Benton Airpark

Airport Master Plan

CITY OF REDDING CALIFORNIA

AIRPORT MASTER PLAN

for

BENTON AIRPARK
Redding, California

FINAL TECHNICAL REPORT

Prepared By
COFFMAN ASSOCIATES, INC.

Revised
March 2005

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Redding, California

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Chapter One
INVENTORY

Inventory

The initial step in the preparation of the airport master plan for Benton Airpark 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 Benton Airpark provides an overview of the airport facilities and airspace. Background information regarding the regional area is also presented, including information regarding the airport's role in the regional, state, and national aviation systems, surface transportation, and the socioeconomic profile.

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

data, or information provided in existing planning documents, to the maximum extent possible.

AIRPORT SETTING

As depicted on **Exhibit 1A**, Benton Airpark is located in the City of Redding, in Shasta County, which lies at the northern end of the Sacramento Valley. Redding serves as the county seat, as well as the center for government, retail trade, wholesale trade, commerce, and recreation for a large portion of Northern California. The City is equal in distance between San Diego and Seattle on Interstate 5. Redding is the largest city north of

Sacramento and is one of three incorporated cities in Shasta County, along with the Cities of Anderson and Shasta Lake.

Climate in the City of Redding is typical of Northern California. Summers are usually warm and dry, and winters are usually mild. Precipitation in the area averages 34 inches per year, with the majority of rainfall occurring in the winter months. Snowfall in the area is infrequent.

AIRPORT HISTORY AND ADMINISTRATION

Benton Airpark is one of two airports located in the City of Redding. Situated on approximately 158.4 acres at an elevation of 719 feet above mean sea level (MSL), the airport serves mainly single-engine and small twin-engine aircraft. Benton Airpark is Redding's first airport and has been in operation since the 1920s. The land was purchased from Grace Welch Elliott for the specific purpose of developing an aerial landing place. The airport's services include permanent aircraft storage, fuel sales, aircraft rental, transient aircraft parking, charters, aircraft maintenance, and flight instruction. Also located at Benton Airpark are flight facilities for Mercy Air Ambulance, the California Highway Patrol (CHP), and the Experimental Aircraft Association (EAA).

Benton Airpark is owned and operated by the City of Redding, Airports Division. Their mission is to provide the most cost-effective, safe, efficient, and well-maintained airport facilities to serve the traveling public, airport tenants, and the community.

AIRPORT SYSTEM PLANNING ROLE

Benton Airpark is included in the *National Plan of Integrated Airport Systems (NPIAS)*. This plan identifies 3,344 existing airports which are significant to national air transportation, as well as airport development necessary to meet the present and future requirements in support of civil needs. An airport must be included in the NPIAS to be eligible for federal funding assistance. Benton Airpark is classified as a general aviation airport in the NPIAS.

At the state level, the California Department of Transportation (CALTRANS), Division of Aeronautics, provides state-wide planning to airports through its *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 well into the future. The CASP is responsible for the general supervision of all aeronautics within the state. It is empowered by state law to make rules and regulations governing all airports, flight schools, and all other aeronautical activity. The CASP defines the specific role of each airport in the state's aviation system and develops forecasts for aviation activity in the State of California. These forecasts assist in the identification of airports in need of capital improvements and provide a guide for programming federal and state development funds.

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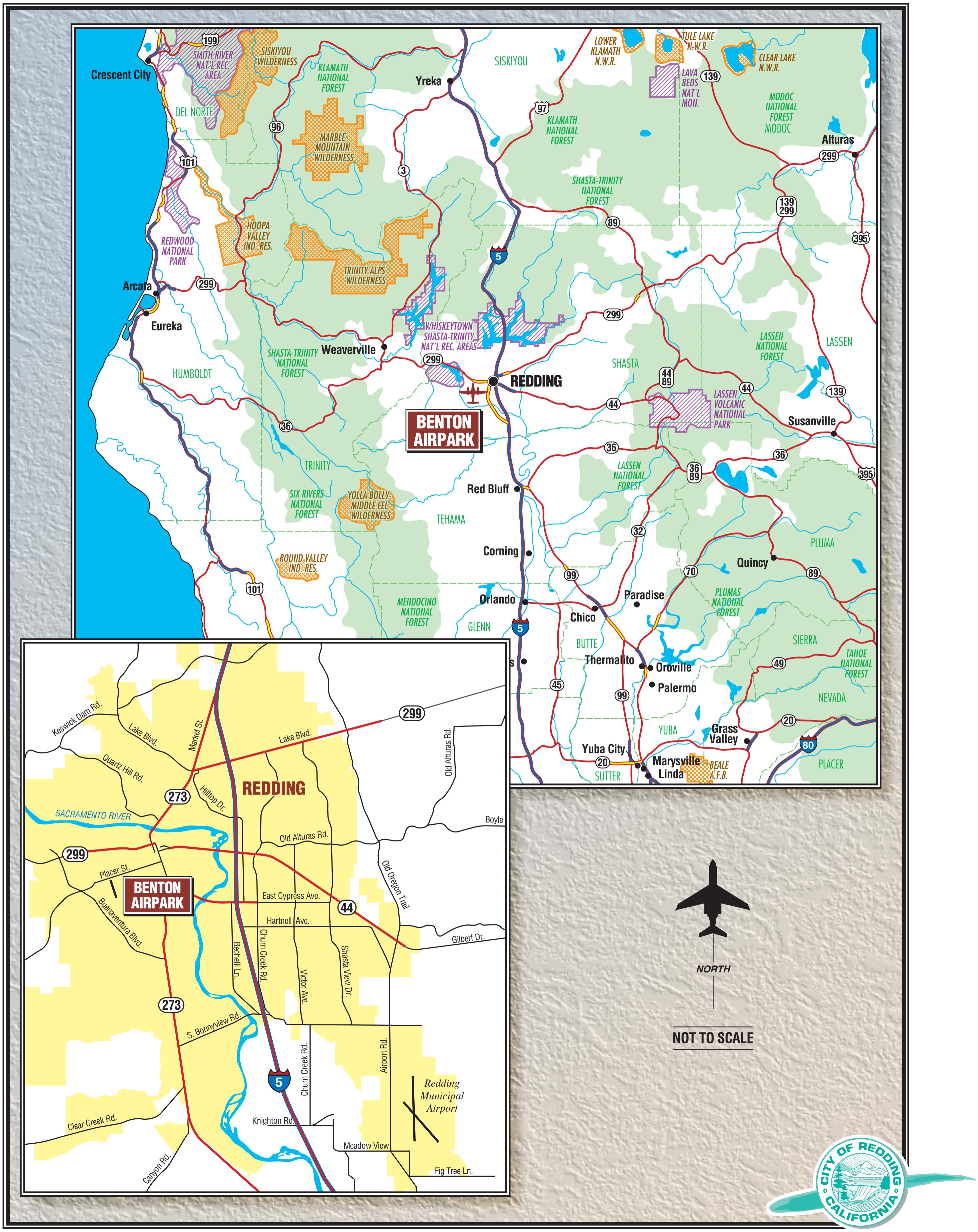

Exhibit 1A
LOCATION MAP

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 1B**. **Table 1A** summarizes airside facility data for Benton Airpark.

TABLE 1A
Airside Facility Data
Benton Airpark

	Runway 15-33
Runway Length (feet) Runway Width (feet)	2,420 80
Runway Surface Material Condition	Asphalt Good
Pavement Markings	Basic
Runway Load Bearing Strength (lbs.) Single Wheel Loading (SWL)	 12,500
Airfield Lighting	Rotating Beacon Medium Intensity Runway Lighting (MIRL)* Precision Approach Path Indicator (PAPI-2L)
Instrument Approach Procedures	None
Weather or Navigational Aids	Segmented Circle Lighted Wind Cone

Source: *Airport Facility Directory; Southwest U.S.* (April 18, 2002).
* Radio-controlled.

Runways

Benton Airpark is served by a single asphalt runway (Runway 15-33), which is 2,420 feet long and 80 feet wide. This asphalt runway is oriented in a northwest-southeast manner and has a load bearing strength of 12,500 pounds single wheel loading (SWL). SWL refers to the design of certain aircraft landing gears which have a single wheel on each main landing gear strut.

Taxiways

At Benton Airpark, Runway 15-33 is served by two full-length parallel taxiways (A and B). Taxiway A parallels Runway 15-33 on the east side and is equipped with four additional taxiways (A1, A2, A3, and A4). These four taxiways serve as entrance/exit and connector taxiways to Taxiway A. Taxiway A1 connects the end of Runway 15 with Taxiway A. Taxiway A2 connects to Taxiway A in front of the aircraft parking ramp. Taxiway A3 serves as an exit taxiway near the south end of the T-hangars, while Taxiway A4 serves as an entrance/exit taxiway to the end of Runway 33.

Taxiway B parallels Runway 15-33 on the west side and is also served by four entrance/exit and connector taxiways (B1, B2, B3, and B4). These four taxiways correspond with Taxiways A1, A2, A3, and A4 on the opposite side of the runway. The taxiway system at Benton Airpark is shown on **Exhibit 1B**.

Airfield Lighting and Signage

Runway 15-33 is equipped with medium intensity runway lighting (MIRL). All airfield lighting systems are controlled through a pilot-controlled lighting system (PCL). This 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.

A two-unit precision approach path indicator (PAPI-2L) is available on both ends of Runway 15-33. A PAPI consists of a system of lights, located at various distances from the runway threshold. When interpreted by the pilot, these lights give him or her an indication of being above, below, or on the designed descent path to the runway.

While the airport is not equipped with taxiway lighting, orange and blue reflectors line the edges of all taxiways. Neither end of Runway 15-33 is equipped with runway end identifier lights (REILs).

Benton Airpark currently has no approach lighting systems. The rotating beacon is co-located with the cell tower. Benton Airpark is equipped with a lighted wind tee, which provides pilots information about wind conditions and a segmented circle, which provides traffic pattern information to pilots. The lighted wind tee and segmented circle are located near the end of Runway 15, on the west side. An additional lighted wind tee is located near the end of Runway 33, on the west side.

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 15-33 identify the runway centerline, designation, and aircraft holding positions.

Taxiway and apron centerline markings are provided to assist aircraft using these airport surfaces. Taxiway centerline markings assist pilots in

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Exhibit 1B
EXISTING AIRPORT & VICINITY

maintaining proper clearance from pavement edges and objects near the taxiway/taxilane edges. Pavement edge markings also identify aircraft parking and aircraft holding positions.

LANDSIDE FACILITIES

Landside facilities are the ground-based facilities that support the aircraft and pilot/passenger handling functions. These facilities typically include the fixed base operator hangar and offices, aircraft storage/maintenance hangars, aircraft parking aprons, and support facilities such as fuel storage, public restrooms, automobile parking, and roadway access. Landside facilities are identified on **Exhibit 1C**.

Aircraft Parking Apron

The apron area includes space for tie-downs, aircraft parking, and taxilane access to hangar facilities. There is one apron area at Benton Airpark, totaling approximately 32,000 square yards. This apron area is located on the northeast side of the airfield and offers tie-downs for both based (30 spaces) and transient aircraft (18 spaces). Two helicopter landing areas are also located on this apron, along with a compass rose, which pilots can use to calibrate their aircraft compass.

General Aviation Facilities

General aviation facilities, as identified on **Exhibit 1C**, are located on both the east and west sides of the airfield. Hillside Aviation, the only fixed base operator (FBO) at Benton Airpark, has an 8,280 square-foot hangar located southeast of the based aircraft tie-downs. They offer flight instruction, aircraft rentals, sightseeing tours/rides, aircraft charters, aircraft maintenance and modification, aircraft parts, aviation accessories, as well as aircraft sales, leasing, and brokerage. The Airpark Café is also located in this building.

Additional general aviation facilities at Benton Airpark include a three-unit hangar shared by the California Highway Patrol (CHP) and Mercy Medical Center. This hangar is located southeast of the CHP building and totals approximately 8,600 square feet.

Several types of hangar storage space are available at Benton Airpark, including T-hangars, shade hangars, box hangars, and open hangars. There are six T-hangar buildings at the airport totaling approximately 64,400 square feet. Four of these are located on the east side of the airfield and two are located on the west side of the airfield. These six T-hangar buildings, all of which are currently occupied, hold a total of 60 aircraft. An office area is available on each end of T-hangars C, D, and E, for a total of six offices. Two shade hangar buildings are located on the west side of the airfield and total approximately 34,200 square feet. There are a total of 30 spaces for aircraft in these shade hangars. One row of open hangars is located north of the shade hangars and holds ten aircraft. Hangar rates for based aircraft, as well as tie-down rates for based and transient aircraft are shown in **Table 1B**.

TABLE 1B Hangar and Tie-down Rates Benton Airpark	
Based Aircraft	**Monthly Rates**
T-hangars 1-20 (A and B)	$118
T-hangars 21-30 (C)	$125
T-hangars 31-40 (D)	$184
T-hangars 41-50 (E)	$228
Open Hangars	$89
Shade Hangars	$89
Aircraft Tie-down (Single)	$34
Aircraft Tie-down (Twin & Helicopter)	$58
Hangar Office	$25
Transient Aircraft	**Daily Rates**
Tie-down (Single)	$4
Tie-down (Twin & Helicopter)	$5
Source: Benton Airpark (July 2002).	

Automobile Parking

There are two parking lots available for automobiles at Benton Airpark. The main parking lot, which is located south of Hillside Aviation, totals approximately 8,900 square yards (200 spaces). The other parking lot is located north of Hillside Aviation and totals approximately 2,150 square yards (50 spaces). Limited parking is also available directly in front of Hillside Aviation.

Fuel Facilities

Fuel facilities at Benton Airpark are located on the west side of the airfield and include two 12,000-gallon above-ground storage tanks.

Aircraft Rescue and Firefighting (ARFF)

There are no ARFF facilities located at Benton Airpark. ARFF services are provided by the City of Redding.

Utilities

Electrical service, water, sewer, and sanitary waste are all furnished by the City of Redding. Natural gas is provided by Pacific Gas & Electric. Pacific Bell provides telephone service.

ENROUTE NAVIGATION AND AIRSPACE

Airport navigational aids, or NAVAIDS, provide electronic navigational assistance to aircraft for approaches to an airport. Benton Airpark does not have any navigational aids located on the field. However, there are several types of navigational aids in the area available to pilots flying to or from Benton Airpark, such as the very high frequency omnidirectional range (VOR) facility and the nondirectional beacon (NDB).

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Exhibit 1C
EXISTING LANDSIDE FACILITIES

The VOR provides azimuth readings to pilots of properly equipped aircraft by transmitting a signal at every degree to provide 360 individual navigational courses. Frequently, distance measuring equipment (DME) is combined with a VOR facility to provide distance, as well as direction information to the pilot. Military tactical air navigation aids (TACANS) and civil VORs are commonly combined to form a VORTAC. A VORTAC provides distance and direction information to civil and military pilots.

The nearest available VOR to Benton Airpark is the Redding VOR/DME, which is located approximately seven nautical miles southeast at Redding Municipal Airport and can be reached on the frequency 108.40 Mhz. The Red Bluff VORTAC, located approximately 30 nautical miles southeast of the airport, can also be utilized by pilots flying to or from Benton Airpark. These facilities are identified on **Exhibit 1D**.

The NDB transmits radio signals which pilots of properly equipped aircraft can determine the bearing to or from the NDB facility and then track to or from the station. Benton Airpark does not have an NDB located on the field. However, pilots flying in or out of Benton Airpark can utilize the Roberta NDB, which is located approximately 28 nautical miles south of the airport and is identified on **Exhibit 1D**.

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 and 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 (i.e. San Francisco International Airport). Class C airspace is controlled airspace surrounding lower activity commercial service airports and some military airports. Class D airspace is controlled airspace surrounding airports with an airport traffic control tower (ATCT). 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.

Benton Airpark is located in Class E airspace, with the floor 1,200 feet above the surface. Approximately two nautical miles to the southeast is Class D airspace, which surrounds Redding Municipal Airport in a radius of approximately five nautical miles, beginning at the surface and extending up to 3,000 feet MSL. This Class D airspace is in effect when the tower is operating (8:30 a.m. to 11:30 p.m.). During the period when the airport traffic control tower is closed, this Class D airspace reverts to Class G airspace.

The Whitmore 1 and Whitmore 2 military operations areas (MOAs) are located approximately 20 nautical miles east of Benton Airpark. The Maxwell 2 MOA is located approximately 17 nautical miles southwest of the airport. MOAs define airspace where a high level of military activity is conducted, and are intended to segregate civil and military aircraft. While civilian operations are not restricted in MOAs, civilian aircraft are cautioned to be alert when MOAs are active and at the specified altitude. All three MOAs are under the control of the Oakland Air Route Traffic Control Center (ARTCC) and military operations are authorized from 11,000 feet MSL or 3,000 feet AGL, whichever is higher. The Whitmore 1 and 2 MOAs are in effect Monday through Friday from 7:30 a.m. to 4:30 p.m., while the Maxwell 2 MOA is in effect Monday through Friday from 5:00 a.m. to 8:00 p.m. These MOAs are identified on **Exhibit 1D**.

For aircraft arriving or departing the regional area using VOR facilities, a system of Federal Airways, referred to as Victor Airways, has been established. Victor Airways are corridors of airspace eight miles wide that extend upward from 1,200 feet AGL to 18,000 feet MSL and extend between VOR navigational facilities. As shown on **Exhibit 1D**, Victor Airways in the area emanate from the Red Bluff VORTAC.

Air Traffic Control

Benton Airpark does not have an airport traffic control tower. Therefore, no formal terminal air services are available. Aircraft operating in the vicinity of the airport are not required to file any type of flight plan or contact any air traffic control facility unless they are entering airspace where contact is mandatory. Air traffic advisories and certain weather information can be obtained using the common traffic advisory frequency (CTAF) channel 122.80 Mhz, also known as UNICOM. Enroute air traffic control services are provided by the Oakland Air Route Traffic Control Center (ARTCC).

The Rancho Murieta Flight Service Station (FSS) provides additional traffic service to pilots operating in the vicinity of the airport. This FSS provides pilots with weather information, airport advisory service, flight planning processing, and communication with other air traffic control facilities. A remote communications outlet (RCO) is located at the Rancho Murieta FSS for activating and closing instrument flight plans.

GENERALIZED LAND USE

Existing land use surrounding Benton Airpark is a mix of residential, open

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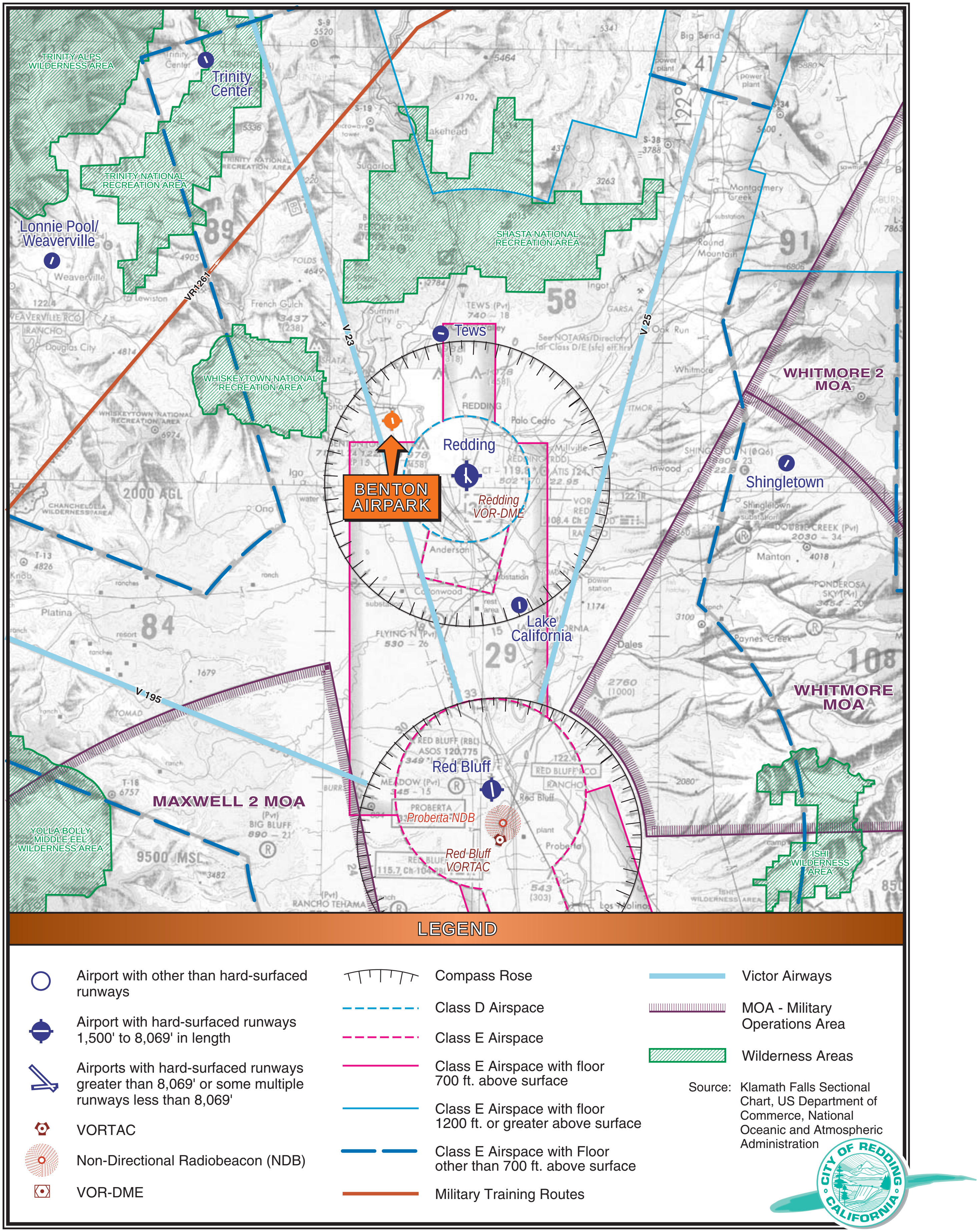

Exhibit 1D
VICINITY AIRSPACE

space, and offices. Residential land use abuts the airport property to the northeast and northwest. St. Joseph's School and St. Joseph's Church are located to the east side of the airport. To the south of the airport runway is a capped landfill (providing a buffer between airport operations and residential areas farther to the south). **Exhibit 1E** presents the street network and jurisdictional boundaries surrounding Benton Airpark.

HEIGHT AND HAZARD ZONING

Height and hazard zoning establishes height limits for new construction near the airport and within the runway approaches. It is based upon an approach plan which describes artificial surfaces defining the edges of airspace which are to remain free of obstructions for the purpose of safe air navigation. It requires that anyone who is proposing to construct or alter an object that affects airspace must notify the Federal Aviation Administration prior to its construction. Benton Airpark's rules and regulations regarding height and hazard zoning are found in the *Redding Municipal Code*, Title 18, Chapter 18.50, which establishes an Airport Environs Overlay District. Recommendations of this study may require revision to this ordinance or the overlays which are attached to the ordinance by reference.

SOCIOECONOMIC CHARACTERISTICS

A variety of historical and forecast socioeconomic data, related to the regional area, was collected for use in various elements of this master plan. This information assists in the determination of aviation service level requirements at the airport. Aviation activity is influenced by the population base, economic strength of the region, and the ability of the region to sustain a strong economic base over an extended period of time. Historical population, employment, and economic data was obtained for use in this study.

POPULATION

Historical population figures for the City of Redding and Shasta County are shown in **Table 1C**. Between 1990 and 2000, the City of Redding added approximately 14,400 new residents, representing an average annual growth rate of 2.0 percent. During this same time, Shasta County grew at an annual average of 1.1 percent, adding approximately 16,200 new residents.

Population forecasts for the City of Redding were provided by the City and project a population of 116,836 by 2022. This is nearly double the population of the City in 1990. Population forecasts for Shasta County were interpolated by Coffman Associates from projections made by the *Complete Economic and Demographic Data Source (CEDDS) 2002*. The CEDDS is published by Woods & Poole Economics, Inc. from information collected by the U.S. Department of Commerce. This forecast projects a total population of 212,500 for Shasta County by 2022, which represents an average annual growth rate of 1.21 percent.

TABLE 1C
Historical and Forecast Population

	HISTORICAL		FORECAST			
Area	**1990**	**2000**	**2007**	**2012**	**2022**	**Avg. Annual Growth Rate (2000-2022)**
City of Redding	66,462	80,865	91,934[1]	100,011[1]	116,836[1]	1.69%
Shasta County	147,036	163,256	178,500[2]	189,300[2]	212,500[2]	1.21%

Source: Historical - U.S. Census Bureau.
[1] City of Redding Forecasts - Provided by the City.
[2] Shasta County Forecasts - Interpolated from CEDDS, Woods & Poole (2002).

EMPLOYMENT

Analysis of a community's employment base can be valuable in determining the overall well-being in that community. The community's make-up and health can significantly determine the availability of jobs, variety of employment opportunities, and types of wages provided by local employers.

According to the California Labor Market Information, average employment statistics showed Shasta County's civilian labor force to be 74,800 for the year 2000, an increase of 6,900 over 1990 figures. The County's annual average unemployment rate of 6.9 percent in the year 2000 was higher than the state's rate of 4.9 percent that same year. However, the county's unemployment rate has declined substantially since 1996, when the unemployment rate was at a high of 9.9 percent. Current average unemployment rates for 2002 (January-May) show Shasta County at 8.1 percent and the State of California at 6.5 percent. The increase in unemployment rates since the year 2000 can be partly attributed to an already slowing economy earlier that year, coupled with the events of September 11th, 2001.

According to the CEDDS (2002), three industries (services, retail trade, and government) dominated Shasta County's total employment in 2000. The services industry accounted for the largest share (28,000), capturing nearly 35 percent of all employment, with the largest concentration of jobs in the health services sector. The retail trade sector contributed 20 percent (16,100) of the total, while the government sector made up over 15 percent (12,300) of all jobs in 2000. The current industry projections for the county, for the period

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Exhibit 1E
PLANNING AREA

2000-2020, indicate that total employment will increase by at least 26,500 jobs, or 3.6 percent. The services, retail trade, and government industries will continue to dominate employment, accounting for nearly 75 percent of all employment in Shasta County by 2020.

The top five major employers in Shasta County for 2001, and the total number of employees, are listed below:

- County of Shasta (1,983)
- Mercy Medical Center (1,570)
- Redding Medical Center(1,200)
- Shasta/Tehama/Trinity Joint Community College (1,025)
- City of Redding (907)

North of Sacramento, Shasta County has become a major medical services center. Together, Mercy Medical Center and Redding Medical Center employ over 2,700 people and represent two of the top five largest employers in Shasta County.

INCOME

Per capita personal income (PCPI), adjusted for 1996 dollars, is shown in **Table 1D** and compares Shasta County, the State of California, and the United States. In 2000, Shasta County's PCPI was $6,000 less than the State of California and $4,500 less than the United States. Forecasts project Shasta County to increase at an annual rate of 1.04 percent through 2022, while California and the United States PCPI are expected to increase at annual rates of 1.07 percent and 1.12 percent, respectively.

SUMMARY

The information discussed in this inventory chapter provides a foundation upon which the remaining elements of the planning process will be constructed. This information will provide guidance, along with additional analysis and data collection, for the development of forecasts of aviation demand and facility requirements.

TABLE 1D
Personal Income Per Capita (1996$)

Area	2000	2022	Annual Increase (2000-2022)
Shasta County	$22,500	$28,270	1.04%
California	$28,500	$36,000	1.07%
United States	$27,000	$34,500	1.12%

Source: CEDDS Woods and Poole (2002), Forecasts Interpolated by Coffman Associates.

DOCUMENT SOURCES

As mentioned earlier, a variety of different sources were utilized in the inventory process. The following listing reflects a partial compilation of these sources. This does not include data provided by airport management as part of their records, nor does it include airport drawings and photographs which were referenced for information. On-site inventory and interviews with staff tenants also contributed to the inventory effort.

Airport/ Facility Directory, Southwest U.S., U.S. Department of Transportation, Federal Aviation Administration, National Aeronautical Charting Office, April 18, 2002 Edition.

Klamath Falls Aeronautical Chart, U.S. Department of Transportation, Federal Aviation Administration, National Aeronautical Charting Office, 66th Edition, April 18, 2002.

National Plan of Integrated Airport Systems (NPIAS), U.S. Department of Transportation, Federal Aviation Administration, 1998-2002.

