrument landing system. It should be noted that practice or training approaches do not count as annual AIAs, nor do instrument approaches conducted in visual conditions.

During poor weather conditions, pilots are less likely to fly and rarely would perform training operations. As a result, an estimate of the total number of AIAs can be made based on a percent of itinerant operations regardless of the frequency of poor weather conditions. An estimate of one percent of itinerant operations is utilized to forecast AIAs at Los Alamos Airport, as presented in **Table 2Q**.

TABLE 2Q
Annual Instrument Approaches (AIAs)
Los Alamos Airport

	AIAs	Itinerant Operations	Ratio
2017	207	20,690	1.00%
2022	216	21,640	1.00%
2032	267	26,725	1.00%

Source: Coffman Associates analysis

In the future, Los Alamos Airport may be increasingly utilized by more sophisticated turboprop and smaller jet aircraft (as is the trend nationally). Also, the increased availability of low-cost navigational equipment could allow for smaller and less sophisticated aircraft to utilize instrument approaches. National trends indicate an increasing percentage of instrument approaches given the greater availability of approaches at airports with GPS and the availability of more cost-effective equipment.

SUMMARY

This chapter has outlined the various activity levels that might reasonably be anticipated over the next 21 years for Los Alamos Airport. **Exhibit 2E** presents a summary of the aviation demand forecasts. The baseline year for forecast data is 2011. The forecasting effort extends 21 years to the year 2032.

Los Alamos Airport is a general aviation facility as defined by the FAA. Runway 9-27 is 6,000 feet long and 120 feet wide. The airport has a non-precision instrument approach that allows pilots to navigate to within 0.5 nautical miles of the airport when visibility is no lower than 1-mile and cloud ceiling heights are at least 548 feet above the airport elevation. If the airport is visible the pilots can proceed to landing.

General aviation activity often trends with national and local economies. The country was in a recessionary period from December 2007 through the third quarter of 2009 and has been slow to recover. Activity at both commercial service airports and general aviation airports has been down. The Los Alamos Airport has, to date, weathered the economic downturn fairly well. The number of based aircraft has remained fairly steady.

Forecasts of aviation activity, including based aircraft and operations, is key to determining future facility requirements. There are currently 70 aircraft based at the airport, and this is forecast to grow to 100 aircraft by 2032. It is estimated that the airport currently experiences approximately 15,100 annual operations. This is forecast to grow to approximately 27,700 operations annually by 2032.

The fleet mix operations, or type and frequency of aircraft use, is important in determining facility requirements and environmental impacts. While single engine piston-powered aircraft are expected to represent the majority of based aircraft, the long term forecast considers the possibility of two based turboprops and one business jet by 2032.

The next step in the master plan process is to use the forecasts to determine development needs for the airport through 2032. Chapter Three – Facility Requirements will address airside elements, such as safety areas, runways, taxiways, lighting, and navigational aids, as well as landside requirements, including hangars, aircraft aprons, and support services. The remaining portions of the master plan will lay out how that growth can be accommodated in an orderly, efficient, and cost-effective manner.

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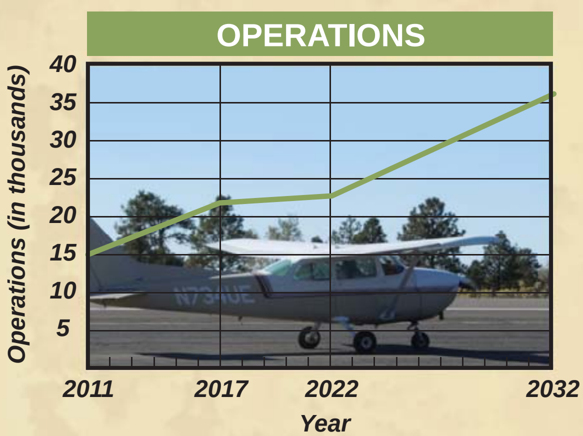
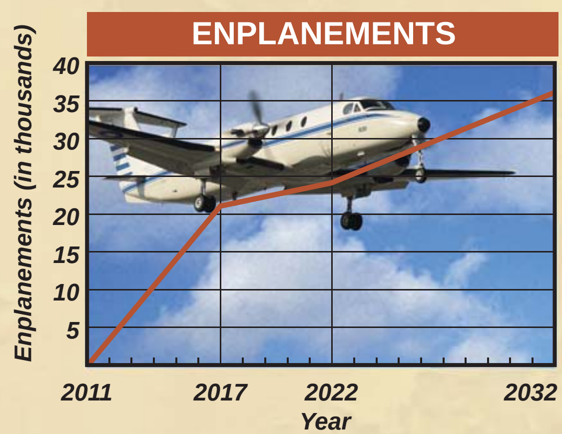
CATEGORY	ESTIMATE 2011	FORECAST 2017	FORECAST 2022	FORECAST 2032
ANNUAL OPERATIONS				
Commuter (Itinerant)	0	5,300	5,300	8,200
General Aviation				
Itinerant	14,235	15,240	16,110	18,115
Local	755	810	860	975
Military				
Itinerant	50	50	50	50
Local	0	0	0	0
Air Taxi (Itinerant)	60	100	180	360
TOTAL ITINERANT	**14,345**	**20,690**	**21,640**	**26,725**
TOTAL LOCAL	**755**	**810**	**860**	**975**
TOTAL OPERATIONS	***15,100***	***21,500***	***22,500***	***27,700***
ENPLANEMENTS	***0***	***21,000***	***24,000***	***36,000***
BASED AIRCRAFT				
Single Engine	61	63	67	76
Multi-Engine	1	2	3	3
Turboprop	0	0	1	2
Business Jet	0	1	1	1
Helicopter	0	1	1	2
Experimental / Other	8	10	12	16
TOTAL BASED AIRCRAFT	***70***	***77***	***85***	***100***





FLEET MIX

Chapter Three

FACILITY REQUIREMENTS

Facility Requirements

To properly plan for the future of Los Alamos Airport (LAM), it is necessary to translate forecast aviation demand into the specific types and quantities of facilities that can adequately serve this identified demand. In this chapter, existing components of the airport are evaluated so that the capacities of the overall system are identified. Once identified, the existing capacity is compared to the forecast activity levels to determine where deficiencies currently exist or may be expected to materialize in the future. Once deficiencies in a component are identified, a more specific determination of the approximate sizing and timing of the new facilities can be made.

As indicated earlier, airport facilities include both airfield and landside components. Airfield elements include those facilities that are related to the arrival, departure, and ground movement of aircraft. The components include:

- Airfield Design Standards
- Runways
- Taxiways
- Navigational Approach Aids
- Airfield Lighting, Marking, and Signage

Landside facilities are needed for the interface between air and ground transportation modes. This includes components for general aviation needs such as:

- Commercial and General Aviation Terminal Space
- Aircraft Hangars
- Aircraft Parking Aprons
- Auto Parking
- Airport Support Facilities

The objective of this effort is to identify, in general terms, the adequacy of the existing airport facilities and outline what new facilities may be needed and when they may be needed to accommodate forecast demands. Having established

these facility requirements, alternatives for providing these facilities will be evaluated in Chapter Four to determine the most practical, cost-effective, and efficient direction for future development.

PLANNING HORIZONS

Cost-effective, safe, efficient, and orderly development of an airport should rely more upon actual demand at an airport than a time-based forecast figure. In order to develop a master plan that is demand-based rather than time-based, a series of planning horizon milestones has been established for Los Alamos Airport that takes into consideration the reasonable range of aviation demand projections prepared in the previous chapter.

It is important to consider that the actual activity at any given time at the airport may be higher or lower than projected activity levels. By planning according to activity milestones, the resulting plan can accommodate unexpected shifts or changes in the area's aviation demand. It is important that the plan accommodate these changes so that airport management can respond to unexpected changes in a timely fashion. These milestones provide flexibility while potentially extending this plan's useful life if aviation trends slow over time. The resulting plan provides airport officials with a financially responsible and needs-based program. **Table 3A** presents the planning horizon milestones for each aircraft activity category. The planning milestones of short, intermediate, and long term generally correlate to the five, ten, and twenty-year periods used in the previous chapter.

TABLE 3A
Planning Horizon Activity Summary
Los Alamos Airport

	Current (2011)	Short Term	Intermediate Term	Long Term
BASED AIRCRAFT				
Single Engine	61	63	67	76
Multi-Engine	1	2	3	3
Turboprop	0	0	1	2
Jet	0	1	1	1
Helicopter	0	1	1	2
Other/Experimental	8	10	12	16
Total Based Aircraft	**70**	**77**	**85**	**100**
ANNUAL OPERATIONS				
Itinerant	14,345	20,690	21,640	26,725
Local	755	810	860	975
Total Annual Operations	**15,100**	**21,500**	**22,500**	**27,700**
ENPLANEMENTS				
Potential Commuter Airline	0	21,000	24,000	36,000

Source: Coffman Associates analysis

PEAKING CHARACTERISTICS

Airport capacity and facility demand analyses typically consider the levels of activity during a peak or design period. The periods used in developing the capacity analyses and facility requirements in this study are as follows:

- **Peak Month** - The calendar month in which traffic activity is highest.

- **Busy Day –** The busy day of a typical week in the peak month. This is primarily used to estimate transient ramp requirements.

- **Design Day** - The average day in the peak month. This indicator is easily derived by dividing the peak month operations by the number of days in the month.

- **Design Hour** - The busiest hour within the design day.

It is important to note that only the peak month is an absolute peak within a given year. All other peak periods will be exceeded at various times during the year. However, they do represent reasonable planning standards that can be applied without overbuilding or being too restrictive.

COMMUTER AIRLINE PEAK PERIODS

Developing an understanding of the anticipated activity levels in terms of both operations and passengers is critical to determining appropriate facility size to accommodate commuter airline activity. Since there is not currently regular commuter activity at the airport, several assumptions must be made which are based on consultant experience with similar airports. For example, it is anticipated that they will be restricted to operations by commuter aircraft with nine or fewer seats as discussed in Chapter Two.

Various design criteria for airline facilities are developed as a factor of enplanements, or passengers boarding an aircraft. Forecast of annual enplanements were presented in the previous chapter. Based on these enplanement forecasts, peaking characteristics have been identified and are presented in **Table 3B**.

The peak month for enplanements is simply calculated as 12 percent of annual enplanements. Many smaller airports with some level of commuter activity will experience a peak month that usually corresponds to peak vacation times or peak work times. For example, Los Alamos Airport may experience higher enplanements generated by Los Alamos National Lab (LANL) employees travelling to Washington, D.C. The design day enplanement level is simply calculated as the peak month divided by the number of days in an average month.

The design hour enplanement level is critical in terminal design and other calculations. The design hour is a function of the flight schedule, aircraft type utilized, and board loading factor (BLF). The flight schedule can be quite dynamic and depends on connections and the overall success of the service. In this analysis, it is assumed that in the short term there will be nine daily round trip flights to Albuquerque. By the long term there would be additional service to another destination such as Denver utilizing a slightly larger turboprop aircraft such as the 19-seat Beech 1900 or 34-seat Saab 340B.

TABLE 3B Commuter Airline Peak Activity Forecast Los Alamos Airport	Short	Intermediate Term	Long Term
Enplanements			
Annual	21,000	24,000	36,000
Peak Month	2,520	2,880	4,320
Design Day	84	96	144
Design Hour	9	14	29
Deplanements			
Design Hour	9	14	29
Total Passengers			
Design Day	168	192	288
Design Hour	18	29	56
Airline Operations			
Annual	5,300	5,300	8,200
Peak Month	636	636	984
Design Day	18	18	26
Design Hour	2	2	4
Departures			
Design Day	9	9	13
Design Hour	1	1	2
Arrivals			
Design Day	9	9	13
Design Hour	1	1	2

At a minimum, the terminal space must be able to accommodate those times when a single aircraft is fully loaded. Therefore, the design hour enplanement for the short term is nine passengers boarding the aircraft. The intermediate term considers the potential for two flights to occur within the same hour. The design hour in this case is calculated as one full airplane and the other with a 60 percent BLF. In the long term, the design hour considers two aircraft, a fully loaded 9-seat Cessna Caravan and a Saab 340B with a BLF of 60 percent.

GENERAL AVIATION PEAK PERIODS

Peaking characteristics are also identified for activity other than that generated by a commuter airline. **Table 3C** presents the general aviation peaking operations. The design day operations levels grow from 60 currently to 78 in the long term. The design hour increases from 11 to 14 over the planning period.

TABLE 3C General Aviation Peaking Operations Los Alamos Airport	Baseline (2011)	Short Term	Intermediate Term	Long Term
Annual	15,100	16,200	17,200	19,500
Peak Month	1,812	1,944	2,064	2,340
Busy Day	85	91	96	109
Design Day	60	65	69	78
Design Hour	11	11	12	14

TOTAL PEAKING CHARACTERISTICS

The peaking characteristics of total aircraft operations are utilized in examining the operational capacity of the airfield and are presented in **Table 3D**. The peak month is estimated at 12 percent of overall operations. The design day is the peak month divided by 30. The busy day has been estimated at 40 percent higher than the design day in the peak month and was calculated by multiplying the design day by 1.4. The design hour is estimated at 17.5 percent of the design day. This calculation is based on activity at other towered general aviation airports and accounts for the fact that there are very few nighttime flights.

TABLE 3D
Total Peaking Operations
Los Alamos Airport

	Baseline (2011)	Short Term	Intermediate Term	Long Term
Annual	15,100	21,500	22,500	27,700
Peak Month	1,812	2,580	2,700	3,324
Busy Day	85	120	126	155
Design Day	60	86	90	111
Design Hour	11	15	16	19

CRITICAL AIRCRAFT

The design standards to be applied to an airport are based on the type of aircraft with the most demanding Airport Reference Code (ARC) expected to regularly use the facility. Regular use is defined as that aircraft or family of aircraft that will perform at least 500 annual operations.

DESIGN AIRCRAFT

The ARC, as described in FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, is a coding system to help identify and determine the appropriate design criteria for an individual airport. The ARC correlates the design and layout of the airport to the operational and physical characteristics of the critical design aircraft. The identified critical design aircraft directly influences pertinent safety criteria such as runway length, runway width, separation distances, building setbacks, and the dimensions of required safety areas surrounding the runway and taxiway system.

The ARC has two components. The first component, depicted by a letter, is the aircraft approach category, which relates to aircraft approach speed (operational characteristic). The second component, depicted by a Roman numeral, is the airplane design group which relates to aircraft wingspan and tail height (physical characteristic). Generally, aircraft approach speed applies to runways and runway-related facilities, while airplane wingspan primarily relates to separation criteria involving taxiways, taxilanes, and landside facilities. **Table 3E** presents the ARC criteria.

As an example, a Beech King Air 200 with an approach speed of 103 knots and wingspan of 54.5 feet would have an ARC of B-II, while a larger corporate jet, such as a Cessna 750 Citation X, with an approach speed of 123 knots and a wingspan of 63.6 feet would have an ARC of C-II. **Exhibit 3A** presents examples of the ARC and the corresponding aircraft type.

TABLE 3E
Airport Reference Code

Aircraft Approach Category		
Category	*Speed*	
A	< 91 Knots	
B	91- < 121 Knots	
C	121- < 141 Knots	
D	141- <166 Knots	
E	>= 166 Knots	
Airplane Design Group[1]		
Group	*Tail Height (ft)*	*Wingspan (ft)*
I	< 20	< 49
II	20- < 30	49- < 79
III	30- < 45	70- < 118
IV	45- < 60	118- < 171
V	60- < 66	171- < 214
VI	66- < 80	214- < 262

Source: FAA AC 150/5300-13, Airport Design
[1] Utilize the most demanding category.

CURRENT CRITICAL AIRCRAFT

The critical design aircraft is defined as the most demanding category of aircraft which conduct 500 or more operations at the airport each year. In some cases, more than one specific make and model of aircraft comprises the airport's critical design aircraft. For example, one category of aircraft may be the most critical in terms of approach speed, while another is most critical in terms of wingspan. Smaller general aviation piston-powered aircraft within approach categories A and B and ADG I conduct the vast majority of operations at Los Alamos Airport. Business turboprops and small business jets also utilize the airport but less frequently.

As of December 2011, there were 70 based aircraft at Los Alamos Airport. Of this total, 69 are single engine piston aircraft and one is a twin engine piston aircraft. All of the based aircraft fall in ARC A-I and all of them have a maximum gross weight of less than 12,500 pounds.

Transient activity is difficult to track since there is not a tower at the airport. It is known that the airport does receive activity from both turboprop and business jets. The activity levels for these types of aircraft fall well below the 500 operations threshold.

The current critical aircraft is defined by airport reference code A/B-I and these are aircraft weighing less than 12,500 pounds (small aircraft exclusively).

FUTURE CRITICAL AIRCRAFT

The future critical aircraft is extremely difficult to reasonably assess. If a Cessna Caravan is utilized in commuter service, then the future ARC would be A-II. The forecast fleet mix of future based aircraft considers the introduction of both turboprops and small business jets at the airport. Due to the airport elevation and existing runway length, based turboprops and jets would likely be of the smaller type. For turboprops, this might include the Piper Malibu, Socata TBM 700, Piper Seneca Turbo, Piper Cherokee Turbo, Piper Navajo Turbo, and/or Piper Cheyenne Turbo. For business jets, this might include the Beech Premier 390, Cessna Citation I, and/or Falcon 10. All of these turboprops and business jets fall in ARC B-I and are less than 12,500 pounds.

The future ARC considered in this master plan will be ARC AB-II (small aircraft exclusively) in order to fully accommodate the Cessna Caravan 208A in operations as a commuter aircraft. Since the Cessna Caravan has a maximum takeoff weight of approximately

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A-I

- Beech Baron 55
- **Beech Bonanza**
- Cessna 150
- Cessna 172
- Cessna Citation Mustang
- Eclipse 500
- Piper Archer
- Piper Seneca

C-I, D-I

- Beech 400
- **Lear 25, 31, 35, 45, 55, 60**
- Israeli Westwind
- HS 125-400, 700

B-I less than 12,500 lbs.

- Beech Baron 58
- Beech King Air 100
- Cessna 402
- **Cessna 421**
- Piper Navajo
- Piper Cheyenne
- Swearingen Metroliner
- Cessna Citation I

C-II, D-II

- Cessna Citation III, VI, VIII, X
- **Gulfstream II, III, IV**
- Canadair 600
- ERJ-135, 140, 145
- CRJ-200/700
- Embraer Regional Jet
- Lockheed JetStar

A-II, B-II less than 12,500 lbs.

- **Super King Air 200**
- Cessna 441
- DHC Twin Otter
- Cessna Caravan 208

C-III, D-III

- ERJ-170, 190
- CRJ 700, 900
- Boeing Business Jet
- **B 737-300 Series**
- MD-80, DC-9
- Fokker 70, 100
- A319, A320
- Gulfstream V
- Global Express

B-I, B-II over 12,500 lbs.

- Super King Air 350
- Beech 1900
- Jetstream 31
- Falcon 10, 20, 50
- Falcon 200, 900
- **Citation II**, III, IV, V
- Saab 340
- Embraer 120

C-IV, D-IV

- **B-757**
- B-767
- C-130
- DC-8-70
- MD-11

A-III, B-III

- DHC Dash 7
- **DHC Dash 8**
- DC-3
- Convair 580
- Fairchild F-27
- ATR 72
- ATP

D-V

- **B-747** Series
- B-777

Note: Aircraft pictured is identified in bold type.
Shaded aircraft categories are least likely to utilize the airport.

Exhibit 3A
AIRPORT REFERENCE CODES

9,000 pounds the small aircraft category will apply.

The results of the Alternatives chapter to follow showed that there are significant challenges to meeting ARC A/B-II design standards. These challenges were discussed in meetings with FAA and the New Mexico Department of Transportation – Aviation Division. At the conclusion of these meetings, it was determined that the critical design aircraft for Los Alamos Airport should remain in ARC A/B-I (small aircraft exclusively). The supporting information for this determination is provided in Chapter Five – Recommended Master Plan Concept.

AIRFIELD CAPACITY

Airfield capacity is measured in a variety of different ways. The **hourly capacity** of a runway measures the maximum number of aircraft operations that can take place in an hour. The **annual service volume (ASV)** is an annual level of service that may be used to define airfield capacity needs. **Aircraft delay** is the total delay incurred by aircraft using the airfield during a given timeframe. FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*, provides a methodology for examining the operational capacity of an airfield for planning purposes. This analysis takes into account specific factors about the airfield.

- **Runway Configuration** – The existing airfield configuration consists of a single runway system without a parallel taxiway. Runway 9-27 is 6,000 feet long and 120 feet wide.

- **Runway Use** – Runway use in capacity conditions will be controlled by wind and/or airspace conditions. For Los Alamos Airport, all landings are to Runway 27 and all takeoffs use Runway 9. This is a one-way in, one-way out runway.

- **Exit Taxiways** – Exit taxiways have an impact on airfield capacity since the number and location of exits directly determines the occupancy time of an aircraft on the runway. For Los Alamos Airport, those taxiway exits, located between 2,000 and 4,000 feet from the runway threshold, count in the capacity determination. At Los Alamos Airport, there are no taxiway exits within this range; therefore, there is no capacity credit for exits. Basically each operation requires the same occupancy time for the runway.

- **Weather Conditions** – The airport operates under visual flight rules (VFR) 97.55 percent of the time. Instrument flight rules (IFR) apply when cloud ceilings are between 500 and 1,000 feet, approximately 1.68 percent of the year. Poor visibility conditions (PVC) apply for minimums below 500 feet and one mile. PVC conditions occur 0.77 percent of the year. **Table 3F** summarizes the weather conditions over the previous 10 years.

TABLE 3F Annual Weather Conditions Los Alamos Airport			
	Meteorological Conditions	Observations	Percent
VFR	Cloud Ceiling >1,000' and Visibility > 3 mi.	41,110	97.55%
IFR	Cloud Ceiling < 1,000' and/or Visibility < 3 mi. (But Cloud Ceiling > 500' and/or Visibility > 1 mi.)	710	1.68%
PVC	Ceiling < 500' and Vis < 1 mi.	324	0.77%
	TOTAL	42,144	100.00%

VFR: Visual Flight Rules
IFR: Instrument Flight Rules
PVC: Poor Visibility Conditions

Source: NOAA National Climatic Data Center (1/2006-12/2012)

- **Aircraft Mix** – Aircraft mix for the capacity analysis is defined in terms of four aircraft classes. Classes A and B consist of small and medium-sized propeller and some jet aircraft, all weighing 12,500 pounds or less. These aircraft are associated primarily with general aviation activity, but do include some air taxi, air cargo, and commuter aircraft. Class C consists of aircraft weighing between 12,500 pounds and 300,000 pounds. The airport experiences a limited number of operations by Class C aircraft. Class D aircraft consists of large aircraft weighing more than 300,000 pounds. The airport does not experience operations by Class D aircraft.

- **Percent Arrivals** – Percent arrivals generally follow the typical 50/50 percent split.

- **Touch-and-Go Activity** – Los Alamos Airport does not allow local touch-and-go operations. Therefore, the touch-and-go percent is effectively zero.

- **Peak Period Operations** – For the airfield capacity analysis, average daily operations and average peak hour operations during the peak month are utilized. Typical operations activity is important in the calculation of an airport's capacity as "peak demand" levels occur sporadically. The peak periods used in the capacity analysis are representative of normal operational activity and can be exceeded at various times throughout the year.

FAA Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay,* does not specifically address the one-way in/one-way out operating nature at Los Alamos Airport. It does, however, address certain "special applications" for determining **hourly capacity**. One of the special applications applies to single runway airports supporting small aircraft only (those under 12,500 pounds). While Los Alamos Airport can accommodate operations by larger aircraft under certain conditions (e.g., not fully loaded), the vast majority of operations are by aircraft under the 12,500 pounds threshold. By dividing the hourly capacity figures from the AC by two, we can generally account for the one-way in/one-way out nature of operations at the airport. **Exhibit 3B** presents the "special applications" runway configurations for determining hourly capacity.

Airfield configuration number three (#3) best represents the current airfield layout

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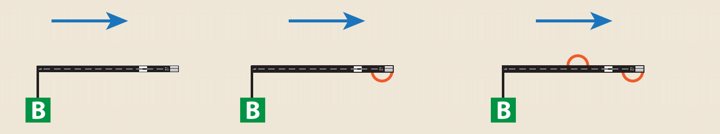
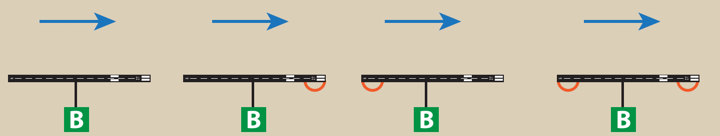
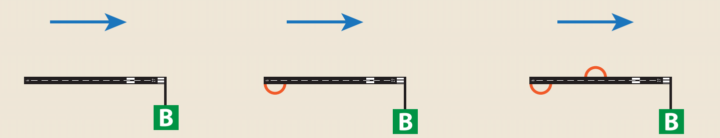
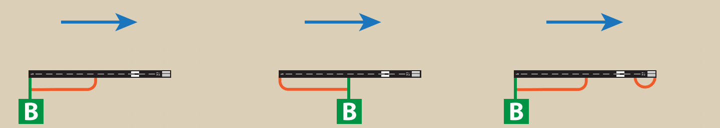
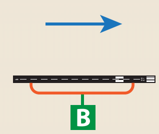
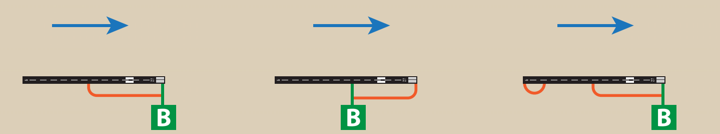
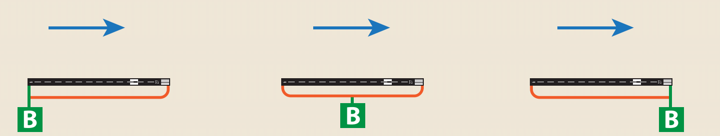
Configuration Number	Airfield Configuration	Hourly Capacity in VFR Percent Touch-and-Go 0 to 25	Hourly Capacity in VFR Percent Touch-and-Go 26 to 50	Hourly Capacity in IFR
		(Operations per Hour)		
1		54 to 66	66 to 85	20 to 24
2		59 to 72	72 to 92	20 to 24
3		40 to 50	50 to 67	20 to 24
4		82 to 97	97 to 117	20 to 24
5		71 to 85	85 to 106	20 to 24
6		60 to 72	72 to 92	20 to 24
7		See Chapter 3 FAA AC 150/5060-5 Airport Capacity and Delay		

LEGEND

Runway

Taxiway

B Basing Area

Turnaround

Direction of Operation

Source: FAA AC 150/5060-5, Airport Capacity and Delay

Exhibit 3B
CAPACITY CONFIGURATIONS

and is utilized to estimate the current hourly capacity of the runway. This configuration best represents the current need for aircraft to back-taxi on the runway to get to the Runway 9 threshold in order to begin the takeoff run. The current hourly capacity is thus estimated at 22.5 ([40+50]/2=45 operations divided by 2 to account for one-way in/one-way out).

The current hourly demand capacity ratio is estimated at 49 percent of capacity. If no changes are made to the runway/taxiway system, the hourly demand/capacity ratio is forecast to increase to over 84 percent of capacity.

In the future, airfield configuration numbers four (#4) and six (#6) are averaged to provide an hourly capacity of 77.8. This figure is then divided by two, to account for one-way in/one-way out operation and results in an hourly capacity of 38.9. This estimate of future hourly capacity is dependent on departing aircraft being able to utilize a partial parallel taxiway to access the Runway 9 threshold. Basically, to improve capacity at the airport, Taxiway F must allow access to the Runway 9 threshold from the terminal area.

The hourly capacity can be improved substantially by eliminating the need for most back-taxiing movements on the runway. If aircraft were able to access the Runway 9 threshold today from Taxiway F, the operational demand would represent approximately 28 percent of capacity. Through the long term planning, this ratio would be approximately 49 percent. Airfield capacity calculations are summarized in **Table 3G**.

TABLE 3G
Estimated Airfield Capacity
Los Alamos Airport

	2011	Short	Intermediate	Long
Annual Operations	15,100	21,500	22,500	27,700
Current Design Hour Estimate	11	15	16	19
Current Runway/Taxiway Configuration				
Hourly Capacity Average	22.5	22.5	22.5	22.5
Hourly Demand/Capacity Ratio (avg.)	48.89%	66.67%	71.11%	84.44%
Average Delay per Operation (Min./Sec.)	0.35/21	0.60/36	0.70/30	1.10/66
Future Runway/Taxiway Configuration*				
Hourly Capacity Average	38.9	38.9	38.9	38.9
Hourly Demand/Capacity Ratio (avg.)	28.28%	38.56%	41.13%	48.84%
Average Delay per Operation (Min./Sec.)	0.15/9	0.2/12	0.22/14	0.35/21

*Assumes partial parallel taxiway access to Runway 9 threshold, eliminating back-taxi movements.
Source: Coffman Associates analysis; FAA AC 150/5060-5, Airport Capacity and Delay

FAA Order 5090.3B, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS), indicates that improvements for airfield capacity purposes should begin to be considered once operations reach 60 to 75 percent of the annual service volume. This is an approximate level to begin the detailed planning of capacity improvements. At the 80 percent level, the planned improvements should be made.

Based on current and projected operations developed for this study, improvements specifically designed to enhance capacity should be considered. The most significant airfield capacity improvement would be to construct a partial parallel taxiway. Analysis in the next chapter will consider additional capacity improvements that are reasonable within the confines of the airport.

AIRFIELD REQUIREMENTS

Airfield requirements include the need for those facilities related to the arrival and departure of aircraft. The adequacy of existing airfield facilities at Los Alamos Airport has been analyzed from a number of perspectives, including:

- Safety Area Design Standards
- Runway
- Taxiway
- Navigational Aids
- Airfield Lighting, Marking, and Signage

SAFETY AREA DESIGN STANDARDS

The minimum standards for the various safety areas surrounding an airport are defined in FAA AC 150/5300-13, *Airport Design*. These imaginary surfaces are intended to protect area airspace and keep them free from obstructions or incompatible land uses that could affect an aircraft's safe operation. These include the runway safety area (RSA), object free area (OFA), obstacle free zone (OFZ), and runway protection zone (RPZ).

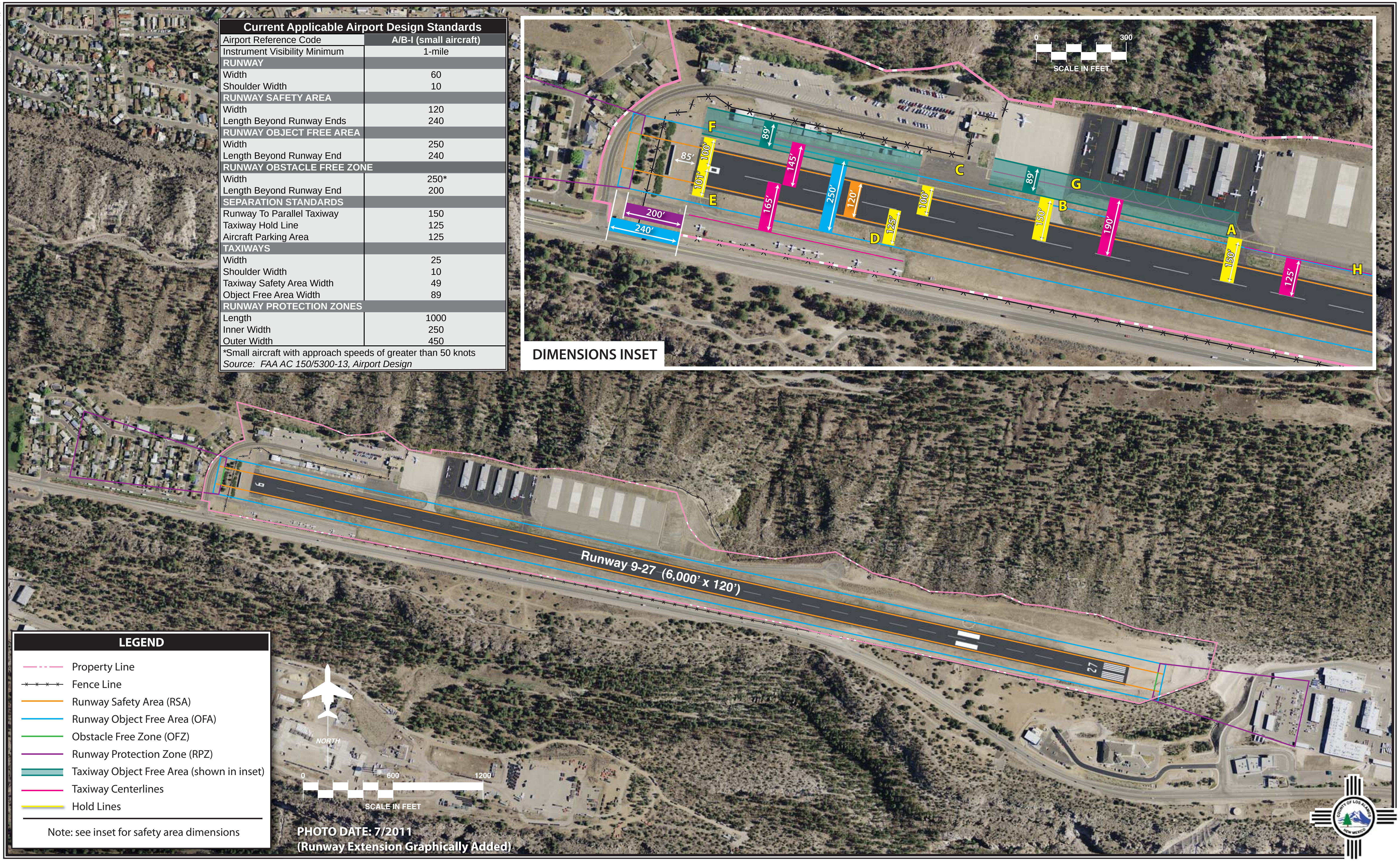
The entire RSA, OFA, and OFZ should be under the direct control of the airport sponsor to ensure these areas remain free of obstacles and can be readily accessed by maintenance and emergency personnel. It is not required that the RPZ be under airport ownership, but it is strongly recommended. An alternative to outright ownership of the RPZ is the purchase of avigation easements (acquiring control of designated airspace within the RPZ) or having sufficient land use control measures in place which ensures that the RPZ remains free of incompatible development.

Dimensional standards for the various safety areas associated with the airfield are a function of the ARC as well as the planned approach visibility minimums. The current critical aircraft falls in ARC A-I (small aircraft exclusively). In the future, the planned ARC is A-II (small aircraft exclusively), which is represented by a Cessna Caravan 208A 675 nine-seat commuter aircraft.

Due to the terrain surrounding the airport and the presence of Restricted Airspace to the immediate south of the airport, the existing non-precision instrument approach is anticipated to be the best approach the airport can obtain. Therefore, design standards will consider a 1-mile visibility minimum.

Analysis in the next chapter will outline methods aimed at meeting FAA RSA standards on Runway 17. **Table 3H** presents the various safety area design standards applied to Los Alamos Airport. The first column represents the current design standards for the airport. The last column represents the design standards if the critical aircraft transitions to ARC A-II (small aircraft exclusively). The middle column is for informational and comparative purposes. **Exhibit 3C** presents a graphic presentation of the various safety areas at the airport.

11MP08-3C-1/16/12



Current Applicable Airport Design Standards

Airport Reference Code	A/B-I (small aircraft)
Instrument Visibility Minimum	1-mile
RUNWAY	
Width	60
Shoulder Width	10
RUNWAY SAFETY AREA	
Width	120
Length Beyond Runway Ends	240
RUNWAY OBJECT FREE AREA	
Width	250
Length Beyond Runway End	240
RUNWAY OBSTACLE FREE ZONE	
Width	250*
Length Beyond Runway End	200
SEPARATION STANDARDS	
Runway To Parallel Taxiway	150
Taxiway Hold Line	125
Aircraft Parking Area	125
TAXIWAYS	
Width	25
Shoulder Width	10
Taxiway Safety Area Width	49
Object Free Area Width	89
RUNWAY PROTECTION ZONES	
Length	1000
Inner Width	250
Outer Width	450

*Small aircraft with approach speeds of greater than 50 knots
Source: FAA AC 150/5300-13, Airport Design

Exhibit 3C
SAFETY AREAS AND
SEPARATION DISTANCES

TABLE 3H
Design Standards

Airport Reference Code	A/B-I (small aircraft)	A/B-I	A/B-II (small aircraft)
Instrument Visibility Minimum	1-mile	1-mile	1-mile
RUNWAY			
Width	60	60	75
Shoulder Width	10	10	10
RUNWAY SAFETY AREA			
Width	120	120	150
Length Prior to Threshold	240	240	300
Length Beyond Runway End	240	240	300
RUNWAY OBJECT FREE AREA			
Width	250	400	500
Length Beyond Runway End	240	240	300
RUNWAY OBSTACLE FREE ZONE			
Width	120[1]	250[2]	250[2]
Length Beyond Runway End	200	200	200
SEPARATION STANDARDS			
Runway Centerline To Parallel Taxiway	150	225	240
Runway Centerline To Taxiway Hold Line	125	200	200
Runway Centerline To Aircraft Parking Area	125	200	250
TAXIWAYS			
Width	25	25	35
Shoulder Width	10	10	10
Taxiway Safety Area Width	49	49	79
Object Free Area Width	89	89	131
RUNWAY PROTECTION ZONES			
Length	1000	1000	1000
Inner Width	250	500	250
Outer Width	450	700	450

[1]Small aircraft with approach speeds of less than 50 knots
[2]Small aircraft with approach speeds greater than 50 knots
Source: FAA AC 150/5300-13, Airport Design

Runway Safety Area (RSA)

The RSA is defined as a "surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway." The RSA is centered on the runway and dimensioned in accordance to the approach speed of the critical aircraft using the runway. The FAA requires the RSA to be cleared and graded, drained by grading or storm sewers, capable of accommodating the design aircraft and fire and rescue vehicles, and free of obstacles not fixed by navigational purpose.

The FAA has placed a higher significance on maintaining adequate RSAs at all airports due to recent aircraft accidents. Under Order 5200.8, effective October 1, 1999, the FAA established a *Runway Safety Area Program*. The Order states, "The objective of the Runway Safety Area Program is that all RSAs at federally-obligated airports ... shall conform to the standards contained in Advisory Circular 150/5300-13, *Airport Design*, to the extent practicable." Each Regional Airports Division of the FAA is obligated to collect and maintain data on the RSA for each runway at the airport and perform airport inspections. The FAA has been visually inspecting the RSAs at each federally obligated airport for the last ten years with a goal to complete the program by 2015.

As previously mentioned, the current critical aircraft is ARC A-I (small aircraft exclusively). For this design category, the

RSA is 120 feet wide, as centered on the runway, and it extends 240 feet beyond each runway end.

The RSA extending to the west of the Runway 9 threshold should be 240 feet long. At Los Alamos Airport, the RSA extends approximately 75 feet before it is penetrated by the blast deflection fence, numerous small shrubs, and finally the airport perimeter fence. The RSA to the east of the Runway 27 threshold has been newly redesigned and provides the full 240-foot RSA.

Object Free Area (OFA)

The runway OFA is "a two-dimensional ground area, surrounding runways, taxiways, and taxilanes, which is clear of objects except for objects whose location is fixed by function (i.e., airfield lighting)." The OFA does not have to be graded and level as does the RSA; instead, the primary requirement for the OFA is that no object in the OFA penetrates the lateral elevation of the RSA. The runway OFA is centered on the runway, extending out in accordance to the critical aircraft design category utilizing the runway.

For ARC A/B-I (small aircraft exclusively), the OFA is 250 feet wide, centered on the runway, and extending 240 feet beyond the runway ends. The OFA beyond the Runway 9 threshold is penetrated by the blast deflection fence, numerous shrubs, the airport perimeter fence, and Airport Road. The windsock closest to the Runway 27 end is located within the OFA.

Obstacle Free Zones (OFZ)

The OFZ is an imaginary surface which precludes object penetrations, including taxiing and parked aircraft. The only allowance for OFZ obstructions is navigational aids mounted on frangible bases which are fixed in their location by function, such as airfield signs. The OFZ is established to ensure the safety of aircraft operations. If the OFZ is obstructed, the airport's approaches could be removed or approach minimums could be increased. The OFZ is 120 feet wide, centered on the runway, and extends 200 feet beyond the runway ends.

Beyond the Runway 9 threshold, the OFZ is penetrated by the blast deflection fence and numerous shrubs. The OFZ beyond the Runway 27 end meets the design standard.

Runway Protection Zones (RPZ)

The RPZ is a trapezoidal area centered on the runway, beginning 200 feet beyond the paved runway end. The RPZ has been established by the FAA to provide an area clear of obstructions and incompatible land uses, in order to enhance the protection of approaching aircraft as well as people and property on the ground. The RPZ is comprised of the Central Portion of the RPZ and the Controlled Activity Area. The dimensions of the RPZ vary according to the visibility minimums serving the runway and the type of aircraft operating on the runway.

The Central Portion of the RPZ extends from the beginning to the end of the RPZ, is centered on the runway centerline, and is the width of the OFA. Only objects necessary to aid air navigation, such as approach lights, are allowed in this portion of the RPZ. The remaining portions of the RPZ, the Controlled Activity Area, have strict land use limitations. Wildlife attractants, fuel farms, places of public assembly, and residences are prohibited. The AC specifically allows surface parking facilities, but they are discouraged.

IMAGINARY SURFACES

Federal Regulation 49 CFR Part 77, *Objects Affecting Navigable Airspace,* establishes standards and notification requirements for objects affecting navigable airspace. Through this Federal Aviation Regulation (FAR) several imaginary surfaces are established surrounding airports. FAR Part 77 guidance defines these surfaces and provides procedures for determining if an object is a potential hazard to air navigation. FAR Part 77 allows the "FAA to identify potential aeronautical hazards in advance thus preventing or minimizing the adverse impacts to the safe and efficient use of navigable airspace."

The FAA will complete an aeronautical study for any proposed construction on or around airports. The following summary presents the impacts that trigger the need for an aeronautical study:

1) Any construction or alteration greater than 200 feet above ground level.

2) Any construction or alternation greater in height than the following slopes:
   a. 100 to 1 for a horizontal distance of 20,000 feet from a runway greater than 3,200 feet in length.
   b. 50 to 1 for a horizontal distance of 10,000 feet from a runway less than 3,200 feet in length.
   c. 25 to 1 for a horizontal distance of 5,000 feet for heliport.

3) Any highway, railroad, or other traversed way that may penetrate one of the imaginary surfaces when adjusted upward 17 feet for highways, 10 feet for other roads, and 23 feet for railroads.

4) When requested by the FAA.

5) Any construction or alteration on a public use airport.

Once the FAA has completed an aeronautical study, a determination is made regarding the impact to air navigation. One of three responses is typically issued:

No Objection: The subject construction did not exceed obstruction standards and marking/lighting is not required.

Conditional Determination: The proposed construction/alteration would be acceptable contingent upon implementing mitigating measures (marking, lighting, etc.).

Objectionable: The proposed construction/alteration is determined to be a hazard and is thus objectionable.

FAR Part 77 assigns three-dimensional imaginary areas to the runway. The imaginary surfaces emanate from the runway centerline and are dimensioned according to the visibility minimums associated with the instrument approach to the runway and the critical aircraft (represented by an aircraft type or group of aircraft with similar characteristics) representing at least 500 annual operations. The FAR Part 77 surfaces include the primary surface, approach surface, transitional surface, horizontal surface, and conical surface. FAR Part 77 surfaces are described below as they apply to Los Alamos Airport currently (ARC B-I, small aircraft) and in the future (ARC A/B-II, small aircraft). A non-precision instrument approach with 1-mile visibility minimums is available currently and in the future.

It should be noted that penetrations to the FAR Part 77 is only the first indication that an object may be a hazard to the airspace. It is not a determination. Only the FAA can make a final determination. **Exhibit 3D** presents the FAR Part 77 surfaces as currently applied to Los Alamos Airport.

Primary Surface

The primary surface is an imaginary surface longitudinally centered on the runway. The primary surface extends 200 feet beyond each runway end. The elevation of any point on the primary surface is the same as the elevation along the nearest associated point on the runway centerline. By regulation, the primary surface for a runway with a non-precision instrument approach is 500 feet wide.

Due to the limited space available at the airport, the application of a 500-foot wide primary surface is not reasonable or feasible. Both the airspace and airports business lines of the FAA were consulted. They indicated that any potential penetrations to the primary surface would be analyzed on an individual bases.

Approach Surface

An approach surface is also established for each runway end. The approach surface begins at the end of the primary surface and extends upward and outward from the primary surface end and is centered along an extended runway centerline. The approach surface leading to each runway end is based upon the type of approach available (instrument or visual) or planned. The inner edge of the approach surface is the same width as the primary surface and it expands uniformly.

The approach surface for Runway 27 extends 5,000 feet in length to a width of 2,000 feet. There is no approach surface to Runway 9, as approaches are prohibited. If the critical aircraft were to transition to one weighing more than 12,500 pounds the approach surface would extend 10,000 feet to a width of 3,500 feet.

Transitional Surface

The runway has a transitional surface that extends upward and outward at right angles to the runway centerline and the extended runway centerline at a slope of 7 to 1 from the sides of the primary surface and from the sides of the approach surface. The surface rises up to a height 150 feet above the highest runway elevation. At that point, the transitional surface is replaced by the horizontal surface.

It should be noted that the west end hangars situated adjacent Taxiway F currently penetrate the transitional surface.

Horizontal Surface

The horizontal surface is established at 150 feet above the airport elevation. Having no slope, the horizontal surface connects the transitional and approach surfaces to the conical surface at a distance of 5,000 feet from the center of the ends of the primary surfaces of each runway.

Conical Surface

The conical surface begins at the outer edge of the horizontal surface. The coni-

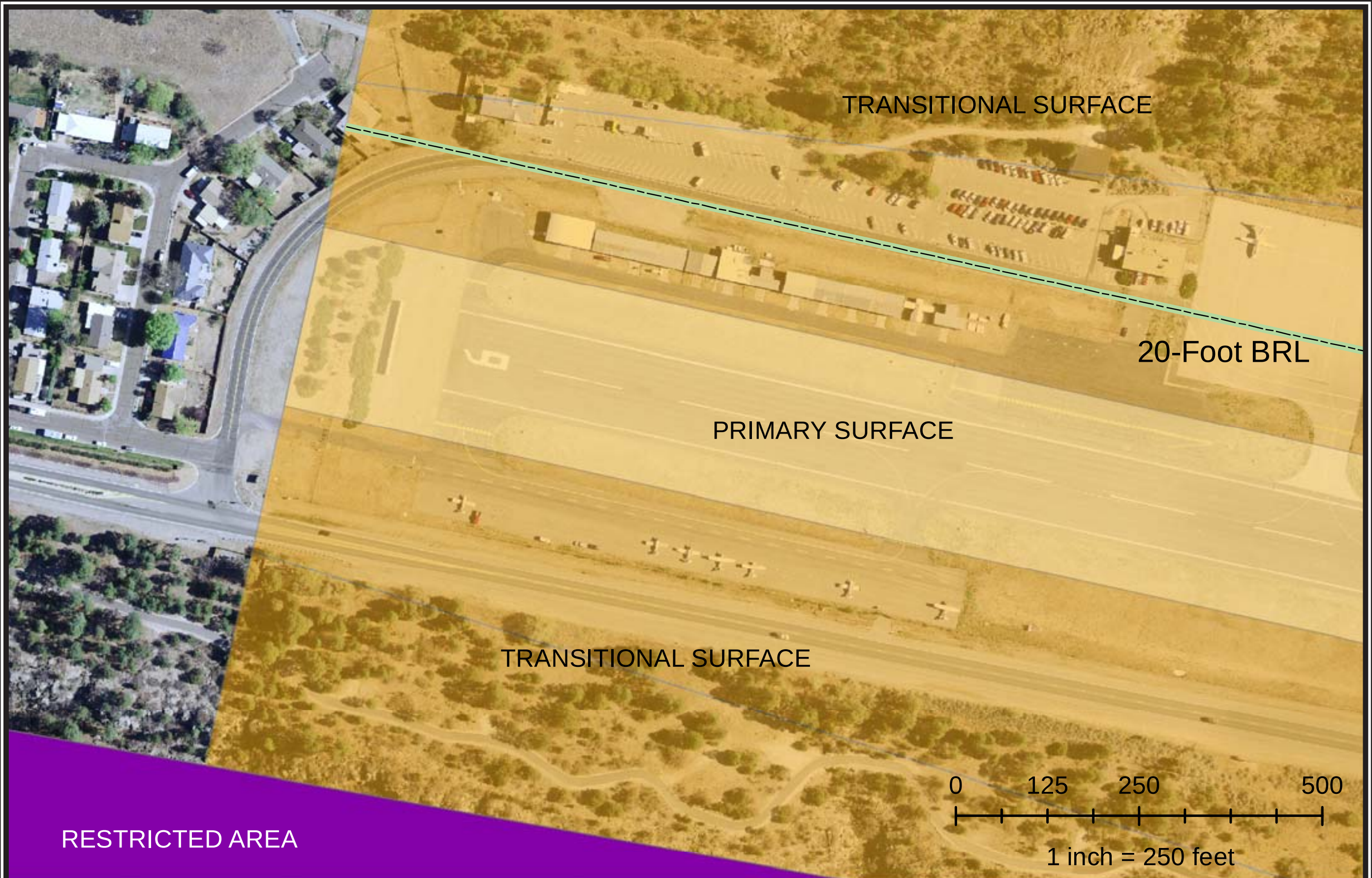


Photo Source: 7.2011; Los Alamos County GIS

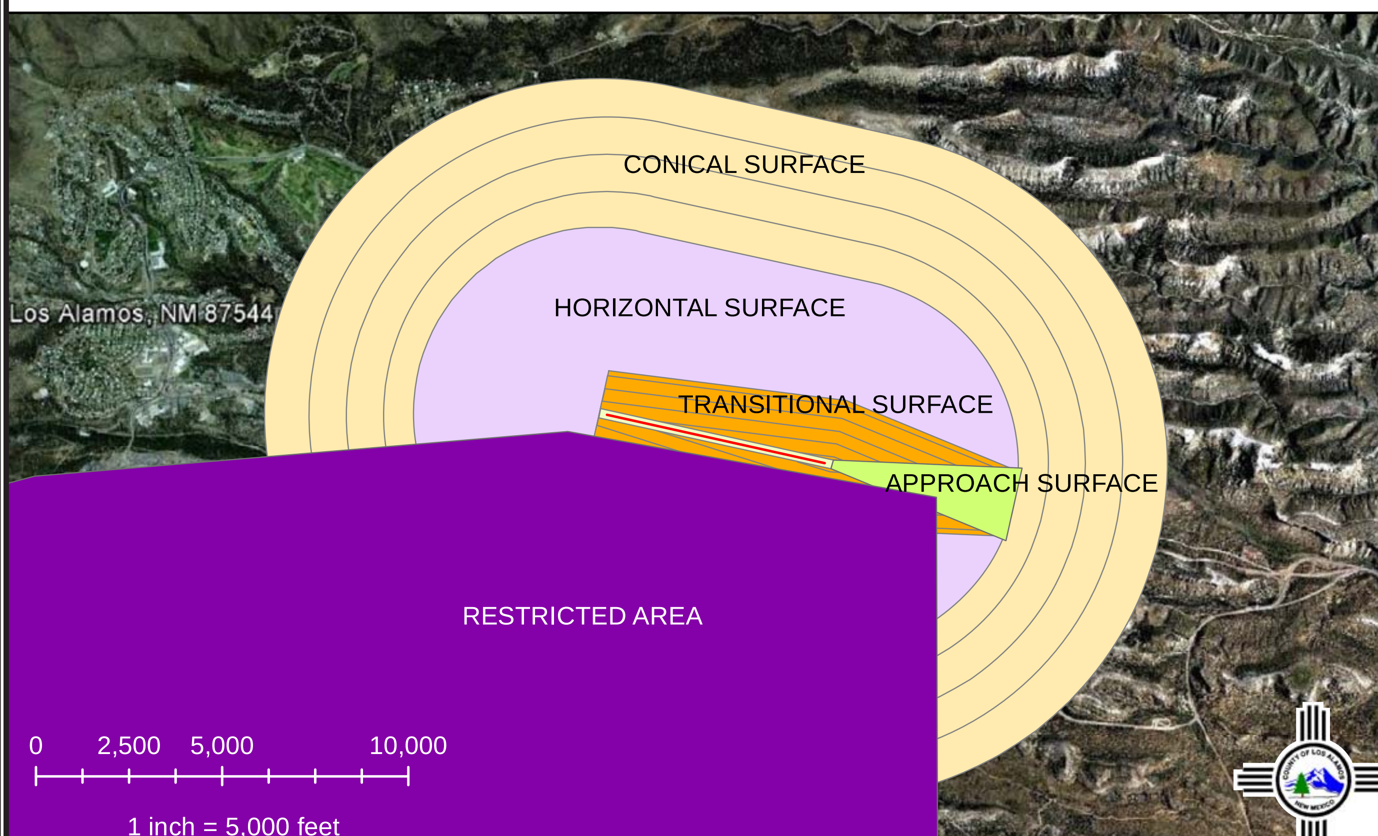


Exhibit 3D
IMAGINARY SURFACE DETAIL

cal surface then continues for an additional 4,000 feet horizontally at a slope of 20 to 1. Therefore, at 4,000 feet from the horizontal surface, the elevation of the conical surface is 350 feet above the airport elevation.

BUILDING RESTRICTION LINE (BRL)

The BRL is an imaginary line which identifies suitable areas for construction on airport property. The BRL encompasses the RPZs, the OFA, the runway visibility zone, various critical areas associated with navigational aids, and areas required for instrument approaches.

The BRL is dimensioned according to the slope of the transitional surface. Therefore, the BRL is variable depending upon the height of structures below the transitional surface. At Los Alamos Airport, a 20-foot BRL would be located 265 feet from the runway centerline. The elevation allowable at the face of the west hangars adjacent Taxiway F is only 7.14 feet. All of these hangars exceed this height. As noted, the FAA would make the determination if the hangars represented a hazard to navigation. Nonetheless, it is incumbent upon the airport sponsor to note the object penetrations and to make appropriate plans to mitigate the penetration to the greatest extent possible. The alternatives discussion in this master plan will examine mitigating solutions.

RUNWAY ORIENTATION

The airport is served by Runway 9-27 oriented in an east-west manner. For the operational safety and efficiency of an airport, it is desirable for the primary runway to be orientated as closely as possible to the direction of the prevailing wind. This reduces the impact of wind components perpendicular to the direction of travel of an aircraft that is landing or taking off (defined as a crosswind).

FAA Advisory Circular 150/5300-13, *Airport Design*, recommends that a crosswind runway should be made available when the primary runway orientation provides less than 95 percent wind coverage for specific crosswind components. The 95 percent wind coverage is computed on the basis of the crosswind not exceeding 10.5 knots (12 mph) for ARC A-1 and B-I; 13 knots (15 mph) for ARC A-II and B-II; 16 knots (18 mph) for ARC C-I through D-II; and 20 knots for ARC A-IV through D-VI. Wind data specific for Los Alamos Airport was obtained from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Center and is depicted on **Exhibit 3E**.

Runway 9-27 provides 93.08 percent wind coverage for 10.5 knot crosswinds, 96.13 percent wind coverage at 13 knots, and 99.12 percent coverage at 16 knots. While there are times that a crosswind runway may be desired, the constraints of the airport site preclude the possibility of constructing a crosswind runway. Therefore, a crosswind runway will not be considered in this master plan.

RUNWAY LENGTH

Runway length requirements are based upon five primary elements: airport elevation, the mean maximum daily temperature of the hottest month, runway gradient, critical aircraft type expected to use the runway, and aircraft loading (weight). Aircraft performance declines as elevation, temperature, and runway gradient factors increase. Therefore, these factors increase runway length requirements.

For calculating runway length requirements at Los Alamos Airport, the elevation is 7,171 feet mean sea level (MSL) and the mean maximum daily temperature of the hottest month is 80 degrees Fahrenheit (F) (July).

Runway 9 has a published runway end elevation of 7,171 feet MSL, while Runway 27 has a published elevation of 7,080 feet MSL. The difference in elevation is 91 feet for a runway gradient of 1.52 percent.

FAA Advisory Circular (AC) 150/5235-4B, *Runway Length Requirements for Airport Design*, provides guidelines to determine runway lengths for civil airports. **Table 3J** presents the runway length results from the AC. Runway length results greater than 30 feet are rounded up to the next 100-foot interval.

TABLE 3J
General Aviation Runway Length Analysis
Los Alamos Airport

AIRPORT AND RUNWAY DATA	
Airport elevation	7,171 feet
Mean daily maximum temperature	80º F
Maximum difference in runway centerline elevation	91 feet
RUNWAY LENGTHS RECOMMENDED FOR AIRPORT DESIGN	
Small airplanes with less than 10 passenger seats	
95 percent of these small airplanes	8,500 feet
100 percent of these small airplanes	8,500 feet
Small airplanes with 10 or more passenger seats	8,500 feet
Large airplanes of 60,000 pounds or less	
75 percent at 60 percent useful load	8,600 feet
75 percent at 90 percent useful load	9,400 feet
100 percent at 60 percent useful load	11,900 feet
100 percent at 90 percent useful load	11,900 feet

Reference: AC 150/5325-4B, Runway Length Requirements for Airport Design

As can be seen in the table, the effects of elevation and runway gradient have a substantial impact on the runway length requirements for various classes of aircraft. According to the AC, a runway length of 8,500 feet would be recommended to accommodate small aircraft, which are those under 12,500 pounds.

To accommodate 75 percent of large aircraft, represented primarily by business jets, at 60 percent useful load, a runway length of 8,600 feet is recommended. To accommodate 100 percent of large aircraft at 60 percent useful load, a runway length of 11,900 feet is recommended.

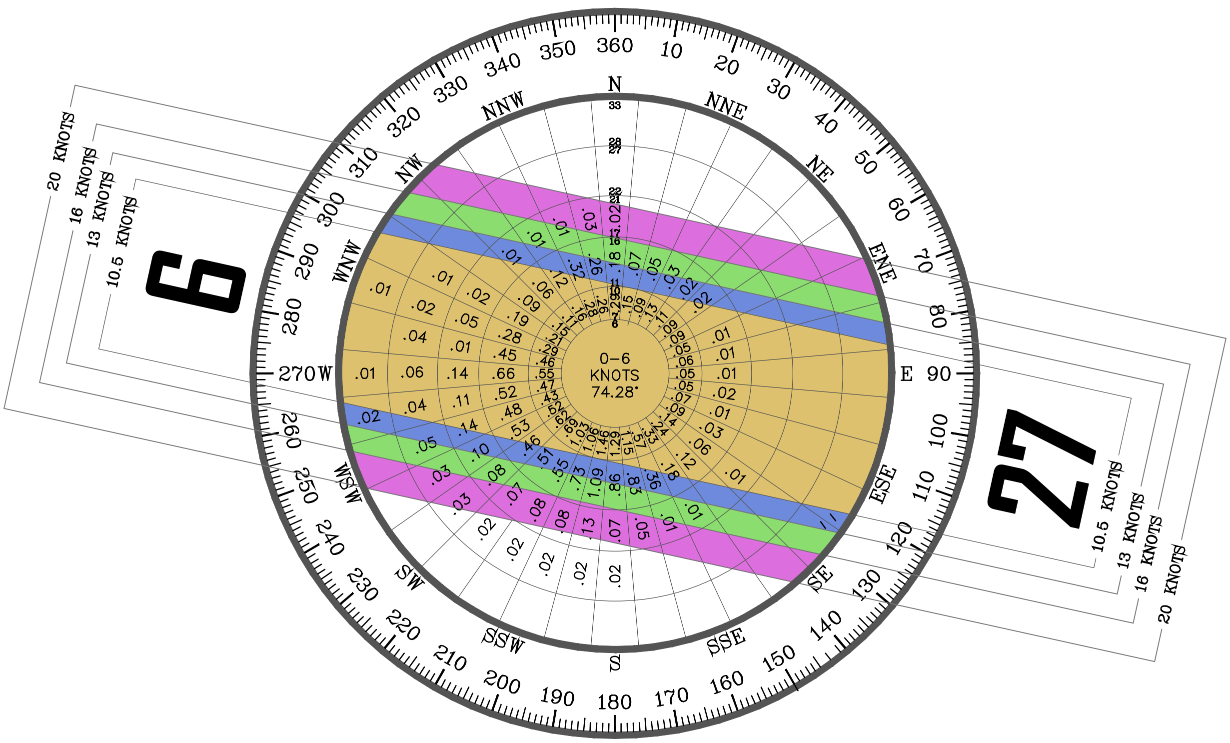
The constraints to the airfield prevent any reasonable efforts to extend the runway beyond the existing 6,000 feet. Extension to the east is difficult due to the extensive fill that would be needed and location of numerous commercial and governmental buildings. On the west end is an established residential neighborhood.

RUNWAY WIDTH

The FAA design standard for runway width is dependent on the critical design aircraft and the approach visibility minimums. The runway width standard for ARC A-I (small aircraft exclusively) is 60

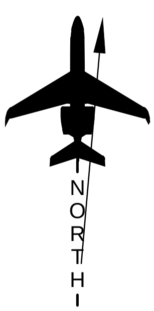
ALL WEATHER WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 9-27	*93.08%*	*96.13%*	*99.12%*	*99.78%*



SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Los Alamos, New Mexico

OBSERVATIONS:
42,144 All Weather Observations
2006-2010



Magnetic Declination
9° 5' East (November 2011)
Annual Rate of Change
00° 07' West (November 2011)

Exhibit 3E
WINDROSE

feet. For ARC A/B-II, the width standard is 75 feet. At Los Alamos Airport, the runway is marked at a width of 120 feet, thus providing an additional safety margin for landing aircraft. This is particularly important at Los Alamos Airport because of the one-way in/one-way out nature of operations. In this operating condition, pilots are more likely to experience crosswinds or even tailwinds, so the additional width provides an additional level of safety.

RUNWAY STRENGTH

The runway at Los Alamos Airport is strength-rated at 43,000 pounds single wheel loading (S). This strength rating exceeds the minimum recommendation for the airport (12,500 lbs. S) but there are times when the pavement strength has proved to be a significant asset. Because of the proximity of the airport to LANL, it is not unusual for high ranking military to utilize the airport arriving on aircraft, such as a Gulfstream IV, weighing up to 74,000 pounds. The pavement strength is adequate for the long term at the airport and should be maintained.

SEPARATION DISTANCES

FAA AC 150/5300-13, *Airport Design*, discusses required minimum separation distances between a runway centerline and various areas on the airport. The separation distances are a function of the approaches approved for the airport and the critical design aircraft.

The runway/taxiway separation standard for ARC A-I (small aircraft exclusively) is 150 feet, centerline to centerline. The separation distance to Taxiway F is 145 feet, to Taxiway G is 190 feet, and to Taxiway H is 125 feet. The alternatives chapter will consider the feasibility of increasing the separation between the runway and taxiways where necessary.

The runway/taxiway separation standard for ARC A/B-II is 240 feet. Considerations will also be given to meeting this standard, in anticipation of the critical aircraft ultimately transitioning to this ARC.

The separation standard from the runway centerline to aircraft parking areas is 125 feet for ARC A/B-I (small aircraft exclusively). For a design aircraft in ARC A/B-II, the aircraft parking area should be 250 feet from the runway centerline.

TAXIWAYS

Taxiways are constructed primarily to facilitate aircraft movements to and from the runway system. Some taxiways are necessary simply to provide access between the aprons and runways, whereas other taxiways become necessary as activity increases at an airport to provide safe and efficient use of the airfield. Taxiways designed to support operations by aircraft in design group I should be 25 feet wide, while those supporting aircraft in design group II should be 35 feet wide.

A taxiway safety area and taxiway object free area apply to taxiways. The width of these safety areas is dependent on the wingspan of critical aircraft. For ADG I aircraft, the taxiway safety area width is 49 feet and the taxiway object free area width is 89 feet. The hangars along Taxiway F penetrate the taxiway object free area. When addressing separation standards in the alternatives chapter, consideration will be given to the various taxiway safety area design standards.

INSTRUMENT NAVIGATION AIDS

As discussed in Chapter One, Los Alamos Airport does have an instrument approach with 1-mile visibility minimums. This approach is unusual in that it directs the pilot to a location approximately 1.2 nautical miles to the east of the airport rather than to the runway threshold. At this point, 1.2 nm from the runway, the pilot must be able to make visual contact with the runway before continuing their descent. As a result, this approach is utilized more like a visual approach than an instrument approach.

The instrument approach should be maintained. Obtaining an approach with lower visibility or cloud ceiling minimums will not be considered in this master plan. Los Alamos Airport is probably fortunate to have any type of instrument approach. All care should be given to preserving this approach including adherence to design standards to the maximum extent practicable, and awareness of potential obstruction by airport management.

VISUAL NAVIGATION AIDS

The airport beacon provides identification of the airport at night for pilots. The beacon is located atop the terminal building. The airport should maintain a functioning beacon at all times.

Runway end identification lights (REILs) are strobe lights set to either side of the runway ends. These lights provide rapid identification of the runway threshold. REILs should be installed at runway ends not currently providing an approach lighting system but supporting instrument operations. REILs are available at the Runway 27 threshold and should be maintained.

Precision approach path indicator (PAPI) lights provide pilots with visual descent information to the runway touchdown zone. This system provides the pilot with a visual representation of being above, on, or below the proper approach glide path. Runway 27 is currently served by a two-box PAPI. This system should be maintained at the airport.

The runway has medium intensity runway lights along the edges of both sides of the runway. These lights provide pilots with a visual of the orientation and length of the runway. These lights should be maintained.

WEATHER REPORTING AIDS

Los Alamos Airport has two windsocks. One is located near the Runway 27 threshold within a segmented circle and the other is adjacent to the terminal building. These facilities should be maintained for the planning period.

Los Alamos Airport is equipped with an Automated Weather Observation System (AWOS-3). AWOS systems are often commissioned by the FAA for airports that meet criteria of either 8,250 annual itinerant operations or 75,500 local operations. The AWOS automatically records weather conditions such as wind speed, wind gust, wind direction, temperature, dew point, altimeter setting, visibility, fog/haze condition, precipitation, and cloud height. This information is then transmitted at regular intervals via radio frequency in the area. Aircraft in the vicinity can receive this information if they have their radio tuned to the correct frequency (124.175 MHz). In addition, pilots and individuals can call a published telephone number and receive the information via an automated voice recording.

This system should be maintained at the airport.

AIRFIELD LIGHTING AND MARKING

Runway markings are designed according to the type of instrument approach available on the runway. FAA AC 150/5340-1F, *Marking of Paved Areas on Airports*, provides guidance necessary to design airport markings. Pavement markings aid in the movement of aircraft along airport surfaces and identify closed or hazardous areas on the airport. Runway 27 has non-precision markings that include the designation, threshold, touchdown zone, centerline, and edges. Runway 9 has basic markings that include the designation, centerline, and edges. The entire runway was re-marked in 2011 in conjunction with the runway extension project.

Hold lines are marked on entrance/exit taxiways connecting to the runway. Pilots are instructed to stop behind these hold lines when other aircraft are operating to or from the runway. For aircraft in ARC A-I (small aircraft exclusively), the hold lines should be marked at a distance of 125 feet from the runway centerline. At Los Alamos Airport, the hold lines are marked as follows:

- Taxiway A Hold Line: 150 feet
- Taxiway B Hold Line: 150 feet
- Taxiway C Hold Line/Run-up Apron: 100 feet
- Taxiway D Hold Line: 125 feet
- Taxiway E Hold Line: 100 feet
- Taxiway F Hold Line: 100 feet

To meet the design standard for the current design aircraft, all hold lines should be at a uniform distance of 125 feet from the runway centerline. If the design aircraft transitions to A/B-II, the hold lines should be at a distance of 200 feet from the runway centerline.

