CARSON CITY AIRPORT

AIRPORT MASTER PLAN

FINAL

AIRPORT MASTER PLAN

For

CARSON CITY AIRPORT
Carson City, Nevada

Prepared for

The Carson City Airport Authority

By

Coffman Associates, Inc.

December 2020

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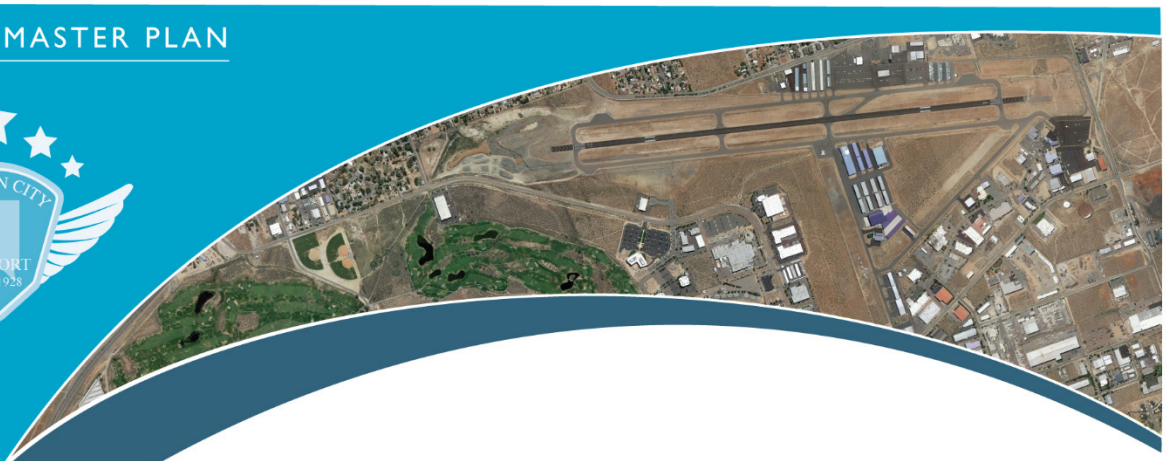
INTRODUCTION



INTRODUCTION

An Airport Master Plan is an evaluation of an airport's aviation demand and an overview of the development that will best meet those demands. The Master Plan establishes development objectives and provides for a 20-year planning period. The process entails development of rationale for various study elements to include airfield configuration, facility development, land use recommendations, and support facilities. It also serves as a strategic tool for establishing airport improvement priorities and obtaining federal and state funding assistance.

Carson City Airport (CXP) is owned and operated by the Carson City Airport Authority. The Airport Master Plan has been undertaken to evaluate the airport's capabilities and role, to forecast future aviation demand, and to plan for the timely development of new or expanded facilities that may be required to meet projected demand. The ultimate goal of the Master Plan is to provide guidelines for the airport's overall maintenance, development, and operation in an environmentally and fiscally responsible manner while adhering to appropriate safety design standards.

The Federal Aviation Administration (FAA) recommends that airports update their long-term planning documents every seven to ten years, or as necessary, to address local changes at the airport. This document will serve an Airport Master Plan Update for the airport. The preparation of this Master Plan is necessary as a timely reassessment of the development direction of CXP that will meet the needs of a dynamic local economy, robust aviation demand including multiple fixed base operators (FBOs), and an ever-changing air transportation industry in general.

The preparation of this Master Plan is evidence that the decision-makers of Carson City Airport Authority recognize the importance of air transportation to the community, as well as the unique challenges operating an airport presents. The investment in an airport yields many benefits to the community and the region. With a sound and realistic Master Plan, CXP will remain an important link to the national air transportation system for the community and maintain the existing public and private investments in its facilities.

STUDY OVERVIEW

Carson City Airport Authority is responsible for funding capital improvements at the airport and obtaining FAA and Nevada Department of Transportation – Aviation Planning Section (NDOT) development grants. In addition, the Authority oversees facility enhancements and infrastructure development conducted by private entities at the airport. The Master Plan is intended to provide guidance for future development and justification for projects for which the airport may receive funding participation through FAA and NDOT airport improvement programs.

Following a systematic approach outlined by the FAA, the Master Plan identifies, and then plans for, future facility needs well in advance of the actual need for the improvements. This is done to ensure that Carson City Airport Authority can coordinate environmental reviews, project approvals, design, financing, and construction to minimize the detrimental effects of maintaining and operating inadequate or inefficient facilities. The output from the master planning process is a recommended development concept which outlines the proposed uses for all areas of airport property, including areas which may be required for environmental mitigation/preservation.

Carson City Airport Authority has contracted with Atkins North America and Coffman Associates, Inc. to undertake the Master Plan. The Airport Master Plan is prepared in accordance with FAA requirements, including Advisory Circular (AC) 150/5300-13A, *Airport Design*, and AC 150/5070-6B, *Airport Master Plans*. The scope of services, budget, and schedule has been approved by the Carson City Airport Authority, following review by the FAA and NDOT.

MASTER PLAN GOALS AND OBJECTIVES

The overall objective of the Airport Master Plan is to provide Carson City Airport Authority with guidance for future development of the airport and meeting the needs of existing and future users, while also being compatible with area development, other transportation modes, and the environment. Accomplishing this objective requires an evaluation of the existing airport to decide what actions should be taken to maintain a safe, adequate, and reliable airport facility. The completed Airport Master Plan will produce a development concept which will provide airport officials with a program for future capital needs to aid in planning, scheduling, and budgeting.

While an Airport Master Plan must be developed according to FAA requirements, it can also be prepared in a manner which makes it useful in strategic planning for the airport. The FAA requires specific elements within a Master Plan. The elements, to be detailed in the following section, are guidelines which allow for a systematic and technical approach to reach the final recommended plan.

This Master Plan will provide a vision for the airport covering the next 20 years. With this vision, the Carson City Airport Authority will have advance notice of potential future airport funding needs so that appropriate steps can be taken to ensure that adequate funds are budgeted and planned.

The specific goals to be considered in the Master Plan include:

- Research and evaluate socioeconomic factors likely to affect the air transportation demand in the region.
- Reflect the goals and visions of the surrounding area, especially those related to quality of life, business and development, and land use. Specific land use areas of interest include unowned airport property on the western side of the airfield.
- Define current and future aviation demand.
- Analysis of existing and future airfield design parameters to meet existing and forecasted demand, including a runway length analysis that will identify a runway length that could allow jet aircraft to operate with greater payloads.
- Determine the projected facility and hangar needs of airport users, which are further supported by airport development alternatives.
- Recommend improvements that will enhance the airport's safety capabilities to the maximum extent possible.
- Produce current and accurate airport base maps and updated airport layout plan (ALP) drawings.
- Establish a schedule of development priorities and a program for the improvements proposed in the Master Plan.
- Prioritize the airport's capital improvement program (CIP) and develop a detailed financial plan.
- Develop the required level of environmental documentation for approval of the new Master Plan.
- Coordinate this Master Plan with local, state, and federal agencies.

MASTER PLAN ISSUES

The Master Plan specifically addresses the following issues:

- Assist the City, through the Planning Advisory Committee (PAC), in determining a long-term vision for the Airport.
- Conduct a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis identifying strengths, weaknesses, realistic markets, goals, resources, and a strategy to move forward. This analysis will factor the strengths and weaknesses of the airport to include physical and operational features.
- Prepare a detailed evaluation of existing and future general aviation aircraft and passenger demand for the airport.
- Based on the realistic evaluation of the facility in terms of configuration, condition, amenities, location, competition, and forecasted aviation demand, establish goals and priorities for the airport to meet that vision.
- Identify airfield alternatives based on goals and opportunities, as well as FAA applicable design standards. The analysis will include an evaluation of the airfield geometry to address potential runway incursion hot spots and non-standard conditions.
- Provide a landside development plan that identifies areas for accommodating the forecasted growth of aviation and aviation-related businesses and, if appropriate, areas for non-aviation revenue-producing opportunities. Consideration will be given to the potential for new or expanded aviation facilities, including, but not limited to, passenger terminal facilities, aircraft storage hangar capacity and ramp capacity, and airport support facilities.
- Assess compatible land use in the vicinity of the airport.
- Prioritize preservation and rehabilitation recommendations in order of greatest overall positive impact.

BASELINE ASSUMPTIONS

The Master Plan typically requires baseline assumptions that will be used throughout the analysis. The baseline assumptions identified for this study include:

- The airport will continue to operate as a publicly owned general aviation reliever airport through the planning period.

- The airport will continue to serve general aviation and corporate business aviation-based tenants, as well as other itinerant operators.

- The aviation industry on the national level will grow as forecast by the FAA in its annual *Aerospace Forecasts*.

- The socioeconomic characteristics of the region will grow as forecast by local, regional, and national agencies.

- A federal and state airport improvement program will be in place through the planning period to assist in funding future capital development needs.

MASTER PLAN PROCESS

The Master Plan is being prepared in a systematic fashion following FAA guidelines and industry-accepted principles and practices. **Exhibit iA** depicts the elements and process involved in the study.

Element 1 – Study Initiation includes the development of the scope of services, budget, and schedule. A Public Advisory Committee (PAC) is also formed and study material will be assembled in a workbook format. General background information will be established that will include outlining the goals and objectives to be accomplished during the Master Plan.

Element 2 – Inventory summarizes the existing conditions at the airport. The inventory efforts are focused on collecting and assembling relevant data pertaining to the airport and the area it serves. Information is collected on existing airfield, landside, and support facilities and operations. Local economic and demographic data is collected to define the local growth trends. A review of existing environmental documentation pertaining to the airport is also included. Planning studies which may have relevance to the Master Plan are also collected and reviewed.

Element 3 – Forecasts examines the potential aviation demand at the airport. The analysis utilizes local socioeconomic information, as well as national and regional air transportation trends, to quantify the levels of aviation activity which can reasonably be expected to occur at the airport. Demand forecasts for general aviation, air taxi, and military activity are provided for five, ten, and 20-year planning periods. The results of this effort are used to determine the types and sizes of facilities which would be required to meet the projected aviation demand at the airport through the long-term planning period.

Element 4 – Facility Requirements converts aviation demand needs into types and volumes of actual physical facilities required to meet existing and forecast demands in aviation activity and identify short-term corrective strategies for problems that demand immediate attention.

Element 5 – Airport Alternatives considers a variety of solutions to accommodate the projected facility needs identified in previous chapters. This chapter proposes various facility and site plan configurations

PROJECT WORK ELEMENTS

PAC #1

INVENTORY

- Airport facilities
- Airspace and air traffic control
- Area socioeconomic data
- Local planning and land use
- Airport access and parking, utilities, and aerial photography

WP

FORECASTS

- Based aircraft and fleet mix
- Annual operations
- Other Aviation Activity

WP

KEY:

PAC - Planning Advisory Committee

PIW - Public Information Workshop

WP - Working Paper

FACILITY REQUIREMENTS

- Taxiways
- Airfield capacity
- Hangar facilities
- Design categories
- Runway length and strength
- Support facilities
- Terminal building
- Aprons
- Navigational aids

WP

PAC #2 PIW #1

AIRPORT ALTERNATIVES

- Evaluate development scenarios (airside, landside, support)

WP

PAC #3 PIW #2

RECOMMENDED MASTER PLAN CONCEPT/ ENVIRONMENTAL REVIEW

- Detailed master plan facility and land use plans
- Review evaluation of NEPA environmental categories
- Noise exposure

WP

FINANCIAL PLAN/CAPITAL IMPROVEMENTS

- Airport Development schedule
- Cost estimates
- Funding sources

WP

PAC #4 PIW #3

AIRPORT LAYOUT PLANS/LAND USE COMPATIBILITY

- Airport layout plan
- Landside drawing
- Recycling plan
- Airspace/approach drawings
- On-airport land use plan
- Property map
- Land use plan

FINAL DOCUMENTATION/DELIVERABLES

- Draft Master Plan Report
- Master Plan/ALP Approvals
- Final Master Plan Report
- Electronic Documentation

Exhibit iA
PROJECT WORK FLOW

which can meet the projected facility needs for both the airfield and landside. An analysis is completed to identify the strengths and weaknesses of each proposed alternative, with the intention of determining a single, preferred conceptual plan.

Element 6 – Recommended Master Plan Concept and Capital Financial Plan provides both a graphic and narrative description of the recommended development plan for the use, development, and operation of the airport. The capital program focuses on the capital needs program which defines the schedules, costs, and funding sources for the recommended capital projects. A detailed CIP is included in this chapter. The Master Plan then evaluates the potential funding sources to analyze financial strategies for successful implementation of the plan.

Element 7 – Airport Layout Plans are developed to depict existing and proposed facilities and provides the official ALP drawings that are produced as a result of the recommended development plan. These drawings are used by the FAA and NDOT in determining grant eligibility and funding.

Element 8 – Environmental Evaluation analyzes potential environmental impacts generated by the recommended development program for the airport.

Element 9 – Public Coordination and Communication provides opportunities to inform the public on the Master Plan process. Working papers are prepared at various milestones in the planning process. A series of PAC meetings and Public Information Workshops are also planned during the process to discuss study findings. A project website is also developed to aid in disseminating information related to the Master Plan.

Element 10 – Final Reports and Approvals provides documents which depict all findings of the study effort and present the study and its recommendations to appropriate local organizations.

Appendix A – Glossary of Terms includes definitions and acronyms referenced throughout the Master Plan document.

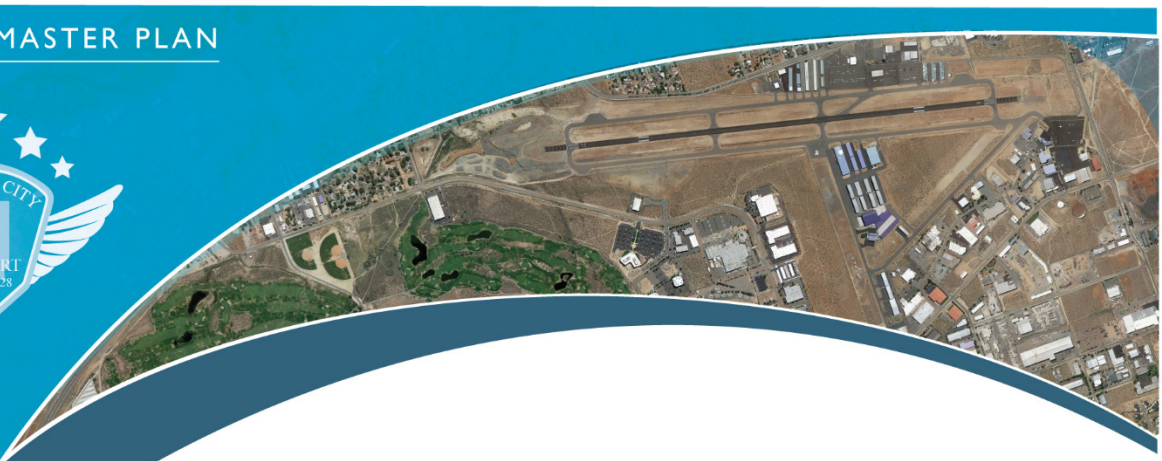
Appendix B – Airport Layout Plans provides the official ALP drawings that are produced as a result of the recommended Master Plan Concept and used by the FAA and NDOT in determining grant eligibility and funding.

STUDY COORDINATION

The airport is of interest to many stakeholders within the surrounding area, including local citizens, community organizations, airport users, area-wide planning agencies, and aviation organizations. A cross-section of community members and aviation interest groups with a vested interest in the airport has been identified to act in an advisory role in the development of the Master Plan. Members of this PAC will review material and provide comments throughout the study to help ensure that a realistic, viable plan is developed. Draft phase reports and other information related to the Master Plan are made available online via a website dedicated to the study at: carsoncity.airportstudy.com.

CHAPTER ONE

INVENTORY



CHAPTER ONE

INVENTORY

The inventory chapter of existing conditions is the initial step in the preparation of the Carson City Airport (CXP) Master Plan. The inventory will serve as an overview of the airport's physical and operational features, including facilities, users, and activity levels, as well as specific information related to the airspace, air traffic activity, and role of the airport. Additionally, a summary of socioeconomic characteristics and review of existing environmental conditions on and adjacent to the airport are detailed, which will provide further input into the study process.

Information provided in Chapter One serves as the baseline for the remainder of the Master Plan, which is compiled using a wide variety of resources, including: applicable planning documents; on-site visits; interviews with airport staff, tenants, and users; aerial and ground photography; federal, state and local publications; and project record drawings. Specific sources include those listed below. Note that environmental resources are detailed at the end of this chapter.

REGIONAL SETTING

Carson City Airport is located in the State Capital of Nevada, Carson City. The "Consolidated Municipality of Carson City" was established in 1969, when Ormsby County and the City of Carson City consolidated. The City is a combined city-county municipality. Carson City County is the fourth largest county in Nevada with approximately 56,000 residents. It is approximately 20 miles from the Reno-Tahoe International Airport and 14 miles east of Lake Tahoe. Both Lake Tahoe and Reno, NV are famous tourist destinations and impact the greater Carson City economy.

AIRPORT ENTRANCE SIGN

As of 2017, the Carson City Metropolitan Statistical Area (MSA) had an estimated 56,000 residents. The Carson City MSA is the smallest of all 366 MSAs in the United States. Additionally, the Reno-Carson City-Fernley Combined Statistical Area had a population of 579,668 according to the 2010 census.

AIRPORT LOCATION

The airport is located within the 157 square mile boundaries of Carson City. The airport is situated at an elevation of 4,704 feet mean sea level (MSL) three miles northeast from the City's central business district in the northeastern quadrant of the County. Airport property consists of approximately 531 acres. **Exhibit 1A** depicts Carson City in its regional and national setting.

REGIONAL ACCESS, CIRCULATION AND PARKING

The airport can be accessed by multiple major thoroughfares. Since the previous Master Plan, U.S. Interstate 580 was completed and now directly and continuously links U.S. Highway 395 from I-80 in Reno with U.S. Highway 50 near the southern boundary of Carson City. U.S. Highways 395 and 50 bisect the city. Highway 395 runs north-south and connects the area to U.S. Interstate 80 north of the city. Highway 50 runs east-west and connects the area to Utah and California. **Exhibit 1B** offers an overview of the roadway system in and around CXP.

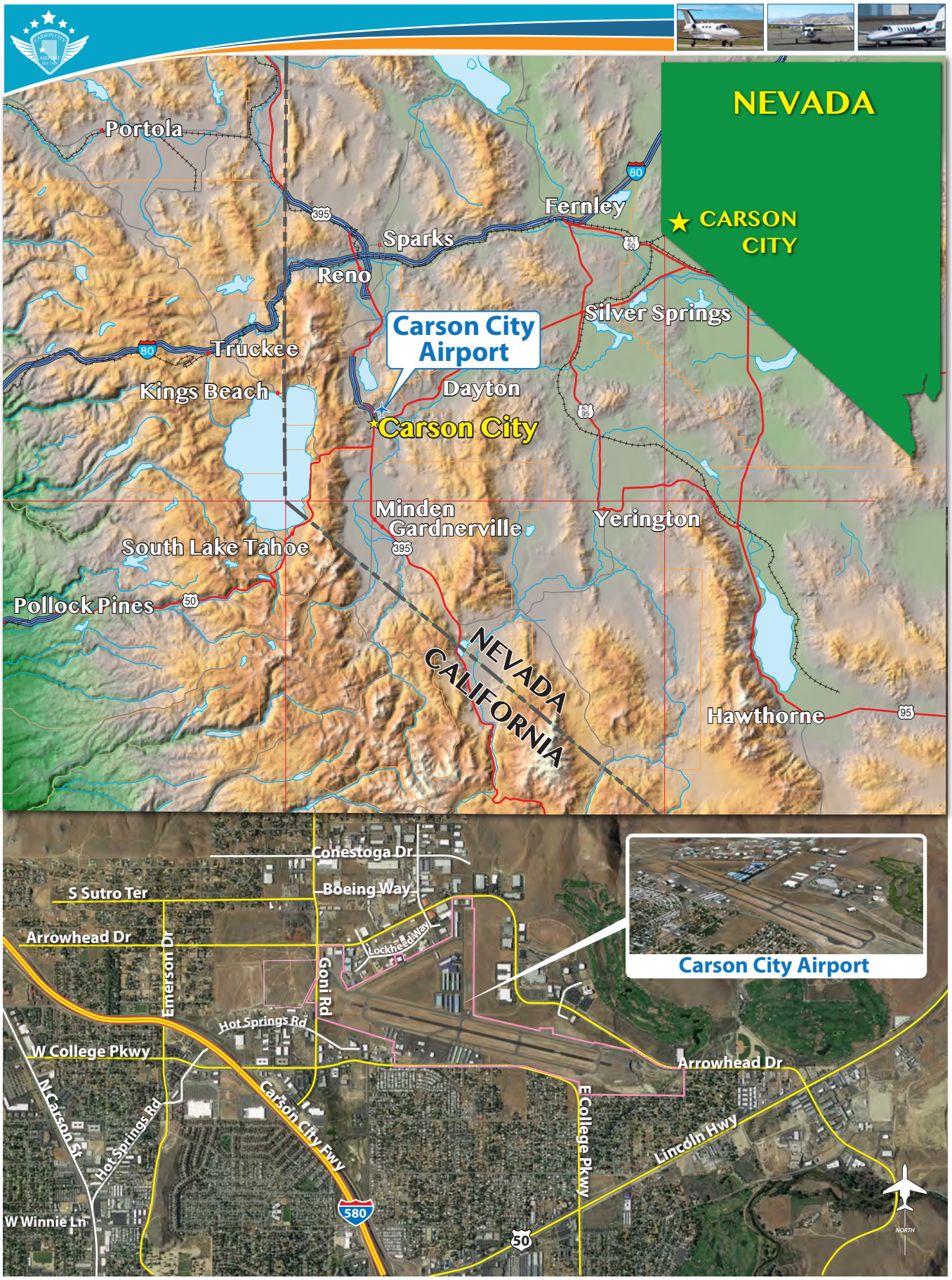


Exhibit 1A
LOCATION/VICINITY MAP

PUBLIC TRANSIT ACCESS

Jumping Around Carson City (JAC) is Carson City's public transit system serving the community with a fleet of buses. JAC began operations in October 2005 and is governed by the Carson City Regional Transportation Commission. The JAC system features a fixed route system as well as JAC Assist, a curb-to-curb program that offers transportation for disabled passengers.

Currently, airport access via JAC is limited but in place via the 2A and 2B stops on East College Parkway. As demand increases, stops and access points could develop and provide additional throughput for the airport.

BICYCLE AND PEDESTRIAN FACILITIES

On April 6, 2006, the Carson City Board of Supervisors adopted the Unified Pathways Master Plan. The Carson City Parks & Recreation Department is seeking to incorporate the Carson River Aquatic Trail Master Plan into the Unified Pathways Master Plan. Currently, there are no facilities on airport property.

LAND USE AND ZONING

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

Carson City categorizes land use into various designations. **Exhibits 1C and 1D** depict existing land uses and zoning for the areas around the airport. Several commercial and light industrial land uses are found along the northern and eastern boundaries of the airport. Residential developments are scattered around the airport, with the heaviest concentrations to the south. The airport industrial park is located to the north. Just east of the approach end of Runway 27 is Cinderlite, a mining operation on airport property.

HEIGHT AND HAZARD PROTECTION

Title 16 of the Carson City Municipal Code provides guidance on height and hazard protection of Carson City. Title 16 integrates Federal Aviation Regulations (F.A.R.) Part 77 imaginary surfaces. In doing so, Title 16 seeks to protect the airspace directly surrounding the airport from structures that could penetrate surfaces and increase risk levels to approach and departing aircraft. Title 16, section 02.040, clearly states that no church, school, theater, drive-in theater, racetrack or similar public assembly shall be permitted within:

1) One-quarter mile from the side of Part 77 surfaces laterally thereto.

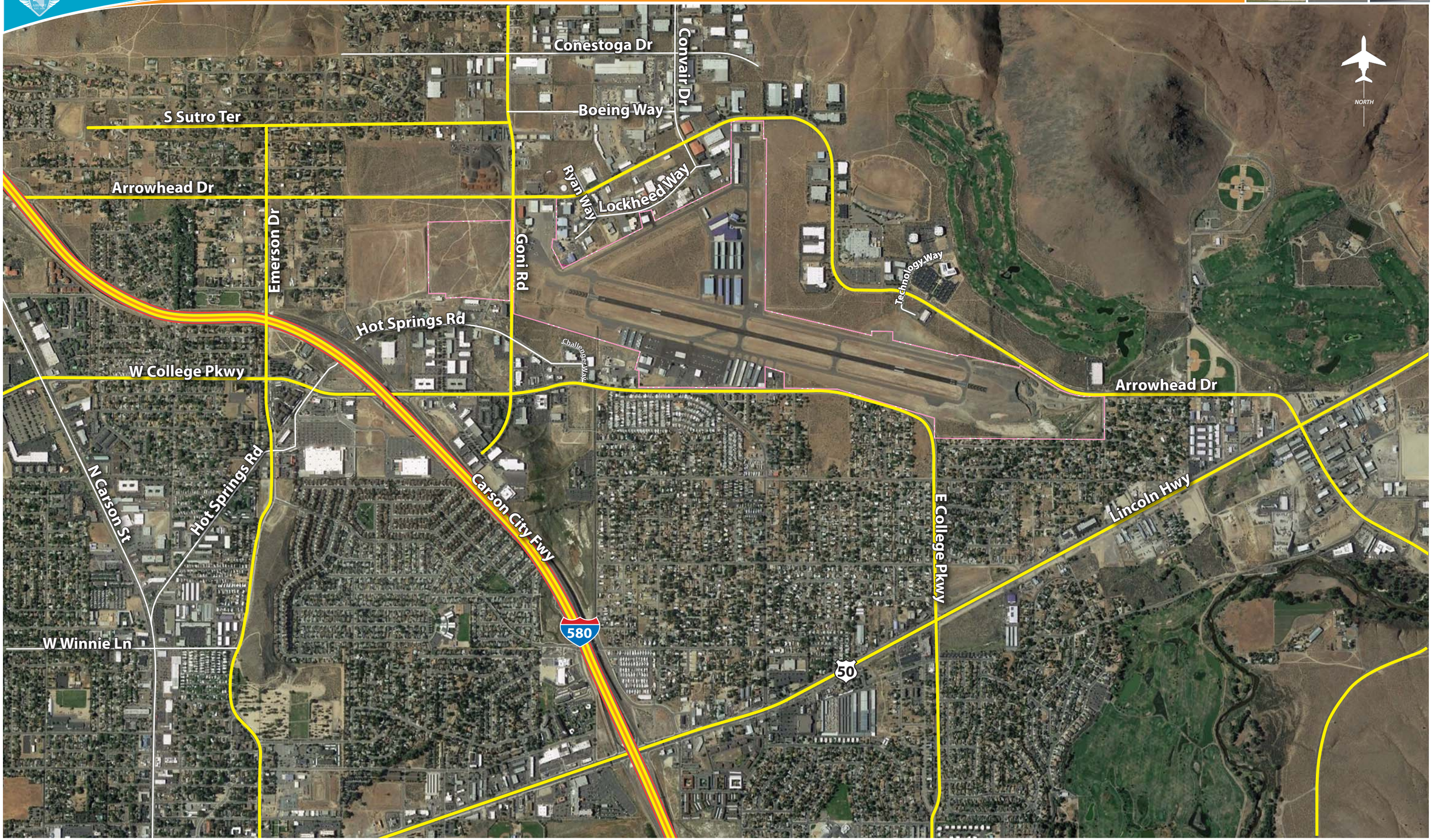
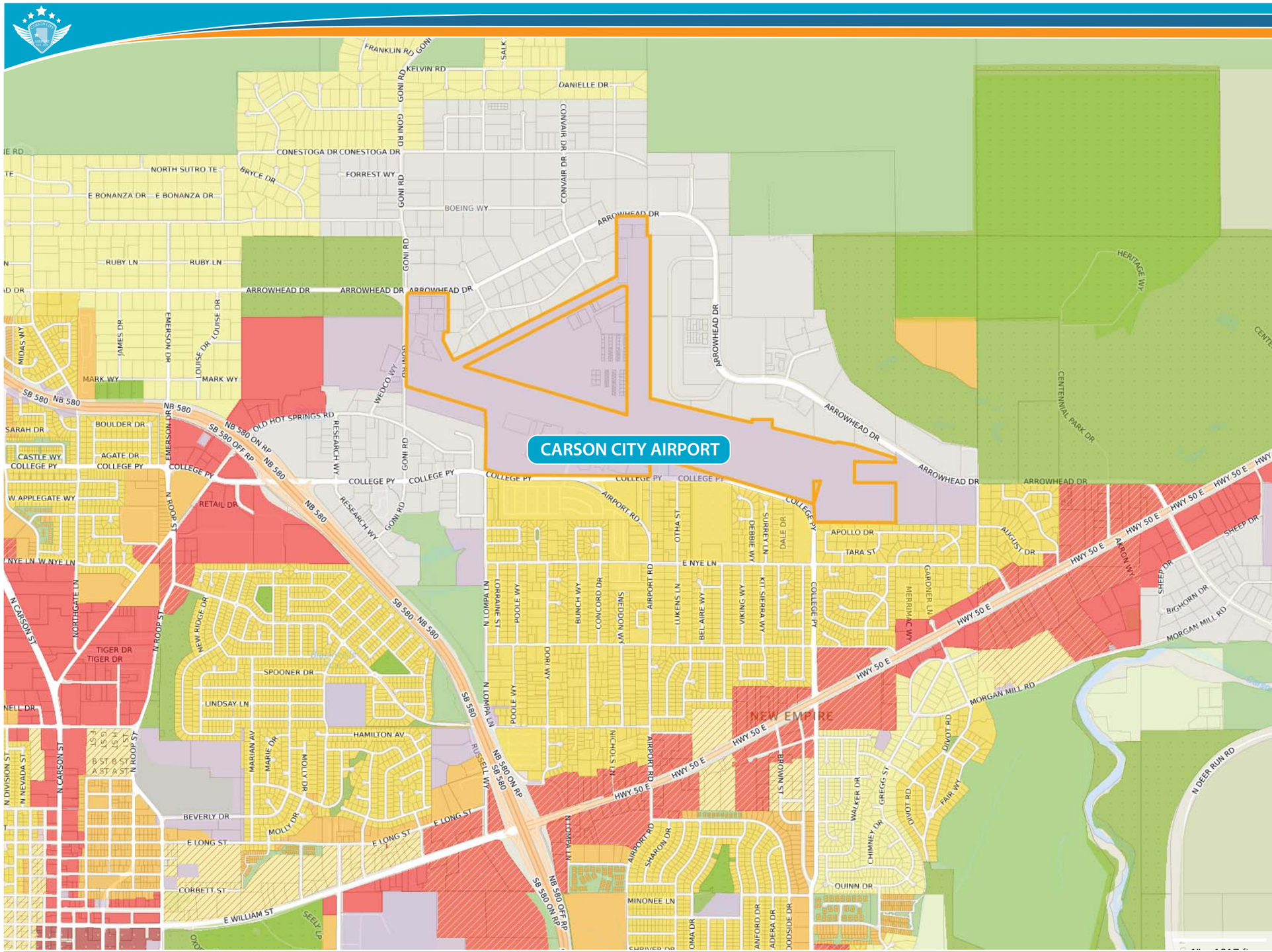


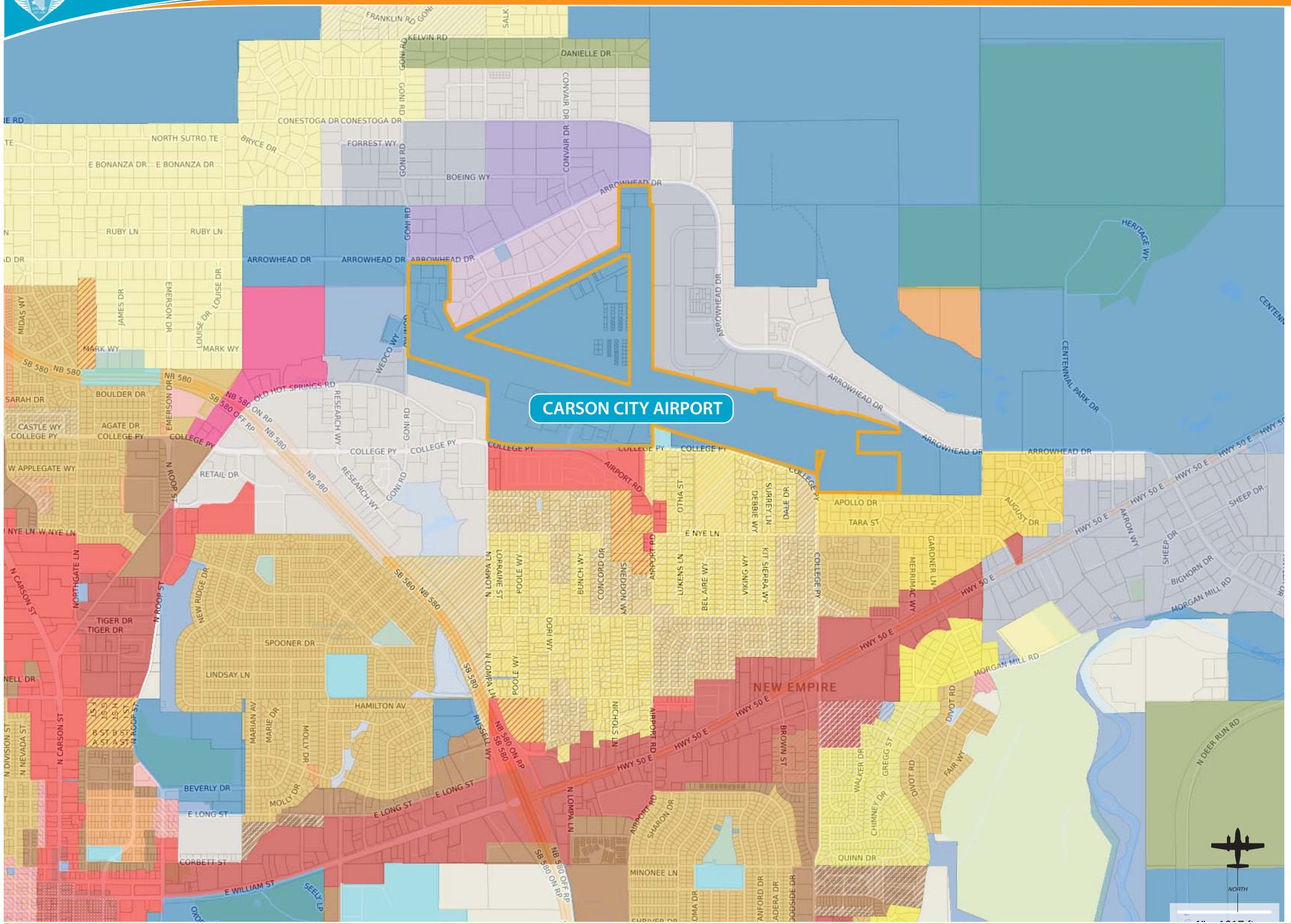
Exhibit 1B
CARSON CITY AIRPORT NEARBY ROADS



LEGEND

- Community/Regional Commercial
- Neighborhood Commercial
- Industrial
- Rural Residential (5-20 ac/du)
- Low Density Residential (0.2-3 du/ac or 5-0.33 ac/du)
- Medium Density Residential (3-8 du/ac)
- High Density Residential (8-36 du/ac)
- Public/Quasi-Public
- Washoe Tribe
- Office
- Vacant Private Land
- Conservation Reserve (Private)
- Downtown Mixed-Use
- Mixed-Use Commercial
- Mixed-Use Residential
- Mixed-Use Employment
- Public Conservation
- Open Space
- Parks & Recreation

SOURCE: Carson City GIS



LEGEND

- Agriculture
- Airport Industrial Park
- Conservation Reserve
- General Commercial
- General Industrial
- General Industrial Airport
- General Office
- Limited Industrial
- Multi-Family Apartments
- Multi-Family apartments PUD
- Multi-Family Apartment SPA
- Multi-Family Duplex
- Multi-Family Duplex PUD
- Mobilehome - 6,000 sf
- Mobilehome - 6,000 sf PUD
- Mobilehome - 12,000 sf
- Mobilehome - 1ac
- Mobilehome Park
- Neighborhood Business
- Neighborhood Business PUD
- Public
- Public Community
- Public Community PUD
- Public Neighborhood
- Public Neighborhood PUD
- Public Regional
- Retail Commercial
- Retail Commercial PUD
- Residential Office
- Residential Office PUD
- Single Family - 6,000 sf
- Single Family - 6,000 sf PUD
- Single Family - 6,000 sf SPA
- Single Family - 12,000 sf
- Single Family - 12,000 sf
- Single Family - 21,000 sf
- Single Family - 21,000 sf PUD
- Single Family - 1 ac
- Single Family - 1 ac PUD
- Single Family - 2 ac
- Single Family - 2 ac PUD
- Single Family - 5 ac

SOURCE: Carson City GIS

Exhibit 1D
ZONING MAP

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2) One-half mile from the end of any runway; this restricted area shall extend in width one-quarter mile on both sides of the extended centerline.

Furthermore, Title 16 bans any and all new airports from being developed within an eight-mile radius of CXP; however, exceptions may be granted by the board upon receipt of proper application, but only after a public hearing.

REGIONAL CLIMATE

Weather conditions are important to the planning and development of an airport. Temperature is an essential factor in determining runway length requirements, while wind direction and speed are used to determine optimum runway orientation. The need for navigational aids and lighting is determined by the percentage of time that visibility is impaired due to cloud coverage or other conditions.

Summers in Carson City are warm, with an average high temperature in July of 90 degrees Fahrenheit (F). The climate is a high-desert climate, so while cooler than other parts of the state, the average low temperatures are still above average throughout the year. Due to its location and elevation, Carson City does experience snowfall in the winter months. According to the Koppen climate classification system, Carson City has a Dry-Summer Sub Tropical climate.

The area receives 9.73 inches of precipitation during an average year, with the largest monthly share being in February with 1.63 inches. Subsequently, the month with the least amount of precipitation is July with an average of 0.18 inches. On average, precipitation falls only 48 days of the year, with the majority occurring in January and February (7 days) and the least occurring in July (2 days).

Table 1A lists common climate data for Carson City, Nevada. Information pertaining to temperature and precipitation was obtained from the National Oceanic and Atmospheric Administration (NOAA).

TABLE 1A
Common Weather Data for Carson City, NV

Period	Avg. Precip. (in.)	Avg. Daily High (F)	Avg. Daily Low Temp. (F)
January	1.56	45	22
February	1.63	50	25
March	1.12	57	30
April	0.45	63	34
May	0.44	71	41
June	0.44	81	47
July	0.18	90	52
August	0.23	88	51
September	0.4	80	43
October	0.69	68	35
November	1.24	54	27
December	1.35	45	22
TOTAL/AVERAGE	**9.73**	**66**	**35.7**

By Federal Aviation Administration (FAA) standards, when calculating runway length needs, one of the inputs is the mean maximum temperature of the hottest month. At Carson City Airport, July is the hottest month, with a monthly average high temperature of 90 degrees F.

Weather conditions for the previous 5 years (CXP) and 10 years (RNO) for both total minutes and total observations at CXP were collected from NOAA's National Climatic Center. By definition, instrument flight rules (IFR) is defined as a cloud ceiling less than 1,000 feet above ground level (AGL) and/or visibility less than three miles. Visual flight rules (VFR) is defined as a ceiling greater than or equal to 3,000 feet AGL and visibility greater than or equal to five miles. RNO averaged 98.8% VFR conditions and 0.53% IFR for total minutes. Likewise, CXP saw 99.03% VFR and 0.47% IFR for total operations. Understanding the distribution of weather patterns at an airport can help forecast and plan far more accurately, thus providing for a larger impact on the aviation community.

CARSON CITY AIRPORT HISTORY

Carson City Airport is owned by Carson City and operated by the Carson City Airport Authority (CCAA). The CCAA was created by the State of Nevada Senate and Assembly in July 1989. The CCAA members are comprised of one city official, one citizen-at-large, one pilot, two manufacturers, and two fixed base operators (FBOs). Prior to the creation of the CCAA, the Airport was operated directly by the City.

Carson City Airport was initially established in 1928 on 76 acres of land provided to Carson City by three prominent local families. The airport expanded significantly in the 1940s and 50s to allow for an east-west runway, taking advantage of the prevailing westerly Sierra Nevada winds. This acreage comprises the approximate footprint of the primary runway. Many areas on the airfield had dirt surfaces and services on the airfield were limited. Early photos show several dirt runways in various orientations. One of the airfield's first runways is now the existing Taxiway C.

Additionally, the 1960s saw FBOs who had been operating on the airport for many years begin to expand and offer a wider range of services. During the 1970s, Carson City selected land north of the main runway and designated the parcel of land the "Carson City Industrial Airpark." Presently, through expansion and land acquisition, the airport is over twice its original size. **Exhibit 1E** details the Carson City Capital Improvement Program projects undertaken since the last Master Plan.

RECENT AIRPORT DEVELOPMENT

In 2001, the FAA accepted the CCAA's Master Plan. In 2009-2010, Carson City received well more than $9 million from the FAA to fund infrastructure improvements including a new, lengthened and realigned main runway, associated taxiways, state-of-the-art weather reporting equipment, and other upgrades. **Exhibit 1E** details the Carson City Capital Improvement Program projects undertaken since the last Master Plan.



Project Description	Total Costs	Federal	Local	Private
Phase I				
Environmental Assessment	150,000	140,625	9,375	0
Acquire Property for Runway Reconstruction	3,500,000	3,281,250	218,750	0
Annual Pavement Maintenance	20,000	18,750	1,250	0
Realign Runway 9-27	10,125,000	9,492,000	633,000	0
Construct Partial Parallel Taxiways (North)	1,000,000	937,500	62,500	0
Rehabilitate Main Apron	336,000	315,000	21,000	0
Annual Pavement Maintenance	20,000	18,750	1,250	0
Rehabilitate Taxiway A	180,000	168,750	11,250	0
Rehabilitate Northwest Apron/Drainage Improvements	464,000	435,000	29,000	0
Annual Pavement Maintenance	20,000	18,750	1,250	0
Total Phase I 2002-2005	**15,815,000**	**14,826,375**	**988,625**	**0**
Phase II				
Install REILs on Runways 9 and 27	130,000	121,875	8,125	0
Install Helipad Perimeter Lighting	50,000	46,875	3,125	0
Expand Main Apron	145,600	136,500	9,100	0
Construct South Access Road/Extend Utilities	73,500	68,906	4,594	0
North Drainage Improvements (Per Drainage Master Plan)	300,000	281,250	18,750	0
Construct North Entrance Roads/Extend Utilities	440,700	413,156	27,544	0
Reconstruct Taxiway A	2,280,800	2,138,250	142,550	0
Extend North Parallel Taxiway	836,600	784,313	52,287	0
Construct Hangar Access Taxilanes (Phase I)	562,250	527,109	35,141	0
Construct North Apron (Phase I)	1,100,000	1,031,250	68,750	0
Pavement Maintenance	500,000	468 ,750	31,250	0
Total Phase II 2006-2010	**6,419,450**	**6,018,234**	**401,216**	**0**
Phase III				
Construct Hangar Access Taxilane (Phase II)	724,800	679,500	45,300	0
Construct North Apron (Phase II)	773,500	725,156	48,344	0
Construct Hangar Access Taxilanes	143,000	134,062	8,938	0
Obtain RPZ Easements	135,000	126,562	8,438	0
Extend Runway 9-27 600 Feet East	543,400	509,438	33,962	0
Widen Runway 9-27 to 100 Feet	1,215,500	1,139,531	75,969	0
Install PAPI - 4 to Runways 9 and 27	130,000	121,875	8,125	0
Pavement Maintenance	1,000,000	937,500	62,500	0
Total Phase III 2011-2020	**4,665,200**	**4,373,624**	**291,576**	**0**
Grand Total	**26,899,650**	**25,218,233**	**1,681,417**	**0**

THE AIRPORT'S SYSTEM ROLE

- Airport planning takes place at the local, state, and national levels, each of which has a different emphasis and purpose. At the local level, the airport has an Airport Master Plan, which was last prepared by Coffman Associates in March of 2000. The airport recently updated their Airport Layout Plan in February of 2016.
- **State**: The Nevada Department of Transportation (NDOT), specifically the Planning Division, created the *Nevada Airport System Plan* (NASP) in September 2004, based on input from local planning documents (i.e., Master Plans and Airport Layout Plans). Additionally, the airport was included in the Analysis of Land Use Around Nevada Airports (January 2009).
- **National**: The Airport is included in the *National Plan of Integrated Airport Systems* (NPIAS), and in the 2012 FAA GA Asset Study, which categorizes overall airport roles and responsibilities based on input from local and state planning efforts (i.e., Master Plans and State System Plans).

LOCAL AIRPORT PLANNING

The Airport Master Plan is the primary local planning document. The master plan is intended to provide a 20-year vision for airport development based on aviation demand forecasts. The most recent update to the airport planning document is the 2001 Airport Master Plan. Over time, the forecast element of an Airport Master Plan typically becomes less reliable due to changes in aviation activity and/or the economy.

As a result, the FAA recommends that airports update their Master Plans every five to ten years, or as necessary, to address any significant changes. Therefore, this is an appropriate time to update the Airport Master Plan and revisit the development assumptions from the previous planning study.

STATE AIRPORT PLANNING

Carson City Airport is included in the 2004 NASP and subsequent 2009 *Analysis of Airport Needs* report as a Reliever Airport. In general, these airports are airports designated by the FAA to relieve congestion at Commercial Service Airports and to provide improved general aviation access to the overall community. Carson City Airport meets all the state recommendations. **Table 1B** details the state requirements in more detail.

TABLE 1B
Facility and Service Criteria for NASP Reliever Airports

Airport Criteria	Minimum Objective
Airport Reference Code	C-II thru D-II
Design Aircraft	Business Jet
Runways	
Length	To handle 100% of small aircraft fleet
Width	75 feet
Strength	30,000 lb.
Lighting	Medium Intensity Runway Lighting
Approach	Precision
Visibility Minimums	¾-mile
Taxiways	
Type	Full Parallel
Services	
Services Available	Terminal, automated weather observation system, fuel

Source: Nevada Airport Systems Plan (2004)

FEDERAL AIRPORT PLANNING

The FAA maintains a database of airports that are eligible for Airport Improvement Program (AIP) funding that are for public use called the *National Plan of Integrated Airport Systems* (NPIAS). The NPIAS categorizes these facilities by the type of activities that take place, including commercial service, cargo service, reliever operations, and general aviation (as seen in **Table 1C**). Furthermore, the FAA provides definitions for the various roles that general aviation facilities provide for their service areas, which **Table 1D** describes. CXP is currently classified as a Regional Reliever Airport in the FAA's NPIAS. Reliever airports are considered high capacity general aviation facilities in major metropolitan areas that provide pilots with alternatives to congested hub airports, while simultaneously providing access to the surrounding area. The following represent reliever airport eligibility requirements:

- The airport must be open to the public;
- The airport must maintain 100 or more based aircraft; or,
- The airport must have at least 25,000 annual itinerant operations.

TABLE 1C
Airport Classifications

Airport Classifications		Hub Type: Percentage of Annual Passenger Boardings (enplanement)	Common Name
Commercial Service: Publicly owned airports that have at least 2,500 passenger boardings each calendar year and receive scheduled passenger service	**Primary:** Have more than 10,000 passenger boardings each year	**Large:** 1% or more	**Large Hub**
		Medium: At least 0.25%, but less than 1%	**Medium Hub**
		Small: At least 0.05%, but less than 0.25%	**Small Hub**
		Non-Hub: More than 10,000, but less than 0.05%	**Non-Hub Primary**
	Nonprimary	**Non-Hub:** At least 2,500 and no more than 10,000	**Nonprimary Commercial Service**
Nonprimary (Except Commercial Service)		Not Applicable	**Reliever General Aviation**

Source: https://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/categories/

TABLE 1D
General Aviation Airport Descriptions

Role	Description
National	Supports the national and state system by providing communities with access to national and international markets in multiple states and throughout the United States.
Regional	Supports regional economies by connecting communities to statewide and interstate markets.
Local	Supplements communities by providing access to primarily intrastate and some interstate markets.
Basic	Links the community with the national airport system and supports general aviation activities (e.g., emergency services, charter or critical passenger service, cargo operations, flight training and personal flying).
Unclassified	Provides access to the aviation system.

Source: https://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/categories/

While CXP is classified in the NPIAS as a Reliever Airport, it has also been identified in Appendix 1B of the *General Aviation Airports: A National Asset* (2012) study as a "Regional" airport. This study identified 467 airports within the regional grouping. The FAA describes the regional group as airports that support the national system by providing communities with access to regional and national markets in multiple states throughout the U.S. These airports have high levels of activity, including jet and multi-engine aircraft operations, as well as single engine aircraft, and average 90 based aircraft, including 3 jets.

The most current plan is the NPIAS 2017-2021, which identified 3,340 public-use airports (3,332 existing and eight proposed) that are important to national air transportation. The plan estimates that approximately $32.5 billion in AIP-eligible airport projects will require financial assistance between 2017 and 2021. **Table 1E** identifies the type of airports included in the NPIAS.

TABLE 1E
Activity and Development at NPIAS Airports

Number of Airports	Airport Category	Percentage of NPIAS Airports	Percentage of 2014 Total Enplanements[1]	Percentage of All Based Aircraft[2]	Percentage of NPIAS Cost[3]
30	Large Hub	1%	72	0.7%	20.9%
31	Medium Hub	1%	15	1.7%	9.6%
72	Small Hub	2%	8	4.7%	12.8%
249	Non-Hub	7%	4	11.6%	16.2%
382	**Primary Subtotal**	**11%**	**99%**	**18.6%**	**59.4%**
89	National	3%	n/a	11.5%	5.4%
531	Regional	16%	n/a	25.6%	12.2%
1,261	Local	38%	n/a	21.2%	15.3%
813	Basic	24%	n/a	3.2%	6.6%
256	Unclassified	8%	n/a	1.0%	0.03%
2,950	**Nonprimary Subtotal**	**89%**	**n/a**	**62.6%**	**39.5%**
3,332	**Total NPIAS Airports**	**100%**	**99%**	**81.2%**	**99.0%**

[1] The remaining one percent of enplanements occurred at non-NPIAS airports
[2] Based on an active general aviation fleet of 203,880 aircraft in 2015
[3] These costs are rounded and do not include the cost for new airports (one percent)
Source: 2017 – 2021 *National Plan of Integrated Airport Systems* (NPIAS)

AVIATION ACTIVITY

At airports primarily serving general aviation activity, based aircraft, socioeconomic considerations, and the total annual operations (takeoffs and landings) are the primary indicators of modeling aeronautical activity. These indicators will be used in subsequent analyses in this Master Plan to project future aeronautical activity and determine future facility requirements.

BASED AIRCRAFT AND ANNUAL OPERATIONS

Carson City Airport does not have an airport traffic control tower (ATCT). Thus, no formal air traffic control services are available. Aircraft operating within the vicinity of the airport are not required to file any flight plan or contact any air traffic control facility, unless they enter any airspace with such requirements. Within subsequent sections of this Master Plan, modeling and analyses will be conducted based on recent based aircraft counts and the FAA's "Model for Estimating General Aviation Operations at Non-Towered GA Airports." For the purpose of the inventory section, the FAA's *Terminal Area Forecast* (TAF) will be utilized to provide a foundation and understanding of the activity at CXP. **Table 1F** summarizes the available TAF information at CXP.

TABLE 1F
Based Aircraft and Annual Operations
Carson City Airport

Year	Based Aircraft	Total OPS
2001	238	74,000
2006	275	83,500
2011	190	83,500
2017	350	83,500

Source: FAA TAF, 2017; Basedaircraft.com, 2018

- **Air Carrier** – operations performed by commercial airline aircraft with greater than 60 seats.
- **Air Taxi** – operations associated with commuter aircraft, but also include for-hire general aviation aircraft.
- **Military Operations** – operations conducted by airplanes and helicopters with a military identification.
- **General Aviation** – includes all other aviation activity from small ultralights to large business jets.

Current and historical numbers of based aircraft help determine the current and future demand for a variety of aircraft support facilities at the airport, including aircraft storage hangars, parking aprons, and pilot and passenger services. Historical data, as provided in **Table 1G**, show that the number of based aircraft has seen peaks and valleys since the previous master plan.

TABLE 1G
Based Aircraft
Carson City Airport

Year	Based Aircraft*
2000	238
2001	238
2002	275
2003	275
2004	275
2005	275
2006	275
2007	262
2008	223
2009	223
2010	190
2011	190
2012	202
2013	206
2014	206
2015	175
2016	176
2017	350

Source: FAA TAF, 2017; Basedaircraft.com, 2017
*Years 2000-2016 are FAA TAF estimates, while 2017 is a basedaircraft.com validated figure.

ECONOMIC IMPACT

In 2018, the University of Nevada Economic Development Center, with funds from Carson City Airport and the United States Department of Commerce Economic Development Administration, published the economic impact analysis, "Economic Impacts of Operation and Construction Activities of the Carson City Airport on the Carson City Economy" in order to assess economic impacts generated by CXP.

The analysis aimed to provide insight for the airport authority and other local economic development agents to help make decisions to benefit CXP and the community at large. The analysis found that the airport has become an important engine of economic growth in Carson City and other areas of Nevada.

Economic activities of the airport include local airport operations, supporting airport industries, activities of general aviation visitors, and airport construction. Through these activities, CXP generates more than a thousand jobs and provides millions of dollars in economic activity for the City of Carson City. **Table 1H** illustrates the summary findings of the analysis for Carson City and the State of Nevada.

TABLE 1H
Carson City Economic Impact

Economic, Employment, and Labor Income Impacts of CXP on the Carson City Economy			
Impact Type	**Output**	**Employment**	**Labor Income**
Direct	$724,365	2.0	$123,158
Indirect and Induced	$365,786	3.1	$248,753
TOTAL	**$1,090,151**	**5.1**	**$371,911**
Economic, Employment, and Labor Income Impacts of CXP Related Economic Sectors			
Direct	$13,862,919	80.7	$2,040,699
Indirect and Induced	$4,391,271	32.7	$1,455,338
TOTAL	**$18,254,190**	**113.4**	**$3,496,037**
Economic, Employment, and Labor Income Impacts of General Aviation Visitors on the Carson City Economy			
Direct	$11,282,623	105.7	$4,130,340
Indirect and Induced	$5,076,947	45.4	$1,776,592
TOTAL	**$16,359,570**	**151.1**	**$5,906,933**
Cumulative One-Time Impacts of CXP Construction on the Carson City Economy			
Direct	$22,217,376	156.1	$9,772,346
Indirect and Induced	$9,240,319	65.8	$2,808,408
TOTAL	**$31,457,695**	**221.9**	**$12,580,754**
Summary of CXP Expenditures, Tenants and Visitor Economic Activity, Employment and Labor Income Impacts on the Carson City Economy			
Direct	$25,869,907	188.4	$6,294,197
Indirect and Induced	$9,834,004	81.2	$3,480,684
TOTAL	**$35,703,911**	**269.6**	**$9,774,881**
Summary of CXP Operation and Construction Impacts on Economic Activity, Employment, and Labor Income on the Carson City Economy			
Direct	$48,087,283	344.5	$16,066,543
Indirect and Induced	$19,074,323	147.0	$6,289,092
TOTAL	**$67,161,606**	**491.5**	**$22,355,635**

Source: Estimation of Economic Impacts of Operation and Construction Activities of the Carson City Airport on the Economy of Carson City (November 2018). Prepared by Thomas R. Harris and Inga Sullivan, University Center for Economic Development, University of Nevada, Reno.