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

City of Redding Airports Division:
http://ci.redding.ca.us/airports/

City of Redding (Homepage):
http://ci.redding.ca.us

Economic Development Corporation of Shasta County:
http://www.shastaedc.org

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

Shasta County (Homepage):
http://www.co.shasta.ca.us/

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

Chapter Two
AVIATION DEMAND FORECASTS

Aviation Demand Forecasts

Facility planning must begin with a definition of the demand that may reasonably be expected to occur at the airport over a specific period of time. For Benton Airpark, this involves forecasts of aviation activity through the year 2022. In this master plan, forecasts of based aircraft, based aircraft fleet mix, and annual aircraft operations will serve as the basis for facility planning.

It is virtually impossible to predict, with any certainty, year-to-year fluctuations of activity when looking 20 years into the future. 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 unforseen facility needs.

The following forecast analysis examines recent developments, historical information, and current aviation trends to provide an updated set of aviation demand projections for Benton Airpark. The intent is to permit the City of Redding to make planning adjustments necessary to ensure that the facility meets projected demands in an efficient and cost-effective manner.

These forecasts have been prepared following the events of September 11, 2001, when four commercial airliners were hijacked. Immediately following the events of September 11th, the national airspace system was closed and all commercial flights were grounded. Following the resumption of flights, commercial airline traffic was down, which led to schedule reductions and layoffs by many of the commercial airlines. The federal government

provided billions of dollars in financial assistance to the commercial airlines, along with loan guarantees. No similar assistance was provided for the general aviation industry. The total impacts September 11th will have on commercial and general aviation can only be determined over time.

The demand-based manner in which this master plan is being prepared is intended to accommodate variations in demand at the airport. Demand-based planning relates capital improvements to demand factors, such as based aircraft, instead of points in time. This allows the airport to address capital improvement needs according to actual demand occurring at the airport. Therefore, should based aircraft slow or decline, it may not be necessary to implement some improvement projects. However, should the airport experience accelerated growth, the plan will have accounted for that growth and will be flexible enough to respond accordingly.

GENERAL AVIATION TRENDS

Each year, the Federal Aviation Administration (FAA) publishes its national aviation forecast. Included in this publication are forecasts for air carriers, regional air carriers, general aviation, and military activity at civilian airports. The forecasts are prepared to meet budget and planning needs of the constituent units of the FAA and to provide information that can be used by state and local authorities, the aviation industry, and the general public. The current edition when this chapter was written was FAA *Aerospace Forecasts, Fiscal Years 2002-2013*. These 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. Long-term FAA forecasts through the year 2025 are provided in the FAA *Long Range Aerospace Forecasts* document.

Following more than a decade of decline, the general aviation industry was revitalized with the passage of the *General Aviation Revitalization Act* in 1994, which limits the liability on general aviation aircraft to 18 years from the date of manufacture. 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. The high cost of product liability insurance was a major factor in the decision by many American aircraft manufacturers to slow or discontinue the production of general aviation aircraft.

However, this continued growth in the general aviation industry slowed considerably in 2001, negatively impacted by the events of September 11th. Thousands of general aviation aircraft were grounded for weeks, due to "no-fly zone" restrictions imposed on operations of aircraft in security-sensitive areas. Some U.S. airports in and around Washington, D.C. and New York City remain closed to visual flight rules (VFR) traffic. This, in addition to the economic recession already taking place in 2001, has had a profoundly negative impact on the general aviation industry.

According to a report released by the General Aviation Manufacturers Association (GAMA), aircraft shipments were down 13.4 percent for the third quarter, and 6.2 percent year-to-date. The Aerospace Industries Association of America (AIAA) expects general aviation shipments to decline for the first time since 1994, down 8.8 percent, to 2,556 aircraft. The number of general aviation hours flown is projected to decline by 2.2 percent in 2002, and increase by only 0.4 percent the following year.

At the end of 2001, the total pilot population, including student, private, commercial, and airline transport, was estimated at 649,957. This is an increase of 3.9 percent, or 24,000 pilots, from 2000. Student pilots were the only group to experience a decrease in 2001, down 6.6 percent from 2000. The number of student pilots is projected to decline by 4.5 percent in 2002, and an additional 1.2 percent the following year. After 2004, the number of student pilots is expected to increase at an average annual rate of 1.0 percent, totaling 90,000 in 2013, which is less than the number recorded in 2000 (93,064).

However, the events of September 11th have not had the same negative impact on the business/corporate side of general aviation. The increased security measures placed on commercial flights has increased interest in fractional and corporate aircraft ownership, as well as on-demand charter flights for short-haul routes. This is reflected in the forecast of active general aviation pilots, excluding air transport pilots, to increase by 54,000 (0.8 percent annually) over the forecast period.

The most notable trend in general aviation is the continued strong use of general aviation aircraft for business and corporate uses. According to the FAA, general aviation operations and general aviation aircraft handled at enroute traffic control centers increased for the ninth consecutive year, signifying the continued growth in the use of more sophisticated general aviation aircraft. The forecast for general aviation aircraft assumes that business use of general aviation will expand much more rapidly than personal/sport use, due largely to the expected growth in fractional ownership.

In 2000, there was an estimated 217,533 active general aviation aircraft, representing a decrease of 0.9 percent from the previous year, and the first decline in five years. **Exhibit 2A** depicts the FAA forecast for active general aviation aircraft in the United States. The FAA forecasts general aviation aircraft to increase at an average annual rate of 0.3 percent over the 13-year forecast period. Single-engine piston aircraft are expected to decrease from 149,422 in the short-term, and then begin a period of slow growth after 2004, reaching 152,000 in 2013. Multi-engine piston aircraft are expected to remain relatively flat throughout the forecast period. Turbine-powered aircraft are expected to grow at an average annual rate of 2.1 percent over the forecast period, faster than all other segments of the national fleet. Turbojet aircraft are expected to provide the largest portion of this growth, with an annual average growth rate of 3.4 percent. This strong growth projected for the turbojet aircraft can be attributed to the growth in the fractional ownership industry, new product offerings (which include new entry level aircraft and long-range global jets), and a shift from commercial travel by many travelers and corporations. Turboprop aircraft, on the other hand, are projected to grow at an average annual rate of only 0.2 percent over the forecast period.

Manufacturer and industry programs and initiatives continue to revitalize the general aviation industry with a variety of programs. For example, Piper Aircraft Company has created Piper Financial Services (PFS) to offer competitive interest rates and/or leasing of Piper aircraft. Manufacturer and industry programs include the "No Plane, No Gain" program promoted jointly by the General Aviation Manufacturers Association (GAMA) and the National Business Aircraft Association (NBAA). This program was designed to promote the use of general aviation aircraft as an essential, cost-effective tool for businesses. Other programs are intended to promote growth in new pilot starts and to introduce people to general aviation. These include "Project Pilot," sponsored by the Aircraft Owners and Pilots Association (AOPA), "Flying Start", sponsored by the Experimental Aircraft Association (EAA), "Be a Pilot," jointly sponsored and supported by more than 100 industry organizations, and "Av Kids," sponsored by the NBAA. 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.

FORECASTING APPROACH

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

The most reliable approach to estimating aviation demand is through the utilization of more than one analytical technique. Methodologies frequently considered include trend line/time-series projections, correlation/ regression analysis, and market share analysis.

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

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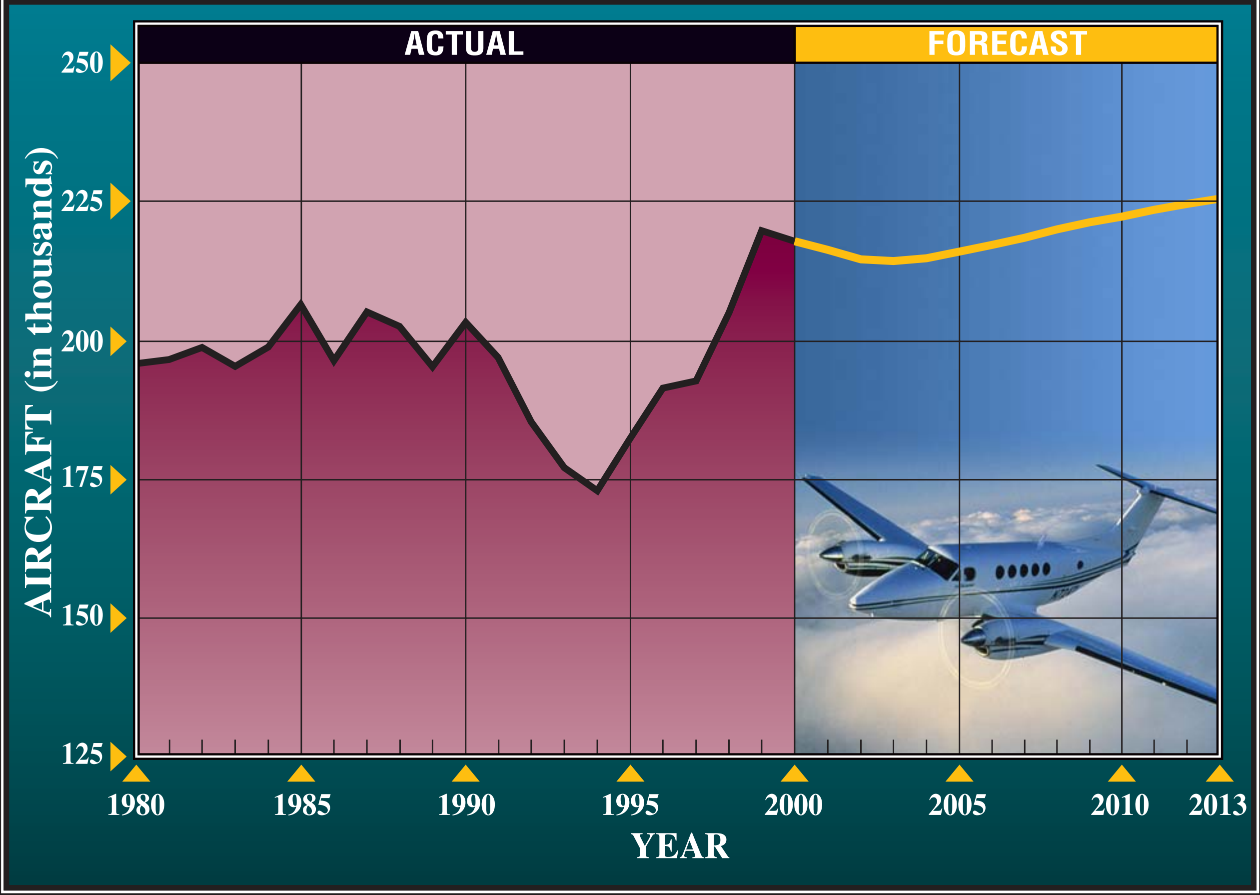
ACTIVE GENERAL AVIATION AIRCRAFT



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

As of Dec. 31	FIXED WING								
	PISTON		TURBINE		ROTORCRAFT				
	Single Engine	Multi-Engine	Turboprop	Turbojet	Piston	Turbine	Experimental	Other	Total
2000	149.4	21.1	5.8	7.0	2.7	4.5	20.4	6.7	217.6
2003	146.0	20.7	5.7	7.5	2.6	4.3	20.4	6.7	213.9
2008	148.7	20.7	5.8	9.6	2.8	4.5	20.8	6.8	219.7
2013	152.0	20.7	5.9	10.9	2.9	4.6	21.4	6.9	225.3

Sources: FAA General Aviation and Air Taxi Activity (and Avionics) Surveys.
FAA Aerospace Forecasts, Fiscal Years 2002-2013.

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

CITY OF REDDING CALIFORNIA

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

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

Regression analysis measures statistical relationships between dependent and independent variables, yielding a "correlation coefficient." The correlation coefficient (Pearson's "r") measures association between the changes in the dependent variable and the independent variable(s). If the "r-squared" value (coefficient determination) is greater than 0.95, it indicates good predictive reliability. A value less than 0.95 may be used, but with the understanding that the predictive reliability is lower.

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

It is important to note that one should not assume a high level of confidence in forecasts that extend beyond five years. Facility and financial planning usually require at least a 10-year preview, since it often takes more than five years to complete a major facility development program. However, it is important to use forecasts which do not overestimate revenue-generating capabilities or understate demand for facilities needed to meet public (user) needs.

AVIATION ACTIVITY FORECASTS

To determine the types and sizes of facilities that should be planned to accommodate general aviation activity, certain elements of the activity must be projected. Indicators of general aviation demand include:

- Based Aircraft
- Based Aircraft Fleet Mix
- Annual Operations
- Peak Activity

The remainder of this chapter will examine historical trends with regard to these areas of general aviation activity and project future demand for these segments of general aviation activity at the airport.

BASED AIRCRAFT FORECASTS

The number of based aircraft is the most basic indicator of general aviation demand at an airport. By first developing a forecast of based aircraft, the growth of other factors can be projected. In 1990, Benton Airpark reported 102 based aircraft. Since then, the number of based aircraft has increased, with 124 reported on the Airport Master Record in 2001. This equates to an average annual growth rate of 0.89 percent.

Forecasts of based aircraft at Benton Airpark have been prepared by examining the airport's market share of registered aircraft in Shasta County and as a market share of U.S. active general aviation aircraft.

Table 2A compares based aircraft at Benton Airpark with historical aircraft registered in Shasta County. As shown in the table, the airport captured 34 percent of aircraft registered in Shasta County in 1990. The airport's market share has increased since then, capturing 37 percent in 2001.

TABLE 2A
Based Aircraft Market Share of Registered Aircraft
Benton Airpark

Year	Benton Airpark Based Aircraft	Shasta County Registered Aircraft	% of Registered Aircraft
1990	102	301	34%
2001	124	331	37%
Constant Market Share			
2007	127	339[1]	37%
2012	129	345[1]	37%
2022	133	356[1]	37%
Increasing Market Share			
2007	131	339[1]	39%
2012	136	345[1]	40%
2022	148	356[1]	42%

Source: Historical Based Aircraft - FAA *Terminal Area Forecasts*; Historical Registered Aircraft - FAA *Terminal Area Forecasts* (1990), Aviation Goldmine CD (2001).
[1] Extrapolated by Coffman Associates.

The total number of aircraft registered in Shasta County in 1990 was 301, which compares to 331 aircraft registered in the County in 2001. This represents an average annual growth rate of 0.87 percent. This percent was then used to project the number of registered aircraft throughout the planning period and yields 339 registered aircraft by 2007; 345 registered aircraft by 2012; and 356 registered aircraft by 2022.

Based on the registered aircraft projections for Shasta County and the airport's historical market share, two forecasts were then developed. The first forecast developed used a constant market share of 37 percent, as reported for 2001. This forecast yields 133 based aircraft at Benton Airpark in 2022. The second forecast developed used an increasing market share (39%-42%) and yielded 148 based aircraft by the year 2022. Both market share forecasts are presented in **Table 2A**.

As previously mentioned, forecasts of based aircraft at Benton Airpark were also developed by examining the airport's historical market share of U.S. active general aviation aircraft. Once again, two forecasts were developed: a constant market share forecast and an increasing market share forecast. The constant market share forecast assumes that based aircraft will continue to grow at the same rate as U.S. active general aviation aircraft and applies the 2001 Benton Airpark market share of 0.057 percent. This forecast yields 133 based aircraft at Benton Airpark by 2022. The increasing market share forecast, which is consistent with the historical trend at Benton Airpark, yields 152 based aircraft at the airport in 2022. Both the constant and increasing market share forecasts are presented in **Table 2B**.

TABLE 2B
Based Aircraft Market Share of U.S. Active General Aviation Aircraft
Benton Airpark

Year	Benton Airpark Based Aircraft	U.S. Active General Aviation Aircraft	% of U.S. Active GA Aircraft Based at Benton
1995	102	188,100	0.054%
2001	124	216,200	0.057%
Constant Share Projection			
2007	124	218,300	0.057%
2012	128	224,300	0.057%
2022	133	234,000[1]	0.057%
Increasing Share Projection			
2007	129	218,300	0.059%
2012	137	224,300	0.061%
2022	152	234,000[1]	0.065%

Source: Historical Based Aircraft from FAA *Terminal Area Forecasts*; Historical and Forecast U.S. Active General Aviation Aircraft from FAA *Aerospace Forecasts, Fiscal Years 2002-2013.*

[1] Extrapolated by Coffman Associates.

Two additional forecasts of based aircraft at Benton Airpark were also examined for this study: the FAA TAF and the *1999 California Aviation System Plan* (CASP). The FAA TAF presents based aircraft projections for Benton Airpark through 2015. This forecast projects based aircraft to remain stagnant at 124 through the year 2015. The 1999 CASP provides forecasts for based aircraft at Benton Airpark through the year 2020. Interpolation of this forecast yields 161 based aircraft in 2007 and 174 based aircraft in 2012.

For planning purposes, a mid-range forecast is generally chosen. The selected planning forecast is one that closely parallels the increasing market share of registered aircraft and yields 130 based aircraft in 2007; 135 based aircraft in 2012; and 145 based aircraft in 2022. **Table 2C** and **Exhibit 2B** summarize the based aircraft forecasts developed for Benton Airpark, including the selected forecast.

TABLE 2C
Summary of Based Aircraft Forecasts
Benton Airpark

	2001	2007	2012	2022
Market Share of Registered Aircraft				
Constant Market Share		127	129	133
Increasing Market Share		131	136	148
Market Share of U.S. Active GA Aircraft				
Constant Market Share		124	128	133
Increasing Market Share		129	137	152
FAA *Terminal Area Forecast*		124	124	-
1999 California Aviation System Plan		161	174	-
Selected Forecast	**124**	**130**	**135**	**145**

[1] Interpolated by Coffman Associates.

BASED AIRCRAFT FLEET MIX

Knowing the aircraft fleet mix expected to utilize the airport in the future is necessary to properly plan facilities that will best serve the level of activity and the type of activities occurring at the airport. Currently, Benton Airpark's fleet mix consists of the following: 113 single-engine aircraft, 12 multi-engine aircraft, and three helicopters. It should be noted that the multi-engine category includes turboprops.

The forecast fleet mix of based aircraft at Benton Airpark was determined by examining existing and forecast national aviation trends. The national trend in general aviation is toward a greater percentage of larger, more sophisticated aircraft as part of the national fleet. The projected trend of based aircraft at Benton Airpark includes a growing number of single-engine aircraft, while the number of multi-engines and helicopters are expected to experience only a slight increase in their numbers. General aviation fleet mix projections for Benton Airpark are presented in **Table 2D** and **Exhibit 2B**.

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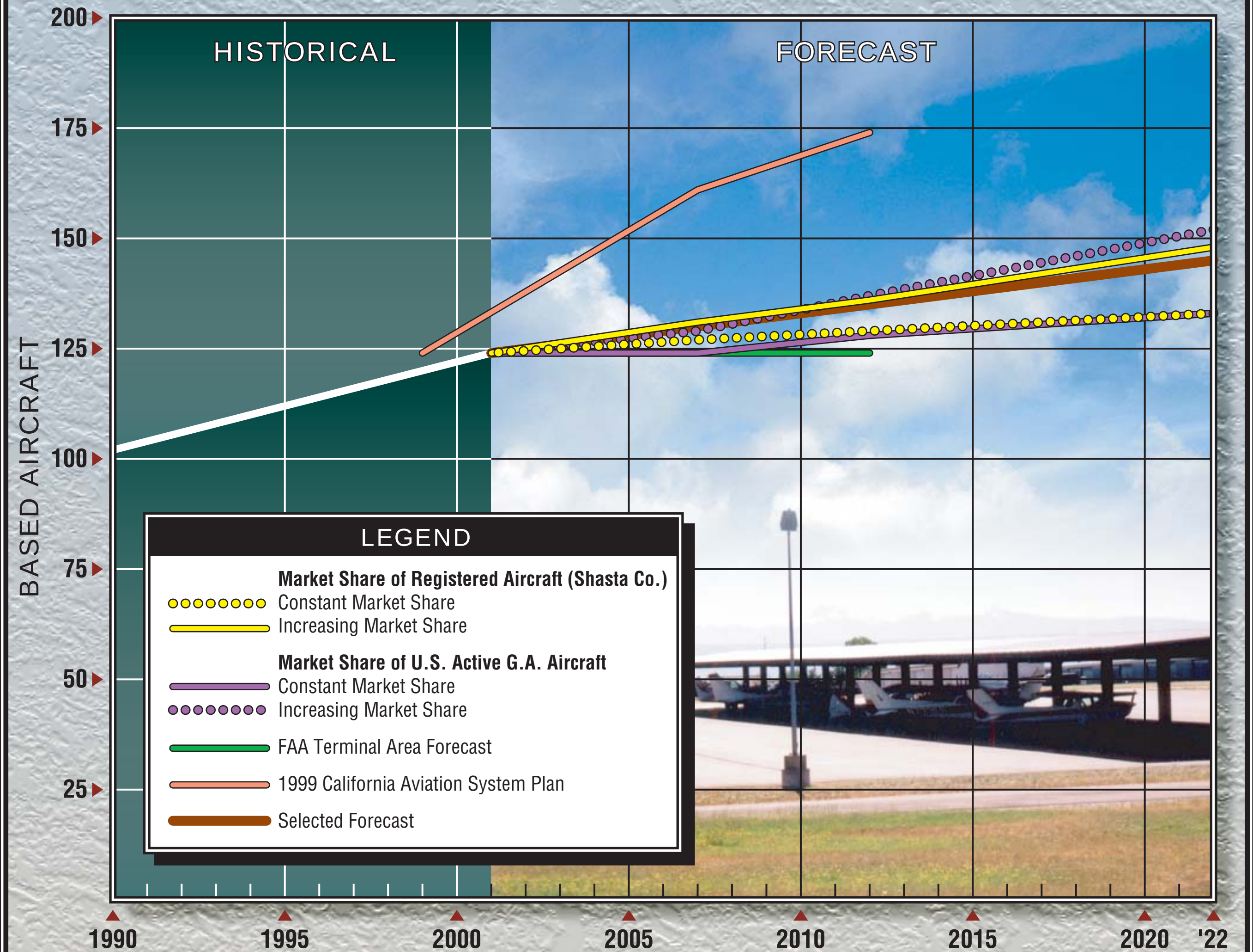


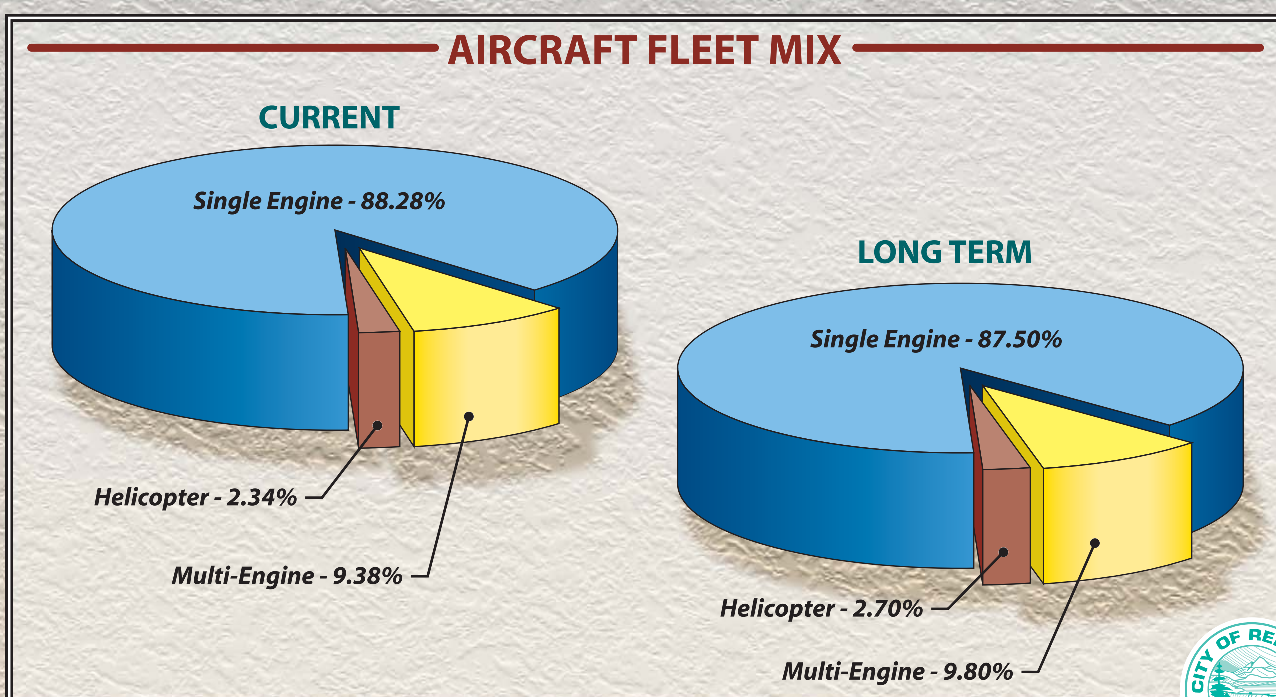


Exhibit 2B
BASED AIRCRAFT FORECASTS

TABLE 2D
General Aviation Fleet Mix Forecast
Benton Airpark

	EXISTING		FORECAST					
Type	**2002**	**%**	**2007**	**%**	**2012**	**%**	**2022**	**%**
Single-Engine	113	88.28%	115	88.10%	119	87.90%	127	87.50%
Multi-Engine	12	9.38%	12	9.45%	13	9.55%	14	9.80%
Helicopter	3	2.34%	3	2.45%	3	2.55%	4	2.70%
Total	**128**	**100.0%**	**130**	**100.0%**	**135**	**100.0%**	**145**	**100.0%**

*Multi-engine category includes turboprop aircraft.

ANNUAL OPERATIONS

Aircraft operations are reported in three general categories: air taxi, general aviation operation, and military. Air taxi operations consist of the use of general aviation aircraft for "on-demand" commercial transport of persons and property in accordance with Federal Aviation Regulation (F.A.R.) Part 135. General aviation operations include a wide range of activity ranging from personal to business and corporate uses. Military operations include those operations conducted by various branches of the military.

Air Taxi and Military Operations

According to FAA reports, air taxi operations at Benton Airpark have remained steady at 1,000 since 1996. Forecasts by the FAA project air taxi operations at the airport to increase throughout the planning period consistent with increasing business use of general aviation. There have been no military operations at Benton Airpark since 1982, and there are not expected to be any throughout the planning period.

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. Generally, local operations are characterized by training operations. Itinerant operations are those performed by aircraft with a specific origin or destination away from the airport. Typically, itinerant operations increase with business and commercial use, since business aircraft are used primarily for transportation from one location to another. According to FAA reports, there were 34,000 total general aviation operations at Benton Airpark in 2001. Operations were split evenly with 50 percent local and 50 percent itinerant.

The first method used to develop forecasts of annual operations was by examining the number of operations per based aircraft. Two forecasts of operations per based aircraft have been developed. First, a constant, or static, level of 275 operations per based aircraft was applied. As shown in **Table 2E**, this yields 39,800 total operations at Benton Airpark by 2022. The second projection, which used an increasing ratio of operations per based aircraft, yields 42,800 total operations by 2022.

TABLE 2E
Operations Per Based Aircraft Forecasts
Benton Airpark

Year	Based Aircraft	Itinerant Operations	Local Operations	Total Operations	Operations Per Based Aircraft
2001	124	17,000	17,000	34,000	275
CONSTANT RATIO PROJECTION					
2007	130	17,900	17,900	35,800	275
2012	135	18,600	18,600	37,200	275
2022	145	19,900	19,900	39,800	275
INCREASING RATIO PROJECTION					
2007	130	18,200	18,200	36,400	280
2012	135	19,200	19,200	38,400	285
2022	145	21,400	21,400	42,800	295

Source: Historical data - FAA *Terminal Area Forecasts*.

The 1999 CASP was also examined for comparative purposes. The CASP projects total general aviation operations in the State of California to grow at an average annual rate of 1.6 percent through 2015. Applying this percentage growth to general aviation operations at Benton Airpark yields 37,400 operations by 2007; 40,500 operations by 2012; and 47,500 operations by 2022.

The 1999 CASP also presents forecasts of annual operations at individual airports in the state through 2020. Interpolation of the forecast for Benton Airpark yields 42,900 annual operations at the airport by 2007 and 45,300 annual operations by 2012. Extrapolation of this forecast yields 51,800 annual operations by 2022.

A summary of all the forecasts, including the selected planning forecast, is presented in **Table 2F**. The selected planning forecast for Benton Airpark is an average of the forecasts and yields 37,000 operations by 2007; 40,000 operations by 2012; and 46,000 operations by 2022. It is expected that operations will continue to be split evenly at 50 percent local and 50 percent itinerant throughout the planning period.

TABLE 2F Summary of General Aviation Operations Forecasts Benton Airpark	2001	2007	2012	2022
Operations Per Based Aircraft				
Constant Ratio Projection		35,800	37,200	39,800
Increasing Ratio Projection		36,400	38,400	42,800
1999 California Aviation System Plan		42,900[1]	45,300[1]	51,800[2]
State's Projected Annual Growth Rate (1.6%)		37,400	40,500	47,500
Selected Forecast	**34,000**	**37,000**	**40,000**	**46,000**

[1] Interpolated by Coffman Associates.
[2] Extrapolated by Coffman Associates.