The airport has distance-to-go markers set to the south side of the runway facing to the west. Pilots taking off are able to quickly identify how much runway length is remaining to the end of the runway. These lighted markers should be maintained.

The runway is served by medium intensity runway lights (MIRL), which are required to serve nighttime operations and instrument approach procedures. The runway edge lighting should be maintained.

There is no taxiway lighting. Taxiway lighting should be installed at airports supporting regularly scheduled commercial/commuter operations or at those airports with at least 100 based aircraft.

AIRSIDE SUMMARY

Los Alamos Airport is constrained from significant future growth of the airside element. The airport is physically located on a mesa with Pueblo Canyon to the north and DP Canyon to the south. State Route 502 is also immediately south of the airport. To the east is the end of the mesa where the terrain drops precipitously and to the west is an established residential neighborhood.

The airside facility requirements section has identified the applicable design standards for the airfield and indicated those standards that do not currently meet standard. The RSA, OFA, and OFZ, as they extend beyond the Runway 9 end, are penetrated by the blast deflection fence, numerous shrubs, the perimeter fence, and Airport Road.

At 6,000 feet in length, the runway has limited capability. An ideal length to accommodate aircraft under 12,500 pounds would be 8,500 feet. To accommodate 75 percent of business jets at 60 percent useful load, a runway length of 8,600 feet is recommended. As a result, the airport must focus on providing the safest operating environment given its limited expansion capability.

The taxiway system is not uniform and at several locations is too close to the runway to meet separation standards. The taxiway system also negatively impacts the overall capacity of the airport.

The airport does have an instrument approach, which is desirable as it extends the capability of the airport at times when weather conditions are less than visual. The navigational aids, including the REILs and PAPIs, are important and should be maintained.

The alternatives chapter of this master plan will present several options for the airport to meet design standards and to maximize operational efficiency. It is possible that the airport will be unable to fully meet design standards, without significantly reducing the capability of the runway system. Therefore, the alternatives chapter will attempt to arrive at a balance that preserves the current capability of the runway system while increasing efficiency. **Exhibit 3F** presents a summary of the airside requirements.

LANDSIDE REQUIREMENTS

Landside facilities are those necessary for the handling of aircraft and passengers while on the ground. These facilities provide the essential interface between the air and ground transportation modes. The capacity of the various components of each area was examined in relation to projected demand to identify future landside facility needs. This includes components for general aviation needs such as:

- Commercial and General Aviation Terminal Space
- Aircraft Hangars
- Aircraft Parking Aprons
- Auto Parking
- Airport Support Facilities

COMMERCIAL TERMINAL FACILITIES

The adequacy of commercial terminal facilities is determined by the size and quantity of various terminal building elements. The size of most terminal building elements is a function of the peak passenger times and overall enplanement (boarding) levels. Planning for commercial terminal facilities should be designed to a reasonable long term passenger service forecast.

Table 3K summarizes the enplanement forecast and various peaking characteristics that serve as input to calculations related to passenger facility planning. The success of commercial passenger service can be very hard to predict. As discussed previously, Los Alamos Airport had commuter service from 1948 to the mid-1990s. Current planning by the airport administration considers up to nine daily round trips to Albuquerque.

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RUNWAYS

AVAILABLE	SHORT TERM	LONG TERM
Runway 9-27	**Runway 9-27**	**Runway 9-27**
ARC A-I (small aircraft exclusively)	Same	ARC A/B-II (Small aircraft exclusively)
6,000' x 120'	Same	Same
43,000# SWL	Same	Same
Non-standard RSA/OFA/OFZ/RPZ	Standard RSA/OFA/OFZ/RPZ	Same

TAXIWAYS

AVAILABLE	SHORT TERM	LONG TERM
Taxiways	**Taxiways**	**Taxiways**
Taxiway widths not uniform	Uniform taxiway widths	Same
Taxiway RSA/OFA deficient	Taxiway RSA/OFA to meet standard	Same
Taxiway/Runway separation deficient	Taxiway/Runway separation to meet standard	Same
Hold line Txy A, B at 150 feet	Move hold line Txy A, B to 125 feet	Hold line all Taxiways at 240 feet
Hold line Txy C, D, E, F at 100 feet	Move hold line Txy C, D, E, F to 125 feet	Hold line all Taxiways at 240 feet
No Taxiway access to Runway 9 threshold	Taxiway access to Runway 9 threshold	Same

NAVIGATIONAL AND WEATHER AIDS

AVAILABLE	SHORT TERM	LONG TERM
AWOS, 2 Windsocks, Segmented Circle	Same	Same
Runway 9-27	**Runway 9-27**	**Runway 9-27**
RNAV (GPS) Rwy 27 (1-mile/548')	Same	Same

LIGHTING AND MARKING

AVAILABLE	SHORT TERM	LONG TERM
Rotating Beacon	Same	Same
Medium Intensity Runway Lighting	Same	Same
Taxiway Lighting (NA)	Taxiway reflectors	Medium Intensity Taxiway Lighting
Runway 9-27	**Runway 9-27**	**Runway 9-27**
Non-precision marking (27)	Same	Same
Basic Marking (9)	Same	Same
REILs (27) PAPI-2L (27)	Same	Same

PAPI - Precision Approach Path Indicator
GPS - Global Positioning System
REIL - Runway End Identification Lights
MIRL - Medium Intensity Runway Lighting
MITL - Medium Intensity Taxiway Lighting

Exhibit 3F
AIRSIDE REQUIREMENTS

TABLE 3K
Passenger Traffic Activity Forecast
Los Alamos Airport

	Short Term	Intermediate Term	Long Term
DESIGN TRAFFIC			
Annual Enplanements	21,000	24,000	36,000
Peak Month Enplanements	2,520	2,880	4,320
Design Day Enplanements	84	96	144
Design Hour Enplanements	9	14	29
Design Day Operations	18	18	26
Peak Hour Operations	2	2	4
PASSENGER PEAKS			
Design Hour Total Passengers	18	29	59
Peak Visitor Ratio	0.40	0.50	0.60
Enplaned Visitors	4	7	18
Total Visitors	7	14	35
AIRCRAFT APRON POSITIONS			
Loading Bridges	0	0	0
Commuter Gates	1	1	2
Total	1	1	2

Source: Coffman Associates analysis

Terminal building area requirements have been considered for the following functional areas:

- Ticketing and Check-in
- Airline Operations Area
- Security Checkpoint
- Gate Facilities/Hold Room
- Baggage Claim
- Rental Car Counters
- Concessions
- Public Lobby
- Restrooms
- Administration/Office Space
- Reserve: Circulation/HVAC
-

Other facilities necessary based on passenger activity:

- Terminal Curb
- Automobile Parking

This section identifies the terminal area facilities required to meet the airport's needs through the long term planning period. These requirements are based upon specific passenger enplanement thresholds, rather than a given year. In this manner, the airport's management can reference the guidelines, even if growth varies from the forecast.

Two primary sources were referenced for guidance on terminal building planning: FAA AC 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities* and Airport Cooperative Research Program, Report 25, *Airport Passenger Terminal Planning and Design*. In addition, the consultant developed various formulas for calculating terminal building needs that have also been utilized to generalize terminal building needs. **Exhibit 3G** presents a summary of each functional area of a terminal building at each planning horizon level.

Ticketing and Check-in

The first destination for enplaning passengers in the terminal building is usually the airline ticket counter. The ticketing area consists of the ticket counters, queuing area for passengers in line at the counters, and the ticket lobby which provides circulation.

The ticket lobby should be arranged so that the enplaning passenger has immediate access and clear visibility to the individual airline ticket counters upon entering the building. Circulation patterns should allow the option of bypassing the counters with minimum interference. Provisions for seating should be minimal to avoid congestion and to encourage passengers to proceed to the gate area. Airline ticket counter frontage, counter area, counter queuing area, ticketing lobby, and airline office and operations area requirements for each potential enplanement level have been calculated.

Security Checkpoint

Only airports that are required to be Part 139 certified are required to follow Transportation Security Administration (TSA) regulations. Los Alamos Airport is not anticipated to initially need dedicated security functions. However, planning for the terminal building does include space for TSA and security checkpoints if the regulations change in the future.

Departure Area

The departure lounge is the designated waiting area used by passengers immediately prior to boarding an aircraft. The departure area should provide adequate seating and circulation to accommodate peak hour enplanements. Restroom and concessions should be made available.

Public Lobby

A lobby directly available from the curb with space for waiting and sitting should be provided adjacent to the ticketing area. The lobby must be large enough to accommodate passengers who are early, passengers with delayed flights, and people who accompany passengers to the airport. This area is the hub of the circulatory route through the terminal and should not conflict with passengers queuing at the ticket counters or with passenger traffic flow.

Bag Claim Facilities

Baggage claim areas should provide a segregated lobby to accommodate arriving passengers claiming bags and visitors, and keep them segregated from ticketing passengers and the main circulation route through the terminal building.

Concessions

The concessions functional area should consider areas for gift shops, restaurant, lounge, and snack shop. This could be accommodated by vending areas until demand increases to such a point that a vendor could successfully operate a deli or restaurant.

Auto Rental Car Area

It is common for rental car agencies to lease counter and office space in the terminal building at commercial service airports. A segregated queuing area would facilitate flow through the main circulation corridor.

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	SHORT TERM	INTERMEDIATE TERM	LONG TERM
Enplanement Level	21,000	24,000	36,000
Ticketing/Check-in			
Number of Airlines	1	1	1
Number of Pax/Half Hr. Peak	6	10	20
No. of Agent Positions	1	1	2
Counter Frontage (l.f.)	4	6	13
Ticket Lobby Queue (s.f.)	101	161	328
Airline Operations (s.f.)			
Counter Area	40	64	131
Airline Ops/Makeup	1,090	1,144	1,294
Subtotal Airline Operations	1,130	1,208	1,425
Security Checkpoint			
Security Checkpoints	1	1	1
Check Point Area (s.f.)	270	432	882
Security Queue Area (s.f.)	130	130	130
Subtotal Security Checkpoint	400	562	1,012
Gate Facilities			
Peak Occupants	9	14	29
Secured Holdroom Area (s.f.)	198	317	647
Total Holdroom Area (s.f.)	198	317	647
Baggage Claim			
Passengers Claiming Bags	5	9	18
Claim Display (l.f.)	25	14	29
Claim Display floor area (s.f.)	125	86	176
Claim Lobby area (s.f.)	292	518	1,164
Total Bag claim area (s.f.)	417	605	1,341
Rental Car Counters			
Counter Frontage (l.f.)	31	32	34
Counter Office Area (s.f.)	627	643	688
Counter Queue Area (s.f.)	188	193	206
Total Rental Car Area (s.f.)	815	836	895
Concessions (s.f.)			
Food and Beverage	187	302	623
Gift Shops	30	50	109
Total Concessions	217	353	732
Public Waiting Lobby (s.f.)			
Public Lobby/Seating	79	130	270
Greeting Lobby	22	43	106
Total Public Waiting Lobby	101	173	376
Restrooms (s.f.)			
Men's/Women's	56	92	194
Administration Offices/Conf. (s.f.)			
Admin Space	1,210	1,240	1,360
Community Conference Room	388	404	437
SUBTOTAL	**5,031**	**5,951**	**8,747**
Circulation Areas (s.f.)	1,258	1,488	2,187
HVAC Reserve (s.f.)	755	893	1,312
Gross Terminal Building Space (s.f.)	**7,044**	**8,331**	**12,246**

Exhibit 3G
TERMINAL BUILDING REQUIREMENTS

Airline Gate Positions

All airline gates planned for Los Alamos Airport assume ground level boarding to the commuter aircraft. In the short term, a single gate would accommodate planned passengers. Ultimately, there could be a need for more than one gate when there are two aircraft on the ground at the same time.

Terminal Curb Frontage

The curb element is the interface between the terminal building and the ground transportation system. The length of curb required for the loading and unloading of passengers and baggage is determined by the type and volume of ground vehicles anticipated in the peak period on the design day.

Table 3L presents the forecast needs for terminal curb and automobile parking.

TABLE 3L
Airline Terminal Automobile Requirements
Los Alamos Airport

	Short Term	Intermediate	Long Term
Terminal Curb			
Enplane Curb (ft)	8	13	26
Deplane Curb (ft)	9	15	31
Total Curb (ft)	18	28	57
Auto Parking			
Total Public Parking	90	109	176
Employee Parking	11	12	18
Rental Car Parking	5	7	15
Total All Parking	105	128	208

Automobile Parking Areas

Automobile parking should be made available for short term passenger drop off and pick up. These lots should be in close proximity to the terminal building. Intermediate lots are intended for short duration overnight parking and are typically located further from the terminal building. Long term lots are typically located the furthest from the terminal building. Employee parking is also typically further from the terminal building. Rental car parking is heavily dependent upon the individual business need. Los Alamos Airport, for example, may need additional rental car parking based on customer preference.

Conclusion

This terminal building analysis presents the typical space necessary to accommodate the forecast peak passenger levels. This analysis is intended to apply to a dedicated terminal building that would accommodate scheduled commuter passenger service that is available to the public.

It is estimated that an initial terminal building encompassing approximately 7,000 square feet would accommodate short term forecast passenger activity levels. By the long term planning period, a terminal building of approximately 12,200 square feet is needed.

AIRCRAFT RESCUE AND FIREFIGHTING

Dedicated on-airport aircraft rescue and firefighting (ARFF) is not required for airports that are not Part 139 certified. In case of an emergency, the Los Alamos County Fire Department will respond. Fire Station No. 6 is the closest to the airport and is located at 457 East Road, approximately ¼-mile to the west of the airport entrance road.

Station No. 6 houses an Engine, an Oshkosh Crash and Fire Rescue (CFR) vehicle, an ambulance, a mini-tender, and a Tender (summer months only). Airports that must have ARFF capability have to meet an Index level that describes the vehicle capacity of various extinguishing material. **Table 3M** presents the ARFF Index requirements. The equipment housed at Station No. 6 currently meets ARFF Index B.

TABLE 3M
ARFF Index Requirements

Index	Aircraft Length	Requirements
Index A	<90'	1. One ARFF vehicle with 500 lbs. of sodium-based dry chemical or 2. One vehicle with 450 lbs. of potassium-based dry chemical and 100 lbs. of water and AFFF for simultaneous water and foam application
Index B	90'-126'	1. One vehicle with 500 lbs. of sodium-based dry chemical and 1,500 gallons of water and AFFF or 2. Two vehicles, one with the requirements for Index A and the other with enough water and AFFF for a total quantity of 1,500 gallons
Index C	126'-159'	1. Three vehicles, one having Index A, and two with enough water and AFFF for all three vehicles to combine for at least 3,000 gallons of agent or 2. Two vehicles, one with Index B and one with enough water and ARFF for both vehicles to total 3,000 gallons
Index D	159'-200'	1. One vehicle carrying agents required for Index A and 2. Two vehicles carrying enough water and AFFF for a total quantity by the three vehicles of at least 4,000 gallons
Index E	>200'	1. One vehicle with Index A and 2. Two vehicles with enough water and AFFF for a total quantity of the three vehicles of 6,000 gallons

AFFF: Aqueous Film-Forming Foam
ARFF: Aircraft Rescue and Firefighting

Source: 14 CFR Part 139

AIRCRAFT HANGARS

The demand for aircraft storage hangars typically depends upon the number and type of aircraft expected to be based at the airport. For planning purposes, it is necessary to estimate hangar requirements based upon forecast operational activity. However, future hangar development should be based on actual demand and economic conditions. This includes hangar space needed for non-storage activities, which would include maintenance or aircraft development such as performed by the EAA.

Utilization of hangar space varies as a function of local climate, security, and owner preferences. The trend in general aviation aircraft, whether single or multi-engine, is toward more sophisticated aircraft (and consequently, more expensive aircraft); therefore, many aircraft owners prefer enclosed hangar space to outside tie-downs. At present, it is estimated that 24 single engine piston-powered aircraft utilize outside tie-down space. This represents 35 percent of the based aircraft total.

Most aircraft owners would prefer an enclosed hangar space to protect their aircraft from the elements. This is particularly true in regions where severe weather or snow events are anticipated. Planning for hangar space assumes that as space is available, more aircraft would be stored in a hangar. By the long term planning period, 92 percent of based aircraft are assumed to be in a hangar.

T-hangars are typically used for smaller single and multi-engine aircraft storage. T-hangars are popular with aircraft owners having one aircraft as they are allowed privacy and individual access to their space. At Los Alamos Airport, there are 32 T-hangar positions. These hangars encompass approximately 35,000 square feet of space.

Some airports will provide a variant of a T-hangar described as a shade hangar. Shade hangars are intended to provide cover from the elements for smaller single and multi-engine aircraft. Shade hangars provide a roof structure but no walls. Future planning will consider T-hangars and shade hangars as the same.

Box hangars are typically utilized by owners of larger aircraft or multiple aircraft or for airport businesses. Box hangars are usually smaller than 6,000 square feet and offer open-space storage. There are 14 box hangar positions at Los Alamos Airport, situated adjacent to Taxiway F. One of these hangars is in the shape of a "T" but for planning purposes is included as a box hangar. Another one of these hangars is specifically used for aircraft construction projects is not considered for permanent aircraft storage. Approximately 1,800 square feet of box hangar space is estimated for non-aircraft storage needs. In total these hangars encompass approximately 17,300 square feet of space.

Conventional hangars are typically 6,000 square feet or larger and utilized for bulk aircraft storage and by airport businesses such as fixed base operators (FBOs), maintenance providers, and flight schools. They are open-space facilities with no supporting structure interference, similar to box hangars. There are no conventional hangars at Los Alamos Airport. Due to the limited area for potential hangar construction, no future conventional hangars are planned.

The aviation demand forecasts indicated that the airport is trending toward an increasing number of based aircraft. A planning standard of 1,300 square feet was used for T-hangar space and 2,500 square feet for box hangar space. Box hangars and conventional hangars are often used for aircraft maintenance, servicing, and office space, a planning standard of 15 percent of the total hangar space is allocated for these requirements.

Table 3N shows the results of the analysis for hangar requirements to accommodate those aircraft that would normally be stored in a hangar if space were available. Within the short term, there is a forecast need for 41 T/Shade hangar positions and 16 box hangar positions. By the long term, a total of 66 T/Shade hangar positions and 26 box hangar positions are needed to meet demand.

TABLE 3N
Aircraft Storage Hangar Requirements
Los Alamos Airport

		Future Requirements			
	Current Supply	Short Term	Intermediate Term	Long Term	Total Need Less Current Supply
Total Based	70	77	85	100	NA
Aircraft To Be Hangared	46	57	70	92	NA
T/Shade Hangar Positions	32	41	50	66	34
Box Hangar Positions	14	16	20	26	12
Hangar Area Requirements (s.f.)					
T/Shade Hangar Hangar Area	35,000	53,200	65,000	85,300	50,300
Box Hangar Area	17,300	40,000	50,000	65,000	47,700
Total Hangar Storage Area (s.f.)*	**52,300**	**93,200**	**115,000**	**150,300**	**98,000**
Maintenance Area Additional	1,800	6,000	7,500	9,800	8,000
Total Hangar and Maintenance Area	**54,100**	**99,200**	**122,500**	**160,100**	**106,000**

*Total rounded to nearest 100

In terms of square footage, an additional 18,200 square feet of T/Shade hangar space is needed in the short term. Through the long term, a total of 50,300 square feet is needed. To accommodate typical demand for box hangar space, an additional 22,700 square feet is needed in the short term. By the long term, a total of 65,500 square feet of box hangar space is forecast. Additional area is needed for office space and maintenance functions within the box hangars. A total of 106,000 square feet of additional hangar space is needed to meet the long term forecast for the airport.

GENERAL AVIATION AIRCRAFT PARKING APRON

FAA Advisory Circular 150/5300-13, *Airport Design*, suggests a methodology by which transient apron requirements can be determined from knowledge of busy-day operations. At Los Alamos Airport, the number of itinerant spaces required was determined to be approximately 13 percent of the busy-day itinerant operations. A planning criterion of 650 square yards per aircraft was applied to determine future transient apron requirements for single and multi-engine aircraft. For business jets (which can be larger), a planning criterion of 1,600 square yards per aircraft position was used. For planning purposes, 80 percent of these spaces are assumed to be utilized by non-jet aircraft.

The aircraft apron should also provide space for locally based aircraft that are tied-down and for maintenance activity. By maintenance activity, this simply means there should be adequate apron space to allow aircraft to be temporarily parked on the apron. Total apron parking requirements are presented in **Table 3P**. It should be noted that the large apron encompassing approximately 25,500 square yards at the east end of the airport is not included in the available count due to the significant heaving of the pavement. This pavement is not currently usable for aircraft.

TABLE 3P
Aircraft Parking Apron Requirements
Los Alamos Airport

	Available	Short Term	Intermediate Term	Long Term
Single, Multi-engine Transient Aircraft Positions	7	9	10	11
Apron Area (s.y.)	3,500	5,900	6,300	7,100
Transient Business Jet Positions	4	2	2	3
Apron Area (s.y.)	6,900	3,600	3,900	4,400
Locally-Based Aircraft Positions	37	25	20	13
Apron Area (s.y.)	9,100	12,500	10,000	6,500
Total Positions	48	36	32	27
Total Apron Area (s.y.)	19,500	22,000	20,200	18,000

Source: Coffman Associates analysis

It is estimated that there are approximately 3,500 square yards of aircraft parking apron available for parking small transient aircraft which includes seven designated parking spaces. While there is no dedicated transient parking for larger aircraft, the apron immediately east of the terminal building can accommodate up to four positions and encompasses approximately 6,900 square yards. The 37 local tie-down positions encompass approximately 9,100 square yards of pavement.

There are currently a total of 37 local aircraft tie-down positions. Presuming that more hangars are constructed, many of these aircraft owners would move their aircraft to a hangar. As a result, the numbers of necessary local tie-down positions decreases over time. Of course, if no new hangars are constructed, then more tie-down positions would be needed to accommodate planned growth in based aircraft. It should be noted that calculations of future apron needs assume more square yards per aircraft than the current tie-down positions provide per aircraft. As a result, the needed apron area increases yet the number of aircraft positions decreases.

Overall, additional transient apron dedicated for small aircraft is needed in the short term planning period. Transient space for business jets appears adequate through the long term planning period. The current apron area available for local tie-downs is adequate through the long term if owners transition to new hangars space as forecast. In total, the existing apron space appears adequate through the long term.

GENERAL AVIATION TERMINAL FACILITIES

General aviation terminal facilities have several functions. Space is required for a pilot's lounge, flight planning, concessions, management, storage, and various other needs. This space is not necessarily limited to a single, separate terminal building, but can include space offered by FBOs or within a passenger terminal facility. Currently, these functions are provided, to some degree, within the existing terminal building.

Airport management indicates the terminal building is in need of more modern environmental and aviation amenities. This includes more efficient heating and cooling equipment and efficient walls and windows. Modern general aviation terminal buildings typically include a pilot lounge with showers and rest areas. A flight planning station is necessary for multiple pilots to retrieve flight information and file flight plans. Many general aviation airports will also have a restaurant or deli and community conference room.

The methodology used in estimating general aviation terminal building space needs is based on the number of itinerant users expected to utilize general aviation facilities during the design hour. General aviation space requirements were then based upon providing 120 square feet per design hour itinerant passenger. A design hour itinerant passenger is determined by multiplying design hour itinerant operations by the number of passengers on the aircraft (multiplier). An increasing passenger count (from 1.8 to 2.1) is used to account for the likely increase in larger, more sophisticated aircraft using the airport. **Table 3Q** outlines the general aviation terminal facility space requirements for Los Alamos Airport.

TABLE 3Q
General Aviation Terminal Area Facilities
Los Alamos Airport

	Available	Short Term	Intermediate Term	Long Term
Design Hour Operations	11	11	12	14
Design Hour Itinerant Operations	10	11	12	13
Multiplier	1.8	1.9	2	2.1
Total Design Hour Itinerant Passengers	18	21	23	28
General Aviation Building Spaces (s.f.)	2,600	2,500	2,800	3,300

At 2,600 square feet, the existing terminal building meets the current space requirements. However, space dedicated to each element in the current terminal building is somewhat misallocated. For example, the public lounge is much larger than necessary, while the pilot lounge is too small. The flight planning room is a converted closet. The administrative offices are also too small.

Future planning for general aviation terminal space provides at least 3,300 square feet. If general aviation terminal building space were to be included within a passenger terminal, then some elements can have a dual function. For example, the public lounge can accommodate both commuter passengers and general aviation users.

GENERAL AVIATION AUTOMOBILE PARKING

General aviation vehicular parking demands have also been determined for Los Alamos Airport. Space determinations were based on an evaluation of existing airport use, as well as industry standards. Terminal automobile parking spaces required to meet general aviation itinerant demands were calculated by multiplying design hour itinerant passengers by a multiplier of 1.8 in the short term, increasing to 2.2 in the long term. This multiplier represents the average number of passengers per general aviation flight.

The parking requirements of based aircraft owners are also considered. Although some owners prefer to park their vehicles near their hangars, safety can be compromised when automobile and aircraft movements are intermixed. For this reason, separate parking requirements, which consider one-half the number of based aircraft at the airport, were applied to general aviation automobile parking space requirements. Parking requirements for the airport are summarized in **Table 3R**.

TABLE 3R
GA Vehicle Parking Requirements
Los Alamos Airport

		Future Requirements		
	Available Estimate	**Short Term**	**Intermediate Term**	**Long Term**
Design Hour Itinerant GA Passengers	18	21	23	29
GA Terminal Spaces (Short and Intermediate Lots)	63	37	44	58
Local User Spaces (Long Term Lots)	120	39	43	50
GA Terminal Parking Area (Short and Inter. Lots)	26,700	14,900	17,600	23,200
GA Local User Parking Area (Long Term Lot)	39,600	15,400	17,000	20,000
Total GA Parking Area (s.f.)	**66,300**	**30,300**	**34,600**	**43,200**
Total Parking Spaces	**183**	**76**	**87**	**108**

All area calculations in square feet
Note: Does not include rental car spaces or area.

For purposes of the vehicle parking analysis, the terminal area lot and the intermediate term parking lot are considered for itinerant airport users. The existing long term lot is considered for local aircraft owners. As can be seen from the table, the vehicle parking spaces in the terminal area lot and intermediate lot (63) meet the forecast needs of the airport through the long term (58 spaces). The long term lot, considered for local users (based aircraft owners), has 120 spaces, where only 39 spaces are needed in the short term and 50 in the long term.

Combined, the existing parking lots provide enough spaces and area to accommodate the long term growth of the airport. The challenge with providing adequate parking is location. While there are enough spaces, the long term lot, for example, is a relatively long way from the terminal building and even further from aircraft hangars. This encourages aircraft owners to drive to their hangars on aircraft movement surfaces. The interactions of vehicles and aircraft should be reduced when possible as a safety measure. Therefore, parking areas for local aircraft owners should be located as closely as possible to hangars.

FUEL STORAGE

Historical fuel sales at the airport were provided by airport administration. Fuel is available only from the self-serve pump located on the hold apron near the Runway 9 threshold. Jet A fuel is not currently available at the airport.

Future fuel sales are a function of the forecast fleet mix of operations presented in the forecasting chapter. Assumptions have been made regarding the number of gallons sold per aircraft operation. It is also assumed that the airport will introduce Jet A fuel for sale. **Table 3S** presents a summary of the potential fuel sales for the airport.

TABLE 3S
Fuel Usage Forecast
Los Alamos Airport

	Historical Fuel Sales					Forecast Fuel Usage		
	2006	**2007**	**2008**	**2009**	**2010**	**2017**	**2022**	**2032**
AvGas								
Daily Usage	122	107	123	118	101	213	224	249
14-Day Usage	1,715	1,496	1,726	1,649	1,419	2,985	3,150	3,492
Annual Usage	44,700	39,000	45,000	43,000	37,000	77,600	81,900	90,800
Jet A								
Daily Usage	0	0	0	0	0	410	419	653
14-Day Usage	0	0	0	0	0	5,750	5,885	9,173
Annual Usage	0	0	0	0	0	149,500	153,000	238,500

Assumptions:
Avgas: 5 gallons per piston operation
Jet A: 20 gallons per turboprop or jet operation
Half of air taxi operations use AvGas
Half of helicopter operations use AvGas
Note: All Figures in gallons.

Source: Airport Records and Coffman Associates analysis

Many airports prefer to have a 14-day supply of fuel available. To accommodate this common standard, the airport should have two 10,000-gallon storage tanks: one for AvGas and one for Jet A fuel. The current AvGas tank has a capacity of 10,000 gallons.

SUMMARY

The intent of this chapter has been to outline the facilities required to meet potential aviation demands projected for Los Alamos Airport for the planning horizon. A summary of the landside requirements is presented on **Exhibit 3H**.

Following the facility requirements determination, the next step is to determine a direction of development which best meets these projected needs. The remainder of the master plan will be devoted to outlining this direction, its schedule, and its costs.

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AIRCRAFT STORAGE

	AVAILABLE	SHORT TERM NEED	INTERMEDIATE NEED	LONG TERM NEED
T-Hangar Positions	32	41	50	66
Box Hangar Positions	14	20	26	35
T-hangar Area (s.f)	35,000	53,200	65,000	85,300
Box Hangar Area (s.f)	7,400	50,300	65,000	86,500
Maintenance Area (s.f.)	1,800	7,500	9,800	13,000
Total Hangar Area (s.f.)	44,200	111,000	139,800	184,800

AIRCRAFT APRON

	AVAILABLE	SHORT TERM NEED	INTERMEDIATE NEED	LONG TERM NEED
Single, Multi-engine Transient Aircraft Positions	7	9	10	11
Apron Area (s.y.)	3,500	5,900	6,300	7,100
Transient Business Jet Positions	4	2	2	3
Apron Area (s.y.)	6,900	3,600	3,900	4,400
Locally-Based Aircraft Positions	37	25	20	13
Apron Area (s.y.)	9,100	12,500	10,000	6,500
Total Positions	48	36	32	27
Total Apron Area (s.y.)	19,500	22,000	20,200	18,000

GENERAL AVIATION SERVICES

	AVAILABLE	SHORT TERM NEED	INTERMEDIATE NEED	LONG TERM NEED
GA Building Space (s.f.)	2,600	2,500	2,800	3,300
GA Terminal Parking Spaces	63	37	44	58
GA Terminal Parking Area (s.f.)	26,700	14,900	17,600	23,200
GA Local User Spaces	120	39	43	50
GA Local User Parking Area (s.f.)	39,600	15,400	17,000	20,000
Total Parking Spaces	183	76	87	108
Total Parking Area (s.f.)	66,300	30,300	34,600	43,200
Fuel Storage Capacity (gal.) - AvGas	10,000	10,000	10,000	10,000
Fuel Storage Capacity (gal.) - Jet A	0	10,000	10,000	10,000

Exhibit 3H
LANDSIDE FACILITY REQUIREMENTS

Chapter Four

ALTERNATIVES

Alternatives

In the previous chapter, airside and landside facilities required to satisfy the demand for the long range planning period were identified. The next step in the planning process is to evaluate reasonable ways these facilities can be provided. There can be many combinations of design alternatives, but the alternatives presented in this chapter are those with the greatest potential for implementation.

Any development proposed for a master plan is evolved from an analysis of projected needs for a set period of time. Though the needs were determined by the best methodology available, it cannot be assumed that future events will not change these needs. The goal of the master planning process is to identify a viable facility development concept for meeting the projected aviation demand elements for the next twenty years. However, no plan of action should be proposed which may be inconsistent with the future goals and objectives of Los Alamos County and its citizens, who have a vested interest in the development and operation of the airport.

The development alternatives for Los Alamos Airport (LAM) can be categorized into two functional areas: airside (runways, navigational aids, taxiways, etc.) and landside (hangars, aprons, and the terminal area). Within each of these areas, specific aviation related facilities are required or desired. **Exhibit 4A** presents the major issues to be discussed in the alternatives chapter.

Each functional area interrelates and affects the development potential of the others. Therefore, all areas must be examined individually and then coordinated as a whole to ensure the final plan is functional, efficient and feasible. For example, a new terminal building may be needed, especially if commuter service is re-

newed. The location and size of a new terminal building will influence development potential for hangars, roads and parking lots.

Prior to presenting development alternatives for Los Alamos Airport, non-development alternatives are briefly considered. Non-development alternatives include the "no-build" or "do-nothing" alternative, the transfer of services to another existing airport, or the development a new airport at a new location.

The Los Alamos Airport plays a critical role in the economic development of the county as well as an important role in the continuity of the national aviation network. There is significant public and private investment at the airport. Pursuit of a non-development alternative would slowly devalue these investments and lead to infrastructure deterioration and potentially the loss of significant levels of federal funding for airport improvements. Ultimately, the safety of aircraft, pilots, and persons on the ground could be jeopardized.

Due to the relatively remote location of Los Alamos, there is not another airport within a reasonable distance that could fulfill the aviation needs and desires of the community. Ohkay Owingeh Airport is 16 miles to the northeast and approximately a 30-minute drive time. Ohkay has limited aviation services and could not sufficiently support Los Alamos aviation activity. The closest airport that could provide a similar level of service is Santa Fe Municipal Airport, which is 21 miles to the southeast but is 42 road miles. Therefore, transfer of aviation services to another airport is not considered feasible.

Finally, abandoning the current airport in favor of constructing a new airport is not considered reasonable at this time. Los Alamos County is currently interested in providing the most capable airport at the current location. As a result, the county has invested in the development of this master plan. Therefore, the non-development alternatives are not considered further.

BACKGROUND CONSIDERATIONS

The following subsections address several design elements that will influence the development of both the airside and land side alternatives. These elements include identification of the current and future critical design aircraft. Under specific circumstances, the critical design aircraft could change, which in turn changes the design standards for the safety areas and the separation requirements. Three factors regarding the critical aircraft will have the greatest influence on the applicable design standards: the wingspan, the approach speed, and the maximum weight of the aircraft (greater than or less than 12,500 pounds). Other background elements that will influence both airside and landside alternatives are object clearing criteria, runway length, and instrument approaches.

In order to maintain a safe and efficient facility, the FAA directs airports to mitigate any current non-standard conditions and plan any future improvements within the parameters of the design standards to the greatest extent possible. The FAA provides primary guidance in Advisory Circular 150/5300-13, *Airport Design*.

CRITICAL DESIGN AIRCRAFT

The airport provides a single runway that is 6,000 feet long and 120 feet wide. The current critical design aircraft falls in airport reference code (ARC) A/B-I (small

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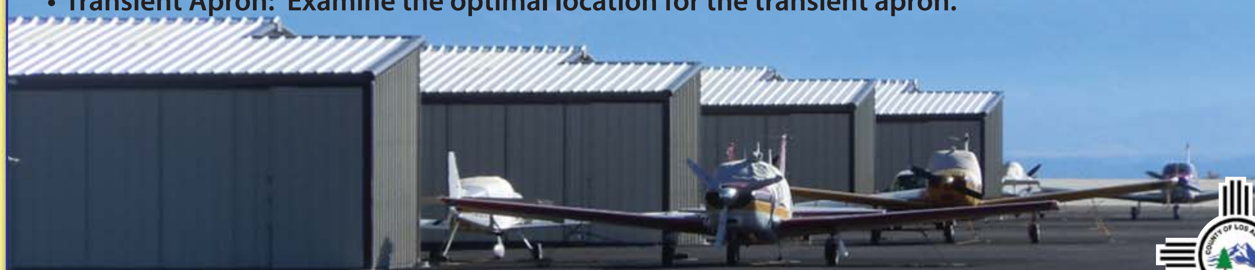
AIRSIDE PLANNING ISSUES

- Design Standards: Examine impacts of a potential transition from Airport Reference Code (ARC) A/B-I (small aircraft) to ARC A/B-II.
- Taxiway Layout: Provide taxiway access to the Runway 9 threshold.
- Runway Length: Desired length of 8,500 feet. Maintain as much as possible while maintaining safety.
- Instrument Approaches: Maintain the existing non-precision instrument approaches.
- Runway Safety Area Determination: Examine each of the six FAA alternatives for meeting RSA standards for both existing ARC A/B-I (small aircraft) and potential future ARC A/B-II design category.
- Safety Areas: Examine current and future object free area (OFA), obstacle free zone (OFZ), and runway protection zones (RPZs) and provide methods for meeting design standards.

LANDSIDE PLANNING ISSUES

- Separation of Activity Levels: Plan facilities so that similar activity types are grouped together.
- Commuter Operations: Examine the landside needs that regularly scheduled commuter service would necessitate.
- Facility Layout: Maximize airport property for aviation related development.
- Terminal Building Location: A new terminal building is needed, the location of which will have a significant impact on future development potential.
- Airport Entrance Road: Examine options for maintaining the existing road, shifting to Nambe Loop Road, and shifting the road to the north to maximize aviation development space.
- South Tie-Down Apron: Examine impacts that a transition to ARC A/B-II may have on this tie-down apron.
- Removal/Relocation of Taxiway F Hangars: Describe the responsibilities of the airport sponsor to the tenants should hangar removal/relocation be necessary.
- Landfill Cap: Currently not suitable for hangar construction but plan for hangars in the long term planning period.
- Transient Apron: Examine the optimal location for the transient apron.



aircraft exclusively). The “small aircraft exclusively” category refers to those aircraft weighing less than 12,500 pounds. This design category is based on the type aircraft operating at the airport on a frequent basis (500 operations annually), and implies that there are not currently 500 or more annual itinerant operations by aircraft weighing more than 12,500 pounds.

The future critical design aircraft may transition to ARC A/B-II as represented by the Cessna Caravan 208A, which may be utilized in a commuter capacity in the short term. The Cessna Caravan 208A has a maximum takeoff weight of less than 9,000 pounds making it a small aircraft (those under 12,500 pounds). Its wingspan is 52 feet, which falls in airplane design group II (ADG-II).

Table 4A presents the current and potential future design standards that apply to Los Alamos Airport. The table also shows the areas where the design standards are not currently met at the airport. For comparative purposes, the table also shows the design standards for ARC A/B-II for aircraft over 12,500 pounds.

NOTE: Much of the following analysis considers the potential transition in critical design aircraft to ARC A/B-II. Following completion of this analysis, meetings were held with FAA and the New Mexico Division of Aviation. At the conclusion of these meetings it was determined that the critical design aircraft for Los Alamos Airport should remain in ARC A/B-I (small aircraft exclusively). The supporting information for this determination is provided in Chapter Five – Recommended Master Plan Concept.

The runway safety area (RSA), object free area (OFA), and obstacle free zone (OFZ) are all penetrated behind the Runway 9 end. The runway/taxiway separation standards are not meet for Taxiways F, C and H. The taxiway hold line location is not met for Taxiways C, E, and F. The taxiway minimum width standard is not met for Taxiway F. The taxiway object free area (TOFA) is not met for Taxiway F. The Runway 27 RPZ extends over developed property.

The airside alternatives will first consider strategies to meet the existing design standards for ARC A/B-I (small aircraft exclusively). Once that has been completed, alternatives for a future transition to a critical design aircraft in ARC A/B-II (small aircraft) will be considered. The goal is to meet design standards today to the greatest extent practicable, then plan for a potential transition to the more restrictive design standards for ARC A/B-II (small aircraft).

POTENTIAL TRANSITION TO ARC B-II (> 12,500 LBS.)

A significant design standard consideration is the potential for the airport to transition from a critical design aircraft represented by smaller aircraft (those under 12,500 pounds) to large aircraft (those over 12,500 pounds). A change to a larger critical aircraft would have several design standard changes. Of particular note is the increase in the width of the OFZ from 250 feet to 400 feet.

TABLE 4A
Design Standards

Airport Status	Current	Future	Comparative	Current Condition and Deficiencies
Airport Reference Code	A/B-I (small aircraft)	A/B-II (small aircraft)	A/B-II	A/B-I (small aircraft)
Critical Aircraft (typ.)	Cessna 172	Cessna Caravan 208A	Beech 1900	Cessna 172
Instrument Visibility Minimum	1-mile	1-mile	1-mile	1-mile
RUNWAY				
Width	60	75	75	120
Shoulder Width	10	10	10	10
RUNWAY SAFETY AREA				
Width	120	150	150	120
Length Prior to Threshold	240	300	300	**75' prior Rwy 9**/240' prior Rwy 27
Length Beyond Runway End	240	300	300	**75' behind Rwy 9**/240' behind Rwy 27
RUNWAY OBJECT FREE AREA				
Width	250	500	500	250
Length Beyond Runway End	240	300	300	**75' behind Rwy 9**/240' behind Rwy 27
RUNWAY OBSTACLE FREE ZONE				
Width	250[1]	250[1]	400	120[1]
Length Beyond Runway End	200	200	200	**75' behind Rwy 9**/200 behind Rwy 27
SEPARATION STANDARDS				
Runway To Parallel Taxiway	150	240	240	**100' to Twy C; 145' to Twy F;** 190' to Twy G**; 125' to Twy H**
Taxiway Hold Line	125	200	200	**Twy C, E, F-100';** Twy D-125'; Twy A&B-150'
Runway to Aircraft Parking Area	125	125	250	125'
TAXIWAYS				
Width	25	35	35	Twy A-40'; Twy B-50'; Twy C-350'; Twy D-35'; Twy E-80'; **Twy F-18'**; Twy H-35'
Shoulder Width	10	10	10	10'
Taxiway Safety Area Width	49	79	79	49'
Object Free Area Width	89	131	131	**Twy F OFA penetrates hangars**
RUNWAY PROTECTION ZONES				
Length	1,000	1,000	1,000	**1,000**
Inner Width	250	250	500	**250**
Outer Width	450	450	700	**450**

[1]Small aircraft with approach speeds greater than 50 knots
BOLD: Indicates current condition is does not meet FAA design standard.

Source: FAA AC 150/5300-13, Airport Design

If the OFZ were required to be 400 feet wide then even less space would be available for future hangar construction. In fact the hangars along Taxiway F would be a penetration to the OFZ. The OFZ would also extend through the fence and over the road on the south side of the airport. If the critical aircraft continues to be represented by an aircraft or group of aircraft weighing less than 12,500 pounds then the OFZ would be a maximum of 250 feet wide.

One scenario where the critical aircraft could transition to the large aircraft category is if commuter passenger service is successful, then there could be a desire to add other destinations. For example Phoenix is approximately 370 miles from Los Alamos and Denver is approximately 290 miles away. These distances are within range of several turboprop aircraft currently used in commercial service such as the 19-seat Beech 1900. This aircraft has a maximum weight of approximately 17,000 pounds with a range of 440 miles and a wingspan of 58 feet. The Beech

1900 is an ARC B-II aircraft which would trigger the implementation of the 400-foot wide OFZ.

The 19-seat Dash-6 Twin Otter Series 400 turboprop is one aircraft currently being manufactured (by Viking Air) that could conceivably be utilized in a commuter capacity that would not trigger the larger OFZ. The Dash-6 Twin Otter has a maximum takeoff weight of 12,500 pounds, a range of 1,050 miles, and a wingspan of 65 feet. This aircraft has the added benefit of being a Short Takeoff and Landing aircraft (STOL). This capability has made the Dash-6 popular for accessing more remote locations and locations at higher elevations. The Dash-6 went into production in 2007 and there have been more than 61 orders to date, nearly all of which have come from international operators. No U.S. carriers currently utilize the aircraft. Use of the Dash-6 in a commuter function would allow the OFZ to remain at 250 feet wide.

A significant disadvantage of the Dash-6 Twin Otter Series 400 aircraft is its maximum cruise speed of 170 knots (196 miles per hour). The Beech 1900 has a cruise speed of 285 knots (328 mph).

In the airside development alternatives, consideration will first be given to meeting the currently applicable design standards for ARC A/B-I (small aircraft). The potential future critical aircraft in ARC A/B-II (small aircraft) will then be considered. NOTE: The application of design standards for a critical aircraft in ARC B-II will also be considered but is not planned as the future design aircraft.

OBJECT CLEARING CRITERIA

Los Alamos Airport is constrained from future expansion due to its location on top of a promontory mesa. As a result, it is critical to plan for the continued safe and efficient operation of the airport. To this end it is important to understand exactly what the requirements are for maintaining certain areas on and near the airport clear of objects or restricted to objects with an allowable function, composition, and/or height. The object clearing criteria are described in AC 150/5300-13, *Airport Design*, and include ground based object free areas and airspace imaginary surfaces. The object clearing areas are:

1) Runway/Taxiway/Taxilane Object Free Area
2) Runway/Taxiway Safety Area
3) Runway Obstacle Free Zone
4) Thresholds including the threshold siting surface (TSS), any areas required for terminal instrument procedures (TERPS), and tower line of sight (where applicable).
5) Navaid Critical Areas
6) FAR Part 77 Surfaces (Primary Surface, Transitional Surface, Approach Surface, Horizontal Surface, and Conical Surface)
7) Runway Protection Zones
8) Other Areas (Those that could have an adverse effect on the airport)

Each of these areas has specific definitions on what is allowable. Obstructions to air navigation must be removed unless an FAA aeronautical study, based on proposed operations, determines otherwise. To determine otherwise, the FAA must find no substantial adverse effect as defined in FAA Order 7400.2, *Procedures for Handling Airspace Matters*. The FAA normally limits aeronautical studies of existing objects to potential obstructions to air navigation which are not included in elements 1-5 listed above. In essence, objects which fall within elements 1-5 must be cleared unless they are specifically allowable. For objects within elements 6-8, the FAA must make a determination whether the object creates a substantial adverse effect on the safe and efficient operation of aircraft.

RUNWAY PROTECTION ZONES (RPZ)

The RPZ is a trapezoidal area beyond the approach and departure ends of the runway. The RPZs are required to be clear of incompatible objects and activities. The RPZ is comprised of the central portion of the RPZ which is defined as the extension of the OFA to the end of the RPZ and the controlled activity area, which are those portions of the RPZ to the sides of the central portion.

According to FAA AC 150/5300-13, *Airport Design*, "land uses prohibited from the RPZs are residences and places of public assembly such as churches, schools, hospitals, office buildings, shopping centers, and other places of public assembly." Paragraph 212a(2)(a) of the AC goes on to state, "While it is desirable to clear all objects from the RPZ, some uses are permitted, provided they do not attract wildlife, are outside of the Runway OFA, and do not interfere with navigational aids (navaids). Automobile parking facilities, although discouraged, may be permitted, provided the parking facility and any associated appurtenances are located outside of the central portion of the RPZ. Fuel storage facilities may not be located in the RPZ."

The Runway 27 RPZ begins 200 feet from the runway end, is centered on the extended runway centerline, is 250 feet wide at the inner portion, extends 1,000 feet, and is 450 feet wide at the outer portion. Encompassed within the RPZ is a portion of the Los Alamos Public Works Department equipment storage facility. The area is used strictly to store public works equipment and material. No maintenance or other related activity takes place in the RPZ.

Los Alamos Airport is unique in that landings are only permissible to Runway 27 and take-offs are only permissible from Runway 9. All traffic arrives from the east and departs to the east. As a result, there is only one RPZ at the airport which is located behind the Runway 27 threshold. Technically, there is no RPZ behind the Runway 9 threshold, as there are no approaches or departures in this direction, therefore the RPZ standards do not apply west of the airport. This determination is reflected on the currently approved Airport Layout Plan (ALP) for the airport.

RUNWAY LENGTH

As discussed in the previous chapter, the recommended runway length to accommodate 95 percent of small aircraft is 8,500 feet. At 6,000 feet currently, the airport could theoretically benefit from an additional 2,500 feet of runway length. The current length may indicate that pilots of certain aircraft will have to make adjustments to their takeoff weight, including fuel load, baggage, and passengers, in order to operate safely.

While the operations at the airport are dominated by small piston powered aircraft, the airport does receive some traffic from turboprops and business jets. The airport is classified in the New Mexico Airport System Plan Update as a Regional General Aviation Facility that should be planned to accommodate 75 percent of large aircraft (e.g. business jets) at 60 percent useful load. A runway length of 8,600 feet would be recommended to meet this state recommendation.

The runway is constrained on all sides. On the east end of the runway is the end of the mesa upon which the airport sits. The terrain drops precipitously, more than 100 feet, at the end of the 240-foot runway safety area. Relatively recent construction of commercial and county government facilities are located beginning approximately 700 feet from the end of the runway safety area. On the west end of the runway is an established residential neighborhood that existed before the airport. On the north and south of the airport are canyons. **Therefore, the current runway length of 6,000 feet is considered the maximum that the existing airport site can support.**

INSTRUMENT APPROACHES

Instrument approaches are critical to extending the usefulness of the airport to times of poor weather conditions. Runway 27 has two non-precision instrument approaches that allows for visibility minimums of 1-mile and cloud ceilings as low as 500 feet. The existing instrument approaches are considered the best the airport may obtain. As a result, no changes or improvements to the instrument approach capability of the airport will be considered. In fact, maintaining the existing instrument approaches is considered an important action.

AIRSIDE ALTERNATIVES

The airside alternatives are focused on planning the runway and taxiway system in such a manner that safety and functionality are improved. To this end, various design standards have been identified, some of which the airport does not currently meet. In the future, the applicable design standards for the airport may change, becoming more restrictive, based on the potential transition of the critical design aircraft from ARC A/B-I (small aircraft) to ARC A/B-II (small aircraft). There is a remote possibility of the airport transitioning to ARC B-II, which includes larger aircraft, thereby introducing even more restrictive design standards. The major airside planning issues were presented previously on **Exhibit 4A**.

SAFETY AREAS

As discussed at length in Chapter Three – Facility Requirements, the runway safety area (RSA), object free area (OFA), and obstacle free zone (OFZ), are all penetrated by objects on the west end of the airport. Of particular concern is the RSA, for which the FAA will not allow a modification to standard. A modification to standard is any change to FAA design standards other than dimensional standards for runway safety areas. According to FAA AC 150/5300-13, *Airport Design*, "Unique local conditions may require modification to airport design standards for a specific airport. The request for modification should show that the modification will provide an acceptable level of safety, economy, durability, and workmanship."

Practical application of the OFZ requires that the surface be clear of all obstructions since it is an operating area in addition to being a design area. In September of 2012, the FAA published AC 150/5300-13A, *Airport Design*, the first major revision of the design AC since 1989. In the new AC it is stated that "the modification of standards process does not apply to the OFZ". In essence, both the OFZ and RSA must meet standard.

The airside alternatives will consider potential solutions to meeting the various safety area design standards. Where it is not feasible to meet the design standard (except for the RSA and OFZ), analysis will be presented that shows if a modification to standard will provide an acceptable level of safety, economy, durability, and workmanship.

RUNWAY SAFETY AREA (RSA) DETERMINATION FOR AIRPLANE DESIGN GROUP (ADG) I

The RSA is a designated area surrounding the runway. According to the FAA, the RSA is to be:

(1) cleared and graded and have 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 that need to be located in the RSA because of their function (in aiding air navigation).

The dimension of the RSA surrounding the runway is a function of the critical aircraft. The current critical aircraft is in ARC A/B-I (small aircraft exclusively). The RSA is 120 feet wide and extends 240 feet beyond the runway ends.

FAA Order 5300.1F, *Modification of Agency Airport Design, Construction, and Equipment Standards*, indicates in Paragraph 6.d the following:

". . . Runway safety areas at both certificated and non-certificated airports that do not meet dimensional standards are subject to FAA Order 5200.8, *Runway Safety Area Program*. Modification of Standards is not issued for nonstandard runway safety areas."

The FAA placed a greater emphasis on meeting RSA standards with the publication of FAA Order 5200.8, *Runway Safety Area Program,* in 1999, following congressional direction. The Order states in Paragraph 5, "The object of the Runway Safety Area Program is that all RSAs at federally obligated airports and all RSAs at airports certified under 14 Code of Federal Regulations (CFR) Part 139 shall conform to the standards contained in AC 150/5300-13, *Airport Design*, to the extent practicable."

The Order goes on to state in Paragraph 8.b:

"The Regional Airports Division Manager shall review all data collected for each RSA in Paragraph 7, along with the supporting documentation prepared by the region for that RSA, and make one of the following determinations:

(1) The existing RSA meets the current standards contained in AC 150/5300-13, *Airport Design*.

(2) The existing RSA does not meet the current standards, but it is practicable to improve the RSA so that it will meet current standards.

(3) The existing RSA can be improved to enhance safety, but the RSA will still not meet current standards.

(4) The existing RSA does not meet current RSA standards, and it is not practicable to improve the RSA."

The findings of this master plan will aid the Regional Airports Division Manager of the FAA's Southwestern Region in making a determination on the existing condition of RSAs at Los Alamos Airport.

Currently, the blast deflection fence is located 75 feet from the Runway 9 threshold which places it within the RSA. The perimeter fence and numerous shrubs are also in the RSA in this location.

Appendix 2 of FAA Order 5200.8 provides direction for an RSA determination. This includes the alternatives that must be evaluated. Paragraph 3 of Appendix 2 states:

"The first alternative that must be considered in every case is constructing the traditional graded runway safety area surrounding the runway. Where it is not practicable to obtain the entire safety area in this manner, as much as possible should be obtained. Then the following alternatives shall be addressed in the supporting documentation . . . :"

- RSA Alternative 1: Construct the traditional graded runway safety area surrounding the runway.
- RSA Alternative 2: Relocation, shifting, or realignment of the runway.
- RSA Alternative 3: Reduction in runway length where the existing runway length exceeds that which is required for the existing or projected design aircraft.
- RSA Alternative 4: A combination of runway relocation, shifting, grading, realignment, or reduction.
- RSA Alternative 5: Implementation of declared distances.
- RSA Alternative 6: Installation of Engineered Materials Arresting Systems (EMAS).

The following subsections will discuss the application of the FAA-recommended alternatives for mitigating non-standard RSAs. These RSA alternatives are based on meeting the RSA design standard for the current critical aircraft (ARC A-I small aircraft). The alternatives considered are presented on **Exhibit 4B** and are described as follows.

RSA Alternative 1: Provide Full RSA

The full RSA is available beyond the Runway 27 end. On the Runway 9 end the blast deflection fence is 75 feet from the runway end. Numerous shrubs and the perimeter fence are also in the RSA behind the Runway 9 threshold. To provide the full RSA, the blast deflection fence, perimeter fence, and shrubs would have to be removed.

Three options for providing the full RSA behind the Runway 9 threshold are presented on **Exhibit 4B**. All three options consider providing an RSA that meets ARC A-I design standards with the RSA extending 240 feet beyond the runway end.

RSA Option 1A plans to relocate the blast deflection fence 165 feet to the west. To accommodate the relocated blast fence, the northwest corner of airport road may have to be shifted slightly, as shown in the exhibit. The road would still cross the OFA. The shrubs are planned to be removed and the perimeter fence would be rerouted outside the RSA but it would still penetrate the OFA.

While this RSA alternative does meet standard for the RSA, it does not for the OFA. A modification to standard would be required for the OFA to be penetrated by Airport Road and a portion of the relocated perimeter fence.

RSA Option 1B considers the impact when providing the full RSA, OFZ and OFA behind Runway 9. Airport Road would have to be rerouted slightly to the north which would necessitate the acquisition of four residential properties. The blast deflection fence and the perimeter fence would be relocated outside the RSA and OFA, and the shrubs would be removed.

RSA Option 1C presents a different method for meeting RSA, OFZ and OFA design standards. In this alternative the blast deflection fence and perimeter fence are relocated and the shrubs are removed. The airport entrance road is planned to be closed and Nambe Place Loop would be converted to the new airport entrance road. By converting Nambe Place Loop to the airport entrance road, the OFA standard behind Runway 9 can be met without acquiring any residential property.

A disadvantage to consider is the potential impact to the neighborhood by rerouting airport vehicular traffic through the neighborhood. This could also be a disadvantage to the airport as there would not be such an obvious entrance road and some visitors could become confused on how to access the airport.

RSA Alternative 2: Relocate, Shift, or Realign the Runway

Relocating the runway would involve physically reconstructing a new runway in a different location on airport property. The constraints of the airport site being located on a mesa, makes relocation unreasonable and this option is not considered further.

A shift of the runway would involve removing approximately 165 feet of the runway from the west end and adding 165 feet to the east. This is not feasible as no additional runway length can be added to the Runway 27 end due to the terrain.

Due to the terrain, with canyons on both sides of the airport, realigning the runway is not possible. Relocating, shifting, or realigning the runway is not considered feasible to solve the non-standard RSA issue and will not be pursued further.

RSA Alternative 3: Decrease Runway Length

A reduction in runway length may have negative impacts on the capability of the runway to serve the critical aircraft. Advisory Circular (AC) 150/5220-22A, *Engineered Materials Arresting Systems (EMAS) for Aircraft Overruns*, published in September 2005, states: "The FAA does not require an airport sponsor to reduce the length of a runway or declare its length to be less than the actual pavement length to meet runway safety area stand-

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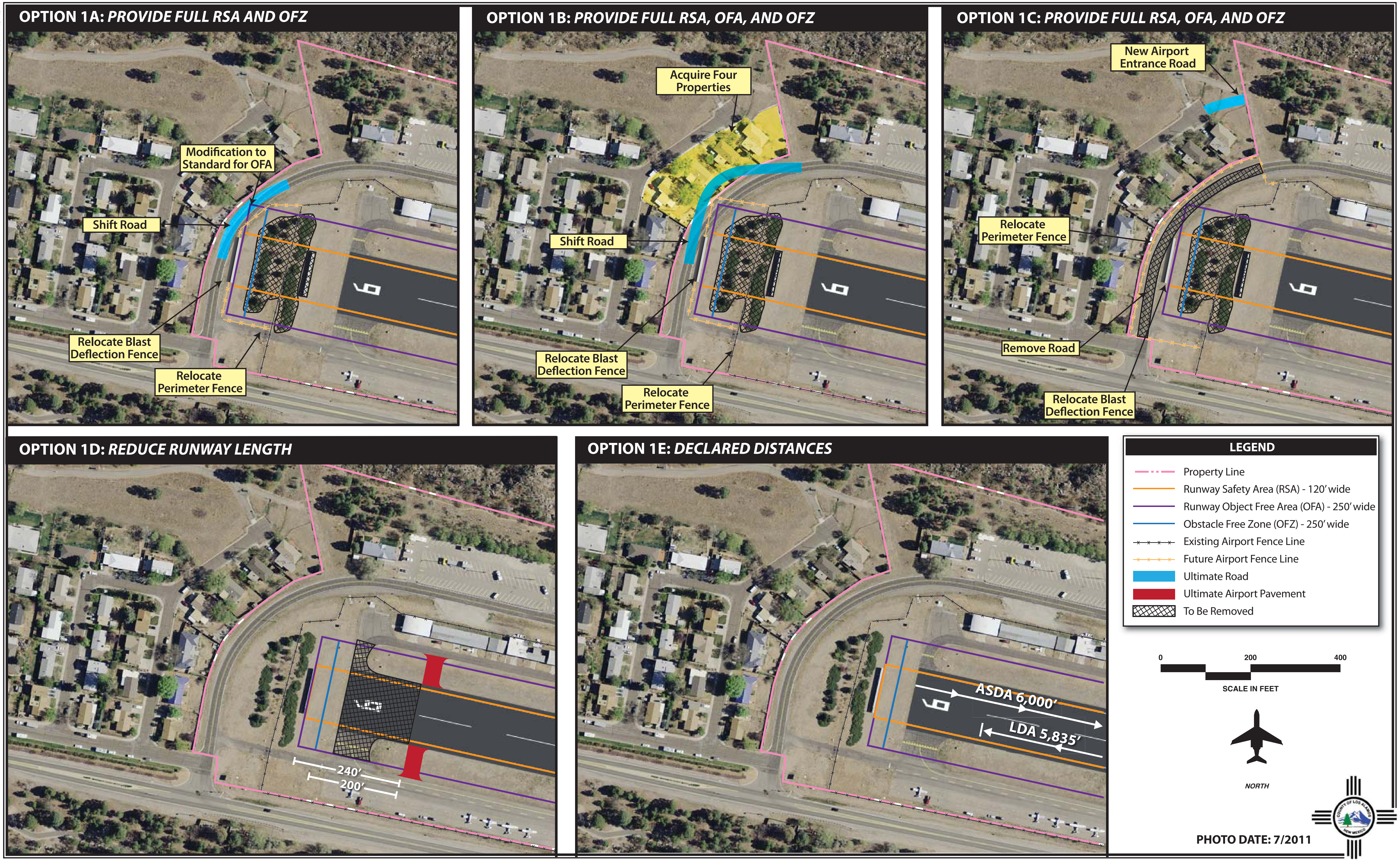

Exhibit 4B
RSA OPTIONS FOR ARC A/B-I (SMALL AIRCRAFT)

ards if there is an operational impact to the airport."

While a reduction of runway length is not recommended, it would accomplish the goal of providing adequate safety area behind the Runway 9 end. By decreasing the runway by 165 feet, a total length of 5,835 feet would remain. ***RSA Option 1D*** shows the alternative of decreasing the runway length. Both the RSA and OFA would extend 240 feet beyond the new Runway 9 threshold and would be short of the blast deflection fence, perimeter fence and the shrubs.

There are several disadvantages to consider with this alternative. First, the runway would be shortened by 155 feet. **Primarily due to the elevation, this is an airport that is in need of more runway length, not less**. Any loss of runway length is a loss of operating capability for the airport. In addition, the FAA, Los Alamos County, and the New Mexico Department of Aeronautics recently completed a five million dollar, 600-foot extension of the runway in order to increase the capability and safety of the runway.

Another disadvantage of reducing the runway length is the long term considerations of a transition to a critical aircraft in ADG-II. The RSA and OFA would extend 300 feet rather than 240 feet beyond the runway end, thus necessitating additional measures in the future.

RSA Alternative 4: Combination Method

The combination method provides for the flexibility to combine runway relocation, shifting, realignment, or reduction in order to provide the full RSA. As discussed above, relocation, realignment, runway shift, and runway length reduction are not practicable; therefore, a combination method is not feasible.

RSA Alternative 5: Implement Declared Distances

Declared distances are the effective runway distances that the airport operator declares available for takeoff run, takeoff distance, accelerate stop distance, and landing distance requirements. These are defined by the FAA as:

Takeoff run available (TORA) - The length of the runway declared available and suitable to accelerate from brake release to lift-off, plus safety factors.

Takeoff distance available (TODA) - The TORA plus the length of any remaining runway or clearway beyond the far end of the TORA available to accelerate from brake release past lift-off, to start of takeoff climb, plus safety factors.

Accelerate-stop distance available (ASDA) - The length of the runway plus stopway declared available and suitable to accelerate from brake release to takeoff decision speed, and then decelerate to a stop, plus safety factors.

Landing distance available (LDA) - The distance from the threshold to complete the approach, touchdown, and decelerate to a stop, plus safety factors.

The TORA and TODA are equal to the actual runway length as a clearway is not provided at the airport. The ASDA and the LDA are the primary considerations in determining the runway length available for use by aircraft, as these calculations must consider providing the RSA to standard in operational calculations. The

ASDA and LDA can be figured as the usable portions of the runway length less the distance required to maintain adequate RSA beyond the ends of the runway or prior to the landing threshold. By regulation, the full RSA must be available at the far end of a departure operation in the ASDA calculation and prior to the landing threshold and beyond the runway end in LDA calculations. At Los Alamos Airport, 240 feet must be available beyond both runway ends.

The landing distance available (LDA) for approaches to Runway 27 would have to be declared 165 feet shorter (5,835 feet) than is currently available (6,000 feet). ASDA calculation for takeoff from Runway 9 to the east would remain at 6,000 feet as 240 feet is available beyond the Runway 27 threshold. Both the TORA and TODA would remain at 6,000 feet. **Table 4B** presents the declared distances that would need to be published in the FAA Airport/Facility Directory.

TABLE 4B
Implementation of Declared Distances
Los Alamos Airport

	Runway 9	Runway 27
TORA	6,000	6,000
TODA	6,000	6,000
ASDA	6,000	5,835*
LDA	5,835*	5,835

TORA: Takeoff run available
TODA: Takeoff distance available
ASDA: Accelerate-stop distance available
LDA: Landing distance available

*Landings to Runway 9 and departures using Runway 27 are prohibited.

The use of declared distances has traditionally been considered as a solution of last resort to remedy non-standard RSAs. This is primarily because the implementation may not be readily visible to pilots. The implementation at Los Alamos Airport would not involve any change in runway marking, so pilots could mistake the available runway length as being 6,000 feet. ***RSA Option 1E*** presents the implementation of declared distances as a solution to meeting RSA design standard.

It should be noted that FAA Order 5190.6B, *FAA Airport Compliance Manual*, provides further guidance regarding declared distances. Appendix R states, "Pilots of small general aviation aircraft do not have a requirement to use declared distances to calculate allowable operating weights; therefore, use of declared distances would not be appropriate at airports serving these aircraft only." As previously discussed, Los Alamos Airport's critical design aircraft includes those with a maximum takeoff weight (MTOW) of 12,500 pounds or less, which are defined as small aircraft by the FAA. As a result, the use of declared distances may not be appropriate for Runway 9-27 given the types of aircraft that operate at the airport on a regular basis.

RSA Alternative 6: Engineered Materials Arresting System (EMAS)

EMAS is an engineered compressible concrete material that is located beyond the runway end for the purpose of safely stopping an aircraft overrun. EMAS functions similar to the sandy, high-speed exits provided on highways in mountainous terrain in order to safely stop a runaway tractor trailer. The FAA considers the installation of EMAS as an acceptable substitute to providing the full RSA in certain circumstances. EMAS is designed to stop an aircraft overrun by exerting predictable deceleration forces on the landing gear as the EMAS material crushes. It is designed to minimize the potential for structural damage to the aircraft, since such damage could result in injuries to passengers and/or affect the predictability of deceleration forces.

The current formulation of EMAS is designed to safely stop aircraft weighing more than 12,500 pounds. Since the current and future critical design aircraft for Los Alamos Airport is less than 12,500 pounds, an EMAS solution is not viable.

RSA Alternative Summary

Each of the six RSA mitigation alternatives, as prescribed by the FAA, has been analyzed in their application to Los Alamos Airport. As stated in FAA Order 5200.8, *Runway Safety Area Program,* "The first alternative that must be considered in every case is constructing the traditional graded runway safety area surrounding the runway." This alternative is feasible by relocating the blast deflection fence, perimeter fence, and removing the shrubs, outside of the 240-foot RSA behind Runway 9.

Both the runway reduction option and the implementation of declared distances option would provide the necessary RSA behind Runway 9. They both would also effectively reduce the overall runway length by 165 feet. As discussed previously, at 6,000 feet in length, the runway is currently short of the recommended length. Any decision to implement a runway reduction or declared distances should be made with the understanding of potential negative impacts to operational capabilities at the airport. With that said, declaring or reducing the runway length by 165 feet is fairly modest and the operational impact may be minor. Declaring shorter or reducing the runway length by 165 feet likely will not additionally impact those that are already impacted by the current runway length.

When considering implementing declared distances or reducing the runway length, the declared distances options is preferable. This option would only impact landing operations while reducing the runway length would impact both landings and departures. It would be important to maintain as much length for departures, since departures typically require more runway length than landings.

Table 4C presents a summary of the RSA determination for Los Alamos Airport. In order of priority, the airport should first consider providing the full 240 RSA beyond both runway ends. This would involve relocating the blast deflection fence, perimeter fence, and removing the shrubs. The second option should be to implement declared distances in order to maximize the operational length of the runway. The last alternative to consider would be to reduce the length of the runway.

