Reno-Stead Airport
Master Plan Update
Final Report

Prepared By

PBS&J

March 2010

RENO-STEAD AIRPORT
MASTER PLAN UPDATE

FINAL REPORT

PREPARED FOR:

RENO-TAHOE AIRPORT AUTHORITY

PREPARED BY:

PBS&J

MARCH 2010

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INTRODUCTION

Reno-Stead Airport

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1.1 GENERAL OVERVIEW

The Reno-Stead Airport Master Plan Update (Master Plan) was a cooperative effort between the Reno-Tahoe Airport Authority (RTAA) and the Federal Aviation Administration (FAA). This Master Plan provides an effective written and graphical representation of the ultimate development of the Reno-Stead Airport (RTS) and the anticipated land uses and development opportunities on RTS. It is the intent of the Master Plan to serve as a management guide for the phased implementation of necessary improvements to meet the expected growth in aviation demand at RTS over a planning period of 20 years, ending in 2028.

RTAA, the owner and operator of both the Reno-Tahoe International Airport (RNO) and RTS, recognizes the importance of RTS to the community and the region. This Master Plan establishes a schedule of priorities and phasing for the various improvements proposed and provides information and guidance to manage and develop facilities to meet the forecasted growth and stimulate business investment in the local economy. An Airport Layout Plan (ALP), which is essential to an airport's ability to qualify for and receive federal and/or state funding assistance, has been included in this Master Plan. In addition to providing the traditional planning guidance described, this Master Plan update examines issues unique to RTS, specifically the large amount of undeveloped land that is part of RTS property and required regional drainage needs. The outcome is a document that not only ensures that RTS will meet projected aviation demands, but also one that will serve as a strategic development plan and marketing tool for RTS, as well as for the RTAA in guiding their airport system as a whole.

1.2 MASTER PLAN GOALS

Six Master Plan goals and additional work tasks were identified after the project kick-off meeting. **Appendix A** provides the agenda, list of meeting attendees and elaboration on the six goals which are as follows:

- Goal No. 1: Provide an airport that is safe, secure and reliable, while continuing to maintain the existing high level of service provided to all RTS users and tenants
- Goal No. 2: Provide planning and development guidance to satisfy anticipated aviation demand and to promote fiscal self-sufficiency by stimulating RTS development and the local economy
- Goal No. 3: Minimize or avoid any negative environmental impacts from proposed development
- Goal No. 4: Promote the development of appropriate and achievable compatible non-aviation land use in undeveloped areas within the RTS
- Goal No. 5: Address infrastructure needs and local drainage issues at RTS
- Goal No. 6: Identify an appropriate development phasing program in association with the airport land use and development plan

To accomplish the goals of the Master Plan, the work tasks included:

- Collecting data and evaluating existing airport facilities and activity (Chapter 2 Inventory of Existing Facilities)
- Reviewing previous forecasts and preparing updated forecasts that provide short, intermediate, and long range (5, 10 and 20 years) projections of aviation demand (Chapter 3 Forecast of Aviation Demand)
- Identifying impacts of the forecast activity on existing facility capacities and determining the enhancements necessary to meet projected demand (Chapter 4 Demand/Capacity Analysis and Facility Requirements)
- Identifying aviation and non-aviation development opportunities, determining which types are appropriate and desired by the RTAA, preparing and evaluating various development alternatives (with and without the National Championship Air Races and Air Show) and selecting a final development concept (Chapter 5 Airport Development Plan)
- Developing alternatives to address airport and local drainage issues, including major drainage collection channels and a possible regional retention basin, in coordination with other involved jurisdictions/agencies (Chapter 6 Drainage Master Plan)
- Refining the selected airport development concept as necessary and developing a graphic representation of existing and proposed development including a complete ALP package (Chapter 7 Airport Layout Plan)
- Determining the airport capital improvements program (costs and revenue), development phasing plan and implementation plan for the proposed development program (Chapter 8 Capital Improvement Program)
- Conducting a public information outreach program to obtain input for the master planning process

The RTS Master Plan was funded by the FAA and the RTAA. Coordination of this study between these agencies was accomplished in stages during the preparation of this Master Plan. Technical work was conducted by PBS&J, Inc. In addition, the general public that makes up the communities surrounding RTS, as well as the users and tenants of RTS, provided critical stakeholder input through surveys and at community meetings.

This Master Plan was prepared in accordance with FAA Advisory Circulars (AC) 150/5070-6B, *Airport Master Plans*, and AC 150/5300-13, *Airport Design, Change 12*, and other related federal standards. In addition, guidance was incorporated from the Nevada Department of Transportation (NDOT) Office of Aviation Planning, the RTAA, other concerned local government agencies, and is consistent with regional planning efforts such as the 2007 Regional Plan, 2030 Regional Transportation Plan, the North Valleys Regional Plan and the Washoe County Consensus Forecast. Prior planning studies and reports regarding RTS and/or the local community, developed within the past 15 years, were used as supporting materials. Those documents are also listed in Appendix A.

1.3 SUMMARY AND RECOMMENDATIONS

The Master Plan program is outlined and documented in detail in Chapter 8 Capital Improvement Program. It is presented in three phases: Phase I covers the short-term five-year period through 2013; Phase II covers the intermediate period through 2018; and Phase III covers the long-term period through 2028.

The major development items include:

Phase I

- Displacement of the Runway 26 threshold by 314 feet, application of declared distances and completion of grading work for runway safety compliance
- Relocation of the end of Runway 32 by 320 feet, application of declared distances and completion of grading work beyond pavement edge for runway safety area compliance
- Construction of new terminal building and adequate vehicle parking for terminal facilities
- Expansion of itinerant aircraft parking area with additional tie down markings and hardware to the west of existing apron by 28 positions
- Widening and strengthening of Taxiway D, which is currently designed to Group II standards, to comply with Group III standards

Phase II

- Construction of new air traffic control tower within Federal Aviation Administration contract tower program
- Installation of instrument landing system and approach lighting system for Runway 26

Phase III

- Rehabilitation of the closed taxiway connecting the north end of Taxiway D with Taxiway C to comply with Group III standards
- Construction of additional parallel taxiways along both runways to provide dual parallel taxiways
- Expansion of based aircraft hangar area to the west of existing hangar development by 54 hangars

Cost estimates for the phased implementation of the entire 20-year development program can be found in Chapter 8 Capital Improvement Program. Some of the projects may be eligible for FAA funding through General Aviation entitlement and Airport Improvement Program discretionary funding. Additionally the cost of the most expensive project, the construction of stormwater drainage improvements, would likely be shared with the local jurisdictions as well as future developers and tenants since mitigation is only required as development of the area occurs and would also provide a regional solution for stormwater drainage in the Stead area.

INVENTORY OF EXISTING FACILITIES

Reno-Stead Airport

2

2.1 GENERAL OVERVIEW

An inventory of airport facilities is essential to the success of a master plan, in that it provides the background information necessary for the remaining portions of the study. The inventory task for the Reno-Stead Airport (RTS) was accomplished through: physical review of facilities, field interviews, tenant surveys, and review of appropriate airport management records. Additional information was obtained from documents and studies about RTS and the local community.

This section provides a general description of the existing airport facilities. It also describes data relevant to the airport's history, geographic locale, climate, and operational role in the aviation system.

2.2 AIRPORT DESCRIPTION

RTS is located approximately ten miles northwest of the central business district of the City of Reno, Nevada. This general aviation (GA) airport, which consists of 5,170 acres, is located in the Stead community within the North Valley area of Washoe County, but still falls primarily within the City of Reno's jurisdiction for land use and zoning control. **Figure 2-1** illustrates the location of RTS within Nevada and **Figure 2-2** depicts RTS in relation to the surrounding community. RTS is owned and operated by the Reno-Tahoe Airport Authority (RTAA) and is the designated general aviation reliever airport for Reno-Tahoe International Airport (RNO), which is located approximately 11 miles to the southeast. RTS currently provides a full range of private, corporate, and flight training aviation services to the northern Nevada and California areas.

U.S. Highway 395 and Interstate 80 are the two major highways in Northern Nevada that pass through the Reno area. U.S. Highway 395 is the main connection to the ancillary roads leading to RTS. U.S. Highway 395 is approximately three miles south of RTS.

2.3 HISTORY

RTS began as the Reno Army Airbase. RTS was originally constructed in 1942 as a training center for enlisted officers and men newly assigned to the Signal Corps. Authority of the base was transferred to the Ferry Division of the Air Transportation Command in October 1943. The Air Transportation Command-Ferry Division was fully functional until the base's deactivation in 1945.

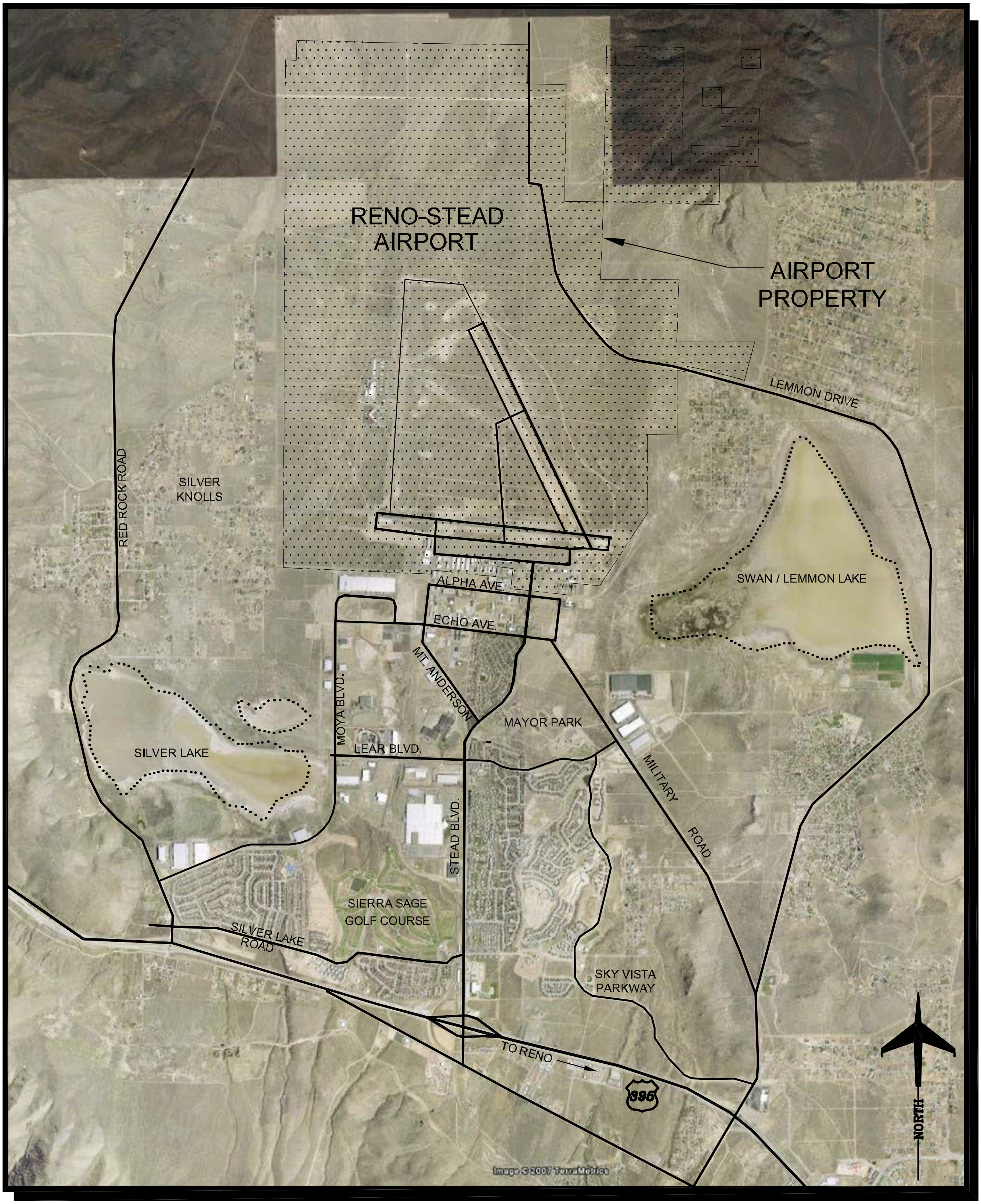
The vacant base was reactivated for training purposes in April 1948 and was used by the Nevada Army National Guard – 192nd Fighter Squadron. Almost two years after the base was reactivated, in the winter of 1949, Lt. Croston Stead was killed while engaged in a training exercise. In January of 1951, to commemorate the lieutenant and his achievements, the base was renamed Stead Air Force Base.

Source: Google Maps, PBSJ, 2007

LOCATION MAP

PBS&J	Master Plan Update Reno-Stead Airport Reno, Nevada	Location Map	Figure 2-1

Plotted By: 11328 J:\AVServ\071889.00 Reno MP\Master Plan Update\Chapter 2 Graphics_Fig2-01-Location Map.dwg Nov29,2007 - 1:07pm



Source: Existing ALP, PBSJ, 2007
Google Earth

VICINITY MAP

PBSJ	Master Plan Update Reno-Stead Airport Reno, Nevada	Vicinity Map	Figure 2-2

Plotted By: 23208 J:\AVServ\071889.00 Reno MP\Master Plan Update\Report Graphics_(CAD&WorkingFiles)\Chapter 2_Fig2-02-Vicinity Map.dwg Mar29,2010 - 1:02pm

The Stead Air Force Base was formally activated in 1952. During the period of 1952 through 1963, the Base was used as a military training center by the Air Force, Navy, Marines, foreign officers, and most of the pre-1965 astronauts. From 1952 to 1958 the United States Air Force Survival School also occupied the Base for training purposes. After 1958, the Base was placed on an inactive status. However, other branches of the military and other federal agencies continued to use the Base for training.

Stead Air Force Base, along with several other military fields throughout the United States, was closed in 1963. It was not until 1966 that Stead Air Force Base was quit claim deeded to the City of Reno. In June of 1966, the former Stead Air Force Base began operation as Reno-Stead Airport.

The distance between the City of Reno and the former base's existing development made it difficult to incorporate and transfer the City's newly acquired property due to legislation prohibiting annexation in non-contiguous areas. In 1968, once legislation was passed to allow annexation in non-contiguous areas, complete incorporation of the base property within the City of Reno was finalized. The airport property, which was a total of 2,300 acres, was subsequently transferred to the Airport Authority of Washoe County in June of 1979.

Several land acquisitions were made by the Airport Authority from 1978 to the present. The first acquisition was the 2,300-acre transfer of ownership pursuant to state enabling legislation, which was followed by the attainment of 600 acres from the Lear Family Trust seven years later. The next land purchase included 2,081 acres in the northern quadrant of the airport in support of the National Championship Air Races and Air Show. The most recent property acquisition involved 125 acres in the northeast quadrant purchased in 2009. RTS currently includes 5,170 acres of land and is operated by the Reno-Tahoe Airport Authority (formerly the Airport Authority of Washoe County, which was renamed on July 1, 2005). All day-to-day activities are administered by RTAA staff.

2.4 AIRSIDE FACILITIES

2.4.1 Runways

There are currently two runways serving RTS. Runway 14-32 is 9,000 feet long, 150 feet wide, and in excellent condition because a full reconstruction of the runway was completed in 2005. The runway is oriented in a northwest to southeast direction with an asphalt surface and load-bearing capacity of 75,000 pounds for single-wheel aircraft, 200,000 pounds for dual-wheel aircraft, and 320,000 pounds for dual-tandem-wheel aircraft. The runway currently complies with the standards specified in Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5300-13, *Airport Design, Change 12* for airport reference code (ARC) C-III aircraft and has precision runway markings. The threshold to Runway 32 has been displaced by 1,200 feet so landings in that direction have 7,800 feet of usable runway while all other operations on this runway make use of the full 9,000 feet available.

Runway 8-26 is oriented in a generally east to west direction and is 7,608 feet long and 150 feet wide. The runway is in good condition and consists of an asphalt surface with a load bearing capacity of 60,000 pounds for single-wheel aircraft, 100,000 pounds for dual-wheel aircraft and 150,000 pounds for dual-tandem-wheel aircraft. Runway 8-26 has non-precision markings and is the predominantly used runway at RTS.

Figure 2-3 illustrates the orientation of Runways 14-32 and 8-26.The overall characteristics of these runways are listed in **Table 2-1**.

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Reno, Nevada

Existing Airside Facilities

Figure
2-3

Table 2-1. Runway Specifications

Dimensions	Runway 8-26	Runway 14-32
Length (feet)	7,608	9,000
Width (feet)	150	150
Surface Material	Asphalt	Asphalt
Surface Treatment	Grooved	Grooved
Load Bearing Capacity by Gear Type		
SWL (pounds)	60,000	75,000
DWL (pounds)	100,000	200,000
DTW (pounds)	150,000	320,000
Approach Slope	20:1; 20:1	20:1; 50:1
Effective Gradient	0.77%	0.05%

Runway End Coordinates	Runway 8	Runway 26	Runway 14	Runway 32
Latitude	39 39' 51.6400"N	39 39'43.9100"N	39 41'00.2189"N	39 39' 40.5500"N
Longitude	119 53 31.8800"W	119 51' 55.1400"W	119 52' 53.7750" W	119 52' 02.5700"W

Source: FAA 5010 Form and 2006 Airport Layout Plan (ALP).

2.4.2 Taxiways

The existing taxiway system at RTS, illustrated in Figure 2-3, connects all runway ends to the terminal area and other airport facilities. Runway 14-32 is served by parallel Taxiway B, which extends from the Runway 14 end to the Runway 32 end. Taxiway B is 50 feet wide and has 400 feet of separation from the Runway 14-32 centerline. The 400 feet of separation and 50-foot width meets FAA Airplane Design Group (ADG) III requirements.

Runway 8-26 is served by parallel Taxiway A on the south side of the runway, adjacent to the apron. Taxiway A is 50 feet wide and has a runway centerline to taxiway centerline separation of 520 feet. Taxiway A meets and exceeds FAA ADG Group III standards.

Taxiway C is located in the middle of the airfield between Runway 14-32 and Runway 8-26 and provides service to both runways. Taxiway C connects to Taxiway B and Taxiway A. Taxiway D connects the Nevada Army National Guard building to Taxiway A.

Both Taxiway A and Taxiway B have several entrance/exit taxiways that connect the parallel taxiway to the runway at various locations. This network of taxiways permits the safe and efficient movement of aircraft around the airfield.

2.4.3 Aircraft Parking Apron

There is one public accessible aircraft parking apron located at RTS. The apron is located directly south of Runway 8-26. The parking apron is approximately 215,000 square yards; 204,000 square yards of this area is paved with asphalt. The remaining parking area is paved with concrete for larger aircraft parking. The asphalt ramp is estimated to have a strength of 20,000 pounds single-wheel load based on historical records; however, no pavement strength testing has been completed.

Temporary grandstands that are used for the National Championship Air Races and Air Show are located generally in the center of the apron area, north of the intersection of

Texas Avenue and Mt. Lola Street, on the south portion of the apron pavement. Two general tie-down areas are located on either side of the grandstands; the one to the east is used by both itinerant and based aircraft while the one to the west is used exclusively by based aircraft. Other aircraft parking areas are designated on the apron and airfield; however, these are mainly used during the National Championship Air Races and Air Show or to stage firefighting aircraft during operations by the Bureau of Land Management (BLM) firefighting support base. The aircraft parking apron is illustrated in **Figure 2-4.**

2.5 METEOROLOGICAL CONDITIONS

Aircraft operations at airports are affected by weather patterns and associated regional meteorological conditions. The amount of rainfall, prevailing wind direction, and average amount of inclement weather all work to determine the runway orientation, instrument approach requirements, and navigational aids (NAVAIDS) required to achieve the safest and most efficient operation possible.

2.5.1 Climate

Reno is located at the west edge of the Great Basin in a semi-arid plateau. The average annual precipitation in the region is 7.5 inches. The December to March period in Reno produces over half of the area's precipitation, which is deposited in the form of mixed rain and snow. Humidity is low during the summer and winter months. The average daily temperature is mild; however, the difference between daily highs and lows often exceeds 45 degrees Fahrenheit (°F). The average annual temperature in Reno is 50.8 °F. The annual monthly average high temperature is 89.6 °F and the annual monthly average low temperature is 21.9 °F.

2.5.2 Wind

The prevailing winds at RTS are generally out of the west, making Runway 8-26 the predominantly used runway. Because of its proximity to most of the existing development at RTS, Runway 8-26 is also the preferred runway during calm wind conditions. Short periods of strong winds out of the south-southwest, which create crosswind conditions with the existing runway configuration, have also been noted through tenant interviews and review of the wind rose data. **Figure 2-5** illustrates the wind rose for RTS. The existing runway layout of RTS exceeds the FAA required 95 percent wind coverage.

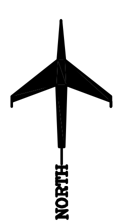
2.6 FACILITY DESIGN CRITERIA

The FAA AC 150/5300-13, *Airport Design*, provides the ARC system in order to coordinate airport design criteria with characteristics of the critical aircraft type intended to operate at an airport. Two separate components comprise the ARC: aircraft approach category and the ADG. The aircraft approach category is an operational characteristic relating to the approach speed of an aircraft. Specifically, the approach categories are based on a factor of 1.3 times the aircraft stall speed in landing configuration at maximum certificated landing weight. Approach categories are represented by a letter designation, as depicted in **Table 2-2**.

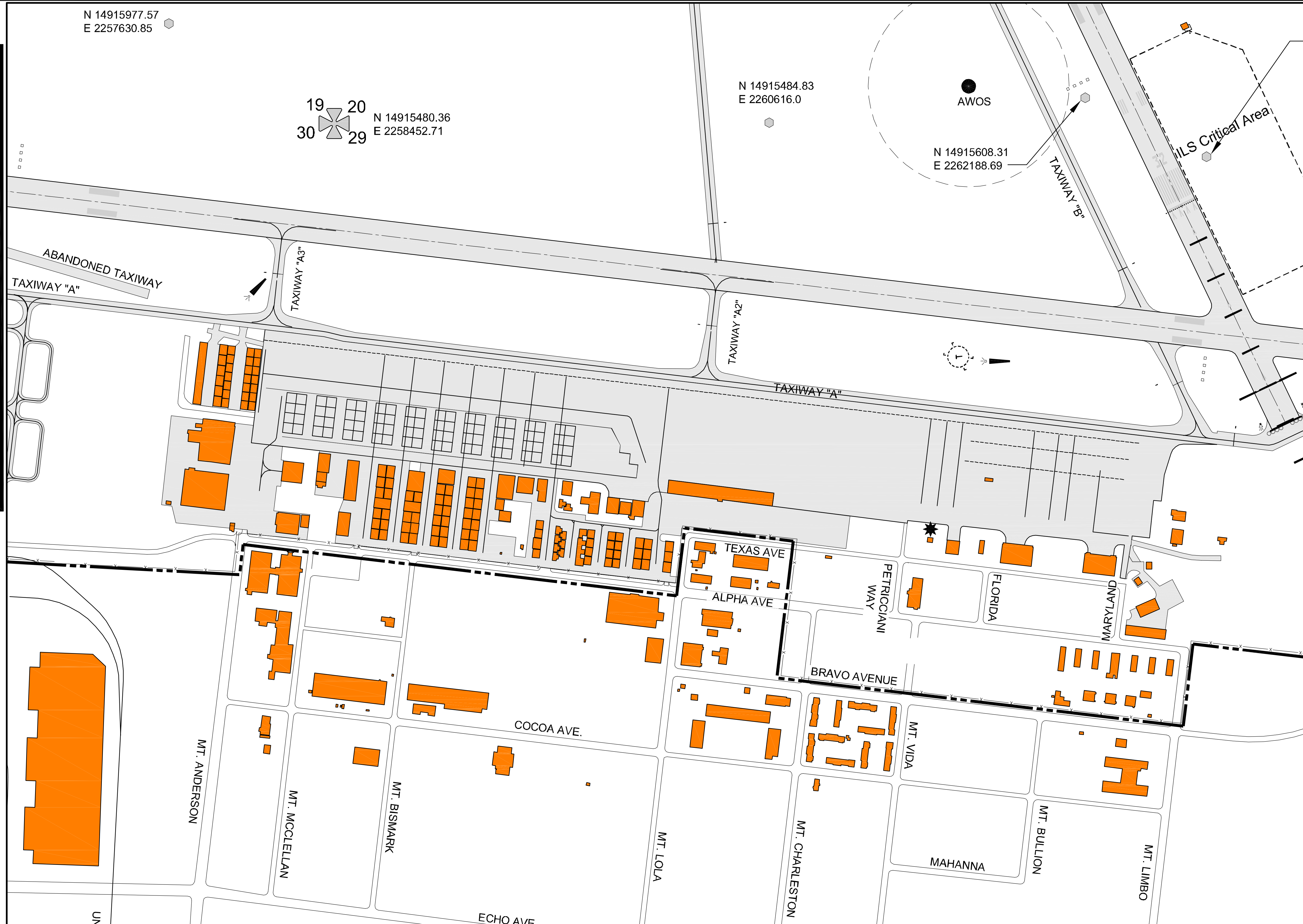
BUILDINGS/FACILITIES

EXISTING	DESCRIPTION	ELEVATION (NAVD 88)
1	BLM FIRE TANKER BASE	5058.6
2	RTAA FUEL FARM	5046.5
3	RTAA MAINTENANCE FACILITY	5065.8
4	RTAA STORAGE UNITS	5046.9
5	AIRPORT LIGHTING VAULT	5046.3
6	AIRCRAFT HANGAR (ACL)	5071.9
7	AIRCRAFT HANGAR (ACL)	5067.6
8	AIRPORT MANAGER'S OFFICE	5036.7
9	ATC TOWER & ROTATING BEACON	5104.8
11	RENO AIR RACE ASSOC. GRANDSTANDS	5068.1
13	PILOT LOUNGE	5037.4
14	FUEL ISLAND	5038.7
15	T-HANGARS	5043.8
16	T-HANGARS	5051.6
17	T-HANGARS	5035.1
18	RENO AIR RACE ASSOC. HANGARS	5054.3
19	RENO AIR RACE ASSOC. HANGARS	5046.3
20	RENO AIR RACE ASSOC. HANGARS	5055.3
21	T-HANGARS	5039.6
22	KANE KLASSIC T-HANGARS	5043.8
23	T-HANGARS	5029.2
24	T-HANGARS	5033.3
25	T-HANGARS	5030.6
26	WASH RACK AND PUBLIC RESTROOM	5025.5
27	AIRCRAFT HANGARS	
28	T-HANGARS	5037.1
29	T-HANGARS	5040.8
30	T-HANGARS	5039.4
31	T-HANGARS	5031.8
32	T-HANGARS	5036.9
33	T-HANGARS	5034.0
34	T-HANGARS	5028.6
35	HANGAR	
35A	HANGAR	
36	HANGAR	5036.9
37	AIRCRAFT HANGAR (LAN-DALE)	5024.0
38	AIRCRAFT HANGAR (NETWORK)	5023.0
39	RENO AIR RACE ASSOC. HANGAR	5024.5
40	AIRCRAFT HANGAR (RARA)	5034.5
41	T-HANGARS	5018.1
42	T-HANGARS	5019.4
43	T-HANGARS	5019.5