SOCIOECONOMIC PROFILE

Socioeconomic characteristics are collected and examined to derive an understanding of the dynamics of growth near an airport. This information is essential in determining aviation demand level require-

ments as most general aviation demand is directly related to the socioeconomic condition of the surrounding area. Statistical analysis of population, employment, and income trends provide a picture of the economic strength of the region, as well as the ability of the area to sustain a strong economic base into the future. Additional socioeconomic data will be used in the forecast chapter; however, the information provided in this chapter will introduce socioeconomic trends in the study area.

Exhibit 1F summarizes historical population, employment, and income estimates for the consolidated municipality of Carson City, the State of Nevada, and the United States of America. Over the next 20 years, the population of Carson City is projected to grow by approximately 3,000 people. The State of Nevada is projected to add approximately 2 million people. These projections equate to compound annual growth rates (CAGRs) of 0.91 percent and 1.29 percent, respectively. Employment projections are also steady for the area as Carson City is forecast to see employment gains of 0.88 percent annually. Income for Carson City and Nevada is projected to grow slightly higher than the national growth rate at 1.11 percent annually. **Exhibit 1G** displays information from the Carson City's top employers and their proximity to CXP.

The socioeconomic trends for the Carson City area have been favorable. After reviewing the cost of living and the tax rate for the region, it stands to reason future projections should see an increase in population and per capita income by 2040. However, the civilian labor force (CLF) has shown signs of a slow decrease since 2000. Currently, the CLF sits at nearly 25,000, which is a -0.37% decrease since 2000. This decrease in CLF mixed with an increase in educated residents, a steady public-sector job market, and a lower cost of living will be reviewed in Chapter Two, Forecasts.

AREA AIRSPACE AND AIR TRAFFIC CONTROL

The *FAA Act of 1958* established the FAA as the responsible agency for the control and use of navigable airspace within the U.S. The FAA has established the National Airspace System (NAS) to protect persons and property on the ground, in addition to establishing a safe and efficient airspace environment for civil, commercial, and military aviation. The NAS covers the common network of U.S. airspace, including air navigation facilities; airports and landing areas; aeronautical charts; associated rules, regulations, and procedures; technical information; and personnel and material. The system also includes components shared jointly with the military.

AIRSPACE STRUCTURE

Airspace within the U.S. is broadly classified as either "controlled" or "uncontrolled." The difference between controlled and uncontrolled airspace relates primarily to requirements for pilot qualifications, ground-to-air communications, navigation and air traffic services, and weather conditions. Six classes of airspace have been designated in the United States, as shown on **Exhibit 1H**. Airspace designated as Class A, B, C, D, or E is considered controlled airspace. Aircraft operating within controlled airspace are

subject to varying requirements for positive air traffic control. The airspace in the vicinity of CXP is depicted on **Exhibit 1J**.

Class A Airspace: Class A airspace includes all airspace from 18,000 feet MSL to flight level (FL) 600 (approximately 60,000 feet MSL) over the contiguous 48 states and Alaska. This airspace is designated in F.A.R. Part 71.33 for positive control of aircraft. All aircraft must be on an IFR clearance to operate within Class A airspace.

Class B Airspace: Class B airspace has been designated around some of the country's major airports, such as McCarren International Airport (LAS) or San Francisco International Airport (SFO) to separate all aircraft within a specified radius of the primary airport. Each Class B airspace is specifically tailored for its primary airport. All aircraft operating within Class B airspace must have air traffic control clearance. Certain minimum aircraft equipment and pilot certification requirements must also be met. This airspace is the most restrictive controlled airspace routinely encountered by pilots operating under VFR in an uncontrolled environment. The nearest Class B airspace supports SFO, to the southwest.

Class C Airspace: The FAA has established Class C airspace at approximately 120 airports around the country that have significant levels of IFR traffic. Class C airspace is designed to regulate the flow of uncontrolled traffic above, around, and below the arrival and departure airspace required for high-performance, passenger-carrying aircraft at major airports. To fly inside Class C airspace, an aircraft must have a two-way radio, an encoding transponder, and have established communication with the ATC facility. Aircraft may fly below the floor of the Class C airspace or above the Class C airspace ceiling without establishing communication with ATC. The nearest Class C airspace to CXP surrounds Reno-Tahoe International Airport (RNO), approximately 20 nautical miles (nm) to the north.

Class D Airspace: Class D airspace is controlled airspace surrounding airports with an ATCT. The Class D airspace typically constitutes a cylinder with a horizontal radius of four or five nm from the airport, extending from the surface up to a designated vertical limit, typically set at approximately 2,500 feet above the airport elevation.

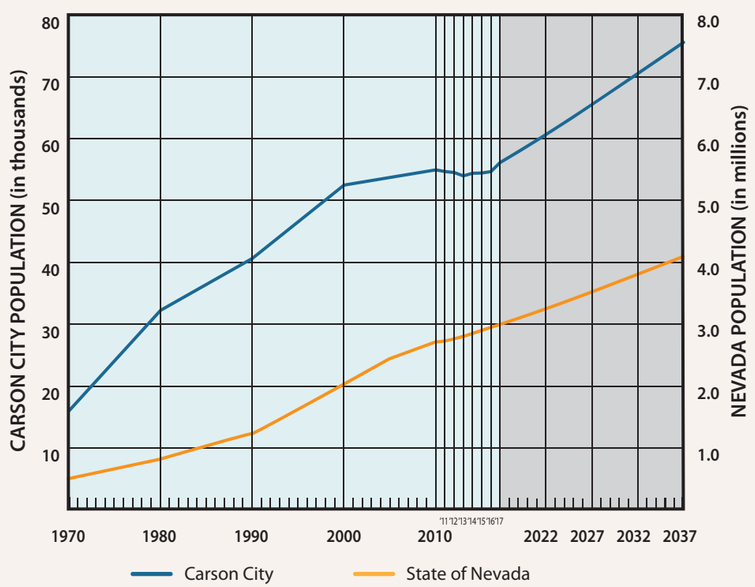
Class E Airspace: Class E airspace consists of controlled airspace designed to contain IFR operations near an airport and while aircraft are transitioning between the airport and enroute environments. Unless otherwise specified, Class E airspace terminates at the base of the overlying airspace. Only aircraft operating under IFR are required to be in contact with ATC when operating in Class E airspace. While aircraft conducting visual flights in Class E airspace are not required to be in radio communications with ATC facilities, visual flight can only be conducted if minimum visibility and cloud ceilings exist. As shown in **Exhibit 1J**, CXP operates within Class E airspace extending from 1,200 AGL to 14,500 MSL.

Class G Airspace: Airspace not designated as Class A, B, C, D, or E is considered uncontrolled, or Class G, airspace. Air traffic control does not have the authority or responsibility to exercise control over air traffic within this airspace. Class G airspace lies between the surface and the overlaying Class E airspace (700 to 1,200 feet above ground level).

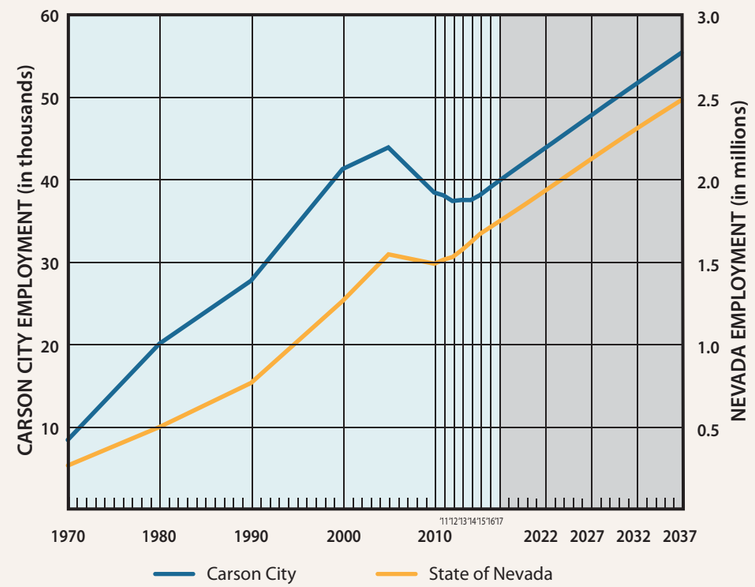
	HISTORICAL													PROJECTED			
	1970	1980	1990	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2022	2027	2037	CAGR 1970-2037
Population																	
Carson City	16,052	32,325	40,714	52,568	55,982	55,030	54,756	54,598	54,057	54,480	54,521	54,742	56,207	60,739	65,563	75,634	2.3%
State of Nevada	495,000	810,000	1,221,000	2,019,000	2,432,000	2,703,000	2,719,000	2,755,000	2,790,000	2,838,000	2,891,000	2,936,000	2,985,000	3,238,000	3,510,000	4,084,000	3.2%
United States	203,982,000	227,226,000	249,62,0003	282,162,000	295,51,0007	309,347,000	311,71,0009	314,103,000	316,427,000	318,907,000	321,421,000	324,161,000	327,168,000	342,677,000	358,822,000	390,515,000	1.0%
Employment																	
Carson City	8,469	20,122	27,758	41,300	43,917	38,463	38,116	37,426	37,547	37,540	38,144	38,980	39,804	43,749	47,681	55,396	2.8%
State of Nevada (in thousands)	256,490	489,580	757,00	1,254,200	1,536,120	1,479,330	1,503,570	1,520,060	1,562,010	1,609,870	1,660,480	1,696,480	1,732,940	1,917,690	2,108,870	2,472,200	3.4%
United States (in thousands)	91,401,970	114,118,460	138,513,700	165,445,970	172,557,360	173,034,690	176,278,690	179,081,670	182,408,050	186,168,100	190,195,370	193,022,610	195,849,190	209,800,450	223,883,180	250,784,780	1.5%
Income - PCPI ($2017)																	
Carson City	$5,642	$12,997	$22,550	$33,886	$24,103	$42,076	$40,982	$37,620	$38,967	$39,875	$43,443	$44,543	$45,757	$54,126	$67,220	$107,886	4.5%
State of Nevada	$5,273	$12,173	$20,978	$32,193	$38,637	$36,818	$37,979	$39,178	$38,885	$40,490	$41,889	$43,504	$44,774	$53,479	$67,009	$108,722	4.6%
United States	$4,198	$10,161	$19,613	$30,619	$35,904	$40,277	$42,453	$44,267	$44,462	$46,414	$48,111	$49,420	$50,801	$60,290	$75,118	$121,368	5.1%

Source: Woods & Poole Complete Economic and Demographic Data Source (CEEDS) 2017 **PCPI** - Per Capita Personal Income **CAGR**: Compound Annual Growth Rate

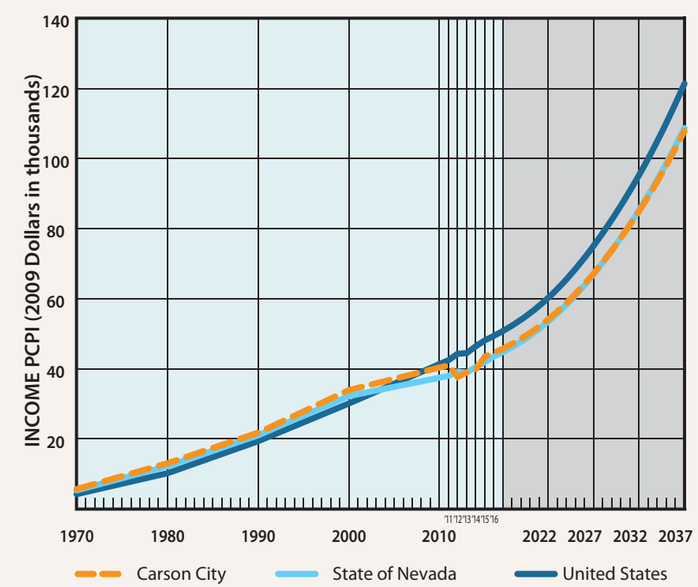
POPULATION

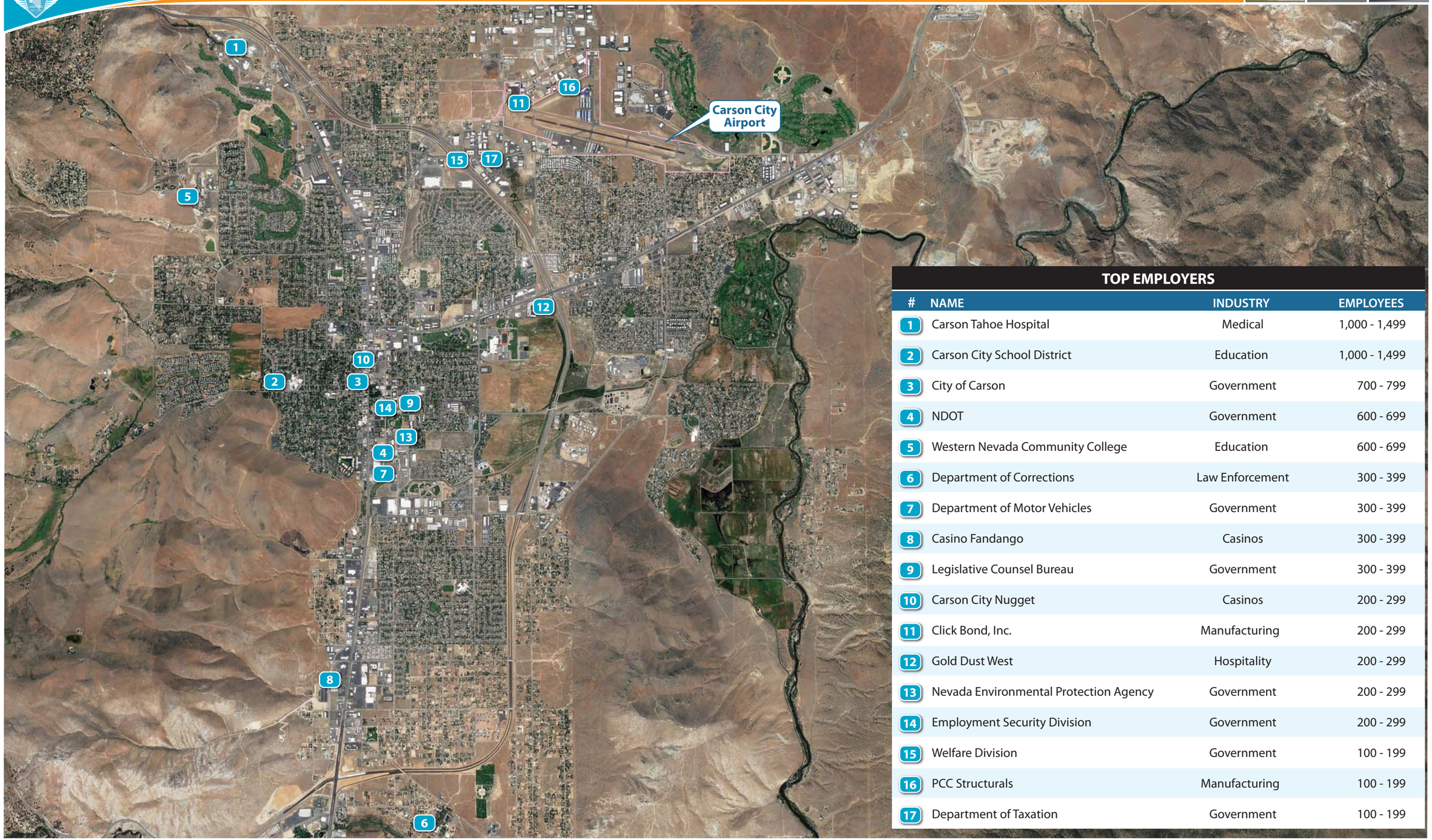


EMPLOYMENT



INCOME

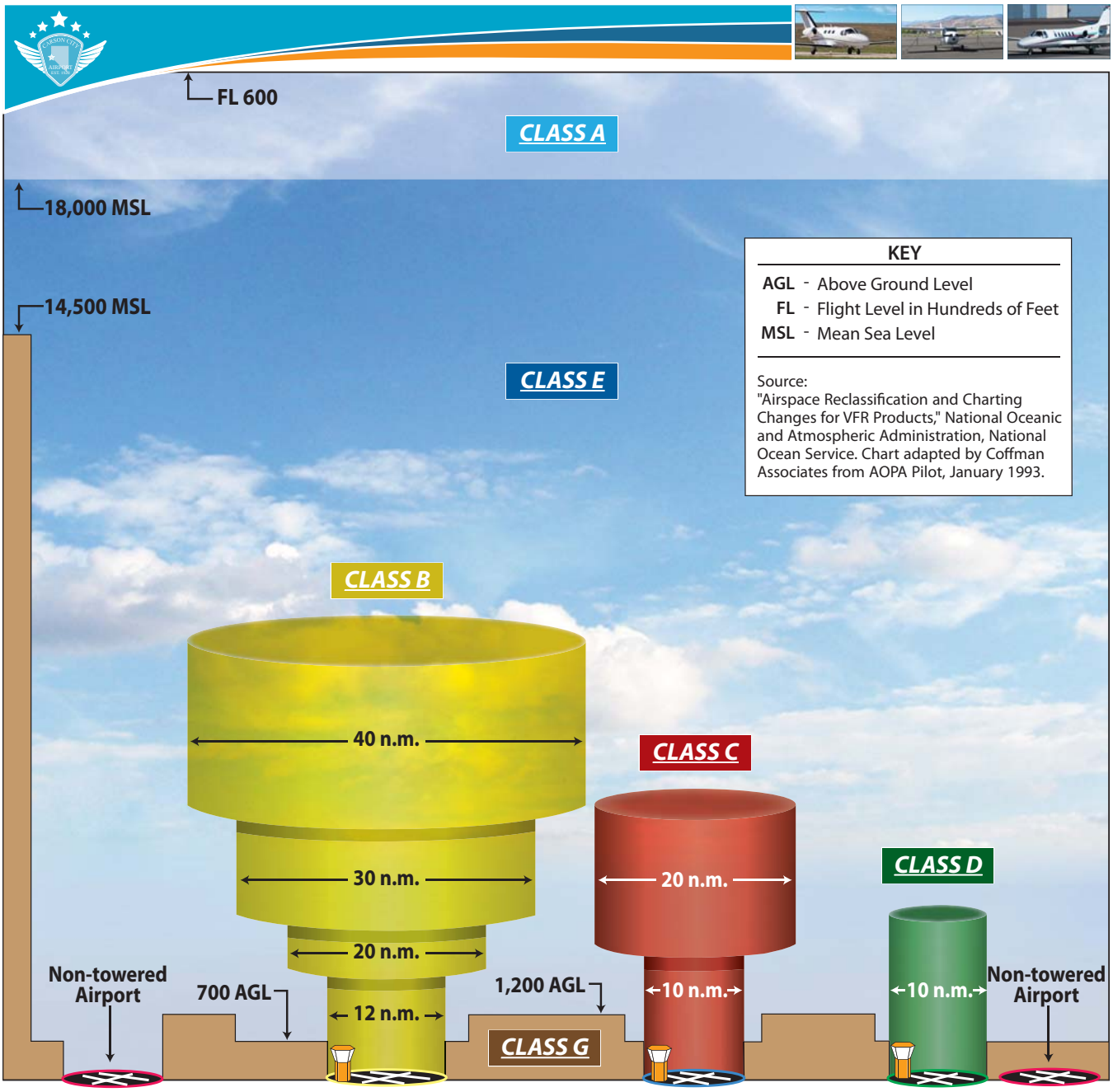




TOP EMPLOYERS

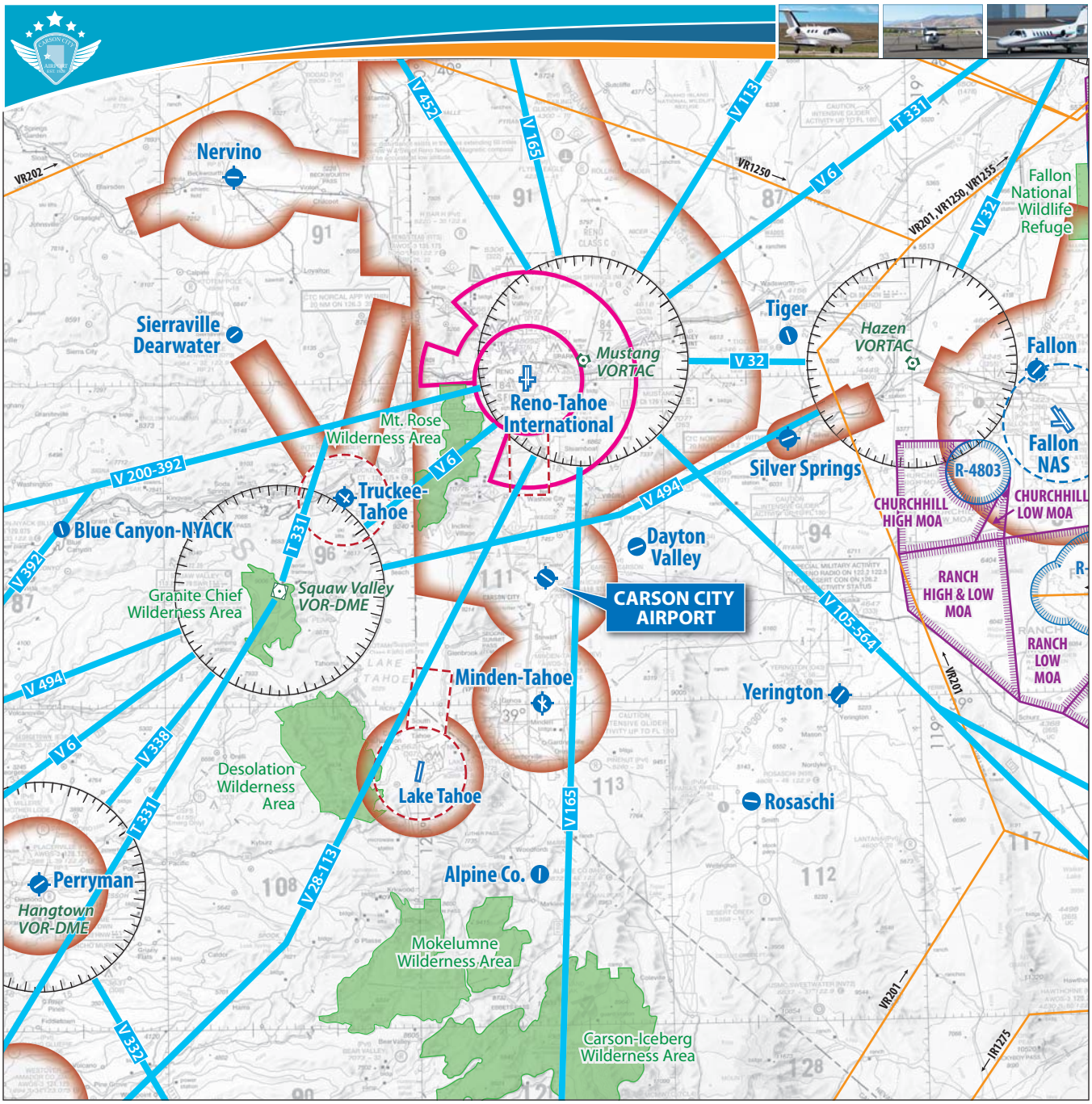
#	NAME	INDUSTRY	EMPLOYEES
1	Carson Tahoe Hospital	Medical	1,000 - 1,499
2	Carson City School District	Education	1,000 - 1,499
3	City of Carson	Government	700 - 799
4	NDOT	Government	600 - 699
5	Western Nevada Community College	Education	600 - 699
6	Department of Corrections	Law Enforcement	300 - 399
7	Department of Motor Vehicles	Government	300 - 399
8	Casino Fandango	Casinos	300 - 399
9	Legislative Counsel Bureau	Government	300 - 399
10	Carson City Nugget	Casinos	200 - 299
11	Click Bond, Inc.	Manufacturing	200 - 299
12	Gold Dust West	Hospitality	200 - 299
13	Nevada Environmental Protection Agency	Government	200 - 299
14	Employment Security Division	Government	200 - 299
15	Welfare Division	Government	100 - 199
16	PCC Structurals	Manufacturing	100 - 199
17	Department of Taxation	Government	100 - 199

Exhibit 1G
CARSON CITY TOP EMPLOYERS PROXIMTY MAP



DEFINITION OF AIRSPACE CLASSIFICATIONS

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



LEGEND

- Airports with other than hard-surfaced runways
- Airport with hard-surfaced runways 1,500' to 8,069' in length
- Airports with hard-surfaced runways greater than 8,069' or some multiple runways less than 8,069'
- VORTAC
- VOR-DME
- Compass Rose
- Wilderness/Wildlife Area
- Class C Airspace
- Class D Airspace
- Class E Airspace
- Class E Airspace with floor 700' above surface
- Military Training Routes
- Victor Airways
- Alert Area and MOA - Military Operations Area
- Prohibited, Restricted, and Warning Areas

Source: San Francisco Sectional Chart, US Department of Commerce, National Oceanic and Atmospheric Administration, August 17, 2017

While aircraft may technically operate within this Class G airspace without any contact with ATC, it is unlikely that many aircraft will operate this low to the ground. Furthermore, federal regulations specify minimum altitudes for flight. F.A.R. Part 91.119*, Minimum Safe Altitudes*, generally states that except when necessary for takeoff or landing, pilots must not operate an aircraft over any congested area of a city, town, or settlement, or over any open-air assembly of persons, at an altitude of 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft.

Over less congested areas, pilots must maintain an altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure. Helicopters may be operated at less than the minimums prescribed above if the operation is conducted without hazard to persons or property on the surface. In addition, each person operating a helicopter shall comply with any routes or altitudes specifically prescribed for helicopters by the FAA.

Special Use Airspace: Special use airspace is defined as airspace where activities must be confined because of their nature or where limitations are imposed on aircraft not taking part in those activities. The designation of special use airspace identifies for other users the areas where military activity occurs, provides for segregation of that activity from other fliers, and allows charting to keep airspace users informed.

Victor Airways: For aircraft arriving or departing the regional area using very high frequency omni-directional range (VOR) facilities, a system of Federal Airways, referred to as Victor Airways, has been established. Victor Airways are corridors of airspace eight miles wide that extend upward from 1,200 feet AGL to 18,000 feet MSL and extend between VOR navigational facilities. For aircraft enroute or departing CXP, there are several Victor Airways available converging at the Mustang VORTAC, which is approximately 21 miles north-northeast of CXP.

Alert Areas: Alert Areas are depicted on aeronautical charts to inform nonparticipating pilots of areas that may contain a high volume of pilot training or an unusual type of aerial activity. Pilots should exercise caution within these areas. All activity within an alert area should be conducted in accordance with regulations, without waiver, and pilots of participating aircraft, as well as pilots transitioning the area, are equally responsible for collision avoidance. There are no Alert Areas near CXP.

Military Airspace: A Military Operations Area (MOA) is an area of airspace designated for military training use. This is not restricted airspace; however, pilots who use this airspace should be on alert for the possibility of military traffic. A pilot needs to be aware that military aircraft may be found in high concentrations, conducting aerobatic maneuvers and possibly operating at high speeds at lower altitudes. The activity status of an MOA is advertised by a Notice to Airmen (NOTAM) and noted on sectional charts.

The Churchill Low and Ranch High and Low MOA is located approximately 45 miles east-northeast from the airport. The MOAs are directly southwest of Fallon, NV.

National Parks/State Parks/Wilderness Areas: Nevada is home to four National Parks, well as Lake Tahoe, which is within 30 nm of the airport. The nearest state park is Washoe Lake which is located eight miles to the north-northwest.

AIRSPACE CONTROL

The FAA has established 21 Air Route Traffic Control Centers (ARTCCs) throughout the continental United States to control aircraft operating under IFR within controlled airspace and while enroute. An ARTCC assigns specific routes and altitudes along Federal Airways to maintain separation and orderly traffic flow. The Oakland Center ARTCC controls IFR airspace enroute to and from CXP.

Flight Service Station (FSS)

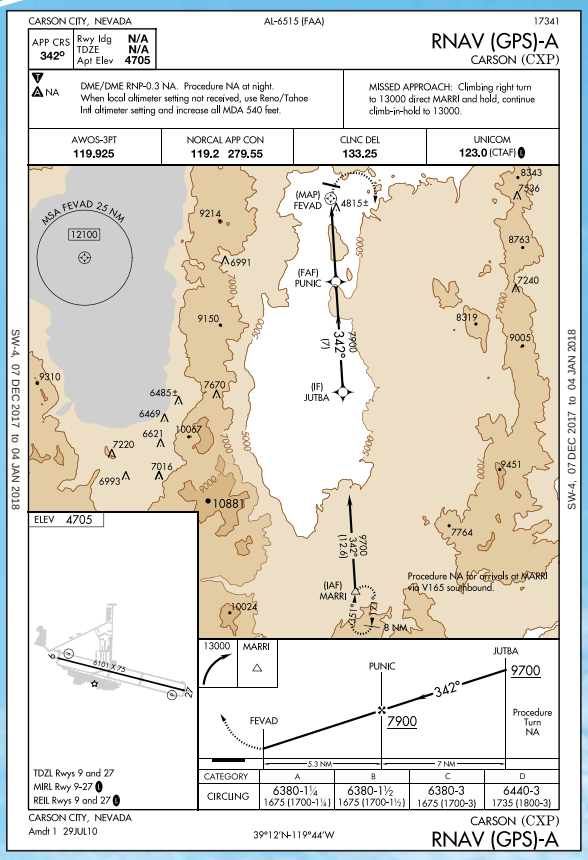
FSSs are air traffic facilities which provide pilot briefings, flight plan processing, inflight radio communications, search and rescue (SAR) services, and assistance to lost aircraft and aircraft in emergency situations. FSSs also relay air traffic control clearances, process NOTAMs, broadcast aviation meteorological and aeronautical information, and notify Customs and Border Protection of trans-border flights. The Reno FSS is the nearest FSS facility to CXP.

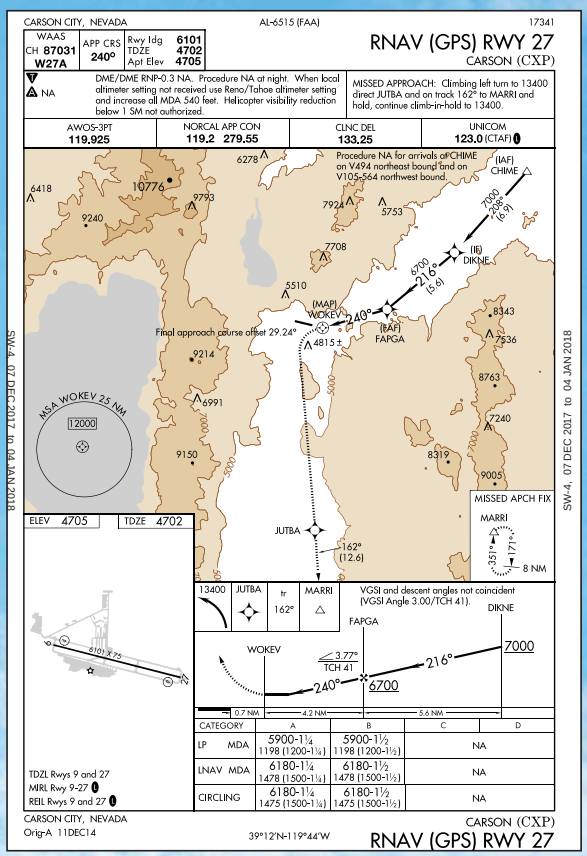
Air Traffic Control Tower

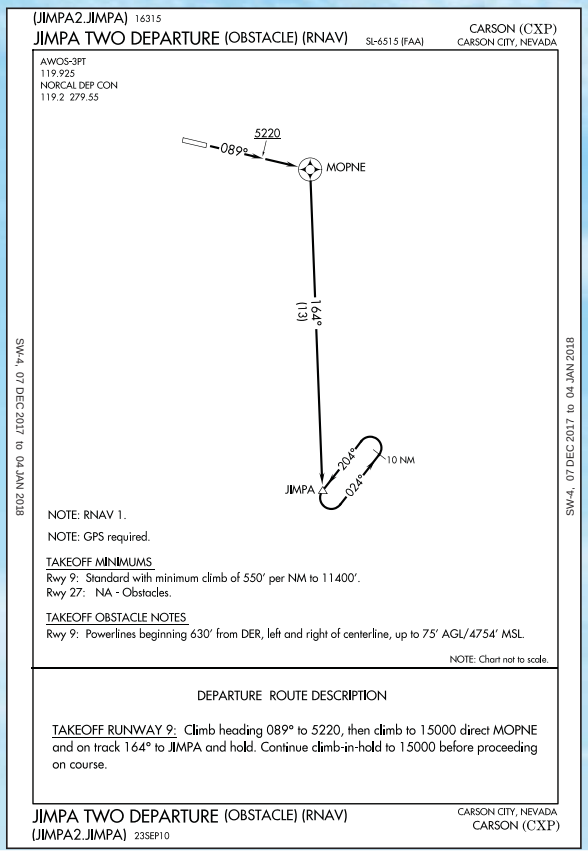
There is no ATCT at Carson City Airport. Aircraft operating in the vicinity of the airport are not required to file any type of flight plan or contact any air traffic control facility unless they are entering airspace where contact is mandatory. Air traffic advisories and certain weather information can be obtained using the airport Unicom/common traffic advisory frequency (CTAF), which can be accessed via radio frequency 123.0 MHz. Enroute air traffic control services are provided through the Oakland ARTCC, which controls aircraft in a large multi-state area.

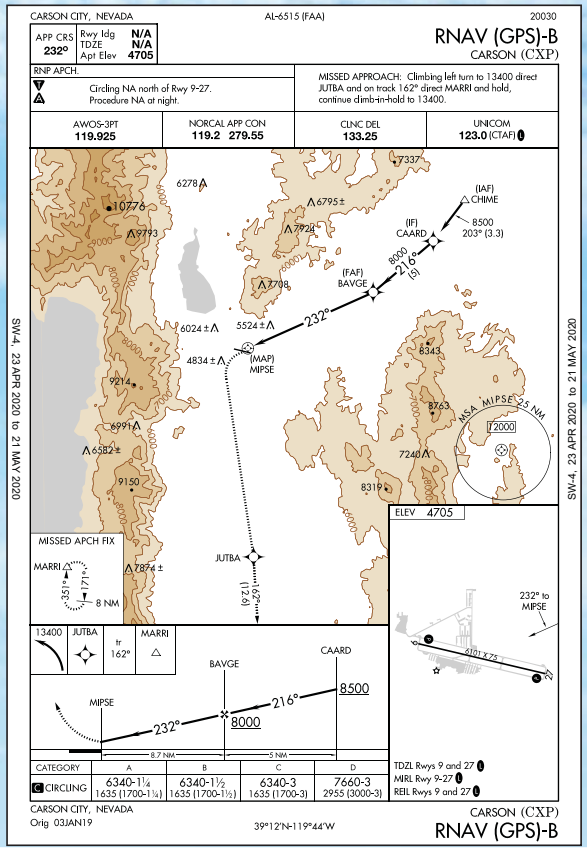
INSTRUMENT APPROACH PROCEDURES

Flight procedures are a set of predetermined maneuvers established by the FAA, using electronic or visual navigational aids that assist pilots in locating and landing or departing from an airport. For CXP, there are instrument approach procedures and departure procedures as shown on **Exhibit 1K**. CXP is served by three instrument approach procedures including an area navigation (RNAV) GPS circling approach serving runway 9-27, as well as RNAV GPS localizer performance (LP) and lateral navigation (LNAV) approaches serving Runway 27. A Standard Instrument Departure (SID) procedure is also provided for departing IFR traffic. The airport website instructs pilots that for departing IRF traffic, pilots shall contact NORCAL Departure on the ground for IFR Clearance Delivery on 133.25 or by phone (916) 391-0596. While airborne, NORCAL Approach can be contacted on 119.2, or Oakland Center on 127.95 Westbound and 125.75 Eastbound.


CARSON CITY, NEVADA
AL-6515 (FAA)
17341
APP CRS 342°
Rwy ldg N/A
TDZE N/A
Apt Elev 4705
RNAV (GPS)-A
CARSON (CXP)
NA
DME/DME RNP-0.3 NA. Procedure NA at night.
When local altimeter setting not received, use Reno/Tahoe Intl altimeter setting and increase all MDA 540 feet.
MISSED APPROACH: Climbing right turn to 13000 direct MARRI and hold, continue climb-in-hold to 13000.
AWOS-3PT 119.925
NORCAL APP CON 119.2 279.55
CLNC DEL 133.25
UNICOM 123.0 (CTAF)
MSA FEVAD 25 NM
12100
(MAP) FEVAD
4815±
(FAF) PUNIC
342°
(7)
7900
(IF) JUTBA
342°
(12.6)
9700
(IAF) MARRI
351°
171°
8 NM
Procedure NA for arrivals at MARRI via V165 southbound.
ELEV 4705
13000
MARRI
JUTBA
PUNIC
342°
9700
7900
FEVAD
Procedure Turn NA
5.3 NM
7 NM
CATEGORY A B C D
CIRCLING 6380-1¼ 1675 (1700-1¼) 6380-1½ 1675 (1700-1½) 6380-3 1675 (1700-3) 6440-3 1735 (1800-3)
TDZL Rwys 9 and 27
MIRL Rwy 9-27
REIL Rwys 9 and 27
CARSON CITY, NEVADA
Amdt 1 29JUL10
39°12'N-119°44'W
CARSON (CXP)
RNAV (GPS)-A
SW-4, 07 DEC 2017 to 04 JAN 2018


CARSON CITY, NEVADA
AL-6515 (FAA)
17341
WAAS CH 87031 W27A
APP CRS 240°
Rwy ldg 6101
TDZE 4702
Apt Elev 4705
RNAV (GPS) RWY 27
CARSON (CXP)
NA
DME/DME RNP-0.3 NA. Procedure NA at night. When local altimeter setting not received use Reno/Tahoe altimeter setting and increase all MDA 540 feet. Helicopter visibility reduction below 1 SM not authorized.
MISSED APPROACH: Climbing left turn to 13400 direct JUTBA and on track 162° to MARRI and hold, continue climb-in-hold to 13400.
AWOS-3PT 119.925
NORCAL APP CON 119.2 279.55
CLNC DEL 133.25
UNICOM 123.0 (CTAF)
Procedure NA for arrivals at CHIME on V494 northeast bound and on V105-564 northwest bound.
(IAF) CHIME
7000
2000
(6.9)
(IF) DIKNE
6700
216°
(5.6)
(MAP) WOKEV
240°
(FAF) FAPGA
Final approach course offset 29.24°
4815±
MSA WOKEV 25 NM
12000
JUTBA
162°
(12.6)
MISSED APCH FIX
MARRI
351°
171°
8 NM
ELEV 4705
TDZE 4702
13400
JUTBA
tr 162°
MARRI
VGSI and descent angles not coincident (VGSI Angle 3.00/TCH 41).
FAPGA
DIKNE
WOKEV
3.77°
TCH 41
240°
6700
216°
7000
0.7 NM
4.2 NM
5.6 NM
CATEGORY A B C D
LP MDA 5900-1¼ 1198 (1200-1¼) 5900-1½ 1198 (1200-1½) NA
LNAV MDA 6180-1¼ 1478 (1500-1¼) 6180-1½ 1478 (1500-1½) NA
CIRCLING 6180-1¼ 1475 (1500-1¼) 6180-1½ 1475 (1500-1½) NA
TDZL Rwys 9 and 27
MIRL Rwy 9-27
REIL Rwys 9 and 27
CARSON CITY, NEVADA
Orig-A 11DEC14
39°12'N-119°44'W
CARSON (CXP)
RNAV (GPS) RWY 27
SW-4, 07 DEC 2017 to 04 JAN 2018


(JIMPA2.JIMPA) 16315
JIMPA TWO DEPARTURE (OBSTACLE) (RNAV)
SL-6515 (FAA)
CARSON (CXP)
CARSON CITY, NEVADA
AWOS-3PT
119.925
NORCAL DEP CON
119.2 279.55
5220
089°
MOPNE
164°
(13)
204°
024°
10 NM
JIMPA
NOTE: RNAV 1.
NOTE: GPS required.
TAKEOFF MINIMUMS
Rwy 9: Standard with minimum climb of 550' per NM to 11400'.
Rwy 27: NA - Obstacles.
TAKEOFF OBSTACLE NOTES
Rwy 9: Powerlines beginning 630' from DER, left and right of centerline, up to 75' AGL/4754' MSL.
NOTE: Chart not to scale.
DEPARTURE ROUTE DESCRIPTION
TAKEOFF RUNWAY 9: Climb heading 089° to 5220, then climb to 15000 direct MOPNE and on track 164° to JIMPA and hold. Continue climb-in-hold to 15000 before proceeding on course.
JIMPA TWO DEPARTURE (OBSTACLE) (RNAV)
(JIMPA2.JIMPA) 23SEP10
CARSON CITY, NEVADA
CARSON (CXP)
SW-4, 07 DEC 2017 to 04 JAN 2018


CARSON CITY, NEVADA
AL-6515 (FAA)
20030
APP CRS 232°
Rwy ldg N/A
TDZE N/A
Apt Elev 4705
RNAV (GPS)-B
CARSON (CXP)
RNP APCH.
Circling NA north of Rwy 9-27.
Procedure NA at night.
MISSED APPROACH: Climbing left turn to 13400 direct JUTBA and on track 162° direct MARRI and hold, continue climb-in-hold to 13400.
AWOS-3PT 119.925
NORCAL APP CON 119.2 279.55
CLNC DEL 133.25
UNICOM 123.0 (CTAF)
(IAF) CHIME
8500
203° (3.3)
(IF) CAARD
8000
216°
(5)
(FAF) BAVGE
232°
5524±
(MAP) MIPSE
MSA MIPSE 25 NM
12000
MISSED APCH FIX
MARRI
351°
171°
8 NM
JUTBA
162°
(12.6)
ELEV 4705
232° to MIPSE
13400
JUTBA
tr 162°
MARRI
BAVGE
CAARD
MIPSE
232°
8000
216°
8500
8.7 NM
5 NM
CATEGORY A B C D
C CIRCLING 6340-1¼ 1635 (1700-1¼) 6340-1½ 1635 (1700-1½) 6340-3 1635 (1700-3) 7660-3 2955 (3000-3)
TDZL Rwys 9 and 27
MIRL Rwy 9-27
REIL Rwys 9 and 27
CARSON CITY, NEVADA
Orig 03JAN19
39°12'N-119°44'W
CARSON (CXP)
RNAV (GPS)-B
SW-4, 23 APR 2020 to 21 MAY 2020

RUNWAY USE AND TRAFFIC PATTERNS

CXP is situated at 4,704 feet MSL. The airport website provides details for the operating procedures at CXP. The traffic pattern at the airport is maintained to ensure the safe and most efficient use of the airspace surrounding the airport. When using Runway 27, except as safety dictates otherwise, all aircraft taking off should proceed straight ahead until reaching the end of the runway and execute a left turn to a heading of 230 degrees as soon as safely possible. After attaining a minimum altitude of 700 feet AGL, or 5,400 feet MSL, and ascertaining there is no danger of collision with other aircraft, the pilot may execute a left or right crosswind turn as appropriate. The pilot should be noise-sensitive to surrounding neighborhoods, and if possible when departing the pattern, delay making the crosswind turn until west of U.S. Business 395 (Carson Street) and resume normal navigation procedures.

Aircraft intending to remain in the traffic pattern shall continue to climb to the traffic altitude of 1,000 feet AGL, or 5,700 MSL, after the crosswind turn from runway heading and shall thereafter follow the pattern as set forth on the associated charts.

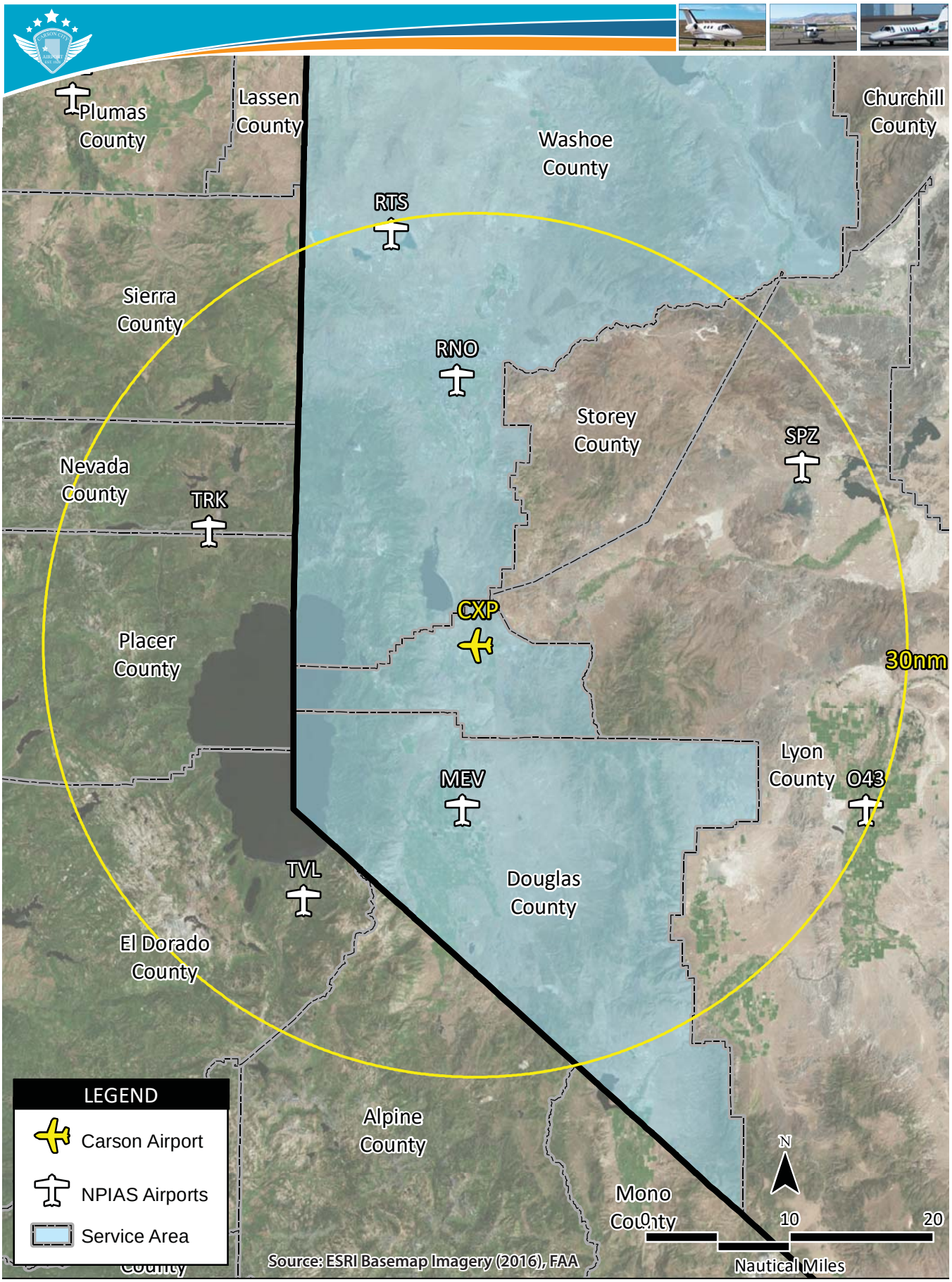
Approach and landings shall be left-hand pattern for Runway 27 and a right-hand pattern for Runway 9. The designated calm wind runway (below 5 knots) is Runway 27. Aircraft entering the traffic pattern within a five-mile radius of the airport should do so at an angle of 45 degrees on the downwind leg and at a minimum altitude of 1,000 feet above the surface, or as prescribed in the FAA Aeronautical Information Manual as updated by the FAA.[1]

AREA AVIATION FACILITIES

A review of other public-use airports with at least one paved runway within a 30-nautical mile radius of CXP was conducted to identify and distinguish the types of air service provided in the region, with details from the analysis shown on **Exhibit 1L**. A 30-nautical mile radius was selected because under general FAA planning guidelines, this distance is assumed to approximately represent a 30-minute drive time, which is a common time/distance that a general aviation pilot or user is willing to drive to access a general aviation airport. Many of the nearby airports are privately owned and are not open to public use. It is also important to consider the capabilities and limitations of these airports when planning for future changes or improvements at CXP. It should be noted that there are 15 other airports in proximity to CXP.

CXP is the only publicly owned airport in Carson City County. There are 11 public airports within a 30-nautical mile radius of CXP, and only Reno-Tahoe International Airport has an ATCT. There are no privately owned airports for public use within the selected sample size, with the exception of Dayton Valley Airpark located approximately nine miles east-northeast of CXP.

[1] http://flycarsoncity.com/information/operating-procedures/, Carson City Airport Authority, 2018


Plumas County
Lassen County
Washoe County
Churchill County
RTS
Sierra County
RNO
Storey County
SPZ
Nevada County
TRK
CXP
Placer County
30nm
Lyon County
O43
MEV
TVL
Douglas County
El Dorado County
Alpine County
Mono County
N
10
20
Nautical Miles
LEGEND
Carson Airport
NPIAS Airports
Service Area
Source: ESRI Basemap Imagery (2016), FAA

AIRPORT FACILITIES AND SERVICES

There are four broad categories of facilities and services at the airport: airfield, landside, aviation services, and support.

Airfield facilities – facilities directly associated with aircraft operations, including runways, taxiways, lighting, markings, navigational aids, and weather reporting. **Exhibit 1M** details all existing airside facilities at CXP.

Landside facilities – facilities necessary to provide a safe transition from surface to air transportation and support aircraft parking, servicing, storage, maintenance, and operational safety, including non-aviation facilities that typically provide a revenue stream to the airport. **Exhibit 1N** details all existing landside facilities at CXP.

Aviation services – organizations or facilities that provide aviation services, including aircraft fueling, aircraft parking, hangar space/leasing, flying clubs, flight instruction, air medical services, and aircraft maintenance.

Support facilities – serve as a critical link to provide the necessary efficiency to aircraft ground operations, such as aircraft rescue, airport maintenance, firefighting (ARFF), and fuel storage.

AIRFIELD FACILITIES

The airfield category includes those facilities directly associated with aircraft operations. This section includes information related to the runway, taxiways, lighting, markings, navigational aids, and weather reporting aids at CXP.

Runway

Runway 9-27 is the only runway at CXP, measuring 6,101 feet long by 75 feet wide. Both approach ends of Runway 9-27 have blast pads measuring 300 feet long by 75 feet wide. **Table 1J** summarizes the characteristics of Runway 9-27. Runway 9-27 was reoriented in 2010.

Exhibit 1M
EXISTING AIRSIDE FACILITIES

Exhibit 1N
EXISTING LANDSIDE FACILITIES

TABLE 1J
Airfield Facility Data
Carson City Airport

Runway Characteristics	RWY 9-27	
Runway Length (ft.)	6,101	
Runway Width (ft.)	75	
Pavement Type	Asphalt - Grooved	
Pavement Condition	Excellent	
Elevation High Point (ft. MSL)	4,704	
Elevation Low Point (ft. MSL)	4,696'	
PCN Designation	18/F/B/X/T	
Gradient	0.15%	
Runway Load Bearing Strength (lbs.)		
Single Wheel	30.0	
Dual Wheel	60.0	
Dual Tandem Wheel	-	
PCN	-	
Runway Pavement Markings	Non-Precision	
Lighting	**RWY 9**	**RWY 27**
Edge Lights	MIRL	
Touchdown Point	4,703.9'	4,697.88'
Touchdown Pointed Lighted	Yes	
Visual Approach Aids		
Runway Electronic Navigation Aids	GPS	GPS
Runway Visual Navigation Aids	REIL | PAPI	REIL | PAPI

GPS – Global Positioning System
MIRL – Medium Intensity Runway Lighting
PAPI – Precision Approach Path Indicator
PCN – Pavement Classification Number
REIL – Runway End Identifier Lights

Source: AirNav, 2017; Carson City Airport, 2017; NDOT, Office of Aviation Planning, Pavement Management System, 2017

Taxiways

Since the previous Master Plan, Taxiway D has been constructed directly north of Runway 9-27. In addition to Taxiway D, CXP has three other primary taxiways (A, B, and C). **Table 1K** offers details for each taxiway on the airport.

Taxiway A is one of two full-length parallel taxiways providing access to both ends of Runway 9-27. Taxiway A is 50 feet wide and located 300 feet south of the runway (centerline to centerline). Five entrance/exit taxiways connect Taxiway A to Runway 9-27. The entrance/exit taxiways are labeled A1-A5 as depicted on **Exhibit 1M**.

Taxiway B is a north-northwest and south-southeast oriented taxiway extending between Runway 9-27 and a series of airport tenants and hangars. Taxiway B is 35 feet wide. It should be noted that Taxiway

TABLE 1K
Taxiway Characteristics
Carson City Airport

Designation	Width (ft.)	PCI Condition Number[1]
Taxiway A	50	81
Taxiway A1	50	81
Taxiway A2	50	81
Taxiway A3	50	81
Taxiway A4	50	81
Taxiway A5	50	81
Taxiway B	35	60
Taxiway C	50	71
Taxiway D	50	81
Taxiway D1	50	78
Taxiway D2	50	75
Taxiway D3[2]	50	79
Taxiway D4[2]	50	79

[1] Out of 100
[2]A near-term future project will re-designate taxiway connectors B and D3 as D3 and D4, respectively.
PCI – Pavement Condition Index
Source: NDOT, 2019

B also serves as a connector taxiway serving the north side of Runway 9-27. The portion of Taxiway B serving as a connector taxiway is 50 feet wide.

Taxiway C is oriented in a northeast-southwest orientation. Taxiway C is 50 feet wide and provides taxiway connector access between the northern hangar area and the west end including a direct link between Taxiways B and D. Taxiway C also offers access for a series of through-the-fence operators located in the Carson City Industrial Airpark.

Taxiway D is the northern full-length parallel taxiway providing access to both ends of Runway 9-27. Taxiway D is 50 feet wide and provides entrance/exit taxiways to Runway 9-27. At present, the entrance/exit taxiways are designated D1, D2, and, D3, with Taxiway B providing a connection to Runway 9-27 between Taxiways D2 and D3. However, it should be noted that a near-term future project will re-designate Taxiways B and D3 as Taxiways D3 and D4, respectively.

TAXIWAY A FACING NORTH EAST

TAXIWAY D1 MARKINGS AT HOLDSHORT

Runway Hold Aprons

Carson City Airport currently has four runway hold aprons for Runway 9-27. There are two hold aprons at each side of each runway end on Taxiways A and D. Each hold apron offers proximately 12,000 square feet of holding space.

