REDLANDS

municipal airport

DRAFT FINAL

Airport Master Plan

DRAFT FINAL
AIRPORT MASTER PLAN

for

REDLANDS MUNICIPAL AIRPORT
Redlands, California

Prepared for the

CITY OF REDLANDS

by

Coffman Associates, Inc.

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Redlands, California

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INTRODUCTION AND SUMMARY

INTRODUCTION AND SUMMARY

The Redlands Municipal Airport Master Plan Update has been undertaken to evaluate the airport's capabilities and role, to forecast future aviation demand, and to plan for the timely development of new or expanded facilities that may be required to meet that demand. The ultimate goal of the Master Plan is to provide systematic guidelines for the airport's overall maintenance, development, and operation.

The Master Plan is intended to be a proactive document which identifies and then plans for future facility needs well in advance of the actual need. This is done to ensure that the City of Redlands can coordinate project approvals, design, financing, and construction in a timely manner, prior to experiencing the detrimental effects of inadequate facilities.

An important result of the Master Plan is reserving sufficient areas for future facility needs. This protects development areas and ensures they will be readily available when required to meet future needs. The intended result is a detailed land use concept which outlines specific uses for all areas of airport property.

The preparation of this Master Plan is evidence that the City of Redlands recognizes the importance of air transportation to the community and the associated challenges inherent in providing for its unique operating and improvement needs. The cost of maintaining an airport is an investment which yields impressive benefits to the community. With a sound and realistic Master Plan, Redlands Municipal Airport can maintain its role as an

important link to the national air transportation system for the community and maintain the existing public and private investments in its facilities.

The City of Redlands initiated this Master Plan in 2007 to reevaluate and adjust as necessary the future development plan for the Redlands Municipal Airport. The last Master Plan for Redlands Municipal Airport was completed in 1991. At the airport, the runway and taxiways have been reconstructed and hangars have been developed. Presently, only a few parcels are available for development on the south side of the airport. This Master Plan was undertaken to examine the future development options for the airport, particularly the area north of Runway 8-26. Helicopter operations were also examined.

The City is responsible for funding all capital improvements at the airport and matching Federal Aviation Administration (FAA) and California Department of Transportation - Aeronautics (CALTRANS) development grants. This Master Plan is intended to provide guidance through an updated capital improvement and financial program to demonstrate the future investments required by the City of Redlands at the Redlands Municipal Airport. Additionally, the City of Redlands desired guidance in operational revenue production at the airport through the use and development of airport property.

The City of Redlands also desired to understand how the continued growth of the local economy and community affects demand at the Redlands Municipal Airport and also how the airport can act as a catalyst for this growth.

This Master Plan is also intended to assist the City of Redlands in protecting the airport from incompatible development, as well as minimizing the impacts of the airport on the local community.

Finally, this Master Plan was initiated to consider the ever-changing needs of the air transportation industry. Since the completion of the last Master Plan, significant changes in the general aviation industry have occurred, including the development and introduction of the very light jet or microjet, and the Sport Pilot rule. Each of these factors was considered in terms of future facility needs at Redlands Municipal Airport.

MASTER PLAN GOALS AND OBJECTIVES

The primary objective of the Redlands Municipal Airport Master Plan was to develop and maintain a financially feasible, long term development program which will satisfy aviation demand and be compatible with community development, other transportation modes, and the environment. The accomplishment of this objective required the evaluation of the existing airport and a determination of what actions should be taken to maintain an adequate, safe, and reliable airport facility to meet the air transportation needs of the area. The completed Master Plan provides an outline of the necessary development and gives responsible officials advance notice of future needs to aid in planning, scheduling, and budgeting.

Specific goals and objectives of the Redlands Municipal Airport Master Plan were:

- **Preserve Public and Private Investments**

The City of Redlands, United States Government (through the Federal Aviation Administration [FAA]), and State of California (through CALTRANS) have made considerable investments in the airport's infrastructure. Private individuals and businesses have made investments in buildings and other facilities. The Master Plan will provide for continued maintenance and necessary improvements to the airport's infrastructure to ensure maximum utility of the private facilities at Redlands Municipal Airport and ensure the continued use of publicly funded facilities.

- **Be Reflective of Community Goals and Objectives**

The Redlands Municipal Airport is a public facility serving the needs of the local residents and businesses. The Master Plan needs to be reflective of the desires and visions the local communities have for quality of life, business and development, and land use. The Master Plan will consider existing community planning documents for surrounding communities and the County in the ultimate design and use of the airport.

- **Maintain Safety**

Safety is an essential consideration in the planning and development at the airport. The Master Plan will focus on maintaining the highest levels of safety for airport users, visitors, employees, and surrounding communities.

- **Preserve the Environment**

Protection and preservation of the local environment are essential concerns in the Master Plan. Any improvements called for in the Master Plan will be mindful of environmental requirements.

- **Attract Public Participation**

To ensure that the Master Plan reflects the concerns of the public, the local communities, airport tenants, airport users, and businesses throughout the region, the Master Plan process will include an active public outreach program to solicit comments and suggestions and include them in the final Master Plan, to the extent possible.

- **Strengthen the Economy**

In continuing support of the area's growing economy, the Master Plan is aimed at retaining and increasing jobs and revenue for the region and its businesses.

The Master Plan accomplished these objectives by carrying out the following:

- Determining projected needs of airport users through the year 2026.
- Developing a realistic, commonsense plan for the use and/or expansion of the airport.
- Developing land use strategies for the use of airport property.
- Establishing a schedule of development priorities and a program for improvements.
- Analyzing the airport's financial requirements for capital improvement needs and grant options.
- Coordinating this Master Plan with local, regional, state, and federal agencies.
- Conducting active and productive public involvement through the planning process.
- Determine the economic benefit of the airport to the community.

BASELINE ASSUMPTIONS

Several baseline assumptions were used throughout the analysis. The baseline assumptions for this study are as follows:

- Redlands Municipal Airport will remain as a general aviation airport through the planning period.
- Rialto Airport will close.
- San Bernardino International Airport will continue its conversion from the former Norton Air Force Base and will accommodate commercial airline, air cargo, and general aviation activity.
- The City of Redlands and San Bernardino County population, employment, and economy will continue to grow positively through the 20-year period of this Master Plan. Specifics of projected growth are contained in Chapter Two, Aviation Demand Forecasts.
- The general aviation industry will continue to grow positively through the planning period. Specifics of projected growth in the national general aviation industry are contained in Chapter Two, Aviation Demand Forecasts.
- Both a federal program and state program will be in place through the planning period to assist in funding future capital development needs.

MASTER PLAN ELEMENTS AND PROCESS

The Redlands Municipal Airport Master Plan Update was prepared in a systematic fashion following FAA guidelines and industry-accepted principles and practices. The Master Plan update for Redlands Municipal Airport has six general elements that are intended to assist in the discovery of future facility needs and provide the supporting rationale for their implementation. **Exhibit A** provides a graphical depiction of the process and elements involved in the Redlands Municipal Airport Master Plan Update.

Element One encompasses the inventory efforts. The inventory efforts are focused on collecting and assembling relevant data pertaining to the airport and the area it serves. Information is collected on existing airport facilities and operations. Local economic and demographic data are collected to define the local growth trends. Planning studies which may have relevance to the Master Plan are also collected. Information collected during the inventory efforts is summarized in Chapter One, Inventory.

Element Two examines the potential demand for aviation activity at the airport. This analysis utilizes local socioeconomic information, as well as national air transportation trends to quantify the levels of aviation activity which can reasonably be expected to occur at Redlands Municipal Airport though the year 2026. This includes general aviation based aircraft and annual aircraft operations by type. The number of based aircraft and operations from an air tour operation will also be considered. The results of this effort are used to determine the types and sizes of facilities which will be required to meet the projected aviation demands for the airport through the planning period. The results of this analysis are presented in Chapter Two, Aviation Demand Forecasts.

Element Three comprises the facility requirements analysis. The intent of this analysis is to compare the existing facility capacities to forecast aviation demand and determine where deficiencies in capacities (as well as excess capacities) may exist. Where deficiencies are identified, the size and type of new facilities to accommodate the demand are identified. The airfield analysis focuses on improvements needed to serve the type of aircraft expected to operate at the airport in the future, as well as navigational aids to increase the safety and efficiency of operations. This element also examines aircraft storage hangars and apron needs. The findings of this analysis are presented in Chapter Three, Facility Requirements.

Element Four considers a variety of solutions to accommodate the projected facility needs. This element proposes various facility and site plan configurations to efficiently and effectively use the available airport property. A thorough analysis is completed to identify the strengths and weaknesses of each proposed development alternative, with the intention of determining a single direction for development. These results are presented in Chapter Four, Airport Development Alternatives.

Element Five comprises two independent, yet interrelated work efforts: a recommended development plan and an environmental overview. Chapter Five, Airport Plans, presents a graphic

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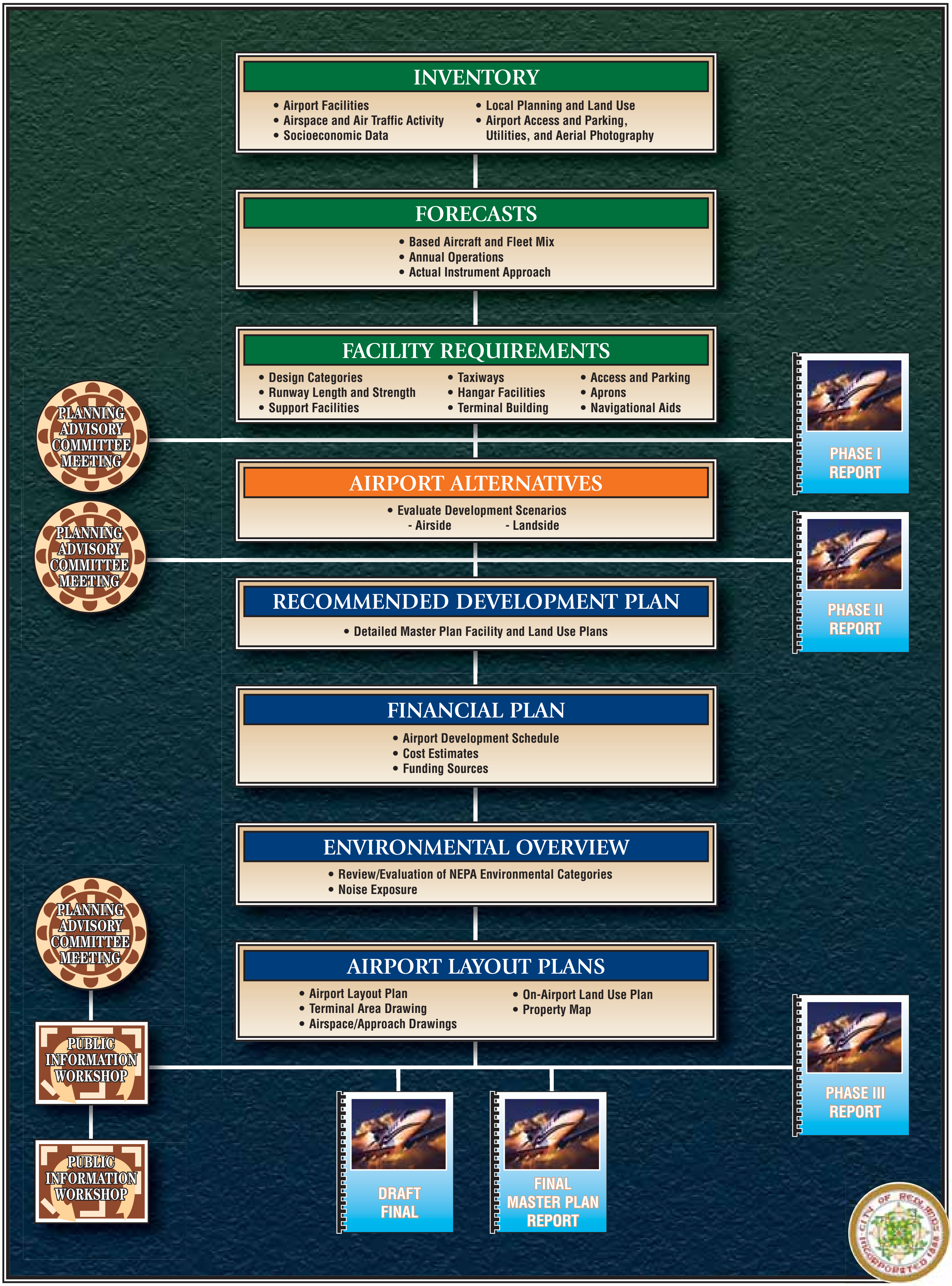

Exhibit A
MASTER PLAN PROCESS

and narrative description of the recommended plan for the use, development, and operation of the airport, and a review of federal environmental requirements applicable to Redlands Municipal Airport. The official Airport Layout Plan (ALP) drawings used by the FAA and CALTRANS in determining grant eligibility and funding will be included as an appendix to the Master Plan.

Element Six focuses on the capital needs program. This program defines the schedules, costs, and funding sources for the recommended development projects. The Capital Improvement Program will be included in Chapter Six.

COORDINATION

The Redlands Municipal Airport Master Plan Update was of interest to many within the local community. This includes local citizens, community organizations, airport users, airport tenants, area-wide planning agencies, and aviation organizations. As an important component of the regional, state, and national aviation systems, the Master Plan Update is of importance to both state and federal agencies responsible for overseeing air transportation.

To assist in the development of the Redlands Municipal Airport Master Plan Update, the City of Redlands has identified a cross-section of community members and interested persons to act in an advisory role in the development of the Master Plan. As members of the Planning Advisory Committee (PAC), the committee members reviewed phase reports and provide comments throughout the study to help ensure that a realistic, viable plan is developed. This committee met three times.

To assist in the review process, draft phase reports were prepared at three milestones in the planning process as shown on **Exhibit A**. The draft phase report process allowed for input and review during each step of the Master Plan process to ensure that all Master Plan issues were fully addressed as the recommended program was developed.

Two public information workshops were also included as part of the plan coordination. The public information workshop allowed the public to provide input and learn about general information concerning the Master Plan. The Master Plan report was also available on the internet via the consultant's web page: www.coffmanassociates.com.

SUMMARY AND RECOMMENDATIONS

The proper planning of a facility of any type must consider the demand that may occur in the future. For Redlands Municipal Airport, this involved updating forecasts to identify potential future aviation demand. Because of the cyclical nature of the economy, it is virtually impossible to predict with certainty year-to-year fluctuations in activity when looking five, ten, and twenty years into the future.

Recognizing this reality, the Master Plan is keyed more to potential demand "horizon" levels than future dates in time. These "planning horizons" were established as levels of activity that will call for consideration of the implementation of the next step in the Master Plan program. By developing the airport to meet the aviation demand levels instead of specific points in time, the airport will serve as a safe and efficient aviation facility which will meet the operational demands of its users while being developed in a cost-efficient manner. This program allows airport management to adjust specific development in response to unanticipated needs or demand. The forecast planning horizons are summarized in **Table A**.

TABLE A
Planning Horizon Summary

	Current	Short Term	Intermediate Term	Long Range
Based Aircraft	224	255	285	350
Annual Operations				
Itinerant	20,500	24,400	33,900	59,600
Local	61,500	73,400	79,100	89,400
Total Operations	82,000	97,800	113,000	149,000

RECOMMENDED MASTER PLAN CONCEPT

The Recommended Master Plan Concept is shown on **Exhibit B**. The airside plan maintains the existing runway length and width. The mix of aircraft currently using and expected to the use the airport through the planning period does not require additional runway length. A partial parallel taxiway is planned on the north side of the runway to support future landside development. A full parallel taxiway could not be developed on this side of the airport without extending into the Santa Ana Wash or relocating the Runway 8 end. Two additional exit taxiways are planned to reduce runway occupancy time after landing. Acquisition of land within the Runway 26 runway protection zone (RPZ) is also planned. This ensures the City has positive control over the RPZ and can prevent incompatible development as required by the FAA.

The landside plan meets forecast demands through the development of the remaining available parcels on the south side of the airport. Beginning at the east end of the airport, space is reserved for a conventional hangar near the intersection of Wabash Avenue and Sessums Drive. Two T-hangars are planned to replace the existing outside tiedown area east of the existing terminal building. Four rows of new hangars are currently under development south of Runway 8-26 as shown on the exhibit.

The underutilized west apron is planned to accommodate a mixture of conventional hangars and T-hangars/box hangars. Two rows of T-hangars/box hangars are planned on the east end of the west apron. The

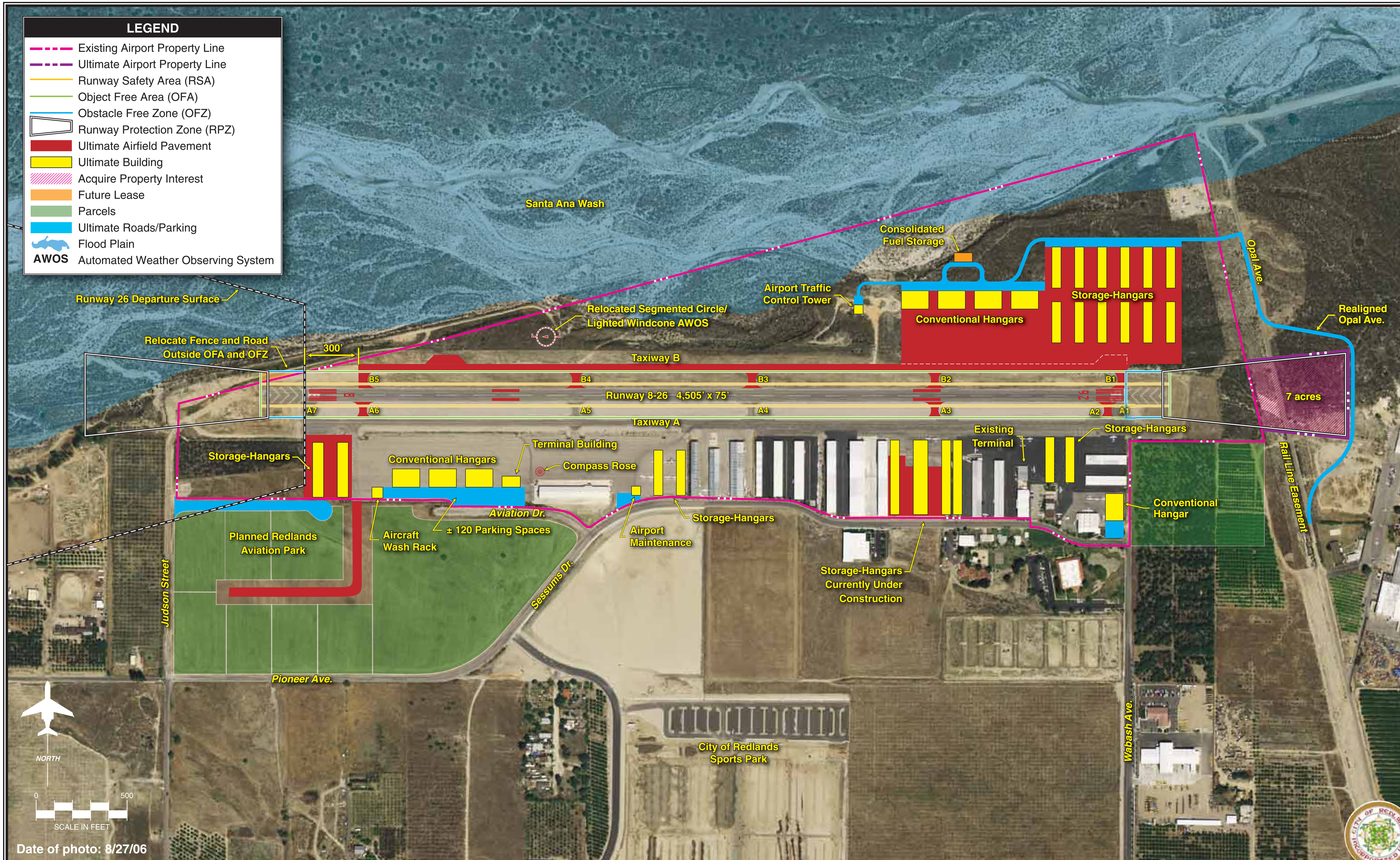

Exhibit B
MASTER PLAN CONCEPT

center of the west apron is planned for larger conventional hangars to accommodate commercial general aviation businesses, such as aircraft maintenance providers. Two additional rows of T-hangars/box hangars are planned west of the west apron and will require new taxilane development.

The ultimate terminal building is planned on the west apron. The existing terminal site is constrained and cannot be readily expanded. This location offers ease of access, the ability to create larger automobile parking areas, and have sufficient ramp area for transient will aircraft parking. A covered aircraft wash rack and airport maintenance facility are also planned for development on the west apron.

The area north of Runway 8-26 is planned to accommodate long term growth. This area is planned for T-hangars/box hangars, conventional hangars, a large apron area, a consolidated fuel farm, and a future airport traffic control tower (ATCT). Vehicle access would be via Opal Avenue. Development on the north side of the airport will require utility extensions.

No helipad is planned for helicopter operations. The area north of Runway 8-26 is needed for future landside development. Sufficient area is not available on the south side of the runway to accommodate a designated helipad. Helicopters are planned to continue to operate to Taxiway A or portions of the west apron for training activity. Transient helicopters are planned to utilize existing and planned apron areas for parking.

The landside plan maintains access to the airport for the Redlands Aviation Park located at the west end of the airport as shown on **Exhibit B**. A potential area for future development off-airport with access to the airport is also located at the east end of the airport. Access from off the airport will require coordination with the FAA.

CAPITAL IMPROVEMENT PROGRAM

Detailed costs were prepared for each development item included in the program. As shown in **Table B**, complete implementation of the plan will require a total financial commitment of approximately $27.2 million dollars over the long-term planning horizon. Over 96 percent of the recommended program funding could be funded through state or federal grant-in-aid programs. The source for federal monies is through the Airport Improvement Program (AIP) administered by the FAA established to maintain the integrity of the air transportation system. Federal monies could come from the Aviation Trust Fund, which is the depository for federal aviation taxes such as those from airline tickets, aviation fuel, aircraft registrations, and other aviation-related fees. Federal AIP funding of 95 percent can be received from the FAA for eligible projects.

The California Transportation Commission (CTC) also participates in state airport development projects. Through the California Department of Transportation – Aeronautics Division (CALTRANS) one-half (2.5 percent) of the local share for projects receiving federal AIP funding is provided. Development staging is shown on **Exhibit C**.

TABLE B
Development Funding Summary

PLANNING HORIZON	Total Costs	Federally Eligible	State Eligible	Local Share
Short Term Planning Horizon	$1,860,500	$1,767,475	$46,513	$46,513
Intermediate Term Planning Horizon	2,599,200	1,326,865	34,918	1,237,418
Long Term Planning Horizon	22,830,000	20,101,000	489,500	2,239,500
TOTAL PROGRAM COSTS	**$27,289,700**	**$23,195,340**	**$570,930**	**$3,523,430**

With the Airport Master Plan completed, the most important challenge is implementation. The cost of developing and maintaining aviation facilities is an investment which yields impressive benefits for the community. This plan and associated development program provides the tools airport management will require to meet the challenges of the future. By providing a safe and efficient facility, the Redlands Municipal Airport will continue to be a valuable asset to the City of Williams and the surrounding community.

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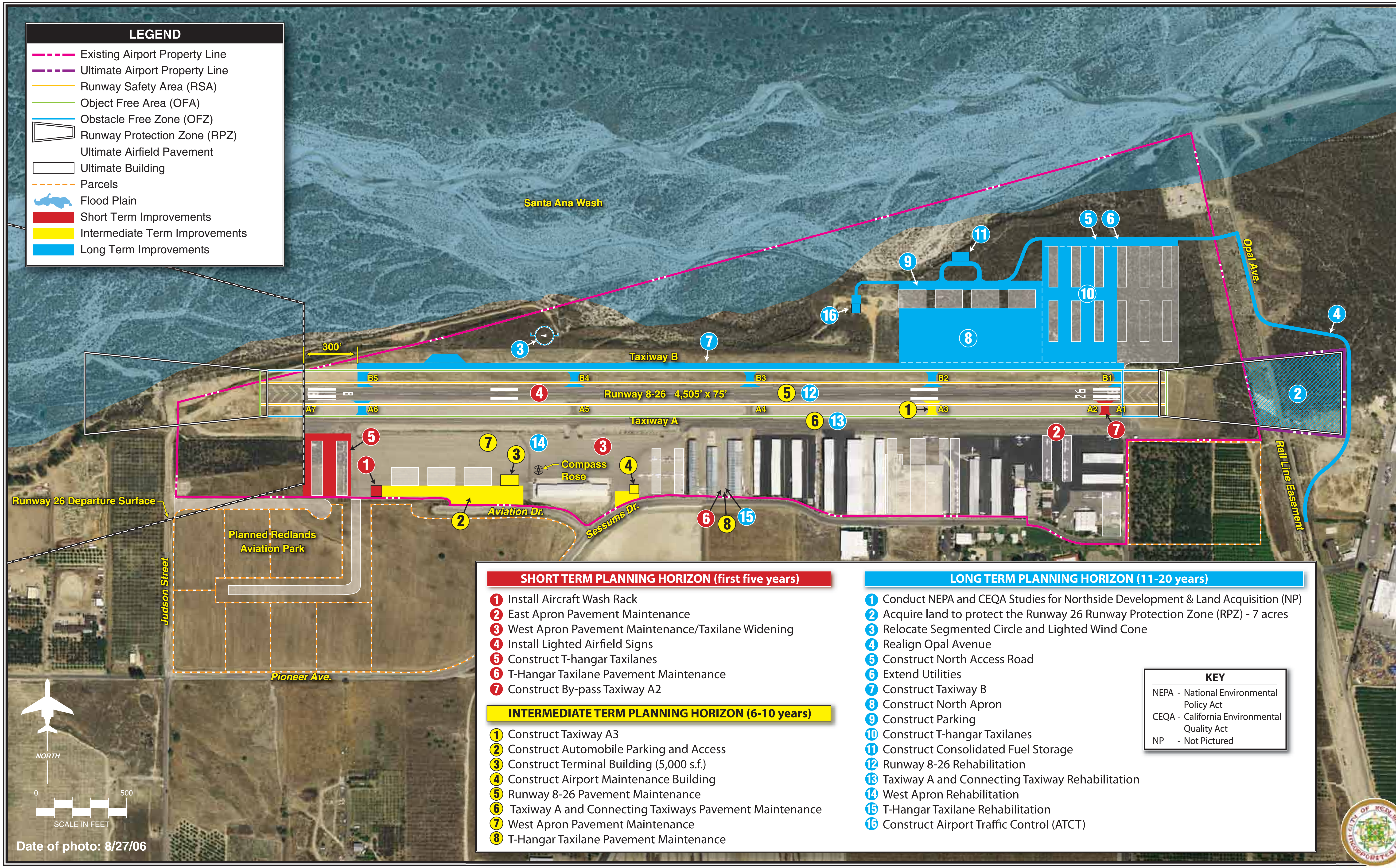

Exhibit C
DEVELOPMENT STAGING

CHAPTER ONE

INVENTORY

INVENTORY

The initial step in the preparation of the airport master plan for Redlands Municipal Airport is the collection of information pertaining to the airport and the area it serves. The information collected in this chapter will be used in subsequent analyses in this study. The inventory of existing conditions at Redlands Municipal Airport provides an overview of the airport facilities, airspace, and air traffic control. Background information regarding the regional area is also collected and presented. This includes information regarding the airport's role in regional, state, and national aviation systems, surface transportation, and socioeconomic profile.

The information was obtained from several sources, including on-site inspections, airport records, review of related planning studies, the Federal Aviation Administration (FAA), various government agencies, a number of Internet sites which presently summarize most statistical information and facts about the airport, and interviews with airport staff and airport tenants. As with any airport planning study, an attempt has been made to utilize data or information provided in existing planning documents to the maximum extent possible.

AIRPORT ADMINISTRATION

Redlands Municipal Airport is owned and operated by the City of Redlands. The day-to-day administration of the airport is the responsibility of the Airport Manager. Within the City, the Redlands Municipal Airport is part of the Quality of Life Department. An Airport Advisory Board reviews and

makes recommendations regarding its administration, management, and operation.

The origination of Redlands Municipal Airport can be traced by to 1947 when the original airport was constructed privately by Robert Kanaga and Austin Welch. At that time, the airport was known as the Redlands Flying Inn Airport. Facilities consisted of a 3,500-foot runway, a maintenance shop, and a single hangar. During the 1950s, the airport was sold to the California Turkey Growers Association, which ran a turkey and chicken ranch on the site. In 1962, with the help of a $20,000 loan from Lockheed, the city was able to purchase land to expand the airport site and make the airport a municipal facility. A summary of capital improvement projects completed at Redlands Municipal Airport since the late 1980s is presented in **Table 1A**.

TABLE 1A
Historical Federal Grant History

Fiscal Year	Project Number	Federal Funds	Description of Project
1987	01	$750,000	Install fence, realign west parallel taxiway, construct west apron
1989	02	450,000	Construct west apron; construct drainage
1989	03	39,600	Master Plan Update
1991	04	500,000	Repair, crack seal, and slurry seal runway and taxiway; relocate displaced threshold at both runway ends; install taxiway guidance signs and runway distance remaining signs; improve west apron drainage
2001	05	150,000	Install apron lighting; rehabilitate Runway 8-26 including Runway Safety Area
2002	6	150,000	Install apron lighting; rehabilitate Runway 8-26 including Runway Safety Area – Phase II
2003	7	$1,793,107	Rehabilitate Runway 8-26, including marking; rehabilitate parallel taxiway and taxiway connectors, including marking.

Source: City of Redlands

AIRPORT FACILITIES

Airport facilities can be functionally classified into two broad categories: airside and landside. The airside category includes those facilities directly associated with aircraft operations. The landside category includes those facilities necessary to provide a safe transition from surface to air transportation and support aircraft servicing, storage, maintenance, and operational safety.

AIRSIDE FACILITIES

Airside facilities include runways, taxiways, airfield lighting, and navigational aids. Airside facilities are identified on **Exhibit 1A**.

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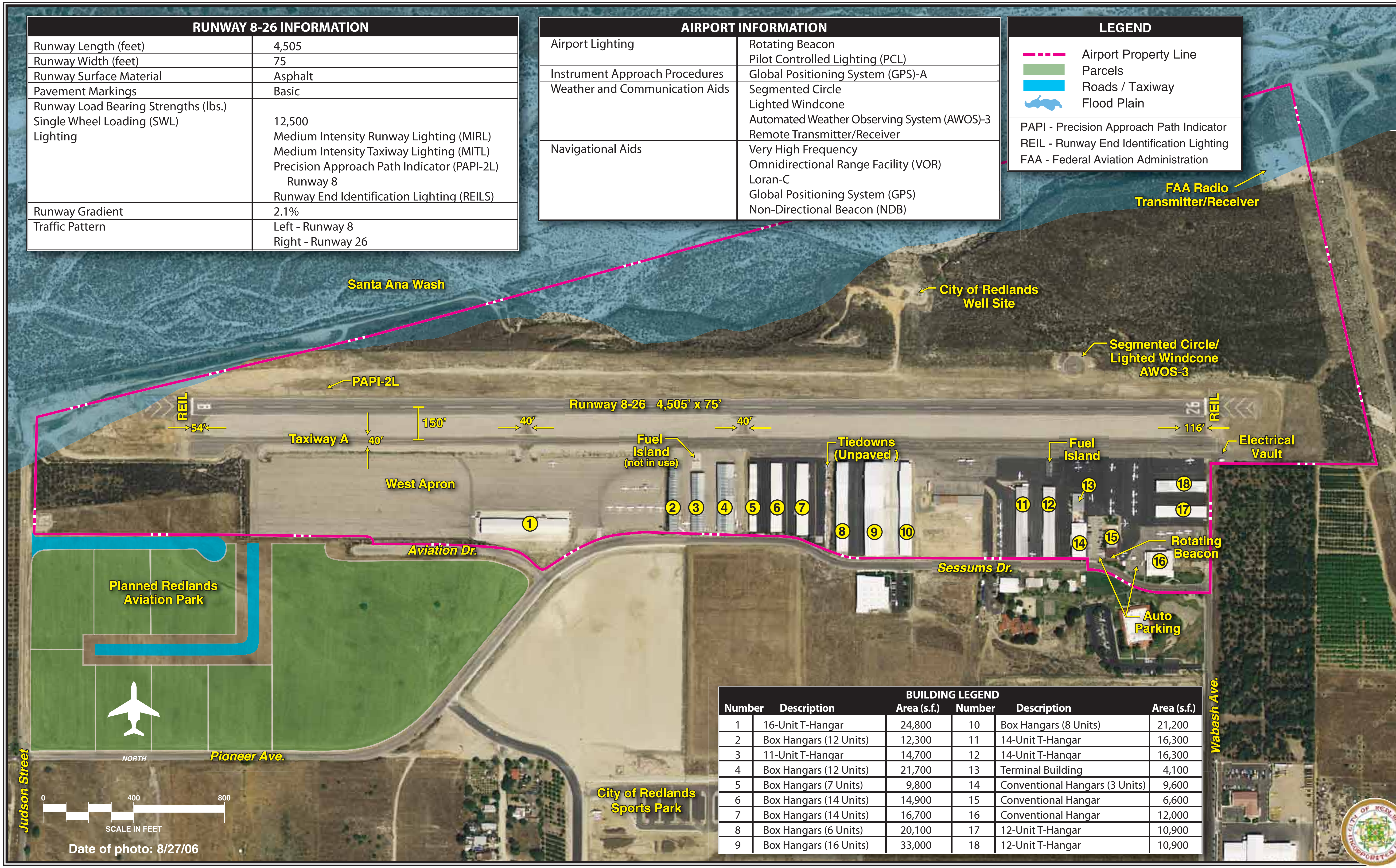

RUNWAY 8-26 INFORMATION

Runway Length (feet)	4,505
Runway Width (feet)	75
Runway Surface Material	Asphalt
Pavement Markings	Basic
Runway Load Bearing Strengths (lbs.) Single Wheel Loading (SWL)	12,500
Lighting	Medium Intensity Runway Lighting (MIRL) Medium Intensity Taxiway Lighting (MITL) Precision Approach Path Indicator (PAPI-2L) Runway 8 Runway End Identification Lighting (REILS)
Runway Gradient	2.1%
Traffic Pattern	Left - Runway 8 Right - Runway 26

AIRPORT INFORMATION

Airport Lighting	Rotating Beacon Pilot Controlled Lighting (PCL)
Instrument Approach Procedures	Global Positioning System (GPS)-A
Weather and Communication Aids	Segmented Circle Lighted Windcone Automated Weather Observing System (AWOS)-3 Remote Transmitter/Receiver
Navigational Aids	Very High Frequency Omnidirectional Range Facility (VOR) Loran-C Global Positioning System (GPS) Non-Directional Beacon (NDB)

LEGEND

- Airport Property Line
- Parcels
- Roads / Taxiway
- Flood Plain

PAPI - Precision Approach Path Indicator
REIL - Runway End Identification Lighting
FAA - Federal Aviation Administration

BUILDING LEGEND

Number	Description	Area (s.f.)	Number	Description	Area (s.f.)
1	16-Unit T-Hangar	24,800	10	Box Hangars (8 Units)	21,200
2	Box Hangars (12 Units)	12,300	11	14-Unit T-Hangar	16,300
3	11-Unit T-Hangar	14,700	12	14-Unit T-Hangar	16,300
4	Box Hangars (12 Units)	21,700	13	Terminal Building	4,100
5	Box Hangars (7 Units)	9,800	14	Conventional Hangars (3 Units)	9,600
6	Box Hangars (14 Units)	14,900	15	Conventional Hangar	6,600
7	Box Hangars (14 Units)	16,700	16	Conventional Hangar	12,000
8	Box Hangars (6 Units)	20,100	17	12-Unit T-Hangar	10,900
9	Box Hangars (16 Units)	33,000	18	12-Unit T-Hangar	10,900

Exhibit 1A
EXISTING FACILITIES

Runway

Redlands Municipal Airport is served by a single runway (Runway 8-26), which is oriented in an east-west direction. Runway 8-26 is 4,505 feet long, 75 feet wide, and is constructed of asphalt. The runway has a load bearing strength of 12,500 pounds single wheel loading (SWL). SWL refers to the design of certain aircraft landing gear which has a single wheel on each main landing gear strut. Paved blast pads are available at each runway end. These areas reduce soil erosion due to propeller wash or engine exhaust. Runway 8-26 was reconstructed in 2003.

Runway 8-26 slopes upward from the west to the east. The Runway 8 threshold elevation is 1,468.8 feet, and the Runway 26 threshold elevation is 1,571.4 feet. The difference of 102.6 feet in elevation results in a runway gradient of 2.1 percent.

Taxiways

The existing taxiway system at Redlands Municipal Airport is illustrated on **Exhibit 1A**. Runway 8-26 is served by full-length parallel Taxiway A, which provides primary access to all landside facilities. Taxiway A is 40 feet wide and lies 150 feet south of Runway 8-26. Taxiway A was reconstructed in 2003.

Four taxiways connect Parallel Taxiway A to Runway 8-26. The connecting taxiway at the Runway 26 end is 116 feet wide. This width allows this area to be used for departure engine run-ups and holding. The connecting taxiway at the Runway 8 end is 54 feet wide. The remaining two connecting taxiways are 40 feet wide. A holding apron is available at each runway end to allow for departure run-ups.

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. The main electrical vault is located south of the Runway 26 along the airport property boundary as shown on **Exhibit 1A**.

Identification Lighting: The location of the airport at night is universally identified by a rotating beacon. A rotating beacon projects two beams of light, one white and one green, 180 degrees apart. The rotating beacon at Redlands Municipal Airport is located south of Runway 8-26 along Sessums Drive as shown on **Exhibit 1A**.

Pavement Edge Lighting: Pavement edge 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. Runway 8-26 is equipped with medium intensity runway lighting (MIRL). Taxiway A is equipped with medium intensity taxiway lighting (MITL) on the north side of the taxiway only. The south side is equipped with retroreflective marking.

Each runway end is equipped with threshold lighting to identify the runway end. Threshold lighting consists of specially designed light fixtures that are red on one-half of the lens and green on the other half of the lens. The red portion of the lights are turned towards the approach surface and intended to be seen from landing aircraft, while the green portion is visible to aircraft on the runway surface.

Visual Approach Lighting: A precision approach path indicator (PAPI-2L) is installed on the north side of Runway 8. A PAPI consists of a system of lights located approximately 1,500 feet from the Runway 8 threshold. When interpreted by the pilot, these lights give him or her indication of being above, below, or on the designed descent path to the runway.

Runway End Identification Lighting: Runway end identifier lights (REILs) provide rapid and positive identification of the approach end of a runway. REILs are typically used on runways without more sophisticated approach lighting systems. The REIL system consists of two synchronized flashing lights, located laterally on each side of the runway facing the approaching aircraft. REILs are installed on both ends of the runway.

Pilot-Controlled Lighting: A pilot-controlled lighting system (PCL) is available at Redlands Municipal Airport. The PCL operates from dusk to dawn and allows pilots to turn on and/or increase the intensity of the airfield lighting systems from the aircraft with the use of the aircraft's radio transmitter. At Redlands Municipal Airport, the Runway 8-26 MIRL, Runway 8 PAPI-2, and REILs can be controlled by PCL system.

Airfield Signs: Airfield identification signs assist pilots in identifying their location on the airfield and directing them to their desired location. Lighted signs are installed at all taxiway and runway intersections.

Distance Remaining Signs: Lighted distance remaining signs are installed at 1,000-foot intervals on Runway 8-26. These signs provide pilots with an indication of the length of runway available for landing or departure.

Pavement Markings

Pavement markings aid in the movement of aircraft along airport surfaces and identify closed or hazardous areas on the airport. The basic markings on Runway 8-26 identify the runway designation and runway centerline.

Taxiway and apron centerline markings are provided to assist aircraft using these airport surfaces. Taxiway centerline markings assist pilots in maintaining proper clearance from pavement edges and objects near the taxiway/taxilane edges. Pavement edge markings also identify aircraft parking and aircraft holding positions.

Holding position markings are located on all connecting taxiways. The hold positions are located 125 feet from the runway centerline.

A compass rose was marked on the west apron in 2008. The compass rose helps pilots calibrate the aircraft compass.

Weather Facilities

The airport is equipped with a lighted wind cone and wind tee, which provide pilots with information about wind velocity and direction. A segmented circle provides traffic pattern information to pilots. The lighted wind cone, wind tee, and segmented circle are located on the north side of the runway, approximately 1,500 feet west of the Runway 26 end.

Redlands Municipal Airport is equipped with an Automated Weather Observation System III (AWOS-III). An AWOS will automatically record weather conditions such as wind speed, wind gusts, wind direction, temperature, dew point, altimeter setting, and density altitude. In addition, the AWOS-III will record visibility, precipitation, and cloud height. This information is then transmitted at regular intervals. The AWOS is located near the segmented circle.

Navigational Aids

Navigational aids are electronic devices that transmit radio frequencies which pilots of properly equipped aircraft translate into point-to-point guidance and position information. The types of electronic navigational aids available for aircraft flying to or from Redlands Municipal Airport include the very high frequency omnidirectional range (VOR) facility, nondirectional beacon (NDB), Loran-C, and global positioning system (GPS).

The VOR, in general, provides azimuth readings to pilots of properly equipped aircraft by 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 directional information to the pilot. In addition, military tactical air navigation (TACAN) and civil VORs are commonly combined to form a VORTAC. A VORTAC provides distance and directional information to civil and military pilots. Pilots flying to or from the airport can utilize the Riverside VOR located approximately 17 nautical miles southwest, the Homeland VOR located approximately 19 nautical miles south, the Paradise VORTAC located approximately 22 nautical miles southwest, or the Pomona VORTAC located approximately 32 nautical miles west. The locations of these facilities are shown on **Exhibit 1B**.

The NDB transmits nondirectional radio signals whereby the pilot of a properly equipped aircraft can determine the bearing to or from the NDB facility and then "home" or track to or from the station. Pilots flying to or from Redlands Municipal Airport can utilize the Petis NDB, located approximately 11 nautical miles west of the airport.

GPS is an additional navigational aid for pilots enroute to the airport. GPS was initially developed by the United States Department of Defense for military navigation around the world. Increasingly, GPS has been utilized more in civilian aircraft. GPS uses satellites placed in orbit around the globe to transmit electronic signals, which properly equipped aircraft use

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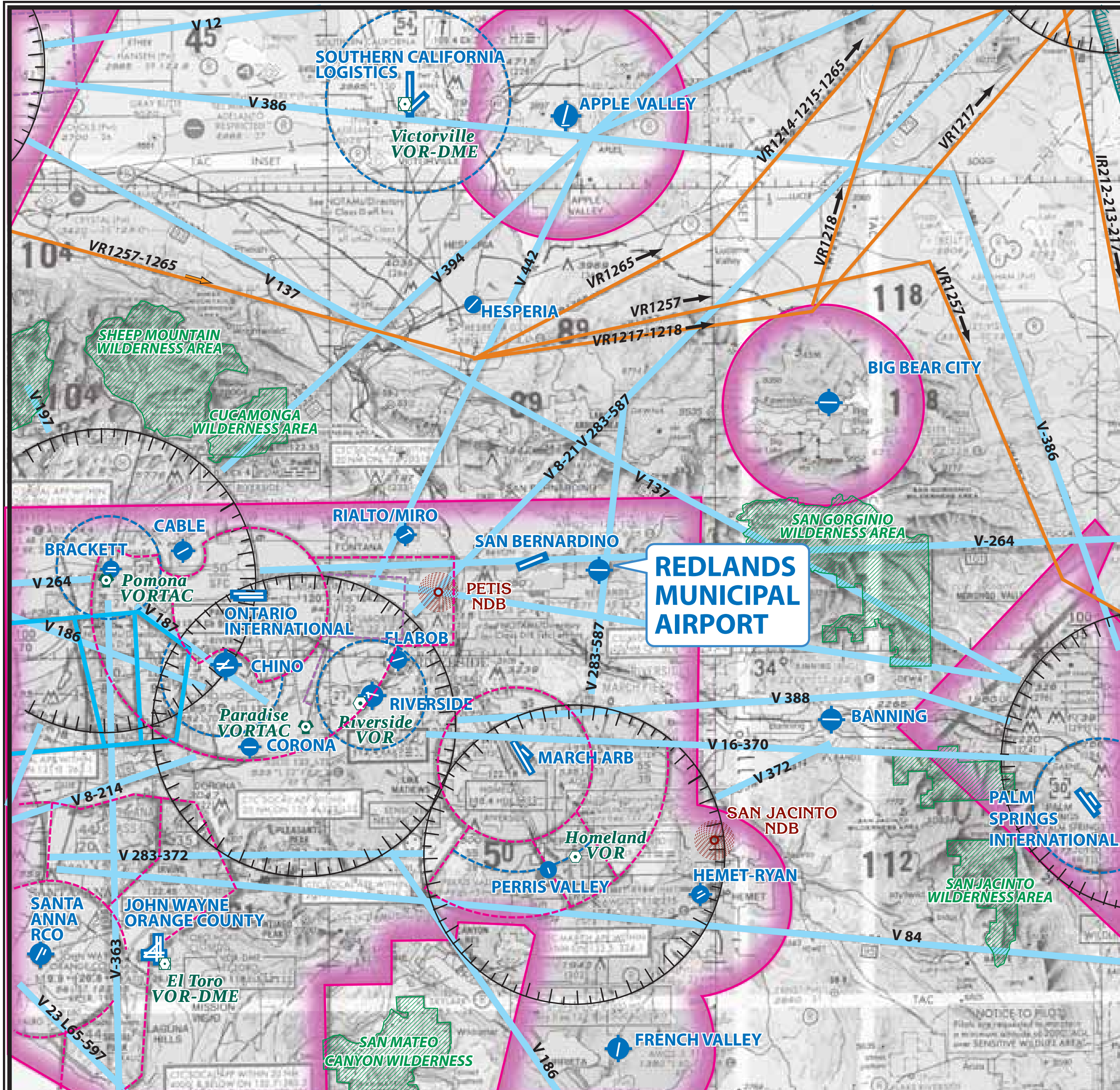

LEGEND

- 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'
- Non-Directional Radiobeacon (NDB)
- VORTAC
- VOR
- VOR-DME
- Class B Airspace
- Class C Airspace
- Class D Airspace
- Class E Airspace
- Class E Airspace with floor 700 ft. above surface
- Victor Airways
- Military Training Routes
- Compass Rose
- Wilderness Area
- Prohibited, Restricted, Warning, and Alert Areas

NORTH

NOT TO SCALE

Source: Los Angeles Sectional Charts, Federal Aviation Administration, National Charting Office 8/02/07

Exhibit 1B
VICINITY AIRSPACE
AND AIRPORTS

to determine altitude, speed, and position information. GPS allows pilots to navigate to any airport in the country, and they are not required to navigate using a specific navigational facility.

In July of 2003, the FAA commissioned a Wide Area Augmentation System (WAAS), which is a GPS-based navigation and landing system that provides guidance to aircraft at thousands of airports and airstrips where there is currently no precision landing capability. WAAS is designed to improve the accuracy and ensure the integrity of information coming from GPS satellites. The FAA is using WAAS to provide vertical navigation (descent) capability in addition to the traditional lateral (course) guidance capabilities.

Loran-C is a ground-based enroute navigational aid which utilizes a system of transmitters located in various locations across the continental United States. Loran-C is similar to GPS as pilots are not required to navigate using a specific facility. With a properly equipped aircraft, pilots can navigate to any airport in the United States using Loran-C.

Instrument Approach Procedures

Instrument approach procedures are a series of predetermined maneuvers established by the FAA using electronic navigational aids that assist pilots in locating and landing at an airport during low visibility and cloud ceiling conditions. Redlands Municipal Airport has one published instrument approach, the GPS-A approach.

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 in order to complete the approach. Cloud ceilings define the lowest level a cloud layer (defined in feet above the ground) can be situated for the pilot to complete the approach. If the observed visibility or cloud ceilings are below the minimums prescribed for the approach, the pilot cannot complete the instrument approach. The different minimum requirements for visibility and cloud ceilings vary, depending on the approach speed of the aircraft.

The GPS-A approach at Redlands Municipal Airport is a circling approach as this approach is designed only to bring the pilot and aircraft over the airport, not directly to a runway end. When using the GPS approach, a properly equipped aircraft with an approach speed less than 90 knots (Approach Category A) can land at the airport when cloud ceilings are 1,100 above the ground and visibility is 1 ¼ miles. For aircraft with approach speeds between 91 knots and 120 knots (Approach Category B), the visibility minimums increase to 1 ½ miles. For aircraft with approach speeds between 121 knots and 140 knots (Approach Category C), the visibility minimums increase to three miles.

Local Operating Procedures

Redlands Municipal Airport is situated at 1,571 feet above mean sea level (MSL). The traffic pattern altitude for all aircraft at the airport is approximately 900 feet above the airfield elevation (2,500 feet MSL). Runway 8 utilizes a left-hand traffic pattern. In doing so, the approach to landing is made using a series of left turns. Conversely, a right traffic pattern is used on Runway 26. In this manner, the approach to landing is made using a series of right turns. For both runways, the traffic pattern is located on the north side of the runway.

A helicopter training pattern is located south of Runway 8-26 so as to not conflict with the fixed-wing aircraft that use the traffic patterns described above. Helicopters are asked to maintain as close a pattern to the airport as possible and not extend more than 1,000 feet north of San Bernardino Avenue (approximately 2,000 feet south of Runway 8-26).

Voluntary noise abatement procedures are in place for departures on Runway 26. The extended departure path for Runway 26 overlies residential development west of the airport. The procedures ask pilots to turn 10 degrees north after departure and avoid turning north or south until after reaching Orange Street and 2,200 feet MSL. A sign is in place near the Runway 26 end to notify pilots of these procedures. Pilots are also requested to face east during their run-up.

Vicinity Airspace

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 National Airspace System. The U.S. airspace structure provides two basic categories of airspace, controlled and uncontrolled, and identifies them as Classes A, B, C, D, E, and G.

Class A airspace is controlled airspace that includes all airspace from 18,000 feet MSL to Flight Level 600 (approximately 60,000 feet MSL). Class B airspace is controlled airspace surrounding high-capacity commercial service airports (Los Angeles International Airport). Class C airspace is controlled airspace surrounding lower activity commercial service airports and some military airports (Ontario International Airport). Class D airspace is controlled airspace surrounding airports with an airport traffic control tower (Riverside Municipal Airport). All aircraft operating within Classes A, B, C, and D airspace must be in contact with the air traffic control facility responsible for that particular airspace. Class E airspace is controlled airspace 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. Aircraft conducting visual flights in Class E airspace are not required to be in radio communications 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 contact with an air traffic control facility.

Airspace in the vicinity of Redlands Municipal Airport is depicted on **Exhibit 1B**. Class E airspace surrounds the airport, with the floor beginning at 700 feet above the surface.

This Class E airspace also encompasses the low altitude Victor Airways in the vicinity of the airport. Victor Airways are corridors of airspace eight miles wide that extend upward from 1,200 feet above ground level (AGL) to 18,000 feet MSL and extend between VOR navigational facilities. Victor Airways in the area emanate from the Homeland, Riverside, and San Jacinto VORs and the Paradise and Pomona VORTACs.

Special Use Airspace

Airspace may be reserved for use by a specific agency, primarily the military, within which operations of other aircraft are restricted or prohibited.

A number of military training routes (MTRs) are located north of Redlands Municipal Airport. These routes are used by military training aircraft which commonly operate at speeds in excess of 250 knots and at altitudes to 10,000 feet MSL. While general aviation flights are not restricted within this area, pilots are strongly cautioned to be alert for high speed military jet training aircraft.

Exhibit 1B also depicts several wilderness areas in the vicinity of Redlands Municipal Airport, including the San Gorginio Wilderness Area, which is located east of the airport. All aircraft in and over these designated Wilderness Areas are requested to remain above 2,000 feet AGL.

Air Traffic Control

There is no airport traffic control tower (ATCT) at Redlands Municipal Airport; therefore, no formal terminal air traffic control services are available for aircraft landing or departing the airport. Aircraft operating in the vicinity of the airport are not required to file any type of flight plan or to contact any air traffic control facility unless they are entering airspace where contact is mandatory. The common traffic advisory frequency (CTAF) is used by pilots to obtain airport information and advise other aircraft of their position in the traffic pattern and intentions.

Aircraft arriving and departing the area are controlled by Southern California Approach Control (SOCAL). SOCAL controls aircraft approaching and departing certain airports in the metropolitan area. All aircraft in radio communication with SOCAL will be provided with altitude, aircraft separation, and route guidance to and from the airport.

An ATCT is planned to be operational in 2008 at San Bernardino International Airport (SBIA). **Exhibit 1C** depicts the proposed Class D airspace for SBIA as it relates to Redlands Municipal Airport.

LANDSIDE FACILITIES

Landside facilities are the ground-based facilities that support the aircraft and pilot/passenger handling functions. These facilities typically include the terminal building, aircraft storage/maintenance hangars, aircraft parking aprons, and support facilities

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Exhibit 1C
PROPOSED SAN BERNARDINO
INTERNATIONAL AIRPORT CLASS D AIRSPACE

such as fuel storage, automobile parking, roadway access, and aircraft rescue and firefighting. Landside facilities are identified on **Exhibit 1A**.

General Aviation Terminal Building

The general aviation terminal building is located on the east apron and is accessed from Sessums Drive. The terminal building is approximately 4,100 square feet and provides a pilot lounge, public waiting area, restrooms, vending machines, and offices for the fixed base operator (FBO).