Property Line



0 250' 500' 1,000'



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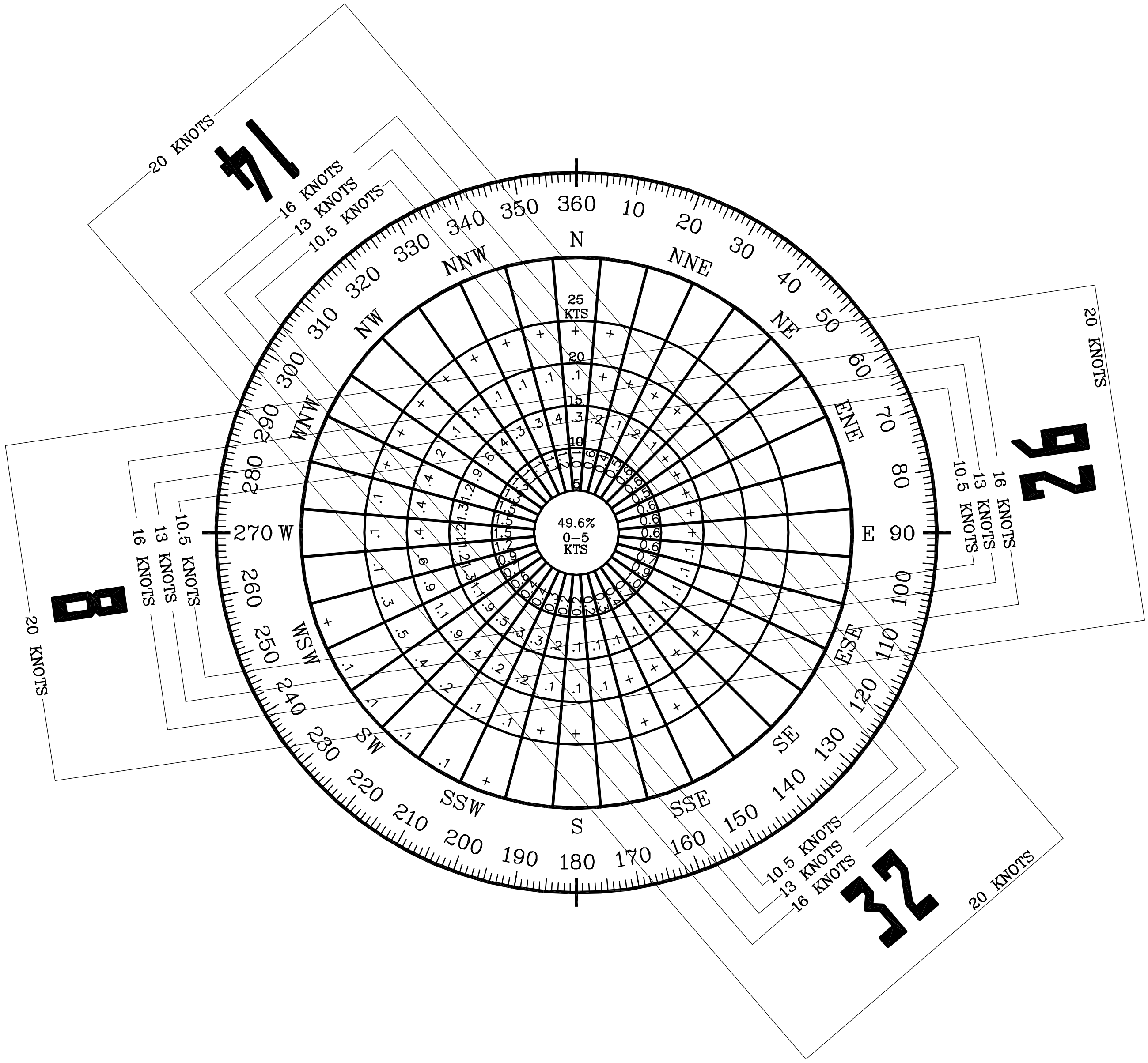
Existing Apron and Terminal Area

Figure 2-4



ALL WEATHER WIND ROSE TABLE				
	10.5 KNOTS	13 KNOTS	16 KNOTS	20 KNOTS
Runway 14-32	*86.71%*	*91.06%*	*95.45%*	*97.98%*
Runway 8-26	*93.05%*	*96.22%*	*98.00%*	*99.58%*
Combined Coverage	*96.13%*	*97.63%*	*98.89%*	*99.68%*

SOURCE:
Western Region Climate Center
DRI Sage building
2215 Raggio Parkway
Reno, Nevada 89512

OBSERVATIONS:
337,390 Observations
1997-2004

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All Weather
Wind Rose

Figure
2-5

Table 2-2. Aircraft Approach Speed Categories

Category	Speed
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 166 knots or more

The ADG is a physical characteristic defined by an aircraft's wingspan. While approach speeds only affect runway design, wingspan affects the design and separation of runways, taxiways, taxilanes, and aprons. A Roman numeral depicts the ADG, as described in the following table.

Table 2-3. Airplane Design Group by Wingspan

Group	Wingspan
Group I	Up to, but not including 49 feet
Group II	49 ft up to, but not including 79 feet
Group III	79 ft up to, but not including 118 feet
Group IV	118 ft up to, but not including 171 feet
Group V	171 ft up to, but not including 214 feet
Group VI	214 ft up to, but not including 262 feet

Airfield improvements are implemented according to the established ARC for the critical or most demanding aircraft expected to utilize an airport or particular runway. The current ARC for RTS is C-III. Some typical C-III aircraft include: the Airbus 320, Boeing 737, MD-80, MD-90 and Boeing 717.

2.7 NAVIGATIONAL AIDS

NAVAIDS are designed to assist pilots and air traffic controllers in maximizing the safe and efficient use of an airport under different meteorological conditions. NAVAIDS refer to any facility available for use in the aid of air navigation. NAVAIDS include lights or any apparatus or equipment used for disseminating weather information, signaling, radio direction finding, or electronic communication. Any other structure or mechanism having a similar purpose for guiding or controlling flight in the air and/or the landing or takeoff of aircraft is also considered a NAVAID. It must be noted that regardless of the level of NAVAIDS provided at RTS, it is likely there will be short periods of time during certain meteorological conditions (e.g, fog, snow, icing, high winds) when aircraft will be unable to utilize RTS.

2.7.1 Enroute Navigational Aids

Enroute NAVAIDS are designed to assist pilots with navigation between their origin and destination airports. These NAVAIDS consist of ground-based transmission facilities and receiving instrumentation onboard aircraft. Two enroute NAVAIDS operate in the Reno area.

The Very High Frequency Omni-Directional Range (VOR) is a ground based NAVAID that transmits high frequency radio signals in all 360 degree compass headings from the station. These radio signals allow a pilot fly along a heading leading to or away from the station. VOR stations are often combined with Distance Measuring Equipment (DME) or Tactical Air Navigation (TACAN) capabilities. Both devices emit signals enabling pilots to determine their line of site distance from the VOR station. The TACAN also provides azimuth information for military aircraft. Pilots flying to and from RTS may use the Mustang VORTAC (VOR and TACAN) and/or the Squaw Valley VOR-DME (VOR and DME). The Mustang VORTAC is approximately 13 nautical miles southeast of RTS. Squaw Valley VOR-DME is located 34.4 nautical miles southwest of RTS.

2.7.2 Terminal Area Navigation and Landing Aids

Terminal area navigation and landing aids are used to assist pilots during aircraft landings and take-offs. The terminal area NAVAIDS and landing aids at RTS include: Precision Approach Path Indicators (PAPIs), lighted windsocks, a lighted segmented circle, and an Instrument Landing System (ILS) on Runway 32.

A PAPI is a light system positioned beside a runway and consists of two to four light boxes that provide a visual indication of an aircraft's position on the approach glide slope for the associated runway. The existing PAPIs at RTS are four-light PAPI systems located on the left side of all four runway ends and can be seen up to five miles during the day and 20 miles at night. Each light of the PAPI is equipped with a lens that splits light output into two segments, red and white. A typical four-light system displays two white lights and two red lights when aircraft are flying on the appropriate approach glide slope. The system displays three red lights and one white light for aircraft flying slightly below the appropriate glide slope and all red lights for aircraft flying well below the glide slope. When aircraft are flying above the appropriate approach glide slope the system displays three white lights and one red light for slightly above and all white lights to those flying well above the glide slope.

A lighted windsock is a landing aid that indicates wind direction and is typically located near the touchdown zone of the runway. There are a total of three lighted windsocks at RTS. The windsock near the intersection of Runways 32 and 26, which is located on the southeast portion of the airfield adjacent to Taxiway A, consists of a windsock combined with a lighted segmented circle. The segmented circle is typically used to help identify the location of the wind direction indicator and will have extensions on the circle if the airport traffic pattern is other than a standard left-hand pattern, which is the case for Runway 26.

An ILS is an instrument approach system that provides electronic horizontal and vertical guidance to aircraft approaching a runway. The ILS typically consists of a localizer (horizontal guidance) transmitter, a glide slope (vertical guidance) transmitter, an outer marker or non-directional beacon (distance guidance), and an approach lighting system (e.g. medium intensity approach light system with runway alignment indicator lights [MALSR]). An ILS is on Runway 32 at RTS. The addition of ILS capabilities at RTS improves the safety and overall availability of RTS during inclement weather for aircraft operations.

2.7.3 Airport Lighting Aids

Airport lighting aids assist pilots in the identification of an airport facility and while maneuvering on the airfield. The existing lighting aids at RTS include a rotating beacon, runway end identification lights, and runway and taxiway edge lights.

A rotating beacon helps approaching pilots identify the location of an airport from a distance at night or during periods of reduced visibility. Rotating beacons that emit alternating flashes of one green and one white light identify civilian-use land airports such as RTS. Rotating beacons are generally in use from dusk to dawn, and when weather conditions deteriorate to a ceiling of less than 1,000 feet and visibility less than three miles, resulting in Instrument Flight Rules conditions (IFR or Instrument Flight Rules are regulations and procedures for flying aircraft whereby navigation and obstacle clearance is maintained with reference to aircraft instruments only and separation from other aircraft is provided by Air Traffic Control). The rotating beacon at RTS is located on top of the Air Traffic Control Tower (ATCT), directly south of the aircraft parking apron and east of Iowa Street.

Runway End Identifier Lights (REILs) are installed to give pilots positive visual identification of the physical end of the runway when approaching an airport. REILs are located on both ends of Runway 14-32 and Runway 8-26 at RTS.

Runway and taxiway lighting systems are used to identify the runway or taxiway pavement edges and aid pilots during landing, takeoff, and/or taxi operations at night or in inclement weather. In order to assist pilots in distinguishing between runways and taxiways, runway lighting is white and taxiway edge lighting is blue. Runway 14-32 and Runway 8-26 are both equipped with High Intensity Runway Lights (HIRLs). Pilots may use the Unicom/Common Traffic Advisory Frequency (CTAF) on 122.7 megahertz (Mhz) in order to self-activate the HIRLs and REILs at RTS. There is currently Medium Intensity Taxiway Lighting (MITL) on Taxiways A and B at RTS. No taxiway lighting exists on Taxiways C or D.

2.8 EXISTING LANDSIDE FACILITIES

2.8.1 Terminal Facility

The existing terminal facility is located on the south side of Runway 8-26, just east of the airport manager's office. The terminal facility is a modular structure and is approximately 1,700 square feet. The existing facility is largely for pilot use and consists of restrooms, storage facilities, a pilot lounge, and a flight planning area. Figure 2-4 depicts the location of the existing terminal/pilot facility.

2.8.2 Aircraft Hangars

There are several aircraft hangar facilities located on RTS. The hangars include a small number of T-Hangars and a significant number of small and large conventional hangars. All existing aircraft hangars are located in proximity to the aircraft parking apron and have direct access to Taxiway A. Based on the current Airport Layout Plan (ALP), 102 aircraft hangars exist on RTS. The majority of the hangars are privately owned and constructed on land leased from the RTAA. The RTAA recently completed construction of three new taxilanes on the southwest side of the airfield specifically for the development of additional aircraft storage hangars at RTS. Through a request for proposals selection process the RTAA has chosen a developer to construct the new hangars. The developer, Silver Pacific Aviation, LLC, has proposed to ultimately place 60 new hangar units on this property. Figure 2-4 depicts the location of all aircraft hangar facilities.

2.8.3 Fixed Base Operator

The fixed base operator (FBO) at RTS is Aviation Classics. Aviation Classics is a full-service FBO offering a wide variety of services, including, but not limited to:

- Aviation fuel (100 low lead and Jet A)
- Self-serve fuel (100 low lead)
- Major and minor maintenance (including Avionics, power plant and airframe)
- Tie-down space
- Restrooms
- Pilot supplies
- Hangar rental
- Used aircraft sales
- Weather and flight planning facilities

The location of the FBO facilities is shown previously in Figure 2-4.

2.8.4 National Championship Air Races and Air Show – Reno Air Racing Association

The National Championship Air Races and Air Show are held annually at RTS. It is a ten-day event held annually in September, featuring multi-lap, multi-aircraft races between high performance aircraft on closed courses that range from 3.18 miles to 8.48 miles in length.

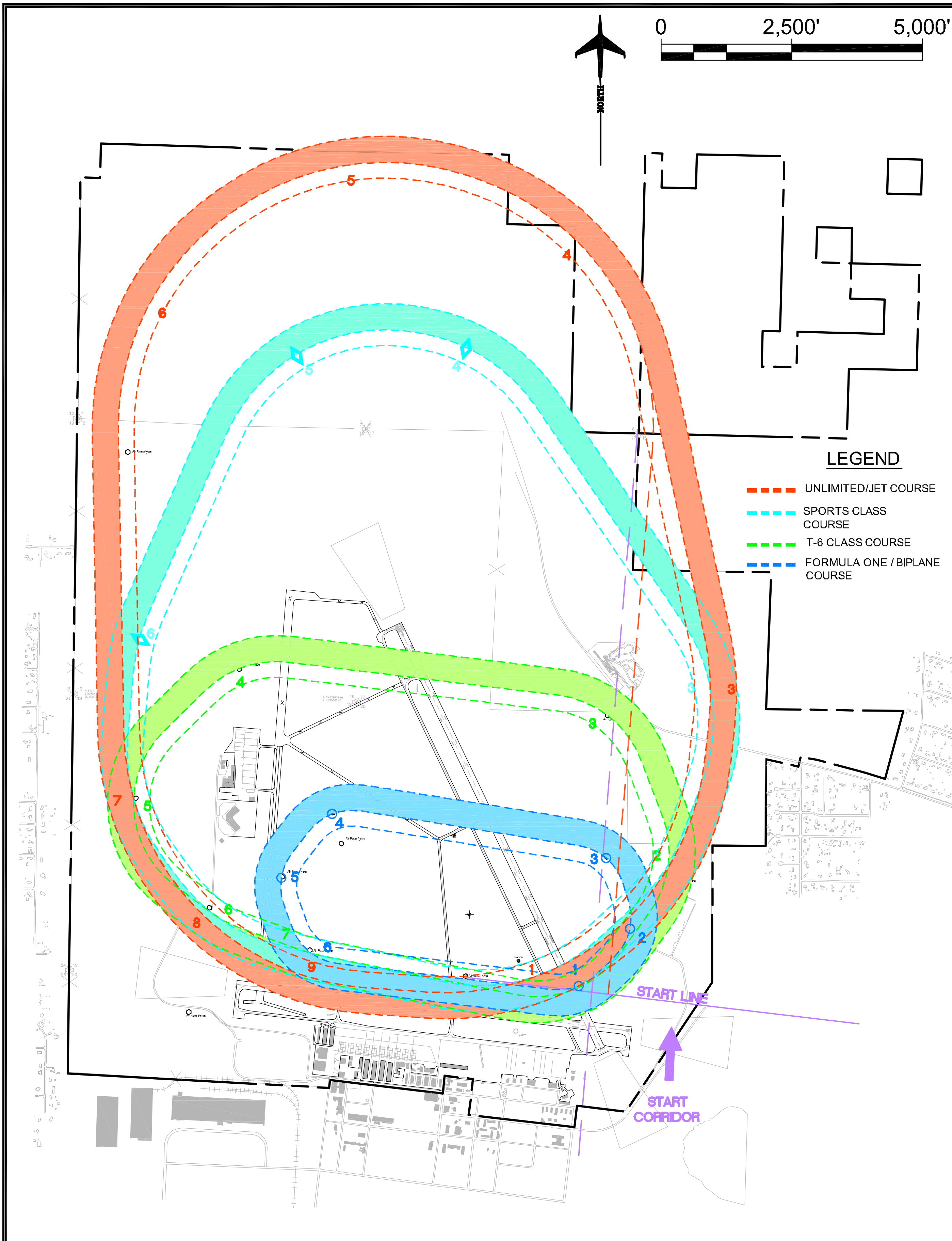
Pilots require special certifications to compete in the National Championship Air Races. The Pylon Racing Seminar is a 3-day certificated course offered annually in June. The seminar allows race pilots to become prepared, experienced, and certified to enter the National Championship Air Races. Courses offered during the seminar include; Ground School, Formation Flying, and Reno Pylon Race Practice Flying. Upon completion of the necessary courses, a check ride by an FAA-certified race Class Check Pilot must be successfully completed in order to compete in the races.

Both the Pylon Racing Seminar and the National Championship Air Races are sponsored by the Reno Air Racing Association (RARA). The four general race courses for the National Championship Races and Air Show include the Unlimited/Jet Course, the Sports Class Course, the T-6 Class Course, and the Formula One/Biplane Course. The race courses are outlined by race pylons for the six race class categories. The six race classes are Biplane, T-6, Formula One, Sport, Jet, and Unlimited. In 2000, the race courses were modified to remain largely on-airport property. A safety area is required for each race course which varies in width based on the race class. **Figure 2-6** illustrates the four Air Race courses and the associated safety areas located at RTS.

RARA has six hangar facilities at RTS. Due to the size and impact of the annual event and associated race courses, RARA's operations play an important role in the future development of RTS.

2.8.5 Other Aviation Tenants

Other existing aviation service providers at RTS include two mechanical repair companies: J and J Aircraft Repair and American Air Racing, and three flight schools: High Sierra Aviation, Aerobatic Company and Flight School, Inc., and Ace Aviation. The Nevada Army National Guard, which is comprised of 14 rotary wing and one fixed wing aircraft, is also located on the airfield and has ground and/or facility leases with RTS. The rotary wing aircraft operated by the Nevada Army National Guard include; six CH-47D (Chinook), five UH-60A (Blackhawk) and three OH-58A/C's (Kiowa) helicopters. The fixed wing aircraft operated by the Nevada Army National Guard is a C-12 (King



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Reno, Nevada

Reno Air Race Courses

Figure 2-6

Air). The Nevada Army National Guard performs significant helicopter training operations on and in the vicinity of RTS. Additionally, the BLM has a fire base located on the east side of the airfield. The base serves all of Northern Nevada and several California counties. Typically there are three based aircraft (two air tractors and one Aero Commander) located at RTS. However, during the fire season (summer months) the base will typically receive several itinerant aircraft and will operate at significantly higher crew and aircraft levels if it is used as a base for local firefighting efforts. Future plans for the base include an expansion to accommodate additional crew facilities, retardant storage and aircraft parking.

2.8.6 Aircraft Rescue and Fire Fighting

Current FAA guidelines do not require RTS to have an Aircraft Rescue and Fire Fighting (ARFF) facility at the airfield. Fire Station #9, which is owned and operated by the City of Reno, is located less than one mile south of RTS, on Mount Vida Street.

2.8.7 Fuel Facilities

The aviation fuel farm facilities at RTS, located east of Maryland Road, are currently owned by the RTAA and leased to Aviation Classics. Existing fuel facilities include a 12,000-gallon above-ground Jet A fuel storage tank and two 12,000-gallon above-ground 100 low lead (LL) storage tanks. There is also a self-service fuel island, operated by Aviation Classics, located on the east end of the aircraft parking apron. The self-service island uses one 12,000-gallon 100LL tank for fuel storage.

Fuel is accessible 24 hours a day, seven days a week through the self-service fuel island. Fuel is also delivered to aircraft via two fuel trucks owned by Aviation Classics. The trucks consist of one 8,000-gallon truck containing Jet A fuel and one 8,000-gallon truck containing 100LL fuel. Figure 2-4 shows the location of the fuel farm and the self-serve island.

2.8.8 Automobile Parking and Ground Access

General automobile parking areas are located adjacent to the apron frontage road near the airport manager's office, terminal/pilot facility, and FBO facilities. Additional parking areas are also located near individual commercial tenants. These parking areas are largely used by airport tenants and their employees. A general public parking/viewing area is located along Petriccianni Street, west of the airport manager's office.

The primary highway ground access to RTS is from U.S. Highway 395. As stated earlier, RTS is approximately three miles north of this major highway, which runs through Spokane, Washington; Reno, Nevada; and San Bernadino, California. The major arterial road to RTS from U.S. Highway 395 is Stead Boulevard. Additional access roads to RTS include Moya Boulevard from Red Rock Road on the southwest side of the RTS and Military Road from Lemmon Drive on the southeast side of RTS. However, all of these access roads ultimately connect to U.S. Highway 395 to the south of RTS.

A rail spur from the Union Pacific Railroad line, located approximately four miles south of RTS, runs west of Stead Boulevard, north to RTS and terminates adjacent to the southwest property line. This spur is currently used to serve several off-airport industries that have been constructed and expanded in the area. However, it is anticipated that the rail spur could be extended to serve on-airport businesses in the future.

2.9 EXISTING ENVIRONMENTAL CONSIDERATIONS

Existing environmental conditions must be considered when planning for any development at an airport. The most significant environmental issues that could affect airport development at RTS include aircraft noise, drainage patterns, water quality and supply, topography, and existing hazardous waste monitoring sites. The following section serves as a brief overview of the existing environmental conditions that should be examined, at a minimum, in conjunction with future development planning and construction projects at RTS.

2.9.1 Aircraft Noise

Noise is typically the most apparent impact that an airport has on the environment. The FAA uses the average Day-Night Sound Level (DNL) in decibel values as the national standard for measuring airport noise. The FAA has determined that a sound level of 65 DNL or less is compatible with residential and other noise sensitive land uses. Noise levels higher than 65 DNL are typically only compatible with more intense land uses, such as commercial and industrial uses.

RTS has seen some residential encroachment over the years, and as a result there is a potential for noise impacts that may be associated with future airport development that must be considered during any development planning efforts. Neighboring land uses around RTS are discussed later in Section 2.11.

2.9.2 Drainage Patterns

The eastern most portion of RTS drains to the southeast of the airport into Swan/Lemmon Lake. The majority of RTS drains to the south and southwest. Surface water drainage from the north of RTS originates in the hills and flows across the airport to the south-southwest, as there are no existing ponds or permanently wet channels within the airport boundaries. The natural drainage of RTS ultimately empties into either Silver Lake, to the southwest of RTS, or Swan/Lemmon Lake to the southeast of the airport. Any development on RTS may increase storm/surface drainage runoff and, therefore, will likely require drainage controls to avoid any increased flows into the neighboring communities. Consideration of these potential drainage requirements must be included in future planning and design concepts at RTS. Further discussion of future drainage requirements will be presented in Chapter 6 Drainage Master Plan.

2.9.3 Water Supply

RTS is located within two hydrological basins in the Lemmon Valley that are divided by the airport fault. It is believed that the airport fault is a barrier to groundwater flow through the region. Further, Lemmon Valley is a Designated Groundwater Basin, which means RTS is located in a hydrographic area where permitted groundwater rights are approaching or exceeding the estimated annual recharge of the area and no additional pumping is allowed.

Due to a higher demand for water than available supply, water importation has become an important method to provide necessary water supply. On October 16, 2007 the Washoe County Commissioners approved a water importation transfer agreement, allowing Washoe County to own, operate, and maintain the water importation infrastructure. The agreement allows approximately 8,000 acre feet per year (af/yr) of water to be pumped into the Stead/Lemmon Valley area. The water transmission pipeline associated with this project is about 28 miles long and extends from six production wells in the southeastern Honey Lake Valley southward through Dry Valley, Bedell Flat and Antelope Valley, to a storage tank at the divide between Antelope Valley and Lemmon Valley.