PEAKING CHARACTERISTICS

Many airport facility needs are related to the levels of activity during peak periods. The periods used in developing facility requirements for this study are as follows:

- **Peak Month** - The calendar month when peak activity occurs.
- **Design Day** - The average day in the peak month. This indicator is derived by dividing the peak month activity by the number of days in the 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 operations represents between 10-12 percent of the airport's annual operations. Monthly operational totals were not available at Benton Airpark. Therefore, for planning purposes, the peak month has been estimated at 10.0 percent of forecast annual operations. The design day was then calculated by dividing the peak month operations by 30. The busy day has been estimated at 25 percent higher than the average day in the peak month and was calculated by multiplying the design day by 1.25. Design hour operations were calculated at 15.0 percent of design day operations. **Table 2G** summarizes peak activity forecasts for Benton Airpark.

TABLE 2G Forecast of Peak Activity Benton Airpark	2001	2007	2012	2022
General Aviation Operations				
Annual	34,000	37,000	40,000	46,000
Peak Month (10.0%)	3,400	3,700	4,000	4,600
Design Day	113	123	133	153
Busy Day	142	154	167	192
Design Hour (15.0%)	17	19	20	23
Source: Peak Month, Design Day, Busy Day, and Design Hour are estimated figures.				

SUMMARY

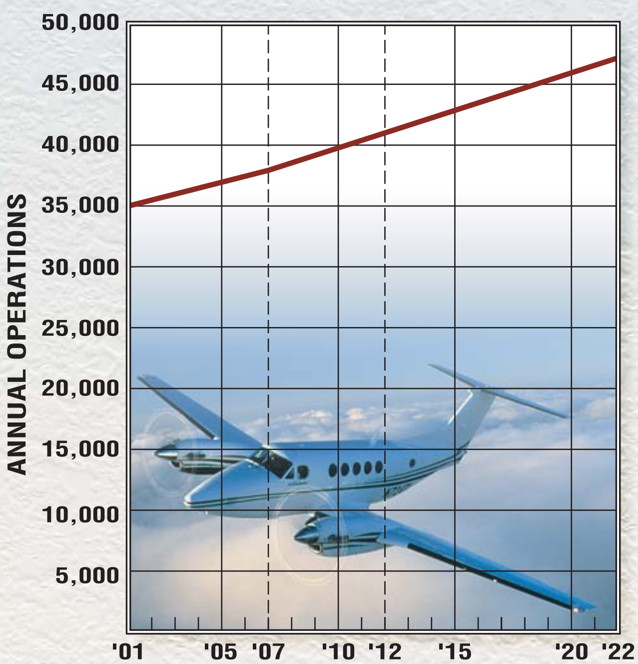
This chapter has provided forecasts for each sector of aviation demand anticipated over the planning period. **Exhibit 2C** presents a summary of the aviation forecasts developed for Benton Airpark. The airport is expected to experience increases in total based aircraft, as well as annual general aviation operations. The next step in this study is to assess the capacity of existing facilities to accommodate forecast demand and determine what types of facilities will be needed to meet these demands.

01SP21-2C-8/7/02

SUMMARY OF AVIATION ACTIVITY FORECASTS

CATEGORY	HISTORICAL 2001	FORECASTS 2007	FORECASTS 2012	FORECASTS 2022
ANNUAL OPERATIONS				
Itinerant				
General Aviation	17,000	18,500	20,000	23,000
Air Taxi	1,000	1,100	1,200	1,400
Total Itinerant	**18,000**	**19,600**	**21,200**	**24,400**
Local				
General Aviation	17,000	18,500	20,000	23,000
Total Operations	**35,000**	**38,100**	**41,200**	**47,400**
BASED AIRCRAFT				
Single Engine	113	115	119	127
Multi-Engine	12	12	13	14
Helicopter	3	3	3	4
Total Based Aircraft	**128**	**130**	**135**	**145**

OPERATIONS FORECAST



BASED AIRCRAFT FORECAST

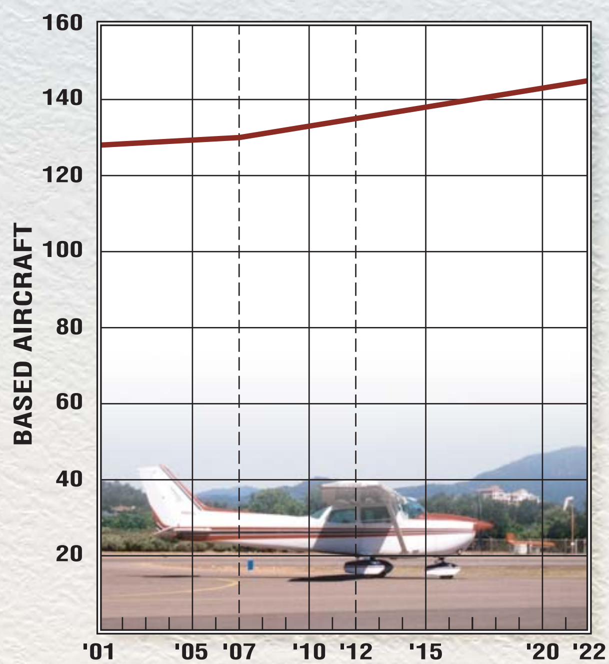


Exhibit 2C
FORECAST SUMMARY

Chapter Three

FACILITY REQUIREMENTS

Facility Requirements

To properly plan for the future of Benton Airpark, 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.

AIRFIELD DESIGN STANDARDS

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 are expected to use, the airport. Planning for future aircraft use is of particular importance since design standards are used to plan separation distances between facilities. These standards must be determined now since the relocation of these facilities will likely be extremely expensive at a later date.

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 code, the airport reference code (ARC), has two components: the first component, depicted by a letter, is the aircraft approach speed (operational characteristic); the second component, depicted by a Roman numeral, is the airplane design group and relates to aircraft wingspan (physical characteristic). Generally, aircraft approach speed applies to runways and runway-related facilities, while aircraft wingspan primarily relates to separation criteria involving taxiways, taxilanes, and landside facilities.

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. The six ADG's used in airport planning 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.

In order to determine facility requirements, an ARC should first be determined, then appropriate airport design criteria can be applied. This begins with a review of the type of aircraft using and expected to use Benton Airpark.

The FAA recommends designing airport functional elements to meet the requirements of the most demanding ARC for that airport. The majority of aircraft currently operating at the airport are single-engine and small twin-engine general aviation aircraft (weighing l2,500 pounds or less), which fall within approach categories A and B and design group I.

In addition, both the California Highway Patrol and Mercy Medical Center air ambulance conduct air operations from Benton Airpark. Mercy Medical Center's air ambulance service reportedly averages approximately

1,450 annual operations (four daily), utilizing three twin-turbo Cessna aircraft (ARC B-I aircraft) and one helicopter. These aircraft, which fall within ARC B-I, are the most demanding class of aircraft operating at the airport. Therefore, the airport's current ARC B-I should be sufficient throughout the planning period.

PLANNING HORIZON LEVELS

The cost-effective, efficient, and orderly development of an airport should rely more upon actual demand at an airport than a time-based forecast figure. In order to develop a master plan that is demand-based rather than time-based, a series of planning horizon milestones have been established for Benton Airpark that take 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 resultant 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 City of Redding 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 resultant plan provides airport officials with a financially responsible and need-based program. **Table 3A** presents the planning horizon milestones for each activity demand category.

TABLE 3A
Planning Horizon Activity Levels
Benton Airpark

	Current Levels	Short-Term	Intermediate Term	Long-Term
Based Aircraft	128	130	135	145
Annual Operations	35,000	38,000	41,000	47,000

AIRFIELD REQUIREMENTS

Airfield requirements include the need for those facilities related to the arrival and departure of aircraft. These facilities are comprised of the following items:

- Runways (including safety areas)
- Taxiways

- Airfield Lighting, Marking, and Signage
- Navigational Aids

The following airfield facilities are outlined to describe the scope of facilities that would be necessary to accommodate the airport's role throughout the planning period.

RUNWAYS

The adequacy of the existing runway system was analyzed from a number of perspectives, including runway orientation, runway length, runway width, and pavement strength. From this information, requirements for runway improvements were determined for the airport.

Runway Orientation

Benton Airpark is currently served by a single runway, oriented in a north-south manner. For the operational safety and efficiency of an airport, it is desirable for the 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 design standards recommend additional runway configurations when the primary runway configuration provides less than 95 percent wind coverage at specific crosswind components. The 95 percent wind coverage is computed on the basis of crosswinds not exceeding 10.5 knots for small aircraft weighing less than 12,500 pounds and from 13 to 20 knots for aircraft weighing over 12,500 pounds.

According to wind data gathered from the Airport Layout Plan (2001), the existing runway configuration provides 99.4 percent wind coverage in 10.5 knot crosswind conditions and 99.8 percent wind coverage in 13 knot crosswind conditions. **Table 3B** summarizes the wind coverage for Runway 15-33 in all-weather conditions.

TABLE 3B
Wind Coverage Summary
All-Weather Conditions

	10.5 knots	13 knots
Runway 15-33	99.4%	99.8%

Source: Airport Layout Plan, 2001.

Runway Length

The adequacy of the existing runway length at Benton Airpark has been analyzed utilizing the FAA's Airport Design Software (Version 4.2D). Several factors are used in determining an airport's runway length requirements, including airport elevation, mean maximum temperature of the hottest month, runway gradient (elevation differences between each runway end), critical aircraft type expected to use the airport, and stage length of the longest nonstop trip destination (applies only to large aircraft weighing 60,000 pounds or more).

For Redding, California, the average maximum daily temperature of the hottest month (July) is 98.8 degrees Fahrenheit (F). The elevation of Benton

Airpark is approximately 720 feet mean sea level (MSL), and the runway gradient for Runway 15-33 is 0.02 percent for a difference in elevation of 5.33 feet between each runway end. As previously mentioned, the most critical or demanding classification of aircraft using the airport are ARC B-I type aircraft. Since large aircraft (over 12,500 pounds) generally do not operate in and out of Benton Airpark, the stage length or haul factor does not apply. It should be noted that aircraft performance declines as elevation, temperature, and runway gradient factors increase.

Applying the preceding factors to the FAA's design software, as presented in **Table 3C**, outlines the runway length requirements for the variety of aircraft presently operating at Benton Airpark. As shown in the table, Runway 15-33's existing runway length of 2,420 feet is nearly 430 feet short of the recommended runway length of 2,850 feet specified (by the FAA's design software) for accommodating 75 percent of small aircraft with less than ten passenger seats. However, the majority of aircraft currently utilizing Benton Airpark can safely operate given the existing runway length.

TABLE 3C
Runway Length Requirements

AIRPORT AND RUNWAY DATA	
Airport elevation	720 feet
Mean daily maximum temperature of the hottest month	98.5 F
Maximum difference in runway centerline elevation	5.0 feet
RUNWAY LENGTH RECOMMENDED FOR AIRPORT DESIGN	
Small airplanes with less than 10 passenger seats	
75 percent of these small airplanes	**2,840 feet**
95 percent of these small airplanes	3,390 feet
100 percent of these small airplanes	4,030 feet

Source: FAA Airport Design Software, Version 4.2D.

The 1987 Redding Airport Master Plan noted that the runway safety area (RSA) for Runway 15 was deficient by 140 feet. The plan proposed relocating the threshold for Runway 15 by 140 feet to the south, which would satisfy FAA RSA design criteria. According to the report, this could be accomplished with or without a comparable (140-foot) extension to the south for the Runway 33 end. The report further stated that without a related extension, the usable landing length for Runway 15 would be reduced to less than 2,300 feet. This recommendation from the 1987 Redding Airport Master Plan was never implemented.

The 1995 Redding Airport Master Plan Update also addressed the RSA at Benton Airpark and found the same 140-foot deficiency on Runway 15. Four alternatives were examined, with the chosen alternative being to maintain the existing runway length. More recently, a Runway Safety Area Study was completed in February 2002 to further examine this issue. This study, along with its proposed alternatives, will be further discussed in Chapter Four.

Runway Width

The width of the existing runway was also examined to determine the need for facility improvements. The current width of Runway 15-33 is 80 feet, which exceeds the 60-foot width FAA design standard for both ARC A-I and B-I. Therefore, no additional runway width is required to serve aircraft expected to operate at the airport throughout the planning period.

Runway Strength

The most important feature of airfield pavement is its ability to withstand repeated use by aircraft of significant weight. Runway 15-33 has a pavement strength of 12,500 pounds single wheel loading (SWL). This is sufficient for the fleet of aircraft currently serving and expected to serve the airport in the future.

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 the runways, whereas other taxiways become necessary as activity increases at an airport to provide safe and efficient use of the airfield.

At Benton Airpark, Runway 15-33 is served by two full-length parallel taxiways, with additional entrance/exit and connector taxiways. These taxiways vary in width, ranging from 30-50 feet wide. According to FAA AC 150/5300-13, *Airport Design*, these are adequate widths for aircraft in design group I.

Runway-taxiway separation standards vary by both ARC and the type of runway approach. The centerlines of parallel Taxiways A and B are each 150 feet from the centerline of Runway 15-33. This is adequate separation for aircraft in ARC B-I and below on runways for small airplanes exclusively.

AIRFIELD LIGHTING, MARKING, AND SIGNAGE

In order to facilitate the safe movement of aircraft about the airfield, airports use pavement markings, lighting, and signage to direct pilots to their destinations. Runway markings are designed according to the type of instrument approach available on the runway. However, there are no instrument approaches available at Benton Airpark and the runway length precludes the ability to provide instrument approaches. Therefore, the basic markings on Runway 15-33 will be sufficient throughout the planning period.

Taxiway and apron areas also require marking. Yellow centerline stripes are currently painted on all taxiway surfaces at the airport to provide this guidance to pilots. The apron surfaces also have centerline markings to indicate the alignment of taxilanes within these areas. Besides routine maintenance of the taxiway striping, these markings will be sufficient throughout the planning period.

Airport lighting systems provide critical guidance to pilots during nighttime and low visibility operations. Runway 15-33 is equipped with medium intensity runway lighting (MIRL), which will be adequate for the planning period.

Effective ground movement of aircraft at night is enhanced by the availability of taxiway lighting. While Benton Airpark is not equipped with taxiway lighting, orange and blue reflectors line the edges of all taxiways at the airport. With routine maintenance, this will be sufficient throughout the planning period.

Airfield signage provides another means of notifying pilots as to their location on the airport. A system of signs placed at several airfield intersections on the airport is the best method available to provide this guidance. Signs located at intersections of taxiways provide crucial information to avoid conflicts between moving aircraft. Directional signage instructs pilots as to their location of taxiways and aprons. At Benton Airpark, lighted signs are installed at all taxiway and runway intersections.

NAVIGATIONAL AND APPROACH AIDS

Electronic and visual guidance to arriving aircraft enhance the safety and capacity of the airfield. Such facilities are vital to the success of the airport, and provide additional safety to passengers using the air transportation system. As previously mentioned, there are no instrument approaches available at Benton Airpark. However, visual approach aids are available at the airport to provide pilots with visual guidance information during landings to the runway. Currently, each end of Runway 15-33 has a two-light precision approach path indicator (PAPI-2) system on the left hand side of the runway, which will be sufficient throughout the planning period.

LANDSIDE FACILITIES

Landside facilities are those necessary for the handling of aircraft while on the ground. These facilities provide the essential interface between the air and ground transportation modes. These areas will be subdivided into two parts: general aviation facilities and support facilities. The capacities of various components of each area were examined in relation to projected demand to identify future landside facility needs.

GENERAL AVIATION FACILITIES

The purpose of this section is to determine the space requirements, throughout the planning period, for those facilities normally associated with general aviation. These areas include the hangars and the aircraft parking aprons.

Hangars

The demand for aircraft storage hangars is dependent upon the number and type of aircraft expected to be based at the airport in the future. For planning purposes, it is necessary to estimate hangar requirements based upon forecast operational activity. However, hangar development should be based upon actual demand trends and financial investment conditions. While a majority of aircraft owners prefer enclosed aircraft storage, a number of based aircraft will still tie-down outside (due to the lack of hangar availability, hangar rental rates, and/or operational needs). Therefore, enclosed hangar facilities should not be planned for each based aircraft. At Benton Airpark, approximately 86 percent of the based aircraft are currently stored in enclosed hangar facilities. It is estimated that the percentage of based aircraft stored in hangars will remain near 83 percent throughout the planning period.

Approximately 89 percent of based aircraft at Benton Airpark are currently stored in T-hangars. For planning purposes, the shade and open hangars have been categorized as T-hangars. The majority of aircraft currently stored in these hangars are single-engine and small twin-engine aircraft. A planning standard of 1,200 square feet per based aircraft stored in T-hangars has been used to determine future T-hangar requirements.

Approximately seven percent of based aircraft are stored in smaller box or executive hangars, and the remaining four percent are stored in larger conventional hangars. Each of these types of hangars are designed for multiple aircraft storage. As the trend towards more sophisticated aircraft continues throughout the planning period, it is important to determine the need for more conventional and executive hangars. For executive and conventional hangars, a planning standard of 1,200 square feet was used for single-engine aircraft, while a planning standard of 3,000 square feet was used for multi-engine aircraft and helicopters.

Since portions of conventional hangars are also used for aircraft maintenance and servicing, requirements for maintenance/service hangar area were estimated using a planning standard of approximately 15 percent of the total hangar space needs.

Recently, new restrooms were added near the hangar storage areas on the east side.

Future hangar requirements for the airport are summarized in **Table 3D**. Chapter Four, Airport Development Alternatives, will examine the options available for hangar development at the airport and determine the best location for each type of hangar facility.

According to the table, available T-hangar area is not sufficient to meet current demands. The reason for this is that the current square footage per aircraft position is much lower than the planning standards used for the forecasts.

TABLE 3D
Aircraft Storage Requirements
Benton Airpark

		FUTURE REQUIREMENTS		
	Currently Available	**Short-Term**	**Intermediate Term**	**Long-Term**
Aircraft to be Hangared	106	108	111	122
T-hangar Positions*	94	94	97	106
Executive Hangar Positions	6	7	7	9
Conventional Hangar Positions	6	7	7	7
Hangar Area Requirements (s.f.)				
T-hangar Area	109,000	112,800	116,400	123,100
Executive Hangar Area	10,000	14,200	17,000	22,000
Conventional Hangar Area	10,000	15,400	17,000	17,600
Total Maintenance Area	**	21,400	22,600	24,400
Total Hangar Area (s.f.)	129,000	163,800	173,000	187,100

* Current positions include shade and open hangars. It is assumed that shade and open hangars (or older T-hangars) will need to be replaced with new hangars in future years.
** Included in other hangar categories.

AIRCRAFT PARKING APRON

A parking apron should provide for the number of locally-based aircraft that are not stored in hangars, and for those aircraft used for air taxi and training activity. Parking should be provided for itinerant aircraft as well. As mentioned in the previous section, approximately 83 percent of based aircraft at Benton Airpark are currently stored in hangars, and that percentage is expected to continue throughout the planning period.

For planning purposes, 15 percent of the based aircraft total will be used to determine the parking apron requirements of local aircraft, due to some aircraft requiring both hangar storage and parking apron. Since the majority of locally-based aircraft are stored in hangars, the area requirement for parking of locally-based aircraft is smaller than for transient aircraft. Therefore, a planning criterion of 650 square yards per aircraft was used to determine the apron requirements for local aircraft.

Along with based aircraft parking needs, transient aircraft parking needs must also be considered when determining apron requirements. A planning criterion of 800 square yards was used for single and multi-engine itinerant aircraft. Currently, there is one apron area at Benton Airpark, totaling approximately 32,000 square yards. However, two helipads and one helicopter parking area are also located on this apron, therefore limiting the area of available tie-downs to 25,000 square yards. This apron area, located on the northeast side of the airfield, has parking for both based (30 spaces) and transient aircraft (18 spaces). An additional row of tie-downs for based aircraft is located south of the shade hangars. This area totals approximately 1,650 square yards and contains parking for an additional eight based aircraft.

Total aircraft parking apron requirements are presented in **Table 3E**. While total aircraft tie-down positions are projected to decrease throughout the planning period, an increase in total apron area is needed. The reason for this is that the current square footage per aircraft parking position is much lower than the planning standards used for the forecasts.

TABLE 3E
Aircraft Parking Apron Requirements
Benton Airpark

	Currently Available	Short-Term	Intermediate Term	Long-Term
Single, Multi-Engine Transient				
Aircraft Positions		14	16	18
Apron Area (s.y.)		11,500	12,500	14,400
Locally-Based Aircraft Positions		20	20	22
Apron Area (s.y.)		12,700	13,200	14,100
Total Positions	56	34	36	40
Total Apron Area (s.y.)	26,650	24,200	25,700	28,500

SUPPORT REQUIREMENTS

Various facilities that do not logically fall within classifications of airfield 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, perimeter road, and airport maintenance facilities.

AIRPORT MAINTENANCE/ STORAGE FACILITIES

Currently, there are no separate maintenance/storage facilities available at Benton Airpark. New area for maintenance/storage may be needed in the future.

FUEL STORAGE/ PERIMETER ROAD

Fuel storage facilities at Benton Airpark are located on the west side of the airfield and include two 12,000-gallon above-ground storage tanks. Areas should be reserved to allow for expansion of the fuel facilities, should their demands change throughout the planning period. Planning standards usually recommend a two-week minimum supply.

With storage on the west side, and refueling requirements on the east side, a perimeter road needs to be sited to prevent fuel trucks from crossing the runway.

SUMMARY

The intent of this chapter has been to outline the facilities required to meet potential aviation demands projected for the airport through the planning horizon. The next step is to develop a direction for implementation that will best meet these projected needs. The remainder of the master plan will be devoted to outlining this direction, its schedule, and costs.

Chapter Four
ALTERNATIVES

Alternatives

The previous chapters have focused on the available facilities, the existing and potential future demand, as well as quantified the level of facilities that are needed both now and in the future. The purpose of this chapter is to formulate and examine rational airport development alternatives that can address the planning horizon demand levels. Because there are literally a multitude of possibilities and combinations thereof, intuitive judgement is necessary to focus in on those opportunities which have the greatest potential for success.

The major functional areas of an airport must be considered in the formulation of alternatives. At Benton Airpark, these include the airfield and landside general aviation facilities. In addition, operational support facilities and surface access for all these functions must be considered. The interrelationships of these functional areas require that they be evaluated both separately and as a whole to ensure the most functionally efficient, cost-effective, and environmentally compatible plan is derived. With this information, as well as the input from government agencies, airport users, and other local stakeholders, a basic airport concept can evolve into a realistic development plan.

AIRPORT ROLE

Within the Federal Aviation Administration's (FAA) *National Plan of Integrated Airport Systems (NPIAS)*, Benton Airpark is classified as a general aviation (GA) airport. The 2,472 general aviation airports that are currently within the *NPIAS* have an average of 29 based aircraft and account for 37 percent of the nation's general aviation fleet. The six (6) additional

airport types in the NPIAS account for 55 percent of all GA aircraft, while the remaining eight (8) percent are based at airports or landing sites that are not part of the NPIAS. General aviation airports are the most convenient form of air transportation for nearly 19 percent of the population and are of particular importance to rural areas. The NPIAS includes cost estimates for development needs for the nation's airports that qualify for federal funding assistance.

As a general aviation airport, Benton Airpark serves the needs of the small aircraft operators in the City of Redding and the surrounding region. The airport is also home to government and corporate operators. Both the California Highway Patrol and Mercy Medical Center air ambulance conduct air operations from the airport. Other services offered at the airport include charter air service, flight instruction, aircraft rentals and sales, aircraft fueling, as well as aircraft maintenance, repair and parts service.

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

FAA Order 5190.6A, Paragraph 4-17j, *Conformance to FAA Criteria and Standards* states: "Any facilities developed with grant funds must be constructed to the then current applicable FAA design standards . . ." Most of these standards are outlined in FAA Advisory Circular 150/5300-13, *Airport Design, Change 7*.

The primary goal for the City of Redding and airport management is to develop and operate the airport to meet the needs of the small aircraft operators in the region. Benton Airpark provides a valuable service in its role as a general aviation airport. Not only does it provide for local operators, it also serves the needs of aircraft operators in the region. Future planning should consider the continued role of the airport to meet general aviation demands of local and regional aircraft owners/operators.

NON-DEVELOPMENT ALTERNATIVES

Non-development alternatives include the no action or "do nothing" alternative, transferring service to an existing airport, or developing an airport at a new location. These alternatives need to be examined first to determine whether future development of Benton Airpark is in the best interest of the City of Redding and the region as a whole.

NO ACTION ALTERNATIVE

The "do-nothing" alternative essentially considers keeping the airport in its present condition and not providing for any type of improvement to the existing facilities. The primary result of this alternative would be the inability of the airport to satisfy the projected aviation demands of the airport service area and comply with FAA design standards.

The general aviation industry has experienced an extended period of adjustment over the last 20 years, but it is now seen as a growth industry once more. In the near future, the FAA will likely approve an entirely new segment of general aviation, sport aviation. This segment will allow for streamlined aircraft certification of smaller, less expensive aircraft. The FAA will also allow easier access to would-be pilots, minimizing pilot certification requirements. Benton Airpark will likely be significantly impacted by sport aviation. This impact will require continued future development.

One of the key considerations of this Master Plan is the potential for providing for current FAA design standards, particularly the runway safety area (RSA). A "no action" approach would ignore the needs of existing aircraft and future airport operators and would be unacceptable to the FAA and the California Department of Transportation (CALTRANS).

AIRPORT CLOSURE

The alternative of closing Benton Airpark and shifting all aviation services to another existing airport was found even less desirable due to the impact that a transfer would have on both the existing Benton Airpark users and other airports in the region.

Benton Airpark's strategic location near the business district and population center of the City of Redding makes it a key airport in support of local commerce. This holds especially true for operators such as the California Highway Patrol (CHP) and Mercy Medical Center. Both of these operators chose Benton Airpark over Redding Municipal Airport or other regional airports due to its location near their base of operations.

One fallacy is that airport closure can be a simple process. Nothing could be further from the truth. Benton Airpark is a public use facility which has been improved, in part, through acceptance and use of federal and state funding sources (FAA in particular). In accepting federal grants-in-aid, the City has agreed to several grant assurances which stipulate that in return for the grant funds, the City will continue to operate the airport under the guidance and purview of the FAA.

The grant assurances obligate the City to maintain the improved facilities for their useful life or 20 years, whichever comes first. If a City defaults, the FAA could require that the grants with unexpired assurances be repaid. The City of Redding has accepted five grants for Benton Airpark since 1991. If the airport were closed before the expiration of the improvements' useful life, or before 2011, the City could be required to remit up to $1,165,126 to the FAA.

Another consideration is the commitment made to airport businesses and tenants. It is typical for airports to enter into long term lease arrangements with airport operators and tenants. In some cases, these leases contain options to extend the current lease by decades. Currently, the airport has several long term leases which will not expire for several years and others which contain options for extension (at the operators discretion) for 10 to 30 years. If the airport were to close, the City would have to either wait for the leases to expire (and not renew) or buy out existing leases. In either event, the cost of buying out current leases would be substantial. Furthermore, the loss of future lease revenues would be in the millions of dollars. The loss of these revenues may not be recoverable to the City as many operators may choose to relocate to an airport other than Redding Municipal Airport. Finally, closing the airport would also close the opportunity to future lease revenues which could be generated by further development.

A final consideration of closing the airport would be the loss of a key economic and service facility. In 2000, an economic study of Benton Airpark indicated that the airport is a major factor in the City's economy with a total economic impact exceeding seven million dollars annually. Much of this impact is the direct result of current leases, however, the airport also infuses the local economy with indirect revenues. Moreover, the airport is home to the CHP and Mercy Medical Center operations. These operations provide benefits to the community which cannot be measured in dollars, but rather in lives saved and/or improved. It is obvious the impact of closing the airport could extend far beyond just the local pilots. Rather, the impact would be adverse to the community as a whole both financially and in their quality of life.

Another option would be constructing a new airport. From the social, political, and environmental standpoints, the commitment of a new large land area must also be considered. There has been significant opposition in the past to attempts to develop new airports across the country. Furthermore, the development of a new airport similar to Benton Airpark would likely take a minimum of seven years to become a reality. The potential exists for significant environmental impacts associated with disturbing a large land area when developing a new airport site. To develop a new site with the capabilities of Benton Airpark could easily cost over $25 million dollars and would not provide the strategic location that Benton Airpark does today.

Overall, closing the airport and transferring service to an existing airport in the region, or constructing an entirely new facility are unreasonable alternatives that should not be pursued further at this time. Benton Airpark is a valuable asset to the economic dynamics of the City of Redding and the surrounding region. It should be developed to the extent practical to maintain and promote commerce in the area.