Aircraft Parking Aprons

Aircraft aprons are wide expanses of pavement where various aircraft functions take place. Some apron areas are designated for locally based aircraft that utilize tie-down positions for outdoor storage. Other apron areas are designated for transient aircraft that are visiting for a short period of time. Portions of aprons are used for aircraft circulation purposes. Often, aprons will serve both local and itinerant needs based on demand. Hold aprons provide an area for pilots to perform routine preflight checks and engine run-ups prior to departure and are typically located in proximity to the runway ends.

There are two main, large aircraft parking aprons at Carson City Airport. The larger of the two, at 65,200 square yards, is located south of Runway 9-27. It is constructed of asphalt and has approximately 134 marked tie-down positions. The second apron is approximately 44,000 square yards and is also constructed of asphalt. It is located northwest of the Runway 9 threshold and contains approximately 43 marked aircraft tie-down positions.

Pavement Strength and Condition

Carson City Airport's pavement strength and condition was inspected May 20, 2018 by Applied Technologies through the NDOT 2018 pavement management system update. **Exhibit 1P** depicts the location for the pavement analysis and summarizes the relevant data for each pavement section examined. There were twenty-one (21) pavement sections defined during the inspection. Runway 9-27 had an overall PCI of 77. Low-severity cracking and weathering as well as high-severity raveling were the primary distresses observed on Runway 9-27. The PCI map provided by Applied Technologies and NDOT is presented on **Exhibit 1P**.

RUNWAY 9

Airfield Lighting

Airfield lighting systems extend an airport's usefulness into periods of darkness and/or poor visibility. The airport has a variety of lighting systems installed for this purpose. The following list categorizes existing lighting systems by function.

Airport Identification Lighting: A rotating beacon signals the location of the airport at night or during low-visibility weather. The rotating beacon does this by projecting two beams of light, one white and one green, 180 degrees apart. CXP's beacon operates from sunset to sunrise and is located southwest of the terminal and south of Weaver Aircraft.

Runway and Taxiway Lighting: Runway and taxiway edge lighting utilizes light fixtures placed near the edge of the pavement to define the lateral limits of the pavement. This lighting is essential for safe operations during night and/or times of low visibility and to provide efficient access to and from the runways and aircraft parking areas. Runway 9-27 is equipped with Medium Intensity Runway Lighting (MIRL), Taxiways A and D are equipped with medium intensity taxiway lighting (MITL), and Taxiways B and C have reflectors. Threshold lighting and Runway End Identifier Lights (REILs) identify each runway end.

RUNWAY AND TAXIWAY LIGHTING AND SIGNAGE

Pilot Controlled Lighting (PCL): Runway 9-27, Taxiways A and D, REILs, and PAPIs are PCL during nighttime hours via radio frequency 123.0 MHz. Carson City Airport's PCL system has three settings:

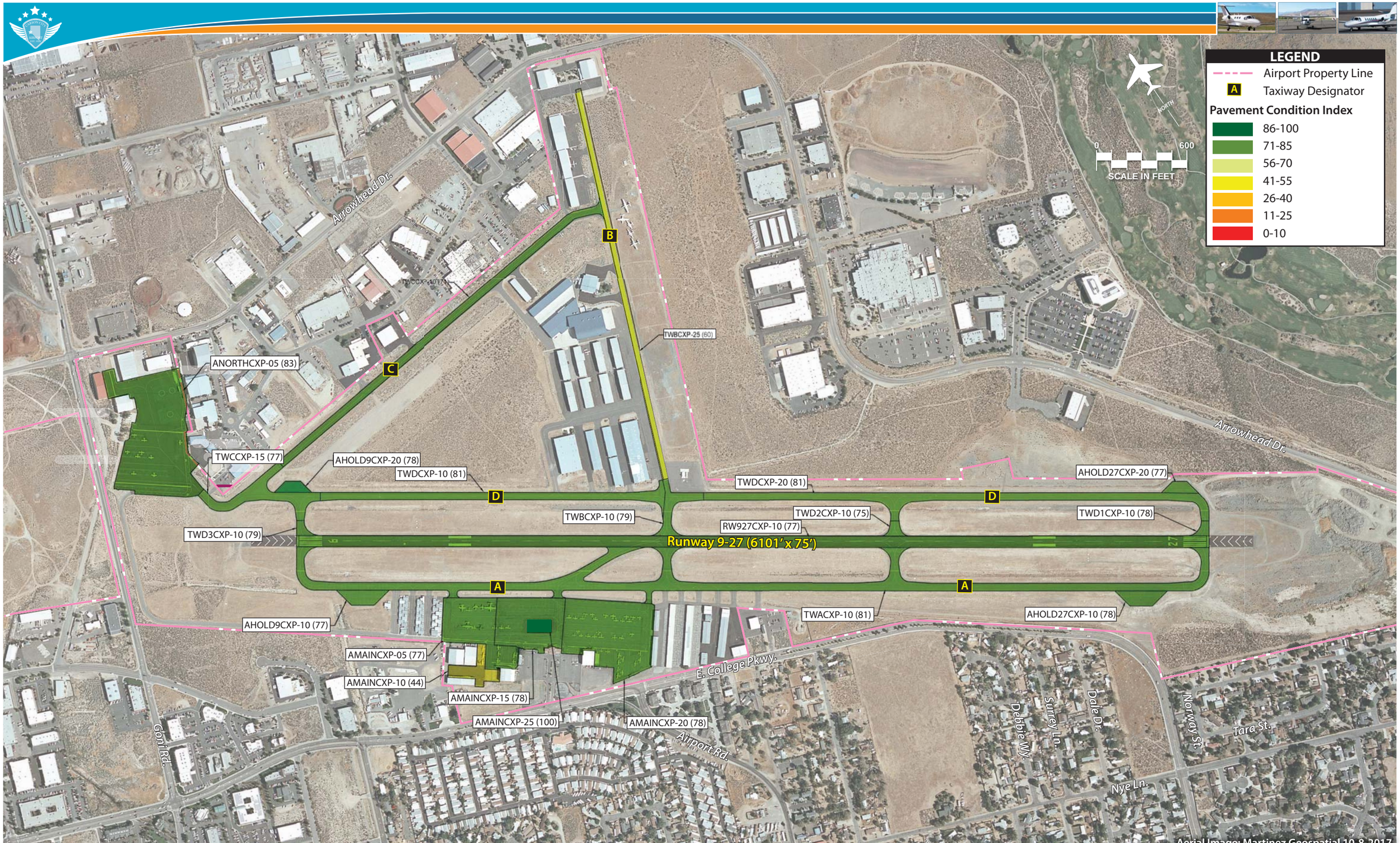
- Low intensity: Three clicks within five seconds
- Medium intensity: Five clicks within five seconds
- High intensity: Seven clicks within five seconds

According the airport's website, all lights operated by PCL will automatically time out after 15 minutes.


TWO-BOX PRECISION APPROACH PATH INDICATOR

Visual Approach Lighting: Visual approach aids are installed at the airport to assist pilots in determining the correct descent path to the runway end during landing. A two-box precision approach path indicator (PAPI-2L) is available on the left side of both runway end approaches. The pilot interprets the system of red and white lights, which gives an indication of being above, below, or on the designated descent path to the runway threshold. A PAPI system has a range of five miles during the day and up to 20 miles at night. Each PAPI at CXP provides a 4.0-degree glide path (Runway 9) and 3.0-degree glide path (Runway 27). However, the PAPI serving Runway 9 is not usable at night due to terrain obstructions and Runway 27 has a NOTAM indicating that it is not usable beyond 1.3 nautical miles.

Airfield Signage: Airfield identification signs assist pilots in identifying runways, taxiway routes, holding positions, and critical areas. The airfield at CXP is equipped with lighted signs located at each taxiway intersection.


LEGEND
Airport Property Line
Taxiway Designator
Pavement Condition Index
86-100
71-85
56-70
41-55
26-40
11-25
0-10
NORTH
0
600
SCALE IN FEET
Arrowhead Dr.
Arrowhead Dr.
TWCCXP-10 (77)
ANORTHCXP-05 (83)
TWCCXP-15 (77)
AHOLD9CXP-20 (78)
TWDCXP-10 (81)
TWBCXP-25 (60)
TWDCXP-20 (81)
AHOLD27CXP-20 (77)
TWBCXP-10 (79)
TWD2CXP-10 (75)
RW927CXP-10 (77)
TWD1CXP-10 (78)
TWD3CXP-10 (79)
Runway 9-27 (6101' x 75')
TWACXP-10 (81)
AHOLD27CXP-10 (78)
AHOLD9CXP-10 (77)
AMAINCXP-05 (77)
AMAINCXP-10 (44)
AMAINCXP-15 (78)
AMAINCXP-25 (100)
AMAINCXP-20 (78)
E. College Pkwy.
Airport Rd.
Goni Rd.
Debbie Wy.
Surrey Ln.
Dale Dr.
Norway St.
Tara St.
Nye Ln.
Aerial Image: Martinez Geospatial 10-8-2017

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Airport Markings

TAXIWAY A

Pavement markings aid in the movement of aircraft along surfaces at the airport and identify closed or hazardous areas. The airport provides and maintains marking systems in accordance with Part 139.311(a) and Advisory Circular 150/5340-1, *Standards for Airport Marking*.

Runway 9-27 is equipped with non-precision runway markings, which identifies the runway number, centerline, threshold marking, aiming points, edge markings, and touchdown zones. The markings are in good condition.

All taxiways at the airport are marked with yellow centerline and holding position markings. Centerline markings assist pilots in maintaining proper clearance from pavement edges and objects near the taxiway edges. Enhanced centerline markings are offered for taxiways leading to the Runway 9-27 holding position markings. Aircraft holding positions are marked at each runway/taxiway intersection 200 feet from the runway centerline.

Navigational Aids and Instrument Landing System (ILS) Equipment

Navigational aids are electronic devices that transmit radio frequencies, which pilots of properly equipped aircraft can translate into point-to-point guidance and position information. The types of electronic navigational aids available for aircraft flying in the vicinity of CXP include a VOR facility and GPS. GPS differs from a VOR in that pilots are not required to navigate using a specific facility. GPS uses satellites placed in orbit around the earth to transmit electronic radio signals, which pilots of properly equipped aircraft use to determine altitude, speed, and other navigational information.

The VOR, in general, provides azimuth readings to pilots of properly equipped aircraft transmitting a radio signal at every degree to provide 360 individual navigational courses. Frequently, distance measuring equipment (DME) is combined with a VOR facility (VOR-DME) to provide distance as well as direction information to the pilot. Military tactical air navigation aids (TACANs) and civil VORs are commonly combined to form a VORTAC. The VORTAC provides distance and direction information to both civil and military pilots. The Squaw Valley VOR-DME facility is located approximately 25 miles west of the airport and as previously mentioned, the Mustang VORTAC is located approximately 21 miles to the north, northeast of the airport.

GPS is an additional navigational aid for pilots that was initially developed by the United States Department of Defense for military navigation. With GPS, pilots can directly navigate to any airport in the

country and are not required to navigate to a specific ground-based navigation facility. Instrument Approach Procedures (IAPs) GPS procedures for approach to Runway 27 and an approach to the airport are available.

Automated Weather Observation System (AWOS)

According to the airport website, "CXP is served by an AWOS-III P/T. The AWOS-III P/T provides automated aviation weather observations 24 hours per day. The system updates weather observations every minute, continuously reporting significant weather changes as they occur. The AWOS system reports cloud ceiling, cloud type, sky condition, visibility, temperature, dew point, wind direction and speed, wind gust, variable wind direction, altimeter setting (barometric pressure), density altitude (airfield elevation corrected for temperature), and thunderstorm/lighting detection. The AWOS frequency is 119.925 and the phone number is (775) 884-4708. "[2]

Segmented Circle and Lighted Wind Cone

CXP has a lighted wind cone and segmented circle located just north of the approach end of Runway 27 and Taxiway D2. The wind cone informs pilots of the wind direction and speed, while the segmented circle indicates aircraft traffic pattern information.

SEGMENTED CIRCLE AND LIGHTED WINDCONE

SUPPLEMENTAL WINDCONE

Additional Airport Documentation

The City maintains several documents which provide guidance for airport management on airport issues. Title 19 – Airport Rules and Regulations has been adopted for the orderly, safe, and efficient operation

[2] http://flycarsoncity.com/information/

of the Carson City Airport. A copy of this document can be found on the airport's website, under the pilot information tab.

LANDSIDE FACILITIES

Landside facilities support the aircraft and pilot/passenger transition between air and ground. Typical landside facilities include the passenger terminal complex, on-airport buildings and hangars, general aviation facilities, and support facilities (i.e., fuel storage, vehicle parking, roadway access, snow removal equipment).

Aviation Businesses

Carson City Airport has numerous aviation businesses including a fixed base operator (FBO). FBOs provide a wide range of services to the general aviation flying public. This includes line-services, fueling, lounge facilities, and pilot services. Some FBOs provide additional services such as aircraft maintenance, flight training, aircraft sales, charter flights, and conference room facilities. There are also other aviation services available at the airport, including sightseeing, museums, specialty aircraft maintenance businesses focusing on piston or turbine engines, as well as the sale and lease of hangar space. Since the previous Master Plan, Mountain West Aviation, LLC purchased Eagle Valley Fuel, LLC (2007) and El Aero, Inc. (2015); however, El Aero still operates as a separate business per the acquisition. **Table 1L** lists the on-airport businesses as of February 2018.

Terminal Complex

Carson City Airport's terminal building was originally constructed by the City in 1963 to serve scheduled passenger airline activities. Since its inception, it has seen passenger service come and go and has been renovated a handful of times. The airport terminal building provides approximately 5,000 square feet of space and is located at the midpoint of the main apron area. There has been no scheduled air service at the airport since 1985. The inside has been renovated and currently houses airport management and administrative personnel.

TERMINAL COMPLEX

TABLE 1L
Aviation Businesses
Carson City Airport

Business Name	Service Provided/Additional Information
Fixed Base Operator and Specialized Aviation Service Operators	
Mountain West Aviation (CXP), LLC	A full service FBO; hangar sales & leasing
El Aero, Inc (Purchased by Mountain West in 2015 but acts as separate business)	Aircraft charters; aircraft maintenance
Sterling Air, Ltd	Aircraft sales/leasing; maintenance; storage
Shadetree Aviation, LLC	Aircraft sales, maintenance and repair, primarily for Yak aircraft.
Weaver Aircraft	Aircraft maintenance; storage and tie-downs
Carson Aviation Services	Aircraft maintenance; avionics repair
WB Aviation LLC	Aircraft maintenance
Flight Training School	
High Sierra Pilots	Pilot training and flying club
Sport Aviation Center	Light-sport and weight-shift trike FBO; ground and flight training
Museum	
Cactus Air Force, LLC	Located west of the main terminal; aircraft museum and restoration services
Scenic Tours	
Hang Gliding Tahoe	Aerial sightseeing of Lake Tahoe and Carson City
Hangar Sales & Leasing	
Carson Air Group Hangar Association	Aircraft hangar storage
Carson Executive Hangar Condominium Association	Aircraft hangar storage
Comstock Aviation	Aircraft hangar storage
Jet Ranch	Corporate aircraft hangar storage & services
Mountain View Community Association	Aircraft hangar storage
Sierra Mountain Airpark	Aircraft hangar storage & aircraft restoration
Silver Flite, Inc. & Yesterday's Flyers	Aircraft hangar storage & aircraft restoration
Sierra Skyway Inc.	Aircraft hangar storage
Flying Clubs	
Experimental Aircraft Association Chapter 403	Located southwest of the CXP terminal building

Source: Flycarsoncity.com, 2017

Fixed Base Operator (FBO) – Mountain West Aviation (CXP)

Mountain West Aviation is the only full service FBO at the airport. However, in 2015, Mountain West purchased El Aero, Inc., which still operates as a separate entity. The FBO provides a large host of services, listed below. The hours of operations are from 6:00 a.m. to 10:00 p.m. daily with after-hours services available on request.

Services, Facilities and Amenities

- Aviation Fuel 24/7
- Restrooms
- Complimentary Food & Beverage
- Hangar Leasing & Sales
- Public Phone
- Contract Fueling
- GPU
- Lavatory Cart
- Aircraft Pre-Heating
- Aircraft Parking
- Auto Parking
- Pilot Supplies
- Pilot Lounge
- Catering
- Nightly Hangars
- Helicopter Tours
- Part 135 Charter Service
- Internet Access

Specialized Aviation Service Operator (SASOs)

There are five SASOs at CXP, as detailed below.

- Sterling Air, Ltd.
- Shadetree Aviation, LLC.
- Weaver Aircraft
- Carson Aviation Services
- Carson City Sheriffs Aero Squadron
- WB Aviation LLC

Flight Schools, Flying Clubs & Scenic Tours

Flight Schools

There are two entities at the airport that operate flight schools: Great Basin Aviation and Sport Aviation Center. However, both provide different forms of training. Details are listed below.

- High Sierra Pilots – Provides fixed-wing flight instruction, flying club, and aircraft rentals.
- Sport Aviation Center – Provides ground and flight training for light-sport and weight-shift trike aircraft.

Flying Clubs

- Experimental Aircraft Association – The Experimental Aircraft Association (EAA) is an international organization of aviation enthusiasts who seek to promote and support recreational flying.

Scenic Tours

- Hang Gliding Tahoe – Hang Gliding Tahoe is a scenic tour operation that provides multiple levels of service to the general public in and around the Lake Tahoe/Carson City area.

Hangar Sales and Leasing

Carson City Airport offers hangar purchase and rental opportunities. The following organizations provide these services at CXP:

- Carson Air Group Association
- Carson Executive Hangar Condominium Association
- Comstock Aviation
- Mountain West Aviation (CXP)
- Mountain View Community Association
- Heritage Hangars
- Jet Ranch
- Sierra Mountain Airpark
- Sierra Skyway
- Silver Flite & Yesterday's Flyers
- Sterling Air

Aircraft Hangar Facilities

Aircraft hangars are an important feature of an airport. Hangars provide enclosed aircraft storage functions and support aviation businesses. When determining future hangar needs, it is necessary to establish the existing hangar capacity by type (conventional, executive/linear box, and T-hangars). Because each hangar will have a different aircraft storage capacity based on the use of the hangar, reasonable estimates have been made. **Table 1M** summarizes the existing hangar facilities at CXP.

CONVENTIONAL HANGAR

LINEAR BOX HANGARS

Vehicle Parking

There are 168 marked vehicular parking spaces to support facilities at the airport, 10 of which are handicapped accessible. There are two designated public parking lots in the area adjacent to the terminal complex and FBO maintenance hangar north of the approach end of Runway 9, near Arrowhead Drive. Parking along hangars is available; however, the space is not clearly marked and designated.

TABLE 1M
Hangar Facilities
Carson City Airport

Owner/Name	Type	# of Hangar Units	Lease Site
American Warbirds	Conventional Hangar	N/A	10,000 ft^2
Carson Air Group	Conventional Hangar	47	80,000 ft^2
Carson Executive	Conventional Hangar	47	118,000 ft^2
Corrao	Executive Hangar	1	46,084 ft^2
Goni Aviation	Conventional Hangar	N/A	11,000 ft^2
G. Byard	Conventional Hangar	N/A	33,740 ft^2
Heritage	Conventional Hangar	4	15,575 ft^2
Jet Ranch	Conventional Hangar	11	86,000 ft^2
Mayes	Conventional Hangar	1	60,162 ft^2
Mountain West	T-Hangars	31	45,720 ft^2
Mountain West -El Aero	Conventional Hangar	1	18,000 ft^2
Mountain West -El Aero	Conventional Hangar	1	12,000 ft^2
Seibold	Executive Hangar	1	46,084 ft^2
Shadetree Aviation, Inc.	Conventional Hangar	N/A	10,000 ft^2
Sierra Mountain Airpark*	Linear Box	9	56,550 ft^2
Sierra Skyway Inc.	Linear Box	18	56,500 ft^2
Sterling	Conventional Hangar	N/A	8,200 ft^2
Thomas	Linear Box	35	42,400 ft^2
Weaver	Maintenance Hangar	N/A	9,000 ft^2
Yesterday's Flyers /Kitchen	Linear Box	27	36,400 ft^2

*Includes Sierra Mountain Airpark North and South.
Source: Carson City Airport, 2017; Google Earth, 2017

Through-the-Fence Operators

Two businesses with the Carson City Industrial Airpark are currently permitted as through-the-fence operators at Carson City Airport. The through-the-fence operators are Click Bond and Mustang Manufacturing. Title 19.03 of the Carson City Municipal Code governs these activities. Under the code, adjoining property owners seeking the privilege to access CXP must apply for a permit. An annual fee of $750 is required to maintain access. Operators are barred from conducting aeronautical services.

Perimeter Fencing

There is approximately 27,281 feet of perimeter fencing at CXP Portions of the airport property are fenced via chain link, with the majority of the perimeter fenced with multi-strand barbed wire.

Utilities

The availability and capacity of the utilities serving the airport are factors in determining the development potential of the airport property, as well as the land immediately adjacent to the facility. Of

primary concern is the availability of water, gas, sewer, and power sources. Utilities are currently supplied by the following providers:

- Water and wastewater – Carson City Utilities Department
- Trash and recycling – Waste Management
- Natural gas – Southwest Gas Corporation
- Electrical – NV Energy

Mining Operations

Directly west of the approach end of Runway 27 and east of Bowers Lane, Cinderlite is conducting a short-term mining operation on airport property. The operations are outside of the Runway Safety Areas (RSAs) and do not penetrate any airspace.

CINDERLITE SHORT-TERM MINING OPERATION

SUPPORT FACILITIES

Several support facilities serve as critical links in providing the necessary efficiency to aircraft ground operations, such as aircraft rescue and firefighting (ARFF), airfield maintenance, and fuel storage.

Fire Station and Aircraft Rescue and Firefighting (ARFF)

There is no dedicated ARFF facility at CXP. Emergency services are provided by the Carson City Fire Department. Additionally, Carson City Fire Station 52 is located along E. College Parkway, south of Runway 9-27, and is available for response to aircraft and airport facility emergencies. Access is through a manually operated gate located south of American Warbirds. Fire Station 52 is equipped with a First-Out Type I structure engine, Type I reserve structure engine, a Type II wildland brush engine, a HazMat response unit, a utility truck with trailers, and one ambulance.

CARSON CITY FIRE STATION 52

Airport Maintenance Facilities

Carson City Airport has a small airport maintenance building south of the approach end of Runway 27, directly east of the NDOT hangar. The building is primarily used to house airport equipment and repair tools. Additionally, the airport stores a Case Tractor (and scoop), snowplow, and a GMC pick-up truck outdoors, near the maintenance building.

Fuel Storage

All fuel storage facilities at Carson City Airport are privately owned and operated. Presently, both the storage tank and the facility are owned by Mountain West Aviation and operated under the El-Aero name. The fuel storage totals 44,000 gallons. Both 100LL and Jet-A is provided and dispensed through mobile fuel trucks.

The fuel facility located at Taxiway B, near Taxiway D, is a self-serve aboveground island consisting of two 10,000-gallon tanks. Both 100LL and 130 Octane fuels are available.

ENVIRONMENTAL INVENTORY

The Environmental Inventory addresses existing conditions at the airport and its environs. This inventory is intended to help identify relevant environmental issues that should be considered during preparation of the master plan. The inventory is organized using the resource categories contained in FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures* (2015). Available information regarding the environmental conditions at the airport and within the surrounding area has been derived from internet resources, agency maps, and existing literature.

AIR QUALITY

The United States (U.S.) Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) based on health risks for six pollutants:

- Carbon monoxide (CO)
- Nitrogen dioxide (NO_2)
- Sulfur dioxide (SO_2)
- Lead (Pb)
- Ozone (O_3)
- Two sizes of particulate matter (PM): PM measuring between 10 and 2.5 micrometers in diameter (PM_{10}), and PM measuring 2.5 micrometers or less in diameter ($PM_{2.5}$)

An area with ambient air concentrations exceeding the NAAQS for a criteria pollutant is said to be a nonattainment area for the pollutant's NAAQS, while an area where ambient concentrations are below

the NAAQS is considered an attainment area. The EPA requires that areas designated as nonattainment demonstrate how they will attain the NAAQS by an established deadline. To accomplish this, states are required to prepare State Implementation Plans (SIPs), which are typically a comprehensive set of reduction strategies and emissions budgets designed to bring the area into attainment.

The Carson City Airport is in Carson City, Nevada. According to the U.S. EPA's Green Book – National Area and County-Level Multi-Pollutant Information, Carson City is in attainment for all federal criteria pollutants.[3]

BIOLOGICAL RESOURCES

The U.S. Fish and Wildlife Service (USFWS) is charged with overseeing the requirements of the *Endangered Species Act* (ESA), specifically Section 7, which sets forth requirements for consultation to determine if a proposed action "may affect" a federally endangered or threatened species. If an agency determines that an action "may affect" a federally protected species, then Section 7(a)(2) requires the agency to consult with USFWS to ensure that any action the agency authorizes, funds, or carries out is not likely to jeopardize the continued existence of any federally-listed endangered or threatened species, or result in the destruction or adverse modification of critical habitat. If a species has been listed as a candidate species, Section 7(a)(4) states that each agency must confer with USFWS.

Additional federal laws protecting biological resources include the *Migratory Bird Treaty Act* (MBTA), which prohibits activities that would harm migratory birds, their eggs, or nests, and the *Bald and Golden Eagle Protection Act*, which prohibits the take (defined as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb") of bald and golden eagles, including their parts, nests, or eggs, without a permit. Executive Order (E.O.) 13312, Invasive Species aims to prevent the introduction of invasive species because of a proposed action. (E.O. 11990, Protection of Wetlands is discussed under the Water Resources section of this report.)

The USFWS Information for Planning and Consultation (IPaC) report indicates that there is potential for activities at the airport to impact the Lahontan cutthroat trout (*Oncorhynchus clarkia henshawi*), a federally threatened fish. The Lahontan cutthroat trout is native to the drainages of the Carson River, which flows approximately one mile southeast of the airport.

Table 1N lists bird species protected under the MBTA and Bald and Golden Eagle Protection Act that may be affected by activities at the airport; it is not an exhaustive list of every bird species potentially found at this location.

[3] EPA Green Book, Nevada Nonattainment/Maintenance Status for Each County by Year for all Criteria Pollutants, data current as of December 31, 2017, https://www3.epa.gov/airquality/greenbook/anayo_nv.html (accessed January 4, 2018).

TABLE 1N
Birds Protected Under the *Migratory Bird Treaty Act* and *Bald and Golden Eagle Protection Act*
Carson City Airport

Protected Species (Scientific Name)	Breeding Season
Bald Eagle (*Haliaeetus leucocephalus)*	Mar 20 – Sep 15
Brewer's Sparrow (*Spizella breweri*)	May 15 – Aug 10
Clark's Grebe (*Aechmophorus clarkia*)	Jan 1 – Dec 31
Golden Eagle (*Aquila chrysaetos*)	Apr 1 – Aug 31
Green-tailed Towhee (*Pipilo chlorurus*)	May 1 – Aug 10
Lewis's Woodpecker (*Melanerpes lewis*)	Apr 20 – Sep 30
Olive-sided Flycatcher (*Contopus cooperi*)	May 20 – Aug 31
Pinyon Jay (*Gymnorhinus cyanocephalus*)	Feb 15 – Jul 15
Sagebrush Sparrow (*Artemisiospiza nevadensis*)	Mar 15 – Jul 31
Tricolored Blackbird (*Agelaius tricolor*)	Mar 15 – Aug 10
White Headed Woodpecker (*Picoides albolarvatus*)	May 1 – Aug 15
Willet (*Tringa semipalmata*)	Apr 20 – Aug 5
Williamson's Sapsucker (*Sphyrapicus thyroideus*)	May 20 – Aug 31
Willow Flycatcher (*Empidonax traillii*)	May 20 – Aug 31

Source: U.S. Fish and Wildlife Service Information for Planning and Conservation (accessed January 4, 2018).

CLIMATE

The EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2015, found that the transportation sector, which includes aviation, accounted for 27 percent of U.S. greenhouse gas (GHG) emissions in 2015. Of this, aviation contributed 160.7 million metric tons (MMT) of carbon dioxide equivalent (CO_2e), or nearly nine percent of all transportation emissions.[4, 5] Transportation sources include cars, trucks, ships, trains, and planes. Most of the GHG emissions from transportation are (carbon dioxide) CO_2 emissions resulting from the combustion of petroleum-based products in internal combustion engines. Relatively small amounts of methane (CH_4), hydrofluorocarbon (HFC), and nitrous oxide (N_2O) are emitted during fuel combustion.

Carbon dioxide equivalent, or CO_2e, is used to describe different greenhouse gases (GHG) in a common unit. For any quantity and type of GHG, CO_2e represents the amount of CO_2 that would have the equivalent global warming potential.

[4] Aviation activity consists of emissions from jet fuel and aviation gasoline consumed by commercial aircraft, general aviation, and military aircraft.
[5] Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015, Table 2-13 (available: https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2015).

From 1990 to 2015, total transportation emissions increased. The upward trend is largely due to increased demand for travel; however, much of this travel was done in passenger cars and light-duty trucks. In addition to transportation-related emissions, **Figure 1A** shows all GHG emissions sources in the U.S. in 2015.

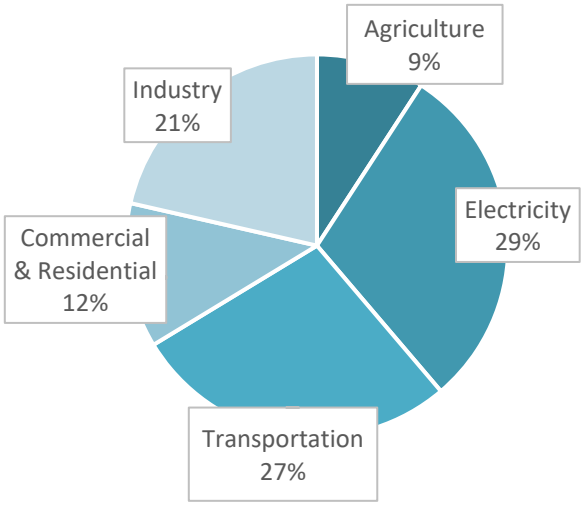


FIGURE 1A - 2015 SOURCES OF GREENHOUSE GAS EMISSIONS IN THE U.S.
SOURCE: U.S. EPA (2017)

Increasing concentrations of GHGs can affect global climate by trapping heat in the Earth's atmosphere. Scientific measurements have shown that Earth's climate is warming, with concurrent impacts, including warmer air temperatures, rising sea levels, increased storm activity, and greater intensity in precipitation events. This climate change is a global phenomenon that can also have local impacts (IPCC 2014). GHGs, such as water vapor (H_2O), CO_2, CH_4, N_2O, and O_3, are both naturally occurring and anthropogenic (man-made).

Research has also shown a direct correlation between fuel combustion and GHG emissions. GHGs from anthropogenic sources include CO_2, CH_4, N_2O, HFCs, perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). CO_2 is the most important anthropogenic GHG because it is a long-lived gas that remains in the atmosphere for up to 100 years.

COASTAL RESOURCES

Federal activities involving or affecting coastal resources are governed by the Coastal Barriers Resource Act, the Coastal Zone Management Act, and E.O. 13089, Coral Reef Protection. There are no coastal resources near the airport, nor is the airport in a coastal area.

DEPARTMENT OF TRANSPORTATION (DOT) ACT: SECTION 4(f)

Section 4(f) of the DOT Act, which was recodified and renumbered as Section 303(c) of Title 49 United States Code (USC), states that the Secretary of Transportation shall not approve any program or project that requires the use of any publicly owned land from a historic site, public park, recreation area, or waterfowl or wildlife refuge of national, state, regional, or local importance unless there is no feasible and prudent alternative to the use of such land, and the project includes all possible planning to minimize harm resulting from the use.

The term "use" includes not only the physical taking of such lands, but "constructive use" of such lands. "Constructive use" of lands occurs when "a project's proximity impacts are so severe that the protected activities, features, or attributes that qualify a resource for protection under Section 4(f) are substantially impaired" (Title 23 Code of Federal Regulations [CFR] Section 771.135).

Table 1P lists all nationally registered historic places and public parks within five miles of the airport (see **Exhibit 1Q** for park locations). There are no recreation areas, wildlife refuges, or wilderness areas within five miles of the airport.

TABLE 1P
Section 4(f) Protected Resources

Name	Distance from Airport	Direction from Airport
National Register of Historic Places (NRHP)		
Raycraft Ranch	1.1 miles	Northwest
George L. Sanford House	1.4 miles	South
The Glenbrook	1.4 miles	South
West Side Historic District	1.8 miles	South
Public Parks		
Eagle Valley Golf Course	0.10 miles	Northeast
John D. Winters Centennial Park	0.90 miles	Northeast
Riley Circle Park	0.85 miles	West
Fulstone Wetlands[1]	0.60 miles	South

[1] Carson City parks and recreation property designated for passive recreation.
Source: Google Maps: Carson City's Parks and Open Spaces (accessed January 2018).

FARMLANDS

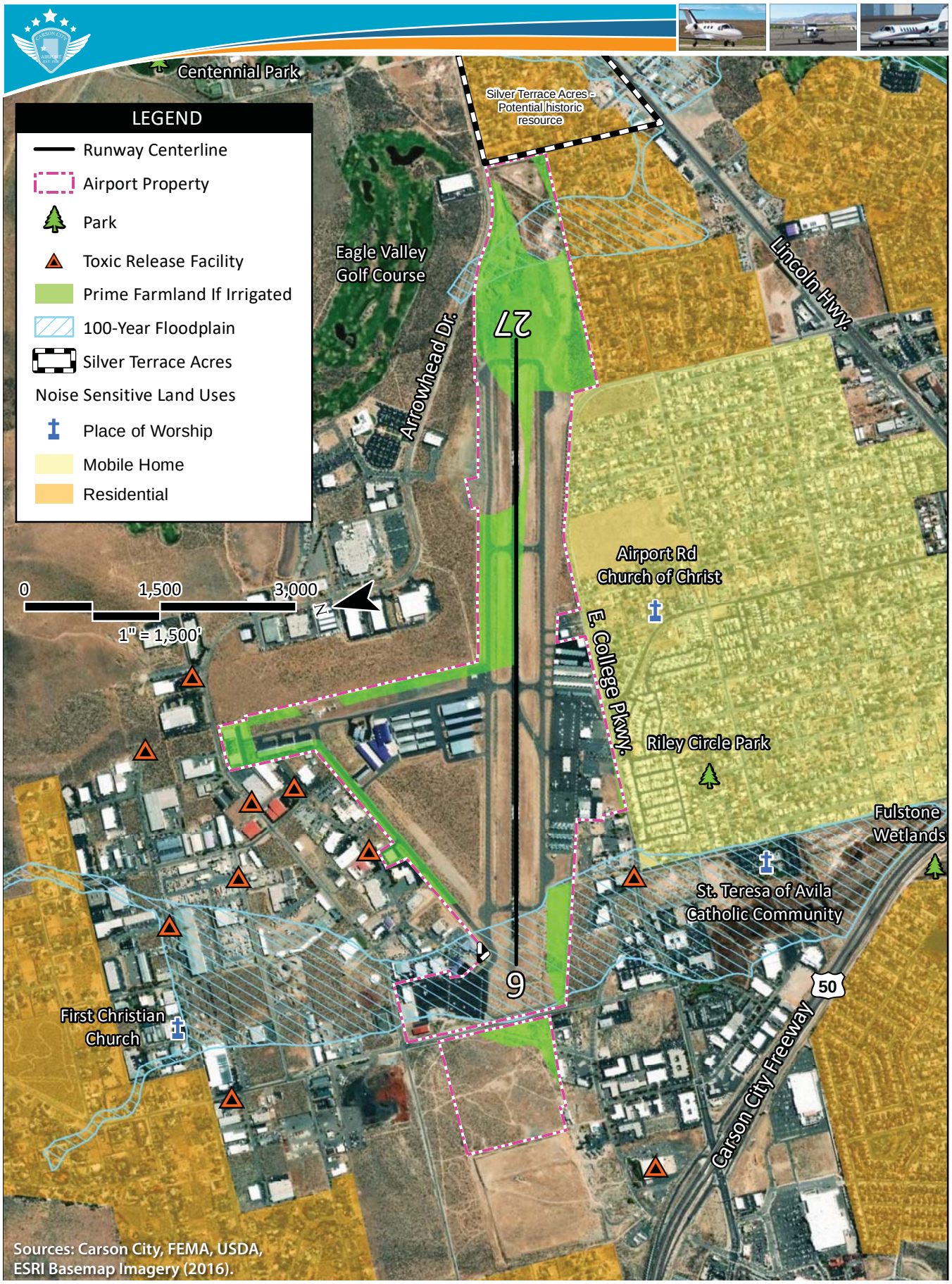
The *Farmland Protection Policy Act* (FPPA) is intended to minimize the impact federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. Under the FPPA, farmland includes prime farmland, unique farmland, prime farmland if drained, and land of statewide or local importance. Farmland subject to FPPA requirements does not have to be currently used for cropland. It can also be forest land, pastureland, or other land, but not water or urban built-up land.

According to the U.S. Department of Agriculture's (USDA) Web Soil Survey, 99 acres of airport property are considered prime farmland[6] if irrigated (see **Exhibit 1Q**). The remaining parts of airport property do not consist of protected farmlands.

HAZARDOUS MATERIALS, SOLID WASTE, AND POLLUTION PREVENTION

Federal, state, and local laws, including the *Resource Conservation Recovery Act* (RCRA) and the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA), as amended (also known as the Superfund)[7], regulate hazardous materials use, storage, transport, and disposal. These laws may extend to past and future landowners of properties containing these materials. Disturbing areas that contain hazardous materials or contaminants can cause significant impacts to soil, surface water, groundwater, air quality, and the organisms using these resources.

[6] **Prime farmland** is land having the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimal use of fuel, fertilizer, pesticides, or products (7 CFR § 657.5).
[7] A **Superfund** site is any land in the U.S. that has been contaminated by hazardous waste and identified by the EPA as a candidate for cleanup as it poses a human health risk and/or the environment (U.S. Department of Health and Human Services).



Sources: Carson City, FEMA, USDA, ESRI Basemap Imagery (2016).

According to the EPA's Environmental Justice Screening (EJSCREEN) and Mapping Tool, there are no brownfields[8] or Superfund sites on or near the airport. There are, however, numerous facilities to the north, west, and south of the airport that are permitted by the EPA to release toxic chemicals,[9] as outlined in **Table 1Q**.

TABLE 1Q
Permitted Toxic Releases Near the Airport

Name	Address	Distance from Airport	Direction from Airport
Wykle Research, Inc	2222 E College Parkway	0.0 miles	South
Carsonite International Corp.	1301 Hot Springs Road	0.04 miles	West
PCC Structurals	2727 Lockheed Way	0.0 miles	North
Re Dixon, Inc.	2801 Lockheed Way	0.0 miles	North
Parker Hannifin Corp.	2801 Arrowhead Drive	0.0 miles	North
Dura-Bond Bearing Company	3200 Arrowhead Drive	0.0 miles	North
Basalite Concrete Products	2600 Boeing Way	0.30 miles	North
Parlex Nevada, Inc.	3000 Conestoga Drive	0.20 miles	North
American Buildings Company	2401 Conestoga Drive	0.40 miles	North
United Engine & Machine Co, Inc.	4909 Goni Road	0.45 miles	North

Source: EPA EJSCREEN and Mapping Tool (accessed January 2018).

The airport disposes solid waste at the Carson City Landfill, located at 3600 Flint Drive, approximately two miles east of the airport.[10]

HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Determination of a project's environmental impact to historic and cultural resources is made under guidance in the *National Historic Preservation Act* of 1966, as amended, the *Archaeological and Historic Preservation Act* of 1974, the *Archaeological Resources Protection Act*, and the *Native American Graves Protection and Repatriation Act* of 1990, among others. Impacts can occur when a proposed project causes an adverse effect on a property which has been identified (or is unearthed during construction) as having historical, architectural, archaeological, or cultural significance.

As mentioned previously in **Table 1P**, there are four sites listed on the NRHP within five miles of the airport. These include: Raycraft Ranch, George L. Sanford house, the Glenbrook, and the West Side Historic District.

The nearest Indian/Native American feature is the Carson Colony, approximately 3.6 miles south of the airport.

[8] A **brownfield** is a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutants, or contaminant (EPA).
[9] U.S. facilities in different industry sectors must report annually how much of certain chemicals are released to the environment and/or managed through recycling, energy recovery and treatment. A "release" of a chemical means it is emitted to the air or water, or placed in some type of land disposal (EPA Toxic Release Inventory [TRI] Program).
[10] Carson City Public Works, http://carson.org/government/departments-g-z/public-works/landfill (accessed January 4, 2018).

LAND USE

Existing land uses around the airport are discussed earlier in this chapter. **Exhibit 1D** illustrates existing land uses near the airport, and **Exhibit 1E** shows the zoning for Carson City.

NATURAL RESOURCES AND ENERGY SUPPLY

Energy usage at the airport includes the consumption of aviation fuel (Jet A and 100LL), gasoline and diesel fuel for vehicles and maintenance equipment, natural gas, and electricity. The airport also uses water and wastewater services. Utility providers are discussed in greater detail earlier in the chapter.

NOISE AND COMPATIBLE LAND USE

Federal land use compatibility guidelines are established under 14 CFR Part 150, Airport Noise Compatibility Planning. Per 14 CFR Part 150, residential land uses and schools are noise-sensitive land uses that are not considered compatible with a 65 decibel (dB) Day-Night Average Sound Level (DNL).[11] Other noise-sensitive land uses (such as religious facilities, hospitals, or nursing homes), if located within a 65 dB DNL contour, are generally compatible when an interior noise level reduction of 25 dB is incorporated into the design and construction of the structure. Special consideration also needs to be given to noise-sensitive areas within Section 4(f) properties where the land use compatibility guidelines in 14 CFR Part 150 do not account for the value, significance, and enjoyment of the area in question (FAA 2015).

There are single- and multi-family residential uses to the northeast and south of the airport. Residences to the south are only separated from airport property by State Route (SR) 531/ E. College Parkway, which runs east/west along the southern boundary of airport property. In addition to residential uses, there are three places of worship within one mile of the airport, as well as an education facility. **Table 1R** lists these uses, and they are shown on **Exhibit 1Q**.

The City of Carson City has an Airport Noise Corridor around the airport (see **Exhibit 1R**).[12] The Airport Noise Corridor is an informal boundary that has no development restrictions, but rather allows airport

[11] Noise-sensitive land uses are generally residences, places of worship, hospitals and health care facilities, and educational facilities. Places of worship are defined as permanently established facilities intended solely for use as places of worship and not meant to be converted to other potential uses. For a hospital and/or health care facility to be considered a noise-sensitive medical facility, it must provide for overnight stays or provide for longer recovery periods, where rest and relaxation are key considerations for use of the facility. Schools are facilities that provide full-time use for instruction and training to students.

[12] City of Carson City NV GIS (updated as of January 6, 2018), http://carsoncity.maps.arcgis.com/home/index.html (accessed January 9, 2018).

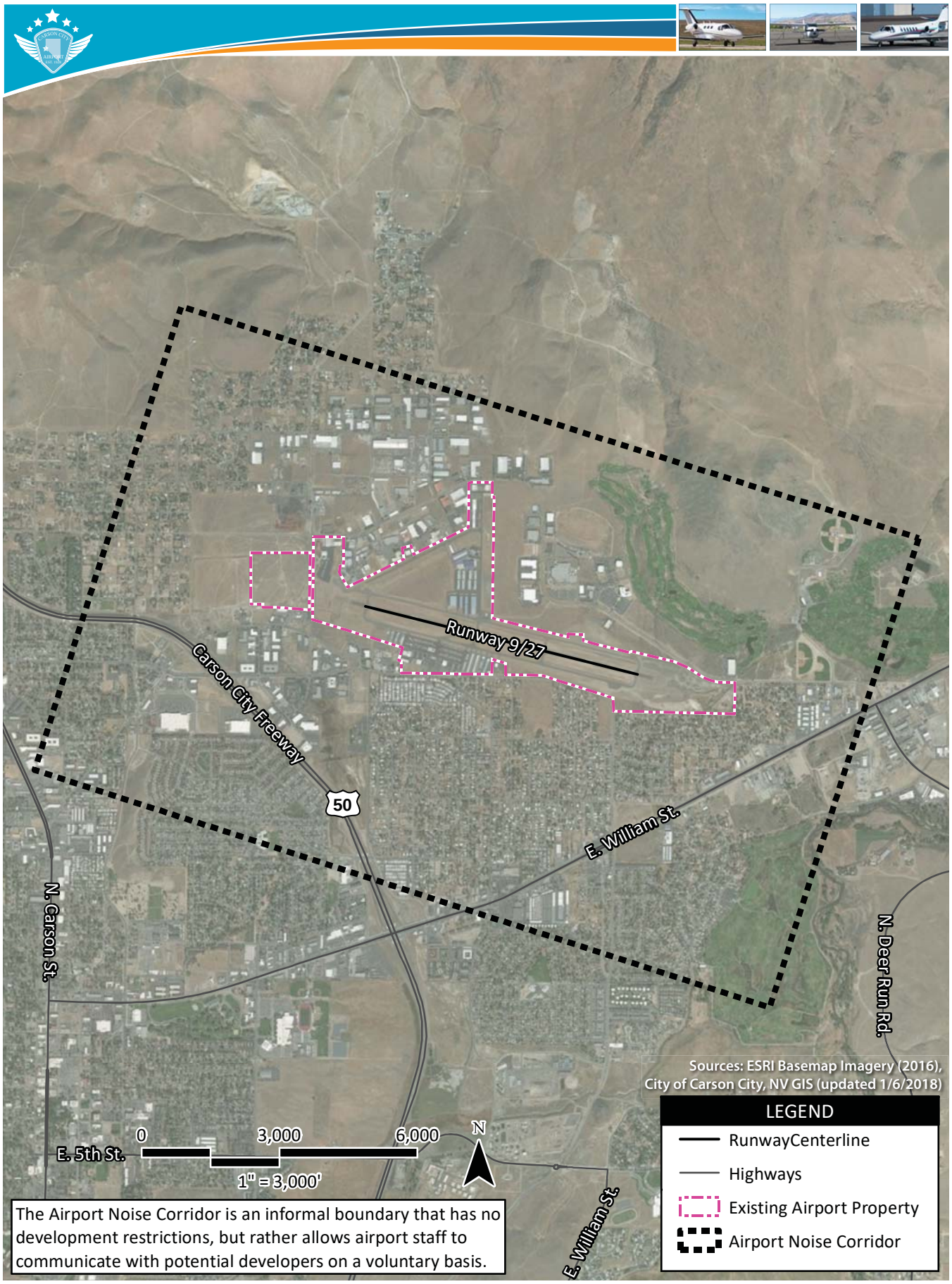


Exhibit 1R
AIRPORT NOISE CORRIDOR

staff to communicate with potential developers within the boundaries on a voluntary basis.[13] More specifically, in instances when tall buildings or residential uses are proposed near the runways, the Airport Authority is asked to review the development proposals for compatibility.[14] Additionally, the Code of Ordinances has traffic rules that should be used when deemed safe by the pilot to be mindful of noise-sensitive uses in surrounding neighborhoods.[15]

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

Socioeconomics is an umbrella term used to describe aspects of a project that are either social or economic in nature. A socioeconomic analysis evaluates how elements of the human environment such as population, employment, housing, and public services might be affected by the proposed action and alternative(s).

TABLE 1R
Noise-sensitive Uses

Name	Distance/Direction from Airport
Places of Worship	
First Christian Church	0.6 miles north
Airport Road Church of Christ	0.2 miles south
St. Teresa of Avila Catholic Community	0.4 miles southwest
Residential Uses	
Single- and multi-family residential	0.0 - 0.7 miles south and northeast
Educational Facilities	
Carson Montessori School	0.60 miles north

Source: U.S. Geological Survey (accessed May 2017)

Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations and policies. Fair treatment means that no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental, and commercial operations or policies. Meaningful Involvement[16] ensures that:

- People have an opportunity to participate in decisions about activities that may affect their environment and/or health;
- The public's contribution can influence the regulatory agency's decision;
- Their concerns will be considered in the decision-making process; and
- The decision makers seek out and facilitate the involvement of those potentially affected.

Pursuant to E.O. 13045, *Protection of Children from Environmental Health Risks and Safety Risks* 62 *Federal Register* 19885, (April 21, 1997), federal agencies are directed, as appropriate and consistent with the agency's mission, to make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children. The FAA is encouraged to identify and assess

[13] Conversation with Hope Sullivan, Planning Manager of the Building Division on January 16, 2018.
[14] Email communication with Kathe Green, Assistant Planner of the Carson City Planning Division on January 16, 2018.
[15] Carson City Code of Ordinances, Title 19: Airport Rules and Regulations, Chapter 19.02: Airport Rules and Regulations, Section 19.02.020.230: Traffic Rules (accessed January 8, 2018).
[16] Requirements for meaningful public involvement by minority and low-income populations are addressed in Paragraph 2-5.2.b of FAA Order 1050.1F.

environmental health risks and safety risks that the agency has reason to believe could disproportionately affect children. Environmental health risks and safety risks include risks to health or to safety that are attributable to products or substances that a child is likely to come in contact with or ingest, such as air, food, drinking water, recreational waters, soil, or products they might use or be exposed to.

The airport is in block group[17] 3, census tract[18] 3, which estimates there are 735 people living below the poverty level in the last 12 months.[19] **Table 1S** describes the race makeup of the area.

The closest school is the Carson Montessori School, located approximately 0.60 miles to the north. This public school provides education services for kindergarten through sixth grades.

TABLE 1S
Race Makeup in Block Group 3, Census Tract 3 in Carson City, NV

Race	Population Estimate
White alone	1,583
Black or African American alone	29
American Indian and Alaska Native alone	0
Asian alone	67
Native Hawaiian and Other Pacific Islander alone	0
Some other race alone	30
Two or more races	15
Total	**1,724**

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates, Table B02001: Race (accessed January 8, 2018).

VISUAL EFFECTS

Visual effects deal broadly with the extent to which the proposed action or alternative(s) would either: 1) produce light emissions that create annoyance or interfere with activities; or 2) contrast with, or detract from, the visual resources and/or the visual character of the existing environment.

Light Emissions

Light emissions include any light that emanates from a light source into the surrounding environment. Examples include airfield and apron flood lighting, navigational aids, terminal lighting, parking facility lighting, and roadway lighting. Glare is a type of light emission that occurs when light is reflected off a surface, including window glass, solar panels, or reflective building surfaces.

Carson City Code of Ordinances has specified lighting standards for new construction of office, retail, commercial, public, institutional, industrial and multi-family buildings.[20] These standards stress the importance of visually identifying and unifying the community character. The regulations laid out in the

[17] **Block groups** are statistical divisions of census tracts that generally contain between 600 and 3,000 people and are used to present data and control block numbering (U.S. Census Bureau, https://www.census.gov/geo/reference/gtc/gtc_bg.html).
[18] **Census Tracts** are small, relatively permanent statistical subdivisions of a county that contain between 1,200 and 8,000 persons, averaging around 4,000 inhabitants (U.S. Census Bureau).
[19] U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates, Table B17017: Poverty Status in the Past 12 Months by Household Type by Age of Householder (accessed January 8, 2018).
[20] Carson City Code of Ordinances, Title 18 Appendix: Carson City Development Standards, Division 1: Land Use and Site Design, 1.3: Lighting Standards (accessed January 8, 2018).

Code of Ordinances require shielding, downlighting, only using the necessary amount of light, and turning fixtures down or off when not required to be illuminated. However, there are several regulations within this section of the Code that the Carson City Airport is exempt from, including permanent rotating searchlights, and vehicular lights and temporary emergency lighting. Note that Title 19: Airport Rules and Regulations takes precedence over all other aspects of the Code of Ordinances if there are conflicts; however, whatever is not regulated within Title 19 is subject to regulation per other titles within the Code of Ordinances.

Visual Resources and Visual Character

Visual resources include buildings, sites, traditional cultural properties, and other natural or human-made landscape features that are visually important or have unique characteristics. Visual resources may include structures or objects that obscure or block other landscape features. In addition, visual resources can include the cohesive collection of various individual visual resources that can be viewed at once or in concert from the area surrounding the site of the proposed action or alternative(s). *Visual character* refers to the overall visual makeup of the existing environment where the proposed action and alternative(s) would be located. For example, areas near densely populated areas generally have a visual character that could be defined as urban, whereas less developed areas could have a visual character defined by the surrounding landscape features, such as open grass fields, forests, mountains, or deserts, etc.

In the Carson City Code of Ordinances, a Skyline Area Map is created that maps the areas that are essential to the City's scenic quality that, if developed without regulation, would negatively affect scenic vistas.[21] The closest restricted skyline boundary area is approximately 0.70 miles northeast of the airport in Centennial Park.

WATER RESOURCES

Wetlands

Certain drainages (both natural and human-made) that are considered "waters of the U.S." come under the purview of the U.S. Army Corps of Engineers (USACE) under Sections 401 and 404 of the Clean Water Act; wetlands are also protected. In addition, E.O. 11990, Protection of Wetlands provides definitions and calls for safeguarding wetlands. Wetlands typically exhibit three characteristics: hydrology, hydrophytes (plants able to tolerate various degrees of flooding or frequent saturation), and poorly drained or "hydric" soils.

There are no wetlands on or in the immediate vicinity of airport property.[22]

[21] Carson City Code of Ordinances, Title 18: Zoning, Chapter 18.08: Hillside Development, Section 18.08.015: Skyline area map (accessed January 8, 2018).
[22] EPA My WATERS Mapper, https://watersgeo.epa.gov/mwm/ (accessed January 8, 2018).

Floodplains

E.O. 11988, Floodplain Management directs federal agencies to act to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by the floodplains. The limits of base floodplains are determined by Flood Insurance Rate Maps (FIRMs) prepared by the Federal Emergency Management Agency (FEMA).

There is a 100-year floodplain (a one percent annual chance flood) that runs through the western end of airport property along the Goni Canyon Creek, which is contained within a drainage channel on airport property. There is another 100-year floodplain on the eastern end of airport property in Golf Course Creek B. Golf Course Creek B flows into the Carson River, along which there is a 100-year floodplain as well.[23] The Carson River is approximately ¾ mile southeast of the airport. The Goni Creek Canyon and Golf Course Creek B floodplains are shown on **Exhibit 1Q**.

Surface Waters

Surface waters include rivers, streams, creeks, lakes, and reservoirs. The primary uses of surface water are for drinking water and other public uses, irrigation, and for industrial purposes (i.e., cooling electricity-generating equipment at a power plant).

The section of Goni Canyon Creek that is on airport property is within a drainage channel; however, it flows freely south of the airport. Several water bodies flow through the Eagle Valley Golf Course and Centennial Park before merging with the Carson River, southeast of the airport. The Carson River (south of the airport) is impaired along seven miles from the Mexican Ditch Gage to New Empire, downstream from the airport. The causes of impairment include dissolved oxygen, E. Coli, mercury in fish tissue, phosphorous, temperature, and turbidity.[24]

The surface waters that supply the Carson City Water System are fed by Kings Creek, Ash Creek, and the Marlette-Hobart Lakes state-run water system. The Quill Surface Water Treatment Plant is located on the west side of Carson City.[25]

Groundwater

Groundwater is subsurface water that occupies the space between sand, clay, and rock formations. The term *aquifer* is used to describe the geologic layers that store or transmit groundwater, such as to wells, springs, and other water sources.