Aircraft Storage Facilities

As identified on **Exhibit 1A**, hangar space at Redlands Municipal Airport is comprised of large conventional hangars, connected "box" hangars, and T-hangars totaling approximately 271,800 square feet. Conventional hangars provide a large, open space free from roof support structures and have the capability to accommodate several aircraft simultaneously. Box hangars are similar to conventional hangars in that they have an open space area free from roof structure supports; however, box hangars are smaller and typically used for storage only. In many cases, box hangars are constructed in a contiguous facility. Similar to box hangars, T-hangars provide individual aircraft storage within a large contiguous facility; however, T-hangars are specifically designed in a "T" configuration in contrast to the square or rectangular design of a box or conventional hangar. The "T" configuration only provides space for the wings and tail section of the aircraft. The T-hangar structures narrows in the back side of the hangar where the tail of the aircraft is placed.

Conventional hangar space at Redlands Municipal Airport totals approximately 28,200 square feet in three separate structures. T-hangar space totals approximately 93,900 square feet in nine structures providing 79 separate hangars. Box hangar spaces totals approximately 149,700 square feet in eight structures providing 89 separate hangars.

A shade hangar was removed in 2007 to allow for the construction of a series of new box hangars. A total of 32 new box hangars were constructed in an open area along Sessums Drive west of the terminal building in 2008.

Aircraft Parking Apron

Several areas are available for aircraft parking at Redlands Municipal Airport. The paved apron located on the east end of the airport near the terminal building totals approximately 31,900 square yards with 70 tiedown spaces. The west aircraft parking apron provides approximately 145 tiedown spaces and encompasses approximately 64,300 square yards. Additional aircraft parking is available on several unpaved areas on the airport.

Fuel Storage Facilities

Two separate aircraft fuel storage facilities are available at Redlands Municipal Airport. The City of Redlands owns a 12,000-gallon underground storage tank and dispensing island located on the west end of the airport. This tank is presently not in use. Redlands Aviation owns and operates a 12,000-gallon underground tank for 100LL Avgas. This tank and fixed-fuel island with self-service capabilities is located on the east apron near the terminal building. A 2,000-gallon Jet A mobile fuel truck is also available for aircraft refueling.

Public Automobile Parking

Several areas are available for vehicle parking at Redlands Municipal Airport. The main parking lot located adjacent to the terminal building totals approximately 13,300 square feet. An additional 8,900 square-foot lot is located farther north along Sessums Drive. Approximately 45 spaces are available in these two lots.

Fire Protection

While not required by federal regulations, the City of Redlands owns and maintains a 1970 Chevy ½ ton short-bed truck at the airport for on-airport emergencies. This vehicle is painted light green, has a checkered flag and warning lights for identification, and is equipped with chemical and water fire extinguishers. The vehicle is stored in an open garage west of the terminal building with a push-button ignition for general use. No staffed fire station is located at the airport. In an emergency, firefighting and rescue services are provided by the City of Redlands.

Fencing

The airport is equipped with six-foot chain link fencing with three-strands of barbed wire on the top. Several automated access-controlled gates are located along Sessums Drive to allow vehicle access to hangar facilities for airport tenants.

Utilities

Water, sanitary sewer, natural gas, and electrical utilities are available at the airport. Water and sanitary sewer services are provided by the City of Redlands. Electrical service at the airport is provided by Southern California Edison. Southern California Gas Company provides natural gas service.

COMMUNITY PROFILE

The purpose of this section is to summarize various studies and data to provide an understanding of the characteristics of the local area. Within this section is a description of ground access systems near the airport, a description of existing and future land use around the airport, local climate data, and a historical summary of the local economy and demographics.

REGIONAL SETTING, ACCESS, AND TRANSPORTATION

Redlands Municipal Airport occupies approximately 170 acres in the northeast portion of the City of Redlands.

The City of Redlands is located in south-central San Bernardino County. Regionally, the airport is located approximately 44 statute miles northwest of Palm Springs and 64 statute miles east of Los Angeles. The location of the airport in its regional setting is presented on **Exhibit 1D**.

Interstate 10 is the major east-west Interstate Highway in the Southern United States. It runs east from Santa Monica through Los Angeles and San Bernardino to the border with Arizona. Interstate 15 traverses the County from north to south and is a major transportation corridor linking the Riverside – San Bernardino Metropolitan Area with the San Diego – Tijuana Metropolitan Area, and various suburban communities between them. Interstate 15 also serves as the primary access route from Southern California to Las Vegas, Nevada.

Redlands Municipal Airport is located along Sessums Drive. From Interstate 10, the airport is accessed via Orange Street to San Bernardino Avenue. The western end of the airport can be accessed via Judson Street. The eastern end of the airport can be accessed by Wabash Avenue.

The San Bernardino Associated Governments (SANBAG) is responsible for oversight of all transit services in San Bernardino County. Omnitrans is the public transit agency serving the City of Redlands. Commuter rail service is provided by Metrolink. The San Bernardino Station is a passenger rail station serving one Amtrak and three Metrolink lines in the county.

REGIONAL AIRPORTS

A review of airports within 30 nautical miles of Redlands Municipal Airport has been made to identify and distinguish the type of air service provided in the area surrounding the airport. Public-use airports within 30 nautical miles of the airport were previously illustrated on **Exhibit 1B**. Information pertaining to each airport was obtained from FAA records.

San Bernardino International Airport is located approximately four nautical miles west of Redlands Municipal Airport. The airport is served by a single 10,001-foot runway. There is no airport traffic control tower at the airport, although one is planned in 2008. There are three published instrument approaches available at San Bernardino International Airport and 30 based aircraft. Services available include aircraft maintenance, aircraft tiedowns, and fuel sales (100LL & Jet A).

Rialto Municipal Airport is located approximately 13 nautical miles west-northwest of Redlands Municipal Airport. The airport is served by two runways, the longest of which is 4,500 feet. There is no airport traffic control tower at the airport. There is one published instrument approach available at the airport. There are 251 aircraft based at Rialto Municipal Airport, and annual operations total approximately 29,900. Services available include aircraft maintenance, aircraft hangars and tiedowns, and fuel sales (100LL & Jet A).

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Exhibit 1D
VICINITY MAP

On April 17, 2007, the City of Rialto through Resolution Number 5468, declared its intent to close Rialto Municipal Airport. This closure was provided by the 2005 Federal Highway Bill known as SAFETEA-LU (Safe, Accountable, Flexible and Efficient Transportation Equity Act – A Legacy for Users) which eliminated federal obligations that prevented its closure. The Rialto Municipal Airport will be closed once all tenants have been relocated. The April 2007 Airport Closure Plan and March 2007 Relocation Plan guide this process. Airport tenants are expected to be relocated to San Bernardino International Airport and other regional general aviation facilities.

Flabob Airport is located approximately 14 nautical miles west-southwest of Redlands Municipal Airport. The airport is served by a single 3,200-foot runway. The airport is not equipped with an airport traffic control tower. There are no published instrument approaches available at the airport. There are 202 based aircraft at Flabob Airport and annual operations total approximately 40,200. Services available include aircraft maintenance, aircraft tiedowns, fuel sales (100LL and 80), and an airport cafe.

Riverside Municipal Airport is located approximately 17 nautical miles west-southwest of Redlands Municipal Airport. The airport is served by two runways, the longest of which is 5,401 feet. The airport is equipped with an airport traffic control tower and there are five published instrument approaches available. There are 246 aircraft based at Riverside Municipal Airport, and annual operations total approximately 102,200. Services available include aircraft maintenance, aircraft hangars and tiedowns, fuel sales (100LL& Jet A), and an airport cafe.

Banning Municipal Airport is located approximately 18 nautical miles east-southeast of Redlands Municipal Airport. The airport is served by a single 5,200-foot runway. The airport is not equipped with an airport traffic control tower and there are no published instrument approaches available. There are 74 based aircraft at Banning Municipal Airport. The airport averages 10,600 annual operations. Services available include aircraft tiedowns and fuel sales (100LL).

Big Bear City Airport is located approximately 18 nautical miles northeast of Redlands Municipal Airport. The airport is served by a single 5,850-foot runway. There is no airport traffic control tower at the airport. There is one published instrument approach available at Big Bear City Airport and 141 based aircraft. The airport averages 29,900 annual operations. Services available include aircraft maintenance, aircraft tiedowns, fuel sales (100LL & Jet A), car rental, and an airport café.

Hesperia Airport is located approximately 19 nautical miles north-northwest of Redlands Municipal Airport. The airport is served by a single 3,910-foot runway. There is no airport traffic control tower at the airport, and there are no published instrument approaches available. There are 27 based aircraft at Hesperia Airport.

The airport averages 5,000 annual operations. Services available include aircraft maintenance, aircraft tiedowns, fuel sales (100LL), and an airport café.

Ontario International Airport is a commercial airline airport located approximately 23 nautical miles west of Redlands Municipal Airport. The airport is served by two runways, the longest of which is 12,197 feet. The airport is equipped with an airport traffic control tower and there are ten published instrument approaches available. There are 25 based aircraft at Ontario International Airport and annual operations total approximately 136,100. Services available include aircraft maintenance, aircraft tiedowns, and fuel sales (100LL and Jet A).

Chino Airport is located approximately 25 nautical miles west-southwest of Redlands Municipal Airport. The airport is served by three runways, the longest of which is 7,000 feet. The airport is equipped with an airport traffic control tower. There are three published instrument approaches available at Chino Airport and 947 based aircraft. The airport averages 168,300 annual operations. Services available include aircraft maintenance, aircraft hangars and tiedowns, fuel sales (100LL & Jet A), and an airport café.

Corona Municipal Airport is located approximately 25 nautical miles west-southwest of Redlands Municipal Airport. The airport is served by a single 3,200-foot runway. There is no airport traffic control tower at the airport. There is one published instrument approach available at Corona Municipal Airport and 414 based aircraft. The airport averages 67,900 annual operations. Services available include aircraft maintenance, aircraft tiedowns, fuel sales (100LL & Jet A), and an airport café.

Cable Airport is located approximately 27 nautical miles west of Redlands Municipal Airport. The airport is served by a single 3,864-foot runway. There is no airport traffic control tower at the airport. There are two published instrument approaches available at Cable Airport and 362 based aircraft. The airport averages 92,000 annual operations. Services available include aircraft maintenance, aircraft tiedowns, fuel sales (100LL & Jet A), and an airport café.

Apple Valley Airport is located approximately 30 nautical miles north of Redlands Municipal Airport. The airport is served by two runways, the longest of which is 6,498 feet. The airport is not equipped with an airport traffic control tower. Two published instrument approaches are available at the airport. There are 133 based aircraft at Apple Valley Airport and annual operations total approximately 37,600. Services available include aircraft maintenance, aircraft tiedowns, fuel sales (100LL and Jet A), and a restaurant.

March Air Reserve Base is located approximately 13.5 nautical miles south-southwest of Redlands Municipal Airport. Prior permission is required for civilian use of the base. The base features a 13,300-foot long by

200-foot wide primary runway and an instrument landing system (ILS).

CLIMATE

The City of Redlands has a temperate climate with about 15 inches of rainfall annually. August is the warmest month, with an average high of 94 degrees Fahrenheit, and December is the coolest month, with an average low of 39 degrees Fahrenheit. **Table 1B** summarizes climatic data for the City of Redlands, including temperatures and precipitation.

TABLE 1B
Climate Summary
Redlands, CA

Month	Average High	Average Low	Average Precipitation
January	65°F	39°F	2.51 in.
February	66°F	41°F	2.69 in.
March	69°F	43°F	2.20 in.
April	74°F	47°F	1.15 in.
May	79°F	51°F	0.41 in.
June	86°F	55°F	0.10 in.
July	94°F	60°F	0.07 in.
August	94°F	61°F	0.17 in.
September	90°F	58°F	0.33 in.
October	81°F	51°F	0.66 in.
November	72°F	43°F	1.12 in.
December	66°F	39°F	1.87 in.

Source: Western Regional Climate Center

LAND USE

The airport is near the northern City limits. The majority of the land to the south and west of the airport is within the City's jurisdiction. To the immediate east of the airport are unincorporated portions of San Bernardino County. The airport is situated along the southern edge of the Santa Ana River, with gradually rising terrain to the east and mountains within three miles to the north and northeast. Agricultural land and open space (including the Santa Ana River) surround the area within one mile of the airport. Extensive residential subdivisions lie beyond one mile to the west and south. New residential development is planned along Pioneer Avenue and Judson Street.

The *City of Redlands General Plan*, which was adopted in 1995, identifies planned land uses in the airport area. **Exhibit 1E** depicts a land use map for the City of Redlands. Area north of the airport is planned to remain undeveloped as this area is mostly limited to flood control associated with the Santa Ana River. Lands along the southern boundary of the airport and along Sessums Drive are reserved for industrial uses. Underneath the west approach area and areas to the east/southeast are designated to remain agricultural. Park usage is indicated for the east approach and under

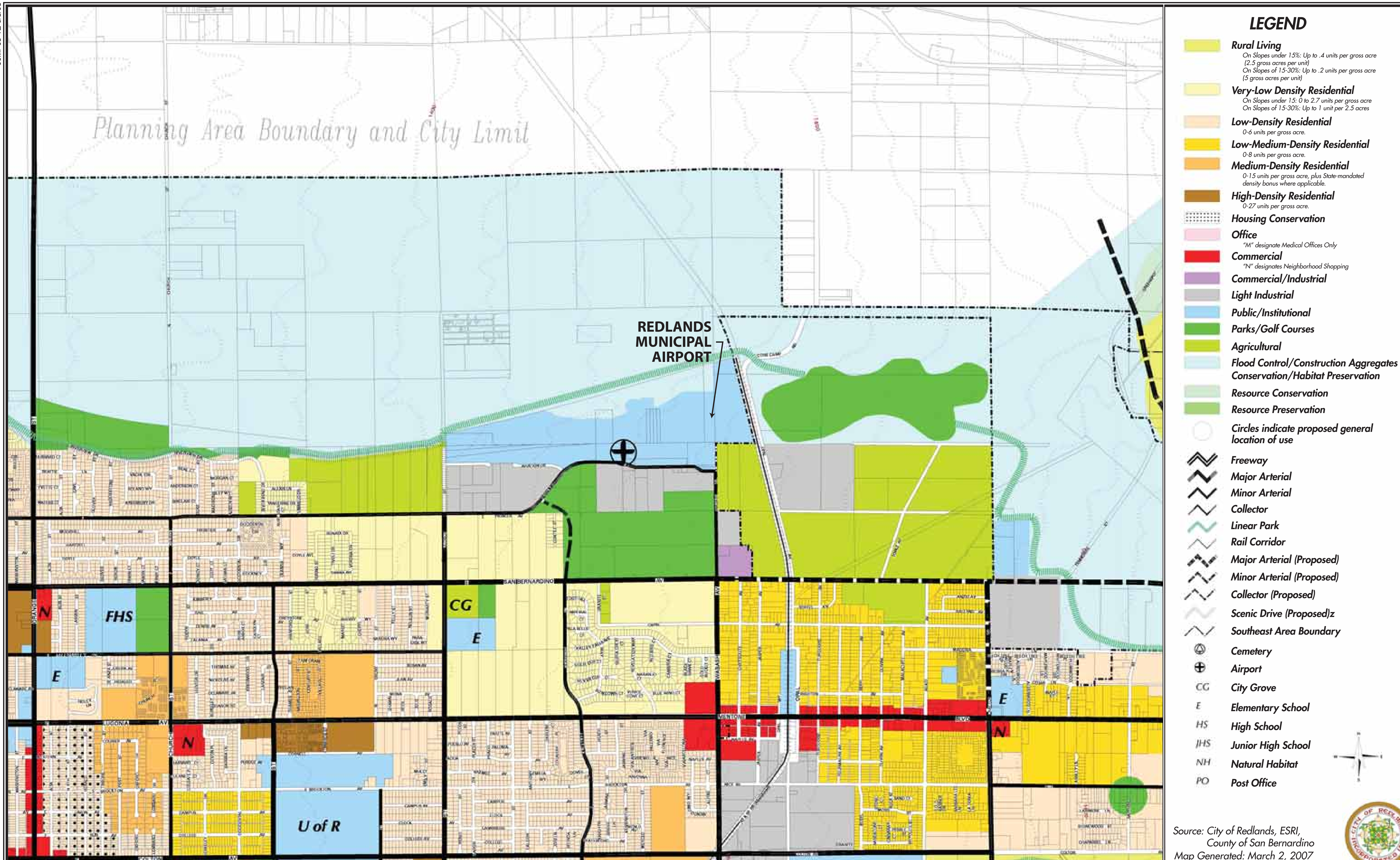


Exhibit 1E
CITY OF REDLANDS LAND USE MAP

helicopter traffic pattern to the south. Residential areas within ¾-mile of the airport boundary are limited to very low density development.

AIRPORT FLIGHT ZONES

Chapter 18.132, *Airport Flight Zone*, of the City of Redlands Municipal Code establishes height restrictions for land lying outside the boundaries of the airport. Section 18.132.020 establishes that no building or structure can intersect the "angle of glide" 40:1 surface that begins at the "end of the takeoff or land strip." Furthermore, no building shall be more than one story or twenty feet in height within 1,000 feet of the exterior boundary of the airport.

REAL ESTATE DISCLOSURE

Chapter 17.28, S*ignage And Marketing Disclosure Requirements For New Residential Subdivision Development Located Within The Redlands Airport Influence Area,* of the City of Redlands Municipal Code establishes regulations and a fee for the provision of signage and marketing disclosure requirements for new residential subdivision development within the Redlands airport influence area. Pursuant to this chapter, the city shall design signs to be located within the city's public rights of way to inform the public that certain subdivision development is located within the Redlands airport influence area. The boundary of the Redlands airport influence area is defined as the geographical area south of the Santa Ana River, east of Orange Street, north of Lugonia Avenue, and west of Sapphire Street.

All sales and marketing materials and sales offices for new residential subdivision development located within the Redlands airport influence area shall comply with the following requirements:

A. Required Posting Of Aerial Photograph Labeling Redlands Airport Influence Area At Sales Offices:

   a. All model homes and sales offices for new residential subdivision development within the Redlands airport influence area shall post an aerial photograph of the Redlands airport influence area in a location clearly visible to prospective buyers. The aerial photograph shall be labeled as follows:

      i. The title, "Redlands Airport Influence Area," shall be printed in a font no smaller than font "40" at the top and center of the aerial photograph. The aerial photograph shall be a minimum of six (6) square feet in size.

      ii. The following text shall be printed in a font no smaller than font "16" in the lower right corner of the photograph: This property is currently located in the vicinity of the Redlands Municipal Airport. This property may be subject to some of the annoyances or inconveniences commonly associated with proximity to airport operations (for example: noise, vibration, or odors), including noise generated by general aviation aircraft, including fixed wing aircraft and helicopters.

iii. The color of the lettering shall contrast with the background of the photograph to facilitate easy reading.

iv. A copy of the aerial photograph shall be available on compact disk for duplication by residential marketing representatives through the city's municipal utilities department.

b. Notation On All Sales And Marketing Materials: All sales and marketing brochures and flyers distributed for the sale of any residence located within the Redlands airport influence area shall contain the following text of font size "12" or larger: *This property is located in the vicinity of the Redlands Municipal Airport. This property may be subject to some of the annoyances or inconveniences associated with proximity to airport operations (for example: noise, vibration, or odors), including noise from general aviation aircraft, but not limited to the landing and take-off of fixed wing aircraft and helicopters.*

AIRPORT LAND USE COMPATIBILITY PLAN

Airport land use commissions (ALUCs) were first established under the *California State Aeronautics Act* in 1967. Although the law has been amended numerous times since then, the fundamental purpose of ALUCs to promote land use compatibility around airports has remained unchanged.

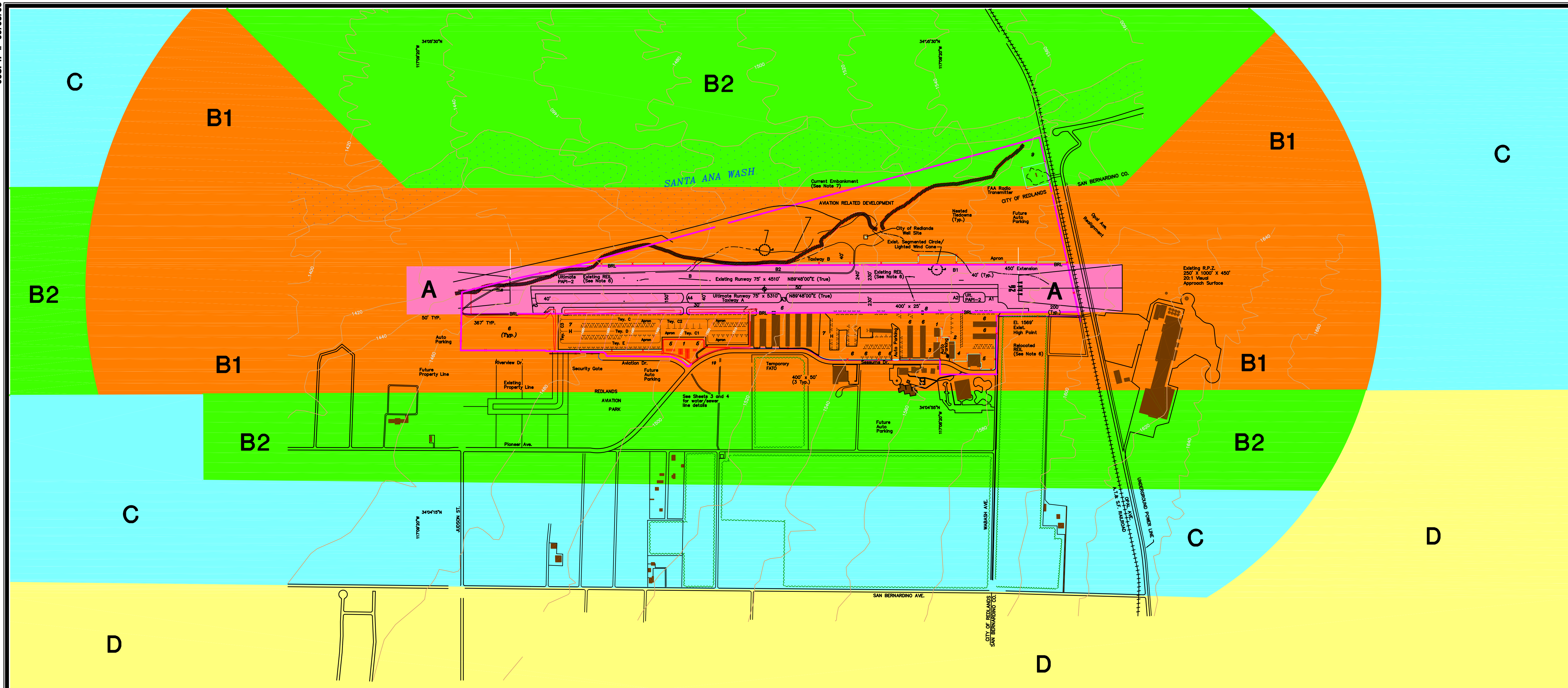
The statute gives ALUCs two principal powers by which to accomplish this objective. First, ALUCs must prepare and adopt an airport land use compatibility plan. Secondly, they must review the plans, regulations, and other actions of local agencies and airport operators for consistency with that plan.

The ALUCs are somewhat limited in their enforcement power. The statute specifically says that ALUCs have no authority over either existing land uses or the operation of airports. Local general plans are the primary mechanism for implementing the compatibility policies set forth in the ALUCs plan. **Exhibit 1F** presents the Redlands Municipal Airport Land Use Compatibility Plan (ALUCP).

The compatibility map defines several zones and provides recommended land uses. A summary of the recommended land uses by zones are as follows:

- Zone A – Runway Protection Zone and within Building Restriction Line: This zone should have no structures except those set by aeronautical function such as airfield lighting and navigational aids.

- Zone B1 – Inner Approach/Departure Zone: Parcels should average at least 20 acres in size with at least 30 percent open



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Existing Airport Property Line

A	Runway Protection Zone or within Building Restriction Zone
B1	Approach/Departure Zone and Adjacent to Runway
B2	Extended Approach/Departure Zone
C	Common Traffic Pattern
D	Other Airport Environs

Source: Revised 2003 Redlands Municipal Airport Land Use Compatibility Plan.

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Exhibit 1F

REVISED 2003 COMPATIBILITY MAP

space. No schools, day care centers, libraries, hospitals, or other noise-sensitive uses. A density of no more than 50 persons per acre.

- Zone B2 – Adjacent to Runway: Parcels should average more than 10 acres in size. No more than 200 persons per acre. No noise-sensitive land uses like Zone B1.

- Zone C – Extended Approach/Departure Zone: Parcels should average more than five acres in size with at least 20 percent open space. A density of no more than 150 persons per acre.

- Zone D – Primary Traffic Patterns and Runway Buffer Area: Parcels should average more than five acres in size with ten percent open space provided. No noise-sensitive land uses. No more than 300 persons per acre.

The ALUCP, originally adopted in 1997, was revised by Redlands City Council Resolution 6152. Resolution 6152 deemed it advisable and desirable to relocate the helicopter flight training pattern 1,000 feet north of San Bernardino Avenue. This resolution also revised the Extended Approach/Departure Zone (B2) to Common Traffic Pattern Zone (C) for the area between San Bernardino Avenue and 1,000 feet to the north extending from one-half mile west of Judson Street to approximately one-half mile east of Wabash Avenue. The 2003 ALUCP had an additional stipulation that the helicopter flight training area be permanently discontinued in the area south of the airport and construction of a training helipad north of Runway 8-26 be constructed. It is important to note that the 2003 ALUCP zone adjustments were based upon the desire to construct a sports park south of the airport and not for changes at the airport.

REDLANDS AVIATION PARK

City of Redlands Specific Plan Number 32 provides zoning approval for the Redlands Aviation Park. The planned Redlands Aviation Park is located along the southern airport boundary and is bounded by Pioneer Avenue to the south and Judson Street to the west. The configuration of the planned Redlands Aviation Park is shown on **Exhibit 1A**. The planned Redlands Aviation Park includes taxiway access to the Redlands Municipal Airport connecting through the west apron.

AIRPORT SYSTEM PLANNING ROLE

Airport planning exists on many levels: national, state, and local. Each level has a different emphasis and purpose. An airport master plan is the primary local airport planning document.

At the regional level, Redlands Municipal Airport is included in the Southern California Association of Government (SCAG) *General Aviation System Plan* (GASP). The GASP evaluates the region's capacity and ability to meet aviation demand. Redlands Municipal Airport is one of 44 general aviation airports included in the GASP, which SCAG considers important to meeting the region's demand for aviation services.

At the state level, the airport is included in the *California Aviation System Plan* (CASP). The purpose of the CASP is to ensure that the state has an adequate and efficient system of airports to serve its aviation needs. The CASP defines the specific role of each airport in the state's aviation system and establishes funding needs. The CASP is updated every five years with the most recent revision being completed in 2003. Redlands Municipal Airport is one of 244 general aviation and reliever airports within the state's aviation system plan.

At the national level, the airport is included in the *National Plan of Integrated Airport Systems* (NPIAS). The NPIAS includes a total of 3,431 airports which are significant to national air transportation. Of this total, 2,847 are general aviation or reliever airports. The NPIAS plan is used by the FAA in administering the Airport Improvement Program (AIP). The NPIAS supports the FAA's strategic goals for safety, system efficiency, and environmental compatibility by identifying specific airport improvements. An airport must be included in the NPIAS to be eligible for federal funding assistance through the AIP program. Redlands Airport is one of 191 general aviation airports in California included in the NPIAS. The NPIAS includes estimates on the total development needs of the nation's airports which are eligible for federal funding assistance.

POPULATION

The size and structure of the local communities and the service area that the airport supports are important factors to consider when planning airport facilities. These factors provide an understanding of the economic base that is needed to determine future airport requirements. Historical population totals are presented in **Table 1C**.

TABLE 1C
Historical Population

Year	City of Redlands	San Bernardino County
1987	52,600	1,155,400
1988	54,500	1,229,300
1989	60,435	1,311,100
1990	60,395	1,418,380
1991	63,135	1,464,203
1992	63,611	1,516,475
1993	63,703	1,546,550
1994	63,269	1,562,188
1995	63,149	1,574,240
1996	62,904	1,591,186
1997	62,953	1,613,959
1998	62,903	1,638,423
1999	63,084	1,667,189
2000	63,591	1,710,139
2001	64,713	1,746,847
2002	66,447	1,793,302
2003	67,919	1,842,325
2004	69,123	1,896,245
2005	70,339	1,948,454
2006	71,043	1,993,983
2007	71,375	2,028,013
Avg. Growth Rate	1.5%	2.9%

Source: California Department of Finance

According to the California Department of Finance, San Bernardino County experienced a 2.9 percent annual increase in population between 1987 and 2007, adding more than 872,000 residents. Meanwhile, the population of the City of Redlands grew at an annual rate of 1.5 percent, adding more than 18,700 residents.

ENVIRONMENTAL INVENTORY

Available information about the existing environmental conditions at Redlands Municipal Airport has been derived from internet resources, agency maps, and existing literature. The intent of this task is to inventory potential environmental sensitivities that might affect future improvements at the airport.

Air Quality

The 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. 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). Various levels of review apply within both NEPA and permitting requirements. Potentially significant air quality impacts, associated with an FAA project or action, would be demonstrated by the project or action exceeding one or more of the NAAQS for any of the time periods analyzed.

The airport is located in San Bernardino County which is in nonattainment for Ozone, (O_3) Carbon Monoxide (CO), Particulate Matter (PM_{10} and $PM_{2.5}$), and Nitrogen Oxide (NO_2). The South Coast Air Quality Management District is responsible for controlling air emissions in the urban areas of San Bernardino County.

Department of Transportation Act: Section 4(f)

Section 4(f) properties include publicly owned land from a public park, recreational area, or wildlife and waterfowl refuge of national, state, or local significance, or any land from a historic site of national, state, or local significance. There are no Section 4(f) resources located on airport property. The City of Redlands has identified areas south and east of the airport as park/open space. The City of Redlands Sport Park is located just south of the airport.

Fish, Wildlife, and Plants

The Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) are charged with overseeing the requirements contained within Section 7 of the *Endangered Species Act*. This Act was put into place to protect animal or plant species whose populations are threatened by human activities. Along with the FAA, the FWS and the NMFS review projects to determine if a significant impact to these protected species will result with implementation of a proposed project. Significant impacts occur when the proposed action could jeopardize the continued existence of a protected species or would result in the destruction or adverse modification of federally designated critical habitat in the area.

In a similar manner, states are allowed to prepare statewide wildlife conservation plans through authorizations contained within the *Sikes Act*. Airport improvement projects should be checked for consistency with the State or DOD Wildlife Conservation Plans where such plans exist.

Redlands Municipal Airport is located just south of the Santa Ana River. Vegetation in the vicinity of the airport is identified as alluvial scrub. This vegetation type is unique scrub vegetation found along floodplains where there is a lack of perennial water. Alluvial scrub is comprised of an assortment of drought deciduous subshrubs and large evergreen woody shrubs. According to the California Natural Diversity Data Base (CNDDB), this vegetation is considered a unique habitat with high priority for preservation.

Numerous federally-listed threatened and endangered species have been identified as having suitable habitat in the region. The FWS Carlsbad Office serves the area where Redlands Municipal Airport is located. According to the Carlsbad Ecological Services website, 58 plant species, eight invertebrate species, nine fish species, four amphibian species, four reptile species, 16 bird species, and eight mammal species have habitat in this region. The CNDDB has documented occurrences for twelve federally and state-listed species in the area. **Table 1D** contains these species. A habitat conservation area for the federally-listed San Bernardino kangaroo rat is located south of the airport adjacent to the Redlands Sports Park. According to the CNDDB, the San Bernardino kangaroo rat has documented occurrences throughout the vicinity of the airport.

TABLE 1D
Threatened or Endangered Species Occurring in the Redlands Quadrangle Area

Species	State Status	Federal Status
Marsh sandwort	Endangered	Endangered
Navin's barberry	Endangered	Endangered
Western yellow-billed cuckoo	Endangered	Candidate
Salt marsh bird's beak	Endangered	Endangered
San Bernardino kangaroo rat	None	Endangered
Stephen's kangaroo rat	Threatened	Endangered
Slender-horned spineflower	Endangered	Endangered
Southwestern willow flycatcher	Endangered	Endangered
Santa Ana River woollystar	Endangered	Endangered
Coastal California gnatcatcher	None	Threatened
Mountain yellow-legged frog	None	Endangered
Least Bell's vireo	Endangered	Endangered

Source: CNNDB, December 2007

Floodplains

Floodplains are defined in *Executive Order 11988, Floodplain Management*, as "the lowland and relatively flat areas adjoining inland and coastal waters…including at a minimum, that area subject to a one percent or greater chance of flooding in any given year" (i.e., that area would be inundated by a 100-year flood). Federal agencies, including the FAA, are directed to "reduce the risk of loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains." A floodplain associated with the Santa Ana River is located just north of the airport. The majority of the airport is protected from a 100-year flood by a levee located just north of airport property. However, the extreme northwest corner of the runway is located within this 100-year floodplain. Airport property to the northeast is also located within this 100-year floodplain. The floodplain is depicted on **Exhibit 1A**.

Historical, Architectural, and Cultural Resources

Determination of a project's impact to historical and cultural resources is made in compliance to with the *National Historic Preservation Act* (NHPA) *of 1966*, as amended for federal undertakings. Two state acts also require consideration of cultural resources. The NHPA requires that an initial review be made of an undertaking's *Area of Potential Effect* (APE) to determine if any properties in, or eligible for inclusion in, the National Register of Historic Places are present in the area. No known historical or archaeological resources are located on airport property.

Water Quality

The airport has a Storm Water Pollution Prevention Plan (SWPPP), which is a requirement of the California National Pollution Discharge Elimination System (NPDES) General Permit. This SWPPP identifies the source of pollutants that affect the quality of industrial storm water discharge and describes practices which may be implemented to reduce the pollutants in the industrial storm water discharge.

Wetlands/Waters of the U.S.

The U.S. Army Corps of Engineers regulates the discharge of dredged and/or fill material into waters of the United States, including adjacent wetlands, under Section 404 of the *Clean Water Act*. Wetlands are defined in *Executive Order 11990, Protection of Wetlands*, as "those areas that are inundated by surface or groundwater with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetation or aquatic life that requires saturated or seasonably saturated soil conditions for growth and reproduction." Categories of wetlands include swamps, marshes, bogs, sloughs, potholes, wet meadows, river overflows, mud flats, natural ponds, estuarine areas, tidal overflows, and shallow lakes and ponds with emergent vegetation. Wetlands exhibit three characteristics: hydrology, hydrophytes (plants able to tolerate various degrees of flooding or frequent saturation), and poorly drained soils.

The Santa Ana River is located north of the airport. However, as seen on the United States Geological Survey (USGS) map, waters associated with the river do not extend onto or traverse airport property. No known wetlands or Waters of the U.S. are located on airport property.

SUMMARY

The information discussed on the previous pages provides a foundation upon which the remaining elements of the planning process will be constructed. Information on current airport facilities and utilization will serve as a basis, with additional analysis and data collection, for the development of forecasts of aviation activity and facility requirement determinations. The inventory of existing conditions is the first step in the process of determining those factors which will meet projected aviation demand in the community and the region.

CHAPTER TWO

FORECASTS

FORECASTS

This chapter will provide forecasts of aviation activity through the year 2026. Forecasts of based aircraft, based aircraft fleet mix, annual aircraft operations, and peak hour operations will serve as the basis for facility planning.

The resulting forecast may be used for several purposes, including facility needs assessments, airfield capacity evaluation, and environmental evaluations. The forecasts will be reviewed and approved by the Federal Aviation Administration (FAA) to ensure that they are reasonable projections of aviation activity. The intent is to permit the City of Redlands to make the necessary planning adjustments to ensure the facility meets projected demands in an efficient and cost-effective manner.

Because aviation activity can be affected by many influences at the local, regional, and national levels, it is important to remember that forecasts are to serve only as guidelines, and planning must remain flexible enough to respond to unforeseen facility needs.

NATIONAL AVIATION TRENDS

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 pro-

vide 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 2007-2020*, published in March 2007. The forecasts use 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.

In the seven years prior to the events of September 11, 2001 (9/11), the U.S. civil aviation industry experienced unprecedented growth in demand and profits. The impacts to the economy and aviation industry from the events of 9/11 were immediate and significant. The economic climate and aviation industry, however, has been on the recovery.

The Office of Management and Budget (OMB) expects the U.S. economy to continue to grow in terms of Gross Domestic Product (GDP) at an average annual rate of 2.9 percent through 2020. The world GDP is forecast to grow at an even faster rate of 3.1 percent over the same period. This will positively influence the aviation industry, leading to passenger, air cargo, and general aviation growth throughout the forecast period (assuming there will be no new successful terrorists incidents against either U.S. or world aviation).

GENERAL AVIATION

In the 13 years since the passage of the *General Aviation Revitalization Act of 1994* (federal legislation which limits the liability on general aviation aircraft to 18 years from the date of manufacture), it is clear that the Act has successfully infused new life into the general aviation industry. 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. According to the General Aviation Manufacturers Association (GAMA), between 1994 and 2000, general aviation aircraft shipments increased at an average annual rate of more than 20 percent, increasing from 928 shipments in 1994 to 3,140 shipments in 2000. As shown in **Table 2A**, the growth in the general aviation industry slowed considerably after 2000, negatively impacted by the national economic recession and the events surrounding 9/11. In 2003, there were over 450 fewer aircraft shipments than in 2000, a decline of 14 percent.

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

Year	Total	SEP	MEP	TP	J	Net Billings ($ millions)
2000	3,140	1,862	103	415	760	13,497.0
2001	2,994	1,644	147	421	782	13,866.6
2002	2,687	1,601	130	280	676	11,823.1
2003	2,686	1,825	71	272	518	9,994.8
2004	2,963	1,999	52	321	591	11,903.8
2005	3,580	2,326	139	365	750	15,140.0
2006	4,042	2,508	242	407	885	18,793.0

SEP - Single Engine Piston; MEP - Multi-Engine Piston; TP - Turboprop; J – Turbofan/Turbojet

Source: GAMA

In 2004, the general aviation production showed a significant increase, returning to near pre-9/11 levels for most indicators. With the exception of multi-engine piston aircraft deliveries, deliveries of new aircraft in all categories increased. In 2006, total aircraft deliveries increased 12 percent. The largest increase was in single engine piston aircraft deliveries that increased seven percent, or by over 180 aircraft. Turbojet and multi-engine piston aircraft also increased significantly from the previous year. As evidenced in the table, new aircraft deliveries in 2006 exceeded pre-9/11 levels by approximately 1,000 aircraft.

On July 21, 2004, the FAA published the final rule for sport aircraft: The *Certification of Aircraft and Airmen for the Operation of Light-Sport Aircraft* rules, which went into effect on September 1, 2004. This final rule establishes new light-sport aircraft categories and allows aircraft manufacturers to build and sell completed aircraft without obtaining type and production certificates. Instead, aircraft manufacturers will build to industry consensus standards. This reduces development costs and subsequent aircraft acquisition costs. This new category places specific conditions on the design of the aircraft, to limit them to "slow (less than 120 knots maximum) and simple" performance aircraft. New pilot training times are reduced and offer more flexibility in the type of aircraft the pilot would be allowed to operate.

Viewed by many within the general aviation industry as a revolutionary change in the regulation of recreational aircraft, this new rule is anticipated to significantly increase access to general aviation by reducing the time required to earn a pilot's license and the cost of owning and operating an aircraft. Since 2004, there have been over 30 new product offerings in the airplane category alone. These regulations are aimed primarily at the recreational aircraft owner/operator. By 2020, there are expected to be 13,200 of these aircraft in the national fleet.

While impacting aircraft production and delivery, the events of 9/11 and the subsequent economic downturn have not had the same negative impact on the business/corporate side of general aviation. The increased security measures placed on commercial flights have increased interest in fractional and corporate aircraft ownership, as well as on-demand charter flights. According to GAMA, the total number of corporate operators increased by approximately 2,300 between 2000 and 2006. Corporate operators are defined as those companies that have their own flight departments and utilize general aviation aircraft to enhance productivity. **Table 2B** summarizes the number of U.S. companies operating fixed-wing turbine aircraft between 1991 and 2006.

TABLE 2B
U.S. Companies Operating Fixed-Wing Turbine Business Aircraft and Number of Aircraft, 1991-2005

Year	Number of Operators	Number of Aircraft
1991	6,584	9,504
1992	6,492	9,504
1993	6,747	9,594
1994	6,869	10,044
1995	7,126	10,321
1996	7,406	11,285
1997	7,805	11,774
1998	8,236	12,425
1999	8,778	13,148
2000	9,317	14,079
2001	9,709	14,837
2002	10,191	15,569
2003	10,661	15,870
2004	10,735	16,369
2005	10,809	16,867
2006	11,611	16,965

Source: GAMA/NBAA

The growth in corporate operators comes at a time when fractional aircraft programs are experiencing significant growth. Fractional ownership programs sell a share in an aircraft at a fixed cost. This cost, plus monthly maintenance fees, allows the shareholder a set number of hours of use per year and provides for the management and pilot services associated with the aircraft's operation. These programs guarantee the aircraft is available at any time, with short notice. Fractional ownership programs offer the shareholder a more efficient use of time (when compared with commercial air service) by providing faster point-to-point travel times and the ability to conduct business confidentially while flying. The lower initial startup costs (when compared with acquiring and establishing a flight department) and easier exiting options are also positive benefits.

Since beginning in 1986, fractional jet programs have flourished. **Table 2C** summarizes the growth in fractional shares between 1986 and 2006. The number of aircraft in fractional jet programs grew rapidly from 2001 to 2006, increasing by approximately 250 aircraft.

Very light jets (VLJs) entered the operational fleet in 2006. Also known as microjets, the VLJ is commonly defined as a jet aircraft that weighs less than 10,000 pounds. There are several new aircraft that fall in this category, including the Eclipse 500 and Adams 700 jets. While not categorized by Cessna Aircraft as a VLJ, the Cessna Mustang is a competing aircraft to many of the VLJs expected to reach the market. These jets cost between $1 and $2 million, can takeoff on runways less than 3,000 feet, and cruise at 41,000 feet at speeds in excess of 300 knots. The VLJ is expected to redefine the business jet segment by expanding business jet flying and offering operational costs that can support on-demand air taxi point-to-point service. The FAA projects 350 VLJs in service in 2007.

TABLE 2C Fractional Shares and Number of Aircraft in Use		
Year	**Number of Shares**	**Number of Aircraft**
1986	3	N/A
1987	5	N/A
1988	26	N/A
1989	51	N/A
1990	57	N/A
1991	71	N/A
1992	84	N/A
1993	110	N/A
1994	158	N/A
1995	285	N/A
1996	548	N/A
1997	957	N/A
1998	1,551	N/A
1999	2,607	N/A
2000	3,834	N/A
2001	3,415	696
2002	4,098	776
2003	4,516	826
2004	4,765	865
2005	4,691	949
2006	4,903	984
Source: GAMA		

In August 2007, the United States Government Accountability Office (GAO) issued a report GAO-07-1001, *VERY LIGHT JETS*, subtitled, Several Factors Could Influence Their Effect on the National Airspace System. This report was conducted in response to the VLJ phenomenon as many aviation forecasters feared the VLJ would eventually lead to significant airspace congestion. The report was not put forth to provide recommendations, but rather to provide information on the industry.

The following is the summary provided by the GAO report:

> *"The eight very light jet forecasts GAO examined provided a range of both the number of very light jets projected to be delivered (roughly 3,000 to 7,600) and the dates by which those numbers would be reached (from 2016 to 2025). The forecasts were based on limited information about the market for very light jets and varied based on a number of assumptions, particularly regarding the development of the air taxi market.*
>
> *The studies GAO reviewed and the experts GAO contacted expressed varying opinions about the impact of very light jets on NAS capacity; however, most of the experts believed that very light jets would have little overall effect on safety. The studies found that the type of airports used by very light jets will influence very light jets' effect on capacity. Experts also mentioned other factors that could affect capacity such as aircraft usage, trip length, and altitude. Most experts GAO contacted believed that very light jets will likely have little impact on safety due to FAA's certification procedures for aircraft, pilots, and maintenance. "*

The report provided limited forecast information developed by eight entities, one being the FAA projections presented in the previous section. All forecasts assumed moderate to strong economic growth. Other factors which will impact the VLJ industry were also considered.

Many believed that the replacement market will be positive for the VLJ industry as older twin engine piston and turboprop aircraft are retired, and some aircraft owners will likely replace them with VLJ aircraft. Another factor is the influence of high numbers of available VLJ models on the market. Rolls-Royce indicated in their analysis that there tends to be a correlation between total aircraft deliveries and number of models on the market. Other factors which will positively influence VLJ growth will be dissatisfaction with other transportation modes, low purchase price of VLJ aircraft, and access to airports with appropriate infrastructure. These factors will more be positive influences to the growth of VLJ markets. Negative factors could include uncertainty of success leading to hesitations in acquiring the VLJ, new training and high cost of insurance, as well as production constraints associated with new aircraft manufacturers.

The eight VLJ forecasts examined by the GAO were somewhat divergent. These forecasts range between 3,106 and 7,649 VLJ deliveries. The difficulty with comparing the forecasts, however, is that several have differing "out years." Some forecast through 2016 while others projected to 2020 and even 2025. **Table 2D** presents the VLJ forecast figures provided by the eight groups.

TABLE 2D
Total Forecast Number of VLJ Deliveries

Forecasting Entity	Forecast End Year	Forecast VLJs Delivered
Embraer – Without strong air taxi demand	2016	~3,000
Embraer – With strong air taxi demand	2016	~6,000
Forecast International (aerospace consulting firm)	2016	~6,000
Honeywell (manufacturer of airspace products)	2016	~5,000
PMI Media (aerospace/defense publisher)	2016	4,124
Teal Group (aerospace consulting firm)	2016	~3,000
Velocity Group (consulting firm) – Moderate air taxi growth	2016	~4,000
Velocity Group (consulting firm) – Strong air taxi growth	2016	~6,000
FAA	2020	6,300
Rolls-Royce	2025	~7,500

Source: FAA

The FAA forecast assumes that the regulatory environment affecting general aviation will not change dramatically. It is expected that the U.S. economy will continue to expand through 2008, and then continue to grow moderately (near three percent annually) thereafter. This will positively influence the aviation industry, leading to passenger, air cargo, and general aviation growth throughout the forecast period (assuming that there will not be any new successful terrorist incidents against either the

U.S. or world aviation). The FAA does recognize that a major risk to continued economic growth is upward pressure on commodity prices, including the price of oil. However, FAA economic models predict a 4.8 percent decrease in the price of oil in 2007, followed by a 7.1 percent increase in 2008. The price of oil is expected to become somewhat less volatile through the remainder of the forecast period.

The FAA projects the active general aviation aircraft fleet to increase at an average annual rate of 1.4 percent over the 14-year forecast period, increasing from 226,422 in 2006 to 274,914 in 2020. This growth is depicted on **Exhibit 2A**. FAA forecasts identify two general aviation economies that follow different market patterns. The turbine aircraft fleet is expected to increase at an average annual rate of 6.0 percent, increasing from 18,058 in 2006 to 31,558 in 2020. Factors leading to this substantial growth include expected strong U.S. and global economic growth, the continued success of fractional-ownership programs, the growth of the VLJ/microjet market, and a continuation of the shift from commercial air travel to corporate/business air travel by business travelers and corporations. Piston-powered aircraft are projected to show minimal growth through 2020 at 0.3 percent annually. Single engine piston aircraft are projected to grow at 0.3 percent annually, while multi-engine piston aircraft are projected to decrease in number by 0.2 percent annually. Piston-powered rotorcraft aircraft are forecast to increase by 5.7 percent annually through 2020.

Aircraft utilization rates are projected to increase through the 14-year forecast period. The number of general aviation hours flown is projected to increase at 3.4 percent annually. Similar to active aircraft projections, there is projected disparity between piston and turbine aircraft hours flown. Hours flown in turbine aircraft are expected to increase at 6.1 percent annually, compared with 1.3 percent for piston-powered aircraft. Jet aircraft are projected to increase at 9.4 percent annually over the next 14 years, being the largest increase in any one category for total aircraft hours flown.

The total pilot population is projected to increase by 51,000 in the next 14 years, from an estimated 455,000 in 2006 to 506,000 in 2020, which represents an average annual growth rate of 0.8 percent. The student pilot population is forecast to increase at an annual rate of 1.2 percent, reaching a total of 100,181 in 2020. Growth rates for other pilot categories over the forecast period are as follows: recreational pilots declining 0.1 percent; commercial pilots increasing 0.8 percent; airline transport pilots increasing 0.2 percent; rotorcraft-only pilots increasing 3.1 percent; glider-only pilots increasing 0.4 percent; and private pilots showing no change. The sport pilot is expected to grow significantly through 2020 at 22.6 percent annually. The decline in recreational pilots and no increase in private pilots is the result of the expectation that most

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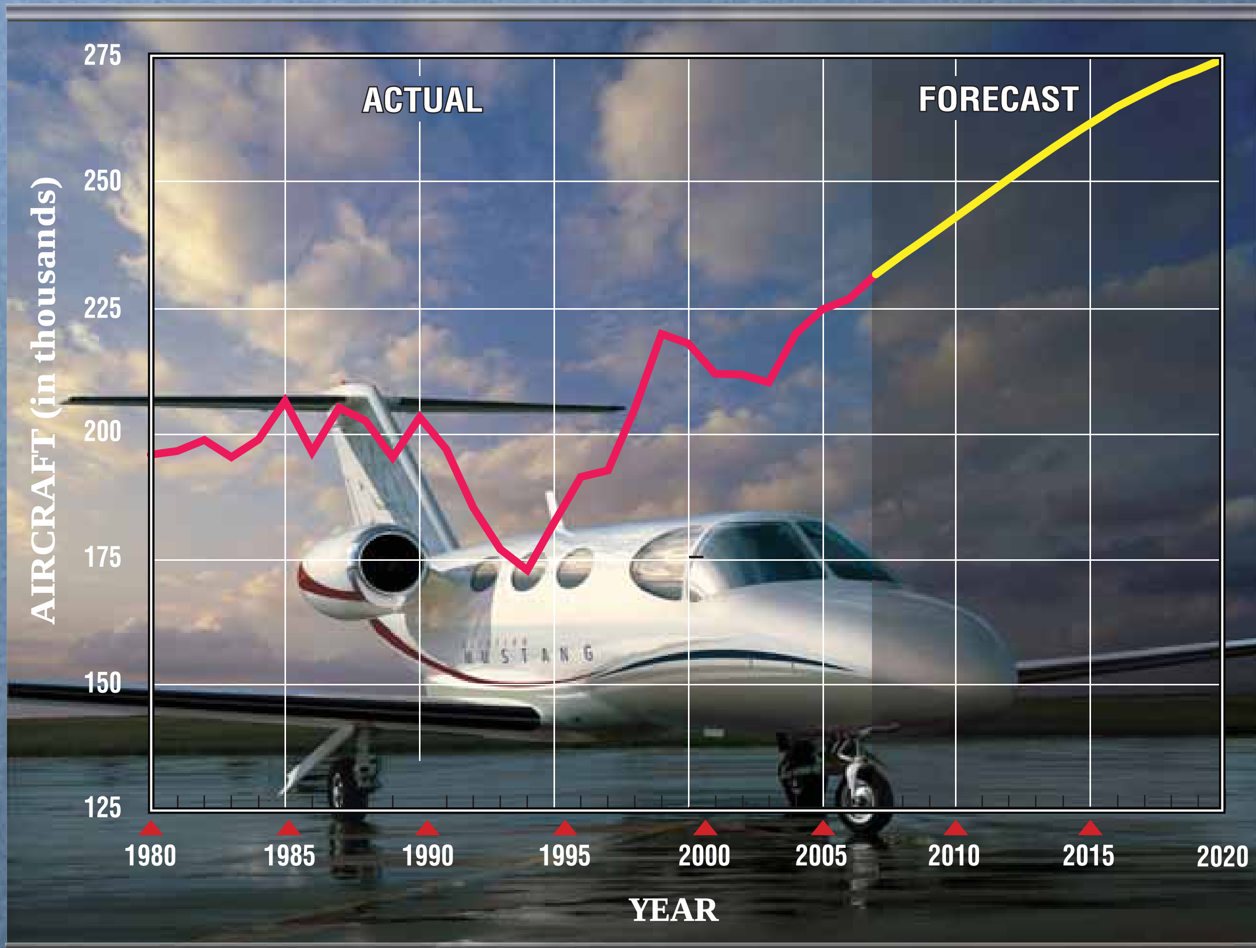
U.S. ACTIVE GENERAL AVIATION AIRCRAFT



U.S. ACTIVE GENERAL AVIATION AIRCRAFT (in thousands)

Year	FIXED WING									
	PISTON		TURBINE		ROTORCRAFT					
	Single Engine	Multi-Engine	Turboprop	Turbojet	Piston	Turbine	Experimental	Sport Aircraft	Other	Total
2006 (Est.)	148.2	19.4	8.0	10.0	3.4	5.9	24.5	0.4	6.6	226.4
2010	150.4	19.2	8.2	13.4	4.8	6.5	27.7	5.6	6.8	242.8
2015	154.0	19.0	8.5	18.0	6.3	7.2	31.1	10.5	6.7	261.4
2020	155.6	18.8	8.8	22.8	7.4	7.9	33.9	13.2	6.6	274.9

Source: FAA Aerospace Forecasts, Fiscal Years 2007-2020.

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

new general aviation pilots will choose to obtain the sport pilot license instead.