AIRFIELD ALTERNATIVES

Analysis presented in the previous chapter indicated that the airport should consider the needs of general aviation aircraft within airport reference code (ARC) B-I. This designation considers all aircraft with approach speeds up to 121 knots and wingspans of less than 49 feet. All aircraft in this group weigh less than 12,500 pounds. **Table 4A** depicts applicable airport design standards for the airport.

AIRFIELD ISSUES

Runway 15-33 is currently 2,420 feet long by 80 feet wide. Analysis in the previous chapter indicated that the current length of the runway falls short of providing the length recommended by the FAA. Furthermore, the runway does not provide for several of FAA's required design standards.

Airfield alternatives must consider meeting FAA design standards whenever practical. This holds especially true for the RSA. The FAA defines the RSA as *"a defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot or excursion from the runway."*

The RSA is an integral part of the runway environment. RSA dimensions are established in Advisory Circular 150/5300-13, *Airport Design*, and are based on the airport reference code. The RSA is intended to provide a measure of safety in the event of an aircraft's excursion from the runway by significantly reducing the extent of personal injury and aircraft damage during overruns, undershoots, and veer-offs. According to the Advisory Circular, the RSA shall be:

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

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

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

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

TABLE 4A
Benton Airpark - ARC A-I and ARC B-I, Airfield Design Standards
Visual or Not Lower than One Mile Approach Visibility Minimums

	FAA Design Standard		
	ARC A-I	**ARC B-I**	**Existing Airport Condition**
Runway			
Width	60'	60'	80'
Runway Safety Area (RSA)			
Width	120'	120'	120'
Length Beyond Runway End	240'	240'	100'
Object Free Area (ROFA)			
Width	250'	250'	250'
Length Beyond Runway End	240'	240'	100'
Obstacle Free Zone (ROFZ)			
Width	250'	250'	250'
Length Beyond Runway End	200'	200'	100'
Runway Centerline to:			
Holding Position	125'	125'	100' (Eastside) 120' (Westside)
Parallel Taxiway Centerline	150'	150'	150'
Edge of Aircraft Parking Apron	125'	125'	Meets or Exceeds
Runway Protection Zones (RPZ)			
Inner Width	250'	250'	250'
Outer Width	450'	450'	450'
Length	1,000'	1,000'	1,000'
Obstacle Clearance	20:1	20:1	20:1
Building Restriction Line (BRL)[1]			
Distance from Runway Centerline	230'	230'	Based on Building Height
Taxiways			
Width	26.5'	26.5'	Varies from 30' to 40'
Safety Area Width	49'	49'	Meets or Exceeds
Object Free Area Width	89'	89'	Meets or Exceeds
Taxiway Centerline to:			
Parallel Taxiway/Taxilane	69'	69'	Meets or Exceeds
Fixed or Moveable Object	44.5'	44.5'	Meets or Exceeds
Taxilanes			
Taxilane Centerline to:			
Parallel Taxilane Centerline	64'	64'	Meets or Exceeds
Fixed or Moveable Object	39.5'	39.5'	Meets or Exceeds
Taxilane Object Free Area	79'	79'	Meets or Exceeds

Source: *FAA Airport Design Software Version 4.2D, F.A.R. Part 77, TERPS*
[1] 15 Foot Building Height

Furthermore, the FAA has placed a higher significance on maintaining adequate RSAs at all airports due to recent aircraft accidents. Under Order 5200.8, the FAA established a Runway Safety Area Program. The Order states, "The goal of the Runway Safety Area Program is that all RSAs at federally obligated airports and all RSAs at airports certificated under 14 CFR part 139 shall conform to the standards contained in Advisory Circular 150/5300-13, *Airport Design*, to the extent practical." Under the Order, each regional airports division of the FAA is obligated to collect and maintain data on the RSA for each runway at federally obligated airports.

The existing RSA width of 120 feet meets current FAA ARC A-I/B-I design standards. However, the existing RSA available beyond each runway end at the Airport is limited to 100 feet (corresponding to the unpaved overruns) where 240 feet is the design requirement. Beyond these 100-foot long overruns, the topography begins to drop in grade steeply, at an approximate 10 to 1 slope for the Runway 15 end, and as much as 25 to 1 for Runway 33.

It should also be noted that Placer Street is located approximately 570 feet north of Runway 15. To the south, approximately 210 to 220 feet off the end of Runway 33 is the closed and capped Benton Landfill. Although Placer Street and the landfill do not represent obstructions to the existing RSAs, they are factors to be considered when developing alternatives to solve the RSA deficiencies currently existing at the Airport.

A related standard to the RSA is the runway object free area (ROFA) which is defined as *"A two dimensional ground area surrounding runways, taxiways, and taxilanes which is clear of objects except for objects whose location is fixed by function."* Except where precluded by other clearing standards, it is acceptable to place objects that need to be located in the ROFA for air navigation purposes or aircraft ground maneuvering purposes and to taxi and hold aircraft in the ROFA. Objects non-essential for air navigation or aircraft ground maneuvering purposes are not to be placed in the ROFA.

The available ROFA width of 250 feet meets the recommended design standard. The required length beyond the runway end for the ROFA is 240 feet. As with the RSA, the existing terrain conditions limit the graded available distance to 100 feet. As long as no object obstructs the ROFA, however, the existing condition should be sufficient.

Another related standard is the runway obstacle free zone (ROFZ) which is defined as *"a volume of airspace centered above the runway. The ROFZ is the airspace above a surface whose elevation at any point is the same as the elevation of the nearest point on the runway centerline."* The ROFZ clearing standard precludes taxiing and parked aircraft and object penetrations, except for frangible NAVAID locations which are fixed by function.

The existing ROFZ width of 250 feet meets the recommended design standard. The required length beyond the runway end for the ROFZ is 200 feet. Like the RSA and ROFZ, the existing terrain restricts the available graded distance to 100 feet. As long as the ROFZ is not obstructed, however, the existing condition should be sufficient.

Given the lack of existing RSA, ROFA, ROFZ, and constraints of surrounding terrain, Placer Road and the landfill, extending Runway 15-33 to meet FAA recommended length (2,850 feet) appears unlikely. Consideration should be given to at least maintaining the existing length while providing for adequate RSA. Airfield alternative analysis will present the findings of a recent study (*Runway Safety Area Study*, February 2002) evaluating methods of improving the RSA. These alternatives will be examined in the following sections.

ALTERNATIVE 1

Runway Alternative 1 explored the possibility of relocating or realigning the runway at Benton Airpark to achieve the required RSAs. However, given the physical constraints and limitations of the existing topography, airport facilities, and surrounding land uses, this alternative was deemed physically and financially infeasible.

ALTERNATIVE 2

Runway Alternative 2 is the "do nothing" alternative. This involves leaving Runway 15-33 in its present condition, with its existing RSA, ROFA, and ROFZ deficiencies. Little or no costs are associated with this alternative. However, an FAA "Safety Area Determination" and approval of a "Modifications to Standards" would be required.

ALTERNATIVE 3

Runway Alternative 3 reduces the length of the runway by relocating the threshold of each runway inward by 140 feet, which reduces the existing runway length to 2,140 feet. The pavement beyond each relocated runway threshold would then be converted to stopways. This alternative would satisfy the FAA design requirement for RSA and ROFA length beyond each runway end, as well as the required 200-foot ROFZ.

While implementation costs associated with this alternative are minimal (i.e. remarking the runway and relocating the runway threshold lights and PAPI-2s), the runway length is reduced by a total of 280 feet. The shorter useable runway length could significantly impact twin-engine and turboprop aircraft operations, particularly in hot weather conditions.

ALTERNATIVE 4

Runway Alternative 4 relocates the threshold of Runway 15 by 140 feet to the south. The resulting safety area for the Runway 15 end would consist of 140 feet of pavement and an additional 100 feet of graded earthen embankment. Runway 33 would be extended by 140 feet to the south along with a graded earthen runway safety area of 240 feet.

A major advantage to this alternative is that it preserves the current runway length of 2,420 feet, while meeting the safety area design requirements for each end of the runway. However, the Benton Landfill is located at the south end of the runway, resulting in significant design and construction expenses related to the extension of Runway 33. Significant on-going maintenance and monitoring will be required, including close coordination with applicable state agencies with regard to design and construction impacts to the landfill.

ALTERNATIVE 5

Runway Alternative 5 is similar to Runway Alternative 3, in which it displaces the threshold of each runway end by 140 feet to satisfy RSA, ROFA, and ROFZ requirements. However, this option employs "declared distances" to satisfy safety area requirements. It maintains the existing runway length of 2,420 feet in either direction for both Takeoff Run Available (TORA) and Takeoff Distance Available (TODA). However, Accelerate-Stop Distance Available (ASDA) and Landing Distance Available (LDA) are reduced to 2,280 feet and 2,140 feet, respectively.

Major advantages to this alternative include no impacts to the landfill and significantly lower costs than the previous alternative. Runway improvements include remarking the runway for the displaced thresholds, relocating the runway threshold lights and PAPI-2s, and modifications to the existing runway edge lighting system. However, this alternative reduces runway length requirements by 140 feet for takeoffs and 280 feet for landings. As previously mentioned, the shorter useable runway length could significantly impact twin-engine and turboprop aircraft operations in hot weather conditions.

ALTERNATIVE 6

Runway Alternative 6 utilizes retaining walls at the ends of each runway in order to create the maximum amount of RSA without impacting the landfill or Placer Street. While this alternative does not meet the full 240 feet of RSA, it does increase the Runway 15 RSA by 50 percent and the Runway 33 RSA by 100 percent. An FAA runway safety area determination will be required for the RSA length. It is also possible to achieve a full safety area by displacing the Runway 15 threshold by 90 feet and the Runway 33 threshold by 40 feet.

No landfill impacts are associated with this alternative and implementation costs are considerably more reasonable than some of the other alternatives. However, there are significant design and construction expenses related to the retaining walls and the earth fill. Similar to Alternatives 3 and 5, displacing the thresholds would reduce the runway length requirements by approximately 90 feet for departures and approximately 130 feet for landings. Again, shorter useable runway length could significantly impact twin-engine and turboprop aircraft operations into and out of Benton Airpark.

ALTERNATIVE 7

Runway Alternative 7 satisfies the RSA length by relocating the Runway 15 threshold 140 feet south of its present location and extending Runway 33 by 140 feet to the south, similar to Runway Alternative 4. However, where this alternative differs is that it proposes removing the existing landfill material within the required project area and replacing it with compacted engineered fill.

Advantages to this alternative are that it maintains the existing runway length and enhances overall runway safety by meeting FAA required RSA standards at each runway end. Removal of landfill material in the proposed project area reduces settling impacts to both the runway and landfill. Disadvantages associated with this alternative include significant design and construction expenses. The removal and relocation of impacted landfill material could be costly and time-consuming, and future inspection and monitoring may be required to assure that the final design does not adversely affect the landfill.

CONCLUSION AND RECOMMENDATIONS

The previous section identified the deficiencies in the existing safety areas at Benton Airpark and the proposed alternatives designed to bring the airport into compliance with FAA design standards to the greatest extent possible. Alternative 4 is the preferred choice and is depicted on **Exhibits 4A** and **4B**. However, if landfill material must be removed based upon additional engineering and environmental evaluations, then Alternative 7 becomes the preferred option. Alternative 4 will retain the current length while minimizing impacts to the landfill. Alternatives which reduce effective length or do nothing are not acceptable. As previously mentioned, the current length falls short of fully providing for the airport's critical aircraft.

Following FAA concurrence, the next step will be to retain an engineering firm to develop a design concept that is not detrimental to the integrity of the Benton Landfill and is acceptable to both the California Integrated Waste Management Board and the California Regional Water Quality Control Board. It is estimated that the design effort of Alternative 4 will cost approximately $250,000. However, the project will be eligible for 90 percent funding from the FAA and 4.5 percent funding from CALTRANS.

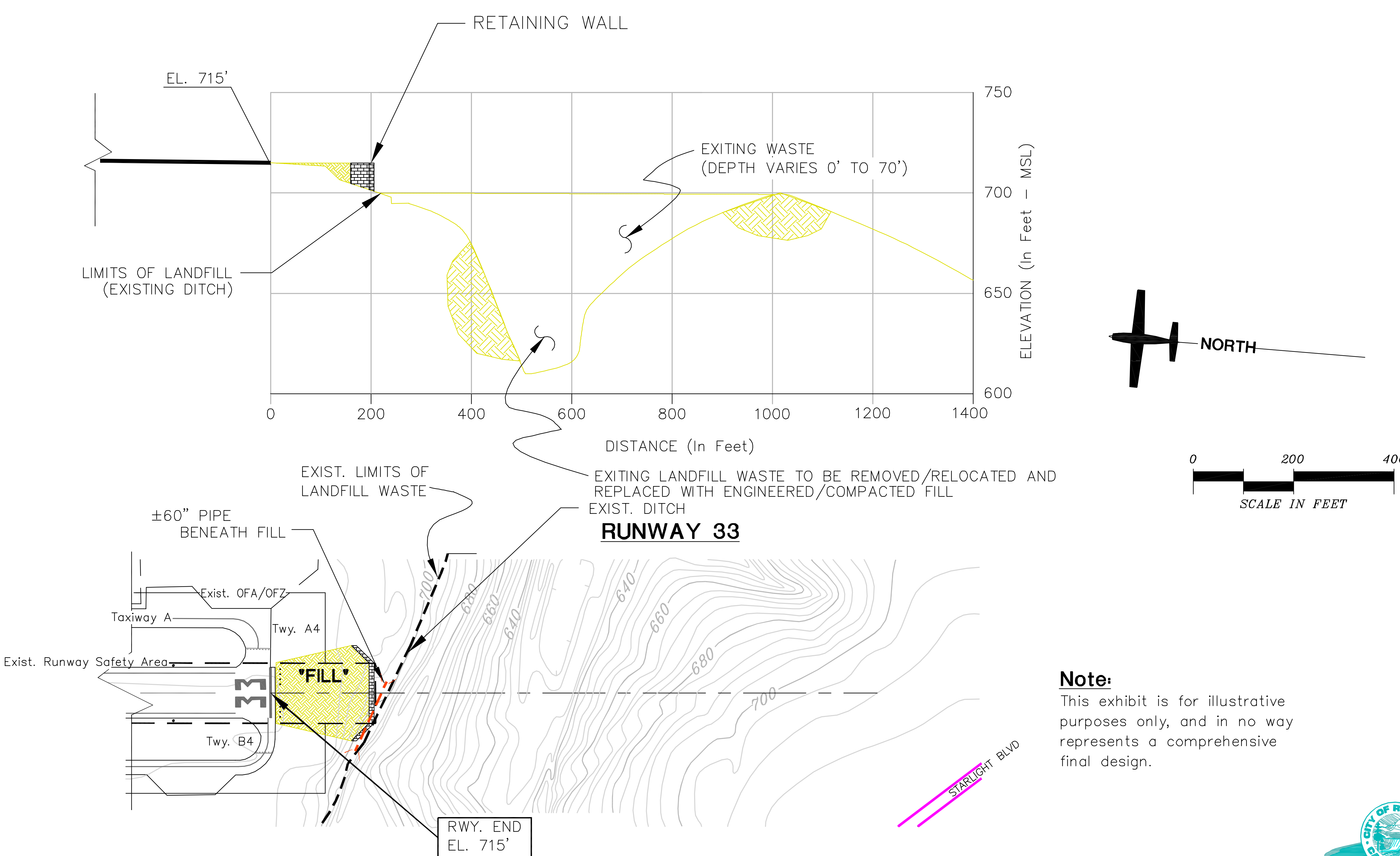
LANDSIDE DEVELOPMENT

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

02-MP-02-benex4A-04/01/2004

Exhibit 4A
PREFERRED AIRFIELD ALTERNATIVE
(ALTERNATIVE 4)

02-MP-03 benex 4B - 04/01/2004



Note:
This exhibit is for illustrative purposes only, and in no way represents a comprehensive final design.

Exhibit 4B
RUNWAY 33 - PREFERRED ALTERNATIVE 4

Consideration must be given to providing for adequate hangar space for a wide variety of general aviation needs. This includes corporate aviation, FBO, and other storage hangars as well. The facility requirements indicated that hangar parking positions should be increased over the planning period. Ultimate development must also consider the most practical, yet beneficial, use of lands for specific hangar uses, eg. T-hangars versus executive or conventional hangars.

Another consideration will be support facilities. In particular, the development of an airport perimeter road. Currently, the airport fuel farm is located on the west side of the airport. Aircraft refueling vehicles must cross the runway twice, once to fill and once to return to the east terminal area. This practice compromises safety. An on-airport perimeter road would allow these vehicles to traverse both sides of the airport without crossing the runway.

A final consideration is maximizing the ability of the airport to be self-sustaining. Future landside development should be done in a manner that is not only cost-effective, but that can increase revenue potential for the airport. A strong revenue capability will help to ensure that the airport does not become a financial burden on the taxpayers of the City of Redding.

In addition to the functional compatibility of the terminal area, the proposed development concept should provide a first class appearance at Benton Airpark. Consideration to aesthetics should be given to the entryway as well as public areas when arranging the various activity areas.

The existing terminal area at Benton Airpark has been developed with basic separation of uses by activity levels. The eastside flight line contains the airport's fixed base operator, CHP, and Mercy Medical, while storage hangars are located to the south. Ideally, terminal area facilities at general aviation airports should follow a linear configuration parallel to the primary runway. The linear configuration allows for greater depth, thereby maximizing space available for aircraft parking apron while providing ease of access to terminal facilities from the airfield. The terminal area has been developed parallel to the runway in a linear fashion.

For many airports, historical development has followed the path of least resistance. In doing so, the airport development many times can prohibit the best use of the airport and hinder future development. This is not the case at Benton Airpark. The historical development has set forth a logical and efficient means to maximizing airport property. Moreover, the airport's future development will likely be dominated by the needs of small aircraft. These aircraft owners typically desire individual storage spaces provided by T-hangars or corporate box hangars.

The airport has several development opportunities available. Few parcels are available in the center of the east terminal area, with bulk development opportunities left at the south ends of the east and west side terminal areas.

For all of these reasons, a single development concept has been prepared. This concept considers a "build out" scenario of airport property. This development will exceed the requirements outlined in the previous chapter, but it will provide the City with a thoughtful direction of the ultimate development of Benton Airpark.

LANDSIDE DEVELOPMENT ALTERNATIVE

Exhibit 4C depicts development of landside terminal facilities according to a logical progression, or "build out" scenario. This alternative considers the needs of small aircraft owners, airport businesses, and corporate operators. The alternative development scheme considers developing various size hangars to meet the needs of a variety of operators. As depicted, the alternative includes the re-use of Dog Park for aviation-related development, which will require the relocation of Dog Park.

The northern central portions of the east terminal area considers conventional hangar development. As proposed, the area could support four 100-foot by 100-foot hangars with an adjoining aircraft apron. These hangars could serve a variety of uses. These uses include FBO expansion, specialty operators (e.g., maintenance operators), corporate operators with several aircraft, or for bulk storage. The plan also considers an 80-foot by 80-foot conventional hangar which could serve many of the same purposes.

This plan also considers continuing T-hangar or executive hangars south of the existing T-hangars on both the east and west sides of the airport. As depicted, these hangars are 60 feet wide. This width is greater than the existing facilities but would allow for twin-engine aircraft or more than one aircraft in each hangar.

If developed as T-hangars, each facility could house ten individual units. If developed as executive hangars, each facility on the east side could support four units while the west side facilities could house five individual units (considering 60-foot by 60-foot). As depicted, the plan would support 80 individual T-hangar units, 40 individual 60-foot by 60-foot executive hangars, or intermixing to meet demand.

The plan also depicts the development of an on-airport perimeter road to serve refueling vehicles. As previously mentioned, the airport's fuel farm is located on the west side of the airport. This location requires the airport's FBO refueling vehicles to cross the runway twice to refuel the truck or aircraft based on the west side of the runway. The plan includes developing a road from Taxiway A, north around the Runway 15 RSA to Taxiway B.

As mentioned, the development proposal provides more than adequate storage space to meet projected demand. The type of future demand will, in large part, dictate the type of facilities required to meet demand. Since smaller aircraft will continue to dominate, T-hangar development will

02MP03-4C-3/8/05

Exhibit 4C
LANDSIDE DEVELOPMENT ALTERNATIVE

be needed. The final plan, or recommended concept, will be determined after discussion with the City, Planning Advisory Committee, and the public.

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.

Upon review of this report by the Planning Advisory Committee, the public, and City officials, 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 long term planning period. The remaining chapters will be dedicated to refining the basic concept into a final plan with recommendations to ensure proper implementation and timing for a demand-based program.

Chapter Five
AIRPORT PLANS

Airport Plans

The airport master planning process evolved through several analytical efforts in the previous chapters intended to analyze future aviation demand, establish airside and landside facility needs, and evaluate options for the future development of the airside and landside facilities. The development alternatives were refined into a single recommended master plan concept. This chapter describes in narrative and graphic form, the recommended direction for the future use and development of Benton Airpark.

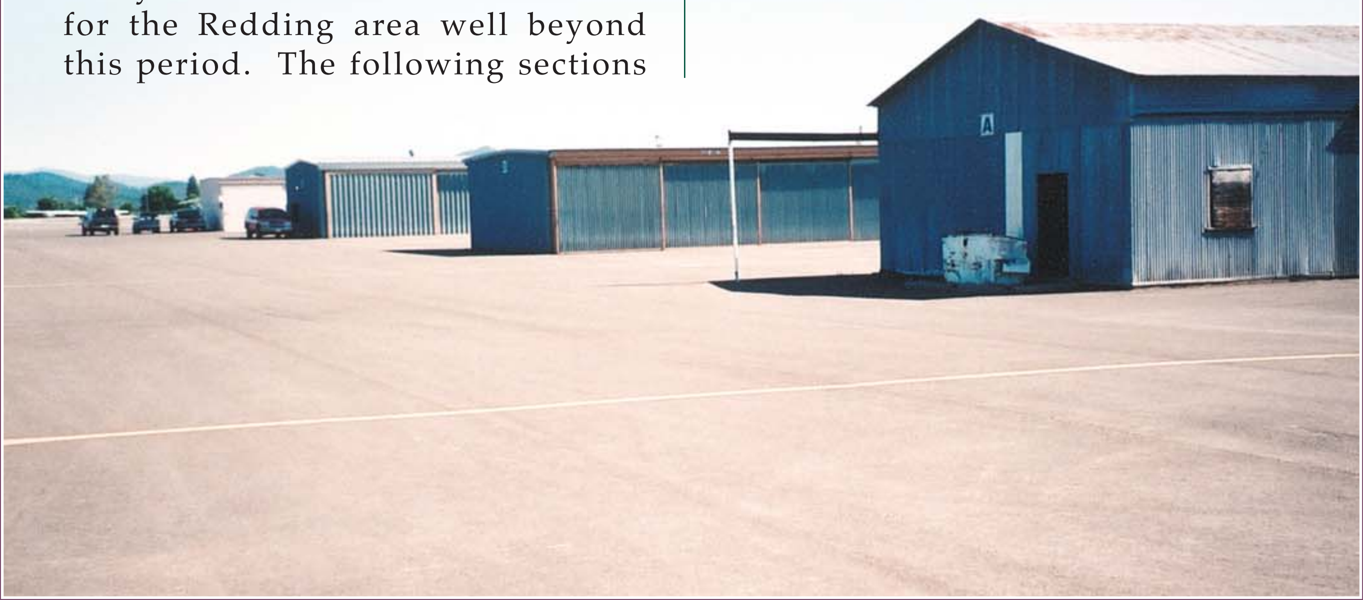
RECOMMENDED MASTER PLAN CONCEPT

The recommended master plan concept, as depicted on **Exhibit 5A**, provides for anticipated facility needs over the next twenty years as well as the airport's ability to accommodate aviation demand for the Redding area well beyond this period. The following sections summarize airside and landside recommendations.

AIRSIDE RECOMMENDATIONS

Airside recommendations include improvements for the runways, taxiways, instrument approaches, or airfield lighting. Airside recommend-ations are as follows:

- Relocate Runway 15 threshold and shift Runway 33 south by approximately 190 feet to provide required safety areas at each runway end and adequate area for a perimeter road. Taxiways and airfield lighting will also need to be adjusted for the runway shift. This will include proper lighting to signify the relocated runway end for



landings on Runway 33. There will be no net gain in the length of runway available for departures in either direction. Engineering evaluations will have to be undertaken on the south end of the runway to determine the feasibility of extending compacted fill over the closed landfill.

LANDSIDE RECOMMENDATIONS

The recommended master plan concept provides for general aviation services and hangar storage requirements. Landside recommendations are as follows:

- Provide for construction of three large conventional hangars (6,400 square feet each) on the east side, on either side of CHP and Mercy facilities and north of Hillside Aviation. Existing auto parking can be expanded as necessary. It should be noted that placement of hangars in this area will not restrict use of the existing wash rack.

- Provide for construction of two additional nested T-hangar buildings on east side (south of Benton Hangar Association) and extend pavement around these new hangars.

- Provide for construction of two large conventional hangars and offices south of the T-hangars (on the east side) to allow for potential relocation of CHP and Mercy (or new tenant). Ramp and auto parking will be provided for these facilities.

- Construct perimeter road around north end of airfield to prevent potential for runway incursions by fuel trucks or other on-airport vehicles.

- Provide for construction of additional nested T-hangar building on west side south of existing shade hangars. (It is assumed that open shade hangars or older T-hangars may be replaced in future years, but remain in existing locations).

- Provide area on west side for construction of individual executive hangars (approximately 60' x 60'). Hangars will share apron, vehicular access, and parking as shown on **Exhibit 5A**. Sixteen units have been depicted.

- Preserve dog park on east side and reserve area on west side for fly-in camping area. This will continue to provide buffer between aircraft operations and adjacent residential areas.

AIRPORT LAYOUT PLANS

The remainder of this chapter provides a brief description of the official layout drawings for the airport that will be submitted to the FAA for review and approval. These plans, referred to as the Airport Layout Plans, have been prepared to graphically depict the

02MP03-5A-3/8/05

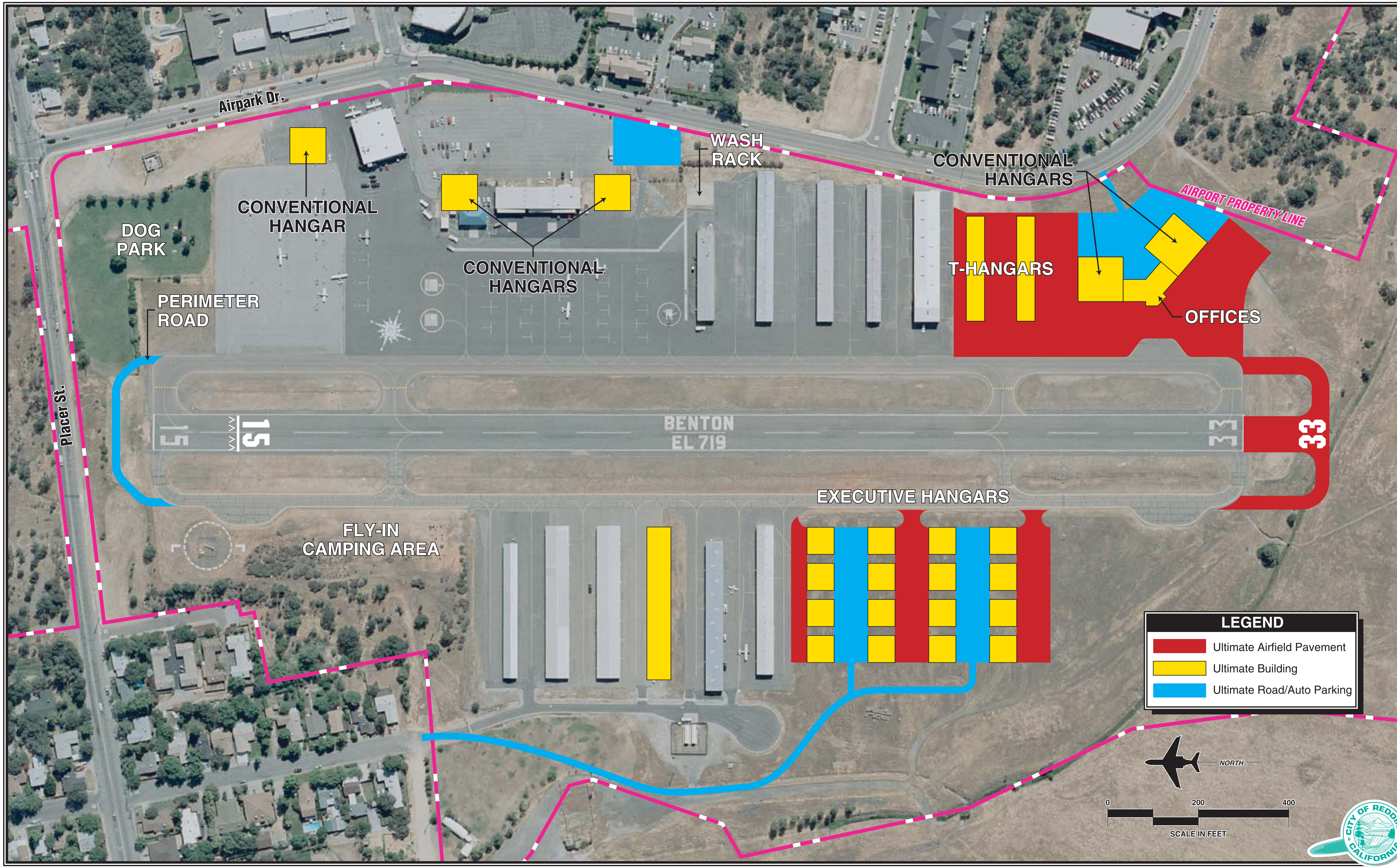


Exhibit 5A
MASTER PLAN CONCEPT

ultimate airfield layout, facility development, and imaginary surfaces which protect the airport from hazards. This set of plans includes:

- Airport Layout Drawing
- General Aviation Area Plan
- On-Airport Land Use Plan
- F.A.R. Part 77 Airspace Plan
- Approach Zone Profiles and RPZ Plans and Profiles
- Property Map

The airport layout plan set has been prepared on a computer-aided drafting system for future ease of use. The computerized plan set provides detailed information of existing and future facility layout on multiple layers that permits the user to focus in on any section of the airport at a desirable scale. The plan can be used as base information for design, and can be easily updated in the future to reflect new development and more detail concerning existing conditions as made available through design surveys. The airport layout plan set is submitted to the FAA for approval and must reflect all future development for which federal funding is anticipated. Otherwise, the proposed development will not be eligible for federal funding. Therefore, updating these drawings to reflect changes in existing and ultimate facilities is essential.