RTS is currently within two water service districts, Truckee Meadows Water Authority (TMWA) and Washoe County. TMWA is responsible for the water supply to the existing airport facilities while the remaining area is within Washoe County's water service district. The Nevada Army National Guard facility at RTS is currently served by an on-site well. **Figure 2-7** illustrates the service areas of the two water utility providers.

The amount of unencumbered water rights owned by the RTAA available to support development at RTS is currently a total of 50 acre-feet. This level of available water rights would limit long-term development of RTS. The availability and cost of additional water rights will likely be a significant factor in future airport development and must be considered in the planning process.

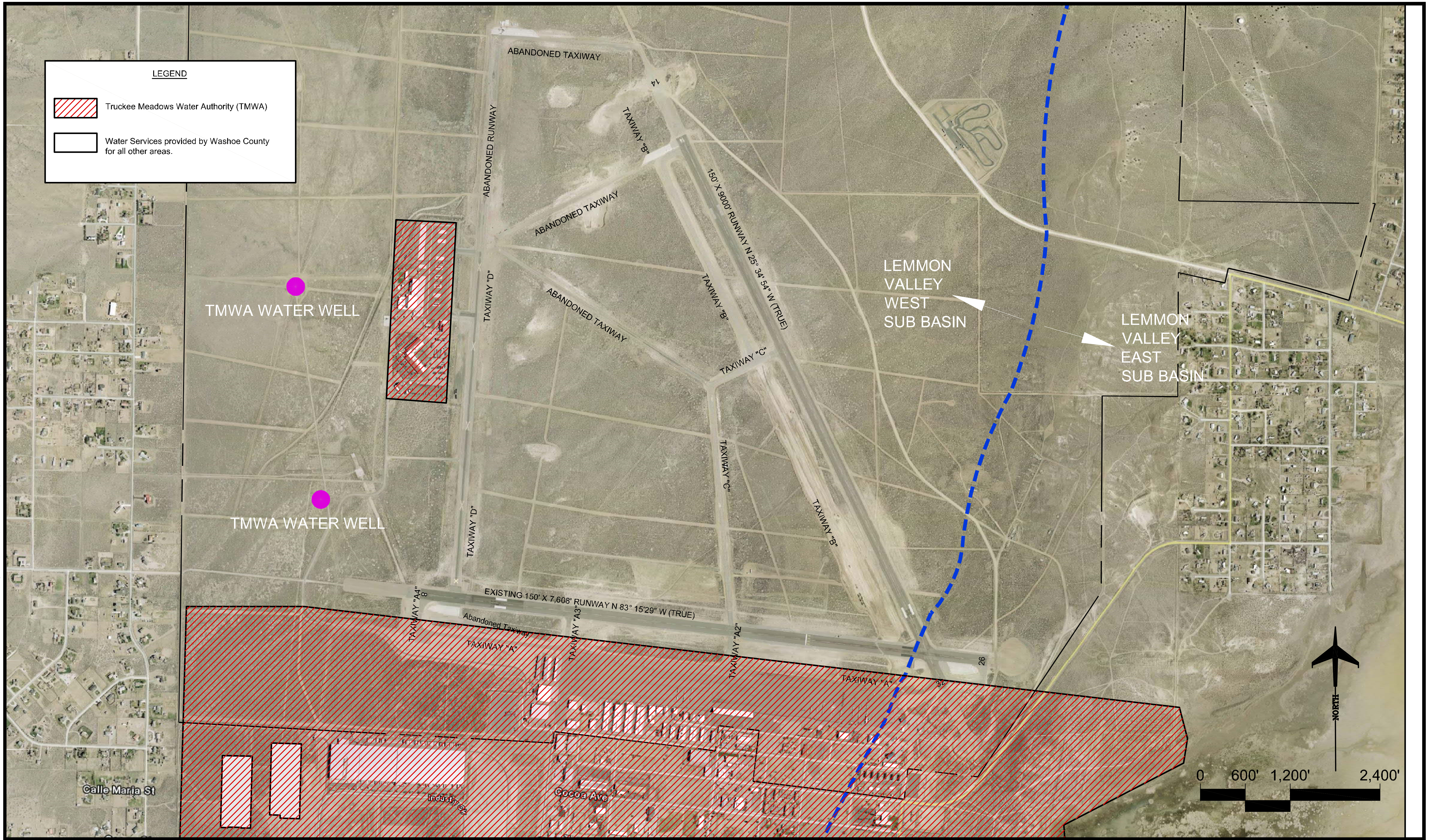
2.9.4 Existing Hazardous Waste Monitoring Sites

RTS currently has two existing areas of soil and groundwater contamination in the southwest quadrant of the property. Since the originating source of the contamination could not be definitively identified, four separate entities executed a Consent Decree that assigned financial liabilities for cleanup of the property. The Consent Decree entities are the U.S. Army Corps of Engineers, RTAA, the Lear Entities, and the City of Reno. The remediation plan has been initiated and includes both extraction (ground water and vapor) and monitoring wells. To date the remediation plan is working well and contamination levels are steadily decreasing. Under the terms of the Consent Decree, new airport development that does not add to the contamination is not required to undertake any special clean-up efforts. However, future development within this area should consider the location of the existing extraction/monitoring wells and any potential impacts to the remediation program. **Figure 2-8** illustrates the contamination plume areas and well locations.

2.10 UTILITIES

Based on existing studies and records of utilities at RTS, the majority of the utilities were constructed in the 1940s and 50s by the military. Sanitary sewer is provided by the Reno Stead Waste Water Treatment Facility, which is owned by the City of Reno. The sanitary sewer lines that serve RTS are part of the original collection system installed by the military over 50 years ago. The majority of lines that service the existing airport buildings access RTS from a main line that runs east and west between Alpha Avenue and Bravo Avenue. However, portions of the existing sanitary sewer alignments are not completely documented.

As noted in Section 2.9.3, water is supplied to RTS by TMWA and Washoe County. The domestic water network enters RTS from the south off of Alpha Avenue. The network generally runs east to west along the southern edge of the apron in front of the hangar facilities. These water lines provide water supply to all of the airport facilities except the Nevada Army National Guard, which is served by an on-site well with its own water supply lines. No water lines are currently available on the majority of the west, north and eastern areas of RTS.



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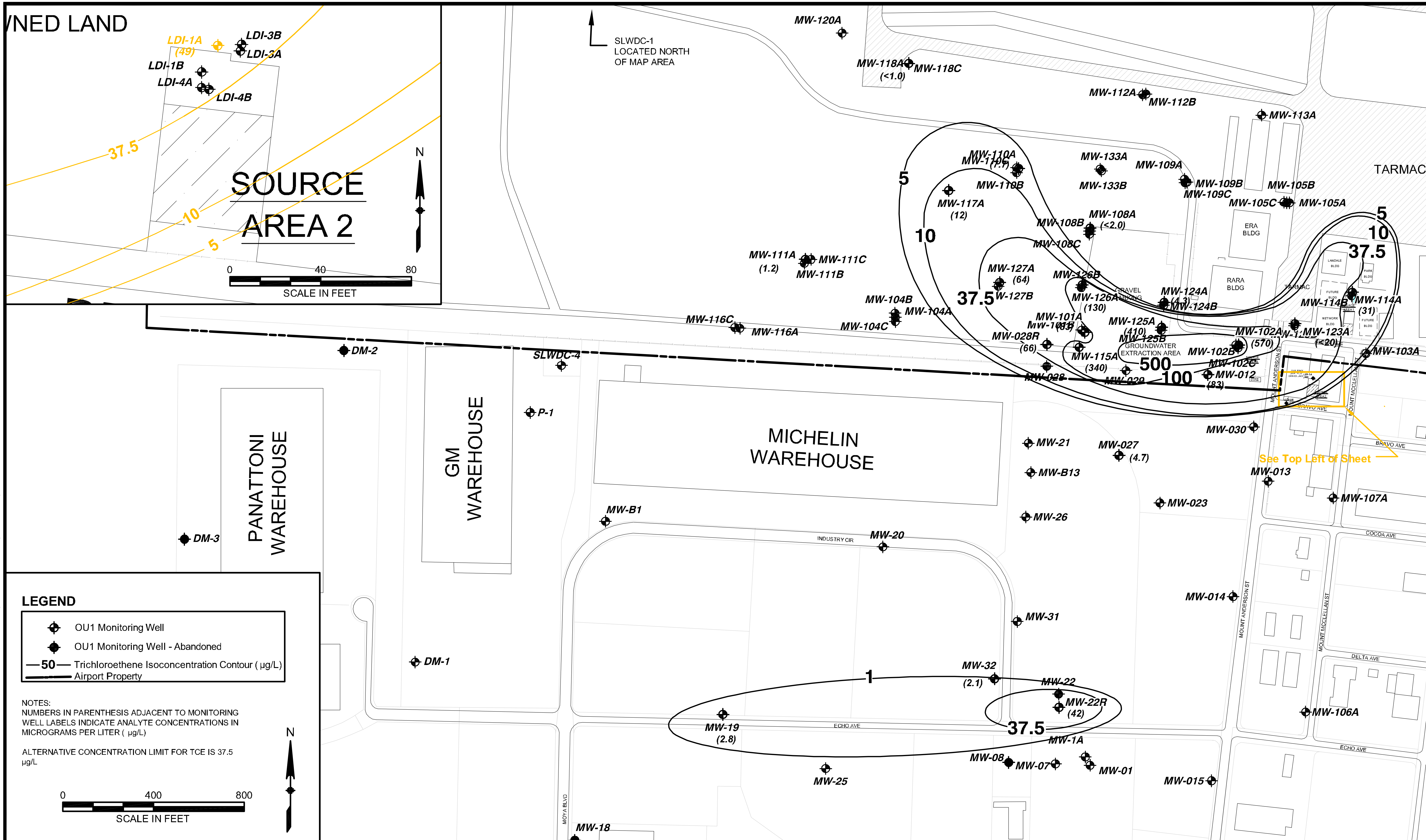
Water Utility Providers
Service Districts

Figure 2-7



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Ground Water Plume Contamination Areas and Monitoring Well Locations

Figure 2-8

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Natural gas and electrical supply are provided to RTS by the NVEnergy. NVEnergy currently has plans to construct a 120 kilo volt (kv) power Transmission line that will pass along the northern and western boundaries of RTS. The new NVEnergy power lines will extend 34 miles starting at the Tracy Lake Power Plant, running through Spanish Springs, around RTS, and ending at the Silver Lake Substation. The proposed action will result in the construction of two new electrical substations one of which will be located at the northwest corner of RTS which can then be used for distribution of power within the airport property. **Figure 2-9** illustrates the location of the selected Tracy/Silver Lake Transmission Line Agreement in the vicinity of RTS.

Natural gas lines at RTS generally run east and west along Texas Avenue and Alpha Avenue and access the airport facilities from these locations. Also, a gas line runs north and south along the majority of the west property line and provides service to the western area of RTS and Nevada Army National Guard facility. Electric service lines run throughout the southern portion of RTS and largely provide service through overhead lines.

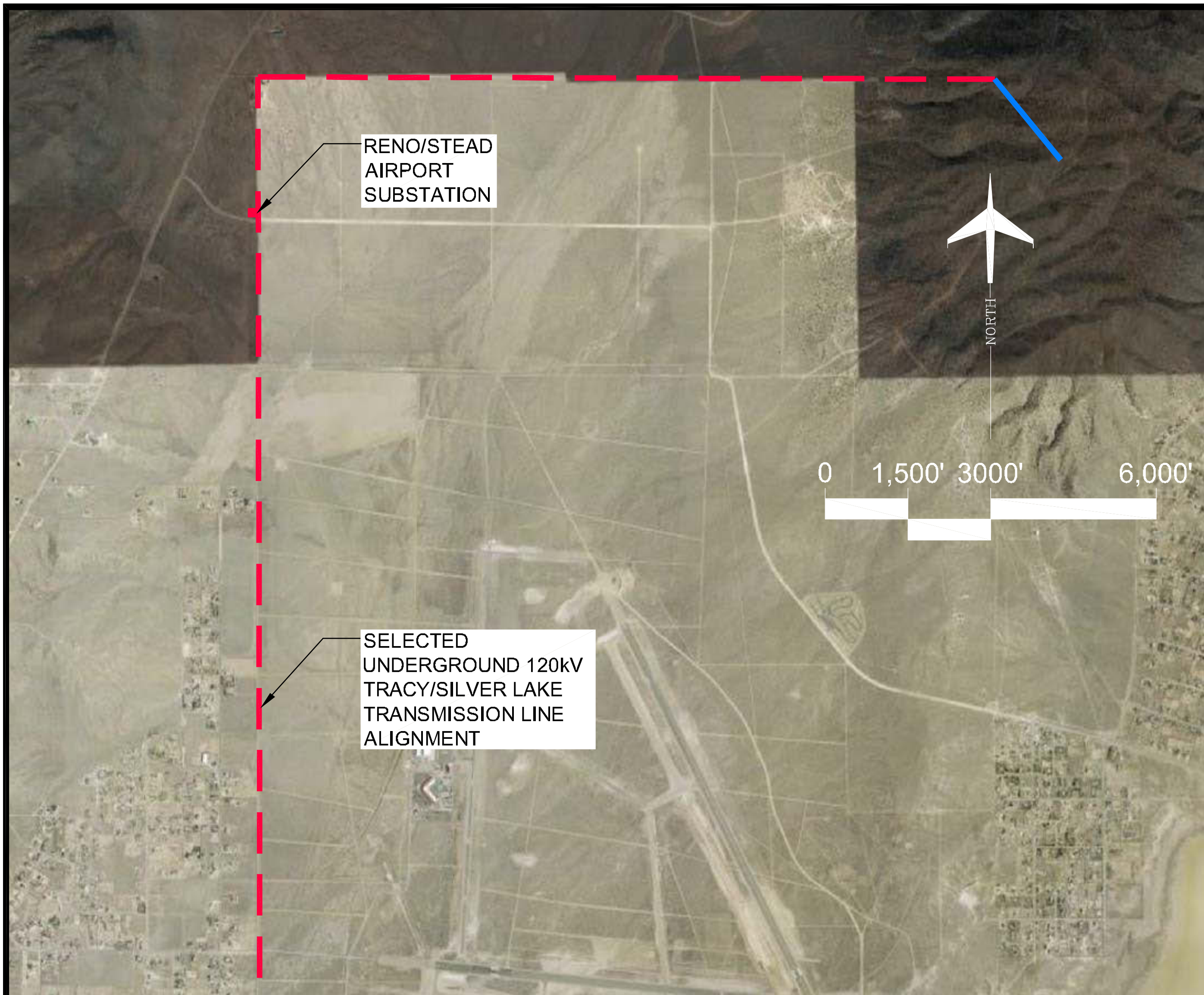
AT&T supplies the telephone service to RTS. The telephone lines generally run along similar alignments as the electric service to RTS. These lines run largely overhead with minimal underground service.

Figure 2-10 illustrates the existing utility networks.

2.11 LAND USE

RTS is located in the northern section of an area known as the Stead Neighborhood, which is within the City of Reno's land use jurisdiction. Lands surrounding the Stead Neighborhood and RTS are under the jurisdiction of Washoe County. Areas east, west, and north of RTS include federal lands, open spaces, general rural, and low density suburban land uses. Industrial, residential, public, and open space land uses are located south of RTS.

RTS is located in the Reno-Stead Airport Regional Center Planning Area Overlay Zoning District (RSARC) as governed by the City of Reno. The purpose of the RSARC District, as identified in Title 18: Annexation and Land Development, is to "modify the underlying mixed use zoning land uses, developmental standards, and development review procedures within the Reno-Stead Airport Regional Center Planning Area Overlay District. This zoning district is intended to maintain the viability of regional airport operations and promote airport compatible uses on property owned by the Authority". **Table 2-4** presents a summary of the land use restrictions within the RSARC as outlined in Title 18: Annexation and Land Development.



PBS&J	Master Plan Update Reno-Stead Airport Reno, Nevada	Selected Tracy/Silver Lake Transmission Line Alignment	Figure 2-9

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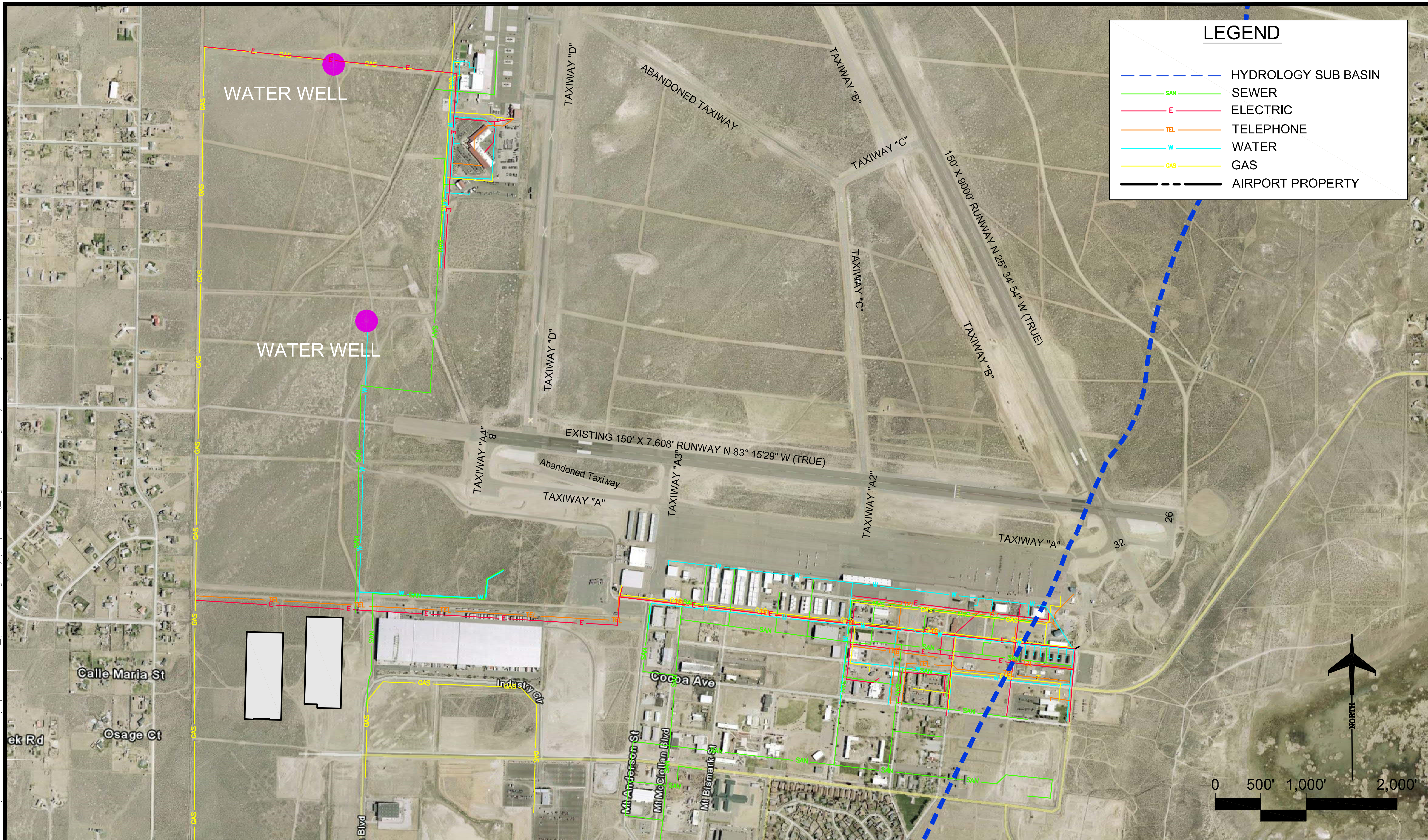

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Existing Utility Network

Figure
2-10

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Table 2-4. RSARC Zoning District

Permitted Uses	Prohibited Uses	Conditional Uses
All allowed, conditional and special use permit land uses in the Mixed Use (MU) zoning designation	Residential land uses	Stables and farms
All allowed, conditional and special use permit land uses in the Industrial Commercial (IC) zoning designation	Schools	
All allowed, conditional and special use permit land uses in the Industrial (I) district	Churches	
Lodging facilities (within one-half mile of the airport terminal)	Libraries	
ATC communication facilities	Medical facilities	
Temporary asphalt and concrete batch plants for airport construction (period not to exceed 4 years)	Daycare facilities	
Airport operations		
Airport facilities		

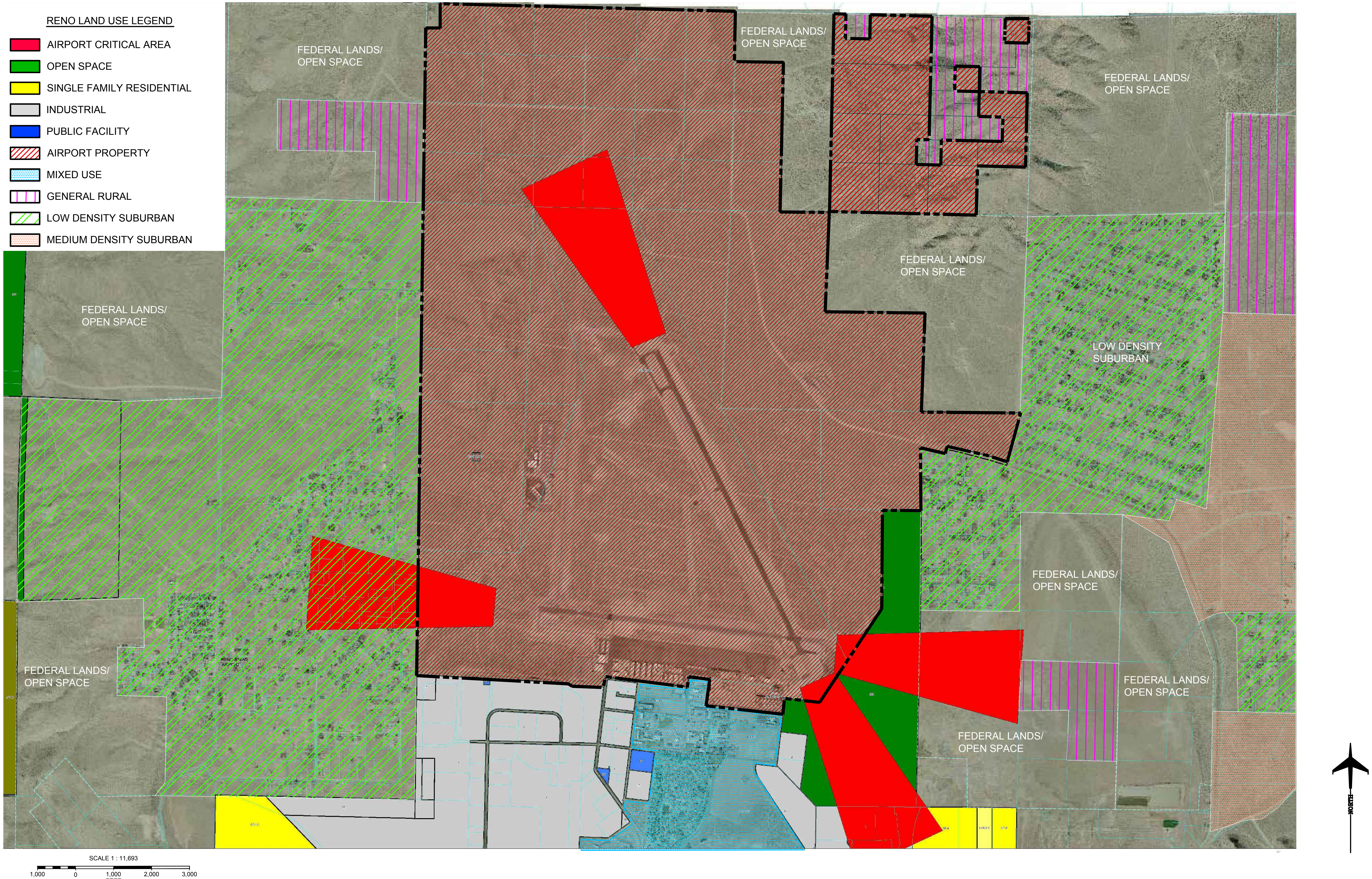
Source: Title 18: Annexation and Land Development, February 9, 2005.

Portions of RTs are also located within the Airport Critical Area Overlay District (ACA) and Airport Noise Exposure General Overlay District (ANE), which have further requirements on the use and development of land in the vicinity of RTS. The complete permitted uses and associated zoning restrictions for each of the three overlay districts can be found in the City of Reno's Title 18: Annexation and Land Development, Chapter 18.08, Zoning.

The existing land uses and their relation to RTS are illustrated in **Figure 2-11**. Solid colors represent lands that fall under the City of Reno jurisdiction, while hatched areas represent those lands that fall under the jurisdiction of Washoe County. Zoning in the vicinity of RTS is shown in **Figure 2-12.**

2.12 AIRSPACE STRUCTURE

RTS is located in Class E airspace and no active ATCT is in operation at RTS except during the National Championship Air Races and Air Show. Two-way communication through Reno approach/departure control is required before entering the local airspace surrounding RTS and a Common Traffic Advisory Frequency (CTAF) is used by pilots to announce their location and intentions when operating into and out of RTS. **Figure 2-13** depicts all the different types of airspace classes in use throughout the United States. The visual flight rules (VFR), and low altitude and high altitude airspace structure within the vicinity of RTS are illustrated in **Figures 2-14, 2-15, and 2-16**, respectively.