Over the past several years, the general aviation industry has launched a series of programs and initiatives whose main goals are to promote and assure future growth within the industry. The "No Plane, No Gain" is an advocacy program created in 1992 by GAMA and the National Business Aircraft Association (NBAA) to promote acceptance and increased use of general aviation as an essential, cost-effective tool for businesses. Other programs are intended to promote growth in new pilot starts and introduce people to general aviation. "Project Pilot," sponsored by the Aircraft Owners and Pilots Association (AOPA), promotes the training of new pilots in order to increase and maintain the size of the pilot population. The "Be A Pilot" program is jointly sponsored and supported by more than 100 industry organizations. The NBAA sponsors "AvKids," a program designed to educate elementary school students about the benefits of business aviation to the community and career opportunities available to them in business aviation. The Experimental Aircraft Association (EAA) promotes the "Young Eagles" program which introduces young children to aviation by offering them a free airplane ride courtesy of aircraft owners who are part of the association. The Civil Air Patrol has a curriculum for cadet flight training. Over the years, programs such as these have played an important role in the success of general aviation and will continue to be vital to its growth in the future.

SOCIOECONOMIC PROJECTIONS

Population, household, and employment growth provide an indication of the potential for sustaining growth in aviation activity over the planning period. Forecasts for the City of Redlands have been collected for this study. Similar statistics for San Bernardino County have also been collected for comparing growth rates.

Table 2E summarizes projections of total population, households and employment developed by the Southern California Association of Governments (SCAG) for the Regional Transportation Plan (RTP). The RTP is undergoing revisions for publication in 2008. These forecasts are from the current version of the RTP prepared in 2004.

As shown in the table, the population of the City of Redlands is projected to grow at an average annual rate of 1.0 percent through 2030. This is slightly lower than the historical growth rate over the past 20 years which averaged 1.5 percent annual growth. The City of Redlands population is projected to grow at a slightly slower rate than San Bernardino County, which is projected to grow at 1.4 percent annually through 2030. While households and total employment in the City of Redlands are projected to grow at a faster pace annually than population, total households and total employment in the City of Redlands is projected to grow at a slightly slower rate than for San Bernardino County as a whole.

TABLE 2E
Forecast Population, Households, and Employment

Year	City of Redlands	San Bernardino County
Population		
2000	63,875	1,718,311
2005	69,288	1,919,215
2010	72,036	2,059,420
2015	76,415	2,229,700
2020	80,737	2,397,709
2025	84,875	2,558,729
2030	88,842	2,713,149
Avg. Annual	1.0%	1.4%
Households		
2000	23,661	530,498
2005	24,857	567,172
2010	26,419	618,782
2015	29,091	686,584
2020	31,865	756,640
2025	34,642	826,669
2030	37,477	897,739
Avg. Annual	1.7%	1.9%
Employment		
2000	25,192	594,923
2005	27,124	669,028
2010	29,777	770,877
2015	34,418	870,491
2020	39,149	972,243
2025	43,921	1,074,861
2030	48,752	1,178,890
Avg. Annual	2.4%	2.3%

Source: SCAG

SERVICE AREA

The local airport service area is defined by the proximity of other airports and the facilities that they are able to provide to general aviation aircraft. General aviation service areas are very closely defined as the result of nearby airports providing similar aircraft tiedown, fuel, and hangar services. The previous chapter detailed all public-use airports within 30 nautical miles of Redlands Municipal Airport. These airports provide a wide range of general aviation services. Considering that the services at each airport vary according to local conditions (hangar, fuel, and tiedown rates, hangar availability, etc.), the service area for Redlands Municipal Airport is not considered to exactly follow the boundaries of any jurisdictional unit and is affected by many of the factors detailed above.

A review of aircraft ownership at Redlands Municipal Airport was made to gain an understanding of the geographical area that Redlands Municipal Airport serves. **Table 2F** summarizes the number of based aircraft in each zip code for the based aircraft owners at Redlands Municipal Airport. Typically, aircraft owners base their aircraft at a particular airport due to its proximity to their residence or business. This is true for Redlands Municipal Airport. The based aircraft service area is shown on **Exhibit 2B**.

This review of based aircraft data reveals that the majority of based aircraft owners are located east of Interstate 215 and along Interstate 10. Approximately 83 percent of the based aircraft owners included in this survey reside within the Cities of Redlands, Yucaipa, Loma Linda, Grand Terrace, Highland, Colton, and San Bernardino. Each of these communities is less than 20 miles from the Redlands Municipal Airport. Redlands Municipal Airport also draws from communities in the San Bernardino Mountains. This survey revealed that 12 based aircraft owners, or approximately six

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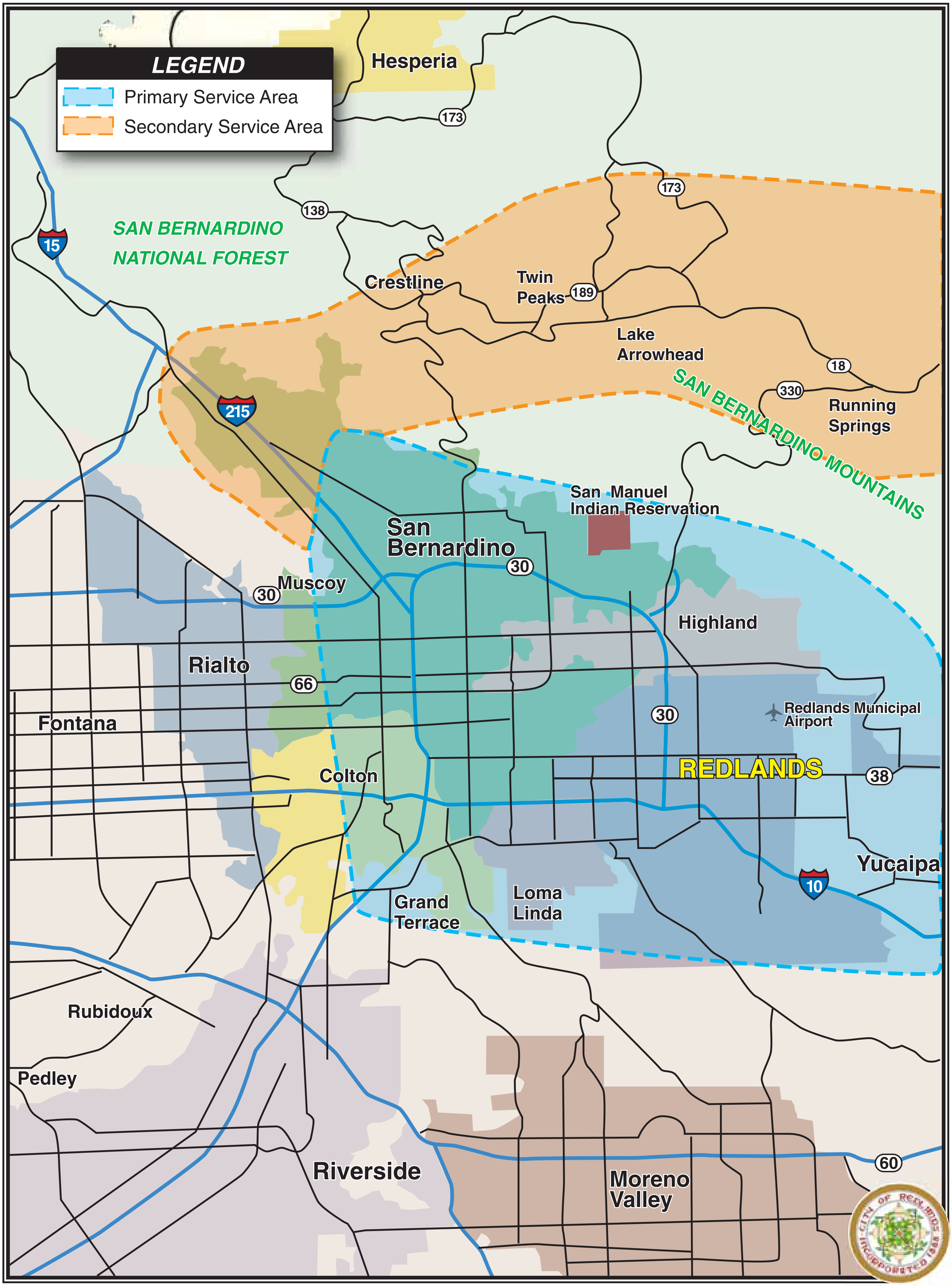


Exhibit 2B
BASED AIRCRAFT
SERVICE AREA

percent of based aircraft, were from communities in the San Bernardino Mountains, even though Big Bear Lake Airport may be located closer to them.

TABLE 2F
Zip Code and City of Based Aircraft Owners

Zip Code	City	Number of Based Aircraft
92374	Redlands	41
92373	Redlands	38
92399	Yucaipa	32
92346	Highland	13
92359	Mentone	8
92320	Calimesa	6
92324	Colton	5
92354	Loma Linda	5
92375	Redlands	5
92223	Beaumont	4
92404	San Bernardino	4
92408	San Bernardino	4
92405	San Bernardino	2
92317	Blue Jay	2
92325	Crestline, Lake Gregory, Valley of Enchantment	2
92352	Lake Arrowhead	2
92378	Rim Forest	2
92382	Running Springs, Arrowbear Lake	2
92385	Sky Forest	1
92391	Twin Peaks	1
92313	Grand Terrace	1
92369	Patton	1
92376	Rialto	1
92334	Fontana	1
92507	Riverside, Box Springs, Canyon Crest	1
92517	Riverside	1
91786	Upland	1
91765	Pomona	1
92270	Rancho Mirage	1
92329	Phelan	1
92371	Phelan	1
92397	Wrightwood	1
92626	Costa Mesa	1
90808	Long Beach	1
92660	Newport Beach	1
92831	Fullerton	1
92025	Escondido	1
92117	San Diego	1
93001	Ventura	1
95321	Groveland	1
Out of State	N/A	5

Source: Airport Records, Coffman Associates Analysis

Redlands Municipal Airport does draw aircraft owners from communities with existing airports. For example, two aircraft owners are located west of Interstate 215 in the communities of Rialto and Fontana, which are served by Rialto Municipal Airport. Two additional aircraft owners reside in Riverside, which is served by Riverside Airport and Flabob Airport. Additional based aircraft owners are drawn from communities in Orange County, the high desert of San Bernardino County, and other parts of California.

In summary, this analysis shows that the primary based aircraft service area for Redlands Municipal Airport is geographically small, encompassing communities within a short travel distance to the airport. However, this analysis also shows that aircraft owners will travel long distances to achieve a desirable location to store their aircraft as 8 percent of the based aircraft were from communities in the metropolitan area where other existing airports were located closer to them. Most likely, these aircraft owners located at Redlands Municipal Airport due to the availability of enclosed aircraft storage.

Pending changes in the role of airports near Redlands Municipal Airport should be considered. San Bernardino International Airport is also located within the Redlands Municipal Airport's primary service area. San Bernardino International Airport is located approximately 4.4 miles west of Redlands Municipal Airport and serves general aviation. As the former Norton Air Force Base, San Bernardino International Airport is also seeking commercial air service and air cargo activities. New general aviation services are being offered at San Bernardino International Airport, including a new national fixed base operator (FBO). The length of the runway and navigational aids at San Bernardino International may tend to attract the larger business and corporate users that cannot use the Redlands Municipal Airport facilities. However, it should be noted that San Bernardino International Airport could also provide facilities for small general aviation aircraft that traditionally have based at Redlands Municipal Airport.

As mentioned previously in Chapter One, Rialto Municipal Airport is scheduled to close in the next few years. Approximately 251 aircraft are based at Rialto Municipal Airport. According to the *Relocation Plan for Proposed Rialto Municipal Airport Closure* (March 2007), the aviation businesses on the airfield have indicated an interest in relocating to an airport within close proximity. The primary relocation airports are San Bernardino International Airport and Flabob Airport, both of which are approximately 10 miles from Rialto Municipal Airport. A portion of the funds generated from the sale of Rialto Municipal Airport to private developers must be directed to San Bernardino International Airport to assist in relocations.

Within the relocation plan, the majority of based aircraft tenants indicated that location, rates, and amenities are the most important factors in selecting a replacement airport. The majority of the tenants indicated the relocation plan a preference for going to San Bernardino or Flabob Airport due to their proximity to Rialto; however, some tenants indicated the potential to relocate to Redlands Municipal Airport.

As in any business, the more attractive the facility in services and capabilities, the more competitive it will be in the market place. If the airport's attractiveness increases in relation to nearby airports, so will the size of the service area. For Redlands Municipal Airport, this can include the availability and cost of hangar facilities. The availability of hangar facilities could draw some of the aircraft needing to relocate from Rialto Municipal Airport or considering basing at San Bernardino International Airport.

AVIATION ACTIVITY FORECASTS

The following forecast analysis examines each of the aviation demand categories expected at Redlands Municipal Airport over the next 20 years. Each segment will be examined individually, and then collectively, to provide an understanding of the overall aviation activity at the airport through 2027.

The need for airport facilities at Redlands Municipal Airport can best be determined by accounting for forecasts of future aviation demand. Therefore, the remainder of this chapter presents the forecasts for airport users, and includes the following:

- Based Aircraft
- Based Aircraft Fleet Mix
- Local and Itinerant Operations
- Peak Activity

BASED AIRCRAFT

The number of based aircraft is the most basic indicator of general aviation demand. By first developing a forecast of based aircraft, the growth of aviation activities at the airport can be projected. Aircraft basing at the airport is somewhat dependent upon the nature and degree of aircraft ownership in the local service area. As a result, aircraft registrations in the area were reviewed and forecast first.

Table 2G outlines the historic registered aircraft in San Bernardino County since 1996. This information was obtained from records of the FAA's Aircraft Registry. There were 1,540 aircraft registered in San Bernardino County in 1996. This number has since increased, with 1,709 registered aircraft reported in the County in 2006, which represents an annual average growth rate of 1.0 percent.

TABLE 2G
Historical Registered Aircraft
San Bernardino County

Year	Registered Aircraft	Annual Growth Rate
1996	1,540	-
1997	1,546	0.4%
1998	1,508	-2.5%
1999	1,510	0.1%
2000	1,533	1.5%
2001	1,550	1.1%
2002	1,541	-0.6%
2003	1,593	3.4%
2004	1,641	3.0%
2005	1,691	3.0%
2006	1,709	1.1%

Source: Aviation Goldmine CD (1996-2000), Avantex Aircraft & Airmen CD (2001-2006).

A couple of factors can be attributed to this growth. First, the economic and population growth in the eastern metropolitan region and, more specifically, the "Inland Empire" region in the past decade have led to new aircraft being placed in the region. Second is the "ripple" effect of growth in commercial air transportation in the region. In 2003, the Southern California Association of Governments (SCAG) completed the *General Aviation System Plan* (GASP). In the plan, SCAG recognized the congested nature of the commercial service airports in the region. The SCAG-GASP indicates that the activity at commercial service airports has a direct effect on general aviation airports, particularly general aviation airports such as Redlands Municipal Airport. As capacity issues at commercial airports become more pronounced, general aviation activity tends to naturally transition to other smaller airports.

For comparison, U.S. active aircraft during the same period grew at 1.3 percent annually, slightly faster than in the county. National growth coincides not only with the improved general economic conditions of the period, but also the enactment of the *General Aviation Revitalization Act*, which was approved by Congress in 1994 and sparked new aircraft manufacturing.

There are no other recently prepared forecasts of registered aircraft to examine and compare. As a result, a projection of county registrations was developed for this study. Several analytical techniques were examined for their applicability to projecting registered aircraft in San Bernardino County. These included time-series extrapolation, regression analyses, and market share analyses.

A time-series analysis of registered aircraft in the county was prepared based upon the historic data gathered between 1996 and 2006. A regression analysis was also developed to compare the relationship of registered aircraft to county population. Both of these resulted in a correlation coefficient (r^2) of less than 0.90. The correlation coefficient (Pearson's "r") measures the association between changes in the dependent variable (enplanements) and the independent variable(s) (calendar years). An r^2 greater than 0.90 indicates good predictive reliability. A value below 0.90 may be used with the understanding that the predictive reliability is lower. Being below the 0.90 threshold, neither the time-series analysis nor regression analysis was considered reliable enough to define long-term registered aircraft in San Bernardino County. Therefore, other methods were used to develop projections of registered aircraft.

Table 2H outlines the history of registered aircraft in San Bernardino County in relation to the total active general aviation aircraft in the United States. While the county's market share decreased initially between 1996 and 1999, it has since increased and was at 0.79 percent in 2006. A constant market share was first applied to the projections of U.S. active general aviation aircraft and yields 2,300 registered aircraft in San Bernardino County by 2026. An increasing market share of U.S. active general aviation aircraft was also developed to reflect the recent historical trend and yields 2,530 registered aircraft in the county by 2026.

TABLE 2H
Registered Aircraft Projections
San Bernardino County

Year	County Registered Aircraft	U.S. Active GA Aircraft	% of U.S. Active GA Aircraft	County Population	Aircraft Per 1,000 Residents
1996	1,540	191,129	0.81%	1,591,186	0.97
1997	1,546	192,414	0.80%	1,613,959	0.96
1998	1,508	204,711	0.74%	1,638,423	0.92
1999	1,510	219,464	0.69%	1,667,189	0.91
2000	1,533	217,533	0.70%	1,710,139	0.90
2001	1,550	211,447	0.73%	1,746,847	0.89
2002	1,541	211,244	0.73%	1,793,302	0.86
2003	1,593	209,606	0.76%	1,842,325	0.86
2004	1,641	212,390	0.77%	1,896,245	0.87
2005	1,691	214,591	0.79%	1,948,454	0.87
2006	1,709	216,835	0.79%	1,993,983	0.86
Constant Market Share of U.S. Active GA Aircraft					
2011	1,950	246,700	0.79%		
2016	2,090	264,700	0.79%		
2021	2,190	277,500[1]	0.79%		
2026	2,300	290,900[1]	0.79%		
Increasing Market Share of U.S. Active GA Aircraft					
2011	2,000	246,700	0.81%		
2016	2,200	264,700	0.83%		
2021	2,360	277,500[1]	0.85%		
2026	2,530	290,900[1]	0.87%		
Constant Ratio Per Capita					
2011	1,800			2,093,000	0.86
2016	1,950			2,264,000	0.86
2021	2,090			2,432,000	0.86
2026	2,230			2,593,000	0.86
Planning Forecast					
2011	1,920	246,700	0.78%	2,093,000	0.92
2016	2,080	264,700	0.79%	2,264,000	0.92
2021	2,210	277,500[1]	0.80%	2,432,000	0.91
2026	2,350	290,900[1]	0.81%	2,593,000	0.91

Source: Historical Registered Aircraft - Aviation Goldmine CD (1996-2000); Avantex Aircraft & Airmen CD (2001-2006); Historical & Forecast U.S. Active GA Aircraft – FAA Aerospace Forecasts, 2007-2020. Historical Population – California Department of Finance; Forecast Population SCAG. [1] Extrapolated

The population of San Bernardino County has also been used as a comparison with registered aircraft in the county. The forecast examines the historical registered aircraft as a ratio of 1,000 residents in San Bernardino

County. As shown in **Table 2H**, the 2006 estimated population for the county was 1,993,983 which equates to 0.86 registered aircraft per 1,000 residents. While this is a decrease from 1997, the ratio of registered aircraft per 1,000 residents in the county has remained fairly constant since 2002 meaning that registered aircraft has been growing at a similar rate to population. Therefore, a constant ratio of 0.86 aircraft per 1,000 residents forecast was developed and yields 2,230 registered aircraft in the county by 2026.

The constant ratio per capita forecast yields the slowest growth rate of 0.9 percent annually. The constant share of U.S. Active Aircraft forecast yields an average annual growth rate of 1.0 percent, while the increasing share of U.S. Active Aircraft forecast yields a 1.3 average annual growth rate. The constant ratio per capita forecast results in a slowing of growth below which has been experienced historically at the airport. Therefore, it more than likely underestimates growth potential. The increasing share of U.S. Active Aircraft forecast most likely overstates growth potential. Considering this, a planning forecast has been prepared which averages all three forecasts. The planning forecast yields 2,350 registered aircraft by 2026. This is an additional 641 aircraft over the planning period, growing at an average annual rate of 1.1 percent.

Based Aircraft Forecasts

Based upon available records, 224 based aircraft were at the airport at the end of 2006. This is an increase over previous years. According to available records from SCAG and the FAA, based aircraft levels have increased from 204 in 1997 to 206 in 2001. Between 1997 and 2006, based aircraft grew at an average annual growth rate of 0.9 percent.

Since annualized based aircraft was not available for this study, several market share analyses have been utilized to examine future based aircraft totals for Redlands Municipal Airport. The first method used to develop forecasts of based aircraft examined the airport's market share of registered aircraft. The 224 based aircraft at Redlands Municipal Airport in 2006 represents 13.1 percent of the total aircraft registered in San Bernardino County. A constant market share forecast was first developed and assumes the airport's market share will remain at 12.9 percent, which yields 308 based aircraft by the year 2026. An increasing market share forecast was also developed. This increasing market share forecast assumes the airport will begin to recapture its market share and is consistent with national trends. This increasing market share forecast yields 353 based aircraft by the end of the planning period. These two market share forecasts are presented in **Table 2J**.

TABLE 2J
Market Share of San Bernardino County Registered Aircraft

Year	Redlands Based Aircraft	San Bernardino County Registered Aircraft	Market Share of Based Aircraft
1997	204	1,546	13.2%
2001	206	1,550	13.3%
2006	224	1,709	13.1%
Constant Market Share			
2011	252	1,920	13.1%
2016	273	2,080	13.1%
2021	290	2,210	13.1%
2026	308	2,350	13.1%
Increasing Market Share			
2011	257	1,920	13.4%
2016	289	2,080	13.9%
2021	318	2,210	14.4%
2026	353	2,350	15.0%

Source: Historical Based Aircraft – SCAG (1997,2001), FAA TAF (2006); Historical Registered Aircraft - Aviation Goldmine CD (1997), Avantex Aircraft & Airmen CD (2006). Forecast Registered Aircraft: Coffman Associates

Another method used to project based aircraft examined the number of based aircraft as a ratio per 1,000 residents in the primary service area. As discussed above, the primary service area includes the cities of Grand Terrace, Highland, Loma Linda, Redlands, San Bernardino, and Yucaipa. The 2006 population of the primary service was estimated at 408,994, which equates to 0.55 based aircraft per 1,000 residents. This is a slight decrease from the ratio of 0.57 based aircraft per 1,000 residents in 1997. A constant ratio of 0.55 based aircraft per 1,000 residents was first completed and yields 256 based aircraft by 2026. An increasing share projection was also completed, assuming the airport begins to recapture aircraft registered in the county and yields 350 based aircraft by the end of the planning period. These two projections are shown in **Table 2K**.

The FAA's *Terminal Area Forecast* (TAF) was also examined. This forecast used a base year of 2006, with an estimated 221 based aircraft. The FAA TAF projects based aircraft at Redlands Municipal Airport to remain static at 221 based aircraft through 2026.

A summary of all the forecasts for based aircraft at Redlands Municipal Airport, as well as the preferred planning forecast, is presented in **Table 2L** and **Exhibit 2C**. As shown on the exhibit, the combination of forecasts represents a "forecast envelope." The forecast envelope represents the area in which future based aircraft at Redlands Municipal Airport should be found.

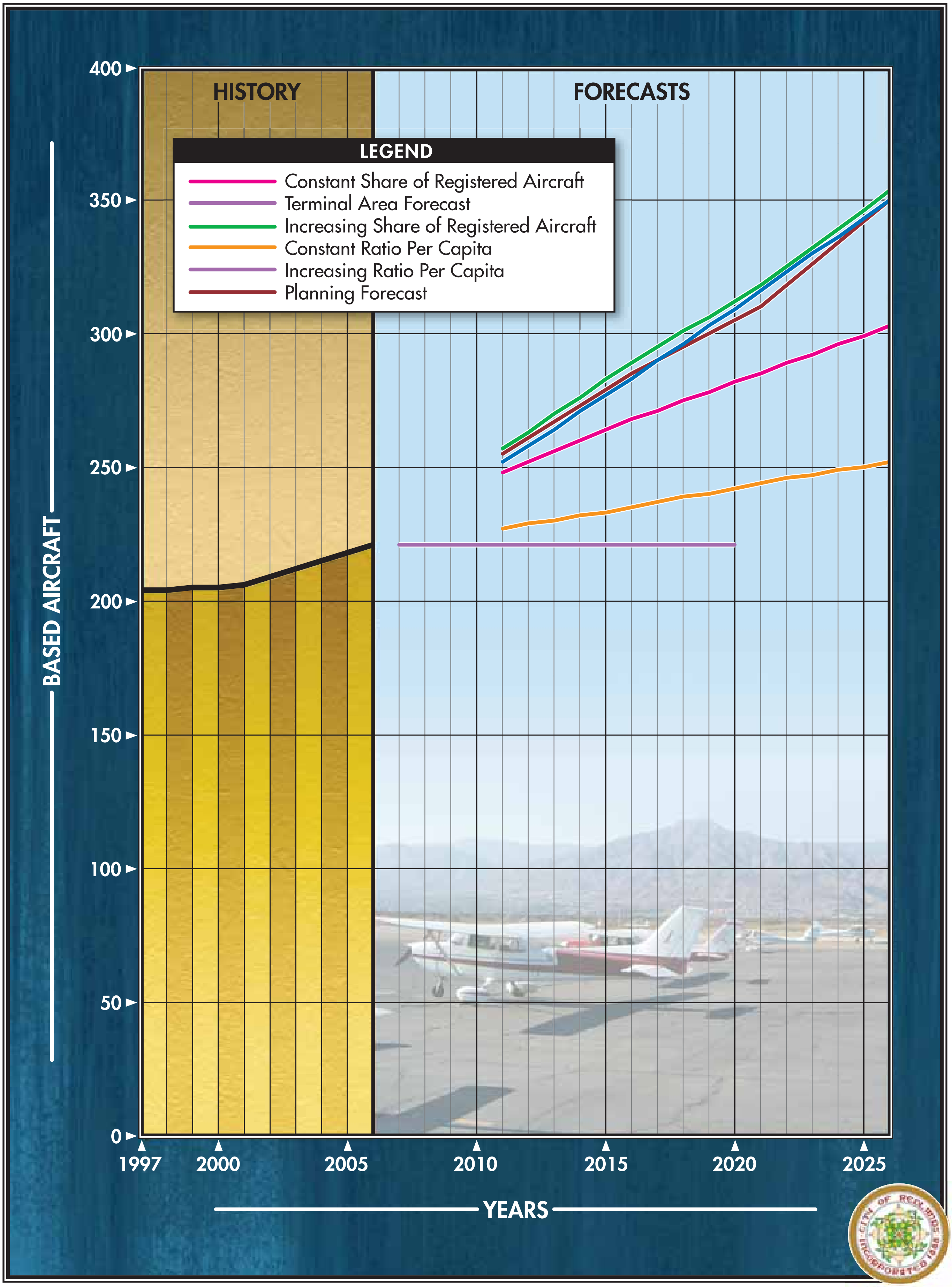


Exhibit 2C
BASED AIRCRAFT FORECASTS

TABLE 2K
Based Aircraft Forecast
Ratio of Based Aircraft Per 1,000 Residents - Primary Service Area

Year	Redlands Based Aircraft	Service Area Population	Based Aircraft Per 1,000 Residents
1997	204	355,587	0.57
2001	206	371,043	0.56
2006	224	408,994	0.55
Constant Share Projection			
2011	231	419,677	0.54
2016	240	435,654	0.54
2021	248	451,323	0.54
2026	256	466,332	0.54
Increasing Share Projection			
2011	252	419,677	0.60
2016	283	435,654	0.65
2021	316	451,323	0.70
2026	350	466,332	0.75

Source: : Historical Based Aircraft – SCAG (1997), FAA TAF (2006); Historical Population – U.S. Census Bureau; Forecast Population – California Department of Finance.

TABLE 2L
Based Aircraft Forecast Summary
Redlands Municipal Airport

	2006	2011	2016	2021	2026
Market Share of San Bernardino County Registered Aircraft					
Constant Market Share		252	273	290	308
Increasing Market Share		257	289	318	353
Aircraft Per 1,000 Residents (Primary Service Area)					
Constant Ratio Projection		231	240	248	256
Increasing Ratio Projection		252	283	316	350
FAA *Terminal Area Forecast*		221	221	221	N/A
Preferred Planning Forecast	**221**	**255**	**285**	**310**	**350**

The preferred planning forecast for Redlands Municipal Airport follows the upper end of the forecasts developed for this analysis. The planning forecast projects based aircraft growing at 2.3 percent annually through 2026 and results in 129 new based aircraft.

Several factors support future growth in based aircraft at the airport. First is socioeconomic growth in the service area. Consistent growth above 1.0 percent annually is expected for population, households, and employment for communities in the service area. The 2003 SCAG GASP projects aviation activity and based aircraft growth in the west San Bernardino County/ West Riverside County/East Los Angeles County will be stronger than all other portions of the metropolitan area. The area in which Redlands Municipal Airport is situated is a rapidly urbanizing area that has the highest concentration of pilots in the Inland Empire. Airports in this area are also projected by the GASP to be some of the first airports that need to accommodate growth due to the lack of landside capacity of urbanized Los Angeles County and Orange County airports.

The Rialto Municipal Airport closure may translate into new based aircraft for Redlands Municipal Airport. While aircraft owners now based at Rialto Municipal Airport indicated that Flabob Airport and San Bernardino International Airport were their first choices, since these airports are only 10 miles from Rialto Municipal Airport, Redlands Municipal Airport is only 13 miles from Rialto Municipal Airport and has been considered as a potential airport to relocate to in the future. Over 250 aircraft are based at Rialto Municipal Airport.

While San Bernardino International Airport will undoubtedly attract new general aviation aircraft as it continues its transformation from a former Air Force Base, San Bernardino International Airport is ideally suited to accommodate the larger business and corporate aircraft. Redlands Municipal Airport may still attract the owners of smaller general aviation aircraft.

Based Aircraft Fleet Mix

The current mix of aircraft based at the airport consists of 194 single engine aircraft, 20 multi-engine aircraft, one turbine-powered aircraft, and six helicopters. Other aircraft such as gliders or ultralights are also based at the airport. While the total number of general aviation aircraft based at Redlands Municipal Airport is projected to increase, it is also important to know the type of aircraft expected to base at the airport. This will ensure the planning of proper facilities in the future.

The forecast mix of based aircraft was determined by comparing existing and forecast U.S. general aviation fleet trends to the fleet mix at Redlands Municipal Airport. The general aviation fleet mix projections for the airport are presented in **Table 2M**. Single engine aircraft will continue to comprise the majority of all based aircraft. While an increase in single engine aircraft at Redlands Municipal Airport can be expected, their percentage of the total fleet mix will likely decrease slightly. Light Sport Aircraft (LSA) will fall within this category.

Only five new multi-engine piston aircraft are projected through the planning period. Nationally, multi-engine piston aircraft are projected to decline at an annual rate o f 0.2 percent. Aircraft within this category are expected to be replaced with the new very-light jets/microjets or turboprops.

Turbine-powered aircraft are projected to grow in number and percentage of the based aircraft fleet mix. Nationally, turbine-powered aircraft are projected to grow at 6.0 percent annually. The existing airfield and landside facilities at Redlands Municipal Airport are sufficient to accommodate all turboprop aircraft within the national fleet as well as the new very-light jets/microjets.

TABLE 2M
Based Aircraft Fleet Mix

Year	Total	Single Engine	Multi-Engine	Turbine	Helicopters	Other
2006	224	194	20	1	6	3
FORECAST						
2011	255	216	22	5	8	4
2016	285	240	23	9	9	4
2021	310	261	23	12	9	4
2026	350	292	25	17	11	5
Change	126	98	5	16	5	2
Percentage Share						
2006	100.0%	86.6%	8.9%	0.4%	2.7%	1.3%
2011	100.0%	85.0%	8.5%	2.0%	3.0%	1.5%
2016	100.0%	84.5%	8.0%	3.0%	3.0%	1.5%
2021	100.0%	84.0%	7.5%	4.0%	3.0%	1.5%
2026	100.0%	83.5%	7.0%	5.0%	3.0%	1.5%

Source for historical data: FAA Records

Steady growth is projected for helicopters. Allowances are made for the continued basing of other aircraft types at the airport such as gliders and ultralights, which are components of the sport/recreational segment of general aviation.

General Aviation Operations

General aviation operations are classified as either local or itinerant. A local operation is a take-off 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. Typically, itinerant operations increase with business and commercial use, since business aircraft are operated on a high frequency.

Redlands Municipal Airport does not have an operational airport traffic control tower (ATCT). Therefore, there are no actual counts of operations at the airport. There are only estimates of annual operations. The FAA records estimates of annual operations in the FAA TAF. The current TAF showed 44,000 annual operations at Redlands Municipal Airport in 2006. The *2003 General Aviation System Study for the SCAG Region* estimated 46,000 annual operations in 2002. The actual source for these estimates is not recorded. However, it is typically not based on any actual sampling/counting method and is often inaccurate due to the method of estimation.

These counts are substantially less than the estimate of annual operations developed for the last Redlands Municipal Airport master plan completed in 1993. For that master plan, air traffic at the airport was monitored with an acoustical counter for 16 days in late October and November 1991. The acoustical counter recorded the sound of each takeoff and landing at the airport. A technician listened to the recordings and developed a count of operations during that period. These counts were compared to fuel sales records and an annual estimate was developed. In 1991, total annual operations were estimated at 65,100. This is more than 20,000 operations higher than both the FAA and SCAG estimates. The FAA and SCAG have never reflected this count in their historical records.

Considering the acoustical count prepared in 1991, it would appear that the FAA TAF and 2003 SCAG studies seem to underestimate activity at Redlands Municipal Airport. Redlands Municipal Airport has flight training schools based at the airport. The airport is also used extensively for flight training from other regional airports. Most notably, the southern helicopter traffic pattern is often used by transient aircraft to conduct flight training at the airport. Therefore, the FAA TAF and SCAG numbers will not be relied upon for use in this study.

To assist in developing an estimate of annual operations at the airport, this study uses methodology developed by the FAA Statistics and Forecast Branch for estimating annual operations. The methodology is included in a report entitled, *Model for Estimating General Aviation Operations at Non-Towered Airports* (July 2001). This study utilized historical data at towered and non-towered airports and developed a series of formulas to estimate annual operations. The formula use several criterion including number of based aircraft, population totals, geographic location, and the relative size of the airport in terms of based aircraft to other airports in the region.

Table 2N summarizes the results of eight of these formulas as they relate to Redlands Municipal Airport. As shown in the table, these formulas result in estimates of annual operations in 2006 ranging from 75,000 to over 99,000. The average of all eight formulas is 82,000. For this Master Plan, the estimate of 82,000 annual operations will be used as the base year total of annual operations for Redlands Municipal Airport. This estimate shows that operational levels have potentially grown at the airport since 1991.

TABLE 2N **Estimates of Historical Aircraft Operations**		
Equation Number	**Equation**	**Result**
1	OPS=21,555 + 242BA	75,037
2	OPS=18,606 + 211BA +.002Pop100	99,818
3	OPS=18,718 + 229BA + 0.001Pop100-10,059WACAORAK	76,559
4	OPS=7,495 + 425BA + 0.001Pop100 - 12,501WACAORAK - 0.56BA^2	78,859
5	OPS=12,598 + 453BA + 0.001Pop100 - 12,956WACAORAK - 0.62BA^2 - 19,958%in50mi	85,992
6	OPS=10,422 + 462BA + 0.001Pop100 - 13,754WACAORAK - 0.68BA2 -23,481%in50mi + 18,587Pop25/Pop100	82,380
7	OPS=9,142 + 449BA + 0.001Pop100 - 13,292WACAORAK - 0.67BA^2 -8,448%in50mi +32,823Pop25/Pop100 - 44,094%in100mi	80,206
8	OPS=7,954 + 440BA + 0.001Pop100 - 13,024WACAORAK -0.65BA^2 +36,362Pop25/Pop100 - 58,055%in100mi	77,404
Average		82,032

Key:
OPS - Total Operations
BA - Based Aircraft
Pop100 - Population within San Bernardino, Riverside, Los Angeles, and Orange Counties
Pop25 - Population within primary service area
WACAORAK - Regional variable, set at 1
%in50mi - Ratio of based aircraft within 50 miles
%in100mi - Ratio of based aircraft within 100 miles
Source: *Models For Estimating General Aviation Activity Operations at Non-Towered Airports Using Towered and Non-Towered Data*

Forecasts of annual operations were developed by examining the number of operations per based aircraft. As shown in **Table 2P**, assuming 82,000 annual operations in 2006, the operations per based aircraft was 366. Holding this ratio constant through the planning period yields 128,100 annual operations. This equates to an average annual growth rate of 2.3 percent. Increasing the operations per based aircraft consistent with national trends of 1.2 percent annual growth, results in 168,000 annual operations in 2026, a 3.7 percent annual growth rate. For planning purposes, the forecast of annual operations has been developed as an average between the two forecast methods. This results in annual operations growing at 3.0 percent annually through 2026. All forecasts are shown on **Exhibit 2D**.

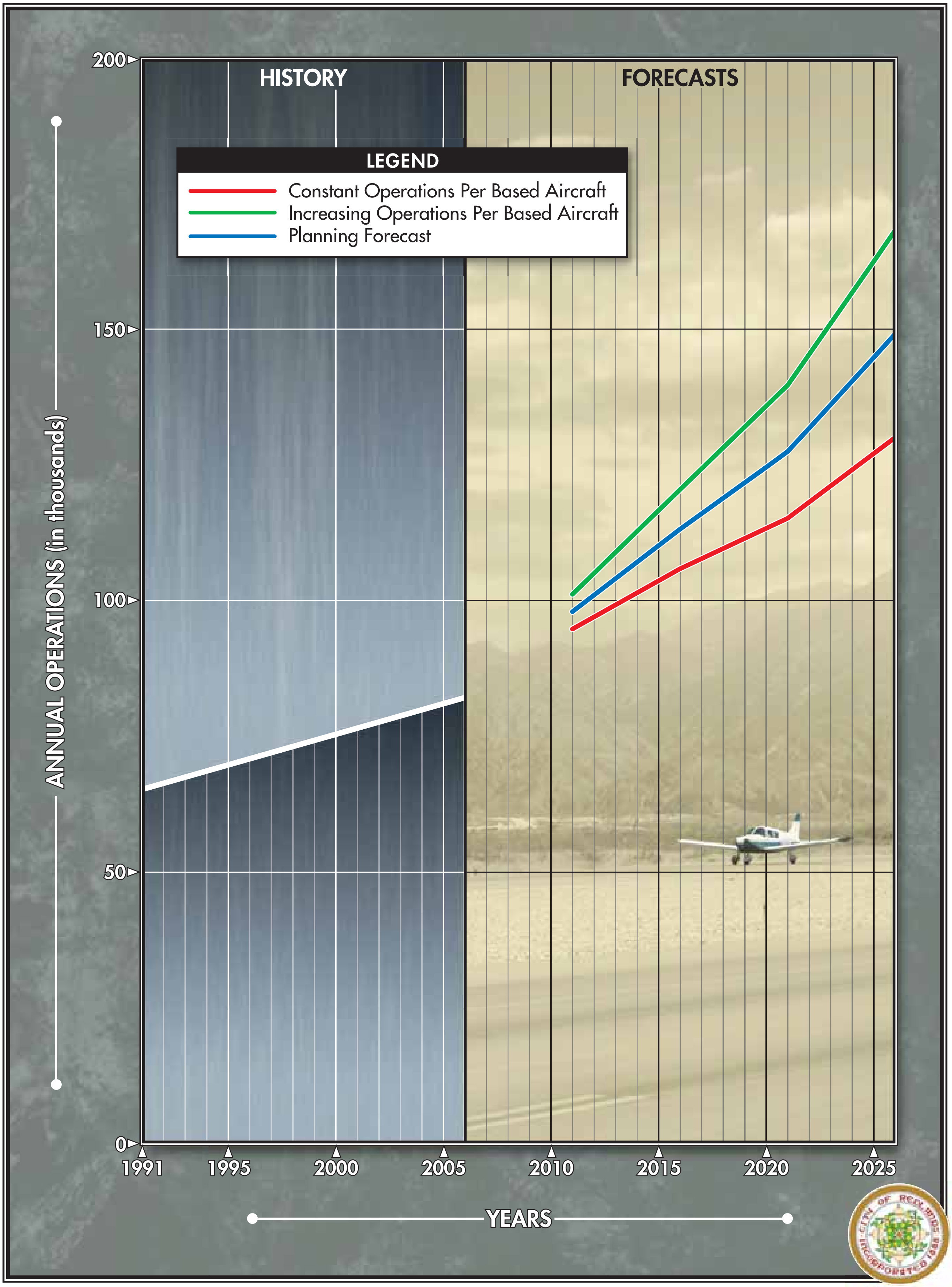


Exhibit 2D
ANNUAL OPERATIONS

TABLE 2P Annual Operations Forecast			
Year	**Based Aircraft**	**Annual Operations**	**Operations Per Based Aircraft**
Historical			
1991	230	65,100	283
2006	224	82,000	366
Forecast			
Constant Operations Per Based Aircraft			
2011	255	93,300	366
2016	285	104,300	366
2021	310	113,500	366
2026	350	128,100	366
Increasing Operations Per Based Aircraft			
2011	255	101,000	396
2016	285	120,300	422
2021	310	139,500	450
2026	350	168,000	480
Planning Forecast			
2011	255	97,800	384
2016	285	113,000	396
2021	310	127,300	411
2026	350	149,000	426
Source: Coffman Associates analysis			

Growth in operations can be expected at Redlands Municipal Airport as based aircraft grow and the socioeconomic conditions of the region expand. In the future, it can be expected that additional flight training will occur at the airport. Additional activity could also be spurred by the closure of Rialto Municipal Airport. Commercial airline, air cargo, and large general aviation aircraft growth at San Bernardino International Airport may also make Redlands Municipal Airport more attractive to certain segments of general aviation.

For planning purposes, it is estimated that 25 percent of the annual operations at Redlands Municipal Airport in 2006 were itinerant and the remaining 75 percent were local operations. It is expected that the percentage of itinerant operations will increase over the planning period, accounting for approximately 40 percent of total operations by 2026. The projection of local and itinerant operations is included in the summary information at the end of this chapter.

PEAKING CHARACTERISTICS

Most facility planning relates to levels of peak activity. The following planning definitions apply to the peak periods:

- Peak Month – The calendar month when peak aircraft operations occur.

- Design Day – The average day in the peak month.

- Busy Day – The busy day of a typical week in the peak month.

- Design Hour – The peak 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.

Typically, the peak month for general aviation operations represents 10-12 percent of the airport's annual operations. For this analysis, 12 percent was used through 2011. After that, the peak month declines to 10 percent by 2026. As operations increase, the peak month typically declines. Design day operations were calculated by dividing the peak month by 30. Daily peak periods are important factors for the provision of adequate aircraft parking apron area on the airport. Typically, busy days account for 1.25 times the design day activity. Design hour operations were estimated at 15 percent of the design day operations. **Table 2Q** summarizes the general aviation peak activity forecasts.

TABLE 2Q
Peak Period Forecasts

	2006	2011	2016	2021	2026
Annual Operations	82,000	97,800	113,000	127,300	149,000
Peak Month	9,840	11,736	12,430	14,003	14,900
Design Day	328	391	414	466	496
Busy Day	410	489	517	583	620
Design Hour (15.0%)	49	59	62	70	75

Source: Coffman Associates analysis

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 at Redlands Municipal Airport, aircraft must land at the airport after following the published Global Positioning System instrument approach procedures and then properly close their flight plan on the ground. The approach must be conducted in weather conditions which necessitate the use of the instrument approach. If the flight plan is closed prior to landing, then the AIA is not counted in the statistics. It should be noted that practice or training approaches do not count as annual AIAs.

Historical AIA information is not available for Redlands Municipal Airport. This does not necessarily indicate that this approach is not used. The FAA does not make records available for each airport.

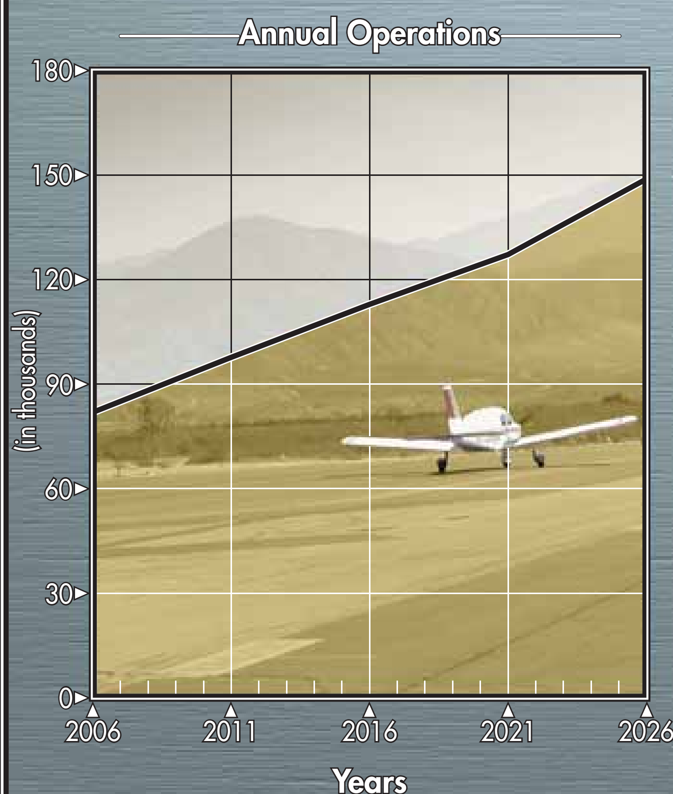
The presence of good flying weather and the type of traffic at the airport indicates that the use of the approach is minimal. Typically, AIAs for airports with available instrument approaches utilized by advanced aircraft will average between one and two percent of itinerant operations. For planning purposes, AIAs are forecast as 1.0 percent of itinerant operations. This forecast is presented in the forecast summary exhibit.

SUMMARY

This chapter has provided forecasts for each sector of aviation demand anticipated over the planning period. **Exhibit 2E** presents a summary of the aviation forecasts developed for Redlands Municipal Airport. The airport is expected to experience an increase in total based aircraft and annual operations throughout the planning period. The next step in this study is to assess the capacity of the existing facilities to accommodate forecast demand and determine what types of facilities will be needed to meet these demands.

06MP03-2E-2/27/08

	FORECASTS				
	2006	2011	2016	2021	2026
Based Aircraft					
Single Engine Piston	194	216	240	261	292
Multi-Engine Piston	20	22	23	23	25
Turbine	1	5	9	12	17
Helicopters	6	8	9	9	11
Other	3	4	4	5	5
Total Based Aircraft	***224***	***255***	***285***	***310***	***350***
Annual Operations					
Local	61,500	73,400	79,100	82,700	89,400
Itinerant	20,500	24,400	33,900	44,600	59,600
Total Annual Operations	***82,000***	***97,800***	***113,000***	***127,300***	***149,000***
Annual Instrument Approaches	N/A	244	339	446	596
Peak Period Forecasts					
Peak Month	9,840	11,736	12,430	14,003	14,900
Design Day	328	391	414	466	496
Busy Day	410	489	517	583	620
Design Hour (15.0%)	49	59	62	70	75



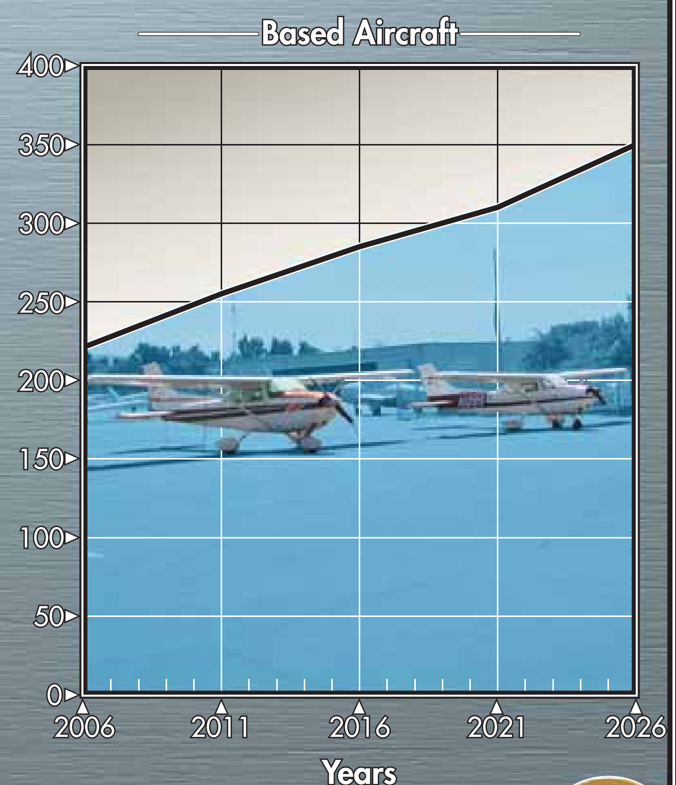


Exhibit 2E
FORECAST SUMMARY

CHAPTER THREE

FACILITY REQUIREMENTS

FACILITY REQUIREMENTS

To properly plan for the future of Redlands Municipal Airport, it is necessary to translate forecast aviation demand into the specific types and quantities of facilities that can adequately serve this identified demand. This chapter uses the results of the forecasts conducted in Chapter Two, as well as established planning criteria, to determine the airfield (i.e., runways, taxiways, navigational aids, marking and lighting) and landside (i.e., hangars, aircraft parking apron, and automobile parking) facility requirements.

The objective of this effort is to identify, in general terms, the adequacy of the existing airport facilities, outline what new facilities may be needed, and when these 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 cost-effective and efficient means for implementation.

PLANNING HORIZONS

The cost-effective, efficient, and orderly development of an airport should rely more upon actual demand at an airport than on 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 Redlands Municipal Airport that

takes into consideration the reasonable range of aviation demand projections prepared in Chapter Two.

It is important to consider that the actual activity 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 the airport staff 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 most important reason for utilizing milestones is that they allow the airport to develop facilities according to need generated by actual demand levels. The demand-based schedule provides flexibility in development, as development schedules can be slowed or expedited according to actual demand at any given time over the planning period. The resulting plan provides airport officials with a financially responsible, need-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.

TABLE 3A
Planning Horizons
Redlands Municipal Airport

	Current	Short Term	Intermediate Term	Long Term
Operations				
Local	61,500	73,400	79,100	89,400
Itinerant	20,500	24,400	33,900	59,600
Total Operations	82,000	97,800	113,000	149,000
Total Based Aircraft	221	255	285	350

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 planning horizon milestones 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.

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 Redlands Municipal Airport has been analyzed from a number of perspectives, including:

- Critical Design Aircraft
- Airfield Capacity

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

CRITICAL DESIGN AIRCRAFT

The selection of appropriate Federal Aviation Administration (FAA) design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using, or expected to use, the airport. The critical design aircraft is defined as the most demanding category of aircraft, or family of aircraft, which conducts at least 500 operations per year at the airport. Planning for future aircraft use is of particular importance since design standards are used to plan separation distances between facilities. These future standards must be considered now to ensure that short term development does not preclude the long range potential needs of the airport.

The FAA has established a coding system to relate airport design criteria to the operational and physical characteristics of aircraft expected to use the airport. This airport reference code (ARC) has two components: the first component, depicted by a letter, is the aircraft approach category and relates to aircraft approach speed (operational characteristic); the second component, depicted by a Roman numeral, is the airplane design group and relates to the aircraft wingspan or tail height (physical characteristic). Generally, aircraft approach speed applies to runways and runway-related facilities, while airplane wingspan/tail height primarily relates to separation criteria involving taxiways, taxilanes, and landside facilities. **Exhibit 3A** depicts typical aircraft within each ARC.

According to FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, an aircraft's approach category is based upon 1.3 times its stall speed in landing configuration at that aircraft's maximum certificated weight. The five approach categories used in airport planning 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.

The airplane design group (ADG) is based upon the aircraft's wingspan or tail height. The six ADGs used in airport planning are as follows:

Group I: Up to but not including 49 feet wingspan or tail height up to but not including 20 feet.

Group II: 49 feet up to but not including 79 feet wingspan or tail height from 20 up to but not including 30 feet.

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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, 900
- Embraer Regional Jet
- Lockheed JetStar
- Super King Air 350

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

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

C-III, D-III

- ERJ-170, 190
- Boeing Business Jet
- B 727-200
- **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 300
- Beech 1900
- Jetstream 31
- Falcon 10, 20, 50
- Falcon 200, 900
- **Citation II**, III, IV, V
- Saab 340
- Embraer 120

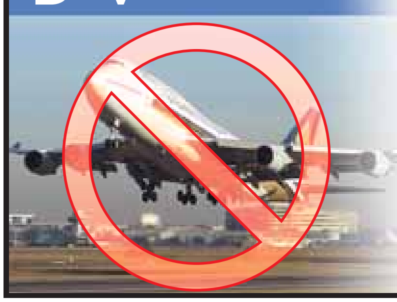
C-IV, D-IV

- **B-757**
- B-767
- C-130
- DC-8-70
- DC-10
- MD-11
- L1011

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.

Exhibit 3A
AIRPORT REFERENCE CODES

Group III: 79 feet up to but not including 118 feet wingspan or tail height from 30 up to but not including 45 feet.

Group IV: 118 feet up to but not including 171 feet wingspan or tail height from 45 up to but not including 60 feet.

Group V: 171 feet up to but not including 214 feet wingspan or tail height from 60 up to but not including 66 feet.

Group VI: 214 feet up to but not including 262 feet wingspan or tail height from 66 up to but not including 80 feet.