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[23] FEMA Flood Map Service Center, FIRM Panels: 3200010103E, 3200010104E, and 3200010112E (accessed January 8, 2018).
[24] EPA, 2012 Waterbody Quality Assessment Report, https://ofmpub.epa.gov/waters10/attains_waterbody.control?p_list_id=NV08-CR-09_00&p_report_type=T&p_cycle=2012#tmdls (accessed January 8, 2018).
[25] *2017 Water Quality Report*, Carson City Public Works.

There are four groundwater basins that provide water to the Carson City Water System: Carson Valley, Dayton Valley, Eagle Valley, and Washoe Valley.[25] The closest sole source aquifer – an aquifer that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer – is the Fresno Streamflow Source Zone, approximately 100 miles south of the airport.[26]

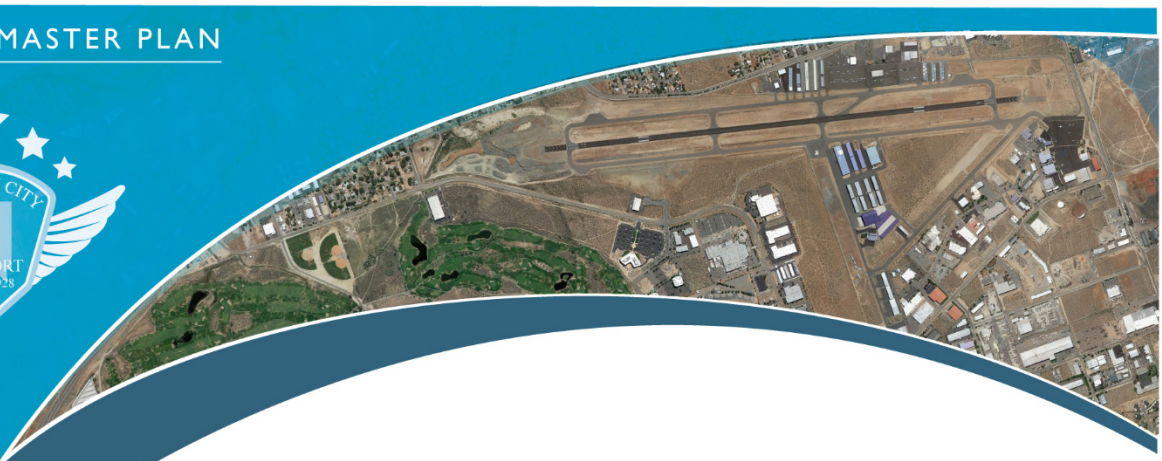
Wild and Scenic Rivers

Wild and scenic rivers refer to designations within the National Park Services' Nationwide Rivers Inventory. Public Law 90-542 states that such rivers are free-flowing and possess "outstanding remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values." The closest designated river feature is the East Fork of the Carson River, located approximately 13 miles south of the airport.

[26] U.S. EPA Environmental Justice Screening and Mapping Tool, https://ejscreen.epa.gov/mapper/ (Version 2017) (accessed January 8, 2018).

CHAPTER TWO

FORECASTS



CHAPTER TWO

FORECASTS

An important factor when planning the future needs of an airport involves a definition of aviation demand that may reasonably be expected to occur in the near term (five years), intermediate (10 years) and long term (20 years). For a general aviation airport, such as Carson City Airport (CXP), forecasts of based aircraft and operations (takeoffs and landings) serve as the basis for facility planning.

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

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

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

The forecast process for an airport master plan consists of a series of basic steps that vary in complexity depending upon the issues to be addressed and the level of effort required. The steps include a review of previous forecasts, determination of data needs, identification of data sources, collection of data, selection of forecast methods, preparation of the forecasts, and evaluation and documentation of the results. FAA Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*, outlines seven standard steps involved in the forecast process, including:

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

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

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

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

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

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

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

The aviation demand forecasts are then submitted to the FAA for their approval. Master plan forecasts for operations and based aircraft for general aviation airports are considered to be consistent with the TAF if they meet certain criteria. Where the 5-year or 10-year forecasts exceed 100,000 total annual operations or 100 based aircraft, the following apply:

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

Forecast that are within these perimeters are considered to be consistent with FAA TAF. If they are exceeded, further justification is required for forecast approval by the FAA.

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

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

FORECASTING APPROACH

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

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

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

For each aviation demand indicator, such as based aircraft and operations, several forecasts are developed. These forecasts are presented to define a reasonable planning envelope. The selected forecast for a particular demand indicator may be one of the forecasts or it may be an average of all the forecasts.

Several standard statistical methods have been employed to generate various projections of aviation demand.

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

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

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

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

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

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

NATIONAL AVIATION TRENDS AND FORECASTS

Each year, the FAA updates and publishes a national aviation forecast. Included in this publication are forecasts for the large air carriers, regional/commuter air carriers, general aviation, and FAA workload measures. The forecasts are prepared to meet budget and planning needs of the FAA and to provide information that can be used by state and local authorities, the aviation industry, and the general public. The current edition when this chapter was prepared was FAA *Aerospace Forecasts – Fiscal Years 2017-*

2037, published in March 2017. The FAA primarily uses the economic performance of the United States as an indicator of future aviation industry growth. Similar economic analyses are applied to the outlook for aviation growth in international markets. The following discussion is summarized from the FAA Aerospace Forecasts.

DOMESTIC ECONOMIC OUTLOOK

Since the previous master plan was completed in March 2001, the U.S. economy experienced an event-filled decade and a half. The U.S. economy faced impacts from the events of September 11th, 2001, global pandemics, the bankruptcy of five network air carriers, all-time high oil prices, and a serious economic recession, with global ramifications.

According to the FAA forecast report, as the economy recovers from the most serious economic downturn and slow recovery since the Great Depression, aviation will continue to grow over the long run. Fundamentally, demand for aviation is driven by economic activity. As economic growth picks up, so will growth in aviation activity. U.S. economic performance in 2016 is estimated to have grown in real GDP to 16.6 trillion (inflation adjusted to 2009 dollars) and is forecast to grow at an average annual growth rate of 2.1 percent through 2037. Although the U.S. economy has managed to avoid a recession, a prolonged period of faster economic growth (e.g., > 3.0 percent) may not be forthcoming. Additional potential headwinds for the global economy include uncertainty surrounding "Brexit," recessions in Russia and Brazil, inconsistent performance in other emerging economies, and a lack of further stimulus in the advanced economies. There is also uncertainty regarding the impact of the new U.S. administration's policies on economic growth.

FAA GENERAL AVIATION FORECASTS

The FAA forecasts the fleet mix and hours flown for single engine piston aircraft, multi-engine piston aircraft, turboprops, business jets, piston and turbine helicopters, light sport, experimental, and others (gliders and balloons). The FAA forecasts "active aircraft," not total aircraft. An active aircraft is one that is flown at least one hour during the year. From 2010 through 2013, the FAA undertook an effort to have all aircraft owners re-register their aircraft. This effort resulted in a 10.5 percent decrease in the number of active general aviation aircraft, mostly in the piston category.

The long term outlook for general aviation is stable to optimistic, as growth at the high end offsets continuing retirements at the lower end segment. The active general aviation fleet is forecast to increase 0.1 percent per year between 2017 and 2037, equating to an absolute increase in the fleet of about 3,400 units. While steady growth in both GDP and corporate profits results in continued growth of the turbine and rotorcraft fleets, the largest segment of the fleet – fixed-wing piston aircraft – continues to shrink over the FAA's forecast.

In 2017, the FAA estimated there were 138,915 piston-powered aircraft in the national fleet. The total number of piston-powered aircraft in the fleet is forecast to decline by 0.9 percent from 2017-2037, resulting in 117,520 by 2037. This includes declines of 0.9 percent annually for single engine pistons and 0.5 percent for multi-engine pistons.

Total turbine aircraft are forecast to grow at an annual growth rate of 1.9 percent through 2037. The FAA estimates there were 30,895 turbine-powered aircraft in the national fleet in 2017, and there will be 45,305 by 2037. This includes annual growth rates of 1.4 percent for turboprops, 2.3 percent for business jets, and 1.8 percent for turbine helicopters.

While comprising a much smaller portion of the general aviation fleet, experimental aircraft, typically identified as home-built aircraft, are projected to grow annually by 1.0 percent through 2037. The FAA estimates there were 28,970 experimental aircraft in 2017, and these are projected to grow to 35,310 by 2037. Sport aircraft are forecast to grow 4.1 percent annually through the long term, growing from 2,685 in 2017 to 5,885 by 2037.

The FAA also forecasts total operations based upon activity at control towers across the U.S. Operations are categorized as air carrier, air taxi/commuter, general aviation, and military.

General aviation operations, both local and itinerant, declined significantly as a result of the 2008-2009 recession and subsequent slow recovery. Through 2037, total general aviation operations are forecast to grow 0.3 percent annually. Air taxi/commuter operations are forecast to decline by 3.0 percent through 2026, and then increase slightly through the remainder of the forecast period. Overall, air taxi/commuter operations are forecast to decline by 0.9 percent annually from 2016 through 2037.

Exhibit 2A presents the historical and forecast U.S. active general aviation aircraft and general aviation operations.

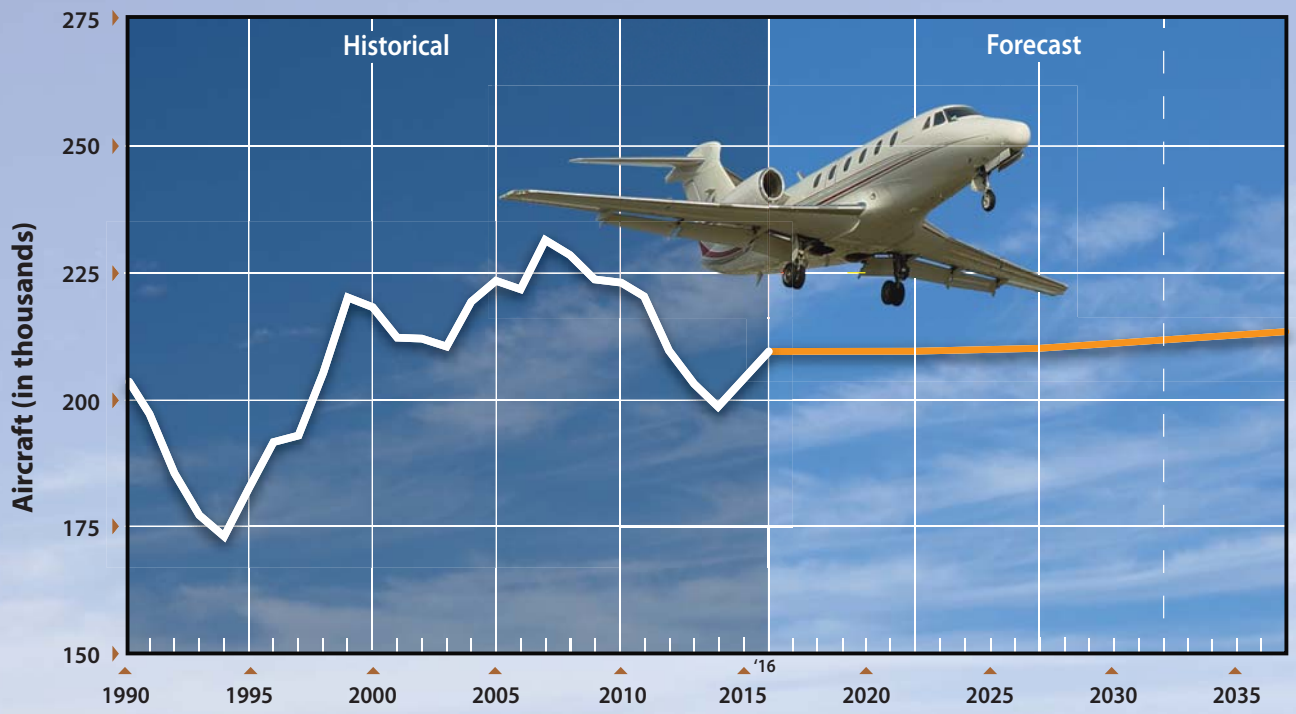
GENERAL AVIATION AIRCRAFT SHIPMENTS AND REVENUE

As previously discussed, the 2008-2009 economic recession has had a negative impact on general aviation aircraft production, and the industry has been slow to recover. Aircraft manufacturing declined for three straight years from 2008 through 2010. **Table 2A** presents historical data related to general aviation aircraft shipments.

Worldwide shipments of general aviation airplanes decreased in 2016, for the second straight year, with a total of 2,262 units delivered around the globe compared to 2,331 units in 2015. Worldwide general aviation billings were also lower than the previous year. In 2016, $20 billion in new general aviation aircraft were shipped, but year-end results were mixed across the market segments. Results were impacted by economic uncertainty in key markets, including Brazil, Europe, and China; however, the U.S. experienced stronger delivery numbers, which is cause for cautious optimism.

U.S. ACTIVE GENERAL AVIATION AIRCRAFT

	2016E	2022	2027	2037	AAGR*
FIXED WING					
Piston					
Single Engine	125,760	120,600	115,245	105,550	-0.9%
Multi-Engine	13,115	12,965	12,705	11,970	-0.5%
Turbine					
Turboprop	9,285	9,115	9,755	12,585	1.4%
Turbojet	14,100	15,845	17,745	22,040	2.3%
ROTORCRAFT					
Piston	3,380	3,605	3,835	4,385	1.3%
Turbine	7,510	8,195	8,925	10,680	1.8%
EXPERIMENTAL					
	28,970	30,895	32,345	35,310	1.0%
SPORT AIRCRAFT					
	2,685	3,480	4,285	5,885	4.1%
OTHER					
	4,955	4,955	4,965	5,015	0.1%
TOTAL	**209,905**	**209,655**	**209,805**	**213,420**	**0.1%**



* AAGR - Average Annual Growth Rate 2017 - 2037

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

Source: FAA Aerospace Forecasts, Fiscal Years 2017-2037.

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

Year	Total	SEP	MEP	TP	J	Net Billings ($millions)
1994	1,132	544	77	233	278	3,749
1995	1,251	605	61	285	300	4,294
1996	1,437	731	70	320	316	4,936
1997	1,840	1,043	80	279	438	7,170
1998	2,457	1,508	98	336	515	8,604
1999	2,808	1,689	112	340	667	11,560
2000	3,147	1,877	103	415	752	13,496
2001	2,998	1,645	147	422	784	13,868
2002	2,677	1,591	130	280	676	11,778
2003	2,686	1,825	71	272	518	9,998
2004	2,962	1,999	52	319	592	12,093
2005	3,590	2,326	139	375	750	15,156
2006	4,054	2,513	242	412	887	18,815
2007	4,277	2,417	258	465	1,137	21,837
2008	3,974	1,943	176	538	1,317	24,846
2009	2,283	893	70	446	874	19,474
2010	2,024	781	108	368	767	19,715
2011	2,120	761	137	526	696	19,042
2012	2,164	817	91	584	672	18,895
2013	2,353	908	122	645	678	23,450
2014	2,454	986	143	603	722	24,499
2015	2,331	946	110	557	718	24,129
2016	2,262	890	129	582	661	20,719

SEP - Single Engine Piston; MEP - Multi-Engine Piston; TP - Turboprop; J - Turbofan/Turbojet
Source: General Aviation Manufacturers Association *2015 General Aviation Statistical Databook & 2016 Industry Outlook*

AIRPORT SERVICE AREA

The initial step in determining the aviation demand for an airport is to define its generalized service area for various segments of aviation. The service area is determined primarily by evaluating the location of competing airports, their capabilities, their services, and their relative attraction and convenience. In determining the aviation demand for an airport, it is necessary to identify the role of the airport, as well as the specific areas of aviation demand the airport is intended to serve. For CXP, the primary role is to accommodate general aviation demand in the region. CXP is classified as a reliever airport within the NPIAS, meaning that one of its main purposes is to relieve general and corporate aviation activity from the regional commercial service airport, Reno-Tahoe International Airport (RNO).

The service area for an airport is a geographic region from which an airport can be expected to attract the largest share of its activity. The definition of the service area can then be used to identify other factors, such as socioeconomic and demographic trends, which influence aviation demand at an airport.

Aviation demand will also be impacted by the proximity and strength of aviation services offered at competing airports, as well as the local and regional surface transportation network.

As in any business enterprise, the more attractive the facility is in terms of services and capabilities, the more competitive it will be in the market. If an airport's attractiveness increases in relation to nearby airports, so will the size of its service area. If facilities and services are adequate and/or competitive, some level of aviation activity might be attracted to an airport from more distant locales.

As a general rule, a general aviation airport's service area typically extends for approximately 30 miles. There are 11 public-use airports within 30 nautical miles of CXP; however, over half of these facilities provide limited aviation services designed to serve small general aviation aircraft only. One airport focuses primarily on scheduled commercial passenger service, Reno-Tahoe International Airport. The other NPIAS airports provide various levels of general aviation services with facilities detailed on **Table 2B**.

TABLE 2B
Competing Regional Airports Summary

Airport	Distance from CXP (nm)	NPIAS Service Level	Based Aircraft	Annual Operations	Longest Runway (feet)	Lowest Approach Visibility Minimums (mile)
Carson City Airport	-	R	350	78,000	6,101	1¼
Dayton Valley Airpark Airport	8.7 ENE	GA	28	3,240	5,343	Vis Approach
Minden-Tahoe Airport	11.5 S	GA	211	79,800	7,399	1¼
Reno-Tahoe International Airport	18.5 N	P	128	84,000	11,001	½
Truckee-Tahoe Airport	20.4 WNW	GA	118	35,000	7,000	1¼
Lake Tahoe Airport	21.7 SW	GA	23	23,790	8,541	¾
Silver Springs Airport	25.7 ENE	GA	13	6,500	6,001	Vis Approach
Alpine County Airport	27 SE	-	0	250	4,443	Vis Approach
Rosaschi Air Park Airport	28.0 SE	-	0	N/A	4,800	Vis Approach
Spanish Springs Airport	28.7 ESE	-	11	4,600	3,418	Vis Approach
Yerington Municipal Airport	29.1 ESE	GA	32	5,990	5,814	Vis Approach
Reno- Stead Airport	29.3 NNW	R	92	53,307	9,000	½-mile

P: Primary; R: General Aviation Reliever; GA: General Aviation; nm: nautical mile
Source: FAA Form 5010-1, *Airport Master Record*; www.airnav.com

The previously mentioned airports' available levels of services and facilities will play a role in limiting the size of CXP's service area. Historically, CXP has remained a very important facility meeting the needs of general aviation operators in the region, including serving the needs of the State capital and the State Gaming Control Board (GCB). The airport is a hub for general aviation business and recreational aircraft activity. In addition, the airport is a designated reliever airport with a purpose of offering capacity relief for the commercial service operations at RNO. In this capacity, the airport should continue to fare well in its ability to compete for general aviation activity considering the strength of services and amenities it has to offer.

As a general aviation reliever airport, CXP's service area is also driven by aircraft owners/operators and where they choose to base their aircraft. The primary consideration of aircraft owners/operators when choosing where to base their aircraft is convenience (i.e., easy access and proximity to the airport). Under this circumstance, the most effective method of defining an airport's service area is by examining the based aircraft by their registered address. It is common for an aircraft based in one location to be registered in another, especially for corporate aircraft which typically are registered by the controlling ownership entity, such as a bank. While the most concentrated areas of based aircraft ownership are located within Carson City, based aircraft are also spread throughout several communities in the greater Reno-Carson City-Lake Tahoe region.

As depicted on **Exhibit 2B**, the majority of CXP based aircraft owners are located within a three-county region which defines the airport's primary service area. This data shows that a high percentage of CXP based aircraft owners reside or do business near the airport. Considering all previous factors, the primary service area for CXP can be defined as being Carson City and extending north into the central and southern portions of Reno and south into northern Douglas County. The primary competitors are, and will continue to be, RNO and Minden-Tahoe Airport, which will act to constrain demand at CXP from these areas. For planning purposes, the three counties of Douglas (South of Carson City), Washoe County (to the north of Carson City), and Carson City will serve as the primary airport service area. The secondary or more broadly defined outer service areas will include much of west/southwestern Nevada. **Table 2C** summarizes the socioeconomic profile of the three-county primary airport service area.

TABLE 2C
Primary Service Area Socioeconomic Profile
Carson City Airport

Year	Service Area Total Population	Service Area Employment	Service Area Total Personal Income*
1990	325,367	227,313	12,050,833,000
2000	435,400	309,015	20,434,137,000
2010	524,191	316,513	22,164,633,000
2017	563,153	353,988	26,283,226,000
CAGR	**2.05**	**1.65**	**2.93**
2022	600,681	384,668	29,999,990,000
2027	640,064	414,731	33,973,734,000
2037	714,742	464,889	41,761,347,000
CAGR	**0.65%**	**0.70%**	**1.23%**

* 2009 Dollars
Primary Service Area includes Carson City, Douglas, and Washoe counties

FAA AND STATE FORECASTS

In an effort to assist the FAA in developing its programs and budgets, the TAF is updated annually. FAA staffing standards and other resource models also use the TAF to forecast requirements for operating

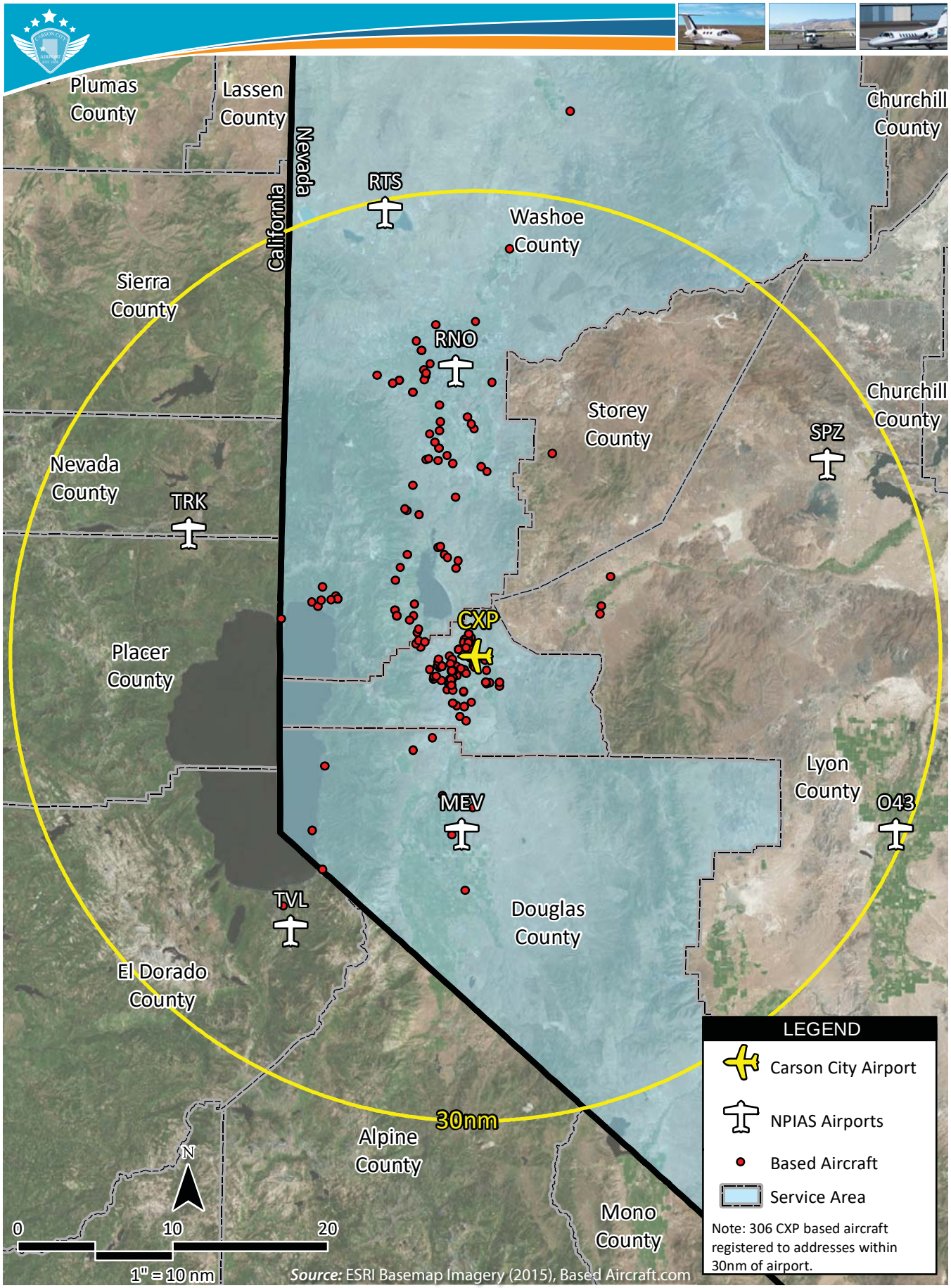


Exhibit 2B
BASED AIRCRAFT SERVICE AREA

the airspace system. Historical and forecast data for enplanements, airport operations, and based aircraft help the FAA, state aviation authorities, and other aviation entities in planning for future airport improvements.

The Nevada Department of Transportation – Planning Division assists airports in the state in identifying infrastructure needs with a state aviation needs study and other special aviation studies. The most recent study on a statewide basis is the *2004 Nevada State Airports System Plan* (NASP), which includes forecasts of aviation activity in the state and for individual airports. The TAF and NASP are referenced throughout the remainder of this chapter as they relate to forecast aviation demand at Carson City Airport.

AVIATION DEMAND FORECASTS

The following forecast analysis examines each of the aviation demand categories expected at CXP over the next 20 years. Each segment will be examined individually, and then collectively, to provide an understanding of the overall aviation activity at the airport through 2037.

The need for airport facilities at CXP can best be determined by accounting for forecasts of future aviation demand. Forecasts for airport activities include the following:

- Registered Aircraft
- Based Aircraft
- Based Aircraft Fleet Mix
- Annual Aircraft Operations
- Peaking Characteristics
- Critical Design Aircraft

For a reliever airport such as CXP, based aircraft, annual aircraft operations, and peak activity levels are the most important indicators of aviation demand that need to be forecast. Future facility requirements, such as hangars and apron area, are derived from the general aviation forecasts.

FAA TERMINAL AREA FORECAST

As previously discussed, on an annual basis the FAA publishes the TAF for each airport included in the NPIAS. The TAF is a generalized forecast of airport activity used by FAA for internal planning purposes. It is available to airports and consultants to use as a point of comparison for development of local forecasts. **Table 2D** presents the *Terminal Area Forecast* for CXP.

As presented in the table, the TAF projects no growth in aircraft operations; however, limited based aircraft growth is projected at a 0.48 percent compound annual growth rate (CAGR), increasing by 19 based aircraft over the next 20 years. Given that there is currently no commercial service activity at CXP, the TAF does not reflect any existing and/or forecast commercial airline passenger enplanements or aircraft operations.

TABLE 2D
2017 FAA Terminal Area Forecast
Carson City Airport

	2017	2022	2027	2037	CAGR 2017-2037
ANNUAL OPERATIONS					
Itinerant					
Air Taxi	7,500	7,500	7,500	7,500	0.00%
General Aviation	37,500	37,500	37,500	37,500	0.00%
Total Itinerant	45,000	45,000	45,000	45,000	0.00%
Local					
General Aviation	38,500	38,500	38,500	38,500	0.00%
Total Local	38,500	38,500	38,500	38,500	0.00%
Total Operations	***83,500***	***83,500***	***83,500***	***83,500***	0.00%
BASED AIRCRAFT					
Based Aircraft	***191***	***195***	***200***	***210***	0.48%

Source: *FAA Terminal Area Forecast* (TAF), January 2018

As presented, the TAF presents a flat, or no-growth, scenario for future aircraft operations. This is a common TAF operation projection for airports, such as CXP without an airport traffic control tower (ATCT). The TAF suggests that annual airport operations are currently and will continue to be dominated by general aviation aircraft movements. The TAF also accounts for air taxi; however, it provides a flat-line forecast for these aviation segments as well. As noted previously, the FAA and NDOT will examine the new forecasts developed for this Master Plan in comparison with the TAF. A comparison between the Master Plan forecasts and TAF is detailed later in this chapter.

In 2017, the TAF estimated that the airport experienced 83,500 total annual aircraft operations. **The TAF also presents a total of 191 based aircraft for 2017; however, the Airport Authority has recently conducted a thorough aircraft count at the airport resulting in 537 aircraft, in which the FAA has fully validated 350 of those as CXP based aircraft. As such, this forecasting effort will utilize the recently validated based aircraft total of 350, which is nearly two times higher than the TAF figure of 191.** Once the forecasts presented here are approved by the FAA, the FAA could update the TAF to reflect the selected forecasts.

PRIMARY SERVICE AREA REGISTERED AIRCRAFT PROJECTIONS

The number of based aircraft is the most basic indicator of general aviation demand. By first developing a forecast of based aircraft for the airport, other general aviation activity and demand can be projected. The process of developing forecasts of based aircraft begins with an analysis of aircraft ownership in the primary general aviation service area through a review of historical aircraft registrations. As previously discussed, a large majority of based aircraft ownership at CXP resides in Carson City, extending into southern Washoe and northern Douglas counties. As such, the analysis here will evaluate and project the service area registered aircraft first, then based aircraft projections for CXP can be made.

Table 2E presents historical data regarding aircraft registered in the primary service area since 1993. These figures are derived from the FAA aircraft registration database that categorized registered aircraft by the aircraft owner's zip code. Although this information generally provides a correlation to based aircraft in a local area, it is not uncommon for some aircraft to be registered in one location but based at an airport outside the location. Moreover, it is important to note that the FAA purged its data requiring all aircraft owners to re-register their aircraft in 2012 (reflected in the 2013 count) to validate outdated and incorrect information. The result of the re-registration was a systemwide reduction of active aircraft by nearly 30 percent. As a result, registered aircraft counts were generally inflated above actual numbers prior to 2012 for most locales. This primary inflation factor involved duplication (or more) of aircraft in the system when aircraft sales or losses were not properly reflected in the database.

TABLE 2E
Service Area Registered Aircraft Fleet Mix

Year	SEP	%	MEP	%	TP	%	J	%	R	%	O	%	Total
1993	913	64.94%	192	13.66%	45	3.20%	51	3.63%	69	4.91%	136	9.67%	1,406
1994	932	64.86%	190	13.22%	58	4.04%	54	3.76%	66	4.59%	137	9.53%	1,437
1995	990	66.00%	194	12.93%	54	3.60%	50	3.33%	72	4.80%	140	9.33%	1,500
1996	993	64.40%	213	13.81%	56	3.63%	60	3.89%	74	4.80%	146	9.47%	1,542
1997	1,014	64.06%	216	13.64%	52	3.28%	69	4.36%	82	5.18%	150	9.48%	1,583
1998	1,019	63.37%	214	13.31%	43	2.67%	111	6.90%	74	4.60%	147	9.14%	1,608
1999	1,036	62.83%	209	12.67%	52	3.15%	111	6.73%	82	4.97%	159	9.64%	1,649
2000	1,142	63.98%	226	12.66%	51	2.86%	109	6.11%	94	5.27%	163	9.13%	1,785
2001	1,185	61.37%	221	11.44%	109	5.64%	142	7.35%	100	5.18%	174	9.01%	1,931
2002	1,190	61.40%	220	11.35%	109	5.62%	142	7.33%	101	5.21%	176	9.08%	1,938
2003	1,161	58.46%	208	10.47%	222	11.18%	118	5.94%	100	5.04%	177	8.91%	1,986
2004	1,210	59.58%	211	10.39%	219	10.78%	131	6.45%	93	4.58%	167	8.22%	2,031
2005	1,250	58.99%	218	10.29%	226	10.67%	145	6.84%	106	5.00%	174	8.21%	2,119
2006	1,400	65.30%	306	14.27%	68	3.17%	75	3.50%	116	5.41%	179	8.35%	2,144
2007	1,402	64.61%	300	13.82%	84	3.87%	75	3.46%	122	5.62%	187	8.62%	2,170
2008	1,350	62.94%	244	11.38%	128	5.97%	116	5.41%	122	5.69%	185	8.62%	2,145
2009	1,322	63.59%	232	11.16%	126	6.06%	102	4.91%	117	5.63%	180	8.66%	2,079
2010	1,296	63.19%	227	11.07%	133	6.48%	102	4.97%	115	5.61%	178	8.68%	2,051
2011	1,280	63.24%	218	10.77%	135	6.67%	99	4.89%	115	5.68%	177	8.75%	2,024
2012	1,141	62.11%	201	10.94%	136	7.40%	102	5.55%	101	5.50%	156	8.49%	1,837
2013	1,067	62.65%	170	9.98%	129	7.57%	102	5.99%	91	5.34%	144	8.46%	1,703
2014	1,212	64.88%	188	10.06%	118	6.32%	112	6.00%	92	4.93%	146	7.82%	1,868
2015	1,245	65.98%	180	9.54%	109	5.78%	109	5.78%	99	5.25%	145	7.68%	1,887
2016	1,248	65.75%	180	9.48%	109	5.74%	116	6.11%	98	5.16%	147	7.74%	1,898
2017	1,204	65.29%	172	9.33%	102	5.53%	121	6.56%	97	5.26%	148	8.03%	1,844
Avg.		63.35%		11.67%		5.64%		5.43%		5.17%		8.75%	

SEP-Single Engine Piston; MEP-Multi-Engine Piston; TP-Turboprop; J-Jet; R-Rotor (Helicopter); O-Other
Source: Coffman Associates analysis of FAA Aircraft Registry Database

As presented in **Table 2E**, the three-county registered aircraft has ranged between a period low of 1,406 in 1993 to a period high of 2,170 in 2007. Since 2007, aircraft registered in the three-county area has generally decreased as can be expected in part due to the FAA re-registration process. As is typical for nearly all areas in the United States, single engine piston aircraft dominate the total aircraft numbers. In 2017, for example, there were 1,844 aircraft registered in the area, of which 1,204 were single engine piston aircraft. Aircraft registrations in 2017 also included 172 multi-engine piston aircraft, 102 turbo-prop aircraft, 121 jets, and 97 helicopters. There were also 148 aircraft included in the "other" category, which can include gliders and ultralights.

Regression Analysis

The primary and most recognized forecasting approach, regression analysis, was the first method utilized in projecting primary service area registered aircraft. Several regression forecasts were prepared, including single-variable and multi-variable regressions examining registered aircraft's correlation with service area socioeconomic indicators, including population, employment, personal income, and gross regional product. None of the regressions resulted in an r^2 value of higher than 0.759. This is primarily due to the generally increasing trend in aircraft registrations between 1993 and 2007 and a generally decreasing trend in aircraft registrations thenceforth, while socioeconomic trends continued to grow. Since an r^2 value of over 0.9 is the general threshold to determine dependability, the regression results were not considered reliable for forecasting purposes and will not be utilized further.

Market Share Analysis

The next step included the development of several market share projections for primary service area registered aircraft. Historically, CXP's share of the active U.S. Aircraft has ranged between 0.85 percent and 0.96 percent. Additionally, the service area ratio of aircraft per 1,000 residents has been generally declining from 4.28 in 2005 to 3.27 in 2017. **Table 2F** presents four different projections and selected forecast for registered aircraft in the primary airport service area. **Exhibit 2C** summarizes the location of registered aircraft in the primary service area.

The first projection considers the relationship of registered aircraft in the service area to the number of national active aircraft. In 2017, registered aircraft in the service area represented 0.8789 percent of the national fleet. By maintaining this as a constant ratio, registered aircraft are forecast to grow at a CAGR of 0.09 percent, reaching 1,876 by 2037.

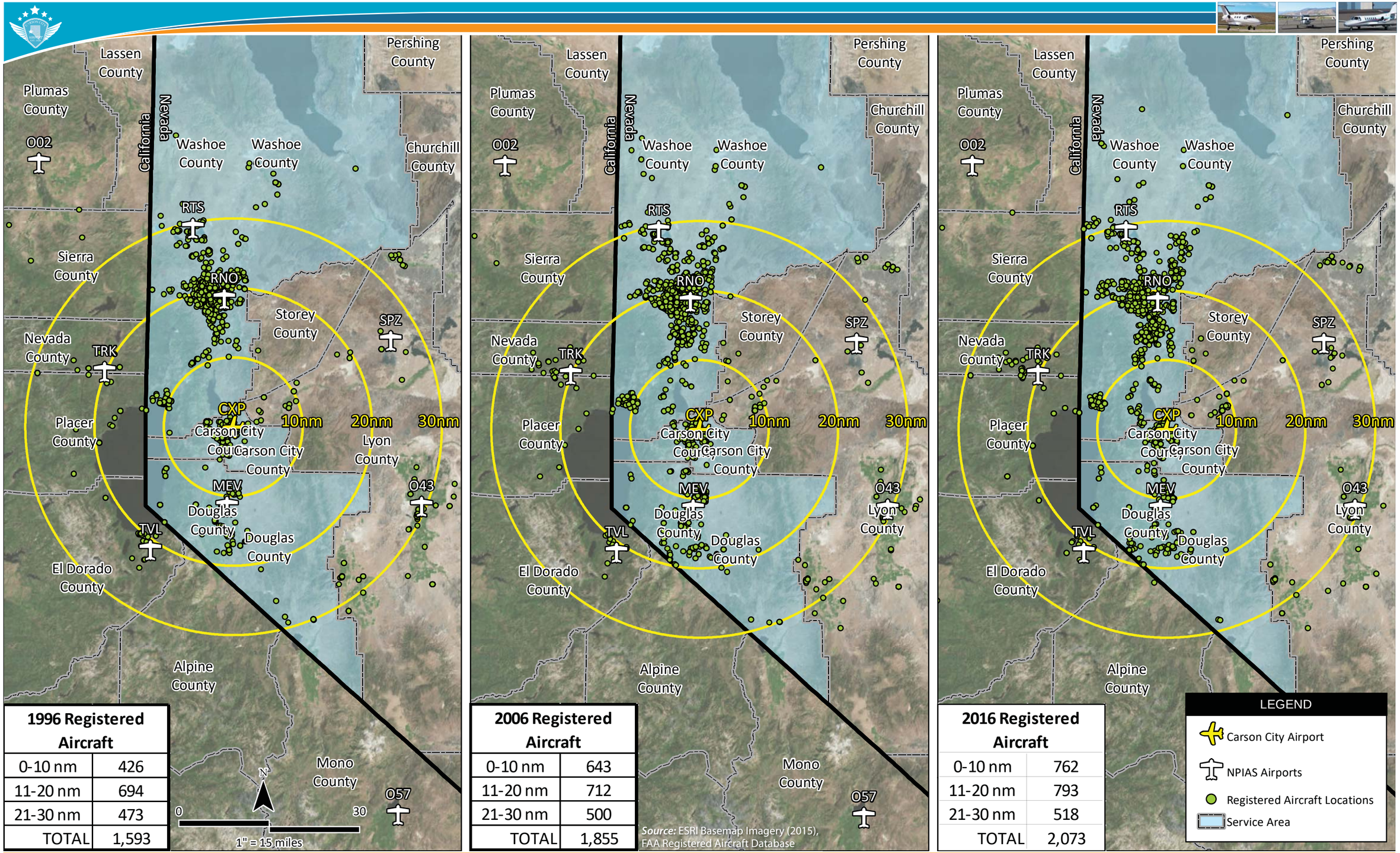
The next forecast considers simply extending the historic growth rate (CAGR 1.48 percent) of registered aircraft in the service area between 1993 to 2017 for the next 20 years. This projection yields 2,474 registrations by 2037.

TABLE 2F
Registered Aircraft Forecast
Douglas County, Washoe County, Carson City

Year	Service Area Registrations[1]	U.S. Active Aircraft[2]	Percent of U.S. Active Aircraft	Service Area Population[3]	Aircraft Per 1,000 Population
2005	2,119	224,257	0.9449%	495,429	4.28
2006	2,144	221,942	0.9660%	491,718	4.36
2007	2,170	231,606	0.9369%	511,178	4.25
2008	2,145	228,664	0.9381%	517,615	4.14
2009	2,079	223,876	0.9286%	520,088	4.00
2010	2,051	223,370	0.9182%	524,191	3.91
2011	2,024	220,453	0.9181%	526,792	3.84
2012	1,837	209,034	0.8788%	530,757	3.46
2013	1,703	199,927	0.8518%	534,962	3.18
2014	1,868	204,408	0.9139%	542,153	3.45
2015	1,887	210,031	0.8984%	549,134	3.44
2016	1,898	209,905	0.9042%	555,901	3.41
2017	1,844	209,800	0.8789%	563,153	3.27
Constant Market Share of U.S. Active Aircraft Fleet (CAGR = 0.09%)					
2022	1,843	209,655	0.8789%	600,681	3.07
2027	1,844	209,805	0.8789%	640,064	2.88
2037	1,876	213,420	0.8789%	714,742	2.62
Historic Growth Scenario 1993-2017 (CAGR = 1.48%) - Selected					
2022	1,985	209,655	0.9466%	600,681	3.30
2027	2,136	209,805	1.0180%	640,064	3.34
2037	2,474	213,420	1.1591%	714,742	3.46
Constant Aircraft Per 1,000 Population of Primary Airport Service Area (CAGR= 1.20%)					
2022	1,967	209,655	0.9382%	600,681	3.27
2027	2,096	209,805	0.9989%	640,064	3.27
2037	2,340	213,420	1.0966%	714,742	3.27
Decreasing Aircraft Per 1,000 Population of Primary Airport Service Area (CAGR = 0.76%)					
2022	1,934	209,655	0.0169%	600,681	3.22
2027	2,016	209,805	0.0141%	640,064	3.15
2037	2,144	213,420	0.0146%	714,742	3.00
Increasing Aircraft Per 1,000 Population of Primary Airport Service Area (CAGR = 2.65%)					
2022	2,253	209,655	0.0197%	600,681	3.75
2027	2,560	209,805	0.0179%	640,064	4.00
2037	3,109	213,420	0.0211%	714,742	4.35

[1] FAA Aircraft Registration Database
[2] FAA Aerospace Forecasts Fiscal Years 2017-2037
[3] Woods and Poole (2017).
CAGR: Compound Annual Growth Rate
Source: Coffman Associates analysis.

The next three forecasts consider the relationship between aircraft registrations and population. In 2017, there were 3.27 registered aircraft per 1,000 people in the service area. By keeping this ratio as a constant, a forecast emerges that results in a 1.20 percent CAGR and 2,340 registered aircraft by 2037.



1996 Registered Aircraft	
0-10 nm	426
11-20 nm	694
21-30 nm	473
TOTAL	1,593

2006 Registered Aircraft	
0-10 nm	643
11-20 nm	712
21-30 nm	500
TOTAL	1,855

2016 Registered Aircraft	
0-10 nm	762
11-20 nm	793
21-30 nm	518
TOTAL	2,073

EXHIBIT 2C
REGISTERED AIRCRAFT SERVICE AREA

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A continued decreasing ratio falling to 3.0 aircraft per 1,000 people is also considered. This projection yields 2,144 registered aircraft by 2037. The final projection utilizes an increasing ratio reaching 4.35 aircraft per 1,000 people and yielded 3,109 registered aircraft by 2037 at a CAGR of 2.65 percent.

Recent declines in registered aircraft and U.S. active aircraft following the 2008-2009 recession have slowly leveled off and are projected to return to growth over time. Ultimately, as the area and industry recover from the recession, the service area registered aircraft should return to earlier levels, and beyond. Based on these factors, the selected primary airport service area registered aircraft projection selected for this planning process is the historic growth rate reaching 2,474 aircraft by 2037.

The registered aircraft projection is one data point to be used in the development of a based aircraft forecast. The following section will present several potential based aircraft forecasts, as well as the selected based aircraft forecast, to be utilized in this study.

CXP BASED AIRCRAFT PROJECTIONS

Forecasts of based aircraft will directly influence needed facilities and applicable airport design standards. The needed facilities may include runway length, airfield pavement and safety area dimensions, aircraft storage hangars, aprons, taxilanes, etc. The applicable design standards will also include necessary separation distances and obstruction clearing surfaces. Generally, this determination is made based on the types and sizes of based aircraft. As an example, the addition of numerous small aircraft may have no effect on design standards, while the addition of a few larger business jets can have a substantial impact on applicable design standards.

Table 2G presents a historical review of CXP based aircraft. The current 2017 based aircraft count at CXP was compiled by airport management accounting for each aircraft by its tail number and then reporting the count to the FAA National Based Aircraft Inventory Program (basedaircraft.com). Based on FAA verified aircraft count detail on basedaircraft.com, there are currently 350 based aircraft at the airport. As of 2017, 19 percent of the service area registered aircraft are based at CXP. It is important to note that the airport administration count was higher than the validated amount of 350; however, the FAA only validates aircraft not currently validated at another location. An aircraft can be based at two locations, but the FAA only allows the official airport-based aircraft count to reflect one airport. As a result, the based aircraft figure being used in this analysis only represents the aircraft validated by the FAA and not what may be located on the airport at any given time.

Because of the numerous variables known to influence aviation demand, several forecasts of based aircraft have been developed. Each of the forecasts is examined for reasonableness and any outliers are discarded or given less weight. The remaining forecasts collectively will create a planning envelope. A single planning forecast is then selected for use in developing facility needs for the airport. The selected forecast of based aircraft can be one of the several forecasts developed or, based on the experience and judgement of the forecaster, it can be a blend of the forecasts.

TABLE 2G
Based Aircraft Market Share of Registered Aircraft Forecast
Carson City Airport

Year	Service Area Registered Aircraft	Aircraft Based at CXP	CXP Market Share
2000	1,785	238	13.33%
2001	1,931	238	12.33%
2002	1,938	275	14.19%
2003	1,986	275	13.85%
2004	2,031	275	13.54%
2005	2,119	275	12.98%
2006	2,144	275	12.83%
2007	2,170	262	12.07%
2008	2,145	223	10.40%
2009	2,079	223	10.73%
2010	2,051	190	9.26%
2011	2,024	143	7.07%
2012	1,837	202	11.00%
2013	1,703	206	12.10%
2014	1,868	206	11.03%
2015	1,887	175	9.27%
2016	1,898	191	10.06%
2017	1,844	350	18.98%
Constant Market Share (CAGR = 1.48%) - Selected Forecast			
2022	1,985	377	18.98%
2027	2,136	405	18.98%
2037	2,474	470	18.98%
Increasing Market Share (CAGR = 2.46%)			
2022	1,985	397	20.00%
2027	2,136	459	21.50%
2037	2,474	569	23.00%

Identifying the current number of based aircraft is critical to the master plan analysis, yet it can be challenging for several reasons. First, historical records of based aircraft were not required to be kept and were commonly estimated by the airport sponsor and/or FAA until 2008. Second, historical based aircraft records for CXP have not been actively maintained over the years. For most general aviation airports, these estimates were the only resource available until the FAA required actual N-number counts to be input into the basedaircraft.com website. As previously noted, the historical FAA based aircraft estimates, as presented in the TAF and shown in **Table 2G** for 2000 to 2016, are much lower than actual numbers, and they do not serve to aid in forecasting due to the significant differences.

Similar to the registered aircraft projections, based aircraft forecasts are first generated using regression and time-series analyses techniques. Due to the lack of verified historical based aircraft data prior to 2017, these techniques did not result in reliable forecasts and will no longer be considered.

The next step was to utilize market share projections. Earlier, the primary service area aircraft registrations were examined and projected. These projections can now be utilized to forecast CXP based aircraft over the planning period. The market share projections developed included a constant and increasing market share (of the primary service area) forecast. The constant market share simply assumes that CXP based aircraft will track the same growth as projected for registered aircraft. Similarly, the increasing market share forecast examines the same data but assumes CXP based aircraft growth rates will outpace that in the greater service area. The constant market share results in a CAGR of 1.48 percent, while the increasing market share returns a 2.46 percent increase annually.

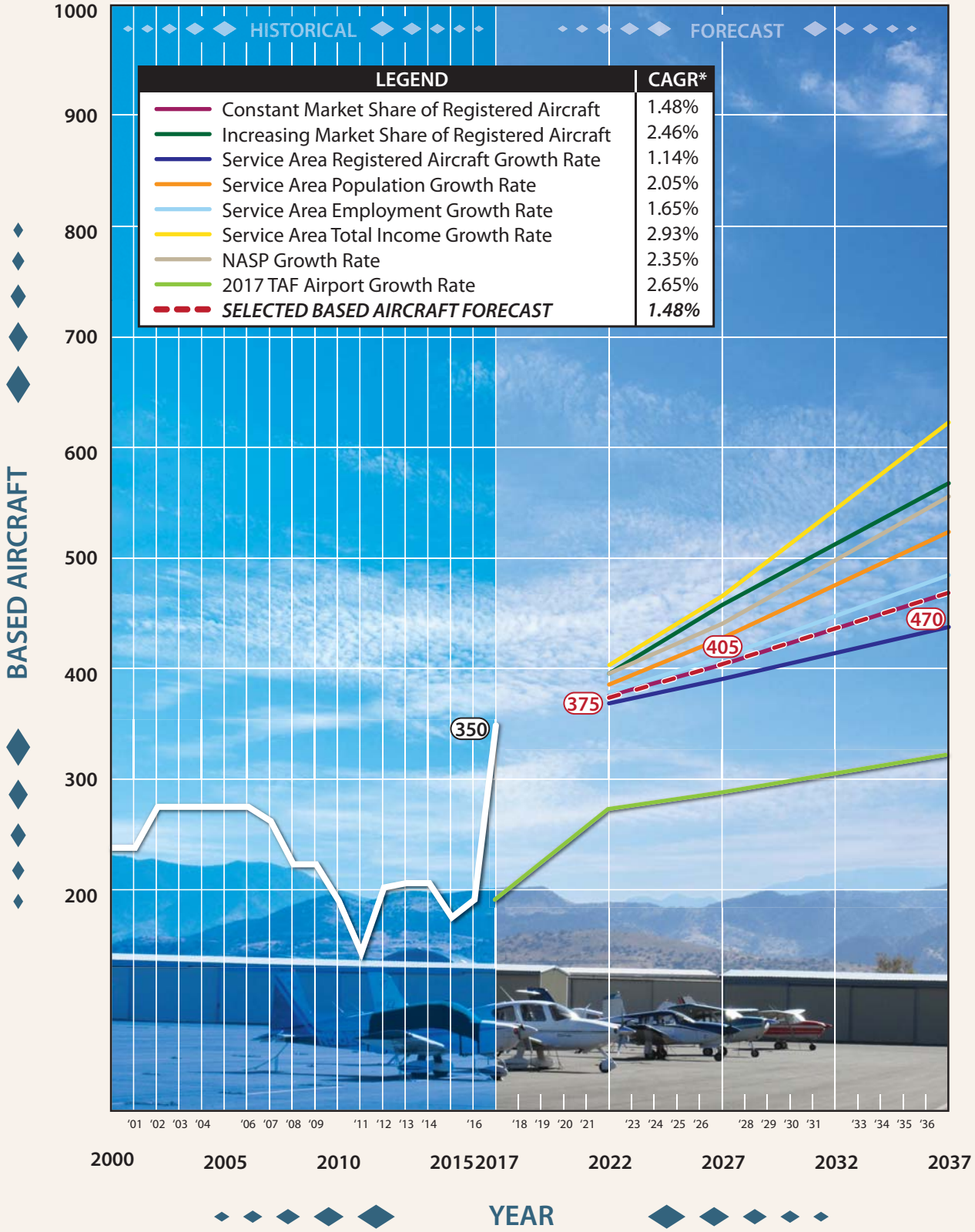
In addition to the previously mentioned market share of registered aircraft forecasts, several other based aircraft projections were made factoring historic growth rates for socioeconomic factors, including population, employment, and total income, as well as historic growth rates for service area registered aircraft as presented in **Table 2H**. These projections vary in CAGR between a low of 1.14 percent historic service area aircraft registration growth rate from 0.48 percent (FAA TAF) to a high of 2.93 percent (income growth rate). In the TAF forecast, the based aircraft are forecast to hit 210 by 2037, at a CAGR of 0.48 percent. Finally, the NASP growth rate of 2.35 percent is a higher-end forecast, with a based aircraft count projected to hit 557 by 2037.

TABLE 2H
Based Aircraft Summary
Carson City Airport

	2017 (Base Year)*	2022	2027	2037	CAGR 2017-2037
Projection Sources					
Constant Market Share of Registered Aircraft	350	377	405	470	1.48%
Increasing Market Share of Registered Aircraft	350	397	459	569	2.46%
Service Area Registered Aircraft Growth Rate	350	370	392	439	1.14%
Service Area Population Growth Rate	350	387	429	525	2.05%
Service Area Employment Growth Rate	350	380	412	486	1.65%
Service Area Total Income Growth Rate	350	404	467	624	2.93%
NASP Growth Rate	350	393	442	557	2.35%
2017 TAF Airport Growth Rate	191	195	200	210	0.48%
SELECTED BASED AIRCRAFT FORECAST	**350**	**375**	**405**	**470**	**1.48%**

* Base year set to 2017 based aircraft figure of 350.
CAGR: Compound annual growth rate
Source: Coffman Associates analysis

The forecasts discussed in **Table 2H**, and further depicted on **Exhibit 2D**, represent a reasonable planning envelope. The selected forecast mirrors two forecasts, maintaining a constant share of the service area registered aircraft and following the projected total income growth rate for the service area, which is projected at a 1.49 percent CAGR. Over the next five years, 375 aircraft are projected to be based at CXP. In 10 years, 405 aircraft are projected and by 2037, 470 based aircraft are projected. This forecast results in a 1.48 percent CAGR through the long-term planning period.



Source: Coffman Associates analysis * **CAGR** - Compound Annual Growth Rate

Future aircraft basing at the airport will depend on several factors, including the state of the economy, fuel costs, available facilities, competing airports, and adjacent development potential. Forecasts assume a reasonably stable and growing economy, as well as reasonable development of airport facilities necessary to accommodate aviation demand. Competing airports will play a role in deciding demand; however, CXP should fare well in this competition as it is served by a runway capable of handling the majority of general aviation aircraft and the airport's capability of being expanded to meet future demand.

Consideration must also be given to the current and future aviation conditions at the airport. CXP provides a full array of general aviation services and has published GPS instrument approach procedures, which makes the facility accessible during poor weather conditions. In short, CXP will continue to be favored by aviation operators due to its location and available facilities. Furthermore, the Carson City Airport Authority has not given any indication that it plans not to support future growth efforts at CXP. Significant investments have been and are currently being made to the facility, and the airport should continue to develop in response to the needs of the service area aircraft operators.

BASED AIRCRAFT FLEET MIX

It is important to have an understanding of the current and projected based aircraft fleet mix at an airport. This will ensure the proper planning of facilities in the future. The forecast mix of based aircraft was determined by comparing existing and forecast U.S. general aviation fleet trends to the fleet mix at the airport. The national trend in general aviation is toward a greater percentage of larger, more sophisticated aircraft as part of the national fleet; however, Carson City Airport is slightly limited with respect to aircraft size because of the constraints to additional runway length, existing airfield pavement strengths, and being located at a high elevation, which can limit aircraft performance, coupled with rising terrain nearby. As such, future based aircraft are forecast to be similar to the mix currently using the airport. One notable addition to the fleet mix is business jets and turboprops in the intermediate and long terms. **Table 2J** presents the current and forecast based aircraft fleet mix.