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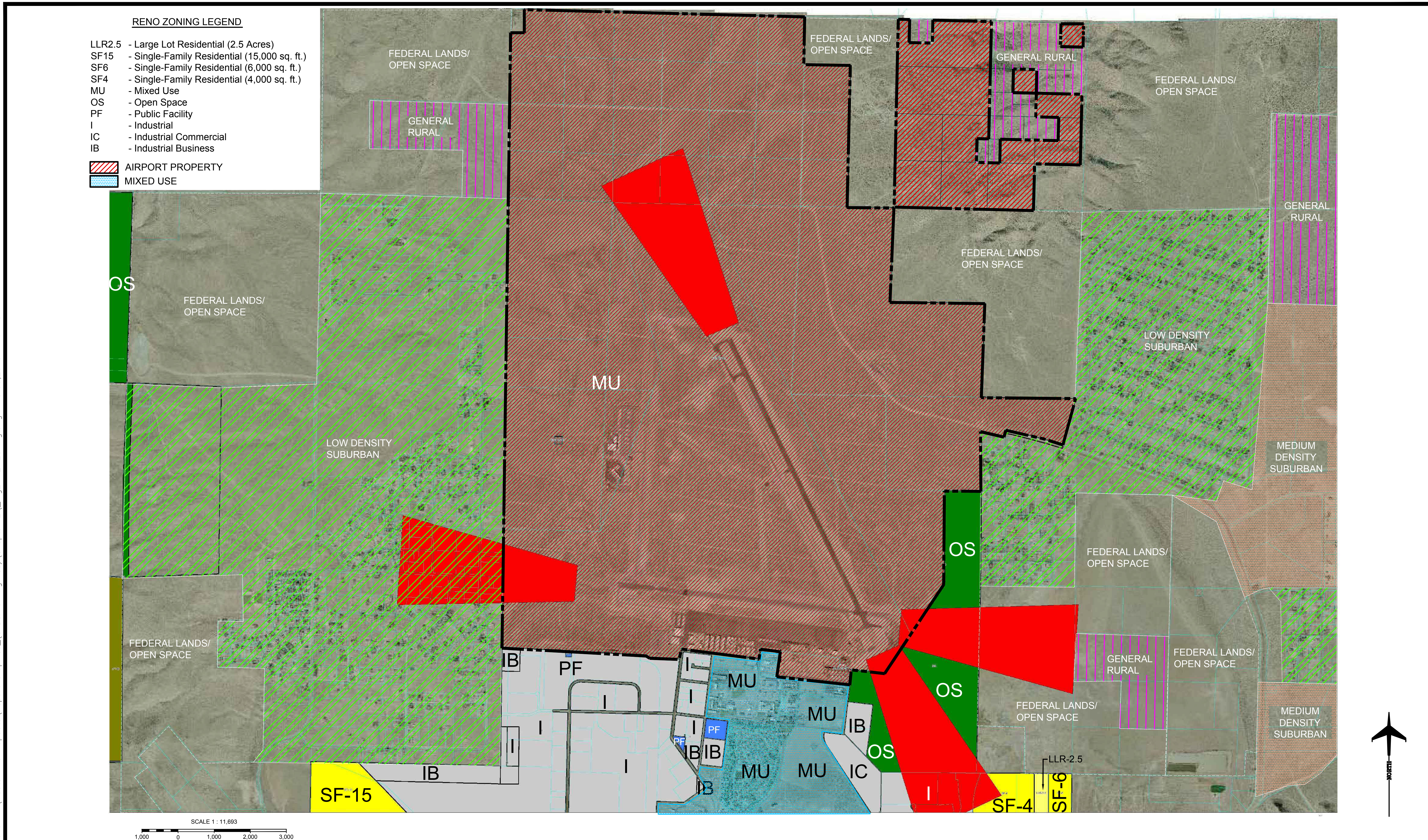
Existing Land Use

Figure 2-11



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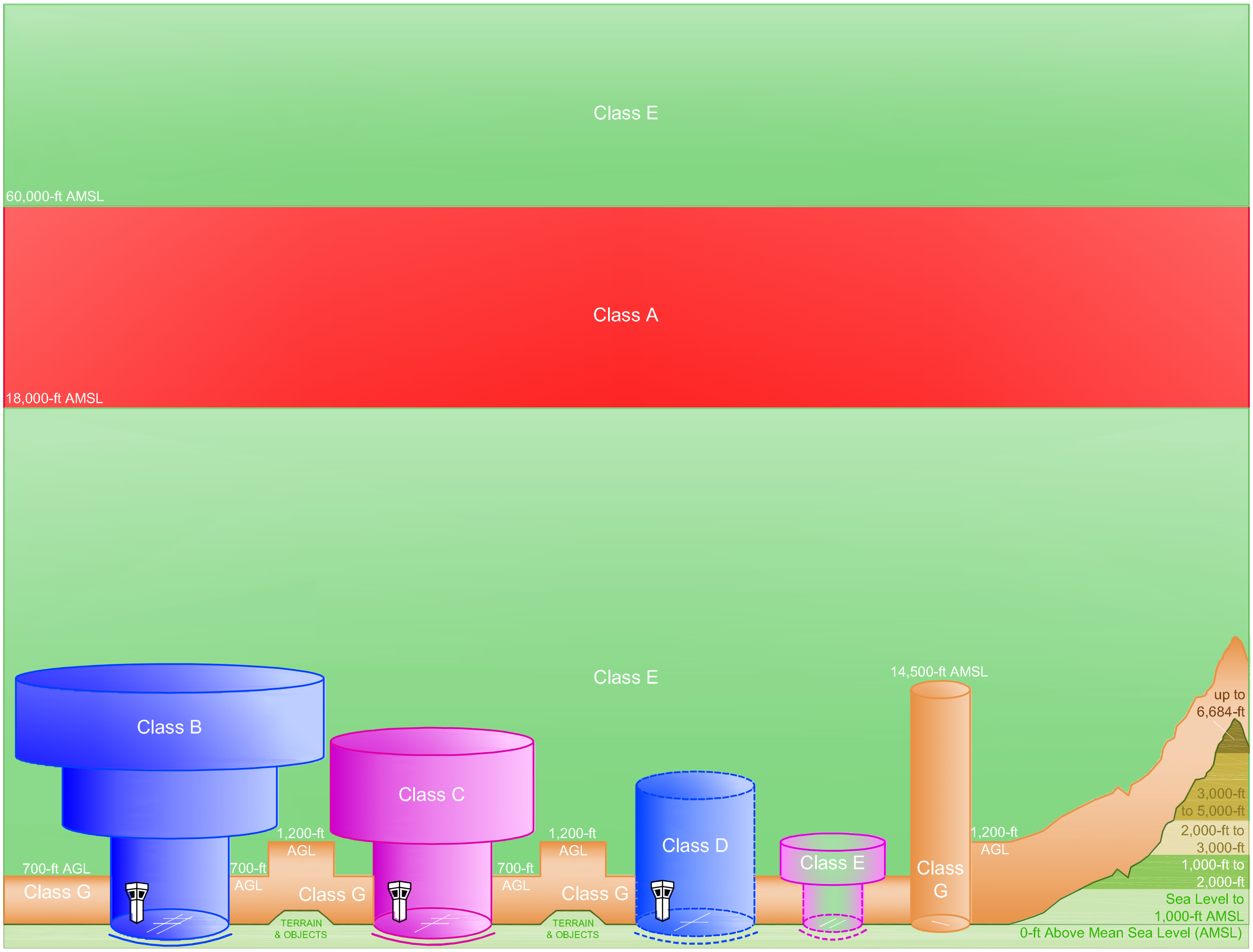
Existing Zoning

Figure 2-12



Communication Requirements and Weather Minimums

	Class A	Class B	Class C	Class D	Class E	Class G
Minimum Pilot Qualification	Instrument Rating	Student *	Student *	Student *	Student *	Student *
Entry Requirements	IFR: ATC Clearance VFR: Operations Prohibited	ATC Clearance	IFR: ATC Clearance VFR: Two-Way Communication w/ ATC	IFR: ATC Clearance VFR: Two-Way Communication w/ ATC	IFR: ATC Clearance VFR: None	None
VFR Visibility Below 10,000 AMSL **	N/A	3 Statute Miles	3 Statute Miles	3 Statute Miles	3 Statute Miles	Day: 1 Statute Mile Night: 3 Statute Miles
VFR Cloud Clearance Below 10,000 AMSL	N/A	Clear of Clouds	500 Below 1,000 Above 2,000 Horizontal	500 Below 1,000 Above 2,000 Horizontal	500 Below 1,000 Above 2,000 Horizontal	500 Below 1,000 Above 2,000 Horizontal ***
VFR Visibility 10,000 AMSL and Above **	N/A	3 Statute Miles	3 Statute Miles	3 Statute Miles	5 Statute Miles	5 Statute Miles
VFR Cloud Clearance 10,000 AMSL and Above	N/A	Clear of Clouds	500 Below 1,000 Above 2,000 Horizontal	500 Below 1,000 Above 2,000 Horizontal	500 Below 1,000 Above 1 Statute Mile Horizontal	1,000 Below 1,000 Above 1 Statute Mile Horizontal
Airport Application	N/A	• Radar • Instrument Approaches • Weather • Control Tower • High Density	• Radar • Instrument Approaches • Weather • Control Tower	• Instrument Approaches • Weather • Control Tower	• Instrument Approaches • Weather	
Special VFR Permitted?	No	Yes	Yes	Yes	Yes	N/A

* Prior to operating within Class B, C, or D airspace (or Class E airspace with an operating control tower), student, sport, and recreational pilots must meet the applicable FAR Part 61 training and endorsement requirements. Solo student, sport, and recreational pilot operations are prohibited at those airports listed in FAR Part 91, Appendix D, Section 4.

** Student pilot operations require at least 3 statute miles visibility during the day and 5 statute miles visibility at night.

*** Class G VFR cloud clearance at 1,200 AGL and below (day): clear of clouds.

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Airspace Classifications

Figure 2-13

PBSJ	Master Plan Update Reno-Stead Airport Reno, Nevada	VFR Airspace Structure	Figure 2-14

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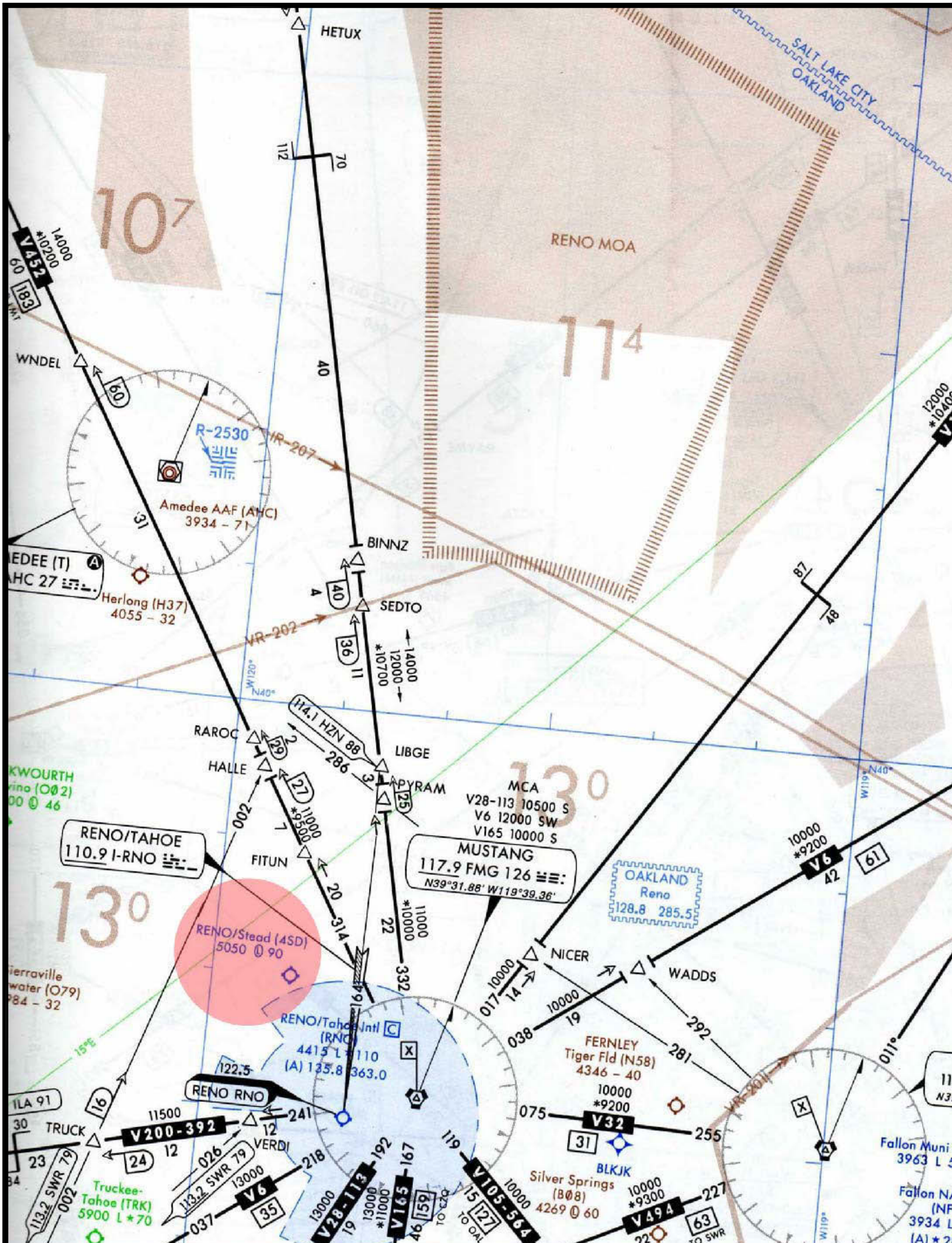
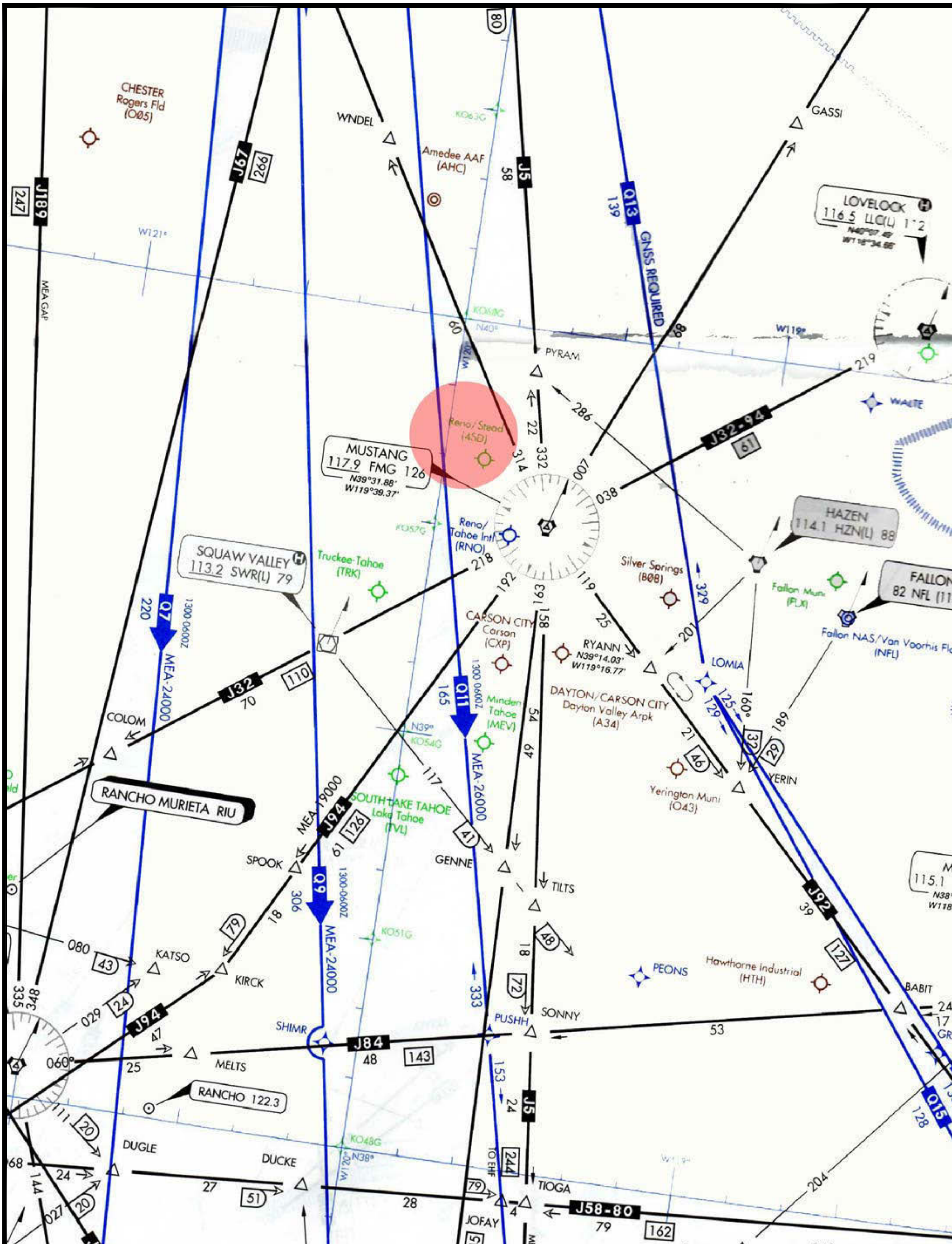


PBS&J	Master Plan Update Reno-Stead Airport Reno, Nevada	Low Altitude Airspace Structure	Figure 2-15



PBS&J	Master Plan Update Reno-Stead Airport Reno, Nevada	High Altitude Airspace Structure	Figure 2-16

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2.12.1 Instrument Approach Procedures

The existing instrument approaches to RTS include a precision instrument landing system (ILS) approach to Runway 32, a non-precision global positioning system/area navigation (GPS/RNAV) approach to Runway 32 and GPS circling approaches to Runways 14 and 32. The lowest approach minimums possible utilizing these approaches is an altitude of 6,390 feet mean sea level (1,400 feet above ground level) and visibility of two miles. The existing published instrument approaches can be found in **Figures 2-17, 2-18,** and **2-19**.

2.12.2 Part 77 Obstructions to Navigable Airspace

Federal Aviation Regulations (FAR) Part 77, *Obstructions to Navigable Airspace*, establish standards for determining obstructions to specific airspace surfaces on and in the vicinity of an airport. An obstruction is defined as any object of natural growth, terrain, or permanent or temporary construction and/or alteration, including related equipment and materials used therein, which penetrate any portion of the "imaginary surfaces." FAR Part 77 establishes these imaginary surfaces to govern the vertical height of obstacles within the vicinity of airports. These surfaces will vary in size and slope depending on the type of runway and the available approaches to each runway end.

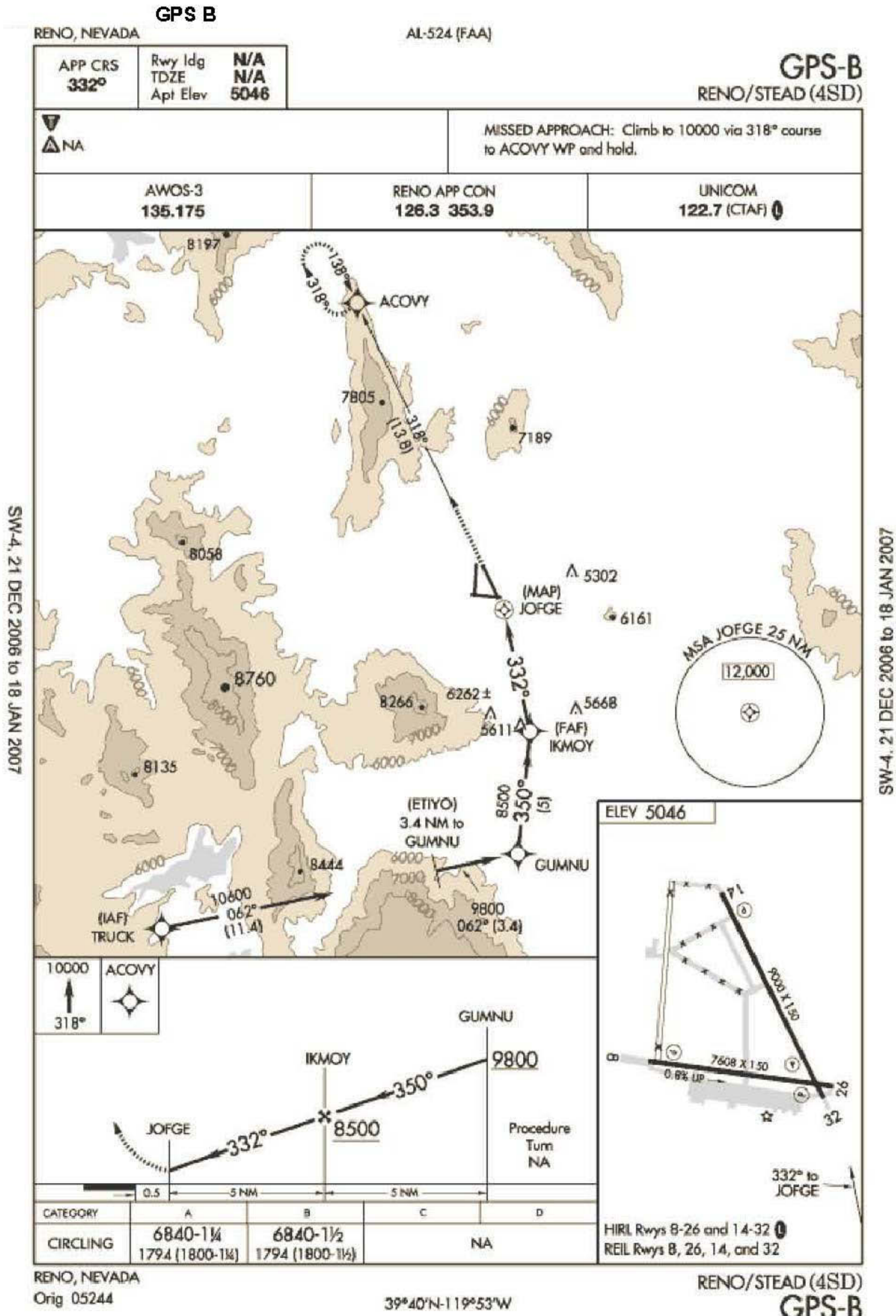
By superimposing these imaginary surfaces over an airport, it is possible to determine the existence and/or severity of obstructions. FAR Part 77 surfaces also provide vertical boundaries for new construction and alterations to existing structures. Once obstructions have been identified, the FAA must review them to determine if they pose a hazard to air navigation. If determined to be a hazard, the obstruction must be removed or altered to eliminate the penetration. If the obstruction is not removed, changes to the airfield and/or approach procedures may be required. Examples of such changes could be displacing a runway threshold or increasing approach minimums to provide obstruction clearance. Any existing obstructions to air navigation at RTS will be discussed in Chapter 7 Airport Layout Plans chapter and further identified on the Airspace drawing within the ALP set. **Figure 2-20** illustrates typical FAR Part 77 surfaces for a precision approach runway.

2.12.3 Special-Use Airspace

Special-use airspace is used to confine certain flight activities and to place limitations on aircraft operations that are not part of these activities. Special-use airspace is divided into alert areas, Military Operation Areas (MOA), warning areas, restricted areas, prohibited areas, controlled firing areas, and national security areas. Although the Nevada Army National Guard is located at RTS, there are no special-use designations within 25 nautical miles of RTS. The nearest special-use airspace designation is the Reno MOA, located approximately 35 nautical miles to the north-northeast of RTS.

2.13 AIRPORTS IN THE VICINITY

Airports located in the surrounding region are of considerable importance when evaluating sources of competition for airspace and aviation services. RTS has many neighboring airports, including public, private, and commercial facilities. Eighteen airports within a 50-nautical-mile radius of RTS have been identified and are discussed briefly in this section. The locations of all airports in the vicinity of RTS are illustrated in **Figure 2-21**.