In order to determine airfield design requirements, the critical aircraft and critical ARC should first be determined, and then appropriate airport design criteria can be applied. This begins with a review of aircraft currently using the airport and those expected to use the airport through the planning period.

The FAA advises designing airfield facilities to meet the requirements of the airport's most demanding aircraft, or critical aircraft. As discussed above, this is the aircraft, or group of aircraft (defined by ARC), with at least 500 annual operations at the airport. In order to determine future facility needs, an ARC should first be determined, and then appropriate design criteria can be applied. This begins with a review of aircraft currently using the airport and those expected to use the airport through the planning period. As shown on **Exhibit 3A**, the airport does not currently, nor is it expected to, regularly serve aircraft in ARCs A-III, B-III, C-I, C-II, C-III, D-III, C-IV, D-IV, or D-V. Aircraft within ARCs A-III, B-III, C-III, D-III, C-IV, D-IV, or D-V are large transport aircraft commonly used by commercial air carriers and air cargo carriers, which do not currently use, nor are they expected to use, the airport through the planning period. Aircraft in ARC C/D-I and C/D-II are expected to regularly utilize San Bernardino International Airport which has the longer runway.

Redlands Municipal Airport is currently utilized by all types of general aviation aircraft ranging from small single engine and multi-engine piston aircraft to turboprop and the occasional business jet aircraft. While the airport is used by a number of helicopters, helicopters are not included in this determination as they are not assigned an ARC. The majority of based aircraft at Redlands Municipal Airport fall within ARCs A-I and B-I and include a wide variety of single engine and multi-engine piston aircraft. This would suggest that the airport falls within ARC B-I. FAA guidelines make a distinction in the B-I ARC for aircraft over 12,500 pounds and those aircraft below 12,500 pounds. For Redlands Municipal Airport, the majority of based aircraft within ARC A-I and B-I are less than 12,500 pounds. Therefore, the ARC that best describes the based aircraft fleet at the airport is ARC B-I, small aircraft exclusively.

The type of transient aircraft using the airport is more diverse than the type of aircraft based at the airport and includes single engine and multi-engine piston aircraft, as well as turboprop aircraft and various business jets.

To further determine the current ARC for the airport, an analysis of activity by more demanding turboprops and business jets was undertaken. In order to discern the number and type of operations at Redlands Municipal Airport, an analysis of instrument flight plan data was conducted. Flight plan data was acquired for this study from the subscription database service, *AirportIQ*. The data available includes documentation of flight plans that are opened and closed on the ground at the airport. Flight plans that are opened or closed from the air are not credited to the airport. Therefore, it is likely that there are more operations at the airport than are captured by this methodology, but they are not included in these calculations. No activity conducted under visual flight conditions is captured.

A review of instrument flight plan data for 2007 reveals only four operations by Cessna Citation 525B business jets and 14 turboprop operations. Turboprop aircraft included Beechcraft KingAir C90 and B200 aircraft and Cessna 425 aircraft. All the business jets and turboprops that operated at the airport on an instrument flight plan fell within Approach Category B and ADGs I and II.

Based upon this information, it appears that based aircraft define the current ARC for the airport as activity levels by aircraft in higher ARCs do not meet the substantial use threshold of 500 annual operations to be considered the current critical design aircraft. In the future, turboprop and business jet activity could increase. The forecasts prepared in Chapter Two projected an increase in business jets to be based at the airport. In particular, these business jets were expected to be microjets or very light jets such as the Eclipse 500 which fall within ARC A-I and are less than 12,500 pounds. In fact, to be defined as a microjet or VLJ, an aircraft must weight less than 10,000 pounds. At only 4.4 nautical miles west, San Bernardino International Airport would be expected to serve the larger business jets. San Bernardino International Airport has the longer runway length, instrument approach capabilities, and general aviation services to serve the larger business jets. Given these considerations, Redlands Municipal Airport should conform to ARC B-I (small aircraft exclusively) through the Long Term Planning Horizon.

AIRFIELD CAPACITY

An airport's airfield capacity is expressed in terms of its annual service volume (ASV). Annual service volume is a reasonable estimate of the maximum level of aircraft operations that can be accommodated in a year without incurring significant delay factors. As aircraft operations surpass the ASV, delay factors increase exponentially. Annual service volume accounts for annual differences in runway use, aircraft mix, and weather conditions. The airport's annual service volume was examined utilizing FAA AC 150/5060-5, *Airport Capacity and Delay*.

Exhibit 3B graphically presents the various factors included in the calculation of an airport's ASV. These include the airfield characteristics, meteorological conditions, aircraft mix, and demand characteristics (aircraft operations). The following describes the input factors as they relate to Redlands Municipal Airport:

- **Runway Configuration** – A single runway (Runway 8-26), which is served by a full-length parallel taxiway. The GPS-A approach at Redlands Municipal Airport is a circling approach. This approach can reduce capacity as it takes longer to complete and longer separations must be maintained between aircraft by air traffic control

- **Runway Use** – Winds indicate using Runway 26 the majority of the time.

- **Exit Taxiways** – Only taxiways between 2,000 feet and 4,000 feet from the landing threshold count in the exit rating. Therefore, Runway 8 has a taxiway exit rating of one, and Runway 26 has a taxiway exit rating of two.

- **Weather Conditions** – The airport operates under visual meteorological conditions (VMC) approximately 94 percent of the time. Instrument meteorological conditions (IMC) occur when cloud ceilings are between 500 and 1,000 feet and visibility is between one and three statute miles. This occurs approximately four percent of the time. Poor visibility conditions (PVC) apply for minimums below 500 feet and one mile. This occurs approximately two percent of the time. Airfield capacity is diminished during IMC and PVC.

- **Aircraft Mix** – Description of the classifications and the percentage mix for each planning horizon is presented in **Table 3B**. As discussed above, the overwhelming majority of operations at the airport are by aircraft less than 12,500 pounds. This is expected to continue through the planning period.

- **Percent Arrivals** – Generally follows the typical 50-50 split.

- **Touch-and-Go Activity** – Percentages of touch-and-go activity are presented in **Table 3B**.

- **Operations Levels** – Operational planning horizons were outlined in the previous section of this chapter. The peak month was estimated at 12 percent of the total annual op-

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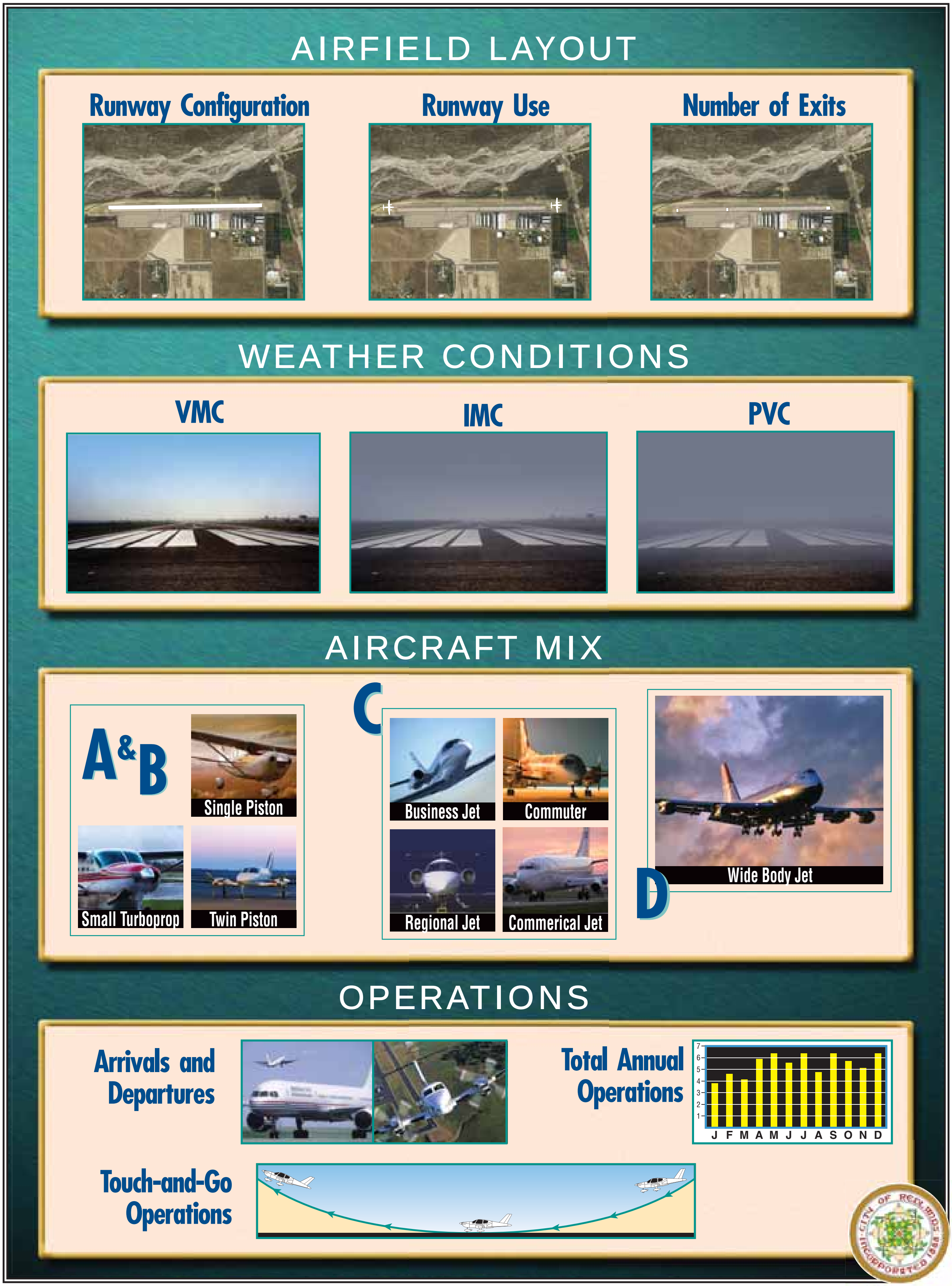

Exhibit 3B
AIRFIELD CAPACITY FACTORS

erations. This is estimated to decrease to 10 percent of operations as annual operations increase and the peak periods become more spread out through the year. The peak hour was estimated at 15 percent of the average daily operations.

TABLE 3B
Aircraft Operational Mix - Capacity Analysis
Redlands Municipal Airport

Aircraft Classification	Current	Short Term	Intermediate Term	Long Term
Classes A & B	99.8%	99.8%	99.8%	99.7%
Class C	0.2%	0.2%	0.2%	0.3%
Class D	0%	0%	0%	0%
Percent Local Operations (Touch-and-Go's)	75%	70%	65%	60%

Definitions: Class A: Small single engine aircraft with gross weights of 12,500 pounds or less.
Class B: Small twin engine aircraft with gross weights of 12,500 pounds or less.
Class C: Large aircraft with gross weights over 12,500 pounds up to 300,000 pounds.
Class D: Large aircraft with gross weights over 300,000 pounds.

Hourly Runway Capacity

Based upon the input factors, current and future hourly capacities for the various operational scenarios at Redlands Municipal Airport were determined. As depicted in **Table 3C**, at Redlands Municipal Airport, the current hourly capacity is 115 operations. This number is expected to remain fairly consistent throughout the planning period as the mix of aircraft will not change significantly.

TABLE 3C
Airfield Demand/Capacity Summary
Redlands Municipal Airport

	Existing	Short Term	Intermediate Term	Long Term
Operational Demand				
Annual	82,000	97,800	113,000	149,000
Design Hour	48	57	60	72
Capacity				
Annual Service Volume	198,000	198,000	216,000	237,000
Weighted Hourly Capacity	115	115	115	115
Percent Capacity	41.4%	49.4%	52.3%	62.9%
Delay				
Per Operation (Seconds)	12	18	24	30
Total Annual (Hours)	273	489	753	1,242

Annual Service Volume

The weighted hourly capacity is utilized to determine the annual service volume using the following equation:

$$ASV = C \times D \times H$$

C = weighted hourly capacity;
D = ratio of annual demand to the average daily demand during the peak month; and
H = ratio of average daily demand to the design hour demand during the peak month.

The existing ratio of annual demand to average demand (D) was determined to be 258 for Redlands Municipal Airport. This number is expected to increase to 310 by the long term planning period as the peak month percentage declines. The ratio of average daily demand to average peak hour demand (H) was determined to be 6.7. This ratio was projected to remain constant over the long term planning period as the peak hour assumptions remain constant.

Using the methodology described above, the current annual service volume was determined to be approximately 198,000 operations. The reduction in the peak month percentages is expected to increase the annual service volume over the planning period to approximately 237,000 annual operations. Factors influencing annual service volume include the lack of a straight-in instrument approach procedure, number of runway exits, and the amount of time that the airport is in PVC conditions. A straight-in instrument approach procedure could increase the annual service volume by approximately three percent. Two additional runway exits could increase annual service by six percent. **Table 3C** summarizes the airport's annual service volume over the long term planning horizon.

Aircraft Delay

Aircraft delay is inherent to airport operations and most usually experienced during peak demand periods when multiple aircraft are using the airport simultaneously. Delays occur to arriving and departing aircraft in all weather conditions. Arriving aircraft delays result in aircraft holding outside of the airport traffic area. Departing aircraft delays result in aircraft holding at the runway end. At lower annual operational thresholds, delays are minimal. However, as the number of annual aircraft operations approaches the airfield's capacity, increasing amounts of delay to aircraft operations begin to occur.

Table 3C also summarizes the aircraft delay analysis conducted for Redlands Municipal Airport. Current annual delay is minimal and estimated at only 12 seconds per operation. As operations increase, delay levels are expected to increase to approximately 30 seconds per operation.

Capacity Analysis Conclusions

Exhibit 3C compares annual service volume to existing and forecast opera-

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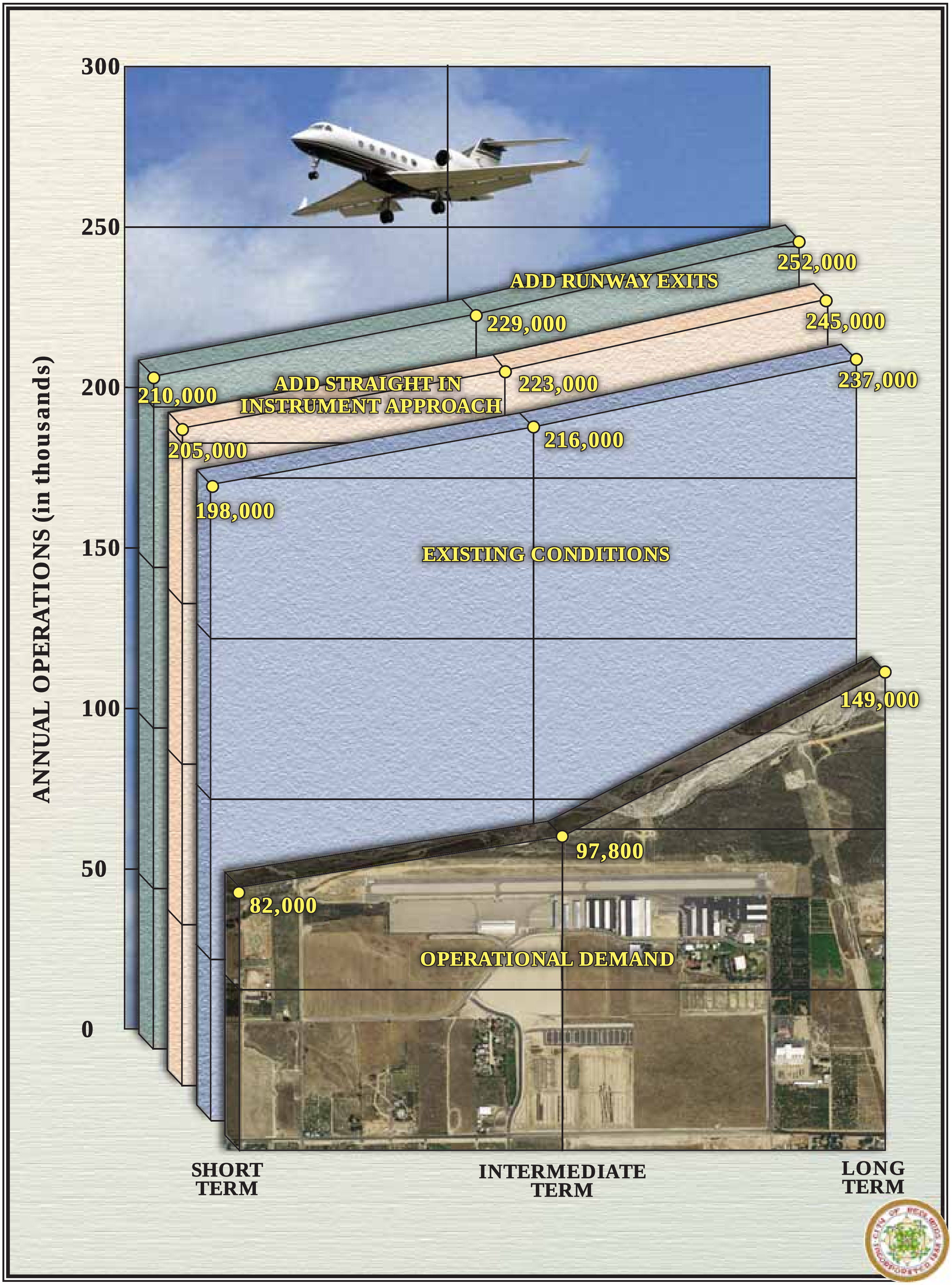

Exhibit 3C
ANNUAL SERVICE VOLUME

tional levels at Redlands Municipal Airport. FAA Order 5090.3C, *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. As shown previously in **Table 3C**, Redlands Municipal Airport may exceed 60 percent of ASV at long term planning horizon operational levels without further improvements.

Table 3D summarizes airfield capacity assuming the addition of exit taxiways or a straight-in instrument approach procedure. Adding two additional runway exits can increase annual service volume to 252,000 by the long term planning horizon. A straight-in instrument approach procedure would increase annual service to 245,000 by the long term planning horizon. In both instances, the airport would be operating at or below 60 percent capacity. Therefore, no additional runways will need to be planned at the airport and the airport can continue to operate efficiently from a single runway. The alternatives analysis will examine optimal locations for the exit taxiways.

TABLE 3D
Airfield Demand/Capacity Summary
With Improvements

	Short Term	Intermediate Term	Long Term
Add Runway Exits			
Capacity			
Annual Service Volume	210,000	229,000	252,000
Weighted Hourly Capacity	122	122	122
Percent Capacity	46.6%	49.3%	59.1%
Add Straight-In Instrument Approach			
Capacity			
Annual Service Volume	205,000	223,000	245,000
Weighted Hourly Capacity	119	119	119
Percent Capacity	47.7%	50.7%	60.8%

RUNWAYS

The adequacy of the existing runway system at Redlands Municipal Airport has been analyzed from a number of perspectives, including runway orientation, runway length, pavement strength, width, and FAA safety standards. From this information, requirements for runway improvements were determined for the airport.

Runway Orientation

The airport is served a single runway. Runway 8-26 is oriented in an east-west manner. For the operational safety and efficiency of an airport, it is desirable for the primary runway to be oriented as close 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, Change 11, *Airport Design*, recommends that a crosswind runway should be made available when the primary runway orientation provides for less than 95 percent wind coverage for specific crosswind components. The 95 percent wind coverage is computed on the basis of the crosswind component not exceeding 10.5 knots (12 mph) for ARCs A-I and B-I; 13 knots (15 mph) for ARCs A-II and B-II; 16 knots (18 mph) for ARCs C-I through D-II.

Wind data necessary for this analysis specific to the Redlands Municipal Airport was not available. Therefore, following FAA guidance, data from the closest available station was used. For this study, data from San Bernardino International Airport, located approximately five miles west of Redlands Municipal Airport, was collected. This data is graphically depicted on the wind rose on **Exhibit 3D**.

As depicted on the exhibit, the single east-west runway at Redlands Municipal Airport provides greater than 95 percent wind coverage for all crosswind conditions. Based upon this wind analysis, the runway system at the airport is properly oriented to prevailing wind flows and aircraft operational safety is maximized. No new runway orientations or a change to the existing orientation is needed at the airport.

Runway Length

The runway length requirements for an airport are based on four primary factors: airport elevation, mean maximum temperature of the hottest month, runway gradient (difference in runway elevation of each runway end), and the critical aircraft type expected to use the airport.

Aircraft performance declines as each of these factors increase. Summertime temperatures and stage lengths are the primary factors in determining runway length requirements. For calculating runway length requirements at the airport, the airport elevation is 1,571 feet above mean sea level (MSL) and the mean maximum temperature of the hottest month is 95.0 degrees Fahrenheit (F).

Runway end elevations vary by approximately 103 feet which results in a longitudinal gradient of 2.1 percent. This is slightly above the surface gradient standards found in FAA AC 5300-13, Airport Design, which specify a maximum longitudinal gradient of two percent. The FAA recently approved the reconstruction of the runway to this gradient in 2003 when the runway was completely reconstructed.

Using the site-specific data described above, runway length requirements for the various classifications of aircraft that may operate at the airport were examined using the FAA Airport Design computer program, Version 4.2D. The program groups general

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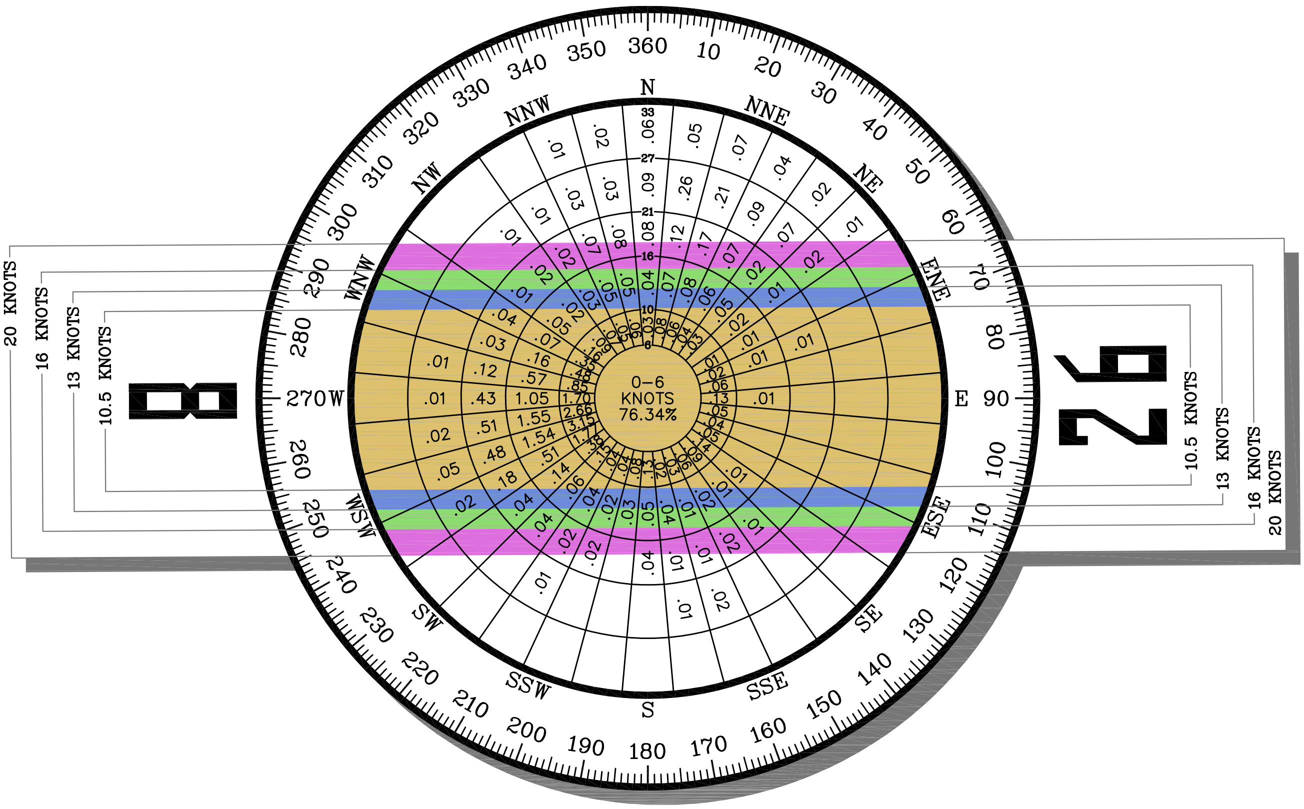
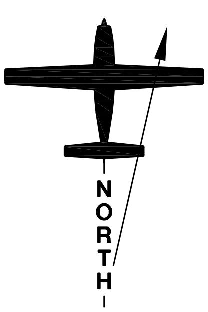
ALL WEATHER WIND COVERAGE

Runway	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 8-26	*97.21%*	*97.67%*	*98.13%*	*98.83%*





Magnetic Variance
12° 41' East (August 2008)
Annual Rate of Change
00° 05' West (August 2008)

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
San Bernardino International Airport (SBD)
San Bernardino, California

OBSERVATIONS:
28,085 All Weather Observations
February 2004–July 2008

Exhibit 3D
WINDROSE

aviation aircraft into several categories, reflecting the percentage of the fleet within each category. As previously discussed, the runway design should be based upon the most critical aircraft performing at least 500 annual operations. **Table 3E** summarizes FAA's generalized recommended runway lengths for Redlands Municipal Airport.

TABLE 3E
Runway Length Requirements
Redlands Municipal Airport

AIRPORT AND RUNWAY DATA	
Airport elevation	1,571 feet
Mean daily maximum temperature of the hottest month	95.0° F
Maximum difference in runway centerline elevation	103 feet
RUNWAY LENGTHS RECOMMENDED FOR AIRPORT DESIGN	
Small airplanes with less than 10 passenger seats	
75 percent of these small airplanes	3,100 feet
95 percent of these small airplanes	3,700 feet
100 percent of these small airplanes	4,400 feet

Reference: FAA's airport design computer software, Version 4.2D

The first step in determining runway length is to identify the list of critical design airplanes that will make regular use of the runway. As previously mentioned, small single and multi-engine piston-powered aircraft conduct over 500 annual operations at Redlands Municipal Airport and are therefore the current critical design aircraft for determining runway length requirements. According to **Table 3E**, the present runway length of 4,505 feet is adequate to accommodate 100 percent of these small airplanes. Therefore, no runway extension is needed.

Runway Width

Runway width is primarily determined by the planning ARC for the particular runway. FAA ARC B-I (small aircraft exclusively) design standards require a 60-foot wide runway. At its current width of 75 feet, Runway 8-26 exceeds this requirement.

Runway Strength

Runway 8-26 has a load bearing strength of 12,500 pounds single wheel loading (SWL). It should be noted that the pavement strength rating is not the maximum weight limit. Aircraft weighing more than the certified strength can operate on the runway on an infrequent basis. However, heavy aircraft operations can shorten the life span of airport pavements. The existing load bearing strength of 12,500 pounds SWL on Runway 8-26 will adequately serve future aircraft operations.

AIRPORT IMAGINARY SURFACES

The FAA has established several imaginary surfaces to protect aircraft operational areas and keep them free from obstructions that could affect the safe operation of aircraft. These include the runway safety area (RSA), object free area (OFA), obstacle free zone (OFZ), and runway protection zone (RPZ).

- **Runway Safety Area (RSA)**

The RSA is "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 an excursion from the runway." The RSA is centered on the runway, extending laterally each side of the runway and beyond each runway end 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. Under Order 5200.8, effective October 1, 1999, the FAA established a *Runway Safety Area Program*. The Order states, "The goal 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 practical." 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.

FAA design standards specify that the RSA for Redlands Municipal Airport extend 60 feet each side of the runway centerline, 240 feet beyond the runway end, and 240 feet prior to the landing threshold. A review of current mapping for Redlands Municipal Airport was completed and indicated that the RSA standards are fully met at Redlands Municipal Airport.

- **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 is centered on the runway, extending out in accordance to the critical aircraft design category utilizing the runway. FAA standards specify that the OFA extend 125 feet on each side of the runway centerline, 240 feet beyond the runway end, and 240 feet prior to the landing threshold. The northwest corner of the OFA beyond the Runway 8 end is obstructed by existing perimeter fencing and extends off airport property. The alternatives analysis will examine options available for meeting this standard.

- **Obstacle Free Zone (OFZ)**

The OFZ is an imaginary surface which precludes object penetrations, including taxiing and parked aircraft. The only allowance for OFZ obstructions is visual navigational aids mounted on frangible bases which are fixed in their location by function. The OFA extends 125 feet on each side of the runway centerline and 200 feet beyond each runway end. The OFZ beyond the Runway 8 end is obstructed by perimeter fencing. The alternatives analysis will examine options available for meeting this standard.

- **Runway Protection Zone (RPZ)**

The runway protection zone (RPZ) is a trapezoidal area centered on the runway and typically beginning 200 feet beyond the 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 FAA does not necessarily require the fee simple acquisition (outright property purchase) of the RPZ area, but recommends that airports maintain positive control over development within the RPZ either through zoning or land use planning or through avigation easements (acquiring control of land use and airspace within the RPZ).

RPZ dimensional standards are based upon the approach visibility minimums to the runway end as well as the approach category. For the current circling approach at Redlands Municipal Airport, the inner width of the RPZ is 250 feet, the outer width is 450 feet, and the RPZ is 1,000 feet long. Portions of the RPZ at each runway end extend off airport property. Presently, there is no incompatible development within the RPZs.

Runway Separation

The FAA Advisory Circular 150/5300-13, *Airport Design*, also discusses separation distances between aircraft and various areas on the airport. The separation distances are a function of the visibility minimums for the instrument approach approved for the airport and the ARC. Under current conditions (ARC B-I serving small airplanes exclusively) and the one mile visibility minimums, aircraft parking areas are required to be at least 125 feet from the runway centerline. At Redlands Municipal Airport, there is currently more than 220 feet between aircraft parking and 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.

Runway 8-26 is served by full-length parallel Taxiway A located 150 feet south of the runway centerline. FAA design standards specify that the parallel taxiway centerline be located 150 feet from the runway centerline. Therefore, Redlands Municipal Airport meets this design requirement.

While not needed for capacity, a parallel taxiway should be planned north of Runway 8-26 to support future aviation-related development on the north side of the airport. Similar to Taxiway A, this taxiway will need to be located 150 feet from the Runway 8-26 centerline.

Taxiway width is determined by the ADG of the most demanding aircraft to use the taxiway. As mentioned previously, the current critical aircraft for the airport falls within ADG I (small aircraft exclusively). FAA criteria call for at least a 25-foot width for taxiways serving aircraft within this ADG. All taxiways serving Runway 8-26 are currently 40 feet or wider, exceeding this requirement.

Holding aprons are available at each runway end. The holding aprons provide an area off the taxiway for predeparture preparations. This allows aircraft ready for departure to by-pass aircraft preparing for departure, reducing delays. These holding aprons should be maintained through the planning period. Holding aprons should be planned for a future northern parallel taxiway.

Consideration should be given to redesignating all taxiways in conformance with FAA AC 150/5340-18D, *Standards for Airport Sign Systems*. This AC specifies that taxiway designations should start from one side of the airport and move to the other. Stub taxiways, such as the connecting taxiways between the runway and parallel taxiway, should be designated alphanumerically. Under the recommendations of this AC, the taxiway identifications for the existing taxiways at the airport would be as follows:

Parallel Taxiway A – Taxiway A
Connecting Taxiway (Runway 26 End) – Taxiway A1
Midfield Connecting Taxiway – Taxiway A2
Midfield Connecting Taxiway – Taxiway A3
Connecting Taxiway A (Runway 8 End) – Taxiway A4

NAVIGATIONAL AIDS AND INSTRUMENT APPROACH PROCEDURES

Navigational Aids

Navigational aids are electronic devices that transmit radio frequencies which properly equipped aircraft and pilots translate into point-to-point guidance and position information. The very high frequency omnidirectional range (VOR), global positioning system (GPS), nondirectional beacon (NDB), and LORAN-C are available for pilots to navigate to and from Redlands Municipal Airport. These systems are sufficient for navigation to and from the airport; therefore, no other navigational aids are needed at the airport.

Instrument Approach Procedures

Instrument approach procedures (IAPs) are a series of predetermined maneuvers established by the FAA using electronic navigational aids that assist pilots in locating and landing at an airport during poor visibility and low cloud ceiling conditions. There are two primary types of IAPs: precision guidance to specific runway and/or non-precision guidance to a runway or the airport itself. The basic difference between a precision and non-precision navigational aid is that the former provides electronic descent, alignment (course), and position guidance, while the non-precision navigational aid provides only alignment and position location information; no elevation information is given.

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 as 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.

Redlands Municipal Airport is served by a single non-precision approach. The GPS approach at Redlands Municipal Airport is a circling approach and provides for landing when visibility is as low as 1¼-miles and cloud ceilings are 1,100 feet above ground level (AGL) for aircraft in approach category A. For aircraft in approach category B, the visibility minimums increase to 1½-mile, while the visibility minimums increase to three miles for approach category C aircraft. These approach minimums are high due to the rapidly rising terrain to the north and east of the airport. Therefore, it is unlikely that lower minimums can be achieved for the airport.

While desirable, the terrain to the north and east, along with the location of San Bernardino International Airport to the west, may limit the ability for establishing a straight-in instrument approach procedure to one of the runway ends at the airport. In fact, the current circling approach has been designed to avoid both the terrain and the airspace surrounding San Bernardino International Airport.

The FAA will be responsible for establishing any future instrument approach procedures to the airport. Nearly all new instrument approach procedures developed in the United States are being developed with GPS. The capabilities and flexibility afforded by GPS may allow for a future instrument approach procedure that could avoid the terrain and airspace issues that currently limit instrument approach development at the airport.

To qualify for a new instrument approach procedure, the airport must meet certain requirements established by the FAA. The process for obtaining a new instrument approach procedure includes the FAA Airport Division certifying that all appropriate on-airport requirements are met. Appendix 16 of FAA AC 150/5330-13 lists the specific requirements that must be met prior to the establishment of a new instrument approach procedure. Qualifying criterion includes minimum runway length, the type of runway markings, hold position signs and markings, type of edge lighting, having a parallel taxiway, approach lighting, meeting OFZ standards, and having clear approach and departure surfaces.

With the exception of non-precision runway markings, Redlands Municipal Airport currently meets all the on-airport requirements for an instrument approach procedure with one statute mile visibility minimums. Therefore, this master plan will include those on-airport facility improvements that are be required to support instrument approach procedures with visibilities as low as one mile.

Ultimately, an Airport Airspace Analysis (AAA) is needed to further determine if a new instrument approach procedure could be developed for the airport. The AAA is completed by the FAA.

AIRFIELD LIGHTING AND MARKING

Currently, there are a number of lighting and pavement marking aids serving pilots using the airport. The lighting and marking aids assist pilots in locating the airport during night or poor weather conditions, as well as assist in the ground movement of aircraft. **Exhibit 3E** summarizes lighting and marking requirements for the airport.

Airport Identification Lighting

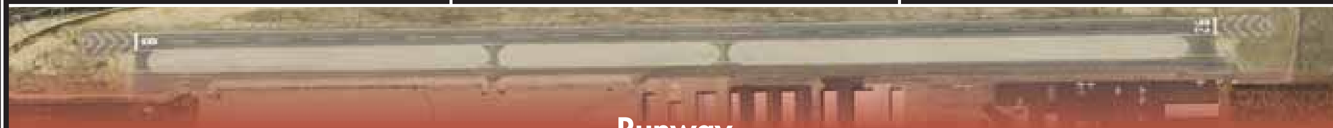
The location of the airport at night is universally indicated by a rotating beacon. For civil airports, a rotating beacon projects two beams of light, one white and one green, 180 degrees apart. At Redlands Municipal Airport, the beacon is located south of Runway 8-26 along Sessums Drive. The beacon is sufficient and should be maintained through the planning period.

Runway and Taxiway Lighting

Runway edge lighting provides the pilot with a rapid and positive identification of the runway and its alignment. Runway 8-26 is equipped with medium intensity runway lighting (MIRL). The north side of Taxiway A at the airport is equipped with medium intensity taxiway lighting (MITL). MITL should be added to the south side of Taxiway A and all future taxiways. The MIRL is sufficient and should be maintained through the planning period.

06MP03-3E-9/3/08

EXISTING	SHORT TERM NEED	LONG TERM NEED



Runway

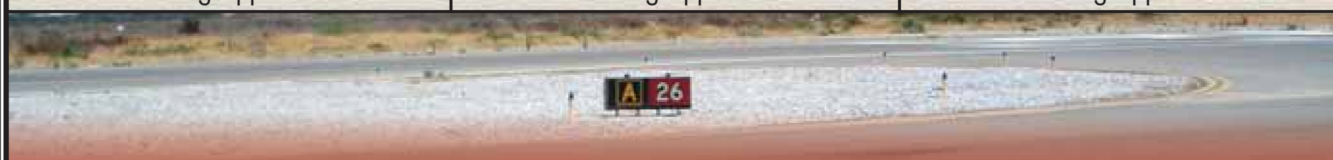
EXISTING	SHORT TERM NEED	LONG TERM NEED
Runway 8-26 ARC B-I (small aircraft exclusively) 4,500′ x 75′ • 12,500 SWL	***Runway 8-26*** ARC B-I (small aircraft exclusively) 4,500′ x 75′ • 12,500 SWL	***Runway 8-26*** ARC B-I (small aircraft exclusively) 4,500′ x 75′ • 12,500 SWL
Runway Safety Area (RSA) 60′ each side of runway centerline 2,400′ beyond each runway end	***Runway Safety Area (RSA)*** 60′ each side of runway centerline 2,400′ beyond each runway end	***Runway Safety Area (RSA)*** 60′ each side of runway centerline 2,400′ beyond each runway end
Object Free Area (OFA) 125′ each side of runway centerline 240′ beyond each runway end	***Object Free Area (OFA)*** 125′ each side of runway centerline 240′ beyond each runway end **Remove Fence From OFA**	***Object Free Area (OFA)*** 125′ each side of runway centerline 240′ beyond each runway end
Obstacle Free Zone (OFZ) 125′ each side of runway centerline 200′ beyond each runway end	***Obstacle Free Zone (OFZ)*** 125′ each side of runway centerline 200′ beyond each runway end **Remove fence from OFZ**	***Obstacle Free Zone (OFZ)*** 125′ each side of runway centerline 200′ beyond each runway end
Runway Protection Zone (RPZ) Inner Width - 250′ Outer Width - 450′ Length - 1,000′	***Runway Protection Zone (RPZ)*** Inner Width - 250′ Outer Width - 450′ Length - 1,000′	***Runway Protection Zone (RPZ)*** Inner Width - 250′ Outer Width - 450′ Length - 1,000′

Taxiways

EXISTING	SHORT TERM NEED	LONG TERM NEED
Parallel Taxiway A-40′ wide 150′ from runway centerline Four Connecting Taxiways	Parallel Taxiway A-40′ wide 150′ from runway centerline Four Connecting Taxiways 40′ or wider **Change Taxiway Designations**	Parallel Taxiway A-40′ wide 150′ from runway centerline **Six Connecting Taxiways** **40′ or wider** **North-Side Parallel Taxiway**

Instrument Approach Procedures

EXISTING	SHORT TERM NEED	LONG TERM NEED
Global Positioning System (GPS) Circling Approach	Global Positioning System (GPS) Circling Approach	Global Positioning System (GPS) Circling Approach



Airfield Lighting and Markings

EXISTING	SHORT TERM NEED	LONG TERM NEED
Rotating Beacon Pilot Controlled Lighting Medium Intensity Runway Edge Lighting (MIRL) Medium Intensity Taxiway Edge Lighting (MITL) Precision Approach Path Indicator (PAPI-2) Runway 8 Runway End Identifier Lights (REILs) Basic Runway Markings	Rotating Beacon Pilot Controlled Lighting Medium Intensity Runway Edge Lighting (MIRL) **Medium Intensity Taxiway Edge Lighting (MITL)** **Lighted Runway / Taxiway Directional Signage** **Precision Approach Path Indicator (PAPI-2)** **Runway 8 and Runway 26** Runway End Identifier Lights (REILs) **Non-precision Runway Markings**	Rotating Beacon Pilot Controlled Lighting Medium Intensity Runway Edge Lighting (MIRL) Medium Intensity Taxiway Edge Lighting (MITL) Lighted Runway / Taxiway Directional Signage Precision Approach Path Indicator (PAPI-2) Runway 8 and Runway 26 Runway End Identifier Lights (REILs) Non-precision Runway Markings

Weather / Communication Facilities

EXISTING	SHORT TERM NEED	LONG TERM NEED
Lighted Wind Indicator / Wind Tee Segmented Circle Automated Weather Observing System (AWOS) Remote Transmitter / Receiver	Lighted Wind Indicator / Wind Tee Segmented Circle Automated Weather Observing System (AWOS) Remote Transmitter / Receiver	Lighted Wind Indicator / Wind Tee Segmented Circle Automated Weather Observing System (AWOS) Remote Transmitter / Receiver

Helipad

EXISTING	SHORT TERM NEED	LONG TERM NEED
None	**Helipad** **2 parking positions** **lighted**	Helipad 2 parking positions lighted

ARC - Airport Reference Code
Note: Items in bold represent future requirement

Exhibit 3E
AIRCRAFT OPERATIONAL AREA REQUIREMENTS

Visual Approach Lighting

In most instances, the landing phase of any flight must be conducted in visual conditions. To provide pilots with visual guidance information during landings to the runway, electronic visual approach aids are commonly provided at airports. Currently, Runway 8 is served by a two-box precision approach path indicator (PAPI-2). Consideration should be given to installing a PAPI-2 at the Runway 26 end.

Runway End Identification Lighting

Runway end identifier lights (REILs) are flashing lights located at each runway end that facilitate identification of the runway end at night and during poor visibility conditions. REILs provide pilots with the ability to identify the runway ends and distinguish the runway end lighting from other lighting on the airport and in the approach areas. REILs are installed on both ends of Runway 8-26. Each system should be maintained through the planning period.

Pilot-Controlled Lighting

Redlands Municipal Airport is equipped with pilot-controlled lighting (PCL). PCL allows pilots to control the intensity of the runway and taxiway lighting using the radio transmitter in the aircraft. PCL also provides for more efficient use of energy. The PCL controls the MIRL, PAPI-2, and REILs. This system should be maintained through the planning period.

Airfield Signs

Airfield identification signs assist pilots in identifying their location on the airfield and directing them to their desired location. Lighted signs are installed on all taxiways and runway intersections serving Runway 8-26. These signs should be maintained throughout the planning period. Facility planning should include changes to the airfield signs to correlate with the taxiway designations described above.

Distance Remaining Signs

Lighted distance remaining signs are installed at 1,000-foot intervals on Runway 8-26. These signs provide pilots with an indication of the length of runway available for landing or departure. These signs should be maintained through the planning period.

Pavement Markings

Runway markings are designed according to the type of approach available on the runway. FAA AC 150/5340-1F, *Marking of Paved Areas on Airports*, provides guidance necessary to design airport markings. The basic markings on Runway 8-26 identify the runway centerline and runway designation. Future facility planning should include non-precision runway marking, which also identify the runway threshold in addition to the runway centerline and designation.

WEATHER REPORTING

The airport currently has a lighted wind cone, wind tee, and segmented circle which provide pilots with information about wind conditions and traffic patterns. These systems are required for the airport and should be maintained through the planning period.

The airport is also equipped with an automated weather observation system (AWOS-III), which provides automated weather observations 24 hours per day. An AWOS will automatically record weather conditions such as wind speed, wind gusts, wind direction, temperature, dew point, altimeter setting, and density altitude. In addition, the AWOS-III will record visibility, precipitation, and cloud height. The AWOS-III should be maintained at Redlands Municipal Airport to provide pilots with accurate weather at the airport.

It should be noted that the AWOS system at Redlands Municipal Airport is currently not linked to the National Weather Service. As a result, up-to-date weather information that is important to aircraft operations is unavailable to weather stations for purposes of disseminating this information to pilots utilizing the airport environment. In order to provide more accurate and timely weather information, consideration should be given to linking the AWOS-III to the National Weather Service reporting system.

HELIPAD

The airport does not have a designated helipad. Helicopters utilize the same areas as fixed-wing aircraft. Helicopter and fixed-wing aircraft should be segregated to the extent possible. Facility planning should include establishing a designated transient helipad at the airport, including providing up to two parking positions. Lighting should be provided to allow the safe operation to the helipad at night.

AIRPORT TRAFFIC CONTROL TOWER

Redlands Municipal Airport currently does not have an airport traffic control tower (ATCT); therefore, no formal terminal air traffic control services are available at the airport. Federal funding for the construction and operation of an ATCT is governed by Title 14 of the Code of Federal Regulation (CFR) Part 170, *Establishment And Discontinuance Criteria For Air Traffic Control Services And Navigational Facilities*.

14 CFR Part 170.13 Airport Traffic Control Tower (ATCT) Establishment Criteria provides the general criteria along with general facility establishment standards that must be met before an airport can qualify for an ATCT. These are as follows:

1. The airport, whether publicly or privately owned, must be open to and available for use by the public as defined in the Airport and Airway Improvement Act of 1982;

2. The airport must be recognized by and contained within the National Plan of Integrated Airport Systems;

3. The airport owners/authorities must have entered into appropriate assurances and covenants to guarantee that the airport will continue in operation for a long enough period to permit the amortization of the ATCT investment;

4. The FAA must be furnished appropriate land without cost for construction of the ATCT, and;

5. The airport must meet the benefit-cost ratio criteria utilizing three consecutive FAA annual counts and projections of future traffic during the expected life of the tower facility. (An FAA annual count is a fiscal year or a calendar year activity summary. Where actual traffic counts are unavailable or not recorded, adequately documented FAA estimates of the scheduled and nonscheduled activity may be used.)

An airport meets the establishment criteria when it satisfies the criterion above and its benefit-cost ratio equals or exceeds one. The benefit-cost ratio is the ratio of the present value of the ATCT life cycle benefits (BPV) to the present value of ATCT life cycle costs (CPV).

The benefits of establishing an ATCT result from the prevention of aircraft collisions, the prevention of other types of preventable accidents, reduced flying time, emergency response notification, and general security oversight. Benefits from preventable collisions are further broken down into mid-air collisions, airborne-ground collisions, and ground collisions. Data collected for analyzing the establishment of an ATCT include scheduled and non-scheduled commercial service, and non-commercial traffic which includes military operations.

Since the cost data fluctuates each year based on new control tower operational cost estimates, development cost estimates, and aircraft operational costs, the benefit/cost analysis ratios change frequently and cannot be readily determined for the airport in the future. The FAA has sole authority over the benefit/cost analysis. Therefore, any analysis must be completed by FAA staff and cannot be developed independently for this Master Plan. The alternatives analysis in Chapter Four will examine potential sites for the permanent construction of an ATCT.

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:

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

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, hangar development should be based on actual demand trends and financial investment conditions.

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. This is evident at Redlands Municipal Airport as approximately 87 percent of based aircraft are located in hangars. This is expected to remain constant through the planning period.

Existing hangar space at Redlands Municipal Airport is comprised of large conventional hangars and connected box and T-hangars. Conventional hangars are 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. Conventional hangar space at Redlands Municipal Airport totals approximately 28,200 square feet in three separate structures.

Box hangars are similar to conventional hangars in that they have an open space area free from roof structure supports; however, box hangars are smaller and typically used for storage only. Box hangar space at Redlands Municipal Airport totals approximately 149,700 square feet in eight structures, providing 89 separate hangar spaces.

T-hangars are used for smaller single and multi-engine aircraft storage. These hangars are individual spaces within a larger structure. T-hangars are popular with aircraft owners having one aircraft as they allow privacy and individual access to their space. T-hangar space at Redlands Municipal Airport totals approximately 93,900 square feet in nine structures, providing 79 separate hangar spaces.

Exhibit 3F indicates the hangar storage requirements for the airport. Currently, approximately 1,450

06MP03-3F-12/20/07

Aircraft Storage Hangar Requirements

	Available	Short Term Need	Intermediate Term Need	Long Term Need
Aircraft to be Hangared	192	221	248	304
T-Hangar / Box Hangars	168	199	222	270
Conventional Hangar Positions	11-18	22	26	34
Hangar Area Requirements (s.f.)				
T-Hangar/Box Hangar Area	243,600	288,600	321,900	391,500
Conventional Hangar Area	28,200	55,000	65,000	85,000
Total Maintenance Area	N/A	8,300	9,800	12,800
Total Hangar Area (s.f.)	***271,800***	***351,900***	***396,700***	***489,300***

Aircraft Parking Apron Requirements

	Available	Short Term Need	Intermediate Term Need	Long Term Need
Single, Multi-Engine Transient Aircraft Positions		26	35	52
Apron Area (s.y.)		20,800	28,000	41,600
Transient Business Aircraft Positions		2	3	4
Apron Area (s.y.)		3,200	14,400	6,400
Locally-Based Aircraft Positions		34	37	46
Apron Area (s.y.)		17,000	18,500	23,000
Total Positions	***215***	***62***	***75***	***102***
Total Apron Area (s.y.)	***96,200***	***41,000***	***51,300***	***71,000***

Transient Passenger Terminal Facilities

	Available	Short Term Need	Intermediate Term Need	Long Term Need
General Aviation Terminal Building Area (s.f.)	4,100	4,200	5,600	9,800

Vehicle Parking Requirements

	Available	Short Term Need	Intermediate Term Need	Long Term Need
Design Hour Passengers		23	31	46
Terminal Vehicle Spaces		30	40	60
Parking Area (s.f.)		12,000	16,000	24,000
General Aviation Spaces		128	143	175
Parking Area (s.f.)		51,200	57,200	70,000
Total Parking Spaces	***45***	***158***	***183***	***235***
Total Parking Area (s.f.)	***22,200***	***63,200***	***73,200***	***94,000***

Exhibit 3F

LANDSIDE FACILITY REQUIREMENTS

square feet of hangar space is provided within the T-hangars/box hangars. This factor was used to determine future T-hangar/box hangar space. Conventional hangar space was determined by providing 2,500 square feet of space for each aircraft projected in the conventional hangars. Maintenance area space was calculated as 15 percent of conventional hangar storage area.

Due to increases in based aircraft, a need for additional hangar space is indicated. It is expected that the aircraft storage hangar requirements will be met through a combination of hangar types. The alternatives analysis will examine the options available for hangar development at the airport and determine the best location for each type of hangar facility. It should be noted that a total of 32 box hangars were constructed along Sessums Drive in 2008. These hangars will satisfy a portion of the T-hangar/box requirements.

AIRCRAFT PARKING APRON

Redlands Municipal Airport has several areas available for aircraft parking. The paved apron located on the east end of the airport near the terminal building totals approximately 31,900 square yards with 70 tiedown spaces. The west aircraft parking apron provides approximately 145 tiedown spaces and encompasses approximately 64,300 square yards.

For planning purposes, 13 percent of the based aircraft total will be used to determine the parking apron requirements of local aircraft. A planning criterion of 500 square yards per aircraft was used to determine the apron requirements for local aircraft.

FAA Advisory Circular 150/5300-13, Change 11, *Airport Design* suggests a methodology by which transient apron requirements can be determined from knowledge of busy-day operations. At Redlands Municipal Airport, the number of itinerant spaces required was determined to be approximately 15 percent of the busy-day itinerant operations. A planning criterion of 800 square yards per aircraft was applied to determine future transient apron requirements for single and multi-engine aircraft. For larger business aircraft (which can be much larger), a planning criterion of 1,600 square yards per parking position was used.

Total apron parking requirements are presented on **Exhibit 3F**. As indicated on the exhibit, sufficient apron is available through the planning period.

GENERAL AVIATION TERMINAL FACILITIES

General aviation terminal facilities have several functions. Space is required for a pilots' 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 fixed base operators for these functions and services. Currently, the airport offers a separate terminal building, which provides approximately 4,100 square feet of space.

In the future, terminal space within the general aviation facilities will be needed to serve the on-demand and air taxi operators using microjet aircraft. A significant number of the microjet orders are intended to be put in air taxi service across the country. Since these services will not be scheduled airline activity, they will be able to efficiently and affordably operate from general aviation terminal facilities.

The methodology used in estimating general aviation terminal facility needs is based on the number of airport 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. Design hour itinerant passengers are determined by multiplying design hour itinerant operations by the number of passengers on the aircraft (multiplier). An increasing passenger count is used to account for the likely increase in larger, more sophisticated aircraft using the airport.

As shown on **Exhibit 3F**, additional terminal area will be needed through the planning period. Future needs could be met with the development of a new facility, expansion of the existing facility, or the private development of similar space in an FBO. The alternatives analysis will examine this in more detail in the following chapter. Additionally, facility planning for terminal should include a restaurant.

AUTOMOBILE PARKING

General aviation vehicular parking demands have been determined for Redlands Municipal Airport. Space determinations were based on 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 1.3 for each planning period. This multiplier represents the anticipated increase in corporate operations and air taxi operations from microjet operators, which in turn increases the number of passengers and parking demands.

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

Parking requirements for the airport are summarized on **Exhibit 3F**. As shown on the exhibit, additional vehicle parking space will be required in the short term. The following chapter will examine various alternatives to meet the projected parking needs.

SUPPORT REQUIREMENTS

Various facilities that do not logically fall within classifications of airfield, terminal building, or general aviation areas have also been identified. These other areas provide certain functions related to the overall operation of the airport, and include fuel storage, aircraft rescue and firefighting, aircraft wash facility, airport maintenance, airport equipment, and security.