AIRPORT LAYOUT DRAWING

The Airport Layout Drawing (ALD) graphically presents the existing and ultimate airport layout. Detailed airport and runway data are provided to facilitate the interpretation of the master plan recommendations. Both airfield and landside improvements are depicted.

GENERAL AVIATION AREA PLAN

The General Aviation Area Plan provides greater detail concerning landside improvements and at a larger scale than the on the ALD. The General Aviation Area Plan includes detail concerning all landside development (both sides of the runway).

ON-AIRPORT LAND USE PLAN

The objective of the On-Airport Land Use Plan is to coordinate uses of the airport property in a manner compatible with the functional design of the airport facility. Airport land use planning is important for the orderly development and efficient use of available space. There are two primary considerations for airport land use planning: first, to secure those areas essential to the safe and efficient operation of the airport; and, second, to determine compatible land uses for the balance of the property which would be most advantageous to the airport and community. The plan depicts the recommendations for ultimate land use development on the airport. When development is proposed it should be directed to the appropriate land use area depicted on this plan.

F.A.R. PART 77 AIRSPACE PLAN

To protect the airspace around the airport and approaches to each runway end from hazards that could affect the safe and efficient operation of aircraft arriving and departing the airport, standards contained in Federal Aviation Regulations (F.A.R.) Part 77, Objects Affecting Navigable Airspace, have been established for use by local authorities to control the height of objects near the airport. The Part 77 Airspace Plan included in this master plan is a graphic depiction of this regulatory criterion. The Part 77 Airspace Plan is a tool to aid local authorities in determining if proposed development could present a hazard to the airport and obstruct the approach path to a runway end. The Part 77 exhibit is frequently attached by reference to the City's overlay zoning ordinance.

F.A.R. Part 77 Imaginary Surfaces

The Part 77 Airspace Plan assigns three-dimensional imaginary areas to each runway. These imaginary surfaces emanate from the runway centerline and are dimensioned according the visibility minimums associated with the approach to the runway end and size of aircraft to operate on the runway. The Part 77 imaginary surfaces include the primary surface, approach surface, transitional surface, horizontal surface, and conical surface. Part 77 imaginary surfaces are described in the following paragraphs.

- **Primary Surface**

The primary surface is an imaginary surface longitudinally centered on the runway. The primary surface extends 200 feet beyond each runway end. The elevation of any point on the primary surface is the same as the elevation along the nearest associated point on the runway centerline. Under Part 77 regulations, the primary surface for Runway 15-33 is 250 feet wide.

- **Approach Surface**

An approach surface is also established for each runway. The approach surface begins at the same width as the primary surface and extends upward and outward from the primary surface end and is centered along an extended runway centerline. The approach surfaces for Runways 15 and 33 extend 5,000 feet from the end of the primary surface at an upward slope of 20 to 1 to a width of 1,250 feet.

- **Transitional Surface**

The runway has a transitional surface that begins at the outside edge of the primary surface at the same elevation as the runway. The transitional surface also connects with the approach surfaces of each runway. The surface rises at a slope of seven to one up to a height which is 150 feet above the highest runway elevation. At that point, the transitional surface is replaced by the horizontal surface.

- **Horizontal Surface**

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

- **Conical Surface**

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

APPROACH ZONE AND RPZ PLANS AND PROFILES

The Approach Zone and RPZ Plans is a scaled drawing of the runway protection zone (RPZ), runway safety area (RSA), obstacle free zone (OFZ), and object free area (OFA) for each runway end. A plan and profile view of each RPZ is provided to facilitate identification of obstructions that lie within these safety areas. Detailed obstruction and facility data is provided to identify planned improvements and the disposition of obstructions.

PROPERTY MAP

The Property Map provides information on the acquisition and identification of all land tracts owned by the city. It denotes which properties were obtained by fee simple title and those that are avigation easements. It also indicates the date of acquisition for each tract and which properties were obtained with federal funds under federal aid programs.

SUMMARY

The airport layout plan set is designed to assist the City of Redding in making decisions relative to future development and growth at Benton Airpark. The plan provides for development to satisfy expected airport needs over the next twenty years. Flexibility will be a key to future development since activity may not occur exactly as forecast. The plan has considered demands that could be placed upon the airport even beyond the twenty year planning period to ensure that the facility is capable of accommodating a variety of circumstances. The F.A.R. Part 77 Airspace Plan should be used as a tool to ensure land use compatibility and restrict the heights of future structures or antennae which pose a hazard to air navigation. Following the general recommendations of the plan, the airport can maintain it's long term viability and continue to provide air transportation services to the local area.

BENTON AIRPARK

AIRPORT LAYOUT PLAN SET

INDEX OF DRAWINGS

PREPARED FOR
CITY OF REDDING, CALIFORNIA

Coffman Associates
Airport Consultants

Coffman Associates 00bentcov04 03-14-05

RUNWAY DATA

RUNWAY DATA	RUNWAY 15-33 EXISTING	RUNWAY 15-33 ULTIMATE
RUNWAY CATEGORY/AIRCRAFT DESIGN GROUP	A-I	SAME
CRITICAL DESIGN AIRCRAFT	BEECH BONAZA	SAME
WINGSPAN OF DESIGN AIRCRAFT	33'6"	SAME
APPROACH SPEED OF DESIGN AIRCRAFT (KNOTS)	72	SAME
MAXIMUM TAKE OFF WIEGHT (lbs)	3,650	SAME
RUNWAY AZIMUTH	353.768	SAME
RUNWAY BEARING (TRUE)	N6°13'55.00"W	SAME
RUNWAY DIMENSIONS	2420' X 80'	SAME
ELEVATION OF RWY. TOUCH DOWN ZONE (MSL)	719.89'	719.00'
ELEVATION OF RUNWAY HIGH POINT (above MSL)	719.89'	719.00'
ELEVATION OF RUNWAY LOW POINT (above MSL)	714.56'	712.00'
WIND COVERAGE IN MPH	12.1–99.35%/15–99.76%	SAME
APPROACH VISIBILITY MINIMUMS	VISUAL/VISUAL	SAME
FAR PART 77 CATEGORY	VISUAL/VISUAL	SAME
RUNWAY INSTRUMENTATION	VISUAL/VISUAL	SAME
RUNWAY APPROACH SURFACES	20:1/20:1	SAME
RUNWAY THRESHOLD DISPLACEMENT	NONE	NONE
RUNWAY STOPWAY	NONE	NONE
RUNWAY SAFETY AREA WIDTH (RSA)	120'	SAME
RSA DISTANCE BEYOND EACH RUNWAY END	100'/100'	240'/240'
RUNWAY OBJECT FREE AREA WIDTH (OFA)	400'	SAME
OFA DISTANCE BEYOND EACH RUNWAY END	240'/240'	240'/240'
RUNWAY OBSTACLE FREE ZONE WIDTH (OFZ)	400'	400'
OFZ DISTANCE BEYOND EACH RUNWAY END	200'/200'	200'/200'
LINE OF SITE REQUIREMENT	NO	SAME
RUNWAY PAVEMENT MATERIAL	ASPHALT	SAME
RUNWAY PAVEMENT SURFACE TREATMENT	NONE	SAME
PAVEMENT STRENGTH (in thousand lbs.)	12.5(S)	SAME
RUNWAY EFFECTIVE GRADIENT (in %)	0.008%	0.18%
MAXIMUM GRADIENT (in %)	2%	SAME
RUNWAY LIGHTING	MIRL	SAME
RUNWAY MARKINGS	VISUAL/VISUAL	PRECISION
RUNWAY APPROACH LIGHTING	NONE	MALSR/MALSR
TAXIWAY PAVEMENT MATERIAL	ASPHALT	SAME
TAXIWAY LIGHTING	MITL	SAME
TAXIWAY MARKING	CENTERLINE, HOLDLINES	SAME
DISTANCE FROM RWY. CL TO HOLD BARS	120'/100'	SAME
VISUAL AIDS	PAPI-2/PAPI-2 --	SAME --
NAVIGATIONAL AIDES	-- --	-- --

[1] Pavement strengths are expressed in Single(S), Dual(D), Dual Tandem(DT), and/or Double Dual Tandem(DDT) wheel loading capacities.

RUNWAY END COORDINATES (NAD 83)

		[1] EXISTING	ULTIMATE
RUNWAY 15	Latitude	40°34'39.521"N	40°34'37.655"N
	Longitude	122°24'24.437"W	122°24'24.170"W
RUNWAY 33	Latitude	40°34'15.777"N	40°34'13.884"N
	Longitude	122°24'20.890"W	122°24'20.784"W

[1] SEE NOTE 2.

AIRPORT DATA

BENTON AIRPARK (085)

CITY; REDDING, CALIFORNIA (OWNER) — COUNTY: SHASTA COUNTY, CALIFORNIA

RANGE: R. 5 N. — TOWNSHIP: T. 3 N. — CIVIL TOWNSHIP: N/A

		EXISTING	ULTIMATE
AIRPORT CATEGORY		GENERAL AVIATION	SAME
DESIGN AIRCRAFT		BEECH BONANZA	SAME
AIRPORT REFERENCE CODE (ARC): RUNWAY CATEGORY/DESIGN GROUP		A-I	SAME
AIRPORT ELEVATION (ABOVE MEAN SEA LEVEL)		719.89'	SAME
MEAN MAXIMUM TEMPERATURE OF HOTTEST MONTH		98.8.°F (July)	SAME
AIRPORT REFERENCE POINT (ARP) COORDINATES (NAD 83) – (CALCULATED: SEE NOTE 2)	Latitude	40°34'27.649"N	SAME
	Longitude	122°24'22.663"W	SAME
AIRPORT and TERMINAL NAVIGATIONAL AIDS		ROTATING BEACON	SAME
GPS APPROACH		NO**	YES

**IMPLEMENTATION OF GPS APPROACH IS CURRENTLY IN PROGRESS

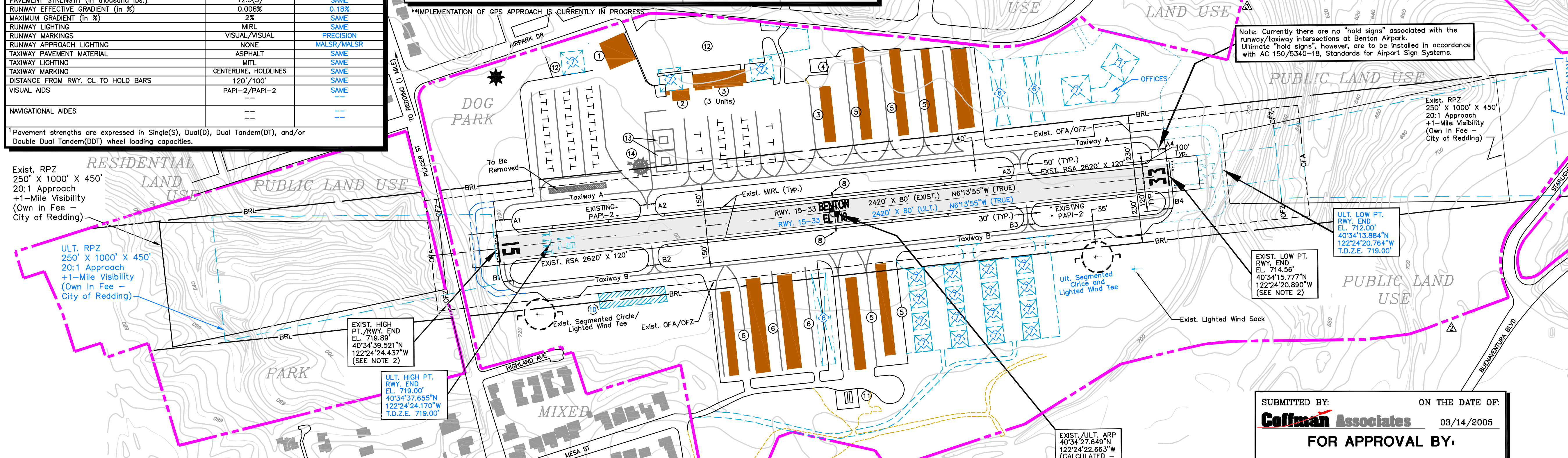
BUILDINGS/FACILITIES

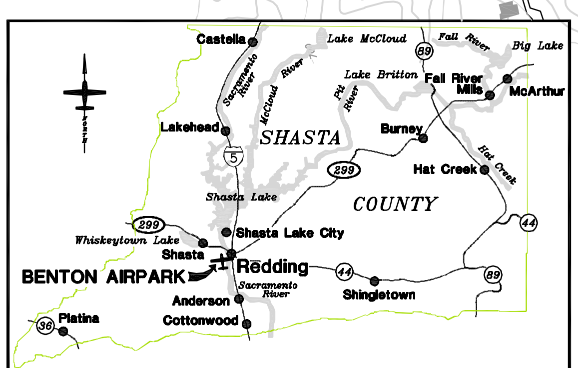
EXISTING	ULTIMATE	DESCRIPTION	EL.
1	--	HILLSIDE AVIATION/AIRPARK CAFE	--
2	--	CALIFORNIA HIGHWAY PATROL	--
3	--	BOX HANGAR	--
4		AIRCRAFT WASH RACK	--
5	5	T-HANGAR	--
6	6	SHADE HANGAR	--
7	7	EXECUTIVE HANGARS	--
8	8	RWY. DISTANCE REMAINING MARKER	--
9	7	E.A.A. HANGAR	--
--	10	FLY-IN CAMPING AREA	--
11	--	FUEL FARM (ABOVEGROUND)	--
12	--	AUTO PARKING	--
13	13	HELIPAD	--
14	--	COMPASS ROSE	--

NOTE: BUILDING EL. WILL BE ADDED WHEN THEY ARE AVAILABLE.

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT (if applicable)
		BUILDING CONSTRUCTION
BRL	BRL	BUILDING RESTRICTION LINE (BRL)
		OBJECT FREE AREA (OFA)
		RUNWAY SAFETY AREA (RSA)
		OBSTACLE FREE ZONE (OFZ)
		DIRT ROAD
		FACILITY CONSTRUCTION
		FENCING
PAPI-2	PAPI-2	NAVIGATIONAL AID INSTALLATION
		RUNWAY END IDENTIFICATION LIGHTS (REIL)
		RUNWAY THRESHOLD LIGHTS
		SECTION CORNER
		SEGMENTED CIRCLE/LIGHTED WIND TEE
1080	1080	TOPOGRAPHIC CONTOURS
		WIND INDICATOR (Lighted)





VICINITY MAP

N.T.S.

LOCATION MAP

N.T.S.

MODIFICATION TO FAA AIRPORT DESIGN STANDARDS

DEVIATION DESCRIPTION	EFFECTED DESIGN STANDARD	STANDARD	EXISTING	PROPOSED DISPOSITION
RUNWAY SAFETY AREA EXIST. SAFETY AREA LENGTH	AC 150/5300-13, AIRPORT DESIGN: RUNWAY SAFETY AREA DISTANCE BEYOND EACH RUNWAY END	240'	100'	AT THE TIME OF THIS SUBMITTAL, THERE IS CURRENTLY A RUNWAY SAFETY AREA STUDY UNDERWAY (PURSUANT TO FAA ORDER 5200.8, RUNWAY SAFETY AREA PROGRAM). THIS STUDY IS BEING PERFORMED UNDER FAA AIP GRANT #3-06-0308-03 AND WILL DETERMINE THE FINAL PROPOSED DISPOSITION.
LOCATION OF HOLDING POSITION MARKINGS FOR RUNWAY/TAXIWAY INTERSECTIONS	AC 150/5340-1H, STANDARDS FOR AIRPORT MARKING: PERPENDICULAR DISTANCE FROM RUNWAY CENTERLINE TO INTERSECTING TAXIWAY/TAXILANE CENTERLINE	125'	100' (EASTSIDE OF RWY. 15-33) 120' (WESTSIDE OF RWY. 15-33)	REQUEST MODIFICATION TO STANDARDS

SUBMITTED BY: Coffman Associates — ON THE DATE OF: 03/14/2005

FOR APPROVAL BY:

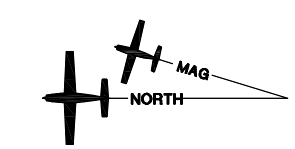
APPROVED BY: — ON THE DATE OF:

Rod A. Dinger
Airports Manager
Support Services Department
Airports Division
City of Redding, California

FAA APPROVAL STAMP

GENERAL NOTES:

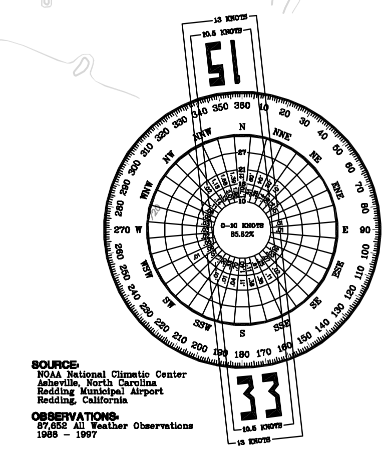
1. Topography, airport layout, residential lot lines, right-of-ways, and elevations are based on data provided by the City of Redding, and Aerial Photo taken 6-25-2003. All dimensions and elevations are subject to field verification.
2. Runway end coordinates are from a field survey conducted by the City of Redding (Summer 1999). Airport Reference Point (ARP) was then revised to reflect these surveyed coordinates using the "GEO83 Geodetic Calculation Program".
3. Lengths of Runway Safety Area, Object Free Area, and Obstacle Free Zone beyond each runway end are NONSTANDARD and are limited due to steep bluff 100 feet from each runway end.
4. Land uses shown adjacent to Benton Airpark were obtained from the City of Redding Land Use Map located on the City of Redding Web site (http://maps.ci.redding.ca.us).
5. Building Restriction Lines (BRL) are established to provide Part 77 clearance for a 15-foot object at the BRL. The BRL may be reduced to the limits of the Runway Object Free Area (OFA) and Runway Protection Zone (RPZ).
6. There are "NO OFZ OBJECT PENETRATIONS" and "NO THRESHOLD SITING SURFACE OBJECT PENETRATIONS" associated with Runway 15-33.
7. There are no Section Corners on or around the airport property.
8. Property Line based on legal description provided by the City of Redding, dated 01-09-2003.



MAGNETIC VARIANCE – 14.92° E (MARCH 2004)

RATE OF CHANGE – 1.44' W ANNUALLY

0 200 400 600 SCALE IN FEET



ALL WEATHER WIND ROSE

ALL WEATHER WIND COVERAGE		
RUNWAYS	10.5 KNOTS (12 M.P.H.)	13 KNOTS (15 M.P.H.)
Runway 15-33	99.35%	99.76%

No.	REVISIONS	DATE	BY	APP'D.
3	REVISE AIRPORT PROPERTY LINE (SOUTHEAST) SUBMIT ALP TO FAA FOR REVALIDATION	12-26-02	MJR	JMH
2	REVISE AIRPORT PROPERTY LINE (SOUTHWEST) SUBMIT ALP TO FAA FOR REVALIDATION	12-20-01	WEH	RAD
1	FAA – ALP APPROVAL SAN FRANCISCO AIRPORTS DISTRICT OFFICE	11-06-00	–	JLP

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BENTON AIRPARK

AIRPORT LAYOUT DRAWING

REDDING, CALIFORNIA

PLANNED BY: James M. Harris P.E.

DETAILED BY: Maggie Beaver

APPROVED BY: James M. Harris P.E.

March 14, 2005 — SHEET 1 OF 6

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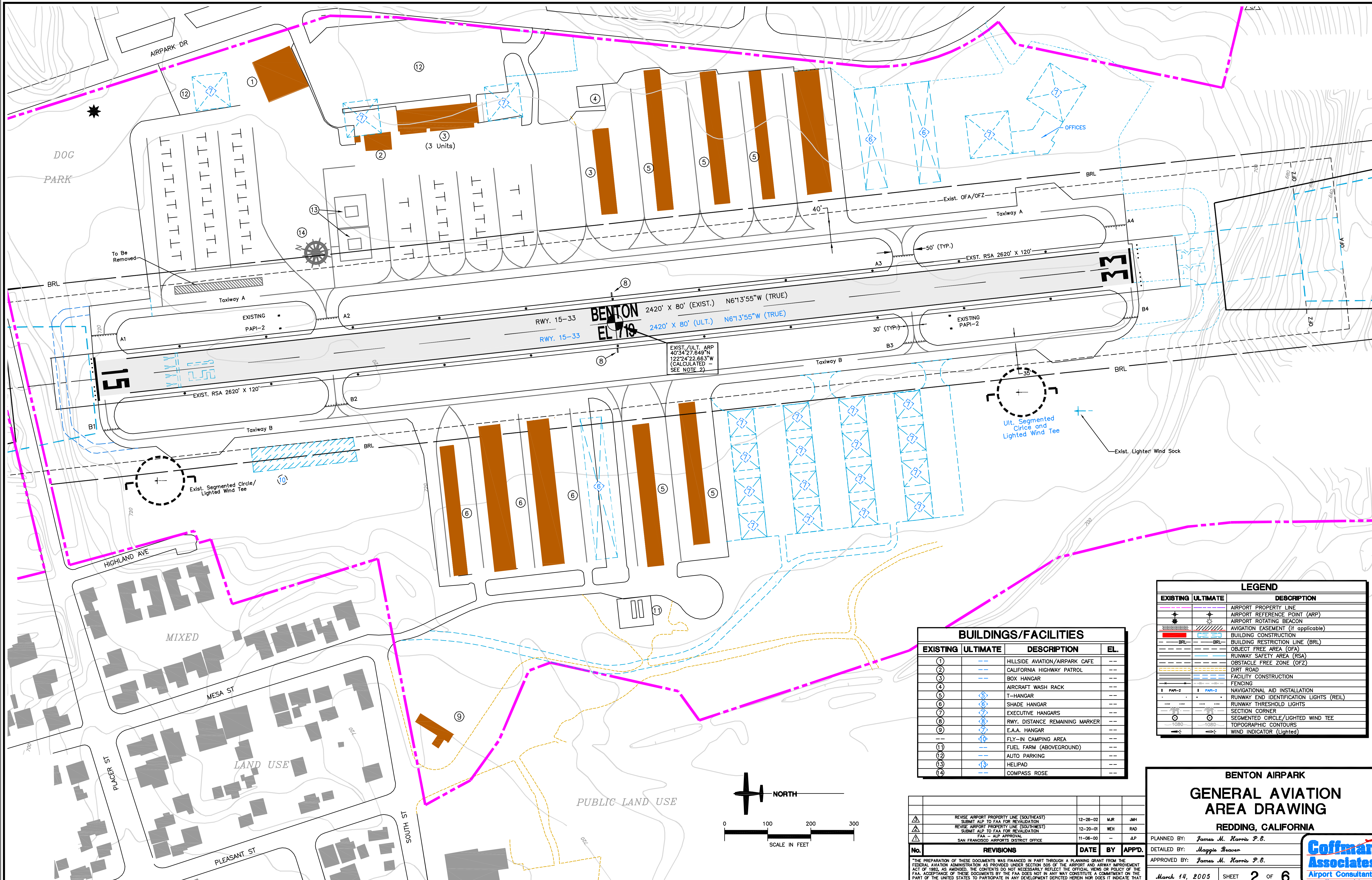

BUILDINGS/FACILITIES

EXISTING	ULTIMATE	DESCRIPTION	EL.
1	--	HILLSIDE AVIATION/AIRPARK CAFE	--
2	--	CALIFORNIA HIGHWAY PATROL	--
3	--	BOX HANGAR	--
4		AIRCRAFT WASH RACK	--
5	5	T-HANGAR	--
6	6	SHADE HANGAR	--
7	7	EXECUTIVE HANGARS	--
8	8	RWY. DISTANCE REMAINING MARKER	--
9	7	E.A.A. HANGAR	--
--	10	FLY-IN CAMPING AREA	--
11	--	FUEL FARM (ABOVEGROUND)	--
12	--	AUTO PARKING	--
13	13	HELIPAD	--
14	--	COMPASS ROSE	--

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT (if applicable)
		BUILDING CONSTRUCTION
BRL	BRL	BUILDING RESTRICTION LINE (BRL)
		OBJECT FREE AREA (OFA)
		RUNWAY SAFETY AREA (RSA)
		OBSTACLE FREE ZONE (OFZ)
		DIRT ROAD
		FACILITY CONSTRUCTION
		FENCING
PAPI-2	PAPI-2	NAVIGATIONAL AID INSTALLATION
		RUNWAY END IDENTIFICATION LIGHTS (REIL)
		RUNWAY THRESHOLD LIGHTS
		SECTION CORNER
		SEGMENTED CIRCLE/LIGHTED WIND TEE
1080	1080	TOPOGRAPHIC CONTOURS
		WIND INDICATOR (Lighted)

No.	REVISIONS	DATE	BY	APP'D.
3	REVISE AIRPORT PROPERTY LINE (SOUTHEAST) SUBMIT ALP TO FAA FOR REVALIDATION	12-26-02	MJR	JMH
2	REVISE AIRPORT PROPERTY LINE (SOUTHWEST) SUBMIT ALP TO FAA FOR REVALIDATION	12-20-01	WEH	RAD
1	FAA - ALP APPROVAL SAN FRANCISCO AIRPORTS DISTRICT OFFICE	11-06-00	-	JLP

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BENTON AIRPARK

GENERAL AVIATION AREA DRAWING

REDDING, CALIFORNIA

PLANNED BY: James M. Harris P.E.
DETAILED BY: Maggie Beaver
APPROVED BY: James M. Harris P.E.