PBS&J	Master Plan Update Reno-Stead Airport Reno, Nevada	Instrument Approach Procedures Circling GPS	Figure 2-17

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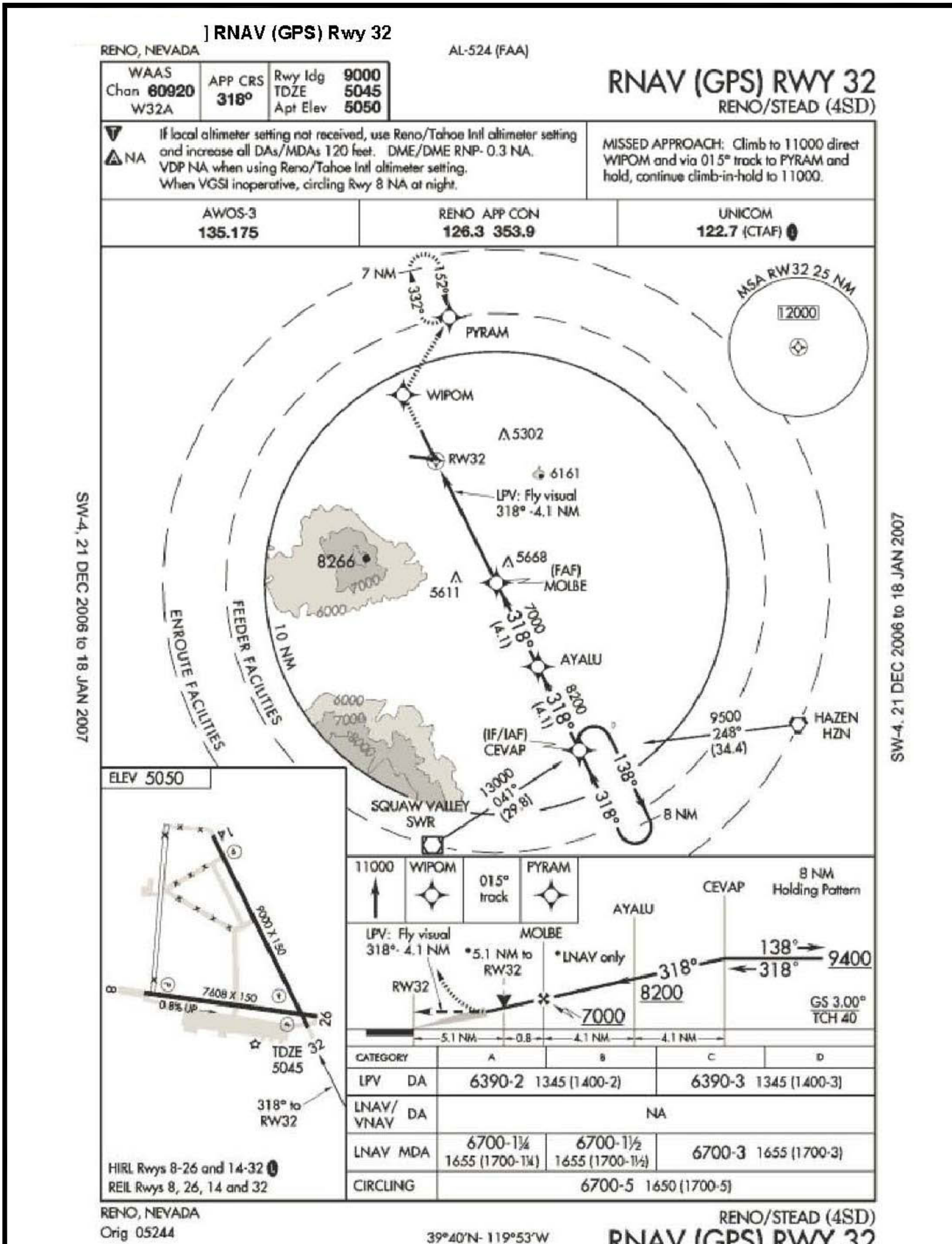

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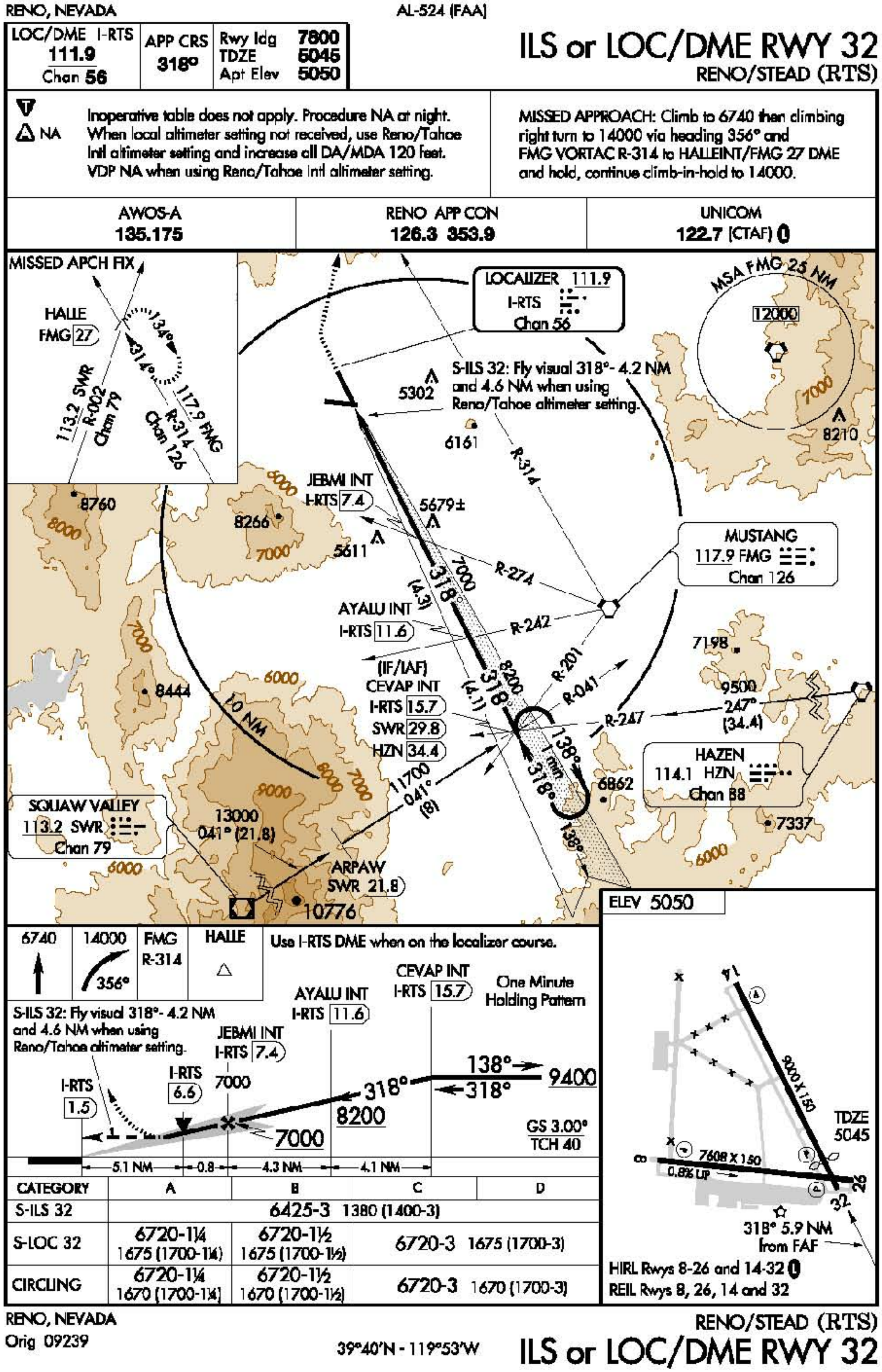
PBS&J	Master Plan Update Reno-Stead Airport Reno, Nevada	Instrument Approach Procedures RNAV / GPS Runway 32	Figure 2-18



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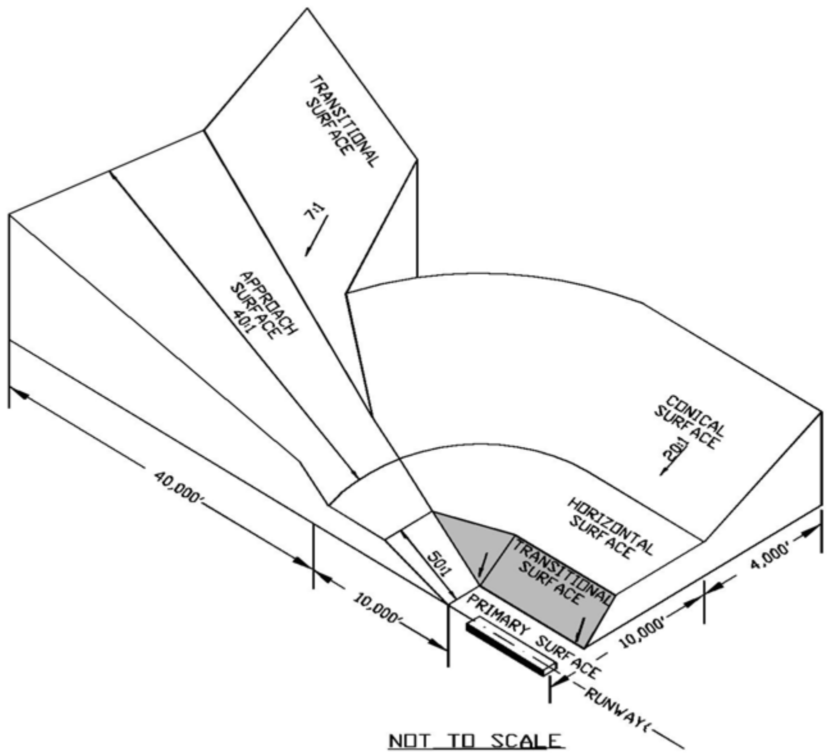
Instrument Approach Procedures
ILS or LOC/DME Rwy 32

Figure 2-19

Figure 2-20. Typical Precision Approach Part 77 Surfaces



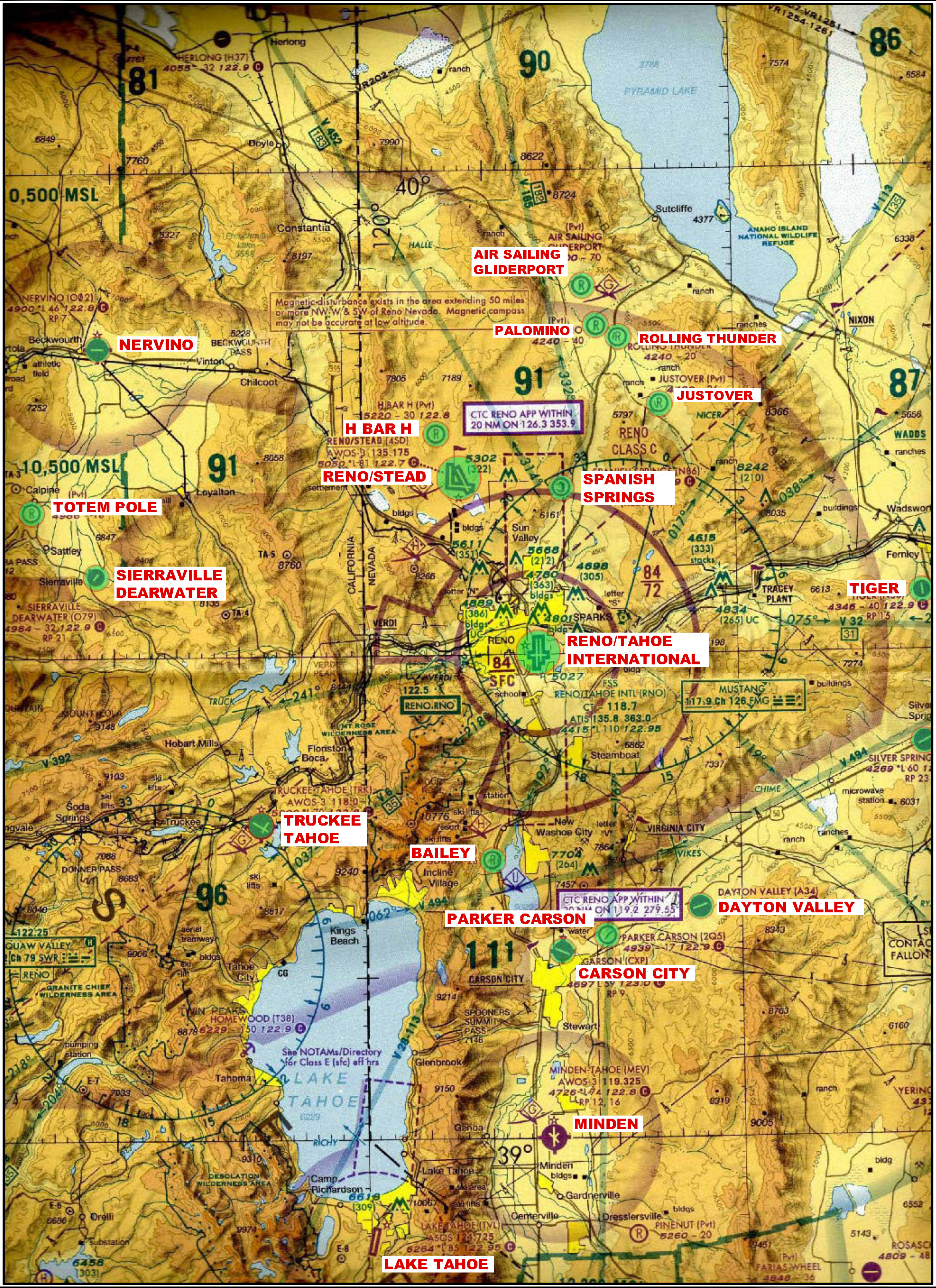
2.13.1 Private-Use

There are seven private-use airports in the area; these airports do not have services available to the general public. **Table 2-5** displays the private-use GA airports, their runway lengths, and their distances from RTS.

Table 2-5. Private Use GA Airports in the Region

Airport Name	Runway length	Distance from RTS
Totem Pole	1,800 feet	25 nm southwest
Air Sailing Gliderport	7,000 feet	17 nm northeast
Rolling Thunder	2,000 feet	14 nm northeast
Bailey Ranch	2,600 feet	22 nm south
H Bar H	3,000 feet	5 nm north
Justover Field	2,600 feet	12 nm northeast
Palomino	4,000 feet	13 nm southwest

Source: San Francisco Sectional Aeronautical Chart 2006.
nm = nautical miles



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PBS&J	Master Plan Update Reno-Stead Airport Reno, Nevada	Airports in the Vicinity	Figure 2-21

2.13.2 Public-Use

Several public-use airports lie within a 50-nautical-mile radius of RTS. These airports include: Reno-Tahoe International Airport (RNO), Truckee Tahoe Airport (TRK), Nervino Airport (O02), Sierraville Dearwater Airport (O79), Spanish Springs Airport (N86), Carson City Airport (CXP), Parker Carson STOLport (2Q5), Dayton Valley Airport (A34), Tiger Field (N58), Minden Tahoe Airport (MEV) and Lake Tahoe Airport (TVL). Information about these facilities is discussed briefly in the following sections.

2.13.2.1 Reno-Tahoe International Airport

RNO is a primary commercial service airport located 11 miles southeast of RTS, which is also owned by RTAA. RNO has three runways, 16R-34L which is 11,002 by 150 feet, 16L-34R which is 9,000 by 150 feet and Runway 7-25 which is 6,102 by 150 feet. RNO provides a complete array of GA services through three Fixed Base Operators (Jet West, Atlantic Aviation and Sierra Air Center) and is the primary air carrier airport for residents in several northern Nevada and California counties.

2.13.2.2 Truckee-Tahoe Airport

TRK is a publicly owned, public-use GA airport located 24 nautical miles southwest of RTS. TRK has two runways. Runway 1-19 is 4,650 by 75 feet and Runway 10-28, which is the primary runway, is 7,000 by 100 feet.

A variety of services and accommodations are available at TRK, including fuel, aircraft parking, aircraft rentals, maintenance, car rentals, a pilot lounge, and restrooms. Annual operations at TRK were reported to be 35,000 in 2005 and there were 123 based aircraft.

2.13.2.3 Nervino Airport

O02 is a public-use, publicly owned GA airport located 24 nautical miles west-northwest of RTS. O02 has one asphalt runway, Runway 7-25, which is 4,651 by 75 feet. O02 has approximately 28 based aircraft on the field. The total operations at O02 were reported to be approximately 16,000 in 2005.

2.13.2.4 Sierraville-Dearwater Airport

O79 is a public-use, publicly owned GA airport located approximately 22 nautical miles west-southwest of RTS. The asphalt runway at O79 is 3,260 by 50 feet. O79 is operated by Sierra County, California. Services are limited at O79, as there is no FBO on the property. Fuel is not available and aircraft storage is only available as a tie-down service. There is one single-engine based-aircraft reported at this field.

2.13.2.5 Spanish Springs Airport

N86 is a public-use, publicly owned GA airport located approximately seven nautical miles east of RTS. N86 has a 3,540 by 71-foot dirt runway. There are 13 reported single-engine based aircraft at the field. Aviation services and other accommodations at N86 are provided by the FBO and include fuel, oxygen, aircraft parking, flight training, transportation, restrooms, and a camping site.

2.13.2.6 Carson City Airport

CXP is a publicly owned, public-use airport located approximately 28 nautical miles south-southeast of RTS. CXP has one asphalt runway. Runway 9-27 is 5,906 by 75 feet. There are two FBOs on the property: El Aero Services and Eagle Valley Fuel. Based aircraft at the facility are reported to be about 275.

2.13.2.7 Parker Carson STOLport

2Q5 is a privately owned public-use STOLport with one runway, located approximately 29 nautical miles south-southeast of RTS. A STOLport is defined as an airport designed for aircraft that only need a short runway. 2Q5's one gravel runway, 6-24, is 1,700 by 40 feet. There are no FBO services located on the field. There are five reported based aircraft on the field.

2.13.2.8 Dayton Valley Airpark

A34 is a privately owned public-use airport located approximately 30 nautical miles south-southeast of RTS. The airport has one 5,343 by 75-foot runway. There are no FBO services or aircraft storage facilities on the airport. The airport is unattended and has a windsock and a segmented circle. There are reportedly 14 single-engine aircraft based at the airport.

2.13.2.9 Tiger Field

N58 is a publicly owned public-use airport. N58 is located approximately 30 nautical miles east of RTS. The airport is unattended and has no services or facilities, other than tie-down aircraft storage. N58 has two runways. Runway 5-23 is 2,750 by 40 feet while Runway 15-33 is 3,974 by 40 feet. There are six reported single-engine aircraft based at the airport.

2.13.2.10 Minden-Tahoe Airport

MEV is a publicly owned public-use airport. MEV is located 40 nautical miles south of RTS. The facility has two paved runways. Runway 16-34 is 7,400 feet long and 100 feet wide and Runway 12-30 is 5,300 feet long and 75 feet wide. MEV also has a one unpaved runway, Runway 12G-30G, that is 2,200 feet long and 60 feet wide. MEV is attended from 8 AM to 4 PM. Soar Minden is the FBO at MEV; they offer a wide variety of services including fuel, oxygen, flight training, parking and aircraft rental. There are 312 based aircraft and an average of 80,000 annual operations reported for MEV. Additionally, MEV has an extensive amount of glider activity.

2.13.2.11 Lake-Tahoe Airport

TVL is a publicly owned public-use airport with one runway. Runway 18-36 is a grooved asphalt runway 8,544 feet long and 150 feet wide. The airport is attended from 6:30 AM to 8:00 PM. There are 69 based aircraft and an average of 24,000 flights annually reported for TVL. Atlantic Aviation provides FBO services for TVL, which include a full service aircraft fuel facility. The airport also has a restaurant on property, the Chase Bar and Grill.

2.14 AREA-WIDE PLANS

The presence and operation of any airport has an effect on every other airport in the National Airspace System (NAS) and the nation's multi-modal transportation network in general. Therefore, regional, state, and national plans are developed in an effort to create a common goal and vision for the transportation system. The plans that must be considered in developing the Master Plan are the Nevada Airport System Plan Update, the Regional Transportation Commission of Washoe County – 2030 Regional Transportation Plan, the North Valley Area Plan, Truckee Meadows Regional Plan, Washoe County Comprehensive Plan, City of Reno Master Plan, Washoe County Consensus Forecasts, and the National Plan of Integrated Airports Systems (NPIAS).

2.14.1 2030 Regional Transportation Plan

The Regional Transportation Commission of Washoe County – 2030 Regional Transportation Plan focuses on development of the roadway system and is necessary to provide a vision for satisfying the existing and anticipated demands on the ground transportation system serving the Washoe County area. The goal of the plan is to provide a safe, efficient, and financially feasible transportation system, providing mobility for residents and economic vitality for the communities. The plan also ensures the respect of the natural and built environment and consistency with land use policies, while addressing multi-modal transportation issues. Consideration of this plan is especially important when discussing ground access, potential multi-modal networks, and land use surrounding RTS.

2.14.2 Nevada Airport System Plan

The Nevada Airport System Plan was updated in September 2004 for the Nevada Department of Transportation (NDOT). The Nevada Airport System Plan is a continuing planning process supported by multiple databases that provide current data on Nevada's aviation activity. The plan incorporates such topics as intermodal transportation networking, economic impact of airports on the local community and the State of Nevada, and development of long-range visions and strategies through strategic planning. The Nevada Airport System Plan provides background on the current anticipated role of RTS within the statewide airport system.

2.14.3 North Valley Area Plan

The most recent North Valley Area Plan was updated in 2004. The plan represents a commitment to a comprehensive and long-range inter-jurisdictional planning document that represents the vision and foresight of the people who live and work in the North Valley area and directly addresses development around RTS. The document is prepared by Washoe County and is intended to meet the needs of the County as well as shared needs of the City of Reno. The area plan provides guidance in analyzing and acting on all private and public development and is the foundation upon which development and land use regulations are based. The plan encompasses the zoning and subdivision ordinances, other development related codes or guidelines, and the County's capital improvement program. Since RTS is primarily within the City of Reno's jurisdiction, these standards only apply to the properties surrounding RTS and the RTAA owned properties to the east.

2.14.4 Truckee Meadows Regional Plan

The Truckee Meadows Regional Plan was last updated in 2007. The administration of the Truckee Meadows Regional Plan is conducted by the Truckee Meadows Regional Planning Agency (TMRPA). The plan provides an opportunity to put into place a resource for the region with a collaborative structure that will serve Truckee Meadows. The regional plan is structured around four planning principles:

- Provide direction and standards for how and where development occurs in Truckee Meadows
- Address the management of natural resources
- Coordination of public facilities and services
- Implement framework for the plan

2.14.5 Washoe County Comprehensive Plan

The Washoe County Comprehensive Plan is the official master plan for the portions of Washoe County outside the Spheres of Influence for the cities of Reno and Sparks and includes countywide elements, area plans, and a number of other more detailed plans. The comprehensive plan was developed in May of 1994 and is currently undergoing various plan and/or element updates. The purpose of the Comprehensive Plan is to act as a guide for the Washoe County Board of County Commissioners, the Washoe County Planning Commission, and the community on matters of growth and development. The Comprehensive Plan guides growth by establishing and implementing policies and action programs which address countywide issues and concerns. The Comprehensive Plan also contains area plans which recognize critical conservation areas, establish existing and future land use and transportation patterns, and identify current and future public services and facilities needs for the County's planning areas.

2.14.6 City of Reno Master Plan

The City of Reno Master Plan includes citywide plans that cover the City and sphere of influence, plans for centers and transit oriented development (TOD) corridors, and neighborhood plans. An update of The City of Reno Master Plan was completed in October 2007. The plan is divided into four sections: *Introduction, Citywide Plans, Center and Corridor Plans, and Neighborhood Plans*.

- The Introduction addresses and summarizes the three main areas within the master plan.
- The Citywide Plan covers the City and its Sphere of Influence.
- The Center and Corridor Plans cover the regional centers and transit oriented development corridors identified in the citywide Land Use Plan and the Truckee Meadows Regional Plan.
- The Neighborhood Plans cover specific areas of the City, other than centers and corridors, where the City Council and Planning Commission have determined that a more detailed plan is necessary.

2.14.7 Washoe County Consensus Forecasts

The *Washoe County Consensus Forecast 2008-2030* provides projections of population, employment, and income for Washoe County. The *Washoe County Consensus Forecast 2008-2030* minimizes the risk of large forecast errors by using a number of sources including:

- Global Insight - a national forecasting firm in Massachusetts that prepares national, state and county forecasts.
- NPA Data Services, Inc. - a national forecasting firm in Arlington, Virginia that forecasts for every county in the United States as well as state and national forecasts.
- Truckee Meadows Water Authority's Population and Employment Econometric Model.
- Woods and Poole - a national forecasting firm in Washington, DC that forecasts for every county in the United States, as well as state and national forecasts.
- 2006 State Demographer's Forecast.

2.14.8 National Plan of Integrated Airports System

The 2007-2011 NPIAS was submitted to Congress in accordance with Section 47103 of Title 49 of the United States Code. The plan identifies 3,431 existing airports that are significant to national air transportation and contains estimates that $46.2 billion in infrastructure development, eligible for federal aid, will be needed over the next five years to meet the needs of all segments of civil aviation. A primary purpose of the NPIAS is to determine eligibility of the significant airports, which consists of all commercial service airports, all reliever airports, and selected GA airports, to receive grants under the Airport Improvement Program (AIP).

The NPIAS classifies RTS as a reliever airport. Reliever airports provide pilots attractive alternatives to using congested hub airports. They also provide GA access to the surrounding area. According to the FAA, there are 274 reliever airports in the NPIAS eligible for approximately $2.89 billion for development projects from 2007 to 2011. Reliever airports also receive special attention in AIP funding.

Reliever airports included in the plan have an average of 232 based aircraft and account for approximately 29 percent of the nation's GA fleet. Understanding the role of reliever airports within the NPIAS is important to understanding the potential future demand and needs of RTS.

2.15 AIRPORT SURVEYS AND TENANT INTERVIEWS

Participation by users of RTS is an essential step in the master planning process and can provide critical information to the planning process. Two questionnaires/surveys were distributed to the airport users, specifically based aircraft tenants and transient pilots. Additionally, interviews were conducted with the larger commercial tenants to obtain more detailed information on-airport facilities, tenant operations, existing demand, and future development plans and/or needs.

The primary goals of the questionnaires and interviews were to collect additional facility and operational data and assist in the identification of future facility requirements. A total of 59 completed tenant and pilot/passenger surveys were received and seven interviews with commercial tenants were conducted. The responses of these surveys and interviews were consolidated and are presented in **Table 2-6.** Copies of the surveys used in this process are presented in **Appendix B**.

Through the use of both the surveys and interviews it was determined that the majority of existing based users are comfortable with the overall existing airport facilities. However, based on the responses, there is a moderate need for a larger terminal facility and a significant need for additional hangars to meet existing demand. Further, a need for a consolidated flight training facility and small food service facility (e.g., restaurant or café) was also identified during tenant interviews and stated within the Other Services section of the surveys. Fuel services and vehicular access to RTS were generally identified as adequate. Some demand for additional maintenance services was identified.

The results of the surveys and interviews will be considered when developing the forecasts of aviation demand and completing demand/capacity and facility requirements analyses later in Chapters 3 and 4.

Table 2-6. Consolidated Results of Airport Surveys and Tenant Interviews

	Single	Twin	Turbo Prop	Jet	Helicopter
Respondents total based aircraft	80	4	2	1	21
Respondents monthly operations (est.)	788	20	40	10	76

Airport Planning Questionnaire Questions	Responses: Yes	Responses: No
Sufficient Apron Space	55	2
Sufficient Hangar Space	29	25
Sufficient Terminal Facilities	43	21
Sufficient Vehicle Parking	53	7
Sufficient Vehicle Access	56	7
Sufficient Fueling Services	52	10
Sufficient Aircraft Maintenance Services	40	16
Would you store your tied-down aircraft in hangar space if available	19	2

Source: PBS&J, 2007.