FUEL STORAGE

Two separate aircraft fuel storage facilities are available at Redlands Municipal Airport. Redlands Aviation owns and operates a 12,000-gallon underground tank for 100LL Avgas. A 2,000-gallon Jet-A mobile fuel truck is also available for aircraft refueling. The City of Redlands owns a 12,000-gallon underground storage tank and dispensing island. However, this tank is not presently in use; however, it may be converted for Jet-A use.

Fuel storage requirements are typically based upon maintaining a two-week supply of fuel during an average month. However, more frequent deliveries can reduce the fuel storage capacity requirement. Generally, fuel tanks should be of adequate capacity to accept a full refueling tanker, which is approximately 8,000 gallons, while maintaining a reasonable level of fuel in the storage tank. The existing 12,000-gallon storage tanks provide this capability and should be adequate through the long term planning period. Since the City of Redlands does not provide fueling services, future fuel storage needs will be determined by those airport businesses selling fuel. Long term facility planning should consider reserving an area for a consolidated fuel farm.

AIRCRAFT RESCUE AND FIREFIGHTING

Redlands Municipal Airport is not currently served by a dedicated aircraft rescue and firefighting facility (ARFF). Federal regulations do not require ARFF services to be located on the airport. ARFF services are required only at FAA certified airports providing scheduled passenger service with greater than nine passenger seats. Unless federal regulations change, there will not be a regulatory requirement for ARFF facilities on the airport.

Emergency services are provided by the City of Redlands. In addition, the City owns and maintains a 1970 Chevy ½ ton short bed truck at the airport for on-airport emergencies. Emergencies will continue to be met by the City of Redlands. Therefore, there are no additional requirements for ARFF services at Redlands Municipal Airport.

AIRPORT MAINTENANCE/ STORAGE FACILITIES

Redlands Municipal Airport does not currently have a separate building dedicated to airport maintenance. Presently, the City does not maintain any maintenance equipment at the airport. The alternatives analysis will evaluate various locations for the development of a separate facility for airport maintenance and storage should the City eventually provide an on-airport maintenance staff.

The FAA does not provide funding for maintenance or equipment storage facilities at general aviation airports. Since an airport maintenance facility does not require aircraft access, it can be located in a more remote location of the airport off the primary flight line location. Vehicle access to the airfield is needed. The airport maintenance facility should be located to provide for public vehicle access without the need to cross aircraft operational areas.

AIRCRAFT WASH FACILITY

Presently, there is not a designated aircraft wash facility on the airport. Consideration should be given to establishing an aircraft wash facility at the airport to collect aircraft cleaning fluids used during the cleaning process.

SECURITY

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 over 12,500 pounds warrant greater security.

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 3F 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.

TABLE 3F
Airport Characteristics Measurement Tool

	Assessment Scale	
Security Characteristic	**Public Use Airport**	**Redlands Municipal Airport**
Location		
Within 20 nm of mass population areas [1]	5	5
Within 30 nm of a sensitive site[2]	4	5
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	3
26-100 based aircraft	2	0
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	0
Runway length less than 5,000 feet, greater than 2,001 feet	4	4
Runway length 2,000 feet or less	2	0
Asphalt or concrete runway	1	1
Operations		
Over 50,000 annual operations	4	4
Part 135 operations	3	3
Part 137 operations	3	0
Part 125 operations	3	0
Flight training	3	3
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**	**32**

Source: Security Guidelines for General Aviation Airports
[1] An area with a total population over 100,000
[2] Sensitive sites include military installations, nuclear and chemical plants, centers of government, national monuments, and/or international ports

Table 3F also ranks Redlands Municipal Airport according to this scale. As shown in the table, the Redlands Municipal Airport ranking on this scale is 32. Points are assessed for the airport being within 20 nautical miles of a mass population area, within 30 nautical miles of a sensitive site, having more than 101 based aircraft, having a runway greater than 2,001 feet in length, having a paved runway surface, having more than 50,000 annual operations, having 14 CFR Part 135 charter operations to the airport, having rental aircraft, and for having flight training activities at the airport.

As shown in **Table 3G**, a rating of 32 points places Redlands Municipal Airport on the third tier ranking of security measures by the TSA. This rating clearly illustrates the importance of meeting security needs at Redlands Municipal Airport as the activity at the airport grows.

TABLE 3G
Recommended Security Enhancements Based on Airport Characteristics Assessment Results

	Points Determined Through Airport Characteristics Assessment			
Security Enhancements	**> 45**	**25-44**	**15-24**	**0-14**
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

Based upon the results of the security assessment, the TSA recommends 13 potential security enhancements for Redlands Municipal Airport. These enhancements are shown in **Table 3G**.

A review of each recommended security procedure is below.

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.

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 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 Redlands Municipal Airport.

Law Enforcement Support: This involves establishing and maintaining a liaison with appropriate law enforcement agencies including local, state, and federal. 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 notifying 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 Redlands Municipal Airport, as well as any new enhancements. This document could consist of, but not be limited to, airport and local law enforcement contact information, including alternates when available, and 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 on board 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 terrorist 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 the 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 AIRCRAFT OPERATOR SECURITY REQUIREMENTS

The major fractional aircraft 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.

PERIMETER FENCING

Perimeter fencing is used at airports to primarily secure the aircraft operations area. The physical barrier of perimeter fencing provides the following functions:

- Gives notice of the legal boundary of the outermost limits of a facility or security-sensitive area.

- Assists in controlling and screening authorized entries into a secured area by deterring entry elsewhere along the boundary.

- Supports surveillance, detection, assessment, and other security functions by providing a zone for installing intrusion-detection equipment and closed-circuit television (CCTV).

- Deters casual intruders from penetrating a secured area by presenting a barrier that requires an overt action to enter.

- Demonstrates the intent of an intruder by their overt action of gaining entry.

- Causes a delay to obtain access to a facility, thereby increasing the possibility of **detection**.

- Creates a psychological deterrent.

- Optimizes the use of security personnel while enhancing the capabilities for detection and apprehension of unauthorized individuals.

- Demonstrates a corporate concern for facility security.

- Provides a cost-effective method of protecting facilities.

- Limits inadvertent access to the aircraft operations area by wildlife.

Perimeter fencing at Redlands Municipal Airport consists of six-foot tall chain-link fencing with three-strands of barbed wire on top. Several automated access gates are located along Sessums Drive to allow vehicle access to hangar facilities. This perimeter fencing should be maintained through the long term planning period.

UTILITIES

Water and sanitary sewer services at the airport are provided by the City of Redlands. Electrical service is furnished by Southern California Edison. Southern California Gas Company provides natural gas services. Access to appropriate utilities for future development is available to the north and south sides of the airport.

SUMMARY

The intent of this chapter has been to outline the facilities required to meet potential aviation demands projected for Redlands Municipal Airport for the planning horizon. 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 cost.

CHAPTER FOUR

AIRPORT DEVELOPMENT ALTERNATIVES

AIRPORT ALTERNATIVES

Prior to defining the development program for Redlands Municipal Airport, it is important to consider development potential and constraints at the airport. The purpose of this chapter is to consider the actual physical facilities that are needed to accommodate projected demand and meet the program requirements as defined in Chapter Three, Facility Requirements.

In this chapter, a series of airport development scenarios are considered for the airport. In each of these scenarios, different physical facility layouts are presented for the purposes of evaluation. The ultimate goal is to develop the underlying rationale that supports the final master plan recommendations. Through this process, an evaluation of the highest and best uses of airport property is made while considering local goals, physical constraints, and federal airport design standards, where appropriate.

Any development proposed by a master plan evolves from an analysis of projected needs. Though the needs were determined by the best methodology available, it cannot be assumed that future events will not change these needs. The master planning process attempts to develop a viable concept for meeting the needs caused by projected demands through the planning period.

The alternatives have been developed to meet the overall program objectives for the airport in a balanced manner. Through coordination with the planning advisory committee (PAC) and the City

of Redlands, the alternatives (or combination thereof) will be refined and modified as necessary to produce the recommended development program. Therefore, the alternatives presented in this chapter can be considered a beginning point in the development of the recommended master plan program, and input will be necessary to define the resultant program.

AIRPORT DEVELOPMENT OBJECTIVES

Prior to identifying objectives specifically associated with development of Redlands Municipal Airport, a non-development alternative is briefly considered. The "no-build" or "do-nothing" alternative essentially considers not making any further improvements to the airport.

The Redlands Municipal Airport plays a critical role in the economic development of the City of Redlands and the surrounding region 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, 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. Therefore, a non-development alternative is not further considered.

It is the goal of this effort to produce a balanced airside and an appropriate landside aircraft storage mix to best serve forecast aviation demands. However, before defining and evaluating specific alternatives, airport development objectives should be considered. As owner and operator, the City of Redlands provides the overall guidance for the operation and development of the Redlands Municipal Airport. It is of primary concern that the airport is marketed, developed, and operated for the betterment of the community and its users. With this in mind, the following development objectives have been defined for this planning effort:

- To preserve and protect public and private investments in existing airport facilities.
- To develop a safe, attractive, and efficient aviation facility in accordance with applicable federal, state, and local regulations.
- To develop a balanced facility that is responsive to the current and long term needs of all general aviation users.
- To be reflective and supportive of the City of Redlands General Plan – 1995.
- To develop a facility with a focus on self-sufficiency in both operational and developmental cost recovery.
- To ensure that future development is environmentally compatible.

AIRPORT ROLE

The design and development of the airport is a reflection of the role that the airport serves in the regional, state, and national aviation systems. As stated in Chapter One, Redlands Municipal Airport is classified as a general aviation airport in the Southern California Association of Governments (SCAG) *General Aviation System Plan* (GASP), *California Aviation System Plan* (CASP), and *National Plan of Integrated Airport Systems* (NPIAS). As such, the airport does not serve, nor is it expected to accommodate, scheduled air carrier transportation.

While these designations essentially reflect the segment of the aviation industry that the airport serves, an understanding and appreciation of the nearby airports also serving general aviation is needed to fully understand the portion of the general aviation industry served by the airport for facility planning and development.

As discussed in previous chapters, Redlands Municipal Airport is one of two airports within the Redlands Municipal Airport primary service area that serves general aviation. The other airport, San Bernardino International Airport, also serves general aviation and is located less than five miles west of the airport. San Bernardino International Airport is equipped with a 10,001-foot long runway that can serve all the aircraft in the general aviation fleet. San Bernardino International Airport is expected to begin regularly scheduled commercial airline service in late 2008. A new full-service fixed base operator (FBO) serving general aviation is planned for 2009. A precision instrument approach is also available at the airport. An airport traffic control tower (ATCT) is also planned for 2008.

The presence of San Bernardino International Airport is a primary factor in defining the Redlands Municipal Airport general aviation market niche. San Bernardino International Airport has the runway length, instrument approach procedures, apron area, and FBO with customs services that are necessary to accommodate large general aviation aircraft business and corporate users. With this existing capability, San Bernardino International Airport will serve the majority of business and corporate users in the Redlands Municipal Airport primary service area.

In the past, Redlands Municipal Airport has been developed to design and safety standards to accommodate single and multi-engine general aviation aircraft weighing less than 12,500 pounds. With the presence of San Bernardino International Airport in the primary service area, Redlands Municipal Airport is expected to continue to serve this segment of general aviation in the future and the development alternatives to follow consider the requirements to serve this market niche. This market niche may be enhanced as commercial air service and the controlled airspace environment at San Bernardino International Airport is implemented. Many aircraft owners in the primary service area may choose Redlands Municipal Airport over San Bernardino International Airport to avoid the commercial airline activity, controlled airspace, and costs.

While historically the general aviation fleet under 12,500 pounds was comprised primarily of piston-powered and turboprop aircraft, new product offerings in this market now include several turbojet business aircraft. Aircraft such as the Cessna Citation, Eclipse 500, and Cessna Mustang fall within the market segment discussed above and these aircraft would be able to safely conduct operations at the airport.

AIRFIELD ALTERNATIVES

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

AIRFIELD PLANNING ISSUES

Exhibit 4A summarizes the primary planning issues related to the airfield. These issues are the result of the analyses conducted previously in Chapter Two, Aviation Demand Forecasts, and Chapter Three, Facility Requirements. These issues have been incorporated into a series of airfield development alternatives. The following describes in detail the specific requirements considered in the development of the airfield.

New Taxiway Designations

The facility requirements analysis concluded that consideration should also be given to designating all taxiways in conformance with FAA AC 150/5340-18D, *Standards for Airport Sign Systems*. This AC specifies that the entrance/exit taxiways that connect Runway 8-26 and parallel taxiways should be designated alphanumerically. All airfield alternatives will include an ultimate taxiway designation plan in accordance with this AC.

Add Exit Taxiways

The airfield capacity analysis in Chapter Three indicated that two additional exit taxiways could increase airfield capacity by six percent. Additional exit taxiways would reduce the amount of time that aircraft occupy the runway after landing. The alternatives analysis to follow assumes the addition of an exit midway between Taxiways A4 and A6, and an exit midway between Taxiways A1 and A3 on all airfield alternatives.

Design Standard Review

The object free area (OFA) and obstacle free zone (OFZ) beyond the Runway 8

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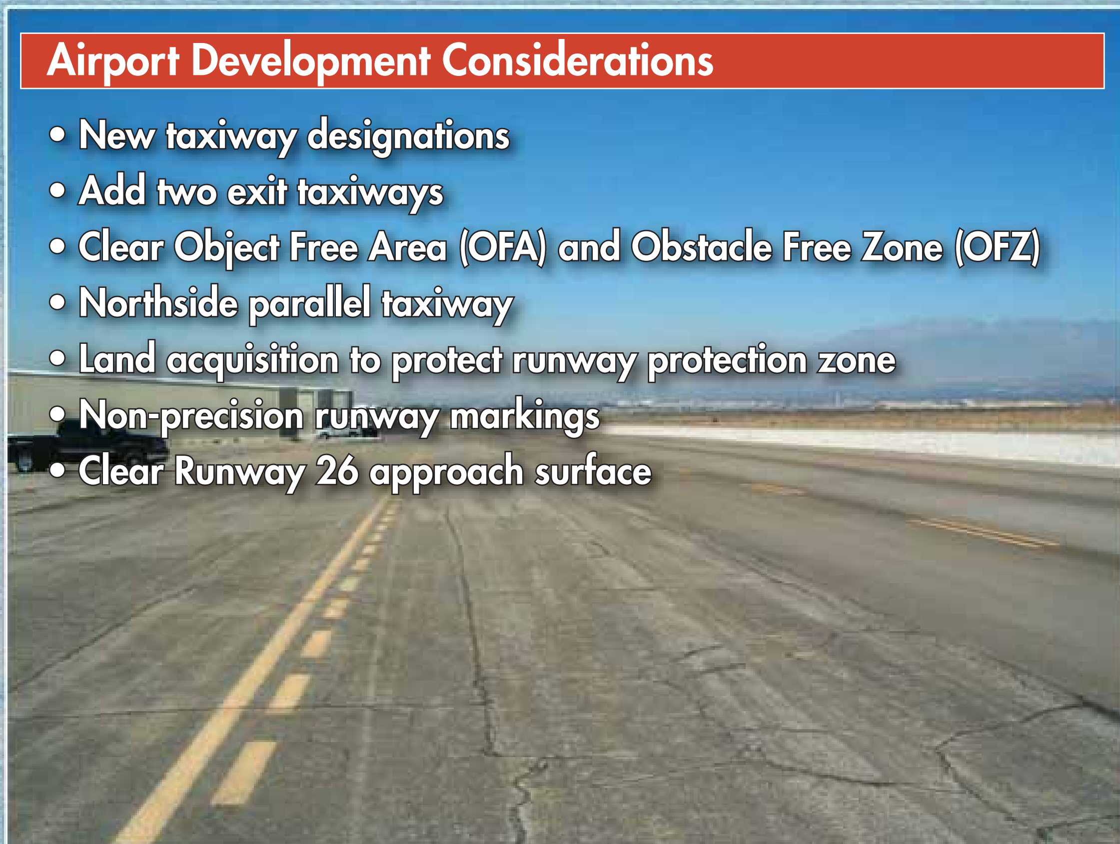

Exhibit 4A
ALTERNATIVE DEVELOPMENT ISSUES

end are currently obstructed by perimeter fencing and extend beyond airport property. The alternatives analysis examines methods to clear the OFA and OFZ so that these safety design standards are fully met at the airport. Typically, the OFA and OFZ are owned in fee by the airport.

Three alternatives are available to meet OFA and OFZ standards. Alternative A proposes to acquire the property encompassed by the OFZ and OFA. Then the perimeter fencing is re-routed around the OFA and OFZ. Alternative B proposes to shift Runway 8-26 to the east to allow for the development of OFA and OFZ on airport property. Alternative C simply relocates the perimeter fencing off airport property and secures the OFA and OFA through an easement.

Securing the runway protection zone (RPZ) is also considered in the development alternatives. The airport currently does not control, in entirety, the existing RPZs on each runway end. Portions of the RPZ on each end extend beyond the existing property line. The RPZ is a trapezoidal area centered on the extended runway centerline to protect people and property on the ground. The RPZ is a two-dimensional area and has no associated approach surface. FAA design standards limit development that can cause the congregation of people on the ground within the RPZ. Compatible development includes uses which do not attract wildlife and do not interfere with navigational aids. There are limitations on surface parking lots. Prohibited land uses include residences and places of assembly (churches, schools, hospitals, office buildings, shopping centers).

Preferably, the RPZ is owned fee simple by the airport sponsor to have complete control over the area. When fee simple ownership is not possible, the FAA encourages an airport operator to have positive control over the RPZ to ensure that incompatible development and/or obstructions are not developed within the RPZ area. In some cases, an avigation easement is acquired to define land use within the RPZ and provide positive control of the airspace above the RPZ.

Other times, local land use policies can be established which protect the RPZ. Still, the underlying land use may be compatible. Such is the case for the Runway 8 RPZ which extends into the Santa Ana Wash. The Santa Ana wash is a designated floodplain. Therefore, the potential for this area to be developed with incompatible development is low. Thus, the RPZ is protected from incompatible development. The RPZ for the Runway 26 end encompasses property that is planned for light industrial as well as flood control/construction aggregates, conservation/habitat preservation and for resource preservation. Acquisition of the Runway 26 RPZ is shown on all alternatives as portions of the RPZ encompass industrial property.

Northside Parallel Taxiway

Aviation-related developments north of Runway 8-26 will ultimately require access to the runway. Therefore, a parallel taxiway should be planned to safely allow access to the runway. A parallel taxiway would need to be placed 150 feet north of the Runway 8-26 centerline to conform to FAA design standards. Extending this taxiway the full length of Runway 8-26 is desirable as future aircraft located north of Runway 8-26 will not have to cross the runway to reach a runway end.

Of consideration with a future parallel taxiway north of Runway 8-26 is connecting to the Runway 8 end. A parallel taxiway connecting to the Runway 8 end would extend beyond airport property and potentially onto the Santa Ana Wash levee. The Runway 8 connecting taxiway must be located perpendicular to Runway 8-26 to conform to FAA safety guidance.

The development of a north parallel taxiway will require the relocation of the segmented circle, lighted wind cone, and automated weather observing system (AWOS). Each development alternative depicts a potential relocation area for these systems.

Non-precision Runway Markings

Runway 8-26 is presently marked with basic runway markings. A future straight-in instrument approach would require non-precision markings. All airfield alternatives depict non-precision markings on both ends of Runway 8-26.

Runway 26 Approach Surfaces

A rail line easement and Opal Avenue extend in a north/south alignment through the Runway 26 approach surface. Clearances for approaches to Runway 26 are defined in Title 14 of the Code of Federal Regulations (CFR) Part 77, *Objects Affecting Navigable Airspace* and within Appendix 2 of FAA AC 150/5300-13, *Airport Design*. 14 CFR Part 77 specifies that the existing approach surface to Runway 26 extend upward and outward at a ratio of 20 to 1. The threshold siting surface requirements in Appendix 2 of 5300-13 specifies the same approach surface ratio.

The rail line easement ground level is approximately 1,596 feet mean sea level (MSL). The Opal Road ground elevation is approximately 1,590 feet MSL. Assuming the Runway 26 end elevation of 1,571 feet MSL, the 14 CFR Part 77 surface and threshold siting surface clears the rail line by approximately six feet MSL and the Opal Avenue alignment by approximately 12 feet. To meet standard, the 14 CFR Part 77 surface and threshold siting surface must clear the rail line by 23 feet and Opal Avenue by 15 feet. Therefore, Opal Avenue is presently an obstruction to the Runway 26 approach surface. Should the rail line ever be put in use, the rail line would be considered an obstruction.

To clear Opal Avenue, the Runway 26 landing threshold would need to be displaced approximately 60 feet west or Opal Avenue ultimately to the east outside the RPZ. The current position of the FAA Western-Pacific Region Airports Division is that public roadways should be located outside the RPZ. To clear the rail line, the Runway 26 threshold would need to be relocated approximately 340 feet west.

AIRFIELD ALTERNATIVE A

Exhibit 4B depicts Airfield Alternative A. This alternative depicts the development of the northside parallel taxiway 150 feet north of the Runway 8-26 centerline extending the full length of the runway. As shown on the exhibit, at the Runway 8 end, portions of the parallel taxiway, Taxiway B6, and the holding apron would extend beyond existing airport property. This alternative assumes the fee simple acquisition of land within the Santa Ana Wash to construct the taxiways and holding apron. This taxiway and holding apron development may potentially impact an existing levee. Additionally, this development is within a designated floodplain and includes habitat for the Kangaroo Rat. Furthermore, an existing dirt road alignment would be crossed which provides access to the City of Redlands well on the north side of the runway. An alternate access route would need to be established and the perimeter fencing relocated. The segmented circle, lighted wind cone, and AWOS are relocated to the west outside future landside development areas.

This alternative further proposes the acquisition of property to relocate the perimeter fence outside the limits of the OFA and OFZ and secure these required safety areas for the airport. New taxiway designations are shown as well as the additional exit taxiways and non-precision markings. The realignment of Opal Avenue is also shown to clear the Runway 26 approach surface. The acquisition of the land encompassed by the Runway 26 RPZ is also shown.

AIRFIELD ALTERNATIVE B

Airfield Alternative B is shown on **Exhibit 4B**. In this alternative, the Runway 8 threshold is shifted approximately 300 feet east to allow the OFA and OFZ to be located entirely on airport property. This also allows for the north parallel taxiway to extend to the Runway 8 on airport property with the requisite perpendicular connecting taxiway. The holding apron is located east of the runway end to allow it to remain on airport property. The segmented circle, lighted wind cone, and AWOS are relocated to the center of the airfield.

The pavement behind the Runway 8 end and portions of Taxiway A are removed. This pavement could not be considered runway as this area is required to meet design standards. Only sufficient pavement would be maintained for the blast pad and could not be considered as runway for takeoff/landing. To maintain existing runway length, the Runway 26 threshold is relocated 300 feet east. Since this alternative moves the Runway 26 end closer to the rail line easement and Opal Avenue, the Runway 26 approach surface would be encroached upon further. The realignment of Opal Avenue is also shown to clear the Runway 26 approach surface.

New taxiway designations are shown as well as the additional exit taxiways and non-precision markings. The acquisi-

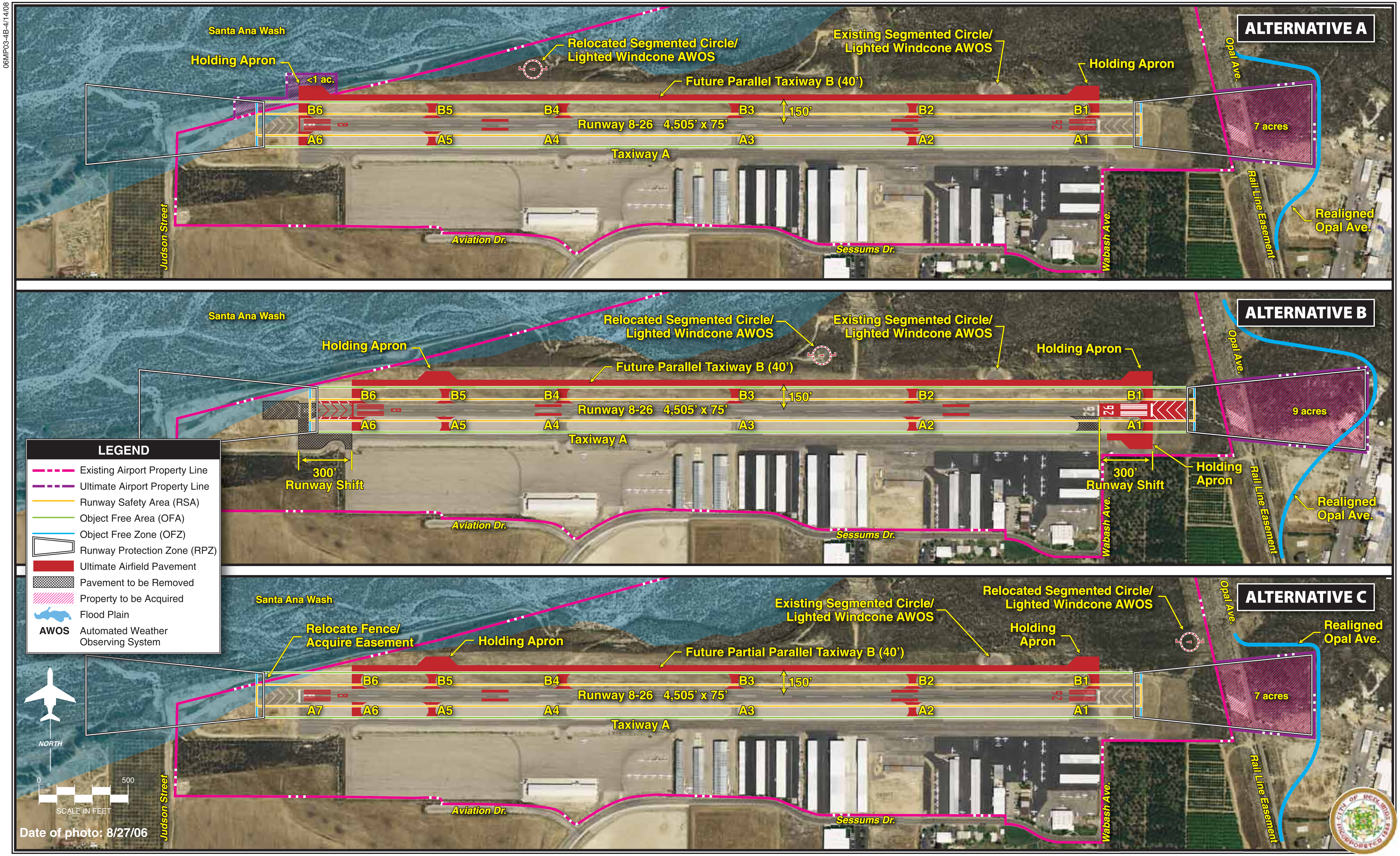

Exhibit 4B
AIRFIELD ALTERNATIVES

tion of the land encompassed by the Runway 26 RPZ is also shown.

AIRFIELD ALTERNATIVE C

Airfield Alternative C is shown on the lower portion of **Exhibit 4B**. In contrast with Airfield Alternative A and Airfield Alternative B, this alternative proposes a partial parallel taxiway on the north side of Runway 8-26. This partial parallel taxiway would extend within approximately 300 feet from the Runway 8 end. A connecting taxiway would extend to Taxiway A. For future aircraft located on the north side of the runway, the Runway 8 end would only be accessible by crossing Runway 8-26 and using Taxiway A to reach the Runway 8 end. Similar to Alternative B, the holding apron is located east of the Runway 8 end to allow it to remain on airport property. The segmented circle, lighted wind cone, and AWOS are relocated to the east outside future landside development areas.

The OFA and OFZ standards are met by the location of the perimeter fence outside airport property along the levee. This would require an easement or property lease to allow the City to relocate the fence.

Similar to previous alternatives, new taxiway designations are shown as well as the additional exit taxiways and nonprecision markings. The realignment of Opal Avenue is also shown to clear the Runway 26 approach surface. The acquisition of the land encompassed by the Runway 26 RPZ is also shown.

LANDSIDE ALTERNATIVES

The general aviation functions to be considered in the development program at Redlands Municipal Airport are diverse and include considerations for aircraft storage, the transfer of passengers between aircraft and ground transportation, as well as automobile parking and access. The interrelationship of these functions is important to defining a long-range landside layout for general aviation uses at the airport. Runway frontage should be reserved for those uses with a high level of airfield interface or need of exposure. Other uses with lower levels of aircraft movements or little need for runway exposure can be planned in more isolated locations.

LANDSIDE PLANNING ISSUES

The primary planning considerations for this analysis are summarized on **Exhibit 4A**. As shown on the exhibit, consideration will need to given within this analysis for accommodating new enclosed hangar area, expanded public terminal facilities, an aircraft wash rack, a helipad, an airport maintenance facility, consolidated fuel storage, an airport traffic control tower, and automobile parking and access. Each of these future needs is explained more fully below.

Public Terminal Facilities

While a public terminal building is not specifically required at a general aviation airport, it does provide some benefits. It provides a central gathering point for air travelers and can include a pilots' lounge and flight planning area and restrooms. Terminal buildings can also provide leaseable space for aviation-related businesses desiring to be located on an airport. Sometimes, the terminal building includes a restaurant.

The terminal building at Redlands Municipal Airport includes restrooms, Redlands Aviation offices, an area for flight planning, and a large lobby area. Presently, the terminal building does not meet Americans with Disabilities Act (ADA) access standards. The restrooms are also not compliant with ADA requirements. The existing terminal site is constrained by apron area, taxilanes, and existing hangar development. Expansion potential is available to the east. Additional public parking is needed for the current terminal as the closest parking area is shared with several other businesses. A new or expanded terminal building would likely need to be funded locally as federal grant funding is not available for general aviation terminal buildings.

Aircraft Storage Hangars

The facility requirements analysis indicated the need for additional aircraft storage facilities. This could include the development of T-hangar units and box hangars for general aviation aircraft storage, as well as larger conventional hangars for accommodating several aircraft simultaneously and accommodating commercial general aviation.

Commercial general aviation facilities are those facilities that are associated with aviation businesses requiring airfield access and providing services to pilots. This includes businesses involved with (but not limited to) aircraft rental and flight training, aircraft charters, aircraft maintenance, line service, and aircraft fueling. High levels of activity characterize businesses such as these, along with a need for apron space for the storage and circulation of aircraft. These facilities are best placed along ample apron frontage with good visibility from the runway system for transient aircraft. The facilities commonly associated with businesses such as these include large commercial type hangars that hold several aircraft. Utility services are needed for these types of facilities, as well as public vehicle access and automobile parking areas.

Helicopter Operations

At times, Redlands Municipal Airport has been used extensively by helicopter traffic. A separate helicopter training pattern has been established on the south side of the airport for helicopter training activities to segregate the helicopters from fixed-wing aircraft which operate on the north side of the runway. Presently, there is no designated helipad on the airport and helicopters must use the existing apron areas and taxiways for training operations. Proper facility planning suggests that fixed-wing aircraft and rotary aircraft should be segregated to the extent practical.

The development of a helipad is considered in the alternatives. FAA AC 150/5390-2A, *Heliport Design*, defines the requirements for the design of a helipad on the airport. A helipad is made up of several different components: the touchdown and lift off area (TLOF), final approach and takeoff area (FATO), safety area, and helipad protection zone. The dimensions of these areas are a function of the diameter of the main rotor of the helicopter. For this analysis, a main rotor diameter of 50 feet was assumed.

The TLOF is the load bearing area where the helicopter lands or takes off. The TLOF is equal to the diameter of the main rotor. In this case, the TLOF is 50 feet wide by 50 feet long.

The FATO surrounds the TLOF and is the area over which the final phase of the approach to a hover, or a landing, is completed and from which the takeoff is initiated. The FATO does not need to be paved. The FATO is 1.5 times the main rotor diameter. The FATO is elongated in the direction of the takeoff and landing of the helicopter based on the airport's elevation. For Redlands Municipal Airport, the FATO is increased by 70 feet. The FATO for Redlands Municipal Airport is 145 feet long by 75 feet wide.

The FATO is surrounded by a safety area extending 20 feet in each direction. The safety area for this analysis is 165 feet long and 95 feet wide. Similar to the FATO, the safety area does not need to be paved. The FATO and the safety area must be free and clear of objects such as parked helicopters, buildings, fences, or objects which could be struck by the main or tail rotor, or catch the skids of an arriving or departing helicopter.

The helipad protection zone begins at the FATO and is approximately 280 feet long. Similar to the RPZ, the helipad protection zone is required to be kept clear of incompatible objects that cause the congregation of people and property on the ground. A helipad is located to the east and west of the TLOF, as helicopter operations take place both east and west.

Obstruction clearance is also a consideration for the helipad. The approach and departure path off each end of the helipad extends upward and outward at a ratio of eight-to-one. A transitional surface extends off the sides of the helipad at a ratio of two-to-one.

Aircraft Wash Rack

Consideration may be given to developing an aircraft wash facility to provide a suitable area for the washing of aircraft. This provides for the proper disposal of aircraft cleaning fluids. The wash rack should be located in close proximity to utilities, if possible, to reduce development costs. The wash rack can be developed in more remote areas of the airport since it is most likely used by based pilots.

Airport Maintenance Facility

The alternatives analysis will examine alternate locations for the development of an airport maintenance facility. This facility would house City-owned maintenance equipment and staff, should the City desire to provide these services on the airport. The airport maintenance facility should be located with public access routes. While the maintenance facility needs access to the airfield via a service road, it should be located in a remote area of the airport so as not to occupy apron frontage that is better used for aviation-related development.

Consolidated Fuel Storage

Long term facility planning should include consolidating all fuel storage at the airport. With consolidated fuel storage, fuel delivery is in one location and can be designed to eliminate the need for the fuel delivery vehicles to access the apron area.

Airport Traffic Control Tower

There is currently no airport traffic control tower (ATCT) at the airport. The landside alternatives will consider potential areas for siting a permanent ATCT. Final site locations and the height of the ATCT cab will be completed by the FAA in a separate study outside the master plan. The purpose of this analysis is to reserve an area for the development of the ATCT in the future. Generally, the ATCT should be located so that it has a clear line-of-sight to all the runways and taxiways to observe aircraft on the ground and a clear view of the aircraft traffic patterns and approach areas.

Through-the-Fence Access

The FAA officially defines through-the-fence access as:

> "Through-the-fence operations are those activities permitted by an airport sponsor through an agreement that permits access to the public landing area by independent entities or operations offering an aeronautical activity or to owners of aircraft based on land adjacent to, but not part of, the airport property."

Presently, the Redlands Aviation Park at the west end of the airport is planned for through-the-fence access, although no development has taken place in the Redlands Aviation Park. Proposals for through-the-fence access have been made for an area at the east end of the airport.

The FAA actively discourages through-the-fence agreements at publicly funded airports. FAA Order 5190.6A, *Airports Compliance Handbook* states the following:

> "As a general principle, FAA will recommend that airport owners refrain from entering into any agreement which grants access to the public landing area by aircraft normally stored and serviced on adjacent property. Exceptions can be granted on a case-by-case basis where operating restrictions ensure safety and equitable compensation for use of the airport."

Congressional concerns over through-the-fence access relate to potential violations of the grant assurances that the airport sponsor makes to the FAA when accepting grant funding through the FAA's Airport Improvement Program (AIP). More specifically, the FAA through Congressional oversight is concerned with the lack of control that an airport sponsor has over activities that are located off airport property, the ability of the airport to maintain an equitable cost structure for all users of the airport including those accessing it from off airport property, and the ability of the airport to achieve financial self-sufficiency.

A codification of through-the-fence access in City code is usually necessary to control and grant access rights to the airport from properties located adjacent to the airport. This would involve the City establishing annual access permit to allow through-the-fence access. Annually, the City council would establish annual permit fees and usage fees for each access permit. Furthermore, the City code would need to limit access rights to parcels to aeronautical or aeronautical-related uses. Aeronautical uses specifically allowed would include: aircraft manufacturing, aircraft parts manufacturing, wholesale aircraft and parts distributing, aircraft parking, and storage solely for aircraft used for these allowable uses. To be consistent with FAA policies, land uses which provide aeronautical services to the general public would not be allowed. This includes, but is not limited to, sales promotions of aircraft, sale of aircraft to the public, aircraft maintenance, aircraft parts rebuilding, aircraft electronic sales and services, aircraft pilot or navigational schools, aircraft fuel or lubricant sales, aircraft agricultural services, aircraft parking, including storage or hangar facilities, and any other activity which promotes or engages on-site public participation in an aircraft-related activity.

Any form of residential development would be specifically prohibited from through-the-fence access as well. Residential land uses are considered incompatible near the airport. Some public use airports that allow through-the-fence access for residential development have been found to be in violation of grant assurances for allowing this type of access.

Development Opportunities and Constraints

The landside alternatives focus on expansion capabilities within the existing property line. On the south side of the runway some infill opportunities are currently under development. A series of hangars are currently being constructed by Redlands Aviation along Sessums Drive. These hangars are shown on each alternative. Additionally, space for a conventional hangar is available in the far southeastern portion of the airport near the intersection of Wabash Avenue and Sessums Drive. Presently, most portions of the west apron area are not utilized for aircraft parking. The area west of the 10-unit T-hangar may be available for hangar development. Vehicle access and utilities would be available from Aviation Drive.

On the north side of the runway, development is limited by the established

100-year floodplain. All development alternatives remain outside this area. Furthermore, all areas north of the runway encompass habitat for the Kangaroo Rat. Any development north of the runway will require mitigation for the loss of habitat. Considering this mitigation requirement, development should be focused on the west apron area first since development on the apron will not have this requirement.

Development on the north side runway will also require the installation of a utility infrastructure. Vehicle access would be required from Opal Avenue, which is presently not paved and needs to be rerouted to maintain proper approach surface clearance. Furthermore, the northside parallel runway would need to be developed to provide safe and efficient access to the runway.

The previous master plan included hangar development between the west apron area and Judson Street. This master plan will not consider the same development. FAA AC 150/5300-13 defines new departure surface requirements for airports that limit development potential behind a runway threshold. The departure surface begins at the runway end and is 1,000 feet wide. This surface extends at a slope of 40:1. The area between the west apron and Judson Street is encompassed by a departure surface. While some development may occur in this area, it must be of a height that would not penetrate the departure surface. Penetrations to the departure surface could reduce runway length for instrument departures on Runway 26 or cause limitations to be placed on instrument departures.

LANDSIDE ALTERNATIVE A

Landside Alternative A is shown on **Exhibit 4C** and assumes the airfield configuration shown on Airside Alternative A. In this alternative, the area of the west apron along Aviation Drive is utilized for conventional hangar development. This takes advantage of the available apron area for commercial general aviation operators. An aircraft wash rack is located next to the 10-unit T-hangar. Adequate water and sanitary sewer services are available along Aviation Drive to support this development and reduce construction costs.

The consolidated fuel storage area and airport maintenance building are located to the west of the west apron area. This area can provide public roadway access as well as access to the apron area for on-airport access. Two enclosed hangar storage areas are available on the east end of the west apron area. These could comprise T-hangars or box type hangars.

The public terminal building is expanded in place to allow extra office space or potentially a restaurant. To meet parking demands, apron area near the terminal building is converted to public parking. This locates public parking closer to the terminal for adequate ADA access.

The helipad is located at the east end of the airport and requires the acquisition of approximately 14 acres of land. An advantage of locating the helipad in this area is that it moves the helicopter pattern to the east away from existing and proposed residential development along

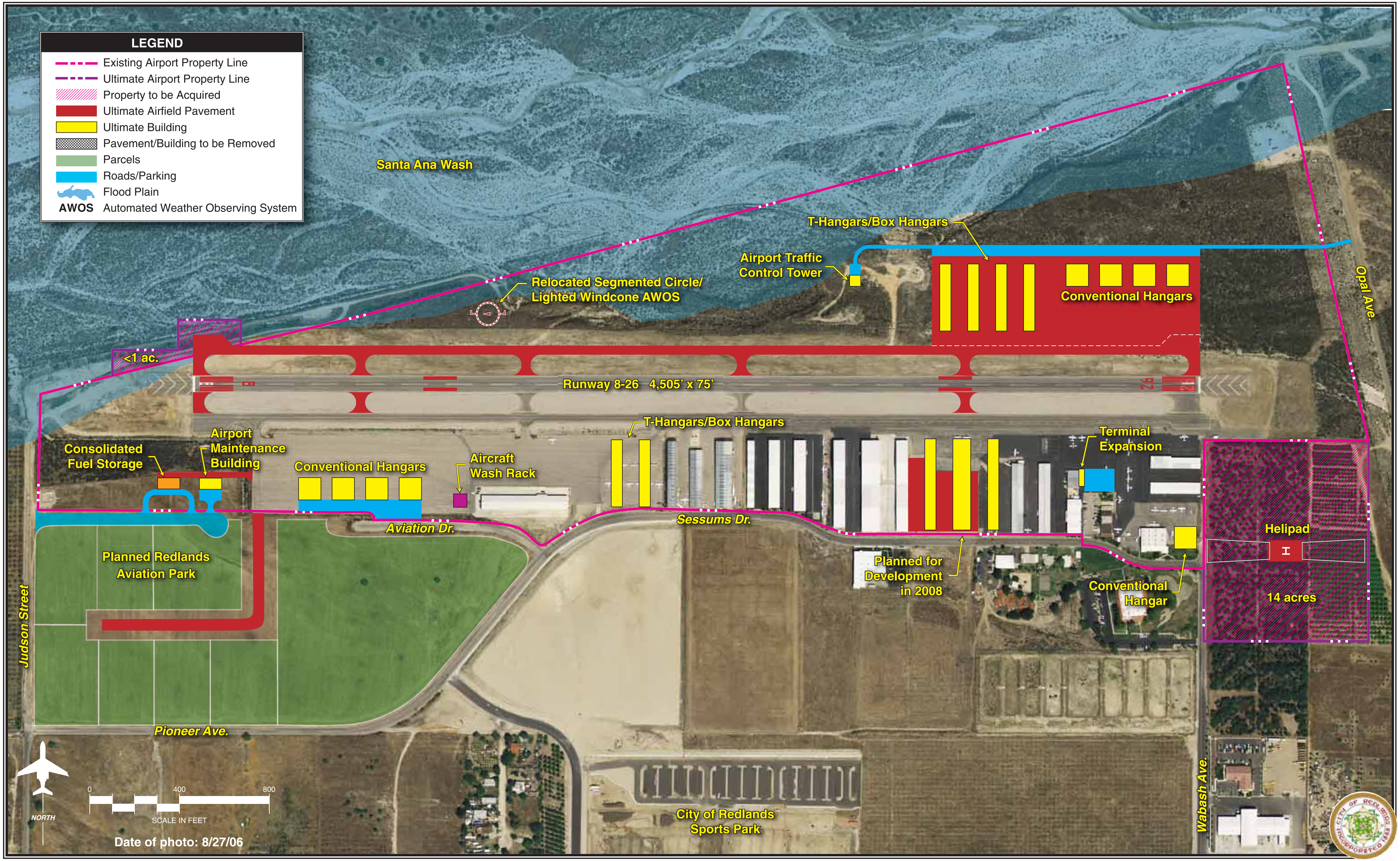

Exhibit 4C
LANDSIDE ALTERNATIVE A

Judson Street. This is most likely the only area to accommodate a helipad on or near the airport due to the land area that a helipad occupies. A helipad cannot be located on the north side of the runway as it would conflict with the fixed wing aircraft traffic pattern. Locating the helipad on the west end of the airport would place the helipad closer to residential development.

On the north side of the runway, both conventional hangar and enclosed T-hangar/box hangar development is planned with apron area. The ATCT is also located on this side of the airport near the midpoint of the runway. This area provides good visibility of the runway and south landside development area. However, the fixed-wing traffic pattern would be located to the rear of the ATCT. Most times it is preferable to locate the ATCT so that the primary traffic pattern can be viewed along with the runway alignment to eliminate the need for the controller to constantly change their field of view.

LANDSIDE ALTERNATIVE B

Landside Alternative B is shown on **Exhibit 4D** and assumes the airfield configuration of Airfield Alternative B. In contrast with Landside Alternative A, this alternative reserves the west apron area for enclosed T-hangar/box hangar development. Since the runway is shifted to the east, development to the west of the west apron is limited by the departure surface.

To accommodate commercial general aviation on the south side of the airport, an apron area and conventional hangar development is proposed at the east end of the airport along the shifted runway. This requires the acquisition of approximately 12 acres of land. The aircraft wash rack is also located along the new apron area, and the airport maintenance facility is also located on this area of land acquisition. In this alternative, future public terminal facilities are assumed to be located within the conventional hangars used by commercial general aviation operators.

Conventional and enclosed T-hangar/box hangar developments as well as the consolidated fuel storage tank are reserved along the north side of the runway. The ATCT is located south of the apron along Sessums Drive. In contrast with Alternative A, this location provides both a view of the runway environment and fixed wing traffic pattern from the front side of the tower cab.

This alternative does not provide for a helipad. For this alternative, helicopters would continue to operate to and from the existing apron areas, and helicopter training operations would continue along Taxiway A or the west apron until developed.

LANDSIDE ALTERNATIVE C

Landside Alternative C is shown in **Exhibit 4E** and assumes the airside development shown on Airfield Alternative C. For this alternative, a new public terminal building is located at the far west end of the airport. This location provides ample apron frontage for aircraft parking and is located along a

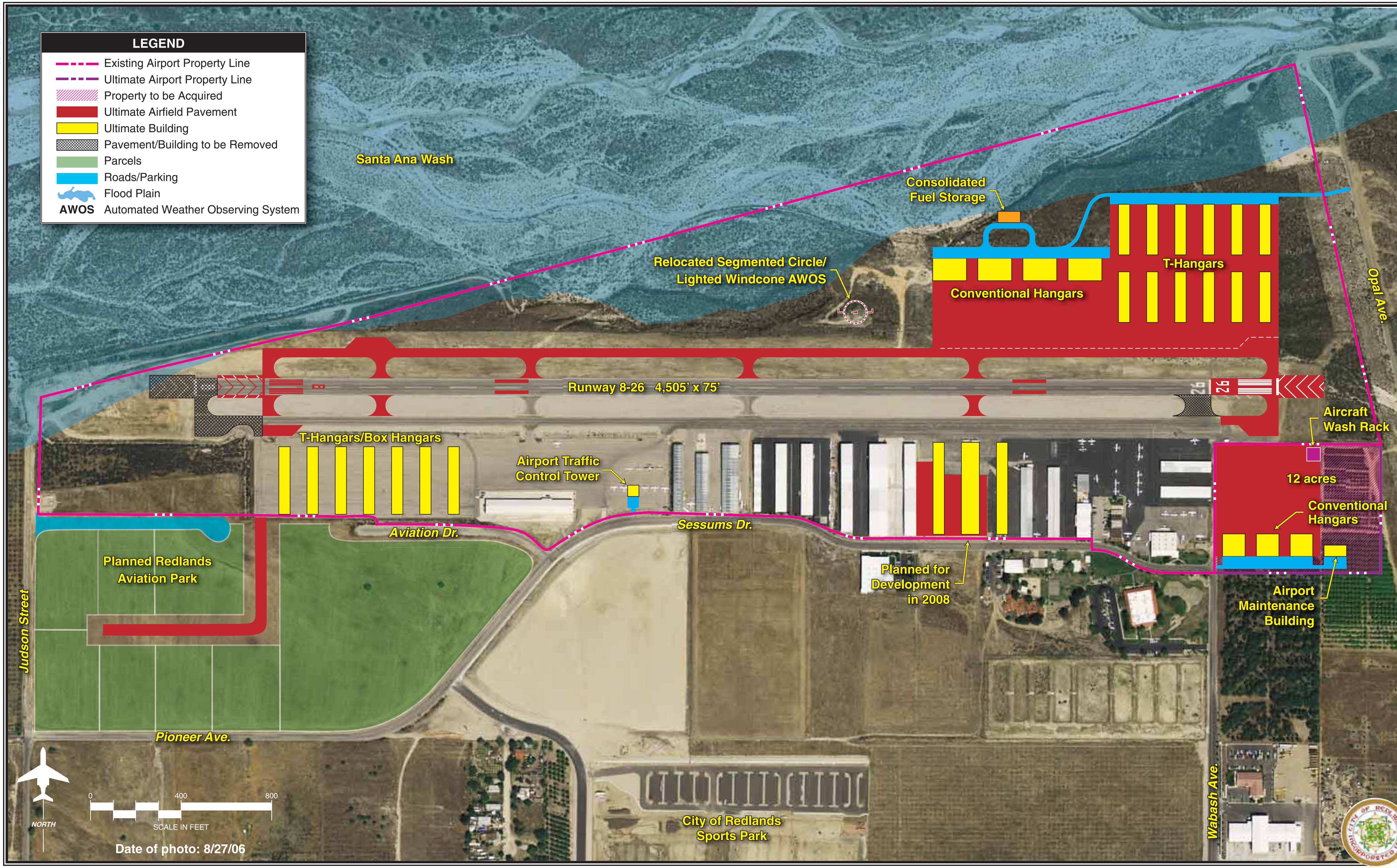

Exhibit 4D
LANDSIDE ALTERNATIVE B

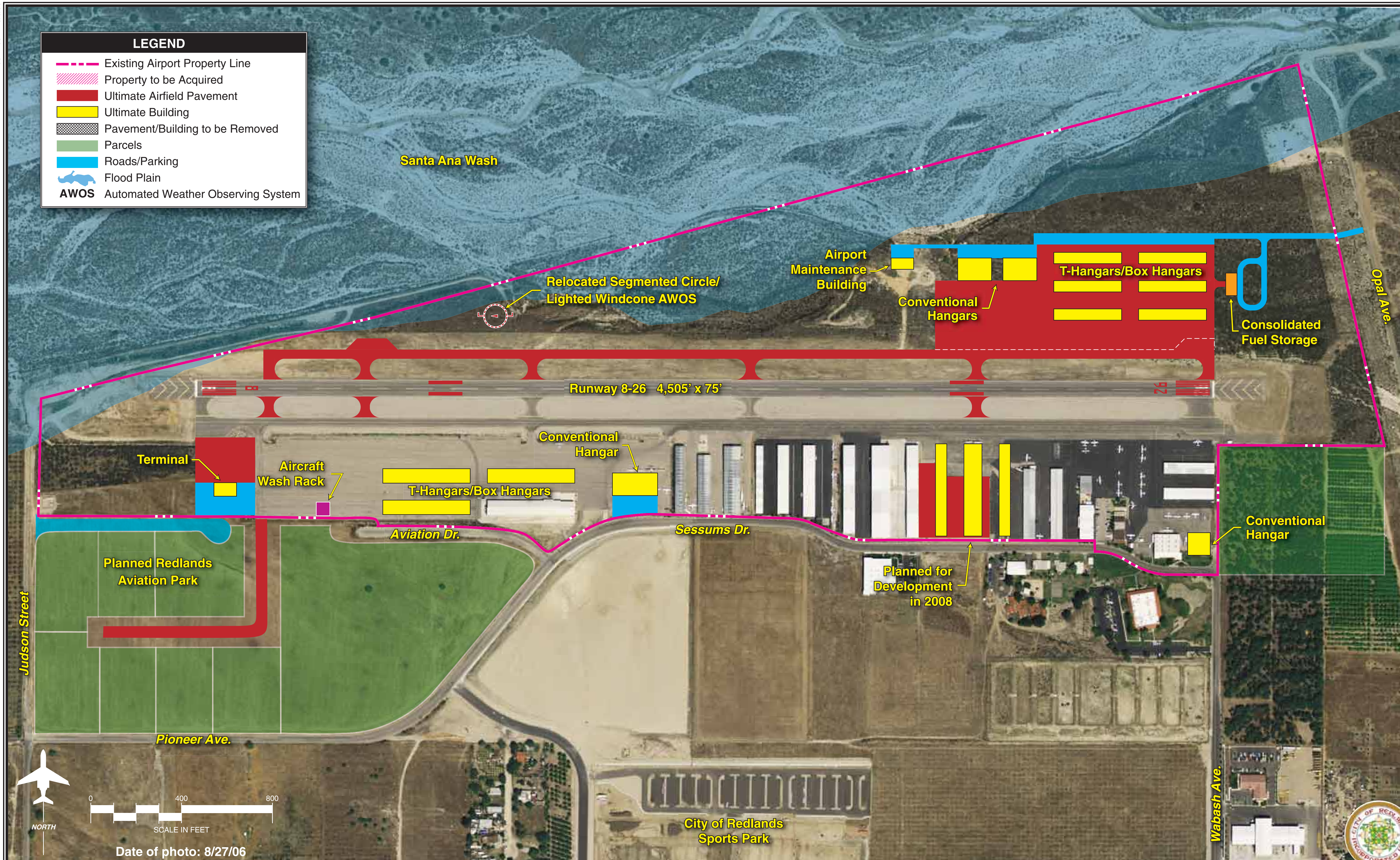

Exhibit 4E
LANDSIDE ALTERNATIVE C

future public roadway. However, this location is at the west end of the runway. Most operations are conducted from Runway 26 at the east end of the runway. Therefore, this location may not be convenient for transient users.

An aircraft wash rack and enclosed T-hangars/box hangars are shown in an east/west alignment along the west apron. A conventional hangar is also planned along Sessums Drive east of the existing 10-unit T-hangar. Similar to previous alternatives, conventional hangars and enclosed T-hangars/box hangars are located on the north side f the runway. The airport maintenance building is located near the City of Redlands public well. The consolidated fuel storage area is located at the end of the hangar area. Along with the Redlands Aviation Park, this alternative also allows for through-the-fence access on the east end of the airport.

Similar to Alternative B, this alternative does not provide for a helipad. For this alternative, helicopters would continue to operate to and from the existing apron areas, and helicopter training operations would continue along Taxiway A or the west apron until developed.