TABLE 4C
Runway Safety Area Analysis Summary
Los Alamos Airport

Option	RSA Alternative	Feasible?	Comments
1	Provide full RSA	Yes	Move blast deflection fence, perimeter, remove shrubs. OFA not met.
2	Relocate, shift, or realign runway	No	Not feasible due to terrain constraints.
3	Reduce runway length	Yes*	Feasible but is a negative impact to operations.
4	Combination method of runway reduction, relocation, or shifting	No	Not feasible due to terrain constrains.
5	Declared distances	Yes*	Feasible but is a negative impact to operations. FAA typically does not support for an airport with a critical aircraft weighing 12,500 lbs. or less.
6	EMAS - Standard	No	Not feasible due to critical aircraft weight.

*Current runway length is less than recommended. These options should only be considered if providing the full RSA is determined to not be feasible.

Source: Coffman Associates analysis of FAA Order 5200.8 Runway Safety Area Program

Based on this analysis of the RSA mitigation alternatives which followed criteria outlined in FAA Order 5200.8, *Runway Safety Area Program,* it is recommended that the FAA Regional Airports Division Manager consider the following determination:

- The existing RSA does not meet the current standards, but it is practicable to improve the RSA so that it will meet current standards.

RSA CONSIDERATIONS FOR AIRPLANE DESIGN GROUP (ADG) II

The previous RSA analysis considered meeting the requirements for ADG I, the current critical design group for the airport. Since the airport may transition to ADG II with the introduction of the Cessna Caravan 208A in commuter service, analysis of these impacts is presented. The same six RSA alternatives analysis categories are considered. These alternatives address the increase in the dimension of the RSA from 120 feet to 150 feet in width and from 240 feet to 300 feet beyond the runway ends.

Exhibit 4C presents a graphic of the viable RSA alternatives. Other safety areas such as the OFA and OFZ are also shown. For ADG II the OFA increases from 240 feet to 300 feet beyond the runway end and the width increases from 250 feet to 500 feet. The OFZ continues to extend 200 feet beyond the runway ends and remains 250 feet wide. The OFZ width assumes that the critical design aircraft continues to be a small aircraft weighing less than 12,500 pounds with approach speeds greater than 50 knots.

Provide Full RSA

Behind the Runway 9 end, the blast deflection fence, perimeter fence, and shrubs would have to be relocated to a distance of at least 300 feet from the runway end. Relocating the blast deflection fence and the perimeter fence out-

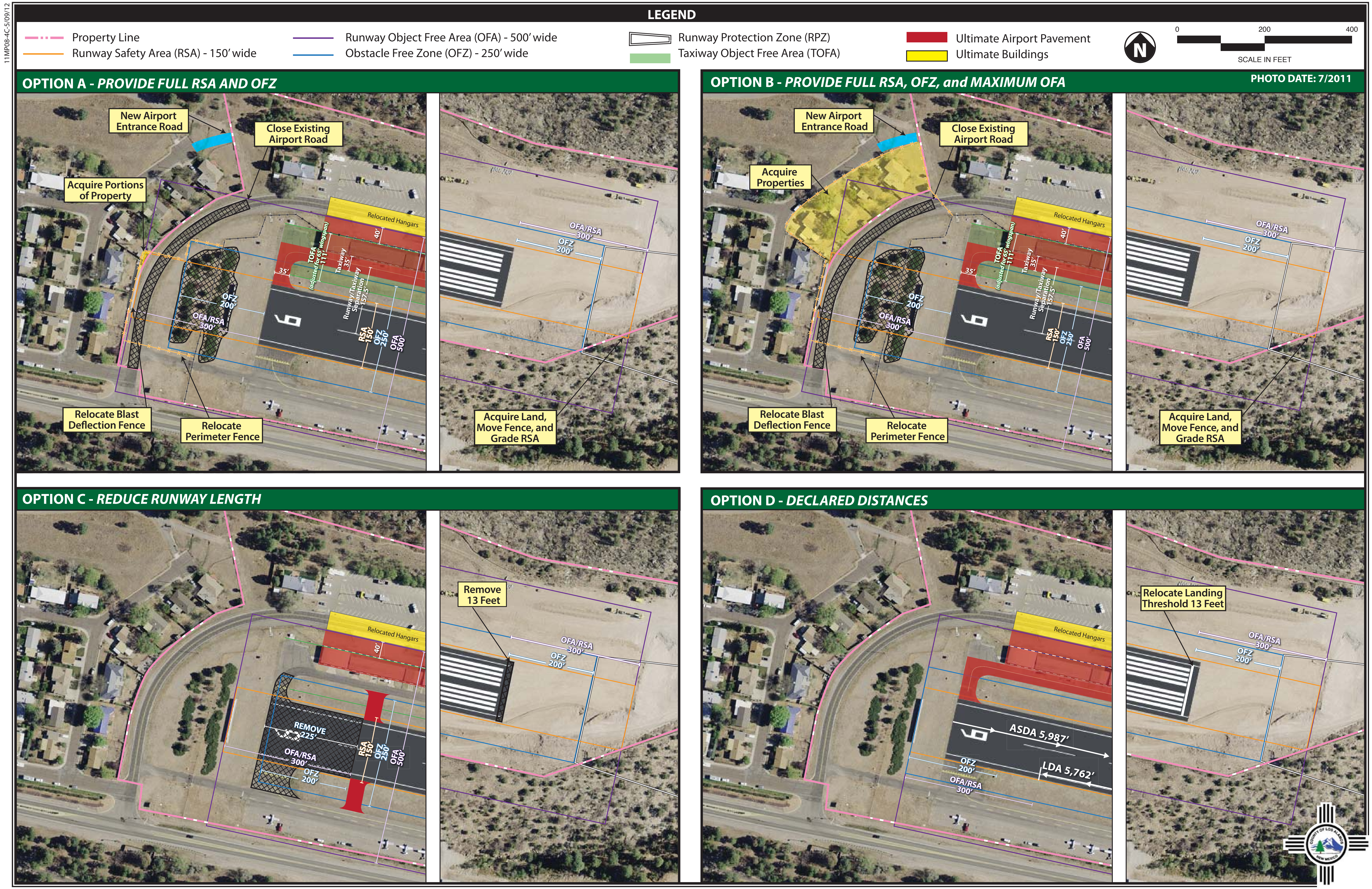

Exhibit 4C
RSA OPTIONS FOR ARC A/B-II (SMALL AIRCRAFT)

side the RSA would, at a minimum, impact the property of three homeowners. The airport would need to acquire a few feet of the backyards of these home owners and shift their fence line to provide for the full RSA. These homes could remain in place under this alternative. **Exhibit 4C – Option A** presents this alternative.

The existing airport entrance road would have to be closed in this alternative since it cannot cross the RSA. Airport traffic would be shifted to Nambe Loop Road. The OFA would extend beyond airport property and would encompass portions of several additional homes necessitating a modification to standards.

A second option for fully meeting RSA standards is presented on **Exhibit 4C – Option B**. This option considers maximizing airport ownership of the OFA in addition to owning the RSA and OFZ. Four residential properties would need to be acquired and two others would have a slight shift in their fence line. The existing airport entrance road would have to be closed and Nambe Loop Road would be planned to provide access to the airport.

For options A and B, the RSA behind the Runway 27 end extends beyond the airport property line and fence line by approximately 13 feet. The airport would have to acquire this small area and shift the perimeter fence. This area would also have to be brought up to RSA grading standards.

Relocate, Shift, or Realign the Runway

Due to the terrain, with canyons on both sides of the airport, realigning the runway is not considered possible. Relocating, realigning, or shifting the runway is not considered feasible to solve the non-standard RSA issue and will not be pursued further.

Decrease Runway Length

To implement this option, the Runway 9 end would have to be reduced by 225 feet and the Runway 27 end would be reduced by 13 feet as shown on **Exhibit 4C – Option C**. The total runway length would be 5,762 feet. The FAA has indicated that airports do not have to reduce runway length if it will have a negative operational impact to the critical design aircraft. As much runway length as possible should be maintained at Los Alamos as 8,500 feet is the recommended length for the airport.

Since the existing runway length of 6,000 feet is already less than desired, the next consideration is if there is a substantial operational impact between the existing length of 6,000 feet and the reduced length of 5,762 feet. For many aircraft operators, the published length of the runway is of critical importance. Some will not consider operating to airports with less than 6,000 feet. Others may have insurance policies that prohibit operation to runways of less than 6,000 feet. Reducing the length of the runway may have an impact on operations to the airport and should be avoided if possible.

Combination Method

The combination method provides for the flexibility to combine runway relocation, shifting, realignment, or reduction in order to provide the full RSA. As discussed above, relocation, realignment, runway shift are not practicable; therefore, a combination method is not feasible.

Declared Distances

Implementing declared distances for ADG II will be slightly different than for ADG I since the RSAs extend 300 feet rather than 240 feet beyond the runway ends. The TORA and TODA would remain at the length of the runway. The ASDA for Runway 9 would be shortened by 13 feet to account for the RSA behind the Runway 27 end. Therefore, 5,987 feet would be available for departure. The LDA for Runway 27 would be shortened by a total of 238 feet for a total landing length of 5,762 feet available. This is calculated by relocating the landing threshold 13 feet to the west and declaring the end of the runway 225 short of the pavement end. **Table 4D** and **Exhibit 4C – Option D** graphically presents this alternative.

TABLE 4D
Implementation of Declared Distances
Los Alamos Airport

	Runway 9	Runway 27
TORA	6,000	6,000
TODA	6,000	6,000
ASDA	5,987	5,762*
LDA	5,762*	5,762

TORA: Takeoff run available
TODA: Takeoff distance available
ASDA: Accelerate-stop distance available
LDA: Landing distance available

*Landings to Runway 9 and departures using Runway 27 are prohibited.

Once again, it should be noted that use of declared distances is typically considered a method of last resort to providing adequate RSA. Any plan to implement declared distances must receive FAA approval. In addition, the FAA has indicated that declared distances are typically not appropriate for airports intended for small aircraft exclusively because these pilots do not have a requirement to learn how to adjust their operational calculations due to the presence of declared distances.

EMAS

EMAS is not a viable option for Los Alamos Airport because the critical aircraft does not weigh enough to be effectively stopped by the crushable concrete material.

Summary

There are effectively three options available for providing adequate RSA for a critical aircraft in ARC A/B-II. They are to provide the full RSA, reduce the runway length, or implement declared distances.

Providing the full RSA would have some impact to the neighborhood to the west of the airport. At a minimum, three properties would be impacted and their backyard fence line would have to be shifted several feet to the west to provide for the cleared RSA and the blast deflection fence. In addition, the existing airport entrance road would cross the RSA and would have to be closed or relocated. Nambe Loop Road is considered for conversion to the airport entrance road in this alternative.

To meet the design standard for RSA, OFZ and OFA behind the Runway 9 end, several residential properties would need to be acquired as well as portions of others. The existing airport entrance road would have to be closed and Nambe Loop Road would be used as the airport entrance road.

The other options for providing adequate RSA for ADG II is to reduce the runway length or to implement declared distances. Both options effectively reduce the operational length of the runway, which should be avoided if possible. When reducing the runway length a total of 5,772 feet would be available for operations in all directions. When implementing declared distances, 5,987 feet would be available for takeoffs from Runway 9 and 5,762 would be available for landing to Runway 27.

The first option for any airport is to meet design standards to the greatest extent practical. At Los Alamos Airport, this will require some property acquisition and closure of the existing airport entrance road to accommodate ARC A/B-II design standards.

TAXIWAY F HANGAR DISPOSITION

The hangars adjacent to Taxiway F are located in such a manner that they penetrate two of the airports imaginary surfaces; the taxiway object free area (TOFA) and the runway transitional surface (FAR Part 77). To mitigate the TOFA penetration, Taxiway F has essentially been closed to through traffic. All aircraft are directed to back-taxi on the runway then turn around on the runway in order to prepare for takeoff. A primary goal of the airside alternatives is to design a taxiway layout system that will allow for taxiway access to the Runway 9 threshold.

Any penetration of the FAR Part 77 surfaces, such as is the case with the transitional surface, is considered an obstruction to air navigation. An obstruction is not necessarily a hazard to air navigation which would require immediate mitigation. A penetration of the FAR Part 77 surfaces should be analyzed by the FAA through an aeronautical study. Aeronautical studies are conducted upon request or as requirement for Airport Layout Plan (ALP) approval. Obstructions to air navigation must be removed unless the aeronautical study determines otherwise. To determine otherwise, the FAA must find no substantial adverse effect as defined in FAA Order 7400.2, *Procedures for Handling Airspace Matters*.

When there are non-standard conditions at an airport, it is incumbent upon the airport sponsor to recognize the condition, evaluate alternatives, and pursue a feasible remedy. The remedy for the hangar penetration of the TOFA has been to essentially close Taxiway F to through traffic. The remedy for the hangar penetration of the transitional surface has been to place obstruction lights on the hangars. Where feasible, penetrations to the transitional surface should be removed.

Due to the extremely limited development area on the airport, the alternatives will prioritize locating the Taxiway F hangars in such a manner that the TOFA is clear. Since the penetration by the transitional surface is not a hazard to air navigation, it is a lower priority to clear the transitional surface unless a new FAA aeronautical study determines otherwise. Upon completion of this Master Plan and ALP, the FAA will conduct an aeronautical study and make a new airspace determination for all planned development.

Five potential development alternatives for Taxiway F are presented in the following subsections. The first considers a "Do-Nothing" alternative, followed by two alternatives that consider the current critical design aircraft (ARC A-I small aircraft) and two that consider the potential transition to a critical aircraft in ARC A/B-II (small aircraft) which would include the Cessna Caravan 208A planned for initial commuter service. A final alternative will present the potential impacts that a transition to full ARC B-II for aircraft greater than 12,500 pounds, would have.

"Do-Nothing" Alternative

The "Do-Nothing" alternative would entail maintaining Taxiway F and the adjacent hangars in their current location as has been the case for decades. Taxiway F would have to remain an access taxilane for the hangars that does not provide access to the Runway 9 threshold. The current back-taxiing maneuver would continue to be required. Over time, the capacity of the runway system will continue to deteriorate, limiting the usefulness of the airport in the future. Efficiency of aircraft movement will continue to be negatively impacted.

Advantages:

- Low cost to implement.
- Current hangar owners are not inconvenienced with relocation or reconstruction.

Disadvantages:

- Hangars remain a penetration to the taxiway object free area.
- Hangars remain a penetration to the FAR Part 77 transitional surface.
- Taxiway F cannot be used to access Runway 9 threshold.
- Aircraft continue to back-taxi on Runway to access Runway 9 threshold.
- Airfield capacity continues to diminish.

Taxiway F Alternative 1 (ADG I – Small Aircraft)

Taxiway F Alternative 1, as presented on **Exhibit 4D**, shows the alterations necessary to meet the separation standards for the current critical aircraft (ARC A/B-I, small aircraft). First, Taxiway F must be reconstructed at a separation distance of 150 feet from the runway, centerline to centerline. The separation distance is currently 145 feet. Taxiway F would need to be at least 25 feet wide to meet the design standard. Next the 89-foot wide TOFA must be clear. To accomplish this, the hangars adjacent Taxiway F must be relocated. To clear the transitional surface, the hangars must be relocated at least 265 feet from the runway centerline which would allow for structures no taller than 20 feet. Relocating the hangars to the north to a distance 265 feet places them on the existing airport entrance road; therefore the access road would have to be relocated.

By relocating the hangars to a distance of 265 feet from the runway centerline, there would be a total distance of 71 feet between hangar doors and the TOFA. This area could be an apron as shown in the exhibit or it could be taxilanes leading to each hangar. Aircraft owners would be able to tug their aircraft from their hangars without blocking Taxiway F or penetrating the TOFA, an improvement on the current situation.

Advantages:

- Taxiway F would provide access to Runway 9 threshold.
- Current design standards for ARC A/B-I small aircraft would be met.
- Hangars would be removed from the FAR Part 77 transitional surface.
- Space (71 feet) would be available for aircraft between TOFA and hangars.

Disadvantages:

- Must relocate airport access road.
- Does not address potential future design standards.

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Exhibit 4D
TAXIWAY F
ALTERNATIVE 1 (ADG I)

- Current hangar owners may be inconvenienced with relocation or reconstruction.

Taxiway F Alternative 2 (ADG I – Small Aircraft)

Taxiway F Alternative 2, presented on **Exhibit 4E**, is the same as the previous alternative except that the hangars are relocated to the north to a distance of 220 feet from the runway centerline. At this distance the FAR Part 77 transitional surface would still be penetrated by the hangars but this is not likely a hazard to air navigation. Approximately 23 feet of space would be available between the hangar doors and the TOFA for Taxiway F.

Advantages:
- Taxiway F would provide access to Runway 9 threshold.
- Airport Road can be maintained in its current location.
- Some space is available outside the hangars, which is an improvement over the current layout.

Disadvantages:
- Hangars would still be a penetration to the transitional surface that may require FAA concurrence.
- The space between the hangar doors and the TOFA is only 23 feet, which is slightly less than the length of a typical aircraft such as a Cessna 172 (27 feet in length)
- Does not address potential future design standards.
- Current hangar owners may be inconvenienced with relocation or reconstruction.

Taxiway F Alternative 3 (ADG II – Small Aircraft)

The next alternative considers the transition to ADG II that would occur with the introduction of the Cessna Caravan 208A in a commuter capacity or 500 combined itinerant operations by ADG II aircraft. The runway taxiway separation distance increases from 150 feet to 240 feet. The TOFA increases from 89 feet wide to 131 feet wide. The RSA increases from 120 feet wide to 150 feet wide and from 240 feet beyond the runway ends to 300 feet beyond the runway ends. The OFA increases from 250 feet wide to 500 feet wide and extends 300 feet beyond the runway ends. The OFZ would increase from 120 feet wide to 250 feet wide.

As shown on **Exhibit 4F**, the hangars are planned to be relocated to a distance of 345.5 feet from the runway centerline. This distance provides 40 feet of space between the hangar doors and the TOFA. This is enough space to park a typical aircraft that falls within in ADG I or II. Relocating the hangars to this distance would severely limit developable space. This alternative provides taxiway access to the Runway 9 threshold for both the current critical aircraft and the future critical aircraft.

Advantages:
- Meets separation standards for ADG II.
- Taxiway F would provide access to Runway 9 threshold.
- TOFA would meet standard for the future critical aircraft in ADG II.

Disadvantages:
- Limits developable space to the north.
- Current hangar owners may be inconvenienced with relocation or reconstruction.

Taxiway F Alternative 4
(ADG II - Small Aircraft - Modified)

The next alternative, presented on **Exhibit 4G**, applies FAA criteria for modifying taxiway separation standards which will still provide an acceptable level of safety for the wing span of a specific aircraft. The separation distance from a taxiway centerline to a fixed or movable object can be modified based on the following equation: (0.7 x wingspan) + 10 feet. This calculation provides a modified width for the TOFA and indicates the closest point where the hangars could be relocated.

The Dash-6 Twin Otter Series 400 aircraft has a wingspan of 65 feet. This aircraft has the largest wingspan of those under 12,500 pounds that is considered for commuter operations at the airport. The 12,500 pound threshold is critical because heavier aircraft would trigger an increase in the OFZ width from 250 feet to 400 feet.

When applying the formula to the 65-foot wingspan of the Dash-6 the separation distance from the taxiway centerline to a fixed object must be at least 55.5 feet. [(0.7 x 65) + 10 = 55.5]. Therefore, the TOFA for the taxiway can be a total of 111 feet wide as centered on the taxiway. The closest the hangars could be to the taxiway is 55.5 feet.

The runway/taxiway separation distance can also be modified if an acceptable level of safety can be maintained. At a minimum, the wing of an aircraft on the taxiway centerline cannot penetrate the RSA or the OFZ. The OFZ is 125 feet from the runway centerline. Half the wingspan of the Dash-6 is 32.5 feet. Therefore the taxiway centerline must be a minimum of 157.5 feet from the runway centerline.

Advantages:
- Taxiway F would provide access to Runway 9 threshold.
- Taxiway F would meet current and future runway/taxiway separation requirements (with modification to standard).
- Provides the maximum feasible developable land for the airport.

Disadvantages:
- Modification to Standard for runway/taxiway separation in the future.
- Modification to standard for TOFA in the future.
- Current hangar owners may be inconvenienced with relocation or reconstruction.

Taxiway F Alternative 5
(ADG II – Large Aircraft - Modified)

Exhibit 4H is developed based on the potential for the critical aircraft to transition to ADG II aircraft weighing more than 12,500 pounds. This would be the case if a Beech 1900 or other ARC A/B-II aircraft were to account for 500 or more annual itinerant operations. The change from the small aircraft category (<12,500 pounds) to the large aircraft category (>12,500 pounds), increases the width of the OFZ from 120 feet wide currently to 400 feet wide. This is significant since the OFZ must be clear of objects; therefore the taxiway and all landside facilities would be pushed further north.

Utilizing the same methodology as presented in the previous alternative, the taxiway centerline would be located 232.5 feet from the runway centerline. The standard runway/taxiway separation is 240 feet. The TOFA would be 111 feet wide, as based on the 65-foot wing span of the Dash-6 aircraft. As a point of com-

Exhibit 4E
TAXIWAY F
ALTERNATIVE 2 (ADG I)

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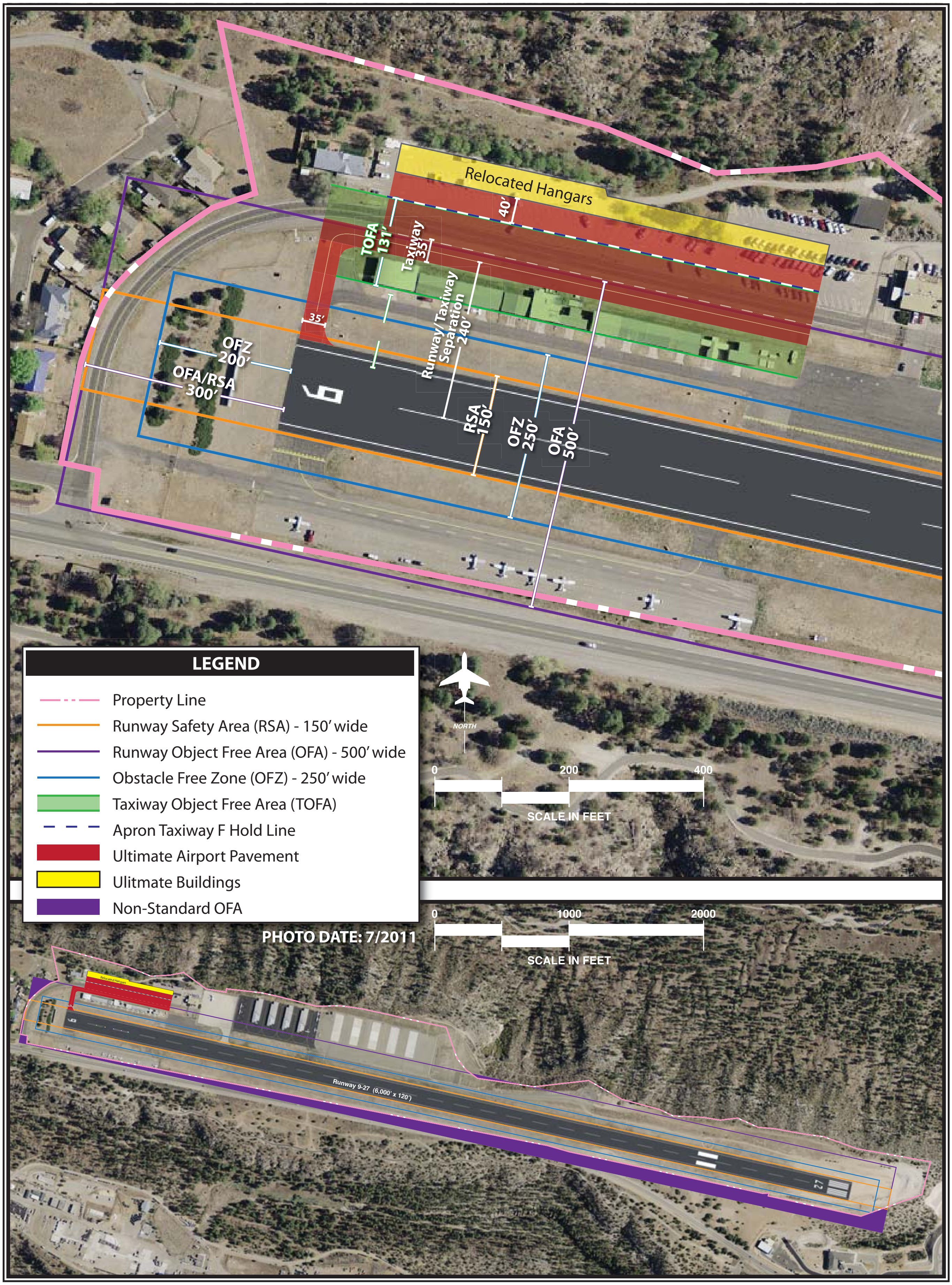

Exhibit 4F
TAXIWAY F ALTERNATIVE 3
(ADG II - SMALL AIRCRAFT)

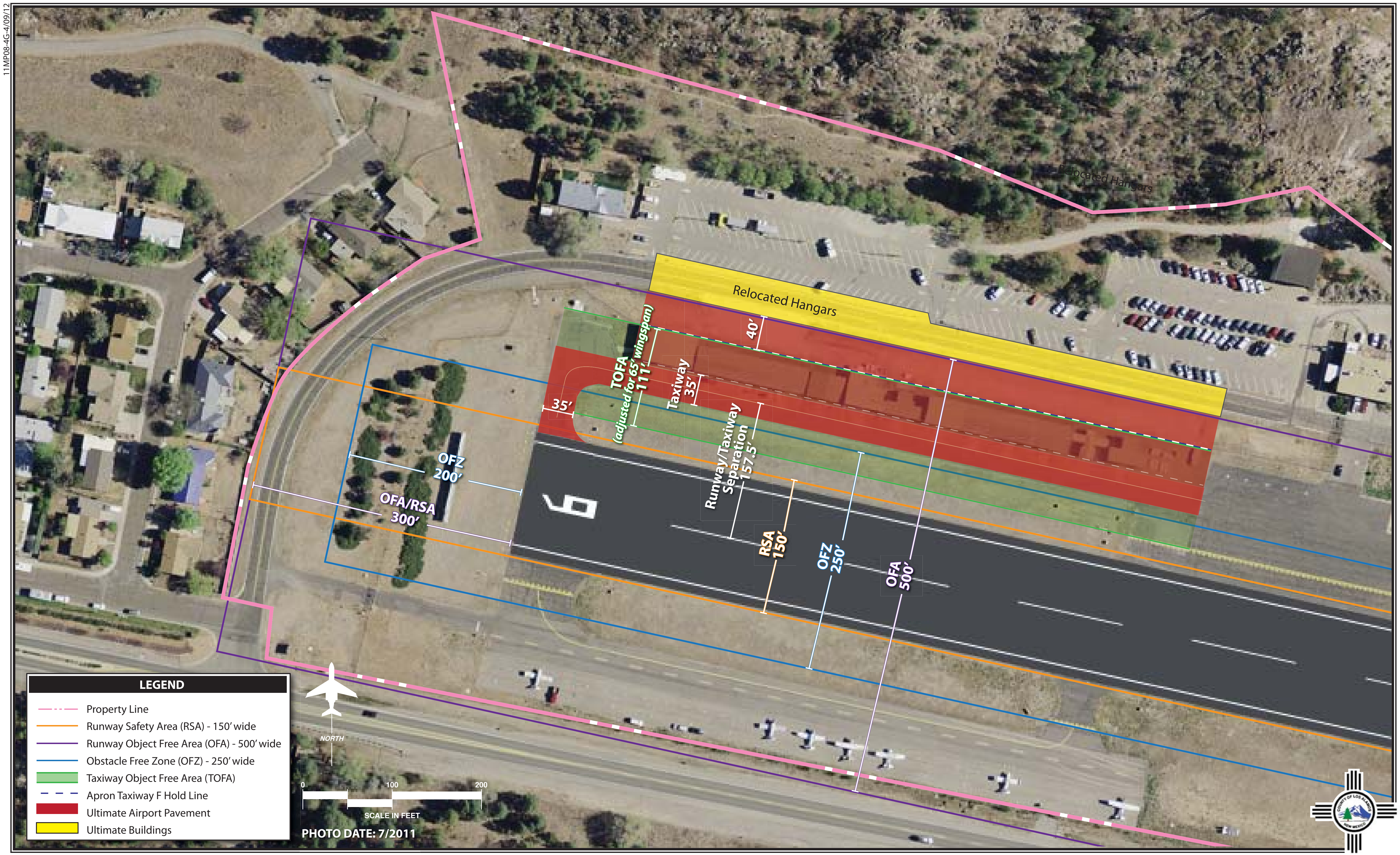

Exhibit 4G
TAXIWAY F
ALTERNATIVE 4 (ADG II - SMALL AIRCRAFT-MODIFIED)

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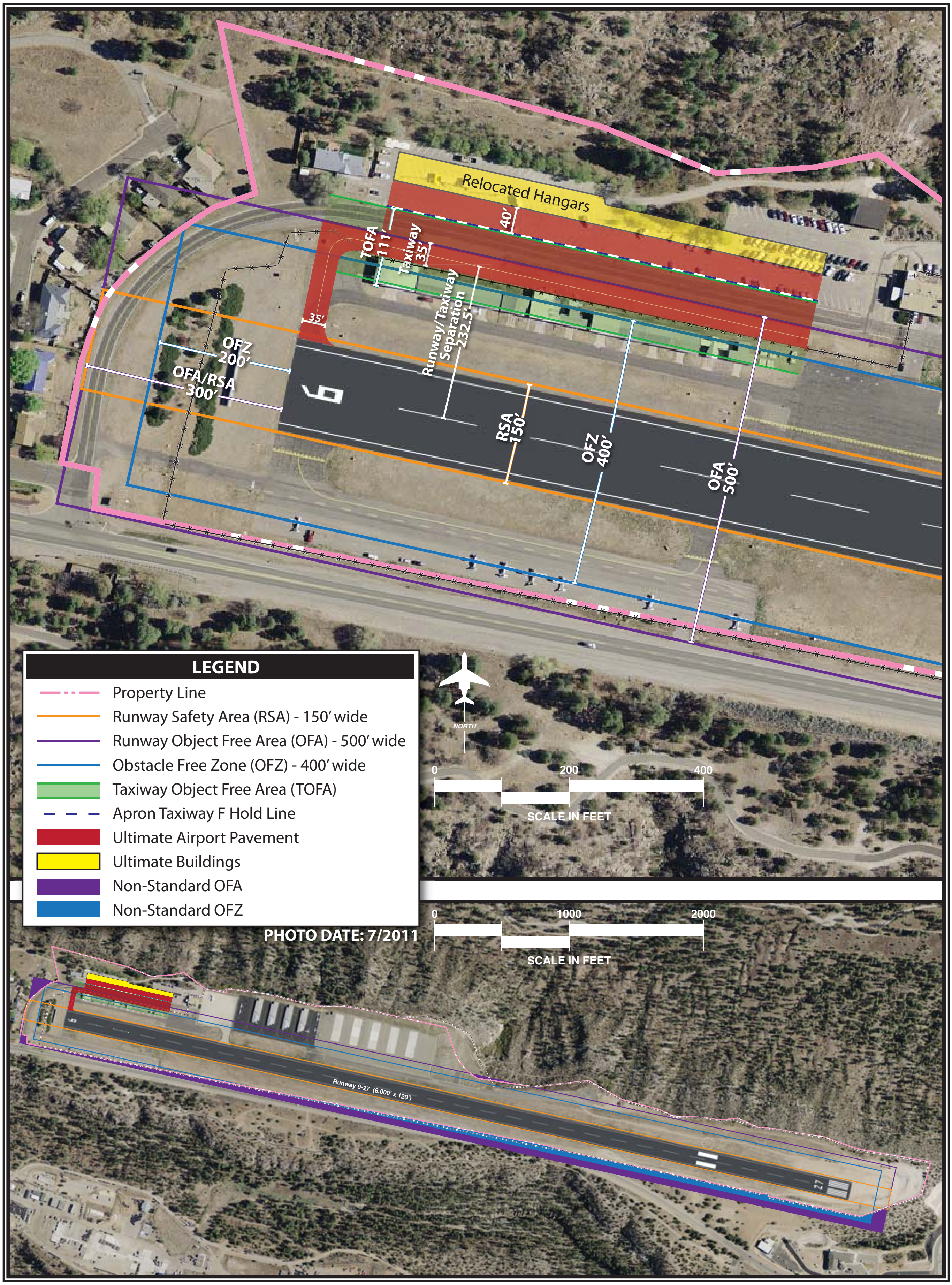

Exhibit 4H
TAXIWAY F ALTERNATIVE 5
(ADG II - LARGE AIRCRAFT-MODIFIED)

parison, the Beech 1900 has a 58-foot wing span, therefore if planning to this aircraft, the taxiway could be at a separation distance from the runway centerline of 229 feet and the TOFA could be 101.2 feet wide. Planning the taxiway and TOFA utilizing a wingspan of 65 feet is preferred as it would provide an appropriate safety margin for most twin-engine turboprops that could operate regularly at Los Alamos Airport.

The hangars have been shifted to the north to a distance of 328 feet from the runway centerline to the hangar doors. This distance provides for 40 feet between the hangar doors and the TOFA, enough space to temporarily park a small aircraft.

Advantages:

- Taxiway F would provide access to Runway 9 threshold.
- Taxiway F would meet current and future runway/taxiway separation requirements.

Disadvantages:

- Modification to Standard for runway/taxiway separation in the future.
- Modification to standard for TOFA in the future.
- Less space available for hangar development.
- Current hangar owners may be inconvenienced with relocation or reconstruction.

AIRSIDE SUMMARY

The airside alternatives have focused on two major elements, the RSA and Taxiway F. The RSA is currently non-standard as the blast deflection fence, perimeter fence, and numerous shrubs are in the RSA behind Runway 9. Following FAA guidance, six potential alternatives for mitigating the non-standard condition were examined. Three of the alternatives are considered feasible but only one would maintain the current operational length of the runway at 6,000 feet.

The RSA alternative which preserves the operational length of the runway essentially requires clearing the existing RSA by removing the shrubs and relocating the blast deflection fence and the perimeter fence to outside the RSA. This option may necessitate a slight rerouting of the airport entrance road to make room for the relocated blast deflection fence. The OFA would still be non-standard requiring FAA approval through a modification to standards determination. This option does not consider the potential for the critical design aircraft to transition to ADG II which increases the length of the RSA and OFA beyond the runway ends.

Taxiway F is too close to the runway and the hangars are too close to the taxiway. A significant goal of this alternatives analysis has been to explore options for opening this taxiway to allow access to the Runway 9 threshold. It is assumed that Taxiway F will need to be completely reconstructed because it is too close to the runway, is in poor condition, and does not have adequate weight bearing capacity. Since Taxiway F needs to be rebuilt, the runway/taxiway separation should meet the long term design standards for the airport.

The limited development area remaining at the airport was a significant consideration when examining alternatives for the location of Taxiway F. The existing runway/taxiway separation and TOFA standards are based on the largest wingspan in each airplane design group. The FAA allows planners to design facilities based on a specific aircraft within that design group if local conditions dictate. Minimum acceptable separation distances based on a 65-foot wingspan were presented. As a result several alternatives were presented that would require a modification to standard for the runway/taxiway separation and the TOFA while still maintaining appropriate and safe separation distances.

These airside alternatives will be considered by the Planning Advisory Committee. Following discussion and review a preferred alternatives will be carried through in the Recommended Master Plan concept to be presented in the next chapter.

LANDSIDE ISSUES

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

Activity in the terminal area should be divided into high, medium, and low intensity levels at the airport. The high-activity area should be planned and developed to provide aviation services on the airport. An example of the high-activity area is the airport terminal building and adjoining aircraft parking apron, which provides outside storage and circulation of aircraft. In addition, large conventional hangars housing fixed base operators (FBOs), corporate aviation departments, or storing multiple aircraft would be considered a high-activity use. A conventional hangar structure in the high-activity area should be a minimum of 6,400 square feet (80 feet by 80 feet). Typically, the best location for high-activity areas is along the flight line near midfield, for ease of access to all areas of the airfield. At Los Alamos, with its unique one-way-in and one-way-out flow, the terminal area may be better situated at the western end of the airfield.

The medium-activity use category defines the next level of airport use and primarily includes smaller corporate aircraft that may desire their own executive hangar storage on the airport. A hangar in the medium-activity use area should be at least 50 feet by 50 feet, or a minimum of 2,500 square feet. The best location for medium-activity use is off the immediate flight line, but still readily accessible. Parking and utilities such as water and sewer should also be provided in this area.

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

In addition to the functional compatibility of the terminal area, the proposed development concept should provide a first-class appearance for Los Alamos Airport. Consideration to aesthetics should be given high priority in all public areas, as the airport may serve as the first and last impression a visitor may have of the community.

Ideally, terminal area facilities at general aviation airports should follow a linear configuration parallel to the primary runway. The linear configuration allows for maximizing available space, while providing ease of access to terminal facilities from the airfield. Each landside alternative will address separation of activity levels and efficiency of layout.

LANDSIDE ALTERNATIVES

The following section describes several landside development alternatives. These alternatives consider facility development providing for separation of activity levels. The goal of this analysis is to indicate development potentials which would provide the County with a specific vision for future development of the airport. The resultant plan will aid the County in strategic marketing of available properties. The following development alternatives analysis utilizes accepted airport planning methodologies in conjunction with FAA AC 5300/13, *Airport Design*.

The three alternatives described below are not the only options for development. In fact, the development options are limitless. The alternatives presented are believed to be reasonable, economically feasible, and implementable. The final concept can be one of these three alternatives or the major elements of one alternative can be combined with other elements to form a single concept.

Previously, various solutions were presented for mitigating the RSA and providing access via Taxiway F to the Runway 9 threshold. The selected solution to these issues will have a significant impact on the potential landside development options. As a result it is necessary to plan landside facilities around a single airside concept. Taxiway F will be considered at a separation of 157.5 feet from the runway centerline to accommodate an ADG II wingspan of 65 feet. The TOFA is planned at 111 feet wide. This concept was previously presented on Exhibit 4G – Alternative 4 (ADG II – Small Aircraft – Modified).

Several landside elements are considered individually prior to including them in an overall landside plan. These include analysis of the airport entrance road, the terminal building, the south apron, Taxiway F hangars, transient apron, and the landfill cap.

AIRPORT ENTRANCE ROAD

One of the landside alternatives considers utilizing Nambe Loop Road as the future airport entrance road. This would only be necessary if the full RSA for ADG II is made available behind the Runway 9 threshold. If another method for meeting RSA is employed (i.e. declared distances or reduced runway length), then the existing airport entrance road could be maintained.

The existing location of the airport entrance road, running parallel to the runway at a separation distance of 275 feet, centerline to centerline, severely constrains potential hangar development. The planned location of terminal building facilities will have a significant impact on the potential location of the airport access road. The three landside alternatives consider maximizing airport property for aviation related development and hangars.

Three primary options for the airport entrance road are considered:

1) Shift airport entrance road to the north to facilitate hangar development between the road and the runway.
2) Shift terminal building location to the west, making the airport entrance road shorter. Thus maximizing development areas to the east of a new terminal building.
3) The entrance road is maintained in its current location, limiting hangar development options.

It should be noted that the terrain north of the existing edge of the parking lots does begin to drop from between 10 to 15 feet before the property line, where the terrain drop is then precipitous, forming the south wall of Pueblo Canyon. The amount of fill needed to utilize these northern portions of airport property could be significant. Retaining walls, similar to those on the southeast end of the runway safety area, may be necessary.

TERMINAL BUILDING

As discussed in the Inventory and Facility Requirements chapters, the terminal building is insufficient to accommodate the needs of the airport, especially if commuter/commercial passenger operations are introduced. By the long term planning period it is estimated that a terminal building with a footprint of approximately 12,200 square feet would be required. The location of a planned terminal building will influence the location of other elements such as the airport entrance road, aircraft apron, and hangars.

The primary goal in the master plan when discussing a new terminal building is location and size. Due to the unique airport site, situated at the edge of a canyon, some consideration is given to the aesthetics of the terminal building. By locating a new terminal building at the north property edge, architects have an opportunity to design a facility that provides breathtaking vistas of Pueblo Canyon. As a result two of the three landside alternatives consider locating a new terminal building on the northern property edge.

NAVIGATIONAL AIDS

The lighted wind sock located at the eastern end of the airport is 120 feet from the runway centerline. While it is outside the current RSA and OFZ, it is within the OFA. It should be relocated outside the OFA or a modification to standard should be issues by the FAA. When the airport transitions to ARC A/B-II and the OFZ expands 250 feet in width (125 feet from centerline), the wind sock will be within the OFZ. At this point it must be relocated. When relocating the windsock it should be outside the future OFA, which would be at least 250 feet from the runway centerline.

The AWOS-3 is situated approximately 150 feet from the runway centerline. It is outside the current OFA but would fall within the OFA when the airport transitions ARC A/B-II design standards. It would have to be relocated outside the OFA or a modification to standards would have to be issued by the FAA. There is a 500-foor critical area that surrounds the AWOS. This area should be clear of unnecessary of object penetrations.

EAST END LAND USE POTENTIAL

In an effort to identify all development potential at the airport, an examination of potential land uses at the eastern end of the airport has been undertaken. This analysis assumes that the parallel taxiway is not planned to extend to the Runway 27 threshold.

On the south side of the runway there is approximately 40 feet from the airport property boundary to the edge of the OFZ. This strip of area is entirely within the OFA. The PAPIs are located on this side of the runway as well and must be clear of obstructions. Any potential development on the south side of the runway must be outside the OFZ and be approved for a modification to standard for the OFA.

On the north side of the runway, to the east of the "hot pad" (end of Taxiway H), there is limited development potential. The AWOS has a 500-foot critical area that must be clear of facilities that could disrupt the function of the various weather sensors. The area that would encompass the AWOS critical area is thus removed from potential development.

The first potential area of development encompasses approximately 2.2 acres. This area is bounded on the west by the "hot pad" (including the TOFA), on the north by the property line, on the east by the AWOS critical area, and on the south by the OFZ. The second potential development area also encompasses approximately 2.2 acres. This area is bounded on the west by the AWOS critical area, on the north by airport property, on the east by the lateral edge of the end of the runway, and on the south by the OFZ.

Most of this potential development area is within the OFA and would require a modification to standards. Any construction in these areas would require the FAA to conduct an airspace analysis. Any facility planned for these areas should be analyzed for the potential to penetrate the FAR Part 77 transitional surface (7:1 slope from the edge of the OFZ). Public access to these areas is not considered feasible; therefore, any planned use should be restricted to authorized airport personal. One potential use that may be acceptable is a snow removal equipment storage building.

FUEL FARM

The existing fuel farm is located at the west end of Taxiway F, adjacent to the hold apron. This location is incompatible with the planned improvements of Taxiway F. If aircraft were fueling in the current location they would be blocking access to the Runway 9 threshold as they would be in the TOFA. The fuel farm should be relocated outside of the safety areas and outside of the runway/taxiway environment, if possible. An area measuring approximately 55 feet in length by 35 feet in width would accommodate two above-ground 10,000 gallon fuel tanks.

When planning a new site for the fuel farm consideration will be given to preserving self-fueling capability. Also considered will be the addition of a Jet A storage tank. If self-serve fueling cannot be maintained due to a lack of potential sites, then two refueling trucks, one for AvGas and one for Jet A fuel would have to be maintained by the airport or an FBO.

SNOW REMOVAL EQUIPMENT STORAGE

Los Alamos Airport experiences winter snowfall. Currently, the Public Works Department assists in snow removal. The airport is planning to acquire a snow plow with a 22-foot blade and a snow broom. To accommodate this equipment, a dedicated snow removal equipment storage facility is needed. Estimates indicate that a 4,500 square foot building would meet the storage need.

SOUTH APRON

To the south of the Runway 9 threshold is a tie-down apron with 16 positions that is parallel to the runway. There are two entrance/exit taxiways leading to this apron. The northern 20 feet of the tie-down apron is marked as a taxilane stretching between the two entrance/exit taxiways. The taxilane centerline is 155 feet from the runway centerline (thus exceeding the 150–foot standard). The TOFA is 79 feet wide therefore no object (e.g. aircraft) can be closer than 39.5 feet to the taxilane centerline. The distance from the taxilane centerline to parked aircraft is approximately 40 feet.

The transitional surface is an imaginary surface that emanates outward and upward from the edge of the primary surface surrounding the runway. The transitional surface is one of the FAR Part 77 imaginary surfaces that when penetrated identifies obstructions to air navigation. The primary surface is 250 feet wide and centered on the runway. The permissible elevation of an object located 190 feet from the runway centerline, is 18.5 feet. The height of a typical ADG I aircraft, such as the Cessna 172, is approximately nine feet. Therefore, small single engine aircraft do not penetrate the transitional surface when parked on this apron.

The OFA surrounding the runway has a width of 250 feet as centered on the runway. Therefore, the area within 125 feet from the runway centerline should be clear of all objects, except those necessary for navigation. The location of the south tie-down apron and aircraft is acceptable under ADG I design standards. If the design standard transitions to ADG II, then the OFA width increases to 500 feet, or 250 feet from the runway centerline. The ADG II OFA would encompass the entire south tie-down apron. A modification to design standard would be necessary to maintain the south apron under these conditions.

REMOVAL/RELOCATION OF TAXIWAY F HANGARS

Each of the landside alternatives to follow considers removing/relocating the 14 hangar positions located along Taxiway F. As previously stated, the hangars penetrate the TOFA making Taxiway F unusable for providing access to the Runway 9 threshold. This has led to an operational change at the airport where departing aircraft are required to back-taxi on the runway for a distance of approximately 700 feet. Providing taxiway access to the Runway 9 threshold would enhance safety at the airport.

In addition, the hangars are currently an obstruction to the FAR Part 77 transitional surface but presumably not a hazard to air navigation. (Note: The FAA has not altered the instrument approach minimums or removed the instrument approach altogether, therefore, the hangars are not considered a hazard to air navigation.)

Hangar removal/relocation is eligible for grant funding through the Airport Improvement Program under certain circumstances. According to FAA Order 5100.37B, *Land Acquisition and Relocation Assistance for Airport Projects*, "safety areas for parallel, bypass, or connecting taxiways and turnarounds as well as holding bays are eligible" for federal assistance. The Order continues, "The lease terms with the airport owner will determine the occupancy rights of the tenant and if the airport must acquire the tenant leasehold or "break" (extinguish) the current lease. In lieu of displacement from the airport, the sponsor may renegotiate a lease for continued occupancy elsewhere on airport property."

All of these hangars were privately constructed and are privately owned. The owners pay an annual ground lease to the airport. The leases for these hangars are for 20 years with one 10 year and two 5 year options. These leases are three years old as of 2012. The privately owned hangars adjacent to Taxiway F are considered real property and the owners would have to be compensated for the relocation/removal of the hangars.

The following regulations must be followed when a federally funded project requires acquisition of real property.

The acquisition of the hangars would first involve the airport obtaining independent appraisals of the hangars. The airport can then acquire the hangars and remove or relocate them. Those former owners have several options including:

1) Relocating to another airport.
2) Construct a hangar at another location on the airport that is consistent with the airport master plan and FAA design standards.
3) Apply the proceeds from the acquisition to lease payment on another hangar/tie-down at the airport at market rate.

TRANSIENT APRON

The transient apron located to the immediate east of the existing terminal building was constructed with an FAA grant more than 20-years ago. Under Federal grant assurances, the apron must be maintained as an apron for at least 20 years. If any Federal funds were expended to maintain the apron then the 20-year useful life of the pavement begins at that point in time. Should the County decide to utilize the existing apron for any purpose other than an apron, then the County may have to reimburse the FAA a pro-rated amount of the Federal investment in the pavement.

Two of the three landside alternatives consider relocating the terminal building and transient apron to the east. If this were done, then the existing transient apron could be repurposed. Approximately 20 aircraft tie-down positions could be accommodated since an apron is intended for this function. If the County or a developer were to construct hangars on the apron then approximately 16 nested T-hangar positions could be accommodated.

LANDFILL CAP

The former landfill at the airport has been capped with the intent of it being able to support landside development such as new hangars. Unfortunately, the landfill cap has had significant settling problems and is currently unsuitable for hangar construction. As originally planned the landfill cap would have been able to support five hangar structures each measuring 200 feet by 65 feet. Depending on the type of hangars constructed approximately 30 new individual units could have been supported.

The original project to cap the landfill and prepare the cap to support hangars was undertaken by the Department of Energy as a precondition to transferring the airport to the County. As of this master planning effort, there are no plans to repair the landfill cap in the near future. Presumably, sometime in the future, the cap may be repaired and hangars may be constructed. This would be a very positive development that would lessen the pressure to construct hangars at other locations on the airport.

LANDSIDE ALTERNATIVE A

Landside Alternative A, presented on **Exhibit 4J**, considers the construction of a new terminal building at the property line north of the Runway 9 threshold. In this location, designers of the terminal building can potentially take advantage of the vistas of both the runway and Pueblo Canyon. As shown on the exhibit, a viewing area is included that would overlook the canyon.

By locating the new terminal building as shown on the exhibit, a new commuter/commercial aircraft apron would need to be constructed. The apron shown is approximately 3,600 square yards of pavement. This apron could accommodate some transient aircraft parking as well.

In this location, public road access to other parts of the airport is not possible. That means that only authorized persons (airport employees and tenants) would have access to any of the hangars to the east of the terminal building. Two box hangars, each encompassing 2,500 square feet, are located adjacent and to the south of the terminal building. These two hangars would be intended to accommodate future airport businesses that may need to be accessible by the public.

To the east of the planned new commuter/commercial apron are five T-hangars structures, each of which has five individual units for a total of 25 new T-hangar positions. Between each of the T-hangar structures is approximately 80 feet for the access taxilane. The south edge of the T-hangar structures abuts the taxiway object free area. Each T-hangar structure is approximately 7,400 square feet of space.

In this landside alternative, the 14 hangar positions currently lining Taxiway F would be removed. Removing these hangars would clear the TOFA and allow taxiway access to the Runway 9 threshold.

The area to the west of the planned new terminal building would be reserved for vehicle parking. As depicted approximately 202 parking spaces are available.

This landside concept considers the alternative of providing the full RSA and maximum OFA for ADG II as presented previously on Exhibit 4C – Option B. Four residential properties would need to be acquired and two others would have a slight shift in their fence line. The existing airport entrance road would have to be closed and Nambe Loop Road would be planned to provide access to the airport.

LANDSIDE ALTERNATIVE B

Landside Alternative B, shown on **Exhibit 4K**, considers the possibility of continuing to provide public road access to the current terminal area while relocating a new terminal building to the north of the Runway 9 threshold. The new terminal building would be located between the

Exhibit 4J
LANDSIDE ALTERNATIVE A

Exhibit 4K
LANDSIDE ALTERNATIVE B

Runway Object Free Area and the planned airport access road which is relocated to the north edge of airport property. The terminal building would be adjacent to the planned new commuter/commercial apron. The new apron would be approximately 3,000 square yards.

To the east of the new apron are three T-hangar structures, each with five individual units. Eighty feet of space for access taxilanes is available between the T-hangar structures. A fourth structure, encompassing approximately 7,400 square feet, is planned to accommodate four connected box hangars. These hangars would have public parking available to the east. This parking lot would also serve two larger box hangars, each approximately 4,900 square feet in size. These box hangars would be intended for airport businesses, such as an FBO or maintenance operation, that needs public road access.

Two vehicle parking lots are planned in this alternative. The terminal building parking lot provides for 102 parking spaces. To the east, the parking lot provides 78 spaces. There are a total of 180 parking spaces provided in this alternative.

The landside alternative is developed around the airside concept of implementing declared distances in order to meet RSA design standards (Previously presented on Exhibit 4C - Option D). Utilizing declared distances eliminates the immediate need to acquire properties, or to relocate the entrance road, the blast deflection fence, and to remove the shrubs behind Runway 9.

LANDSIDE ALTERNATIVE C

Landside Alternative C, as shown on **Exhibit 4L**, considers a replacement terminal building located at approximately the same location as the current structure, just shifted slightly to the north. The planned terminal building would provide direct access to the existing transient apron. The current terminal building would ultimately be removed under this concept. Another feasible option would be to construct an addition onto the existing terminal building.

To the west of the new terminal building is a large parking lot, providing 153 spaces that would serve the terminal building and two larger box hangars. The box hangars encompass 3,600 square feet each and would be intended for future aviation-related businesses.

To the west are three T-hangar structures with four individual aircraft storage positions within each. The last row of hangars to the west is three connected box hangars. Each of these encompasses approximately 2,500 square feet. These three hangars would be accessible to the public and could therefore serve aviation businesses.

The airport entrance road is relocated to the northern portion of airport property. As discussed, shifting the airport entrance road to the north would increase developable property and allow for the planned hangar construction.

The western box hangars would have 35 vehicle parking spaces. Along the northern edge of the hangars is another 113 parking spaces. These spaces could be utilized as a long term parking lot. In total this alternatives provides for 301 vehicle parking spaces.

The landside alternative is developed around the airside concept of implementing declared distances in order to meet RSA design standards (Previously presented on Exhibit 4C - Option D). Utilizing declared distances eliminates the immediate need to acquire properties, or to relocate the entrance road, the blast deflection fence, and to remove the shrubs behind Runway 9.

LANDSIDE SUMMARY

Three landside alternatives have been presented. Each of the layouts is based on the assumption that the design aircraft for the airport will transition from small aircraft in ADG I to small aircraft in ADG II. The transition in design aircraft means that the length and width of the RSA, OFA, and OFZ increase, further limiting potential development area.

Table 4E presents a summary of the planned hangar space at the airport. The number of available units within each hangar structure is estimated by assigning 1,300 square feet for T/Shade hangar space and 2,500 square feet for box hangar space. If hangar space continues to be constrained at the airport, aircraft owners will likely double-up aircraft in a hangar that was estimated to house only a single aircraft.

TABLE 4E
Hangar Summary
Los Alamos Airport

Hangar Type	Alternative A	Alternative B	Alternative C
New T/Shade-Hangars			
Footprint (s.f.)	37,000	22,200	18,000
Units	25	15	12
New Box Hangars			
Footprint (s.f.)	5,000	17,200	14,700
Units (est.)	2	8	7
SUBTOTAL NEW HANGARS			
Footprint (s.f.)	42,000	39,400	32,700
Units (est.)	27	23	19
Existing T-Hangars			
Footprint (s.f.)	35,000	35,000	35,000
Units	32	32	32
Box Hangars Removed			
Footprint (s.f.)	5,600	5,600	5,600
Units (est.)	13	13	13
SUBTOTAL EXISTING AND NEW HANGARS LESS REMOVED HANGARS			
Footprint (s.f.)	71,400	68,800	62,100
Units (est.)	46	42	38
Landfill Cap New Hangars			
Footprint (s.f.)	65,000	65,000	65,000
Units	30	30	30
TOTAL EXISTING AND NEW HANGARS			
Footprint (s.f.)	136,400	133,800	127,100
Units (est.)	76	72	68

Source: Coffman Associates analysis

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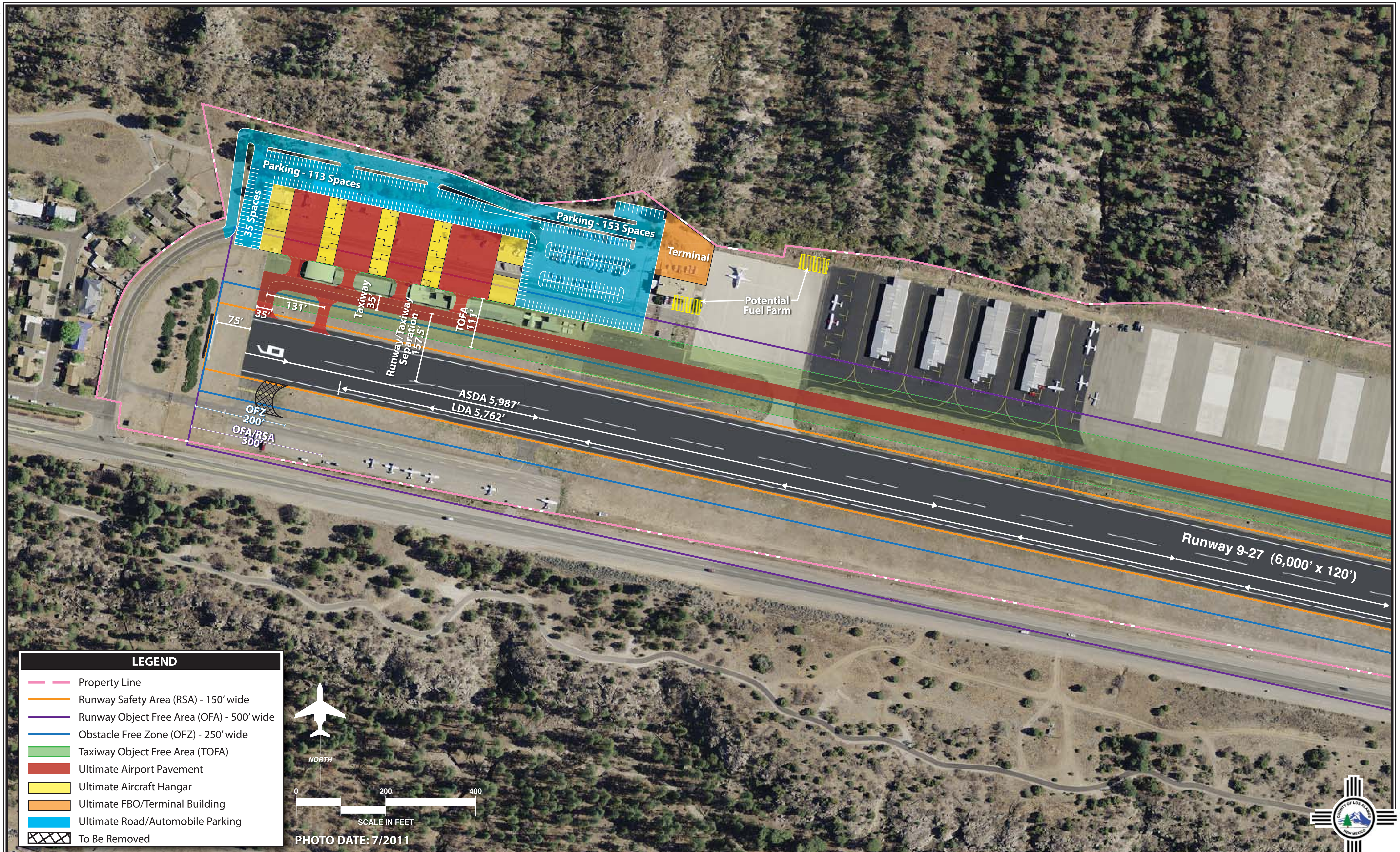

Exhibit 4L
LANDSIDE ALTERNATIVE C

There is currently 52,300 square feet of hangar space at the airport supplying 45 individual aircraft storage units. Each of the landside alternatives considers the removal/relocation of the 13 hangars (14 units) encompassing approximately 17,300 square feet currently situated adjacent to Taxiway F. The box hangars are then replaced with new hangars at a different location. Because the new hangar space assumes a larger hangar area for each aircraft, the total number of storage units declines slightly in two of the three alternatives.

Analysis in Chapter Three – Facility Requirements indicated a need for a total of 160,100 square feet of hangar space. The proposed hangar construction does not fully meet the forecast long term need for hangar space. The total number of hangar positions needed by the long term was forecast at 92. Due to the constrained nature of the airport, it may not be feasible to accommodate all those who desire a hangar.

A new terminal building is planned and presented on the landside alternatives. A new terminal building should be planned to serve general aviation users and a larger building, approximately 12,200 square feet, should be planned to accommodate an active commuter service operation.

The location of the planned terminal building is critical to positioning other facilities such as hangars, access roads and parking lots. Two of the landside alternatives consider a terminal building positioned at the edge of the northern property line. This location is intended to take advantage of the unique local terrain by having the terminal building overlook Pueblo Canyon.

An effort has been made to reserve space for future aviation related businesses that could be established at the airport. To this end, the landside alternatives identify larger box hangars that also have public road access. Landside Alternatives B and C provide more box hangar space since the access road is able to reach further east. The location of the terminal building on Landside Alternative A effectively limits the extent of the public access road. Therefore, only two box hangars are feasible.

Aircraft tie-down positions are an important element of the aircraft storage mix at Los Alamos Airport. As presented previously there are 37 aircraft tie-down positions. Over time, as more hangars are built, fewer tie-down positions would be necessary. Nonetheless, airport management should be cognizant of the need for tie-down space when undertaking projects at the airport. For example, if a new commercial/commuter apron were constructed, then the existing apron may be available for additional tie-down positions.

Vehicle parking is another important consideration. There is a forecast need for 208 commuter/commercial terminal vehicle parking spaces and 108 general aviation vehicle parking spaces, a total of 316 vehicle parking spaces. Landside Alternative A provides 202 spaces, Landside Alternative provides 180, and Landside Alternative C provides 301 spaces. Once again, the constrained nature of the airport makes meeting long term demand challenging.

SUMMARY

The process utilized in assessing the airside and landside development alternatives involved a detailed analysis of short and long term requirements, as well as future growth potential. Safety, both in the air and on the ground, was given a high priority in the analysis of alternatives. Every effort has been made to meet design standards for both the current and future critical aircraft.

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

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

Chapter Five

RECOMMENDED MASTER PLAN CONCEPT

Recommended Master Plan Concept

The airport master planning process for Los Alamos Airport (LAM) has evolved through the development of forecasts of future demand, an assessment of future facility needs, and an evaluation of airport development alternatives to meet those future facility needs. The planning process has included the development of three sets of working papers. The draft reports were presented to the Planning Advisory Committee (PAC) and at a Public Information Workshop.

The PAC is comprised of both aviation and non-aviation constituencies with an investment or interest in Los Alamos Airport. Specifically represented on the PAC are the following aviation stakeholders: the Federal Aviation Administration (FAA), New Mexico Division of Aviation, Based Pilots Population, Hangar Owners, Aircraft Owners and Pilots Association (AOPA), Experimental Aircraft Association (EAA), Civil Air Patrol, On-Airport Maintenance Businesses, Los Alamos County Engineer, and Los Alamos County Capital Projects and Facilities. Non-aviation stakeholders include: two Eastern Area residents, three local business owners, Los Alamos National Lab, Los Alamos Economic Development, Los Alamos County Emergency Services, and Los Alamos County Community Development. This diverse group has provided extremely valuable input into the recommended plan.

In addition to the PAC, the recommended concept has integrated comments and suggestions from members of the Los Alamos Community at-large. On June 20, 2012, a public information workshop was held where any interested citizen could learn about the master plan process and have their specific questions answered. Many suggestions from the public have been incorporated into the recommended concept. Of particular importance to the community was a desire to minimize the potential impact to the Eastern Area community, while

maintaining a sufficient level of safety for users of the airport.

In the previous chapter, several development alternatives were analyzed to explore options for the future growth and development of Los Alamos Airport. The development alternatives have been refined into a single recommended concept for the master plan. This chapter describes, in narrative and graphic form, the recommended concept for the future use and development of Los Alamos Airport.

The recommended master plan concept preserves the current nature of the airport by maintaining the focus on supporting small single and multi-engine piston-powered aircraft. The airport will continue to experience some limited activity by small business jets as well. The recommended master plan concept, as shown on **Exhibit 5A**, presents the ultimate configuration for the airport that preserves the role of the airport while meeting FAA design standards to the greatest degree feasible. A phased program to implement the recommended development concept will be presented in Chapter Six - Capital Improvement Program.

The following sections will describe in narrative and graphic form the recommended concept and the rationale behind it.

AIRSIDE CONCEPT

The airside plan generally considers those improvements related to the runway and taxiway system. Runway 9-27 is planned to remain in a one-way in/one-way out operational configuration. The airport reference code is planned to remain ARC A/B-I (small aircraft exclusively). The runway is planned to remain at its current length; however, declared distances are recommended in order to provide for the required runway safety area that extends to the west of the Runway 9 pavement end.

The taxiway system is planned to be improved in order to provide greater efficiency of ground movement and improve safety by increasing pilot situational awareness through design. The planned improvements have the additional benefit of increasing the overall capacity of the airport, which could be important in the future. Taxiway improvements include construction of a partial parallel taxiway that will extend to the Runway 9 threshold, thereby eliminating the need for aircraft to back-taxi to the Runway 9 threshold. The following subsections describe the details of the airside development plan.

OPERATIONAL CONFIGURATION

At Los Alamos Airport, approach operations are restricted to Runway 27 and take-off operations are restricted to Runway 9. In essence, operations to or from the west are not permitted. This operational configuration is planned to remain in place throughout the duration of this airport master plan.

The one-way-in/one-way-out operational configuration has existed since before the airport became open to public use and since before the airport was included in the *National Plan of Integrated Airport Systems* (NPIAS). The purpose of the unique operational configuration is two-fold; first, the rapidly rising terrain to the west severely restricts safe operation to or from that direction, and second, due to the proximity of the Eastern Area residential neighborhood, the one-way-in/one-way-out operational configuration limits environmental impacts (i.e., noise).

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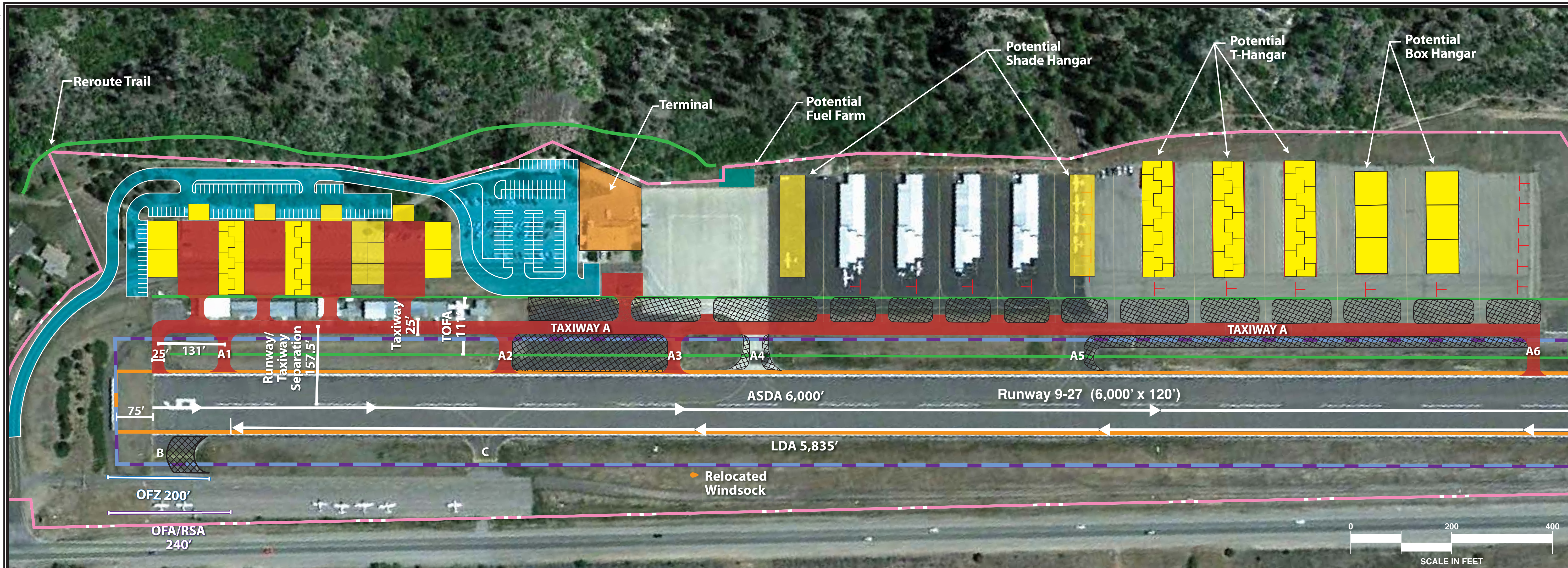

LEGEND

- Property Line
- Runway Safety Area (RSA) - 120' wide
- Runway Object Free Area (OFA) - 250' wide
- Obstacle Free Zone (OFZ) - 250' wide
- Runway Protection Zone (RPZ)
- Taxiway Object Free Area (TOFA)
- Potential Airport Pavement
- Potential Aircraft Hangar
- Potential FBO/Terminal Building
- Potential Road/Automobile Parking
- To Be Removed
- Potential Usable Land

NORTH

Aerial: Google Earth, 5-4-2012

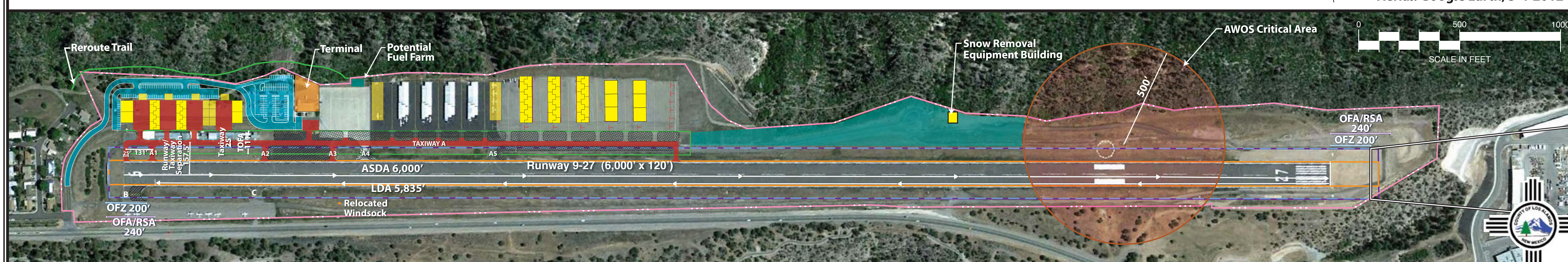

Exhibit 5A
RECOMMENDED CONCEPT

AIRPORT REFERENCE CODE

The design of numerous airfield elements such as runway length, runway safety area, object free area, obstacle free zone, runway protection zones, as well as various setbacks are based on the applicable airport reference code (ARC), which was previously described in Chapter Three – Facility Requirements. The applicable ARC is defined by the category of aircraft that, as a group, represent 500 or more annual operations at the airport. **The current ARC for the airport falls in A/B-I (small aircraft exclusively).** This ARC includes those aircraft weighing less than 12,500 pounds and includes most single and multi-engine piston-powered aircraft and some turboprop aircraft.