TABLE 2J
Based Aircraft Fleet Mix
Carson City Airport

Aircraft Type	2017	Percent	2022	Percent	2027	Percent	2037	Percent
Single Engine Piston	248	70.9%	262	69.9%	282	69.6%	330	70.2%
Multi-Engine Piston	44	12.6%	44	12.0%	43	10.6%	37	7.9%
Turboprop	14	4.0%	18	4.8%	20	4.9%	28	6.0%
Jet	22	6.3%	22	5.9%	28	6.9%	36	7.7%
Helicopters	22	6.3%	29	7.5%	32	7.9%	39	8.3%
Total	**350**	**100.0%**	**375**	**100.0%**	**405**	**100.0%**	**470**	**100.0%**

Source: Coffman Associates analysis of FAA Registered Aircraft Database

Most of the based aircraft at CXP, 70.9 percent, are small single-engine piston aircraft, such as the Cessna 172. While the FAA projects that piston-powered aircraft will decline in numbers nationwide over the forecast period, it is anticipated that this category will continue to account for most of the aircraft at CXP; however, real growth is anticipated to occur within the more sophisticated categories, including turboprop, helicopter, and jet. The turboprop and jet categories are projected to add 14 based aircraft over the next 20 years, while helicopters are projected to grow by 17.

ANNUAL OPERATIONS

Operations are categorized by the FAA as air carrier, air taxi/commuter, general aviation, and military. They are further subclassified as local or itinerant. A local operation is a take-off or landing performed by an aircraft that operates within close proximity of an airport, or which executes simulated approaches or touch-and-go operations at an airport. Itinerant operations are those performed by aircraft with a specific origin or destination away from an airport. Generally, local operations are characterized by training operations. Itinerant operations increase with business and commercial use, since business aircraft operate on a high frequency and are not typically utilized for local training operations.

Determining general aviation operations can be challenging at airports that do not have an airport traffic control tower, such as CXP. It is therefore necessary to rely, to some degree, on operations estimates that were previously completed. The FAA TAF is one such estimate that provides an acceptable baseline. Moreover, the FAA requires the master plan to remain within a TAF tolerance defined earlier unless specific information is provided to the contrary.

Following established methodology, existing operations will first be examined. Then several new operations forecasts will be developed, which will create a reasonable planning envelope from which a specific forecast will be selected. The operations forecasts will be developed for each segment of aviation and then combined to form a total operations forecast.

EXISTING TOTAL GENERAL AVIATION OPERATIONS FORECASTS

Table 2K presents existing general aviation (GA) operations estimated by the FAA and the State of Nevada for CXP. The FAA TAF (2017) projects operations to remain static throughout the planning horizon, at 76,000 total general aviation (GA) operations. The *Nevada Aviation System Plan* [NASP (2004)], with a base year of 2000, includes airport-specific information related to commercial operations but only projects systemwide general aviation operations. The NASP projected CXP operations to grow to over 111,000 operations by 2020 with CAGR of 2.35 percent.

TABLE 2K
Existing General Aviation Operations Forecasts
Carson City Airport

Year	GA Local	GA Itinerant	GA Total
2017 TAF			
2017	38,500	37,500	76,000
2022	38,500	37,500	76,000
2027	38,500	37,500	76,000
2037	38,500	37,500	76,000
CAGR 2017-2037	**0.00%**	**0.00%**	**0.00%**
Nevada Airport System Plan (NASP) – 2004			
2000	35,000	35,000	70,000
2010	49,300	49,300	98,600
2015	55,700	55,700	111,400
2020	55,700	55,700	111,400
CAGR 2000-2020	**2.35%**	**2.35%**	**2.35%**

Itinerant General Aviation Operations Forecast

Four forecasts of itinerant general aviation operations have been developed and are shown in **Table 2L** and on **Exhibit 2E**. These four forecasts combine to form the planning envelope from which the selected forecast is established.

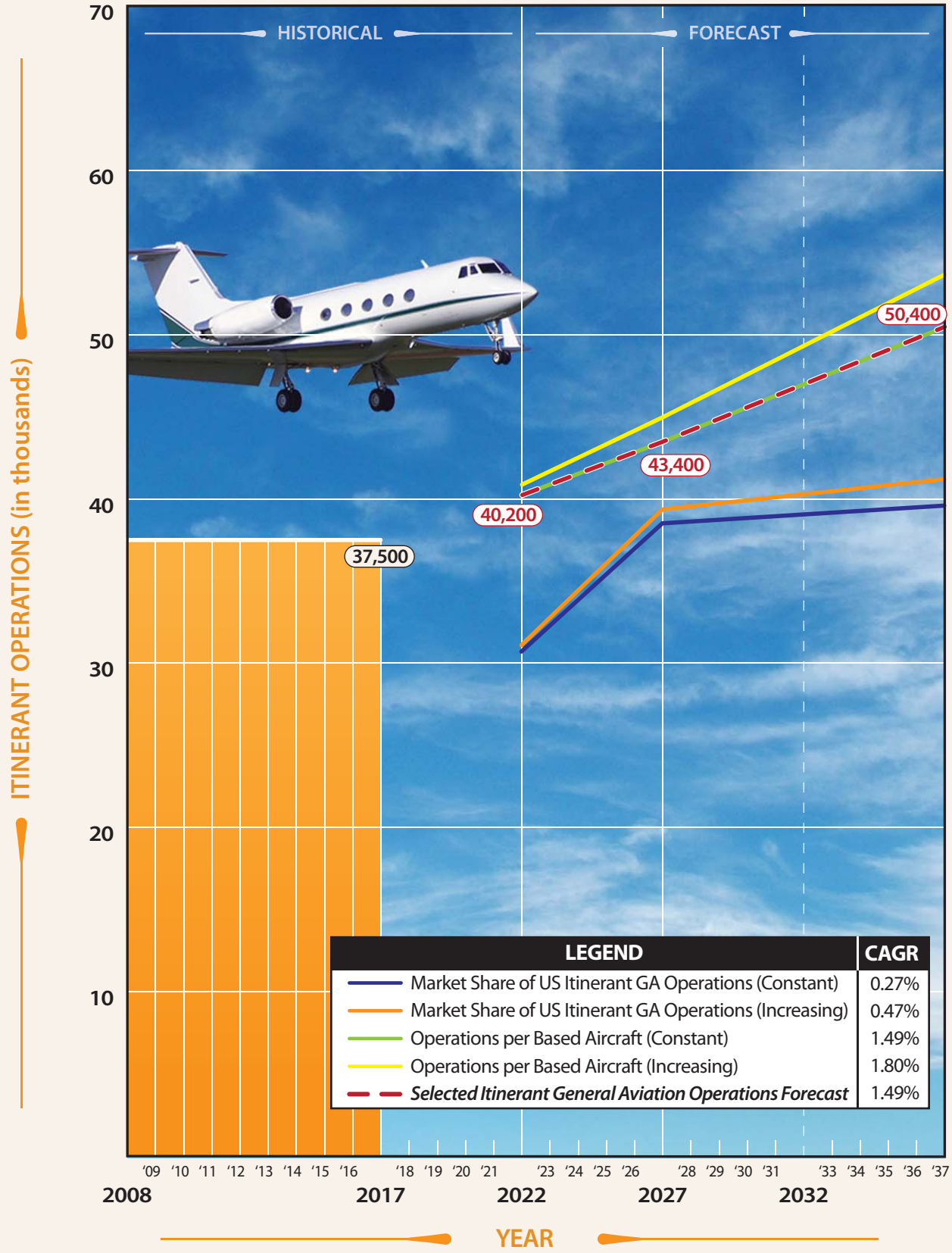
TABLE 2L
Itinerant General Aviation Operations Planning Forecast Envelope
Carson City Airport

Method	2022	2027	2037	CAGR
Market Share of US Itinerant GA Operations (Constant)	30,709	38,512	39,591	0.27%
Market Share of US Itinerant GA Operations (Increasing)	31,098	39,358	41,196	0.47%
Operations per Based Aircraft (Constant)	40,200	43,400	50,400	1.49%
Operations per Based Aircraft (Increasing)	40,875	44,955	53,580	1.80%
Selected Itinerant General Aviation Operations Forecast	**40,200**	**43,400**	**50,400**	**1.49%**

CAGR = Compound annual growth rate

National GA itinerant operations have been declining since at least 2000 but have taken a steeper decline since the beginning of the Great Recession and have yet to recover; however, the FAA forecasts a reversal over the course of the next 20 years. Through 2037, the FAA forecasts a CAGR of 0.3 percent for itinerant GA operations.

Two forecasts consider the historical itinerant general aviation operations at the airport in relation to the FAA's national itinerant general aviation operations as forecast. The first maintains the 2017 share (0.27 percent) constant throughout the planning period. The second considers an increasing share of national itinerant general aviation operations based upon the historic trend, which saw CXP's market share grow by 0.05 percent in the past nine years. The next two forecasts consider the relationship



CAGR - Compound Annual Growth Rate

Exhibit 2E
ITINERANT GENERAL AVIATION OPERATIONS

between itinerant general aviation operations and based aircraft (as projected previously). The first maintains a constant share of itinerant GA operations per based aircraft and the second considers an increasing share going to 114 operations per based aircraft. Currently, the airport experiences an estimated 107 itinerant GA operations per based aircraft.

Ultimately, the constant operations per based aircraft projection has been carried forward as the selected forecast. This is based upon on the potential for future growth in the business aircraft market and projected population and economic growth for the service area. The selected forecast maintains a reasonable operations per based aircraft level of 107. The CAGR is 1.49 percent.

Local General Aviation Operations Forecast

Similarly, four forecasts of local general aviation operations have been developed and are shown in **Table 2M** and depicted in a chart on **Exhibit 2F**.

TABLE 2M
Local General Aviation Operations Planning Forecast Envelope
Carson City Airport

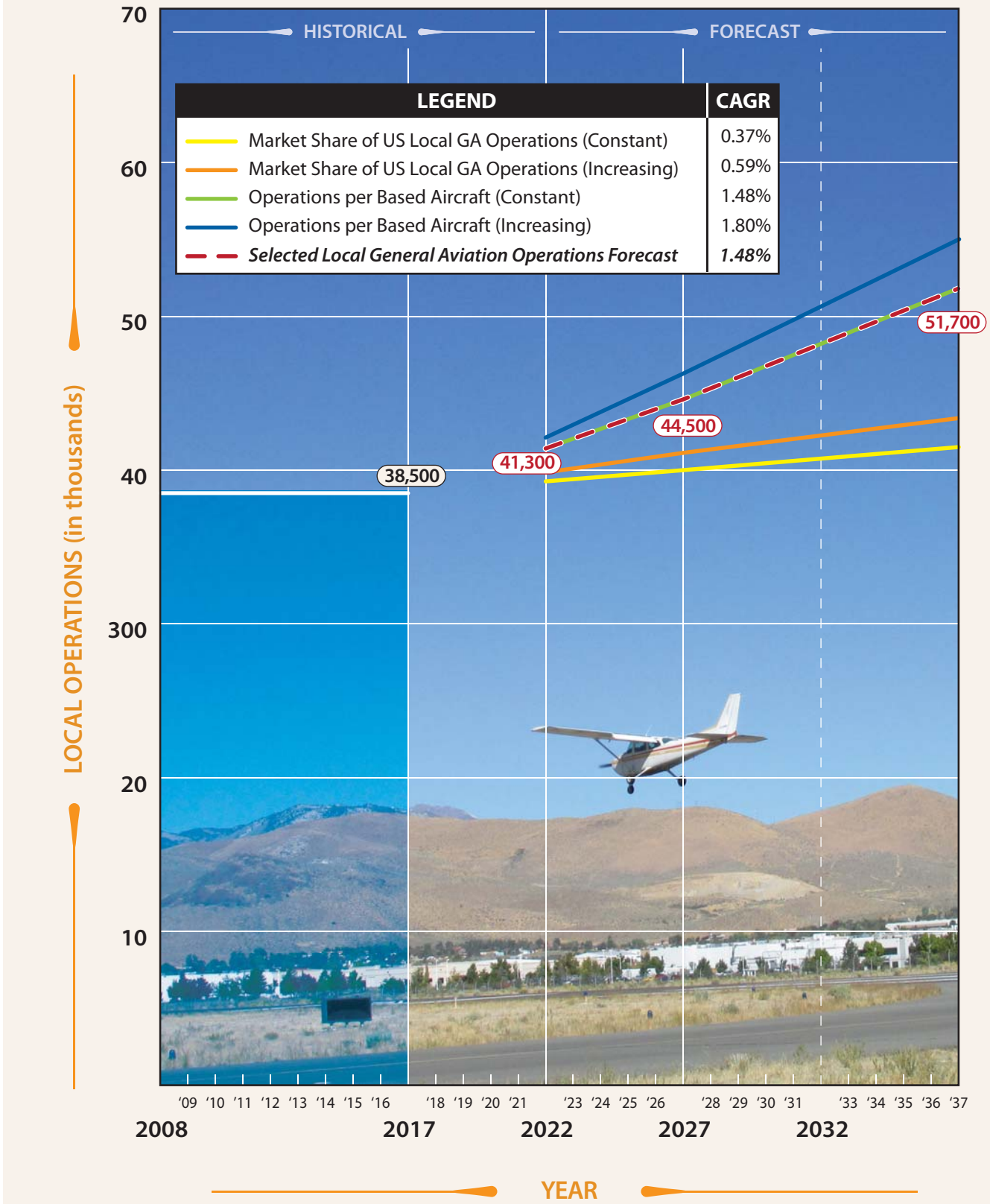
Method	2022	2027	2037	CAGR
Market Share of US Local GA Operations (Constant)	39,190	39,906	41,421	0.37%
Market Share of US Local GA Operations (Increasing)	39,775	41,046	43,294	0.59%
Operations per Based Aircraft (Constant)	41,300	44,500	51,700	1.48%
Operations per Based Aircraft (Increasing)	42,000	46,170	54,990	1.80%
Selected Local General Aviation Operations Forecast	**41,300**	**44,500**	**51,700**	**1.48%**

CAGR = Compound annual growth rate

The FAA's national projections for local GA operations estimate a modest 0.4 percent annual growth rate through 2037. The first forecast considers maintaining CXP's market share of constant at 0.33 percent of national local GA operations as forecast by the FAA, which yields 41,421 operations by 2037 at a CAGR of 0.37 percent. An increasing market share forecast considers the potential for CXP to reach a market share of 0.35 percent by 2037, which results in 43,294 GA local operations at a CAGR of 0.59 percent.

The next projection maintains constant the number of local GA operations per based aircraft (110), resulting in 51,700 operations by 2037 and a CAGR of 1.48 percent. Finally, increasing the number of Local GA operations per based aircraft to 117 results in local GA operations growth to 54,990 by 2037 and a CAGR of 1.80 percent.

Ultimately, the constant operations per based aircraft projection has been carried forward as the selected forecast. This is based upon the potential for growth in based aircraft at CXP and projected population and economic growth for the service area. The selected forecast maintains a reasonable operations per based aircraft level of 110.



CAGR - Compound Annual Growth Rate

AIR TAXI OPERATIONS FORECAST

Air taxi operations are those with the authority to provide "on-demand" transportation of persons or property via aircraft with fewer than 60 passenger seats. Air taxi includes a broad range of operations, including some smaller commercial service aircraft, some charter aircraft, air cargo aircraft, many fractional ownership aircraft, and air ambulance services.

Based on an examination of flight plans filed and closed on the ground from years 2015-2017, as well as multiple interviews with stakeholders at the airport, it was determined that CXP experiences approximately 2,000 air taxi operations annually. Per the FAA Aerospace Forecast, the air taxi/commuter category is projected to decline by -0.82 percent by 2037; however, this projection generally correlates to air taxi operations conducted by regional airlines. With strong based business jet growth projected for the airport, it is reasonable to assume that some of these aircraft will be utilized for air taxi (Part 135) operations. Thus, a new air taxi forecast was generated for this report and is presented in **Table 2N.**

TABLE 2N
Air Taxi Operations Forecasts
Carson City Airport

Year	CXP Air Taxi Operations[1]	U.S. ATCT Air Taxi Operations[2]	CXP Market Share	CXP Based Business Jets	Air Taxi Ops per Based Aircraft
2017	2,000	7,381,000	0.0271%	22	91
Constant Market Share of National Air Taxi Operations (CAGR = -0.82%)					
2022	1,477	5,451,000	0.0271%	22	67
2027	1,531	5,649,000	0.0271%	28	55
2037	1,695	6,257,000	0.0271%	36	47
Increasing Market Share of National Air Taxi Operations (CAGR = 0.58%)					
2022	1,908	5,451,000	0.035%	22	87
2027	2,090	5,649,000	0.037%	28	75
2037	2,246	6,257,000	0.036%	36	62
Constant Air Taxi Operations Per Based Business Jet (CAGR = 2.54%) - Selected Forecast					
2022	2,000	5,451,000	0.0367%	22	91
2027	2,500	5,649,000	0.0443%	28	91
2037	3,300	6,257,000	0.0527%	36	91
Increasing Air Taxi Operations Per Based Business Jet (CAGR = 2.98%)					
2022	1,980	5,451,000	0.0363%	22	90
2027	2,660	5,649,000	0.0471%	28	95
2037	3,600	6,257,000	0.0575%	36	100

[1] Master Plan Forecast
[2] FAA Aerospace Forecasts – Fiscal Years 2017-2037
CXP = Carson City Airport; GA = General Aviation

In an effort to generate reliable air taxi operations forecasts, four different forecasting techniques were utilized. The first forecast analyzes the existing CXP market share of the U.S. air taxi operations, which is held at a constant at 0.0271 percent throughout the planning period. This forecast yields a total of 1,695 air taxi operations by 2037 at a CAGR -0.82 percent. The second forecast assumes an increase in

CXP's market share of U.S. air taxi operations, yielding a CAGR of 0.58 percent and a total of 2,246 operations by year 2037.

In addition, forecasts based upon constant and increasing ratio projections of air taxi operations per based business jets were also prepared. The constant ratio projection maintains 91 air taxi operations per based jet through the planning period, yielding a total of 3,300 annual air taxi operations by 2037. The increasing ratio projection grows air taxi operations per based business jet to 100, yielding a total of 3,600 air taxi operations by 2037. Accounting for the potential for based business jet growth, the constant ratio projection of air taxi operations per based business jet has been selected as the preferred planning forecast.

OPERATIONS FLEET MIX

Developing an understanding of the operational fleet mix, including the approximate volume of operations by aircraft type, is utilized in airfield capacity analysis, fuel storage capacity analysis, and pavement utilization determination. The FAA Traffic Flow Management System Count (TFMSC) database captures a portion of operations by aircraft type utilizing flight plan data. However, most flights are not required to file a flight plan and, therefore, this database represents a minimum level of activity. **Table 2P** details CXP's fleet mix operational forecast.

Piston operations have consistently been the majority of the total operations at CXP since the previous master plan. Due to the changes in the industry, that status quo will be challenged over the next 20 years as turboprop and jet operations increase.

TABLE 2P
Fleet Mix Operations Forecast
Carson City Airport

	2017	%	2022	%	2027	%	2037	%
Local Operations								
Piston	38,400	99.74%	41,100	99.52%	44,200	99.33%	51,200	99.03%
Helicopter	100	0.26%	200	0.48%	300	0.67%	500	0.97%
Total Local	38,500	100.00%	41,300	100.00%	44,500	100.00%	51,700	100.00%
Itinerant Operations								
Single Piston	20,750	52.53%	20,450	48.46%	14,550	31.70%	16,950	31.56%
Multi-Piston	8,800	22.28%	9,000	21.33%	8,600	18.74%	7,400	13.78%
Turboprop	3,250	8.23%	4,250	10.07%	4,750	10.35%	6,750	12.57%
Jet	200	0.51%	300	0.71%	8,700	18.95%	11,400	21.23%
Helicopters	6,500	16.46%	8,200	19.43%	9,300	20.26%	11,200	20.86%
Total Itinerant	39,500	100.00%	42,200	100.00%	45,900	100.00%	53,700	100.00%
Total Operations	78,000		83,500		90,400		105,400	

Source: Coffman Associates analysis

By identifying a baseline number of operations by aircraft type, it is then possible to produce an estimate of future operations by aircraft category. Experience at other airports has shown that general operational estimates can be made by multiplying the number of based aircraft by utilization factors. For this analysis, multi-engine piston aircraft are estimated to account for approximately 200 operations per based aircraft annually. Turboprops are estimated at approximately 250 annual operations per based aircraft, and jets and helicopters are estimated at 300 annual operations per based aircraft.

ANNUAL INSTRUMENT APPROACHES (AIAs)

An instrument approach, as defined by the FAA, is "an approach to an airport with the intent to land an aircraft in accordance with an Instrument Flight Rule (IFR) flight plan, when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude." To qualify as an instrument approach, aircraft must land at the airport after following one of the published instrument approach procedures. Forecasts of annual instrument approaches (AIAs) provide guidance in determining an airport's requirements for navigational aid facilities. Practice or training approaches do not count as annual AIAs.

While AIAs can be partially attributed to weather, they may be expected to increase as transient operations and operations by more sophisticated aircraft increase through the planning period. For this reason, AIA projections consider a constant percentage of 2.0 of annual general aviation and air taxi itinerant operations. The projections are presented in **Table 2Q**.

TABLE 2Q
Annual Instrument Approaches (AIAs)
Carson City Airport

Year	Itinerant Operations	Ratio	AIAs
2017	39,500	2.00%	790
2022	42,200	2.00%	800
2027	45,900	2.00%	900
2037	53,700	2.00%	1,100

Source: Coffman Associates analysis

PEAKING CHARACTERISTICS

Many aspects of facility planning relate to levels of peaking activity – times when the airport is busiest. For example, the appropriate size of a terminal building can be estimated by determining the number of people that could reasonably be expected to use the facility at a given time. The following planning definitions apply to the peak periods:

- **Peak Month** -- The calendar month when peak aircraft operations occur.
- **Design Day** -- The average day in the peak month.
- **Busy Day** -- The busy day of a typical week in the peak month.
- **Design Hour** -- The peak hour within the design day.

Because there is no control tower at the airport, it is necessary to estimate the peak periods. It is known that Carson City Airport experiences significant warm weather peaks. In addition, the analyst's experience with other similar airports has informed the peaking calculations. The peak month for operations is estimated to represent 12.0 percent of annual operations. The design day is simply the peak month divided by the number of days in that month, which is estimated at 30 days. The busy day is calculated as 25 percent higher than the design day, which is derived based on the average of the peak day for each week of the peak month. The design hour is the peak hour of the design day, which is estimated as 17.5 percent of the design day. **Table 2R** details the peaking characteristics at CXP.

TABLE 2R
Peaking Characteristics
Carson City Airport

Peak Period	2017	2022	2027	2037
Annual Operations	78,000	83,500	90,400	105,400
Peak Month (12.0%)	9,360	10,020	10,848	12,648
Busy Day	390	418	452	527
Design Day	312	334	362	422
Design Hour (17.5%)	55	58	63	74

Source: Coffman Associates, 2017

FORECAST SUMMARY AND COMPARISON TO THE TAF

The FAA will review the forecasts of this Master Plan and compare them to the TAF. Where the 5- or 10-year forecasts exceed 100,000 total annual operations or 100 based aircraft, the FAA prefers that the forecasts differ by less than 10 percent in the 5-year period and 15 percent in the 10-year period. Where the forecasts do differ, supporting documentation should be provided.

Table 2S presents a direct comparison of the 2017 TAF to the forecasts in this Master Plan. In the 5-year timeframe, the Master Plan operations forecast is lower than the TAF. By 2037, the Master Plan forecast is 12 percent higher than the TAF. The primary reason for the difference is the TAF presents a zero-growth scenario and the TAF stated that 7,500 operations occur at CXP; however, no data can be found to support this. As previously mentioned, based on examination of flight plans filed and closed on the ground from years 2015-2017 and stakeholder interviews, that number is closer to2,000 operations annually.

TABLE 2S
Forecast Comparison to the *Terminal Area Forecast*
Carson City Airport

	BASE YEAR	FORECAST			
	2017	2022	2027	2037	CAGR 2017-2037
Total Operations					
Master Plan Forecast	78,000	83,500	90,400	105,400	1.52%
2017 FAA TAF	83,500	83,500	83,500	83,500	0.00%
% Change	-6.6%	0.0%	8.3%	26.2%	
Master Plan Itinerant Forecast	39,500	42,200	45,900	53,700	1.55%
2017 FAA TAF	37,500	37,500	37,500	37,500	0.00%
% Change	5.3%	12.5%	22.4%	43.2%	
Master Plan Local Forecast	*38,500*	*41,300*	*44,500*	*51,700*	1.48%
2017 FAA TAF	38,500	38,500	38,500	38,500	0.00%
% Change	0.0%	7.3%	15.6%	34.3%	
Based Aircraft					
Master Plan Forecast	350	375	405	470	1.48%
2017 FAA TAF	191	195	200	210	0.48%
% Change	83.2%	92.3%	102.5%	123.8%	

CAGR: Average annual growth rate
Source: Coffman Associates analysis

AIRCRAFT/AIRPORT/RUNWAY CLASSIFICATION

The FAA has established several aircraft classification systems that group aircraft types based on their performance (approach speed in landing configuration) and design characteristics (wingspan and landing gear configuration). These classification systems are used to determine the appropriate airport design standards for specific airport elements, such as runways, taxiways, taxilanes, and aprons.

AIRCRAFT CLASSIFICATION

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using, or are expected to use, an airport. The critical design aircraft is used to define the design parameters for an airport. The design aircraft may be a single aircraft type or a composite aircraft representing a collection of aircraft with similar characteristics. The critical design aircraft is defined by three parameters: Aircraft Approach Category (AAC), Airplane Design Group (ADG), and Taxiway Design Group (TDG). FAA AC 150/5300-13A, *Airport Design*, describes the following airplane classification systems, the parameters of which are presented on **Exhibit 2G**.

Aircraft Approach Category (AAC): A grouping of aircraft based on a reference landing speed (V_{REF}), if specified, or if V_{REF} is not specified, 1.3 times stall speed (V_{SO}) at the maximum certificated landing

AIRCRAFT APPROACH CATEGORY (AAC)

Category	Approach Speed
A	less than 91 knots
B	91 knots or more but less than 121 knots
C	121 knots or more but less than 141 knots
D	141 knots or more but less than 166 knots
E	166 knots or more

AIRPLANE DESIGN GROUP (ADG)

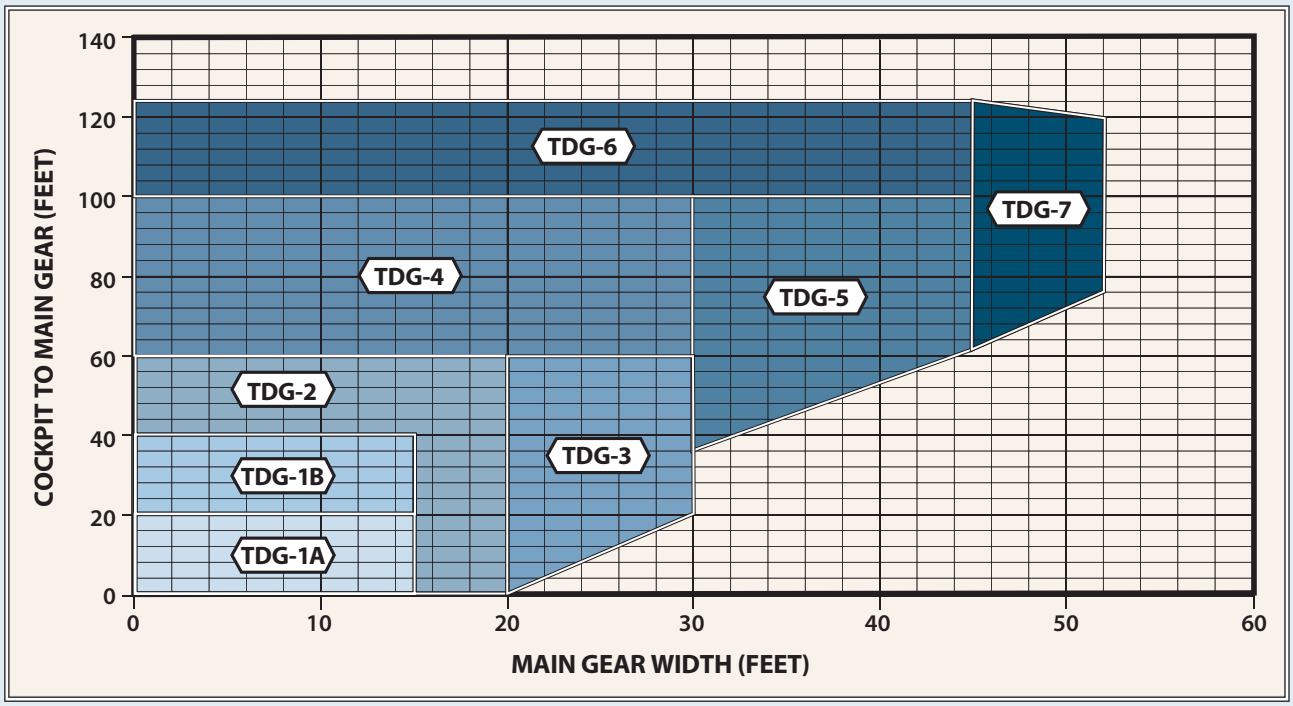
Group #	Tail Height (ft)	Wingspan (ft)
I	<20	<49
II	20-<30	49-<79
III	30-<45	79-<118
IV	45-<60	118-<171
V	60-<66	171-<214
VI	66-<80	214-<262

VISIBILITY MINIMUMS

RVR* (ft)	Flight Visibility Category (statute miles)
VIS	3-mile or greater visibility minimums
5,000	Not lower than 1-mile
4,000	Lower than 1-mile but not lower than ¾-mile
2,400	Lower than ¾-mile but not lower than ½-mile
1,600	Lower than ½-mile but not lower than ¼-mile
1,200	Lower than ¼-mile

***RVR**: Runway Visual Range

TAXIWAY DESIGN GROUP (TDG)



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

weight. V_{REF}, V_{SO}, and the maximum certificated landing weight are those values as established for the aircraft by the certification authority of the country of registry.

The AAC generally refers to the approach speed of an aircraft in landing configuration. The higher the approach speed, the more restrictive the applicable design standards. The AAC, depicted by a letter A through E, is the aircraft approach category and relates to aircraft approach speed (operational characteristic). The AAC generally applies to runways and runway-related facilities, such as runway width, runway safety area (RSA), runway object free area (ROFA), runway protection zone (RPZ), and separation standards.

Airplane Design Group (ADG): The ADG, depicted by a Roman numeral I through VI, is a classification of aircraft which relates to aircraft wingspan or tail height (physical characteristic). When the aircraft wingspan and tail height fall in different groups, the higher group is used. The ADG influences design standards for taxiway safety area (TSA), taxiway object free (TOFA), taxilane object free area, apron wingtip clearance, and various separation distances.

Taxiway Design Group (TDG): A classification of airplanes based on outer-to-outer Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance. The TDG relates to the undercarriage dimensions of the design aircraft. The taxiway design elements determined by the application of the TDG include the taxiway width, taxiway edge safety margin, taxiway shoulder width, taxiway fillet dimensions, and, in some cases, the separation distance between parallel taxiways/taxilanes. Other taxiway elements, such as the taxiway safety area (TSA), taxiway/taxilane object free area (TOFA), taxiway/taxilane separation to parallel taxiway/taxilanes or fixed or movable objects, and taxiway/taxilane wingtip clearances are determined solely based on the wingspan (ADG) of the design aircraft utilizing those surfaces. It is appropriate for taxiways to be planned and built to different TDG standards based on expected use.

Exhibit 2H presents the classification of most common aircraft in operation today. Generally, recreational and business piston and turboprop aircraft will fall in AAC "A," "B," and ADG I and II; business jets typically fall into AAC "B" and "C,"; and the larger commercial aircraft will fall in AAC "C" and "D."

AIRPORT AND RUNWAY CLASSIFICATION

These classifications, along with the aircraft classifications defined previously, are used to determine the appropriate FAA design standards to which the airfield facilities are to be designed and built.

***Airport Reference Code (ARC)*:** An airport designation that signifies the airport's highest Runway Design Code (RDC), minus the third (visibility) component of the RDC. The ARC is used for planning and design only and does not limit the aircraft that may be able to operate safely on the airport. The current ALP for the airport, which will be updated as part of this planning effort, identifies an ARC of D-II for civilian activity and ARC C-IV for military activity.



A-I

- Beech Baron 55
- **Beech Bonanza**
- Cessna 150
- Cessna 172
- Cessna Citation Mustang
- Eclipse 500/550
- Piper Archer
- Piper Seneca

B-I

- Beech Baron 58
- Beech King Air A90/100
- Cessna 402
- **Cessna 421**
- Piper Navajo
- Piper Cheyenne
- Swearingen Metroliner
- Cessna Citation I (525)

B-II

- Super King Air 200
- Cessna 441
- DHC Twin Otter
- Super King Air 350
- **Cessna Caravan**
- Citation Excel (560), Sovereign (680)
- Falcon 50, 900, 2000
- **Citation Bravo (550)**
- Embraer 120

A-III, B-III

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

C-I, D-I

- Beech 400
- **Lear 31, 35,** 45, 60
- Israeli Westwind

C-II, D-II

- **Cessna Citation X (750)**
- Gulfstream 100, 200,300
- Challenger 300/600
- ERJ-135, 140, 145
- CRJ-200/700
- Embraer Regional Jet
- Lockheed JetStar
- Hawker 800

C-III, D-III

less than 100,000 lbs.

- ERJ-170
- CRJ 705, 900
- Falcon 7X
- **Gulfstream 500**, 550, 650
- Global Express, Global 5000
- Q-400

C-III, D-III

over 100,000 lbs.

- ERJ-90
- Boeing Business Jet
- B-727
- **B-737**-300, **700,** 800
- MD-80, DC-9
- A319, A320

C-IV, D-IV

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

D-V

- **B-747-400**
- B-777
- B-787
- A-330, A-340

Note: Aircraft pictured is identified in bold type.

Runway Design Code (RDC): A code signifying the design standards to which the runway is to be built. The RDC is based upon planned development and has no operational component. The AAC, ADG, and runway visual range (RVR) are combined to form the RDC of a particular runway. The RDC provides the information needed to determine certain design standards that apply. The first component, depicted by a letter, is the AAC and relates to aircraft approach speed (operational characteristics). The second component, depicted by a Roman numeral, is the ADG and relates to either the aircraft wingspan or tail height (physical characteristics), whichever is most restrictive. The third component relates to the visibility minimums expressed by RVR values in feet of 1,200 (⅛-mile); 1,600 (¼-mile); 2,400 (½-mile); 4,000 (¾-mile); and 5,000 (1-mile). The RVR values approximate standard visibility minimums for instrument approaches to the runways. The third component should read "VIS" for runways designed for visual approach use only.

Approach Reference Code (APRC): A code signifying the current operational capabilities of a runway and associated parallel taxiway with regard to landing operations. Like the RDC, the APRC is composed of the same three components: the AAC, ADG, and RVR. The APRC describes the current operational capabilities of a runway under particular meteorological conditions where no special operating procedures are necessary, as opposed to the RDC, which is based upon planned development with no operational component. The APRC for a runway is established based upon the minimum runway-to-taxiway centerline separation.

Departure Reference Code (DPRC): A code signifying the current operational capabilities of a runway and associated parallel taxiway with regard to take-off operations. The DPRC represents those aircraft that can take off from a runway, while any aircraft are present on adjacent taxiways, under meteorological conditions with no special operating conditions. The DPRC is similar to the APRC but is composed of two components: ACC and ADG. A runway may have more than one DPRC depending on the parallel taxiway separation distance.

CRITICAL DESIGN AIRCRAFT

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using, or are expected to use, an airport. The critical design aircraft is used to define the design parameters for an airport. The design aircraft may be a single aircraft or a composite aircraft representing a collection of aircraft classified by the three parameters: AAC, ADG, and TDG. In the case of an airport with multiple runways, a design aircraft is selected for each runway.

The first consideration is the safe operation of aircraft likely to use an airport. Any operation of an aircraft that exceeds design criteria of an airport may result in either an unsafe operation or a lesser safety margin; however, it is not the usual practice to base the airport design on an aircraft that uses the airport infrequently.

The critical design aircraft is defined as the most demanding aircraft type, or grouping of aircraft with similar characteristics, that make regular use of the airport. Regular use is 500 annual operations, excluding touch-and-go operations. Planning for future aircraft use is of particular importance since the design standards are used to plan separation distances between facilities. These future standards must be considered now to ensure that short-term development does not preclude the reasonable long-range potential needs of the airport. Therefore, if the critical design aircraft is anticipated to change within the next five years, that aircraft (or family of aircraft) should be used as the current critical design aircraft.

AIRPORT CRITICAL DESIGN AIRCRAFT

The FAA maintains the Traffic Flow Management System Count (TFMSC) database which documents aircraft operations at most NPIAS airports. Information is added to the TFMSC database when pilots file flight plans and/or when flights are detected by the National Airspace System, usually via radar. The database includes documentation of commercial traffic (air carrier and air taxi), general aviation, and military aircraft. Due to factors, such as incomplete flight plans and limited radar coverage, TFMSC data does not account for all aircraft activity at an airport by a given aircraft type. Most VFR and some non-enroute IFR traffic is excluded. Therefore, there are more operations at an airport than are captured by this methodology. Nonetheless, this is a valid source to determine if the number of documented operations exceeds the FAA threshold. TFMSC data is available for activity at Carson City Airport and was utilized in this analysis.

Current Critical Design Aircraft

Exhibit 2J presents the TFMSC operational mix at the airport for turboprops and jets for the last 10 years. As can be seen, the airport experiences activity by a range of single piston, turboprops, and several small business jets. Each year over the last ten years, those in aircraft approach category B and airplane design group II have exceeded the 500 operations threshold. **Table 2T** summarizes this information. Very few operations are conducted by aircraft in aircraft approach category C or D.

While several aircraft types contribute to the cumulative total for B-II operations, by far the most prevalent aircraft type is the Cessna Citation Latitude business jet.

The MTOW of the Cessna Citation Latitude is 30,800 pounds; therefore, the medium aircraft category will apply and is typically represented as (M). The cockpit to main gear length is 27.00 feet, which falls in TDG 1B. The wing span is 72.33 feet, which falls in AAC B. It is worth noting that currently CXP is home to a large collection of unique aircraft that occasionally operate including, predominantly, the Grumman G-111 Albatross, which is capable of landing in open water. Additionally, nearby Lake Tahoe is known for allowing amphibious aircraft operations. **Therefore, the current critical design aircraft for the Airport is the Cessna Citation Latitude and is best described as B-II-1B**.

AIRPORT REFERENCE CODE OPERATIONS SUMMARY

ARC	Aircraft	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
A-I	Eclipse 400/500	1	11	4	10	2	13	5	19	3	10
	Epic Dynasty	0	1	2	0	2	6	4	0	2	4
	Kodiak Quest	0	0	0	0	0	0	0	0	2	0
	Lancair Evolution/Legacy	0	1	0	0	0	11	0	64	51	41
	Mitsubishi MU-2	36	25	9	6	6	6	1	4	2	9
	Pilatus PC-7	1	0	0	0	1	1	1	1	0	0
	Piper Malibu/Meridian	22	38	44	60	52	103	48	60	43	20
	Total	60	76	59	76	63	140	59	148	103	84
A-II	Cessna Caravan	0	1	3	9	8	14	11	12	2	1
	De Havilland Twin Otter	3	0	0	2	0	1	0	0	0	0
	Pilatus PC-12	93	81	137	168	159	186	188	228	201	144
	Total	96	82	140	179	167	201	199	240	203	145
B-I	Aero Commander 690	7	8	7	0	1	0	0	0	0	0
	Beech 99 Airliner	0	1	0	0	0	0	0	0	0	0
	Beechjet 400	10	5	10	17	5	9	10	31	16	25
	Citation CJ1/CJ2	67	82	100	145	121	107	158	292	381	378
	Citation I/SP	5	20	18	23	13	25	21	33	33	15
	Citation M2	0	0	0	0	0	0	0	0	0	5
	Citation Mustang	0	9	35	60	38	7	19	151	142	129
	Falcon 10	0	0	2	0	0	0	0	6	0	0
	King Air 90/100	180	116	155	36	40	46	49	62	82	37
	L-39 Albatross	0	0	0	0	0	0	0	1	0	0
	Phenom 100	0	0	10	6	6	30	8	4	4	4
	Piaggio Avanti	12	19	12	25	41	31	24	23	48	41
	Piper Cheyenne	45	52	81	53	67	61	74	85	92	37
	Premier 1	23	18	6	4	4	3	2	3	2	2
	Socata TBM 7/850/900	8	13	20	38	28	15	22	17	45	137
	Swearingen Merlin	1	2	1	0	1	0	2	2	0	0
	Swearingen SJ-30	0	0	0	0	0	0	2	0	0	0
	Total	358	345	457	407	365	334	391	710	845	810
B-II	Aero Commander 680/900 Series	71	68	132	197	83	11	189	215	152	131
	Cessna Conquest	0	2	4	0	4	1	6	78	8	18
	Citation CJ3/CJ4	11	6	13	22	48	77	116	151	91	84
	Citation II/SP/Latitude	401	399	266	353	276	170	356	388	431	455
	Citation V/VII/Sovereign	29	26	23	38	23	32	26	40	22	20
	Citation XLS	12	12	5	22	25	6	8	33	26	21
	Dornier 328	2	0	0	0	0	0	0	0	0	0
	Falcon 20/50	2	2	4	2	2	2	6	4	6	0
	Falcon 2000	4	0	0	2	2	2	6	2	4	2
	Falcon 900	2	2	0	2	10	6	0	2	4	0
	King Air 200/300/350	181	197	174	279	140	106	83	87	119	103
	King Air F90	6	3	3	8	7	7	6	2	3	0
	Phenom 300	0	0	0	2	0	4	0	12	6	11
	Shorts 330/360	0	0	3	0	0	0	0	0	0	0
	Total	721	717	627	927	620	424	802	1014	872	845
B-III	Bombardier Global Express	2	3	1	0	0	4	2	2	2	0
	De Havilland Dash 8 Series	0	0	0	0	0	0	1	0	0	0
	Total	2	3	1	0	0	4	3	2	2	0
C-I	BAe HS 125 Series	0	0	0	0	0	2	0	0	0	0
	Learjet 20 Series	5	5	4	2	2	0	0	0	0	0
	Learjet 31	2	3	8	0	0	0	0	0	0	2
	Learjet 40 Series	2	10	10	4	0	10	8	0	0	12
	Learjet 50 Series	0	0	0	5	4	6	0	0	6	0
	Learjet 60 Series	4	0	4	12	10	13	4	8	4	7
	Westwind II	2	1	0	2	0	0	3	2	0	0
	Total	15	19	26	25	16	31	15	10	10	21
C-II	Bombardier CRJ 100/200/700	2	0	0	0	2	2	0	0	0	0
	Challenger 300/600/604	2	8	10	19	10	6	12	15	15	22
	Citation X	8	5	9	6	4	8	4	18	10	8
	Embraer ERJ-135/140/145	2	0	0	0	0	0	0	1	0	0
	Gulfstream 100/150	2	0	2	2	0	2	0	3	0	0
	Gulfstream 200/280	0	6	4	9	4	4	4	4	2	2
	Gulfstream G100	0	1	1	2	0	0	2	0	0	0
	Gulfstream G-III	5	5	10	14	4	8	6	12	13	12
	Hawker 4000	0	0	0	2	0	0	0	0	0	0
	Hawker 800	28	4	35	16	18	13	6	10	9	0
	Learjet 70 Series	0	0	0	0	0	0	0	0	2	4
	Total	49	29	71	70	42	43	34	63	51	48
C-IV	Boeing 707	0	1	0	0	0	0	1	0	0	0
	C-130 Hercules	0	0	0	0	0	0	1	0	0	0
	Total	0	1	0	0	0	0	2	0	0	0
D-I	Learjet 35/36	8	18	2	9	4	8	6	6		4
	Total	8	18	2	9	4	8	6	6	6	4
D-III	Gulfstream 500/600	0	0	0	0	0	0	0	10	6	2
	Total	0	0	0	0	0	0	0	10	6	2
D-V	Airbus A340	1	0	0	0	0	0	0	0	0	0
	TOTAL	1	0	0	0	0	0	0	0	0	0

AIRPORT REFERENCE CODE OPERATIONS TOTALS

ARC	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
A-I	60	76	59	76	63	140	59	148	103	84
A-II	96	82	140	179	167	201	199	240	203	145
B-I	358	345	457	407	365	334	391	710	845	810
B-II	721	717	627	927	620	424	802	1014	872	845
B-III	2	3	1	0	0	4	3	2	2	0
C-I	15	19	26	25	16	31	15	10	10	21
C-II	49	29	71	70	42	43	34	63	51	48
C-IV	0	1	0	0	0	0	2	0	0	0
D-I	8	18	2	9	4	8	6	6	6	4
D-III	0	0	0	0	0	0	0	10	6	2
D-V	1	0	0	0	0	0	0	0	0	0
TOTAL	1310	1290	1383	1693	1277	1185	1511	2203	2098	1959

APPROACH CATEGORY

AC	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
A	156	158	199	255	230	341	258	388	306	229
B	1081	1065	1085	1334	985	762	1196	1726	1719	1655
C	64	49	97	95	58	74	51	73	61	69
D	9	18	2	9	4	8	6	16	12	6
TOTAL	1310	1290	1383	1693	1277	1185	1511	2203	2098	1959

DESIGN GROUP

DG	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
I	441	458	544	517	448	513	471	874	964	919
II	866	828	838	1176	829	668	1035	1317	1126	1038
III	2	3	1	0	0	4	3	12	8	2
IV	0	1	0	0	0	0	2	0	0	0
V	1	0	0	0	0	0	0	0	0	0
TOTAL	1310	1290	1383	1693	1277	1185	1511	2203	2098	1959

Source: Traffic Flow Management System Counts

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TABLE 2T
Jet and Turboprop Operations by Design Category
Carson City Airport

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
APPROACH CATEGORY										
A	156	158	199	255	230	341	258	388	306	229
B	1,081	1,065	1,085	1,334	985	762	1,196	1,726	1,719	1,655
C	64	49	97	95	58	74	51	73	61	69
D	9	18	2	9	4	8	6	16	12	6
DESIGN GROUP										
I	441	458	544	517	448	513	471	874	964	919
II	866	828	838	1,176	829	668	1,035	1,317	1,126	1,038
III	2	3	1	0	0	4	3	12	8	2
IV	0	1	0	0	0	0	2	0	0	0
V	1	0	0	0	0	0	0	0	0	0

Source: Traffic Management System Count (TFMSC)

Future Design Aircraft

The future design aircraft is expected to remain unchanged over the next 20 years. Therefore, the future design aircraft will continue to be classified as B-II-1B.

There are four primary impediments to the airport seeing enough activity by larger aircraft to transition to the next ACC - C, which are jet aircraft:

- The available runway length limits the capability of larger jet aircraft to operate at the airport.
- Instrument approach limitations.
- The passenger market may not be able to support regular service by a larger aircraft.

RUNWAY DESIGN CODE

Runways are assigned a RDC. The RDC relates to specific FAA design standards that should be met in relation to each runway. The RDC takes into consideration the AAC, ADG, and the RVR. In most cases, the critical design aircraft will also be the RDC for the primary runway.

Runway 9-27 RDC

Runway 9-27 should be designed to accommodate the critical design aircraft. This runway is 6,101 feet long and 75 feet wide. This runway has GPS-based non-precision instrument approaches providing visibility minimums down to 1-1/4 mile. **Therefore, the RDC for Runway 9-27 is B-II-5000**.

Approach and Departure Reference Code

The approach (APRC) and departure (DPRC) reference codes describe the operational capabilities of a runway and adjacent taxiways where no special operating procedures are necessary. Because runway-to-taxiway separation standards are a direct function of the critical design aircraft and the instrument approach visibility minimums, the APRC and DPRC represent the most restrictive RDC that could be implemented based on these criteria. The parallel taxiways are 300 feet from the runway, centerline-to-centerline. Therefore, the APRC is B/III/5000 and D/II/5000 and the DPRC is B/III and D/II for the runway.

CRITICAL AIRCRAFT SUMMARY

Several classification systems combine to form the nomenclature which identifies the various airport design standards. As noted previously, the AAC is represented by the letters A-E and it relates to the aircraft approach speed. The ADG is represented by the Roman numerals I-VI and it represents the aircraft wing span or tail height, whichever is more restrictive. The TDG is represented by a number 1-7, and it is a function of the main landing gear width and cockpit-to-wheel distance. The RVR is a representation of the lowest instrument approach visibility minimum at an airport, and it is represented by an approximate measurement in feet.

Table 2U presents a summary of the current and future design standards to be applied at the airport. The overall airport reference code for the airport is B-II, which is best represented by the Cessna Citation Latitude.

TABLE 2U
Design Aircraft and Airport Classification
Carson City Airport

Airport Reference Code (ARC)	Runway Design Code (RDC)	Airport Design Aircraft	Approach Reference Code (APRC)	Departure Reference Code (DPRC)	Representative Aircraft
B-II	B-II-5000	B-II-1B	B/III/5000 D/II/5000	B/III D/II	Citation Latitude

Source: Coffman Associates analysis utilizing FAA AC 150/5300-13A, *Airport Design.*

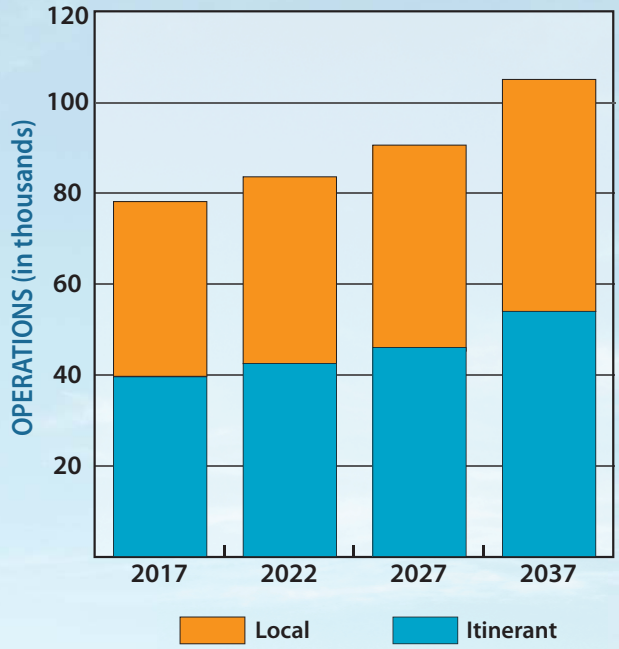
SUMMARY

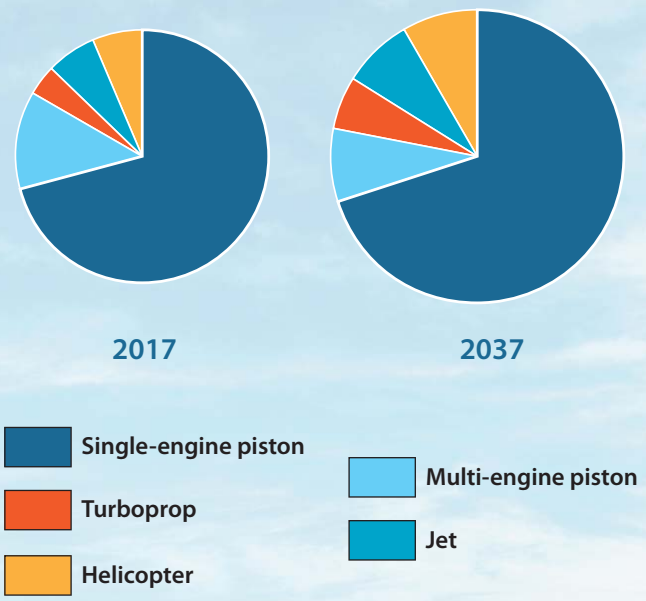
This chapter has outlined the various activity levels that might reasonably be anticipated over the next 20 years at Carson City Airport. **Exhibit 2K** presents a summary of the aviation demand forecasts. The baseline year for forecast data is 2017. The forecasting effort extends 20 years to the year 2037.

General aviation activity often trends with national and local economies. Carson City, like the United States, was in a recessionary period from roughly 2008 through the third quarter of 2009 and has been

	2017	FORECAST 2022	FORECAST 2027	FORECAST 2037	CAGR 2017-37
ANNUAL OPERATIONS					
Itinerant Operations					
Air Taxi	2,000	2,000	2,500	3,300	2.54%
General Aviation	37,500	40,200	43,400	50,400	1.49%
Military	0	0	0	0	0
Total Itinerant Operations	***39,500***	***42,200***	***45,900***	***53,700***	***1.55%***
Local Operations					
General Aviation	38,500	41,300	44,500	51,700	1.48%
Military	0	0	0	0	0
Total Local Operations	***38,500***	***41,300***	***44,500***	***51,700***	***1.48%***
TOTAL ANNUAL OPERATIONS (rounded)	**78,000**	**83,500**	**90,400**	**105,400**	**1.52%**
BASED AIRCRAFT					
Single-engine piston	248	262	282	330	1.44%
Multi-engine piston	44	45	43	37	-0.86%
Turboprop	14	18	20	28	3.53%
Jet	22	22	28	36	2.49%
Helicopter	22	28	32	39	2.90%
TOTAL BASED AIRCRAFT	**350**	**375**	**405**	**470**	**1.48%**
PEAKING CHARACTERISTICS					
Peak Month (12%)	9,360	10,020	10,848	12,648	1.52%
Busy Day (1.40%)	390	418	452	527	1.52%
Design Day (30)	312	334	362	422	1.52%
Design Hour (17.5%)	55	58	63	74	1.52%

CAGR - Compound Annual Growth Rate





slow to recover. Activity at both commercial service airports and general aviation airports has been down.

Forecasts of aviation activity, including based aircraft and operations, is key to determining future facility requirements. There are currently 350 aircraft based at the airport (including Ultra-Lights), and this is forecast to grow to 470 aircraft by 2037. The airport experienced an estimated 78,000 total operations in 2017. This is forecast to grow to approximately 105,400 operations annually by 2037.

The fleet mix operations, or type and frequency of aircraft use, is important in determining facility requirements and environmental impacts. While single-engine piston-powered aircraft are expected to represent the majority of based aircraft, the forecast considers the possibility of more turboprop and business jet aircraft utilizing and basing at the airport over the course of the planning period.

The next step in the Master Plan process is to use the forecasts to determine development needs for the airport through 2037. Chapter Three – Facility Requirements will address airside elements, such as safety areas, runways, taxiways, lighting, and navigational aids, as well as landside requirements, including hangars, aircraft aprons, and support services. As a general observation, Carson City Airport is well-positioned for growth into the future. The remaining portions of the Master Plan will lay out how that growth can be accommodated in an orderly, efficient, and cost-effective manner.