SUMMARY

The process utilized in assessing the airside and landside development alternatives involved a detailed analysis of short and long-term requirements, as well as future growth potential. Current airport design standards were considered at each stage of development.

These alternatives presented an ultimate configuration of the airport that would need to be developed over a long period of time. The next phase of the master plan will define a reasonable phasing program to implement the ultimate plan over time.

Upon review of this chapter by the City, the public, and the PAC, a final master plan concept can be formed. The resultant plan will represent an airside facility that fulfills safety and design standards, and a landside complex that can be developed as demand dictates. The proposed development plan for the airport must represent a means by which the airport can grow in a balanced manner, both on the airside as well as the landside, to accommodate forecast demand. In addition, it must provide (as all good development plans should) for flexibility in the plan to meet activity growth beyond the 20-year planning period.

CHAPTER FIVE

RECOMMENDED MASTER PLAN AND CAPITAL PROGRAM

RECOMMENDED MASTER PLAN & CAPITAL PROGRAM

The planning process for the Redlands Municipal Airport Master Plan has included several analytic efforts in the previous chapters intended to project potential aviation demand, establish airside and landside facility needs, and evaluate options for improving the airport to meet those airside and landside facility needs. The process, thus far, included the presentation of two draft phase reports (representing the first four chapters of the Master Plan) to the Planning Advisory Committee (PAC) and the City of Redlands. A plan for the use of Redlands Municipal Airport has evolved considering their input. The purpose of this chapter is to describe, in narrative and graphic form, the plan for the future use of Redlands Municipal Airport.

DEMAND-BASED PLAN

The master plan for Redlands Municipal Airport has been developed according to a demand-based schedule. Demand-based planning establishes planning guidelines for the airport based upon airport activity levels, instead of points in time. By doing so, the levels of activity derived from the demand forecasts can be related to the actual capital investments needed to safely and efficiently accommodate the level of demand being experienced at the airport. More specifically, the intention of this master plan is that the facility improvements needed to serve new levels of demand should only be implemented when the levels of demand experienced

at the airport justify their implementation.

For example, the aviation demand forecasts indicate based aircraft at Redlands Municipal Airport can be expected to grow over the long term. This forecast is supported by the airport service area's expectation for a growing population and economy, as well as historical trends that indicate higher based aircraft levels can be supported by the airport service area.

Future based aircraft levels, however, will be dependent upon the actual growth in population and the economy, as well as the trends in the industry. Factors affecting future based aircraft levels include the hangar cost, the ultimate closure of Rialto Airport, growth of commercial airline activity at San Bernardino International Airport, and the impact of high oil prices on recreational aviation. Individually or collectively, these factors can slow or accelerate based aircraft levels differently. Since changes in these factors can affect the accuracy of time-based forecasts over time, it can be difficult to predict the exact time a given improvement may become justified for the out-years of the planning period.

For these reasons, the Redlands Municipal Airport Master Plan has been developed as a demand-based plan. The master plan projects a based aircraft level of 255 for the short term planning horizon. As such, the five-year capital improvement program (CIP) should be considering those needs necessary to accommodate a milestone of 255 based aircraft. When based aircraft levels reach 255, the master plan suggests planning begin to consider the next horizon level of 285 based aircraft. While the aviation demand forecasts suggested this level could be reached in another five years, a varying economy or changes in the airport service area could speed up or slow down when this horizon is reached.

Should the 255 based aircraft level take longer to achieve than projected in the aviation demand forecasts, any related improvements to accommodate the next horizon of 285 based aircraft would be delayed. Should this level be reached sooner, the schedule to implement the improvements could be accelerated. This provides a level of flexibility in the master plan and can extend the time between master plan updates.

A demand-based master plan does not specifically require the implementation of any of the demand-based improvements. Instead, it is envisioned that implementation of any master plan improvement would be examined against demand levels prior to implementation. In many ways, this master plan is similar to a community's general plan. The master plan establishes a plan for the use of airport facilities consistent with the potential aviation needs and capital needs required to support that use. However, individual projects in the plan are not implemented until the need is demonstrated and the project is approved for funding. **Table 5A** summarizes the planning milestones used in this Master Plan.

TABLE 5A
Activity Milestones

	Baseline	Short Term	Intermediate Term	Long Term
ANNUAL OPERATIONS				
Total Itinerant	61,500	73,400	79,100	89,400
Total Local	20,500	24,400	33,900	59,600
Total Operations	**82,000**	**97,800**	**113,000**	**149,000**
BASED AIRCRAFT	**224**	**255**	**285**	**350**

Source: Coffman Associates Analysis

RECOMMENDED MASTER PLAN CONCEPT

The Master Plan Concept represents the development direction for the Redlands Municipal Airport through the planning period of this Master Plan. The Master Plan Concept is the consolidation and refinement of the three airfield and four landside alternatives, presented in Chapter Four, into a single development concept collectively representing input received from the PAC and the City of Redlands.

AIRSIDE PLAN

As shown on **Exhibit 5A**, the airside plan maintains Runway 8-26 in its existing location, similar to Airfield Alternatives A and B presented in Chapter Four. Consideration was given in the alternatives to shifting Runway 8-26 to the east (Airfield Alternative B); however, this alternative was dismissed by the City and PAC due to cost considerations and limited benefits to users. Shifting to the east would have allowed the future northern parallel taxiway to extend completely to a relocated Runway 8 end on airport property while also clearing the object free area (OFA) and obstacle free zone (OFZ) beyond the Runway 8 end which are currently obstructed by perimeter fencing. While providing these benefits, shifting the runway to the east would require an additional two acres of land acquisition to protect the Runway 26 RPZ which currently extends beyond airport property, and the construction of 300 feet of new runway and taxiway pavement to maintain the existing runway length. Analysis in Chapter Three showed that the existing runway length is required to support the mix of aircraft expected to use the airport through the planning period; therefore, the runway could not be shortened to clear the OFZ and OFA.

The PAC supported the partial parallel taxiway alignment shown in Alternative C for the northern parallel taxiway. This extends the northern parallel taxiway within 300 feet of the Runway 8 end. Crossing taxiways (Taxiways A6 and B5) will allow aircraft to cross the runway and reach the Runway 8 end. A partial parallel taxiway was supported as Runway 8 use is limited (approximately 15 percent of the time) and this alignment avoided the 100-year floodplain and impacts to the Santa Ana Wash levee located along the airport boundary. Furthermore, this alterna-

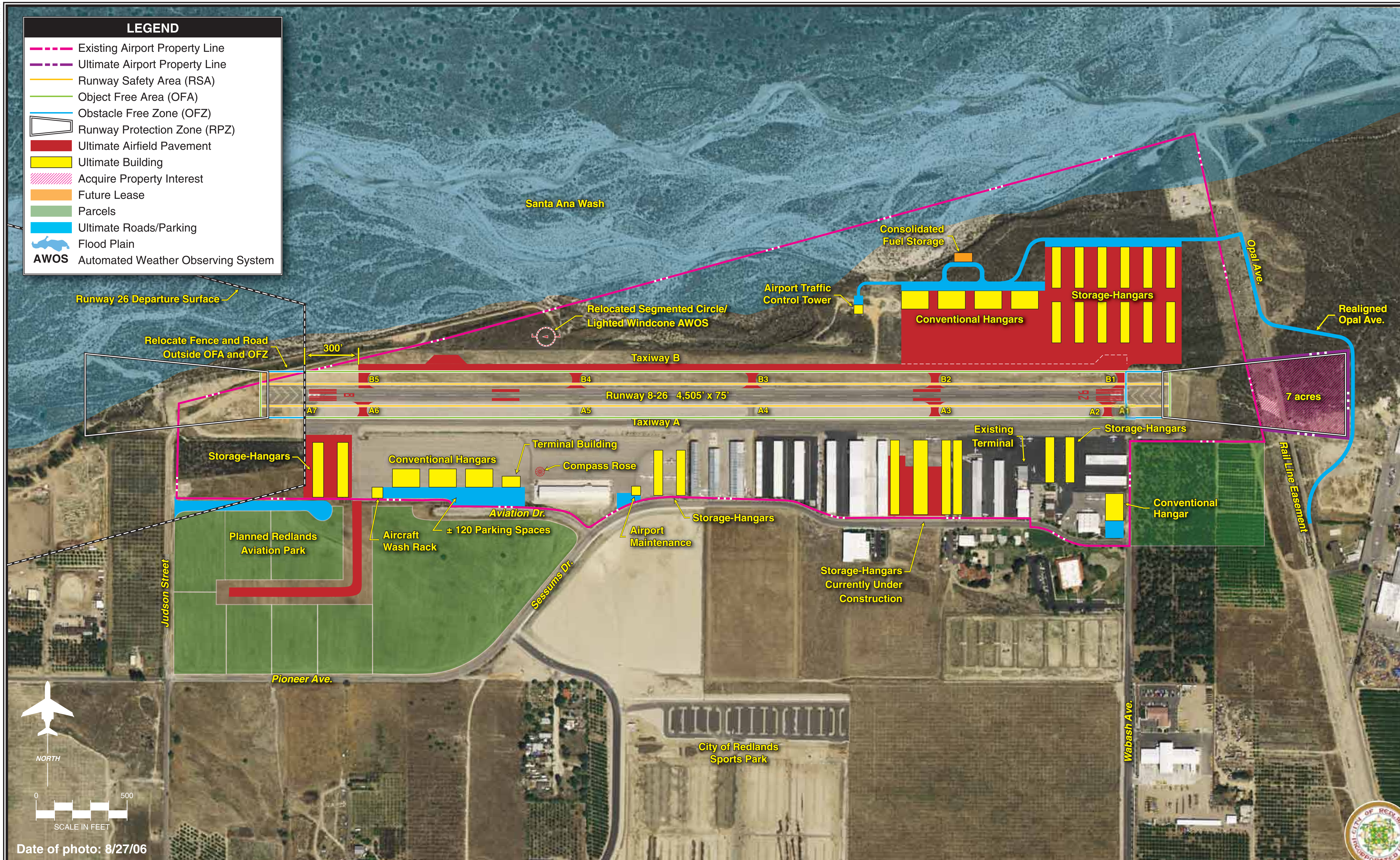

Exhibit 5A
MASTER PLAN CONCEPT

tive allowed the taxiway to remain on airport property. The taxiway is planned at 35 feet wide and the taxiway centerline line would be located 150 feet from the Runway 8-26 centerline to conform to Federal Aviation Administration (FAA) design standards. The development of the north partial parallel taxiway will require the relocation of the segmented circle, lighted wind cone, and automated weather observing system (AWOS) to the west as shown on **Exhibit 5A**.

Maintaining the runway in its existing location leaves the OFZ and OFA extending beyond airport property near the levee. A service road and perimeter fence extend through the OFA and OFZ. Initial discussions with San Bernardino County Flood Control for this master plan indicated a willingness to lease the necessary property to the City of Redlands at fair market value to allow for relocation of the perimeter fence and service road to clear the OFA and OFZ.

The airfield capacity analysis in Chapter Three indicated that two additional exit taxiways could increase airfield capacity by six percent. Additional exit taxiways would reduce the amount of time that aircraft occupy the runway after landing. The airfield plan includes a new exit taxiway midway between Taxiways A1 and A4. The taxiways connecting the future partial parallel taxiway north of Runway 8-26 (Taxiways A6 and B5) will also serve as exit taxiways for aircraft landing on Runway 26. A by-pass taxiway (Taxiway A2) is planned at the Runway 26 end to reduce congestion during peak periods.

Exhibit 5A also depicts a new designation for each existing and future taxiway at the airport in conformance with FAA AC 150/5340-18D, *Standards for Airport Sign Systems*. This AC specifies that the entrance/exit taxiways that connect Runway 8-26 and parallel taxiways should be designated alphanumerically.

Securing the runway protection zone (RPZ) is also considered in the master plan concept. The airport currently does not control, in entirety, the existing RPZs on each runway end. Portions of the RPZ on each end extend beyond the existing property line. The RPZ is a trapezoidal area centered on the extended runway centerline to protect people and property on the ground. The RPZ is a two-dimensional area and has no associated approach surface. FAA design standards limit development that can cause the congregation of people on the ground within the RPZ. Compatible development includes uses which do not attract wildlife and do not interfere with navigational aids. There are limitations on surface parking lots. Prohibited land uses include residences and places of assembly (churches, schools, hospitals, office buildings, shopping centers).

The Runway 8 RPZ extends into the Santa Ana Wash. The Santa Ana wash is a designated floodplain. Therefore, the potential for this area to be developed with incompatible development is low. Thus, the RPZ is protected from incompatible development. The RPZ for the Runway 26 end encompasses property that is planned for light industrial as well as flood control/construction aggregates, conservation/habitat preservation and for resource preservation. The acquisition of seven acres of land within the Runway 26 RPZ is included in the Master Plan Concept.

Runway 8-26 is presently marked with basic runway markings. A future straight-in instrument approach would require non-precision markings. The Master Plan Concept includes non-precision markings on both ends of Runway 8-26.

Both a rail line easement and Opal Avenue extend in a north/south manner the through the Runway 26 approach surface. As discussed in Chapter Four, both the rail line (if developed) and Opal Avenue are obstructions. The Master Plan Concept relocates Opal Avenue to the east to clear the approach surface. This also removes Opal Avenue from the RPZ. The FAA Western-Pacific Region Airports Division current position is that roads should not extend through the RPZ. Should the rail line ever be developed, it would be necessary to lower the rail bed to clear the Runway 26 approach surface.

LANDSIDE PLAN

The planned landside development is also shown on **Exhibit 5A**. Should activity occur as forecast, development on the north side of Runway 8-26 will be required to accommodate aviation activity. The landside plan avoids development within the 100-year flood plain, a City of Redlands well located on the north side of Runway 8-26, and an existing FAA antenna farm located in the northeast corner of the airport.

Development west of the Runway 8 end is limited due to the existence of the Runway 26 departure surface. The limits of the departure surface are shown on **Exhibit 5A**. The Runway 26 departure surface extends at a 40:1 slope outward and upward beyond the Runway 8 end. Within this area, the height of objects is limited. Should objects penetrate this surface, limitations can be placed on instrument departures. To avoid penetrations to this surface, no development is planned beyond the Runway 8 end on airport property.

The landside plan maintains access to the airport for the Redlands Aviation Park located at the west end of the airport as shown on **Exhibit 5A**. A potential area for future development off-airport with access to the airport is also located at the east end of the airport.

Arrangements such as these where adjacent landowners have direct airfield access to a publicly owned landing area such as Redlands Municipal Airport are commonly called a through-the-fence operation. It is the FAA's general policy to discourage through-the-fence activities.

The obligation to make an airport available for the use and benefit of the public does not impose any requirement to permit access by aircraft from adjacent property. On the contrary, the existence of such an arrangement has been recognized as an encumbrance upon the airport property itself. Airport obligations arising from federal grant agreements and conveyance instruments apply to dedicated airport land and facilities, and not to private property adjacent to the airport, even when the property owner is granted a through-the-fence privilege.

The owner of a public airport is entitled to seek recovery of the initial and continuing costs of providing a public-use landing area. The owners of airports receiving federal funds have been required to establish a fee and rental structure designed to make the airports as self-sustaining as possible. Most public airports seek to recover a substantial part of airfield operating costs indirectly through various arrangements affecting commercial activities on the airport.

The concern has been that development of aeronautical businesses on land uncontrolled by the airport owner may give the through-the-fence operation a competitive advantage that will be detrimental to the on-airport operators on whom the airport owner relies for revenue and service to the public. To avoid a potential imbalance, the airport owner may refuse to authorize such through-the-fence operations.

Arrangements that permit aircraft to gain access to a public landing area from off-site property must include safety and security considerations to control potential hazards from vehicular and aircraft traffic. In addition, the airport and the private owner must address legal, insurance, and management implications related to liability and administrative and operational controls.

Any agreement for a through-the-fence operation must include provisions making such operations subject to the same federal obligations as tenants on airport property. Furthermore, the airport owner must ensure that the through-the-fence operators contribute a fair share toward the cost of the operation, maintenance, and improvement of the airport so that they do not gain an unfair economic advantage over on-airport operators.

If these can be accommodated through an agreed upon "through-the-fence agreement" that is approved by the FAA, the through-the-fence arrangement can be a viable opportunity for the economic advancement of Redlands Municipal Airport.

The landside plan meets forecast demands through the development of the remaining available parcels on the south side of the airport. Beginning at the east end of the airport, space is reserved for a conventional hangar near the intersection of Wabash Avenue and Sessums Drive. Two T-hangars are planned to replace the existing outside tiedown area east of the existing terminal building. Four rows of new hangars are currently under development south of Runway 8-26 as shown on the exhibit.

The underutilized west apron is planned to accommodate a mixture of conventional hangars and T-hangars/box hangars. Two rows of T-hangars/box hangars are planned on the east end of the west apron. The center of the west apron is planned for larger conventional hangars to accommodate commercial general aviation businesses, such as aircraft maintenance providers. Two additional rows of T-hangars/box hangars are planned west of the west apron and will require new taxilane development.

The ultimate terminal building is planned on the west apron. The existing terminal site is constrained and cannot be readily expanded. This location offers ease of access, the ability to create larger automobile parking areas, and have sufficient ramp area for transient aircraft parking. A covered aircraft wash rack and airport maintenance facility are also planned for development on the west apron.

The area north of Runway 8-26 is planned to accommodate long term growth. This area is planned for T-hangars/box hangars, conventional hangars, a large apron area, a consolidated fuel farm, and a future airport traffic control tower (ATCT). Vehicle access would be via Opal Avenue. Currently, instrument departures to the east are not authorized. Therefore, there is not an associated departure surface beyond the Runway 26 end. Therefore, in contrast with the Runway 8 end, aviation-related development can be accommodated beyond the Runway 26 end as shown. Development on the north side of the airport will require utility extensions.

No helipad is planned for helicopter operations. The area north of Runway 8-26 is needed for future landside development. Sufficient area is not available on the south side of the runway to accommodate a designated helipad. Helicopters are planned to continue to operate to Taxiway A or portions of the west apron for training activity. Transient helicopters are planned to utilize existing and planned apron areas for parking.

ENVIRONMENTAL OVERVIEW

A review of the potential environmental impacts associated with proposed airport projects is an essential consideration in the airport master plan process. The primary purpose of this section is to review the proposed improvement program at Redlands Municipal Airport to determine whether the proposed actions could, individually or collectively, have the potential to significantly affect the quality of the environment. The information contained in this section was obtained from previous studies, various internet websites, and analysis by the consultant.

Construction of any improvements depicted on the Airport Layout Plan (ALP) will require compliance with the *National Environmental Policy Act* (NEPA) *of 1969*, as amended. This includes privately funded projects in addition to those projects receiving federal funding. Prior to any development on the airport, the City of Redlands needs to coordinate with the FAA Western-Pacific Region Airports Division environmental staff.

In addition, because the airport is located in California, compliance with the *California Environmental Quality Act* (CEQA) is also necessary. CEQA requires consideration of the environmental impacts of the entire improvement program prior to local adoption of the master plan. CEQA compliance is initially determined by the preparation of an Initial Study, which will be prepared separately.

For projects not "categorically excluded" under 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.*

The following sections provide a description of the environmental resources which could be impacted by the proposed airport development, as depicted on **Exhibit 5A**. Of the 20 environmental categories, the following resources are not found within the airport environs:

- Coastal Resources
- Department of Transportation Act, Section 4(f) Properties
- Farmland
- Wetlands
- Wild and Scenic Rivers

AIR QUALITY

The 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. 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). Various levels of review apply within both NEPA and permitting requirements. Potentially significant air quality impacts, associated with an FAA project or action, would be demonstrated by the project or action exceeding one or more of the NAAQS for any of the time periods analyzed.

The airport is located in San Bernardino County which is in nonattainment for Ozone, (O_3) Carbon Monoxide (CO), Particulate Matter (PM_{10} and $PM_{2.5}$), and Nitrogen Oxide (NO_2). Further air quality analysis is required to determine potential air quality impacts which could result from proposed airport development projects. Coordination with the regional air quality board will be necessary.

NOISE

Aircraft sound emissions are often the most noticeable environmental impact an airport will produce on a surrounding community. If the sound is sufficiently loud or frequent in occurrence, it may interfere with various activities or otherwise be considered objectionable. To determine noise-related impacts that the proposed action could have on the environment surrounding the airport, noise exposure patterns based on projected future aviation activity were analyzed.

Aircraft Noise Analysis Methodology

The standard methodology for analyzing noise conditions at airports involves the use of a computer simulation model. The FAA has approved the Integrated Noise Model (INM) for this use.

In California, the INM describes aircraft noise in the Community Noise Exposure Level (CNEL) metric. CNEL is defined as the average A-weighted sound level as measured in decibels (dB), during a 24-hour period. A 5dB penalty applies to noise events occurring in the evening (7:00 p.m. to 10:00 p.m.), while a 10 dB penalty applies to noise events occurring at night (10:00 p.m. to 7:00 a.m.). CNEL is a summation metric which allows objective analysis and can describe noise exposure comprehensively over a large area. The 65 CNEL contour has been established as the threshold of incompatibility, meaning that noise levels below 65 CNEL are considered compatible with underlying land uses. CNEL is an accepted metric by the FAA, Environmental Protection Agency (EPA), and Department of Housing and Urban Development (HUD), among others, as an appropriate measure of cumulative noise exposure.

The INM works by defining a network of grid points at ground level around the airport. It then selects the shortest distance from each grid point to each flight track and computes the noise exposure for each aircraft operation by aircraft type and engine thrust level along each flight track. Corrections are applied for air-to-ground acoustical attenuation, acoustical shielding of the aircraft engines by the aircraft itself, and aircraft speed variations. The noise exposure levels for each aircraft are summed at each grid point location. The CNEL at all grid points is used to develop noise exposure contours for selected values (e.g., 65, 70, and 75 CNEL). Noise contours are then plotted on a base map of the airport environs using the CNEL metrics.

In addition to the mathematical procedures defined in the model, the INM has another very important element. This is a database containing tables correlating noise, thrust settings, and flight profiles for most of the civilian aircraft and many common military aircraft operating in the United States. This database, often referred to as the noise curve data, has been developed under FAA guidance based on rigorous noise monitoring in controlled settings. In fact, the INM database was developed through decades of research, including extensive field measurements. The database also includes performance data for each aircraft to allow for the computation of airport-specific flight profiles (rates of climb and descent). The most recent version of the INM, Version 7.0, was used for modeling the noise condition for the purposes of this Master Plan.

INM Input

A variety of user-supplied input data is required to use the INM. This includes the airport elevation, average annual temperature, airport area terrain, a mathematical definition of the airport runways, the mathematical description of ground tracks above which aircraft fly, and aircraft assignments to individual flight tracks.

- **Activity Data**

Airport activity is defined as the take-offs and landings by aircraft operating at the facility; this is also referred to as aircraft operations.

Existing airport activity (i.e., take-offs and landings, or operations by aircraft) was derived from activity estimates. **Table 5B** provides a breakdown of operations for the baseline condition as well as the future (2027) forecasts.

- **Fleet Mix**

The selection of individual aircraft types is important to the modeling process because different aircraft types generate different noise levels. The aircraft fleet mix was derived from a review of filed flight plans available through *AirportIQ,* a content provider of completed flight plans. **Table 5B** summarizes the generalized fleet mix data input into the noise analysis.

TABLE 5B
Current and Ultimate Aircraft Mix and Operations

Aircraft Type (INM Designation)	Baseline	Ultimate (2027)
Single Engine Fixed Propeller (GASEPF)	35,200	64,100
Single Engine Variable Pitch Propeller (GASEPV)	35,900	64,800
Multi-Engine Piston (BEC58P)	8,200	13,300
Turboprop (CNA441)	800	3,000
Light Fanjet (CNA500)	200	800
Helicopter (R22)	1,700	3,000
Total Operations	**82,000**	**149,000**

Source for forecast operations: Aviation Demand Forecasts, Chapter Two

Because single engine aircraft in the general aviation fleet are consistent in their noise characteristics, the INM utilizes two composite single engine models. The FAA's substitution list indicates that the general aviation single engine variable pitch propeller model, the GASEPV, represents a number of single engine general aviation aircraft such as the Beech Bonanza, Cessna 177 and 180, Piper Cherokee Arrow, Piper PA-32, Cirrus, and Mooney aircraft. The general aviation single engine fixed pitch propeller model, the GASEPF, represents the Cessna 150 and 172, Piper Archer, Piper PA-28-140 and -180, and the Piper Tomahawk, among others.

The database list recommends the BEC58P, the Beech Baron, to represent the light twin-engine aircraft such as the Piper Navajo, Beech Duke, Cessna 310, and others. The CNA441, typically the Cessna 441, effectively represents the light turbo-prop aircraft such as the Beech King Air, Cessna Conquest, and others.

For the business jet fleet, the CNA500 effectively represents the Cessna Citation I, II, and V series aircraft – or the smaller jets within the fleet. This aircraft also represents the very light jets in the national fleet such as the Eclipse 500 and the Cessna Mustang. The Robinson R22 effectively represents the helicopter activity at Redlands Municipal Airport.

All the above choices conform to the Pre-Approved Substitution List published by the FAA Office of Environment and Energy (AEE) branch in Washington, D.C.

- **Time-of-Day**

The time-of-day at which operations occur is important as input to the INM due to the 5 decibel weighting of evening (7:00 p.m. to 10:00 p.m.) and 10 decibel weighting of nighttime (10:00 p.m. to 7:00 a.m.) flights. In calculating airport noise exposure, one operation at night has the same noise emission value as 10 operations during the day by the same aircraft. For modeling the noise exposure contours, one percent of operations were assumed to occur at night and four percent of operations were assumed to occur in the evening.

- **Runway Use**

Runway usage data is another essential input to the INM. For modeling purposes, wind data analysis usually determines runway use percentages. Aircraft will normally land and take-off into the wind. However, wind analysis provides only the directional availability of a runway and does not consider pilot selection, primary runway operations, or local operating conventions. For this analysis, Runway 8 was assumed to be used 15 percent of the time, with Runway 26 being used 85 percent of the time.

INM Output

Noise contours were prepared for the baseline and future (2027) conditions at the airport. As indicated on **Exhibit 5B**, the noise contours extend beyond existing airport property. However, no incompatible land uses are contained within the noise contours.

COMPATIBLE LAND USE

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. Typically, significant impacts will occur over noise-sensitive areas within the 65 CNEL noise contour. As indicated above, no noise-sensitive residential land uses are currently contained within the 65 CNEL and higher noise contours.

The City of Redlands has adopted the *Redlands Municipal Airport Land Use*

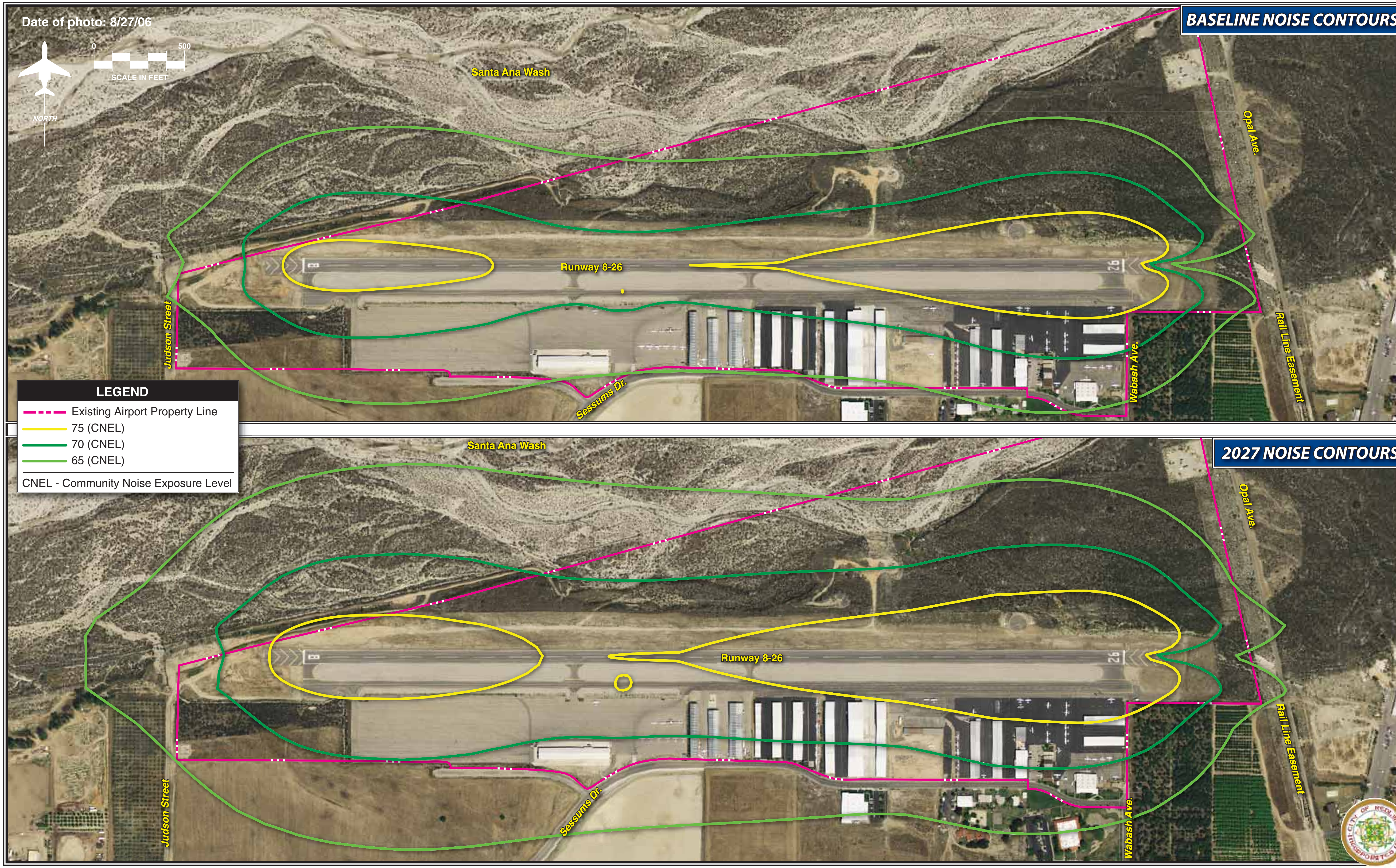

Exhibit 5B
NOISE CONTOURS

Compatibility Plan (ALUCP). The purpose of the CLUP is to promote compatible land uses for airport operations.

The Redlands City Council adopted the original ALUCP on February 17, 1997. The 1997 ALUCP established compatibility criteria and a map intended for use in evaluating land use proposals in the Redlands Municipal Airport vicinity. The compatibility policies and maps included in the 1997 ALUCP are based upon the 1993 *Redlands Municipal Airport Master Plan* as adopted by the City of Redlands. The aircraft fleet mix and operation levels used to determine the ALUCP zones were also taken from the 1993 Airport Master Plan. It should also be noted that the existing condition fleet mix and operation information for the Master Plan is based upon 1991 data.

The 1997 ALUCP was revised and approved by Redlands City Council Resolution 6152 on May 6, 2003. Resolution 6152 deemed it advisable and desirable to relocate the helicopter flight training pattern 1,000 feet north of San Bernardino Avenue and redesignate the Extended Approach/Departure Zone (B2) to Common Traffic Pattern Zone (C) for the area between San Bernardino Avenue and 1,000 feet to the north extending from one-half mile west of Judson Street to approximately one-half mile east of Wabash Avenue. It is important to note that the 2003 ALUCP zone adjustments were based upon the desire to construct a sports park south of the airport and not for changes at the airport. The revised 2003 Compatibility Map was shown previously on Exhibit 1E.

Since this Master Plan maintains the helicopter traffic pattern south of Runway 8-26, helicopter overflights of areas between San Bernardino Road north to the airport can be expected at altitudes at or below 500 feet above the ground (AGL). Fixed-wing aircraft also over fly this area for entry into the fixed-wing flight pattern located north of the runway. An update to ALUCP should be considered. A revised ALUCP would be based upon this new Master Plan and forecasts of aviation demand and follow the guidance of the current *California Airport Land Use Planning Handbook*. This update should also give consideration to the continued potential for helicopter training overflights south of the airport. Residential land uses should be restricted in the area of potential overflight south of Runway 8-26. Therefore, restoration of the Common Traffic Pattern Zone (C) to south of San Bernardino Avenue and extension of the Extended Approach/Departure Zone (B2) to areas north of San Bernardino Avenue should be considered. Residential uses, such as hangars with attached residences or single family homes with airfield access should also be prohibited adjacent to the airport.

FISH, WILDLIFE, AND PLANTS

The Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) are charged with overseeing the requirements contained within Section 7 of the *Endangered Species Act*. This Act was put into place to protect animal or plant species whose populations are threatened by human activities. Along with the FAA, the FWS and the NMFS review projects to determine if a significant impact to these protected species will result with implementation of a proposed project. Significant impacts occur when the proposed action could jeopardize the continued existence of a protected species or would result in the destruction or adverse modification of federally designated critical habitat in the area.

In a similar manner, states are allowed to prepare statewide wildlife conservation plans through authorizations contained within the *Sikes Act*. Airport improvement projects should be checked for consistency with the State or DOD Wildlife Conservation Plans where such plans exist.

Redlands Municipal Airport is located just south of the Santa Ana River. Vegetation in the vicinity of the airport is identified as alluvial scrub. This vegetation type is unique scrub vegetation found along floodplains where there is a lack of perennial water. Alluvial scrub is comprised of an assortment of drought deciduous shrubs and large evergreen woody shrubs. According to the California Natural Diversity Data Base (CNDDB), this vegetation is considered a unique habitat with high priority for preservation.

Numerous federally listed threatened and endangered species have been identified as having suitable habitat in the region. The FWS Carlsbad Office serves the area where Redlands Municipal Airport is located. According to the Carlsbad Ecological Services website, 58 plant species, eight invertebrate species, nine fish species, four amphibian species, four reptile species, 16 bird species, and eight mammal species have habitat in this region. The CNDDB has documented occurrences for twelve federally and state-listed species in the area. A habitat conservation area for the federally listed San Bernardino kangaroo rat is located south of the airport adjacent to the Redlands Sports Park. According to the CNDDB, the San Bernardino kangaroo rat has documented occurrences throughout the vicinity of the airport. The area north of Runway 8-26 is known Kangaroo Rat habitat and will likely require mitigation as development occurs in this area. Prior to development, further studies will be required for all species.

FLOODPLAINS

Floodplains are defined in Executive Order 11988, *Floodplain Management*, as "the lowland and relatively flat areas adjoining inland and coastal waters...including at a minimum, that area subject to a one percent or greater chance of flooding in any given year" (i.e., that area would be inundated by a 100-year flood). Federal agencies, including the FAA, are directed to "reduce the risk of loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains." A floodplain associated with the Santa Ana River is located just north of the airport. The majority of the airport is protected from a 100-year flood by a levee located just north of airport property. However, the extreme northwest corner of the runway is located within this 100-year floodplain. Airport property to the northeast is also located within this 100-year floodplain. The floodplain is depicted on **Exhibit 5A**. The proposed development plan avoids the 100-year floodplain.

Historical, Architectural, and Cultural Resources

Determination of a project's impact to historical and cultural resources is made in compliance with the *National Historic Preservation Act* (NHPA) *of 1966*, as amended for federal undertakings. Two state acts also require consideration of cultural resources. The NHPA requires that an initial review be made of an undertaking's *Area of Potential Effect* (APE) to determine if any properties in, or eligible for inclusion in, the National Register of Historic Places are present in the area. No known historical or archaeological resources are located on airport property. Prior to development, surveys should be conducted to assist with Section 106 consultation with the State Historic Preservation Officer.

CONSTRUCTION IMPACTS

Construction impacts typically relate to the effects on specific impact categories, such as air quality or noise during construction. The use of BMPs during construction is typically a requirement of construction-related permits such as a National Pollutant Discharge Elimination System (NPDES) permit. Use of these measures typically alleviates potential resource impacts.

Short-term construction-related noise impacts could occur with implementation of the proposed project as there are scattered residences in the vicinity. However, these impacts typically do not arise unless construction is being undertaken during early morning, evening, or nighttime hours. Furthermore, the proposed projects will be undertaken on a demand basis and will not be constructed simultaneously.

Construction-related air quality impacts can be expected. Air emissions related to construction activities will be short-term in nature and will be included in the air emissions inventory, if one is requested.

HAZARDOUS MATERIALS, POLLUTION PREVENTION, AND SOLID WASTE

The airport must comply with applicable pollution control statutes and requirements. Impacts may occur when changes to the quantity or type of solid waste generated, or type of disposal, differ greatly from existing conditions. No impaired waters or regulated hazardous material sites are located on or in the vicinity of the airport.

The airport will need to comply with the NPDES operations permit requirements. With regard to construction activities, the airport and all applicable contractors will need to comply with the requirements and procedures of the construction-related NPDES General Permit, including the preparation of a *Notice of Intent* and a *Stormwater Pollution Prevention Plan* prior to the initiation of project construction activities.

As a result of increased operations at the airport, solid waste may slightly increase; however, these increases are not anticipated to be significant.

LIGHT EMISSIONS AND VISUAL IMPACTS

Impacts occur when lighting associated with an action will create an annoyance among people in the vicinity or interfere with their normal activities. Aesthetic impacts relate to the extent that the development contrasts with the existing environment and whether the jurisdictional agency considers this contrast objectionable.

No new airside lighting is anticipated. Landside development at the airport will create new hangar space, an expanded terminal building, additional automobile parking areas, and the potential for new aviation revenue support parcels. High density residential development is located to the west and southwest of the airport. The residential homes may experience an increase of annoyance due to light and visual impacts created by new lighting added to the hangars and apron areas.

NATURAL RESOURCES AND ENERGY SUPPLY

In instances of major proposed actions, power companies or other suppliers of energy will need to be contacted to determine if the proposed project demands can be met by existing or planned facilities.

Increased use of energy and natural resources are anticipated as the operations at the airport grow. None of the planned development projects are anticipated to result in significant increases in energy consumption.

SECONDARY (INDUCED) IMPACTS

These impacts address those secondary impacts to surrounding communities resulting from the proposed development, including shifts in patterns of population growth, public service demands, and changes in business and economic activity to the extent influenced by airport development.

Significant shifts in patterns of population movement, growth, or public service demands are not anticipated as a result of the proposed development. It could be expected, however, that the proposed development would potentially induce positive socioeconomic impacts for the community over a period of years. The airport, with expanded facilities and services, would be expected to attract additional users. It is also expected to encourage tourism, industry and trade, and to enhance the future growth and expansion of the community's economic base. Future socioeconomic impacts resulting from the proposed development are anticipated to be primarily positive in nature.

SOCIOECONOMIC IMPACTS, ENVIRONMENTAL JUSTICE, AND CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISKS

Impacts occur when disproportionately high and adverse human health or environmental effects occur to minority and low-income populations; disproportionate health and safety risks occur to children; and extensive relocation of residents, businesses, and disruptive traffic patterns are experienced. Development is expected to occur on the airport and will not cause any disproportionate impacts for minority or low income populations. The health and safety risks to children are not expected to be disproportionate with the existing operation of the airport that limits access to the aircraft operational areas and construction areas as a matter of ongoing security and safety compliance with the airport's certification.

The proposed action includes the development of internal airport roads and extension of Opal Avenue. These roads will provide access to the proposed aviation-related facilities. These roads are not anticipated to disrupt the local transportation patterns.

WATER QUALITY

Water quality concerns associated with airport expansion most often relate to domestic sewage disposal, increased surface runoff and soil erosion, and the storage and handling of fuel, petroleum, solvents, etc.

Construction of the proposed improvements will result in an increase in impermeable surfaces and a resulting increase in stormwater runoff. During the construction phase, the proposed development may result in short-term impacts on water quality. Temporary measures to control water pollution, soil erosion, and siltation through the use of BMPs should be used. The airport will need to continue to comply with its current NPDES operations permit requirements.

With regard to construction activities, the airport and all applicable contractors will need to obtain and comply with the requirements and procedures of the construction-related NPDES General Permit, including the preparation of a *Notice of Intent* and a *Stormwater Pollution Prevention Plan* prior to the initiation of product construction activities.

As development occurs at the airport, the Storm Water Pollution Prevention Plan (SWPPP) will need to be modified to reflect the additional impervious surfaces and any stormwater retention facilities. The addition and removal of impervious surfaces may require modifications to this plan should drainage patterns be modified.

CAPITAL PROGRAM

The previous analyses presented the needs of the airport, on both the airside and the landside, over the course of the next 20 years. In this section, a capital program will be developed to present specific projects recommended for the airport to achieve the master plan vision. The master plan vision is based on the airport achieving specific demand-based triggers such as a growth in based aircraft, an increase in very light jet activity, and an overall increase in operations.

This chapter will present specific detail on the capital projects needed based on demand. Each project will be prioritized, with immediate need for safety-related projects having the highest priority. Cost estimates associated with each project will be presented. A discussion of the available funding sources will also be provided.

AIRPORT DEVELOPMENT SCHEDULES AND COST SUMMARIES

With the establishment of a recommended concept, the next step is to determine a realistic schedule and the associated costs for implementing the plan. This section will examine the overall cost of each item in the development plan and present a development schedule. This plan assumes hangars will be constructed with private funds, while the City will maximize grant funding for taxilane and infrastructure development. Pavement preservation and maintenance is limited to areas operated by the City. Leasehold pavement areas are not eligible for federal funding.

As a master plan is a conceptual document, implementation of these capital projects should only be undertaken after further refinement of their design and costs through architectural and engineering analyses. Moreover, some projects may require further environmental study, such as property acquisition.

The cost estimates presented in this chapter have been increased by 15 percent to allow for contingencies that may arise on the project. The cost estimates also include 25 percent for design and engineering, and construction inspection and project management. Capital costs presented here should be viewed only as estimates subject to further refinement during design. Nevertheless, these estimates are considered reasonable for planning purposes. Cost estimates for each of the development projects listed in the capital program are in 2008 dollars. **Exhibit 5C** presents the proposed capital improvement program (CIP) for the Redlands Municipal Airport. **Exhibit 5D** depicts development staging.

The proposed CIP has been divided into three planning horizons: short, intermediate, and long term. By grouping the projects, airport administration can accelerate projects that become critical or delay projects that are not priorities.

On an annual basis, airports submit a five-year capital improvement plan to the FAA. The CIP submittal is intended to alert the FAA to priority projects for which the airport intends to request grant funding. Items from the most recent airport CIP submittal are included in this 20-year CIP.

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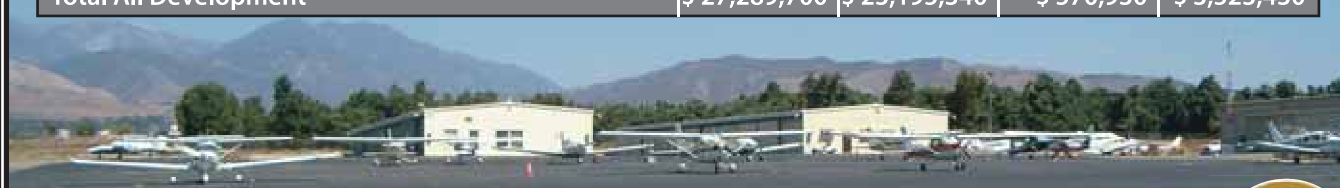
	Total Cost	Federally Eligible	CALTRANS Eligible	Local Share
Short Term Planning Horizon (first five years)				
1. Install Aircraft Wash Rack	$ 480,000	$ 456,000	$ 12,000	$ 12,000
2. East Apron Pavement Maintenance	150,000	142,500	3,750	3,750
3. West Apron Pavement Maintenance/Taxilane Widening	450,000	427,500	11,250	11,250
4. Install Lighted Airfield Signs	200,000	190,000	5,000	5,000
5. Construct T-hangar Taxilanes	428,100	406,695	10,703	10,703
6. T-Hangar Taxilane Pavement Maintenance	63,700	60,515	1,593	1,593
7. Construct By-pass Taxiway A2	88,700	84,265	2,218	2,218
Subtotal Short Term Planning Horizon	**$ 1,860,5800**	**$ 1,767,475**	**$ 46,513**	**$ 46,513**
Intermediate Term Planning Horizon (6-10 years)				
1. Construct Taxiway A3	$ 88,700	$ 84,265	$ 2,218	$ 2,218
2. Construct Automobile Parking and Access	463,900	440,705	11,598	11,598
3. Construct Terminal Building (5,000 s.f.)	877,500	-	-	877,500
4. Construct Airport Maintenance Building	325,000	-	-	325,000
5. Runway 8-26 Pavement Maintenance	251,600	239,020	6,290	6,290
6. Taxiway A and Connecting Taxiways Pavement Maintenance	156,400	148,580	3,910	3,910
7. West Apron Pavement Maintenance	372,400	353,780	9,310	9,310
8. T-Hangar Taxilane Pavement Maintenance	63,700	60,515	1,593	1,593
Subtotal Intermediate Term Planning Horizon	**$ 2,599,200**	**$ 1,326,865**	**$ 34,918**	**$ 1,237,418**
Long Term Planning Horizon (11-20 years)				
1. Conduct NEPA and CEQA Studies for Northside Development & Land Acquisition	$ 750,000	$ 712,500	$ 18,750	$ 18,750
2. Acquire land to protect the Runway 26 Runway Protection Zone (RPZ) - 7 acres	362,200	344,090	9,055	9,055
3. Relocate Segmented Circle and Lighted Wind Cone	75,000	71,250	1,875	1,875
4. Realign Opal Avenue	917,100	871,245	22,928	22,928
5. Construct North Access Road	825,400	784,130	20,635	20,635
6. Extend Utilities	402,500	382,375	10,063	10,063
7. Construct Taxiway B	2,900,100	2,755,095	72,503	72,503
8. Construct North Apron	2,500,000	2,375,000	62,500	62,500
9. Construct Parking	463,900	440,705	11,598	11,598
10. Construct T-hangar Taxilanes	1,280,300	1,216,285	32,008	32,008
11. Construct Consolidated Fuel Storage	250,000	-	-	250,000
12. Runway 8-26 Rehabilitation	2,700,900	2,565,855	67,523	67,523
13. Taxiway A and Connecting Taxiway Rehabilitation	1,700,800	1,615,760	42,520	42,520
14. West Apron Rehabilitation	4,000,600	3,800,570	100,015	100,015
15. T-Hangar Taxilane Rehabilitation	701,200	666,140	17,530	17,530
16. Construct Airport Traffic Control (ATCT)	3,000,000	1,500,000	-	1,500,000
Subtotal Long Term Planning Horizon	**$ 22,830,000**	**$ 20,101,000**	**$ 489,500**	**$ 2,239,500**
Total All Development	**$ 27,289,700**	**$ 23,195,340**	**$ 570,930**	**$ 3,523,430**



CALTRANS - California Department of Transportation
CEQA - California Environmental Quality Act
NEPA - National Environmental Policy Act

Exhibit 5C
AIRPORT DEVELOPMENT SCHEDULE

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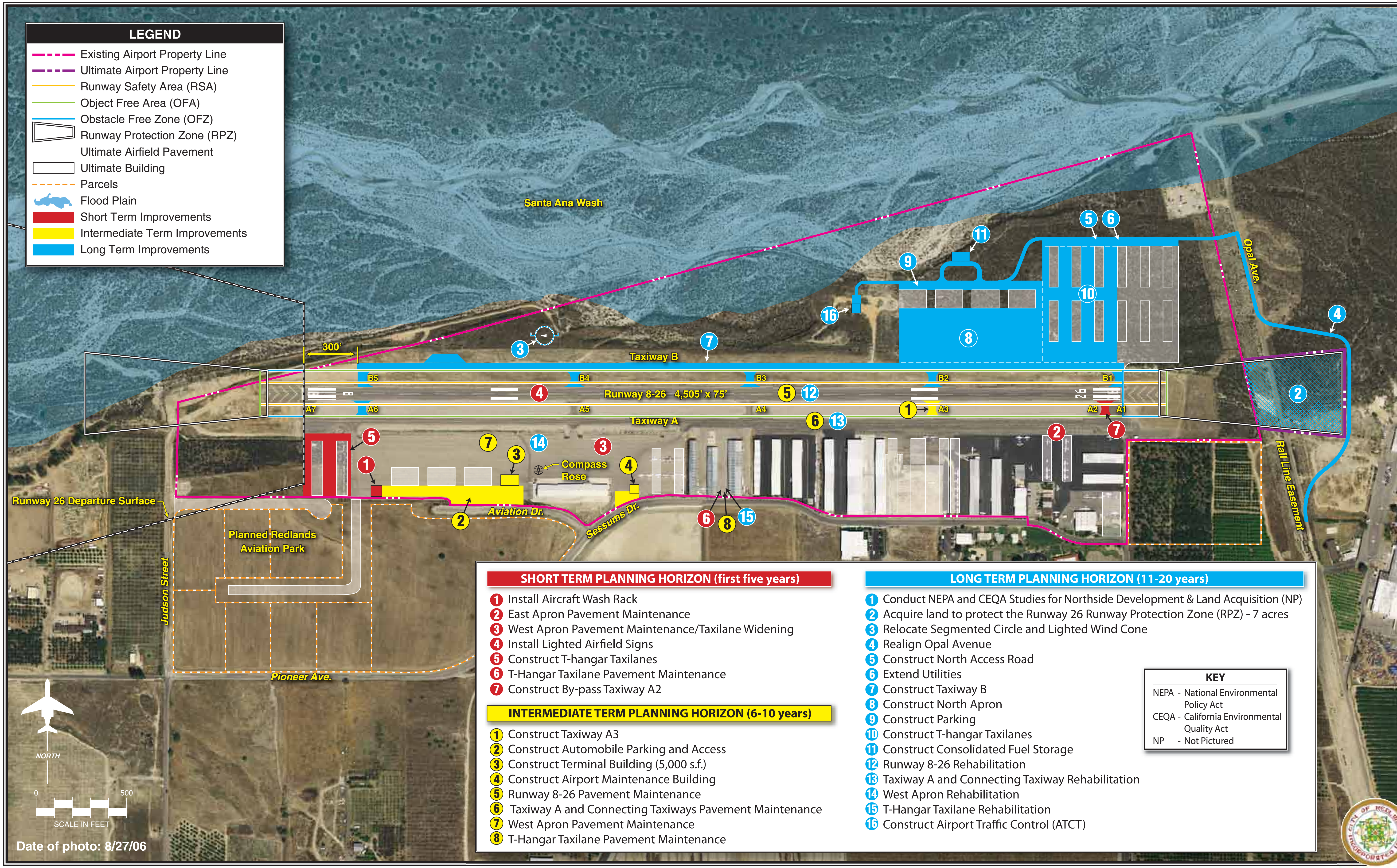


Exhibit 5D
DEVELOPMENT STAGING

SHORT TERM IMPROVEMENTS

Priorities in the short term planning horizon include installing an aircraft wash rack. This is necessary to comply with storm water permitting at the airport. The aircraft wash rack allows for the collection of debris and cleaning fluids used during the cleaning process. The aircraft wash rack is planned for the west apron.

Maintenance of portions of the west apron and east apron are planned. This will include pavement overlays and/or seal coating as necessary. A taxiway leading to the west apron will be widened to allow for easier access by aircraft.

The airport is presently without lighting directional signs. A project programmed for the short term planning period would install these signs which would also include assigning new taxiway designations at the airport. Taxiway A2 is programmed for development. This taxiway will reduce congestion at this runway end during peak periods.

Finally, the construction of two T-hangar taxilanes at the far west end of the west apron is planned. These taxilanes will support the development of two T-hangar/box hangar structures.

The total investment necessary for the short term capital improvement program is approximately $1.7 million. Of this total, $1.6 million is eligible for FAA grant funding and approximately $44,300 is eligible for state funding. The remaining $44,300 would be the responsibility of the City of Redlands.

INTERMEDIATE TERM IMPROVEMENTS

The intermediate term focuses on west apron development. Automobile parking and access is planned for the new terminal and conventional hangars planned to be constructed. An airport maintenance building is programmed as well as the construction of a new terminal. The airport maintenance building and terminal are not eligible for FAA grant funding. Therefore, these projects must be funded entirely by the City of Redlands. Loans may be available from the California Department of Transportation, Aeronautics Division for these projects.

The construction of exit Taxiway A3 is also programmed. Maintenance to the runway, airside taxiways, west apron, and T-hangar taxilanes operated by the City is also programmed.

The total investment necessary for the intermediate term capital improvement program is approximately $2.6 million. Of this total, $1.3 million is eligible for FAA grant funding and approximately $34,900 is eligible for state funding. The remaining $1.2 million would be the responsibility of the City of Redlands.

LONG TERM IMPROVEMENTS

Long term capital planning focuses on north side development. The long term planning horizon includes all infrastructure development necessary to develop the north side of the airport. This includes realigning and paving Opal Avenue, constructing the north access road, extending utilities, constructing apron and taxilanes, constructing the north partial parallel Taxiway B, Taxiways A5 and B5, automobile parking, and a consolidated fuel farm. While eligible for FAA funding, it is assumed that the construction of the consolidated fuel farm would need to be provided by the City of Redlands. FAA prefers to place grant funding on pavement maintenance projects and new pavement construction.

Prior to developing the north side and acquiring land within the Runway 26 RPZ, extensive environmental analysis and permitting may be necessary. Conducting the necessary NEPA and CEQA studies are included in this planning horizon.

The final project in the master plan is the construction of a replacement airport traffic control tower. First, a formal airport traffic control tower (ATCT) site selection study should be undertaken. This study will develop justification for a replacement ATCT and present a benefit-cost analysis. Once justification for a replacement ATCT is established, operational and spatial requirements are planned following guidance provided in FAA Order 6480.4, *Airport Traffic Control Tower Siting Criteria*. Factors such as visibility, size, height, signal strength, and height and hazard compliance will be considered. The north side location for the existing tower is adequate as it meets current tower specifications. Federal guidance limits FAA funding for the ATCT at $1.5 million. The remaining costs must be met locally.