The airport does, on occasion, experience activity by larger aircraft, including some of the largest business jets in the national fleet, but the number of operations by these larger aircraft is insufficient to lead to a change in the applicable ARC.

As of this writing (October 2012), the airport has been notified by the U.S. Department of Transportation that their application for a Small Community Air Service Development Program grant (SCASDP) has been accepted. As a result, the airport will have approximately $272,000 available to subsidize and promote commuter air service to and from Albuquerque. The business plan for providing this commuter air service envisions the use of a 9-seat Cessna Caravan (ARC A-II) turboprop aircraft. Several carriers utilize this type of aircraft. The business plan also envisions nine daily departures on weekdays and four daily departures on the weekend days, which would equate to approximately 5,500 annual operations. The Cessna Caravan has a maximum certified takeoff weight of 8,800 pounds and falls in ARC A-II. Therefore, if commuter air service is initiated as envisioned, the applicable ARC would technically transition to ARC A/B-II (small aircraft exclusively).

In Chapter Four – Alternatives, an extensive analysis following FAA guidance of the impacts of a change to ARC A/B-II (small aircraft) was presented. It became clear that designing airfield elements to ARC A/B-II (small aircraft) standards would have a significant negative impact to the community and the users of the airport. The community was not willing to support encroachment into the Eastern Area neighborhood. The FAA desired to preserve the usefulness of the multimillion dollar runway extension recently completed. The airport sponsor desires to maximize aviation uses at the airport and maintain a safe and efficient airport.

Following direct consultation with the FAA and the New Mexico Division of Aviation, it was agreed that Los Alamos Airport has historically been planned and designed as an A/B-I (small aircraft) airport and it should remain an A/B-I (small aircraft) airport. **Therefore, the applicable ARC for the airport in the future is to remain ARC A/B-I (small aircraft exclusively).**

DESIGN STANDARDS

The FAA has established design criteria to define the physical dimensions of runways and taxiways, as well as the imaginary surfaces surrounding them which protect the safe operation of aircraft at the airport. These design standards also define the separation criteria for the placement of landside facilities. The applicable design standards now and in the future at Los Alamos fall in ARC A/B-I (small aircraft).

Table 5A presents the design standards to be applied at Los Alamos Airport. Those elements that do not currently meet design standard are presented in bold in the right side column. Elements that are less than the design standard must be planned to be improved to meet standard. Those elements that exceed design standard must be assessed individually to determine if a re-design that meets standard is necessary to improve safety and efficiency.

TABLE 5A
Design Standards for Los Alamos Airport

	Current and Future Design Standard	Current Condition Compared to Design Standard[1]
Airport Reference Code/ Runway Design Code	A/B-I (small aircraft)	A/B-I (small aircraft)
Representative Aircraft Type	Cessna 210	Cessna 210
Approach Visibility Minimum	1-mile	1-mile
RUNWAY		
Width	60'	**120'**
Shoulder Width	10'	10'
RUNWAY SAFETY AREA		
Width	120'	120'
Length Prior to Threshold	240'	**75' prior Rwy 9**/240' prior Rwy 27
Length Beyond Runway End	240'	**75' behind Rwy 9/**240' behind Rwy 27
RUNWAY OBJECT FREE AREA		
Width	250'	250'
Length Beyond Runway End	240'	**75' behind Rwy 9**/240' behind Rwy 27
RUNWAY OBSTACLE FREE ZONE		
Width	250'	250'
Length Beyond Runway End	200'	**75' behind Rwy 9**/200' behind Rwy 27
SEPARATION STANDARDS		
Runway Centerline To Parallel Taxiway	150'	**100' to Twy C; 145' to Twy F; 190' to Twy G; 125' to Twy H**
Runway Centerline To Taxiway Hold Line	125'	**Twy C, E, F-100';** Twy D-125'; **Twy A&B-150'**
Runway Centerline To Aircraft Parking Area	125'	125'
TAXIWAYS		
Width[2]	25'	**Twy A-40'; Twy B-50'; Twy C-350'; Twy D-35'; Twy E-80'; Twy F-18'; Twy H-35'**
Shoulder Width	10'	10'
Taxiway Safety Area Width	49'	49'
Object Free Area Width	89'	**Twy F OFA penetrates hangars**
RUNWAY PROTECTION ZONES		
Length	1,000'	1,000'
Inner Width	250'	250'
Outer Width	450'	450'

[1]**BOLD** elements are non-standard and may be deficient or exceed design standard.
[2]Taxiways that exceed standard should be planned to be reconfigured to meet standard.
Source: FAA AC 150/5300-13A, Airport Design

As the table shows, there are several elements on the airfield that do not currently meet design standards. These deficiencies are primarily caused by the location of the blast deflection fence, the Taxiway F hangars, the holdline locations, and the runway/taxiway separation distances. It is incumbent upon the airport sponsor to identify these deficiencies and to prepare a plan to remedy the deficiencies. This master plan will serve this purpose in addition to providing the overall long term development plan for the airport.

Chapter Three discussed the requirements for the RSA, OFA, OFZ, and the RPZ. The following sections will discuss the application of these various safety areas for ARC A/B-I (small aircraft) at Los Alamos Airport. **Exhibit 5B** shows detail of the existing design standard deficiencies for ARC A/B-I and the modifications recommended which would bring the runway system up to standard.

Runway Safety Area (RSA)

The RSA for ARC A/B-I (small aircraft) is 120 feet wide as centered on the runway, and it extends 240 feet beyond the runway ends. On the Runway 9 end, the blast deflection fence is 75 feet from the pavement end, placing it within the RSA. Also within the RSA are numerous shrubs and the perimeter fence. On the Runway 27 end, the RSA meets design standard; however, the southeast corner of the RSA extends over the cinder service road. Since the service road meets RSA grading standards and is only accessible by authorized airport personnel, the RSA is considered to meet the design standard. This design was also approved by the FAA for the recently completed runway extension project.

The FAA will not grant a modification to standards for the RSA. The airport must plan to meet RSA standards to the greatest extent possible. Following FAA guidance, several methods for providing the required RSA were previously presented in Chapter Four - Alternatives. After consultation with the PAC and a public information workshop, the preferred mitigation method is to implement declared distances, the impact of which will be discussed at greater length later in this chapter.

Utilization of declared distances reduces the published runway lengths available for both landing and takeoff, which pilots refer to when operating into and out of an airport. In effect, the operational length available to pilots is reduced in order to provide adequate RSA.

Several other options for providing adequate RSA were presented but were not carried over into the recommended concept. The RSA mitigation options were previously presented on Exhibit 4B.

Option 1A considered relocating the blast deflection fence to a distance of 240 feet from the end of Runway 9. The shrubs would have to be removed and the perimeter fence would have to be relocated. Due to space constraints, the airport entrance would have to be shifted slightly to provide a completely clear RSA.

Option 1A was not carried through to the recommended concept because the usefulness of the blast deflection fence would be significantly diminished by placing it further from the runway end. The removal of the shrubs would also remove a natural noise buffering barrier which may expose Eastern Area residents to greater aircraft noise.

Option 1B is a variation on Option 1A that shifted the airport entrance road in order to provide for a clear OFA in addition to a clear RSA. This option would have required the acquisition of four Eastern Area homes.

As discussed previously, there is not local support for encroaching upon this neighborhood; therefore, this option was not carried through.

Option 1C is similar to Option 1B in that it aims to meet both RSA and OFA standards but rather than acquiring homes to allow for a shift in the airport entrance road, the entrance road is closed and Nambe Loop Road, which is a residential street in the Eastern Area neighborhood, is utilized as the new airport entrance road. Option 1C was also considered too intrusive on the Eastern Area neighborhood. As a result, this concept was not carried forward to the recommended concept.

Option 1D considered reducing the runway length by 165 feet on the Runway 9 end in order to make the full 240-foot RSA available. This option would permit the blast fence, shrubs, and perimeter fence to remain in place. The operational length of the runway would be limited to 5,835 feet in both directions. This option was not considered further because the implementation of declared distances (Option E) provides additional takeoff length.

Option E considers the implementation of declared distances. This is the recommended airside concept included in this master plan. Implementation of declared distances would provide notification to pilots, through publication in the Airport Facility Directory, of the available runway length for calculation of takeoff and landing operations. For landing on Runway 27, there would be 5,835 feet available. For takeoff from Runway 9, the full 6,000 feet would be available.

The last option was the potential for constructing an aircraft arresting system behind the Runway 9 end. This system, called Engineered Material Arresting System (EMAS), is made of porous concrete blocks that have the capability of stopping certain aircraft, with minimal damage. Installation of EMAS is an acceptable substitute to providing full RSA in certain circumstances. EMAS is rigid and capable of supporting some heavy objects including firefighting trucks. It is not capable of absorbing light aircraft. The smallest aircraft that would benefit from EMAS is medium-sized business jets.

Some members of the community, especially residents of the Eastern Area, indicated a desire to provide a greater level of protection from a potential overrun by business jets, which operate at the airport on occasion. Since business jets operate infrequently and are not forecast to represent the critical aircraft at the airport, the FAA would not financially support an EMAS installation. As a result, the estimated cost of $3-$4 million to install EMAS would fall entirely on the airport sponsor. In addition, an EMAS would not improve the RSA as a standard EMAS installation requires at least 600 feet of area prior to the runway end. EMAS installations are more appropriate at airports where the critical aircraft dictates an RSA that extends 1,000 feet beyond the runway ends. At these airports, an EMAS that is located within 600 feet of the runway end can provide an RSA equivalence of 1,000 feet. In addition, an EMAS installation would require the removal/relocation of the blast deflection fence, thereby reducing its effectiveness. Therefore, EMAS is not considered an effective substitute to meeting RSA standards at Los Alamos Airport.

Object Free Area (OFA)

The OFA for ARC A/B-I (small aircraft) is 250 feet wide and extends 240 feet beyond the runway ends. The OFA meets design standards except where it is penetrated by the blast deflection fence, shrubs, perime-

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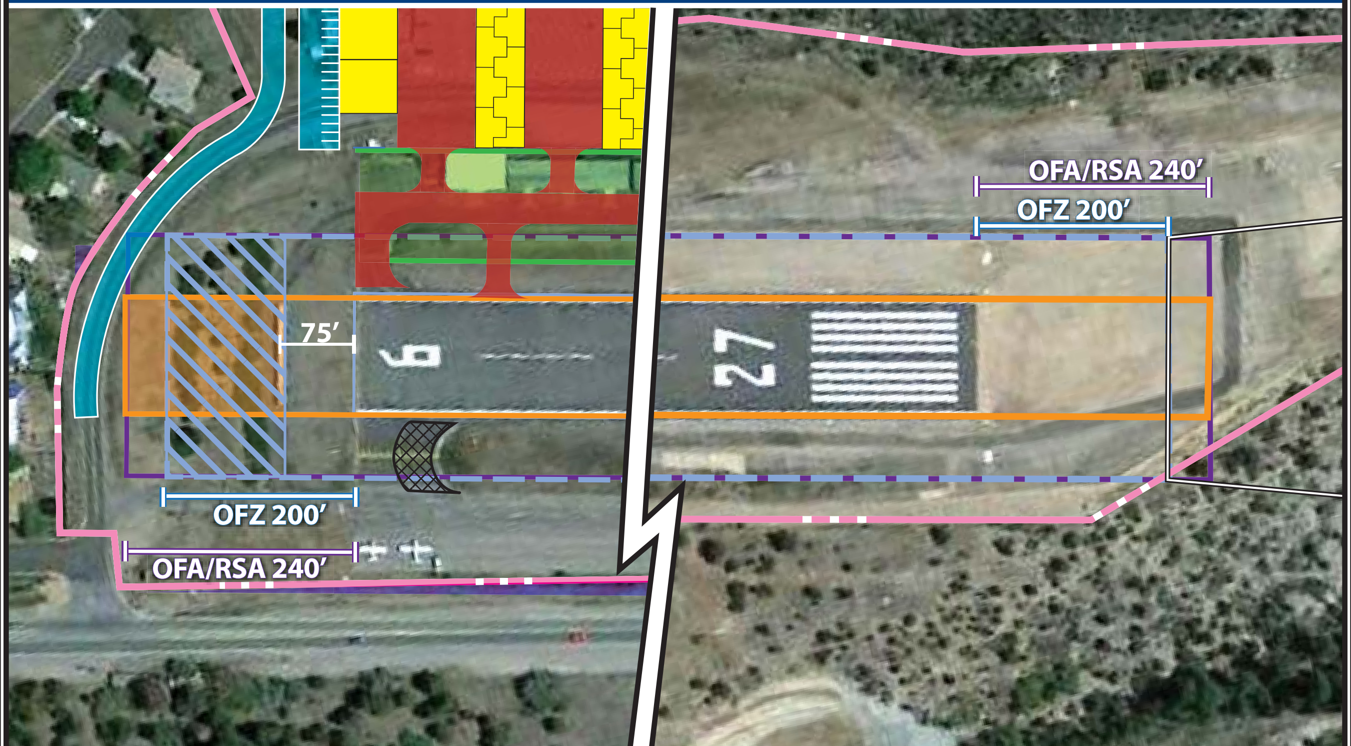
ARC A/B-I (small aircraft) Design Standard Deficiencies



LEGEND

- Runway Safety Area (RSA) - 120' wide
- Object Free Area (OFA) - 250' wide
- Obstacle Free Zone (OFZ) - 250' wide
- Non-Standard RSA
- Non-Standard OFZ
- Non-Standard OFA

ARC A/B-I (small aircraft) Declared Distances Solution

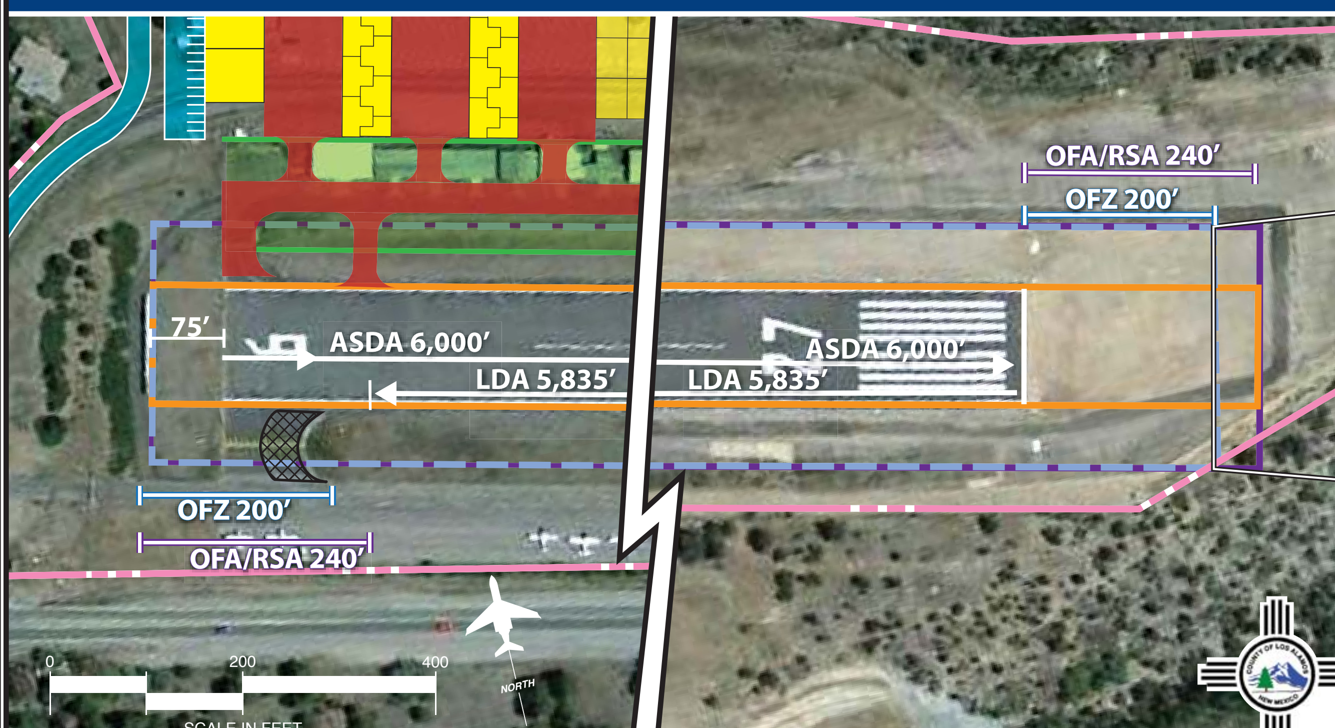


Photo Date: 5-4-2012; Google Earth

Exhibit 5B
RUNWAY END DETAIL

ter fence, and the airport entrance road on the Runway 9 end.

When implementing declared distances, the length of the OFA is adjusted in the same manner as the RSA. Therefore, the length of the OFA beyond the declared end of the runway will be the same as the RSA. A small portion of the southeast corner of the OFA will extend beyond airport property. This area is below the lateral elevation of the runway, thus meeting standard. This area is also county-owned land, thus providing additional safeguards against incompatible objects.

Obstacle Free Zone (OFZ)

The OFZ extends 200 feet beyond the runway ends and varies in width based on the type of aircraft utilizing the airport. For airports designed for small aircraft exclusively, such as Los Alamos Airport, the OFZ width is either 120 feet or 250 feet depending on the approach speed of the landing aircraft. The critical aircraft for Los Alamos Airport dictates that the OFZ width is 250 feet currently and in the future.

The current OFZ meets design standards except for the penetration by the blast deflection fence, shrubs, and perimeter fence behind the Runway 9 end. Implementation of declared distances will also have the effect of meeting the OFZ design standards. The OFZ also extends beyond airport property in the same location as the OFA. Like the OFA, this area is owned by the county which ensures compatible land uses. It should be noted that this small corner of the OFZ is located over a very steep slope where incompatibilities are highly unlikely.

Runway Protection Zone (RPZ)

The RPZ is a trapezoidal shaped area beginning 200 feet beyond the runway end. The inner width is 250 feet, the outer width is 450 feet, and it is 1,000 feet long. The function of the RPZ is to protect people and property on the ground. Typically, this is achieved through airport ownership of the RPZs, although proper land use control measures, such as easements, are acceptable. The RPZs should be cleared of any incompatible objects or activities. Prohibited land uses include residences and places of public assembly, such as churches, schools, hospitals, office buildings, and shopping centers.

RPZs are applicable for approach and departure ends of runways. Since Runway 9 is not available for approaches and Runway 27 is not available for departures, there is no RPZ extending to the west of Runway 9.

The Runway 27 RPZ extends over county-owned land and facilities. As such, the county, which also owns the airport, has positive control over the RPZ. Nonetheless, it is recommended that the county establish, at a minimum, an avigation easement that encompasses the entire RPZ. The easement should provide airport management with the ability to prevent incompatible land uses and to limit the height of structures within the RPZ.

Runway/Taxiway Separation

The separation standard for runways and taxiways is based primarily on the wingspan of the critical design aircraft. With a critical design aircraft in ARC A/B-I, the runway/taxiway separation standard is 150 feet from centerline to centerline. Taxiway F is currently 145 feet from the runway centerline. Taxiway C is 100 feet from the runway and Taxiway H is 125 feet from the runway.

The recommended master plan concept includes a slightly wider runway/taxiway separation, designed to provide additional wingtip clearance for a portion of the aircraft within airplane design group (ADG) II. The partial parallel taxiway is planned at a separation distance of 157.5 feet from the runway centerline. This distance allows aircraft with a wingspan of up to 65 feet to operate safely on the taxiway without the wing penetrating the runway OFZ. This design acknowledges that in the future (perhaps very near future) an ADG II commuter air service aircraft may begin regular passenger service. By locating the parallel taxiway at a separation distance of 157.5 feet, airport management preserves its ability to accommodate commuter aircraft now and into the future. This design was described in detail on Exhibit 4G.

The separation distance is calculated based on a specific wingspan. In this case, the widest wingspan of a potential commuter aircraft weighing less than 12,500 pounds was utilized. The example aircraft is the Dash 6 Twin Otter, Series 400 with a wingspan of 65 feet. As a point of comparison, the Cessna Caravan 208A has a wingspan of 52 feet. If an aircraft with a 65-foot wingspan is travelling on the parallel taxiway, the wing must remain clear of the runway RSA or OFZ, whichever is closer. At Los Alamos, the OFZ is 125 feet from the runway centerline (the RSA is 60 feet). Add to this half the aircraft wingspan (32.5 feet), and the result is the planned 157.5-foot runway/taxiway separation.

Runway/Aircraft Parking Separation

The distance from the runway centerline to permissible aircraft parking areas is 125 feet for the small aircraft design category. This distance is equal to half the width of the OFZ. If the critical aircraft were to transition to one weighing more than 12,500 pounds, then the separation distance increases to 200 feet (as does the OFZ). A separation distance of 200 feet would require closure of the south aircraft tie-down apron and relocation of State Route 502. Therefore, there are distinct advantages to maintaining a critical aircraft that weighs less than 12,500 pounds.

Taxiway Object Free Area (TOFA)

For a designated taxiway, an area that is 89 feet wide, as centered on the taxiway, must be clear of penetrating objects. Only those objects necessary for aircraft navigation, such as edge lighting, is permissible.

Since the parallel taxiway planned for Los Alamos Airport is positioned to accommodate an aircraft with up to a 65-foot wingspan, the designated TOFA must be adjusted as well. Following FAA guidance, the TOFA is calculated at a width of 111 feet, as centered on the taxiway (65 feet times 0.7 plus 10 feet = 55.5 feet from centerline). Therefore, the object clearing area surrounding the planned parallel taxiway must be 111 feet wide.

RUNWAY LENGTH AND WIDTH

In 2011, the runway at Los Alamos Airport was extended by 450 feet bringing its total length to 6,000 feet. This project was facilitated by a $4.5million grant from the FAA and significant matching funds from the airport sponsor and the New Mexico Department of Transportation - Aviation Division. The recommended runway length for the airport is 8,500 feet. This length is much longer than typical for an airport designed around an ARC A/B-I (small aircraft) design aircraft. This is primarily due to the airport elevation, summertime mean maximum temperature, and runway gradient. The physical constraints at the airport prevent any further extension of the runway; therefore, all efforts have been made to preserve the maximum available runway length at Los Alamos Airport. The recommended concept maintains the 6,000-foot runway platform; however, declared distances are recommended in order to provide adequate safety area beyond the runway ends.

The runway is currently 120 feet wide. The design standard for ARC A/B-I (small aircraft) is 60 feet wide. It is recommended that the current runway width be maintained in order to provide an additional margin of safety at the airport. There are several factors that justify maintaining the 120-foot wide runway including the physical location of the airport atop a narrow promontory. This location generates unpredictable wind gusts that can be very different at various positions along the runway. For example, it is common to have wind gusts rush up the canyon walls and cross the center portion of the runway, while winds at the approach end of the runway are in a different direction.

In addition, the one-way-in/one-way-out operating nature of the runway requires pilots to takeoff or land when wind directions may not be optimal. For example, pilots may operate with significant crosswinds, so the additional runway width provides a needed safety margin.

Declared Distances

The recommended master plan concept includes implementation of declared distances in order to provide for the required RSA beyond the Runway 9 end. In Chapter Four – Alternatives, following FAA guidance, six options for providing adequate RSA were examined. The preferred alternative is to implement declared distances at the airport so that pilots will know that under certain operating conditions, the usable runway length may not be equal to the pavement length of 6,000 feet.

To recap, declared distances are the effective runway distances that the airport operator declares available for takeoff run, takeoff distance, accelerate stop distance, and landing distance requirements. These are defined by the FAA as:

Takeoff run available (TORA) - The length of the runway declared available and suitable to accelerate from brake release to lift-off, plus safety factors.

Takeoff distance available (TODA) - The TORA plus the length of any remaining runway or clearway beyond the far end of the TORA available to accelerate from brake release past lift-off, to start of takeoff climb, plus safety factors.

Accelerate-stop distance available (ASDA) - The length of the runway plus stopway declared available and suitable to accelerate from brake release to takeoff decision speed, and then decelerate to a stop, plus safety factors.

Landing distance available (LDA) - The distance from the threshold to complete the approach, touchdown, and decelerate to a stop, plus safety factors.

TORA and TODA are applicable to takeoff; ASDA to rejected takeoff; and LDA to landing calculations. In application at Los Alamos Airport, the TORA and TODA in both directions is equal to the 6,000-foot pavement length. Note: Since takeoffs are not permitted to the west from Runway 27, the TORA and TODA calculation will have no impact on pilot operations.

The ASDA and the LDA are the primary considerations in determining the runway length declared available for use by aircraft, as these calculations must consider providing the RSA to standard in operational calculations. The ASDA and LDA can be figured as the usable portions of the runway length less the distance required to maintain adequate RSA beyond the ends of the runway or prior to the landing threshold. By regulation, the full RSA must be available at the far end of a departure operation in the ASDA calculation and prior to the landing threshold and beyond the runway end in LDA calculations. For ARC A/B-I, the RSA extends 240 feet beyond the declared end of the runway and 240 feet prior to the landing threshold.

The ASDA for Runway 9 will be 6,000 feet. The ASDA will start at the Runway 9 threshold and extend to the end of the pavement. The ASDA for Runway 27 is calculated beginning at the pavement end and ending 165 feet short of the Runway 9 pavement end in order to provide the full 240-foot RSA before the blast deflection fence. Therefore, the ASDA for Runway 27 is 5,835 feet. Note: takeoffs are not permitted from Runway 27 to the west.

The LDA for Runway 9 is calculated beginning 165 feet from the Runway 9 pavement end, thus providing the full 240 feet of RSA necessary prior to landing. Since landing operations are not permitted to Runway 9, it may not be necessary to mark a displaced landing threshold. The LDA for Runway 27 would begin at the pavement end and end 165 feet short of the Runway 9 pavement end in order to provide the full 240 feet of RSA prior to the blast deflection fence. Therefore, the LDA for Runway 27 is 5,835 feet long. **Table 5B** presents the declared distances to be applied at Los Alamos Airport.

TABLE 5B
Declared Distances
Los Alamos Airport

	Runway 9	**Runway 27**
ARC	**A/B-I (small Aircraft)**	
Takeoff Runway Available (TORA)	6,000	6,000*
Takeoff Distance Available (TODA)	6,000	6,000*
Accelerate Stop Distance Available (ASDA)	6,000	5,835*
Landing distance Available (LDA)	NA	5,835

*Operations in these directions are not permitted at Los Alamos Airport
Note: All measurements are in feet.

There are advantages and disadvantages to implementing declared distances at Los Alamos Airport. The most significant advantage is that no homes will be impacted in the Eastern Area neighborhood. The airport entrance road would remain in its current location. The airport property boundary would remain as it is currently. The cost to implement declared distances would be minimal compared to options that require property acquisition or physical runway length reduction. A significant advantage of implementing declared distances is that the entire 6,000-foot runway length will be available for takeoff operations, which is when pilots typically need more runway length.

The primary disadvantage to implementing declared distances is that the landing length will be slightly shorter than the available pavement length. Since landing operations typically require less runway length, the operational impact is considered minimal.

As noted, at 6,000 feet in length, the existing runway is less than the FAA recommended runway length of 8,500 feet. By declaring the runway to be shorter, there may be some negative operational impact. Quantifying the negative operational impact is nearly impossible, but there may be some since we know that the airport experiences activity by aircraft that typically need more runway length. The loss of 165 feet of calculated landing length is not considered significant and it is likely that all aircraft that currently operate at the airport will be able to continue to do so.

RUNWAY STRENGTH

Runway 9-27 is strength-rated at 43,000 pounds for single wheel loads (SWL). This strength rating exceeds the minimum requirement of 12,500 pounds SWL typically maintained for airports designed for small aircraft only. On occasion, Los Alamos Airport will experience activity by heavier general aviation aircraft such as the Gulfstream V, which can weigh up to 96,000 pounds, if fully loaded. In addition, the airport serves a direct national defense function due to the location of Los Alamos National Labs (LANL). The airport also serves as a base for forest firefighting activities that often requires use of heavier aircraft. The current strength rating for the runway should be maintained into the future.

RUNWAY MARKINGS

Runway 27 has markings associated with the non-precision instrument approaches. Runway 9 has visual markings. The implementation of declared distances, based on a critical design aircraft in ARC A/B-I (small aircraft exclusively), would normally lead to a recommendation to mark the Runway 9 threshold as displaced by 165 feet. However, it is recommended to maintain the current Runway 9 threshold markings since landings are not permitted to Runway 9. Marking a displaced landing threshold could lead to pilots inadvertently believing that landings are permitted. Therefore, no change to the runway markings is needed to implement declared distances.

INSTRUMENT APPROACHES

Instrument approaches are critically important to extending the availability of the airport in periods of poor weather. Through a series of predefined maneuvers, pilots can operate into an airport safely. The existing instrument approaches allow for visibility minimums as low as one mile and cloud ceilings as low as 500 feet. The plan considers maintaining these approaches. Lower minimums are not considered necessary and may not be feasible due to the complexity of the terrain and the various penetrations of the airport imaginary surfaces (e.g., primary surface, transitional surface).

TAXIWAYS AND TAXILANES

Taxiway and taxilane design standards are a function of the airplane design group (ADG) for the airport. The ADG for Los Alamos Airport is Group I, which dictates a taxiway width of 25 feet. Planning for future taxiways include redesigning all taxiways to meet the 25-foot width standard.

Taxiways and taxilanes provide for the efficient movement of aircraft on the ground at the airport. A standard airport taxiway system typically provides a full length parallel taxiway. At Los Alamos Airport, with its unique one-way-in/one-way-out procedure, there is not a need for direct taxiway access to the Runway 27 threshold since takeoffs are not allowed to the west. All takeoffs are from Runway 9 to the east. Therefore, there is only a need for taxiway access to the Runway 9 threshold extending to the terminal and hangar areas.

Currently, taxiway access to the Runway 9 threshold is not available. All pilots are instructed to back-taxi on the runway a distance of approximately 700 feet, turn around, and then begin their takeoff run. In addition, any aircraft that needs more landing length beyond the turn-off at Taxiway C will also have to turn around on the runway and taxi back to the terminal area.

Where possible, taxiways should be designed in such a manner that they are familiar to pilots in order to prevent, through design, pilot errors. Accessing a runway from a threshold taxiway is normal; back-taxiing on the runway is not and should be avoided if possible. While local pilots certainly understand the back-taxiing maneuver, visiting pilots may not. Thus, through taxiway layout design, potential pilot errors can be prevented.

For the recommended master plan concept, a partial parallel taxiway extending from the Runway 9 threshold to the intersection with Taxiway H is planned. This taxiway would be separated from the runway by a distance of 157.5 feet, which exceeds the ADG design standard of 150 feet. The additional separation distance is recommended in order to provide an additional wingtip safety margin for a portion of ADG II aircraft. This includes the planned commuter aircraft, which falls in ADG II.

The runway/taxiway separation of 157.5 feet is based on the largest wingspan of a potential commuter aircraft at the airport. In this case, the 65-foot wingspan of the Dash 6, Twin Otter, 400 series, was utilized. Other potential commuter aircraft such as the Cessna Caravan 208A (52-foot wingspan), Pilatus PC-12 (53-foot wingspan), and Cessna 402/414 (44-foot wingspan), all have shorter total wingspans. The Dash 6 has a wingspan that exceeds some larger commuter aircraft including the 19-seat Beech 1900 (58-foot wingspan) and the 30-seat Embraer 120 (65-foot wingspan).

The replacement for Taxiway F would extend from the Runway 9 threshold to the end of the landfill cap. This taxiway would replace the existing Taxiways F, C, G, and H. The entire taxiway system should be redesignated. The new partial parallel taxiway should be Taxiway A which would include the Runway 9 threshold taxiway. The north side exit taxiways should be designated A1 through A6 as one moves from west to east. The south side taxiways leading to the tie-down ramp should be designated B and C.

While a do-nothing alternative was considered for Taxiway F, the primary reason it is not carried forward to the recommended master plan concept is that the hangars currently penetrate the taxiway object free area. Because of this, pilots are instructed to back-taxi on the runway, rather than use Taxiway F, to access the takeoff threshold. As mentioned before, back-taxiing on the runway is non-standard and increases the possibility of pilot errors. This is a safety concern that is a high priority for the FAA and the taxiway should be brought up to modern airport design standards.

The do-nothing alternative also has the effect of limiting economic growth for the airport derived from general aviation activity. The opportunity for the airport to market property for personal aviation use or for the establishment of an aviation-related business is extremely limited. Planning for the partial parallel taxiway will lead to the redevelopment and expansion of the existing Taxiway F hangar area, since they would have to be removed or relocated in order to provide adequate taxiway object free area (TOFA). Construction of a partial parallel taxiway is the start of the process to grow the airport economically. The ability for the county to maximize developable space is dependent on removing/relocating the existing Taxiway F hangars to make room for more hangars and improved facilities.

In addition, the county should be cognizant of the aesthetic appearance of the airport. The airport is one of the entrances to Los Alamos. A positive first impression should be a goal for community leaders. Some of the hangars adjacent to Taxiway F are in poor condition and do not represent the nature of the community. An opportunity exists to greatly improve both the operation of the airport and the appearance of the airport by planning for a new partial parallel taxiway that leads to the Runway 9 threshold.

VISUAL NAVIGATION AIDS

The airport beacon is currently located on a tower immediately adjacent the terminal building. When a new terminal building is constructed, a beacon should be included.

The runway has recently been outfitted with a two-light precision approach path indicator light system (PAPI). PAPIs provide pilots with visual confirmation of the appropriate glide path to the runway. The implementation of declared distances will not impact the location or calibration of the PAPIs.

Runway end identification lights (REILs) are strobe lights set to the side of the runway which provide rapid identification of the landing threshold. REILs are normally provided for instrument capable runways when an approach lighting system is not available. The REILs adjacent to the Runway 27 landing threshold will be maintained in their current location.

Business jet capable runways should provide distance-to-go markers. These lighted signs are set to the side of the runway every 1,000 feet. Each box shows a single number representing how many thousand feet of runway length remain until the end of the runway. Distance-to-go markers are currently installed at the airport. The implementation of declared distances should not impact the current location of the distance-to-go markers.

WEATHER AND COMMUNICATION AIDS

The airport has two lighted windsocks: one near the terminal building and one near the Runway 27 end. The windsock nearest the terminal building is recommended to be relocated to the south side of the runway in order to allow for a future aircraft run up area.

The windsock nearest the Runway 27 end is 120 feet from the runway centerline. This places it within the OFA by five feet. A modification to standard would be necessary to maintain the windsock in the current location; otherwise, the windsock would need to be shifted to the north by at least five feet.

A segmented circle provides pilots with a distinct visual indicator of the location of various airport navigational aids including the windsock. The segmented circle at Los Alamos Airport should be moved in conjunction with the relocation of the Runway 27 windsock, if that is necessary.

The AWOS-3 is situated 150 feet from the runway centerline. The AWOS-3 provides critical real-time weather conditions at the airfield. The AWOS can be maintained at its current location.

AIRSIDE CONCLUSION

Los Alamos Airport is unique in many ways, especially the one-way-in/one-way-out operating nature of the runway. This operating condition is planned to remain in place at the airport. Therefore, landings are only permitted to Runway 27 and departures are only permitted from Runway 9. All operations will continue to be to or from the east.

The critical design aircraft falls in ARC A/B-I (small aircraft exclusively). This design category includes small single and some multi-engine piston-powered aircraft. This design category is planned to remain the planning standard for the airport. However, the airport does receive activity by aircraft with slightly wider wingspans at times. Therefore, portions of the airside, particularly the taxiway system, have been planned to accommodate a wider wingspan.

Taxiway F is situated 145 feet from the runway centerline, which does not meet the minimum design standard of 150 feet. The hangars adjacent to Taxiway F are located approximately 30 feet from the taxiway centerline, making all of them a penetration to the taxiway object free area. As a result, pilots are instructed to back-taxi on the runway in order to depart on Runway 9.

Taxiway F is planned to be improved to allow direct access to the Runway 9 threshold. The taxiway is planned at a separation distance of 157.5 feet from the runway centerline. This separation distance provides an additional safety margin to better accommodate aircraft with larger wingspans, including potential commuter aircraft. The hangars adjacent Taxiway F are planned to be removed/relocated outside of the taxiway object free area.

The planned redesign of Taxiway F will bring the taxiway system up to modern design standards and allow direct access to the Runway 9 threshold. Pilots will no longer have to back-taxi on the runway, which has the added benefit of improving airfield capacity.

LANDSIDE CONCEPT

The primary goal of landside facility planning is to provide adequate aircraft storage space to meet forecast needs, while also maximizing operational efficiencies and land uses. Achieving this goal yields a development scheme which segregates aircraft activity levels while maximizing the airport's revenue potential.

At Los Alamos Airport, the area available for development is extremely limited. The primary limiting factor is the natural terrain surrounding the airport, as it is located on a narrow promontory with rapidly rising terrain to the immediate west, and canyons to the north and south. To the east is a steep drop in terrain at the end of the runway safety area. The airport is also constrained on the south by State Route 502. On the north side, the Taxiway F hangars, airport entrance road, and large vehicle parking lots, prevent further aviation development.

The primary objective of the landside development concept is to increase operational safety and to maximize the developable space at the airport for the economic benefit of the community. This is accomplished primarily through the redevelopment of the underutilized vehicle parking lot west of the terminal building. The redevelopment of this area provides two primary benefits:

- Taxiway F can be reconstructed to provide direct access to the Runway 9 threshold; and,
- Portions of the vehicle parking lot can be redeveloped to provide more hangar development area.

LANDSIDE ALTERNATIVES REVIEW

In Chapter Four – Alternatives, three specific development alternatives were presented on Exhibits 4J, 4K, and 4L. The primary difference between the three landside alternatives was the location of the airport terminal building. The location of the terminal building would dictate the hangar development possibilities.

Landside Alternative A (Exhibit 4J) positioned a new terminal building farther west than the existing building and north, overlooking the canyon. This location would require the construction of a new transient/commercial apron to be adjacent to the terminal building. It would also necessitate acquiring several homes to accommodate a new vehicle parking lot. Airport Road was shortened, making only two hangars available for public access. All other hangars would require vehicles to cross active airport pavements.

Landside Alternative A was not carried forward into the master plan concept for several reasons. First, the airport and the community all wish to find solutions that limit the impact to the Eastern Area neighborhood. Second, only two hangars are planned to have public access which does not promote economic growth at the airport as much as the other options. Third, construction of a new terminal building and transient/commercial apron would be very costly and does not adequately take advantage of the existing facilities. Finally, nearly all of the hangars planned would require vehicles to cross active airport pavements. This should be limited, where possible, in order to enhance the safety of ground movements for vehicles and aircraft at the airport.

Landside Alternative B (Exhibit 4K) maintained the concept of a new terminal building and new transient/commercial apron located west of the current terminal area. This alternative shifted the location of the new terminal building closer to the runway system in order to allow the public road to extend farther to the east. By extending the road east, more hangars would be accessible by the public, thereby increasing the potential economic impact of attracting businesses and users to the airport. This alternative identified four box hangars and two large conventional hangars for this purpose.

Landside Alternative B was not carried through as the recommended concept. The primary reason is that construction of a new terminal area would be costly and it does not take advantage of existing facilities, such as the existing terminal building and transient/commercial apron. This concept also provided the fewest number of vehicle parking places, which could be a concern as commuter service is initiated at the airport.

Landside Alternative C (Exhibit 4L) most closely reflects the recommended master plan concept. The existing transient/commercial apron is maintained, thus lowering development costs. The existing terminal building is maintained initially. Ultimately, as the commuter service presumably grows, a replacement terminal building may be needed. Most of the planned new hangars would have public vehicle access which would increase economic development opportunities at the airport. This concept works within the existing airport boundary, thus limiting and, in many respects, reducing the impact to the Eastern Area neighborhood.

The following sections will describe the recommended master plan concept in further detail.

HANGARS

The master plan concept shows two primary hangar development areas: west of the existing airport terminal building and the landfill cap area. Both areas have significant obstacles to development. Development of the landfill cap area is dependent upon this area being repaired to a standard that can support hangars. Currently, the landfill cap has settled to such a degree that hangars cannot be constructed. In fact, much of the area is not traversable by aircraft because the pavement settlement has left cracks and pavement drops.

The recommended landside concept shows the location of various hangar types. Every effort has been made to group similar hangar types together in order to minimize the interaction of large and small aircraft. For example, planned T-hangar structures are all grouped together as are box hangars. **Table 5C** presents the total hangar area provided in the master plan concept.

TABLE 5C
Planned Hangar Space
Los Alamos Airport

Facility Type	Existing Hangar Space	Additional Hangar Space Needed	Total Hangar Space Needed	Planned East Side Hangars	Planned West Development Area Hangars	Total Planned Hangars	Total Hangar Space Less Twy F Hangars
T/Shade Hangars	35,000	50,300	85,300	52,600	15,000	67,600	102,600
Box Hangars	17,300	47,700	65,000	25,200	26,400	51,600	51,600
Maintenance/Office	1,800	8,000	9,800	3,500	4,500	8,000	9,800
Total Hangar Space	**54,100**	**106,000**	**160,100**	**81,300**	**45,900**	**127,200**	**164,000**

Measurements in square feet.
Source: Coffman Associates analysis

There is approximately 54,100 square feet of existing hangar space at the airport. The forecasts of aviation demand indicated that there may be a need for an additional 106,000 square feet of hangar space. The total hangar space estimate includes hangar area that may be used for activities that are not specifically related to aircraft storage, such as aircraft maintenance or office space. Generally, this space is estimated as 15 percent of box hangar space.

Planning for the landfill cap hangar development includes three T-hangar facilities and two connected box hangar structures. Each T-hangar facility provides for eight individual aircraft storage units and approximately 12,200 square feet of space. The connected box hangar facilities provide for three individual units each (6 total) and encompass approximately 12,600 square feet each (25,200 s.f. total). The existing hangar pads on the landfill were configured to support these hangars.

The timing of the development of the landfill is dependent on repairs of the subsiding pavement. The original landfill cap construction was undertaken by the Department of Energy as a precondition to transferring the operation of the airport to the county.

Currently there are aircraft tie down positions on both ends of the existing east T-hangar complex. A shade structure that can protect eight aircraft from the elements is planned for each of these areas. The shade structures would encompass approximately 8,000 square feet. The eastern most shade structure would require a portion of the landfill cap to be repaired to support aircraft and the structure.

Exhibit 5C presents a large scale view of the planned landside development in the terminal area for the airport. The airport entrance road is planned to be shifted to the north, which will provide access to the existing terminal area and open up more area for hangar development. As shown, the hangar layout is a mix of T-hangars and clear-span box hangars. Ten of the 14 box hangars shown would have public access. Only four would require vehicles to cross airfield pavements. As such, these four units would be recommended for private owners not engaged in a business that needs public access to the hangar.

The layout for the west development area provides for two T-hangar structures, each providing six individual units and 7,500 square feet of space. Ten individual box hangars, each encompassing approximately 1,400 square feet of space each, are planned. Four larger box hangars are also planned, two encompass 3,500 feet each and another two encompass 2,900 square feet each.

This west development area would replace the Taxiway F hangars. The 13 Taxiway F hangars encompass approximately 17,300 square feet of space and 14 individual units. The new west area development plans for a total of 41,400 square feet of hangar space and includes 12 T-hangar units and 14 box hangar units.

Taken together, both development areas provide for 67,600 square feet of space for new T-hangars and a total of 36 new T-hangar units. The new box hangar space is estimated at 51,600 square feet providing 20 hangar units. An additional 8,000 square feet of space is projected for non-aircraft storage purposes, such as aircraft maintenance or office space.

In total, approximately 127,200 square feet of new hangar space is planned. The removal and replacement of the Taxiway F hangars (approximately 17,300 square feet) is included in this total. Therefore, the overall landside plan provides for over 164,000 square feet of hangar space. The plan provides for a total of 104 enclosed hangar units as shown in **Table 5D**. It should be noted that some individual hangars may be capable of housing more than one aircraft, if desired.

TABLE 5D
Planned Individual Hangar Units
Los Alamos Airport

	Existing	Forecast Need	Total Need	Planned East Side Units	Planned West Development Area Units	Total Hangar Units Less Twy F Units
T/Shade Hangars	32	34	66	40	12	84
Box Hangars	14	12	26	6	14	20
Total	46	46	92	46	26	104

Note: For planning purposes, the existing hangars on Twy F are considered box hangars.
Source: Coffman Associates analysis

It should be clear that in the future, it is critical for the landfill cap to be repaired to a level that can support hangar development. While the recommended hangar development plan very nearly meets the long term projected need, if the landfill cap cannot support hangars, then future growth of the airport, in terms of based aircraft, will become limited.

The landside layout plan is a road map to future development at the airport. It should be followed to the greatest extent possible because the plan takes into consideration various FAA separation standards and it provides a strategy that maximizes developable land. Nonetheless, the airport sponsor does have the flexibility to make changes to the landside layout plan if circumstances should change in the future. It is recommended that any adjustments considered maintain the general layout pattern suggested. To approve a hangar project that does not substantially adhere to the recommended plan could severely limit future hangar growth.

TERMINAL BUILDING

The terminal building was constructed in 1970 and encompasses approximately 2,600 square feet. Today, it houses airport administration offices, a rental car counter, an office for the Civil Air Patrol, a small flight planning room, a visitor lobby, and counter space located in the lobby area. For many years, the terminal building supported Ross Aviation's operation of a small commuter airline service. The airport has been without regular commuter service since 1996.

As of this writing (November 2012), the county has been awarded a Small Community Air Service Development Program (SCASDP) grant from the U.S. Department of Transportation (USDOT) in the amount of $272,000. The airport manager submitted the grant application, which outlines the need for nine daily roundtrip flights between Los Alamos and Albuquerque. A nine-seat Cessna Caravan 208A is the planned aircraft to be utilized in this service.

The space requirements by functional area for the terminal building were previously presented on Exhibit 3G. In the short term, a facility of approximately 7,000 square feet may be needed. In the intermediate term, approximately 8,400 square feet may be needed, and by the long term, a 12,000-square-foot facility may be needed. The estimated terminal building size was based on achieving enplanement (passenger boarding) levels of 21,000 in the short term, 24,000 in the intermediate term, and 36,000 in the long term.

While the master plan ultimately recommends a replacement terminal building, the current facility should be able to accommodate initial passenger service as envisioned. To accommodate growth in enplanements, there may be a need to expand the terminal building as an interim step before constructing a larger facility. **Exhibit 5D** presents both the existing terminal building layout and an option for expanding the existing building.

The layout suggested would expand the terminal building to the north. This area would be planned to accommodate an expanded passenger waiting room, a bag claim area, restrooms, and several offices. The current Civil Air Patrol office would be converted to a rental car counter that arriving passengers would pass. The current rental car counter would be converted to the airline ticket counter. This layout provides for a good passenger flow that separates arriving and departing passengers to a large extent.

11MP08-5C-8/18/12

Exhibit 5C
RECOMMENDED
TERMINAL AREA PLAN

Terminal Operational Considerations

How a commuter airline chooses to operate will have an impact on the capability of the existing terminal building to accommodate commuter service. Since the air service plan considers an aircraft no larger than nine passenger seats, the airport is not required to have a CFR Part 139 commercial air service certificate. Thus, many of the requirements of a certificated airport will not apply to Los Alamos. For example, bag screening is not required.

Since the nine-seat Cessna Caravan 208A is the likely commuter aircraft, demand for airline staffing at the airport will be minimal. While some airlines may have one or two employees represent the company at distant airports, others may call on flight crews to function as ticket agents and baggage handlers. The latter is more common when the company uses the Caravan exclusively. In order to avoid the expense of staffing a ticket counter, airline operators will encourage customers to use e-Ticketing via the internet. When presented to the pilot or other crew member, the ticket will be validated by comparison to a manifest prepared by the company. When confirmed, the pilot will (if necessary) load the passenger's bags on the aircraft. For those passengers that "walk-in" at the last minute and do not have a ticket in hand, the airline will have a telephone or some other electronic means available for that passenger to secure a ticket at the airport. Upon arrival, the pilot or crew member will confirm the purchase with the company and the passenger will be allowed to board. As a final option, passengers can purchase a ticket directly from the flight crew. If the contracting commuter airline desires ticket counter space, the ticket counter in the main lobby, which was previously utilized by Ross Aviation, should be adequate for this purpose.

Arriving and departing aircraft are planned to be staged on the existing ramp. They will be parked on the lead-in line located 90 feet from the terminal building door. No sheltered access (jet bridge or passenger walkway) is planned to be provided.

Baggage claim can be handled a number of ways. Often with small commuter airlines, passengers will simply pick up their bag from the side of the aircraft after it has been unloaded by either the pilot or ground support. Another option is for the pilot or ground support personnel to load baggage onto a cart and position the cart near the airside terminal entrance door. **Exhibit 5D** showed a baggage claim area included with the potential expansion of the terminal building. Ground crew could load bags from the outside and passengers could pick them up on the inside.

VEHICULAR ACCESS AND PARKING

A planning consideration for any airport master plan is the segregation of vehicles and aircraft operational areas. This is both a safety and security consideration for the airport. Aircraft safety is reduced and accident potential increased when vehicles and aircraft share the same pavement surfaces. Vehicles contribute to the accumulation of debris on aircraft operational surfaces, which increases the potential for Foreign Object Damage (FOD), especially for turbine-powered aircraft. The potential for runway incursions is also increased, as vehicles may inadvertently access an active runway or taxiway area if they become disoriented once on the aircraft operational area (AOA). Airfield security may be compromised as there is loss of control over the vehicles as they enter the secure AOA. The greatest concern is for public vehicles, such as delivery vehicles and visitors, which may not fully understand the operational characteristics of aircraft and the markings in place to control vehicle access. The best solution is to provide dedicated vehicle access roads to each landside facility that is separated from the aircraft operational areas with security fencing.

The segregation of vehicle and aircraft operational areas is supported by FAA guidance established in June 2002. FAA AC 150/5210-20, *Ground Vehicle Operations on Airports*, states, "The control of vehicular activity on the airside of an airport is of the highest importance." The AC further states, "An airport operator should limit vehicle operations on the movement areas of the airport to only those vehicles necessary to support the operational activity of the airport."

The landside concept for Los Alamos Airport includes efforts to reduce the need for vehicles to cross aprons or taxiways. However, due to the extremely limited development area available at the airport, access to some hangars will still require tenants to traverse aircraft pavements. Dedicated vehicle parking areas, which would be outside the planned airport perimeter fence, are considered for most of the hangars planned west of the terminal building. By necessity, some hangars will not have dedicated vehicle parking, which is not unusual at general aviation airports where private aircraft owners will typically park in their hangar when operating their aircraft.

Short Term Parking Lot Utilization

Once commuter air service begins, the current operating nature of the airport parking lots may change significantly. The short term parking lot provides approximately 68 spaces, 32 of which are leased by the rental car agency. These are prime spaces within a comfortable walking distance to the terminal building. The airport may want to limit the number of rental car spaces close to the terminal building and encourage use of the long term lot for rental vehicles not needed immediately for pickup. Ultimately, the close-in lot is reconfigured to include 136 parking spaces, which can accommodate rental cars and some local general aviation users as well.

Some consideration should be given to the impact that a successful commuter operation may have on the rental car agency. Currently, Hertz processes as many as 100 rentals per week. Many of these are people driving to Albuquerque to pick up a departing flight. If these air passengers fly from Los Alamos, then there is no need to rent a car. At the same time, air service could be expected to increase business and leisure travel to Los Alamos.

ON-AIRPORT LAND USE

Los Alamos Airport currently encompasses approximately 89 acres. As the airport has accepted grants for capital improvements from the FAA, the airport sponsor has agreed to certain grant assurances. Grant assurances related to land use assure that airport property will be reserved for aeronautical purposes. Because of the limited land available at the airport, the entire property should be reserved for aeronautical purposes.

SUPPORTING INFRASTRUCTURE REQUIREMENTS

Several airport elements to be considered fall under the supporting infrastructure category. The following presents details on these elements.

11MP08-11/16/11

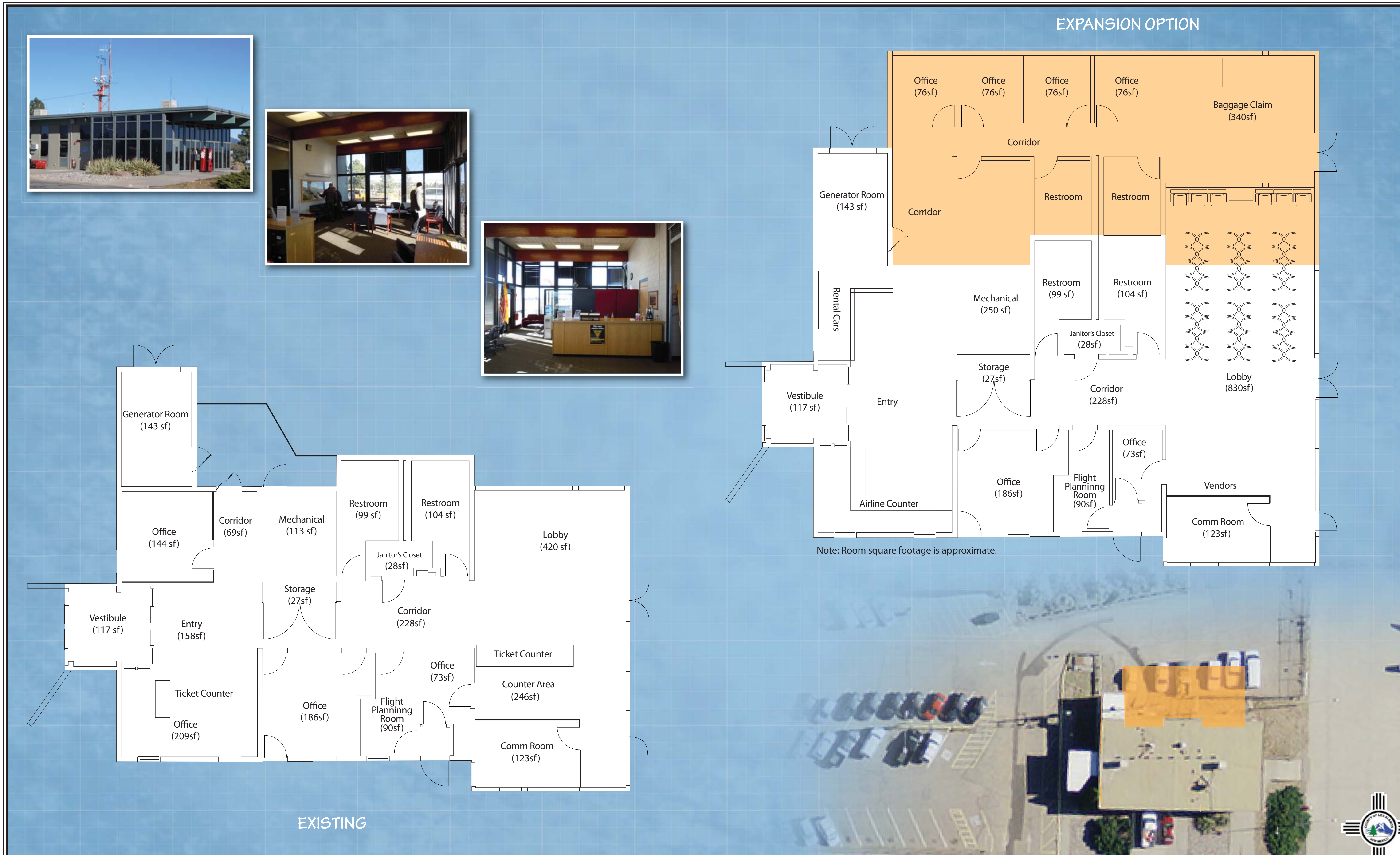


Exhibit 5D
TERMINAL BUILDING EXPANSION OPTION

SNOW REMOVAL EQUIPMENT (SRE) BUILDING

Los Alamos is at an elevation of more than 7,000 feet. The airport averages approximately 59 inches of snowfall annually. Within the next several years the airport is budgeted to acquire a heavy duty snow removal vehicle with a 22-foot rubber blade snow plow attachment. Also budgeted is a snow broom vehicle. In addition, the airport plans to acquire a tractor to pull a larger mower. A proper storage facility is needed for this and other airport maintenance equipment.

A SRE facility is planned to be located at the end of Taxiway H. The footprint of the building is 4,000 square feet in size. This area of the airport has very limited potential uses and is recommended to support airport administrative purposes.

FUEL STORAGE

Currently, Los Alamos Airport offers only 100LL AvGas. This fuel is available adjacent to the hold apron located near the Runway 9 threshold. Pilots must fuel their aircraft through the self-serve feature of the existing pump.

The airport is in need of Jet A fuel, especially now that commuter air service appears to be beginning in the near future. The commuter air service is likely to utilize a Cessna Caravan 208A (or similar aircraft) which is a turboprop that requires Jet A fuel. In addition, the airport does experience activity by privately owned turboprops and jets that could benefit from the convenience of Jet A fuel.

The master plan concept includes the installation of a new fuel farm that could replace the existing underground storage facility. The new fuel farm is planned to be located on the northeast corner of the main transient apron. Two 12,000-gallon storage tanks are planned: one for AvGas and one for Jet A fuel. As planned, fuel delivery will continue to be self-service. In the future, fuel could be delivered via truck if this service is desired.

The airport plans to acquire maintenance equipment, including a snow plow, a snow broom, and a tractor mower. To support this equipment, a 100-gallon fuel storage tank for diesel and/or regular unleaded gasoline is planned. This tank may be co-located with the fuel farm or perhaps adjacent to the planned SRE building.

AIRPORT RESCUE AND FIREFIGHTING (ARFF)

Los Alamos Airport is well-positioned for emergency response as the closest fire station is located ¼-mile to the west on State Route 502. The station houses several apparatuses that can be used when responding to airport emergencies. Several firefighters have been formally trained and are ARFF-certified.

Airports that have commercial service are required to meet various emergency response criteria if the airport is CFR Part 139 certified. Those airports that have commercial service utilizing an aircraft with more than nine passenger seats are required to have a Part 139 certificate and must meet the ARFF requirements.

Commercial service for Los Alamos Airport is planned to utilize a nine-seat aircraft. Thus, the airport does not have to meet the Part 139 ARFF requirements. Nonetheless, the equipment available and the response time from the fire station would meet the minimal requirements for a commercial service airport.

PERIMETER FENCING AND AESTHETICS

The airport has full perimeter fencing currently but those portions on the south and west sides of the airport are in poor condition. In these areas, the perimeter fence is an 8-foot high field fence, but there are numerous areas with large holes that permit wildlife, especially coyotes, onto the runway environment. The field fence should be replaced.

When the airport moves forward with replacing the field fence, consideration should be given to aesthetics. One of the first sights for visitors driving up State Route 502 as they enter Los Alamos is the airport and the fence. Los Alamos may want to consider upgrading the fencing in this area to make the entrance to the town more visually appealing.

In addition to the recommended fencing improvements, the intersection of Airport Road and State Route 502 could be improved. There is a capped waterline that extends to the grassy area near the airport entrance. This line could be utilized to irrigate any landscaping that might be introduced.

Finally, as one enters the airport, one of the first sights is the Taxiway F hangars. Many of these hangars are in various states of disrepair and deterioration. Replacing these hangars, as is planned, would enhance the visual appeal of the airport for visitors.

SECURITY RECOMMENDATIONS

In cooperation with representatives of the general aviation community, the Transportation Security Administration (TSA) published security guidelines for general aviation airports. These guidelines are contained in the publication entitled, *Security Guidelines for General Aviation Airports*, published in May 2004. Within this publication, the TSA recognized that general aviation is not a specific threat to national security. However, the TSA does believe that general aviation may be vulnerable to misuse by terrorists as security is enhanced in the commercial portions of aviation and at other transportation links.

To assist in defining which security methods are most appropriate for a general aviation airport, the TSA defined a series of airport characteristics that potentially affect an airport's security posture. These include:

1. Airport Location – An airport's proximity to areas with over 100,000 residents or sensitive sites that can affect its security posture. Greater security emphasis should be given to airports within 30 miles of mass population centers (areas with over 100,000 residents) or sensitive areas such as military installations, nuclear and chemical plants, centers of government, national monuments, and/or international ports.

2. Based Aircraft – A smaller number of based aircraft increases the likelihood that illegal activities will be identified more quickly. Airports with based aircraft weighing more than 12,500 pounds warrant greater security measures.

3. Runways – Airports with longer paved runways are able to serve larger aircraft. Shorter runways are less attractive as they cannot accommodate the larger aircraft which have more potential for damage.

4. Operations – The number and type of operations should be considered in the security assessment.

Table 5E summarizes the recommended airport characteristics and ranking criterion. The TSA suggests that an airport rank its security posture according to this scale to determine the types of security enhancements that may be appropriate. As shown in the table, Los Alamos Airport's ranking on this scale is 19. Points are assessed for the airport having a certain number of based aircraft, having a paved runway greater than 5,001 feet in length, having 14 CFR Part 135 charter operations, and for having rental aircraft activities at the airport. In addition, the airport's proximity to sensitive areas enhances the need for adequate security.

TABLE 5E
General Aviation Airport Security Measurement Tool
Transportation Security Administration

	Assessment Scale	
Security Characteristic	**Public Use Airport**	**Los Alamos Airport**
Location		
Within 20nm of mass population areas[1]	5	0
Within 30nm of a sensitive site[2]	4	4
Falls within outer perimeter of Class B airspace	3	0
Falls within boundaries of restricted airspace	3	0
Based Aircraft		
Greater than 101 based aircraft	3	0
26-100 based aircraft	2	2
11-25 based aircraft	1	0
10 or fewer based aircraft	0	0
Based aircraft over 12,500 pounds	3	0
Runways		
Runway length greater than 5,001 feet	5	5
Runways less than 5,000 feet and greater than 2,001 feet	4	0
Runway length less than 2,000 feet	2	0
Asphalt or concrete runway	1	1
Operations		
Over 50,000 annual operations	4	0
Part 135 operations (Air taxi and fractionals)	3	3
Part 137 operations (Agricultural aircraft)	3	0
Part 125 operations (20 or more passenger seats)	3	0
Flight training	3	0
Flight training in aircraft over 12,500 pounds	4	0
Rental aircraft	4	4
Maintenance, repair, and overhaul facilities conducting long-term storage of aircraft over 12,500 pounds	4	0
Totals	**64**	**19**

[1] An area with a population over 100,000
[2] Sensitive sites include military installations, nuclear and chemical plants, centers of government, national monuments, and/or international ports

Source: Security Guidelines for General Aviation Airports (TSA 2004)

As shown in **Table 5F**, a rating of 19 points places Los Alamos Airport on the second tier ranking of security measures by the TSA. This rating clearly illustrates the importance of meeting security needs at Los Alamos Airport as activity at the airport grows. The airport is not projected to transition to the third or fourth tier during the planning period. Based upon the results of the security assessment, the TSA recommends nine potential security enhancements for Los Alamos Airport. These enhancements are outlined in **Table 5F** and are discussed in detail.

TABLE 5F
Recommended Security Enhancements
Los Alamos Airport

Security Enhancements	Points Determined Through Airport Security Characteristics Assessment			
	> 45	25-44	15-24	0-14
	Tier 1	Tier 2	Tier 3	Tier 4
Fencing	■			
Hangars	■			
Closed-Circuit Television (CCTV)	■			
Intrusion Detection System	■			
Access Controls	■	■		
Lighting System	■	■		
Personal ID System	■	■		
Challenge Procedures	■	■		
Law Enforcement Support	■	■	■	
Security Committee	■	■	■	
Transient Pilot Sign-in/Sign-Out Procedures	■	■	■	
Signs	■	■	■	
Documented Security Procedures	■	■	■	■
Positive/Passenger/Cargo/Baggage ID	■	■	■	■
Aircraft Security	■	■	■	■
Community Watch Program	■	■	■	■
Contact List	■	■	■	■

Source: Security Guidelines for General Aviation Airports

Fencing: The most common form of securing the airport perimeter. Fencing alone may not discourage a determined intruder; however, it can serve to alert airport management to the presence of unauthorized individuals. Where fencing an entire airport is not economical or necessary, partial fencing of sensitive areas, such as the terminal area or hangar areas, can deter intruders.

Hangars: Where possible, all aircraft should be stored within a secured hangar. The hangars should have locks and the locks should be changed with each new tenant.

Closed-circuit Television (CCTV): CCTV systems make it possible for fewer people to constantly monitor the airport. When employed with a video recording mechanism, possible security breaches that are discovered after the fact may be reviewed.

Intrusion Detection Systems (IDS): Intrusion detection systems consist of video monitoring of airport facilities by an outside contractor. When a security breach is identified or an emergency occurs, the monitoring company can quickly notify emergency responders. Costs vary depending on the type of system, monitoring fees, and equipment. The benefit of such systems is they can replace the need for physical security personnel.

Access Controls: To delineate and adequately protect security areas from unauthorized access, it is important to consider boundary measures, such as fencing, walls, or other physical barriers, electronic boundaries (e.g., sensor lines, alarms), and/or natural barriers. Physical barriers can be used to deter and delay the access of unauthorized persons onto sensitive areas of airports. Such structures are usually permanent and are designed to be a visual and psychological deterrent as well as a physical barrier. The airport provides perimeter fencing with access control gates for both vehicles and pedestrians.

Lighting System: Protective lighting provides a means of continuing a degree of protection from theft, vandalism, or other illegal activity at night. Security lighting systems should be connected to an emergency power source, if available.