CHAPTER THREE

FACILITY REQUIREMENTS

CHAPTER THREE

FACILITY REQUIREMENTS

To properly plan for the future of Carson City Airport (CXP), it is necessary to translate forecast aviation demand into the specific types and quantities of facilities that can adequately serve the identified demand. This chapter will evaluate the existing capacities of the airport and outline any new facilities needed to accommodate projected forecast levels. The existing capacity is compared to the forecast activity levels prepared in Chapter Two to determine where deficiencies currently exist or may be expected to materialize in the future. This chapter will analyze the following elements:

- Airfield Capacity
- Airport Physical Planning Criteria
- Airside and Landside Facility Requirements

As indicated previously in Chapter One, airport facilities include both airside and landside components. Airside facilities include those that are related to the arrival, departure, and ground movement of aircraft. The components include:

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

Landside facilities are needed for the interface between air and ground transportation modes. The general aviation elements analyzed include:

- Terminal Facilities
- Aircraft Hangars
- Aircraft Parking Aprons
- Automobile Parking
- Airport Support Facilities

Once deficiencies are identified, alternatives for meeting existing or proposed needs and/or proper design standards will be evaluated in Chapter Four. The alternatives analysis will determine the most practical, cost-effective, and efficient direction for future airport development.

The facility requirements at CXP were evaluated using guidance contained in several Federal Aviation Administration (FAA) publications, including the following:

- Advisory Circular (AC) 150/5300-13A, Change 1, *Airport Design*
- AC 150/5060-5, *Airport Capacity and Delay*
- AC 150/5325-4C, *Runway Length Requirements for Airport Design*
- Federal Aviation Regulation (FAR) Part 77, *Objects Affecting Navigable Airspace*
- FAA Order 5090.3C *Field Formulation of the National Plan of Integrated Airport Systems (NPIAS)*.

DEMAND-BASED PLANNING HORIZONS

An updated set of aviation demand forecasts for the airport has been established, with a summary of the primary forecasting elements presented previously on Exhibit 2K. These activity forecasts include general aviation and air taxi annual operations, based aircraft, fleet mix, and peaking characteristics. With this information, specific components of the airfield and landside systems can be evaluated to determine their capacity to accommodate future demand.

Cost-effective, efficient, and orderly development of an airport should rely more upon actual demand than on a time-based forecast figure. In order to develop a master plan that is demand-based rather than time-based, a series of planning horizon milestones have been established that take into consideration the reasonable range of aviation demand projections. The planning horizons presented in **Table 3A** are segmented as the Short-Term (approximately years 1-5), the Intermediate-Term (approximately years 6-10), and the Long-Term (years 11-20 and possibly beyond).

It is important to consider that actual activity at the airport may be higher or lower than what the annualized forecast portrays. By planning according to activity milestones, the resultant plan can accommodate unexpected shifts or changes in the area's aviation demand. It is important for the plan to accommodate these changes so that airport officials can respond to unexpected changes in a timely fashion.

The most important reason for utilizing milestones is it allows airport management the flexibility to make decisions and develop facilities according to needs generated by actual demand levels. The demand-based schedule provides flexibility in development, as development schedules can be slowed or expedited according to demand at any given time over the planning period. The resultant plan provides airport officials with a financially responsible and needs-based program.

TABLE 3A
Planning Horizon Activity Levels
Carson City Airport

		PLANNING HORIZON		
	Base Year 2017	Short Term	Intermediate Term	Long Term
Based Aircraft	***350***	***375***	***405***	***470***
Itinerant Operations				
Air Taxi	2,000	2,000	2,500	3,300
General Aviation	37,500	40,200	43,400	50,400
Total Itinerant Operations	***39,500***	***42,200***	***45,900***	***53,700***
Local Operations				
General Aviation	38,500	41,300	44,500	51,700
Total Annual Operations	***78,000***	***83,500***	***90,400***	***105,400***

Source: Coffman Associates analysis

AIRFIELD CAPACITY

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

FACTORS AFFECTING ANNUAL SERVICE VOLUME

This analysis considers specific factors about the airfield in order to calculate the airport's ASV. These various factors are depicted in **Exhibit 3A**. The following describes the input factors as they relate to CXP and include airfield layout, weather conditions, aircraft mix, and operations.

- **Runway Configuration** – The existing airfield configuration consists of a single runway supported by full-length parallel Taxiways A and D. Runway 9-27 is 6,101 feet long and 75 feet wide.

- **Runway Use** – Runway use in capacity conditions will be controlled by wind and/or airspace conditions. For CXP, the direction of takeoffs and landings are generally determined by the speed and direction of the wind. It is generally safest for aircraft to takeoff and land into the wind, avoiding a crosswind (wind that is blowing perpendicular to the travel of the aircraft) or tailwind components during these operations. Based upon current wind patterns, Runway 27 is utilized

AIRFIELD LAYOUT

Runway Configuration

Runway Use

Number of Exits

WEATHER CONDITIONS

VMC
Visual Meteorological Conditions

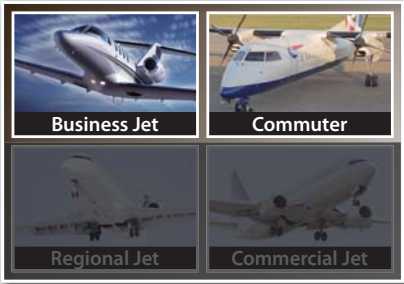
IMC
Instrument Meteorological Conditions

PVC
Poor Visibility Conditions

AIRCRAFT MIX

Category A & B Aircraft

Category C Aircraft



Category D Aircraft

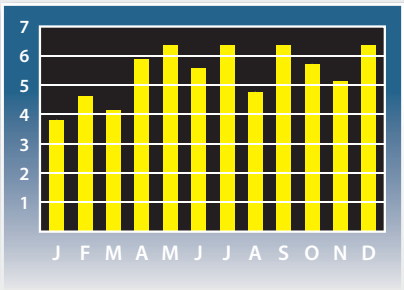
OPERATIONS

Arrivals

Departures

Touch-and-Go Operations

Total Annual Operations



most often. The availability of instrument approaches is also considered. While a circling instrument approach serves Runways 9 and 27, Runway 27 is primarily utilized in instrument weather conditions since it is served by a GPS approach with the lowest approach minimums (5,900 ft. cloud ceiling and 1¼-mile visibility minimums).

- **Exit Taxiways** – Exit taxiways have a significant impact on airfield capacity since the number and location of exits directly determines the occupancy time of an aircraft on the runway. This range is based upon the mix index of the aircraft that use the runway. Based upon mix, only taxiways between 2,000 feet and 4,000 feet from the landing threshold count in the exit rating at CXP. The exits must be at least 750 feet apart to count as separate exit taxiways. Utilizing these standards, the exit taxiway rating is two for Runway 9 and two for Runway 27.

- **Weather Conditions** – Weather conditions can have a significant impact on airfield capacity. Airport capacity is usually highest in clear weather, when flight visibility is at its best. Capacity is diminished as weather conditions deteriorate and cloud ceilings and visibility are reduced. As weather conditions deteriorate, the spacing of aircraft must increase to provide allowable margins of safety and air traffic vectoring. The increased distance between aircraft reduces the number of aircraft which can operate at the airport during any given period, thus reducing overall airfield capacity.

According to meteorological data collected from the on-airport automated weather observation system (AWOS), the Airport operates under visual meteorological conditions (VMC) approximately 99.03 percent of the time. VMC exist whenever the cloud ceiling is greater than 1,000 feet above ground level (AGL) and visibility is greater than three statute miles. Instrument meteorological conditions (IMC) are defined when cloud ceilings are between 500 and 1,000 feet AGL or visibility is between one and three miles. According to the weather observations, IMC prevailed approximately 0.47 percent of the time. Poor visibility conditions (PVC) apply for cloud ceilings below 500 feet and visibility minimums below one mile. PVC conditions occur approximately 0.49 percent of the year. **Table 3B** summarizes the weather conditions experienced at the CXP over a five-year period of time.

TABLE 3B
Weather Conditions
Carson City Airport

Condition	Cloud Ceiling	Visibility	Percent of Total
VMC	> 1,000' AGL	> 3 statute miles	99.03%
IMC	≥ 500' AGL and ≤ 1,000' AGL	1-3 statute miles	0.47%
PVC	< 500' AGL	< 1 statute mile	0.49%

VMC - Visual Meteorological Conditions
IMC - Instrument Meteorological Conditions
PVC - Poor Visibility Conditions
AGL - Above Ground Level

Source: National Oceanic and Atmospheric Administration (NOAA) - National Climatic Data Center. Carson City Airport Automated Weather Observation System (AWOS) observations from 2010 - 2015.

- **Aircraft Mix** – Aircraft mix for the capacity analysis is defined in terms of four aircraft classes. Classes A and B consist of small- and medium-sized propeller and some jet aircraft, all weighing 12,500 pounds or less. These aircraft are associated primarily with general aviation activity. A large majority of aircraft operations at CXP are those in Classes A and B. Class C consists of aircraft weighing between 12,500 pounds and 300,000 pounds. These aircraft include most business jets and some turboprop aircraft. Class D aircraft consists of large aircraft weighing more than 300,000 pounds. The airport does not experience operations by Class D aircraft. In the future, aircraft in Class C will continue to constitute a substantial number of fixed-wing operations, while Class D aircraft are not projected to contribute any operational activity as part of the overall aircraft fleet mix at the airport.

- **Percent Arrivals** – The percentage of arrivals as they relate to total operations of the airport is important in determining airfield capacity. Under most circumstances, the lower the percentage of arrivals, the higher the hourly capacity. The aircraft arrival-departure percentage split is typically 50/50, which is the case at CXP.

- **Touch-And-Go Activity** – A touch-and-go operation involves an aircraft making a landing and then an immediate takeoff without coming to a full stop or exiting the runway. As previously discussed in Chapter Two, these operations are normally associated with general aviation training activity and classified as a local operation. A high percentage of touch-and-go traffic normally results in a higher operational capacity because one landing and one takeoff occurs within a shorter time than individual operations. Touch-and-go operations at CXP account for approximately 49 percent of total annual operations. A similar ratio is expected in the future.

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

CAPACITY ANALYSIS CONCLUSIONS

Given the factors outlined above, the airfield ASV will range between 200,000 and 230,000 annual operations. The ASV does not indicate a point of absolute gridlock for the airfield; however, it does represent the point at which operational delay for each aircraft operation will increase exponentially. The current operational level for the Airport represents approximately 39 percent of the airfield's ASV, if the ASV is considered at the low end of the typical range of 200,000 annual operations. By the end of the planning period, total annual operations are expected to represent 53 percent of the airfield's ASV.

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

While no significant capacity improvements will be necessary, options to improve airfield efficiency will still be considered in the Master Plan.

AIRSIDE FACILITY REQUIREMENTS

As indicated earlier, airport facilities include both airfield and landside components. Airfield facilities are those related to the arrival, departure, and ground movement of aircraft. The FAA has established various dimensional design standards related to the airfield to ensure the safe operations of aircraft.

The FAA design standards impact the design of each of the airfield components to be analyzed. The following airfield components are analyzed for compliance to FAA design standards in detail:

- Runway Orientation
- Safety Area Design Standards
- Runways
- Taxiways
- Navigational and Approach Aids
- Lighting, Marking, and Signage

RUNWAY ORIENTATION

For the operational safety and efficiency of an airport, it is desirable for the primary runway to be oriented as close as possible to the direction of the prevailing wind. This reduces the impact of wind components perpendicular to the direction of travel of an aircraft that is landing or taking off. Runway 9-27 at CXP is orientated in an east-west manner.

FAA AC 150/5300-13A, *Airport Design,* recommends that a crosswind runway be made available when the primary runway orientation provides for less than 95 percent wind coverage for specific crosswind components. The 95 percent wind coverage is based on the crosswind component not exceeding 10.5 knots (12 mph) for RDC A-I and B-I, 13 knots (15 mph) for RDC A-II and B-II, and 16 knots (18 mph) for RDC A-III, B-III, C-I through C-III, and D-I through D-III.

Weather data specific to CXP was obtained from the National Oceanic Atmospheric Administration (NOAA) National Climatic Data Center. This data was collected from the on-field AWOS over a continuous period from June 2010 to July 2015. A total of 121,365 observations of wind direction and other data points were made. To formulate a proper windrose, the FAA requires at least 10 years of data. As such, the data obtained from the CXP AWOS does not meet the FAA requirement. Ultimately, it is ideal for the weather reporting station to be located on-airport; however, this is not always feasible. The analysis can be done with a regional reporting station as long as conditions are generally similar. In an effort to obtain at least 10 years of data, the nearest weather reporting station, located 18.5 nautical miles to the north at Reno/Tahoe International Airport (RNO), was also examined.

Exhibit 3B presents the all-weather wind rose for Runway 9-27 utilizing weather data available from the on-airport AWOS at CXP as well as weather data from RNO, which meets the 10-year data requirement.

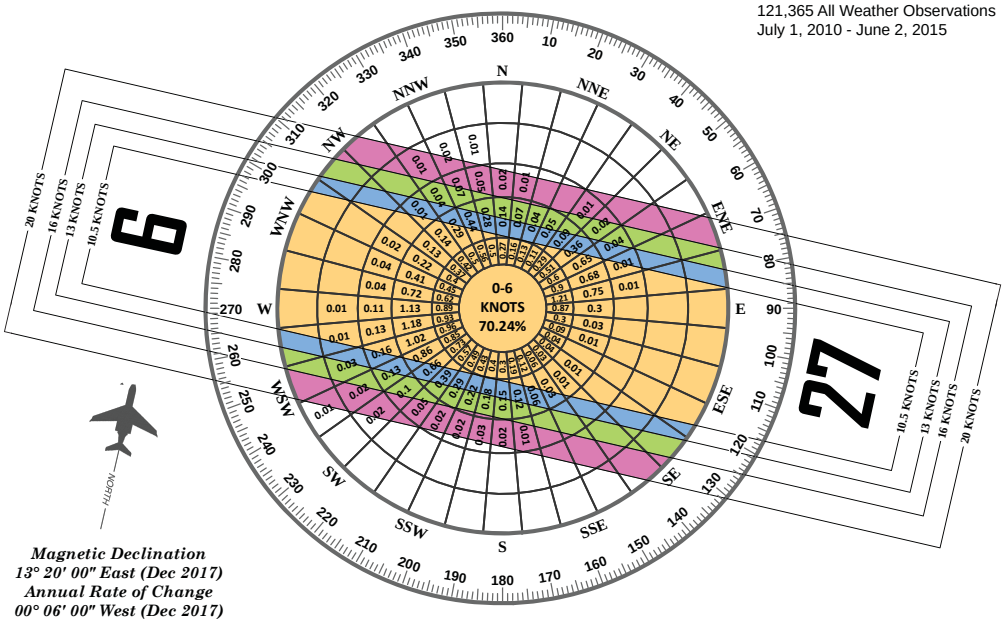


Carson City Airport Windrose

ALL WEATHER WIND COVERAGE				
Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 9-27	95.84%	98.12%	99.54%	99.90%

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Carson City Airport
Carson City, Nevada

OBSERVATIONS:
121,365 All Weather Observations
July 1, 2010 - June 2, 2015



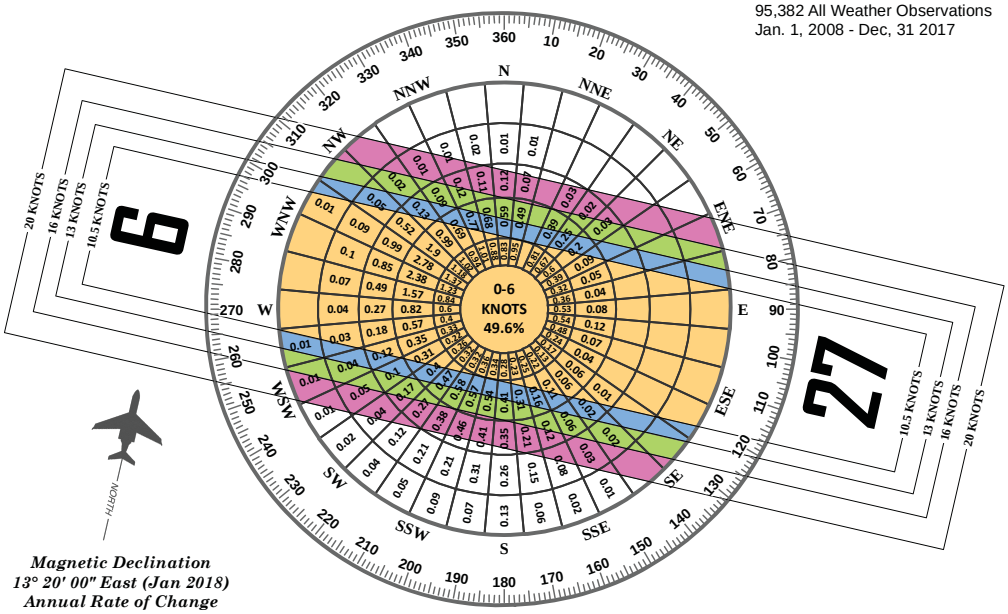
Magnetic Declination
13° 20' 00" East (Dec 2017)
Annual Rate of Change
00° 06' 00" West (Dec 2017)

Reno/Tahoe International Airport Windrose

ALL WEATHER WIND COVERAGE				
Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 9-27	88.83%	92.26%	95.53%	97.72%

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Reno/Taho Intl. Airport
Reno, NV

OBSERVATIONS:
95,382 All Weather Observations
Jan. 1, 2008 - Dec, 31 2017



Magnetic Declination
13° 20' 00" East (Jan 2018)
Annual Rate of Change
00° 06' 00" West (Jan 2018)

A wind rose is a graphic tool that gives a succinct view of how wind speed and direction are historically distributed at a particular location. The table at the top of each wind rose indicates the percent of wind coverage for the runway and specific wind intensity. Utilizing weather data available from the CXP AWOS, Runway 9-27 provides 95.84 percent wind coverage for 10.5 knot crosswinds, 98.12 percent coverage at 13 knots, 99.54 percent at 16 knots, and 99.90 percent at 20 knots, in all-weather conditions. Under all-weather conditions local to RNO, Runway 9-27 provides 88.83 percent wind coverage for 10.5 knot crosswinds, 92.26 percent coverage at 13 knots, 95.53 percent at 16 knots, and 97.72 percent at 20 knots.

Although the weather data obtained from RNO meets the 10-year requirement, significant terrain differences exist between CXP and RNO, which greatly affect local wind patterns. As such, weather data local to CXP will be utilized for this analysis. Therefore, the existing runway orientation at CXP should be maintained as it is properly orientated to meet predominant winds, and a crosswind runway is not needed.

SAFETY AREA DESIGN STANDARDS

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

The entire RSA, ROFA, and ROFZ must be under the direct ownership of the airport sponsor to ensure these areas remain free of obstacles and can be readily accessed by maintenance and emergency personnel. The RPZ should also be under airport ownership. An alternative to outright ownership of the RPZ is the purchase of avigation easements (acquiring control of designated airspace within the RPZ) or having sufficient land use control measures in place which ensure the RPZ remains free of incompatible development. The various airport safety areas are graphically presented on **Exhibit 3C**.

Dimensional standards for the various safety areas associated with the runway are a function of the type of aircraft expected to use the runway as well as the instrument approach capability. **Table 3C** presents the FAA design standards as they apply to Runway 9-27 at CXP. As identified in Chapter Two, the existing and ultimate critical design aircraft is classified as B-II. Therefore, the design standards for runway design code (RDC) B-II are examined under existing and ultimate conditions.

TABLE 3C
Runway Design Standards
Carson City Airport

	Runway 9-27 Existing/Ultimate
RUNWAY CLASSIFICATION	
Runway Design Code	B-II
Visibility Minimums	5000
RUNWAY DESIGN	
Runway Width	75
Blast Pad Length x Width	150 x 95 (Both Runway Ends)
RUNWAY PROTECTION	
Runway Safety Area (RSA)	
Width	150
Length Beyond Departure End	300
Length Prior to Threshold	300
Runway Object Free Area (ROFA)	
Width	500
Length Beyond Departure End	300
Length Prior to Threshold	300
Runway Obstacle Free Zone (ROFZ)	
Width	400
Length Beyond Departure End	200
Length Prior to Threshold	200
Approach Runway Protection Zone (RPZ)	
Length	1,000
Inner Width	500
Outer Width	700
Departure Runway Protection Zone (RPZ)	
Length	1,000
Inner Width	500
Outer Width	700
RUNWAY SEPARATION	
Runway Centerline to:	
Hold Position	200
Parallel Taxiway	240
Aircraft Parking Area	250

Note: All dimensions in feet
Source: FAA AC 150/5300-13A, Change 1, *Airport Design*

Runway Safety Area

The RSA is defined in FAA AC 150/5300-13A, *Airport Design,* as a "surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of undershoot, overshoot, or excursion from the runway." The RSA is centered on the runway and dimensioned in accordance to the approach speed of the critical design aircraft using the runway. The FAA requires the RSA to be cleared and graded, drained by grading or storm sewers, capable of accommodating the design aircraft and fire


LEGEND
Airport Property Line
Taxiway Designator
Runway Safety Area (RSA)
Runway Object Free Area (ROFA)
Runway Obstacle Free Zone (ROFZ)
Runway Protection Zone (RPZ)
Uncontrolled Property
High-Energy-Area
0
800
SCALE IN FEET
NORTH
RPZ incompatible land use (+/- 0.5 acres)
Supplemental windcone to be relocated
Short term mining operation
Supplemental windcone to be relocated
See inset
Runway 9-27 (6,101' x 75')
A
A1
A2
A3
A4
A5
B
B
C
D
D
D1
D2
D3
Arrowhead Dr.
Arrowhead Dr.
Sunrise
Bowers Ln.
Apollo Dr.
Lida Cir.
Tara St.
Norway St.
Dale Dr.
Surrey Ln.
Debbie Wy.
Nye Ln.
Airport Rd.
E. College Pkwy
Gonzales Rd.
Aerial Image: Atkins 10-8-2017

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and rescue vehicles, and free of obstacles not fixed by navigational purpose such as runway edge lights or approach lights.

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

For the existing and ultimate RDC B-II design, the FAA calls for the RSA to be 150 feet wide and extend 300 feet beyond the runway ends. As depicted on **Exhibit 3C**, it appears the airfield conforms to existing and ultimate RSA standards, which should be maintained throughout the planning horizon.

Runway Object Free Area

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

For RDC B-II design, the FAA calls for the ROFA to be 500 feet wide, extending 300 feet beyond each runway end. Currently, the ROFA is penetrated by two supplemental windcones, one located on the southeast side of Runway 9-27 between Taxiway Connectors A1 and A2 and the other located on the northwest side between Taxiway Connectors B and D4. It is recommended that the airport relocate each supplemental windcone out of the existing and ultimate ROFA as they are not considered "fixed by function." It should be noted, however, that each supplemental windcone has been installed with frangible couplings, which are designed to beak easily to ensure minimal or no damage should impact or collision occur.

Runway Obstacle Free Zone

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

The FAA's criterion for runways utilized by aircraft weighing more than 12,500 pounds requires a clear ROFZ to extend 200 feet beyond the runway ends and 400 feet wide (200 feet on either side of the

runway centerline). The ROFZ standards are met on Runway 9-27 except for the supplemental windcones serving each end of the runway. Similar to the ROFA, the supplemental windcones should be relocated out of the ROFZ as they are not fixed by their function.

Runway Protection Zone

The RPZ is a trapezoidal area centered on the runway, typically beginning 200 feet beyond the runway end. The RPZ has been established by the FAA to provide an area clear of obstructions and incompatible land uses, in order to enhance the protection of people and property on the ground. The RPZ is comprised of the central portion of the RPZ and the controlled activity area. The central portion of the RPZ extends from the beginning to the end of the RPZ, is centered on the runway, and is the width of the ROFA. The controlled activity area is any remaining portions of the RPZ. The dimensions of the RPZ vary per the visibility minimums serving the runway and the type of aircraft (design aircraft) operating on the runway.

While the RPZ is intended to be clear of incompatible objects or land uses, some uses are permitted with conditions and other land uses are prohibited. According to AC 150/5300-13A, the following land uses are permissible within the RPZ:

- Farming that meets the minimum buffer requirements;
- Irrigation channels, as long as they do not attract birds;
- Airport service roads, as long as they are not public roads and are directly controlled by the airport operator;
- Underground facilities, as long as they meet other design criteria, such as RSA requirements, as applicable; and
- Unstaffed navigational aids (NAVAIDs) and facilities, such as required for airport facilities that are fixed by function in regard to the RPZ.

Any other land uses considered within RPZ land owned by the airport sponsor must be evaluated and approved by the FAA Office of Airports. The FAA has published *Interim Guidance on Land Uses within a Runway Protection Zone* (9.27.2012), which identifies several potential land uses that must be evaluated and approved prior to implementation. The specific land uses requiring FAA evaluation and approval include:

- Buildings and structures (Examples include, but are not limited to: residences, schools, churches, hospitals or other medical care facilities, commercial/industrial buildings, etc.)
- Recreational land use (Examples include, but are not limited to: golf courses, sports fields, amusement parks, other places of public assembly, etc.)

- Transportation facilities. Examples include, but are not limited to:
    - Rail facilities - light or heavy, passenger or freight
    - Public roads/highways
    - Vehicular parking facilities
- Fuel storage facilities (above and below ground)
- Hazardous material storage (above and below ground)
- Wastewater treatment facilities
- Above-ground utility infrastructure (i.e., electrical substations), including any type of solar panel installations.

The *Interim Guidance on Land within a Runway Protection Zone* states, "RPZ land use compatibility also is often complicated by ownership considerations. Airport owner control over the RPZ land is emphasized to achieve the desired protection of people and property on the ground. Although the FAA recognizes that in certain situations the airport sponsor may not fully control land within the RPZ, the FAA expects airport sponsors to take all possible measures to protect against and remove or mitigate incompatible land uses."

Currently, the RPZ review standards are applicable to any new or modified RPZ. The following actions or events could alter the size of an RPZ, potentially introducing an incompatibility:

- An airfield project (e.g., runway extension, runway shift),
- A change in the critical design aircraft that increases the RPZ dimensions,
- A new or revised instrument approach procedure that increases the size of the RPZ, and/or
- A local development proposal in the RPZ (either new or reconfigured).

Since the interim guidance only addresses a new or modified RPZ, existing incompatibilities are generally (but not always) grandfathered under certain circumstances. While it is still necessary for the airport sponsor to take all reasonable actions to meet the RPZ design standard, FAA funding priority for certain actions, such as relocating existing roads in the RPZ, will be determined on a case-by-case basis.

RPZs have been further designated as approach and departure RPZs. The approach RPZ is a function of the Aircraft Approach Category (AAC) and approach visibility minimums associated with the approach runway end. The departure RPZ is a function of the AAC and departure procedures associated with the runway. For a particular runway end, the more stringent RPZ requirements (usually associated with the approach RPZ) will govern the property interests and clearing requirements that the airport sponsor should pursue.

Currently, the southwest corner of the RPZ serving Runway 9 contains a portion of Goni Road. However, it should be noted that the property on either side of the road is owned by CXP. Moreover, the portion of the roadway within the Runway 9 RPZ is confined to approximately 0.5 acres and does not traverse the central portion of the RPZ. The RPZ serving Runway 27 is owned entirely by CXP and is clear of all incompatible land uses. However, it should be noted that a short-term mining operation is currently taking place within the Runway 27 RPZ.

As previously mentioned, since the interim guidance only addresses new or modified RPZs, existing incompatibilities are generally considered grandfathered conditions. For example, roads that are in the current RPZ are typically allowed to remain as grandfathered unless the runway environment changes. The airport sponsor should take reasonable actions to meet RPZ design standards, which could include relocating Goni Road from within the existing Runway 9 RPZ; however, the roadway could be considered acceptable since it existed before the RPZ standards were published. Funding priority for certain actions, such as relocating existing roads in RPZs, will be determined on a case-by-case basis.

Further examination of the RPZs associated with each runway end will be undertaken later in this study. The potential for improved instrument approach procedures and their effects on RPZ dimensions will also be considered.

Runway/Taxiway Separation

The design standard for the required separation between runways and parallel taxiways is a function of the critical design aircraft and the instrument approach visibility minimum. The separation design standard for RDC B-II with not lower than 1-mile visibility minimums is 240 feet from the runway centerline to the parallel taxiway centerline. Currently, parallel Taxiways A and D are 300 feet from the runway (centerline to centerline). Therefore, the location of parallel Taxiways A and D exceeds the current and proposed design standards and should be maintained accordingly.

Hold Line Separation

The FAA mandates that taxiway holding positions be located a certain distance from the runway. The standard hold line location for RDC B-II is 200 feet from the runway centerline. Currently, all holding positions serving Runway 9-27 are located 200 feet from the runway centerline and should be maintained accordingly throughout the long-term planning horizon.

Aircraft Parking Area Separation

For RDC B-II standards with not lower than one-mile visibility approach minimums, aircraft parking areas should be at least 250 feet from the Runway 9-27 centerline. All aircraft parking areas at CXP meet this standard and should be maintained accordingly.

RUNWAY 9-27

The adequacy of the existing runway system at CXP has been analyzed from a number of perspectives, including runway orientation and adherence to safety area standards. From this information, requirements for runway improvements were determined for the airport. Runway elements, such as configuration, length, width, and strength, are now presented.

Runway Length

AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides guidance for determining runway length needs. A draft revision of this AC is currently available (150/5325-4C), and the FAA is utilizing the draft revision in most cases when evaluating runway length needs for airports.

There is not a direct relationship between the classification of the design aircraft (e.g., B-I, B-II) and runway length as airplanes operate on a wide variety of available runway lengths. The suitability of the runway length is governed by many factors, including elevation, temperature, wind, aircraft weight, wing flap settings, runway condition (wet or dry), runway gradient, vicinity airspace obstructions, useful load, and any special operating procedures.

Aircraft performance declines as elevation, temperature, and runway gradient factors increase. For CXP, the mean maximum daily temperature of the hottest month is 89.6 degrees Fahrenheit (F), which occurs in July. The airport elevation is 4,704.6 feet above mean sea level (MSL). The reported gradient of Runway 9-27 is 0.15 percent, which conforms to FAA design standards.

Airport sponsors can pursue policies that can maximize the suitability of the runway length. Policies, such as area zoning and height and hazard restrictions, can protect an airport's runway length. Airport ownership (fee simple or easement) of land leading to the runway ends can reduce the possibility of natural growth or man-made obstructions. Planning of runways should include an evaluation of aircraft types expected to use the airport now and in the future. Future plans should be realistic and supported by the FAA-approved forecasts and should be based on the critical design aircraft (or family of aircraft).

The first step in evaluating runway length is to determine general runway length requirements for the majority of aircraft operating at the airport. The majority of operations at CXP are conducted using smaller single engine piston-powered aircraft weighing less than 12,500 pounds.

Table 3D summarizes the FAA's generalized recommended runway lengths determined for CXP. FAA AC 150/5325-4B recommends that airports be designed to at least serve 95 percent of small airplanes. The advisory circular further defines the fleet categories as follows:

- **95 Percent of Small Airplane Fleet:** Applies to airports that are primarily intended to serve medium-sized population communities with a diversity of usage and a greater potential for increased aviation activities. This category also includes airports that are primarily intended to serve low-activity locations, small population communities, and remote recreational areas.
- **100 Percent of Small Airplane Fleet:** This type of airport is primarily intended to serve communities located on the fringe of a metropolitan area or a relatively large population community that is remote from a metropolitan area.

TABLE 3D
Small Aircraft Runway Length Calculations
Carson City Airport

Airport Elevation:	4,704.6 feet above mean sea level
Average High Monthly Temp.:	89.6 degrees F (August)
Runway Gradient:	0.15%
Fleet Mix Category	**Recommended Runway Length**
95% of small aircraft	5,900 feet
100% of small aircraft	6,100 feet
Small aircraft 10+ passenger seats	6,100 feet

Source: FAA AC 150/5325-4B (and Draft 4C), Runway Length Requirements for Airport Design.

Business Jet Runway Length Requirements

The airport is also utilized by aircraft weighing more than 12,500 pounds but less than 60,000 pounds, including most small to mid-sized business jet aircraft. Runway length requirements have also been calculated for these aircraft types. These calculations take into consideration the runway gradient and landing length requirements for contaminated runways (wet). Business jets tend to need greater runway length when landing on a wet surface because of their increased approach speeds. AC 150/5325-4B stipulates that runway length determination for business jets consider a grouping of airplanes with similar operating characteristics. The AC provides two separate "family groupings of airplanes," each based upon their representative percentage of aircraft in the national fleet. The first grouping is those business jets that make up 75 percent of the national fleet, and the second group is those making up 100 percent of the national fleet. **Table 3E** presents a partial list of common aircraft in each aircraft grouping. A third group considers business jets weighing more than 60,000 pounds. Runway length determination for these aircraft must be based on the performance characteristics of the individual aircraft.

TABLE 3E
Business Jet Categories for Runway Length Determination

75 percent of the national fleet	MTOW (lbs.)	75-100 percent of the national fleet	MTOW (lbs.)	Greater than 60,000 pounds	MTOW (lbs.)
Lear 35	20,350	Lear 55	21,500	Gulfstream II	65,500
Lear 45	20,500	Lear 60	23,500	Gulfstream IV	73,200
Cessna 550	14,100	Hawker 800XP	28,000	Gulfstream V	90,500
Cessna 560XL	20,000	Hawker 1000	31,000	Global Express	98,000
Cessna 650 (VII)	22,000	Cessna 650 (III/IV)	22,000		
IAI Westwind	23,500	Cessna 750 (X)	36,100		
Beechjet 400	15,800	Challenger 604	47,600		
Falcon 50	18,500	IAI Astra	23,500		

MTOW: Maximum Take-Off Weight

Source: FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*

Table 3F presents the results of the runway length analysis for business jets developed following the guidance provided in AC 150/5325-4B. To accommodate 75 percent of the business jet fleet at 60 percent useful load, a runway length of 6,700 feet is recommended. This length is derived from a raw length of 6,541 feet that is adjusted, as recommended, for runway gradient and consideration of landing length needs on a contaminated runway. To accommodate 100 percent of the business jet fleet at 60 percent useful load, a runway length of 9,900 feet is recommended.

Utilization of the 90 percent category for runway length determination is generally not allowed for design purposes by the FAA unless there is a demonstrated need with users having long trip lengths. This would require documentation of activity by business jet operators that fly out frequently with heavy loads. To accommodate 75 percent of the business jet fleet at 90 percent useful load, a runway length of 8,700 feet is recommended.

TABLE 3F
Business Jet Runway Length Requirements
Carson City Airport

Airport Elevation	4704.6 feet above mean sea level			
Average High Monthly Temp.	89.6 degrees (July)			
Runway Gradient	0.15%			
Fleet Mix Category	**Raw Runway Length from FAA AC**	**Runway Length with Gradient Adjustment**	**Wet Surface Landing Length for Jets (+15%)***	**Final Runway Length**
75% of fleet at 60% useful load	6,541	6,632	5,500	6,700
100% of fleet at 60% useful load	9,819	9,910	5,500	9,900
75% of fleet at 90% useful load	8,600	8,691	7,000	8,700

*Max 5,500' for 60% useful load and max 7,000' for 90% useful load in wet conditions
Source: FAA AC 150/5325-4B, Runway Length Requirements for Airport Design.

Another method to determine runway length requirements for jet aircraft at CXP is to examine each aircraft's flight planning manual under conditions specific to the airport. Several aircraft were analyzed for takeoff length required with a design temperature of 89.6 degrees F at a field elevation of 4,704.6 feet MSL.

Exhibit 3D provides a detailed runway takeoff length analysis for the most common business jet and turboprop aircraft in the national fleet. This data was obtained from Ultranav software which computes operational parameters for specific aircraft based on its flight manual data. Additionally, **Exhibit 3D** specifies the designation "OL" to refer to aircraft that are out of limits at a specific useful load for the runway. The analysis includes the maximum takeoff weight (MTOW) allowable and the percent useful load from 60 percent to 100 percent. This analysis shows that Runway 9-27 will have difficulty accommodating business jet aircraft at 100 percent useful load on design day temperatures. The average takeoff length needed for all business jets, within operational limits, analyzed at 100 percent useful load is 6,402 feet. This is 301 feet longer than the current length of Runway 9-27.



		Takoff Lengths Required for:				
		Useful Load				
Aircraft Name	**MTOW (lbs.)**	**60%**	**70%**	**80%**	**90%**	**100%**
Pilatus PC-12	9,921	2,909	3,173	3,454	3,749	4,060
King Air C90GTi	10,100	3,308	3,554	3,825	4,096	4,367
Citation I/SP	11,850	3,861	4,195	**OL**	**OL**	**OL**
Citation Sovereign	30,300	4,069	4,410	4,797	5,263	5,865
Citation (525A) CJ2	12,375	4,293	4,660	5,025	5,466	**OL**
Lear 31A	17,000	4,113	4,806	5,553	6,509	**OL**
Citation II (550)	13,300	4,405	4,939	5,515	6,277	7,391
Citation 560 XLS	20,200	4,612	4,967	5,430	5,970	**OL**
King Air 350	15,000	4,841	5,033	5,238	5,644	5,994
King Air 1900D	17,120	5,210	5,581	5,967	6,389	6,822
Lear 45XR	21,500	5,238	5,629	6,051	6,867	7,846
Beechjet 400A	16,300	5,346	5,831	**OL**	**OL**	**OL**
Hawker 4000	39,500	5,452	6,013	6,716	7,472	**OL**
Citation Mustang	8,645	5,022	6,075	**OL**	**OL**	**OL**
Citation (525) CJ1	10,600	5,473	6,112	6,737	**OL**	**OL**
Lear 40	21,000	5,477	6,264	7,615	9,345	**OL**
Gulfstream III	69,700	5,878	6,489	**OL**	**OL**	**OL**
Challenger 300	38,850	6,085	6,668	7,280	8,016	8,874
Premier 1A	12,500	6,109	6,808	7,587	**OL**	**OL**
Citation X	35,700	6,341	7,075	**OL**	**OL**	**OL**
Gulfstream 550	91,000	6,274	7,273	8,624	9,715	**OL**
Lear 60	23,500	7,306	8,146	9,223	**OL**	**OL**

OL - Out of Limits; Runway Length Requirement surpasses existing CXP runway length

MTOW - Maximum Takeoff Weight

Source: Ultranav software



		Landing Lengths Required for:					
		CFR Part 25		CFR Part 91K		CFR Part 135	
Aircraft Name	MLW (lbs.)	Dry	Wet	Dry (.8)	Wet (.8)	Dry (.6)	Wet (.6)
Westwind II	19,000	2,640	3,040	3,300	3,800	4,400	5,067
Citation I/SP	11,350	2,686	3,089	3,358	3,861	4,477	5,148
Westwind I	19,000	2,690	3,090	3,363	3,863	4,483	5,150
Falcon 10	17,640	3,043	3,499	3,804	4,374	5,072	5,832
King Air 1900D	16,765	3,300	3,795	4,125	4,744	5,500	**6,325**
Citation Mustang	8,000	2,859	4,039	3,574	5,049	4,765	**6,732**
Hawker 4000	33,500	3,660	4,218	4,575	5,273	6,100	**7,030**
Lear 40	19,200	3,280	4,265	4,100	5,331	5,467	**7,108**
Lear 45XR	19,200	3,282	4,265	4,103	5,331	5,470	**7,108**
Citation Sovereign	27,100	3,309	4,328	4,136	5,410	5,515	**7,213**
Citation (525) CJ1	9,800	3,332	4,548	4,165	5,685	5,553	**7,580**
Premier 1A	11,600	3,699	4,794	4,624	5,993	**6,165**	**7,990**
Gulfstream 150	21,700	3,565	5,248	4,456	**6,560**	5,942	**8,747**
Sabreliner 65	21,755	3,861	5,275	4,826	**6,594**	**6,435**	**8,792**
Citation (525A) CJ2	11,500	3,680	5,320	4,600	**6,650**	**6,133**	**8,867**
Lear 31A	16,000	3,407	5,451	4,259	**6,814**	5,678	**9,085**
Challenger 300	33,750	2,883	5,525	3,604	**6,906**	4,805	**9,208**
Lear 60	19,500	4,130	5,608	5,163	**7,010**	**6,883**	**9,347**
Gulfstream 550	75,300	3,080	5,917	3,850	**7,396**	5,133	**9,862**
Beechjet 400A	15,700	4,185	**6,245**	5,231	**7,806**	**6,975**	**10,408**
Citation 560 XLS	18,700	3,977	**6,272**	4,971	**7,840**	**6,628**	**10,453**
Gulfstream III	58,500	3,544	**6,793**	4,430	**8,491**	5,907	**11,322**
Citation X	31,800	4,703	**6,830**	5,879	**8,538**	**7,838**	**11,383**
Citation III	19,000	4,716	**6,926**	5,895	**8,658**	**7,860**	**11,543**
Citation II (550)	12,700	3,035	**7,334**	3,794	**9,168**	5,058	**12,223**

Bold - Runway Length Requirement surpasses existing CXP runway length

MLW - Maximum Landing Weight

Source: Ultranav software

Exhibit 3D also presents the runway length required for landing under three operational categories: Title 14 Code of Federal Regulations (CFR) Part 25, CFR Part 91k, and CFR Part 135. CFR Part 25 operations are those conducted by individuals or companies which own their aircraft. CFR Part 91k includes operations in fractional ownership programs which utilize their own aircraft under direction of pilots specifically assigned to said aircraft. CFR Part 135 applies to all for-hire charter operations, including most fractional ownership operations. The landing lengths highlighted in red indicate a runway length requirement that exceeds 6,101 feet, which is the length of Runway 9-27. The landing length analysis shows an average landing length of 6,286 feet for aircraft operating under CFR Part 91k during wet runway conditions and an average of 8,381 feet for aircraft operating under Part 135 during wet runway conditions. Certain aircraft, such as several Gulfstream and Cessna Citation series aircraft, require over 9,000 feet of runway length for landing when operating at maximum landing weight under Part 135 during wet runway conditions.

As previously noted, the FAA will typically only support runway length planning to the 60 percent useful load factor unless it can be demonstrated that aircraft are frequently operating fully loaded (90 percent). Most business aircraft are capable of taking off on the runway at CXP at or above 90 percent useful load. Examples of aircraft that can still operate at 90 percent useful load include the Citation Sovereign and Citation 560 XLS. For landing situations, the majority of the aircraft analyzed require additional runway length when operating under Part 135 rules and wet runway conditions. In addition, over half of the aircraft analyzed require additional runway length when landing under Part 91k rules and wet runway conditions. Newer generation business aircraft tend to operate more efficiently, requiring shorter runway lengths.

Many factors are considered when determining appropriate runway length for safe and efficient operations of aircraft at CXP. The airport should strive to accommodate business jets to the greatest extent possible as demand would dictate. Runway 9-27 is currently 6,101 feet long and can accommodate a diverse mix of business jets. The analysis notes that more aircraft are subject to weight restrictions at useful loads of 70 percent or greater during hot days.

Justification for any runway extension to meet the needs of business jets would require regular use on the order of 500 annual itinerant operations. This is the minimum threshold required to obtain FAA grant funding assistance. The existing length of Runway 9-27 does not fully provide for all jet activity, especially during hot weather conditions and when jet aircraft are carrying full useful loads. **Analysis in the next chapter will examine potential runway alternatives that could be achieved at CXP to better accommodate the needs of larger aircraft during the 20-year planning period of this Master Plan.**

Runway Width

Runway width design standards are primarily based on the critical aircraft but can also be influenced by the visibility minimums of published instrument approach procedures. Runway 9-27 is currently 75 feet wide, which meets the standard for the existing RDC of B-II. The current runway width should be maintained through the long-term planning horizon.

Runway Strength

An important feature of airfield pavement is its ability to withstand repeated use by aircraft. The FAA reports the pavement strength for Runway 9-27 at 30,000 pounds single wheel loading (SWL) and 60,000 pounds dual wheel loading (DWL). This strength rating refers to the configuration of the aircraft landing gear. For example, SWL indicates an aircraft with a single wheel on each landing gear.

The strength rating of a runway does not preclude aircraft weighing more than the published strength rating from using the runway. All federally obligated airports must remain open to the public, and it is typically up to the pilot of the aircraft to determine if a runway can support their aircraft safely. An airport sponsor cannot restrict an aircraft from using the runway simply because its weight exceeds the published strength rating. On the other hand, the airport sponsor has an obligation to properly maintain the runway and protect the useful life of the runway, typically for 20 years.

According to the FAA publication, *Airport/Facility Directory*, "Runway strength rating is not intended as a maximum allowable weight or as an operating limitation. Many airport pavements are capable of supporting limited operations with gross weights in excess of the published figures." The directory goes on to say that those aircraft exceeding the pavement strength should contact the airport sponsor for permission to operate at the airport.

The strength rating of a runway can change over time. Regular usage by heavier aircraft can decrease the strength rating, while periodic runway resurfacing can increase the strength rating. The current runway strength is adequate to accommodate a large majority of aircraft that currently operate at the airport and are forecast to utilize the airport in the future. As such, the existing pavement strength rating should be maintained throughout the planning horizon.

Runway Blast Pads

A runway blast pad is a surface adjacent to the end of the runway provided to reduce the erosive effect of jet blast and propeller wash. At CXP, each end of Runway 9-27 is provided with a blast pad. The blast pads are currently dimensioned at approximately 300 feet long by 75 feet wide. FAA RDC B-II design standards maintain that blast pads serving B-II runways should be 150 feet long by 95 feet wide. The airport should consider re-sizing the existing blast pads to meet current FAA standards.

TAXIWAYS

The design standards associated with taxiways are determined by the Taxiway Design Group (TDG) or the Airplane Design Group (ADG) of the critical design aircraft. As determined previously, the applicable ADG for Runway 9-27 is currently ADG II, which should be maintained throughout the planning horizon. **Table 3G** presents the various taxiway design standards related to ADG II.

TABLE 3G
Taxiway Dimensions and Standards
Carson City Airport

STANDARDS BASED ON WINGSPAN	Existing/Ultimate ADG II		
Taxiway Protection			
Taxiway Safety Area (TSA) width	79’		
Taxiway Object Free Area (TOFA) width	131’		
Taxilane Object Free Area width	115’		
Taxiway Separation			
Taxiway Centerline to:			
Fixed or Movable Object	65.5’		
Parallel Taxiway/Taxilane	105’		
Taxilane Centerline to:			
Fixed or Movable Object	57.5’		
Parallel Taxilane	97’		
Taxiway Centerline to:			
Runway 9-27 Centerline (1-mile visibility)	240’		
Wingtip Clearance			
Taxiway Wingtip Clearance	26’		
Taxilane Wingtip Clearance	18’		
STANDARDS BASED ON TDG	**TDG 1B**	**TDG 2**	**TDG 3**
Taxiway Width Standard	25’	35’	50’
Taxiway Edge Safety Margin	5’	7.5’	10’
Taxiway Shoulder Width Standard	10’	15’	20’

ADG: Airplane Design Group
TDG: Taxiway Design Group
Source: FAA AC 150/5300-13A, Airport Design

The table also shows those taxiway design standards related to TDG. The TDG standards are based on the Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance of the critical design aircraft expected to use those taxiways. Different taxiway and taxilane pavements can and should be planned to the most appropriate TDG design standards based on usage.

The current taxiway design for Runway 9-27 is TDG 1B, based upon the current critical aircraft, the Citation Latitude. As such, the taxiways on the airfield should be at least 25 feet wide. However, it should be noted that all taxiways associated with Runway 9-27 are 50 feet wide, conforming to TDG 3 standards. Taxiway B, as well as various taxilanes providing access to hangar facilities, are 35 feet wide and conform to TDG 2 standards. While taxiway widths exceed current design needs, they should be maintained as such. Moreover, with 28 turboprops and 36 jets forecast to base at CXP by year 2038, future taxiway construction should consider a width of 50 feet to adequately address the forecasted fleet mix at CXP.

Taxiway Design Considerations

FAA AC 150/5300-13A, *Airport Design*, provides guidance on recommended taxiway and taxilane layouts to enhance safety by avoiding runway incursions. A runway incursion is defined as "any occurrence at an airport involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft."

The taxiway system at the airport generally provides for the efficient movement of aircraft; however, recently published AC 150/5300-13A, *Airport Design*, provides recommendations for taxiway design. The following is a list of the taxiway design guidelines and the basic rationale behind each recommendation:

1. **Taxi Method**: Taxiways are designed for "cockpit over centerline" taxiing with pavement being sufficiently wide to allow a certain amount of wander. On turns, sufficient pavement should be provided to maintain the edge safety margin from the landing gear. When constructing new taxiways, upgrading existing intersections should be undertaken to eliminate "judgmental over-steering," which is where the pilot must intentionally steer the cockpit outside the marked centerline in order to assure the aircraft remains on the taxiway pavement.

2. **Steering Angle**: Taxiways should be designed such that the nose gear steering angle is no more than 50 degrees, the generally accepted value to prevent excessive tire scrubbing.

3. **Three-Node Concept**: To maintain pilot situational awareness, taxiway intersections should provide a pilot a maximum of three choices of travel. Ideally, these are right- and left-angle turns and a continuation straight ahead.

4. **Intersection Angles**: Design turns to be 90 degrees wherever possible. For acute-angle intersections, standard angles of 30, 45, 60, 120, 135, and 150 degrees are preferred.

5. **Runway Incursions**: Design taxiways to reduce the probability of runway incursions.
   - *Increase Pilot Situational Awareness*: A pilot who knows where he/she is on the airport is less likely to enter a runway improperly. Complexity leads to confusion. Keep taxiway systems simple using the "three node" concept.
   - *Avoid Wide Expanses of Pavement*: Wide pavements require placement of signs far from a pilot's eye. This is especially critical at runway entrance points. Where a wide expanse of pavement is necessary, avoid direct access to a runway.
   - *Limit Runway Crossings*: The taxiway layout can reduce the opportunity for human error. The benefits are twofold – through simple reduction in the number of occurrences and through a reduction in air traffic controller workload.
   - *Avoid "High-Energy" Intersections*: These are intersections in the middle third of runways. By limiting runway crossings to the first and last thirds of the runway, the portion of the runway where a pilot can least maneuver to avoid a collision is kept clear.

- *Increase Visibility*: Right-angle intersections between taxiways and runways provide the best visibility. Acute-angle runway exits should be avoided unless there is a capacity issue. A right-angle turn at the end of a parallel taxiway is a clear indication of approaching a runway.
- *Avoid "Dual Purpose" Pavements*: Runways used as taxiways and taxiways used as runways can lead to confusion. A runway should always be clearly identified as a runway and only a runway.
- *Indirect Access*: Do not design taxiways to lead directly from an apron to a runway. Such configurations can lead to confusion when a pilot typically expects to encounter a parallel taxiway.
- *Hot Spots*: Confusing intersections near runways are more likely to contribute to runway incursions. These intersections must be redesigned when the associated runway is subject to reconstruction or rehabilitation. Other "hot spots" should be corrected as soon as practicable.

6. **Runway/Taxiway Intersections**:
   - *Right-Angle*: Right-angle intersections are the standard for all runway/taxiway intersections, except where there is a need for a high-speed exit. Right-angle taxiways provide the best visual perspective to a pilot approaching an intersection with the runway to observe aircraft in both the left and right directions. They also provide optimal orientation of the runway holding position signs so they are visible to pilots.
   - *Acute-Angle*: Acute angles should not be larger than 45 degrees from the runway centerline. A 30-degree taxiway layout should be reserved for high-speed exits. The use of multiple intersecting taxiways with acute angles creates pilot confusion and improper positioning of taxiway signage.
   - *Large Expanses of Pavement*: Taxiways must never coincide with the intersection of two runways. Taxiway configurations with multiple taxiway and runway intersections in a single area create large expanses of pavement, making it difficult to provide proper signage, marking, and lighting.

7. **Taxiway/Runway/Apron Incursion Prevention**: Apron locations that allow direct access into a runway should be avoided. Increase pilot situational awareness by designing taxiways in such a manner that forces pilots to consciously make turns. Taxiways originating from aprons and forming a straight line across runways at mid-span should be avoided.
   - *Wide Throat Taxiways*: Wide throat taxiway entrances should be avoided. Such large expanses of pavement may cause pilot confusion and makes lighting and marking more difficult.
   - *Direct Access from Apron to a Runway*: Avoid taxiway connectors that cross over a parallel taxiway and directly onto a runway. Consider a staggered taxiway layout that forces pilots to make a conscious decision to turn.
   - *Apron to Parallel Taxiway End*: Avoid direct connection from an apron to a parallel taxiway at the end of a runway.

The existing taxiway system at CXP is found to be adequate in meeting existing and future air traffic demand. However, as presented on **Exhibit 3E**, the existing taxiway geometry conflicts with the current FAA taxiway design standards established in AC 150/5300-13A, including:

- Direct access provided from Taxiway B to Runway 9-27;
- Direct access from the taxilane serving GA hangars to Runway 9-27 via Connector A3;
- Connector A4 is acutely angled and noncompliant with current standards; and
- Connector A3 to Taxiway B and Connectors A2 to D2 provide runway crossings through the high-energy-area.

In the alternatives chapter, potential solutions to correct these non-standard taxiway layouts will be presented. Analysis in the next chapter will also consider improvements which could be implemented on the airfield to minimize runway incursion potential, improve efficiency, and conform to FAA standards for taxiway design. Any future taxiways planned will also take into consideration the taxiway design standards.

Taxilane Design Considerations

Taxilanes are distinguished from taxiways in that they do not provide access to or from the runway system directly. Taxilanes typically provide access to hangar areas. As a result, taxilanes can be planned to varying design standards depending on the type of aircraft utilizing the taxilane. For example, a taxilane leading to a T-hangar area only needs to be designed to accommodate those aircraft typically accessing the T-hangar.

NAVIGATIONAL AND APPROACH AIDS

Navigational aids are devices that provide pilots with guidance and position information when utilizing the runway system. Electronic and visual guidance to arriving aircraft enhance the safety and capacity of the airfield. Such facilities are vital to the success of an airport and provide additional safety to passengers using the air transportation system. While instrument approach aids are especially helpful during poor weather, they are often used by pilots conducting flight training and operating larger aircraft when visibility is good.

Instrument Approach Aids

Instrument approaches are categorized as either precision or non-precision. Precision instrument approach aids provide an exact course alignment and vertical descent path for an aircraft on final approach to a runway, while non-precision instrument approach aids provide only course alignment information. In the past, most existing precision instrument approaches in the United States have been the instrument

landing system (ILS); however, with advances in global positioning system (GPS) technology, it can now be used to provide both vertical and lateral navigation for pilots under certain conditions.

CXP currently has circling instrument approach capabilities to Runway 9-27, providing visibility minimums of 1¼ miles and 1,675-foot cloud ceilings AGL. In addition, Runway 27 is served by an area navigation (RNAV) GPS instrument approach providing visibility minimums of 1¼ miles and cloud ceilings of 1,198 feet AGL.

Due to fleet mix demands and stakeholder development considerations, additional instrument approach capabilities should be considered over the planning period. Analysis in the next chapter will examine the potential impacts of increasing the instrument approach capabilities serving Runway 9-27.