The total investment for the long term capital needs program is approximately $22.8 million. Of this total, $20.1 million is eligible for FAA grant funding and approximately $489,500 is eligible for state funding. The remaining $2.2 million would be the responsibility of the City of Redlands.

CAPITAL IMPROVEMENT FUNDING SOURCES

Financing capital improvements at the airport will not rely solely on the financial resources of the airport. Capital improvement funding is available through various grant-in-aid programs on both the state and federal levels. The following discussion outlines key sources of funding potentially available for capital improvements at Redlands Municipal 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 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 in late 2003 and was titled, *Century of Aviation Re-authorization Act*, or Vision 100. The four-year bill covered FAA fiscal years 2004, 2005, 2006, and 2007. Vision 100 expired at the end of fiscal year 2007. In December 2007, AIP was included in the omnibus appropriation act and authorized $3.5 billion in 2008 for airport improvements. However, full authorization was never granted. A series of continuing resolutions were passed in order to carry the program through June 2008 at 75 percent of authorized funding levels. As of June 2008, a new multi-year AIP authorization and authority bill had not been passed.

The source for airport improvement funds from the federal government 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. Under the AIP program, examples of eligible development projects include the airfield, public aprons, and access roads.

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 enplanement (passenger boarding) levels. When Congress appropriates the full amounts authorized by Vision 100 and the extension bills, eligible general aviation airports could receive up to $150,000 of funding each year in Non-Primary Entitlement (NPE) funds (*National Plan of Integrated Airport Systems* [NPIAS] inclusion is required for general aviation entitlement funding). Redlands Municipal Airport qualified for full NPE funding as the NPIAS includes over $150,000 in yearly capital projects. Under Vision 100, Redlands Municipal Airport is eligible for 95 percent funding assistance. This is projected to remain the same through the planning period.

The remaining AIP funds are distributed by the FAA based upon 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 are given preference in funding. 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. Other funds can come through the Facilities and Equipment (F&E) section of the FAA. As activity conditions warrant, the airport will be considered by F&E for various navigational aids to be installed, owned, and maintained by the FAA.

STATE FUNDING PROGRAM

In support of the state airport system, the California Transportation Commission (CTC) also participates in state airport development projects. An aeronautics account has been established within the state transportation fund, from which all airport improvement monies are drawn. Tax revenues have been collected and deposited in the aeronautics account from the sale of general aviation jet fuel ($0.02 per gallon) and AvGas ($0.18 per gallon). The

CTC has established three grant programs to distribute funds deposited in the aeronautics account: annual grants, acquisition and development (A&D) grants, and AIP matching grants. Another funding source provided by the CTC is low-interest loans. Because Redlands Municipal Airport is classified as a reliever airport, it is eligible to receive AIP matching grants, A&D grants, and low-interest loans from the state. Each of these is discussed below.

AIP Matching Grants

State AIP Matching Grants are designed to assist airports in meeting the local match for AIP grants from the FAA. The airport must meet FAA eligibility requirements when applying for the state grant. The matching rate is currently set at 2.5 percent and cannot be allocated until the federal grant has been accepted by the airport sponsor. The sponsor also should not begin construction on a project until the Grant Agreement with the Division of Aeronautics is fully executed.

Acquisition and Development (A&D) Grants

A&D grants are designed to provide funding to airports for the purpose of land acquisition and development. This grant has a minimum allocation level of $10,000 and provides up to $500,000 per fiscal year (maximum allowable funding to a single airport yearly). Grant requests are initiated through the CIP process and require a local match of 10 to 50 percent of the project's cost (the level has been 10 percent for the last 10+ years). Unlike annual grants, reliever and commercial service airports are eligible for the A&D grant. Redlands Municipal Airport could turn to this source of funding if and when federal grants are not forthcoming.

California Airport Loan Program

The loan program provides funding for all airports within the State of California which are owned by an eligible public agency and open to the public without exception. These loans provide funding to eligible airports for construction and land acquisition projects which will benefit the airport and improve its self-sufficiency. The loans can be used for nearly any airport-related project and the funding limits are not bound by law or regulation. The amount of the loan is determined in accordance with project feasibility and the sponsor's financial status. Terms of the loan provide eight to fifteen years for its payback, and the interest rate is based upon the most recent State of California bond sale.

LOCAL FUNDING

The balance of project costs, after consideration has been given to grants, must be funded through local resources (i.e., airport revenues or City of Redlands revenues). The goal for the operation of the airport is to generate ample revenues to cover all operating and maintenance costs, as well as the local matching share of capital expenditures.

There are several alternatives for local financing options for future development at the airport, including airport revenues, direct funding from the City, 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.

Local funding options may also include the solicitation of private developers to construct and manage hangar facilities. The airport has, in the past, supported private development of hangars and, in some cases, taxilanes. Private hangar development should only be allowed within the definition of the airport master plan and within the rules and regulations of the airport in order to maintain an efficient airport facility layout.

SUMMARY

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 ability to continuously monitor the existing and forecast status of airport activity must be provided and maintained. 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 the 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, decision-makers, and the community, so that they are better able to recognize change and its effects. In addition to adjustments in aviation demand, decisions made as to when to undertake the improvements recommended in this master plan will impact the period that 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. Updating can be done by the manager, thereby improving the plan's effectiveness.

In summary, the planning process requires that airport management 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 decelerated.

APPENDIX A

GLOSSARY OF TERMS

Glossary of Terms

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 non-regulatory 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: An alphabetic classification of aircraft based upon 1.3 times the stall speed in a landing configuration at their maximum certified landing weight.

AIRCRAFT OPERATION: The landing, takeoff, or touch-and-go procedure by an aircraft on a runway at an airport.

AIRCRAFT OPERATIONS AREA: 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 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 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 LAYOUT DRAWING (ALD): The drawing of the airport showing the layout of existing and proposed airport facilities.

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 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 enroute 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 enroute phase of flight.

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.

AUTOMATED WEATHER OBSERVATION STATION (AWOS): Equipment used to automatically record weather conditions (i.e. cloud height, visibility, wind speed and direction, temperature, dewpoint, 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).

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.

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.

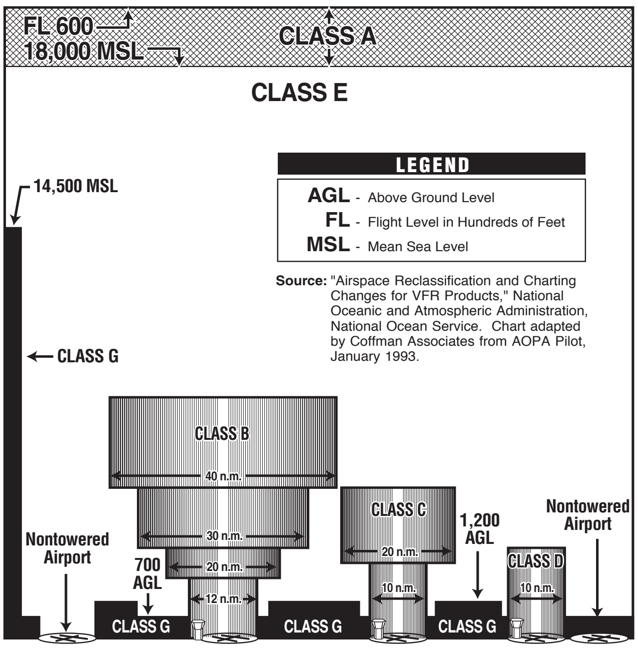
- *CLASS B:* Generally, the airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports. The configuration of Class B airspace is unique to each airport, but typically consists of two or more layers of air space and is designed to contain all published instrument approach procedures 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 proce dures. 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."

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; and

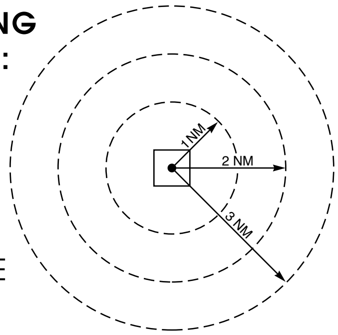
- *LANDING DISTANCE AVAILABLE (LDA):* The runway length declared available and suitable for landing.

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 A-weighted 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."

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 non-scheduled 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 ar 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.

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.

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."

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.

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.

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.

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.

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.

KNOTS: A unit of speed length used in navigation that is equivalent to the number of nautical miles traveled in one hour.

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 enroute navigation.

LOW INTENSITY RUNWAY LIGHTS: The lowest classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

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.

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.)

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.

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.

OPERATION: A take-off or a landing.

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.

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 Sevice Volume. PVC conditions exist when the cloud ceiling is less than 500 feet and visibility is less than one mile.

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 enroute 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 enroute 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 END IDENTIFIER LIGHTS (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 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.

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 TERMINAL ARRIVAL (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.

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 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.

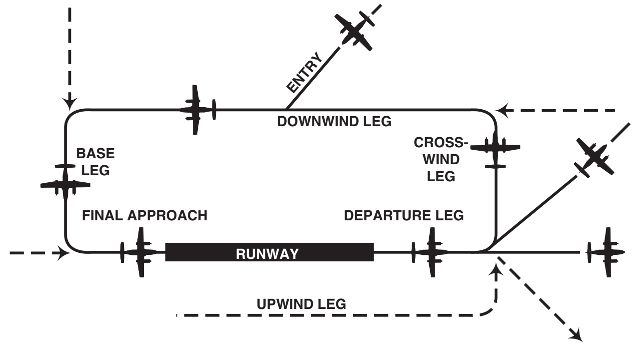
TOUCHDOWN: The point at which a landing aircraft makes contact with the runway surface.

TOUCHDOWN 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.

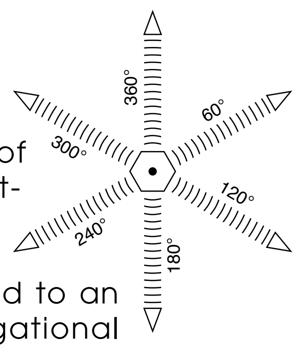


UNCONTROLLED AIRPORT: An airport without an air traffic control tower at which the control of Visual Flight Rules traffic is not exercised.

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."



VECTOR: A heading issued to an aircraft to provide navigational guidance by radar.

VERY HIGH FREQUENCY/ OMNIDIRECTIONAL RANGE STATION (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 STATION/ 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."

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.

Abbreviations

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)

APV: instrument approach procedure with vertical guidance

ARC: airport reference code

ARFF: aircraft rescue and firefighting

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 (100LL)

AWOS: automated weather observation station

BRL: building restriction line

CFR: Code of Federal Regulations

CIP: capital improvement program

DME: distance measuring equipment

DNL: day-night noise level

DWL: runway weight bearing capacity for aircraft with dual-wheel type landing gear

DTWL: runway weight bearing capacity fo 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 middle marker

LOC: ILS localizer

LOM: compass locator at ILS outer marker

LORAN: long range navigation

MALS: medium intensity approach lighting system

MALSR: medium intensity approach lighting system with runway alignment 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 rulemaking

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

REIL: runway end identifier 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 sequenced flashers

SSALR: 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 type landing gear

STWL: runway weight bearing capacity for aircraft with single-wheel tandem type landing gear

TACAN: tactical air navigational aid

TDZ: touchdown zone

TDZE: touchdown zone elevation

TAF: Federal Aviation Administration (FAA) Terminal Area Forecast

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

ECONOMIC BENEFIT STUDY

HIGHLIGHTS

This report presents an analysis of the economic benefits of Redlands Municipal Airport for the economy of the airport service area, which includes the City of Redlands as well as nearby cities including Yucaipa, Highland, and other communities.

Redlands Municipal Airport serves as a gateway that welcomes commerce and visitors into the region and provides access for citizens and businesses to travel outward via general aviation. Economic benefits (revenues, employment and earnings) are created when economic activity takes place both on and off the airport. The highlights of the economic benefit analysis are set out below.

HIGHLIGHTS

Economic Benefit Analysis
Redlands Municipal Airport

- **The primary economic benefits (not including multiplier effects) of on-airport activity and off-airport visitor spending summed to $7.3 million in 2006.**
- **The total economic benefits (including all multiplier effects of secondary benefits) of Redlands Municipal Airport summed to $16.2 million in 2006.**
- **On-airport employers produced $6.9 million of economic output in 2006, with earnings to workers and proprietors of $561,000.**
- **Economic activity resulting from the presence of the airport created $2.5 million of annual tax revenues, including $1 million revenues for state and local government**
- **General aviation travelers using Redlands Municipal Airport accounted for 7,634 visitor days in the airport service area, and visitor expenditures exceeded $425,000.**
- **Seventy-eight percent of based aircraft owners responded that the airport is important to the success of their businesses.**
- **Based aircraft at the airport flew 33,000 hours in 2006; this travel had an estimated charter equivalent value of $39 million.**
- **Firms represented by business users of based aircraft at Redlands Municipal Airport accounted for 1,470 employees and $636 million in sales.**

MEASURING BENEFITS

The presence of an airport creates benefits for a community in many ways. Airports bring essential services, including enhanced medical care (such as air ambulance service), support for law enforcement and fire control, and courier delivery of mail and high value parcels. These services raise the quality of life for residents and maintain a competitive environment for economic development.

General aviation allows business travelers to reach destinations without the delays and uncertainty of today's airline flights and provides access to more than 5,300 airports in the nation, compared to approximately 565 served by scheduled airlines.

Although qualitative advantages created by the presence of an airport are important, they are also difficult to measure. In studying airport benefits, regional analysts have emphasized indicators of economic activity for airports that can be quantified, such as dollar value of output, number of jobs created, and earnings of workers and proprietors of businesses.

Economic benefit studies differ from cost-benefit analyses, which are often called for to support decision-making, typically for public sector capital projects.

Study of economic benefit is synonymous with measurement of economic performance. The methodology was standardized in the publication by the Federal Aviation Administration, *Estimating the Regional Economic Significance of Airports*, Washington DC, 1992.

Following the FAA methodology, this study views Redlands Municipal Airport as a source of measurable economic output (the production of aviation services) that creates revenues for firms, and employment and earnings for workers on and off the airport.

Aviation spending on the airport injects revenues into the community when firms buy products from suppliers and again when employees of the airport spend for household goods and services. In addition, spending by air visitors produces revenues for firms in the hospitality sector as well as employment and earnings for workers.

Benefit Measures

The quantitative measures of economic benefits of the Redlands Municipal Airport are each described below.

Revenue is the value in dollars of the output of goods and services produced by businesses. For government units, the budget is used as the value of output.

Output is equivalent to revenue or spending or sales. From the perspective of the business that is the supplier of goods and services, the dollar value of output is equal to the revenues received by that producer. From the viewpoint of the consumer, the dollar value of the output is equal to the amount that the consumer spent to purchase those goods and services from the business.

Earnings are a second benefit measure, made up of employee compensation (the dollar value of payments received by workers as wages and benefits) and proprietor's income of business owners.

Employment is the third benefit measure, the number of jobs supported by the revenues created by the airport.

To measure the economic benefits of the airport, information on revenues, employment and earnings was obtained directly from suppliers and users of aviation services through on-site interviews and mailed survey forms.

Those contacted included private sector firms on the airport, government agencies, general aviation air travelers, and based aircraft owners. Redlands Municipal Airport staff provided valuable assistance with data collection.

TABLE B1
Summary of Economic Benefits: 2006
Redlands Municipal Airport

	BENEFIT MEASURES		
Source	**Revenues**	**Earnings**	**Employment**
All On-Airport Economic Benefits	**$6,856,000**	**$561,000**	**19**
Air Visitor Benefits	**427,000**	**171,000**	**7**
Primary Benefits: Sum of On-Airport & Air Visitor Benefits	**7,283,000**	**732,000**	**26**
Secondary Benefits (Multiplier Effects)	***8,897,000***	***787,000***	***20***
TOTAL BENEFITS	**$16,180,000**	**$1,519,000**	**46**

ECONOMIC BENEFIT SUMMARY

The economic benefits of Redlands Municipal Airport for 2006 are shown in Table B1.

For 2006, the total benefits of the airport, including on-airport, air visitor, and secondary benefits (which result as dollars recirculate in the regional economy), were calculated to be:

- **$16.2 Million Revenues**
- **$1.5 Million Earnings**
- **46 Total Employment**

On-Airport Benefits

At the time of the inventory for preparation of the Master Plan, there were 221 based aircraft on the airport, including 194 single engine planes, 20 multi engine planes, 1 jet, 3 helicopters and 3 other craft.

Operations on Redlands Municipal Airport supported a total of 8 private and public employers including FBO services, pilot training, avionics, maintenance, and storage, as well as airport administration.

Including revenues and employment these economic units were responsible for on-airport benefits of:

- **$6.9 Million Revenues**
- **$0.561 Million Earnings**
- **19 On-Airport Jobs**

Air Visitor Benefits

An important source of aviation-related spending comes from the more than 6,000 air visitors that arrive at the airport each year on general aviation aircraft.

Visitors traveling for business or personal reasons spend for lodging, food and drink, entertainment, retail goods and services, and ground transportation including auto rental and taxis, creating annual airport service area output, employment and earnings of:

- **$0.427 Million Revenues**
- **$0.171 Million Earnings**
- **7 Off-Airport Jobs**

Primary Benefits

The primary benefits represent the sum of on-airport and air visitor revenues, earnings and employment due to the presence of the airport. Primary benefits are the "first round" impacts and do not include any multiplier effects of secondary spending. The primary benefits of on-airport and air visitor economic activity related to Redlands Municipal Airport were:

- **$7.3 Million Revenues**
- **$0.732 Million Earnings**
- **26 Jobs**

Combined revenue flows for businesses and employers on and off the airport sum to a value of $7.3 million. The airport presence created benefits to workers by providing incomes of $0.732 million. There were 26 jobs supported directly by the suppliers and users of aviation services.

Secondary Benefits

Secondary benefits or multiplier effects are created when the initial spending by airport employers or visitors circulates and recycles through the economy. In contrast to initial or primary benefits, the secondary benefits measure the magnitude of successive rounds of re-spending as those who work for or sell products to airport employers or the hospitality sector spend dollars.

For example, when an aircraft mechanic's wages are spent to purchase food, housing, clothing, and medical services, these dollars create more jobs and income in the general economy of the region through multiplier effects of re-spending.

Input-output analysis shows the initial revenue stream of $7.3 million created by the presence of the airport stimulated secondary benefits from multiplier effects within the service area of:

- **$8.9 Million Revenues**
- **$0.787 Million Earnings**
- **20 Jobs**

Value of Based Aircraft Travel

Owners of general aviation aircraft based at the airport report 33,000 business and personal hours flown each year. The Charter Equivalent Value of this travel was computed as $39.3 million, or more than $175,000 of equivalent value per aircraft per year.

ON-AIRPORT BENEFITS

Table B2 illustrates the annualized employment, earnings and value of output (revenues) produced by Redlands Municipal Airport tenants in 2006. Values shown for revenues, employment and earnings are the primary benefits and do not include multiplier effects of secondary benefits.

Surveys were distributed to airport employers to collect data on employment and economic activity. In addition, interviews were conducted and telephone follow-up contact was made to supplement the surveys in some cases. Respondents were informed that the survey results were confidential and only aggregate totals would appear in the written report.

On-airport economic activity created annual output of $6.9 million. Private sector aviation and non-aviation revenues were $6.7 million and governmental budgets were $0.2 million.

Private Aviation Firms

Redlands Airport offers a range of FBO services available for the aviation community including general aviation aircraft maintenance, servicing, inspections, and fueling for various categories of aircraft including piston, turboprop, helicopters and jet. Some 270,000 square feet of hangar space is available in several structures on the airport.

Aviation activities on the airport include flight training from introductory to advanced instruction, aircraft charter and rental, as well as pilot supplies.

Private Non-Aviation Firms

At present there is one non-aviation employer located directly on airport property. In the past, the typical approach to airport benefit analysis would restrict employment and revenue tallies to aviation firms only.

But today, analysts and planners have become increasingly aware of the importance of airports as drivers of economic growth within a region. Moreover, business sites on airport property have become attractive for non-aviation employers who desire locations with ready access to air transport or locations that are outside more congested industrial areas. In this report, aviation and non-aviation employers on the airport are combined in a single category of "on-airport employers."

This approach is consistent with modern economic development objectives, and also maintains the confidentiality of airport employers. Since there is only one non-aviation employer, the specific contribution of this firm to revenue and employment on the airport cannot be disclosed.

Government Budget

Operating funds for the airport are provided within the budget of the City of Redlands. This amount of $213,000 for the most recent year is included as part of the "output" originating on the airport, since it represents the value of government services.

On-Airport Summary

Economic activity on the airport by private aviation and non aviation employers as well as government agencies summed to $6.9 million of revenues and 19 jobs created. Payroll and proprietor's income (earnings) was $561,000.

TABLE B2
On-Airport Benefits: Revenues, Earnings and Employment
Redlands Municipal Airport

	BENEFIT MEASURES		
Sources of On-Airport Benefits	**Revenues**	**Earnings**	**Employment**
Private Aviation Employers FBO Services & Fueling Avionics & Maintenance Aircraft Storage Pilot Training & Supplies **Private Non-Aviation Employer** **City of Redlands**	**$6,856,000**	**$561,000**	**19**

Source: Survey of Employers, Redlands Municipal Airport

AIR VISITOR BENEFITS

Redlands Municipal Airport attracts general aviation visitors from throughout the region and the nation who come to the area for business, recreational and personal travel, including visiting relatives, medical consultation, or retail and investment spending.

This section provides detail on economic benefits from general aviation air travelers who use the airport. Values shown for spending (revenues), employment and earnings are benefits of initial visitor outlays and do not include secondary benefits of multiplier effects.

General Aviation Visitors

In order to analyze general aviation traffic patterns at the airport, a database of 3,000 general aviation flight plans involving Redlands Municipal Airport as either the destination or origin for travel was obtained from the FAA.

In this sample, the most frequent source of itinerant flights arriving at Redlands Municipal Airport was Jack Northrop Field (Hawthorne, California). Second in importance was Glendale Municipal Airport in the Phoenix, Arizona, metropolitan area.

These originations were followed by Camarillo in the Oxnard area, McClellan Palomar (Oceanside, California) and Santa Barbara Municipal rounding out the top five (Table B3). Overall, general aviation aircraft arriving at Redlands during the study period originated at more than 75 airports around the Western region and the nation.

TABLE B3
GA Aircraft Itinerant Origination
Redlands Municipal Airport

Rank and Origin	State
1. Northrop Field (Hawthorne)	CA
2. Glendale Municipal	AZ
3. Montgomery Field (San Diego)	CA
4. Camarillo	CA
5. McClellan-Palomar	CA
6. Santa Barbara Municipal	CA
7. Chino	CA
8. Love Field (Prescott)	AZ
9. John Wayne Airport	CA
10. Daugherty Field (Long Beach)	CA
11. North Las Vegas	NV
12. Big Bear City	CA
13. Chandler Municipal	AZ
14. Riverside Municipal	CA
15. McCarran International	NV

Source: FAA Flight Plan Data Base and Redlands Municipal Airport Records

Past years have often seen more than 15,000 itinerant general aviation operations annually at Redlands Municipal Airport. Operations involve both arrivals and departures.

It is useful to differentiate between itinerant operations by based and transient aircraft. An itinerant operation involves an origination or destination airport other than Redlands Municipal Airport. However, both based and non-based aircraft contribute to itinerant activity in any given day.

When a Redlands based aircraft returns to Redlands Municipal Airport from a flight to Sacramento, for example, that is an itinerant operation. When an aircraft based at an airport other than Redlands arrives at

Redlands Municipal Airport, that aircraft is classified as a transient itinerant.

Based aircraft contribute to the economic benefits of the airport through spending by owners for fuel, storage, maintenance, insurance, and other outlays in the Redlands area.

Transient aircraft bring benefits to the airport service area when they spend for fuel or maintenance while at the airport, or when visitors spend for food, lodging, and other expenses such as auto rental in the Redlands area. Overnight transient visitors typically have much larger expenditures than transient visitors who stay for a day or portion of a day.

According to analysis of flight records, there were 3,040 transient aircraft arrivals at Redlands Municipal Airport in 2006. Of these, 440 brought overnight visitors and 2,600 were one-day visitors (Table B4).

TABLE B4
General Aviation Transient Aircraft
Redlands Municipal Airport

Item	Annual Value
Itinerant AC Arrivals	10,250
Transient AC Arrivals	3,040
Overnight Transient AC	440
One Day Transient AC	2,600

Source: Derived from FAA Data and Redlands Municipal Airport Records

Separate analyses were conducted for those GA visitors with an overnight stay and those whose visit was one day or less in duration.

Overnight GA Visitors

Information on visiting general aviation aircraft was derived from a mail survey of visiting aircraft owners and pilots. Visitors were asked about the purpose of their trip, the size of the travel party, length of stay, type of lodging, and outlays by category.

The travel patterns underlying the calculation of overnight GA visitor economic benefits are shown in Table B5, for the 440 transient overnight aircraft arrivals during the year.

TABLE B5
General Aviation Overnight Visitors
Redlands Municipal Airport

Item	Annual Value
Transient AC Arrivals	3,040
Overnight Transient AC	440
Avg. Party Size	1.9
Number of Visitors	836
Average Stay (Days)	2.6
Visitor Days	2,174
Spending per Aircraft	$541
Total Expenditures	$237,000

Source: Derived from FAA Data, Redlands Municipal Airport Records and GA Visitor Survey

The average party size was 1.9 persons and the average overnight travel party stayed in the area for 2.6 days. There were 836 overnight visitors for the year, with a combined total of 2,174 visitor days. Spending per travel party per aircraft averaged $541. Total spending by all GA overnight visitors summed to $237,000 for the year.

Table B6 shows the percentage distribution of outlays by overnight travel parties at Redlands Municipal Airport. Food and Beverage accounts for 27 percent of visitor spending, averaging $144 per aircraft travel party.

Retail spending, at $119 per overnight aircraft made up 22 percent. Lodging, at $114 per overnight aircraft, made up 21 percent. Entertainment was the smallest expenditure category, at $59 for each visiting overnight general aviation travel party.

TABLE B6
Spending Per Overnight GA Aircraft
Redlands Municipal Airport

Category	Spending	Percent
Lodging	$114	21
Food/Drink	144	27
Retail	119	22
Entertainment	59	11
Transportation	105	19
TOTAL	$541	100

Source: GA Visitor Survey

Day GA Visitors

According to flight operations records, 25 percent of itinerant general aviation aircraft arriving at Redlands Municipal Airport were transients that stayed on the airport for one day or less.

During the year, there were 2,600 transient aircraft that stopped at the airport for one day. Some were only on the ground for a few minutes while others were parked several hours when the travel party had their aircraft serviced, pursued a personal activity or conducted business.

The average stay in the area for one day travel parties was 5.3 hours, according to arrival and departure records, with a range of 1 to 15 hours (Table B7).

TABLE B7
General Aviation Day Visitors
Redlands Municipal Airport

Item	Annual Value
Transient AC Arrivals	3,040
One Day Transient AC	2,600
Average Stay (Hours)	5.3
Avg. Party Size	2.1
Number of GA Visitors	5,460
Spending per Aircraft	$73
Total Expenditures	$190,000

Source: Derived from FAA Data, Redlands Municipal Airport Records and GA Visitor Survey

The economic benefits from arriving transient aircraft travel parties are of two types. Those pilots or aircraft owners that buy fuel or have their aircraft serviced on the airport are making purchases which contribute to the revenue stream received by aviation businesses on the airport. That type of spending creates output, employment, and earning on the airport. Those economic benefits are shown in Table B2 as on-airport benefits.

However, if the aircraft travel party leaves the airport to visit a corporate site, conduct a business meeting, or attend a sporting or cultural event, these off-airport activities generate off-airport spending that create jobs and earnings in the local community.

The total economic benefits created by off-airport spending by one-day general aviation visitors tallied to $190,000.

TABLE B8
Spending Per Day Visitor Aircraft
Redlands Municipal Airport

Category	Spending	Percent
Food/Drink	42	58
Retail	8	11
Entertainment	5	1
Transportation	18	25
TOTAL	$73	100

Source: GA Visitor Survey

The 2,600 day trip aircraft brought 5,772 visitors to the Redlands area during the year. The average spending per one-day aircraft was reported as $73.

The largest expenditure category for one-day visiting travel parties was purchase of food and beverages, which averaged $42 per aircraft travel party for the day and accounted for 58 percent of outlays (Table B8).

Spending for ground transportation (such as taxi or auto rental) was the second largest category, at $18 per aircraft.

Combined GA Visitor Spending

Table B9 shows the economic benefits resulting from spending in the region by combined overnight and day general aviation visitors arriving at Redlands Municipal Airport.

To recap, there were 3,040 transient general aviation aircraft that brought visitors to the airport during the year. Of these, 440 were arriving overnight general aviation aircraft and 2,600 were one day visiting aircraft that were parked long enough to make off-airport expenditures.

Each overnight travel party spent an average of $541 during their trip to the airport service area and travelers on each day visitor aircraft reported spending $73 per trip.

Multiplying the expenditures for each category of spending by the number of aircraft yields the total outlays for lodging, food and drink, entertainment, retail spending and ground transportation due to GA visitors during the year. This spending summed to $427,000 in annual revenues.

There were 7,634 visitor days attributable to general aviation travelers during the year. Twenty eight percent of visitor days (2,174) were due to overnight GA travelers and seventy two percent (5,460) were from one-day visitors.

On an average day, there were 21 visitors in the service area that had arrived by general aviation aircraft. Average daily spending by all GA air travelers was $1,170 within the airport service area. The average economic impact of any arriving GA transient aircraft (combined overnight and day visitor) was $140.

The largest single spending category by combined overnight and day visitors was for food and drink. The outlay of $172,000 accounted for 40 percent of the $427,000 spent by GA visitors. Spending by general aviation visitors for ground transportation was $93,000. Taken together, these two categories accounted for 56 percent of spending by visitors in the Redlands Municipal Airport service area. The third largest category was retail sales, at $73,000.

Of total spending of $427,000 created by GA visitors, an average of 40 cents of each dollar circulated within the service area as earnings generated by the presence of the airport. (Earnings includes wages and salaries paid to workers as well as income received by proprietors of businesses.) The earnings taken home by tourism/visitor sector workers and proprietors for spending in their own community summed to $171,000 during the year.

Expenditures by GA visitors created 7 jobs in the tourist sector in the Redlands Municipal Airport service area. Food and drink spending created the greatest number of jobs and the largest dollar value of earnings received by workers and proprietors ($59,000).

TABLE B9
Economic Benefits from GA Visitors - Revenues, Earnings and Employment
Redlands Municipal Airport

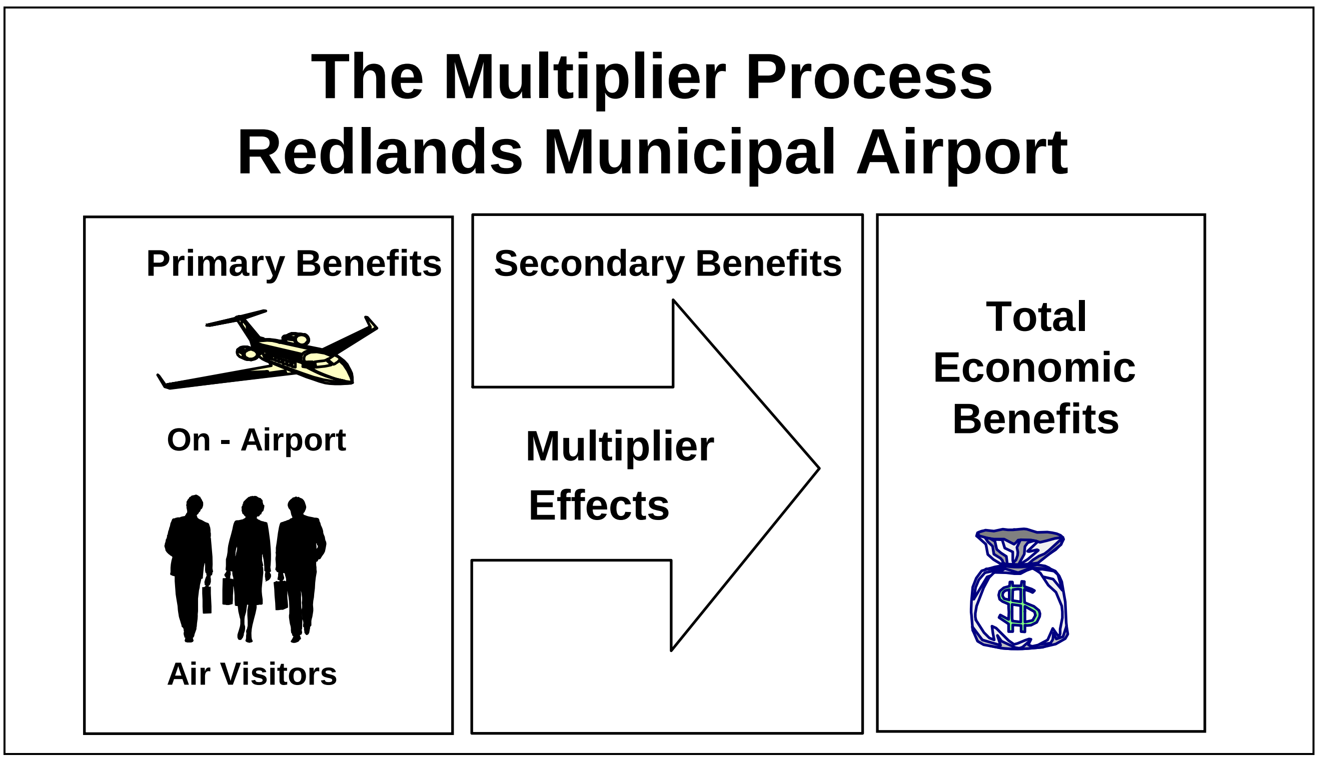
Category	Overnight AC Expenditures	One Day AC Expenditures	Total Visitor Expenditures	Earnings	Employment
Lodging	$50,000		$50,000	$18,000	1
Food/Drink	63,000	$109,000	172,000	59,000	3
Retail Sales	52,000	21,000	73,000	32,000	1
Entertainment	26,000	13,000	39,000	13,000	1
Ground Trans.	46,000	47,000	93,000	49,000	1
TOTAL	$237,000	$190,000	$427,000	$171,000	7

SECONDARY BENEFITS: MULTIPLIER EFFECTS

The output, employment, and earnings from on-airport activity and off-airport visitor spending represent the computed primary benefits from the presence of Redlands Municipal Airport. For the service area, these primary benefits summed to $7.3 million of output (measured as revenues to firms and budgets of administrative units), 26 jobs, and earnings to workers and proprietors of $0.732 million. These figures for initial economic activity created by the presence of the airport do not include the "multiplier effects" that result from additional spending induced in the economy to produce the initial goods and services.

Production of aviation output requires inputs in the form of supplies and labor. Purchase of inputs by aviation firms has the effect of creating secondary or multiplier revenues and employment that should be included in total benefits of the airport. Airport benefit studies rely on multiplier factors from input-output models to estimate the impact of secondary spending on output, earnings and employment to determine benefits, as illustrated in the figure below.

The multipliers used for this study were from the IMPLAN input-output model based on data for San Bernardino County from the California Department of Economic Development and the U. S. Bureau of Economic Analysis. To demonstrate the methodology, average San Bernardino County multipliers are shown in Table B10.



The multipliers represent weighted averages for combined industries in each category. For example, the visitor benefits multipliers shown combine lodging, food services, retailing, auto rental and entertainment multipliers used in the analysis.

The multipliers in this table illustrate the process for calculating the secondary and total impacts on all industries of the regional economy resulting from the initial impact of each aviation related industry. The multipliers for output show the average dollar change in revenues for all firms in the service area due to a one-dollar increase in revenues either on the airport or through visitor spending.

For example, each dollar of new output (revenue) created by on-airport employers circulates through the economy until it has stimulated ***total*** output in all industries in the service area of $2.22 or, put differently, the revenue multiplier of 2.22 for on-airport activity shows that for each dollar spent on the airport there is ***additional*** spending created as $1.21 of secondary or multiplier spending.

Primary revenues from all sources associated with the presence of Redlands Municipal Airport were $7.3 million for the year. After accounting for the multiplier effect, total revenues created within the service area were $16.2 million. Secondary revenues were $8.9 million, the difference between total and initial revenues.

The multiplier for earnings shows the dollar change in earnings for the economy due to a one-dollar increase in earnings either on the airport or in the visitor sector. The earnings multipliers determine how wages paid to workers on or off the airport stay within the economy and create additional spending and earnings for workers in other industries. For example, each dollar of wages paid for workers on the airport stimulates an additional $1.96 of earnings in the total economy.

The initial wages of $0.561 million for aviation workers and proprietors on the airport were spent for consumer goods and services that in turn created additional earnings of $0.538 million for workers in the general economy.

The total earnings benefit of the airport was $1.5 million, consisting of $0.732 million of initial benefits and $0.787 million of secondary benefits. The economic interpretation is that the presence of the airport provided employment and earnings for workers, who then re-spent these dollars in the service area.

The multipliers for employment show the total change in jobs for the service area due to an increase of one job on or off the airport. Each job on the airport is associated with 1.74 total jobs in the rest of the airport service area. Similarly, each job in the hospitality industry supported by air visitor spending is associated with 1.86 total jobs (primary + secondary) in the general economy.

The overall result is that the 26 initial jobs created by the airport supported an additional 20 jobs in the service area as secondary employment. The sum of the initial aviation related jobs and secondary jobs created in the general economy is the total employment of 46 workers that can be attributed to the presence of the airport.

The information above is intended for illustration only. In the full analysis, appropriate separate multipliers were used for on-airport aviation employers and visitor spending categories (lodging, eating places, retail, entertainment, and ground transportation).

TABLE B10
Average Multipliers and Secondary Benefits Within the Airport Service Area
Redlands Municipal Airport

Revenue Source	Primary Revenues	Average Output Multipliers	Secondary Revenues	Total Revenues
On-Airport Benefits	**$6,856,000**	**2.22**	**$8,362,000**	**$15,218,000**
Visitor Benefits	**427,000**	**2.25**	**535,000**	**962,000**
Revenues	***$7,283,000***		***$8,897,000***	***$16,180,000***
Earnings Source	**Primary Earnings**	**Average Earnings Multipliers**	**Secondary Earnings**	**Total Earnings**
On-Airport Benefits	**$561,000**	**1.96**	**$538,000**	**$1,099,000**
Visitor Benefits	**171,000**	**2.46**	**249,000**	**420,000**
Earnings	***$732,000***		***$787,000***	***$1,519,000***
Employment Source	**Primary Employment**	**Average Employment Multipliers**	**Secondary Employment**	**Total Employment**
On-Airport Benefits	**19**	**1.74**	**14**	**33**
Visitor Benefits	**7**	**1.86**	**6**	**13**
Employment	***26***		***20***	***46***

Notes: Multipliers above are weighted averages intended to illustrate how secondary and total benefits were calculated for Redlands Municipal Airport. In the full analysis, separate multipliers were used for on-airport employers (FBO and other airport businesses), and visitor spending (lodging, eating places, retailing, entertainment, and ground transportation). Multipliers were for Redlands Municipal Airport service area (San Bernardino County) as produced by the IMPLAN input-output model based on data from the California Department of Economic Development and U. S. Bureau of Economic Analysis.

BASED AIRCRAFT BENEFITS

A survey of owners of aircraft based at Redlands Municipal Airport was conducted to compile information on private aircraft usage patterns, including number of trips per year, purpose of travel, average party size, and hours flown per trip. Questions were also posed concerning the importance of the airport for residential location and businesses of flyers.

TABLE B11
Based Aircraft Profile
Redlands Municipal Airport

Type	Number
Total Based Aircraft	**221**
Single Engine	**194**
Multi-Engine	**20**
Turbine	**1**
Helicopter/Other	**6**

Source: Redlands Municipal Airport

Mailing addresses were obtained through the assistance of the City of Redlands who provided access to public records on aircraft ownership.

There were 221 based-aircraft at Redlands Municipal Airport (Table B11). Of these, 194 were single engine, 20 were multi-engine, 3 were helicopters, and there was 1 jet. Other types of aircraft at the airport included gliders and ultralights.

Characteristics of based aircraft at Redlands Municipal Airport are set out in Table B12. The table illustrates that the average value for an individual aircraft was $126,000 and annual outlays were $14,000 for maintenance, upkeep, storage, and other expenses such as insurance.

Multiplying the average expenditures per aircraft of $14,000 times 221 aircraft gives total outlays by aircraft owners of more than $3.0 million injected into the economy, much of it going to the immediate airport service area.

The aircraft based at Redlands Municipal Airport represent assets to their owners with estimated total value exceeding $30 million. Many based aircraft are viewed as investments by their owners that provide returns through enhanced revenues and time savings when compared to scheduled airline travel. Entries in Table B12 also illustrate the relation between private aircraft ownership and business activity in the San Bernardino County area served by the airport.

Aircraft owners contribute to the economy when they use their aircraft for business purposes. Faster travel and more responsive businesses make the entire region more competitive. According to the aircraft owner survey, Redlands based aircraft are used for business for 16,000 flying hours per year.

The presence of the airport as a factor affecting the personal quality of life and business success of aircraft owners was measured by survey questions asking respondents to rate the airport as “very important, important, slightly important, or not important” to their residential location decision and their business.

The survey results show that Redlands Municipal Airport is a significant factor in influencing the success of business and professional activity of aircraft owners.

- **Seven out of ten of all responding based aircraft owners (78%) said that the airport is "very important" or "important" to the success of their business.**

- **Further, nine out of ten aircraft owners (95%) stated that the airport is "very important" or "important" to their residential location decision.**

Those who reported the airport as important to their business were also asked for information about their business.

- **Firms represented by users of based aircraft for business purposes accounted for 1,470 employees in the county and surrounding area, and the businesses of the combined respondents accounted for a reported $636 million in annual sales.**

Drawing from these results, it is evident that Redlands Municipal Airport plays a key role in the overall quality of life and level of economic activity in the San Bernardino County area, and particularly supports the business community.

TABLE B12
Based Aircraft Characteristics and Business Activity
Redlands Municipal Airport

Category	All Based AC
Average Aircraft Value	$126,000
Maintenance & Upkeep per Year	$14,000
Business Hours Flown per Year	16,000
Business Hours as Percent of All Hours	48.5%
Airport "Very Important" /"Important" to Business	78.6%
Employees of Owners of Based Aircraft	1,470
Annual Sales of Firms with Aircraft	$636,000,000

Notes: Figures are derived from Based Aircraft Owner Survey; business jet not included in computation of average value or maintenance expenses.

Based aircraft owners at Redlands Municipal Airport reported flying 33,000 non-training hours per year (Table B13). Of these, 16,000 or 48.5 percent were for business and 17,000 or 51.5 percent were for personal travel. Of all owners, 70 percent reported significant business use for their aircraft.

TABLE B13
Based Aircraft Use Patterns
Redlands Municipal Airport

Usage Measure	Annual Hours
Total Number of Hours	33,000
Business Hours	16,000
Personal Hours	17,000
Percent Business Hours	48.5%
Percent Personal Hours	51.5%

Source: Based Aircraft Owner Survey

The typical business trip for a general aviation aircraft had 1.1 persons in the travel party (Table B14), according to survey responses completed by aircraft owners. Redlands Municipal Airport based aircraft flew 17,600 passenger hours during the year for business purposes.

The average aircraft based at Redlands Municipal Airport was flown 86 hours on personal trips per year. The typical round trip for pleasure, recreation or other personal reasons had 2.2 persons in the travel party (Table B15). There were 37,400 passenger hours flown for personal reasons that originated at Redlands Municipal Airport during the year.

(Note: Passenger hours flown on business or personal use were computed from multiplying average party size by hours flown, to obtain total passenger hours.)

TABLE B14
Based Aircraft - Business Use
Redlands Municipal Airport

Item	Annual Value
Business Hours	16,000
Avg. Party Size	1.1
Passenger Hours	17,600

Source: Based Aircraft Owner Survey

TABLE B15
Based Aircraft - Personal Use
Redlands Municipal Airport

Usage Measure	Annual Value
Personal Hours	17,000
Avg. Hours per AC	86
Avg. Party Size	2.2
Passenger Hours	37,400

Source: Based Aircraft Owner Survey

An estimate of the value of travel on based aircraft may be obtained by computing the cost of making these same trips on a chartered flight. This approach is approved by the Internal Revenue Service for valuation of aircraft travel use by corporate executives.

The cost of charter flights varies by time, distance and type of aircraft. Table B16 shows charter rates for round trips of two to four hours from Redlands Municipal Airport in 2006. A weighted average charter cost was determined for single and multi engine aircraft by assigning a cost equivalent weighted by the number of each aircraft type based at the airport. For example, since 90% of the aircraft are single engine, the cost of a single engine charter had a weight of 0.9 in the charter cost for single and multi engine flights, to produce a weighted charter cost of $710 per hour for non-jet charters.

The one business jet based at the airport flew 10.5 percent of the total 33,000 hours reported for the year. The $5,247 jet charter cost was thus weighted by 10.5% and combined with the $710 to produce a charter cost weighted by hours flown of $1,186. The charter equivalent value of general aviation business travel originating at Redlands Municipal Airport for the year totaled $39.1 million.

This value of travel estimate, while very large, does not accurately measure all the associated economic gains and benefits that result from business trips. A single air trip can result in additional profits, fees, or revenues to a firm. Trips for medical reasons have high economic value as well. Further, the flexibility compared to scheduled airline travel and the time saved by general aviation travel compared to automobile use is not calculated here, but has economic significance.

TABLE B16
Charter Equivalent Value of General Aviation Travel For Business
Redlands Municipal Airport

Aircraft Type	Number	Weights	Charter Cost (Hr)	Weighted Cost
Single Engine	**194**	**0.91**	**$674**	***$710***
Multi Engine	**20**	**0.09**	**$1,079**	
Aircraft Type	**Hours**	**Weights**	**Charter Cost (Hr)**	**Weighted Cost**
Non-Jet	**30,000**	**.895**	**$710**	***$1,186***
Jet	**3,000**	**.105**	**$5,247**	
			Overall *Weighted Hourly Charter Cost*	***$1,186***

Charter Equivalent Value Based On Weighted Cost Per Flight

Hours	Trip Cost	Total Value
33,000	**$1,186**	**$39,138,000**

Note: Charter costs by aircraft type for 2.5 hour round trip, average of various charter firms, 2006. Does not include standby time, landing fees, other charges. Distance range 50-600 miles.

SUMMARY & FUTURE BENEFITS

Airports are available to serve the flying public and support the regional economy every day of the year. On a typical day at Redlands Municipal Airport, there are more than 50 operations by aircraft involved in local or itinerant activity including flight instruction, touch and go operations, corporate travel, or transient aircraft bringing passengers visiting the area for personal travel or on business.

During each day of the year, Redlands Municipal Airport generates $43,800 of revenues within its service area (see box). Revenues and production support jobs, not only for the suppliers and users of aviation services, but throughout the economy.

Each day Redlands Municipal Airport provides 19 jobs on the airport and in total supports 46 area workers bringing home daily earnings of $4,000 for spending in their home communities.

On an average day during the year, there are 20 visitors in the area who arrived at Redlands Municipal Airport. Some will stay in the Redlands area for only a few hours while they conduct their business, and others will stay overnight. The average spending by these visitors on a typical day injects $1,170 into the local economy.

Table B17 shows a summary of current economic benefits associated with the airport. Primary benefits to the service area, without multiplier effects, include revenues of $7.3 million, 26 jobs and earnings to workers and proprietors of $0.732 million.

Redlands Municipal Airport Daily Economic Benefits

- **$43,800 Revenue**
- **46 Local Jobs Supported**
- **$1,170 Visitor Spending**
- **20 Air Visitors**

TABLE B17
Summary of Economic Benefits: 2006
Redlands Municipal Airport

	Revenues	Earnings	Employment
On-Airport Activity	**$6,856,000**	**$561,000**	**19**
Air Visitors	**427,000**	**171,000**	**7**
Primary Benefits	**7,283,000**	**732,000**	**26**
Secondary Benefits	**8,897,000**	**787,000**	**20**
Total Benefits	**16,180,000**	**1,519,000**	**46**

Note: Revenues, earnings and employment benefits reflect activity associated with 82,000 operations in 2006.

Including secondary or multiplier effects, total benefits to the service area are $16.2 million in revenues, 46 jobs and earnings of $1.5 million.

Redlands Municipal Airport is the origin of thousands of general aviation trips per year. Corporate and other private aircraft are used to visit other parts of the nation, and to bring visitors, customers and employees to the Redlands area. The estimated cost of chartering aircraft to serve the business needs of these travelers was found to be $39.1 million. In addition, the presence of the Redlands Municipal Airport provides unmeasured benefits in the form of flexibility in travel not found through reliance on scheduled air carriers.

It is important for citizens and policy makers to be aware that there are unmeasured but qualitative benefits from aviation that represent significant social and economic value created by airports for the regions which they serve. In addition to exerting a positive influence on economic development in general, aviation often reduces costs and increases efficiency in individual firms. Annual studies by the National Business Aviation Association show that those firms with business aircraft have sales 4 to 5 times larger than those that do not operate aircraft. In 2006, the net income of aircraft operating companies was 6 times larger than non-operators (see National Business Aviation Association, *Fact Book*, 2006).

Future Benefits

The service area of Redlands Municipal Airport is located one of the stronger growth areas of California. The area served by the airport has become an attractive location for business and newcomers seeking respite from the congestion and urban issues facing the more heavily urbanized portions of Southern California, particularly the Los Angeles area. Tables B18 through B20 illustrate the future benefits of the Redlands Municipal airport based on short term, intermediate term and long term operations forecasts.

TABLE B18
Aviation Related Economic Benefits: Short Term Demand Planning Horizon
Redlands Municipal Airport

	Revenues	Earnings	Employment
On-Airport Benefits	$8,100,000	$660,000	22
Visitor Benefits	510,000	205,000	8
Primary Benefits	8,610,000	865,000	30
Secondary Benefits	10,600,000	939,000	22
Total Benefits	$19,210,000	$1,604,000	52

Note: Revenues, earnings and employment benefits exclude capital projects. Values shown are constant 2006 dollars, and represent airport operation growth from 82,000 to 97,800.

TABLE B19
Aviation Related Economic Benefits: Intermediate Term Demand Planning Horizon
Redlands Municipal Airport

	Revenues	Earnings	Employment
On-Airport Benefits	$9,300,000	$775,000	26
Visitor Benefits	590,000	235,000	9
Primary Benefits	9,890,000	1,110,000	35
Secondary Benefits	12,200,000	1,080,000	28
Total Benefits	$21,0900,000	$2,190,000	63

Note: Revenues, earnings and employment benefits exclude capital projects. Values shown are constant 2006 dollars, and represent airport operation growth from 97,800 to 113,000.

TABLE B20
Aviation Related Economic Benefits: Long Term Demand Planning Horizon
Redlands Municipal Airport

	Revenues	Earnings	Employment
On-Airport Benefits	**$10,500,000**	**$870,000**	**30**
Visitor Benefits	**700,000**	**270,000**	**11**
Primary Benefits	**11,200,000**	**1,040,000**	**41**
Secondary Benefits	**13,700,000**	**1,200,000**	**31**
Total Benefits	**$25,000,000**	**$2,240,000**	**72**

Note: Revenues, earnings and employment benefits exclude capital projects. Values shown are constant 2006 dollars, and represent airport operation growth from 113,000 to 127,300.

Tax Impacts

Because of the spending, jobs, and earnings created by the presence of Redlands Municipal Airport, the facility is an important source of public revenues. As airport activity expands, tax revenues will continue to grow.

Estimated tax potential is set out in Table B21. The table shows the revenues for each tax category based on current average tax rates relative to output and personal income (earnings) for Redlands, San Bernardino County, and California. Federal taxes are applied using current federal rates.

The first column in Table B21 shows tax revenues associated with the current level of airport activity and total economic benefits of $16.2 million. The 46 workers in the service area have earnings of $1.5 million.

Federal social security taxes are estimated at $643,000, the largest component of federal taxes. The second largest federal tax category is the personal income tax of $525,000.

Overall, federal tax revenues currently collected due to economic activity associated with Redlands Municipal Airport are estimated to be $1.48 million. State and local tax revenues are shown in the lower portion of the table. Tax revenues sum to $1.0 million for the current level of operations. The largest single component is sales taxes of $299,500. Combined federal, state, and local taxes are $2.49 million at the current level of operations.

Projected taxes for future demand based activity levels are available for aviation related activity only. From $2.9 million for short term activity, total taxes rise to $3.86 million as demand and airport activity rise to higher operations in the intermediate term. In the long term planning period, total economic benefits related to aviation reaches $25 million, including all multiplier effects and taxes are $3.86 million.