FORECAST OF AVIATION DEMAND

Reno-Stead Airport

3

3.1 GENERAL OVERVIEW

This chapter presents forecasts of aviation activity for Reno-Stead Airport (RTS) that will serve as the basis for airport facility planning over a 20-year planning period and beyond (2006 to 2030). Although these forecasts cover an extended timeframe, aviation, social, and economic trends can only be projected with reasonable confidence for the near-term (3-7 years). Unexpected events in any of these trends can cause dramatic changes to the 20-year projections. Therefore, aviation activity forecasts and master plans themselves must continually be evaluated and updated on a regular basis.

The forecast analysis identifies the Air Trade Area, describes socioeconomic characteristics, discusses the methodology used for projecting aircraft activity at RTS, and examines historical data, recent aviation trends, as well as local factors to provide updated General Aviation (GA) forecasts for the following:

- Based aircraft and fleet mix
- Airport operations (local and itinerant)
- Instrument approach operations
- Peak hour airport operations
- Fuel flowage

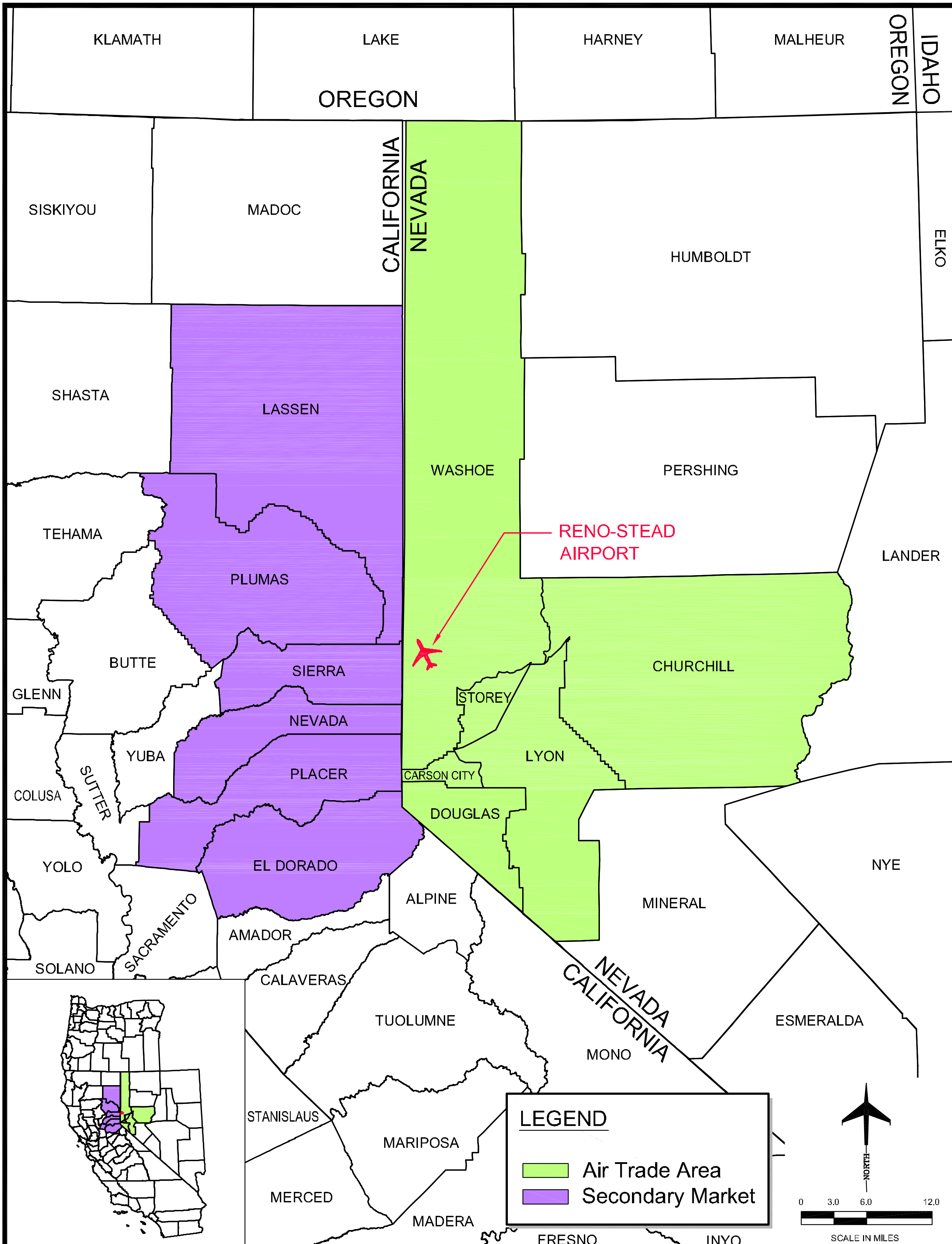
3.2 DEFINED AIR TRADE AREA

As shown in **Figure 3-1**, the Catchment Area for RTS includes an Air Trade Area and a larger Secondary Market. The Air Trade Area is defined as the area immediately surrounding RTS, whose population and economic activity generate the majority of the airport's aviation activity. This area includes Carson City and the following counties: Washoe, Storey Douglas, Lyon, and Churchill.

The Secondary Market includes the following counties in California: El Dorado, Lassen, Nevada, Placer, Plumas, and Sierra. Although the secondary market represents the uniqueness of Reno and the influences that the adjacent state of California has on population growth and other factors of the regional economy, it is not the primary source of activity generated at RTS. The demographic and economic data utilized to project future activity at RTS will focus on the Air Trade Area of the Catchment Area so as to allow this forecast to remain consistent with the forecast methodology described in the *Reno-Tahoe International Airport (RNO) Master Plan Update* completed in 2005.

3.3 DEMOGRAPHIC AND ECONOMIC DATA

The socio-economic characteristics of the surrounding community and overall region are important factors in estimating the demand for aviation services at an airport and evaluating the overall opportunity for future development. Population demographics, in addition to employment and earnings statistics, provide indications of the community's ability to support aviation activities over an extended period of time. The statistical link between these social and economic indicators can be used to gauge the overall



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PBS&J

Master Plan Update
Reno-Stead Airport
Reno, Nevada

Defined Catchment Area

Figure 3-1

community demand for aviation services and is often used to support aviation activity forecasts and airport development planning. Thus, a variety of historical and forecast socio-economic characteristics were obtained for use in the RTS Master Plan Update (Master Plan). The socioeconomic factors that were evaluated include historical and projected levels of population, employment, total earnings, and per capita income.

3.3.1 Population

The size and changes of local population often relate directly to the size of the pilot population and extent of aircraft ownership within a given market. Historical and projected levels of population in Washoe County, the Air Trade Area, the State of Nevada, and the United States are summarized in **Table 3-1** and illustrated in **Figure 3-2**. The population in Washoe County has increased at an average annual growth rate of 2.8 percent from 1990 to 2008. The overall population in the Air Trade Area has increased at an average annual growth rate of 2.9 percent from 1990 to 2008, a rate more than twice the national average of 1.1 percent. The State of Nevada grew fastest at a rate of 4.5 percent during the same period. The state's and county's continued strong population growth is due mainly to a high rate of net migration (particularly from California). The major reasons for net migration into Nevada include job opportunities and lower cost of living.

Projections of future population levels obtained for the period 2010 through 2030 indicate that the state population is expected to continue to experience a steady 2.0 percent annual average growth rate. Washoe County and the Air Trade Area are also projected to continue to experience a similar increase in population through 2030. All three, the county, state, and Air Trade Area are projected to grow significantly faster than the national average.

3.3.2 Employment

The level of employment provides another perspective into the economic stability of a given geographic area and the propensity for aviation. The historical and projected levels of employment for Washoe County, the Air Trade Area, the State of Nevada, and the United States are summarized in **Table 3-2** and illustrated in **Figure 3-3**. Historical growth in employment in Washoe County between 1990 and 2008 was robust with an average annual growth rate of 2.8 percent. Employment levels in the Air Trade Area have also steadily increased at the same average annual growth rate during this period. The State of Nevada outpaced the United States, Air Trade Area, and Washoe County with an average annual growth rate of 4.1 percent.

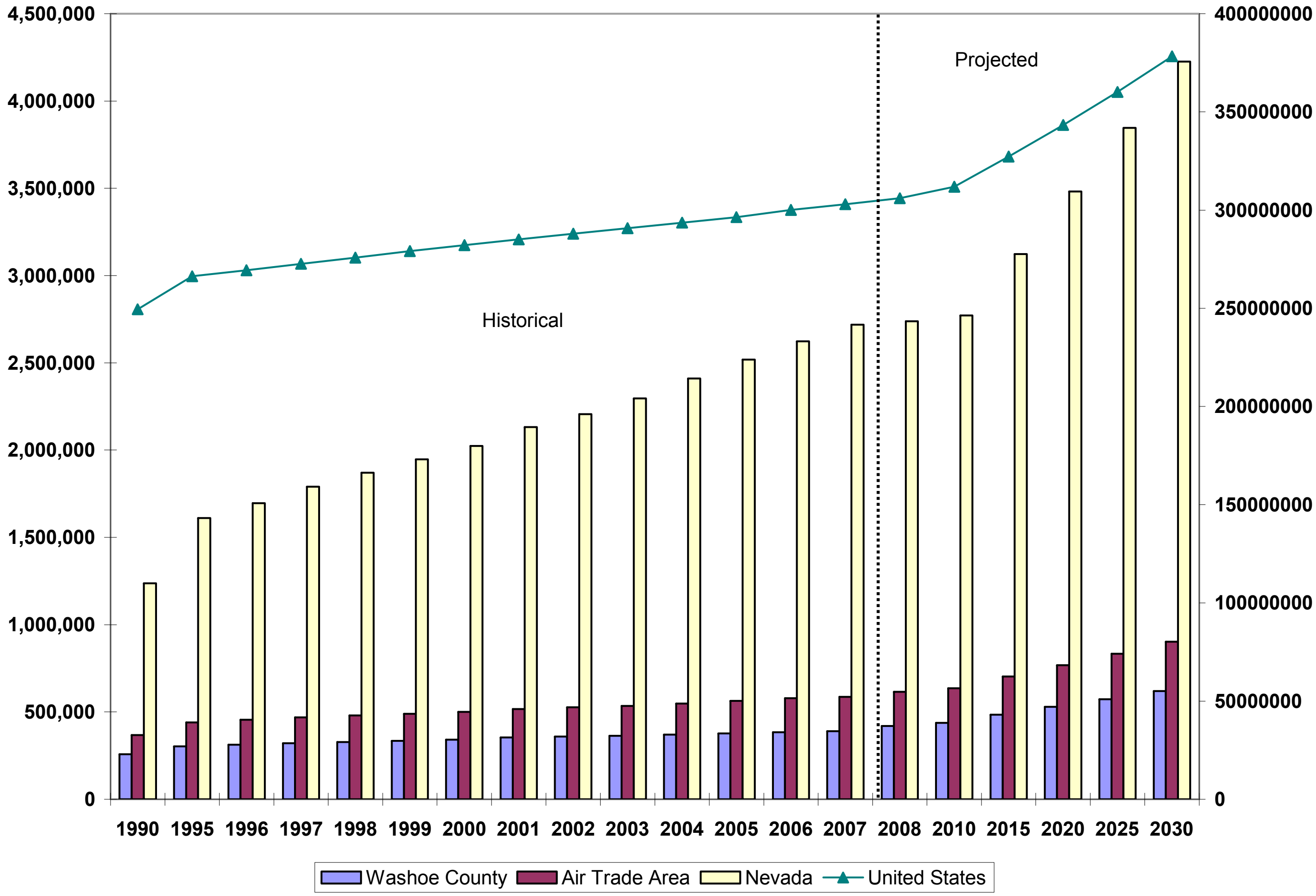
Projections of future employment levels obtained for the period 2010 through 2030 indicate that state employment is expected to continue to experience a 2.4 percent annual average growth rate. The Air Trade Area is also projected to continue to experience an increase in employment with an average annual growth rate of 1.9 percent through 2030. Both the state and Air Trade Area are projected to grow significantly faster than the national average.

Table 3-1. Historical and Projected Population

Year	Washoe County	Air Trade Area	Nevada	United States
Historical				
1990	259,680	367,390	1,236,130	249,438,712
1995	306,219	440,455	1,611,593	266,278,393
1996	315,956	455,623	1,696,405	269,394,284
1997	324,438	468,673	1,790,207	272,646,925
1998	331,485	479,216	1,870,881	275,854,104
1999	338,183	489,702	1,946,366	279,040,168
2000	345,426	500,150	2,023,378	282,193,477
2001	356,985	516,863	2,132,498	285,107,923
2002	363,062	526,011	2,206,022	287,984,799
2003	367,326	544,844	2,296,566	290,850,005
2004	374,127	561,951	2,410,768	293,656,842
2005	380,902	583,513	2,518,869	296,410,404
2006	383,330	578,313	2,623,050	300,085,843
2007	389,650	587,145	2,718,337	303,041,121
2008	419,037	615,953	2,738,733	305,995,488
Forecast				
2010	437,439	607,908	3,087,428	311,843,984
2015	483,803	658,558	3,605,713	327,290,594
2020	528,654	708,093	4,001,520	343,338,608
2025	573,332	757,532	4,315,334	360,186,639
2030	620,323	827,623	4,603,219	378,302,736
Average Annual Growth Rates				
1990-2008	2.8%	2.9%	4.5%	1.1%
2008-2030	1.8%	1.7%	2.0%	1.0%

Sources: Nevada Small Business Development Center, State of Nevada Demographer, Washoe County Consensus Forecast 2003-2025/2008-2030, Woods & Poole Economics.

Figure 3-2. Historical and Projected Population



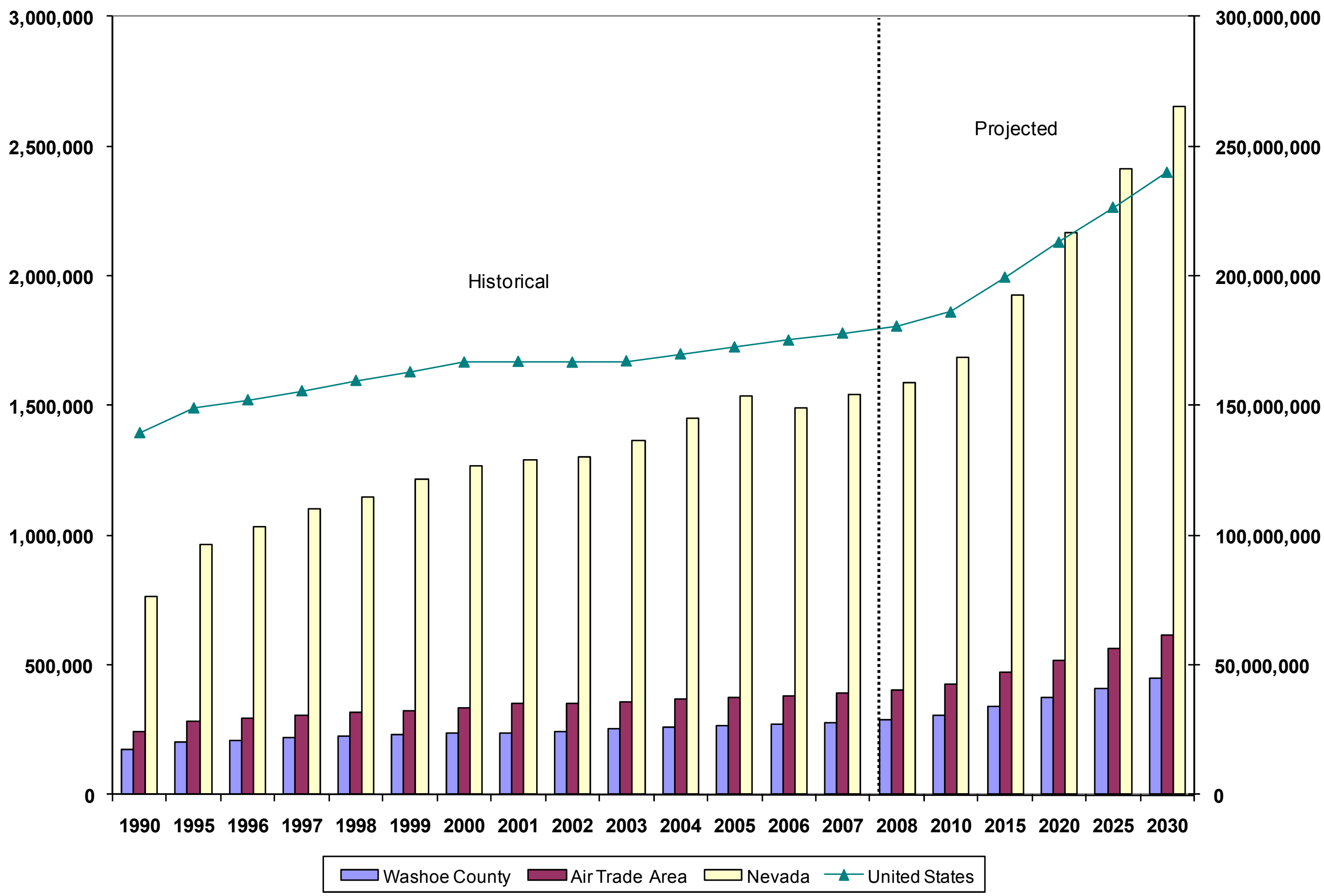
Sources: Nevada Small Business Development Center, State of Nevada Demographer, Washoe County Consensus Forecast 2003-2025/2008-2030, Woods & Poole Economics.

Table 3-2. Historical and Projected Employment

Year	Washoe County	Air Trade Area	Nevada	United States
Historical				
1990	176,480	245,420	766,439	139,380,891
1995	202,070	283,880	963,957	148,982,794
1996	210,670	295,820	1,035,389	152,150,190
1997	219,030	308,410	1,101,531	155,608,203
1998	226,120	317,200	1,145,198	159,628,186
1999	230,700	325,950	1,214,618	162,955,270
2000	238,760	337,700	1,267,998	166,758,782
2001	240,280	351,020	1,288,793	167,014,631
2002	240,990	352,160	1,303,589	166,699,004
2003	256,010	349,320	1,363,363	167,174,328
2004	261,650	356,560	1,449,791	169,880,573
2005	267,100	363,810	1,537,864	172,587,009
2006	272,440	382,620	1,493,404	175,246,102
2007	277,860	390,370	1,541,894	177,954,540
2008	291,360	406,200	1,590,345	180,663,082
Forecast				
2010	304,640	414,140	1,687,153	186,079,920
2015	338,685	451,560	1,928,661	199,622,184
2020	373,960	488,320	2,169,687	213,164,406
2025	410,670	524,530	2,410,583	226,706,689
2030	449,883	568,557	2,651,713	240,248,993
Average Annual Growth Rates				
1990-2008	2.8%	2.8%	4.1%	1.5%
2008-2030	2.0%	1.9%	2.4%	1.3%

Sources: Washoe County Consensus Forecast 2003-2025/2008-2030, Woods & Poole Economics.

Figure 3-3. Historical and Projected Employment



Sources: Washoe County Consensus Forecast 2003-2025/2008-2030, Woods & Poole Economics.

3.3.3 Total Earnings

Earnings are also a strong predictive element for general aviation demand. The category Earnings is compensation paid to workers and is not a measure of company earnings or profits. This category includes wages, salaries, and other income, and proprietors' income. The category also includes personal contributions for social insurance (social security, unemployment). Earnings data is recorded by place of work, so that earnings of an employee who works in one county or state but resides in another are recorded in the county/state where the job is. It should be noted that all earnings, income, and retail sales data is shown in constant 1996 dollars to show real levels adjusted for inflation and remain consistent with the Washoe County Consensus Forecasts and Woods and Poole economics data. This adjustment of current dollar information to a comparison of constant dollar amounts creates an "apples to apples comparison" of real economic growth over the period.

Historical and projected earnings for Washoe County, the Air Trade Area, the State of Nevada, and the United States are summarized in **Table 3-3** and illustrated in **Figure 3-4**. The earnings of both the residents of Washoe County and the Air Trade Area have increased at an average annual growth rate of 3.8 percent from 1990 to 2008. During this same period the State of Nevada grew at an average annual growth rate of 5.6 percent while earnings for the entire United States grew at 2.8 percent annually.

Projections of future earnings obtained for the period 2010 through 2030 indicate that the state earnings are expected to continue to experience a 3.9 percent annual average growth rate. The Air Trade Area is also projected to continue to experience an increase in earnings with an average annual growth rate of 2.4 percent through 2030. Again, both the state and Air Trade Area are projected to grow faster than the national average.

3.3.4 Per Capita Income

Per capita income can be a valuable indication of the economic conditions for a particular area. Strong income coupled with strength in overall employment levels and specific categories of employment are needed to support both business and recreational aircraft ownership and use. Historical and projected per capita income for Washoe County, the Air Trade Area, the State of Nevada, and the United States are summarized in **Table 3-4** and illustrated in **Figure 3-5**. Washoe County grew at an average annual growth rate of 2.7 percent from 1990 to 2008. The Air Trade Area grew at an average annual growth rate of 2.5 percent from 1990 to 2008. The State of Nevada and United States grew at approximately half that rate during the same timeframe with only 1.3 and 1.5 percent, respectively.

Table 3-4 also shows another positive vantage point relative to per capita personal income. Historically per capita income in the Air Trade Area averaged approximately 113 percent of that of the United States in the period from 1990 to 2008. The historical Air Trade Area per capita income is also higher than that of the State of Nevada's during the same time period, averaging just over 109 percent.

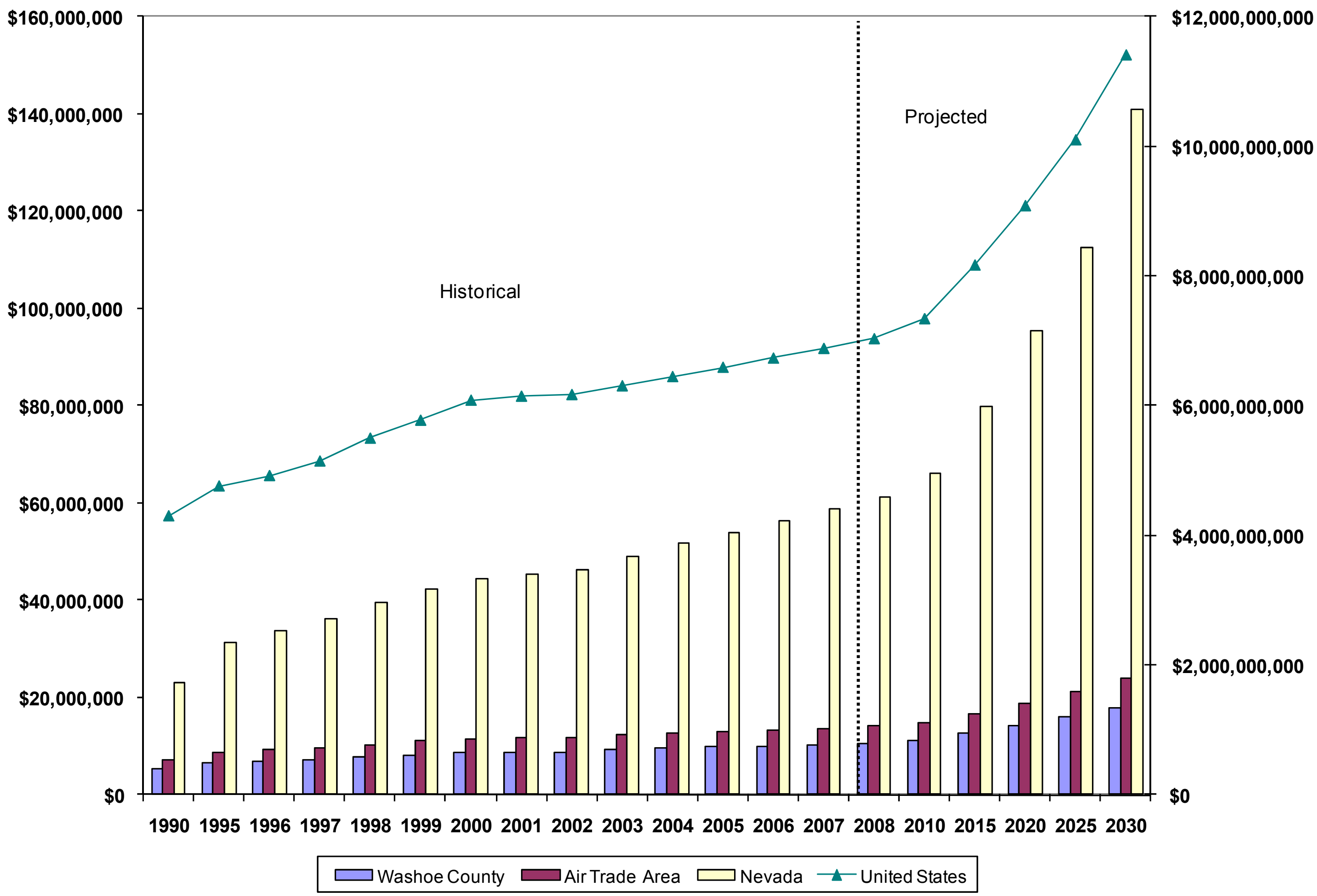
Projections of future per capita income obtained for the period 2010 through 2030 indicate that the state earnings are expected to continue to experience only a 1.1 percent average annual growth rate. Meanwhile, the Air Trade Area is projected to continue to experience a very strong average annual growth rate of 2.4 percent through 2030, about double the State of Nevada and United States rates.