March 14, 2005 | SHEET 2 OF 6

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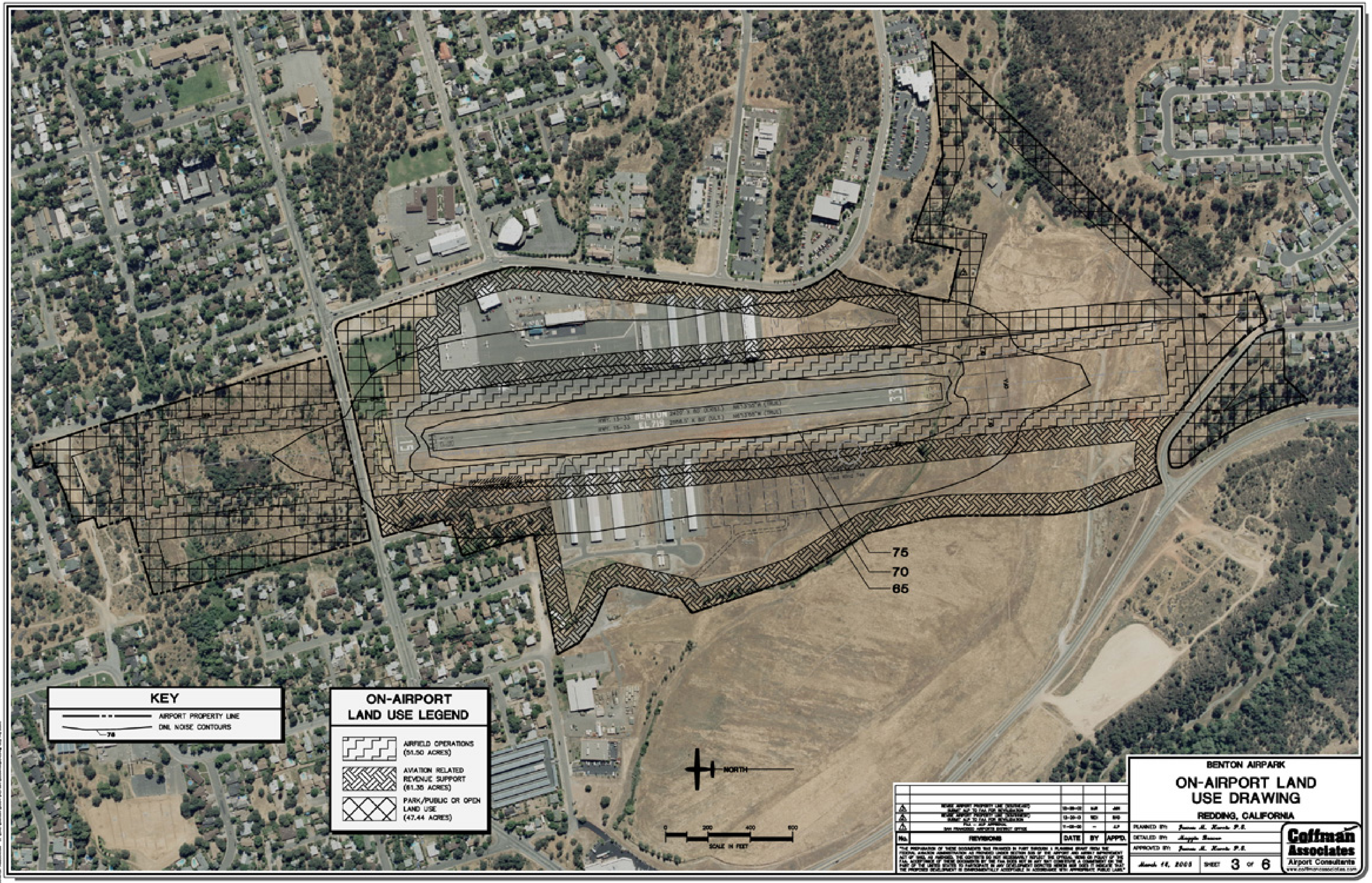
KEY
AIRPORT PROPERTY LINE
DNL NOISE CONTOURS
ON-AIRPORT LAND USE LEGEND
AIRFIELD OPERATIONS (51.50 ACRES)
AVIATION RELATED REVENUE SUPPORT (61.35 ACRES)
PARK/PUBLIC OR OPEN LAND USE (47.44 ACRES)
75
70
65
NORTH
SCALE IN FEET
0
200
400
600
No.
REVISIONS
DATE
BY
APPD.
BENTON AIRPARK
ON-AIRPORT LAND USE DRAWING
REDDING, CALIFORNIA
PLANNED BY:
DETAILED BY:
APPROVED BY:
SHEET 3 OF 6
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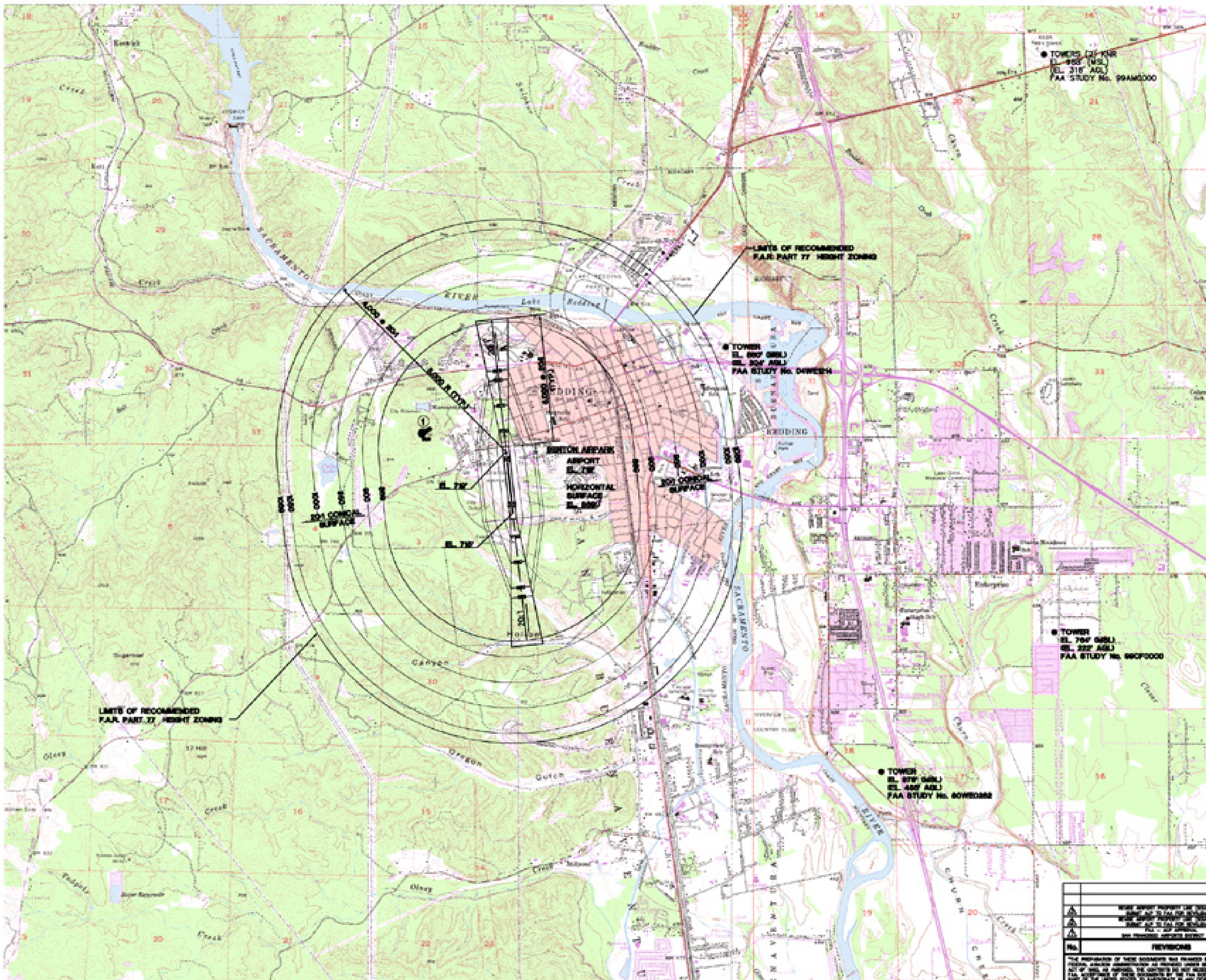

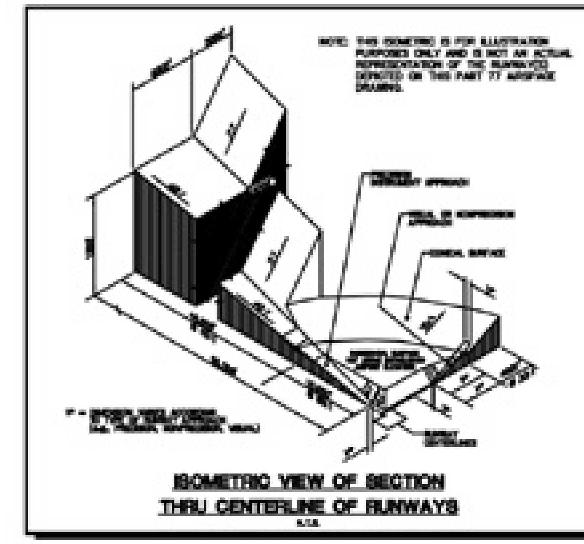

OBSTRUCTION TABLE					
Object Description	Object Elevation	Obstructed Part 77 Surface	Surface Elevation	Object Penetration	Proposed Object Disposition
(1) Terrain	902' MSL	Horizontal	MSL	Up to 52'	Request FAA Aeronautical Study

ABBREVIATIONS:

MSL = MEAN SEA LEVEL
AGL = ABOVE GROUND LEVEL

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 inner and outer portion of the approach surfaces, are illustrated on the APPROACH ZONES PROFILE/RUNWAY PROTECTION ZONE PLANS AND PROFILES DRAWING sheet 5 of 6 of these plans.
4. Existing and future height and hazard ordinances are to be amended and/or referenced upon approval of updated PART 77 AIRSPACE PLAN.

MAGNETIC VARIANCE - 15.52° E (March 2004)
RATE OF CHANGE - 1.07' W ANNUALLY

0 2000 4000 6000
SCALE IN FEET

No.	REVISIONS	DATE	BY	APPD.
	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	—	[illegible]

[illegible]

BENTON AIRPARK

PART 77 AIRSPACE DRAWING

REDDING, CALIFORNIA

PLANNED BY: *James M. Harris P.E.*
DETAILED BY: *Maggie Beaver*
APPROVED BY: *James M. Harris P.E.*

March 16, 2005 SHEET 4 OF 6

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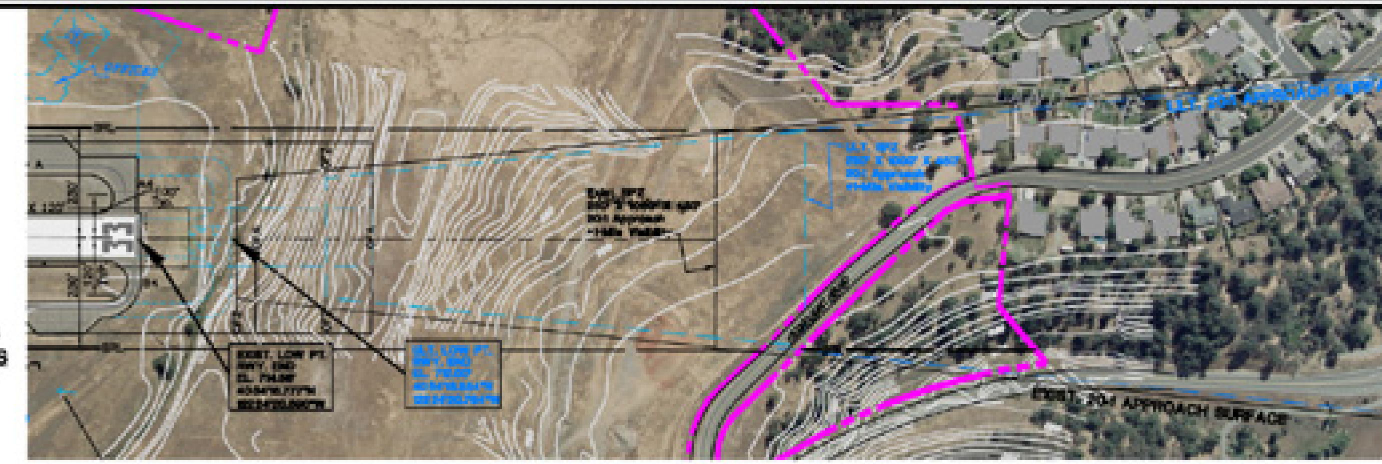
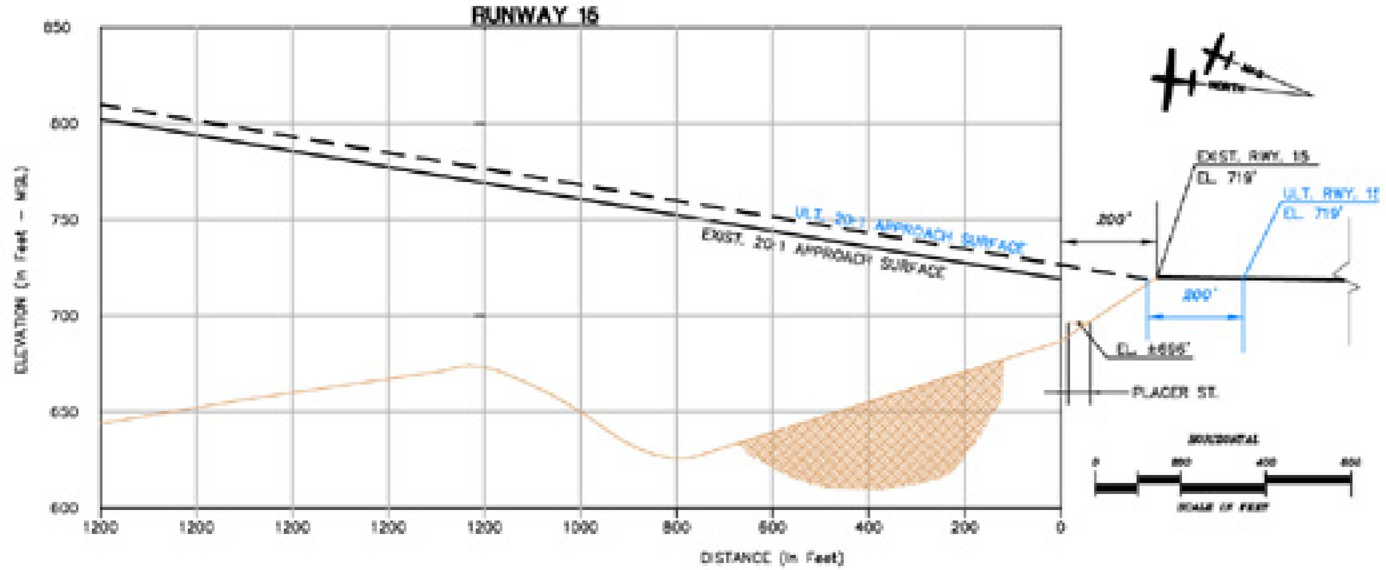
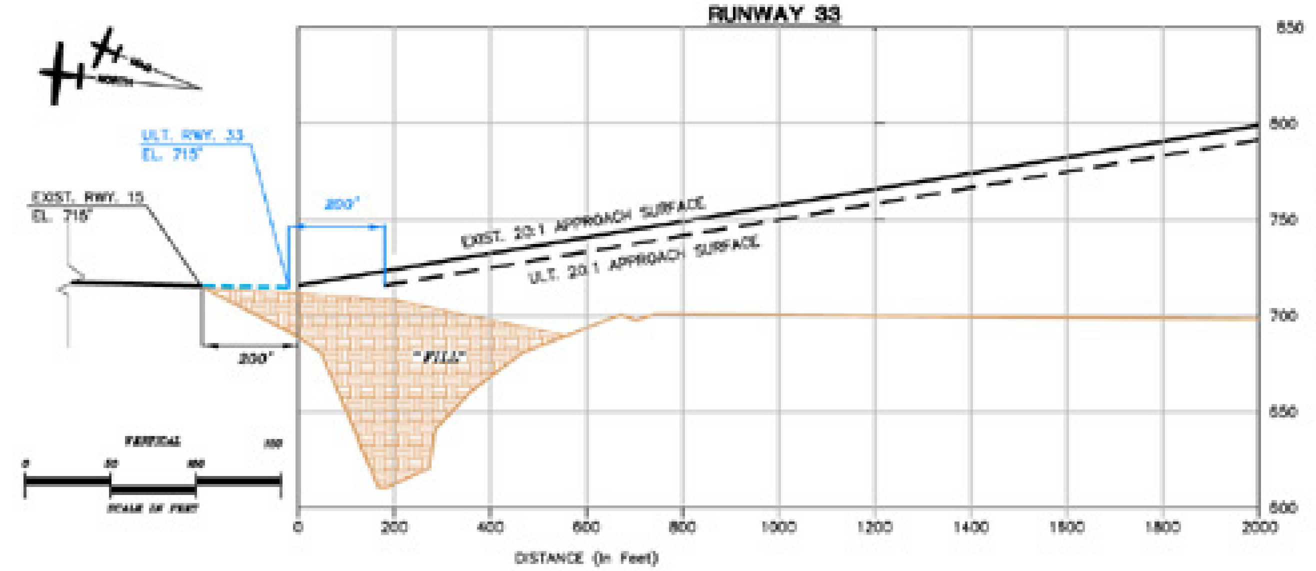
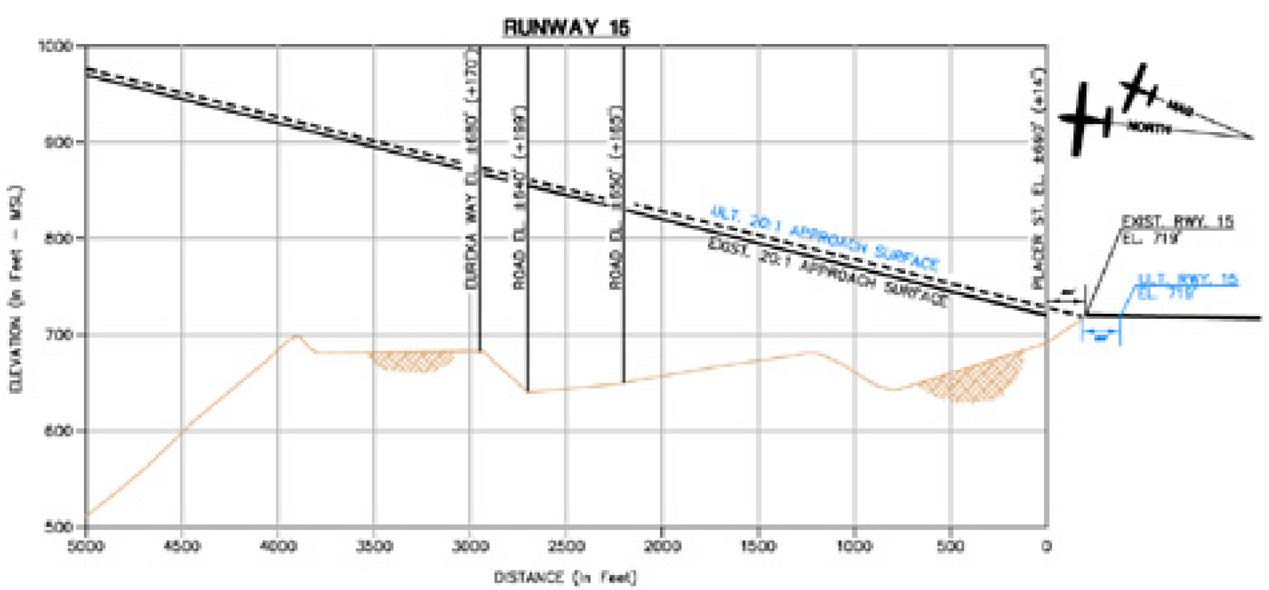
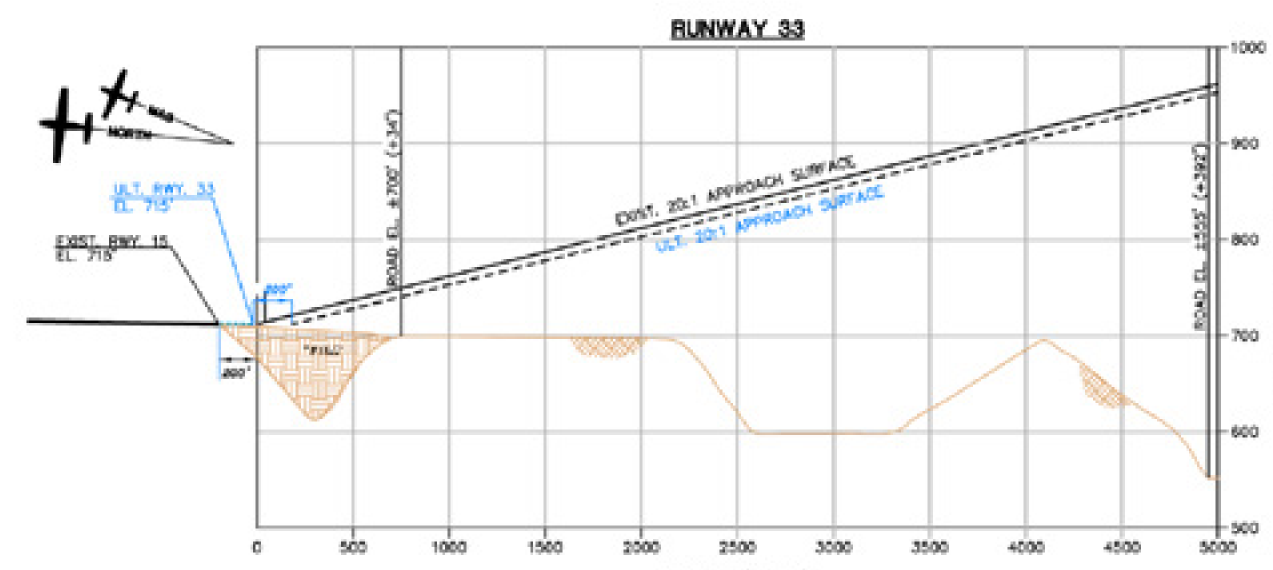
RUNWAY 15-33
PROTECTION ZONES
PLANS AND PROFILES











HORIZONTAL

0 500 1000 1500

SCALE IN FEET

VERTICAL

0 100 200 300

SCALE IN FEET

GENERAL NOTES:

1. No obstructions noted within the Approach Zones or Runway Protection Zones depicted above.

2. Depiction of features and objects within the primary, transitional, and horizontal Part 77 surfaces, are illustrated on the PART 77 AIRSPACE PLAN, sheet 4 of 6, of these plans.

RUNWAY 15-33 APPROACH ZONES PROFILES

No.	REVISIONS	DATE	BY	APP'D.

BENTON AIRPARK

APPROACH ZONE PROFILES AND RWY PROTECTION ZONE PLAN AND PROFILES DRAWING

REDDING, CALIFORNIA

PLANNED BY: James M. Harris P.E.

DETAILED BY: Maggie Brown

APPROVED BY: James M. Harris P.E.

March 14, 2005 SHEET 5 OF 6

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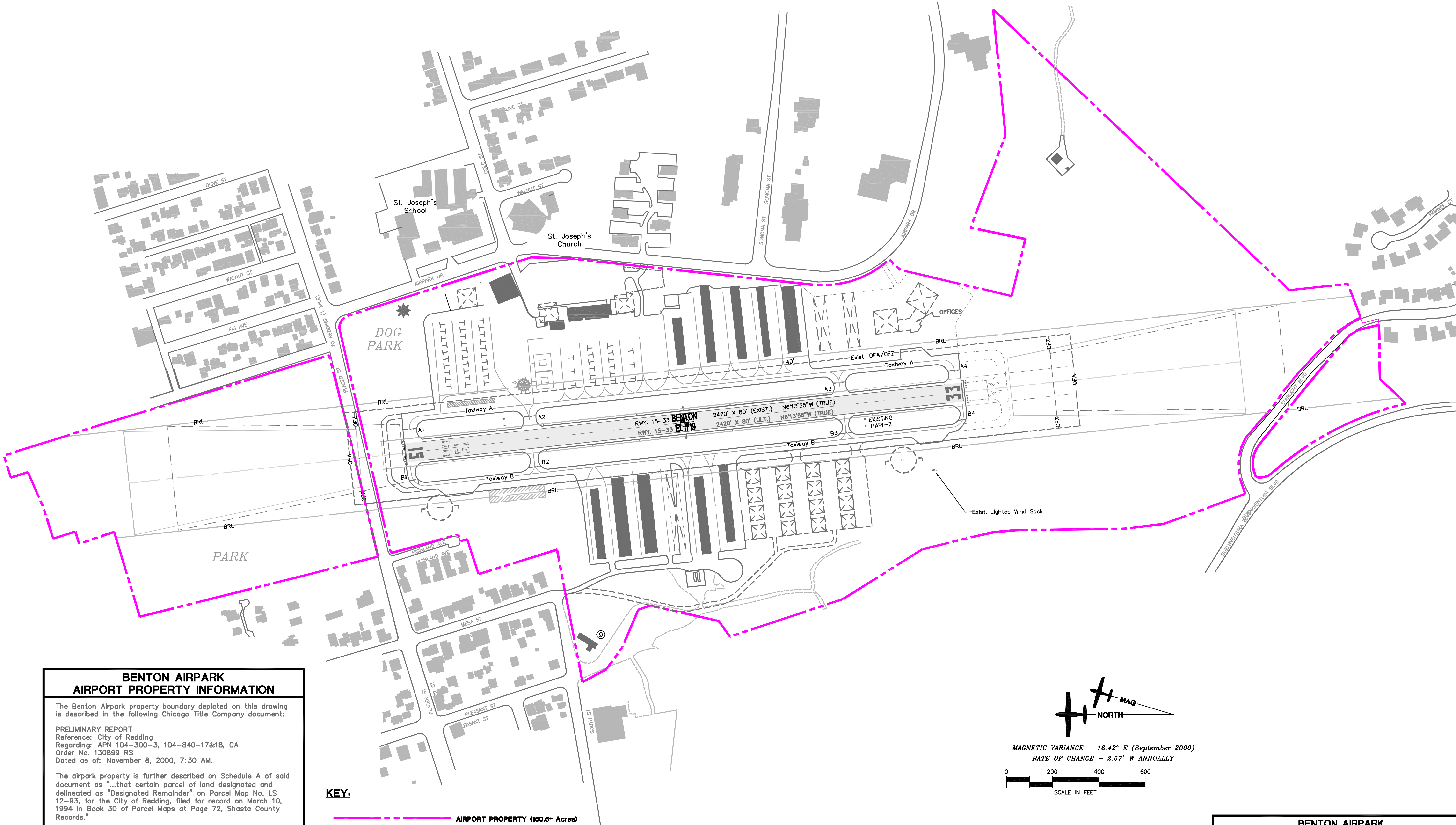

BENTON AIRPARK AIRPORT PROPERTY INFORMATION

The Benton Airpark property boundary depicted on this drawing is described in the following Chicago Title Company document:

PRELIMINARY REPORT
Reference: City of Redding
Regarding: APN 104–300–3, 104–840–17&18, CA
Order No. 130899 RS
Dated as of: November 8, 2000, 7:30 AM.

The airpark property is further described on Schedule A of said document as "...that certain parcel of land designated and delineated as "Designated Remainder" on Parcel Map No. LS 12–93, for the City of Redding, filed for record on March 10, 1994 in Book 30 of Parcel Maps at Page 72, Shasta County Records."

Original document regarding the subject property described in the above–named report is:

Bargain and Sale Deed
Reference: 33 O.R. 353
Grantor: Grace Welsh Elliot of Los Angeles, California
Grantee: City of Redding, Shasta County, California
Date: December 10, 1927
Acreage: 416.85

KEY:

AIRPORT PROPERTY (160.6± Acres)

No.	REVISIONS	DATE	BY	APP'D.
3	REVISE AIRPORT PROPERTY LINE (SOUTHEAST) SUBMIT ALP TO FAA FOR REVALIDATION	12–26–02	MJR	JMH
2	REVISE AIRPORT PROPERTY LINE (SOUTHWEST) SUBMIT ALP TO FAA FOR REVALIDATION	12–20–01	WEH	RAD
1	FAA – ALP APPROVAL SAN FRANCISCO AIRPORTS DISTRICT OFFICE	11–06–00	–	JLP

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BENTON AIRPARK
AIRPORT PROPERTY MAP
REDDING, CALIFORNIA

PLANNED BY: James M. Harris P.E.
DETAILED BY: Maggie Beaver
APPROVED BY: James M. Harris P.E.
March 14, 2005
SHEET 6 OF 6

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Appendix A
GLOSSARY OF TERMS AND ABBREVIATIONS

Appendix A

GLOSSARY OF TERMS

ACCELERATE-STOP DISTANCE AVAILABLE (ASDA): see declared distances.

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) transport 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.

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 ELEVATION: The highest point on an airport's usable runway 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.

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.

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.

AIR TAXI: An air carrier certificated in accordance with 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.

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 (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.

ALERT AREA: see special-use airspace.

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.

AUTOMATIC DIRECTION FINDER (ADF): an aircraft radio navigation system which senses and indicates the direction to a non-directional radio beacon (NDB) ground transmitter.

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

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.

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."

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.

BUILDING RESTRICTION LINE (BRL): A line which identifies suitable building area locations on the airport.

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.

CROSSWIND: wind flow that is not parallel to the runway of the flight path of an aircraft.

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.

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.