TABLE B21
Tax Impacts from On Airport and Visitor Economic Activity
Redlands Municipal Airport

Federal Taxes				
Revenue Category	**Current**	**Short Term**	**Intermediate Term**	**Long Term**
Corporate Profits Tax	$238,000	$284,000	$328,000	$370,000
Personal Income Tax	525,500	626,500	724,000	816,000
Social Security Taxes	643,000	767,000	886,000	998,000
All Other Federal Taxes	82,000	98,000	113,000	127,000
Total Federal Taxes	**$1,488,500**	**$1,775,500**	**$2,051,000**	**$2,311,000**
State and Local Taxes				
Revenue Category	**Current**	**Short Term**	**Intermediate Term**	**Long Term**
Corporate Profits Tax	$62,000	$74,000	$85,500	$96,000
Motor Vehicle Taxes	12,000	14,000	16,000	18,000
Property Taxes	200,000	238,500	275,500	310,000
Sales Taxes	299,500	357,000	413,000	465,000
Personal Income Tax	177,000	211,000	244,000	275,000
All Other S & L	252,000	301,000	348,000	392,000
Total S & L	**$1,002,500**	**$1,195,500**	**$1,382,000**	**$1,556,000**
Total Taxes	**$2,491,000**	**$2,971,000**	**$3,433,000**	**$3,867,000**

Note: All figures are in CY2006 dollars. Derived from average tax rates in Redlands, CA and Federal sources. Current impact estimate based on economic activity associated with 82,000 operations; short term operations of 97,800; intermediate operations of 113,000 and long term operations of 127,300.

APPENDIX C

AIRPORT LAYOUT PLAN DRAWINGS

AIRPORT LAYOUT PLANS
FOR
REDLANDS MUNICIPAL AIRPORT

Prepared for the

City of Redlands, California

INDEX OF DRAWINGS

1. AIRPORT LAYOUT DRAWING
2. PART 77 AIRSPACE DRAWING
3. RUNWAY APPROACH ZONE PROFILES/RUNWAY PROFILE
4. INNER PORTION OF RUNWAY 8-26 APPROACH SURFACE DRAWING
5. DEPARTURE SURFACE DRAWING
6. AIRPORT PROPERTY MAP

DRAFT

Coffman Associates
Airport Consultants

RUNWAY DATA

	RUNWAY 8-26			
	EXISTING		ULTIMATE	
	8	26	8	26
AIRCRAFT APPROACH CATEGORY-DESIGN GROUP	B-I [1]		B-I [1]	
APPROACH VISIBILITY MINIMUMS (LOWEST)	1 MILE	1 MILE	1 MILE	1 MILE
CRITICAL AIRCRAFT	BEECH KING AIR F90		BEECH KING AIR F90	
CRITICAL AIRCRAFT WINGSPAN	45.9'		45.9'	
CRITICAL AIRCRAFT UNDERCARRIAGE WIDTH	13.0'		13.0'	
CRITICAL AIRCRAFT APPROACH SPEED (KNOTS)	108		108	
CRITICAL AIRCRAFT MAXIMUM CERTIFIED TAKEOFF WEIGHT (LBS.)	10,950		10,950	
14 C.F.R. PART 77 CATEGORY	C	C	C	C
PERCENTAGE OF WIND COVERAGE (ALL WEATHER IN MPH)	97.21%-12/97.67%-15/98.13%-18/98.83%-23		97.21%-12/97.67%-15/98.13%-18/98.83%-23	
LINE OF SIGHT REQUIREMENT MET	YES		YES	
MAXIMUM ELEVATION (ABOVE MSL)	1574.2		1574.2	
LOWEST ELEVATION (ABOVE MSL)	1471.5		1471.5	
RUNWAY DIMENSIONS	4,505' x 75'		4,505' x 75'	
RUNWAY BEARING (TRUE BEARING - DECIMAL DEGREES)	89.6615	296.6698	89.6615	296.6698
RUNWAY APPROACH SURFACES (14 C.F.R. PART 77)	20:1	20:1	20:1	20:1
RUNWAY END ELEVATION	1468.8	1571.4	1468.8	1571.4
RUNWAY THRESHOLD DISPLACEMENT	0'	0'	0'	0'
RUNWAY THRESHOLD SITING REQUIREMENTS (APPENDIX 2, CATEGORY)	2	2	2	2
RUNWAY STOPWAY	0'	0'	0'	0'
RUNWAY SAFETY AREA (RSA)	4,985' x 120'		4,985' x 120'	
RUNWAY SAFETY AREA (RSA) BEYOND RUNWAY STOP END	240'	240'	240'	240'
RUNWAY OBSTACLE FREE ZONE (OFZ)	4,905' x 120'		4,905' x 120'	
RUNWAY OBSTACLE FREE ZONE (OFZ) BEYOND RUNWAY STOP END	200'	200'	200'	200'
RUNWAY OBJECT FREE AREA (OFA)	4,822' x 250'		4,985' x 250'	
RUNWAY OBJECT FREE AREA (OFA) BEYOND RUNWAY STOP END	77'	240'	240'	240'
RUNWAY PAVEMENT SURFACE MATERIAL	ASPHALT		ASPHALT	
RUNWAY PAVEMENT STRENGTH (IN THOUSAND LBS.)[2]	12.5(S)		12.5(S)	
RUNWAY EFFECTIVE GRADIENT	2.28%		2.28%	
RUNWAY MAXIMUM GRADIENT	2.28%		2.28%	
RUNWAY TOUCHDOWN ZONE ELEVATION (ABOVE MSL)	1556.4	1551.2	1556.4	1551.2
RUNWAY MARKING	BASIC	BASIC	NONPRECISION	NONPRECISION
RUNWAY LIGHTING	MIRL		MIRL	
RUNWAY APPROACH LIGHTING	NONE	NONE	NONE	NONE
RUNWAY TO TAXIWAY SEPARATION (FROM CENTERLINE TO CENTERLINE)	150'		150'	
RUNWAY HOLD LINE POSITION (FROM RUNWAY CENTERLINE)	125'		125'	
TAXIWAY TO TAXILANE SEPARATION (FROM CENTERLINE TO CENTERLINE)	69'		69'	
TAXIWAY CENTERLINE TO FIX OR MOVEABLE OBJECT	44.5'		44.5'	
TAXIWAY LIGHTING	MITL		MITL	
TAXIWAY MARKING	CENTERLINE		CENTERLINE	
TAXIWAY SURFACE MATERIAL	ASPHALT		ASPHALT	
TAXIWAY WINGTIP CLEARANCE	20'		20'	
TAXIWAY WIDTH	40' TO 116'		40' TO 116'	
TAXIWAY SAFETY AREA WIDTH	49'		49'	
TAXIWAY OBJECT FREE AREA WIDTH	89'		89'	
RUNWAY VISUAL NAVIGATIONAL AIDS	REIL PAPI-2L	REIL	REIL PAPI-2L	REIL PAPI-2L

[1]Small aircraft exclusively.
[2]Pavement strengths are expressed in Single(S) wheel loading capacities.

AIRPORT DATA

REDLANDS MUNICIPAL AIRPORT (REI)

CITY: REDLANDS, CALIFORNIA | COUNTY: SAN BERNARDINO, CA | RANGE: 3 W | TOWNSHIP: 1 S

		EXISTING	ULTIMATE
AIRPORT SERVICE LEVEL		GENERAL AVIATION	GENERAL AVIATION
AIRPORT REFERENCE CODE		B-I [1]	B-I [1]
DESIGN AIRCRAFT		BEECH KING AIR F90	BEECH KING AIR F90
AIRPORT ELEVATION		1571.4 MSL	1571.4 MSL
MEAN MAXIMUM TEMPERATURE OF HOTTEST MONTH		94° F (AUGUST)	94° F (AUGUST)
AIRPORT REFERENCE POINT (ARP) COORDINATES (NAD 83)	LATITUDE	34° 05' 06.940" N	34° 05' 06.940" N
	LONGITUDE	117° 08' 46.960" W	117° 08' 46.960" W
AIRPORT AND TERMINAL NAVIGATIONAL AIDS		SEGMENTED CIRCLE PAPI-2L (8) GPS-A	SEGMENTED CIRCLE PAPI-2L GPS-A ATCT
GPS APPROACH		YES	YES

[1]Small aircraft exclusively.

RUNWAY END COORDINATES (NAD 83)

RUNWAY		EXISTING	ULTIMATE
Runway 8	Latitude	34° 05' 06.810" N	34° 05' 06.810" N
	Longitude	117° 09' 13.740" W	117° 09' 13.740" W
Runway 26	Latitude	34° 05' 07.070" N	34° 05' 07.070" N
	Longitude	117° 08' 20.190" W	117° 08' 20.190" W

ULTIMATE BUILDINGS/FACILITIES

BLDG. NO.	DESCRIPTION
101	TERMINAL BUILDING
102	AIR TRAFFIC CONTROL TOWER (ATCT)
103	CONVENTIONAL HANGAR
104	CONVENTIONAL HANGAR
105	CONVENTIONAL HANGAR
106	CONVENTIONAL HANGAR
107	CONVENTIONAL HANGAR
108	CONVENTIONAL HANGAR
109	CONVENTIONAL HANGAR
110	CONVENTIONAL HANGAR
111	STORAGE HANGAR
112	STORAGE HANGAR
113	STORAGE HANGAR
114	STORAGE HANGAR
115	STORAGE HANGAR
116	STORAGE HANGAR
117	STORAGE HANGAR
118	STORAGE HANGAR
119	STORAGE HANGAR
120	STORAGE HANGAR
121	STORAGE HANGAR
122	STORAGE HANGAR
123	STORAGE HANGAR
124	STORAGE HANGAR
125	STORAGE HANGAR
126	STORAGE HANGAR
127	STORAGE HANGAR
128	STORAGE HANGAR
129	AIRCRAFT WASH RACK
130	AIRPORT MAINTENANCE
131	CONSOLIDATED FUEL STORAGE

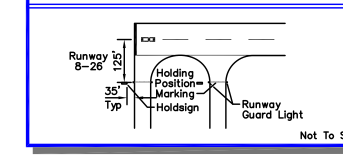
EXISTING BUILDINGS/FACILITIES

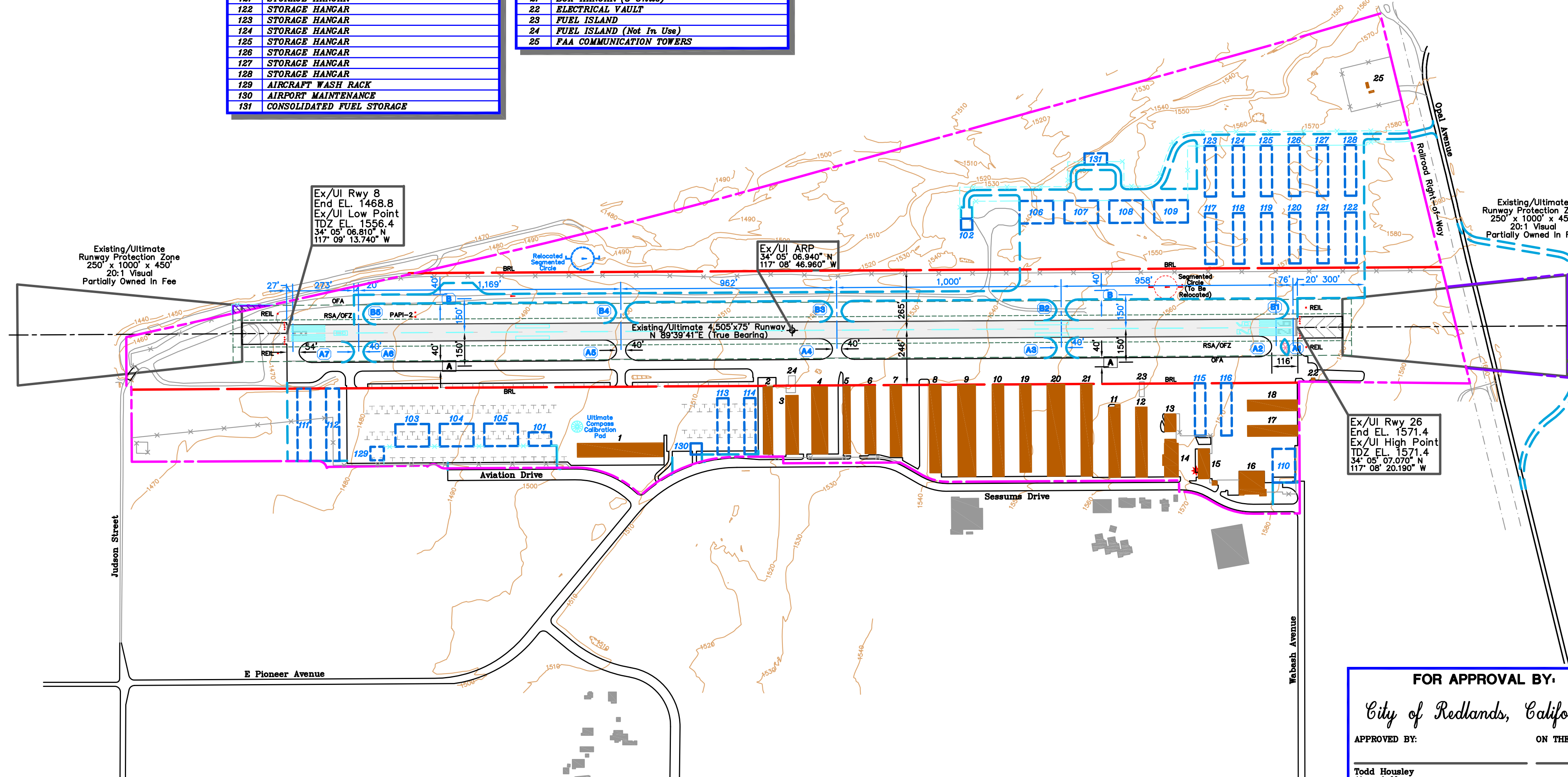
BLDG. NO.	DESCRIPTION
1	T-HANGAR (16 Units)
2	BOX HANGAR (12 Units)
3	T-HANGAR (11 Units)
4	BOX HANGAR (12 Units)
5	BOX HANGAR (7 Units)
6	BOX HANGAR (14 Units)
7	BOX HANGAR (14 Units)
8	BOX HANGAR (6 Units)
9	BOX HANGAR (16 Units)
10	BOX HANGAR (8 Units)
11	T-HANGAR (14 Units)
12	T-HANGAR (14 Units)
13	TERMINAL BUILDING
14	CONVENTIONAL HANGAR (3 Units)
15	CONVENTIONAL HANGAR
16	CONVENTIONAL HANGAR
17	T-HANGAR (12 Units)
18	T-HANGAR (12 Units)
19	BOX HANGAR (6 Units)
20	BOX HANGAR (16 Units)
21	BOX HANGAR (8 Units)
22	ELECTRICAL VAULT
23	FUEL ISLAND
24	FUEL ISLAND (Not In Use)
25	FAA COMMUNICATION TOWERS

THRESHOLD SITING SURFACE OBJECT PENETRATIONS

OBJECT	PENETRATION	DISPOSITION
RUNWAY 26 - SERVICE ROAD	6'	---

HOLDING POSITION MARKINGS/SIGN





VICINITY MAP

LOCATION MAP

OBSTACLE FREE ZONE (OFZ) OBJECT PENETRATIONS

OBJECT	PENETRATION	DISPOSITION
Fence Off End Of Runway 8	1'	Lease Property/Relocate Fence

LEGEND

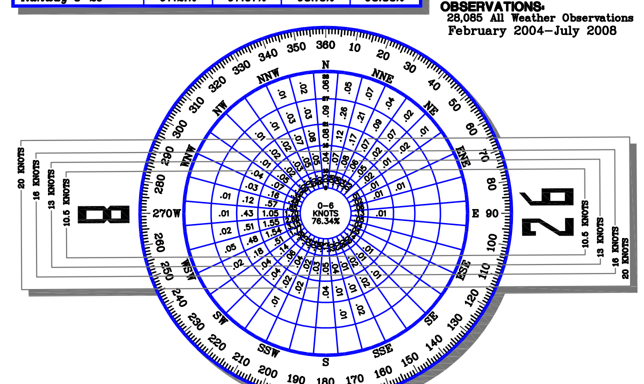
EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		BUILDING REMOVAL
		BUILDING CONSTRUCTION (On/Off Airport)
BRL	BRL	BUILDING RESTRICTION LINE (BRL)
		FACILITY (PAVEMENT) CONSTRUCTION
		FENCING
		LEASE PARCEL
PAPI-2	PAPI-2	PRECISION APPROACH PATH INDICATOR
xOFA	uOFA	RUNWAY OBJECT FREE AREA
xOFZ	uOFZ	RUNWAY OBSTACLE FREE ZONE
		RUNWAY PROTECTION ZONE (RPZ)
xRSA	uRSA	RUNWAY SAFETY AREA
		RUNWAY END IDENTIFICATION LIGHTS (REIL)
		RUNWAY THRESHOLD LIGHTS
34/35 3/2	34/35 3/2	SECTION CORNER
		SEGMENTED CIRCLE/WIND INDICATOR
A1	B1	TAXIWAY DESIGNATION
		TAXIWAY HOLD LINE
1080	1080	TOPOGRAPHY
		WIND INDICATOR (Lighted)

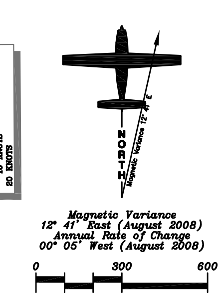
ALL WEATHER WIND COVERAGE

Runway	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 8-26	97.21%	97.67%	98.13%	98.83%

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
San Bernardino International Airport (SBD)
San Bernardino, California

OBSERVATIONS:
28,085 All Weather Observations
February 2004-July 2008





GENERAL NOTES:

1. Depiction of features and objects, including related elevations and clearances, within the runway depicted on the INNER PORTION APPROACH SURFACE DRAWINGS.
2. Building Restriction Line (BRL) is established in accordance with 14 C.F.R. Part 77 criteria.
3. All Elevations are in NAVD 88.
4. Fence extends along property line except where shown.
5. There are no Primary Airport Control (PAC) or Secondary Airport Control (SAC) points within five miles of Redlands Municiapl Airport (REI).

FOR APPROVAL BY:

City of Redlands, California

APPROVED BY: ______ ON THE DATE OF: ______

Todd Housley
Airport Manager

FAA APPROVAL STAMP

NO.	REVISIONS	BY	DATE APP'D.

"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 OFFICAL 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."

REDLANDS MUNICIPAL AIRPORT (REI)

AIRPORT LAYOUT DRAWING

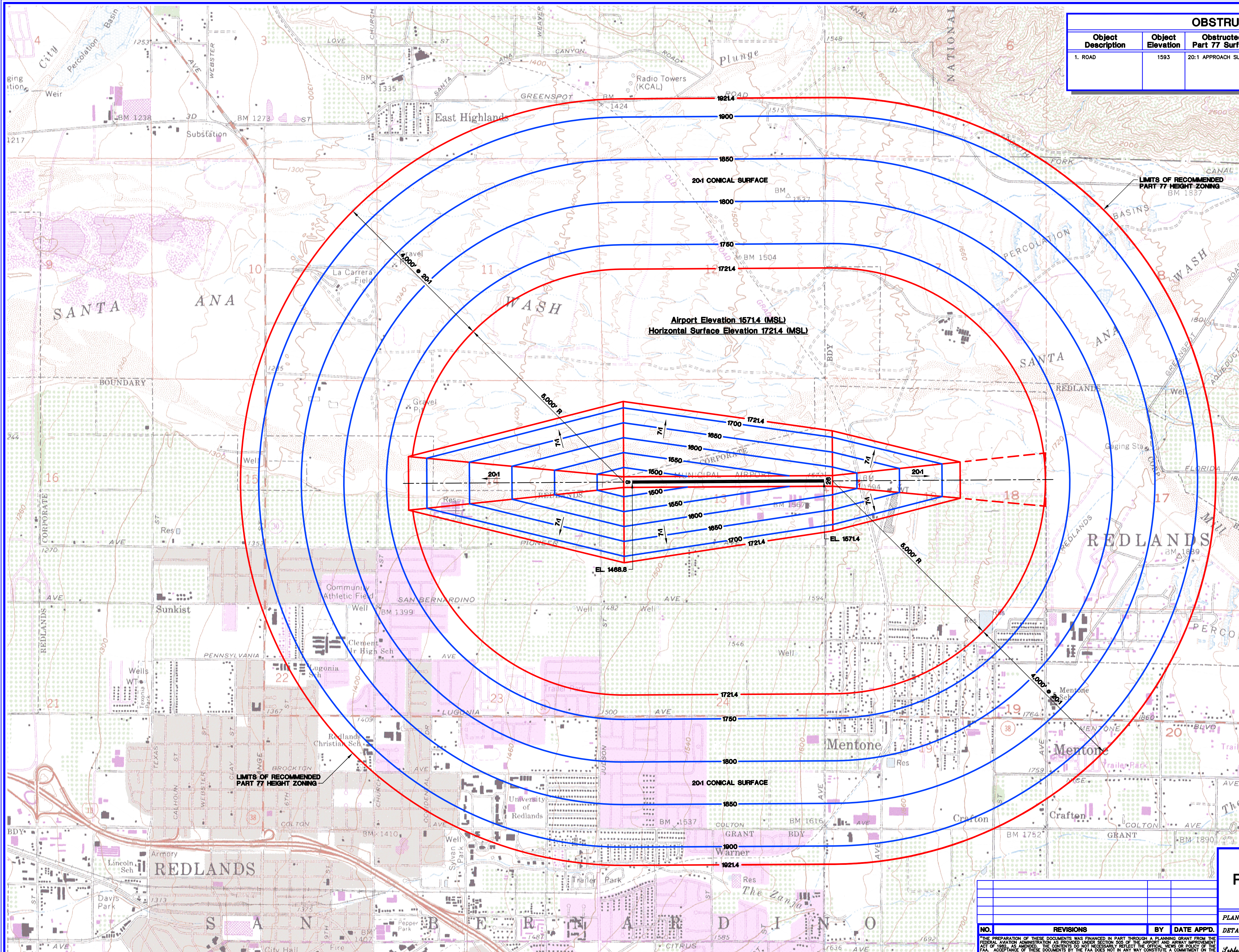
DRAFT

REDLANDS, CALIFORNIA

PLANNED BY: Christopher M. Hugunin
DETAILED BY: Richard A. Lally

September 8 2008 | SHEET 1 OF 6

Coffman Associates
Airport Consultants



OBSTRUCTION TABLE

Object Description	Object Elevation	Obstructed Part 77 Surface	Surface Elevation	Object Penetration	Proposed Object Disposition
1. ROAD	1593	20:1 APPROACH SURFACE	1597	6'	TO BE RELOCATED

OBSTRUCTION LEGEND

- OBSTRUCTION
- GROUP or MULTIPLE OBSTRUCTIONS
- TOPOGRAPHIC OBSTRUCTION

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 PART 77 AIRSPACE DRAWING, sheet 2 of these plans.
3. Depiction of features and objects within the outer portion of the approach surfaces, is illustrated on the RUNWAY APPROACH ZONES PROFILES, sheet 4 of these plans.
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5. Distance for road obstructions and clearances reflect a safety clearance of 10' for airport service roads, 15' for noninterstate roads, 17' for interstate roads, and 23' for railroads.

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REDLANDS MUNICIPAL AIRPORT (REI)

PART 77 AIRSPACE PLAN

DRAFT

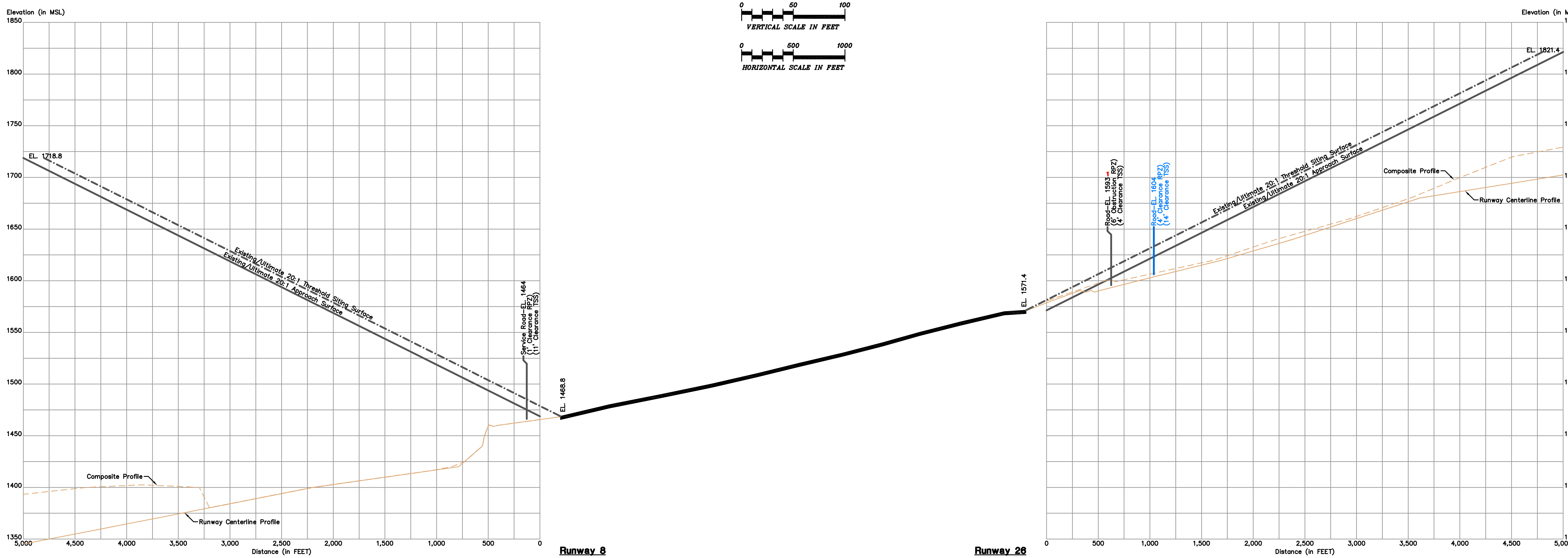
REDLANDS, CALIFORNIA

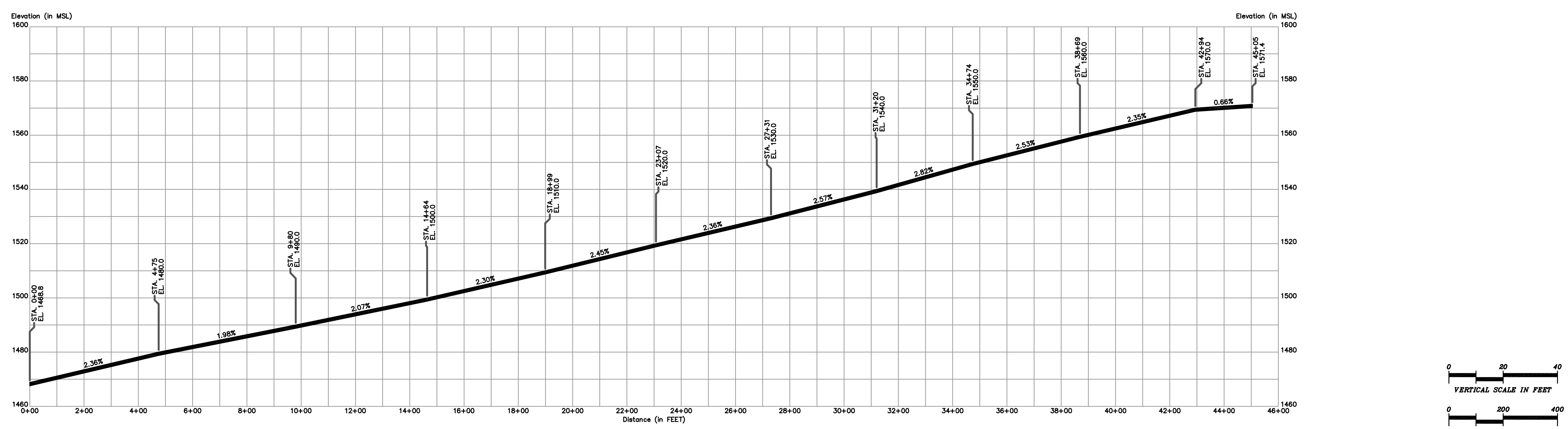
PLANNED BY: Christopher M. Huguenin

DETAILED BY: Richard A. Lally

September 8 2008 SHEET 2 OF 6

Coffman Associates Airport Consultants





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Object Description	Object Elevation	Obstructed Part 77 Surface	Surface Elevation	Object Penetration	Proposed Object Disposition
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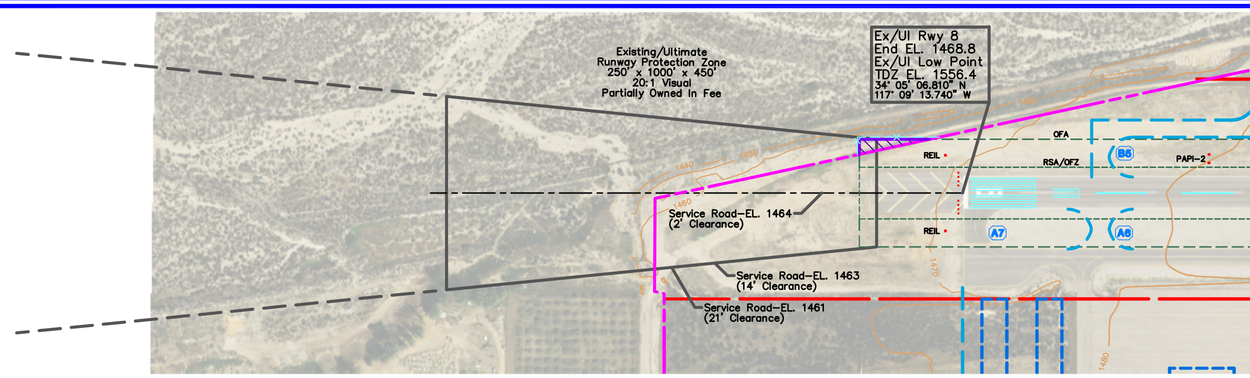
REDLANDS MUNICIPAL AIRPORT (REI)
RUNWAY APPROACH ZONE PROFILES/RUNWAY PROFILE
REDLANDS, CALIFORNIA

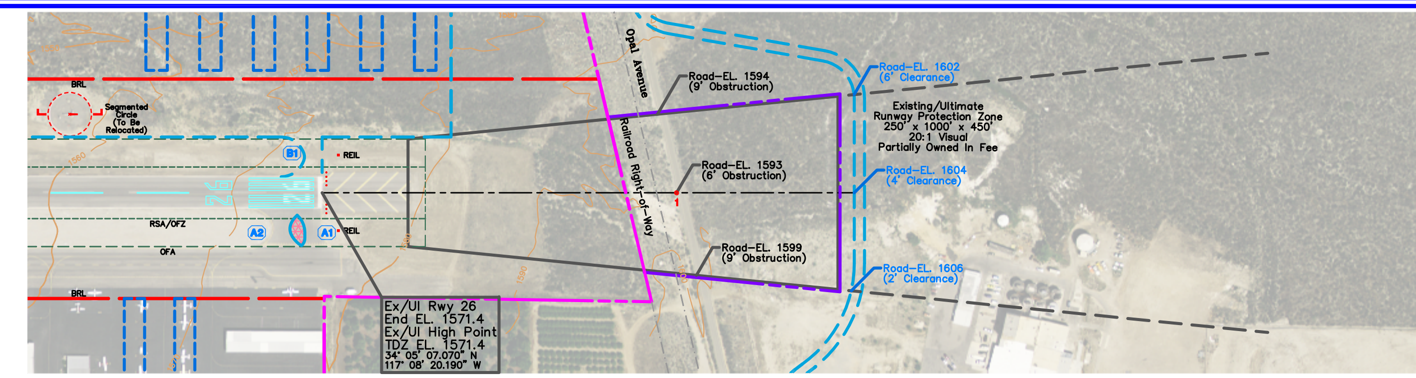
DRAFT

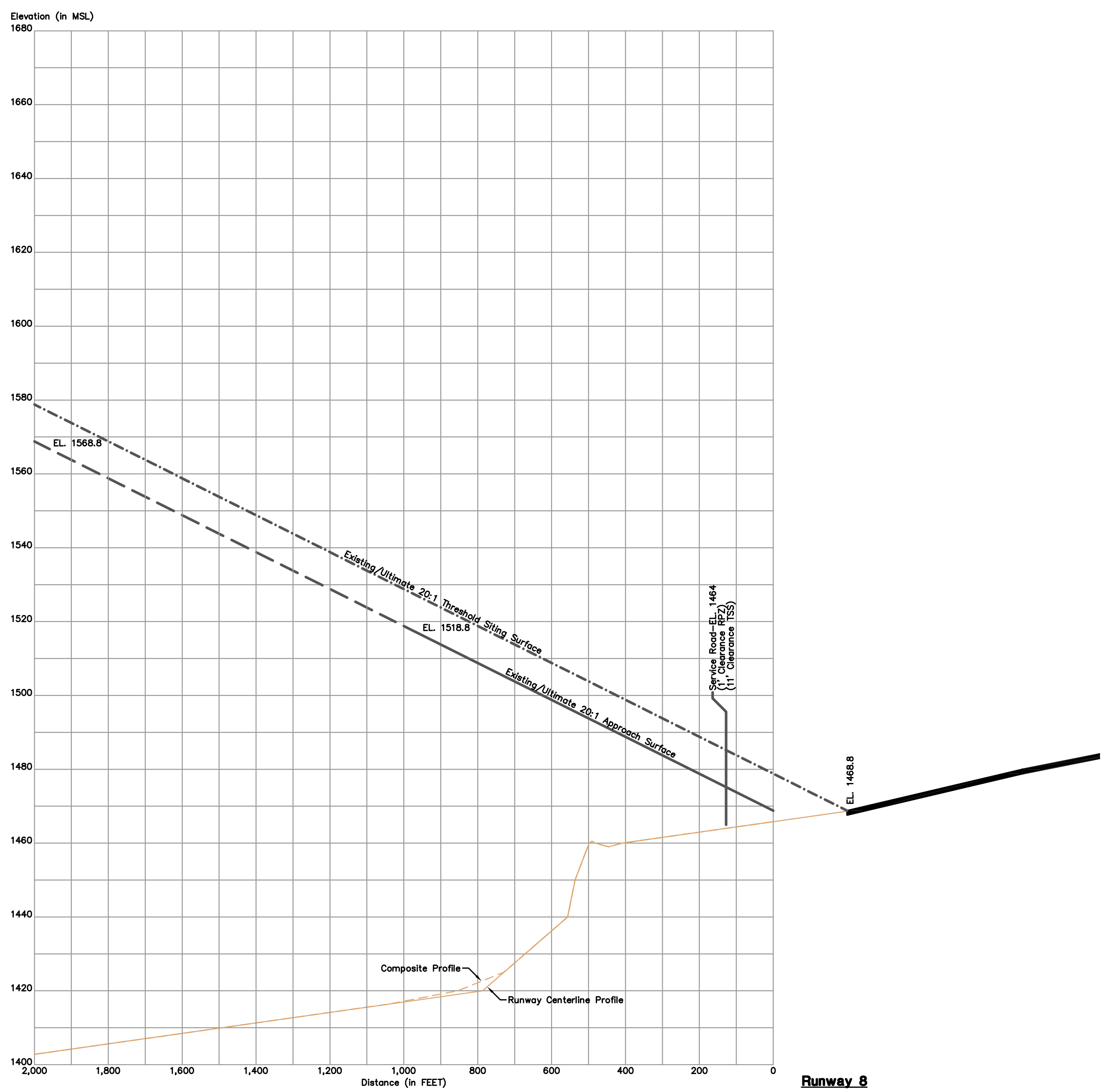
PLANNED BY: *Christopher M. Hugunin*
DETAILED BY: *Richard A. Lally*

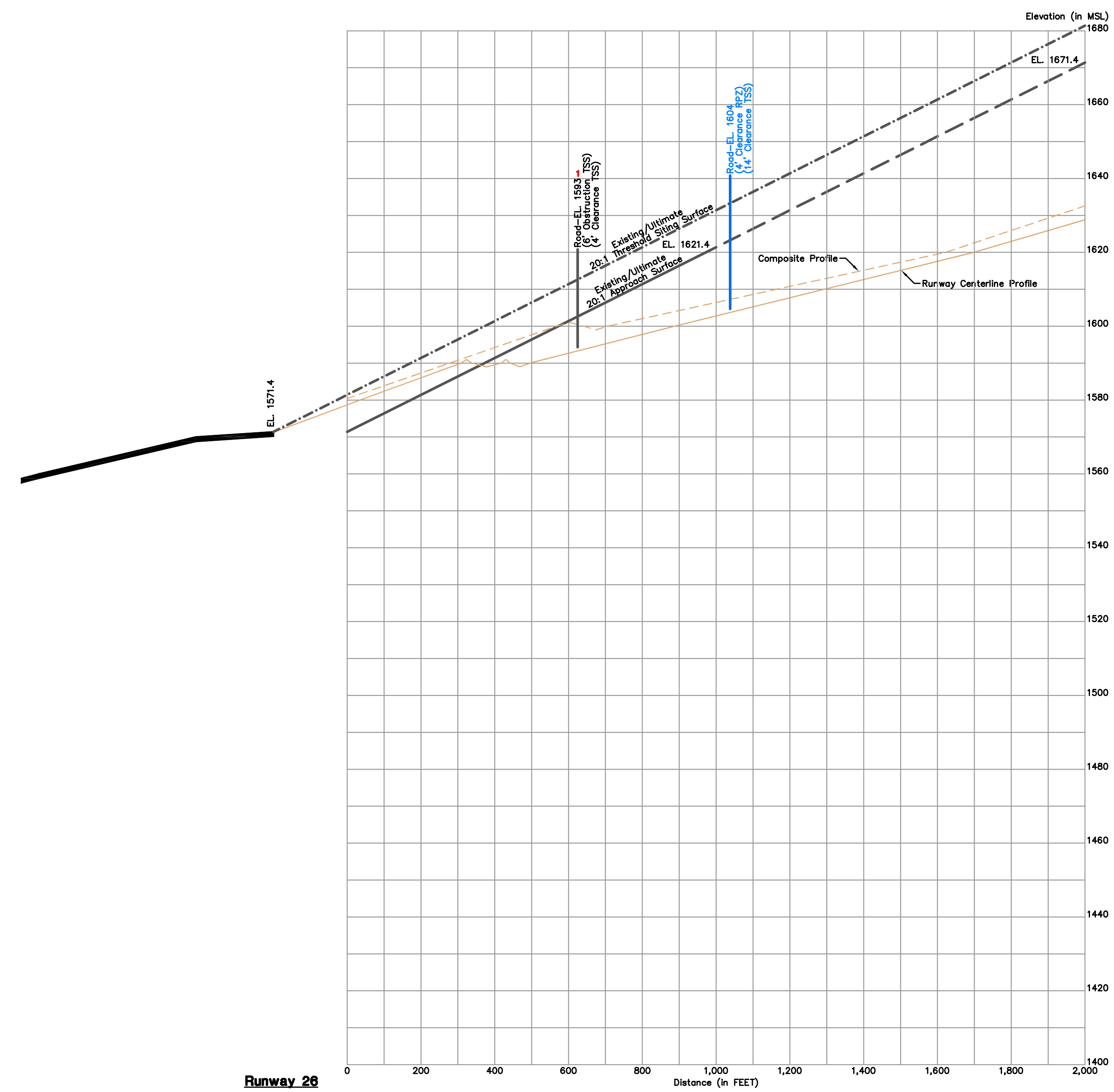
September 8 2008 SHEET 3 OF 6

Coffman Associates Airport Consultants









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1. ROAD	1593	20:1 APPROACH SURFACE	1597	6'	TO BE RELOCATED

0 20 40
VERTICAL SCALE IN FEET

0 200 400
HORIZONTAL SCALE IN FEET

NO.	REVISIONS	BY	DATE APP'D.

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REDLANDS MUNICIPAL AIRPORT (REI)

INNER PORTION OF RUNWAY 8-26 APPROACH SURFACE DRAWING

REDLANDS, CALIFORNIA

DRAFT

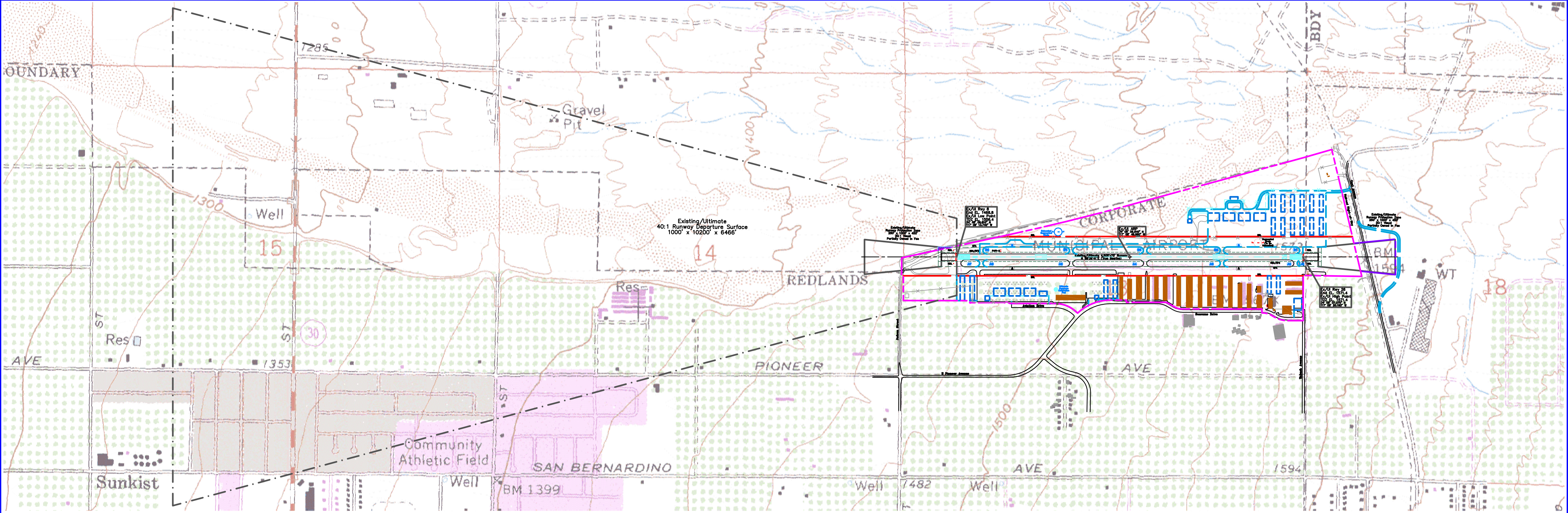
PLANNED BY: Christopher M. Hugunin

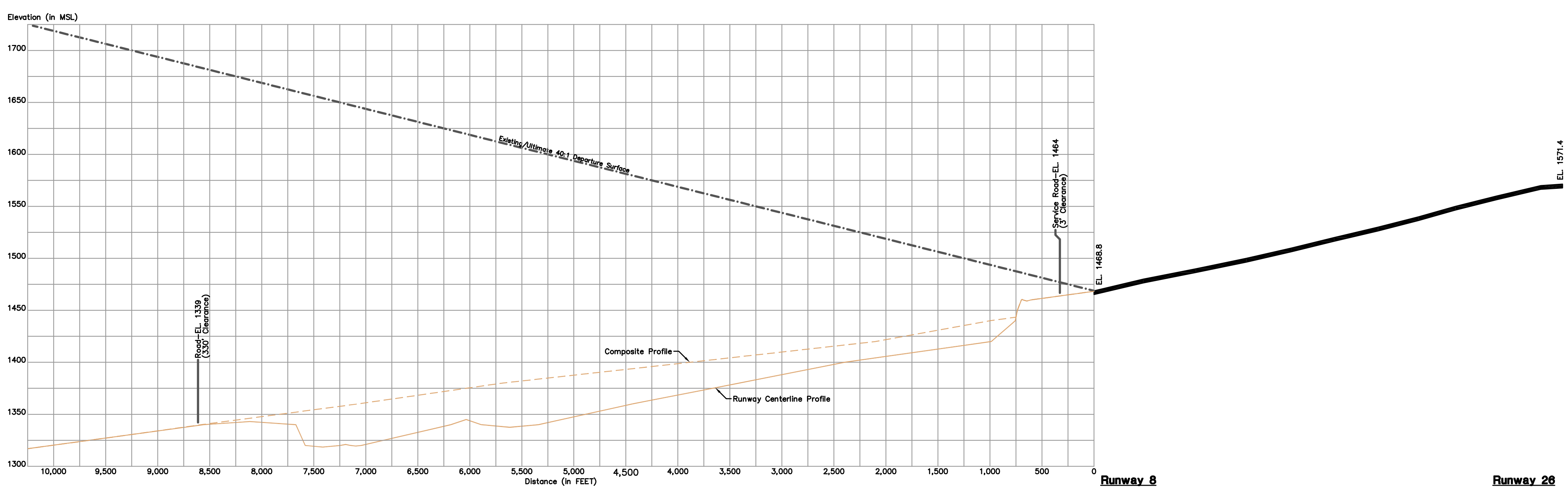
DETAILED BY: Richard A. Lally

September 8 2008 | SHEET 4 OF 6

Coffman Associates Airport Consultants

Coffman Associates R:\CAD\LallyR\Master Plans\REI (Redlands)\ALP\REI ALP Set.dwg September 8, 2008 12:09pm





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4. Depiction of features and objects within the inner portion of the approach surfaces, is illustrated on the INNER PORTION OF RUNWAY APPROACH SURFACE DRAWINGS, sheet 4 of these plans.
5. Distance for road obstructions and clearances reflect a safety clearance of 10' for airport service roads, 15' for noninterstate roads, 17' for interstate roads, and 23' for railroads.
6. Exising and future height and hazard ordinances are to be amended and/or referenced upon approval of updated PART 77 AIRSPACE DRAWING.

DEPARTURE OBSTRUCTION TABLE

Object Description	Object Elevation	Obstructed Part 77 Surface	Surface Elevation	Object Penetration	Proposed Object Disposition

VERTICAL SCALE IN FEET: 0 20 40

HORIZONTAL SCALE IN FEET: 0 200 400

NO.	REVISIONS	BY	DATE APP'D.

"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 OFFICAL 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."

REDLANDS MUNICIPAL AIRPORT (REI)

DEPARTURE SURFACE DRAWING

DRAFT

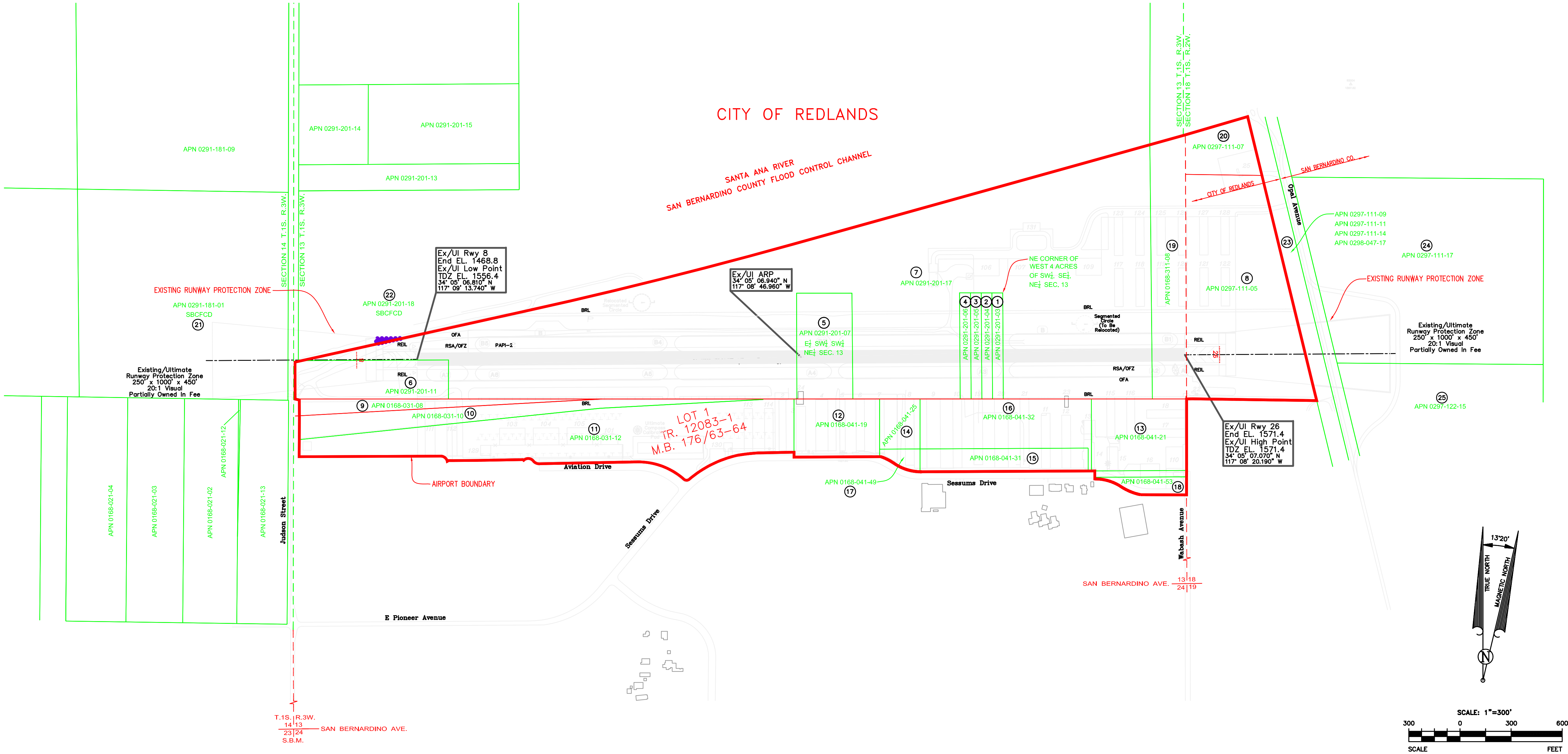
REDLANDS, CALIFORNIA

PLANNED BY: Christopher M. Hugunin

DETAILED BY: Richard A. Lally

September 8 2008 SHEET 5 OF 6

Coffman Associates Airport Consultants



SUBMITTED BY: ____________________ DATE: __________
JAMES J. IMBIORSKI – EXECUTIVE VICE PRESIDENT, ASSOCIATED ENGINEER'S

PROPERTY DATA TABLE				
No.	A.P.N.	DEED INFORMATION	RECORDER'S DATE	OWNERSHIP TYPE
* (1)	0291–201–03	BK 5673/833 O.R.	APR. 02, 1962	FEE SIMPLE
* (2)	0291–201–04	BK 5673/833 O.R.	APR. 02, 1962	FEE SIMPLE
* (3)	0291–201–05	BK 5673/833 O.R.	APR. 02, 1962	FEE SIMPLE
* (4)	0291–201–06	BK 5673/833 O.R.	APR. 02, 1962	FEE SIMPLE
* (5)	0291–201–07	BK 5673/833 O.R.	APR. 02, 1962	FEE SIMPLE
* (6)	0291–201–11	BK 5781/155 O.R.	OCT. 09, 1962	FEE SIMPLE
* (7)	0291–201–17	BK 5800/456 O.R.	NOV. 13, 1962	FEE SIMPLE
* (8)	0297–111–05	BK 5971/62 O.R.	AUG. 16, 1963	FEE SIMPLE
* (9)	0168–031–08	BK 6202/958 O.R.	AUG. 03, 1964	FEE SIMPLE
* (10)	0168–031–10	BK 8360/34 O.R.	FEB. 01, 1974	FEE SIMPLE
* (11)	0168–031–12	INSTRUMENT NO. 85–217619	SEPT. 6, 1985	FEE SIMPLE
* (12)	0168–041–19	BK 6311/792 O.R.	JAN. 15, 1965	FEE SIMPLE
* (13)	0168–041–21	BK 6630/120 O.R.	MAY 19, 1966	FEE SIMPLE
* (14)	0168–041–25	BK 6537/894 O.R.	DEC. 23, 1965	FEE SIMPLE
* (15)	0168–041–31	BK 6630/122 O.R.	MAY 19, 1966	FEE SIMPLE

PROPERTY DATA TABLE				
No.	A.P.N.	DEED INFORMATION	RECORDER'S DATE	OWNERSHIP TYPE
* (16)	0168–041–32	BK 6630/120 O.R.	MAY 19, 1966	FEE SIMPLE
* (17)	0168–041–49	BK 6537/835 O.R.	DEC. 23, 1965	FEE SIMPLE
* (18)	0168–041–53	BK 6630/122 O.R. **	MAY 19, 1966	FEE SIMPLE
* (19)	0168–311–08	BK 5800/456 O.R.	NOV. 13, 1962	FEE SIMPLE
* (20)	0297–111–07	BK 6702/268 O.R.	SEPT. 26, 1966	FEE SIMPLE
(21)	0291–181–01	FUTURE ULTIMATE PROPERTY		
(22)	0291–201–18	FUTURE ULTIMATE PROPERTY		
(23)	0297–111–09,11,14; 0298–047–17	FUTURE ULTIMATE PROPERTY		
(24)	0297–111–17	FUTURE ULTIMATE PROPERTY		
(25)	0297–122–15	FUTURE ULTIMATE PROPERTY		

NOTES:

* LAND ACQUISITION WAS DONE VIA LOCAL FUNDS ONLY

** INDICATES PORTION OF LAND DESCRIBED IN THIS DOCUMENT HAS BEEN SUBDIVIDED.

ALL LAND SHOWN HEREON WITHIN THE DISTINCTIVE BOUNDARY LINE IS OWNED BY THE CITY OF REDLANDS

REVISIONS			
DATE	BY	MARK	DESCRIPTION

DESIGNED JJI DRAWN FB CHECKED BI

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PROPERTY MAP

EXHIBIT "A"

REDLANDS MUNICIPAL AIRPORT

REDLANDS, CALIFORNIA

DRAWN BY: FB

DATE: 10/16/2008

SCALE: 1"=300'

APPROVED BY: JJI

JOB NO.

SHEET: 1 of 1

Associated Engineers, Inc.
3311 EAST SHELBY STREET • ONTARIO, CA 91764
TEL. (909) 980–1982 • FAX: (909) 941–0891

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