Table 3-3. Historical and Projected Earnings (in thousands)

Year	Washoe County	Air Trade Area	Nevada	United States
Historical				
1990	$5,361,600	$7,159,870	$23,139,751	$4,302,268,000
1995	$6,493,400	$8,759,860	$31,246,050	$4,762,703,000
1996	$6,826,010	$9,193,100	$33,786,820	$4,922,925,000
1997	$7,144,670	$9,640,770	$36,101,330	$5,147,021,000
1998	$7,659,590	$10,341,490	$39,411,577	$5,498,691,000
1999	$8,210,440	$11,027,330	$42,413,527	$5,776,253,000
2000	$8,572,020	$11,475,010	$44,342,640	$6,084,932,000
2001	$8,845,150	$11,775,200	$45,344,294	$6,146,426,000
2002	$8,784,060	$11,736,910	$46,109,836	$6,171,591,000
2003	$9,191,240	$12,269,290	$48,975,602	$6,306,578,000
2004	$9,540,150	$12,695,310	$51,670,898	$6,448,721,000
2005	$9,792,970	$13,035,960	$54,000,349	$6,591,930,000
2006	$10,048,170	$13,380,060	$56,376,334	$6,733,971,905
2007	$10,308,430	$13,731,210	$58,787,303	$6,883,258,792
2008	$10,569,040	$14,082,980	$61,219,211	$7,032,836,482
Forecast				
2010	$11,106,030	$14,808,240	$66,251,343	$7,341,134,000
2015	$12,546,010	$16,755,290	$79,900,799	$8,168,481,000
2020	$14,137,970	$18,910,340	$95,277,714	$9,084,387,000
2025	$15,899,330	$21,296,490	$112,656,797	$10,099,791,000
2030	$17,849,320	$23,939,830	$141,063,879	$11,409,260,000
Average Annual Growth Rates				
1990-2008	3.8%	3.8%	5.6%	2.8%
2008-2030	2.4%	2.4%	3.9%	2.2%

Note: All figures presented in 1996 dollars.
Sources: Nevada Small Business Development Center, State of Nevada Demographer, Washoe County Consensus Forecast 2003-2025/2008-2030, Woods & Poole Economics.

Figure 3-4. Historical and Projected Earnings (in thousands)



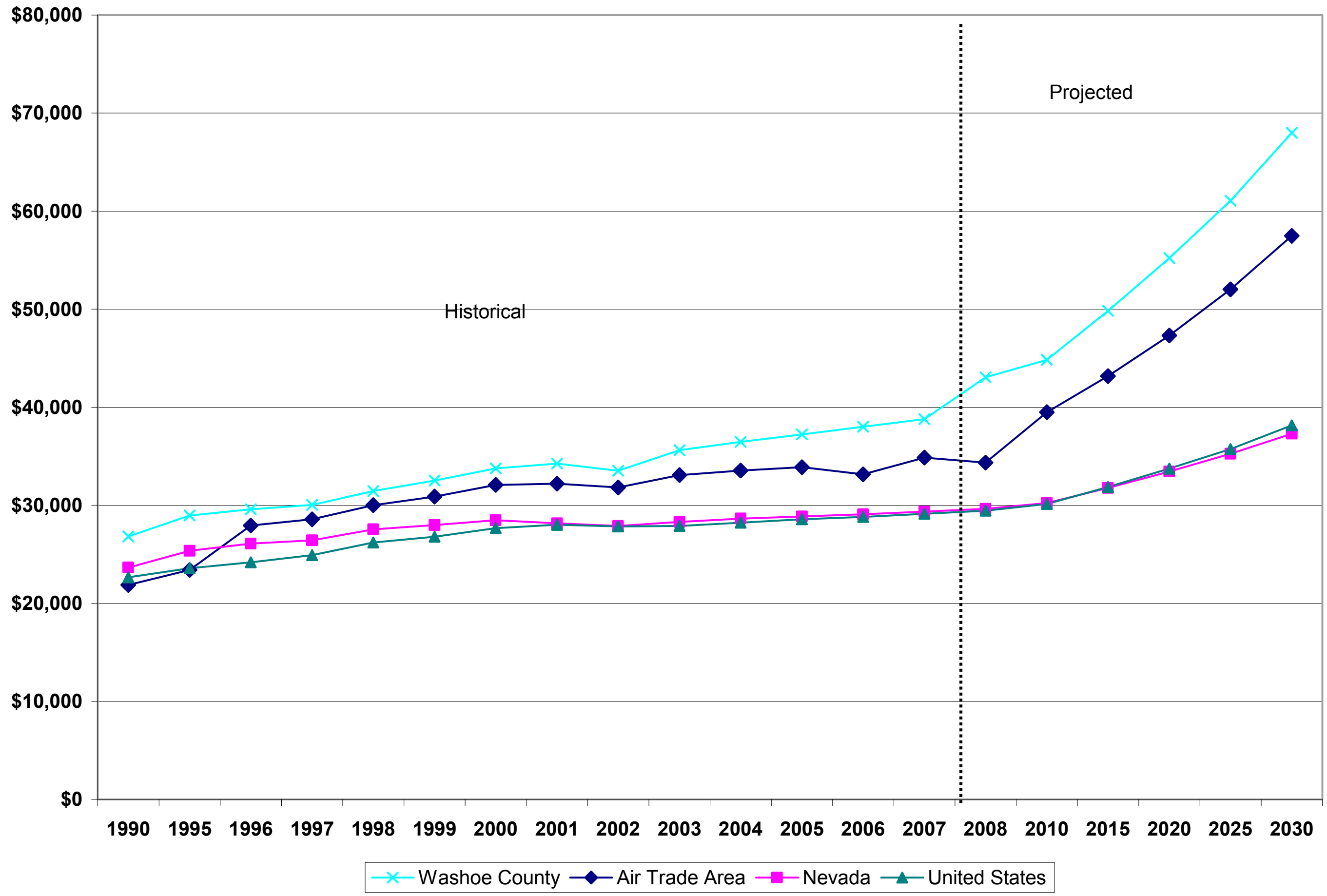
Note: All figures presented in 1996 dollars.
Sources: Nevada Small Business Development Center, State of Nevada Demographer, Washoe County Consensus Forecast 2003-2025/2008-2030, Woods & Poole Economics.

Table 3-4. Historical and Projected Per Capita Income

Year	Washoe County	Air Trade Area	Nevada	United States	Air Trade Area % of NV Population	Air Trade Area % of US Population
Historical						
1990	$26,806	$21,871	$23,645	$22,634	92.5%	96.63%
1995	$28,949	$23,396	$25,351	$23,573	92.3%	99.25%
1996	$29,599	$27,937	$26,085	$24,175	107.1%	115.56%
1997	$30,032	$28,579	$26,417	$24,914	108.2%	114.71%
1998	$31,448	$30,014	$27,544	$26,202	109.0%	114.55%
1999	$32,515	$30,884	$27,979	$26,786	110.4%	115.30%
2000	$33,770	$32,067	$28,473	$27,655	112.6%	115.96%
2001	$34,244	$32,196	$28,155	$28,015	114.4%	114.93%
2002	$33,527	$31,805	$27,883	$27,826	114.1%	114.30%
2003	$35,610	$33,079	$28,296	$27,895	116.9%	118.59%
2004	$36,460	$33,540	$28,643	$28,228	117.1%	118.82%
2005	$37,230	$33,879	$28,865	$28,562	117.4%	118.62%
2006	$38,010	$33,140	$29,070	$28,805	114.0%	115.05%
2007	$38,780	$34,856	$29,353	$29,130	118.7%	119.66%
2008	$43,041	$34,356	$29,638	$29,456	115.9%	116.63%
Forecast						
2010	$44,832	$39,498	$30,235	$30,133	130.6%	131.08%
2015	$49,823	$43,165	$31,772	$31,869	135.9%	135.45%
2020	$55,217	$47,320	$33,440	$33,736	141.5%	140.27%
2025	$61,058	$52,012	$35,235	$35,734	147.6%	145.55%
2030	$67,975	$57,473	$37,301	$38,143	154.1%	150.68%
Average Annual Growth Rates						
1990-2008	2.7%	2.5%	1.3%	1.5%		
2008-2030	2.1%	2.4%	1.1%	1.2%		

Note: All figures in 1996 dollars.
Sources: Nevada Small Business Development Center, State of Nevada Demographer, Washoe County Consensus Forecast 2003-2025/2008-2030, Woods & Poole Economics.

Figure 3-5. Per Capita Income



Note: All figures in 1996 dollars.
Sources: Nevada Small Business Development Center, State of Nevada Demographer, Washoe County Consensus Forecast 2003-2025/2008-2030, Woods & Poole Economics.

3.4 METHODOLOGY

Various methods of forecasting aviation demand exist and are widely used throughout the industry. Trend line analysis examines cycles of historical aviation activity and uses mathematical techniques to extrapolate these historic trends into the future. Regression analysis is a statistical technique that ties aviation demand to economic measures. Market share analysis is a technique that assumes a top-down relationship between national, regional, and local forecasts. Local forecasts are a market share percentage of regional or national forecasts. Operations per based aircraft (OPBA) is a ratio used to compare based aircraft and operations, one value divided by another. All of these forecasting techniques as well as influences unique to the region were considered in projecting aircraft activity for RTS and are reflected in the selected forecasts. These methods will be discussed in greater detail throughout this chapter.

3.5 FORECASTING TRENDS AND CONSIDERATIONS

In preparing a forecast of aviation demand for RTS, it is important to have a general understanding of the events and trends that are influencing the aviation industry as a whole and general aviation in particular. National general aviation trends can provide some insight into the growth potential at RTS. State, regional, and local economic and business trends along with demographic changes can also assist in the development of more accurate aviation demand forecasts for RTS. These trends are discussed below.

3.5.1 National General Aviation Trends

Following more than a decade of decline, the general aviation industry was revived with the passage of the General Aviation Revitalization Act of 1994 (GARA), which limited manufacturer's product liability on general aviation aircraft to 18 years. This legislation encouraged firms such as Cessna and Piper Aircraft to re-enter the single-engine piston aircraft manufacturing sector. GARA's positive impacts on the national GA industry since its passage are currently reflected in several GA activity statistics. Since 1994, activity statistics indicate an increase in GA operations at Federal Aviation Administration (FAA) air traffic controlled facilities, an increase in the active GA aircraft fleet size, and record shipments and billings of fixed-wing GA aircraft.

However, the positive growth and outlook for the general aviation industry was affected to a degree by the terrorist attacks on September 11, 2001 coupled with that of an economic recession that began in early 2001. In the past few years the general aviation industry has demonstrated mixed signs of recovery, but the long-term projection is still one of growth. GA's positive future is attributed to the following:

- Continued growth in business and corporate use of general aviation;
- Innovative ways of sharing the cost of aircraft ownership and/or new ways of accessing business aircraft;
- The potential expanded use of general aviation as an alternative to commercial passenger airline use by corporate travelers;
- Industry promotion of learn-to-fly programs, including the introduction of the Sport Pilot License;
- The introduction of light sport aircraft (LSA) and very light jet (VLJ) aircraft, consisting of relatively inexpensive one and two engine jet aircraft;

- The future role of the Small Aircraft Transportation System (SATS) in the United States; and
- Continued advancement of avionics and computer technology.

Specific trends related to GA activity, as identified in the FAA Aerospace Forecasts, Fiscal Years 2007-2020 and other national resources are identified below. These trends are discussed in terms of the number of aircraft shipments and billings, active fleet, and hours flown.

3.5.1.1 Active Shipments and Billings

The General Aviation Manufacturers Association (GAMA) tracks and reports total shipments and billings of general aviation aircraft. GAMA statistics for 2006 indicate continued growth of the general aviation aircraft manufacturing industry. During 2006, general aviation aircraft shipments totaled 4,042, an increase of approximately 12.9 percent over 2005. Estimated billings for new manufactured general aviation shipments in 2006 totaled $18.8 billion dollars, an increase of 24.1 percent over 2005.

3.5.1.2 Active GA Fleet

In 2006, the FAA estimated that there were 226,422 active general aviation aircraft. The growth of the active general aviation aircraft fleet is forecast to increase by an annual average rate of 1.4 percent through 2020, growing to 274,914 in 2020. Single-engine piston aircraft (including helicopters) will continue to be the dominant aircraft in the GA fleet mix but are expected to grow at only about 0.30 percent overall per year through 2020. The more expensive, turbine-powered fleet (including helicopters) is projected to grow at an average annual rate of 3.6 percent through 2020 with the turbine jet fleet increasing at 6.0 percent per year. FAA attributes the growth of turbine aircraft to the success of fractional ownership, the introduction of new types of turbine aircraft that have piqued buyer interest, strong U.S. and global economies, and a transition from commercial air travel to corporate/business air travel by many business travelers and corporations.

The FAA also assumes that relatively inexpensive VLJs as well as new light sport aircraft could dilute or weaken the replacement market for piston-engine aircraft. The FAA/Transportation Research Board Business Aviation Panel has suggested that the market for VLJs could add an additional 6,300 of these aircraft to the general aviation fleet by 2020.

3.5.1.3 Hours Flown

The number of general aviation hours flown is projected to increase by 3.4 percent annually from 27,543,000 in 2006 to 43,860,000 in 2010. Much of the increase reflects increased flying by business and corporate aircraft as well as steady, if relatively small, annual percentage increases in utilization rates for piston aircraft. Hours flown by turbine aircraft (including helicopters) are forecast to increase 6.1 percent annually over the forecast period, compared to the 1.3 percent for piston-powered aircraft. Jet aircraft are forecast to account for most of the increase, with hours flown expanding at an average annual rate of 9.4 percent over the forecast period. The large increases in jet hours result from the introduction of very light jets and increases in the fractional ownership fleet.

3.5.1.4 Active Pilots

Between 2000 and 2006, the total number of active general aviation pilots has declined and the FAA is projecting that this decline will continue through the year 2010. However, between 2010 and 2020, the FAA is projecting the number of active general aviation pilots (excluding air transport pilots) to increase at an average annual rate of 1.2 percent. Critical to general aviation and the aviation industry as a whole are the number of student pilots. In 2006, the number of student pilots decreased by 2.7 percent. However, the number of student pilots is projected to increase from 84,866 in 2006 to 100,181 in 2020, an average annual rate of 1.2 percent. The largest existing and projected growth is in the sport pilot category. As of December 31, 2007, the number of sport pilot certificates issued was 939. FAA is projecting that 16,252 new sport pilots will be certified during the forecast period, an average annual increase of 22.6 percent.

3.5.2 Regional and Local Trends

The long-term outlook for the State of Nevada economy remains one of strong, steady growth and expansion. As highlighted earlier in this chapter, the population, employment, earnings, and per capita income of Washoe County and the defined Air Trade Area have grown at significantly faster rates than the national growth rate from 1990 to 2008, and future projections continue this trend. This increase is a result of people and businesses relocating into the region, primarily from California. Regional growth factors and the strength of the local economy are important considerations and influences in projecting future aviation demand at RTS. Therefore, a brief discussion of the area's unique blend of factors such as the quality of life, market access, favorable tax climate, business-friendly climate, and tourism are discussed below.

3.5.2.1 Quality of Life

Northern Nevada's natural beauty and distinctive four-season climate offer almost every type of recreational activity. The majestic Sierra Nevada mountain range forms the western boundary of the Truckee Meadows, featuring alpine and Nordic skiing at 18 major resorts. Fishing, sailing, swimming, hiking, biking, camping, and horseback riding are all exceptional. A quick escape is easy with more than 39 golf courses. The Reno-Sparks-Tahoe area is the cultural center of the Sierras. The "Biggest Little City" also offers many diverse options in the performing, visual, and literary arts. Northern Nevada offers over 100 residential subdivisions offering homes in the price range of $120,000 to $500,000. There are many neighborhoods featuring different types of architecture from old, charming historical houses to modern styles. In a quick comparison to areas of comparable population, northern Nevada is right on par when it comes to cost of living. Reno-Sparks has consistently rated among the most affordable and "hottest" cities in the region.

3.5.2.2 Location and Market Access

Nevada offers great highway and air accessibility to the major western markets and is strategically located as the hub of the 11-state western region. The area is well suited to provide distribution, warehouses, or other support business services to markets in Nevada, California, Oregon, Washington, Idaho, and Utah. Reno is located four hours from the major international and domestic shipping hub of the San Francisco Bay Area. The proximity to major West coast ports provides next day capability for movement of cargo back and forth for import and export as well as domestic spoke-and-hub services via air, truck, or rail. The area also represents an ideal location for parts, supply, assembly, or other industrial services to support businesses in the western United States.

3.5.2.3 Favorable Tax Environment

Because a majority of tax revenues in Nevada are generated from the tourism and gaming industries, Nevada's tax burden is one of the lightest in the nation. Nevada is one of only seven states without a personal income tax and one of only three without a corporate income tax. In addition, Nevada does not have unitary, franchise or inventory tax, inheritance tax, or estate and/or gift tax. It is this tax structure that has allowed Nevada to rank as number three of the 10 best states in the "Tax Foundation's 2008 State Business Tax Climate Index."

3.5.2.4 Business Friendly Climate

The State of Nevada and various units of government within Nevada, as well as private utilities and regional development associations, offer various tax and other incentives/assistance for new or expanding businesses. These tax incentives for new or expanding businesses are in addition to the already relatively low taxes within Nevada. This generally pro-growth and pro-business attitude is in contrast to some other western states. These tax incentive or relocation assistance packages are in addition to the basic attributes necessary to locate a business in western Nevada such as available land, adequate infrastructure (e.g. roads, utilities), trained labor force, etc. Environmental laws are also generally favorable for industrial, retail/commercial, residential development within Nevada. Within the past few years, magazines such as Forbes, Time, and Inc. have cited Nevada as one of the best states in the country for jobs and business growth.

3.5.2.5 Tourism

The Reno-Tahoe region is described as "America's Adventure Place." In addition to the area's breath-taking beauty, Reno and Lake Tahoe offers an amazing mix of history, art, and culture. The Reno-Tahoe area has world-class ski and snowboarding resorts, major golf courses, 24-hour gaming, entertainment, and rich night life.

Tourism is the major industry in the Reno area. The hotel and casino industry attracts more than five million visitors annually and adds over $4 billion to the local economy each year. Reno Annual Events include Hot August Nights, Reno Tahoe Open, Tahoe-Reno International Film Festival, and Reno Balloon Races. The National Championship Air Races and Air Show has been held at RTS every year since 1964. The event draws fans from all over the world, including a large local following, and brings millions of dollars to the regional economy each year.

The Reno-Sparks Convention & Visitors Authority owns and operates a number of facilities to support tourism. After a recent expansion and renovation, the Reno-Sparks Convention Center now offers over 500,000 square feet of meeting/exhibition space and 46 meeting rooms, plus a 30,000 square foot multi-purpose ballroom. The Reno Events Center opened in downtown Reno in early 2005. This 7,000 seat multi-purpose center provides additional convention and meeting space to attract industry conventions, business meetings, and shows. Reno is unique in having the only bowling stadium designed exclusively for bowling tournaments. This 78 lane facility opened in 1995. A new agreement with the American Bowlers Congress assures tournaments in Reno for two out of every three years through 2018.

Triple-A Baseball has also come to Reno with the first game played by the Reno Aces in April of 2009. The new stadium has seating for 10,000 and is located along the Truckee

River at the historic Freight House site. SK Baseball purchased the Tucson, Arizona Sidewinders and brought the team to Reno. SK Baseball is working with a retail developer to create a retail/entertainment district, named the Freight House District, which will surround the stadium.

Major outdoor retailers are also catching on to the recreational treasure located in Reno. Retailers such as Cabela's, Scheels and Bass Pro Sports have built or are in the process of constructing mega-stores in the Reno-Sparks area. These stores are not only expected to provide more jobs and economic stimulation but are expected to become major tourist draws.

It is due to the above regional growth factors and influences that the area will continue to grow and prosper as more people and businesses flee the high cost of living, high taxes, and congestion of California to Nevada. This has and will continue to produce a positive impact on the growth of aviation activity at RTS.

3.6 BASED AIRCRAFT FORECAST

A projection of GA aircraft that will be based at RTS is required for the proper planning of future airside and landside requirements, such as runway usage, aircraft parking apron, and the number of hangars needed. The historical based aircraft data was obtained primarily from the Federal Aviation Administration's (FAA) Terminal Area Forecast (TAF), 2007. The data was also compared against based aircraft counts presented in the *1994 Airport Development Plan* for the Reno-Stead Airport prepared by Coffman Associates, Inc., as well as the data in the *Nevada Airport System Plan Update* prepared for the Nevada Department of Transportation by Aries Consultants Ltd., September 2004. All sources have areas of incomplete or inconsistent data. **Table 3-5** shows the compiled and smoothed historical based aircraft data that is used in creating this report's forecasts. The forecast of Based Aircraft was developed using four forecasting techniques as described below.

3.6.1 Trend Line Analysis

Trend Line analysis examines historical growth trends in activity and applies these trends to current demand levels to produce projections of future activity. Trend line analysis assumes that activity, and the factors that have historically affected activity, will continue to influence demand levels at similar rates over an extended period of time. Linear trend projections are typically used to provide baseline forecasts that reflect stable market conditions.

Table 3-5. Historical Based Aircraft

Year	1994 Airport Development Plan	FAA TAF	Nevada Airport System Plan	Derived Historical Based Aircraft
1990	n/a	205	n/a	209
1991	154	181	n/a	215
1992	150	170	n/a	219
1993	154	170	n/a	221
1994	n/a	171	n/a	225
1995	161	216	n/a	227
1996	n/a	216	n/a	228
1997	n/a	216	n/a	229
1998	n/a	216	n/a	230
1999	n/a	216	n/a	235
2000	183	216	231	241
2001	247	231	233	247
2002	249	258	235	249
2003	250	261	237	250
2004	255	262	240	255
2005	205	262	243	258
2006	258	264	245	261
Average Annual Growth Rates				
1990-1995	n/a	1.1%	n/a	1.7%
1995-2000	2.6%	0.0%	n/a	1.2%
2000-2006	7.1%	3.4%	1.2%	1.3%

Note: Derived Historical Based Aircraft were calculated by averaging the results of a single variable regression analysis of socioeconomic elements.
Sources: 1994 Airport Development Plan (Coffman Associates), FAA Terminal Area Forecast, 2007, Nevada Airport System Plan Update, 2004, and PBS&J, 2009.

As shown in **Table 3-6**, based aircraft at RTS grew at an average annual growth rate of 1.4 percent from 1990 to 2006. The Trend Line Analysis indicates that the number of based aircraft at RTS is expected to grow at an average annual rate of 1.4 percent during the planning period to 364 based aircraft by the year 2030.

3.6.2 Regression Analyses

The demographic and economic elements of the surrounding community are among the principal factors in forecasting the levels of aviation activity at an airport. Population demographics, in addition to employment and earnings statistics, provide indications of the community's ability to support aviation activities and of the underlying level of demand for aviation services.

Regression analysis refers to a technique for studying and comparing relationships between various socioeconomic independent variables (population, employment, per capita income, etc.) and dependent variables (based aircraft and/or operations). The coefficient of determination (r2) is a statistical measure showing the extent to which

Table 3-6. Trend Analysis Results

	Year	Based Aircraft
Historical		
	1990	209
	1991	215
	1992	219
	1993	221
	1994	225
	1995	227
	1996	228
	1997	229
	1998	230
	1999	235
	2000	241
	2001	247
	2002	249
	2003	250
	2004	255
	2005	258
	2006	261
Forecast		
	2010	276
	2015	296
	2020	317
	2025	340
	2030	364
	Average Annual Growth Rates	
	1990-2006	1.4%
	2006-2030	1.4%

Note: Trend analysis of historical based aircraft from 1990 to 2006.
Source: PBS&J, 2009.

there is a relationship between the two variables. The closer the r^2 value is to 1.0, the higher the confidence level is that a change in the value of socioeconomic values would translate into a change in airport activity. As rule of thumb, an r^2 value over 0.95 carries a strong statistical correlation.

The regression modeling was based on demographic elements from the RTS Air Trade Area discussed earlier in this chapter. The RTS Air Trade Area socioeconomic data was used because that data most accurately reflects the impacts on based aircraft as a result of the large geographic catchment area that generates the majority of RTS's aviation activity. This analysis regressed individual elements of population, employment, earnings, and per capita income from historical data against the number of based aircraft to determine if a positive relationship existed that could serve as the basis for a forecast. As shown in **Table 3-7**, the four socioeconomic variables of population, employment, earnings, and per capital income produced r^2 values of 0.97, 0.28, 0.96, and 0.86, respectively. Overall, the regression methodology resulted in high correlations between population and earnings and based aircraft. As shown in Table 3-7, population and earnings projects based aircraft to increase to 314 and 337, respectively by the year 2030.

3.6.3 Market Share Analysis

The market share analysis methodology examines RTS's historical share of the national, state, and regional market. This approach assumes the growth in activity at the airport to be proportionate to the activity of the nation, state, and region. Therefore, as market shares are held constant over the forecast period, the resulting increases in the activity occur based on the growth rates established in the FAA's Aerospace Forecasts and TAF, 2007. As shown in **Table 3-8**, based aircraft are projected to increase at an average annual rate of 0.8 percent and reach 319 by 2030.

Table 3-7. Regression Analysis Results – Single Independent Variable

		Based Aircraft Projections			
Year	Based Aircraft	Population	Employment	Earnings	Per Capita Income
Historical					
1990	209				
1991	215				
1992	219				
1993	221				
1994	225				
1995	227				
1996	228				
1997	229				
1998	230				
1999	235				
2000	241				
2001	247				
2002	249				
2003	250				
2004	255				
2005	258				
2006	261				
Forecast					
2010		264	251	269	262
2015		276	257	284	273
2020		287	262	300	285
2025		298	267	318	299
2030		314	272	337	313
Average Annual Growth Rates					
1990-2006	1.4%				
2006-2030		1.2%	0.3%	1.6%	1.1%
R-Square		0.97	0.28	0.96	0.87

Sources: Nevada Small Business Development Center, State of Nevada Demographer, Washoe County Consensus Forecast 2003-2025/2008-2030, Wood & Poole Economics, PBS&J, 2009.