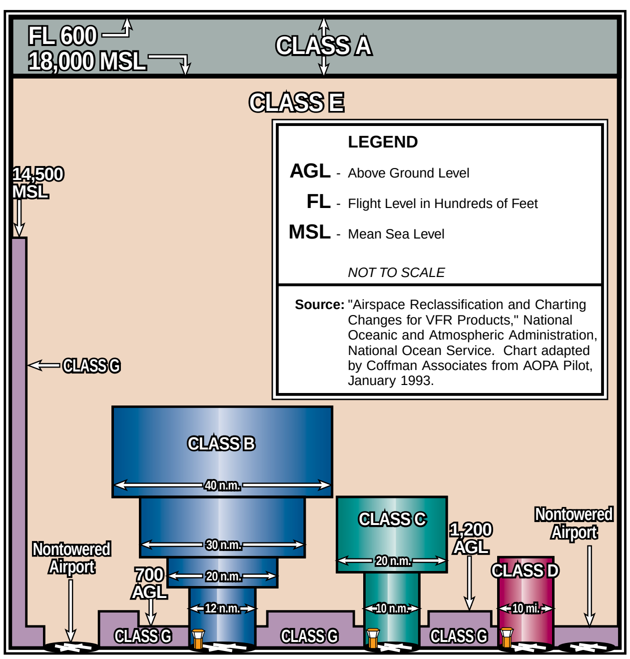
- *CLASS C:* generally, the airspace from the surface to 4,000 feet above the air port elevation (charted as MSL) surrounding those airports that have an operational control tower and radar approach control and are served by a qualifying number of IFR operations or passenger enplanements. Although individually 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 airport that have an operational control tower. Class D air space is individually tailored and configured to encompass published instrument approach procedures.
  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 LEG: A flight path at right angles to the landing runway off its upwind end. See "traffic pattern."

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;

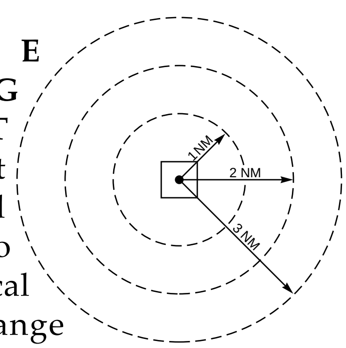
- *TAKEOFF DISTANCE AVAILABLE (TODA):* The TORA plus the length of any remaining runway and/or clear way beyond the far end of the TORA;

- *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.

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.

ENPLANED PASSENGERS: the total number of revenue passengers boarding aircraft, including originating, stop-over, and transfer passengers, in scheduled and non-scheduled services.

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.”

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.

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: See “GPS.”

GPS - GLOBAL POSITIONING SYSTEM: A system of 24 satellites used as reference points to enable navigators equipped with GPS receivers to determine their latitude, longitude, and altitude.

HELIPAD: a designated area for the takeoff, landing, and parking of helicopters.

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.

INSTRUMENT APPROACH: 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): Rules governing the procedures for conducting instrument flight. Also a term used by pilots and controllers to indicate type of flight plan.

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.

LANDING DISTANCE AVAILABLE (LDA): see declared distances.

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.

LORAN: long range navigation, 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.

MICROWAVE LANDING SYSTEM (MLS): an instrument approach and landing system that provides precision guidance in azimuth, elevation, and distance measurement.

MILITARY OPERATIONS AREA (MOA): see special-use airspace.

MISSED APPROACH COURSE (MAC): The flight route to be followed if, after an instrument approach, a landing is not effected, and occurring normally:

1. When the aircraft has descended to the decision height and has not established visual contact; or

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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.

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.

NONDIRECTIONAL 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.

NONPRECISION APPROACH PROCEDURE: a standard instrument approach procedure in which no electronic glide slope is provided, such as VOR, TACAN, NDB, or LOC.

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.

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 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.

PROHIBITED AREA: see special-use airspace.

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 BLAST PAD: a surface adjacent to the ends of runways provided to reduce the erosive effect of jet blast and propeller wash.

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 VISUAL RANGE (RVR): an instrumentally derived value, in feet, representing the horizontal distance a pilot can see down the runway from the runway end.

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.

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.

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.

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 ultra-high 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.

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.

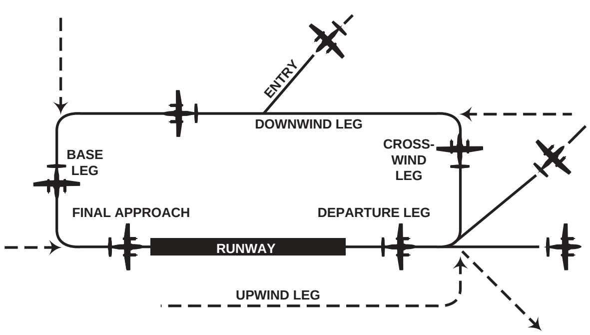
TOUCH-AND-GO: an operation by an aircraft that lands and departs on a runway without stopping or exiting the runway. A touch-and-go is recorded as two operations: one operation for the landing and one operation for the takeoff.

TOUCHDOWN 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.

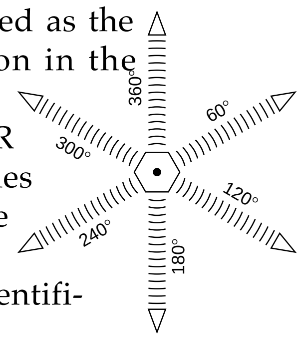


UNICOM: A nongovernment communication facility which may provide airport information at certain airports. Locations and frequencies of UNICOM's are shown on aeronautical charts and publications.

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.

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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.

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.

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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 light ing 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

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

DTWL: runway weight bearing capacity for 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)

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

RCO: remote communications outlet

REIL: runway end identifier lighting

RNAV: area navigation

RPZ: runway protection zone

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 omnidirectional range

VORTAC: VOR and TACAN collocated

Appendix B
ECONOMIC BENEFIT ANALYSIS

EXECUTIVE SUMMARY

This report presents estimates of the economic benefits of Benton Airpark for the economy of the airport service area, including the City of Redding and Shasta County, California. The Benton Airpark is a general aviation airport with a service area similar to that of Redding Municipal Airport. However, the Airpark has its own unique characteristics that make it attractive to based aircraft owners and visitors coming to the area and records 18,000 itinerant operations per year.

There are 128 based aircraft on the airport, including 113 single engine planes, 12 multi-engine aircraft, and 3 rotary craft.

Measuring Economic Benefits

The presence of an airport creates benefits for a community in diverse ways. Aviation related services such as support for law enforcement and fire control raise the quality of life for residents and maintain a competitive environment for economic development.

Benton Airpark serves the Shasta County area and beyond as home to a major air ambulance service and an air unit of the California Highway Patrol.

Benton Airpark provides a means for general aviation passengers to reach destinations without the delays and uncertainty of today's airline flights. General aviation air travel provides access to more than 5,300 airports in the nation, compared to approximately 546 served by scheduled airlines (and considered commercial service airports.)

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 benefits 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 Benton Airpark as a source of measurable economic output (the production of aviation services) that creates employment and earnings for workers on and off the airport.

Business 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 Benton Airpark are each described below.

Output is the value in dollars of the production of goods and services by businesses or the budget of a government unit. 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 received by those who have their own business.

Employment is the third benefit measure, the number of jobs supported by the revenues created by the presence of Benton Airpark.

To measure the economic benefits of the airport, information on revenues, employment and earnings was obtained directly from suppliers and users of aviation services to tabulate the economic activity created by the presence of the airport.

Data collection involved interviews and surveys of on-airport employers including private sector firms and government agencies and airport administrative staff. Air visitors completed surveys on spending, length of stay, and purpose of travel. Based aircraft owners were surveyed on expenditures and travel patterns.

Benefit Sources

Economic benefits (output, employment and earnings) are created when economic activity takes place both on and off the airport. The economic benefits of Benton Airpark for 2002 are shown in Table B1.

The total benefits of the airport, the sum of the direct benefits and the indirect benefits, which result as dollars re-circulate in the regional economy, were calculated to be:

- $12.3 Million Revenues
- $6.4 Million Earnings
- 247 Total Employment

On-Airport Direct Benefits

Including the revenues and employment created by outlays for airport capital projects, Benton Airpark employers were responsible for on-airport benefits of:

- $6.4 Million Revenues
- $3.1 Million Earnings
- 108 On-Airport Jobs

Operations on Benton Airpark supported a total of 5 private and public employers offering FBO services, maintenance, repairs and parts; food service and assistance with ground transportation; aircraft sales and rental; flight instruction; air ambulance and medical transport; and law enforcement support for the region through an air unit of the California State Highway Patrol.

TABLE B1
Summary of Economic Benefits: 2002
Benton Airpark

	BENEFIT MEASURES		
Source	Revenues	Earnings	Employment
On-Airport Aviation Benefits	$6,100,000	$2,900,000	104
Capital Projects (Budgeted 2003)	300,000	200,000	4
All On-Airport Economic Benefits	6,400,000	3,100,000	108
Air Visitor Benefits	550,000	200,000	13
Direct Benefits: Sum of On-Airport & Air Visitor Benefits	6,950,000	3,300,000	121
Indirect Benefits (Multiplier Effects of Secondary Spending)	5,400,000	3,100,000	126
TOTAL BENEFITS	$12,350,000	$6,400,000	247

Interviews with on-airport employers provided a tally of 104 aviation-related jobs. Of these, 75 (or 76 percent) were in the private sector. These employees brought home annual earnings of $2.9 million in 2002.

In addition to the revenues and employment created by on-airport businesses and government units, the Benton Airpark also creates jobs and injects dollars into the economy whenever capital improvements projects are undertaken.

Capital spending outlays for improvements in the most recent fiscal year (FY 2003) were budgeted at $293,000. This spending supported the equivalent of 4 person-years of employment on the airport while the projects were underway.

Combining employment from tenants and capital projects, the total employment on the airport during 2002 was 108 workers and combined payrolls to workers were $3.1 million.

Air Visitor Direct Benefits

An additional source of aviation-related spending comes from visitors to the area that arrive at Benton Airpark. When air travelers make off-airport expenditures these outlays create revenues (sales) for firms that supply goods and services to visitors.

During a typical year, there are more than 5,000 visiting general aviation private, governmental, corporate, or chartered aircraft that arrive at Benton Airpark.

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. These outlays by general aviation visitors in 2002 created annual airport service area output, employment and earnings of:

- $550,000 Revenues
- $200,000 Earnings
- 13 Off-Airport Jobs

The economic benefits from general aviation visitors are reviewed in more detail below, in a separate section of this report.

Combined Direct Benefits

The combined direct benefits represent the sum of on-airport and off-airport (visitor) revenues, earnings and employment due to the presence of the airport. Direct benefits are the "first round" impacts and do not include any multiplier effects of secondary spending.

The direct benefits of on-airport and off-airport economic activity related to Benton Airpark were:

- $6.9 Million Revenues
- $3.3 Million Earnings
- 121 Jobs

Combined revenue flows for businesses and employers on and off the airport summed to a value of $6.9 million for 2002.

The airport presence created benefits to workers by providing income and earnings within the region of $3.3 million, which represents the payment for the labor component of airport economic activity. There were 121 jobs supported directly by the suppliers and users of aviation services.

Indirect Benefits (Multiplier Effects)

Indirect benefits (multiplier effects) are created when the initial spending by airport employers or visitors circulates and recycles through the economy.

In contrast to initial or direct benefits, the indirect 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.

Similarly, revenues earned by on-airport firms are injected back into the regional economy to buy goods and services from suppliers. This spending creates additional revenues, earnings and employment as well.

The multiplier effects of spending created by the presence of Benton Airpark were calculated through application of the Implan input-output model based on data for Shasta County, California.

The initial direct revenue stream in the service area of $6.9 million created by the presence of Benton Airpark was estimated to stimulate indirect benefits from multiplier effects within the airport service area of:

- $5.4 Million Revenues
- $3.1 Million Earnings
- 126 Jobs

GENERAL AVIATION VISITORS

In order to analyze general aviation traffic patterns at the airport, a database of 1,200 general aviation flight plans was obtained from the FAA.

Past years have often seen more than 18,000 itinerant general aviation operations annually at Benton Airpark. Operations involve both arrivals and departures. It is necessary to differentiate between itinerant operations by based and transient aircraft.

An itinerant operation typically involves an origination or destination airport other than Benton Airpark. However, both based and non-based aircraft contribute to itinerant activity in any given day.

When a based aircraft returns to Benton Airpark from SFO (San Francisco), for example, that is an itinerant operation. When an aircraft based at an airport other than Benton Airpark arrives at Benton, that aircraft is classified as a transient.

According to analysis of flight records, there were 5,366 transient aircraft arrivals at Benton Airpark in 2002. Of these, 471 brought overnight visitors and 4,895 were one-day visitors (Table B2).

Separate analyses were conducted for those GA visitors with an overnight stay and those whose visit was one day or less in duration. To compute economic benefits based on visitor spending, one day aircraft were further partitioned into those staying less than 4 hours and 4 hours or more.

Visitor spending estimates were computed only for those aircraft staying 4 hours or longer at Benton Airpark, reflecting the fact that many aircraft stop only for fuel or for some other short term purpose and travelers do not spend for food, retail shopping, or ground transportation off the airport.

TABLE B2
General Aviation Transient Aircraft
Benton Airpark

Item	Annual Value
Itinerant Operations	18,000
Transient Arrivals	5,366
Overnight Transients	471
One Day Transients	4,895

Source: Derived from FAA Flight Plan Data Base and Benton Airpark records, 2002

Overnight GA Visitors

Information on general aviation visitors was collected from a mail survey of aircraft owners and pilots arriving at Benton Airpark. Visitors were asked the size of the travel party, their length of stay, type of lodging, and outlays on various expenditures categories.

The travel patterns underlying the calculation of overnight GA visitor economic benefits are shown in Table B3.

There were an estimated 471 transient overnight aircraft. The average party size was 2.6 persons and the average overnight travel party stayed in the metropolitan area for 2.7 days. There were 1,367 overnight visitors for the year, including crew, with a combined total of 3,691 visitor days.

The number of visitors shown as 1,367 includes crew but average party size does not include crew. Crew expenditures are included in calculations of spending per aircraft of $944. The total spending by all GA overnight visitors summed to $440,000 for the year.

TABLE B3
General Aviation Overnight Visitors
Benton Airpark

Item	Annual Value
Transient Arrivals	5,366
Overnight Transients	471
Avg. Party Size	2.6
Number of Visitors, including crew	1,367
Average Stay (nights)	2.7
Visitor Days	3,691
Spending per Aircraft	$944
Total Expenditures	$440,000

Source: GA Visitor Survey

Table B4 shows the percentage distribution of outlays by overnight travel parties at Benton Airpark. These expenditures were made within the airport service area but off the airport.

Lodging accounted for 44 percent of visitor spending, averaging $411 per aircraft travel party. Food and drink made up 25 percent. Retail spending and transportation each contributed 12 percent to visitor expenditures.

TABLE B4
Spending Per Overnight GA Aircraft
Benton Airpark

Category	Spending	Percent
Lodging	$411	44
Food/Drink	236	25
Retail	114	12
Entertainment	71	7
Transportation	112	12
TOTAL	$944	100

Source: GA Visitor Survey

<u>Day GA Visitors</u>

According to flight operations records, 58 percent of itinerant general aviation, or ninety one percent of transient general aviation aircraft arriving at Benton Airpark were transients that stayed on the airport for one day or less.

During the year, there were 4,895 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 economic benefits from arriving 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 B1 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 may generate off-airport spending that create jobs and earnings in the local community.

TABLE B5
General Aviation Day Visitors
Benton Airpark

Item	Annual Value
Transient Arrivals	5,366
One Day Transients	4,895
Stay >/= 4 Hours	971
Average Stay (Hours)	5.6
Avg. Party Size	2.1
Number of Visitors, including crew	2,067
Spending per Aircraft	$113
Total Expenditures	$110,000

Source: Derived from FAA Flight Plan Data Base and GA Visitor Survey

Of the 4,895 transient aircraft that stopped at Benton Airpark during the past year, there were 971 that were parked for more than four hours but not overnight (Table B5).

The average stay in the area for those travel parties was 5.6 hours, according to arrival and departure records, with a range of 4 to 12 hours.

For the purposes of this study, those travel parties that arrived and departed within four hours were assumed to have not left the airport and not contributed any significant spending off the airport.

TABLE B6
Spending Per Day Visitor Aircraft
Benton Airpark

Category	Spending	Percent
Lodging	$0	
Food/Drink	56	50
Retail	29	26
Entertainment	10	8
Transportation	18	16
TOTAL	$113	100

Source: GA Visitor Survey

Day trip aircraft brought 2,067 visitors, including crew, to the Redding area during the year. The average spending per one-day aircraft averaged $113. The total economic benefits created by off-airport spending by one-day general aviation visitors tallied to $110,000 of output (revenues or sales off the airport).

The largest expenditure category for one-day visiting travel parties was food and drink, which averaged $56 per aircraft travel party for the day and accounted for 50 percent of outlays (Table B6). Spending for retail was the second largest category, at $29 per aircraft.

Combined GA Visitor Spending

Table B7 shows a summary of economic benefits resulting from spending in the region by combined overnight and day general aviation visitors arriving at Benton Airpark.

To recap, there were 5,366 transient general aviation aircraft that brought visitors to the airport during the year. Of these, 471 were arriving overnight general aviation aircraft and 971 were one day visiting aircraft that were parked more than 4 hours, long enough to make off-airport expenditures.

Each overnight travel party spent an average of $944 during their trip to the airport service area and travelers on each day visitor aircraft spent an estimated $113 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 $550,000.

Average daily spending by all GA air travelers in the service area exceeded $1,500. The average economic impact of any arriving GA transient aircraft (combined overnight and day visitors staying more than 4 hours) was $381.

The largest spending category by general aviation visitors was expenditures for lodging, with outlays of $200,000 or 36 percent of the total. Spending for food and beverages accounted for 29 percent of GA visitor spending and was the second largest category, with outlays of $160,000 for the year.

Taken together, these two categories accounted for 65 percent of the economic benefits from GA visitors to Benton Airpark.

Of total spending of $550,000 created by GA visitors, an average of 36 cents of each dollar was used within the service area by employers as earnings paid out to workers.

Wages taken home by tourism/visitor sector workers for spending in their own community summed to $200,000 during the year. Earnings in the lodging industry accounted for nearly 36 percent of total earnings created from visitor spending as lodging workers took home $71,000.

Expenditures by GA visitors created 13 direct jobs in the tourist sector in the Benton Airpark service area.

Food and Drink spending created the greatest number of jobs, 5, with earnings to workers and proprietors of $60,000. Food and Drink industry jobs accounted for 38 percent of the employment from visitor spending

Lodging created 4 jobs and the retail, entertainment, and ground transportation industries combined to create an additional 4 jobs in the airport service area.

TABLE B7
Economic Benefits from GA Visitors - Revenues, Earnings and Employment
Benton Airpark

Category	Spending per AC		Revenues	Earnings	Employment
	Overnight	Day			
Lodging	$411		$200,000	$71,000	4
Food/Drink	236	$56	160,000	60,000	5
Retail Sales	114	29	80,000	40,000	2
Entertainment	71	10	40,000	14,000	1
Ground Transport	112	18	70,000	15,000	1
TOTAL	$944	$113	$550,000	$200,000	13

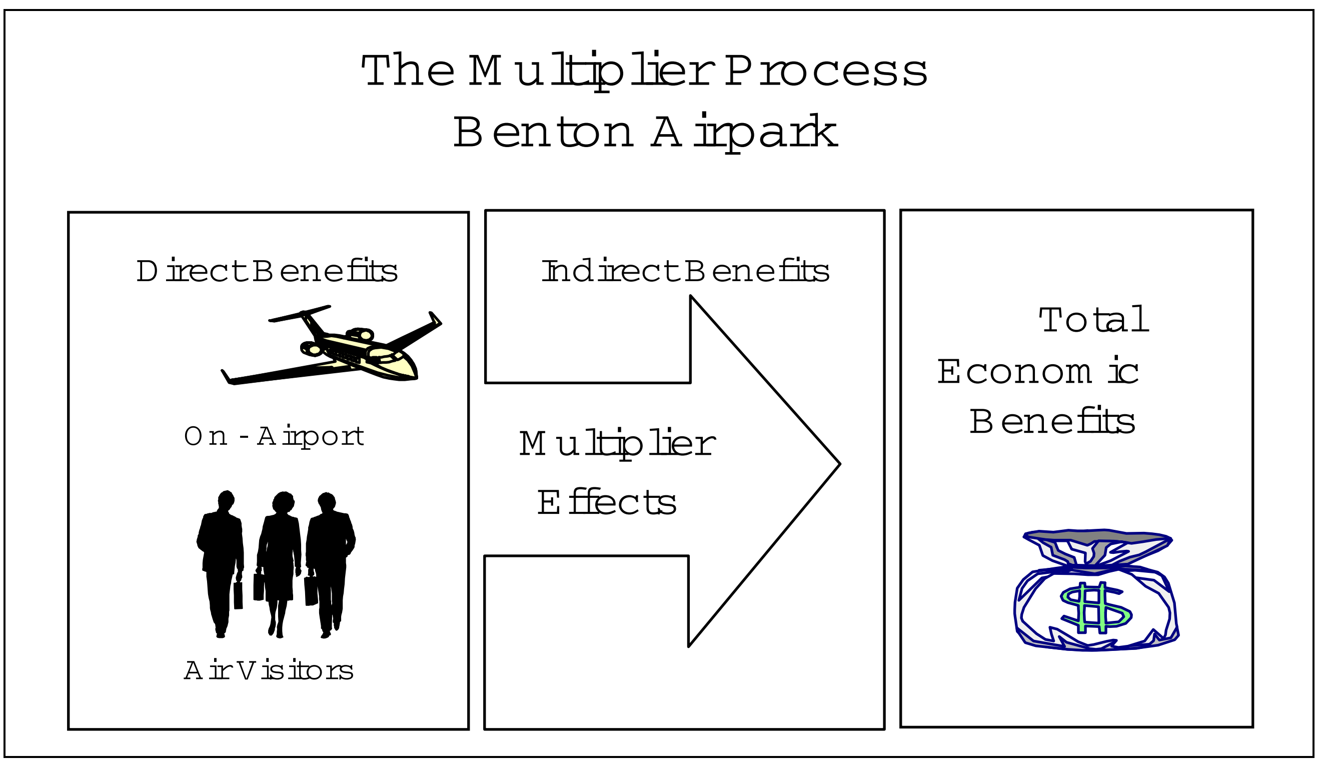
Note: Earnings and employment figures were derived from the Implan input-output model based on data for Shasta County from the California Employment Development Department and the United States Bureau of Economic Analysis. Employment is not necessarily full time equivalents; includes full and some part time workers, figures rounded to head counts.

INDIRECT BENEFITS: MULTIPLIER EFFECTS

The output, employment, and earnings from on-airport activity and off-airport visitor spending represent the computed direct benefits from the presence of Benton Airpark. For the service area, these direct benefits summed to $6.9 million of output (measured as revenues to firms and budgets of administrative units), 121 jobs, and earnings to workers and proprietors of $3.3 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 indirect revenues, employment, and earnings due to the presence of the airport 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 indirect and total benefits, as illustrated in the figure below.

The multipliers used for this study were from the IMPLAN input-output model based on data for Shasta County from the California Employment Development Department and the U.S. Bureau of Economic Analysis. To demonstrate the methodology, average service area multipliers are shown in Table B8.



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 indirect and total impacts on all industries of the regional economy resulting from the direct 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 $1.7656. Or, put differently, the revenue multiplier of 1.7656 for on-airport activity shows that for each dollar spent on the airport there is additional spending created of $0.7656 or 76.56 cents of indirect or multiplier spending.

Direct revenues from all sources associated with the presence of Benton Airpark were $6.9 million for the year. After accounting for the multiplier effect, total revenues created within the service area were $12.3 million. Indirect or secondary revenues were $5.4 million, the difference between total and direct revenues.

The multiplier for earnings shows the dollar change in earnings for the service area 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 non-aviation industries. For example, each dollar of wages paid for workers on the airport stimulates an additional $1.9354 of earnings in the total economy.

The initial direct wages of $3.3 million for aviation workers and proprietors on the airport were spent for consumer goods and services that in turn created additional earnings of $3.1 million for workers and proprietors in the general economy.

The total earnings benefit of the airport was $6.4 million, consisting of $3.3 million of direct benefits and $3.1 million of indirect 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 economy due to an increase of one job on or off the airport. Each job on the airport is associated with 1.1198 additional jobs in the rest of the airport service area economy. Similarly, each job in the hospitality industry supported by air visitor spending is associated with 0.5384 additional jobs in the general economy.

The overall result is that the 121 direct jobs created by the airport supported an additional 126 jobs in the service area as indirect employment. The sum of the direct aviation related jobs and indirect jobs created in the general economy is the total employment of 247 workers that can be attributed to the presence of the airport.

The information above is intended for illustration only. In the full analysis separate multipliers were used for on-airport aviation employers and visitor spending categories (lodging, eating places, retail, entertainment, and ground transportation).

TABLE B8
Average Multipliers and Indirect Benefits Within the Airport Service Area
Benton Airpark

Revenue Source	Direct Revenues	Average Output Multipliers	Indirect Revenues	Total Revenues
On-Airport Benefits	$6,400,000	1.7656	$4,900,000	$11,200,000
Visitor Benefits	550,000	1.9090	500,000	1,050,000
Revenues	$6,950,000		$5,350,000	$12,350,000
Earnings Source	**Direct Earnings**	**Average Earnings Multipliers**	**Indirect Earnings**	**Total Earnings**
On-Airport Benefits	$3,100,000	1.9354	$2,900,000	$6,000,000
Visitor Benefits	200,000	2.000	200,000	400,000
Earnings	$3,300,000		$3,100,000	$6,400,000
Employment Source	**Direct Employment**	**Average Employment Multipliers**	**Indirect Employment**	**Total Employment**
On-Airport Benefits	108	2.1198	119	227
Visitor Benefits	13	1.5384	7	20
Employment	121		126	247

Notes: Multipliers above are weighted averages intended to illustrate how indirect and total benefits were calculated for Benton Airpark. In the full analysis, separate multipliers were used for on-airport employers (FBO, other aviation businesses, non-aviation), and visitor spending (lodging, eating places, retailing, entertainment, and ground transportation). Multipliers were for Benton Airpark Area as produced by the IMPLAN input-output model based on data from the California Employment Development Department and U.S. Bureau of Economic Analysis.

BASED AIRCRAFT ANALYSIS

A survey of owners of aircraft based at Benton Airpark was conducted to compile information on private aircraft usage patterns, including number of trips per year, purpose of travel, average party size, and average distance flown per trip. Questions were also posed concerning the importance of the airport for residential location and businesses of flyers.

There were 128 based-aircraft at Benton Airpark in 2002 (Table B9). Of these, 113 were single engine, 12 were multiengine aircraft, and 3 were rotary aircraft. A total of 38 aircraft owners returned surveys for this study, to provide a response rate of 30 percent.

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 Benton Airpark is a significant factor in influencing the success of business and professional activity of aircraft owners.

- Eight out of ten aircraft owners (83%) stated that the airport is "very important" or "important" to their residential location decision.
- Seven out of ten of all responding based aircraft owners (72%) said that the airport is "very important" or "important" to the success of their business location.

TABLE B9
Based Aircraft Profile
Benton Airpark

Type	Number
Total Based Aircraft	128
Single Engine Piston	113
Multi-Engine Piston	12
Helicopter	3

Source: Benton Airpark and Coffman Associates, 2002

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 900 employees in the county and surrounding area, and the businesses of the combined respondents accounted for more than $200 million of annual sales.

Drawing from these results, it is evident that Benton Airpark plays a key role in the overall quality of life and level of economic activity in the Redding/Shasta County airport service area, and particularly supports the business community.

TABLE B10 Based Aircraft Characteristics – Benton Airpark	
Category	All Benton Airpark Based AC
Average Reported Aircraft Value	$65,000
Average Maintenance Outlays per Year	$6,500
Business Hours per Year	112
Business Trips – Average Party Size	1.8
Airport "Very Important or "Important" to Business	72%
Total employees of owners of based aircraft	900
Annual Sales for Business with Aircraft	$200,000,000
Source: Based Aircraft Survey	

Characteristics of based aircraft at Benton Airpark are set out in Table B10. The table illustrates that the average value for an individual aircraft was $65,000 and annual outlays were $6,500.

Based aircraft owners at Benton Airpark reported an average of 190 non-training hours per year (Table B11), or approximately 3.6 hours per week. The range of annual hours reported by aircraft owners included some who used one plane for up to 200 hours per year.

The average aircraft based at Benton Airpark was flown 78 hours on personal trips per year. The typical round trip for pleasure, recreation or other personal reasons had 1.9 persons in the travel party (Table B12). There were an estimated 18,525 passenger hours flown for personal reasons that originated at Benton Airpark during the year.