Personal ID System: This refers to a method of identifying airport employees or authorized tenants and allowing access to various areas of the airport through badges or biometric controls.

Vehicle ID System: This refers to an identification system which can assist airport personnel and law enforcement in identifying authorized vehicles. Vehicles can be identified through the use of decals, stickers, or hang tags.

Challenge Procedures: This involves an airport watch program which is implemented in cooperation with airport users and tenants to be on guard for unauthorized and potentially illegal activities at the airport.

Law Enforcement Support: This involves establishing and maintaining a liaison with appropriate law enforcement including local, state, and federal agencies. These organizations can better serve the airport when they are familiar with airport operating procedures, facilities, and normal activities. Procedures may be developed to have local law enforcement personnel regularly or randomly patrol ramps and aircraft hangar areas, with increased patrols during periods of heightened security.

Security Committee: This committee should be composed of airport tenants and users drawn from all segments of the airport community. The main goal of this group is to involve airport stakeholders in developing effective and reasonable security measures and disseminating timely security information.

Transient Pilot Sign-in/Sign-Out Procedures: This involves establishing procedures to identify non-based pilots and aircraft using their facilities, and implementing sign-in/sign-out procedures for all transient operators and associating them with their parked aircraft. Having assigned spots for transient parking areas can help to easily identify transient aircraft on an apron.

Signs: The use of signs provides a deterrent by warning of facility boundaries as well as notification of the consequences for violation.

Documented Security Procedures: This refers to having a written security plan. This plan would include documenting the security initiatives already in place at Los Alamos Airport, as well as any new enhancements. This document should consist of airport and local law enforcement contact information, and include utilization of a program to increase airport user awareness of security precautions such as an airport watch program.

Positive/Passenger/Cargo/Baggage ID: A key point to remember regarding general aviation passengers is that the persons boarding these flights are generally better known to airport personnel and aircraft operators than the typical passenger on a commercial airliner. Recreational general aviation passengers are typically friends, family, or acquaintances of the pilot in command. Charter/sightseeing passengers typically will meet with the pilot or other flight department personnel well in advance of any flights. Suspicious activities such as use of cash for flights or probing or inappropriate questions are more likely to be quickly noted and authorities could be alerted. For corporate operations, typically all parties onboard the aircraft are known to the pilots. Airport operators should develop methods by which individuals visiting the airport can be escorted into and out of aircraft movement and parking areas.

Aircraft Security: The main goal of this security enhancement is to prevent the intentional misuse of general aviation aircraft for criminal purposes. Proper securing of aircraft is the most basic method of enhancing general aviation airport security. Pilots should employ multiple methods of securing their aircraft to make it as difficult as possible for an unauthorized person to gain access to it. Some basic methods of securing a general aviation aircraft include: ensuring that door locks are consistently used to prevent unauthorized access or tampering with the aircraft; using keyed ignitions where appropriate; storing the aircraft in a hangar, if available, and locking hangar doors, using an auxiliary lock to further protect aircraft from unauthorized use (i.e., propeller, throttle, and/or tie-down locks); and ensuring that aircraft ignition keys are not stored inside the aircraft.

Community Watch Program: The vigilance of airport users is one of the most prevalent methods of enhancing security at general aviation airports. Typically, the user population is familiar with those individuals who have a valid purpose for being on airport property. Consequently, new faces are quickly noticed. A watch program should include elements similar to those listed below. These recommendations are not all-inclusive. Additional measures that are specific to each airport should be added as appropriate, including:

- Coordinate the program with all appropriate stakeholders, including airport officials, pilots, businesses and/or other airport users.
- Hold periodic meetings with the airport community.
- Develop and circulate reporting procedures to all who have a regular presence on the airport.
- Encourage proactive participation in aircraft and facility security and heightened awareness measures. This should include encouraging airport and line staff to "query" unknowns on ramps, near aircraft, etc.
- Post signs promoting the program, warning that the airport is watched. Include appropriate emergency phone numbers on the sign.
- Install a bulletin board for posting security information and meeting notices.
- Provide training to all involved for recognizing suspicious activity and appropriate response tactics.

Contact List: This involves the development of a comprehensive list of responsible personnel/agencies to be contacted in the event of an emergency procedure. The list should be distributed to all appropriate individuals. Additionally, in the event of a security incident, it is essential that first responders and airport management have the capability to communicate. Where possible, coordinate radio communication and establish common frequencies and procedures to establish a radio communications network with local law enforcement.

FRACTIONAL JET OPERATOR SECURITY REQUIREMENTS

The major fractional jet operators have established minimum standards for airports serving their aircraft. These minimum standard documents specify the following general security requirements:

Identification: The airport should issue unique identification badges for employees who have access to the aircraft operations areas. Unescorted passenger access to the ramp is prohibited.

Employees: The airport must conduct FAA-compliant background checks on each employee. The airport must have pre-employment drug screening.

Aircraft Security: Aircraft cannot be left unattended when the ground power unit or auxiliary power unit is operating. Aircraft must be locked when unattended. Aircraft must be parked in well-lit, highly visible areas with a minimum of six-foot chain-link fencing. Security cameras are preferred. Sightseers or visitors are not allowed access aboard or near aircraft.

Facility Security: Visual surveillance of all aircraft operational areas belonging to the airport is required. The airport shall establish controlled access to the aircraft operational areas. The airport should maintain at least six feet between safety fence and parked ground equipment. Bushes and shrubs must be less than four feet in height.

SUMMARY

The recommended master plan concept has been developed with significant input from the PAC and the public. The plan is a road map to manage forecast growth at the airport. The plan represents an effort to maximize developable space at the airport over the next 20 years and beyond. It also provides a plan to bring the airport up to modern design standards to the greatest extent possible.

For decades, the airport has been limited to one-way in/one-way out operations. This operating procedure is to remain intact. Landings are only permitted to Runway 27 and takeoffs are only permitted from Runway 9.

The current and future design aircraft for most airfield and landside facilities falls in airport reference code A/B-I (small aircraft exclusively). This design category is best represented by single and some multi-engine piston aircraft. The design category is not planned to change during the 20-year scope of the master plan.

A new parallel taxiway is planned at a separation distance from the runway of 157.5 feet. This distance exceeds the minimum standard of 150 feet in order to accommodate small commuter aircraft that may operate at the airport. The parallel taxiway will connect to the Runway 9 threshold, thus eliminating the need for pilots to back-taxi on the runway. The parallel taxiway will require the removal/relocation of the existing Taxiway F hangars.

The RSA is penetrated by the blast deflection fence, shrubs, and the perimeter fence. To provide for the required RSA beyond the runway ends, it is recommended that the airport implement declared distances. With declared distances, the airport can publish takeoff and landing lengths that are different than the actual pavement length. With this information, pilots can adjust their runway length needs when operating at the airport.

On the landside, planning includes providing space for a mix of hangar types. It also provides for more hangars that would be suitable for aviation-related businesses. The existing hangars along Taxiway F are planned to be removed/relocated in order to meet object clearing criteria for the new taxiway. This will also open up space for hangar development.

At some point, the landfill cap must be repaired in order to support additional hangar development. Without the landfill cap hangars, the overall plan cannot accommodate the forecast demand for hangars. In essence, the airport will be unable to meet projected growth which will hinder the economic benefits that aviation brings to the community.

Overall, five specific development strategies have emerged from the master planning process:

1) Construct taxiway access to the Runway 9 threshold.

2) Remove/relocate the hangars adjacent to Taxiway F in order to facilitate taxiway access to the Runway 9 threshold and to increase hangar development space and airfield capacity.

3) The current terminal building location should be maintained for any future terminal building expansion or construction.

4) Implement declared distances in order to meet runway design standards.

5) Maximize developable space for aviation-related development.

The next chapter of this master plan will consider methods for funding the recommended improvements and will provide a reasonable schedule for undertaking the projects based on demand over the course of the next 20 years.

Chapter Six

CAPITAL IMPROVEMENT PROGRAM

Capital Improvement Program

The analyses completed in previous chapters evaluated development needs at the airport over the next 20 years and beyond, based on forecast activity and operational efficiency. Next, basic economic, financial, and management rationale is applied to each development item so that the feasibility of each item contained in the plan can be assessed.

The presentation of the capital improvement program (CIP) has been organized into two sections. First, the airport development schedule and CIP cost estimate is presented in narrative and graphic form. Second, capital improvement funding sources on the federal, state, and local levels are identified and discussed.

AIRPORT DEVELOPMENT SCHEDULES AND COST SUMMARIES

Now that the recommended concept has been developed and specific needs and improvements for the airport have been established, the next step is to determine a realistic schedule (implementation timeline) and associated costs for the plan. This section will examine the overall cost of each project identified in the capital improvement program (CIP) and present a development schedule. The recommended improvements are grouped by planning horizon: short term, intermediate term, and long term. The short term planning horizon is further sub-divided into yearly increments. **Table 6A** summarizes key activity milestones for the three planning horizons.

TABLE 6A
Planning Horizon Summary
Los Alamos Airport

	Base Year 2011	Short Term	Intermediate Term	Long Term
BASED AIRCRAFT	70	77	85	100
Single Engine	61	63	67	76
Multi Engine	1	2	3	3
Turboprop	0	0	1	2
Business Jet	0	1	1	1
Helicopter	0	1	1	2
Experimental/Other	8	10	12	16
ENPLANEMENTS	0	21,000	24,000	36,000
ANNUAL OPERATIONS				
Commuter Airline	0	5,300	5,300	8,200
General Aviation				
Itinerant	14,235	15,240	16,110	18,115
Local	755	810	860	975
Air Taxi Activity				
Itinerant	60	100	180	360
Military Activity				
Itinerant	50	50	50	50
TOTAL OPERATIONS	**15,100**	**21,500**	**22,500**	**27,700**

Source: Coffman Associates analysis

A key aspect of this master plan is the use of demand-based planning milestones. Many projects should be considered based on actual demand levels within the next five years. As short term horizon activity levels are reached, it will then be time to program for the intermediate term based upon the next activity milestones. Similarly, when the intermediate term milestones are reached, it will be time to program for the long term activity milestones.

Many development items included in the recommended concept will need to follow these demand indicators. For example, the plan includes construction of new hangars and taxilanes. Based aircraft will be the primary indicator for these projects. If based aircraft growth occurs as projected, additional hangars should be constructed to meet the demand. Often this potential growth is tracked with a hangar waiting list.

If growth slows or does not occur as forecast, some projects may be delayed. As a result, capital expenditures will be made on an as-needed basis, which leads to a more responsible use of capital assets. Construction of hangars is typically undertaken by the airport sponsor or by private developers. All of the hangars at the airport were privately financed with the developer paying a ground lease for the site.

The airport sponsor can, if they choose, construct hangars and act as the lessor. The challenge is that the economics of hangar construction and leasing over the last decade have made it difficult to amortize a 20-year loan on facilities while charging a reasonable monthly rent. This is the case across the country where local airport sponsors are relying increasingly on private developers to build facilities at airports. Nonetheless, some airport sponsors see a benefit to building hangar facilities in order to stimulate aviation activity and business development, even if the monthly rents have to be subsidized to some degree.

The airport CIP presents a hangar construction schedule and shows the county financing the construction. Private developers are also welcome to construct any or all of the proposed hangars and may use the CIP cost estimates as a baseline. Naturally, it will be up to the Los Alamos County Council to approve any expenditure for the airport. Therefore, it should not be assumed that the county is bound to construct any of the proposed hangars.

Some development items do not depend specifically on demand. Safety-related projects should be programmed in a timely manner regardless of the forecast growth in activity. Other items, such as pavement maintenance, should be addressed in a scheduled manner and are not dependent on reaching aviation demand milestones. These types of projects typically are more associated with day-to-day operations.

As a master plan is a conceptual document, implementation of the capital projects should only be undertaken after further refinement of their design and costs through engineering analyses. Moreover, some projects may require additional infrastructure improvements (i.e., drainage improvements, extension of utilities, etc.) that could increase the cost estimate and could impact the schedule.

Once the list of necessary projects was identified and refined, project-specific cost estimates were developed. The cost estimates include design, engineering, construction administration, and contingencies that may arise on the project. Capital costs presented here should be viewed only as estimates subject to further refinement during design. Nevertheless, these estimates are considered sufficient for planning purposes. Cost estimates for each of the development projects in the CIP are in current (2012) dollars. **Exhibit 6A** presents the proposed CIP for Los Alamos Airport. **Exhibit 6B** presents the CIP overlaid onto the airport aerial photograph and broken out into planning horizons.

The FAA utilizes a national priority ranking system to help objectively evaluate potential airport projects. Projects are weighted toward safety improvements, pavement preservation and reconstruction, meeting standards, and enhancing capacity. The FAA will participate in the highest priority projects before considering lower priority projects, even if a lower priority project is considered a more urgent need by the local sponsor. Nonetheless, the project should remain a priority for the airport and funding support should continue to be requested in subsequent years.

The following categories are used to identify each project type:

- Safety/Security: These are the highest priority projects for the FAA. They would include various safety projects and equipment.
- Reconstruction/Maintenance: These are the second highest FAA priority and include pavement reconstruction and preservation.
- Standards: This is the third highest priority and includes projects

intended to meet airport design standards. These projects typically include safety and reconstruction elements.

- Capacity Enhancement: These projects include runway extensions and terminal area improvements such as additional taxilanes. These projects can also be related to other elements such as safety and meeting design standards.
- Environmental Documentation: These projects typically are associated with other elements such as capacity enhancements, reconstruction, or safety.
- Planning: Continuous planning is important to maintaining an economically viable airport.
- Landside Improvements: This category includes hangar construction and other elements typically not funded through the FAA.

The following sections will describe in greater detail the projects identified for the airport over the next 20 years. The short term (0-5 years) projects are presented in yearly increments. The intermediate (years 6-10) and long term (years 10-20) are grouped by local priority.

SHORT TERM IMPROVEMENTS

The projects identified for the short term planning period have been prioritized based on airport need and potential to be funded. If any of these projects cannot be funded in the timeframe indicated, the airport sponsor should consider the project for the following year.

2013 Projects

Three projects are considered for the fiscal 2013 planning period. The airport has an agreement in place for the funding of an airport snow plow vehicle with a 22-foot rubber blade. This equipment is intended for airport usage and the rubber blade is intended to preserve the runway grooves.

The next project is an important maintenance project. Both Taxiway F and Taxiway C are rapidly deteriorating and are in need of complete reconstruction. Both of these pavement surfaces are also considered for future projects that rely on the timing of other projects in order to limit disruption at the airport. For example, Taxiway F is planned to be completely reconstructed and shifted slightly to the north in fiscal 2017. Taxiway C is planned to be redesigned to meet standard and reconstructed in the long term planning period (sometime in years 10-20).

This project provides for a slurry seal of both Taxiway F and Taxiway C in order to seal the pavement and reduce the development of loose objects. Some consideration could be given to a more extensive rehabilitation project for the Taxiway C area since it is not slated for reconstruction for at least 10 years; however, Taxiway F should only receive the minimum maintenance necessary to provide a safe operating environment until such a time that it can be reconstructed at the proper separation distance and weight bearing strength.

Twice in the last four years Los Alamos has experienced storms with damaging

11MP08-6A-01/22/13

	PROJECT DESCRIPTION	Project Classification	Project Cost	FAA Eligible	State Eligible	Local Share
SHORT TERM PROGRAM (0-5 YEARS)						
2013						
1	Acquire Snow Plow Vehicle	SA	$288,600	$119,200	$119,400	$50,000
2	Maintenance Twy F and Twy C	SA/RE	$100,000	$0	$0	$100,000
3	Construct 8-Unit Shade Hangar	LS	$200,000	$0	$0	$200,000
2013	**TOTAL**		**$588,600**	**$119,200**	**$119,400**	**$350,000**
2014						
4	Replace Security/Wildlife Fence	SA	$410,000	$369,000	$20,500	$20,500
5	Acquire Runway Broom Vehicle	SA	$300,000	$0	$150,000	$150,000
6	Construct 8-Unit Shade Hangar	LS	$200,000	$0	$0	$200,000
7	South Apron Seal Coat	RE	$40,000	$0	$20,000	$20,000
8	Environmental Documentation	EN	$200,000	$180,000	$10,000	$10,000
2014	**TOTAL**		**$1,150,000**	**$549,000**	**$200,500**	**$400,500**
2015						
9	Design Taxiway F (Phase 1)	SA/RE/ST	$34,000	$30,600	$1,700	$1,700
10	Design West Development Area Including Roads, Parking, Taxilanes, and Hangar Pads	SA/RE/ST/LS	$175,000	$157,500	$8,750	$8,750
11	Design & Construct SRE Building	ST	$560,000	$504,000	$28,000	$28,000
12	East T-Hangar Pavement Seal Coat	RE	$65,000	$0	$32,500	$32,500
2015	**TOTAL**		**$834,000**	**$692,100**	**$70,950**	**$70,950**
2016						
13	Construct Airport Entrance Road, Parking Lots, and Site Prep Hangar Area	SA/RE/ST/LS	$1,872,000	$1,684,800	$93,600	$93,600
14	Install Fuel Farm (AvGas, Jet A, Mogas)	LS	$1,286,000	$0	$643,000	$643,000
15	Runway Asphalt Rejuvenation	RE	$145,000	$0	$72,500	$72,500
2016	**TOTAL**		**$3,303,000**	**$1,684,800**	**$809,100**	**$809,100**
2017						
16	Acquire & Remove Taxiway F Hangars	SA	$608,000	$547,200	$30,400	$30,400
17	Construct Phase 1 Taxilane	CA	$337,000	$303,300	$16,850	$16,850
18	Construct Phase 1 Hangars	LS	$1,092,000	$0	$0	$1,092,000
19	Construct Taxiway F Phase 1 (Rwy 9 to Twy C)	SA/RE/ST	$358,000	$322,200	$17,900	$17,900
20	Tractor with Pull Mower	LS	$80,000	$0	$40,000	$40,000
2017	**TOTAL**		**$2,475,000**	**$1,172,700**	**$105,150**	**$1,197,150**
2018						
21	Construct Phase 2 Taxilanes	CA	$169,000	$152,100	$8,450	$8,450
22	Construct Phase 2 Hangars	LS	$588,000	$0	$0	$588,000
23	Expand/Replace Terminal Building	LS	$5,040,000	$0	$0	$5,040,000
24	South Apron Seal Coat	RE	$40,000	$0	$20,000	$20,000
2018	**TOTAL**		**$5,837,000**	**$152,100**	**$28,450**	**$5,656,450**
TOTAL SHORT TERM PROGRAM			**$14,187,600**	**$4,369,900**	**$1,333,550**	**$8,484,150**

	PROJECT DESCRIPTION	Project Classification	Project Cost	FAA Eligible	State Eligible	Local Share
INTERMEDIATE TERM PROGRAM (6-10 YEARS)						
25	Rehabilitate Transient Concrete Apron and Taxiway B	RE	$947,000	$852,300	$47,350	$47,350
26	Construct Phase 3 Taxilanes	CA	$169,000	$152,100	$8,450	$8,450
27	Construct Phase 3 Hangars	LS	$1,008,000	$0	$0	$1,008,000
28	Construct LandfillCap T-Hangar Facility (8 units)	LS	$560,000	$0	$0	$560,000
29	Construct LandfillCap Box Hangars (3 units)	LS	$630,000	$0	$0	$630,000
30	Rehabilitate South Tie-Down Apron	RE	$438,000	$394,200	$21,900	$21,900
31	Runway Asphalt Rejuvenation	RE	$145,000	$0	$72,500	$72,500
32	East T-Hangar Pavement Seal Coat	RE	$65,000	$0	$32,500	$32,500
TOTAL INTERMEDIATE TERM PROGRAM			**$3,962,000**	**$1,398,600**	**$182,700**	**$2,380,700**
LONG TERM PROGRAM (11-20 YEARS)						
33	Construct Taxiway F Phase 2 (Twy C to Twy H)	SA/RE	$936,000	$842,400	$46,800	$46,800
34	Construct LandfillCap Box Hangars (3 units)	LS	$630,000	$0	$0	$630,000
35	Construct LandfillCap T-Hangar Facility (8 units)	LS	$560,000	$0	$0	$560,000
36	Construct LandfillCap T-Hangar Facility (8 units)	LS	$560,000	$0	$0	$560,000
37	Master Plan Update	PL	$300,000	$270,000	$15,000	$15,000
38	Rehabilitate East T-Hangar Pavement	RE	$1,012,000	$910,800	$50,600	$50,600
39	Runway Asphalt Rejuvenation (2x)	RE	$290,000	$0	$145,000	$145,000
40	South Apron Seal Coat (2x)	RE	$80,000	$0	$40,000	$40,000
41	East T-Hangar Pavement Seal Coat (2x)	RE	$130,000	$0	$65,000	$65,000
TOTAL LONG TERM PROGRAM			**$4,498,000**	**$2,023,200**	**$362,400**	**$2,112,400**
TOTAL PROGRAM COSTS			**$22,647,600**	**$7,791,700**	**$1,878,650**	**$12,977,250**

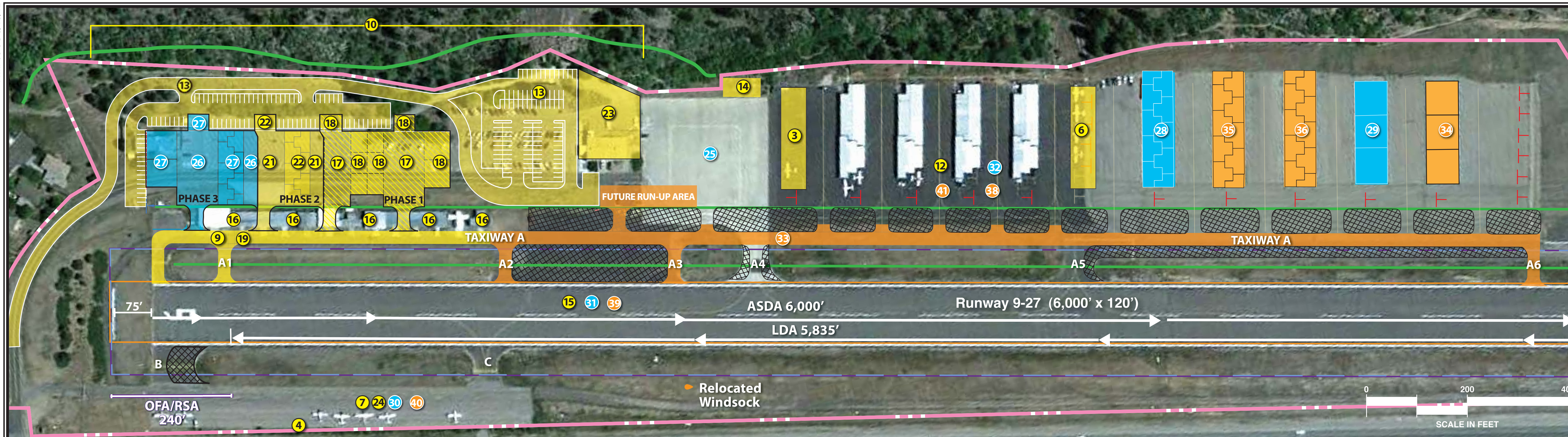
Classification Key:

SA: Safety/Security
RE: Reconstruction/Maintenance
ST: Standards
CA: Capacity
EN: Environmental
PL: Planning
LS: Landside

Note: Totals may not equal due to rounding

Exhibit 6A
CAPITAL IMPROVEMENT PROGRAM

11MP08-5C-8/18/12



SHORT TERM PROGRAM (0-5 YEARS)

2013
1. Acquire Snow Plow Vehicle - NP
2. Maintenance Taxiway F and Taxiway C - NP
3. Construct 8-Unit Shade Hangar

2014
4. Replace Security/Wildlife Fence
5. Acquire Runway Broom Vehicle -NP
6. Construct 8-Unit Shade Hangar
7. South Apron Seal Coat
8. Environmental Documentation -NP

2015
9. Design Taxiway F (Phase 1)
10. Design West Development Area Including Roads, Parking, Taxilanes, and Hangar Pads
11. Design & Construct SRE Building
12. East T-Hangar Pavement Seal Coat

2016
13. Construct Airport Entrance Road, Parking Lots, and Site Prep Hangar Area
14. Install Fuel Farm (AvGas, Jet A, Mogas)
15. Runway Asphalt Rejuvenation

2017
16. Acquire & Remove Taxiway F Hangars
17. Construct Phase 1 Taxilanes
18. Construct Phase 1 Hangars
19. Construct Taxiway F Phase 1 (Rwy 9 to Twy C)
20. Acquire Tractor with Pull Mower - NP

2018
21. Construct Phase 2 Taxilanes
22. Construct Phase 2 Hangars
23. Expand/Replace Terminal Building
24. South Apron Seal Coat

INTERMEDIATE TERM PROGRAM (6-10 YEARS)

25. Rehabilitate Transient Concrete Apron and Taxiway B
26. Construct Phase 3 Taxilanes
27. Construct Phase 3 Hangars
28. Construct LandfillCap T-Hangar Facility (8 units)
29. Construct LandfillCap Box Hangars (3 units)
30. Rehabilitate South Tie-Down Apron
31. Runway Asphalt Rejuvenation
32. East T-Hangar Pavement Seal Coat

LONG TERM PROGRAM (11-20 YEARS)

33. Construct Taxiway F Phase 2 (Twy C to Twy H)
34. Construct LandfillCap Box Hangars (3 units)
35. Construct LandfillCap T-Hangar Facility (8 units)
36. Construct LandfillCap T-Hangar Facility (8 units)
37. Master Plan Update -NP
38. Rehabilitate East T-Hangar Pavement
39. Runway Asphalt Rejuvenation(2X)
40. South Apron Seal Coat (2x)
41. East T-Hangar Pavement Seal Coat (2x)

NP - Not Pictured

LEGEND

- Property Line
- Runway Safety Area (RSA) - 120' wide
- Runway Object Free Area (OFA) - 250' wide
- Obstacle Free Zone (OFZ) - 250' wide
- Runway Protection Zone (RPZ)
- Taxiway Object Free Area (TOFA)
- To Be Removed
- Potential Usable Land Recommended for Non-public Airport Functions

NORTH

Aerial: Google Earth, 5-4-2012

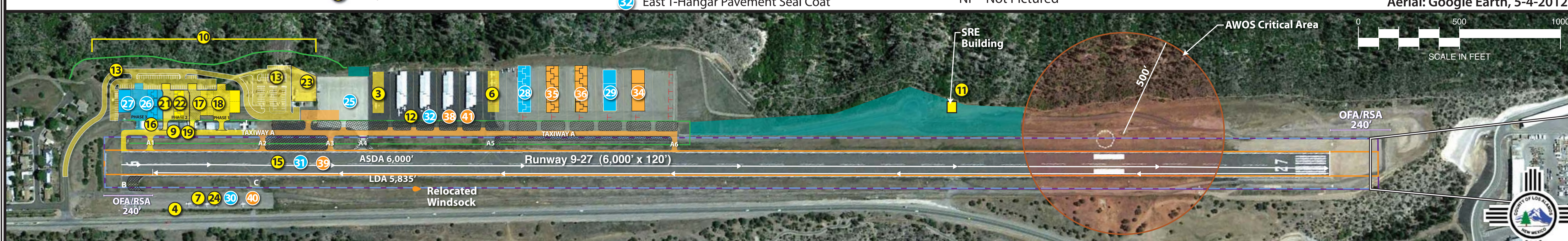


Exhibit 6B
PROJECT PHASING

hail. Numerous aircraft have been damaged to such a degree that they can't be flown. To address a pressing need for more aircraft covering an eight-unit shade hangar is planned. This structure has open sides and provides a basic level of protection from the elements. Certain shade hangars can have sides and doors added at a later time to create full T-hangars.

2014 Projects

The next project identified is replacement of the fence that runs along the south and west sides of the airport. As discussed previously, the existing fence is in very poor condition and is ineffective. Wild animals, including coyotes, are commonly found on the runway. When the airport moves forward with this project, community leaders should give consideration to an aesthetically appealing fence since the road adjacent to the airport is the main entrance to the community.

The next project is the acquisition of a runway broom vehicle. This vehicle allows rapid removal of snow and debris from the runways and taxiways. This vehicle will complement the snow plow vehicle planned to be acquired in 2013.

The next project considered is a second eight-unit aircraft shade hangar. These shade hangar structures have become a priority for the airport because of several recent hail storm events that caused significant damage to uncovered aircraft.

Maintenance of aircraft pavement is a critical consideration for any airport. Regular pavement maintenance can extend the useful life of pavement and increase safety by reducing the potential for FOD (foreign object debris), which can damage aircraft. The maintenance project considered in 2014 is a seal coat for the south tie-down apron. Planned is a GSB-88 seal coat. A seal coat is planned every three years until the apron is fully rehabilitated.

In subsequent years, the west terminal area is planned to be redesigned and reconstructed. Several elements of this project may require environmental review, especially the planned disposition of the hiking trail immediately north of the airport. As such, proper environmental documentation should be developed as required by the FAA. This is likely to be an environmental assessment.

2015 Projects

The next year of the CIP represents the beginning of a multi-year phased project to redevelop the west side of the airport. The first element is the design phase of the replacement Taxiway F project. The first phase of the parallel taxiway project extends from the Runway 9 threshold to the intersection with Taxiway C. A bypass taxiway is included in the design. Stub taxilanes are included that will ultimately lead to the new hangar development areas.

The next project is the design of the entire west development area. This includes everything from the west end of the airport to the front door of the terminal building. Included is design of the airport entrance road, the parking lots, and the hangar development areas.

The next project for 2015 is the design and construction of a building to house snow removal equipment and other airport maintenance apparatus. The structure is planned to be located near the end of what is currently Taxiway H. As planned, the facility is estimated at 4,000 square feet.

The taxilanes to the east T-hangar was seal coated in 2011. In 2015, it is recommended for a new seal coat using GSB-88 to preserve the usefulness of the pavement. An additional seal coat is recommended approximately every four years here after.

2016 Projects

Now that the design of the west development area has been completed, it is time to initiate construction. It will be very important to properly phase the construction so that disruption to existing airport users is minimized. It is anticipated that the specific phasing of the west development area will depend greatly on the availability of financial resources. The phased plan presented here is thought to be the most economical approach to the redevelopment of the west area and thought to have the least disruption to airport users. Nonetheless, construction of any kind leads to a certain level of inconvenience.

The construction phase of the west development area begins with overall site preparation. The entire area is planned to be cleared and leveled. A retaining wall is anticipated along portions of the north property line. The retaining wall should be aesthetically pleasing, perhaps incorporating natural vegetative covering. Also to be considered is the location of the existing hiking trail. Construction of the retaining wall would present an opportunity to include the relocated hiking trail at its base.

The new airport entrance road and the parking lots are then planned. While the entrance road will need to extend to the terminal building, the parking lots could be phased in to some degree if funding were not available.

The next project considered for 2016 is the design and installation of a replacement fuel farm. This fuel farm could replace the existing fuel capability. It is important that the new fuel farm be in place before the construction of Taxiway F, which may negatively impact the existing fuel farm. In addition, the airport should consider installing Jet-A fuel as well since the commuter aircraft is a turboprop.

By 2016 the runway may be in need of some maintenance. Because of the grooves in the runway, a traditional slurry seal or GSB-88 is not recommended instead a runway rejuvenator is planned. Additional rejuvenation is planned every five years.

2017 Projects

The projects identified for 2017 are related to the west end hangar/taxiway redevelopment. Several elements of the redevelopment must occur simultaneously in order to minimize the inconvenience to airport users and tenants. The existing hangars must be acquired, the replacement hangars and taxilane must be constructed, and the partial parallel taxiway must be completed so that the new hangars can access the runway system. Because it is so important that these construction elements occur at nearly the same time, the airport may consider combining these projects into a single effort. For purposes of the CIP, the projects are separated in order to provide an understanding of the overall project components, the location of the projects, and the financial eligibility of the individual projects.

The west end hangar and taxilane development is planned in three distinct phases. The development is phased because of financial realities. Hangar construction is typically not funded through federal grants and local funds are limited. For purposes of the CIP, all hangar construction is assumed to be undertaken by the county.

The first element of the west end redevelopment is the acquisition of the 13 hangars along Taxiway F. These hangars would then be removed and the site would be prepared to support the new development. The airport sponsor should be aware that acquisition of the private hangars may be time-consuming and can be complicated. Coordination with the FAA and NMDOT should happen very early in the process, perhaps even several years before construction is planned.

The owners of the Taxiway F hangars are significant supporters and contributors to the economic vitality of the airport. When their hangars are removed/relocated, care should be given to minimize any real or perceived negative economic impact to them. For example, many of the aircraft stored in these hangars are home built and are especially susceptible to adverse weather conditions (i.e. hail). Therefore, to the greatest extent feasible, these aircraft owners should have a covered storage space made available so that their aircraft do not have to remain outside. Particular attention should be paid to the phasing of the construction of new hangars and taxiway F, and removal of existing hangars.

The phase 1 development includes construction of nine box hangars, each measuring 42 feet by 33 feet. Two larger hangars, each measuring 60 feet by 60 feet, are also planned. One of these hangars is intended to be used as the airport maintenance business. The other would be available for lease and could accommodate at least two aircraft. The phase 1 hangar development area would provide an estimated 13 individual aircraft positions. This hangar mix is intended to provide adequate replacement hangars for those who are displaced by the removal of the Taxiway F hangars.

Two taxilanes are also constructed that would provide access to the new partial parallel taxiway. While hangars are typically not eligible for federal grants, public taxilanes such as those planned are eligible.

The third element is the construction of the new partial parallel taxiway. This taxiway is planned to extend from the Runway 9 threshold to the current Taxiway C. A bypass taxiway is included as well as four stub taxilanes providing access to the new hangar areas.

There are many potential combinations of phasing of the west development projects. It may be possible to construct phase one of the new hangars without removing the existing Taxiway F hangars. Once the new hangars are constructed then a portion or all of the old hangars should be removed and a taxilane extended to the new hangars. The specific details will need to be developed in the design phase of the project but it is vitally important to provide a direct transition of aircraft from the old hangars to either a new hangar or to a temporary hangar, while the access taxilanes and the new portion of the parallel taxiway is constructed.

The final project identified for 2017 is the acquisition of a tractor and pull-behind mower. The existing airfield mowing equipment is inadequate and needs to be updated.

2018 Projects

In the last year of the short term planning period, two major projects are considered, both of which will depend on demand and financial resources. The first is the construction of phase 2 of the west development area. This includes a taxilane extending to the partial parallel taxiway, construction of two box hangars and a six-unit T-hangar facility.

The last project considered in the short term is the construction of a new terminal building. This project is truly a placeholder as the need is going to be dictated by the success of commuter service. If the service proves extremely popular, a new facility could be needed earlier than 2018. In this case, airport management should accelerate this project. If commuter service is moderately successful but not enough to justify a new facility, then the project can be scaled back to simply be an expansion of the existing facility. Expansion of the terminal building, as previously shown on Exhibit 5D, is estimated at approximately $750,000. If there is little or no demand, then a replacement terminal building may be shifted to the intermediate or long term timeframe.

The last project in 2018 is maintenance of the south apron.

Short Term Summary

The short term projects generally cover the next five years for the airport. The projects identified represent the beginning of significant redevelopment projects for the airport. The old hangars along Taxiway F are planned to be removed allowing for a new taxiway to be constructed that would meet current design standards and provide direct access to the Runway 9 threshold.

The entire west end of the airport is planned to be redeveloped in such a manner to maximize the very limited space available at the airport. The airport entrance road is shifted to the north and the hangar development area is expanded. Construction of the new hangars is divided into three distinct phases. Two of the three phases are planned in the short term.

The short term projects total approximately $14.19 million. Approximately $4.37 million is eligible for FAA grant funding. Approximately $1.33 million is eligible for NMDOT funding. The remaining $8.48 million would be the responsibility of the local airport sponsor. (It should be noted that slightly more than $5 million of the local share is for construction of a replacement terminal building.)

INTERMEDIATE TERM IMPROVEMENTS

In order to provide maximum flexibility to the airport when programming capital projects, the intermediate term projects have been grouped and generally include those projects that may be needed in years six through ten. Airport management should regularly assess the need for these projects based on actual demand and growth at the airport.

The intermediate term projects include the rehabilitation of the main transient/commuter concrete apron and Taxiway B. The timing of this project is dependent on the condition of the pavement. If this project moves forward prior to the construction of the rest of the parallel taxiway, special attention should be given to Taxiway B. Currently, Taxiway B provides direct access to the runway from the apron which can lead to runway incursions. Taxiway B should be reconfigured so that pilots are forced to make a turn prior to entering the runway environment.

Phase 3 of the west end hangar development is planned in the intermediate term. This includes the taxilane, five box hangars and 6 T-hangar units. Once again, this project is justified only when there is existing demand at the airport.

The construction of a T-hangar facility and a set of connected box hangars on the landfill cap are planned in the intermediate term. Of course, the timing of this project is dependent on the cap being repaired to a point where it can support hangars and aircraft.

The next project considered for the intermediate planning horizon is the rehabilitation of the south aircraft tie-down apron. This project is planned as a mill and overlay.

Two ongoing maintenance projects are also in the intermediate term. The runway may need a rejuvenation application and the east T-hangar taxilanes may need a seal coat.

The intermediate term projects total approximately $3.96 million. Approximately $1.4 million is eligible for FAA grant funding. These projects are eligible for approximately $183,000 in state funding, with the remaining $2.38 million being the responsibility of the airport sponsor. It should be noted that all hangar construction is assumed to be undertaken exclusively by the airport; however, private developers could also undertake hangar construction.

LONG TERM IMPROVEMENTS

Long term projects are those planned for years 11-20. Again, these projects are grouped in order to provide airport management flexibility in determining project priority based on actual demand factors.

The remaining portion of the parallel taxiway is planned in the long term. This portion of the taxiway would extend from what is currently the western edge of Taxiway C to the east, to the end of the landfill cap. This taxiway would replace Taxiways C, G, and H. The entire parallel taxiway would then be set at a uniform separation distance of 157.5 feet from the runway centerline.

This project would include efforts to meet recent taxiway design updates. For example, Taxiway C represents a "wide expanse of pavement." To alleviate this, Taxiway C is replaced by the parallel taxiway and any extra pavement is removed. It should be noted that in lieu of pavement removal, the pavement can be painted as non-movement area.

As previously noted, the new taxiway design standards indicate that direct access from an apron to a runway should be avoided. Therefore, the access point from the transient apron is shifted in order to force pilots to make a turn before entering the runway environment.

The taxilanes to the existing T-hangars and the planned landfill cap hangars are planned to extend from the parallel taxiway. This is a slightly different layout than exists currently but it does maximize development space.

Long term projects include final infill of new hangars on the landfill cap. This includes two T-hangar facilities and an additional row of connected box hangars.

The next project is rehabilitation of the existing T-hangar taxilanes. This is envisioned as a mill and overlay.

Placeholders are included for various maintenance projects associated with the runway, south apron and the east T-hangar taxilanes. Other maintenance issues can arise over time and the airport should consider the potential for additional maintenance not specifically called out in the CIP.

The long term projects total approximately $4.5 million, of which approximately $2.03 million is eligible for FAA funding and $360,000 is eligible for state funding. The remaining $2.11 million would be the responsibility of the airport owner.

CAPITAL IMPROVEMENT SUMMARY

A 20-year capital improvement program for Los Alamos Airport has been presented. The CIP represents an ambitious road map that would bring the airport up to modern design standards to the greatest extent possible. It also represents an economic road map that aims to maximize developable space for aviation uses.

The major elements of the CIP include construction of a parallel taxiway, replacement terminal building, and redevelopment of the western portion of the airport. The planned parallel taxiway would extend from the Runway 9 threshold to the end of the landfill cap. This project is phased over time. The existing terminal building may be inadequately sized to support forecast passenger activity. While a replacement facility is ultimately planned, an interim step could be to expand the existing facility.

The area west of the terminal building is planned for complete redevelopment. The hangars adjacent to Taxiway F would be removed and new hangars are planned to be constructed. The airport entrance road is shifted to the north to allow for the hangar development. The terminal building is provided with a much larger parking lot.

The CIP is intended as a road map of airport improvements to help guide the airport sponsor, the FAA, and the state aviation division on needed projects. The plan as presented will meet the forecast demand over the next 20 years. However, the plan also shows the importance of repairing the landfill cap so that it can support the planned hangars.

Some of the projects identified should be undertaken in conjunction with others. For example, the removal of the existing Taxiway F hangars should coincide as closely as possible with the construction of phase 1 hangars. Every effort should be made to limit the amount of time that hangar owners would have to wait to transition to a new hangar. At the same time, the replacement parallel taxiway will need to provide access to the new hangars. The phasing of the redevelopment of the western portion of the airport should be given high priority.

While the CIP necessarily identifies specific years for short term projects and general timeframes for intermediate and long term projects, project priority can change. This CIP is a dynamic list and will change over time. This is the function of a usable airport master plan. Airport management should reassess the priority of projects frequently and balance many factors including funding availability.

The total 20-year CIP proposes approximately $22.65 million in airport development costs. Of this total, approximately $7.79 million would be eligible for FAA grant funding and $1.88 million would be eligible for state funding. The local funding requirement for the proposed 20-year CIP is $12.98 million.

CAPITAL IMPROVEMENT FUNDING SOURCES

There are generally four sources of funds used to finance airport development: airport cash flow, revenue and general obligation bonds, federal/state/local grants, and passenger facility charges (PFCs), which are reserved for commercial service airports. Access to these sources of financing varies widely among airports, with some large airports maintaining substantial cash reserves and most small commercial service and general aviation airports often requiring subsidies from local and state governments to fund operating expenses and to finance modest improvements.

Financing capital improvements at the airport will not rely solely on the financial resources of the airport or the city. Capital improvement funding is available through various grant-in-aid programs on both the state and federal levels. Historically, Los Alamos Airport has received federal and state grants. While some years more funds could be available, the CIP was developed with project phasing in order to remain realistic and within the range of anticipated grant assistance. The following discussion outlines key sources of funding potentially available for capital improvements at Los Alamos Airport.

FEDERAL GRANTS

Through federal legislation over the years, various grant-in-aid programs have been established to develop and maintain a system of public use airports across the United States. The purpose of this system and its federally based funding is to maintain national defense and to promote interstate commerce. The most recent legislation affecting federal funding was enacted on February 17, 2012 and is titled, the *FAA Modernization and Reform Act of 2012*.

The law authorizes the FAA's Airport Improvement Program (AIP) at $3.35 billion for fiscal years 2012 through 2015. Eligible airports, which included those in the *National Plan of Integrated Airport Systems* (NPIAS), such as Los Alamos Airport, can apply for airport improvement grants. **Table 6B** presents the approximate distribution of the AIP funds. Currently, Los Alamos Airport is eligible to apply for grants which may be funded through state apportionments, the small airport fund, and/or discretionary categories. As passenger enplanements increase, the airport would be eligible for additional entitlement funds based on passenger enplanement thresholds.

TABLE 6B
Federal AIP Funding Distribution

Funding Category	Percent of Total	Funds*
Apportionment/Entitlement		
Passenger Entitlements	29.19%	$977,865,000
Cargo Entitlements	3.00%	$100,500,000
Alaska Supplemental	0.65%	$21,775,000
State Apportionment for Nonprimary Entitlements	10.35%	$346,725,000
State Apportionment Based on Area and Population	9.65%	$323,275,000
Carryover	10.77%	$360,795,000
Small Airport Fund		
Small Hubs	1.67%	$55,945,000
Nonhubs	6.68%	$223,780,000
Nonprimary (GA and Reliever)	3.34%	$111,890,000
Discretionary		
Capacity/Safety/Security/Noise	11.36%	$380,560,000
Pure Discretionary	3.79%	$126,965,000
Set Asides		
Noise	8.40%	$281,400,000
Military Airports Program	0.99%	$33,165,000
Reliever	0.16%	$5,360,000
Totals	100.00%	$3,350,000,000

* FAA *Modernization and Reform Act of 2012*
AIP: Airport Improvement Program
Source: FAA Order 5100.38C, Airport Improvement Program Handbook

Funding for AIP-eligible projects is undertaken through a cost-sharing arrangement in which FAA provides up to 90 percent of the cost and the airport sponsor invests the remaining 10 percent. In exchange for this level of funding, the airport sponsor is required to meet various Grant Assurances, including maintaining the improvement for its useful life, usually 20 years.

The source for AIP funds is the Aviation Trust Fund. The Aviation Trust Fund was established in 1970 to provide funding for aviation capital investment programs (aviation development, facilities and equipment, and research and development). The Aviation Trust Fund also finances the operation of the FAA. It is funded by user fees, including taxes on airline tickets, aviation fuel, and various aircraft parts.

Apportionment (Entitlement) Funds

Federal AIP funds are distributed each year by the FAA from appropriations by Congress. A portion of the annual distribution is to primary commercial service airports based upon minimum enplanement levels of at least 10,000 passengers annually. If the airport exceeds the enplanement threshold, then it would receive a minimum of $1 million. Other entitlement funds are distributed to cargo service airports, states and insular areas (state apportionment), and Alaska airports.

General aviation airports included in the NPIAS can receive up to $150,000 each year in Non-Primary Entitlement (NPE) funds. These funds can be carried over and combined for up to four years, thereby allowing for completion of a more expensive project. In the past, Los Alamos Airport has received NPE funding.

The states also receive an apportionment based on a federal formula that takes into account area and population. The FAA then distributes these funds for projects at various airports throughout the state.

Small Airport Fund

If a large or medium hub commercial service airport chooses to institute a passenger facility charge (PFC), which is a fee of up to $4.50 on each airline ticket, for funding of capital improvement projects, then their apportionment is reduced. A portion of the reduced apportionment goes to the small airport fund. The small airport fund is reserved for small-hub primary commercial service airports, non-hub commercial service airports, and general aviation airports.

Discretionary Funds

The remaining AIP funds are distributed by the FAA based on the priority of the project for which they have requested federal assistance through discretionary apportionments. A national priority ranking system is used to evaluate and rank each airport project. Those projects with the highest priority from airports across the country are given preference in funding. High priority projects include those related to meeting design standards, capacity improvements, and other safety enhancements.

Under the AIP program, examples of eligible development projects include the airfield, public aprons, and access roads. Additional buildings and structures may be eligible if the function of the structure is to serve airport operations in a non-revenue generating capacity, such as maintenance facilities. Some revenue-enhancing structures, such as T-hangars, may be eligible if all airfield improvements have been made; however, the priority ranking of these facilities is very low.

Whereas entitlement monies are guaranteed on an annual basis, discretionary funds are not assured. If the combination of entitlement, discretionary, and airport sponsor match does not provide enough capital for planned development, projects may be delayed.

Set-Aside Funds

Portions of AIP funds are set-asides designed to achieve specific funding minimums for noise compatibility planning and implementation, select former military airfields (Military Airport Program), and select reliever airports. Los Alamos Airport does not qualify for set-aside funding.

FAA Facilities and Equipment (F&E) Program

The Airway Facilities Division of the FAA administers the Facilities and Equipment (F&E) Program. This program provides funding for the installation and maintenance of various navigational aids and equipment of the national airspace system. Under the F&E program, funding is provided for FAA Airport Traffic Control Towers (ATCTs), enroute navigational aids, on-airport navigational aids, and approach lighting systems.

While F&E still installs and maintains some navigational aids, on-airport facilities at general aviation airports have not been a priority. Therefore, airports often request funding assistance for navigational aids through AIP and then maintain the equipment on their own. At Los Alamos Airport, both the REILs and PAPIs were funded through AIP and are maintained by the airport.

STATE AID TO AIRPORTS

The New Mexico Department of Transportation – Aviation Division recognizes the valuable contribution to the state's transportation economy that airports make. Therefore, NMDOT administers several programs to aid in maintaining airports in the state. Funding for state aviation grant programs is sourced from taxes on jet fuel, aircraft registration fees, and apportionment by the state legislature from the general fund. On an annual basis, approximately $3 million is available for state grants.

New Mexico Aviation Grant Program

The Aviation Division administers the aviation grant program. Grants are typically awarded either in support of a federal grant or as a state grant. The state will pay for 50 percent of the local match on federal grants. That means on AIP grants the federal share is 90 percent, the state share is up to five percent, and the local share is the remaining five percent.

State grants are administered as a 50/50 cost share with the local airport sponsor. Projects eligible for the state grant program include all AIP eligible projects, as well as many potential projects not eligible for AIP grants. For example, the state can participate in revenue generating projects such as fuel farms and hangars. Project participation is determined by the management of the Aviation Division.

New Mexico Air Service Assistance Program

The final grant program available to state airports is the Air Service Assistance Program. This grant program is specifically established by the state legislature and is codified in New Mexico Code, Title 18, Chapter 11, Part 3. Under this program, two or more communities can submit a grant application for funds of up to $200,000 with a 50 percent match. The grant funds are restricted to marketing, promotion, and certain equipment, and cannot be used as a direct subsidy to an airline.

LOCAL FUNDING

The balance of project costs, after consideration has been given to grants, must be funded through local resources. The goal of the airport is to generate enough revenue to cover all operating and capital expenditures, if possible. As with many general aviation airports, this is not always possible and other financing methods may be needed.

There are several alternatives for local financing options of future development at the airport, including airport revenues, direct funding from the general fund, bonds, and leasehold financing. These strategies could be used to fund the local matching share, or to complete a project if grant funding cannot be arranged.

There are several municipal bonding options available, including general obligation bonds, limited obligation bonds, and revenue bonds. General obligation bonds are a common form of municipal bond which is issued by voter approval, is secured by the full faith and credit of the community, and future tax revenues are pledged to retire the debt. As instruments of credit and because the community secures the bonds, general obligation bonds reduce the available debt limit of the community. Due to the community pledge to secure and pay general obligation bonds, they are the most secure type of municipal bond and are generally issued at lower interest rates and carry lower costs of issuance. The primary disadvantage of general obligation bonds is that they require voter approval and are subject to statutory debt limits. This requires that they be used for projects that have broad support among the voters, and that they are reserved for projects that have the highest public priorities.

In contrast to general obligation bonds, limited obligation bonds (sometimes referred to as self-liquidating bonds) are secured by revenues from a local source. While neither general fund revenues nor the taxing power of the local community is pledged to pay the debt service, these sources may be required to retire the debt if pledged revenues are insufficient to make interest and principal payments on the bonds. These bonds still carry the full faith and credit pledge of the local community and are considered, for the purpose of financial analysis, as part of the debt burden of the local community. The overall debt burden of the local community is a factor in establishing interest rates on municipal bonds.

There are several types of revenue bonds, but in general, they are a form of municipal bond, which is payable solely from the revenue derived from the operation of a facility that was constructed or acquired with the proceeds of the bonds. For example, a lease revenue bond is secured with the income from a lease assigned to the repayment of the bonds. Revenue bonds have become a common form of financing airport improvements. Revenue bonds present the opportunity to provide those improvements without direct burden to the taxpayer. Revenue bonds normally carry a higher interest rate because they lack the guarantees of general and limited obligation bonds.

Leasehold financing refers to a developer or tenant financing improvements under a long term ground lease. The obvious advantage of such an arrangement is that it relieves the community of all responsibility for raising the capital funds for improvements. However, the private development of facilities on a ground lease, particularly on property owned by a government agency, produces a unique set of concerns. In particular, it may be more difficult to obtain private financing as only the improvements and the right to continue the lease can be claimed in the event of a default. Ground leases normally provide for the reversion of improvements to the airport at the end of the lease term, which reduces their potential value to a lender taking possession. Also, companies that want to own their property as a matter of financial policy may not locate where land is only available for lease.

LOCAL FINANCIAL CONSIDERATIONS

The operation of the airport generates revenues, which are secured by federal grant assurances to be utilized at the airport. While the revenues generated are significant, they are oftentimes not enough to fund both airport operating expenditures and capital improvement requirements. Most general aviation airports in the country do not generate enough revenues to cover operating expenses and require some level of community tax or bonding support to fund operations and capital expenditures.

There are several alternatives for local financing options for future development at the airport, including airport revenues, direct funding from the county, issuing bonds, and leasehold financing. These strategies could be used to fund the local matching share or complete the project if grant funding cannot be arranged.

The airport is owned by Los Alamos County and conducts its daily operations through the collection of various rates and charges. These revenues are generated specifically by airport operations. There are, however, restrictions on the use of revenues collected by the airport. All receipts, excluding bond proceeds or related grants and interest, are irrevocably pledged to the punctual payment of operating and maintenance expenses, payment of debt service for as long as bonds remain outstanding, or for additions or improvements to airport facilities.

All general aviation airports should establish standard basis rates for various leases. All lease rates should be set to adjust to a standard index such as the Consumer Price Index (CPI) to assure that fair and equitable rates continue to be charged into the future. Many factors will impact what the standard lease rate should be for a particular facility or ground parcel. For example, ground leases for aviation-related facilities should have a different lease rate than for non-aviation leases. When airports own hangars, a separate facility lease rate should be charged. The lease rate for any individual parcel or hangar can vary due to availability of utilities, condition, location, and other factors. Nonetheless, standard lease rates should fall within an acceptable range. In addition, the airport should charge a fuel flowage to the fuel distributor for the right to dispense fuel at the airport.

Airport Revenue

Airports are capable of generating revenue since they can be operated as a business and not just as a public amenity. Los Alamos Airport generates revenue from several sources, including ground leases, fuel flowage fees, and through a lease agreement with the rental car agency. An examination of the fee structure for airport revenue sources was undertaken.

The airport does not currently own any of the hangar structures on the airport; however, it does lease the ground upon which those hangars rest. Tenants pay an annual fee based on the square footage footprint of the leasehold. Aircraft tie-down spaces are treated the same way at the same rate as a ground lease. These rates are adjusted annually based on the CPI (CPI Adjustment). All ground leases include reversion clauses for the improvements. The rates charged for ground leases are within the expected range for an airport like Los Alamos Airport.

The airport also receives revenues through an agreement with the rental car agency. Currently, the rental car agency leases counter space in the terminal building, leases 32 vehicle parking spaces near the entrance to the terminal building, and provides eight percent of gross sales. This arrangement is within industry standards.

The airport also receives revenues from the sale of aviation fuel on the airport. The current fuel concession is owned by a local consortium that pays a ground lease and a fuel flowage fee of $0.07 per gallon sold. The fuel flowage fee also applies to any operator that brings their own fuel to the airport (e.g., U.S. Forest Service). The fee is within industry standards. The airport also has in place a fee structure for temporary use permits (right of entry permit).

Table 6C presents the operating revenue and expenses for the last five years. This information does not include any capital grants (FAA/State funding) or expenditures (matching funds). The table shows that Los Alamos Airport, like most general aviation airports, requires operating subsidy from the general fund. On average, the airport requires approximately $150,000 annually.

TABLE 6C
Historical Operating Revenue and Expenses
Los Alamos Airport

	2008	2009	2010	2011	2012
OPERATING REVENNUE					
Licenses & Permits	$ -	$ -	$ -	$ 1,110	$ 2,581
Chgs Svcs-Utilities (Phy. Envir.)	3,518	0	0	0	0
Chgs Svcs-Transportation	36,393	43,604	48,030	47,535	49,185
Investment Income	6,866	524	6,339	12,789	(923)
Rentals/Concessions	54,356	40,825	34,853	38,139	37,167
TOTAL OPERATING REVENUE	**$ 101,134**	**$ 84,953**	**$ 89,222**	**$ 99,573**	**$ 88,010**
OPERATING EXPENSES					
Personnel Services	$ 104,032	$ 91,687	$ 88,228	$ 105,820	$ 107,293
Employee Benefit Costs	29,975	23,297	27,172	44,403	37,266
Outside Prof/Cont/Prop Services	7,280	15,450	13,737	10,483	14,031
Other Purchased Services	6,140	7,051	10,627	10,756	14,401
Materials And Supplies	17,627	5,692	9,899	4,887	6,291
Intra/Interfund Charges-Flexible	7,552	6,844	8,194	7,293	8,684
Intra/Interfund Charges-Fixed	67,229	55,524	60,595	76,961	79,598
Capital Outlay >$500	11,437	0	7,020	0	0
Debt/Fiscal Charges	0	0	0	0	8
TOTAL OPERATING EXPENSES	**$ 251,273**	**$ 205,544**	**$ 225,472**	**$ 260,604**	**$ 267,573**
GROSS OPERATING PROFIT/(LOSS)	**$(150,139)**	**$(120,591)**	**$(136,250)**	**$(161,031)**	**$(179,562)**
TRANSFERS-IN*	**$ 150,139**	**$ 120,591**	**$ 136,250**	**$ 161,031**	**$ 179,562**
NET OPERATING PROFIT/(LOSS)	**$ (0)**	**$ (0)**	**$ (0)**	**$ (0)**	**$ (0)**

*Actual transfers to the airport fund include capital matching funds; therefore, this is an estimate of the transfers-in related to operation of the airport.

Source: Los Alamos Airport

Airport Expenses

Airports are large industrial facilities that will have a variety of expenses. Typically, operating expenses will include personnel services, supplies, utilities, maintenance, and debt service. Most general aviation airports do not generate enough revenue to cover operating expenses. Therefore, airport sponsors must provide some level of funding in order to provide a minimum level of aviation support.

Financial Summary

The above financial discussion is intended to show that the operation of Los Alamos Airport meets various requirements and goals set forth by the FAA.

Grant Assurance #24 – Fee and Rental Structure: Requires the airport sponsor to set fee, lease rates, and other charges that are directed at making the airport as self-sustaining as possible. Airport sponsors must impose fair market value charges for noncommercial uses of airport property, but aeronautical user charges may be less than fair market value. As demonstrated, the fee and rental structure for airport property and facilities is fair and equitable.

Grant Assurance #25 – Airport Revenues: Restricts the use of airport revenue generated by the airport and local taxes on aviation fuel to be expended for the capital or operating costs of the airport, the local airport system, or other facilities owned or operated by the airport sponsor, which directly and substantially relate to the actual air transportation of passengers or property or noise mitigation efforts. Under the *Single Audit Act of 1984*, the airport must conduct an annual audit and assure the government that airport funds have been properly used. In general, revenue generated by the airport may not be diverted to functions unrelated to the operation and maintenance of the airport. Examples of revenue diversion include:

a) General economic development;
b) Marketing and promotional activities unrelated to the airport;
c) Payments in lieu of taxes or other assessments that exceed the value of services;
d) Payments to compensate sponsoring governmental bodies for lost tax revenues exceeding stated tax rates; and
e) Direct or indirect payments of airport revenue beyond that which is required to pay for services and facilities provided to the airport.

The county maintains a separate airport fund for accounting of airport revenues and expenses.

The CIP presented indicates a need for approximately $14 million in airport improvements in the next five to six years. The only revenue source that is currently guaranteed is the federal non-primary entitlement funding of up to $150,000 annually. If the airport exceeds 10,000 enplanements annually the entitlement increases to at least $1 million annually. Clearly, other revenue sources will need to be identified in order to accomplish the projects identified in the CIP. Airport management should work with the FAA to pursue discretionary grants. They should also work with the state aviation agency to fund priority projects.

Several of these projects are interconnected and considered only a part of the overall development project. For example, the redevelopment of the west end of the airport consists of several projects including site preparation, taxiway/taxilane construction, hangar construction, road relocation and parking lot construction. The airport should begin the process of securing funding now in order to obtain commitments for these projects.

SUMMARY

There is a continuous debate in communities across the country about the mission of local airports. Many communities view the local airports as assets and treat them as another department within the local government structure. Under this structure, like parks, the airport is not expected to be a profit center. Other communities view the airport as a business center where profit is the goal. Most communities settle on some combination where revenue generation is maximized and any additional funds needed come from the general operating budget of the sponsoring community.

The best means to begin implementation of the recommendations in this master plan is to first recognize that planning is a continuous process that does not end with completion and approval of this document. Rather, the airport should implement measures that allow them to track various demand indicators, such as based aircraft, hangar demand, and operations. The issues upon which this master plan is based will remain valid for a number of years. The primary goal is for the airport to best serve the air transportation needs of the region, while continuing to be economically self-sufficient.

The actual need for facilities is most appropriately established by airport activity levels rather than a specified date. For example, projections have been made as to when additional hangars may be needed at the airport. In reality, however, the timeframe in which the development is needed may be substantially different. Actual demand may be slower to develop than expected. On the other hand, high levels of demand may establish the need to accelerate development. Although every effort has been made in this master planning process to conservatively estimate when facility development may be needed, aviation demand will dictate when facility improvements need to be delayed or accelerated.

The real value of a usable master plan is in keeping the issues and objectives in the minds of the managers and decision-makers so that they are better able to recognize change and its effect. In addition to adjustments in aviation demand, decisions made as to when to undertake the improvements recommended in this master plan will impact how long the plan remains valid. The format used in this plan is intended to reduce the need for formal and costly updates by simply adjusting the timing of project implementation. Updating can be done by the manager, thereby improving the plan's effectiveness.

In summary, the planning process requires the airport management to consistently monitor the progress of the airport in terms of aircraft operations and based aircraft. Analysis of aircraft demand is critical to the timing and need for new airport facilities. The information obtained from continually monitoring airport activity will provide the data necessary to determine if the development schedule should be accelerated or delayed.

Appendix A

GLOSSARY OF TERMS

A

ABOVE GROUND LEVEL: The elevation of a point or surface above the ground.

ACCELERATE-STOP DISTANCE AVAILABLE (ASDA): See declared distances.

ADVISORY CIRCULAR: External publications issued by the FAA consisting of nonregulatory material providing for the recommendations relative to a policy, guidance and information relative to a specific aviation subject.

AIR CARRIER: An operator which: (1) performs at least five round trips per week between two or more points and publishes flight schedules which specify the times, days of the week, and places between which such flights are performed; or (2) transports mail by air pursuant to a current contract with the U.S. Postal Service. Certified in accordance with Federal Aviation Regulation (FAR) Parts 121 and 127.

AIRCRAFT: A transportation vehicle that is used or intended for use for flight.

AIRCRAFT APPROACH CATEGORY: A grouping of aircraft based on 1.3 times the stall speed in their landing configuration at their maximum certificated landing weight. The categories are as follows:

- Category A: Speed less than 91 knots.
- Category B: Speed 91 knots or more, but less than 121 knots.
- Category C: Speed 121 knots or more, but less than 141 knots.
- Category D: Speed 141 knots or more, but less than 166 knots.
- Category E: Speed greater than 166 knots.

AIRCRAFT OPERATION: The landing, takeoff, or touch-and-go procedure by an aircraft on a runway at an airport.

AIRCRAFT OPERATIONS AREA (AOA): A restricted and secure area on the airport property designed to protect all aspects related to aircraft operations.

AIRCRAFT OWNERS AND PILOTS ASSOCIATION: A private organization serving the interests and needs of general aviation pilots and aircraft owners.

AIRCRAFT RESCUE AND FIRE FIGHTING: A facility located at an airport that provides emergency vehicles, extinguishing agents, and personnel responsible for minimizing the impacts of an aircraft accident or incident.

AIRFIELD: The portion of an airport which contains the facilities necessary for the operation of aircraft.

AIRLINE HUB: An airport at which an airline concentrates a significant portion of its activity and which often has a significant amount of connecting traffic.

AIRPLANE DESIGN GROUP (ADG): A grouping of aircraft based upon wingspan. The groups are as follows:

- Group I: Up to but not including 49 feet.
- Group II: 49 feet up to but not including 79 feet.
- Group III: 79 feet up to but not including 118 feet.
- Group IV: 118 feet up to but not including 171 feet.
- Group V: 171 feet up to but not including 214 feet.
- Group VI: 214 feet or greater.

AIRPORT AUTHORITY: A quasi-governmental public organization responsible for setting the policies governing the management and operation of an airport or system of airports under its jurisdiction.

AIRPORT BEACON: A navigational aid located at an airport which displays a rotating light beam to identify whether an airport is lighted.

AIRPORT CAPITAL IMPROVEMENT PLAN: The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

AIRPORT ELEVATION: The highest point on the runway system at an airport expressed in feet above mean sea level (MSL).

AIRPORT IMPROVEMENT PROGRAM: A program authorized by the Airport and Airway

Improvement Act of 1982 that provides funding for airport planning and development.

AIRPORT LAYOUT DRAWING (ALD): The drawing of the airport showing the layout of existing and proposed airport facilities.

AIRPORT LAYOUT PLAN (ALP): A scaled drawing of the existing and planned land and facilities necessary for the operation and development of the airport.

AIRPORT LAYOUT PLAN DRAWING SET: A set of technical drawings depicting the current and future airport conditions. The individual sheets comprising the set can vary with the complexities of the airport, but the FAA-required drawings include the Airport Layout Plan (sometimes referred to as the Airport Layout Drawing (ALD), the Airport Airspace Drawing, and the Inner Portion of the Approach Surface Drawing, On-Airport Land Use Drawing, and Property Map.

AIRPORT MASTER PLAN: The planner's concept of the long-term development of an airport.

AIRPORT MOVEMENT AREA SAFETY SYSTEM: A system that provides automated alerts and warnings of potential runway incursions or other hazardous aircraft movement events.

AIRPORT OBSTRUCTION CHART: A scaled drawing depicting the Federal Aviation Regulation (FAR) Part 77 surfaces, a representation of objects that penetrate these surfaces, runway, taxiway, and ramp areas, navigational aids, buildings, roads and other detail in the vicinity of an airport.

AIRPORT REFERENCE CODE (ARC): A coding system used to relate airport design criteria to the operational (Aircraft Approach Category) to the physical characteristics (Airplane Design Group) of the airplanes intended to operate at the airport.

AIRPORT REFERENCE POINT (ARP): The latitude and longitude of the approximate center of the airport.

AIRPORT SPONSOR: The entity that is legally responsible for the management and operation of an airport, including the fulfillment of the requirements of laws and regulations related thereto.

AIRPORT SURFACE DETECTION EQUIPMENT: A radar system that provides air traffic controllers with a visual representation of the movement of aircraft and other vehicles on the ground on the airfield at an airport.

AIRPORT SURVEILLANCE RADAR: The primary radar located at an airport or in an air traffic control terminal area that receives a signal at an antenna and transmits the signal to air traffic control display equipment defining the location of aircraft in the air. The signal provides only the azimuth and range of aircraft from the location of the antenna.

AIRPORT TRAFFIC CONTROL TOWER (ATCT): A central operations facility in the terminal air traffic control system, consisting of a tower, including an associated instrument flight rule (IFR) room if radar equipped, using air/ground communications and/or radar, visual signaling and other devices to provide safe and expeditious movement of terminal air traffic.

AIR ROUTE TRAFFIC CONTROL CENTER: A facility which provides en route air traffic control service to aircraft operating on an IFR flight plan within controlled airspace over a large, multi-state region.

AIRSIDE: The portion of an airport that contains the facilities necessary for the operation of aircraft.

AIRSPACE: The volume of space above the surface of the ground that is provided for the operation of aircraft.

AIR TAXI: An air carrier certificated in accordance with FAR Part 121 and FAR Part 135 and authorized to provide, on demand, public transportation of persons and property by aircraft. Generally operates small aircraft "for hire" for specific trips.

AIR TRAFFIC CONTROL: A service operated by an appropriate organization for the purpose of providing for the safe, orderly, and expeditious flow of air traffic.

AIR ROUTE TRAFFIC CONTROL CENTER (ARTCC): A facility established to provide air traffic control service to aircraft operating on an IFR flight plan within controlled airspace and principally during the en route phase of flight.

AIR TRAFFIC CONTROL SYSTEM COMMAND CENTER: A facility operated by the FAA which is responsible for the central flow control, the central altitude reservation system, the airport reservation position system, and the air traffic service contingency command for the air traffic control system.

AIR TRAFFIC HUB: A categorization of commercial service airports or group of commercial service airports in a metropolitan or urban area based upon the proportion of annual national enplanements existing at the airport or airports. The categories are large hub, medium hub, small hub, or non-hub. It forms the basis for the apportionment of entitlement funds.