Visual Approach Aids

In most instances, the landing phase of any flight must be conducted in visual conditions. To provide pilots with visual guidance information during landings to the runway, electronic visual approach aids are commonly provided at airports. Runways 9 and 27 are equipped with a two-box precision approach path indicator (PAPI-2) light system. These visual lighting systems indicate to a pilot if they are on the correct glide path to the runway. The Runway 27 PAPI-2 is set to the standard 3.0 approach glide path, while Runway 9's PAPI-2 is set at a higher, nonstandard 4.0-degree glide slope. It is recommended that CXP install PAPI-4, as they are generally favorable for airports with jet traffic.

Runway end identification lights (REILs) are flashing lights located at the runway threshold end that facilitate rapid identification of the runway end at night and during poor visibility conditions. REILs provide pilots with the ability to identify the runway thresholds and distinguish the runway end lighting from other lighting on the airport and in the approach areas. The FAA indicates that REILs should be considered for all lighted runway ends not planned for a more sophisticated approach lighting system. Currently, REILs serve Runway 9-27 and should be maintained throughout the planning horizon. REILs are strobe lights set to either side of the runway.

Weather Reporting Aids

CXP is served by a lighted windcone and segmented circle as well as two supplemental windcones. The windcones provide information to pilots regarding wind speed and direction. Typically, a windcone is "centralized" on the airfield system and co-located with a segmented circle. The segmented circle consists of a system of visual indicators designed to provide traffic pattern information to pilots. Currently, the primary windcone and segmented circle is located on the north end of Runway 9-27 and approximately 2,200 feet east of Taxiway B. Supplemental windcones serve each end of Runway 9-27 and are located on the left side, approximately 1,000 feet beyond the approach end of each respective runway. The existing lighted windcone and segmented circle and supplemental windcones should be maintained


LEGEND
Airport Property Line
Taxiway Designator
Runway Safety Area (RSA)
Runway Object Free Area (ROFA)
Runway Obstacle Free Zone (ROFZ)
Runway Protection Zone (RPZ)
RPZ Incompatible Land Use
High-Energy-Area
0
800
SCALE IN FEET
NORTH
Taxiway Connector A4 is acutely angled
Taxiway crossings through the high-energy-area are provided via Taxiway Connectors A2 and D2
Short term mining operation
Runway 9-27 (6,101' x 75')
Direct access provided to Runway 9-27 by Taxiway B and Taxiway Connector B
Taxiway crossings through the high-energy-area are provided via Taxiway Connectors A3 and B
Direct access provided to Runway 9-27 by Taxilane and Taxiway Connector A3
Arrowhead Dr.
E. College Pkwy.
Gonzales Rd.
Sunrise
Apollo Dr.
Lida Cir.
Tara St.
Norway St.
Dale Dr.
Nye Ln.
Bowers Ln.
Aerial Image: Atkins 10-8-2017

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throughout the planning horizon. However, as previously mentioned, the supplemental windcones should be relocated out of the ROFA to meet existing RDC B-II safety area design standards.

As discussed in Chapter One, CXP is served by an automated weather observation system III (AWOS-III P/T). The AWOS-III P/T automatically records the following weather conditions:

- Wind speed, gusts, and direction
- Temperature
- Dew point
- Altimeter setting
- Density altitude
- Visibility
- Precipitation accumulation
- Cloud height
- Present weather identification
- Thunderstorm/lightning reporting

This information is transmitted at regular intervals on the airport's AWOS-III P/T aeronautical advisory frequency (119.925 MHz) or via a local telephone number (775-884-4708), where a computer-generated voice will present airport weather information. AWOS-III P/T broadcasts are updated on a minute-by-minute basis and provide arriving and departing pilots with the current weather conditions. This system should be maintained through the planning period.

AIRFIELD LIGHTING, MARKING, AND SIGNAGE

There are several lighting and pavement marking aids serving pilots using CXP. These aids assist pilots in locating an airport and runway at night or in poor visibility conditions. They also assist in the ground movement of aircraft.

Airport Identification Lighting

The location of the airport at night is universally indicated by a rotating beacon. For civil airports, a rotating beacon projects two beams of light, one white and one green, 180 degrees apart. The existing beacon, located southwest of the airport terminal and west-southwest of the Mountain West hanger, should be maintained through the planning period.

Runway and Taxiway Lighting

Runway lighting provides the pilot with positive identification of the runway and its alignment. Runway 9-27 is served by medium intensity runway lighting (MIRL) and should be maintained throughout the planning period.

Taxiways A and D are equipped with light emitting diode (LED) medium intensity taxiway lighting (MITL), while B and C are equipped with blue retro reflective sticks. The MITL system is vital for safe and efficient

ground movements. Thus, planning should consider installing LED MITL on all taxiways over the planning period. At minimum, all taxilanes leading to hangars should be served with blue reflectors.

Pavement Markings

Runway markings are typically designed to the type of instrument approach available on the runway. FAA AC 150/5340-1K, *Standards for Airport Markings*, provides guidance necessary to design airport markings.

Runway 9 and Runway 27 both have non-precision markings which are consistent with the instrument approach capabilities of the runway. These markings should be maintained through the planning horizon.

Airfield Signs

Airfield identification signs assist pilots in identifying their location on the airfield and directing them to their desired location. Lighted signs are installed on the runway and taxiway system on the airfield. The signage system includes runway and taxiway designations, holding positions, routing/directional, distance remaining, and runway exits. All of these signs should be maintained throughout the planning period.

LANDSIDE FACILITY REQUIREMENTS

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

- General Aviation Terminal Facilities and Automobile Parking
- Aircraft Storage Hangars
- Aircraft Parking Aprons
- Airport Support Facilities

GENERAL AVIATION TERMINAL FACILITIES AND AUTOMOBILE PARKING

General aviation terminal facilities at an airport are often the first impression of the community that corporate officials and other visitors will encounter. General aviation terminal facilities typically provide space for passenger waiting, pilots' lounge, pilot flight planning, concessions, management, storage, and various other needs. This space is not necessarily limited to a single, separate terminal building, but can

include space offered by fixed base operators (FBOs) and other specialty operators for these functions and services. Through the acquisition of El Aero Services, Mountain West Aviation is the only general aviation terminal service provider located on the airfield. Although CXP maintains its own terminal building, it is primarily being utilized for administrative purposes at this time.

The methodology used in estimating general aviation terminal facility needs was based upon the number of airport users expected to utilize general aviation facilities during the design hour. Space requirements for terminal facilities were based on providing 125 square feet per design hour itinerant passenger. A multiplier of 2.6 in the short term, increasing to 3.0 in the long term, was also applied to terminal facility needs in order to better determine the number of passengers associated with each itinerant aircraft operation. This increasing multiplier indicates an expected increase in business and recreational operations through the long term. These operations often support larger turboprop and jet aircraft which accommodate an increasing passenger load factor.

Table 3H outlines the space requirements for general aviation terminal services at CXP through the long-term planning period. As shown in the table, up to 11,800 square feet of space could be needed in the long-term for general aviation passengers. The amount of terminal space currently offered at CXP is approximately 10,300 square feet. These spaces include designated areas for flight planning, pilots' lounge, restroom facilities, quiet rooms, and other amenities.

TABLE 3H
General Aviation Terminal Area Facilities
Carson City Airport

	Currently Available	Short Term Need	Intermediate Term	Long Term Need
Design Hour Itinerant Operations	23	25	27	31
Passenger Multiplier	2.5	2.6	2.8	3.0
Design Hour Itinerant Passengers	58	64	75	94
General Aviation Services Facility Area (s.f.)	10,300[1]	8,000	9,400	11,800
Vehicle Parking Spaces	168[2]	177	197	235

[1]Includes approximate space offered by FBOs at the Airport.
[2]Approximate number of total marked vehicle parking spaces at the Airport.
Source: Coffman Associates analysis

Other specialty aviation operators on the airfield also provide space for pilots and passengers. It can be assumed that adequate services and space is provided to accommodate their customers.

General aviation vehicular parking demands have also been determined for CXP. Space determinations for itinerant passengers were based on an evaluation of existing airport use, as well as standards set forth to help calculate projected terminal facility needs.

The parking requirements of based aircraft owners should also be considered. Although some owners prefer to park their vehicles in their hangar, safety can be compromised when automobile and aircraft movements are intermixed. For this reason, separate parking requirements, which consider 30 percent of based aircraft at the airport, were applied to general aviation automobile parking space requirements. Utilizing this methodology, parking requirements for general aviation activity call for approximately 177 spaces in the short-term, increasing to approximately 235 spaces in the long-term planning horizon. It is estimated that there are 168 marked vehicle parking spaces at CXP currently serving various airport activities, including the FBO and other general aviation functions. Future consideration in the Master Plan will be given to providing vehicle parking to support additional development potential.

AIRCRAFT STORAGE HANGARS

The demand for aircraft hangars typically depends on local climate, security, and owner preferences. The trend in general aviation aircraft, whether single or multi-engine, is toward more sophisticated aircraft (and, consequently, more expensive aircraft); therefore, many aircraft owners prefer enclosed hangar space to outside tiedowns.

The demand for aircraft storage hangars is dependent upon the number and type of aircraft expected to be based at an airport in the future. For planning purposes, it is necessary to estimate hangar requirements based upon forecast operational activity. However, hangar development should be based upon actual demand trends and financial investment conditions.

While the majority of aircraft owners prefer enclosed aircraft storage, a number of based aircraft will still use outdoor tiedown spaces (due to lack of hangar availability, hangar rental rates, and/or operational needs). Therefore, enclosed hangar facilities do not necessarily need to be planned for each based aircraft. At CXP, it is estimated that approximately 15 percent of aircraft are currently based on aircraft parking aprons, with the remainder housed in hangar spaces. The percentage of based aircraft housed in hangar spaces is projected to remain constant throughout the planning horizon.

There are a variety of aircraft storage options typically available at an airport including shade hangars, T-hangars, linear box hangars, executive/box hangars, and bulk storage conventional hangars. Shade hangars are the most basic form of aircraft protection and are common in warmer climates. These structures provide a roof covering, but no walls or doors. There are no shade hangars at CXP, and for purposes of planning, any future shade hangars are included in the T-hangar need forecast.

T-hangars are intended to accommodate one small single engine piston aircraft or, in some cases, one multi-engine piston aircraft. T-hangars are so named because they are in the shape of a “T,” providing a space for the aircraft nose and wings, but no space for turning the aircraft within the hangar. Essentially, the aircraft can be parked in only one position. T-hangars are commonly “nested” with several individual storage units to maximize hangar space. In these cases, taxiway access is needed on both sides of the nested T-hangar facility. T-hangars are popular with aircraft owners with tighter budgets as

they tend to be the least expensive enclosed hangar space to build and lease. Currently, CXP has a total of 45,720 square feet of T-hangar storage capacity.

Similar to the T-hangar style is the linear box hangar. Linear box hangars typically provide storage for a single aircraft and can be nested with multiple individual linear box hangars. Unlike the T-hangar, linear box hangars enable to user to store aircraft in more ways than one. Ultimately, this will allow the user to maximize aircraft storage space. At this time, linear box hangars account for 135,350 square feet of aircraft hangar storage space at CXP. For planning purposes, any future linear box hangars are included in the T-hangar space need forecast. User and developer preferences will dictate the ultimate styles selected at the airport.

The next type of aircraft hangar common for storage of general aviation aircraft is the executive/box hangar. Executive/box hangars typically provide a larger space, generally with an area between 2,500 and 6,000 square feet. This type of hangar can provide for maneuverability within the hangar, can accommodate more than one aircraft, and may have a small office and utilities. Executive/box hangars may be connected in a row of units with doors facing a taxilane. Executive box hangars may also be stand-alone hangars. These hangars are typically utilized by a corporate/business entity or to support an on-airport business. CXP currently has 92,168 square feet of aircraft storage capacity dedicated to executive box hangars.

Conventional hangars are the large, clear span hangars typically located facing the main aircraft apron at airports. These hangars provide for bulk aircraft storage and are often utilized by airport businesses, such as a fixed base operator (FBO) and/or aircraft maintenance business. Conventional hangars are generally larger than executive/box hangars and can range in size from 6,000 square feet to more than 20,000 square feet. Often, a portion of a conventional hangar is utilized for non-aircraft storage needs such as maintenance or office space. There is currently 471,677 square feet of aircraft hangar storage space dedicated to conventional hangars at CXP.

Planning for future aircraft storage needs is based on typical owner preferences and standard sizes for hangar space. For determining future aircraft storage needs, a planning standard of 1,200 square feet per based aircraft is utilized for T-hangars. For conventional hangars, a planning standard of 3,000 square feet is utilized for turboprop aircraft, 6,000 square feet is utilized for business jet aircraft, and 1,500 square feet is utilized for helicopter storage needs.

In total, there is approximately 744,915 square feet of hangar, maintenance, and office space provided on the airport for general aviation activities. Future hangar requirements for the airport are summarized in **Table 3J**. While some based aircraft will continue to utilize aircraft parking apron space instead of hangar facilities, the overall percentage of aircraft seeking hangar space is projected to increase during the long-term planning period. Since portions of the hangars are known to be used for aircraft maintenance servicing, requirements for maintenance/service hangar area were estimated using a planning standard of 250 square feet per based aircraft.

TABLE 3J
Aircraft Hangar Requirements
Carson City Airport

	Currently Available	Short Term Need	Intermediate Term Need	Long Term Need
Total Based Aircraft	350	375	405	470
Aircraft to be Hangared	297	319	344	400
Hangar Area Requirements				
T-Hangar/Linear Box Area (s.f.)	181,070	195,800	211,100	249,800
Executive Box Hangar Area (s.f.)	92,168	104,200	110,200	134,200
Conventional Hangar Area (s.f.)	471,677	480,700	522,700	581,200
Maintenance Area (s.f.)	--	79,800	165,800	265,800
Total Hangar Area (s.f.)	744,915*	860,500	1,009,800	1,231,000

Note: *Includes total hangar and maintenance area currently at the airport

Source: Coffman Associates analysis

The analysis indicates that there is a potential need for over 486,000 square feet of hangar storage space to be offered through the long-term planning period. This includes a mixture of hangar and maintenance areas. Due to the projected increase in based aircraft, annual general aviation operations, and hangar storage needs, facility planning will consider additional hangars at CXP. It is expected that the aircraft storage hangar requirements will continue to be met through a combination of hangar types.

It should be noted that hangar requirements are general in nature and based on the aviation demand forecasts. This analysis utilizes industry standards, and actual need could vary based on individual user requirements and desires. The actual need for hangar space will further depend on the actual usage within hangars. For example, some hangars may be utilized entirely for non-aircraft storage, such as maintenance; yet from a planning standpoint, they have an aircraft storage capacity. Therefore, the needs of an individual user may differ from the calculated space necessary.

AIRCRAFT PARKING APRON

FAA Advisory Circular 150/5300-13A, *Airport Design*, suggests a methodology by which transient apron requirements can be determined from knowledge of busy-day operations. At CXP, the number of itinerant spaces required was determined to be approximately 15 percent of the busy-day itinerant operations for general aviation operations. A planning criterion of 800 square yards per aircraft was applied to determine future transient apron requirements for single and multi-engine aircraft. For business jets (which can be much larger), a planning criterion of 1,600 square yards per aircraft position was used. In addition, CXP has based aircraft that utilize outside aircraft tiedowns for storage. It is assumed that these aircraft require less space than transient aircraft; therefore, a planning criterion of 650 square yards per aircraft was applied. Apron parking requirements are presented in **Table 3K**. Transient apron parking needs are divided into business jet needs and smaller single and multi-engine aircraft needs.

TABLE 3K
Aircraft Parking Apron Requirements
Carson City Airport

	Available	Short Term	Intermediate Term	Long Term
Based GA Aircraft Positions	53	56	61	70
Transient Single/Multi-Engine Aircraft Positions	119	26	29	34
Transient Business Jet Positions	5	4	5	8
Total Positions	177*	86	95	112
Total Apron Area (s.y.)	109,200	63,400	70,700	85,200

*Available parking only includes marked positions.

The existing general aviation apron areas are located south of Runway 9-27 and northwest of the Runway 9 threshold. The total apron area available at CXP encompasses approximately 109,200 square yards of pavement. The existing transient apron areas include a total of 119 marked tiedown positions and can accommodate both small and large aircraft. The long-term forecast indicates that the existing apron areas are sufficient, if maintained properly throughout the planning horizon. It should be noted, however, that local demands will ultimately dictate apron area needs.

AIRPORT SUPPORT FACILITIES

Various other landside facilities that play a supporting role in overall airport operations have also been identified. These support facilities include:

- Aircraft Rescue and Firefighting (ARFF)
- Aviation Fuel Storage
- Maintenance/Storage Facilities
- Utilities
- Perimeter Fencing and Gates

Aircraft Rescue and Firefighting

Presently, there is no dedicated airport rescue and firefighting (ARFF) facility at CXP. Requirements for ARFF services at an airport are established under Title 14 CFR Part 139, which applies to the certification and operation of airports served by any scheduled or unscheduled passenger operation of an air carrier using an aircraft with more than nine seats. Since the airport is not a Part 139 facility, an on-site ARFF facility is neither required nor justified. At present, emergency services are provided by the Carson City Fire Department. Carson City Fire Station 52 is located adjacent to airport property, directly west of the airport entrance road and south of Runway 9-27. The fire station has access to the airfield through a manually operated gate.

Aviation Fuel Storage

As outlined in Chapter One, fuel facilities available at CXP include self-serve Jet A and 100LL available for purchase with a credit card on a 24-hour basis. Fuel is stored in two aboveground fuel storage tanks, which are owned and operated by Mountain West Aviation and provide 10,000 gallons of storage capacity for 100LL and Jet A fuel each. In addition, there are two 12,000-gallon Jet A and 100LL underground storage tanks that are utilized by El Aero Services. Total, there is 44,000 gallons of fuel storage capacity at CXP. It should be noted that fuel storage capacity is also available in FBO fuel service trucks. For planning purposes, only permanent fuel storage facilities will be considered in the fuel capacity analysis.

Maintaining a 14-day fuel supply would allow the airport to limit the impact of a disruption of fuel delivery. Currently, the airport has enough static fuel storage to meet the 14-day supply criteria for both Jet A and 100LL fuel.

Historic fuel flowage data was utilized to project future fuel storage capacity needs. In 2017, the airport pumped 215,656 gallons of Jet A fuel and 88,701 gallons of 100LL. This works out to approximately 2.76 gallons per turbine operation and 1.14 gallons per piston operation. Over a five-year period ranging from 2013 to 2017, the airport averaged approximately 3.38 gallons per turbine operation and 1.73 per piston operation. Based upon projected operational growth, maintaining the five-year average ratios constant through the forecast period results in total flowage increasing to 522,000 gallons for Jet A and 266,500 gallons of 100LL. According to this analysis, which is summarized on **Table 3L**, existing fuel storage capacity should be adequate through the long-term planning horizon.

TABLE 3L
Fuel Storage Requirements
Carson City Airport

			Planning Horizon		
	Available	5-year Annual Average	Short Term	Intermediate Term	Long Term
Jet A					
Daily Usage (gal.)		722	1,130	1,220	1,430
14-Day Supply (gal.)	22,000	14,800	15,800	17,100	20,000
Annual Usage (gal.)		263,413	412,500	445,300	522,000
100LL					
Daily Usage (gal.)		370	580	630	730
14-Day Supply (gal.)	22,000	7,600	8,100	8,800	10,200
Annual Usage (gal.)		134,909	211,700	230,000	266,500

Assumptions:
Jet A: 3.38 gallons per turbine operation
100LL: 1.73 gallons per piston operation

Maintenance/Storage Facilities

Currently, the airport utilizes excess space inside and surrounding the electrical vault to store equipment as it does not currently have a building dedicated to maintenance or storage. The airport should

consider the addition of a building specifically dedicated to the storage of airport maintenance equipment. The alternatives in the next chapter will examine potential locations for a dedicated storage and maintenance facility in the future.

Utilities

The availability and capacity of the utilities serving the airport are factors in determining the development potential of the airport property, as well as the land immediately adjacent to the facility. As discussed in Chapter One, the availability of water, gas, sewer, and power sources are of primary concern when assessing available utilities. Currently, the airport's electrical needs are served by NV Energy, while the City of Carson City provides the airport's potable water and wastewater needs. Natural gas service is provided by Southwest Gas Corporation. Given the forecast potential for future landside facility growth, the utility infrastructure serving the airport may need to be expanded to serve future development.

Perimeter Fencing and Gates

Perimeter fencing is used at airports primarily to secure the aircraft operational area and reduce wildlife incursions. The physical barrier of perimeter fencing has the following functions:

- Gives notice of the legal boundary of the outermost limits of a facility or security-sensitive area.
- Assists in controlling and screening authorized entries into a secured area by deterring entry elsewhere along the boundary.
- Supports surveillance, detection, assessment, and other security functions by providing a zone for installing intrusion-detection equipment and closed-circuit television (CCTV).
- Deters casual intruders from penetrating a secured area by presenting a barrier that requires an overt action to enter.
- Demonstrates the intent of an intruder by their overt action of gaining entry.
- Causes a delay to obtain access to a facility, thereby increasing the possibility of detection.
- Creates a psychological deterrent.
- Optimizes the use of security personnel, while enhancing the capabilities for detection and apprehension of unauthorized individuals.
- Demonstrates a corporate concern for facility security.
- Limits inadvertent access to the aircraft operations area by wildlife.

The airport has perimeter fencing which serves both operational security and as a deterrent to wildlife accessing the airfield movement areas. The fence is a combination of chain link and barbed wire fencing consisting of over 27,000 linear feet of fencing which is regularly inspected. Several controlled-access and manual gates associated with the fencing lead to different areas on the airfield. Currently, there is a gap in fencing over the drainage ditch near Carson City Fire Department Station 52's training facility,

and there have been reports of unauthorized entries. Consideration should be given to installing a complete perimeter fence that is 6- to 8-feet tall, with 3-strand barbed wire.

SUMMARY

This chapter has outlined the safety design standards and facilities required to meet potential aviation demand projected at CXP for the next 20 years. In an effort to provide a more flexible Master Plan, the yearly forecasts from Chapter Two have been converted to planning horizon levels. The short-term roughly corresponds to a five-year timeframe, the intermediate-term is approximately ten years, and the long-term is 20 years. By utilizing planning horizons, airport management can focus on demand indicators for initiating projects and grant requests rather than on specific dates in the future. A summary of the airside and landside requirements is presented on **Exhibits 3F and 3G**, respectively.

In Chapter Four, potential improvements to the airside and landside systems will be examined through a series of airport development alternatives. Most of the alternatives discussion will focus on those capital improvements that would be eligible for federal and state grant funds. Other projects of local concern will also be presented. Ultimately, an overall airport development plan that presents a vision beyond the 20-year scope of this Master Plan will be developed.



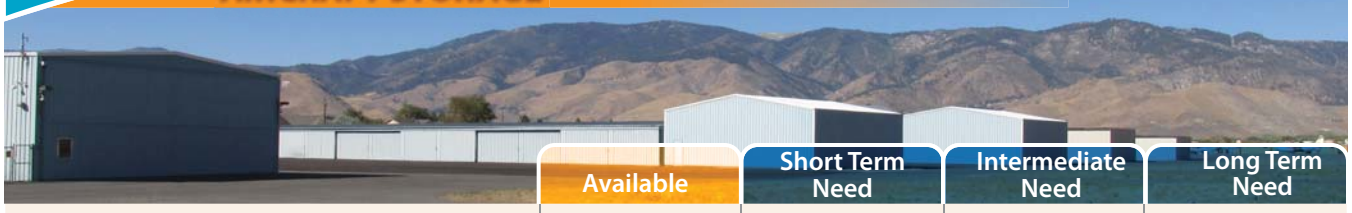
	AVAILABLE	POTENTIAL IMPROVEMENT/CHANGE
RUNWAY 09-27		
	RDC: **B-II-5000**	B-II-5000
	Dimensions: **6,101' x 75'**	Consider Additional Runway Length
	Pavement Strength: **30,000 lbs SWL/ 60,000 lbs DWL**	Same
TAXIWAYS		
	Parallel Taxiway: **Yes**	Maintain Full Length Parallel Taxiway
	Parallel Taxiway Separation from runway: **300'**	Same
	Widths: **35-50'**	Same
	Holding Position Locations from Ruwnay: **200'**	Same
NAVIGATION AND WEATHER AIDS		
	Instrument Approaches: **Not Lower than 1 mile GPS**	Consider Improved Approach Minimums
	AWOS, Lighted Wind Cone, and Beacon	Same
LIGHTING AND MARKING		
	Runway Lighting: **MIRL**	Same
	Runway Marking: **Non-Precision**	Same
	Taxiway Lighting: **MITL**	Same
	Approach Aids: **PAPI-2, REILs**	PAPI-4

KEY

AWOS - Automated Weather Observation System
DWL - Dual Wheel Loading
MIRL - Medium Intensity Runway Lighting
MITL - Medium Intensity Taxiway Lighting
PAPI - Precision Approach Path Indicator
RDC - Runway Design Code
REIL - Runway End Identification Lights
SWL - Single Wheel Loading

Exhibit 3F
AIRSIDE FACILITY REQUIREMENTS

AIRCRAFT STORAGE



	Available	Short Term Need	Intermediate Need	Long Term Need
T-Hangar/Box/Linear Box Hangar Area (s.f.)	181,070	195,800	211,100	249,800
Executive Box Hangar Area (s.f.)	92,168	104,200	110,200	134,200
Conventional Hangar Area (s.f.)	471,677	480,700	522,700	581,200
Office/Maintenance Area (s.f.)	-	79,800	165,800	265,800
Total Hangar Storage Area (s.f.)	744,915	860,500	1,009,800	1,231,000

AIRCRAFT APRON

Single, Multi-engine Transient Aircraft Positions	119	26	29	34
Transient Business Jet Positions	5	4	5	8
Locally Based Aircraft Positions	53	56	61	70
Total Positions	177	86	95	112
Total Apron Area (s.y.)	109,200	63,400	70,700	85,200

TERMINAL FACILITY AND AUTOMOBILE PARKING REQUIREMENTS

GA Terminal Building Space (s.f.)	10,300	8,000	9,400	11,800
GA Terminal Parking Spaces	-	64	75	94
Based Aircraft Auto Spaces	-	113	122	141
Total GA Auto Parking Spaces	168	177	197	235

SUPPORT FACILITY REQUIREMENTS

14-Day Fuel Storage Capacity (gal.) 100LL	22,000	8,100	8,800	10,200
14-Day Fuel Storage Capacity (gal.) Jet A	22,000	15,800	17,100	20,000
Security Fencing/Gates	-Consider Fencing Enhancements			Maintain
Airport Maintenance Facilities	-Consider Maintenance Facility			Maintain

Exhibit 3G
LANDSIDE FACILITY REQUIREMENTS

CHAPTER FOUR

AIRPORT ALTERNATIVES

CHAPTER FOUR

AIRPORT ALTERNATIVES

In the previous chapter, airport facilities required to satisfy the demand through the long-range planning period were identified. The next step in the planning process is to evaluate reasonable ways these facilities can be provided. The purpose of this chapter is to formulate and examine rational airport development alternatives that can address the short-, intermediate-, and long-term planning horizon levels. Because there are a multitude of possibilities and combinations, it is necessary to focus on those opportunities which have the greatest potential for success. Each alternative provides a differing approach to meet existing and future facility needs, and these layouts are presented for purposes of evaluation.

Airports, especially those located in urban settings, eventually become constrained and require careful planning to ensure long-term viability. Some airports become constrained due to limited space (property) availability, while others may become constrained due to encroachment of adjacent land use development. Thoughtful consideration should be given to the layout of future facilities and impacts they could have on potential airfield improvements at Carson City Airport (CXP), especially those related to the runway and taxiway system and the limited property availabilities for landside development. Proper planning at this time will ensure the long-term viability of the airport for both aviation and economic growth.

The primary goal of this planning process is to develop a viable plan for meeting the needs resulting from the projected market demand over the next 20 years. The plan of action should be developed in a manner that is consistent with the future goals and objectives of the Carson City Airport Authority, airport users, and citizens of Carson City, who have a vested interest in the development and operation of the Carson City Airport.

The goal is to develop the underlying rationale which supports the final recommended development concept. Through this process, an evaluation of the highest and best uses of airport property will be made while also weighing local development goals, physical and environmental constraints, and appropriate airport design standards.

The development alternatives for CXP can be categorized into two functional areas as previously outlined: **airside** (runways, taxiways, navigational aids, etc.) and **landside** (hangars, parking aprons, terminal area, and vehicle parking, etc.). Within each of these areas, specific capabilities and facilities are required or desired. In addition, the utilization of airport property to provide revenue support for the airport, and to benefit the economic well-being of the community and surrounding region, must be considered.

Each functional area interrelates and affects the development potential of the other. Therefore, all relevant airside and landside areas are examined individually and then combined to ensure the final plan is functional, efficient, and cost-effective. The total impact of all these functional areas on the existing airport must be evaluated to determine if investment in the airport will meet the needs of the community, both during and beyond the 20-year planning period.

The alternatives presented in this chapter are developed to meet projected aviation demand and comply with Federal Aviation Administration (FAA) design standards to the greatest extent practicable. While capital outlays necessary to implement a plan are important, the alternative analysis completed here will not limit or judge reasonable development plans based on projected costs. The investment necessary for each alternative is not considered at this point to ensure that the final plan first meets the needs of the airport and its users. The approach is intended to ensure that the best plan is put forth, not the lowest cost plan. Only where a project cost would be extraordinarily high is it considered as a limiting factor. Once a final plan is developed, cost estimates will be developed for each individual project considered during the next 20 years.

Through coordination with the Carson City Airport Authority, the Planning Advisory Committee (PAC), and the public, an alternative, or combination of two or more, will be refined and modified as necessary into a recommended development concept. Therefore, the alternatives presented in this chapter can be considered a starting point in the evolution of a recommended development concept for the future of CXP.

NON-DEVELOPMENT ALTERNATIVES

Prior to presenting development alternatives for CXP, non-development alternatives were considered. Non-development alternatives include the “no-build” or “no-action” alternative, the transfer of services to another existing airport, as well as development of a new airport.

CXP plays a critical role in the economic development of the City of Carson City, surrounding region, and State of Nevada as well as in the continuity of the national aviation network. There is significant public and private investment at the airport. The pursuit of a non-development alternative would slowly devalue these investments and lead to infrastructure deterioration and potentially the loss of significant levels of federal and state funding for airport improvements. If facilities are not maintained and improved so that the airport provides a pleasant experience for the visitor or business traveler, these individuals may consider doing business elsewhere. Ultimately, the safety of aircraft, pilots, and persons on the ground could be jeopardized. Furthermore, non-development alternatives are inconsistent with the long-term goals of the FAA and the Nevada Department of Transportation – Aviation Planning Section (NDOT), which are to enhance local and interstate commerce. Finally, the FAA requires all airports which have received federal grants to continue to maintain the airport. Therefore, the "no-build" or "no-action" alternative will not be considered further.

The alternative of shifting aviation services to another existing airport or development of a new airport site was also found to be an undesirable alternative. The development of a new airport is a very complex and expensive alternative. A new site will require substantial land area, duplication of investment in airport facilities, installation of supporting infrastructure that is already available, and significant environmental impacts. Furthermore, the Carson City Airport Authority, FAA, and NDOT have all contributed to significant funding to improvements at the airport in recent years. The continuing growth expected in the area demonstrates the need for a highly functional and convenient airport. Based upon the aviation demand forecasts developed in Chapter Two, it has been determined that the airport can accommodate projected future demand in its current location. As a result, the transfer of aviation services to another existing or newly constructed airport is not a practical and/or reasonable option. As such, the remainder of this chapter will outline options for developing the airport in a manner which will meet existing and ultimate aviation demand for the CXP service area.

AIRPORT DEVELOPMENT OBJECTIVES

It is the goal of this effort to produce a safe and efficient airfield as well as landside facilities, which includes appropriate general aviation terminal space, aircraft storage mix, and aviation businesses to best serve forecast aviation demands. However, before defining and evaluating alternatives, specific airport development objectives will be considered. As owner and operator, the Carson City Airport Authority provides the overall guidance for the operation and development of the airport. It is of primary concern that the airport is marketed, developed, and operated for the betterment of the community and its users. The following development objectives have been defined for this planning effort:

- Conform to FAA and NDOT design and safety standards, wherever practical, for the mix of aircraft that could potentially use the airport during the 20-year planning period.
- Preserve and protect public and private investments in existing airport facilities.
- Develop a safe, attractive, and efficient aviation facility in accordance with applicable federal, state, and local regulations.

- Provide sufficient airport capacity which will meet the long-term planning horizon demand levels (general aviation, aviation businesses, and support facilities).
- Reflect and support the long-term planning efforts currently applicable to the region.
- Identify any future land acquisition needs.
- Develop a facility with a focus on self-sufficiency in both operational and development cost recovery.
- Ensure that future development is environmentally compatible.

REVIEW OF PREVIOUS AIRPORT PLANS

The previous master plan for CXP was completed in 2001. As a part of this planning effort, the Airport Layout Plan (ALP) was also updated and approved by the FAA. It should be noted, however, that CXP has since undergone airport planning in the form of ALP narrative updates and has a current ALP dated February 2016. Moreover, some significant changes have occurred since the master plan to include the construction of a slightly reoriented runway and associated taxiway system.

The Airport Layout Drawing (ALD) is shown on **Exhibit 4A**. The ALD provides information on existing and ultimate conditions at CXP, including:

- Airport data related to airport category, Airport Reference Code (ARC), elevation, wind conditions, temperature, and navigational aids located at the airport.
- Runway data related to the critical design aircraft, safety areas, markings, lighting, and visual and navigational aids associated with the runway and taxiway system.

Additionally, the ALD graphically depicts information and further outlines airside and landside recommendations based upon previous airport planning that include:

- Maintaining ARC B-II design standards for Runway 9-27.
- Implement a non-precision instrument approach with visibility minimums of not lower than one mile.
- Non-precision runway markings consistent with the ultimate non-precision instrument approach.
- Additional landside development in the form of hangars, aircraft parking, and support facilities.
- Ultimate property acquisition that could support future development or provide protection for the airfield.

The assumptions made and conclusions drawn from the previous planning efforts will be independently evaluated in this master plan. Some elements from the previous planning efforts may continue to be viable and could be included in this planning effort. Other elements may no longer be viable based on changes to design standards (FAA published new design standards in September of 2012), changes in the long-term vision for the airport, environmental concerns, and/or financial considerations. The remainder of this chapter will present various alternatives to consider for both the airside and landside development of the airport.

RUNWAY END COORDINATES (NAD 83)

RUNWAY		EXISTING	ULTIMATE
Runway 9	Latitude	39° 11' 39.2126" N	39° 11' 39.2126" N
	Longitude	119° 44' 34.9566" W	119° 44' 34.9566" W
Runway 27	Latitude	39° 11' 25.3700" N	39° 11' 25.3700" N
	Longitude	119° 43' 19.5503" W	119° 43' 19.5503" W

DEVIATIONS FROM FAA AIRPORT STANDARDS

DEVIATION DESCRIPTION	AFFECTED DESIGN STANDARD	STANDARD	EXISTING	PROPOSED DISPOSITION
TERRAIN	Part 77 Approach Surface Runway 9	34:1	VARIES	REMOVE HILL

FAA APPROVAL STAMP

Carson City Airport Authority

APPROVED BY: ON THE DATE OF:

Mr. Guy Williams, Chairman

RUNWAY DATA

RUNWAY 9–27	EXISTING		ULTIMATE	
	9	27	9	27
DESIGN AIRCRAFT	Cessna Citation III		Cessna Citation III	
DESIGN AIRCRAFT WINGSPAN	53.5'		53.5'	
DESIGN AIRCRAFT APPROACH SPEED	114 KTS		114 KTS	
DESIGN AIRCRAFT MAX. CERTIFIED TAKEOFF WEIGHT	22,000 LBS		22,000 LBS	
RUNWAY EFFECTIVE GRADIENT	0.146%		0.146%	
MAXIMUM RUNWAY GRADIENT	0.216%		0.216%	
PERCENTAGE OF WIND COVERAGE (MPH)	10.5–95.50%		10.5–95.50%	
APPROACH VISIBILITY MINIMUMS (Lowest)	Visual		1 Mile	
RUNWAY MARKING	Visual		Nonprecision	
F.A.R. PART 77 CATEGORY	Visual		Nonprecision	
RUNWAY C/L TO PARALLEL TAXIWAY C/L	300'		300'	
TAXIWAY C/L TO FIXED OR MOVEABLE OBJECT	100'		100'	
TAXIWAY OBJECT FREE AREA WIDTH	131'		131'	
TAXIWAY SAFETY AREA WIDTH	79'		79'	
TAXIWAY WINGTIP CLEARANCE	26'		26'	
ELEVATION OF RUNWAY ENDS (NAVD 88)	4704.44	4695.51	4704.44	4695.51
RUNWAY TOUCHDOWN ZONE ELEVATION (NAVD 88)	4703.89	4697.88	4703.89	4697.88
ELEVATION OF RUNWAY HIGH POINT	4704.44		4704.44	
ELEVATION OF RUNWAY LOW POINT	4695.51		4695.51	
LINE OF SIGHT REQUIREMENT MET	MEET		MEET	
RUNWAY DIMENSIONS	6,100' x 75'		6,100' x 75'	
RUNWAY SURFACE MATERIAL	Asphalt		Asphalt	
TAXIWAY SURFACE MATERIAL	Asphalt		Asphalt	
RUNWAY APPROACH SLOPE	20:1	20:1	20:1	20:1
RUNWAY PAVEMENT STRENGTH (in thousand lbs.)	30(S)/60(D)		30(S)/60(D)	
RUNWAY LIGHTING	MIRL		MIRL	
RUNWAY ELECTRONIC NAVIGATIONAL AIDS	GPS	GPS	GPS	GPS
RUNWAY VISUAL NAVIGATIONAL AIDS	REIL PAPI	REIL PAPI	REIL PAPI	REIL PAPI
RSA LENGTH BEYOND STOP END OF RUNWAY	300'		300'	
RSA WIDTH	150'		150'	
OFA LENGTH BEYOND STOP END OF RUNWAY	300'		300'	
OFA WIDTH	500'		500'	
OFZ LENGTH BEYOND STOP END OF RUNWAY	200'		200'	
OFZ WIDTH	300'		300'	
RUNWAY CENTERLINE TO HOLD BARS AND SIGNS	200'		200'	
AIRCRAFT APPROACH CATEGORY–DESIGN GROUP	B–II		B–II	
RUNWAY AZIMUTH	104.0000		104.0000	
RUNWAY BEARING (Decimal Degrees)	N 76°00'00.00" W		N 76°00'00.00" W	
TAXIWAY WIDTH	50'		50'	
TAXIWAY MARKING	Centerline		Centerline	
TAXIWAY LIGHTING	MITL		MITL	

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

GENERAL NOTES:

1. Depiction of features and objects, including related elevations and clearances, within the runway protection zones are depicted on the INNER PORTION OF THE APPROACH SURFACE DRAWINGS.
2. Details concerning terminal improvements are depicted on the TERMINAL FACILITIES DRAWING.
3. Recommended land use are depicted on the AIRPORT LAND USE DRAWING.
4. Building Restriction Line (BRL) is established in accordance with F.A.R. Part 77 criteria, for a 25 foot clearance of the transitional surface. BRL location may vary in accordance with runway object free area, runway protection zone, navaid critical areas, and areas required for terminal instrument procedures.
5. All elevations are in NAVD88, and all coordinates are NAD83.
6. Line–Of–Sight standards met.
7. No Threshold Siting Surface object penetrations.
8. Existing and Ultimate fence line extends along property line, except where shown.
9. All on site monuments are provided with plastic or brass caps.

AIRPORT DATA TABLE

Carson Airport (CXP)		
OWNER: City of Carson City	AIRPORT NPIAS CODE: GA	
CITY: Carson City, Nevada	COUNTY: Carson City, Nevada	
RANGE: 20 East TOWNSHIP: 15 North	CIVIL TOWNSHIP: N/A	
	EXISTING	ULTIMATE
AIRPORT SERVICE LEVEL	General Aviation	General Aviation
AIRPORT REFERENCE CODE	B–II	B–II
AIRPORT ELEVATION (NAVD 88)	4704 MSL	4704 MSL
MEAN MAXIMUM TEMPERATURE OF HOTTEST MONTH	89° F (July)	89° F (July)
AIRPORT REFERENCE POINT (ARP) Latitude	39°11'32.2903"N	39°11'32.2903"N
COORDINATES (NAD 83) Longitude	119°43'57.2523"W	119°43'57.2523"W
AIRPORT and TERMINAL NAVICATIONAL AIDS	Rotating Beacon Segmented Circle	Rotating Beacon Segmented Circle
GPS Approach	9/27	9/27

ULTIMATE BUILDINGS/FACILITIES

NO.	DESCRIPTION
33	HANGAR PARCEL
34	T–HANGAR (Nested)

EXISTING BUILDINGS/FACILITIES

NO.	DESCRIPTION	ELEV.
1	TERMINAL/AIRPORT OFFICE	4702
2	CONVENTIONAL HANGAR (Sterling Air)	4721
3	CARSON CITY SHERIFF	4711
4	T–HANGARS (Comstock Aviation)	4706
5	T–HANGARS (Silver Flight)	4711
6	CONVENTIONAL HANGAR (Yesterday's Flyers)	4712
7	CONVENTIONAL HANGAR (State of Nevada)	4712
8	MEETING ROOM/OFFICES (Experimental Aircraft Assoc.)	4698
9	CONVENTIONAL HANGAR (EL–AERO)	4712
10	CONVENTIONAL HANGAR (Weaver Aircraft)	4714
11	CONVENTIONAL HANGAR (American Warbirds)	4720
12	CONVENTIONAL HANGAR (Byard)	4712
13	PORT–A–PORT	4708
14	N/A	N/A
15	CONVENTIONAL HANGAR (Shadtree Aviation)	4735
16	CONVENTIONAL HANGAR (Cubix)	4746
17	CONVENTIONAL HANGAR (EL–AERO)	4735
18	CONVENTIONAL HANGAR (EL–AERO)	4738
19	FUEL STORAGE (EL–AERO)	N/A
20	FUEL FACILITY (Min. West Aviation)	N/A
21	T–HANGARS (Fletcher)	4728
22	T–HANGARS (Crystal Bay Aviation/Fletcher)	4743
23	CONVENTIONAL HANGAR (Contri)	4763
24	CONVENTIONAL HANGAR (Corrao)	4755
25	CONVENTIONAL HANGAR (Brooks)	4772
26	CONVENTIONAL HANGAR (Corrao)	4774
27	CONVENTIONAL HANGAR (WT Investments)	N/A
28	CONVENTIONAL HANGAR (Carson Air Group)	N/A
29	CONVENTIONAL HANGAR (Jet Ranch)	N/A
30	AIRPORT ELECTRICAL VAULT	4697
31	AUTOMATED WEATHER OBSERVATION SYSTEM (AWOS)	4695

Magnetic Variance
13° 26' East (December 2016)
Annual Rate of Change
6' West (December 2016)

0 400 800
SCALE IN FEET

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		ABANDONED/REMOVED PAVEMENT
		AIRPORT PAVEMENTS
		AIRPORT PROPERTY LINE
		AIRPORT LEASE PARCEL
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		BUILDING REMOVAL
		BUILDING CONSTRUCTION
	BRL	BUILDING RESTRICTION LINE (BRL)
		PERMITTED THRU THE FENCE ACCESS
		FENCING
PAPI–2		OBTAIN AVIATION EASEMENT
		NAVIGATIONAL AID INSTALLATION
		RUNWAY EDGE LIGHTS
		RUNWAY END IDENTIFICATION LIGHTS (REIL)
OFA		RUNWAY OBJECT FREE AREA
OFZ		RUNWAY OBSTACLE FREE ZONE
RSA		RUNWAY SAFETY AREA
		RUNWAY THRESHOLD LIGHTS
		SECTION CORNER
		SEGMENTED CIRCLE/WIND INDICATOR
A	A	TAXIWAY DESIGNATIONS
1000		CONTOUR
		WIND INDICATOR (Lighted)

SOURCE:
Carson City Weather Station
Carson City, Nevada
January 1987 to December 1987

ALL WEATHER WIND COVERAGE	12 MPH 10.5 Knots
Runway 9–27	95.50%

No.	REVISIONS	DATE	BY	APP'D.
1	Updated ALP	8/06	BF	NW
2	Updated ALP	1/09	BF	
3	Realigned Runway Configuration	12/10	BF	
4	Updated Projects	12/14	BF	

Carson City Airport

AIRPORT LAYOUT PLAN

Carson City, Nevada

ATKINS
555 Double Eagle Court, Suite 2000 | Reno, Nevada 89521-8991
Tel: +1.775.828.1622 | Fax: +1.775-828-1826

PLANNED BY: JWC
DETAILED BY: BDF
APPROVED BY: GW
FEBRUARY 2016
SHEET 2 OF 9

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AIRPORT ALTERNATIVE CONSIDERATIONS

As previously detailed, the development alternatives are categorized into two functional areas: airside and landside. Airside considerations relate to runways, taxiways, navigational aids, lighting and marking aids, etc. and require the greatest commitment of land area to meet the physical layout of the airport, as well as the required airfield safety standards. The design of the airfield also defines minimum set-back distances from the runway and object clearance standards. These criteria are defined first to ensure that the fundamental needs of the airport are met. Landside considerations include hangars, aircraft parking aprons, terminal services, as well as utilization of remaining property to provide revenue support for the airport and to benefit the economic development and well-being of the regional area.

Exhibit 4B presents both airside and landside alternative considerations that will be specifically addressed in this analysis. These issues are the result of the findings of the aviation demand forecasts and facility requirements evaluations, as well as input from the PAC, airport management, Carson City Airport Authority, and the public.

The remainder of this chapter will describe various development alternatives for airside and landside facilities. Although each area is treated separately, ultimate planning will integrate the individual requirements, so they can complement one another.

ANALYSIS OF AIRSIDE DEVELOPMENT CONSIDERATIONS

This section identifies and evaluates various airside development factors at CXP to meet the requirements set forth in Chapter Three. Airside facilities are, by nature, the focal point of an airport complex. Because of their primary role and the fact that they physically dominate airport land use, airfield facility needs are often the most critical factor in the determination of viable development options.

AIRPORT DESIGN CRITERIA

Applicable standards for airport design are outlined in FAA Advisory Circular (AC) 150/5300-13A, *Airport Design*, Change 1. The design of airfield facilities is primarily based on the physical and operational characteristics of aircraft using the airport. As discussed in Chapter Two, a Runway Design Code (RDC) is applied to each runway at an airport to identify the appropriate design standards for the runway and associated taxiway system. The RDC is made up of the Aircraft Approach Category (AAC), the Airplane Design Group (ADG), and the approach visibility minimums expressed in runway visual range (RVR) values. It relates to the largest and fastest aircraft that regularly operate at the airport. The FAA has historically defined regular use as at least 500 annual operations at the airport. While this can, at times, be represented by one specific make and model of aircraft, most of the runways' RDC values are represented by several different aircraft, which collectively operate frequently at the airport.

Analysis in the Forecasts chapter indicated that the RDC for Runway 9-27 at CXP is currently B-II-5000. The airfield should continue to be planned for some of the most demanding general aviation business

AIRSIDE CONSIDERATIONS

- Explore design criteria required to meet runway design code (RDC) C-II
- Examine the potential to extend Runway 9-27
- Analyze improved instrument approach procedures
- Evaluate the taxiway system against airfield safety, design and geometry standards
- Upgrade airport visual aids

LANDSIDE CONSIDERATIONS

- Determine efficient land uses that allow the airport to meet the needs of aviation users and promote non-aviation uses where possible
- Identify locations for hangar development to meet projected demand
- Evaluate options to construct support facilities needed for aviation activities
- Examine options for additional vehicle parking access while best segregating aircraft and vehicle traffic on airport movement areas

jet aircraft utilizing the airport and should strive to accommodate business jets to the greatest extent possible as demand dictates. Given the aircraft fleet mix expected to utilize the airport in the future, the alternative analysis will evaluate facility development that could meet ultimate RDC C-II-5000 standards on Runway 9-27. While an upgrade to RDC C-II may not be required or needed, if the requisite critical aircraft does present in the future, this analysis can offer steps to meet FAA design criteria. Furthermore, alternative analysis will also consider the potential impacts of improved instrument approach capabilities serving Runway 9-27. The surrounding mountainous terrain presents challenges to implementing instrument approach procedures at CXP; however, newer NexGen GPS and associated technologies may allow for such to occur. **Table 4A** summarizes the airfield safety areas for existing RDC B-II-5000 as well as RDC C-II-5000 standards for comparison.

TABLE 4A
Runway Design Standards
Carson City Airport

	Runway 9-27	
RUNWAY CLASSIFICATION		
Runway Design Code	Existing B-II-5000	C-II-5000
RUNWAY DESIGN		
Runway Width	75	100
Blast Pad Length x Width	150 x 95 (Both Runway Ends)	150 x 120 (Both Runway Ends)
RUNWAY PROTECTION		
Runway Safety Area (RSA)		
Width	150	500
Length Beyond Departure End	300	1,000
Length Prior to Threshold	300	1,000
Runway Object Free Area (ROFA)		
Width	500	800
Length Beyond Departure End	300	1,000
Length Prior to Threshold	300	1,000
Runway Obstacle Free Zone (ROFZ)		
Width	400	400
Length Beyond Departure End	200	200
Length Prior to Threshold	200	200
Approach Runway Protection Zone (RPZ)		
Length	1,000	1,700
Inner Width	500	500
Outer Width	700	1,010
Departure Runway Protection Zone (RPZ)		
Length	1,000	1,700
Inner Width	500	500
Outer Width	700	1,010
RUNWAY SEPARATION		
Runway Centerline to:		
Hold Position	200	250
Parallel Taxiway	240	300
Aircraft Parking Area	250	400

Note: All dimensions in feet
Source: FAA AC 150/5300-13A, Change 1, *Airport Design*

RUNWAY DESIGN CODE C-II-5000 SAFETY AREA CONSIDERATIONS

As discussed in Chapter Three, the design of airfield facilities includes both the pavement areas to accommodate landing and ground operations of aircraft, as well as the required safety areas to protect aircraft operational areas and keep them free of obstructions that could affect the safe operation of aircraft at the airport. The safety areas include the runway safety area (RSA), runway object free area (ROFA), runway obstacle free zone (ROFZ), and runway protection zone (RPZ). The applicable design standards for the runway system were previously outlined in Chapter Three. Because of the aviation demand forecasts developed for CXP in Chapter Two, prudent planning would suggest alternative analysis for RDC C-II-5000 standards be considered. As such, **Exhibit 4C** depicts RDC C-II-5000 safety areas on the existing runway environment.

Runway Safety Area

According to AC 150/5300-13A, Change 1, the FAA requires the RSA to be graded and stabilized 500 feet wide (centered on runway) and extend 1,000 feet beyond each runway end for RDC C-II design for take-off operations. Only 600 feet of RSA is needed prior to each threshold for landing operations.

Under RDC C-II-5000 design parameters at CXP, the RSA would extend over the drainage channels that run the length of Taxiways A and D. To meet standard, the drainage channels would need to be relocated. Moreover, the RSA would extend beyond the east end of Runway 27 and encompass a portion of the mining operation currently taking place on airport property. In the same fashion, an RSA that extends 1,000 feet west beyond the Runway 9 threshold would be penetrated by vegetation. Ultimately, the areas identified would need to be cleared and graded appropriately to conform with RDC C-II-5000 standards. In addition, the supplemental windcones currently serving Runways 9 and 27 would also penetrate the RSA and would need to be relocated to comply with C-II standards.

Runway Object Free Area

The FAA calls for the ROFA to be 800 feet wide, extending 1,000 feet beyond each runway end for RDC C-II design. Like the RSA, only 600 feet of ROFA is needed prior to the landing threshold.

Under these conditions, the supplemental windcones serving Runways 9 and 27 would also penetrate the ROFA. Although the supplemental windcones are mounted on frangible couplings, it is recommended that the supplemental windcones be relocated outside the ROFA in order to comply with RDC C-II standards. The ROFA would also extend over the on-airport mining operation to the east, and west over the north aircraft apron. In addition, a portion of the northwestern ROFA would extend off airport property, encompassing approximately 0.2 acres of unowned property consisting of an automobile parking lot. Vegetation penetrating the west end of the ROFA would also need to be cleared prior to conforming with RDC C-II standards. Finally, the north-central portion of the ROFA would be penetrated by two linear box hangars located approximately 370 and 385 feet from runway centerline. Similarly, the

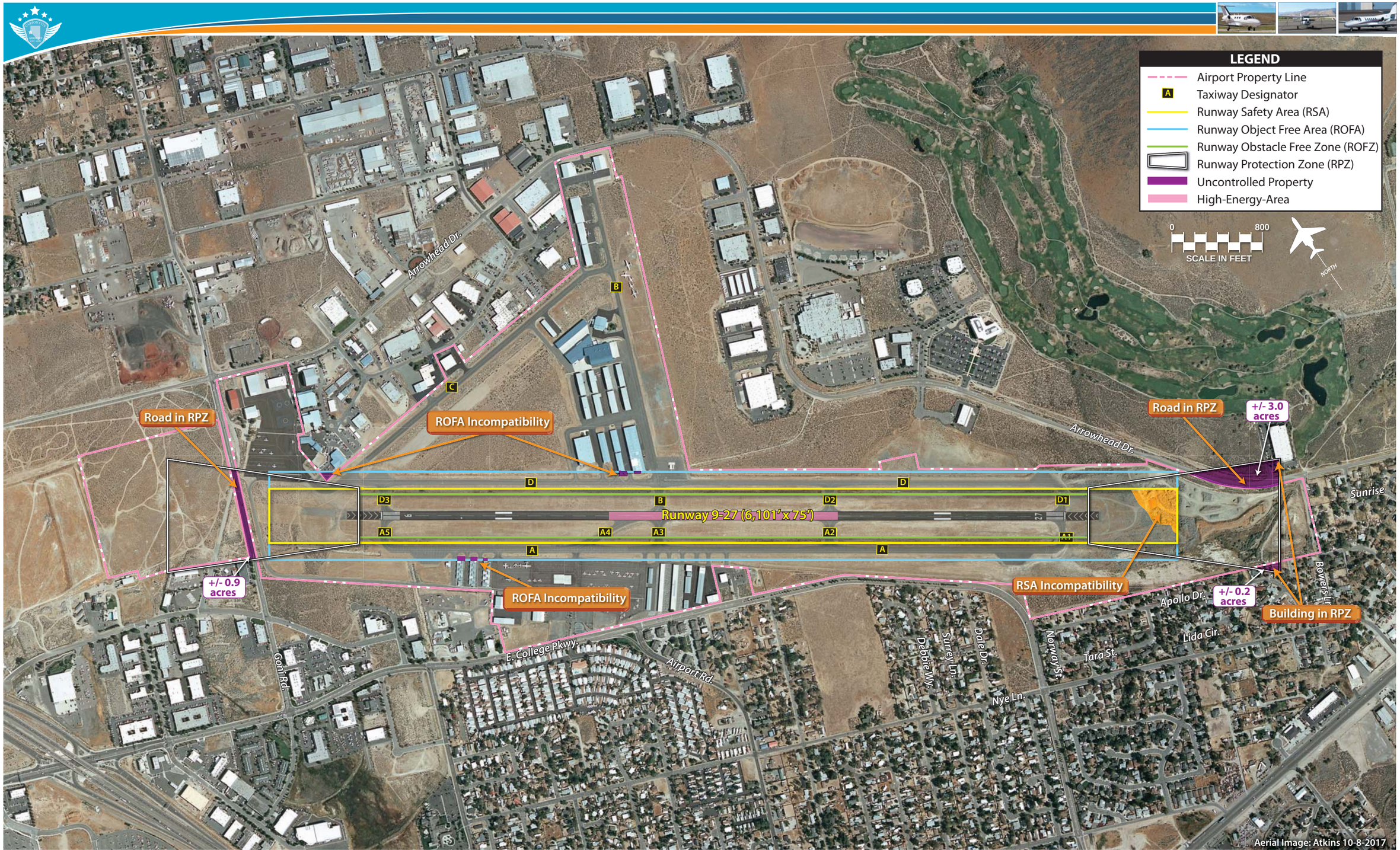

Exhibit 4C
RDC C-II AIRFIELD SAFETY AREA CONSIDERATIONS

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ROFA would be penetrated by three Port-A-Port hangar rows, one row being located approximately 365 feet from runway centerline, and two rows located approximately 385 feet from runway centerline. All ROFA incompatibilities would likely need to be resolved prior to implementing RDC C-II standards.