Of all owners, 59 percent reported some business use for their aircraft and among those who reported business use, the average was 112 hours for business purposes per year.

The typical business use for a general aviation aircraft had 1.8 persons in the travel party (Table B13). Benton Airpark based aircraft flew 14,000 business hours for the year. Passenger hours flown on business were computed from multiplying average party size by hours flown, to obtain 25,200 passenger hours.

TABLE B11 Based Aircraft Use Patterns Benton Airpark	
Use	Annual Hours
Avg. Annual Hours	190
Avg. Business Hours	112
Avg. Personal Hours	78
Percent Business	49%
Percent Personal	41%
Source: Based Aircraft Owner Survey	

An estimate of the dollar value of travel on based aircraft may be obtained by computing the cost of making these same trips on a chartered flight. This is one approach recommended by the Internal Revenue Service for valuation of aircraft travel use by corporations.

TABLE B12 Based Aircraft - Personal Use Benton Airpark	
Item	Annual Value
Avg. Party Size	1.9
Avg. Personal Hours	78
All GA Personal Hours	9,750
Passenger Hours	18,525
Source: Based Aircraft Owner Survey	

TABLE B13 Based Aircraft - Business Use Benton Airpark	
Item	Annual Value
Avg. Party Size	1.8
Avg. Business Hours	112
All GA Business Hours	14,000
Passenger Hours	25,200
Source: Based Aircraft Owner Survey	

The weighted average round trip hours for combined personal and business trips from the survey was 1.97 hours per trip. The cost of charter flights varies by distance and type of aircraft and was calculated to be $221 per hour.

Excluding helicopters the 125 based aircraft flew a total of 23,750 hours during the year. Assigning an average charter value of $221 per hour, the "charter equivalent value" of general aviation travel originating at Benton Airpark for the year totaled $5.2 million.

This $5.2 million charter equivalent value of travel figure does not measure all the associated economic gains and benefits such as those from business trips, which may be substantial. A single air trip can result in additional profits, fees, or revenues to a business firm. Trips for medical reasons often 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 often significant.

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 Benton Airpark, there are more than 95 operations by aircraft involved in local or itinerant activity including flight training, corporate travel, or general aviation aircraft bringing passengers visiting the area for personal travel or on business.

During each day of the year, Benton Airpark generates $34,000 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 Benton Airpark provides 108 jobs directly on the airport and in total supports 247 local jobs in the airport service area. These workers bring home daily earnings of $17,500 for spending in their home communities.

On an average day during the year, there are 16 visitors in the area who arrived at Benton Airpark. Some will stay in the Redding 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 $1,500 into the local economy.

Table B14 shows a summary of current economic benefits associated with the airport. Direct benefits to the service area, without including multiplier effects, include revenues of $6.95 million, 121 jobs and earnings to workers and proprietors of $3.3 million.

Benton Airpark
Daily Economic Benefits

- $34,000 Revenue
- 247 Local Jobs Supported
- $1,500 Visitor Spending
- 16 Air Visitors

TABLE B14
Summary of Economic Benefits: 2002
Benton Airpark

	Revenues	Earnings	Employment
On-Airport Activity	$6,400,000	$3,100,000	108
Air Visitors	550,000	200,000	13
Direct Benefits	6,950,000	3,300,000	121
Indirect Benefits	5,400,000	3,100,000	126
Total Benefits	$12,350,000	$6,400,000	247

Note: Revenues, earnings and employment benefits reflect activity associated with 35,000 itinerant operations in 200 and capital improvement budget of $300,000 for 2002

Including indirect or multiplier effects, total benefits to the service area are $12.3 million in revenues, 247 jobs and earnings of $6.4 million.

Benton Airpark 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 the globe, and to bring visitors, customers and employees to the Redding area. The estimated cost of chartering aircraft to serve the needs of these travelers was found to be $5.2 million. In addition, the presence of the Benton Airpark 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 2000, the net income of aircraft operating companies was 6 times larger than non-operators. Two thirds of the Fortune 500 firms operate aircraft and 88 percent of the top100 have business aircraft (see National Business Aviation Association, Fact Book, 2002).

As aviation activity increases in the airport service area, the economic benefits of the airport to the regional economy can be expected to increase. As capital improvement projects are typically extended over a number of years, this impact is included in the current year economic benefits, but excluded in the short, intermediate and long term forecasts. These forecasts are intended to demonstrate only those changes associated with direct on-airport activity and general aviation visitor presence.

The short term planning horizon for the airport is associated with an increase in operations to an annual level of 38,100. Assuming commerce on the airport and in the community increases at the same pace, employment on the airport will rise to 113 (not including workers for capital improvement projects) and jobs related to air visitors will increase to 14 (Table B15). Visitor spending will reach $600,000 (measured in 2002 dollars) and the revenue benefits due to the presence of the airport will exceed $12.9 million, including all multiplier effects.

The intermediate term planning horizon is based on 41,200 operations (Table B16). Employment on the airport will rise to 122 jobs and the total employment impact on and off the airport after all multiplier effects are 282 jobs, with earnings rising to $7.1 million. Revenues will increase to $13.9 million (2002 dollars) in the intermediate term.

The long term is defined as an airport activity level of 47,400 operations per year. The long-term projections imply on-airport employment of 141 workers with earnings from on-airport jobs reaching $4 million. Spending by air visitors will be $750,000, with employment of 18 workers in visitor industries.

Accounting for all multiplier effects, jobs supported in the airport service area under the long-term assumptions total 324. Revenues will be $16 million, and earnings will be $8.2 million, measured in 2002 dollars (see table B17).

TABLE B15
Summary of Economic Benefits: Short Term
Benton Airpark

	Revenues	Earnings	Employment
On-Airport Activity	$6,600,000	$3,200,000	113
Air Visitors	600,000	220,000	14
Direct Benefits	7,200,000	3,420,000	127
Indirect Benefits	5,700,000	3,200,000	133
Total Benefits	$12,900,000	$6,620,000	260

Note: Revenues, earnings and employment for short-term forecast period reflect activity associated with 38,100 operations per year

TABLE B16
Summary of Economic Benefits: Intermediate Term
Benton Airpark

	Revenues	Earnings	Employment
On-Airport Activity	$7,200,000	$3,500,000	122
Air Visitors	600,000	200,000	15
Direct Benefits	7,800,000	3,700,000	137
Indirect Benefits	6,100,000	3,400,000	145
Total Benefits	$13,900,000	$7,100,000	282

Note: Revenues, earnings and employment for intermediate term forecast period reflect activity associated with 41,200 operations per year

TABLE B17
Summary of Economic Benefits: Long Term
Benton Airpark

	Revenues	Earnings	Employment
On-Airport Activity	$8,200,000	$4,000,000	141
Air Visitors	700,000	300,000	18
Direct Benefits	8,900,000	4,300,000	159
Indirect Benefits	7,100,000	3,900,000	165
Total Benefits	$16,000,000	$8,200,000	324

Note: Revenues, earnings and employment for long term forecast period reflect activity associated with 47,400 operations per year

TAX IMPACTS

Because of the spending, jobs, and earnings created by the presence of Benton Airpark, 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 B18. The table shows the revenues for each tax category that could potentially be collected based on current average tax rates relative to output and personal income (earnings) for California and Shasta County.

The first column in Table B18 shows tax revenues associated with the current level of Benton Airpark operations. The total of 247 workers with jobs supported by the presence of the airport have earnings of $6.4 million. Federal personal income taxes are estimated at $650,000, the largest component of federal taxes. The second largest federal tax category is social security contributions of $648,000. Corporate profits taxes on a revenue base of $12.3 million are estimated as $140,000.

Overall, federal tax revenues collected due to economic activity associated with Benton Airpark are estimated to be $1.6 million (in 2002 dollars).

State and local tax revenues are shown in the lower portion of the table. State and local tax revenues sum to $800,000 for the current level of airport operations.

The largest single component is sales taxes of $300,000 (this figure includes combined estimates for both state and local sales taxes). Property taxes are the second largest source of revenues, estimated as $200,000.

Combined federal, state, and local taxes are $2.5 million at the current level of operations and are projected to rise to $2.7 million at the short term operations level of 38,100. The long-term level of 47,400 operations would bring tax revenues of $2.2 million federal taxes and $1.1 million state and local revenues.

TABLE B18
Tax Impacts From On-airport and Off-Airport Economic Activity
Benton Airpark

Federal Taxes				
Revenue Category	Current	Short Term	Intermediate Term	Long Term
Corporate Profits Tax	$140,000	$150,000	$160,000	$190,000
Personal Income Tax	650,000	700,000	770,000	890,000
Social Security Taxes	648,000	700,000	760,000	875,000
All Other Federal Taxes	240,000	250,000	280,000	320,000
Total Federal Taxes	$1,678,000	$1,800,000	$1,970,000	$2,275,000
State and Local Taxes				
Revenue Category	Current	Short Term	Intermediate Term	Long Term
Corporate Profits Tax	$31,000	$35,000	$37,000	$43,000
Motor Vehicle Taxes	10,000	10,000	13,000	14,000
Property Taxes	200,000	200,000	230,000	260,000
Sales Taxes	300,000	335,000	360,000	420,000
Personal Income Tax	140,000	150,000	165,000	190,000
All Other State & Local Taxes	130,000	150,000	150,000	170,000
Total State & Local Taxes	$811,000	$880,000	$955,000	$1,097,000
TOTAL TAX REVENUES	$2,489,000	$2,680,000	$2,925,000	$3,372,000

Notes: All figures are in 2002 dollars. Derived from average tax rates in Shasta County, California and federal sources. Current impact estimate based on economic activity associated with 35,000 operations. Short term operations = 38,100 intermediate term = 41,200; long term = 47,400

Appendix C
ENVIRONMENTAL OVERVIEW

Appendix C
ENVIRONMENTAL OVERVIEW

The protection and preservation of the local environment are essential concerns in the master planning process. Now that a program for the use and development of Benton Airpark has been proposed, it is necessary to review environmental issues to ensure that the program can be implemented in compliance with applicable environmental regulations, standards, and guidelines.

All of the improvements planned for Benton Airpark, as depicted on the Airport Layout Plan (ALP), will require compliance with the *National Environmental Policy Act (NEPA) of 1969,* as amended. While many of the improvements will be categorically excluded and will not require NEPA documentation, the proposed runway extension will likely require the preparation of a NEPA document. Compliance with the provisions of NEPA for this project will be required prior to the extension of the runway and is outside the scope of this master plan. As detailed in FAA Order 5050.4A, *Airport Environmental Handbook*, compliance with NEPA is generally satisfied with the preparation of an Environmental Assessment (EA). In cases where a categorical exclusion is issued, environmental issues such as wetlands, threatened or endangered species, and cultural resources are further evaluated during the federal, state, and/or local permitting processes.

In addition, because the airport is located in California, it may be required to comply with the *California Environmental Quality Act* (CEQA). CEQA requires consideration of the environmental impacts of the entire improvement program prior to local adoption of the Airport Master Plan. Compliance with CEQA is typically satisfied with the preparation of an Initial Study or Environmental Impact Report.

This section of the master plan is not intended to satisfy NEPA or CEQA's requirements; rather, it is intended only to supply a preliminary review of environmental issues that would need to be analyzed in more detail within the NEPA or permitting processes. Consequently, this analysis ***does not*** address mitigation or the resolution of environmental issues. The following pages consider the environmental resources as outlined in FAA Order 5050.4A.

Review of Environmental Resources
Proposed Facility Improvements

Environmental Resource	Anticipated Impacts
Noise. The Yearly Day-Night Average Sound Level (DNL) is used in this study to assess aircraft noise. DNL is the metric currently accepted by the Federal Aviation Administration (FAA), Environmental Protection Agency (EPA), and Department of Housing and Urban Development (HUD) as an appropriate measure of cumulative noise exposure. These three agencies have each identified the noise contour as the threshold of incompatibility. Within the State of California, the Community Noise Equivalent Level (CNEL) is used in place of DNL.	• Noise contours were prepared for existing and forecast (2022) conditions. Exhibits prepared on aerial photography base maps have been included at the conclusion of this appendix. • Benton Airpark serves Design Group I and II aircraft and has annual operations of 35,000. Long-term annual operations are forecasted to be 47,000. There is no noise- sensitive development within the existing or forecast 65 CNEL contours.

Review of Environmental Resources (Continued) Proposed Facility Improvements	
Environmental Resource	**Anticipated Impacts**
Compatible Land Use. The compatibility of existing and planned land uses in the vicinity of an airport is usually associated with the extent of noise impacts related to that airport. In this context, the noise analysis described above concludes that there is no significant impact.	• Land use to the northeast and northwest of the airport are existing residential areas. Land use directly to the north, off Runway 15, is open space and is owned by the airport. To the east of the airport are mixed land uses including office buildings, a church, and a school. To the south, southwest, and west of the airport is a capped landfill. • Land use off the end of the runways are compatible with the airport. Due to the low number of operations, noise contours do not extend off airport property. Therefore, there are no impacts to noise-sensitive development. • The On-Airport Land Use Plan coordinates the uses of airport property in a manner compatible with the functional design of the airport facility. This plan helps ensure that those areas essential to the safe and efficient operation of the airport are secure. In addition, the plan determines compatible land uses for the balance of the property which would be most advantageous to the airport and community.

Review of Environmental Resources (Continued) Proposed Facility Improvements	
Environmental Resource	**Anticipated Impacts**
Social Impacts. These impacts are often associated with the relocation of residents or businesses or other community disruptions.	• The proposed projects will not involve the need to relocate any residence or business. • The proposed project includes the construction of a perimeter road around the north end of the airfield to prevent the potential for runway incursions. This road will remain on airport property and is not anticipated to impact the local transportation network. • Additional traffic to the executive hangars west of the runway may increase traffic on South Street. This increase is not anticipated to be significant.
Induced Socioeconomic 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.	• Shifts in patterns of population movement or growth, or public service demands, are possible 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, trade, and to enhance the future growth and expansion of the community's economic base. Future socioeconomic impacts resulting from the proposed development would be primarily positive in nature.

Review of Environmental Resources (Continued) **Proposed Facility Improvements**	
Environmental Resource	**Anticipated Impacts**
Air Quality. The US 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 (O3), Carbon Monoxide (CO), Sulfur Dioxide (SO2), Nitrogen Oxide (NO), Particulate matter (PM10), and Lead (Pb). Various levels of review apply within both NEPA and permitting requirements.	• Benton Airpark is located in Shasta County, which is in non-attainment for Ozone (O_3) and Particulate Matter (PM_{10}). To determine potential impacts, further analysis and coordination is required.
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.	• The runway safety area would extend into the Benton Landfill which is located south of Runway 33. Further coordination with both the California Integrated Waste Management Board and the California Regional Water Quality Control Board is necessary in order to ensure that the design concept is not detrimental to the integrity of the landfill, thus compromising water quality. • The airport will need to comply with current 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 product construction activities.

Review of Environmental Resources (Continued) Proposed Facility Improvements	
Environmental Resource	**Anticipated Impacts**
Section 4(f) Lands. These include publicly-owned land from a public park, recreation 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 two recreational areas on airport property: a dog park (until such time that it can be relocated to a mutually agreeable site) and proposed fly-in camping area. Within the proposed plan, these areas will be preserved.
Historical and Cultural Resources	• Coordination with the Northeast Center of the California Historic Resource Information System indicated that the project is located in an area considered to be sensitive for prehistoric, protohistoric, and historic cultural resources. • Airport property has never been surveyed for cultural resources; therefore, a cultural resource survey of the unpaved portions of the project area will be required to determine potential impacts prior to future development.
Threatened or Endangered Species and Biological Resources	• Coordination received from the United States Department of the Interior Fish and Wildlife Service indicated several listed species which may occur in the area or be affected by the proposed projects. Many of these species are fish, invertebrates, or amphibians whose habitat is aquatic. However, the bald eagle and northern spotted owl are known to reside in the area. • A biological survey will be required to determine if protected species are present on airport property or in the project's vicinity prior to future development.
Waters of the U.S. Including Wetlands	• According to the National Wetland Inventory Map, there are no wetlands or waters of the U.S. present on airport property.

Review of Environmental Resources (Continued) Proposed Facility Improvements	
Environmental Resource	**Anticipated Impacts**
Floodplains	• According to a Federal Emergency Management Agency Flood Insurance Rate Map, Benton Airpark is not within a 100-year floodplain.
Wild and Scenic Rivers	• No impacts. The airport is not near any designated wild and scenic rivers.
Farmland	• Information received from the Natural Resource Conservation Service indicated the presence of four soil types in the airport vicinity. These soils (perkins gravelly loam, red bluff gravelly loam, redding gravelly loam, and newton gravelly loam) all have a fair-to-poor rating for topsoil due to high gravel content. Therefore, it is not anticipated that any prime or unique farmland will be affected by the proposed projects.
Energy Supply and Natural Resources	• No significant impacts anticipated. The proposed improvements will not have a measurable effect on local energy supplies or natural resources.
Light Emissions	• No significant impacts anticipated.
Solid Waste	• No significant impacts anticipated. Solid waste generation will not be appreciably different than would exist without the action.

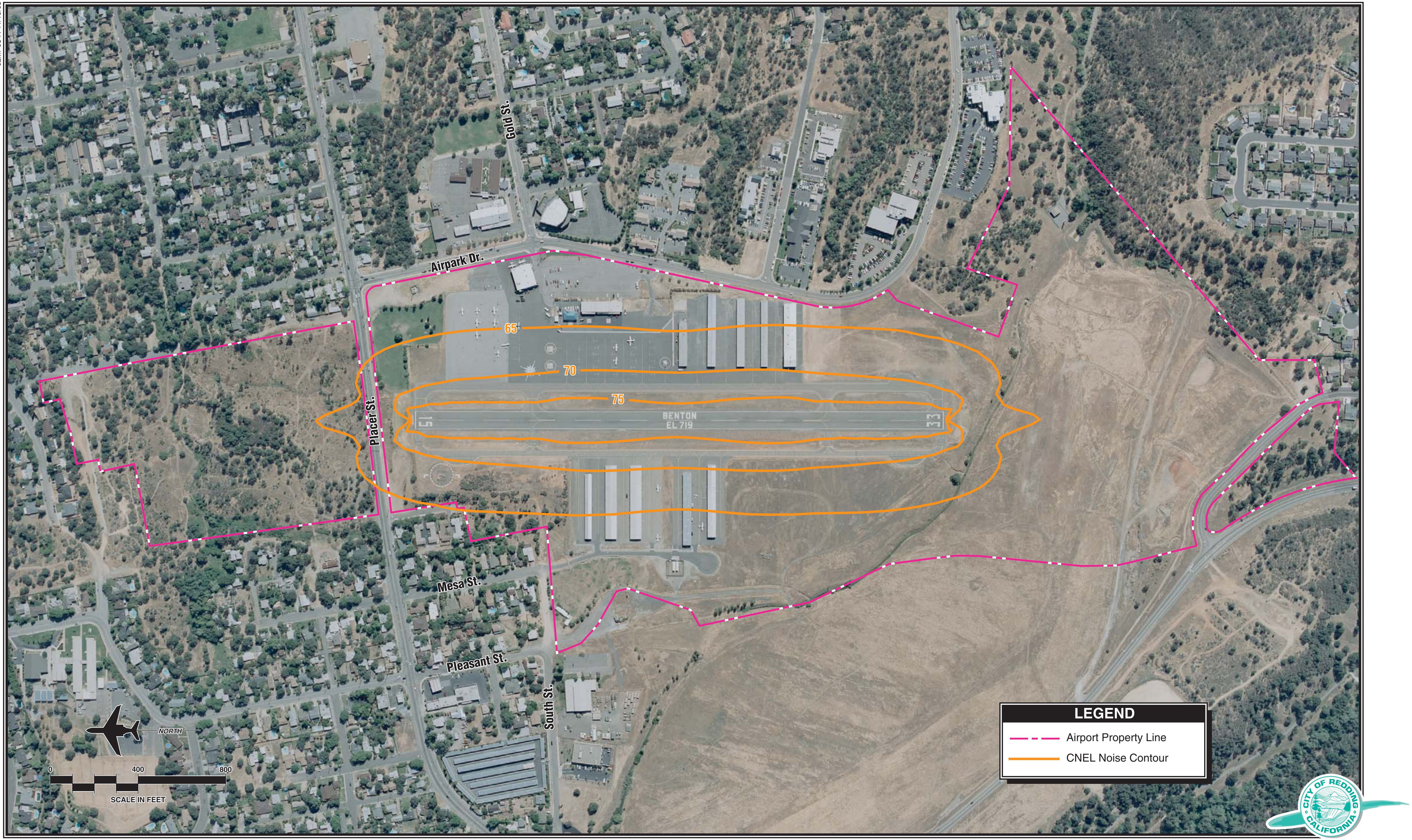


Exhibit A
EXISTING NOISE EXPOSURE CONTOURS

02MP03-B-3/8/05

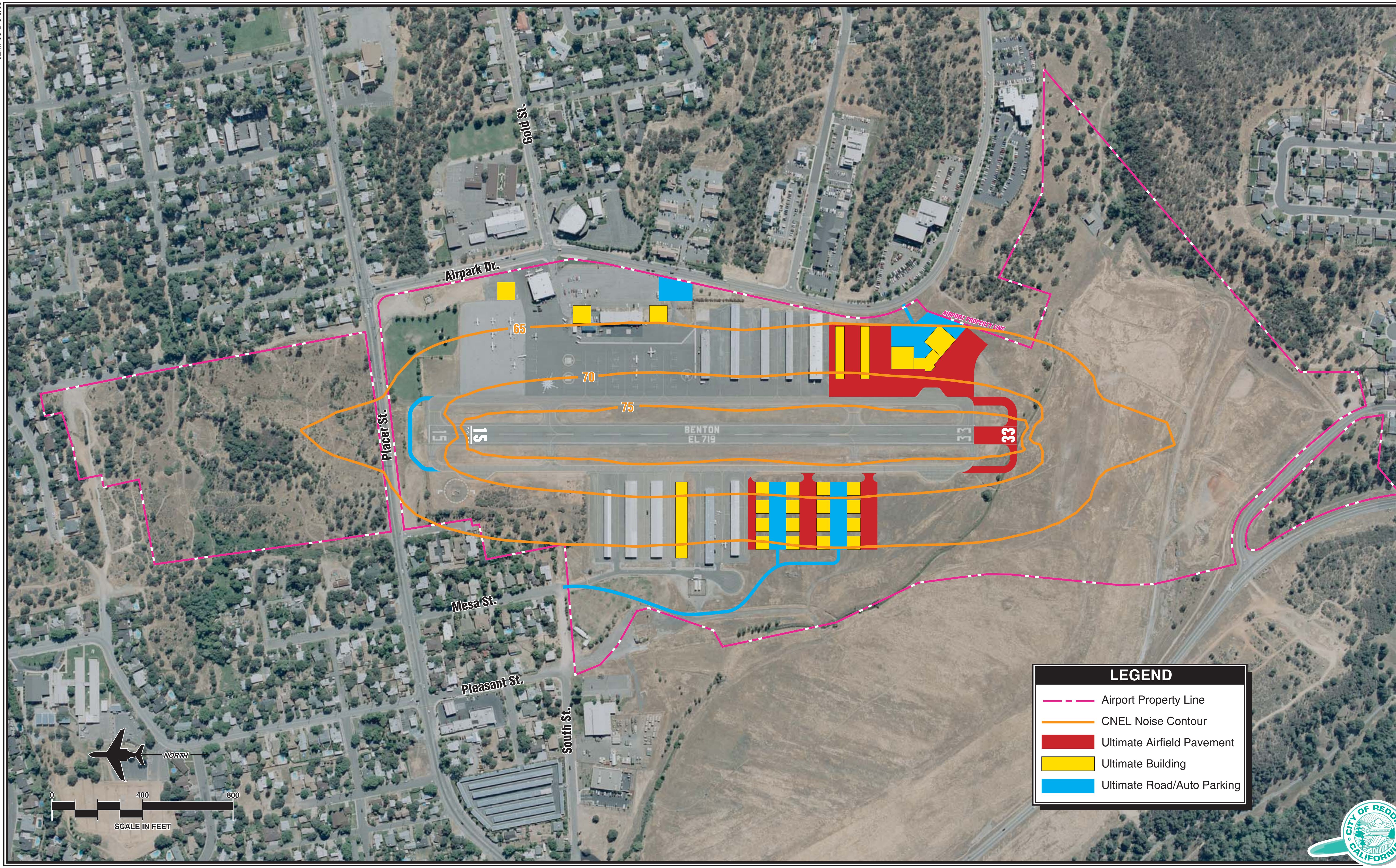


Exhibit B
FUTURE NOISE EXPOSURE CONTOURS

Appendix D
CAPITAL IMPROVEMENTS PROGRAM

Benton Airpark
Preliminary Airport Capital Improvement Costs

Year	Description	Unit	Total Units	Unit Cost	Total Cost	AIP Eligible	State Eligible	Local Share
2004	Construct Perimeter Road	Lineal Ft.	2700	$20	$54,000	$48,600	$2,400	$3,000
	Design Runway Safety Area Project				$255,000	$229,500	$11,500	$14,000
	Annual Pavement Preservation				$50,000	$45,000	$2,300	$2,700
	Subtotal				$359,000	$323,100	$16,200	$19,700
2005	Runway Safety Area Project*				$3,600,000	$3,240,000	$162,000	$198,000
	Annual Pavement Preservation				$50,000	$45,000	$2,300	$2,700
	Subtotal				$3,650,000	$3,285,000	$164,300	$200,700
2006	Overlay Runway	Sq. Yds.	21500	$20	$430,000	$387,000	$19,400	$23,600
	Security Fencing-Phase III				$260,000	$234,000	$11,700	$14,300
	Annual Pavement Preservation				$50,000	$45,000	$2,300	$2,700
	Subtotal				$740,000	$666,000	$33,400	$40,600
2007	Hangar Site Preparation-East Side	Spaces	12	$10,000	$120,000	$108,000	$5,400	$6,600
	Hangar Construction-East Side	Spaces	12	$20,000	$240,000	$0	$0	$240,000
	Water Pollution Control Facility Rehab.				$180,000	$162,000	$8,100	$9,900
	Annual Pavement Preservation				$50,000	$45,000	$2,300	$2,700
	Subtotal				$590,000	$315,000	$15,800	$259,200
2008	Construct West Side Access (Mesa St.)	Lineal Ft.	1600	$20	$32,000	$28,800	$1,400	$1,800
	Hangar Site Preparation-West Side	Spaces	8	$10,000	$80,000	$72,000	$3,600	$4,400
	Hangar Construction-West Side	Spaces	8	$20,000	$160,000	$0	$0	$160,000
	Annual Pavement Preservation				$50,000	$45,000	$2,300	$2,700
	Subtotal				$322,000	$145,800	$7,300	$168,900
	Total Short Term				$5,661,000	$4,734,900	$237,000	$689,100
2009-2013	Construct New Conventional Hangars	Sq. Ft.	20000	$26	$520,000	$0	$0	$520,000
	Auto Parking	Sq. Yds.	1400	$25	$130,000	$84,000	$75,600	$3,800
	Hangar Site Preparation-East Side	Spaces	12	$10,000	$120,000	$108,000	$5,400	$6,600
	Hangar Construction-East Side	Spaces	12	$20,000	$240,000	$0	$0	$240,000
	Land Acquisition - Approach Protection				$200,000	$180,000	$9,000	$11,000
	Annual Pavement Preservation				$250,000	$225,000	$11,300	$13,700
	Total Intermediate Term				$1,460,000	$597,000	$101,300	$761,700
2014-2023	Construct New Conventional Hangars	Sq. Ft.	20000	$26	$520,000	$0	$0	$520,000
	Hangar Site Preparation-West Side	Spaces	8	$10,000	$80,000	$72,000	$3,600	$4,400
	Hangar Construction-West Side	Spaces	8	$20,000	$160,000	$0	$0	$160,000
	Add Nested T-Hangar on West Side	Spaces	10	$20,000	$200,000	$0	$0	$200,000
	Increase Fuel Storage				$150,000	$0	$0	$150,000
	Annual Pavement Preservation				$500,000	$450,000	$22,500	$27,500
	Total Long Term				$1,610,000	$522,000	$26,100	$1,061,900
	Total Airport Development Program				$8,731,000	$5,853,900	$364,400	$2,512,700

*Detailed estimate developed for Runway Safety Area Study, Alternative 4.
Includes compacted embankment over landfill, paving, lighting, and engineering.

Coffman Associates
Airport Consultants

KANSAS CITY
(816) 524-3500

237 N.W. Blue Parkway
Suite 100
Lee's Summit, MO 64063

PHOENIX
(602) 993-6999

4835 E. Cactus Road
Suite 235
Scottsdale, AZ 85254