AIR TRANSPORT ASSOCIATION OF AMERICA: An organization consisting of the principal U.S. airlines that represents the interests of the airline industry on major aviation issues before federal, state, and local government bodies. It promotes air transportation safety by coordinating industry and governmental safety programs and it serves as a focal point for industry efforts to standardize practices and enhance the efficiency of the air transportation system.

ALERT AREA: See special-use airspace.

ALTITUDE: The vertical distance measured in feet above mean sea level.

ANNUAL INSTRUMENT APPROACH (AIA): An approach to an airport with the intent to land by an aircraft in accordance with an IFR flight plan when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude.

APPROACH LIGHTING SYSTEM (ALS): An airport lighting facility which provides visual guidance to landing aircraft by radiating light beams by which the pilot aligns the aircraft with the extended centerline of the runway on his final approach and landing.

APPROACH MINIMUMS: The altitude below which an aircraft may not descend while on an IFR approach unless the pilot has the runway in sight.

APPROACH SURFACE: An imaginary obstruction limiting surface defined in FAR Part 77 which is longitudinally centered on an extended runway centerline and extends outward and upward from the primary surface at each end of a runway at a designated slope and distance based upon the type of available or planned approach by aircraft to a runway.

APRON: A specified portion of the airfield used for passenger, cargo or freight loading and unloading, aircraft parking, and the refueling, maintenance and servicing of aircraft.

AREA NAVIGATION: The air navigation procedure that provides the capability to establish and maintain a flight path on an arbitrary course that remains within the coverage area of navigational sources being used.

AUTOMATED TERMINAL INFORMATION SERVICE (ATIS): The continuous broadcast of recorded non-control information at towered airports. Information typically includes wind speed, direction, and runway in use.

AUTOMATED SURFACE OBSERVATION SYSTEM (ASOS): A reporting system that provides frequent airport ground surface weather observation data through digitized voice broadcasts and printed reports.

AUTOMATIC WEATHER OBSERVATION STATION (AWOS): Equipment used to automatically record weather conditions (i.e. cloud height, visibility, wind speed and direction, temperature, dew point, etc.)

AUTOMATIC DIRECTION FINDER (ADF): An aircraft radio navigation system which senses and indicates the direction to a non-directional radio beacon (NDB) ground transmitter.

AVIGATION EASEMENT: A contractual right or a property interest in land over which a right of unobstructed flight in the airspace is established.

AZIMUTH: Horizontal direction expressed as the angular distance between true north and the direction of a fixed point (as the observer's heading).

B

BASE LEG: A flight path at right angles to the landing runway off its approach end. The base leg normally extends from the downwind leg to the intersection of the extended runway centerline. See "traffic pattern."

BASED AIRCRAFT: The general aviation aircraft that use a specific airport as a home base.

BEARING: The horizontal direction to or from any point, usually measured clockwise from true north or magnetic north.

BLAST FENCE: A barrier used to divert or dissipate jet blast or propeller wash.

BLAST PAD: A prepared surface adjacent to the end of a runway for the purpose of eliminating the erosion of the ground surface by the wind forces produced by airplanes at the initiation of takeoff operations.

BUILDING RESTRICTION LINE (BRL): A line which identifies suitable building area locations on the airport.

C

CAPITAL IMPROVEMENT PLAN: The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute Airport Improvement Program funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

CARGO SERVICE AIRPORT: An airport served by aircraft providing air transportation of property only, including mail, with an annual aggregate landed weight of at least 100,000,000 pounds.

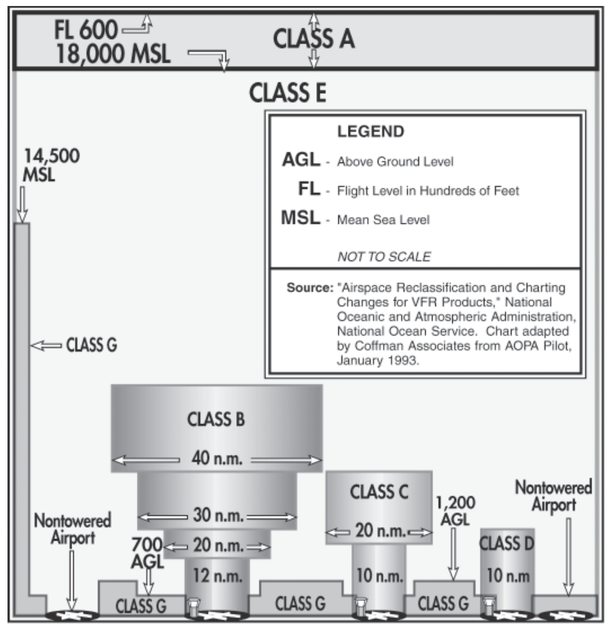
CATEGORY I: An Instrument Landing System (ILS) that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 100 feet above the horizontal plane containing the runway threshold.

CATEGORY II: An ILS that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 50 feet above the horizontal plane containing the runway threshold.

CATEGORY III: An ILS that provides acceptable guidance information to a pilot from the coverage limits of the ILS with no decision height specified above the horizontal plane containing the runway threshold.

CEILING: The height above the ground surface to the location of the lowest layer of clouds which is reported as either broken or overcast.

CIRCLING APPROACH: A maneuver initiated by the pilot to align the aircraft with the runway for landing when flying a predetermined circling instrument approach under IFR.



CLASS A AIRSPACE: See Controlled Airspace.

CLASS B AIRSPACE: See Controlled Airspace.

CLASS C AIRSPACE: See Controlled Airspace.

CLASS D AIRSPACE: See Controlled Airspace.

CLASS E AIRSPACE: See Controlled Airspace.

CLASS G AIRSPACE: See Controlled Airspace.

CLEAR ZONE: See Runway Protection Zone.

COMMERCIAL SERVICE AIRPORT: A public airport providing scheduled passenger service that enplanes at least 2,500 annual passengers.

COMMON TRAFFIC ADVISORY FREQUENCY: A radio frequency identified in the appropriate aeronautical chart which is designated for the purpose of transmitting airport advisory information and procedures while operating to or from an uncontrolled airport.

COMPASS LOCATOR (LOM): A low power, low/medium frequency radio-beacon installed in conjunction with the instrument landing system at one or two of the marker sites.

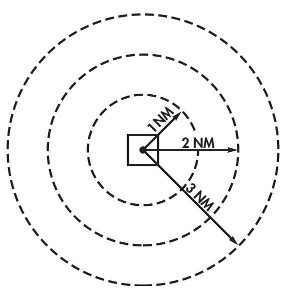
CONICAL SURFACE: An imaginary obstruction-limiting surface defined in FAR Part 77 that extends from the edge of the horizontal surface outward and upward at a slope of 20 to 1 for a horizontal distance of 4,000 feet.

CONTROLLED AIRPORT: An airport that has an operating airport traffic control tower.

CONTROLLED AIRSPACE: Airspace of defined dimensions within which air traffic control services are provided to instrument flight rules (IFR) and visual flight rules (VFR) flights in accordance with the airspace classification. Controlled airspace in the United States is designated as follows:

- **CLASS A**: Generally, the airspace from 18,000 feet mean sea level (MSL) up to but not including flight level FL600. All persons must operate their aircraft under IFR.

- **CLASS B**: Generally, the airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports. The configuration of Class B airspace is unique to each airport, but typically consists of two or more layers of air space and is designed to contain all published instrument approach procedures to the airport. An air traffic control clearance is required for all aircraft to operate in the area.



- **CLASS C**: Generally, the airspace from the surface to 4,000 feet above the airport elevation (charted as MSL) surrounding those airports that have an operational control tower and radar approach control and are served by a qualifying number of IFR operations or passenger enplanements. Although individually tailored for each airport, Class C airspace typically consists of a surface area with a five nautical mile (nm) radius and an outer area with a 10 nautical mile radius that extends from 1,200 feet to 4,000 feet above the airport elevation. Two-way radio communication is required for all aircraft.

- **CLASS D**: Generally, that airspace from the surface to 2,500 feet above the air port elevation (charted as MSL) surrounding those airports that have an operational control tower. Class D airspace is individually tailored and configured to encompass published instrument approach procedure . Unless otherwise authorized, all persons must establish two-way radio communication.

- **CLASS E**: Generally, controlled airspace that is not classified as Class A, B, C, or D. Class E airspace extends upward 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 encompasses all Victor Airways. Only aircraft following instrument flight rules are required to establish two-way radio communication with air traffic control.

- **CLASS G**: Generally, that airspace not classified as Class A, B, C, D, or E. Class G airspace is uncontrolled for all aircraft. Class G airspace extends from the surface to the overlying Class E airspace.

CONTROLLED FIRING AREA: See special-use airspace.

CROSSWIND: A wind that is not parallel to a runway centerline or to the intended flight path of an aircraft.

CROSSWIND COMPONENT: The component of wind that is at a right angle to the runway centerline or the intended flight path of an aircraft.

CROSSWIND LEG: A flight path at right angles to the landing runway off its upwind end. See "traffic pattern."

D

DECIBEL: A unit of noise representing a level relative to a reference of a sound pressure 20 micro newtons per square meter.

DECISION HEIGHT: The height above the end of the runway surface at which a decision must be made by a pilot during the ILS or Precision Approach Radar approach to either continue the approach or to execute a missed approach.

DECLARED DISTANCES: The distances declared available for the airplane's takeoff runway, takeoff distance, accelerate-stop distance, and landing distance requirements. The distances are:

- **TAKEOFF RUNWAY AVAILABLE (TORA)**: The runway length declared available and suitable for the ground run of an airplane taking off.
- **TAKEOFF DISTANCE AVAILABLE (TODA)**: The TORA plus the length of any remaining runway and/or clear way beyond the far end of the TORA.
- **ACCELERATE-STOP DISTANCE AVAILABLE (ASDA)**: The runway plus stopway length declared available for the acceleration and deceleration of an aircraft aborting a takeoff.
- **LANDING DISTANCE AVAILABLE (LDA)**: The runway length declared available and suitable for landing.

DEPARTMENT OF TRANSPORTATION: The cabinet level federal government organization consisting of modal operating agencies, such as the Federal Aviation Administration, which was established to promote the coordination of federal transportation programs and to act as a focal point for research and development efforts in transportation.

DISCRETIONARY FUNDS: Federal grant funds that may be appropriated to an airport based upon designation by the Secretary of Transportation or Congress to meet a specified national priority such as enhancing capacity, safety, and security, or mitigating noise.

DISPLACED THRESHOLD: A threshold that is located at a point on the runway other than the designated beginning of the runway.

DISTANCE MEASURING EQUIPMENT (DME): Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.

DNL: The 24-hour average sound level, in Aweighted decibels, obtained after the addition of ten decibels to sound levels for the periods between 10 p.m. and 7 a.m. as averaged over a span of one year. It is the FAA standard metric for determining the cumulative exposure of individuals to noise.

DOWNWIND LEG: A flight path parallel to the landing runway in the direction opposite to landing. The downwind leg normally extends between the crosswind leg and the base leg. Also see "traffic pattern."

E

EASEMENT: The legal right of one party to use a portion of the total rights in real estate owned by another party. This may include the right of passage over, on, or below the property; certain air rights above the property, including view rights; and the rights to any specified form of development or activity, as well as any other legal rights in the property that may be specified in the easement document.

ELEVATION: The vertical distance measured in feet above mean sea level.

ENPLANED PASSENGERS: The total number of revenue passengers boarding aircraft, including originating, stop-over, and transfer passengers, in scheduled and nonscheduled services.

ENPLANEMENT: The boarding of a passenger, cargo, freight, or mail on an aircraft at an airport.

ENTITLEMENT: Federal funds for which a commercial service airport may be eligible based upon its annual passenger enplanements.

ENVIRONMENTAL ASSESSMENT (EA): An environmental analysis performed pursuant to the National Environmental Policy Act to determine whether an action would significantly affect the environment and thus require a more detailed environmental impact statement.

ENVIRONMENTAL AUDIT: An assessment of the current status of a party's compliance with applicable environmental requirements of a party's environmental compliance policies, practices, and controls.

ENVIRONMENTAL IMPACT STATEMENT (EIS): A document required of federal agencies by the National Environmental Policy Act for major projects are legislative proposals affecting the environment. It is a tool for decision-making describing the positive and negative effects of a proposed action and citing alternative actions.

ESSENTIAL AIR SERVICE: A federal program which guarantees air carrier service to selected small cities by providing subsidies as needed to prevent these cities from such service.

F

FEDERAL AVIATION REGULATIONS: The general and permanent rules established by the executive departments and agencies of the Federal Government for aviation, which are published in the Federal Register. These are the aviation subset of the Code of Federal Regulations.

FEDERAL INSPECTION SERVICES: The provision of customs and immigration services including passport inspection, inspection of baggage, the collection of duties on certain imported items, and the inspections for agricultural products, illegal drugs, or other restricted items.

FINAL APPROACH: A flight path in the direction of landing along the extended runway centerline. The final approach normally extends from the base leg to the runway. See "traffic pattern."

FINAL APPROACH AND TAKEOFF AREA (FATO). A defined area over which the final phase of the helicopter approach to a hover, or a landing is completed and from which the takeoff is initiated.

FINAL APPROACH FIX: The designated point at which the final approach segment for an aircraft landing on a runway begins for a non-precision approach.

FINDING OF NO SIGNIFICANT IMPACT (FONSI): A public document prepared by a Federal agency that presents the rationale why a proposed action will not have a significant effect on the environment and for which an environmental impact statement will not be prepared.

FIXED BASE OPERATOR (FBO): A provider of services to users of an airport. Such services include, but are not limited to, hangaring, fueling, flight training, repair, and maintenance.

FLIGHT LEVEL: A designation for altitude within controlled airspace.

FLIGHT SERVICE STATION: An operations facility in the national flight advisory system which utilizes data interchange facilities for the collection and dissemination of Notices to Airmen, weather, and administrative data and which provides pre-flight and in-flight advisory services to pilots through air and ground based communication facilities.

FRANGIBLE NAVAID: A navigational aid which retains its structural integrity and stiffness up to a designated maximum load, but on impact from a greater load, breaks, distorts, or yields in such a manner as to present the minimum hazard to aircraft.

G

GENERAL AVIATION: That portion of civil aviation which encompasses all facets of aviation except air carriers holding a certificate of convenience and necessity, and large aircraft commercial operators.

GENERAL AVIATION AIRPORT: An airport that provides air service to only general aviation.

GLIDESLOPE (GS): Provides vertical guidance for aircraft during approach and landing. The glideslope consists of the following:

1. Electronic components emitting signals which provide vertical guidance by reference to airborne instruments during instrument approaches such as ILS; or

2. Visual ground aids, such as VASI, which provide vertical guidance for VFR approach or for the visual portion of an instrument approach and landing.

GLOBAL POSITIONING SYSTEM (GPS): A system of 24 satellites used as reference points to enable navigators equipped with GPS receivers to determine their latitude, longitude, and altitude.

GROUND ACCESS: The transportation system on and around the airport that provides access to and from the airport by ground transportation vehicles for passengers, employees, cargo, freight, and airport services.

H

HELIPAD: A designated area for the takeoff, landing, and parking of helicopters.

HIGH INTENSITY RUNWAY LIGHTS: The highest classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

HIGH-SPEED EXIT TAXIWAY: A long radius taxiway designed to expedite aircraft turning off the runway after landing (at speeds to 60 knots), thus reducing runway occupancy time.

HORIZONTAL SURFACE: An imaginary obstruction- limiting surface defined in FAR Part 77 that is specified as a portion of a horizontal plane surrounding a runway located 150 feet above the established airport elevation. The specific horizontal dimensions of this surface are a function of the types of approaches existing or planned for the runway.

I

INITIAL APPROACH FIX: The designated point at which the initial approach segment begins for an instrument approach to a runway.

INSTRUMENT APPROACH PROCEDURE: A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing, or to a point from which a landing may be made visually.

INSTRUMENT FLIGHT RULES (IFR): Procedures for the conduct of flight in weather conditions below Visual Flight Rules weather minimums. The term IFR is often also used to define weather conditions and the type of flight plan under which an aircraft is operating.

INSTRUMENT LANDING SYSTEM (ILS): A precision instrument approach system which normally consists of the following electronic components and visual aids:

1. Localizer.
2. Glide Slope.
3. Outer Marker.
4. Middle Marker.
5. Approach Lights.

INSTRUMENT METEOROLOGICAL CONDITIONS: Meteorological conditions expressed in terms of specific visibility and ceiling conditions that are less than the minimums specified for visual meteorological conditions.

ITINERANT OPERATIONS: Operations by aircraft that are not based at a specified airport.

K

KNOTS: A unit of speed length used in navigation that is equivalent to the number of nautical miles traveled in one hour.

L

LANDSIDE: The portion of an airport that provides the facilities necessary for the processing of passengers, cargo, freight, and ground transportation vehicles.

LANDING DISTANCE AVAILABLE (LDA): See declared distances.

LARGE AIRPLANE: An airplane that has a maximum certified takeoff weight in excess of 12,500 pounds.

LOCAL AREA AUGMENTATION SYSTEM: A differential GPS system that provides localized measurement correction signals to the basic GPS signals to improve navigational accuracy integrity, continuity, and availability.

LOCAL OPERATIONS: Aircraft operations performed by aircraft that are based at the airport and that operate in the local traffic pattern or within sight of the airport, that are known to be departing for or arriving from flights in local practice areas within a prescribed distance from the airport, or that execute simulated instrument approaches at the airport.

LOCAL TRAFFIC: Aircraft operating in the traffic pattern or within sight of the tower, or aircraft known to be departing or arriving from the local practice areas, or aircraft executing practice instrument approach procedures. Typically, this includes touch and-go training operations.

LOCALIZER: The component of an ILS which provides course guidance to the runway.

LOCALIZER TYPE DIRECTIONAL AID (LDA): A facility of comparable utility and accuracy to a localizer, but is not part of a complete ILS and is not aligned with the runway.

LONG RANGE NAVIGATION SYSTEM (LORAN): Long range navigation is an electronic navigational aid which determines aircraft position and speed by measuring the difference in the time of reception of synchronized pulse signals from two fixed transmitters. Loran is used for en route navigation.

LOW INTENSITY RUNWAY LIGHTS: The lowest clas- sification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

M

MEDIUM INTENSITY RUNWAY LIGHTS: The middle classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

MICROWAVE LANDING SYSTEM (MLS): An instrument approach and landing system that provides precision guidance in azimuth, elevation, and distance measurement.

MILITARY OPERATIONS: Aircraft operations that are performed in military aircraft.

MILITARY OPERATIONS AREA (MOA): See special-use airspace

MILITARY TRAINING ROUTE: An air route depicted on aeronautical charts for the conduct of military flight training at speeds above 250 knots.

MISSED APPROACH COURSE (MAC): The flight route to be followed if, after an instrument approach, a landing is not affected, and occurring normally:

1. When the aircraft has descended to the decision height and has not established visual contact; or

2. When directed by air traffic control to pull up or to go around again.

MOVEMENT AREA: The runways, taxiways, and other areas of an airport which are utilized for taxiing/hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. At those airports with a tower, air traffic control clearance is required for entry onto the movement area.

N

NATIONAL AIRSPACE SYSTEM: The network of air traffic control facilities, air traffic control areas, and navigational facilities through the U.S.

NATIONAL PLAN OF INTEGRATED AIRPORT SYSTEMS: The national airport system plan developed by the Secretary of Transportation on a biannual basis for the development of public use airports to meet national air transportation needs.

NATIONAL TRANSPORTATION SAFETY BOARD: A federal government organization established to investigate and determine the probable cause of transportation accidents, to recommend equipment and procedures to enhance transportation safety, and to review on appeal the suspension or revocation of any certificates or licenses issued by the Secretary of Transportation.

NAUTICAL MILE: A unit of length used in navigation which is equivalent to the distance spanned by one minute of arc in latitude, that is, 1,852 meters or 6,076 feet. It is equivalent to approximately 1.15 statute mile.

NAVAID: A term used to describe any electrical or visual air navigational aids, lights, signs, and associated supporting equipment (i.e. PAPI, VASI, ILS, etc.)

NAVIGATIONAL AID: A facility used as, available for use as, or designed for use as an aid to air navigation.

NOISE CONTOUR: A continuous line on a map of the airport vicinity connecting all points of the same noise exposure level.

NON-DIRECTIONAL BEACON (NDB): A beacon transmitting nondirectional signals whereby the pilot of an aircraft equipped with direction finding equipment can determine his or her bearing to and from the radio beacon and home on, or track to, the station. When the radio beacon is installed in conjunction with the Instrument Landing System marker, it is normally called a Compass Locator.

NON-PRECISION APPROACH PROCEDURE: A standard instrument approach procedure in which no electronic glide slope is provided, such as VOR, TACAN, NDB, or LOC.

NOTICE TO AIRMEN: A notice containing information concerning the establishment, condition, or change in any component of or hazard in the National Airspace System, the timely knowledge of which is considered essential to personnel concerned with flight operations.

O

OBJECT FREE AREA (OFA): An area on the ground centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

OBSTACLE FREE ZONE (OFZ): The airspace below 150 feet above the established airport elevation and along the runway and extended runway centerline that is required to be kept clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function, in order to provide clearance for aircraft landing or taking off from the runway, and for missed approaches.

ONE-ENGINE INOPERABLE SURFACE: A surface emanating from the runway end at a slope ratio of 62.5:1. Air carrier airports are required to maintain a technical drawing of this surface depicting any object penetrations by January 1, 2010.

OPERATION: The take-off, landing, or touch-and-go procedure by an aircraft on a runway at an airport.

OUTER MARKER (OM): An ILS navigation facility in the terminal area navigation system located four to seven miles from the runway edge on the extended centerline, indicating to the pilot that he/she is passing over the facility and can begin final approach.

P

PILOT CONTROLLED LIGHTING: Runway lighting systems at an airport that are controlled by activating the microphone of a pilot on a specified radio frequency.

PRECISION APPROACH: A standard instrument approach procedure which provides runway alignment and glide slope (descent) information. It is categorized as follows:

- **CATEGORY I (CAT I)**: A precision approach which provides for approaches with a decision height of not less than 200 feet and visibility not less than 1/2 mile or Runway Visual Range (RVR) 2400 (RVR 1800) with operative touchdown zone and runway centerline lights.

- **CATEGORY II (CAT II)**: A precision approach which provides for approaches with a decision height of not less than 100 feet and visibility not less than 1200 feet RVR.

- **CATEGORY III (CAT III)**: A precision approach which provides for approaches with minima less than Category II.

PRECISION APPROACH PATH INDICATOR (PAPI): A lighting system providing visual approach slope guidance to aircraft during a landing approach. It is similar to a VASI but provides a sharper transition between the colored indicator lights.

PRECISION APPROACH RADAR: A radar facility in the terminal air traffic control system used to detect and display with a high degree of accuracy the direction, range, and elevation of an aircraft on the final approach to a runway.

PRECISION OBJECT FREE AREA (POFA): An area centered on the extended runway centerline, beginning at the runway threshold and extending behind the runway threshold that is 200 feet long by 800 feet wide. The POFA is a clearing standard which requires the POFA to be kept clear of above ground objects protruding above the runway safety area edge elevation (except for frangible NAVAIDS). The POFA applies to all new authorized instrument approach procedures with less than 3/4 mile visibility.

PRIMARY AIRPORT: A commercial service airport that enplanes at least 10,000 annual passengers.

PRIMARY SURFACE: An imaginary obstruction limiting surface defined in FAR Part 77 that is specified as a rectangular surface longitudinally centered about a runway. The specific dimensions of this surface are a function of the types of approaches existing or planned for the runway.

PROHIBITED AREA: See special-use airspace.

PVC: Poor visibility and ceiling. Used in determining Annual Service Volume. PVC conditions exist when the cloud ceiling is less than 500 feet and visibility is less than one mile.

R

RADIAL: A navigational signal generated by a Very High Frequency Omni-directional Range or VORTAC station that is measured as an azimuth from the station.

REGRESSION ANALYSIS: A statistical technique that seeks to identify and quantify the relationships between factors associated with a forecast.

REMOTE COMMUNICATIONS OUTLET (RCO): An unstaffed transmitter receiver/facility remotely controlled by air traffic personnel. RCOs serve flight service stations (FSSs). RCOs were established to provide ground-to-ground communications between air traffic control specialists and pilots at satellite airports for delivering en route clearances, issuing departure authorizations, and acknowledging instrument flight rules cancellations or departure/landing times.

REMOTE TRANSMITTER/RECEIVER (RTR): See remote communications outlet. RTRs serve ARTCCs.

RELIEVER AIRPORT: An airport to serve general aviation aircraft which might otherwise use a congested air-carrier served airport.

RESTRICTED AREA: See special-use airspace.

RNAV: Area navigation - airborne equipment which permits flights over determined tracks within prescribed accuracy tolerances without the need to overfly ground-based navigation facilities. Used en route and for approaches to an airport.

RUNWAY: A defined rectangular area on an airport prepared for aircraft landing and takeoff. Runways are normally numbered in relation to their magnetic direction, rounded off to the nearest 10 degrees. For example, a runway with a magnetic heading of 180 would be designated Runway 18. The runway heading on the opposite end of the runway is 180 degrees from that runway end. For example, the opposite runway heading for Runway 18 would be Runway 36 (magnetic heading of 360). Aircraft can takeoff or land from either end of a runway, depending upon wind direction.

RUNWAY ALIGNMENT INDICATOR LIGHT: A series of high intensity sequentially flashing lights installed on the extended centerline of the runway usually in conjunction with an approach lighting system.

RUNWAY DESIGN CODE: A code signifiying the design standards to which the runway is to be built.

RUNWAY END IDENTIFICATION LIGHTING (REIL): Two synchronized flashing lights, one on each side of the runway threshold, which provide rapid and positive identification of the approach end of a particular runway.

RUNWAY GRADIENT: The average slope, measured in percent, between the two ends of a runway.

RUNWAY PROTECTION ZONE (RPZ): An area off the runway end to enhance the protection of people and property on the ground. The RPZ is trapezoidal in shape. Its dimensions are determined by the aircraft approach speed and runway approach type and minima.

RUNWAY REFERENCE CODE: A code signifying the current operational capabilities of a runway and associated taxiway.

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

RUNWAY VISIBILITY ZONE (RVZ): An area on the airport to be kept clear of permanent objects so that there is an unobstructed line of- site from any point five feet above the runway centerline to any point five feet above an intersecting runway centerline.

RUNWAY VISUAL RANGE (RVR): An instrumentally derived value, in feet, representing the horizontal distance a pilot can see down the runway from the runway end.

S

SCOPE: The document that identifies and defines the tasks, emphasis, and level of effort associated with a project or study.

SEGMENTED CIRCLE: A system of visual indicators designed to provide traffic pattern information at airports without operating control towers.

SHOULDER: An area adjacent to the edge of paved runways, taxiways, or aprons providing a transition between the pavement and the adjacent surface; support for aircraft running off the pavement; enhanced drainage; and blast protection. The shoulder does not necessarily need to be paved.

SLANT-RANGE DISTANCE: The straight line distance between an aircraft and a point on the ground.

SMALL AIRPLANE: An airplane that has a maximum certified takeoff weight of up to 12,500 pounds.

SPECIAL-USE AIRSPACE: Airspace of defined dimensions identified by a surface area wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon aircraft operations that are not a part of those activities. Special-use airspace classifications include:

- **ALERT AREA**: Airspace which may contain a high volume of pilot training activities or an unusual type of aerial activity, neither of which is hazardous to aircraft.

- **CONTROLLED FIRING AREA**: Airspace wherein activities are conducted under conditions so controlled as to eliminate hazards to nonparticipating aircraft and to ensure the safety of persons or property on the ground.

- **MILITARY OPERATIONS AREA (MOA)**: Designated airspace with defined vertical and lateral dimensions established outside Class A airspace to separate/segregate certain military activities from instrument flight rule (IFR) traffic and to identify for visual flight rule (VFR) traffic where these activities are conducted.

- **PROHIBITED AREA**: Designated airspace within which the flight of aircraft is prohibited.

- **RESTRICTED AREA**: Airspace designated under Federal Aviation Regulation (FAR) 73, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Most restricted areas are designated joint use. When not in use by the using agency, IFR/VFR operations can be authorized by the controlling air traffic control facility.

- **WARNING AREA**: Airspace which may contain hazards to nonparticipating aircraft.

STANDARD INSTRUMENT DEPARTURE (SID): A preplanned coded air traffic control IFR departure routing, preprinted for pilot use in graphic and textual form only.

STANDARD INSTRUMENT DEPARTURE PROCEDURES: A published standard flight procedure to be utilized following takeoff to provide a transition between the airport and the terminal area or en route airspace.

STANDARD TERMINAL ARRIVAL ROUTE (STAR): A preplanned coded air traffic control IFR arrival routing, preprinted for pilot use in graphic and textual or textual form only.

STOP-AND-GO: A procedure wherein an aircraft will land, make a complete stop on the runway, and then commence a takeoff from that point. A stop-and-go is recorded as two operations: one operation for the landing and one operation for the takeoff.

STOPWAY: An area beyond the end of a takeoff runway that is designed to support an aircraft during an aborted takeoff without causing structural damage to the aircraft. It is not to be used for takeoff, landing, or taxiing by aircraft.

STRAIGHT-IN LANDING/APPROACH: A landing made on a runway aligned within 30 degrees of the final approach course following completion of an instrument approach.

T

TACTICAL AIR NAVIGATION (TACAN): An ultrahigh frequency electronic air navigation system which provides suitably-equipped aircraft a continuous indication of bearing and distance to the TACAN station.

TAKEOFF RUNWAY AVAILABLE (TORA): See declared distances.

TAKEOFF DISTANCE AVAILABLE (TODA): See declared distances.

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 an airport to another.

TAXIWAY DESIGN GROUP: A classification of airplanes based on outer to outer Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance.

TAXIWAY SAFETY AREA (TSA): A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway.

TERMINAL INSTRUMENT PROCEDURES: Published flight procedures for conducting instrument approaches to runways under instrument meteorological conditions.

TERMINAL RADAR APPROACH CONTROL: An element of the air traffic control system responsible for monitoring the en-route and terminal segment of air traffic in the airspace surrounding airports with moderate to high levels of air traffic.

TETRAHEDRON: A device used as a landing direction indicator. The small end of the tetrahedron points in the direction of landing.

THRESHOLD: The beginning of that portion of the runway available for landing. In some instances the landing threshold may be displaced.

TOUCH-AND-GO: An operation by an aircraft that lands and departs on a runway without stopping or exiting the runway. A touch-and go is recorded as two operations: one operation for the landing and one operation for the takeoff.

TOUCHDOWN: The point at which a landing aircraft makes contact with the runway surface.

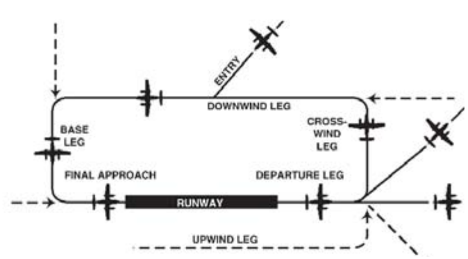
TOUCHDOWN AND LIFT-OFF AREA (TLOF): A load bearing, generally paved area, normally centered in the FATO, on which the helicopter lands or takes off.

TOUCHDOWN ZONE (TDZ): The first 3,000 feet of the runway beginning at the threshold.

TOUCHDOWN ZONE ELEVATION (TDZE): The highest elevation in the touchdown zone.

TOUCHDOWN ZONE (TDZ) LIGHTING: Two rows of transverse light bars located symmetrically about the runway centerline normally at 100- foot intervals. The basic system extends 3,000 feet along the runway.

TRAFFIC PATTERN: The traffic flow that is prescribed for aircraft landing at or taking off from an airport. The components of a typical traffic pattern are the upwind leg, crosswind leg, downwind leg, base leg, and final approach.



U

UNCONTROLLED AIRPORT: An airport without an air traffic control tower at which the control of Visual Flight Rules traffic is not exercised.

UNCONTROLLED AIRSPACE: Airspace within which aircraft are not subject to air traffic control.

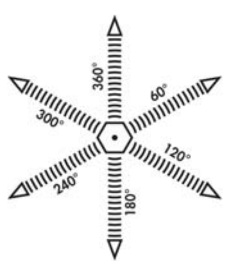
UNIVERSAL COMMUNICATION (UNICOM): A nongovernment communication facility which may provide airport information at certain airports. Locations and frequencies of UNICOM's are shown on aeronautical charts and publications.

UPWIND LEG: A flight path parallel to the landing runway in the direction of landing. See "traffic pattern."

V

VECTOR: A heading issued to an aircraft to provide navigational guidance by radar.

VERY HIGH FREQUENCY/ OMNIDIRECTIONAL RANGE (VOR): A ground-based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the national airspace system. The VOR periodically identifies itself by Morse Code and may have an additional voice identification feature.



VERY HIGH FREQUENCY OMNI-DIRECTIONAL RANGE/ TACTICAL AIR NAVIGATION (VORTAC): A navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance-measuring equipment (DME) at one site.

VICTOR AIRWAY: A control area or portion thereof established in the form of a corridor, the centerline of which is defined by radio navigational aids.

VISUAL APPROACH: An approach wherein an aircraft on an IFR flight plan, operating in VFR conditions under the control of an air traffic control facility and having an air traffic control authorization, may proceed to the airport of destination in VFR conditions.

VISUAL APPROACH SLOPE INDICATOR (VASI): An airport lighting facility providing vertical visual approach slope guidance to aircraft during approach to landing by radiating a directional pattern of high intensity red and white focused light beams which indicate to the pilot that he is on path if he sees red/white, above path if white/white, and below path if red/red. Some airports serving large aircraft have three-bar VASI's which provide two visual guide paths to the same runway.

VISUAL FLIGHT RULES (VFR): Rules that govern the procedures for conducting flight under visual conditions. The term VFR is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.

VISUAL METEOROLOGICAL CONDITIONS: Meteorological conditions expressed in terms of specific visibility and ceiling conditions which are equal to or greater than the threshold values for instrument meteorological conditions.

VOR: See "Very High Frequency Omnidirectional Range Station."

VORTAC: See "Very High Frequency Omnidirectional Range Station/Tactical Air Navigation."

W

WARNING AREA: See special-use airspace.

WIDE AREA AUGMENTATION SYSTEM: An enhancement of the Global Positioning System that includes integrity broadcasts, differential corrections, and additional ranging signals for the purpose of providing the accuracy, integrity, availability, and continuity required to support all phases of flight.

AC: advisory circular

ADF: automatic direction finder

ADG: airplane design group

AFSS: automated flight service station

AGL: above ground level

AIA: annual instrument approach

AIP: Airport Improvement Program

AIR-21: Wendell H. Ford Aviation Investment and Reform Act for the 21st Century

ALS: approach lighting system

ALSF-1: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT I configuration)

ALSF-2: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT II configuration)

AOA: Aircraft Operation Area

APV: instrument approach procedure with vertical guidance

ARC: airport reference code

ARFF: aircraft rescue and fire fighting

ARP: airport reference point

ARTCC: air route traffic control center

ASDA: accelerate-stop distance available

ASR: airport surveillance radar

ASOS: automated surface observation station

ATCT: airport traffic control tower

ATIS: automated terminal information service

AVGAS: aviation gasoline - typically 100 low lead (100L)

AWOS: automatic weather observation station

BRL: building restriction line

CFR: Code of Federal Regulation

CIP: capital improvement program

DME: distance measuring equipment

DNL: day-night noise level

DWL: runway weight bearing capacity of aircraft with dual-wheel type landing gear

DTWL: runway weight bearing capacity of aircraft with dual-tandem type landing gear

FAA: Federal Aviation Administration

FAR: Federal Aviation Regulation

FBO: fixed base operator

FY: fiscal year

GPS: global positioning system

GS: glide slope

HIRL: high intensity runway edge lighting

IFR: instrument flight rules (FAR Part 91)

ILS: instrument landing system

IM: inner marker

LDA: localizer type directional aid

LDA: landing distance available

LIRL: low intensity runway edge lighting

LMM: compass locator at ILS outer marker

LORAN: long range navigation

MALS: midium intensity approach lighting system with indicator lights

MIRL: medium intensity runway edge lighting

MITL: medium intensity taxiway edge lighting

MLS: microwave landing system

MM: middle marker

MOA: military operations area

MSL: mean sea level

NAVAID: navigational aid

NDB: nondirectional radio beacon

NM: nautical mile (6,076.1 feet)

NPES: National Pollutant Discharge Elimination System

NPIAS: National Plan of Integrated Airport Systems

NPRM: notice of proposed rule making

ODALS: omnidirectional approach lighting system

OFA: object free area

OFZ: obstacle free zone

OM: outer marker

PAC: planning advisory committee

PAPI: precision approach path indicator

PFC: porous friction course

PFC: passenger facility charge

PCL: pilot-controlled lighting

PIW public information workshop

PLASI: pulsating visual approach slope indicator

POFA: precision object free area

PVASI: pulsating/steady visual approach slope indicator

PVC: poor visibility and ceiling

RCO: remote communications outlet

RRC: Runway Reference Code

RDC: Runway Design Code

REIL: runway end identification lighting

RNAV: area navigation

RPZ: runway protection zone

RSA: runway safety area

RTR: remote transmitter/receiver

RVR: runway visibility range

RVZ: runway visibility zone

SALS: short approach lighting system

SASP: state aviation system plan

SEL: sound exposure level

SID: standard instrument departure

SM: statute mile (5,280 feet)

SRE: snow removal equipment

SSALF: simplified short approach lighting system with runway alignment indicator lights

STAR: standard terminal arrival route

SWL: runway weight bearing capacity for aircraft with single-wheel tandem type landing gear

TACAN: tactical air navigational aid

TAF: Federal Aviation Administration (FAA) Terminal Area Forecast

TDG: Taxiway Design Group

TLOF: Touchdown and lift-off

TDZ: touchdown zone

TDZE: touchdown zone elevation

TODA: takeoff distance available

TORA: takeoff runway available

TRACON: terminal radar approach control

VASI: visual approach slope indicator

VFR: visual flight rules (FAR Part 91)

VHF: very high frequency

VOR: very high frequency omni-directional range

VORTAC: VOR and TACAN collocated

Appendix B

AIR CARRIER ANALYSIS
14 CFR PART 139

Appendix B
AIR CARRIER ANALYSIS
14 CFR PART 139

Los Alamos Airport

Prior to June 9, 2004, Title 14 of the Code of Federal Regulations (CFR) Part 139 applied to airports that had scheduled or unscheduled air carrier operations in aircraft with a seating capacity of more than 30 passenger seats. Under the 2004 amendments, 14 CFR Part 139 also now applies to airports with scheduled air carrier operations in aircraft with a seating capacity of more than nine passenger seats. If an airport has only unscheduled air carrier operations in aircraft with a seating capacity of less than 31 passenger seats, Part 139 does not apply.

Previously, airports were issued an Airport Operating Certificate (AOC) or a Limited Airport Operating Certificate (LOAC) corresponding to either scheduled or unscheduled air carrier operations. These certificates have now been replaced with a single AOC that covers operation of a Class I, II, III, or IV airport. The class of airport is determined by the seating capacity of the air carrier aircraft and the schedule of service. The class of airport will be discussed in detail later in this document.

The purpose of this report is to analyze potential compliance with these new regulations as they apply to Los Alamos Airport. This report summarizes each section of the 14 CFR Part 139 regulations and what would need to be done at Los Alamos Airport to comply with this regulation.

CLASSIFICATION

In order to apply for an AOC, the airport must provide written documentation to the Federal Aviation Administration (FAA) Northwest Mountain Region Airports Division that there is currently air carrier service or that air carrier service will begin on a certain date. Without air carrier service, this regulation does not apply. During periods when there is no air carrier service, the airport's AOC becomes inactive.

As mentioned above, the 14 CFR Part 139 certification requirements applicable to Los Alamos Airport will relate to the type of aircraft serving the airport. In helping to define the airport's class, it is important to understand the distinction between the definition of large and small air carrier aircraft.

- A large air carrier aircraft is designed for 31 passenger seats or more.
- A small air carrier aircraft is designed for 10 to 30 passenger seats.

Note: 14 CFR Part 139 does not apply to airports served by scheduled air carrier aircraft with nine seats or less and/or unscheduled air carrier aircraft with 30 seats or less.

14 CFR Part 139 defines four airport classifications as follows:

- **Class I** - an airport certificated to serve scheduled operations of large air carrier aircraft that also can serve unscheduled passenger operations of large air carrier aircraft and/or scheduled operations of small air carrier aircraft. A Class I airport may serve any class of air carrier operations.
- **Class II** - an airport certificated to serve scheduled operations of small air carrier aircraft and the unscheduled passenger operations of large air carrier aircraft. A Class II airport cannot serve scheduled large air carrier aircraft.
- **Class III** - an airport certificated to serve scheduled operations of small air carrier aircraft. A Class III airport cannot serve scheduled or unscheduled large air carrier aircraft.
- **Class IV** - an airport certificated to serve unscheduled passenger operations of large air carrier aircraft. A Class IV airport cannot serve scheduled large or small air carrier aircraft.

Note: The FAA will only allow an airport to be certificated for the type of operations currently occurring at the airport.

14 CFR PART 139 CERTIFICATION OF AIRPORTS

The following sections of this report will examine each section of 14 CFR Part 139. A summary of the regulation is provided, as well as an explanation of what Los Alamos Airport would need to do to be in compliance with these regulations. Deadlines for compliance are noted. Worksheets to help with record keeping are provided where applicable.

SUBPART A – GENERAL

139.1 Applicability.

This regulation applies to airports serving scheduled air carrier operations in aircraft designed for more than nine passenger seats or airports serving unscheduled air carrier operations in aircraft designed for more than 30 passenger seats, and are located in any state of the United States, the District of Columbia, or any territory or possession of the United States.

139.3 Delegation of authority.

The FAA Administrator has the authority to issue, deny, and revoke the AOC to specific levels of management within the Office of Airports. In most cases, this will be the Regional Airports Division Manager.

139.5 Definitions.

AFFF means aqueous film forming foam agent.

Air carrier aircraft means an aircraft that is being operated by an air carrier and is categorized as either a large air carrier aircraft if designed for at least 31 passenger seats or a small air carrier aircraft if designed for more than nine passenger seats but less than 31 passenger seats, as determined by the aircraft type certificate issued by a competent civil aviation authority.

Air carrier operation means the takeoff or landing of an air carrier aircraft and includes the period of time from 15 minutes before until 15 minutes after the takeoff or landing.

Airport means an area of land or other hard surface (excluding water) that is used or intended to be used for the landing and takeoff of aircraft, including any buildings and facilities.

Airport Operating Certificate means a certificate, issued under this part, for operation of a Class I, II, III, or IV airport.

Average daily departures means the average number of scheduled departures per day of air carrier aircraft computed on the basis of the busiest three consecutive calendar months of the immediately preceding 12 consecutive calendar months. However, if the average daily departures are expected to increase, then "average daily departures" may be determined by planned rather than current activity in a manner authorized by the Administrator.

Certificate holder means the holder of an Airport Operating Certificate issued under this part.

Class I airport means an airport certificated to serve scheduled operations of large air carrier aircraft that can also serve unscheduled passenger operations of large air carrier aircraft and/or scheduled operations of small air carrier aircraft.

Class II airport means an airport certificated to serve scheduled operations of small air carrier aircraft and the unscheduled passenger operations of large air carrier aircraft. A Class II airport cannot serve scheduled large air carrier aircraft.

Class III airport means an airport certificated to serve scheduled operations of small air carrier aircraft. A Class III airport cannot serve scheduled or unscheduled large air carrier aircraft.

Class IV airport means an airport certificated to serve unscheduled passenger operations of large air carrier aircraft. A Class IV airport cannot serve scheduled large or small air carrier aircraft.

Clean agent means an electrically nonconducting volatile or gaseous fire extinguishing agent that does not leave a residue upon evaporation and has been shown to provide extinguishing action equivalent to halon 1211 under test protocols of FAA Technical Report DOT/FAA/AR-95/87.

Heliport means an airport, or an area of an airport, used or intended to be used for the landing and takeoff of helicopters.

Index means the type of aircraft rescue and firefighting equipment and quantity of fire extinguishing agent that the certificate holder must provide in accordance with Sec. 139.315.

Joint-use airport means an airport owned by the United States that leases a portion of the airport to a person operating an airport specified under Sec. 139.1(a).

Movement area means the runways, taxiways, and other areas of an airport that are used for taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and aircraft parking areas.

Regional Airports Division Manager means the airport's division manager for the FAA region in which the airport is located.

Safety area means a defined area comprised of either a runway or taxiway and the surrounding surfaces that is prepared or suitable for reducing the risk of damage to aircraft in the event of an undershoot, overshoot, or excursion from a runway or the unintentional departure from a taxiway.

Scheduled operation means any common carriage passenger-carrying operation for compensation or hire conducted by an air carrier for which the air carrier or its representatives offers in advance the departure location, departure time, and arrival location. It does not include any operation that is conducted as a supplemental operation under 14 CFR Part 121 or public charter operations under 14 CFR Part 380.

Shared-use airport means a U.S. Government-owned airport that is co-located with an airport specified under Sec. 139.1(a) and at which portions of the movement areas and safety areas are shared by both parties.

Unscheduled operation means any common carriage passenger-carrying operation for compensation or hire, using aircraft designed for at least 31 passenger seats, conducted by an air carrier for which the departure time, departure location, and arrival location are specifically negotiated with the customer or the customer's representative. It includes any passenger-carrying supplemental operation conducted under 14 CFR Part 121 and any passenger-carrying public charter operation conducted under 14 CFR Part 380.

Wildlife hazard means a potential for a damaging aircraft collision with wildlife on or near an airport. As used in this part, "wildlife" includes feral animals and domestic animals out of the control of their owners.

139.7 Methods and procedures for compliance.

An airport that receives an AOC must comply with the requirements of subparts C and D of Part 139. FAA Advisory Circulars (AC) present acceptable methods and procedures, but not the only means, for demonstrating compliance with the applicable regulations. The FAA will consider other methods of demonstrating compliance. The method or procedure must be approved by the Airport Certification Safety Inspector (ACSI) and included in your Airport Certification Manual (ACM).

SUBPART B – CERTIFICATION

139.101 General requirements.

Based upon the most likely class determination discussed in previous paragraphs, the airport must comply with 14 CFR Part 139 to establish scheduled airline service. This requires obtaining an AOC and getting an approved ACM.

139.103 Application for certificate.

Two signed copies of the ACM and one signed copy of Form 5280-1.

139.105 Inspection authority.

The ACSI is allowed to inspect the airport at any time to ensure compliance with this regulation and the airport's approved ACM. These inspections may be unannounced and may include tests to determine compliance with the applicable parts. Failure to allow these inspections or tests may result in civil penalties or certificate action.

139.107 Issuance of certificate.

Los Alamos Airport is entitled to a certificate if there is air carrier service, the airport has submitted all the documentation as outlined under Section 139.103, and the airport is equipped and able to provide a safe airport operating environment in accordance with the approved ACM and any other provisions imposed by the FAA to ensure safety in air transportation. Once approved, the certificate will be mailed to the operating entity with the effective date.

139.109 Duration of certificate.

Once issued, the AOC is valid indefinitely unless it is surrendered or it is suspended or revoked by the FAA.

139.111 Exemptions.

An airport may petition the FAA for an exemption from any requirement of Part 139 including Airport Rescue and Firefighting (ARFF). These requests for exemption must be in writing and submitted at least 120 days before the proposed effective date of the exemption. An exact detail of what must be included in the request and the necessary procedures are outlined under 139.111(b) and (c) and 14 CFR Part 11.

Exemptions, if approved, will be time limited and normally not exceed one year. An exemption is not a permanent fix. Airports should work towards full compliance and the termination of the exemption.

Also, an exemption is not a "Modification of Standards" which is covered in FAA Order 5300.1, "Approval Level for Modification of Agency Airport Design and Construction Standards." Questions about "Exemptions" and "Modification of Standards" should be addressed to the ACSI.

139.113 Deviations.

Without prior approval, an airport may deviate from any of the requirements of subpart D of this regulation or the ACM to the extent necessary to deal with an emergency that is required to protect life or property.

Within 14 days after the emergency that caused a deviation, the airport must provide a written description of the deviation to the Regional Airports Division Manager.

SUBPART C – AIRPORT CERTIFICATION MANUAL

139.201 General requirements.

An airport must have and comply with an approved ACM. The ACM must contain all the elements contained in 139.203. AC 150/5210-21 provides a format for the ACM that is acceptable to the FAA. The airport must maintain a complete and current copy at all times. The airport will also need to provide a copy to the ACSI. Therefore, the original and all changes must be submitted in duplicate.

In addition, the airport must provide the ACM to all airport personnel responsible for its implementation. This includes air carriers, fixed base operator (FBO) personnel, and emergency response personnel. Personnel should be trained on the contents of the ACM and expected to comply with its provisions.

139.203 Contents of Airport Certification Manual.

The ACM is a description of the operating procedures, facilities and equipment, responsibility assignments, and any other information needed by personnel concerned with operating the airport on how they need to comply with the provisions of subpart D of Part 139.

As evident from the chart below, the ACM elements are the same for Class I, II, and III airports. The primary differences between a Class I and Class III AOC are as follows:

- Class I airports are required to conduct a full scale emergency exercise every three years. Class III airports are not required to conduct a full-scale emergency exercise.
- Class III airports can pursue exemptions from Airport Rescue and Fire Fighting (ARFF) requirements. Class I airports cannot.

REQUIRED AIRPORT CERTIFICATION MANUAL ELEMENTS				
Manual elements	**Class I**	**Class II**	**Class III**	**Class IV**
1. Lines of succession of airport operational responsibility	X	X	X	X
2. Each current exemption issued to the airport from the requirements of this part	X	X	X	X
3. Any limitations imposed by the Administrator	X	X	X	X
4. A grid map or other means of identifying locations and terrain features on and around the airport that are significant to emergency operations	X	X	X	X
5. The location of each obstruction required to be lighted or marked within the airport's area of authority	X	X	X	X
6. A description of each movement area available for air carriers and its safety areas, and each road described in § 139.319(k) that serves it	X	X	X	X
7. Procedures for avoidance of interruption or failure during construction work of utilities serving facilities or NAVAIDS that support air carrier operations	X	X	X	
8. A description of the system for maintaining records, as required under § 139.301	X	X	X	X
9. A description of personnel training, as required under § 139.303	X	X	X	X
10. Procedures for maintaining the paved areas, as required under § 139.305	X	X	X	X
11. Procedures for maintaining the unpaved areas, as required under § 139.307	X	X	X	X

REQUIRED AIRPORT CERTIFICATION MANUAL ELEMENTS				
Manual elements	**Class I**	**Class II**	**Class III**	**Class IV**
12. Procedures for maintaining the safety areas, as required under §139.309	X	X	X	X
13. A plan showing the runway and taxiway identification system, including the location and inscription of signs, runway markings, and holding position markings, as required under §139.311	X	X	X	X
14. A description of, and procedures for maintaining, the marking, signs, and lighting systems, as required under § 139.311	X	X	X	X
15. A snow and ice control plan, as required under § 139.313	X	X	X	
16. A description of the facilities, equipment, personnel, and procedures for meeting the aircraft rescue and firefighting requirements, in accordance with §§ 139.315, 139.317 and 139.319	X	X	X	X
17. A description of any approved exemption to aircraft rescue and firefighting requirements, as authorized under § 139.111	X	X	X	X
18. Procedures for protecting persons and property during the storing, dispensing, and handling of fuel and other hazardous substances and materials, as required under § 139.321	X	X	X	X
19. A description of, and procedures for maintaining, the traffic and wind direction indicators, as required under § 139.323	X	X	X	X
20. An emergency plan as required under § 139.325	X	X	X	X
21. Procedures for conducting the self-inspection program, as required under § 139.327	X	X	X	X
22. Procedures for controlling pedestrians and ground vehicles in movement areas and safety areas, as required under § 139.329	X	X	X	
23. Procedures for obstruction removal, marking, or lighting, as required under § 139.331	X	X	X	X
24. Procedures for protection of NAVAIDS, as required under § 139.333	X	X	X	
25. A description of public protection, as required under § 139.335	X	X	X	
26. Procedures for wildlife hazard management, as required under § 139.337	X	X	X	
27. Procedures for airport condition reporting, as required under § 139.339	X	X	X	X
28. Procedures for identifying, marking, and lighting construction and other unserviceable areas, as required under § 139.341	X	X	X	
29. Any other item that the Administrator finds is necessary to ensure safety in air transportation	X	X	X	X

It is imperative that the ACM describe the actual conditions and operations at the airport. If changes occur, the manual must be updated in accordance with 139.205. As part of the ACSI inspection, a pre-inspection review of the ACM will always be accomplished. The ACM must be kept current at all times.

139.205 Amendment of Airport Certification Manual.

An "amendment" to the ACM is a significant change in the method of compliance to Part 139 by the airport operator. Simple changes to names, phone numbers, and minor wording corrections constitute a "revision." These revisions must still be submitted to the ACSI for approval in a timely manner, but do not constitute an actual amendment.

The ACM is formally amended either at the discretion of the certificate holder or at the request of the FAA. Examples of what constitutes an amendment are major changes to the Emergency or Wildlife Hazard Management Plans, change in ARFF index, or an addition of a new runway. All proposed amendments by the certificate holder must be submitted in writing to the ACSI at least 30 days prior to the effective date of the amendment unless a shorter time period is allowed by the FAA.

If the FAA initiates the amendment, the proposed amendment will be provided to the airport operator in writing. There will be at least seven days to respond. After review of the airport operator's response, the FAA will issue a final amendment that becomes effective not less than 30 days after the certificate holder receives it. The FAA can issue an immediate amendment if there is an emergency situation requiring such action. The airport can petition the FAA within 30 days of such an emergency amendment to reconsider the emergency situation or the amendment itself.

SUBPART D – OPERATIONS

139.301 Records.

An airport is required to maintain certain records for specified periods of time. These records must be in a manner prescribed in the applicable section of Part 139 and as authorized by the ACSI. These records must be made available during inspection. The period of time these records must be maintained is as follows (in consecutive calendar months):

Personnel training (24 Months)
Emergency personnel training (24 Months)
Airport tenant fueling inspection (12 Months)
Airport tenant fueling agent training (12 Months)
Self-inspection (6 Months)
Movement areas and safety areas training (24 Months)
Accident and incident (12 months)
Airport condition (6 Months)
Any additional records deemed necessary by the ACSI

What constitutes acceptable records will be covered under the appropriate section.

139.303 Personnel.

An airport must provide sufficient and qualified personnel to comply with the requirements of Part 139 and the ACM. The important point here is that there must be a balance between the number of personnel an airport employs and the training/experience level these personnel possess. Personnel who access movement areas and safety areas to perform their duties must be properly trained and equipped to their job. This training must be accomplished prior to commencement of their duties and at least once every 12 consecutive calendar months.

Neither the ACSI nor other FAA offices will dictate to an airport what constitutes sufficient qualified personnel. The number of personnel an airport operator needs is that which is required to meet, maintain, and operate the airport at the minimum safety standards set forth in Part 139. The conditions found on the airport are what an ACSI must base their determination on as to whether there are sufficient qualified personnel. An ACSI can observe personnel while performing their duties and, if necessary, even test personnel on their knowledge of a subject appropriate to their responsibilities.

Also, having numerous employees may meet the test of sufficiency, but inadequate training may leave an individual less than qualified. A training program is a mandatory requirement and must include the requirements of Part 139 and the ACM. Records of this training must be kept for 24 consecutive calendar months. The curriculum for the initial and recurrent training must include the areas specified in this part, and a description must be included in the ACM. The FAA may require additional subject areas for training as appropriate.

An airport may use an independent organization or designee to comply with the requirements of this part and the ACM, but this arrangement would have to be approved by the ACSI, and this organization or designee would still have to meet the same requirements.

139.305 Paved areas.

All pavements available for air carrier use, including runways, taxiways, loading ramps, and parking areas must be maintained to meet the required specifications of this part. Although there is a specific criterion, any pavement cracks or variations that could impair an air carrier aircraft's directional control is a violation of this part and needs to be immediately addressed. A good self-inspection program is important to identifying potential problem areas before they exceed standards. These inspections should be conducted in varying weather conditions, such as heavy rain, to determine if the pavement is draining properly and to identify areas where ponding is occurring so that these areas can be repaired.

The airport should have a regular maintenance program in place to remove mud, dirt, sand, loose aggregate, debris, foreign objects, rubber deposits and other contaminates, as well as repair cracks, holes, and deterioration. Any crack or surface variation that produces loose aggregate or other contaminants shall be immediately repaired. The airport should work with the FAA Airport District Office (ADO) to procure funding for major repairs and reconstructions, but this does not relieve the airport of its responsibility to make immediate repairs or restrict air carrier use if necessary.

AC 150/5380-6, *Guidelines and Procedures for Maintenance of Airport Pavements*, provides an introduction to airport pavement maintenance and is a good starting point for airport personnel. Also, AC 150/5380-7, *Pavement Management System*, describes the components of a Pavement Management System.

139.307 Unpaved areas.

There are no unpaved areas for potential air carrier operations.

139.309 Safety areas.

A safety area is an area comprised of either a runway or taxiway and the surrounding surfaces that is prepared or suitable for reducing the risk of damage to aircraft in the event of an undershoot, overshoot, or excursion from a runway or the unintentional departure from a taxiway. Safety area design and dimensional standards shall be provided and maintained for each runway and taxiway that is available for air carrier use.

Safety areas must be cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations. They should also allow for water to adequately drain, preventing accumulation. The safety area is there to support an aircraft without causing major damage. Safety areas should also be able to support ARFF equipment under dry conditions.

No objects may be located in the safety area unless they are located there specifically for their function. Usually, items located in the safety areas are limited to signs, lighting, and navigational aids. Items that are approved to remain in the safety areas shall be on frangible structures with the frangible point no higher then three inches above the grade.

Currently, safety areas beyond the Runway 9 threshold do not meet design standards on the airport.

AC 150/5300-13, *Airport Design*, paragraph 305 and Appendix 8 discuss Runway Safety Areas (RSA), and paragraph 403 discusses Taxiway Safety Areas.

139.311 Marking, signs, and lighting.

Airports must provide and maintain a marking system for air carrier operations. This includes marking runways for the approach with the lowest authorized minimums, taxiway centerlines and edge markings as appropriate, holding position markings, and marking instrument landing system (ILS) critical areas. Markings must be provided and maintained so that pilots can easily see them. Maintaining markings means to have a scheduled maintenance program to repaint faded, chipped, or worn markings. This includes the addition of glass beads on all required markings and the outlining of markings with a black border on light colored pavements. Markings should also be kept clean and free of rubber deposits. AC 150/5340-1, *Standards for Airport Markings*, contains the acceptable standards for airport markings at airports with air carrier operations.

Los Alamos Airport is equipped with an RNAV (GPS) approach to Runway 27. Runway 27 has non-precision markings, while Runways 9 has basic markings. Edge markings are consistent with standards. Holding position markings are not consistent with standards.

Airports must provide and maintain a sign system for air carrier operations. This sign system must include signs identifying taxiing routes, holding position signs, and ILS critical area signs. Depending on the Class of the airport, the signs may be required to be illuminated. Other signs must be lighted if they are installed on a lighted runway or taxiway. Signs must be properly positioned appropriate to their size and must be maintained so that pilots can easily read them. Maintaining signs includes replacing worn or faded panels and keeping them clear of snow and vegetation. An airport sign plan must be submitted to the ACSI for approval and included in the ACM. AC 150/5340-18, *Standards for Airport Sign Systems*, provides guidance for the type of airport signs.

Airports must provide and maintain a lighting system for air carrier operations when the airport is open at night or during periods of reduced visibility. This system must include runway lights that meet the specifications for the takeoff and landing minimums of the runway and one taxiway lighting system. In addition to runway and taxiway lighting, an airport is required to have an airport beacon, approach lighting that meets the specifications for takeoff and landing minimums unless this lighting is provided and maintained by the FAA, and obstruction marking and lighting as appropriate. AC 150/5340-24, *Runway and Taxiway Edge Lighting System*, describes acceptable standards for the design, installation, and maintenance of runway and taxiway edge lighting systems.

Runway 9-27 has medium intensity runway lighting (MIRL). The taxiways are unlit. The airport has a rotating beacon.

The airport is responsible for maintaining its marking, lighting, and signs. This means that that they should be clean, unobscured, and clearly visible at all times. Any faded, missing, or nonfunctional items should be repaired or replaced. Marking, lighting, and signs are used by pilots and need to be easily seen and able to provide an accurate reference to the user.

FAA Advisory Circulars that provide assistance with compliance with this section are listed below.

AC 150/5340-21, *Airport Miscellaneous Lighting Visual Aids*, describes the standards for the system design, installation, inspection, testing, and maintenance of airport miscellaneous visual aids (i.e., airport beacons, beacon towers, wind cones, wind tees, and obstruction lights).

AC 150/5340-26, *Maintenance of Airport Visual Aid Facilities*, provides recommended guidelines for maintenance of airport visual aid facilities.

AC 150/5340-27A, *Air-to-Ground Radio Control of Airport Lighting Systems*, contains the FAA standard operating configurations for air-to-ground radio control of airport lighting systems.

AC 150/5345-44F, *Specification for Taxiway and Runway Signs*, contains a specification for lighted and unlighted signs to be used on taxiways and runways.

139.313 Snow and ice control.

A snow and ice control plan is needed in an area where measurable snow and icing conditions occur at least once a year. This plan must be approved by the ACSI and becomes an enforceable part of the ACM. When snow and/or icing conditions occur, the airport must execute the approved plan.

139.315 Aircraft Rescue and Fire Fighting (ARFF): Index determination.

The length of air carrier aircraft and the average scheduled daily departures of air carrier aircraft determine ARFF index. The minimum ARFF index will always be Index A.

Below is the length of air carrier aircraft that make up a particular index:

(1) Index A includes aircraft less than 90 feet in length.
(2) Index B includes aircraft at least 90 feet but less than 126 feet in length.
(3) Index C includes aircraft at least 126 feet but less than 159 feet in length.
(4) Index D includes aircraft at least 159 feet but less than 200 feet in length.
(5) Index E includes aircraft at least 200 feet in length.

Small turboprops such as the Embraer 120 and Bombardier Q200 fall within Index A, as do small regional jets such as the Bombardier CRJ 200 and Embraer 135.

Paragraph (e) of this section allows for a Class III airport, most likely to apply to Los Alamos Airport, to comply with this section if they can provide a level of safety comparable to Index A. The alternate compliance must include the criteria listed in paragraph 139.315(e)(i-iv).

Note: Determination of ARFF index is used to determine the minimum ARFF equipment and agents that must be available for air carrier operations to occur on an airport.

139.317 Aircraft rescue and firefighting: Equipment and agents.

Once the ARFF index has been determined, a determination of the minimum type and number of ARFF vehicles, the type and number of pounds of dry chemical, the amount of Halon 1211 or clean agent (referred to as agent/s) that must be on the truck(s), and the amount of aqueous film forming foam (AFFF) and water that must be available on the truck(s) is determined. Refer to 139.317(a-e) for applicable index requirements.

All trucks used to comply with index B and above must be equipped with a turret. This section also specifies the foam discharge rate and the agent discharge rate for each vehicle (139.317(f-g)). Other extinguishing agents may be used only if they are approved by the ACSI and in amounts that provide the same level of firefighting capability.

Vehicles must be able to carry enough AFFF to mix with twice the amount of water the vehicle is required to carry.

FAA Advisory Circulars that may assist with compliance with this section are listed below.

AC 150/5210-6C, *Aircraft Fire and Rescue Facilities and Extinguishing Agents* outlines scales of protection considered as the recommended level compared with the minimum level in Federal Aviation Regulation (F.A.R.) Part 139.49 and tells how these levels were established from test and experience data.

AC 150/5220-4, *Water Supply Systems for Aircraft Fire and Rescue Protection* provides guidance for the selection of a water source and standards for the design of a distribution system to support ARFF service operations on airports.

AC 150/5220-10C *Guide Specification for Water/Foam Aircraft Rescue and Firefighting Vehicles* contains performance standards, specifications, and recommendations for the design, construction, and testing of a family of ARFF vehicles.

AC 150/5220-19, *Guide Specification for Small Agent Aircraft Rescue and Fire Fighting Vehicles* contains performance standards, specifications, and recommendations for the design, construction, and testing of a family of small, dual agent ARFF vehicles.

AC 150/5220-10C, *Guide Specification for Water/Foam Aircraft Rescue and Firefighting Vehicles* contains performance standards, specifications, and recommendations for the design, construction, and testing of a family of ARFF vehicles.

AC 150/5210-13A, *Water Rescue Plans, Facilities, and Equipment* provides guidance to assist airport operators in preparing for water rescue operations.

AC 150/5210-15, *Airport Rescue and Firefighting Station Building Design* provides standards and guidance for planning, designing, and constructing an airport rescue and firefighting station.

AC 150/5210-19, *Driver's Enhanced Vision System (DEVS)* contains performance standards, specifications, and recommendations for DEVS.

AC 150/5220-4B, *Water Supply Systems for Aircraft Fire and Rescue Protection* provides guidance for the selection of a water source and standards for the design of a distribution system to support ARFF service operations on airports.

139.319 Aircraft Rescue and Firefighting: Operational requirements.

It is required that an airport, during air carrier operations (defined as the period of time 15 minutes before until 15 minutes after the takeoff or landing) provide the ARFF capability for their required index. If the average daily departures or the length of aircraft changes such that the index increases, the airport is required to meet the ARFF required by the increased ARFF index. If there is reduction in average daily departures or the length of aircraft, the airport may reduce its index by following the procedures under section 139.319(d)(1-3).

ARFF vehicles are required to be ready and capable to meet their intended requirements as required by 139.319(g)(1-3) and the response requirements of 139.319(h)(1-2). The ACSI will initiate a timed response drill during inspections. Vehicles must also be equipped with the necessary radios to communicate with all required parties as outlined in 139.319(e)(1-4), and they must be appropriately marked and lighted in accordance with 139.319(f)(1-2).

ARFF personnel must be trained and equipped to perform their duties. Personnel training includes initial and recurrent training with a curriculum that is approved by the ACSI and includes all the elements of 139.319(i)(2)(i-xi) and (3).

Initial Training. Prior to any person assuming ARFF duties, they must have completed initial training as outlined above. It is not acceptable to simply take a structural firefighter and assign them to ARFF duties without additional training. Initial training may be accomplished during an initial ARFF training course offered by an approved facility or internally using an approved curriculum. The internal curriculum must be approved by the ACSI. Initial training is not complete until the individual has participated in at least one live-fire drill. Initial ARFF training records are kept as long as the person is employed and will be made available during each inspection.

Recurrent Training. Once an ARFF person has completed initial training, they must receive recurrent instruction every 12 consecutive calendar months using an approved curriculum. The Aircraft Rescue and Fire Fighting (ARFF) Computer-Based Training (CBT) CD is an excellent supplement to the curriculum, but should not be considered all-inclusive. Practical application with the airport's equipment, airport familiarization, driving on the airport, and duties under the airport emergency plan are just a few areas that cannot be fully taught using the CD. ARFF personnel must also participate in at least one live-fire drill every 12 consecutive calendar months. The live-fire drill must be accomplished at an approved training facility or in a manner acceptable to the ACSI.

An airport is required to maintain a record of all recurrent training given to each individual for 24 consecutive calendar months, and these records will be made available during each inspection.

Medical Services. The airport is required to have at least one individual available during air carrier operations that has been trained and is current in basic emergency medical services, as outlined in 139.319(i)(4). The individual must have received at least 40 hours of training in the required topics, and a record of this training must be maintained for 24 consecutive calendar months and made available for inspection. The emergency medical person does not have to be an ARFF person and they do not need to meet the timed response requirements. Off-airport personnel, such as an ambulance service, may be used if a reasonable response time is assured. How the airport will meet this requirement must be approved by the ACSI and documented in the ACM.