Table 3-8. Market Share Results

Year	Based Aircraft				Market Share		
	Western Pacific	State of Nevada	U.S. Total	Reno-Stead	RTS Share of Western Pacific Region	RTS Share of State of NV	RTS Share of US
Historical							
2001	36,700	2,545	189,569	247	0.7%	9.7%	0.1%
2002	36,747	2,436	191,412	249	0.7%	10.2%	0.1%
2003	37,058	2,456	192,779	250	0.7%	10.2%	0.1%
2004	36,905	2,361	195,759	255	0.7%	10.8%	0.1%
2005	37,920	2,415	199,813	258	0.7%	10.7%	0.1%
2006	38,193	2,526	201,070	261	0.7%	10.3%	0.1%
Forecast							
2010	39,440	2,591	207,142	270	0.7%		
2015	41,133	2,678	215,451	281	0.7%		
2020	42,944	2,775	224,599	293	0.7%		
2025	44,919	2,878	234,971	307	0.7%		
2030	46,744	2,950	245,737	319	0.7%		
Average Annual Growth Rate							
2001-2006	0.8%	-0.1%	1.2%	1.1%			
2006-2030	0.8%	0.6%	0.8%	0.8%			

Notes: FAA data in fiscal years, 2006 is estimated, data extrapolated from 2025 to 2030.

Sources: FAA Terminal Area Forecast, Fiscal Years 2006-2025 March 2007 and PBS&J, 2009.

3.6.4 Selected Based Aircraft Forecast

The selection of a preferred based aircraft forecast should be the best representation of what is expected to occur at RTS. All of the previously mentioned forecasting methods are good standard techniques used in the industry but each have certain limitations to truly predict activity in a dynamic and growing market. Each of these methodologies assume the future will be identical to the past and/or rely on a set of projections developed for another purpose. These projections do not fully account for the airport development that is currently underway, the positive growth influences of the local region, or the capacity and access challenges other airports in the region will face in the future.

As a result, the preferred based aircraft forecast for RTS utilizes the results of the methodologies discussed previously to establish a baseline projection which has then been adjusted to account for conditions/activities likely to influence the future. Since the regression analysis comparing population of the Air Trade Area to based aircraft yielded a very high correlation and produced a mid-range projection of the various techniques, it was chosen as the most appropriate to represent the baseline forecast. The following discussion describes the influencing factors and adjustments made to the baseline forecast to achieve the preferred based aircraft forecast presented in **Table 3-9** and used to determine future facility requirements.

New T-hangar units are currently being constructed at RTS. Based on the waiting list, Reno-Tahoe Airport Authority (RTAA) anticipates that the new T-hangar development will attract 50 new tenants/based aircraft over the next two years. As such, the selected based aircraft forecast reflects 25 new based aircraft in 2009 and 25 new aircraft in 2010.

An additional subjective factor of 0.25 percent was also applied to the based aircraft growth rate every five years from 2010 to 2030 in order to account for anticipated growth influences of the local economy as well as RTS's anticipated increase in market share within the region. For example, future capacity constraints at Reno-Tahoe International Airport will likely cause some GA aircraft to relocate to RTS. Comparable GA airports in proximity to RTS such as Truckee-Tahoe, Carson City, and Minden-Tahoe also have development constraints that will likely increase the market share at RTS. Truckee-Tahoe is surrounded by noise sensitive residential communities, and therefore has voluntary noise abatement procedures in effect. Carson City cannot obtain an Instrument Landing System (ILS) and recently could not obtain a Global Positioning System (GPS) approach. Both runways at Minden-Tahoe Airport have published gross weight limitations (30,000 pounds single wheel and 50,000 pounds dual wheel landing configurations). In addition, Minden-Tahoe has several voluntary noise abatement procedures in place. As these capacity and access challenges intensify at other airports in the future RTS, which has no such constraints, will play an ever-increasing role in serving the GA needs of the region.

As shown in Table 3-9**,** based aircraft are projected to increase at an average annual rate of 3.1 percent from 2006 to 2030, reaching 539 by the end of the planning period. The growth rate follows that of population plus influences of the local economy and potential increases in market share within the region.

Table 3-9. Selected Forecast of Based Aircraft

Year	Based Aircraft
Historical	
1990	209
1991	215
1992	219
1993	221
1994	225
1995	227
1996	228
1997	229
1998	230
1999	235
2000	241
2001	247
2002	249
2003	250
2004	255
2005	258
2006	261
Forecast	
2010	318
2015	356
2020	404
2025	464
2030	539
Average Annual Growth Rates	
1990-2006	1.4%
2006-2010	5.1%
2010-2015	2.3%
2015-2020	2.6%
2020-2025	2.8%
2025-2030	3.0%
2006-2030	3.1%

Sources: Reno Tahoe Airport Authority, Nevada Small Business Development Center, State of Nevada Demographer, Washoe County Consensus Forecast 2003-2025/2008-2030, Woods & Poole Economics, RTAA, and PBS&J, 2009.

3.7 FORECAST OF BASED AIRCRAFT – FLEET MIX

The forecast of based aircraft presented in **Table 3-9** was used to project the types of based aircraft (the fleet mix) that is expected at RTS. The current fleet mix (2006) was identified by aircraft class: single-engine piston, multi-engine piston, military (helicopters), civilian helicopters, turboprop, and jet aircraft. This information was sourced from RTS records and FAA Form 5010. The future fleet mix was projected by examining historical trends, available airport information, and national data for general aviation aircraft. As shown in **Table 3-10** the share of based single-engine aircraft are projected to increase throughout the planning period while the share of multi-engine aircraft at RTS is projected to decrease. The turboprop share of based aircraft is projected to remain relatively constant. Additionally, the share of based jet and helicopters at RTS is expected to increase during the planning period. These shares are consistent with the national GA industry trends described in Section 3.5. *The Master Plan for Nevada Army National Guard*, September 20, 2002 was reviewed to determine an estimate of growth for military based aircraft. Based military aircraft are projected to grow at an average annual rate of 3.2 percent from 2006 to 2030.

3.8 FORECAST OF AIRCRAFT OPERATIONS

The demand for general aviation facilities is typically expressed in terms of based aircraft, discussed in the previous section, and aircraft operations. The preparation of aviation operations forecasts is essential in assessing the needs and requirements for future aviation development and will serve as an overall planning guide for identifying airport capacity needs. The forecasts prepared in this section use 2006 as the baseline year, with projections extending to 2030 with the overall goal to provide the RTAA with reasonable aviation demand forecasts to assess the current and future capacities of RTS, as well as planning adjustments necessary to ensure that the facilities can meet the projected level of demand. The methodologies and underlying assumptions that are used to prepare the forecasts of aircraft operations for RTS are discussed in the following sections.

3.8.1 Total Operations

Forecasts of total operations were prepared using a ratio of aircraft operations to based aircraft from historical data. The OPBA is then applied to forecasts of based aircraft to develop estimates of future annual operations. This methodology is a common forecast technique because it directly links the aircraft to their average level of annual utilization at RTS.

As shown in **Table 3-11,** the historical OPBA has fluctuated since 1985 from a high of 306 to a low of 245. For the purposes of projecting future aircraft operations at the airport, it was assumed that the average of 1990-2006 estimated OPBA value of 273 is applied to the projected number of based aircraft. The number of total operations is projected to increase from 64,000 in 2006 to 147,148 in 2030, representing an average annual growth rate of 3.5 percent during the planning period.

Table 3-10. Forecast of Based Aircraft – Fleet Mix

Year	Single-Engine Piston	% of Total	Multi-Engine Piston	% of Total	Military	% of Total	Turbo Prop	% of Total	Jet	% of Total	Helicopter	% of Total	Total
2006	175	67.0%	23	8.8%	15	5.7%	2	.8%	19	7.3%	27	10.3%	261
Forecast													
2010	216	68.0%	23	7.3%	18	5.7%	2	.8%	25	7.6%	34	10.7%	318
2015	243	68.3%	23	6.6%	20	5.7%	3	.8%	28	7.8%	38	10.8%	356
2020	277	68.6%	23	5.7%	24	6.0%	3	.8%	33	8.0%	44	10.9%	404
2025	322	69.4%	22	4.7%	28	6.0%	4	.8%	37	8.1%	51	11.0%	464
2030	376	69.8%	22	4.1%	32	6.0%	4	.8%	45	8.3%	59	11.0%	539
Average Annual Growth Rates													
2006-2030	3.2%		-0.2%		3.3%		2.9%		3.7%		3.3%		3.1%

Source: FAA Form 5010, Airport Records and PBS&J, 2009.

Table 3-11. Forecast of Total Operations

Year	Based Aircraft	Total Operations	OPBA
Historical			
1985	93	43,400	251
1986	173	43,400	241
1987	169	60,000	306
1988	196	61,303	302
1989	203	60,000	293
1990	205	60,000	287
1991	181	60,000	279
1992	170	60,000	274
1993	170	65,000	294
1994	171	65,000	289
1995	216	65,000	286
1996	216	65,000	285
1997	216	65,000	284
1998	216	65,000	283
1999	216	65,000	277
2000	216	65,000	270
2001	231	65,000	263
2002	258	64,000	257
2003	261	65,000	260
2004	262	65,000	255
2005	262	64,000	248
2006	264	64,000	245
Forecast			
2010	318	86,813	273
2015	356	97,267	273
2020	404	110,317	273
2025	464	126,650	273
2030	539	147,178	273
Average Annual Growth Rates			
1985-2006	2.0%	1.9%	
2006-2030	3.1%	3.5%	

Sources: FAA Terminal Area Forecast, PBS&J, 2009.

3.8.2 Forecast of Itinerant and Local Operations

General aviation operations are classified as either local or itinerant. Local operations involve a take-off or landing performed by an aircraft that operates within sight of the airport or which executes simulated approaches or touch-an-go operations at the airport. Itinerant operations are those performed by aircraft with a specific origin or destination away from the airport. As shown in **Table 3-12**, the percentage of operations at RTS performed by itinerant aircraft has held constant at a range between 46.2 and 45.3 percent. For the purposes of this analysis, the 2006 percentage distribution of itinerant and local share of the total operations was held constant into the future at 45.3 percent and 54.7 percent, respectively.

Table 3-12. Forecast of Itinerant and Local Operations

Year	Itinerant Operations	Itinerant Share	Local Operations	Local Share	Total Operations
Historical					
1985	18,400	42.4%	25,000	57.6%	43,400
1986	18,400	42.4%	25,000	57.6%	43,400
1987	25,000	41.7%	35,000	58.3%	60,000
1988	25,336	41.3%	35,967	58.7%	61,303
1989	25,000	41.7%	35,000	58.3%	60,000
1990	25,000	41.7%	35,000	58.3%	60,000
1991	25,000	41.7%	35,000	58.3%	60,000
1992	25,000	41.7%	35,000	58.3%	60,000
1993	30,000	46.2%	35,000	53.8%	65,000
1994	30,000	46.2%	35,000	53.8%	65,000
1995	30,000	46.2%	35,000	53.8%	65,000
1996	30,000	46.2%	35,000	53.8%	65,000
1997	30,000	46.2%	35,000	53.8%	65,000
1998	30,000	46.2%	35,000	53.8%	65,000
1999	30,000	46.2%	35,000	53.8%	65,000
2000	30,000	46.2%	35,000	53.8%	65,000
2001	30,000	46.2%	35,000	53.8%	65,000
2002	29,000	45.3%	35,000	54.7%	64,000
2003	30,000	46.2%	35,000	53.8%	65,000
2004	30,000	46.2%	35,000	53.8%	65,000
2005	29,000	45.3%	35,000	54.7%	64,000
2006	29,000	45.3%	35,000	54.7%	64,000
Forecast					
2010	39,326	45.3%	47,487	54.7%	86,813
2015	44,062	45.3%	53,205	54.7%	97,267
2020	49,974	45.3%	60,343	54.7%	110,317
2025	57,372	45.3%	69,278	54.7%	126,650
2030	66,672	45.3%	80,506	54.7%	147,178
Average Annual Growth Rate					
1985-2006	2.2%		1.6%		1.9%
2006-2030	3.5%		3.5%		3.5%

Sources: FAA Terminal Area Forecast, PBS&J, 2009.

3.8.3 Forecast of Military Operations

Military operations are also an important factor in air traffic activity at RTS. The Army Aviation Support Facility of the Nevada Army Air Guard is based at RTS. Currently, the Nevada Army Air Guard has 14 helicopters and one fixed wing aircraft based at RTS. Historical and forecasted military operations identified in the FAA Terminal Area Forecasts show a constant 10,000 operations per year for military. *The Master Plan for the Nevada Army National Guard* was completed in September of 2002 and as part of the proposed facility expansion, there was a projection of based military aircraft from 2002 to 2020.

In projected future military operations, an OPBA methodology was also applied. With 10,000 operations and 15 based aircraft, the military yields 667 OPBA. **Table 3-13** provides the military operations forecast through the planning period. As shown, military operations are projected to increase from 10,000 in 2006 to approximately 21,300 by 2030, an average annual growth rate of 3.2 percent.

Table 3-13. Forecast of Military Operations

Year	Based Aircraft	Operations	OPBA
Historical			
2006	15	10,000	667
Forecast			
2010	18	12,006	667
2015	20	13,340	667
2020	24	16,008	667
2025	28	18,676	667
2030	32	21,344	667
Average Annual Growth Rate			
2006-2030		3.2%	

Sources: Master Plan for Nevada Army National Guard, September 30, 2002 and PBS&J, 2009.

3.9 ALTERNATIVE FORECASTS

To ensure that the forecasting process reasonably reflects likely activity levels at RTS in the future, the assumptions behind the preferred forecast were tested and an alternative forecast was prepared. Since RTS has a stable community of aviation users with no long-term constraint challenges or commercial operations, the only assumption that could affect the forecast is the discontinuation of the National Championship Air Races and Air Show held at RTS.

The 2006 acoustical traffic counter data was examined for operations that appeared to be specifically related to the National Championship Air Races and Air Show. In 2006 the National Championship Air Races and Air Show was held September 13-17, with activity at RTS showing a spike from September 10 through September 18. There is also a training and qualifications period in June (Pylon Racing School), which was identified as being June 16 through June 18 in 2006. It was found that, excluding the National Championship Air Races and Air Show periods (June 16-18, September 10-18), RTS averages 68 operations a day. During the National Championship Air Races and Air Show periods that average rises to 373 operations a day. Although RTS is closed to all other traffic during the event, it is assumed that if the National Championship Air Races and Air Show were not held, RTS would still have the annual average of 68 operations for each of the twelve days that make up the National Championship Air Races and Air Show periods. This alternative forecast subtracts out the operations that are above and beyond (incremental to) the daily average. As a result, there were a total of approximately 3,660 additional operations during the National Championship Air Races and Air Show periods. These operations that are identified as being additional and attributable to the National Championship Air Races and Air Show account for 5.72 percent of the total 2006 annual operations at RTS.

It is assumed that military and helicopter operations do not change based on the National Championship Air Races and Air Show. Therefore, in order to forecast the reduction in operations that would occur if the National Championship Air Races and Air Show were discontinued, all operations other than military and helicopter were reduced by 7.0 percent, which yields a total operations reduction of 5.72 percent. These reductions were applied to each of the forecast years. The reduced forecast is shown with the preferred forecast and the difference between the two on **Table 3-14**. Given this minor difference, no significant impact for facilities planning is expected from continuation or discontinuation of the National Championship Air Races and Air Show.

Table 3-14. Alternative Forecast of Total Annual Aircraft Operations

	Year	Itinerant	Local	Total
Operations	**Actual**			
	2006	29,000	35,000	64,000
	Forecast			
	2010	39,326	47,487	86,813
	2015	44,062	53,205	97,267
	2020	49,974	60,343	110,317
	2025	57,372	69,278	126,650
	2030	66,672	80,506	147,178
Without National Championship Air Races and Air Show	2010	37,077	44,770	81,847
	2015	41,542	50,162	91,703
	2020	47,115	56,892	104,007
	2025	54,091	65,315	119,406
	2030	62,858	75,901	138,759
Difference	2010	(2,249)	(2,716)	(4,966)
	2015	(2,520)	(3,043)	(5,564)
	2020	(2,858)	(3,452)	(6,310)
	2025	(3,282)	(3,963)	(7,244)
	2030	(3,814)	(4,605)	(8,419)

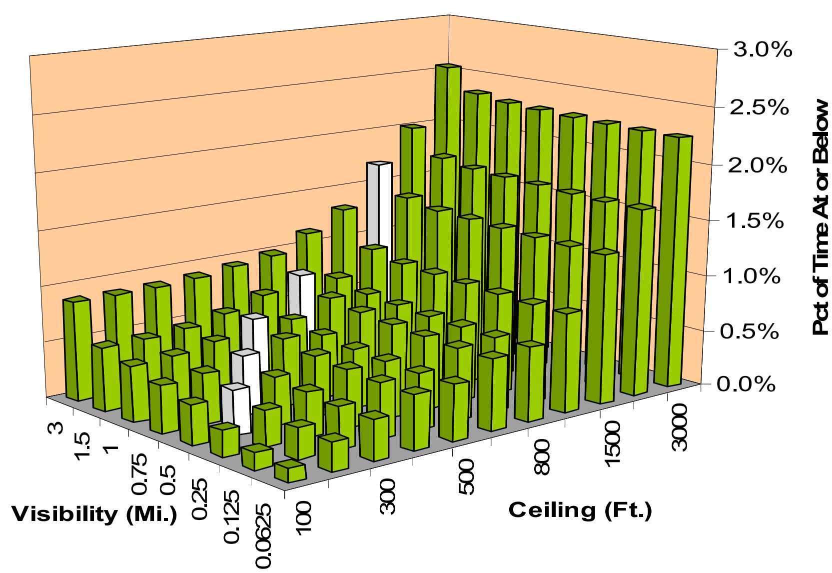
Source: PBS&J, 2009.

3.10 FORECAST OF INSTRUMENT OPERATIONS

As described in Chapter 2, an Instrument Landing System (ILS) has been installed on Runway 14-32 and was certified and operational starting in July 2009. In order to develop a forecast of the expected ILS operations at RTS now that the system is online, two factors were considered. The first factor was the number of ILS operations based on weather related events where weather conditions necessitated the use of the ILS. To calculate this portion of ILS operations demand, the FAA's Benefit-Cost Analysis model was referenced. This model is used in the funding approval process and includes historical weather data specific to each airport and standard assumptions on visibility and ceiling minima; this allows the model to calculate expected ILS usage at an airport. The second factor in the development of the forecast of ILS operations is the number of training operations that will likely use ILS facilities. The calculation of this portion of the ILS operations forecast was adapted from the ILS Environmental Assessment (ILS EA) which was recently completed.

Figure 3-6 shows the model's calculation of extrapolated weather distribution for RTS. This extrapolation shows that weather conditions would require use of the ILS for approximately 2.25 percent of the time. Without any other contradictory data, it was determined that it would be reasonable to expect 2.25 percent of forecasted operations to operate using the ILS. This forecast of weather related ILS operations is presented on **Table 3-15.**

Figure 3-6. Extrapolated Weather Distribution for Reno-Stead



Source: FAA's Instrument Landing System Cost-Benefit Model.

In addition to the weather related ILS operations, approximately 8.0 percent of total operations are expected to use the ILS system for training purposes. The ILS EA had estimated 10.0 of the total operations would utilize the ILS system, and this report calculated 2.25 percent of total operations as ILS weather related and approximately 8.0 percent of total operations as ILS training related operations. The ILS training operations and total ILS operations are shown in **Table 3-15**.

Table 3-15. Forecast of Total ILS Operations

Year	Total Operations	ILS Weather Related Operations	ILS Training Operations	Total ILS Operations
Historical				
2006	64,000			
Forecast				
2010	86,813	1,953	6,945	8,898
2015	97,267	2,189	7,781	9,970
2020	110,317	2,482	8,825	11,307
2025	126,650	2,850	10,132	12,982
2030	147,178	3,312	11,774	15,086

Notes: ILS system came online July 2009.
Sources: Final Environmental Assessment for Instrument Landing System and Approach Lighting System for Runway 32 at Reno-Stead Airport, December 2005 and PBS&J, 2009.

3.11 FORECAST OF PEAK OPERATIONS – MONTH, DAY AND YEAR

Many of the facility planning requirement calculations that will be presented in subsequent chapters are based on accommodating peak periods of activity. Peaking characteristics are usually defined as peak month, average day of the peak month, and peak hour activity.

The FAA defines the theoretical “peak-hour operations” as the total number of aircraft operations expected to occur at an airport, averaged for two adjacent peak hours of a typical peak time. Peaking characteristics are determined from peak monthly activity, average daily activity within the peak month and then estimating the peak hourly activity within the Average Day Peak Month (ADPM).

The first step in this process is to identify RTS’s peak month. Actual historical data is unavailable, however, based on conversations with airport staff and tenants, the summer months of June, July and August are identified as the busiest months. Experience at other general aviation airports without air traffic control towers has shown that approximately 12 percent of total annual operations occur during the peak month. This factor was applied to estimate the peak month total operations at RTS. As shown on **Table 3-16**, approximately 9,600 operations likely occurred during RTS’s peak month in 2006. By 2030 the peak month operations are expected to total approximately 22,077.

As the number of days in a month varies throughout the year, typically 30.42 is used to represent the average number of days in a month. The peak month operations are divided by the average number of days in a month in order to calculate an airport’s ADPM, as represented by the following equation: Average Day = (Peak month/ 30.42 days). RTS’s ADPM operations were approximately 316 in 2006 and are expected to increase to 726 in 2030.

The peak hour is the busiest hour during the average day of the peak month. Typically between 10 and 20 percent of the daily activity occurs during the peak hour at general aviation airports. This report uses 15 percent of the ADPM for the peak hour. As shown on Table 3-16, the peak hour operations in 2006 were 47 and are expected to increase to 109 by 2030.

It is important to remember that these calculations are for planning purposes only and represent totals used in FAA approved planning procedures. It is acceptable and probably likely that the peak hour, day, and month calculations do not exactly match actual conditions.

Table 3-16. Forecast of Peak Operations

Year	Total Operations	Peak Month Operations	Average Day Operations	Peak Hour Operations
Historical				
2006	64,000	9,600	316	47
Forecast				
2010	86,813	13,022	428	64
2015	97,267	14,590	480	72
2020	110,317	16,548	544	82
2025	126,650	18,998	625	94
2030	147,178	22,077	726	109

Source: PBS&J, 2009.

3.12 FORECAST OF FUEL FLOWAGE

An additional consideration in facility requirements planning is preparation of projected fuel flowage demand, measured in gallons, which is used to size the facilities necessary to meet that demand. Current fuel flowage estimates come from RTS records and are divided into two classes of fuel: Jet-A and 100 Low Lead (LL).

Estimates of fuel flowage were developed by taking the 2006 fuel flowage for Jet-A and 100LL and multiplying them by the growth rates for jet aircraft and non-jet aircraft respectively. This is an estimate of the level of fuel flowage and obviously depends on factors such as whether fuel is purchased locally or at other locations, increasing/decreasing fuel efficiency, greater/lesser intensity of aircraft use, average length of trip, etc. The fuel flowage forecast is shown in **Table 3-17**.

3.13 FORECAST SUMMARY

Table 3-18 presents the forecast summary for RTS using the forecasts of aviation activity developed in this chapter. These forecasts will be used in later sections to develop the demand/capacity analysis and facility requirements for RTS out to 2030.

Table 3-17. Forecast of Fuel Flowage (in Gallons)

Year	Jet Operations	Jet-A Fuel (gal)	Jet-A per operation (gal)	Non-Jet Operations	100LL Fuel (gal)	100LL per operation (gal)
Historical						
2006	4,672	190,638	40	59,328	157,401	3
Forecast						
2010	7,379	295,160	40	79,434	238,302	3
2015	8,851	354,040	40	88,416	265,248	3
2020	10,258	410,320	40	100,058	300,174	3
2025	11,905	476,200	40	114,745	344,235	3
2030	14,129	565,160	40	133,049	399,147	3

Source: Aviation Classics, LTD and PBS&J, 2009.

Table 3-18. Summary of Forecast Activity

	Base Year	Forecasts				
	2006	2010	2015	2020	2025	2030
Based Aircraft						
Single-Engine Piston	175	216	243	277	322	376
Multi-Engine Piston	23	23	23	23	22	22
Military	15	18	20	24	28	32
Turboprop	2	2	3	3	4	4
Jet	19	25	28	33	37	45
Helicopter	27	34	38	44	51	59
Total	261	318	356	404	464	539
Aircraft Operations						
Local Operations	35,000	47,487	53,205	60,343	69,278	80,506
Itinerant	29,000	39,326	44,062	49,974	57,372	66,672
Total	64,000	86,813	97,267	110,317	126,650	147,178
ILS Operations						
Weather Related	see note	1,953	2,189	2,482	2,850	3,312
Training Related	see note	6,945	7,781	8,825	10,132	11,774
Total		8,898	9,970	11,307	12,982	15,086
Peak Level Operations						
ADPM	316	428	480	544	625	726
ADPM Peak Hour	47	64	72	82	94	109
Annual Fuel Flowage (gallons)						
Jet A	190,638	295,160	354,040	410,320	476,200	565,160
100LL	157,401	238,302	265,248	300,174	344,235	399,147
Total	348,039	533,462	619,288	710,494	820,435	964,307

Note: ILS online July 2008.
Source: PBS&J, 2009.