The airport must also meet the requirements of 139.319(i)(5 & 6) with regards to hazardous materials guidance and maintaining emergency access roads.

FAA Advisory Circulars that may assist with compliance with this section are listed below.

AC 150/5210-17, *Programs for Training of Aircraft Rescue and Firefighting Personnel* provides information on courses and reference materials for training of ARFF personnel and Change 1, AC 150/5210-17. Change 1 changed the AC to reflect a new source for the FAA Standard Basic Aircraft Rescue and Firefighting Curriculum and to update other sources of training programs.

Note: An Aircraft Rescue and Fire Fighting (ARFF) Computer-Based Training (CBT) CD is available from the ACSI.

AC 150/5210-18, *Systems for Interactive Training of Airport Personnel* provides guidance in the design of systems for interactive training of airport personnel.

AC 150/5210-7C, *Aircraft Rescue and Firefighting Communications* provides guidance for planning and implementing the airport ARFF communications systems.

AC 150/5210-14A, *Airport Fire and Rescue Personnel Protective Clothing* was developed to assist airport management in the development of local procurement specifications for an acceptable, cost-effective proximity suit for use in aircraft rescue and firefighting operations.

139.321 Handling and storing of hazardous substances and materials.

The airport is required to establish and maintain acceptable fire safety standards for handling fuel servicing on the airport. This includes storing and dispensing fuel. These standards must be approved by the ACSI and included in the ACM. It is recommended that the airport adopt NFPA 407, Standard for Aircraft Fuel Servicing (current edition) as the standard for the airport. 139.321(b)(1-7) lists the minimum standards that must be addressed if NFPA 407 is not adopted.

Once the standards are approved and adopted, the airport, as a fueling agent, if applicable, and all other fueling agents on the airport including Part 121 and Part 135 certificated air carriers, must comply with the standards. To ensure compliance, the airport must inspect the trucks and storage and dispensing facilities every three consecutive calendar months. The inspection records must be maintained for 12 consecutive calendar months. The inspection results should show the discrepancies found and the corrective action taken. Regardless of the inspections, the airport must require fueling agents to immediately correct any noncompliance with a standard. If the fueling agent cannot correct the deficiency in a reasonable period of time, the airport will notify the ACSI.

All fueling agents shall have at least one supervisor that has completed an approved fuel-training course in fire safety. A list of nationally approved courses is attached. The individual must complete the training prior to initial performance of duties or be enrolled in a course that will be completed within 90 days of starting work. They must also receive recurrent training every 24 consecutive calendar months. Any training courses other than the nationally approved courses must be reviewed and approved by the ACSI as acceptable. The inspector will want to see documentation of the training.

The supervisor must provide initial on-the-job training and recurrent instruction every 24 consecutive calendar months to all other employees that are responsible for handling fuel in any manner. Once every 12 consecutive calendar months, the fueling agent must provide the airport written confirmation that all training has been accomplished. The written confirmation must be maintained for 12 consecutive calendar months and should include the name of the person receiving the training and the date the training occurred.

These inspections can be performed by someone other than airport staff, such as the Fire Marshall. The ACM must state who will be responsible for these inspections.

AC 150/5230-4 *Aircraft Fuel Storage, Handling, and Dispensing On Airports* provides guidance in this area.

139.323 Traffic and wind direction indicators.

An airport must have a wind cone that provides surface wind direction information to pilots and supplemental wind cones at each end of all air carrier runways or at a point visible to a pilot during final approach and prior to takeoff. If the airport is open at night, it must be lighted.

There is no control tower at Los Alamos Airport. A lighted wind cone is located at the north central terminal area. A supplemental wind cone within a segmented circle is located near the Runway 27 end. Runway 9-27 is lighted and REILs are installed on Runway 27.

FAA Advisory Circulars that may assist with compliance with this section are listed below.

AC 150/5340-5B, *Segmented Circle Airport Marker System* sets forth standards for a system of airport marking consisting of certain pilot aids and traffic control devices.

AC 150/5340-23B, *Supplemental Wind Cones* describes criteria for the location and performance of supplemental wind cones.

139.325 Airport Emergency Plan.

The airport is required to write and maintain an Airport Emergency Plan (AEP). The plan is designed to minimize personal injury and damage to property in the event of an emergency situation. All parties that have a role in the plan should participate in the development of the plan. AC 150/5200-31A, *Airport Emergency Plan* provides guidance for the preparation and implementation of emergency plans at civil airports. The AEP may be written using the guidance provided in the AC and must include all applicable parts of 139.325(b-f).

The plan will be submitted in two copies to the ACSI for approval. The AEP Review Checklist must be completed and included with the submission of the AEP. The ACSI will review the plan and, once approved, it will become part of the ACM.

Once completed, the AEP must be coordinated with all parties that have responsibilities under the plan. All airport personnel having duties and responsibilities under the plan must be trained on their assignments under the plan. Once every 12 consecutive calendar months, the plan must be reviewed with all parties that have responsibilities under the plan. This is the opportunity to get everyone together and go through the plan page by page to ensure everyone is familiar with their duties and that the information in the plan is accurate. The airport should keep a participant list as well as minutes of the meeting. Any changes to the plan should be immediately submitted to the ACSI for approval.

Every 36 consecutive calendar months, all Class I airports must hold a full-scale emergency plan exercise. Class II, III, and IV airports do not need to complete this requirement; however, it is recommended. The AEP Exercise Evaluation Checklist should be used to prepare and evaluate the exercise. The purpose of the full-scale exercise is to test the effectiveness of the AEP through a response of the airport and its mutual aid for a disaster at the airport. All planning, execution, and evaluation documentation should be maintained for inspection purposes.

FAA Advisory Circulars that may assist with compliance with this section are listed below.

AC 150/5200-12B, *Fire Department Responsibility in Protecting Evidence at the Scene of an Aircraft Accident* furnishes general guidance for the airport, employees, airport management, and other personnel responsible for firefighting and rescue operations on the proper presentation of evidence at the scene of an aircraft accident.

AC 150/5210-2A, *Airport Emergency Medical Facilities and Services* provides information and advice so that airports may take specific voluntary preplanning actions to assure at least minimum first-aid and medical readiness appropriate to the size of the airport in terms of permanent and transient personnel.

139.327 Self-inspection program.

The self-inspection program is considered the cornerstone of compliance with many of the sections of Part 139. The airport must perform an inspection daily unless otherwise authorized by the ACSI and approved in the ACM. If there is air carrier service on any given day, including weekends and holidays, an inspection must be performed. The inspection schedule is required to be included in the ACM. Inspections will also be completed when required by unusual conditions or an aircraft accident/incident. Usually the inspections are recorded on an inspection checklist that is an approved part of the ACM. The inspection record must include the conditions found and the corrective action that was taken to fix the discrepancy. Each daily-recorded inspection must be maintained for 12 consecutive calendar months.

Personnel trained to identify noncompliance with all the areas that are being inspected must complete self-inspections. These personnel must be trained in accordance with 139.303 and receive initial and recurrent instruction. This initial instruction must be documented and maintained for the duration of the employee's employment. Recurrent training must be completed every 12 consecutive calendar months. Training records shall be maintained for 24 consecutive calendar months.

Instruction must include the following:

1) Airport familiarization, including airport signs, marking, and lighting
2) Airport emergency plan
3) Notice to Airmen (NOTAM) notification procedures
4) Procedures for pedestrians and ground vehicles in movement areas and safety areas
5) Discrepancy reporting procedures
6) A reporting system to ensure prompt correction of unsafe airport conditions noted during the inspection.

Note: A person sent to inspect the airport that is not thoroughly familiar with the requirements of Part 139 and all applicable ACs may provide an inaccurate report and potentially provide airport management with a false sense of well-being. If, during an annual certification inspection, discrepancies are discovered that should have been identified under the self-inspection program, the airport should reevaluate the self-inspection process, training, and/or personnel conducting the inspections.

All personnel responsible for self-inspections should be thoroughly familiar with the contents of AC 150/5200-18B, *Airport Safety Self-Inspection* and AC 150/5200-29, *Announcement of Availability: Airport Self-Inspection Videotape* (which may be obtained through the ACSI).

It is critical that the self-inspection program is tied to the airport condition reporting system. The use of the NOTAM system is acceptable, but an additional system to immediately notify air carriers directly may be necessary. In some cases, the information or NOTAM may have to be hand delivered, faxed, or e-mailed directly to the air carrier in order to ensure prompt notification. The air carriers should also be notified as soon as the discrepancy is corrected.

<u>139.329 Pedestrians and Ground Vehicles.</u>

The only pedestrians or ground vehicles that should be allowed to be in the movement areas (runway and taxiways) and safety areas are those that are absolutely necessary for airport operations. The airport is responsible for limiting access to the movement areas to authorized personnel and vehicles only. Normally, this limits the access to rescue, maintenance, and inspection activities. Construction would be considered maintenance, but the airport must ensure that the construction safety plan is in compliance with this section. Wherever possible, service roads should be constructed to alleviate vehicles such as fuel trucks from entering the movement areas.

The airport must establish and implement procedures for access to the operational movement and safety areas. This means that the airport must establish a driver's training program that includes provisions for all personnel that may have to drive or walk in the movement/safety areas. The training program must be approved and included in the ACM. It must also include the consequences that the airport will enforce if an individual does not follow the rules. This training must be documented and the documentation must be maintained for 24 consecutive calendar months.

The Los Alamos Airport air carrier movement area would be defined as Runway 9-27, Taxiway B, and the transient ramp immediately east of the terminal building. The driver of any vehicle which might cross any of these areas would require ground vehicle training.

It should be noted that not all tenants gaining access through the fence would require ground vehicle training. Tenants accessing T-hangars or other buildings on the airport would not require training unless they must cross the air carrier movement areas.

FAA Advisory Circulars that may assist with compliance with this section are listed below.

AC 150/5210-20, *Ground Vehicle Operations on Airports* contains guidance to airport operators developing ground vehicle operation training programs.

AC 150/5210-5B, *Painting, Marking, and Lighting of Vehicles Used on an Airport* provides guidance, specifications, and standards in the interest of airport personnel safety and operational efficiency for painting, marking, and lighting of vehicles operating in the airport operations areas.

139.331 Obstructions.

Any objects that are within the airport's authority that have been determined by the FAA to be an obstruction must be removed, marked, or lighted unless an FAA aeronautical study has determined that it is not necessary. If the object has not had an FAA aeronautical study, the airport is required to initiate the study. The airport must have procedures in place for the identification of obstructions to the applicable Part 77 imaginary surfaces. Applicability of airport authorities will be determined on a case-by-case basis.

FAA Advisory Circulars that may assist with compliance with this section are listed below.

AC 150/5340-21, *Airport Miscellaneous Lighting Visual Aids* describes the standards for the system design, installation, inspection, testing, and maintenance of airport obstruction lights.

AC 150/5345-43E, *Specification for Obstruction Lighting Equipment* contains the FAA specification for obstruction lighting equipment.

139.333 Protection of NAVAIDS.

The airport must prevent the construction of facilities near NAVAIDS and air traffic control facilities that would derogate the signal or operation of the facility. This includes electronic and visual facilities.

This is usually accomplished with signage and restricting access to the airport to those authorized to use the airport and through defining safety measures during construction.

139.335 Public protection.

The airport must have safeguards to prevent inadvertent entry to the movement areas by unauthorized person or vehicles. Fencing that meets Transportation Security Administration (TSA) regulations are acceptable to meet the requirements of this section. The airport must also provide reasonable protection of persons and property from jet blast. The airport perimeter fencing would need to be upgraded.

139.337 Wildlife hazard management.

Wildlife hazard management at airports is a critical issue that, if taken lightly, poses a serious threat to life and property. For this reason, airports are required to take immediate action to alleviate wildlife hazards any time they are detected.

If an airport has any of the occurrences listed in 139.337(b)(1-4), they are required to have a wildlife hazard assessment. The wildlife hazard assessment usually starts with an initial consultation and possibly a site visit. The consultation and/or site visit will determine the need for a complete wildlife hazard assessment. If it is required, the wildlife hazard assessment must be completed by an individual as specified under 139.337(c) and include the items listed under 139.337(c)(1-5). Wildlife hazard assessments and plans are eligible for Airport Improvement Plan (AIP) funding and need to be coordinated with the ADO.

The wildlife hazard assessment is submitted to the ACSI, who will determine if there is a need for a wildlife hazard management plan. If it is determined that a plan is required, the certificate holder must write a plan using the assessment as a guide. The plan is submitted to the ACSI for approval and is implemented by the airport. Section 139.337(e) and (f) will be followed in the development, writing and implementation of the plan.

All airport personnel that may be required to execute the plan must be trained on its implementation, and the airport must evaluate the effectiveness of the plan at least every 12 consecutive calendar months or whenever additional occurrences that triggered the assessment occur.

If an airport has an advisory for wildlife in the Airport Facility Directory (AFD), they will be required to have an initial consultation and site visit. If it is determined that a wildlife hazard assessment is required, then one must be performed.

FAA Advisory Circulars that may assist with compliance with this section are listed below.

AC 150/5200-33, *Hazardous Wildlife Attractants on or Near Airports* provides guidance on locating certain land uses having the potential to attract hazardous wildlife to or in the vicinity of public-use airports.

AC150/5200-32, *Announcement of Availability: Bird Strike Incident/Ingestion Report* explains the nature of the revision of FAA Form 5200-7, Bird Strike Incident/Ingestion Report and how it can be obtained.

AC 150/5200-34, *Construction or Establishment of Landfills near Public Airports* contains guidance on complying with new Federal statutory requirements regarding the construction or establishment of landfills near public airports.

139.339 Airport condition reporting.

The airport is required to collect and disseminate the airport condition to all air carriers. They can use the NOTAM system or another system approved by the ACSI to accomplish this requirement. Airport conditions that may affect the safe operations of air carriers are listed under section 139.339(c)(1-9). The airport must keep a record of each dissemination of airport condition to air carriers for 12 consecutive calendar months.

FAA Advisory Circulars that may assist with compliance with this section are listed below.

AC 150/5200-28B, *Notices to Airmen (NOTAMS) for Airport Operators* provides guidance for use of the NOTAM system in airport condition reporting.

139.341 Identifying, marking, and lighting construction and other unserviceable areas.

The airport is responsible for the marking and lighting of construction and unserviceable areas, construction equipment and roadways, and areas adjacent to a NAVAID that may cause the derogation of the signal or failure of the NAVAID. They must also include procedures for avoiding damage to existing utilities and other underground facilities.

The best way to comply with this section is to have a thorough construction safety plan. The safety plan must include all the items required by this section.

FAA Advisory Circulars that may assist with compliance with this section are listed below.

AC 150/5345-55, *Lighted Visual Aid to Indicate Temporary Runway Closure* provides guidance in the design of a lighted visual aid to indicate temporary runway closure.

139.343 Non-complying conditions.

An airport must limit air carrier operations to only those parts of the airport that are safe for air carrier operations. If any of the requirements of subpart D cannot be met to the extent that unsafe conditions exist on the airport, it is the responsibility of the airport to close those areas to air carrier use until they are brought back into compliance.

Example: Disabled aircraft or vehicles on a runway or taxiway, taxi routes with inadequate wing tip clearance, or parking aprons that will not support the weight or turning radius due to design or condition.

SUMMARY

The requirements of this section would only apply if Los Alamos Airport were to receive regularly scheduled commercial service by an airline utilizing an aircraft with 10 or more passenger seats.

Several projects would need to be undertaken to ensure that the airfield system complies with FAA design standards. These projects will be outlined in the airport master plan. In addition, the following steps would need to be taken for 14 CFR Part 139 compliance at Los Alamos Airport:

1. Prepare and submit a Class III ACM to the FAA (139.203).
2. Prepare ground vehicle operating rules and regulations and a ground vehicle training program (139.329).
3. Prepare a training program for airport personnel involved with Part 139 implementation (139.303/327).
4. Ensure that FBOs comply with the fuel training requirements (139.321).
5. Develop a record-keeping system (139.301/303) for the following:
    a. Personnel training (24 Months)
    b. Emergency personnel training (24 Months)
    c. Airport tenant fueling inspection (12 Months)
    d. Airport tenant fueling agent training (12 Months)
    e. Self-inspection (6 Months)
    f. Movement areas and safety areas training (24 Months)
    g. Accident and incident (12 months)
    h. Airport condition (6 Months)
6. Prepare and submit an Airport Emergency Plan (AEP) to the FAA (139.325).
7. Acquire an ARFF vehicle and comply with ARFF training and operational requirements (139.315/317/319).

Appendix C

FORECAST APPROVAL LETTER

Patrick C. Taylor

From: Summer.Guerrero@faa.gov
Sent: Wednesday, April 11, 2012 9:37 AM
To: Patrick C. Taylor
Cc: Jim Harris; Peter Soderquist
Subject: RE: Los Alamos Forecast Approval

With this email, we are approving the forecast provided on the basis that we do not expect to use the local forecasts for decision making.

Thanks,

Summer J. Guerrero, P.E., PMP, CEI
Civil Engineer
LA/NM Airports Development Office, ASW-640
Southwest Region
2601 Meacham Boulevard
Fort Worth, TX 76137
Ph.: 817-222-5643
Fax: 817-222-5988

Appendix D

ENVIRONMENTAL OVERVIEW

Appendix D
ENVIRONMENTAL OVERVIEW

Analysis of the potential environmental impacts of the proposed airport development concept, as discussed in Chapter Five is an important component of the Airport Master Plan process. The primary purpose of this appendix is to provide an inventory of environmental sensitivities within Los Alamos County and on or near the airport, where applicable, and to evaluate the development program to determine whether proposed actions could individually or collectively affect the quality of the environment.

Construction of the improvements depicted on the recommended development concept plan will require compliance with the *National Environmental Policy Act* (NEPA) *of 1969*, as amended, to receive federal financial assistance. For projects not "categorically excluded" under Federal Aviation Administration (FAA) Order 1050.1E, *Environmental Impacts: Policies and Procedures*, compliance with NEPA is generally satisfied through the preparation of an Environmental Assessment (EA). In instances where significant environmental impacts are expected, an Environmental Impact Statement (EIS) may be required. While this portion of the master plan is not designed to satisfy the NEPA requirements for a categorical exclusion, EA, or EIS, it is intended to supply a preliminary review of environmental issues that would need to be analyzed in more detail within the NEPA process. This evaluation considers all environmental categories required for the NEPA process as outlined in FAA Order 1050.1E and Order 5050.4B, *National Environmental Policy Act* (NEPA) *Implementation Instructions for Airport Actions.*

AIR QUALITY

The United States (U.S.) Environmental Protection Agency (EPA) has adopted air quality standards that specify the maximum permissible short-term and long-term concentrations of various air contaminants based on potential health effects. The National Ambient Air Quality Standards (NAAQS) consist of primary and secondary standards for six criteria pollutants, which include: ozone (O_3), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen oxide (NO), particulate matter (PM_{10} and $PM_{2.5}$), and lead (Pb). Potentially significant air quality impacts associated with an FAA project or action is demonstrated by the project or action exceeding one or more of the NAAQS for any of the time periods analyzed.

To ensure that a federal action complies with the NAAQS, the *Clean Air Act* (CAA) establishes a General Conformity Rule for all general federal actions, including airport improvement projects, if the action is located within a nonattainment area. Los Alamos County, New Mexico, is an attainment area for all criteria pollutants by the EPA.[1]

Under NEPA, the FAA requires that an air quality emissions inventory be prepared for federal actions at airports where forecast general aviation operations exceed 180,000. At this time, as discussed in Chapter Two of this Airport Master Plan update (Table 2N), the airport is forecast to have future total operations of 27,700 by the year 2032. Therefore, operational air quality emission inventories would not be required for future projects under NEPA. Construction-related air quality impacts are discussed below in the section on Construction Impacts.

Additionally, of growing concern is the impact of proposed projects on climate change. Greenhouse gases (GHGs) are those that trap heat in the earth's atmosphere. Greenhouse gases can be either naturally occurring or anthropogenic (man-made) and include water vapor (H_2O) and carbon dioxide (CO_2). Several classes of halogenated substances that contain fluorine, chlorine, or bromine are also GHGs, but they are, for the most part, solely a product of industrial activities. All GHG inventories measure CO_2 emissions, but beyond CO_2, different inventories include different greenhouse gases (such as methane [CH_4], nitrous oxide [N_2O], and O_3).

No significance thresholds for the creation of GHG have been promulgated to date. However, research has shown that there is a direct link between fuel combustion and GHG emissions. Therefore, sources that require fuel or power at an airport are the primary sources that would generate GHGs. Aircraft jet engines, like many other vehicle engines, produce CO_2, H_2O, nitrogen oxides (NO_x), CO, oxides of sulfur (SO_x), unburned or partially combusted hydrocarbons (known as volatile organic compounds, VOCs), particulates, and other trace compounds. A Center for Climate Strategies[2] report (2006) estimates that GHG emissions from jet fuel and aviation fuel will comprise approximately two percent of New Mexico's total gross GHG emissions (CCS 2006).

[1] http://www.epa.gov/oar/oaqps/greenbk/anay_nm.html, accessed October 3, 2012.

[2] The Center for Climate Strategies is a public-purpose, non-profit, nonpartisan 501(c)(3) partnership organization established in 2004 to assist in climate policy development at the federal and state levels.

The scientific community is developing areas of further study to enable it to more precisely estimate aviation's effects on the global atmosphere. The FAA is currently leading or participating in several efforts intended to clarify the role that commercial aviation plays in greenhouse gases and climate changes. The most comprehensive and multi-year program geared towards quantifying climate change effects of aviation is the Aviation Climate Change Research Initiative (ACCRI) funded by the FAA and the National Aeronautics and Space Administration (NASA). ACCRI hopes to reduce key scientific uncertainties in quantifying aviation-related climate impacts and provide timely scientific input to inform policy-making decisions. The FAA also funds Project 12 of the Partnership for Air Transportation Noise & Emissions Reduction (PARTNER) Center of Excellence research initiative to quantify the effects of aircraft exhaust and contrails on global and U.S. climate and atmospheric composition.

COASTAL RESOURCES

Federal activities involving or affecting coastal resources are governed by the *Coastal Barriers Resource Act* (CBRA), the *Coastal Zone Management Act* (CZMA), and Executive Order (E.O.) 13089, *Coral Reef Protection*.

Los Alamos County, New Mexico, is not located within a Coastal Management Zone or Coastal Barrier Area. The Los Alamos Airport is located approximately 665 miles east of the nearest U.S. coastal area (the Pacific Coast of southern California).

COMPATIBLE LAND USE/NOISE

The compatibility of existing and planned land uses in the vicinity of an airport is usually associated with the extent of the airport's noise impacts. Significant impacts are most likely to occur over noise-sensitive areas within the 65 decibel (dB) day-night noise exposure level (DNL) contour. (DNL is the metric currently accepted by the FAA, the EPA, and the Department of Housing and Urban Development [HUD] as an appropriate measure of cumulative noise exposure.) FAA Orders 1050.1E and 5050.4B define a significant noise impact as one which would occur if the proposed action would cause noise-sensitive areas to experience an increase in noise of 1.5 DNL or more at or above the 65 DNL noise contour when compared to a No Action alternative for the same timeframe. Noise-sensitive land uses include residences, schools, hospitals, and places of worship.

Existing and projected noise contours associated with the proposed Airport Master Plan update are depicted in **Exhibit D1**. There are currently three houses within the 2012 65 DNL noise contour, two of which are also within the 70 DNL contour. These homes are located on the northeast end of Nambe Place. Based on forecast 65 DNL contours for the year 2032, no new homes would be affected. However, the third house on Nambe Place, currently outside the 70 DNL, would be located partially within the 70 DNL in the year 2032. If the above noise contours are confirmed through a Part 150 Noise study, these structures might be eligible for sound insulation or other mitigation.

Compatible land use also addresses nearby features that could pose a threat to safe aircraft operations. These features include land uses that attract wildlife (for example, landfills and water features) or structures within approach and departure surfaces. There are no wildlife attractants such as landfills or water features located near the airport.

Existing land use near the airport is discussed in Chapter One - Inventory. Exhibit 1B shows generalized land uses surrounding the airport. The airport is bounded by Pueblo Canyon to the north and New Mexico State Route (NM) 502 to the south. Land at the east end of the airport is developed with commercial uses (e.g., hotel) and county facilities at the Pajarito Cliffs Site; on the west end of the airport is the Eastern Area residential neighborhood, a park, and Fire Station No. 6. There are no land uses that would pose a safety hazard to the airport.

CONSTRUCTION IMPACTS

Airport construction impacts can include dust, air emissions, traffic, storm water runoff, and noise. Construction-related dust impacts are typically mitigated below a level of significance through the use of best management practices (BMPs), such as those identified in FAA Advisory Circular (AC) 150/5371-10, *Standards for Specifying Construction of Airports, Item P-156, Temporary Air and Water Pollution, Soil Erosion and Siltation Control*.

A generalized list of BMPs is as follows:

<u>Site Preparation and Construction</u>

- Minimize land disturbance
- Suppress dust on traveled paths which are not paved through wetting, use of watering trucks, chemical dust suppressants, or other reasonable precautions to prevent dust from entering ambient air
- Cover trucks when hauling soil
- Minimize soil track-out by washing or cleaning truck wheels before leaving construction site
- Stabilize the surface of soil piles
- Create windbreaks

<u>Site Restoration</u>

- Revegetate or stabilize any disturbed land not used
- Remove unused material
- Remove soil piles via covered trucks or stockpile dirt in a protected area

In addition to the creation of dust, construction projects planned at the airport could have temporary air quality impacts due to emissions from the operation of construction vehicles and equipment. Thus, air emissions inventories related to construction activities may be required for NEPA documentation efforts.

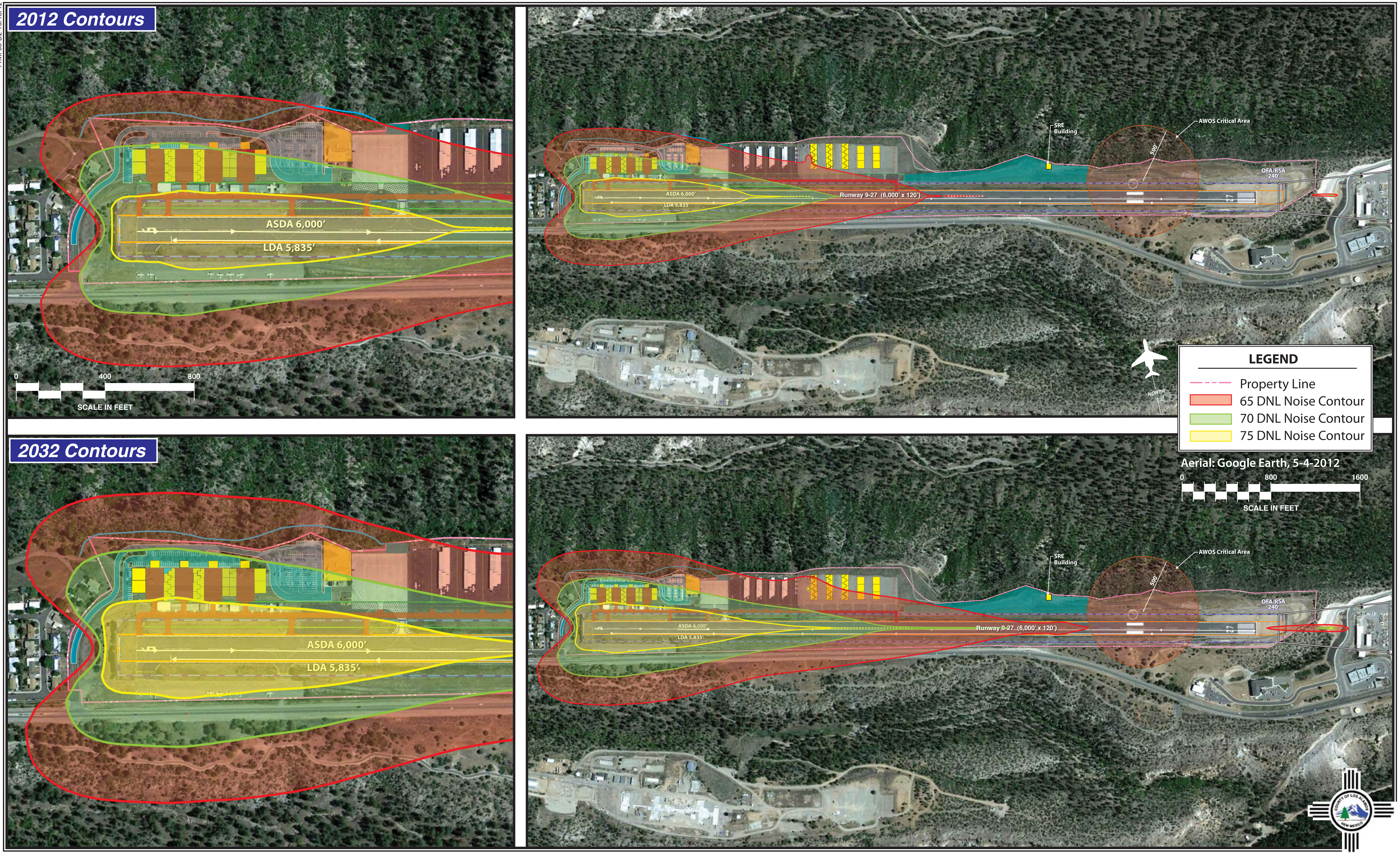


Exhibit D1
NOISE CONTOURS

Construction traffic impacts occur when trucks or heavy equipment need to access a site through a residential neighborhood or other sensitive area or on already congested streets or intersections. In the case of the Los Alamos airport, no construction traffic impacts would occur since access to the airport does not involve residential neighborhoods or congested streets, but occurs directly from NM 502 via Airport Road.

Water quality concerns occur if there are storm events during the construction period. In New Mexico, the EPA retains permitting authority under the *Clean Water Act* (CWA) to establish water quality standards, control discharges, and regulate other issues concerning water quality. EPA's National Pollutant Discharge Elimination System (NPDES) 2012 Construction General Permit (CGP) (NMR120000) is in effect in New Mexico and requires that "the site operator design, install, and maintain erosion and sediment controls that minimize the discharge of pollutants from earth-disturbing activities" (Part 2.1) and that "permittees are required to minimize the amount of soil exposed during construction activities" (Part 2.1.1.1). The design, installation, and maintenance of erosion and sedimentation controls are also spelled out in the 2012 CGP.[3] As previously mentioned, FAA AC 150/5371-10 also requires the implementation of BMPs to control erosion and siltation. BMPs could include temporary measures such as the use of berms, fiber mats, gravels, mulches, and slope drains.

Construction projects at the airport would result in temporary noise. The only noise-sensitive receptors in proximity to the airport are within a residential neighborhood located immediately west of the end of the airport. The property line of the closest home is approximately 300 feet from the Runway 9 end; another nine homes are located within 500 feet. The entire neighborhood is located within approximately 0.3 mile from the western end of the airport. Proposed development at the west end of the airport includes the construction of additional hangars, a parking area, and a parallel and connector taxiway. All construction at the west end of the airport should be restricted to the daylight hours to ameliorate noise impacts to the residents.

DEPARTMENT OF TRANSPORTATION (DOT) ACT: SECTION 4(f)

Section 4(f) of the *Department of Transportation Act of 1966* (49 United States Code [USC] 303) protects against the loss of significant publicly owned parks and recreation areas, publicly owned wildlife and waterfowl refuges, and historic sites as a result of federally funded transportation projects. The Act states that a project that requires the "use" of such lands shall not be approved unless there is no "feasible and prudent" alternative and the project includes all possible planning to minimize harm from such use. In addition, the term "use" includes not only the physical taking of such lands, but "constructive use" of such lands. "Constructive use" of lands occurs when "a project's proximity impacts are so severe that the protected activities, features, or attributes that qualify a resource for protection under Section 4(f) are substantially impaired" (23 Code of Federal Regulations [CFR] Part 771.135).

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[3] http://www.epa.gov/npdes/pubs/cgp2012_finalfactsheet.pdf, accessed September 21, 2012.

According to the National Register of Historic Places (NRHP), there are five listed resources on the NRHP between one and two miles from the airport: two segments of Bayo Road; Lujan Road; Grant Road; and Los Alamos Scientific Laboratory.[4] It is not known whether or not significant subgrade historic sites are located on the airport itself; the entire airport is either paved or previously graded. No historic aboveground structures have been identified.

In addition to historic properties listed on the NRHP, Section 4(f) lands include publicly owned recreation areas. There are several publicly owned recreational areas in proximity to the airport. One is the Tsankawi Section of the Bandelier National Monument, located approximately 2.25 mile east of the eastern end of the airport. (The main part of the Bandelier National Monument is located approximately five miles south and southwest of the airport.) To the west of the airport are several parks and golf courses within the town of Los Alamos. The closest of these public recreational areas is East Park, located approximately 0.25 mile from the western end of the airport. No constructive use of this park is anticipated as a result of planned airport improvements; the park is located outside of the 65 DNL.

There is also currently a trail (Pueblo Canyon Rim Trail) that traverses the northern edge of the airport, partially on airport property, and is part of the Canyon Rim Loop, a 4.1-mile hike that is included within the Los Alamos County Trail network.[5] The Los Alamos County Trail network connects to the Santa Fe National Forest to the west and is planned to ultimately connect to other trails farther east. Recent improvements to the trail include a 280-foot pedestrian bridge in the vicinity of the Pajarito Cliffs facilities.[6] The proposed development concept plan includes the rerouting of this trail outside of the airport boundaries. Potential impacts to this resource would need to be addressed in compliance with Section 4(f) of the *Department of Transportation Act of 1966*.

FARMLAND

Based on the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service's Web Soil Survey map, the following soils are present at the airport: rock outcrop-Hackroy complex, 1 to 8 percent slopes; and Hackroy-Nyjack association, 1 to 5 percent slopes.[7] These soils are not considered to be prime farmland or other farmland categories protected under the *Farmland Protection Policy Act* (FPPA) (7 USC 4201 et seq.). Therefore, the USDA's Farmland Conversion Impact Rating (Form AD-1006) would not need to be completed for any airport projects and significant impacts to farmland would not occur as a result of the Airport Master Plan update.

[4] http://nrhp.focus.nps.gov/natreg/docs/Download.html, accessed October 3, 2012.
[5] http://www.losalamosnm.us/parks/trails/Pages/LACTrailNet.aspx, accessed November 2, 2012.
[6] http://lacadoptatrail.blogspot.com/2010/07/canyon-rim-trail-opening-on-august-21.html, accessed October 15, 2012.
[7] http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx, accessed October 9, 2012.

FISH, WILDLIFE, AND PLANTS

Section 7 of the *Endangered Species Act* (ESA), as amended (16 USC 1531 et seq.), applies to federal agency actions and sets forth requirements for consultation to determine if a proposed action "may affect" a federally endangered or threatened species. If an agency determines that an action "may affect" a federally protected species, then Section 7(a)(2) requires the agency to consult with the U.S. Fish and Wildlife Service (USFWS) to ensure that any action the agency authorizes, funds, or carries out is not likely to jeopardize the continued existence of any federally listed endangered or threatened species, or result in the destruction or adverse modification of critical habitat. If a species has been listed as a candidate species, Section 7(a)(4) states that each agency must confer with the USFWS.

The *Fish and Wildlife Coordination Act* requires that agencies consult with the state wildlife agencies and the Department of the Interior concerning the conservation of wildlife resources where the water of any stream or other water body is proposed to be controlled or modified by a federal agency or any public or private agency operating under a federal permit.

The *Migratory Bird Treaty Act* (MBTA) prohibits private parties and federal agencies in certain judicial circuits from intentionally taking a migratory bird, their eggs, or nests. The MBTA prohibits activities which would harm migratory birds, their eggs, or nests unless the Secretary of the Interior authorizes such activities under a special permit.

E.O. 13112, *Invasive Species*, directs federal agencies to use relevant programs and authorities, to the extent practicable and subject to available resources, to prevent the introduction of invasive species and provide for restoration of native species and habitat conditions in ecosystems that have been invaded. FAA is to identify proposed actions that may involve risks of introducing invasive species on native habitat and populations. "Introduction" is the intentional or unintentional escape, release, dissemination, or placement of a species into an ecosystem as a result of human activity. "Invasive species" are alien species whose introduction does, or is likely to, cause economic or environmental harm or harm to human health.

There are three federally listed species for Los Alamos County under the ESA, as published on the USFWS New Mexico Ecological Service's database.[8] The southwestern willow flycatcher (*Empiconax traillii extimus*) and the black-footed ferret (*Mustela nigripes*) are listed as endangered; the Mexican spotted owl (*Strix occidentalis lucida*) is listed as threatened with a designated critical habitat. There are also 11 species identified as "sensitive" and are candidate species for listing on the ESA, experimental, non-essential populations, or Species of Special Concern. **Table D1** gives explanations for each of these categories.

[8] http://www.fws.gov/southwest/es/NewMexico/SBC_view.cfm?spcnty=Los%20Alamos, accessed October 10, 2012.

TABLE D1
Listed and Sensitive Species in Los Alamos County, New Mexico

Common Name	Scientific Name	Group	Status
Southwestern willow fly-catcher	*Empidonax traillii extimus*	Bird	Endangered
Black-footed ferret	*Mustela nigripes*	Mammal	Endangered
Mexican spotted owl	*Strix occidentalis luci-da*	Bird	Threatened/
Jemez Mountains salamander	*Plethodon neomexi-canus*	Amphibian	Candidate
Yellow-billed cuckoo	*Coccyzus americanus*	Bird	Candidate
Gunnison's prairie dog	*Cynomys gunnisoni*	Mammal	Candidate
New Mexican meadow jump-ing mouse	*Zapus hudsonius lute-us*	Mammal	Candidate
Whooping crane	*Grus americana*	Bird	Experimental, Non-essential population
New Mexico silverspot but-terfly	*Speyeria nokomis nitocris*	Arthropod - Inver-tebrate	Species of Concern
American peregrine falcon	*Falco peregrinus ana-tum*	Bird	Species of Concern
Arctic peregrine falcon	*Falco peregrinus tundrius*	Bird	Species of Concern
Northern goshawk	*Accipiter gentilis*	Bird	Species of Concern
Goat Peak pika	*Ochotona princeps nigrescens*	Mammal	Species of Concern
Townsend's big-eared bat	*Corynorhinus town-sendii*	Mammal	Species of Concern

Source: USFWS, New Mexico Ecological Services Field Office, http://www.fws.gov/southwest/es/NewMexico/SBC_view.cfm?spcnty=Los%20Alamos, accessed October 10, 2012.

NOTES:

Endangered – Any species which is in danger of extinction throughout all or a significant portion of its range.

Threatened – Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Candidate – Taxa for which USFWS has sufficient information to propose that they be added to the list of en-dangered and threatened species, but the listing action has been precluded by other higher priority listings.

Experimental, Non-essential population – A reintroduced population established outside the species' current range, but within its historical range. For purposes of Section 7 consultation under the ESA, this population is treated as a proposed species, except when it is located within a National Wildlife Refuge and National Park, when the population is considered threatened.

Proposed – Any species that is proposed in the Federal Register to be listed under Section 4 of the ESA. This could be either proposed for endangered or threatened status.

Species of Concern – Taxa for which further biological research and field study are needed to resolve their conservation status OR are considered sensitive, rare, or declining on lists maintained by Natural Heritage Programs, State wildlife agencies, other Federal agencies, or professional/academic scientific societies. Spe-cies of Concern are included here for planning purposes only.

It is not anticipated that impacts to federally-listed bird species would occur as a result of the proposed airport improvements since the airport has been previously disturbed and graded and suitable habitat is not present; however, the USFWS New Mexico Ecological Service recommends that field surveys for the black-footed ferret be conducted if a project involves impacts to prairie dog towns or complexes of 200 acres or more for the Gunnisons' prairie dog and/or 80 acres or more for any subspecies of the black-tailed prairie dog. Since the airport consists of 89 acres, it should be confirmed that there are not any prairie dog complexes at the airport before any airport projects commence.

Although unlikely, if any migratory birds are identified at the airport and ground disturbance is planned during their nesting period, a certified biologist should conduct preconstruction surveys for the presence of nests within 500 feet of the construction areas. If active nests are found, further coordination with the USFWS to address the requirements of the MBTA should occur.

The proposed airport projects would not control or modify any water resources; therefore, the *Fish and Wildlife Coordination Act* is not applicable. In addition, per E.O. 13112, no invasive species are likely to be introduced into native habitats as a result of airport development projects; re-vegetation plans required under any Stormwater Pollution Prevention Plans (SWPPP) should utilize native plants to the extent feasible.

FLOODPLAINS

As defined in FAA Order 1050.1E, agencies are required to "make a finding that there is no practicable alternative before taking action that would encroach on a base floodplain based on a 100-year flood." E.O. 11988, *Floodplain Management,* directs federal agencies to reduce the risk of flood loss, minimize the impact of floods on human safety, health and welfare, and restore and preserve the natural and beneficial values served by the floodplains. Natural and beneficial values of floodplains include providing ground water recharge, water quality and maintenance, fish, wildlife and plants, open space, natural beauty, outdoor recreation, agriculture, and forestry. FAA Order 1050.1E (9.2b) indicates that "if the proposed action and reasonable alternatives are not within the limits of, or if applicable, the buffers of a base floodplain, a statement to that effect should be made" and no further analysis is necessary. The limits of base floodplains are determined by Flood Insurance Rate Maps (FIRMs) prepared by the Federal Emergency Management Agency (FEMA).

The Los Alamos airport, which used to be the site of the Los Alamos National Laboratory, has not been mapped by FEMA (see FIRM Panel No. 35028C0045C). However, the closest mapped 100-year floodplain is associated with Pueblo Canyon Creek at the bottom of the neighboring canyon. Due to the airport's location on a plateau, it is not located within a 100-year floodplain, and the Airport Master Plan update is consistent with FAA Order 1050.1E and E.O. 11988.

HAZARDOUS MATERIALS, POLLUTION PREVENTION, AND SOLID WASTE

There are four primary federal laws that govern the handling and disposal of hazardous materials, chemicals, substances, and wastes, all of which fall under the jurisdiction of the U.S. EPA. The two statutes of most importance to the FAA in proposing actions to construct and operate facilities and navigational aids are the *Resource Conservation Recovery Act*

(RCRA) (as amended by the *Federal Facilities Compliance Act of 1992*) and the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA), as amended (also known as Superfund). RCRA governs the generation, treatment, storage, and disposal of hazardous wastes; CERCLA provides for cleanup of any release of a hazardous substance (excluding petroleum) into the environment. Other laws include the *Hazardous Materials Transportation Act*, which regulates the handling and transport of hazardous materials and wastes, and the *Toxic Substances Control Act* (TSCA), which regulates and controls the use of polychlorinated biphenyls (PCBs) as well as other chemicals or toxic substances in commercial use.

Per FAA Order 1050.1E, Appendix A, thresholds of significance are typically only reached when a resource agency has indicated that it would be difficult to issue a permit for the proposed development. A significant impact may also be realized if the proposed action would affect a property listed on the National Priorities List (NPL).

According to the EPA's Enviromapper EJView Tool, there are no Superfund or NPL sites located at the airport.[9] Construction of airport development projects would result in earthwork disturbances. These projects would involve the reuse of paved or graded areas. Previous construction at the airport has not resulted in the uncovering of hazardous materials; therefore, it is unlikely that future airport development projects would do so. Future airport operations occurring as part of the Airport Master Plan update could involve the use of additional hazardous materials. Airport facilities and businesses would be required to comply with all applicable laws and permitting requirements.

Pollution prevention at the airport is regulated through several laws, including the hazardous materials regulations cited above and a statewide 2008 Storm Water General Permit (MSGP) (NMR050000) for multi-sector industrial activities.[10] Air transportation activities are included in Sector S. In addition, as discussed further in the Construction Impacts and Water Quality sections, water quality concerns are regulated under the CWA. The use of BMPs during construction is a requirement of construction-related permits such as NPDES Construction General Permit (NMR12000) and is incorporated into general and/or project-specific SWPPPs.

In 2009, after nearly 30 years of operation, the Los Alamos County landfill reached its capacity and was replaced by the Los Alamos County Eco Station. Solid waste for the airport, as well as the rest of the County, is now shipped about 90 miles to the Rio Rancho Landfill.[11] The Eco Station consists of a solid waste transfer station and is located at the old Los Alamos County landfill at 3701 E. Jemez Road, Los Alamos, NM 87544.

HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Historical, architectural, and archaeological resources as well as Native American cultural resources are protected by several different federal laws including, but not limited to, the

[9] http://epamap14.epa.gov/ejmap/printmap.html, accessed October 15, 2012.
[10] http://cfpub.epa.gov/npdes/stormwater/msgp.cfm, accessed September 24, 2012.
[11] http://www.losalamosnm.us/getgreen/Pages/CitizensWaste.aspx, accessed October 8, 2012.

Archaeological Resources Protection Act (ARPA) *of 1979*, the *National Historic Preservation Act of 1966*, and the *Native American Graves Protection & Repatriation Act*. In particular, Section 106 of the *National Historic Preservation Act* requires the FAA to consider the effects of proposed actions on sites listed on, eligible for listing on, or potentially eligible for listing on, the NRHP. To assist with this determination, an area of potential effect (APE) is defined in consultation with the State Historic Preservation Officer (SHPO). The APE includes the areas that would be directly or indirectly impacted by proposed actions. Once the APE is defined, an inventory is taken of NRHP-eligible properties within the APE and an assessment of impacts is undertaken. The determination regarding significant impacts on protected resources occurs in consultation with the SHPO as well.

Unless the airport has already been surveyed for cultural resources, impacts could occur if potentially eligible cultural resources are disturbed. Therefore, prior to implementation of planned improvements, cultural resources records searches would be necessary at the airport. Projects identified on the recommended development concept plan for the airport that would occur in previously undisturbed and unsurveyed areas are likely to require a field survey as well. Impacts may occur when a proposed project causes an adverse effect on a property which has been identified (or is unearthed during construction) as having historical, architectural, archaeological, or cultural significance.

LIGHT EMISSIONS AND VISUAL EFFECTS

Airport lighting is characterized as either airfield lighting (i.e., runway, taxiway, approach and landing lights) or landside lighting (i.e., security lights, building interior lighting, parking lights, and signage).

The following airfield lighting is in place at the airport:

- A rotating beacon that projects two beams of light, one white and one green, 180 degrees apart, located atop the airport terminal;
- Medium intensity runway lighting (MIRL);
- Runway end identifier lights (REILs) (i.e., strobe lights set to the side of the runway landing threshold on the approach to Runway 27);
- Precision approach path indicator lights (PAPI-2L) serving the end of Runway 27;
- Two lighted windsocks - one at the terminal building and one approximately 700 feet from the Runway 27 threshold on the north side within a segmented circle;
- Lighted distance-to-go markers set to the south side of the runway and spaced every one thousand feet to mark the distance remaining to the end of the runway;
- Lighted airfield signs located throughout the airfield system.

The airfield MIRL and REILs run automatically from 5:30 – 8:30 a.m. and from 4:30 – 11:30 p.m. There is also a pilot-controlled lighting system (PCL) which allows the pilot to turn on, or increase the intensity of, these lights from the aircraft using the aircraft's transmitter. In this case, the lights will turn back off after 15 minutes. The PAPIs are on 24 hours per day. Limited security and building lights are also present landside.

FAA significance thresholds for light emissions are generally when an action's light emissions create an annoyance that would interfere with normal activities. For example, if a high intensity strobe light, such as a REIL system, would produce glare on any adjoining site, particularly residential uses, this could constitute a significant adverse impact. The visual sight of aircraft, aircraft contrails, or aircraft or airport lighting, especially from a distance that is not normally intrusive, is not assumed to be an adverse impact.

For visual effects, an action is considered significant when consultation with federal, state, or local agencies, tribes, or the public shows that visual effects contrast with the existing environments and the agencies state the effect is objectionable. Visual and lighting impacts relate primarily to the presence of sensitive visual receptors in proximity to an airport. These would normally be residents or users of a designated scenic resource such as a scenic corridor.

The airport is located on a plateau that is bordered by undeveloped open space (Pueblo Canyon on the north and Los Alamos Canyon on the south) on two sides. The primary visual receptors of the airport are the residents living to the west of the airport and passersby on NM 502. Longer range views of the airport are available from the neighboring plateaus on the opposite sides of the canyons. NM 502 is not considered to be a scenic corridor or an America's Byway.[12]

The primary changes proposed under the Airport Master Plan update involve relocating hangars to facilitate taxiway access to the Runway 9 threshold, the implementation of declared distances to allow the airport to meet runway design standards, and expansion of the existing terminal to the north. In terms of changes to the airport's light emissions, several existing light sources would be relocated as follows:

- If a new terminal building is constructed, an appropriate beacon would be included;
- The lighted windsock nearest the terminal building is planned to be relocated to the south side of the runway if the aircraft run-up area is constructed in this area;
- The existing lighted windsock (and segmented circle), near the Runway 27 end are within the Object Free Area (OFA) and should be relocated so that they are at least 125 feet from the runway centerline.

The relocated lighting listed above is not expected to create adverse lighting impacts to surrounding land uses; no additional lighting at the airport is included in this Airport Master Plan update. Visually, the airport would continue to maintain its appearances as a general aviation airport.

NATURAL RESOURCES AND ENERGY

The FAA considers an action to have a significant impact on natural resources and energy when an action's construction, operation, or maintenance would cause demands that exceed available or future (project year) natural resource or energy supplies. Therefore, in

[12] http://byways.org/explore/states/NM/maps.html, accessed November 1, 2012.

instances when proposed actions necessitate the expansion of utilities, power companies or other suppliers of natural resources and energy would need to be contacted to determine if the proposed project demands can be met by existing or planned facilities.

The Los Alamos Department of Public Utilities provides natural gas and electricity to the Los Alamos community, including the airport. The use of energy and natural resources at the airport would occur both during construction of planned facilities and during operation of the airport as it grows. However, none of the planned development projects at the airport are major or are anticipated to result in significant increases in the demand for natural resources or energy consumption beyond what is readily available by the service provider.

SECONDARY (INDUCED) IMPACTS

FAA Order 1050.1E, Appendix A, states that secondary impacts should be addressed when the proposed project is a major development proposal that could involve shifts in patterns of population movement and growth, public service demands, and changes in business and economic activity due to airport development.

None of the proposed development for the airport would be considered major development or would involve shifts of population movement or growth. Rather, it would involve the expansion of the existing terminal and the relocation of existing land uses to improve safety at the airport. Based on the forecast analysis summarized in Chapter Two of this Airport Master Plan update, the airport is expected to have an average annual growth rate in total operations of approximately three percent through the year 2032 (Table 2N); annual growth in based aircraft is expected to be an average of 1.5 additional aircraft per year (Table 2H). This amount of annual growth at the airport for the next 20+ years would not be expected to result in secondary impacts on the County or the Town of Los Alamos.

Temporary construction-related work generated by planned airport improvements could provide economic benefits to the County or town in the form of increased employment and income.

SOCIOECONOMIC IMPACTS, ENVIRONMENTAL JUSTICE, AND CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISKS

Socioeconomic impacts known to result from airport improvements are often associated with relocation activities or other community disruptions, including alterations to surface transportation patterns, division or disruption of existing communities, interferences with orderly planned development, or an appreciable change in employment related to the project. Social impacts are generally evaluated based on areas of acquisition and/or areas of significant project impact, such as areas encompassed by noise levels in excess of 65 DNL.

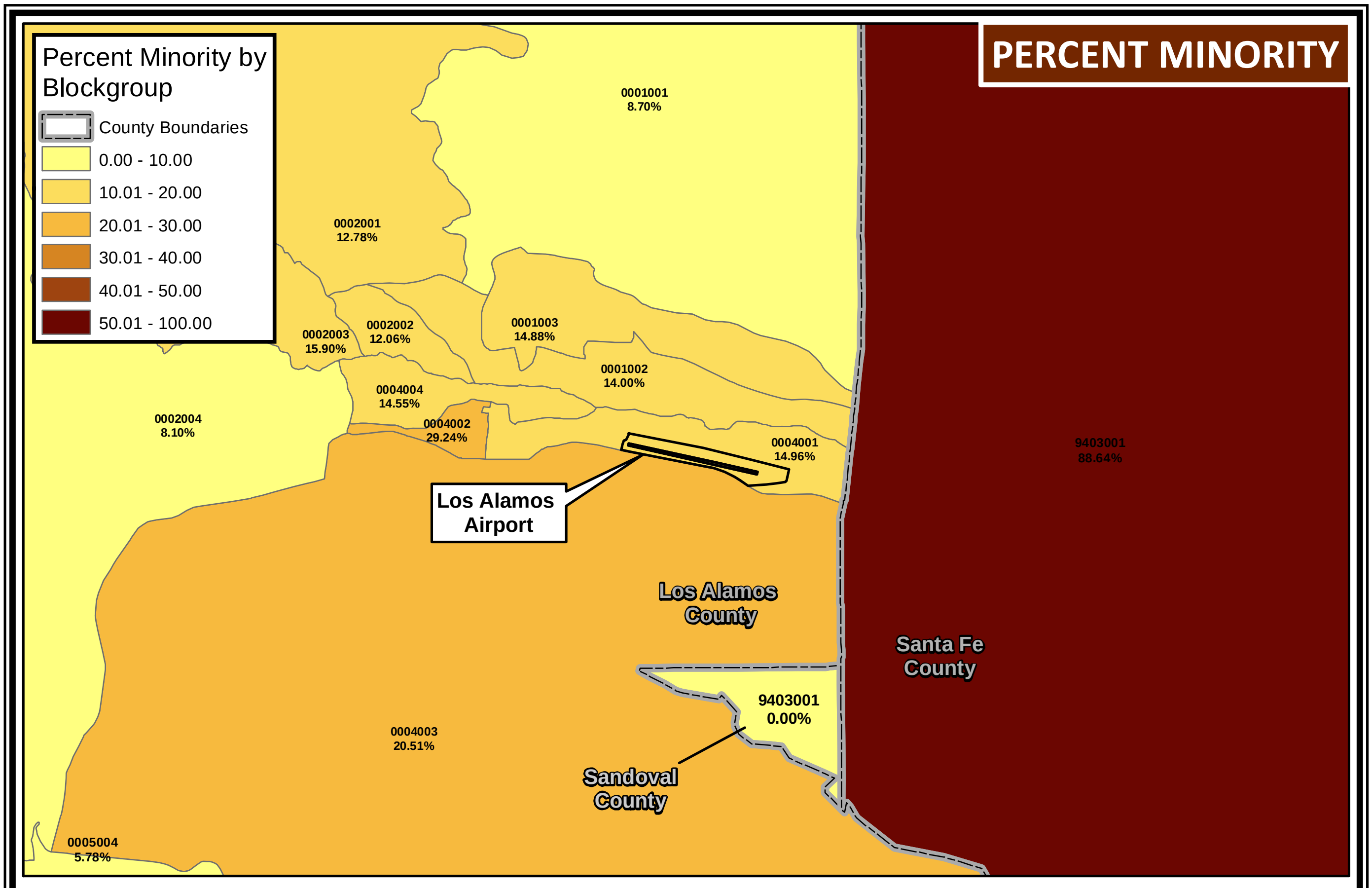
Per FAA Order 1050.1E, Appendix A, the thresholds of significance for this impact category are reached if the project negatively affects a disproportionately high number of minority or low-income populations or if children would be exposed to a disproportionate number of health and safety risks. E.O. 12898, *Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations,* and the accompanying Presidential Memorandum, and DOT Order 5610.2, *Environmental Justice*, require FAA to provide for meaningful public involvement by minority and low-income populations as well as analysis that identifies and addresses potential impacts on these populations that may be disproportionately high and adverse.

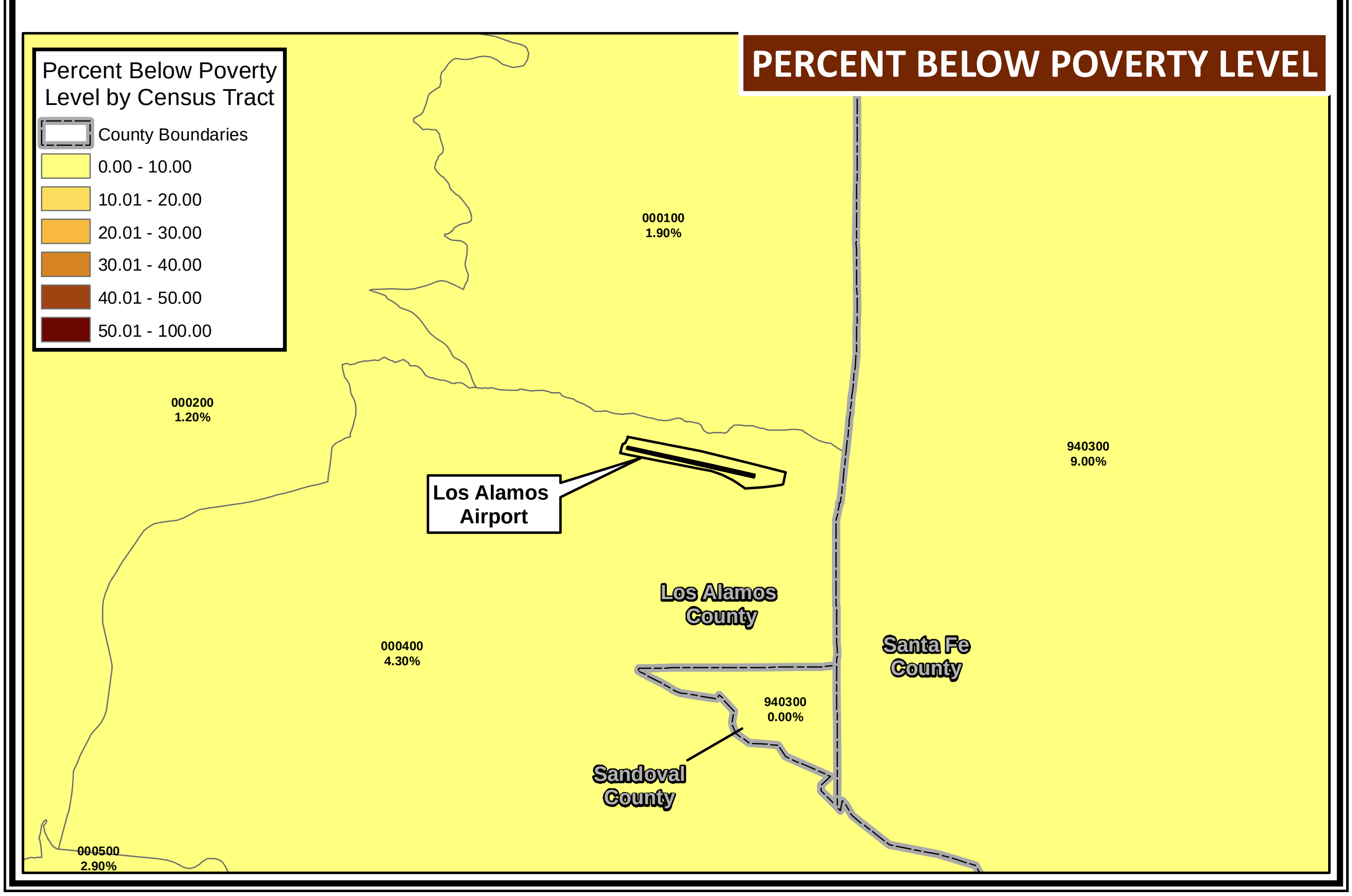
Pursuant to E.O. 13045, *Protection of Children from Environmental Health Risks and Safety Risks,* federal agencies are directed to identify and assess environmental health and safety risks that may disproportionately affect children. These risks include those that are attributable to products or substances that a child is likely to come in contact with or ingest, such as air, food, drinking water, recreational waters, soil, or products to which they may be exposed.

The acquisition of residences and farmland is required to conform with the *Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970* (Uniform Act). These regulations mandate that certain relocation assistance services be made available to homeowners/tenants of affected properties. This assistance includes help finding comparable and decent substitute housing for the same cost, moving expenses, and in some cases, loss of income.

The U.S. Census taken in 2010 provides information regarding socioeconomic conditions in the Los Alamos area. General population and employment data are discussed in Chapters One and Two of the Airport Master Plan update. The percentage of minority populations by block group and persons living below the poverty level by census tract that include, or are near, the airport are shown on **Exhibit D2**. (The 2010 census data does not provide poverty rate data by block group.) Approximately 15 percent of the population in the block group that contains the airport is from minority groups; approximately 4 percent of the households in the same census tract as the airport are below the poverty rate. The San Ildefonso Indian Reservation is located to the east of the airport within Santa Fe County; this area can be seen in the exhibit as an area of almost 90 percent minority population.

Since the Airport Master Plan update does not involve expanding airport operations beyond the existing airport boundaries, no relocation of housing or businesses would be necessary to implement the recommended development concept plan. Existing communities, transportation patterns, and planned development would not be disrupted. The airport's projected three percent annual growth for the next 20+ years would not significantly change future growth in the Los Alamos area or have disproportionate adverse impacts on minority, low-income, or children populations. Three homes are located within the 65 or 70 DNL, as discussed previously under Land Use Compatibility/Noise; these residences are not located in an area of high minority or low-income population.





Source: Blockgroup shapefile and Census data for Minority Map are from 2010 Census.
Census Tract shapefile and Census data for Poverty Map are from 2010 Census.

Exhibit D2
MINORITY AND LOW INCOME POPULATIONS

WATER QUALITY

The airport is located within the Los Alamos subwatershed (HUC 12:130201011303) of the Upper Rio Grande watershed. There are two CWA Section 303(d) Impaired Waters within the subwatershed. Pueblo Canyon, to the north of the airport, and Los Alamos Canyon, to the south of the airport, are both listed for several types of metals. [13]

As discussed previously, water quality in New Mexico is monitored and protected by the U.S. EPA under the authority of the CWA and the NPDES permitting process through a statewide 2008 Storm Water General Permit (MSGP) (NMR050000) for multisector industrial activities and a statewide 2012 Construction General Permit (CGP) (NMR120000). Future development projects of the Airport Master Plan update should be evaluated to address their interface with the airport's storm water drainage system and should be incorporated into a SWPPP. Conditions of the statewide MSGP and CGP would be applicable to all new development at the airport.

Short-term water quality issues related to construction of airport development projects have also been discussed under Construction Impacts.

WETLANDS AND WATERS OF THE U.S.

Certain drainages (both natural and human-made) come under the purview of the U.S. Army Corps of Engineers (USACE) under Section 404 of the CWA; wetlands are also protected. There are no aquatic features present at the airport that would indicate the potential for wetland habitat.[14] In addition, the USDA Web Soil Survey indicates that there are no hydric soils.[15] The airport is located on a flat plateau surrounded on both sides by deep canyons. No wetlands or waters of the U.S. would be affected by the proposed Airport Master Plan update.

WILD AND SCENIC RIVERS

The State of New Mexico has four designated Wild and Scenic Rivers segments: Jemez River (East Fork); Pecos River; Rio Chama; and Rio Grande.[16] The nearest segment to the airport, the Jemez River (East Fork), is located approximately 15 miles to the southwest. No impacts to designated Wild and Scenic Rivers would occur as a result of proposed airport development.

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[13] http://watersgeo.epa.gov/mwm/, accessed November 1, 2012.
[14] Ibid.
[15] http://www.fws.gov/southwest/es/NewMexico/SBC_view.cfm?spcnty=Los%20Alamos, accessed October 10, 2012.
[16] http://www.rivers.gov/rivers/new-mexico.php, accessed November 1, 2012.

CONCLUSION

Table D2 summarizes the environmental evaluation for the proposed Airport Master Plan update. In general, the recommended development concept plan would provide for approximately three percent annual growth in total operations and a 1.72 percent annual growth in based aircraft at the airport through the year 2032.

Potential environmental sensitivities that may be present at or near the airport include: noise-sensitive land uses; a potential Section 4(f) resource (i.e., a public trail); an endangered species under the ESA; migratory birds protected under the MBTA; and sensitive cultural resources.

TABLE D2
Summary of Potential Environmental Concerns
Los Alamos Airport Master Plan Update

FAA Resource Category	Potential Concern	Mitigation Measures
Air Quality	None. Los Alamos County is in an attainment area for all NAAQS and the airport's projected growth forecast is below NEPA levels for requiring an air emissions inventory.	None necessary.
Coastal Resources	None. Los Alamos Airport is not located within the Coastal Zone.	None necessary.
Compatible Land Use/Noise	There are currently three houses within the 2012 65 DNL noise contour, two of which are also within the 70 DNL contour. Based on forecast 65 DNL contours for the year 2032, no new homes would be affected. However, one house, currently outside the 70 DNL, would be located partially within the 70 DNL in the year 2032. There are no nearby features that would pose a threat to safe aircraft.	If the noise contours are confirmed through a Part 150 Noise study, these structures might be eligible for sound insulation or other mitigation.
Construction Impacts	Proposed development at the west end of the airport near adjacent noise-sensitive residences includes the construction of additional hangars, a parking area, and a parallel and connector taxiway. No other potentially significant construction impacts would occur. BMPs would be incorporated to minimize dust, emissions, and water quality concerns. All construction site access would occur via the airport access road to NM 502.	All construction at the west end of the airport should be restricted to the daylight hours to ameliorate noise impacts to the residents.

TABLE D2 (Continued)
Summary of Potential Environmental Concerns
Los Alamos Airport Master Plan Update

FAA Resource Category	Potential Concern	Mitigation Measures
DOT Act: Section 4(f)	There is a public trail that traverses the northern edge of the airport, partially on airport property. The proposed development concept plan includes the rerouting of this trail outside of the airport boundaries.	Mitigation for this Section 4(f) resource would need to be addressed in compliance with Section 4(f) of the *Department of Transportation Act of 1966*.
Farmland	None. There is no prime farmland or other land protected by the FPPA located at the airport.	None necessary.
Fish, Wildlife, and Plants	The black-footed ferret, a federally listed endangered species, is known to occur in Los Alamos County. There are no other federally listed species or MBTA-protected birds known to occur at the airport.	Prior to construction, it should be confirmed that there are not any prairie dog complexes at the airport. Although unlikely, if any migratory birds are identified at the airport and ground disturbance is planned during their nesting period, a certified biologist should conduct preconstruction surveys for the presence of nests within 500 feet of the construction areas. If active nests are found, further coordination with the USFWS to address the requirements of the MBTA should occur.
Floodplains	None. The airport is located on a plateau; no airport development projects are proposed within a known 100-year floodplain.	None necessary.
Hazardous Materials, Pollution Prevention, and Solid Waste	None. Prior construction at the airport has not resulted in the uncovering of any hazardous materials and future use of hazardous materials would be required to comply with all applicable laws and permitting requirements. The airport also operates under statewide NPDES permits. No issues with solid waste disposal are expected.	None necessary.
Historic, Architectural, Archaeological, and Cultural Resources	Unless the airport property has already been surveyed for cultural resources, impacts may occur if potentially eligible cultural resources are disturbed by airport development projects.	Prior to implementation of planned improvements, a cultural resources records search would be necessary. Projects identified on the recommended development concept plan that would occur in previously undisturbed and unsurveyed areas are likely to require a field survey.

TABLE D2 (Continued) Summary of Potential Environmental Concerns Los Alamos Airport Master Plan Update		
FAA Resource Category	**Potential Concern**	**Mitigation Measures**
Light Emissions and Visual Effects	None. Additional lighting related to the new hangars and other relocated lighting due to airport safety improvements are not expected to noticeably change the night appearance of the airport. Visually, the airport will continue to maintain its appearance as a general aviation airport.	None necessary.
Natural Resources and Energy	None. Planned development projects at the airport are not anticipated to result in a demand for natural resources or energy consumption beyond what is available by service providers.	None necessary.
Secondary (Induced) Impacts	None. An annual three percent growth at the airport for the next 20+ years would not be expected to result in secondary impacts on the County or the Town of Los Alamos.	None necessary.
Socioeconomic Impacts, Env. Justice, and Children's Env. Health and Safety Risks	No long-term socioeconomic impacts are expected. The Airport Master Plan update does not involve expanding airport operations beyond the existing airport boundaries. Homes located within the 65 or 70 DNL are not located in an area of high minority or low-income population.	None necessary.
Water Quality	None. Conditions of the statewide MSGP and CGP would be applicable to all new development at the airport.	None necessary.
Wetlands and Waters of the U.S.	None. There are no aquatic features or hydric soils present at the airport that would indicate the potential for wetland habitat or waters of the U.S. The airport is located on a flat plateau surrounded on both sides by deep canyons.	None necessary.
Wild and Scenic Rivers	None. The airport is located approximately 15 miles from the closest designated Wild and Scenic Rivers segment.	None necessary.

REFERENCES

CCS (Center for Climate Strategies) 2006. Appendix D: New Mexico Greenhouse Gas Inventory and Reference Case Projections, 1990 – 2020, prepared for the New Mexico Environment Department, November.

Appendix E

AIRPORT PLANS

Appendix E
AIRPORT PLANS

As part of this master plan, the Federal Aviation Administration (FAA) requires the development of several technical drawings detailing specific parts of the airport and its environs. The technical drawings are collectively referred to as the Airport Layout Plan (ALP) set. These drawings were created on a computer-aided drafting system (CAD) and serve as the official depiction of the current and planned condition of the airport. These drawings will be delivered to the FAA for their review and approval. The FAA will critique the drawings from a technical perspective to be sure all applicable federal regulations are met.

The five primary functions of the ALP, as summarized from AC 150/5070-6B, *Airport Master Plans*, are:

1) An approved plan is necessary for the airport to receive financial assistance under the terms of the *Airport and Airway Improvement Act of 1982* (AIP), as amended, and to be able to receive specific Passenger Facility Charge funding. An airport must keep its ALP current and follow that plan, since those are grant assurance requirements of the AIP and previous airport development programs, including the 1970 Airport Development Aid Program (ADAP) and Federal Aid Airports Program (FAAP) of 1946, as amended. While ALPs are not required for airports other than those developed with assistance under the aforementioned federal programs, the same guidance can be applied to all airports.

2) An ALP creates a blueprint for airport development by depicting proposed facility improvements. The ALP provides a guideline by which the airport sponsor can ensure that development maintains airport design standards and safety requirements, and is consistent with airport and community land use plans.

3) The ALP is a public document that serves as a record of aeronautical requirements, both present and future, and as a reference for community deliberations on land use proposals and budget resource planning.

4) The approved ALP enables the airport sponsor and the FAA to plan for facility improvements at the airport. It also allows the FAA to anticipate budgetary and procedural needs. The approved ALP will also allow the FAA to protect the airspace required for facility or approach procedure improvements.

5) The ALP can be a working tool for the airport sponsor, including its development and maintenance staff.

It should be noted that the FAA requires that any changes to the airfield (i.e., runway and taxiway system, etc.) be represented on the drawings. The landside configuration developed during this master planning process is also depicted on the drawings, but the FAA recognized that landside development is much more fluid and often dependent upon specific developer needs. Thus, an updated drawing set is not typically necessary for future landside alterations provided they do not impact the airside plan.

AIRPORT LAYOUT PLAN SET

The ALP set includes several technical drawings which depict various aspects of the current and future layout of the airport. The following is a description of the ALP drawings included with this master plan.

AIRPORT LAYOUT PLAN DRAWING

An official Airport Layout Plan (ALP) drawing has been developed for Los Alamos Airport, a draft of which is included in this appendix. The ALP drawing graphically presents the existing and ultimate airport layout plan. The ALP drawing will include such elements as the physical airport features, wind data tabulation, location of airfield facilities (i.e., runways, taxiways, navigational aids), and existing general aviation development. Also presented on the ALP are the runway safety areas, airport property boundary, and revenue support areas.

The computerized plan provides detailed information on existing and future facility layouts on multiple layers that permit the user to focus on any section of the airport at a desired scale. The plan can be used as base information for design and can be easily updated in the future to reflect new development and more detail concerning existing conditions as made available through design surveys.

FAR PART 77 AIRSPACE DRAWING

Federal Aviation Regulation (F.A.R.) Part 77, *Objects Affecting Navigable Airspace*, was established for use by local authorities to control the height of objects near airports. The FAR Part 77 Airspace Drawing included in this master plan is a graphic depiction of this regulatory criterion. The FAR Part 77 Airspace Drawing is a tool to aid local authorities in determining if proposed development could present a hazard to aircraft using the airport. The FAR Part 77 Airspace Drawing can be a critical tool for the airport sponsor's use in reviewing proposed development in the vicinity of the airport.

The airport sponsors should do all in their power to ensure development stays below the FAR Part 77 surfaces to protect the role of the airport. The following discussion will describe those surfaces that make up the recommended FAR Part 77 surfaces at Los Alamos Airport.

The FAR Part 77 Airspace Drawing assigns three-dimensional imaginary surfaces associated with the airport. These imaginary surfaces emanate from the runway centerline(s) and are dimensioned according to the visibility minimums associated with the approach to the runway end and size of aircraft to operate on the runway. The FAR Part 77 imaginary surfaces include the primary surface, approach surface, transitional surface, horizontal surface, and conical surface. Each surface is described as follows.

Penetrations to the FAR Part 77 are considered obstructions to the airport airspace. Further analysis by the FAA, through an aeronautical survey, is necessary to determine if any obstructions are hazards to air navigation. No current or planned future development at the airport is considered a hazard; however, this ALP set will be reviewed by the FAA and an aeronautical survey will be undertaken, and there is a possibility that hazards may be identified. In this case, the hazards would have to be mitigated.

Primary Surface

The primary surface is an imaginary surface longitudinally centered on the runway. The primary surface extends 200 feet beyond each runway pavement end. The elevation of any point on the primary surface is the same as the elevation along the nearest associated point on the runway centerline. The primary surface for Runway 9-27 is 500 feet wide as centered on the runway.

Approach Surface

An approach surface is also established for each runway end supporting aircraft approaches. At Los Alamos Airport, there is an approach surface leading to Runway 27 but there is not an approach surface associated with Runway 9 as landings are not permitted to this runway end. The approach surface begins at the same width as the primary surface, extends upward and outward from the primary surface end, and is centered along an extended runway centerline. The approach surface leading to the runway is based upon the type of approach available (instrument or visual) or planned.

The approach surface for Runway 27 extends a horizontal distance of 5,000 feet at a 20:1 slope. The outer width of the approach surface is 2,000 feet. The instrument approach is not planned to change in the future.

Transitional Surface

The runway has a transitional surface that begins at the outside edge of the primary surface at the same elevation as the runway. The surface rises at a slope of 7:1, up to a height of 150 feet above the highest runway elevation. At that point, the transitional surface is replaced by the horizontal surface.

Horizontal Surface

The horizontal surface is a plane 150 feet above the established airport elevation. Having no slope, the horizontal surface connects the transitional and approach surfaces to the conical surface at a distance of 5,000 feet from the end of the primary surface.

Conical Surface

The conical surface begins at the outer edge of the horizontal surface. The conical surface then continues for an additional 4,000 feet horizontally at a slope of 20:1. Therefore, at 4,000 feet from the horizontal surface, the elevation of the conical surface is 350 feet above the highest airport elevation.

APPROACH SURFACE PROFILE DRAWINGS

The runway profile drawing presents the entirety of the FAR Part 77 approach surface to the end of the runway. It also depicts the runway centerline profile with elevations. This drawing provides profile details that the Airspace Drawing does not.

The approach surface profile drawings include identified penetrations to the approach surface. Penetrations to the approach surface are considered obstructions. The FAA will determine if any obstructions are also hazards which require mitigation. The FAA utilizes other design criteria such as the threshold siting surface (TSS) and various surfaces defined in FAA Order 8260.3B, *Terminal Instrument Procedures* (TERPS), to determine if an obstruction is a hazard.

If an obstruction is a hazard, the FAA can take many steps to protect air navigation. The mitigation options range from the airport owner removing the hazard to installing obstruction lighting to the FAA adjusting the instrument approach minimums.

TERMINAL AREA DRAWING

The terminal area drawing is a larger scale plan view drawing of existing and planned aprons, buildings, hangars, parking lots, and other landside facilities.

AIRPORT LAND USE DRAWING

The objective of the Airport Land Use Drawing is to coordinate uses of the airport property in a manner compatible with the functional design of the airport facility. Airport land use planning is important for orderly development and efficient use of available space. There are two primary considerations for airport land use planning. These are to secure those areas essential to the safe and efficient operation of the airport and to determine compatible land uses for the balance of the property which would be most advantageous to the airport and community. In essence, this drawing depicts the suggested highest and best potential uses for airport property.

The depiction of on-airport land uses on this drawing becomes the official FAA acceptance of current and future land uses. There are two different land uses identified for Los Alamos Airport: Airfield Operations and Aviation Development. Some airports with more property may have areas designated for Revenue Support or other non-aviation classifications.

The Airfield Operations category includes the immediate runway and taxiway environment and includes the navigational aid critical areas, runway and taxiway safety areas, and the runway protection zone. The Airfield Operations area is reserved for facilities critical to the safe operations of aircraft on the runways and taxiways.

The Aviation Development category reserves critical space adjacent to the Airfield Operations area for aviation-specific activity. This activity includes all facilities necessary for aviation-related functions including hangars, terminal buildings, fuel farms, parking, and access roads. Essentially any facilities to be developed in the Aviation Development area must be intended for a function that requires access to the runway and taxiway system.

Los Alamos Airport encompasses only 89 acres. As a result, there is no property identified for non-aviation revenue support functions. All property is reserved for aviation functions.

AIRPORT PROPERTY MAP

The Airport Property Map, often referred to as Exhibit A, provides information on property under airport control and is, therefore, subject to FAA grant assurances. The various recorded deeds that make up the airport property are listed in tabular format. The primary purpose of the drawing is to provide information for analyzing the current and future aeronautical use of land acquired with federal funds.

DEPARTURE SURFACE DRAWING

For runways supporting instrument operations, such as Runway 27, a separate drawing depicting the departure surface is required. The departure surface, when clear, allows pilots to follow standard departure procedures. The departure surface emanates from the departure end of the runway (TODA) to a distance of 10,200 feet. The inner width is 1,000 feet and the outer width is 6,466 feet. The slope of the departure surface is 40:1.

Obstacles frequently penetrate the departure surface. Where object penetrations exist, the departure procedure can be adjusted by:

a) Non-standard climb rates, and/or
b) Non-standard (higher) departure minimums.
c) Reduction in the TODA length.

Therefore, it is important for the airport sponsor to identify and remove departure surface obstacles whenever possible in order to enhance takeoff operations at the airport. The airport sponsor should also prevent any new obstacles from developing.

U.S. Department
of Transportation
**Federal Aviation
Administration**

Airports Division
Southwest Region
Arkansas, Louisiana,
New Mexico, Oklahoma,
Texas

2601 Meacham Blvd
Fort Worth, Texas 76137

May 30, 2013

Los Alamos County
Attn: Peter Soderquist
1040 Airport Road
Los Alamos, NM 87544

Dear Mr. Soderquist:

Subject: Aeronautical Study No.: *2013-ASW-1025-NRA*
Airport Layout Plan Approval – FINAL DETERMINATION

The Federal Aviation Administration (FAA) has reviewed and conditionally approved the Airport Layout Plan (ALP) for Los Alamos Airport located in Los Alamos, New Mexico. The review was conducted under the authority of the Federal Aviation Regulation (FAR) Part 77 and under the requirements of the Terms and Conditions of Accepting Airport Improvement Program Grants dated September 1, 1999. This review has considered the safety and utility of aircraft operations and planned navigational aids as related to this proposal.

The FAA conducted an aeronautical study of the airport and the proposed improvements on the ALP (Aeronautical Study No. *2013-ASW-1025-NRA*) and determined that the ALP would not be objectionable from an airspace utilization standpoint; therefore, the ALP is conditionally approved subject to the conditions listed below:

1. Airport must update the iOE-AAA airport database to reflect the revised ALP as necessary.
2. This request of an ALP review does not constitute a request for development of any Instrument Approach Procedures. Any request for IAP should be made 12 to 18 months prior to desired publication cycle date. Up to date survey data must be provided at the time of request.

In making this determination, the FAA has considered matters such as the effect the proposal would have on existing or planned traffic patterns of neighboring airports, the effects it would have on the existing airspace structure and project programs of the FAA, the effects it would have on the safety of persons and property on the ground, and the effects that existing or proposed manmade objects (on file with the FAA) and known natural objects within the affected area would have on the airport proposal.

Please note the FAA has not yet made an environmental determination concerning the proposed improvements. This determination is not a commitment of Federal funds and does not constitute FAA approval or disapproval of the physical development involved in the proposal. In addition, the proposed development must be environmentally acceptable in accordance with Public Law 91-190, Public Law 91-258, and/or Public Law 90-495. An environmental finding is a prerequisite to any major airport development project when Federal aid will be granted for the project.

Prior to the construction of any proposed above ground development, including hangars, buildings, etc., as depicted on the ALP, a separate aeronautical study of each development will be required along with associated environmental documentation. Exact description of the development, including NAD 83 latitude/longitude coordinates of building corners, heights, and construction material types, will be required before a determination can be made as to its effect on aviation.

This approval does not include equipment, such as tower cranes, that may be used during construction. A separate airspace notice will be necessary for each development and associated construction equipment.

This final determination does not authorize construction of the development, nor constitute FAA's commitment to participate in the proposed development.

The FAA cannot prevent the construction of structures near an airport. The airport environs can only be protected through such means as local zoning ordinances or acquisitions of property rights. You are reminded that your local zoning may need updating based on the approved ALP. You may wish to adopt the plan by local resolution and publicize it in a newspaper of local circulation.

Sincerely,

Lacey D. Spriggs
Manager, LA/NM Airports
Development Office

Enclosure

AIRPORT LAYOUT PLANS

FOR

LOS ALAMOS AIRPORT

Los Alamos, New Mexico

INDEX OF DRAWINGS

MARCH 2013

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RUNWAY DECLARED DISTANCE	EXISTING		ULTIMATE	
	RWY 9	RWY 27	RWY 9	RWY 27
TAKEOFF RUN AVAILABLE (TORA)	6000'	6000' *	Same	Same
TAKEOFF DISTANCE AVAILABLE (TODA)	6000'	6000' *	Same	Same
ACCELERATE-STOP DISTANCE AVAILABLE (ASDA)	6000'	5835' *	Same	Same
LANDING DISTANCE AVAILABLE (LDA)	N/A	5835'	Same	Same

* Operations in these directions are not permitted.

RUNWAY COORDINATES (NAD 83)

LAM Airport Detail October 2012: http://avnwww.jccbi.gov/datasheet/		EXISTING/ULTIMATE
Runway 9 End Coordinates (NAD 83) EL. 7170.9 / N/A (NAVD 88)	Latitude	35° 52' 53.2370" N
	Longitude	106° 16' 42.8810" W
Runway 27 End Coordinates (NAD 83) EL. 7079.6/TDZ EL. 7125.6 (NAVD 88)	Latitude	35° 52' 40.4920" N
	Longitude	106° 15' 31.6670" W

GENERAL NOTES:

1. Depiction of features and objects, including related elevations and clearances, within the runway protection zones are depicted on the INNER PORTION OF RUNWAY APPROACH SURFACE DRAWINGS.
2. Details concerning terminal improvements are depicted on the TERMINAL AREA DRAWING.
3. Future Taxiways are 25' wide and Holding Position marking are 125' from Runway Centerline.
4. Rename Partial Parallel Taxiway F to Taxiway A and connecting Taxiways as A1 thur A7.
5. NAVD 88 Datum was used for all vertical elevations and NAD 83 for all horizontal elevations.

LEGEND

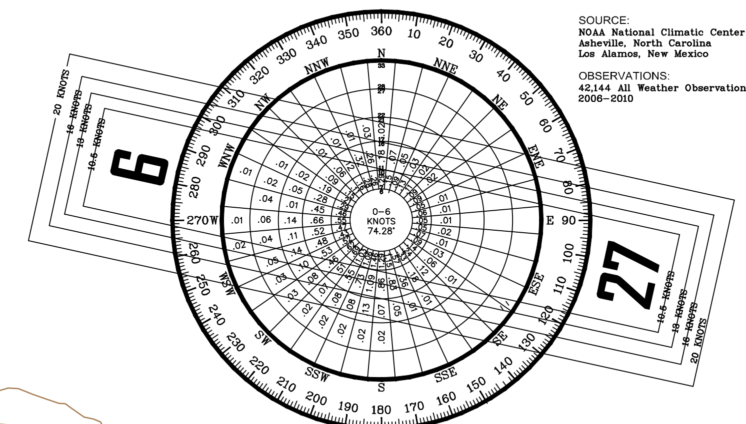
EXISTING	ULTIMATE	DESCRIPTION
	SAME	ABANDONED PAVEMENT (To Be Removed)
	SAME	AIRPORT PROPERTY LINE/FENCE
	SAME	AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
	SAME	BUILDING ABANDONMENT (To Be Removed)
		BUILDING
		PAVEMENT
		FENCING
PAPI-2L	SAME	NAVIGATIONAL AID INSTALLATION (PAPI-2)
	SAME	RUNWAY THRESHOLD LIGHTS and REIL
10 11 15 14	SAME	SECTION CORNER
		SEGMENTED CIRCLE/WIND INDICATOR
7080	SAME	TOPOGRAPHY (NAVD 88)
		HOLDING POSITION MARKING
BRL/TOFA	SAME	BUILDING RESTRICTION LINE / TAXIWAY OFA
TOFA	SAME	TAXIWAY OFA
Extd OFA	SAME	EXTENDED OBJECT FREE AREA
xOFA	SAME	OBJECT FREE AREA
xRSA	SAME	RUNWAY SAFETY AREA
xOFA/xOFZ	SAME	OBJECT FREE AREA/OBSTACLE FREE ZONE
	SAME	SURVEY MONUMENT (PACS/SACS)
	SAME	RUNWAY PROTECTION ZONE (RPZ)
BRL	SAME	BUILDING RESTRICTION LINE (BRL)
		TIE-DOWNS
	SAME	AWOS-3
	SAME	AWOS-3 CRITICAL AREA (500' R)
	SAME	ANEMOMETER
	SAME	SURVEY MONUMENT

ALL WEATHER WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 9-27	93.08%	96.13%	99.12%	99.78%

AIRPORT DATA

OWNER: Los Alamos	CITY: Los Alamos, New Mexico	LOS ALAMOS AIRPORT (LAM)	
COUNTY: Los Alamos	RANGE: 6E TOWNSHIP: 19N	EXISTING	ULTIMATE
AIRCRAFT APPROACH CATEGORY-DESIGN GROUP		B-I	Same
DESIGN CRITICAL AIRCRAFT		Cessna C-210L	Same
AIRPORT ELEVATION (NAVD 88)		7170.9 MSL	Same
MEAN MAXIMUM TEMPERATURE OF HOTTEST MONTH		80.0° F (July)	Same
AIRPORT REFERENCE POINT (ARP)	Latitude	35° 52' 46.8700" N	Same
COORDINATES (NAD 83) NOS SURVEY DATED	Longitude	106° 16' 07.2700" W	Same
AIRPORT INSTRUMENT APPROACH PROCEDURES		None	Same
RNAV (GPS) APPROACH		GPS Y (1 mile) RWY 27 GPS Z (1 mile) RWY 27	Same
AIRPORT and TERMINAL NAVIGATIONAL AIDS		AWOS-3 Airport Rotating Beacon Lighted Windsock Segmented Circle	Same



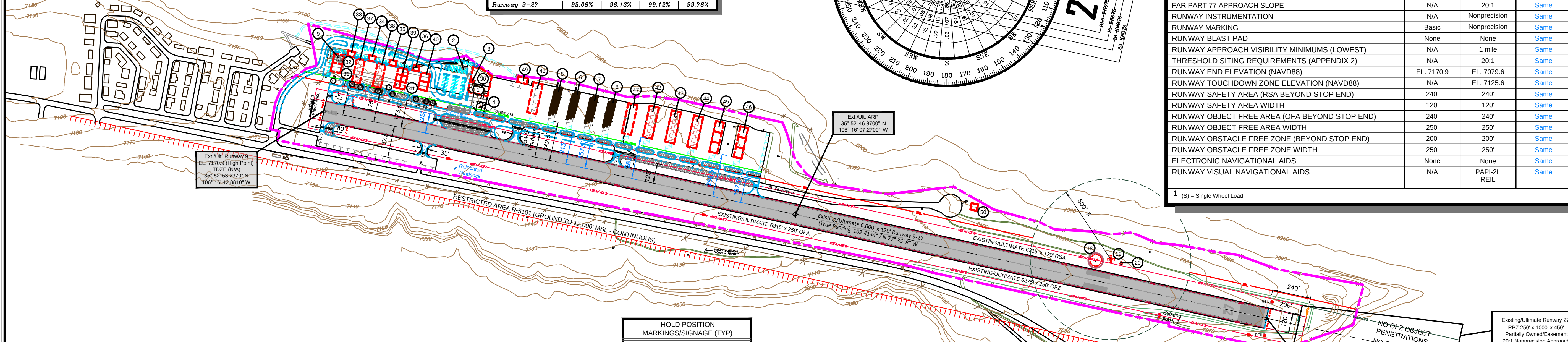
SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Los Alamos, New Mexico

OBSERVATIONS:
42,144 All Weather Observations
2006-2010

RUNWAY DATA

RUNWAY DATA	Runway 9-27 EXISTING		Runway 9-27 ULTIMATE	
AIRCRAFT APPROACH CATEGORY-RUNWAY DESIGN CODE	B-I-NP1 (Small)		B-I-NP1 (Small)	
DESIGN CRITICAL AIRCRAFT	Cessna C-210L		Same	
WINGSPAN OF DESIGN AIRCRAFT	36.8'		Same	
MAX. CERTIFIED TAKEOFF WEIGHT OF DESIGN A/C	3800 lbs. (MTOW)		Same	
DESIGN AIRCRAFT APPROACH SPEED IN KNOTS	75 (KNOTS)		Same	
TAXIWAY CENTERLINE TO FIXED OR MOVABLE OBJECT	44.5'		Same	
TAXIWAY WINGTIP CLEARANCE	20'		Same	
RUNWAY CENTERLINE TO PARALLEL TAXIWAY CENTERLINE	N/A		Same	
RUNWAY DIMENSIONS (L X W)	6,000' X 120'		Same	
RUNWAY TRUE BEARING (NGS SURVEY)	102.40°/282.41°		Same	
RUNWAY WIND COVERAGE (16 KNOTS/18 MPH)	99.12%		Same	
RUNWAY SHOULDERS	10'		Same	
RUNWAY MAXIMUM ELEVATION/HIGH POINT (NAVD88)	7170.9 MSL		Same	
RUNWAY LOW POINT ELEVATION (NAVD88)	7079.6 MSL		Same	
RUNWAY LIGHTING (PCL)	MIRL		Same	
RUNWAY EFFECTIVE GRADIENT/MAXIMUM GRADIENT	1.5%		Same	
RUNWAY PAVEMENT MATERIAL / SURFACE TREATMENT	Asphalt (PFC)		Same	
RUNWAY PAVEMENT STRENGTH (IN THOUSAND LBS.) [1]	43(S)		Same	
LINE OF SIGHT REQUIREMENT MET	Yes		Same	
TAXIWAY WIDTH	25'		Same	
TAXIWAY LIGHTING	Reflectors		MITL	
TAXIWAY MARKING	Centerline		Same	
TAXIWAY SURFACE MATERIAL	Asphalt		Same	
TAXIWAY SAFETY AREA WIDTH	49'		Same	
TAXIWAY OBJECT FREE AREA WIDTH	89'		Same	
TAXIWAY HOLDING POSITION MARKING/HOLDSIGN	125'		Same	
	RUNWAY 9	RUNWAY 27	RUNWAY 9	RUNWAY 27
FAR PART 77 CATEGORY	N/A	NP-A	Same	Same
FAR PART 77 APPROACH SLOPE	N/A	20:1	Same	Same
RUNWAY INSTRUMENTATION	N/A	Nonprecision	Same	Same
RUNWAY MARKING	Basic	Nonprecision	Same	Same
RUNWAY BLAST PAD	None	None	Same	Same
RUNWAY APPROACH VISIBILITY MINIMUMS (LOWEST)	N/A	1 mile	Same	Same
THRESHOLD SITING REQUIREMENTS (APPENDIX 2)	N/A	20:1	Same	Same
RUNWAY END ELEVATION (NAVD88)	EL. 7170.9	EL. 7079.6	Same	Same
RUNWAY TOUCHDOWN ZONE ELEVATION (NAVD88)	N/A	EL. 7125.6	Same	Same
RUNWAY SAFETY AREA (RSA BEYOND STOP END)	240'	240'	Same	Same
RUNWAY SAFETY AREA WIDTH	120'	120'	Same	Same
RUNWAY OBJECT FREE AREA (OFA BEYOND STOP END)	240'	240'	Same	Same
RUNWAY OBJECT FREE AREA WIDTH	250'	250'	Same	Same
RUNWAY OBSTACLE FREE ZONE (BEYOND STOP END)	200'	200'	Same	Same
RUNWAY OBSTACLE FREE ZONE WIDTH	250'	250'	Same	Same
ELECTRONIC NAVIGATIONAL AIDS	None	None	Same	Same
RUNWAY VISUAL NAVIGATIONAL AIDS	N/A	PAPI-2L REIL	Same	Same

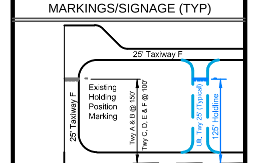
1 (S) = Single Wheel Load



DEVIATIONS FROM FAA AIRPORT DESIGN STANDARDS

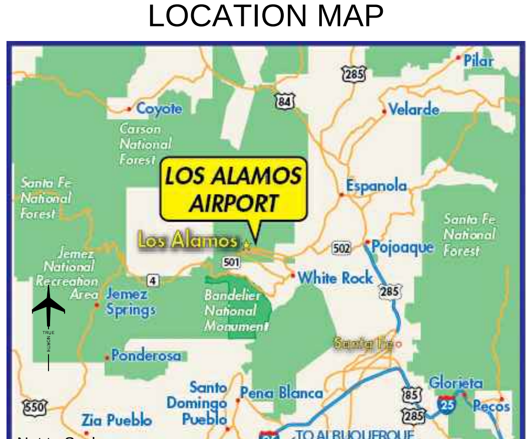
DEVIATION DESCRIPTION	EFFECTED DESIGN STANDARD	STANDARD	EXISTING	PROPOSED DISPOSITION
Segmented Circle/Windsock	Runway Object Free Area (OFA/OFZ)	240'	240'	Request Modification to Standard
Blast Fence 75' from Runway 9 End	Runway Object Free Area (OFA)	240'	165'	Apply for Runway Declared Distances
Blast Fence 75' from Runway 9 End	Runway Safety Area (RSA)	240'	165'	Apply for Runway Declared Distances
Blast Fence 75' from Runway 9 End	Obstacle Free Zone (OFZ)	200'	125'	Apply for Runway Declared Distances
Road 103' from Runway 27 End	Runway Safety Area (RSA)	240'	103'	Service Road-No Action
Runway Centerline to Taxiway Centerline	Runway CL to Taxiway CL	150'	125'	Relocate Parallel Taxiway CL to 157.5' from Runway Centerline
Taxiway Holding Position Marking & Holdsign	Holding Position Marking/Holdsign	125'	Varies	Relocate to 125' from Runway Centerline

HOLD POSITION MARKINGS/SIGNAGE (TYP)



(Not To Scale)

LOCATION MAP



Not to Scale:

	ULTIMATE BUILDINGS/FACILITIES DESCRIPTION	Elevation
30	TERMINAL BUILDING	30' AGL
31	HANGAR (62 'x 56')	25' AGL
32	HANGAR (62 'x 56')	25' AGL
33	HANGARS (42' x 33')	25' AGL
34	HANGARS (42' x 33')	25' AGL
35	HANGARS (42' x 33')	35' AGL
36	HANGARS (42' x 33')	35' AGL
37	T-HANGAR (6 units 147' x 51')	35' AGL
38	T-HANGAR (6 units 147' x 51')	35' AGL
39	HANGARS (6 @ 42' x 33')	35' AGL
40	HANGAR (56' x 52')	20' AGL
41	HANGAR (56' x 52')	20' AGL
42	T-HANGAR (8 units 198' x 58')	22' AGL
43	T-HANGAR (8 units 198' x 58')	22' AGL
44	T-HANGAR (8 units 198' x 58')	22' AGL
45	BOX HANGAR (3 @ 65' x 50')	22' AGL
46	BOX HANGAR (3 @ 65' x 50')	22' AGL
47	SHED HANGAR (190' x 58')	20' AGL
48	SHED HANGAR (190' x 58')	20' AGL
49	FUEL FARM	N/A
50	SRE BUILDING	18' AGL

EXISTING BUILDING/FACILITIES	ELEVATION
1. TERMINAL BUILDING (To Be Replaced)	-
2. STORAGE BUILDING (To Be Removed)	-
3. AIRPORT BEACON (To Be Relocated)	7172
4. WINDSOCK (Relocate)	7176
5. T-HANGAR	-
6. T-HANGAR	-
7. T-HANGAR	-
8. T-HANGAR	-
9. MOBILE HOME (To Be Relocated)	-
10. T-HANGAR (To Be Removed)	-
11. T-HANGAR (To Be Removed)	-
12. T-HANGAR (To Be Removed)	-
13. T-HANGAR (To Be Removed)	-
14. T-HANGAR (To Be Removed)	-
15. T-HANGAR (To Be Removed)	-
16. T-HANGAR (To Be Removed)	-
17. T-HANGAR (To Be Removed)	-
18. SEGMENTED CIRCLE/WINDSOCK	7120
19. AWOS-3	-
20. ANEMOMETER	7110
21. FUEL PUMP (Relocate)	N/A

FAA APPROVAL STAMP

FEDERAL AVIATION ADMINISTRATION
Southwest Region
APPROVED
Approved – Subject to conditions
Comments in Letter Dated 5/30/2013
5/30/2013 [signature]
DATE MANAGER, LOUISIANA/NEW MEXICO ADO

FOR APPROVAL BY:

[signature] 3/23/13
Harry Burgess
LOS ALAMOS COUNTY ADMINISTRATOR
DATE:

No.	REVISIONS	DATE	BY	APP'D.
3	-	-	-	-
2	-	-	-	-
1	Airport Layout Plan approved by Los Alamos County, New Mexico	2/1/08	M-C&A	-

TRUE NORTH 8°59'13" E

Magnetic Declination
8° 59' 13" East (October 2012)
Annual Rate of Change 7.4' West

0 300 600 900
SCALE IN FEET

LOS ALAMOS AIRPORT

AIRPORT LAYOUT PLAN

Los Alamos, New Mexico

PLANNED BY: Patrick C. Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: James M. Harris, P.E.

March 1, 2013

Coffman Associates
Airport Consultants
www.coffmanassociates.com

ULTIMATE BUILDINGS/FACILITIES		
DESCRIPTION		Elevation
30	TERMINAL BUILDING	30' AGL
31	HANGAR (62 'x 56')	25' AGL
32	HANGAR (62 'x 56')	25' AGL
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34	HANGARS (42' x 33')	25' AGL
35	HANGARS (42' x 33')	35' AGL
36	HANGARS (42' x 33')	35' AGL
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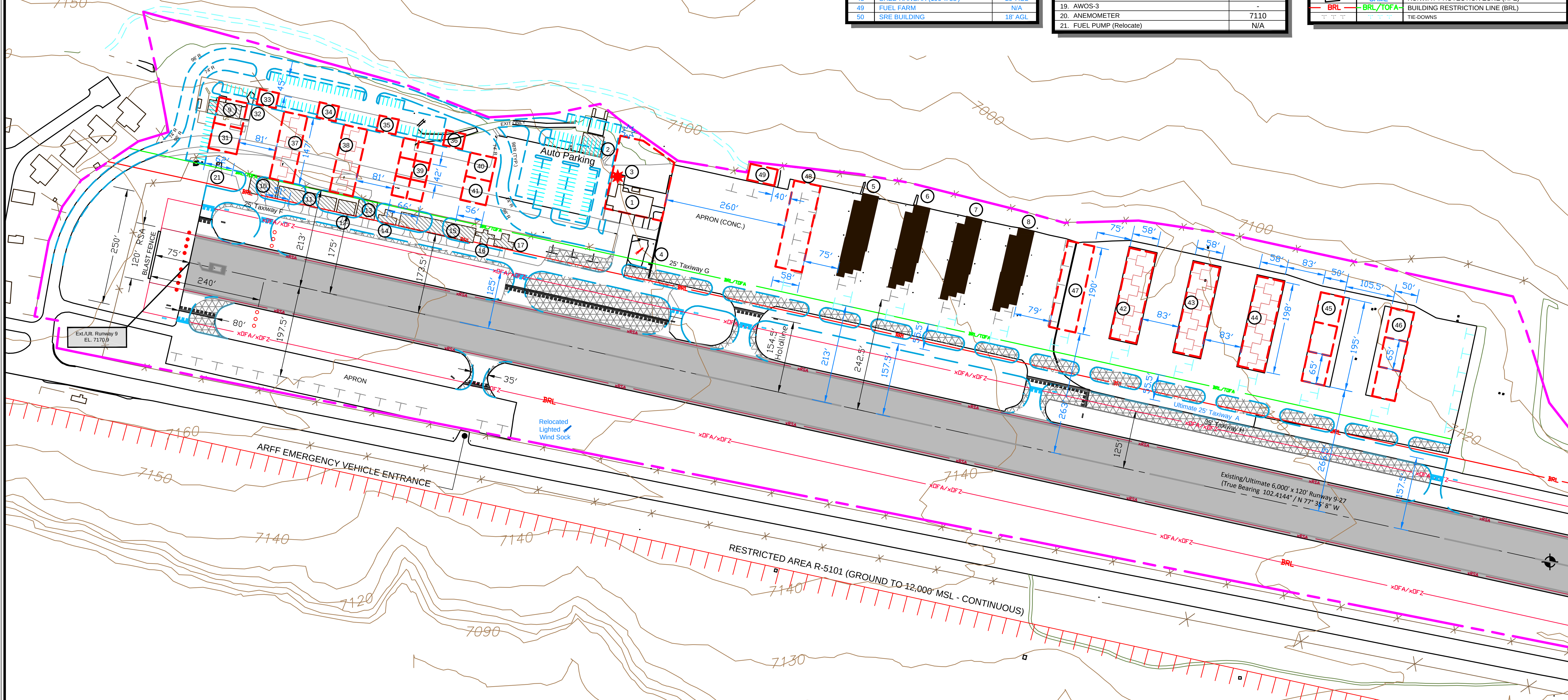
49	FUEL FARM	N/A
50	SRE BUILDING	18' AGL

EXISTING BUILDING/FACILITIES	
	ELEVATION
1. TERMINAL BUILDING (To Be Replaced)	-
2. STORAGE BUILDING (To Be Removed)	-
3. AIRPORT BEACON (To Be Relocated)	7172
4. WINDSOCK (Relocate)	7176
5. T-HANGAR	-
6. T-HANGAR	-
7. T-HANGAR	-
8. T-HANGAR	-
9. MOBILE HOME (To Be Relocated)	-
10. T-HANGAR (To Be Removed)	-
11. T-HANGAR (To Be Removed)	-
12. T-HANGAR (To Be Removed)	-
13. T-HANGAR (To Be Removed)	-
14. T-HANGAR (To Be Removed)	-
15. T-HANGAR (To Be Removed)	-
16. T-HANGAR (To Be Removed)	-
17. T-HANGAR (To Be Removed)	-
18. SEGMENTED CIRCLE/WINDSOCK	7120
19. AWOS-3	-
20. ANEMOMETER	7110
21. FUEL PUMP (Relocate)	N/A

LEGEND		
EXISTING	ULTIMATE	DESCRIPTION
	SAME	ABANDONED PAVEMENT (To Be Removed)
	SAME	AIRPORT PROPERTY LINE/FENCE
	SAME	AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
	SAME	BUILDING ABANDONMENT (To Be Removed)
		BUILDING
	SAME	DRAINAGE
		PAVEMENT
		FENCING
	SAME	RUNWAY THRESHOLD LIGHTS and REIL
34 35 / 3 2	SAME	SECTION CORNER
		SEGMENTED CIRCLE/WIND INDICATOR
7080	SAME	TOPOGRAPHY (NAVD 88)
		HOLDING POSITION MARKING
xOFA	SAME	OBJECT FREE AREA
xRSA	SAME	RUNWAY SAFETY AREA
xOFA/xOFZ	SAME	OBJECT FREE AREA/OBSTACLE FREE ZONE
	SAME	SURVEY MONUMENT (PACS/SACS)
	SAME	RUNWAY PROTECTION ZONE (RPZ)
BRL	BRL/TOFA	BUILDING RESTRICTION LINE (BRL)
		TIE-DOWNS



General Note:

1. Ultimate Taxiways are 25' Typical.
2. Ultimate Holding Position are 125' from Runway Centerline.

TRUE NORTH

8°59'13" E

Magnetic Declination
8° 59' 13" East (October 2012)
Annual Rate of Change 7.4' West

0 100 200 300

SCALE IN FEET

No.	REVISIONS	DATE	BY	APP'D.
3	-	-	-	-
2	-	-	-	-
1	Airport Layout Plan approved by Los Alamos County, New Mexico	2/1/08	M-C&A	-

THE PREPARATION OF THESE DOCUMENTS WAS FINANCED IN PART THROUGH A PLANNING GRANT FROM THE FEDERAL AVIATION ADMINISTRATION AS PROVIDED UNDER SECTION 505 OF THE AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982, AS AMENDED. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THESE DOCUMENTS BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED HEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.

LOS ALAMOS AIRPORT

TERMINAL AREA PLAN

Los Alamos, New Mexico

PLANNED BY: Patrick C. Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: James M. Harris, P.E.

March 1, 2013 | SHEET 2 OF 7

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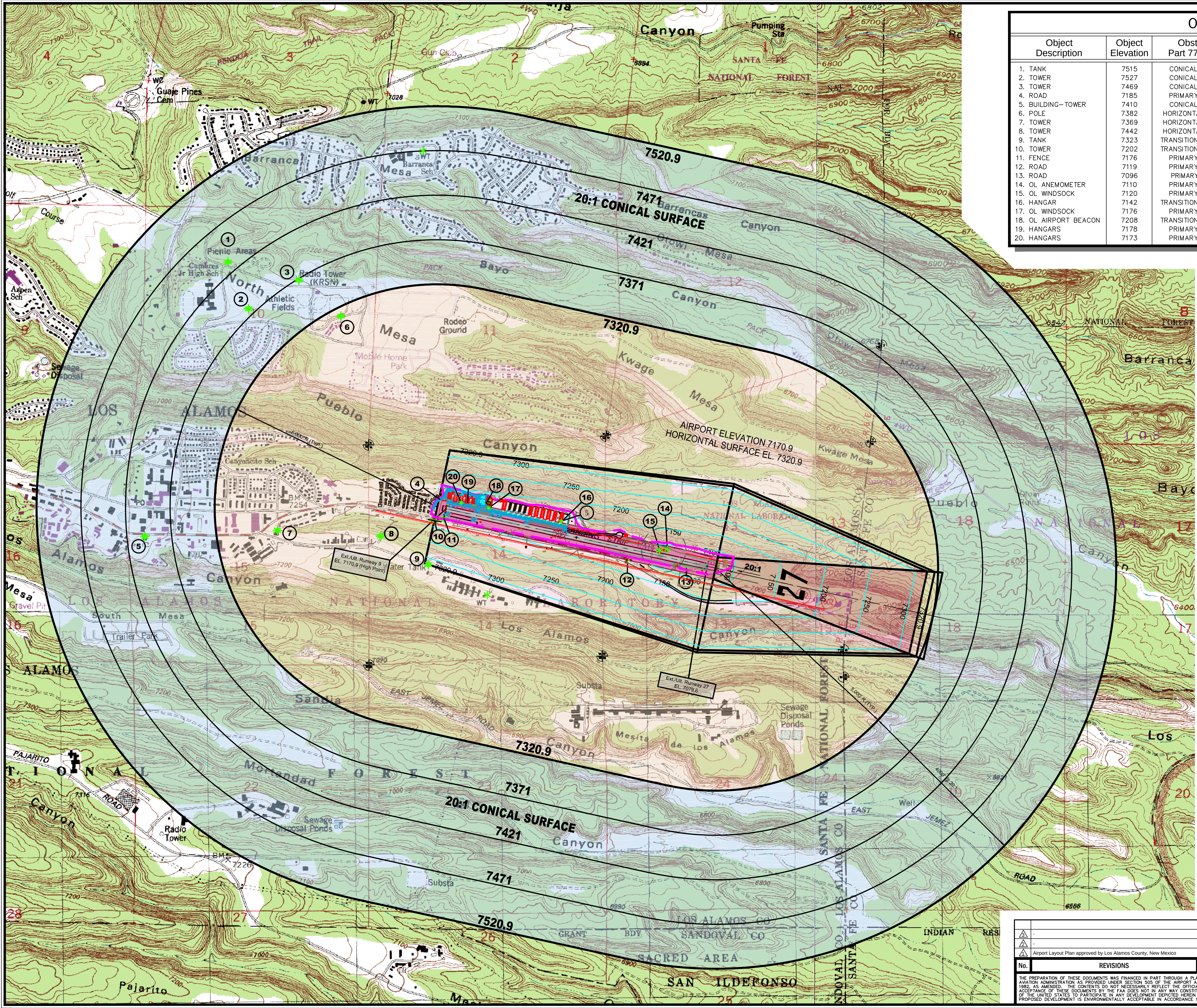
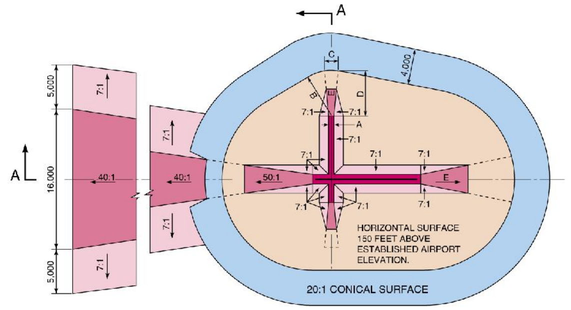


OBSTRUCTION TABLE

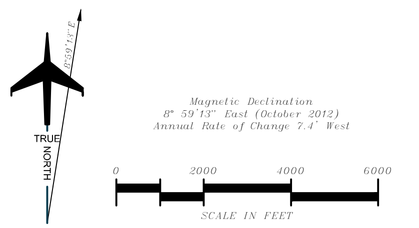
Object Description	Object Elevation	Obstructed Part 77 Surface	Surface Elevation	Object Penetration	Proposed Object Disposition
1. TANK	7515	CONICAL SURFACE	7433	82.1'	FAA STUDY 2004ASW06951OE
2. TOWER	7527	CONICAL SURFACE	7378	148.6'	FAA STUDY 2009ASW05012OE
3. TOWER	7469	CONICAL SURFACE	7371	98'	FAA STUDY 1965ASW00339OE
4. ROAD	7185	PRIMARY SURFACE	7171	14'	REQUEST AERONAUTICAL STUDY
5. BUILDING–TOWER	7410	CONICAL SURFACE	7401	9'	FAA STUDY 2000ASW03798OE
6. POLE	7382	HORIZONTAL SURFACE	7321	61'	REQUEST AERONAUTICAL STUDY
7. TOWER	7369	HORIZONTAL SURFACE	7321	48'	FAA STUDY 2005ASW04957OE
8. TOWER	7442	HORIZONTAL SURFACE	7321	121'	FAA STUDY 2005ASW04610OE
9. TANK	7323	TRANSITIONAL SURFACE	7321	2'	REQUEST AERONAUTICAL STUDY
10. TOWER	7202	TRANSITIONAL SURFACE	7165	37'	REQUEST AERONAUTICAL STUDY
11. FENCE	7176	PRIMARY SURFACE	7171	5'	REQUEST AERONAUTICAL STUDY
12. ROAD	7119	PRIMARY SURFACE	7106	13'	REQUEST AERONAUTICAL STUDY
13. ROAD	7096	PRIMARY SURFACE	7088	8'	ARFF SERVICE ROAD
14. OL ANEMOMETER	7110	PRIMARY SURFACE	7095	15'	NO ACTION
15. OL WINDSOCK	7120	PRIMARY SURFACE	7098	22	NO ACTION
16. HANGAR	7142	TRANSITIONAL SURFACE	7122	20'	REQUEST AERONAUTICAL STUDY
17. OL WINDSOCK	7176	PRIMARY SURFACE	7157	19'	NO ACTION
18. OL AIRPORT BEACON	7208	TRANSITIONAL SURFACE	7176	32'	NO ACTION
19. HANGARS	7178	PRIMARY SURFACE	7158	20'	REQUEST AERONAUTICAL STUDY
20. HANGARS	7173	PRIMARY SURFACE	7161	12'	REQUEST AERONAUTICAL STUDY

GENERAL NOTES:

1. Obstructions, clearances, and locations are calculated from ultimate runway end elevations and ultimate approach surfaces, unless otherwise noted.
2. Depiction of features and objects within the primary, transitional, and horizontal Part 77 surfaces, is illustrated on the AIRPORT AIRSPACE DRAWINGS, sheet 3.
3. Depiction of features and objects within the outer portion of the approach surfaces, is illustrated on the APPROACH SURFACE PROFILES. sheet 4.
4. Depiction of features and objects within the inner portion of the approach surfaces, is illustrated on the INNER PORTION OF THE RUNWAY APPROACH SURFACE DRAWINGS, sheet 4.



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



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LOS ALAMOS AIRPORT

AIRPORT AIRSPACE DRAWING

Los Alamos, New Mexico

PLANNED BY: Patrick C. Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: James M. Harris, P.E.

March 1, 2013 | SHEET 3 OF 7

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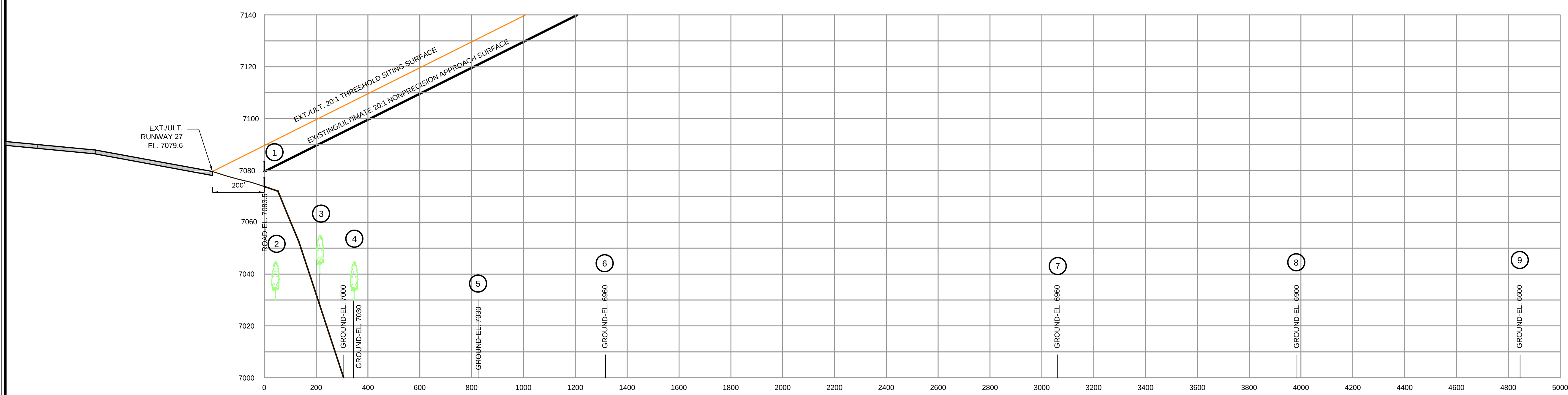
Airport Consultants
www.coffmanassociates.com



RUNWAY 27 OBSTRUCTION TABLE

Object Description/Elevation	Obstructed Part 77 Surface	Approach Penetration	TSS Penetration	Proposed Object Disposition
1 ROAD EL. 7083.5	20:1 APPROACH	3.9'	0'	Service Road – No Action
– –	–	–	–	–

GENERAL NOTES:

1. Obstructions, clearances, and locations are calculated from ultimate runway end elevations and ultimate approach surfaces, unless otherwise noted. Road obstructions reflect a safety clearance of 10' for dirt roads or private roads, 15' for noninterstate roads, 17' for interstate roads, and 23' for railroad. Existing and future height and hazard ordinances are to be amended and/or referenced upon approval of updated AIRPORT AIRSPACE DRAWING. Additional obstruction data is illustrated on Aeronautical Data Sheet (ADS) National Geodetic Survey (NGS) and National Ocean Survey (NOS) document OC6860, AIRPORT OBSTRUCTION CHART.
2. Depiction of features and objects within the primary, transitional, and horizontal Part 77 surfaces, is illustrated on the AIRPORT AIRSPACE DRAWING, sheet 3.
3. All Landings on Rw 27 and all Departures on Rw 09 (Regardless of Conditions).

TRUE NORTH

8°59'13"E

Magnetic Declination
8° 59' 13" East (October 2012)
Annual Rate of Change 7.4' West

0 200 400 600
HORIZONTAL SCALE IN FEET

0 20 40 60
VERTICAL SCALE IN FEET

No.	REVISIONS	DATE	BY	APP'D.
3	-	-	-	-
2	-	-	-	-
1	Airport Layout Plan approved by Los Alamos County, New Mexico	2/1/08	M-C&A	-

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LOS ALAMOS AIRPORT

INNER PORTION OF RUNWAY 27 APPROACH SURFACE DRAWING

Los Alamos, New Mexico

PLANNED BY: Patrick C. Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: James M. Harris, P.E.

March 1, 2013 | SHEET 4 OF 7

Coffman Associates
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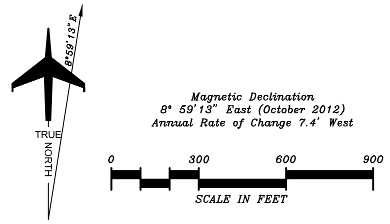
www.coffmanassociates.com

GENERAL NOTES:

1. Depiction of features and objects, including related elevations and clearances, within the runway protection zones are depicted on the INNER PORTION OF RUNWAY APPROACH SURFACE DRAWINGS.
2. Details concerning terminal improvements are depicted on the TERMINAL AREA DRAWING.
3. Future Taxiways are 25' wide and Holding Position Marking are 125' from Runway Centerline.
4. Rename Partial Parallel Taxiway F to Taxiway A and connecting Taxiways as A1 thur A7.
5. NAVD 88 Datum was used for all vertical elevations and NAD 83 for all horizontal elevations.

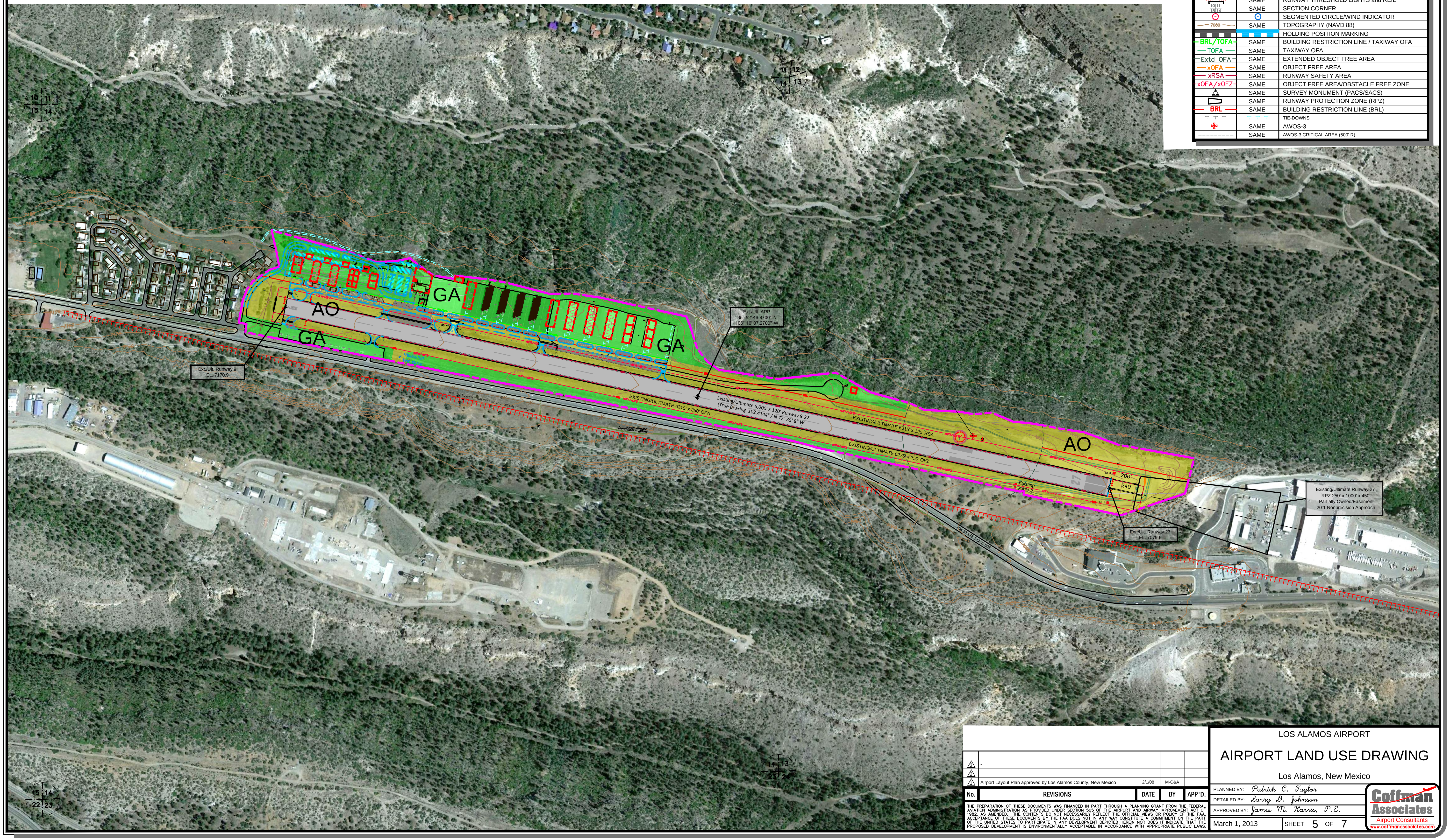


AIRPORT LAND USE LEGEND

AO	AIRFIELD OPERATIONS
GA	GENERAL AVIATION

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
	SAME	ABANDONED PAVEMENT (To Be Removed)
	SAME	AIRPORT PROPERTY LINE/FENCE
	SAME	AIRPORT REFERENCE POINT (ARP)
	SAME	AIRPORT ROTATING BEACON
	SAME	BUILDING ABANDONMENT (To Be Removed)
		BUILDING
		PAVEMENT
		FENCING
PAPI-2L	SAME	NAVIGATIONAL AID INSTALLATION (PAPI-2)
	SAME	RUNWAY THRESHOLD LIGHTS and REIL
10 11 15 14	SAME	SECTION CORNER
		SEGMENTED CIRCLE/WIND INDICATOR
7080	SAME	TOPOGRAPHY (NAVD 88)
		HOLDING POSITION MARKING
BRL/TOFA	SAME	BUILDING RESTRICTION LINE / TAXIWAY OFA
TOFA	SAME	TAXIWAY OFA
Extd OFA	SAME	EXTENDED OBJECT FREE AREA
xOFA	SAME	OBJECT FREE AREA
xRSA	SAME	RUNWAY SAFETY AREA
xOFA/xOFZ	SAME	OBJECT FREE AREA/OBSTACLE FREE ZONE
	SAME	SURVEY MONUMENT (PACS/SACS)
	SAME	RUNWAY PROTECTION ZONE (RPZ)
BRL	SAME	BUILDING RESTRICTION LINE (BRL)
		TIE-DOWNS
	SAME	AWOS-3
	SAME	AWOS-3 CRITICAL AREA (500' R)



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LOS ALAMOS AIRPORT

AIRPORT LAND USE DRAWING

Los Alamos, New Mexico

PLANNED BY: Patrick C. Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: James M. Harris, P.E.

March 1, 2013

SHEET 5 OF 7

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EXISTING PROPERTY DATA

Parcel	Grantor/Grantee	Property Interest	Acreage	Recording Information	Book & Pages	Date Recorded	Federal Project Number
Airport Tract 1A	Los Alamos County	Airport Property Survey	89.09	Document 126919	Book 6 / Page 98	9/24/1997	-

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
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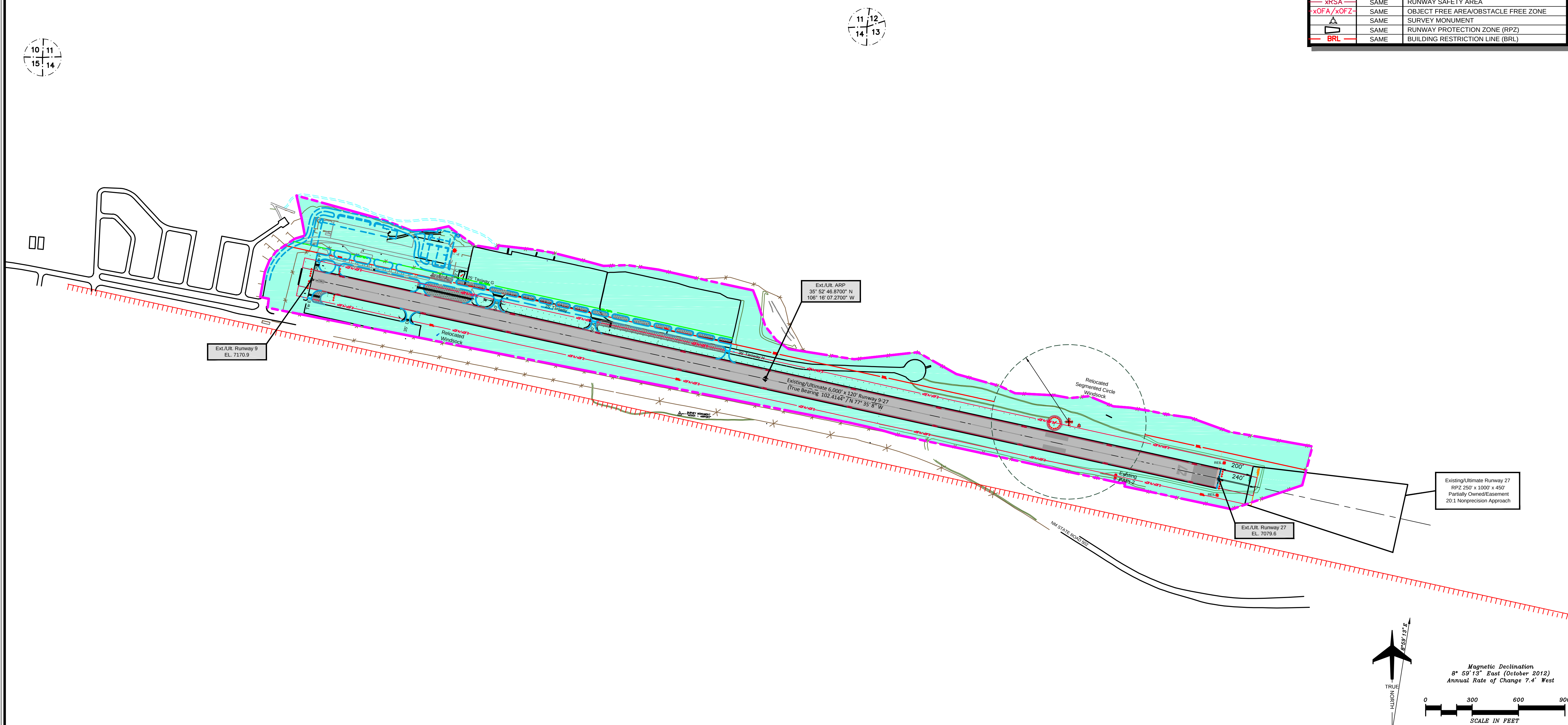
	SAME	AIRPORT PROPERTY LINE/FENCE
	SAME	AIRPORT REFERENCE POINT (ARP)
	SAME	AIRPORT ROTATING BEACON
	SAME	BUILDING ABANDONMENT (To Be Removed)
		PAVEMENT
		FENCING
PAPI-2L	SAME	NAVIGATIONAL AID INSTALLATION (PAPI-2)
	SAME	RUNWAY THRESHOLD LIGHTS and REIL
10 11 15 14	SAME	SECTION CORNER
		SEGMENTED CIRCLE/WIND INDICATOR
7080	SAME	TOPOGRAPHY (NAVD 88)
		HOLDING POSITION MARKING
BRL/TOFA	SAME	BUILDING RESTRICTION LINE / TAXIWAY OFA
xOFA	SAME	OBJECT FREE AREA
xRSA	SAME	RUNWAY SAFETY AREA
xOFA/xOFZ	SAME	OBJECT FREE AREA/OBSTACLE FREE ZONE
	SAME	SURVEY MONUMENT
	SAME	RUNWAY PROTECTION ZONE (RPZ)
BRL	SAME	BUILDING RESTRICTION LINE (BRL)



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LOS ALAMOS AIRPORT

AIRPORT PROPERTY MAP
EXHIBIT A

Los Alamos, New Mexico

PLANNED BY: Patrick C. Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: James M. Harris, P.E.

March 1, 2013 — SHEET 6 OF 7

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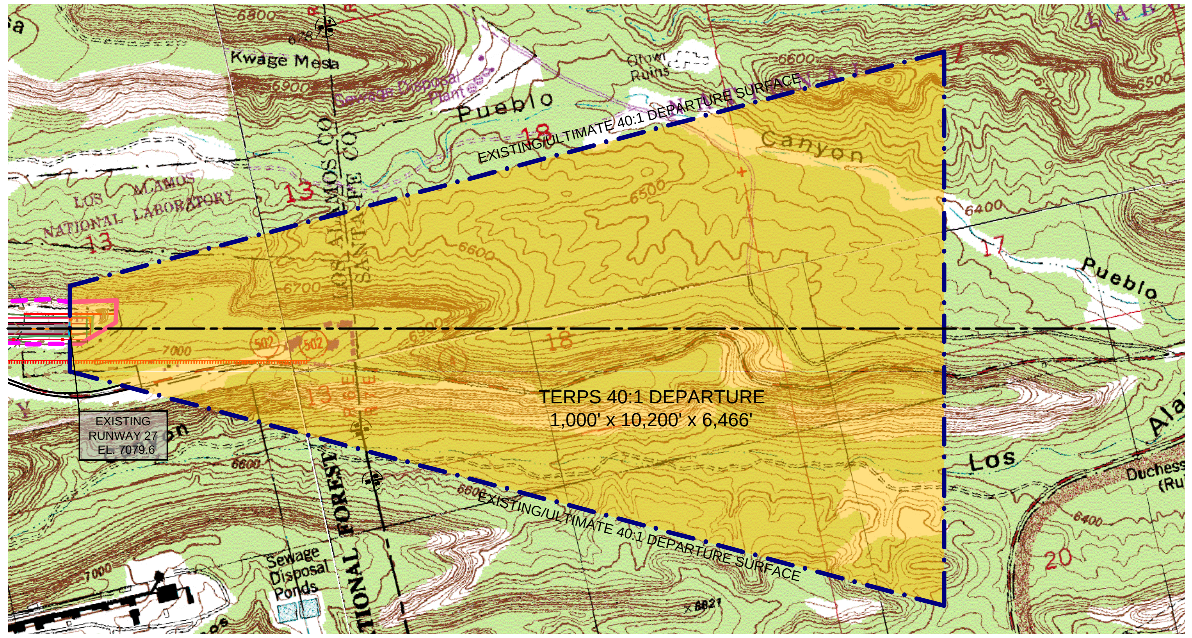
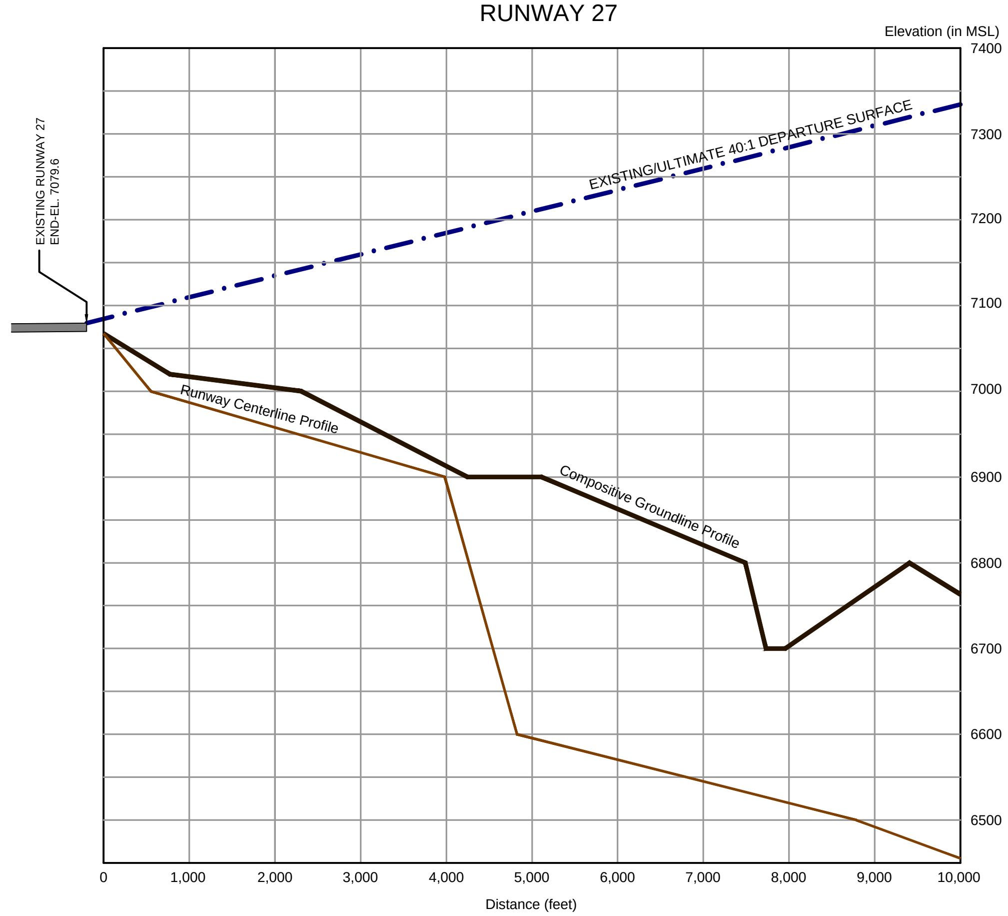
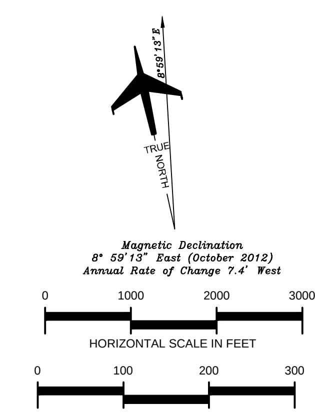


RUNWAY 27





OBSTRUCTION TABLE

Runway 27 Object Description/Elevation	Departure Surface Obstructed	Object Penetration	Proposed Object Disposition
NONE	–	–	–

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LOS ALAMOS AIRPORT

DEPARTURE SURFACE DRAWING RUNWAY 27 END

Los Alamos, New Mexico

PLANNED BY: Patrick C. Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: James M. Harris, P.E.

March 1, 2013

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