Runway Obstacle Free Zone

As discussed in Chapter Three, the FAA's criterion for runways utilized by aircraft weighing more than 12,500 pounds requires a clear ROFZ to extend 200 feet beyond the runway ends and 400 feet wide (200 feet on either side of the runway centerline). The ROFZ standards are met on Runway 9-27 except for the supplemental windcones serving each end of the runway. Like the RSA and ROFA, the supplemental windcones would need to be relocated out of the ROFZ as they are not fixed by their function.

Runway Protection Zone

FAA AC 150/5300-13A, Change 1, defines the RPZ as "*An area at ground level prior to the threshold or beyond the runway end to enhance the safety and protection of people and property on the ground.*" The goal of the RPZ standard is to increase safety for both pilots and people on the ground by maintaining the RPZ free of items that attract groupings of people or property.

The FAA has further divided the RPZ into two areas: the Central Portion of the RPZ and the Controlled Activity Area. The Central Portion of the RPZ extends from the beginning to the end of the RPZ, centered on the runway centerline. Its width is equal to the width of the ROFA. The Controlled Activity Area is the remaining area of the RPZ on either side of the Central Portion of the RPZ.

Where practical, airport owners should own the property under the runway approach and departure areas to at least the limits of the RPZ, and it is desirable to clear the entire RPZ of all above-ground objects. Where this is impractical, airport owners, at a minimum, should maintain the RPZ clear of facilities supporting incompatible activities. This especially applies to the Central Portion of the RPZ. Any change to the RPZ could require full compliance, including the acquisition of uncontrolled property, removal or rerouting of public roadways, and or the relocation of residential or commercial land uses.

The disposition of RPZs for each runway end should be considered individually. The FAA recommends that an airport have ownership of the RPZ lands where feasible. If outright ownership is not feasible, then easements can be acceptable. Easements in the RPZ should allow an airport to positively limit the height of structures and restrict incompatible uses from being located. A third option for protection of the RPZs that extend beyond airport property is implementation of strict land use zoning that, at a minimum, prohibits residential development or other incompatible development and restricts structure heights. This option is not always achievable, especially in urbanized locales due to existing zoning and personal property rights.

In the past, FAA guidance did not clearly identify all objects which could be located inside the RPZ except to qualify that the object could not be an attractant to a congregation of people. In newer guidance, however, the FAA stipulates that certain land uses are permissible without further evaluation, and other land uses will require further evaluation and ultimate FAA approval. Chapter Three outlined the updated guidance provided in AC 150/5300-13A, Change 1, and *Interim Guidance on Land Uses within a Runway Protection Zone* (September 27, 2012).

If an airport cannot fully control the entirety of the RPZ, the RPZ land use standards have recommendation status for that portion of the RPZ not controlled by the airport owner. In essence, this means that the FAA can require a change to the runway environment so the entirety of the RPZ can be properly secured. The FAA has always held that residences, businesses, and similar uses should be excluded from the RPZ, although this objective was not uniformly enforced. Objects such as public roads have been allowed under previous guidance unless it posed an airspace obstruction; however, FAA's current guidance does not readily allow for public roads in the RPZ as they have to be evaluated and approved on a case-by-case basis.

As previously discussed in Chapter Three, since the new RPZ guidance addresses new or modified RPZs, existing incompatibilities may be grandfathered under certain conditions. For example, roads that are in the current RPZ are typically allowed to remain as grandfathered unless the runway environment changes. As such, an upgrade to RDC C-II-5000 standards would necessitate a change to the RPZs serving Runway 9-27. Under C-II standards, each RPZ would expand to 500 feet wide at the inner portion, 1,010 feet wide at the outer portion, and 1,700 feet in overall length beginning 200 feet prior to the landing threshold.

Although the RPZ serving Runway 9 would remain on airport property, it would ultimately extend across Goni Road and Wedco Way as depicted on **Exhibit 4C**. Each road would traverse the central portion of the RPZ. In addition, the RPZ would lie atop a portion of the north apron. The RPZ serving Runway 27 would contain a portion of the on-airport mining operation taking place at the east end of the airfield. Furthermore, the RPZ would extend northeast beyond airport property, encompassing approximately 3.0 acres of uncontrolled property, a portion of Arrowhead Drive, and a parking lot serving an adjacent building. Likewise, the southeast portion of the RPZ would extend beyond airport property, encompassing approximately 0.2 acres of uncontrolled property as well as residential property. To conform with ultimate RDC C-II standards, all RPZ incompatibilities identified would need to be reviewed and approved with the potential for mitigation measures prior to approval.

RUNWAY 9-27 EXTENSION ALTERNATIVES

The runway length analysis conducted in the previous chapter concluded that the existing length of Runway 9-27 does not fully provide for all jet activity, especially during hot weather conditions and when jet aircraft are carrying useful loads of greater than 70 percent. A length of 6,700 feet was identified as the ideal length to accommodate 75 percent of the business jet fleet at 60 percent useful load.

A series of alternatives have been prepared to examine the potential impacts of extending Runway 9-27 in accordance with RDC B-II-5000 design criteria. Consideration was given to an extension with associated RDC C-II standards, but the requisite and significantly enlarged RSA and OFA would require substantial cost items, making the alternative impractical. As examples, the mining area would need to be filled and stabilized up to be only a maximum two percent grade down from end of pavement. Homes to the east and southeast would likely need to be acquired with residents moved. Goni Road and Wedco Way would need to be relocated much farther west. These items would likely prove cost-prohibitive to implement.

An extension to the east or west would be challenging due to various constraining issues that need to be weighed. From a physical standpoint, any runway extension alternatives need to also include the associated impacts on the taxiway system and navigational aids and lighting systems. A runway extension also needs to consider the associated safety areas and RPZs. Land within the RSA needs to be cleared and graded to meet FAA design standards, and RPZs need to be cleared of incompatible land uses.

Constraining factors to consider include Goni Road and Wedco Way to the east and Arrowhead Drive, the on-airport mining operation, residential, and commercial property to the west. Public roadways are considered incompatible land uses within the RPZ, so an extension of the runway to the east or west could require the rerouting of Goni Road, Wedco Way, or Arrowhead Drive. Residential and commercial property are also incompatible land uses and a runway extension may result in a need to purchase and relocate affected homes and/or businesses.

Runway 9-27 Alternative 1

Alternative 1, presented on **Exhibit 4D**, considers extending Runway 9-27 by 600 feet to the east for a runway length of 6,701 feet. As depicted, this alternative would ultimately shift the RPZ beyond the airport property boundary, encompassing approximately 0.8 acres of uncontrolled property as well as a portion of Arrowhead Drive. As presented, this alternative considers the acquisition of uncontrolled airport property and rerouting of Arrowhead Drive. Rerouting public roads such as Arrowhead Drive would introduce significant cost to the project and could result in potentially significant environmental impacts. In addition, the RSA, ROFA, and ROFZ would also extend to the east over the on-airport mining operation. All safety area incompatibilities would need to be mitigated prior to construction of a runway extension.

Actions associated with this alternative include:

- Acquisition of approximately 0.8 acres of property to protect the RPZ, including the rerouting of Arrowhead Drive.
- Mitigate safety area incompatibilities associated with the RSA, ROFA, and ROFZ.
- Rerouting of the perimeter service road.
- Extension of the runway's medium intensity runway lighting system (MIRL).
- Extension of Taxiways A and D to the ultimate Runway 27 threshold, including the medium intensity taxiway lighting (MITL) system and airfield signage.

Runway 9-27 Alternative 2

As presented on **Exhibit 4D**, Alternative 2 considers extending Runway 9-27 by 600 feet to the west for a runway length of 6,701 feet. With the full extension to the west, the issue becomes public roadways, which are now generally considered incompatible land uses. Although the RPZ serving the ultimate Runway 9 would remain on airport property, it would be traversed by Goni Road and Wedco Way. The ultimate RSA, ROFA, and ROFZ would remain on airport property and clear of incompatibilities with the exception of vegetation on the west side of the airfield. To meet FAA design standards, Goni Road and Wedco Way would need to be relocated to the west and all safety areas cleared and graded.

Actions associated with this alternative include:

- Relocating Goni Road and Wedco Way to the west, out of the ultimate Runway 9 RPZ.
- Clearing and grading of the RSA, ROFA, and ROFZ associated with the extended runway.
- Extension of the runway's MIRL.
- Extension of Taxiways A and D to the ultimate Runway 9 threshold, including the MITL and airfield signage.

Runway 9-27 Alternative 3

Alternative 3 considers a split extension to Runway 9-27, maximizing the runway's potential length, while limiting impacts on the surrounding constraints as much as possible. Like Alternative 2, this alternative considers a 600-foot extension to the west. Although Goni Road and Wedco Way may be required to be relocated to the west and out of the ultimate RPZ, the airport could maintain full ownership of the ultimate RPZ. Moreover, the extended RSA, ROFA, and ROFZ could readily be cleared of vegetation and graded to meet FAA standards. This alternative also considers a runway extension of 200 feet to the east, for an ultimate runway length of 6,901 feet. The shorter extension to the east would keep the RPZ from extending over several residential properties, and the RSA, ROFA, and ROFZ would remain clear of the on-airport mining operation. To fully protect the RPZs serving ultimate Runway 9-27, this alternative may require the acquisition of approximately 0.2 acres and the relocation of Arrowhead Drive, Goni Road, and Wedco Way.

Actions associated with this alternative include:

- Acquisition of approximately 0.2 acres and the relocation of Arrowhead Drive, Goni Road, and Wedco Way.
- Clearing and grading of the RSA, ROFA, and ROFZ associated with the extended runway.
- Extension of the runway's MIRL.
- Extension of Taxiways A and D to the ultimate Runway 9 and 27 thresholds, including the MITL and airfield signage.
- Rerouting of the perimeter service road.

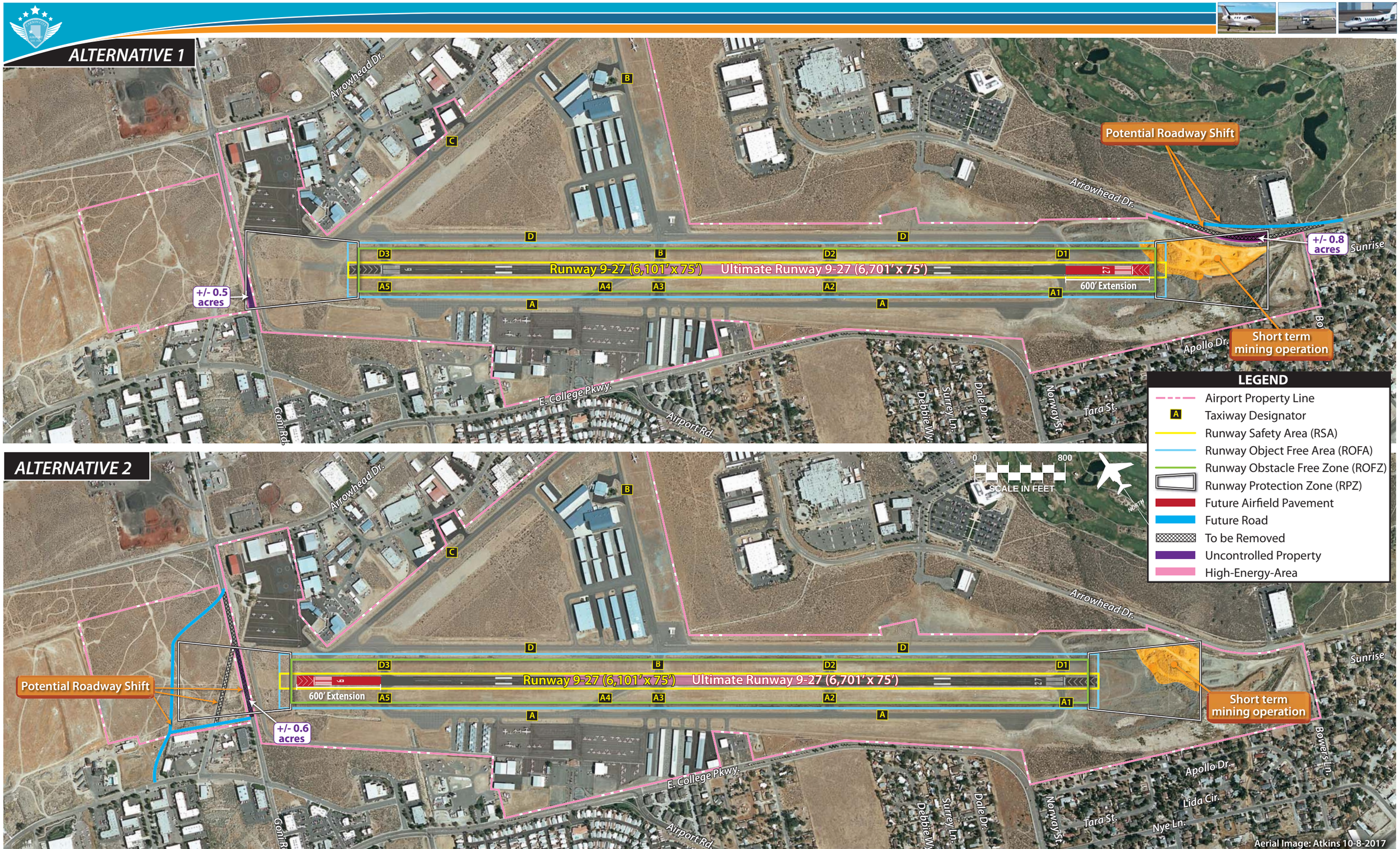
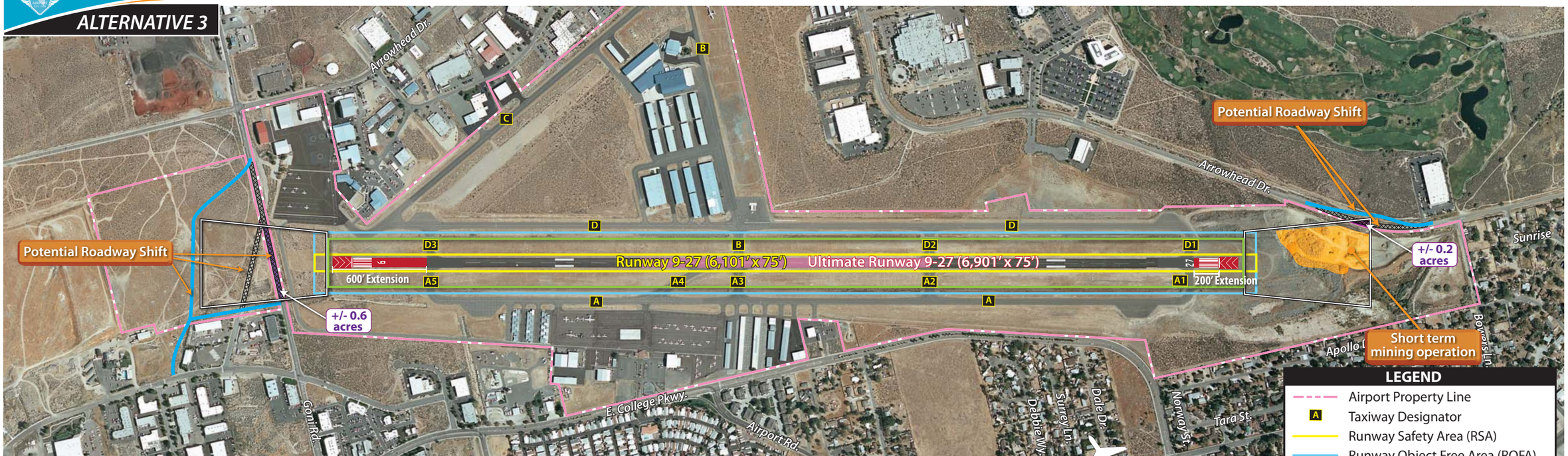
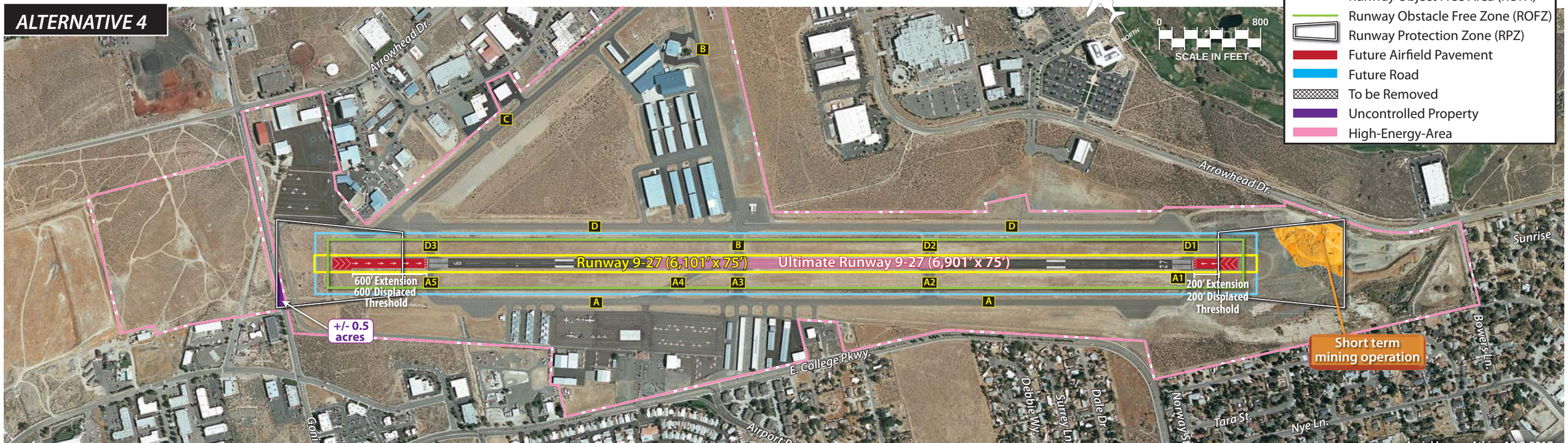


Exhibit 4D
RUNWAY EXTENSION ALTERNATIVES

ALTERNATIVE 3



ALTERNATIVE 4



LEGEND

- Airport Property Line
- A Taxiway Designator
- Runway Safety Area (RSA)
- Runway Object Free Area (ROFA)
- Runway Obstacle Free Zone (ROFZ)
- Runway Protection Zone (RPZ)
- Future Airfield Pavement
- Future Road
- To be Removed
- Uncontrolled Property
- High-Energy-Area

NORTH

0 800
SCALE IN FEET

Exhibit 4D
RUNWAY EXTENSION ALTERNATIVES

Runway 9-27 Alternative 4

Alternative 4 examines the maximum possible Runway 9-27 length without the need for property acquisition. As shown on **Exhibit 4D**, this alternative considers an ultimate runway length of 6,901 feet with a 600-foot extension to the west and a 200-foot extension to the east, like Alternative 3. However, this alternative utilizes displaced runway thresholds and declared distances to eliminate any property acquisition and or public road relocation associated with a runway extension. In doing so, the implementation of declared distances will ensure that the ultimate approach and departure RPZs serving Runway 9-27 remain in their existing locations.

Declared distances represent the maximum distances available and suitable for meeting takeoff, rejected takeoff, and landing distance performance requirements for turbine powered aircraft. Declared distances include takeoff run available (TORA) and takeoff distance available (TODA), which apply to takeoff; accelerate stop distance available (ASDA), which applies to a rejected takeoff; and landing distance available (LDA), which applies to landing. Each declared distance can be defined as follows:

- TORA: the distance to accelerate from brake release to lift-off, plus safety factors.
- TODA: the distance to accelerate from brake release past lift-off to takeoff climb, plus safety factors.
- ASDA: the distance to accelerate from brake release to takeoff decision speed and then decelerate to a stop, plus safety factors.
- LDA: the distance from the threshold to complete the approach, touchdown, and decelerate to a stop, plus safety factors.

Ultimate declared distances imposed on Runway 9-27 for Alternative 4 are presented on **Exhibit 4D** and **Table 4B**.

Actions associated with this alternative include:

- Clearing and grading of the RSA, ROFA, and ROFZ associated with the extended runway.
- Extension of the runway's MIRL.
- Extension of Taxiways A and D to the ultimate Runway 9 and 27 thresholds, including the MITL and airfield signage.
- Rerouting of the perimeter service road.

TABLE 4B
Runway 9-27 Declared Distances
Carson City Airport

Category	Runway 9	Runway 27
LDA	6,301'	6,701'
ASDA	6,901'	6,901'
TORA	6,701'	6,301'
TODA	6,901'	6,901'

LDA: Landing Distance Available
ASDA: Accelerate Stop Distance Available
TORA: Takeoff Run Available
TODA: Takeoff Distance Available
Source: Coffman Associates' analysis.

INSTRUMENT APPROACH CONSIDERATIONS

The instrument approach capability at an airport is an important consideration that directly impacts the utility of the airport, with lower visibility minimums increasing the utility of an airport. From an economic development standpoint, it is important to achieve the lowest possible visibility minimums. The best

approach minimums possible will prevent aircraft from having to divert to another airport, which can create additional operating costs and time delays for aircraft operators, their passengers, as well as on-airport businesses.

CXP is currently equipped with an area navigation (RNAV) global positioning system (GPS) approach, which provides visibility minimums down to 1¼-mile and cloud ceilings of 1,198 feet above ground level (AGL) on Runway 27. Runway 9-27 is also served by a circling RNAV GPS instrument approach that also provides visibility minimums down to 1¼-mile and cloud ceilings of 1,675 feet AGL. It should be noted, however, that all instrument approach procedures currently serving CXP are not approved for night-time operation.

Because of forecast fleet mix demands and stakeholder development considerations, the following analysis examines improved visibility minimums on each end of Runway 9-27 at CXP. The dimensions of the RPZ will change if the instrument approach capabilities are improved with lower minimums. **Table 4C** presents the dimensions of the RPZs based upon the various approach visibility minimums. The alternative analysis presented on **Exhibit 4E** examines potential RPZ impacts to Runway 9-27 based upon improved instrument approach capabilities.

TABLE 4C
Runway Protection Zones

	Instrument Approach Capabilities		
Visibility Minimum	≥ 1-Mile	≥ ¾-Mile	< ¾-Mile
Approach Runway Protection Zone			
Inner Width	500	1,000	1,000
Outer Width	700	1,510	1,750
Length	1,000	1,700	2,500
Departure Runway Protection Zone			
Inner Width	500	500	500
Outer Width	700	700	700
Length	1,000	1,000	1,000

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

Runway 9 Alternative 1: Not Lower Than ¾-Mile

This alternative, presented on **Exhibit 4E**, illustrates the RPZ impacts to Runway 9 for an instrument approach providing visibility minimums of not lower than ¾-mile. Ultimately, the approach RPZ would expand to encompass a total acreage amount of 48.98 acres. Of this area, approximately 6.3 acres would extend beyond airport property. In addition, the Controlled Activity Area on the north side of the RPZ would extend over a commercial use building and its adjoining automobile parking lot as well as a portion of the north aircraft apron. The Controlled Activity Area located on the south side of the RPZ would contain five commercial buildings and their supporting automobile parking lots. It is also important to note that Goni Road and Wedco Way would traverse the entirety of the RPZ, including the Central Portion.

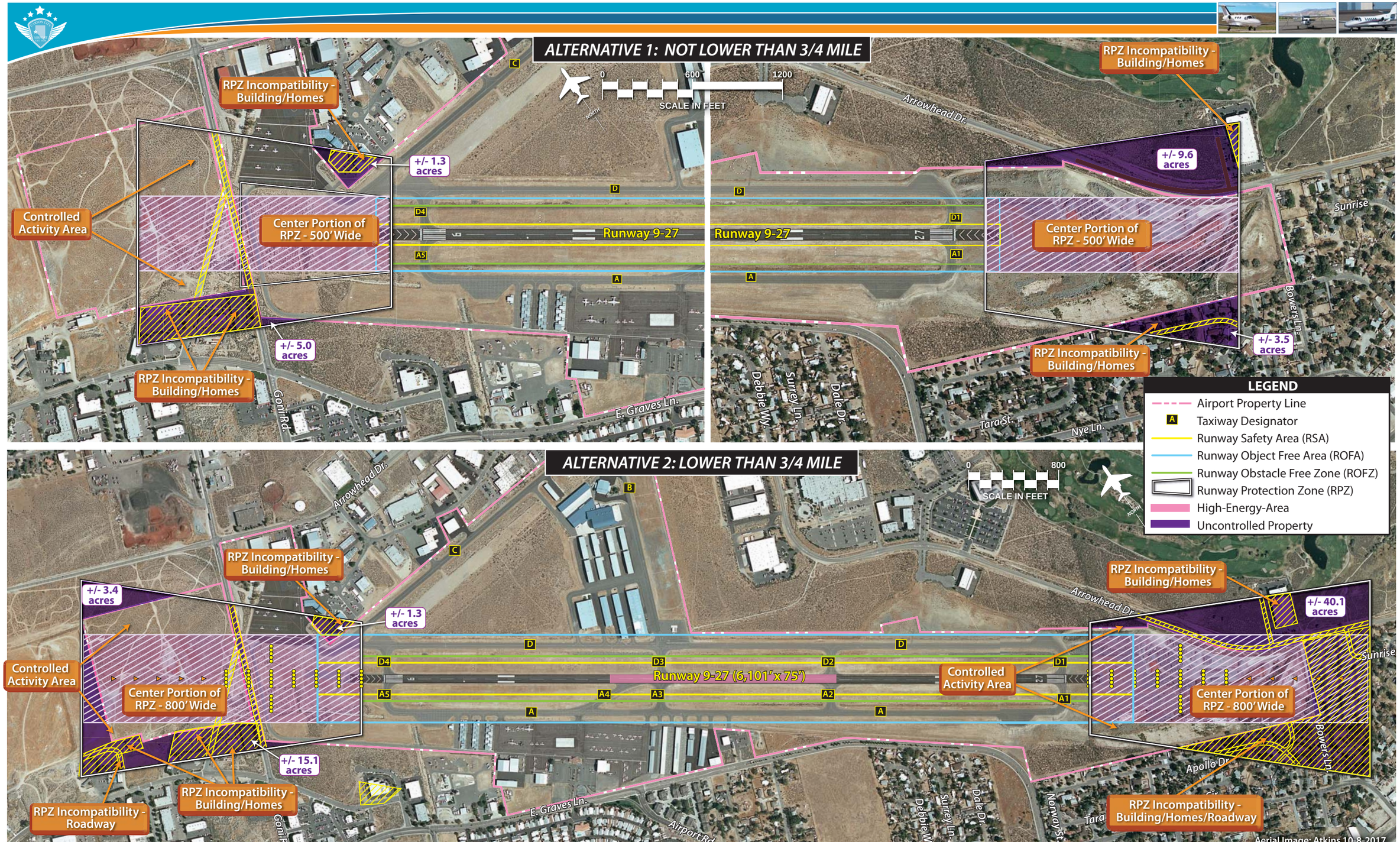


Exhibit 4E
IMPROVED INSTRUMENT APPROACH CONSIDERATIONS

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Runway 27 Alternative 1: Not Lower Than ¾-Mile

Like Runway 9, the RPZ serving Runway 27 would also be expanded to include a total acreage amount of 48.98 acres for an instrument approach providing visibility minimums of not lower than ¾-mile. Under these conditions, the RPZ would extend off airport property, encompassing approximately 13.1 acres of uncontrolled property. The Controlled Activity Area on the north side of the RPZ would contain a portion of Arrowhead Drive, an access road, an automobile parking lot serving a commercial building, as well as a portion of the commercial building itself. Furthermore, the Controlled Activity Area on the south side of the RPZ would include multiple homes and a portion of Apollo Drive in the residential area. Under this scenario, the Central Portion of the RPZ would remain on airport property and clear of any foreseeable incompatibilities.

Runway 9-27 Alternative 2: Lower Than ¾-Mile

As presented on **Exhibit 4E**, Alternative 2 examines the impacts of an instrument approach offering visibility minimums lower than ¾-mile on Runway 9-27. Under these conditions, safety area impacts not only affect the RPZs serving each runway end, but also the RSA and ROFA. For an RDC B-II runway with an instrument approach offering visibility minimums lower than ¾-mile, the RSA is 300 feet wide and the ROFA is 800 feet wide. Both the RSA and ROFA extend 600 feet beyond each runway end under these conditions. The ROFZ remains unchanged.

Moreover, a precision instrument approach such as this introduces the concept of the precision obstacle free area (POFZ). The POFZ is defined as "a volume of airspace above an area beginning at the runway threshold, at the threshold elevation, and centered on the extended runway centerline, 200 feet long by 800 feet wide." The POFZ is only in effect when the following operational conditions are met:

I. Vertically-guided approach
II. Reported ceiling below 250 feet and/or visibility less than ¾ of a statute mile
III. An aircraft on final approach within two miles of the runway threshold

When these conditions are met, aircraft holding for take-off must hold in such a position so that neither the fuselage nor the tail of the aircraft penetrates the POFZ. However, the wings of the aircraft can penetrate the surface.

Given the multitude of safety area impacts associated with a precision instrument approach, Alternative 2 depicts Runway 9-27 in its entirety with all associated safety areas. As shown on the exhibit, the ultimate RSA and POFZ appear to be clear of all obstructions. Since the ROFZ remains unchanged in this scenario, the only obstructions would be the existing supplemental windcones serving Runways 9 and 27 as noted in Chapter Three. The northwestern portion of the ultimate ROFA would extend off airport property, encompassing approximately 0.2 acres of unowned property as well as a portion of an adjacent parking lot. Vegetation penetrating the southwest corner of the ROFA would also need to be cleared prior to implementation of the approach. Furthermore, the north-central portion of the ROFA would be

penetrated by two linear box hangars located approximately 370 and 385 feet from runway centerline. Similarly, the ROFA would be penetrated by the Port-A-Port hangar rows, one row being located approximately 365 feet from runway centerline, and two rows located approximately 385 feet from runway centerline. All ROFA incompatibilities would need to be resolved prior to implementation of a precision instrument approach.

In this alternative, the RPZ serving Runway 9 would be expanded to include a total of 78.91 acres. Of the total acreage, approximately 19.8 acres would extend off airport property. The Controlled Activity Area on the north side of the RPZ would contain a commercial building, the adjoining automobile parking lot, and a portion of the north aircraft apron. The Controlled Activity Area serving the south side of the RPZ would extend over a several commercial buildings, automobile parking lots, and access roads. It should be mentioned that the entirety of the RPZ is traversed by Goni Road and Wedco Way, including the Central Portion of the RPZ. In addition, the northeastern corner of the Central Portion of the RPZ also contains a portion of automobile parking lot.

Like the RPZ serving Runway 9, the RPZ serving Runway 27 would also be expanded. Ultimately, the RPZ serving Runway 27 would extend off airport property, encompassing a total of 40.1 acres of uncontrolled property. Under this scenario, the RPZ serving Runway 27 would be traversed by numerous public roadways including Arrowhead Drive, an automobile access road serving a commercial building, as well as multiple residential streets and homes. The Controlled Activity Areas serving the north and south sides of the RPZ as well as the Central Portion of the RPZ would include a significant amount of residential and commercial property.

An approach lighting system in the form of a medium intensity approach lighting system with runway alignment indicator lights (MALSR) is needed to achieve an approach providing less than ¾-mile visibility minimums. This approach lighting system begins 200 feet from the landing threshold and extends approximately 2,400 feet in the approach area. As such, **Exhibit 4E** designates a MALSR for each runway end.

Instrument Approach Analysis Summary

In addition to the RPZs, the determination of airspace obstructions that may be associated with these improved approach procedures would need to be further evaluated. The two primary resources for determining airspace obstructions are Title 14 Code of Federal Regulations (CFR) Part 77, *Objects Affecting Navigable Airspace* and *Terminal Instrument Procedures* (TERPS). Part 77 is a filter which identifies potential obstructions, whereas TERPS is the critical tool in determining actual flight obstructions, as its analysis is used to evaluate and develop instrument approach procedures, including visibility minimums and cloud heights associated with approved approaches.

Further determination by the FAA would be needed to determine the extent of removing or lowering potential obstructions that may exist to support an instrument approach procedure that could serve ultimate conditions proposed on Runway 9-27. The FAA has also set forth other various conditions and

criteria for a runway to achieve lower visibility minimums. These conditions and criteria are outlined in **Table 4D**.

TABLE 4D
Standards for Instrument Approach Procedures

Criteria	Visibility Minimums	
	¾-mile to < 1 Mile	< ¾-mile
HATh	≥ 250 feet	<250 feet
TERPS GQS	Clear	Clear
PA final approach surfaces	Not Required	Clear
POFZ (PA & APV only)	Not Required	Required
TERPS Chapter 3, Section 3	20:1 Clear	34:1 Clear
ALP	Required	Required
Minimum Runway Length	3,200 feet	4,200 feet (paved)
Runway Markings	Non-precision	Precision
Holding Position Signs & Markings	Non-precision	Precision
Runway Edge Lights	HIRL/MIRL	HIRL/MIRL
Parallel Taxiway	Required	Required
Approach Lights	Recommended	MALSR, SSALR, or ALSF
Applicable Runway Design Standards, e.g. OFZ	≥ ¾-statute mile approach visibility minimums	< ¾-statute mile approach visibility minimums
Threshold Siting Criteria to be Met	20:1 Clear	34:1 Clear
Survey Required	VGS (PA & APV)/NVGS	VGS

HATh – Height Above Threshold
TERPS – United States Standard for Terminal Instrument Procedures
GQS – Glide Path Qualification Surface
OFZ – Obstacle Free Zone
PA – Precision Approach
POFZ – Precision Obstacle Free Zone
ALP – Airport Layout Plan
HIRL – High Intensity Runway Lights
MIRL – Medium Intensity Runway Lights
MALSR – Medium Intensity Runway Lights with Runway Alignment Indicator Lights
SSALR – Simplified Short Approach Lighting System with Runway Alignment Indicator Lights
ALSF – Approach Lighting System with Sequenced Flashing Lights
VGS – Vertically Guided Survey
NVGS – Non-Vertically Guided Survey
APV – Approach with Vertical Guidance
Source: FAA Advisory Circular 150/5300-13A, *Airport Design*

Due to advancements in technology associated with instrument approach procedures, the proposed instrument approach options would require minimal enhancements to ground-based navigational aids, as these runway ends are currently served by GPS technologies. For Runway 9-27, the option of lowering visibility minimums below ¾-mile would require the installation of a MALSR, which can cost approximately $2 million to install. However, it should be noted that over 90 percent of the total cost could be eligible for FAA/NDOT grant funding.

As previously detailed, any change to the runway environment that includes a new or revised instrument approach procedure that increases the RPZ dimensions is subject to a further evaluation of the RPZs meeting updated guidance from the FAA. If an airport cannot fully control the entirety of the RPZ from

being free of incompatible land uses, the FAA can require a change to the runway environment to properly secure the RPZs. If enhanced instrument approach procedures are pursued on either runway end at the airport, it is important that airport management properly coordinate with the FAA to ensure full use of the runway being affected.

TAXIWAY DESIGN

Taxiway design has historically followed the critical aircraft utilizing the runway and taxiway system. Common design issues have included parallel taxiway separation from the runway, taxiway width, and overall system efficiency. FAA AC 150/5300-13A, Change 1, *Airport Design*, instituted new design standards for taxiways, some of which impact planning for CXP. Most of the new or updated standards were enacted to mitigate the potential for runway incursion events. Changes were also aimed at improving pilot situational awareness. The FAA has indicated that all airfields should be planned to meet these standards. Actual changes will be made over time as grant funding is made available.

A new taxiway design standard put into place under AC 150/5300-13A, Change 1, is the prohibition of direct access between an aircraft parking area and a runway. As such, the FAA recommends constructing "no-taxi islands" or re-routing or removing the taxiways and replacing them in a location that does not provide direct access. No-taxi islands can be developed using markings around the island, green paint to identify the island, and lighting around the island; or, the islands can be developed by removing the pavement altogether. Either option will present an obstruction which will require a pilot to navigate a turn prior to entering a runway environment. The stated goal is to promote higher situational awareness in the cockpit to minimize unintended runway incursions.

FAA design standards also present a new concept of a runway's "high-energy area." The high-energy area is defined as the middle third of a runway and is typically the location where aircraft are moving rapidly for takeoff or landing. It is this area where aircraft are more vulnerable to accidents with other aircraft crossing through as they cannot readily slow or stop to avoid impacts. FAA guidance highly discourages the location of taxiways which route aircraft across a runway through the high-energy area.

TAXIWAY GEOMETRY ALTERNATIVES

CXP is served by two full-length parallel taxiways on the north (Taxiway B) and south (Taxiway A) sides of Runway 9-27, as well as nine entrance/exit taxiways. While the existing taxiway system meets certain standards outlined in the AC, there are some issues that should be addressed. The following are the taxiway geometry concerns on the airfield:

- Direct access provided from Taxiway B to Runway 9-27;
- Direct access from the taxilane serving general aviation (GA) hangars to Runway 9-27 via Connector A3;
- Connector A4 is acutely angled and noncompliant with current standards; and
- Connector A3 to Taxiway B and Connectors A2 to D2 provide runway crossings through the high-energy area.

Given the complexity of the exiting taxiway system serving CXP, each taxiway interrelates and affects the development potential of the others. Therefore, all taxiway geometry issues are examined individually. Each alternative (or combination thereof) can then be coordinated to ensure the functionality of the ultimate taxiway system.

Taxiway A Alternative Considerations

Currently, Taxiway Connector A3 provides direct access to Runway 9-27 from the taxilane serving hangar units to the south. As discussed, the FAA has expressed concern regarding taxiway linkage as a direct access route to a runway, which should be considered for modification. Another concern regarding Taxiway A is the location of the runway crossings provided from Taxiway Connector A3 to Taxiway B, and Connectors A2 to D2, which are located within the runway's high-energy area. Furthermore, Taxiway Connector A4 is acutely angled to Runway 9-27 and is oriented at less than 90 degrees perpendicular to the runway, ultimately limiting visibility of the runway environment. Taxiway A4 is generally termed a "high-speed" exit, which are common for commercial service airport; however, FAA's updated geometry recommends avoiding these layouts where practical and implementing them only when adequate capacity concerns suggest their use.

Alternatives aimed at improving the design issues associated with Taxiway A are graphically presented on **Exhibit 4F**. It should be noted that the implementation of a no-taxi island was considered as a potential alternative for the direct access issue associated with Taxiway A; however, it is not further explored as the direct access linkage does not involve an apron area.

Taxiway A Alternative 1

As presented on **Exhibit 4F**, Alternative 1 considers the removal and relocation of Taxiway Connectors A2 and A3 to the east. Ultimately, removal and relocation of Connectors A2 and A3 would eliminate the direct access and high-energy crossing associated with Connector A3 as well as the high-energy runway crossing provided from Connector A2 to D2. In addition, this alternative also considers the removal, relocation, and straightening of Taxiway Connector A4 to 90 degrees perpendicular to Runway 9-27.

Taxiway A Alternative 2

Like Alternative 1, Alternative 2 examines the removal, relocation, and straightening of Taxiway Connector A4 to 90 degrees perpendicular to Runway 9-27. Connector A4 is proposed to remain in its existing location. This alternative also considers the removal of existing Connectors A2 and A3, eliminating all direct access and high-energy crossings associated with Runway 9-27. In their place, a single taxiway connector could be located equidistant between existing Connectors A2 and A3.

Taxiway A Alternative 3

To address direct access, high-energy runway crossings, and acute angle taxiway geometry issues associated with Taxiway A, Alternative 3 considers the removal of Connectors A2 and A3. In their place, a single taxiway connector serving Runway 9-27 could be constructed east of the existing Connector A2. Furthermore, Connector A4 could be straightened to 90 degrees perpendicular to Runway 9-27 in its current location to preserve existing pavement.

Taxiway B and D Alternative Considerations

In their existing configuration, Taxiways B and D provide direct access to Runway 9-27 as well as a crossing through the high-energy area. Direct access to Runway 9-27 is provided via Taxiway B, while high-energy runway crossings are provided from Taxiway B to Connector A3 and Connectors D2 to A2. Alternatives to mitigate existing taxiway geometry incompatibilities associated with Taxiways B and D are presented on **Exhibit 4G**. Like the alternative taxiway design considerations associated with Taxiway A, the implementation of a no-taxi island to mitigate direct access associated with Taxiways B and D is not further considered given the lack of apron area. As such, each alternative considers the removal and relocation of taxiway connectors to mitigate all direct access and high-energy runway crossing incompatibilities.

Taxiway B and D Alternative 1

Upon removal of Connector D2 and the Taxiway B Connector, a single taxiway connector could be constructed equidistant between existing Connectors D2 and Taxiway B Connector. Ultimately, this alternative would mitigate all taxiway geometry incompatibilities associated with Taxiways B and D while remaining a cost-effective option as only one new taxiway connector will be constructed.

Taxiway B and D Alternative 2

Alternative 2 considers the removal and relocation of Connector D2 farther to the east and the Taxiway B Connector to the west. Contrary to Alternative 1, this alternative will provide access points between Taxiway D and Runway 9-27 equal to the current taxiway layout, albeit less efficient than the existing configuration.

Taxiway B and D Alternative 3

This alternative examines the removal and relocation of Connector D2 and the Taxiway B Connector, placing a new connector immediately east of existing Taxiway B Connector, and another new connector farther west, like the western connector placement in Alternative 2. Taxiway connector placement in

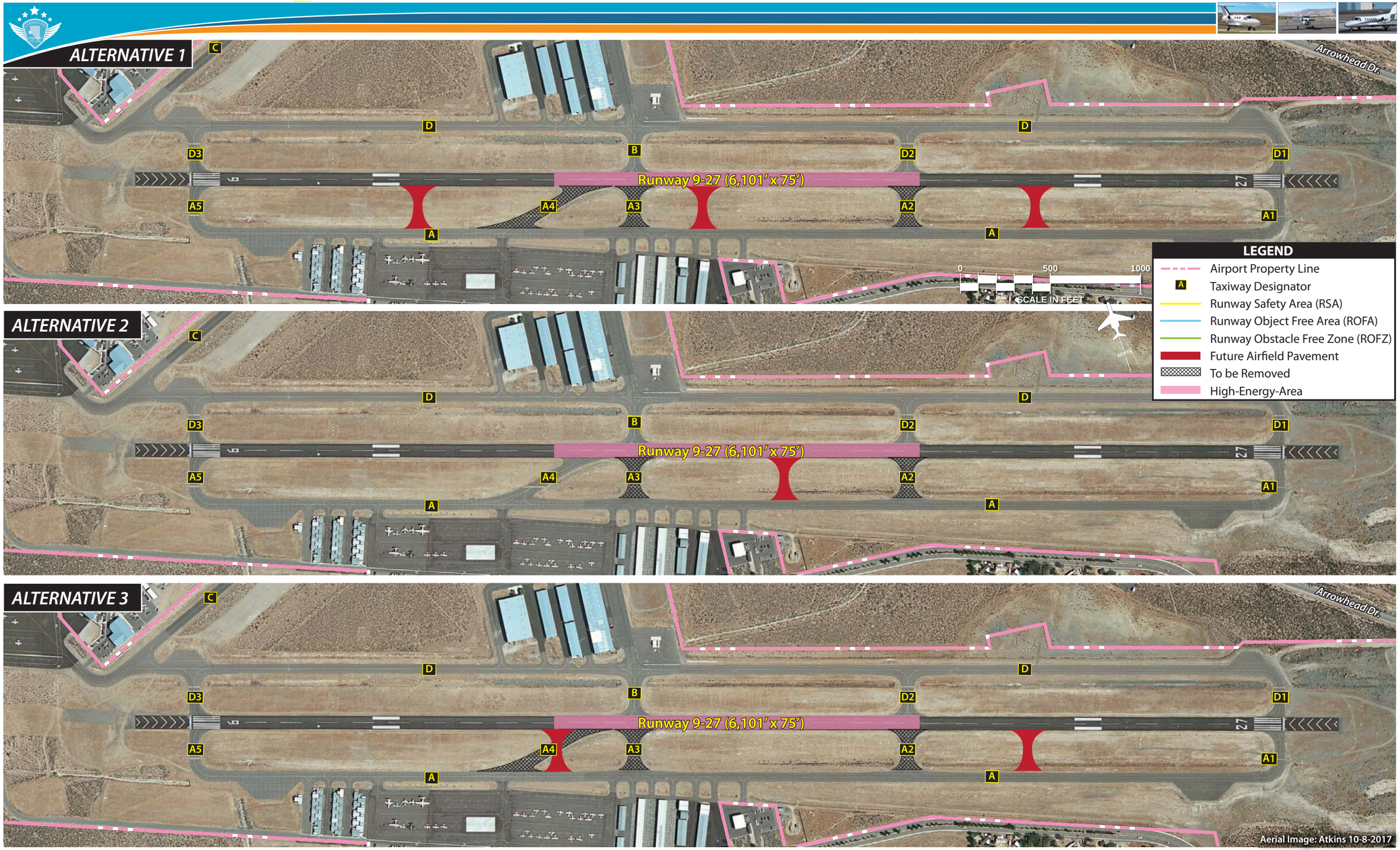


Exhibit 4F
TAXIWAY A ALTERNATIVES

Exhibit 4G
TAXIWAYS B AND D ALTERNATIVES

this alternative would provide midfield runway access most like the existing configuration while complying with all taxiway geometry standards.

Taxiway C and D Intersection Alternative Considerations

The existing intersection of Taxiways C and D converges on the north and west sides of Runway 9-27, near the north aircraft apron. In its current condition, the taxiway providing access to the north aircraft apron must curve to the south and immediately north to remain on airport property and maintain taxiway safety area (TSA) and taxiway object free area (TOFA) design standards. Under airplane design group (ADG) II standards, the TSA is 79 feet wide and the TOFA is 131 feet wide. Ideally, the taxiway providing access to the north aircraft apron would remain in line with existing full-length parallel Taxiway D. As such, alternative options to remedy the existing taxiway alignment are presented in the figures below.

Taxiway C and D Alternative 1

Alternative 1, presented in **Figure 4A**, examines an extension of the existing Taxiway D to the west, which would ultimately align with the north aircraft apron. Under this scenario, the proposed taxiway, TSA, and TOFA would extend off airport property, encompassing approximately 0.1 acres of unowned property which is being utilized as an automobile parking lot. To meet ultimate TSA and TOFA design requirements, portions of the existing automobile parking lot would need to be removed or relocated.

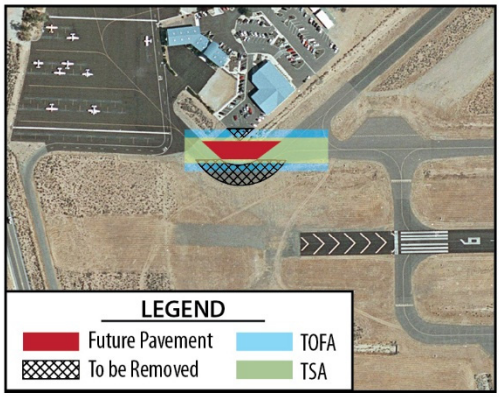


Figure 4A

Taxiway C and D Alternative 2

As presented in **Figure 4B**, Alternative 2 also proposes an extension of existing Taxiway D to the west connecting directly with the north aircraft apron. This option would also encompass approximately 0.1 acres of unowned airport property and require clearing of the ultimate TSA and TOFA to meet taxiway design standards. In addition, the taxiway configuration in this alternative considers a connector providing access to ultimate Runway 9-27 extended 600 feet to the west.

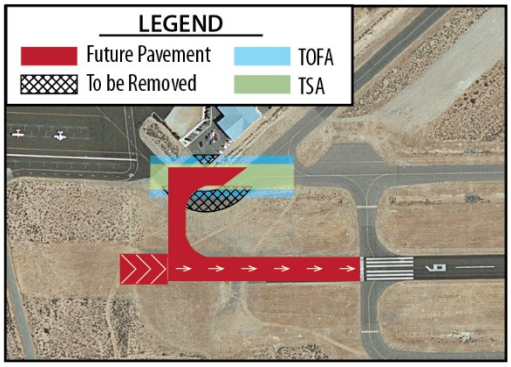


Figure 4B

Taxiway C and D Alternative 3

As presented in Alternatives 1 and 2, unowned airport property and the ultimate TSA and TOFA requirements would also apply to Alternative 3 as they relate to the extension to parallel Taxiway D to the west; however, this alternative, depicted in **Figure 4C**, considers relocating the intersection of Taxiways C and D to the east and removing the remainder Taxiway C to the west. In doing so, the existing hold apron serving Runway 9, along Taxiway D, could be replaced with a standard hold apron consistent with updated FAA guidance. This guidance recommends that hold aprons be designed to allow aircraft to bypass one another to taxi to the runway. Under this concept, each parking area on the hold apron is independent, with the ability for aircraft to bypass others both on entrance and exit.

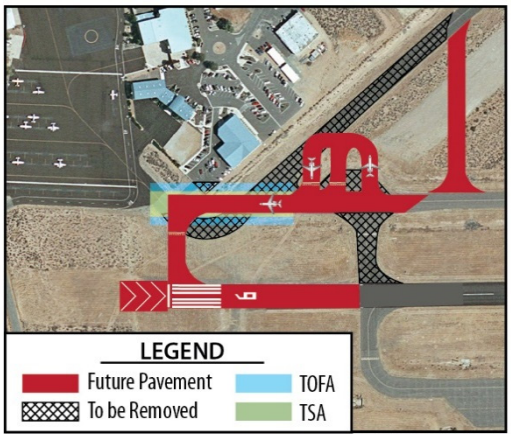


Figure 4C

This alternative also considers the removal and relocation of the D4 Taxiway Connector serving ultimate Runway 9-27 extended 600 feet to the west.

ANCILLARY AIRFIELD CONSIDERATIONS

Visual Approach Aids

Precision approach path indicator (PAPI) systems provide pilots with visual guidance information while on approach to land. Chapter Three identified a need to upgrade the two-box PAPI-2 systems currently installed on Runway 9-27 to four-box PAPI-4 systems. PAPI-4s are recommended for runways that serve jet operations. PAPI systems are typically located on the left side of the runway for approaching aircraft, at a distance from the runway threshold that would be determined during the installation process, to achieve the correct threshold crossing height (TCH) and obstacle clearing surface (OCS). The PAPI-2s serving Runway 9-27 could be upgraded to PAPI-4s in their current locations or, depending on whether the runway is extended, a new site may need to be identified.

Taxiway Lighting

As discussed in Chapter Three, Taxiways A and D are equipped with light emitting diode (LED) medium intensity taxiway lighting (MITL), while B and C are equipped with blue retro reflective sticks. The MITL system is vital for safe and efficient ground movements. Planning should consider installing LED MITL on all taxiways and, at minimum, all taxilanes leading to hangars should be served with blue reflectors. These lighting upgrades could be undertaken in the event of a reconstruction/rehabilitation pavement project associated with various pavements on the taxiway system.

Airfield Signage

As discussed in Chapter Three, airfield identification signs assist pilots in identifying their location on the airfield and directing them to their desired location. Currently, lighted signs are installed on the runway and taxiway system on the airfield. The signage system includes runway and taxiway designations, holding positions, routing/directional, distance remaining, and runway exits. All these signs should be maintained throughout the planning period; however, the taxiway connector extending between Taxiway D and Runway 9-27 should be designated as Taxiway Connector D3 to maintain the labeling cadence of taxiway connectors extending from Taxiway D. The existing portion of the taxiway extending north from Taxiway D will ultimately maintain its current designation of Taxiway B. The proposed taxiway signage will be reflected on the recommended development concept to be presented in the next chapter.

AIRSIDE SUMMARY

The airside development considerations have focused on several elements that include mitigating safety area deficiencies, improving existing and future taxiway development on the airfield, enhancing instrument approach capabilities to the runway system, and analyzing other ancillary airfield support items. These alternatives will be considered by the PAC, airport management, Carson City Airport Authority, and the public. Following discussion and review with these entities, a preferred recommended airside development concept will be drafted and presented in the next chapter.

ANALYSIS OF LANDSIDE DEVELOPMENT CONSIDERATIONS

Generally, landside issues are related to those facilities necessary or desired for the safe and efficient parking and storage of aircraft, movement of pilots and passengers to and from aircraft, airport support facilities, and overall revenue support functions. Landside planning considerations, summarized previously on **Exhibit 4B**, will focus on strategies following a philosophy of separating activity levels. To maximize airport efficiency, it is important to locate facilities together that are intended to serve similar functions. The best approach to landside facility planning is to consider the development to be like that of a community where land use planning is the guide. For airports, the land use guide in the terminal area should generally be dictated by aviation activity levels. Due to the amount of developable land available at CXP, consideration will also be given to non-aviation uses that can provide additional revenue support to the airport and support economic development for the region.
Landside planning issues focus on facility locating strategies following a philosophy of separating activity levels. Therefore, it is important to plan for an appropriate mix of smaller T-hangars, executive hangars, and larger conventional hangars.

The orderly development of the airport terminal area (those areas parallel to the runway and along the flight line) can be the most critical, and probably the most difficult, development to control on an airport. A development approach of “taking the path of least resistance” can have a significant effect on the long-term viability of an airport. Allowing development without regard to a functional plan can result in a

haphazard array of buildings and small ramp areas which will eventually preclude the most efficient use of valuable space along the flight line.

The alternatives to be presented are not the only options for development. In some cases, a portion of one alternative could be intermixed with another. Also, some alternative development concepts could be replaced with others. The final recommended plan only serves as a guide for the airport which will aid in strategic planning of available properties. Many times, airport operators change their plan to meet the need of specific users. The goal in analyzing landside development alternatives is to focus future development so that airport property can be maximized.

AIRPORT LAND USE PLANNING

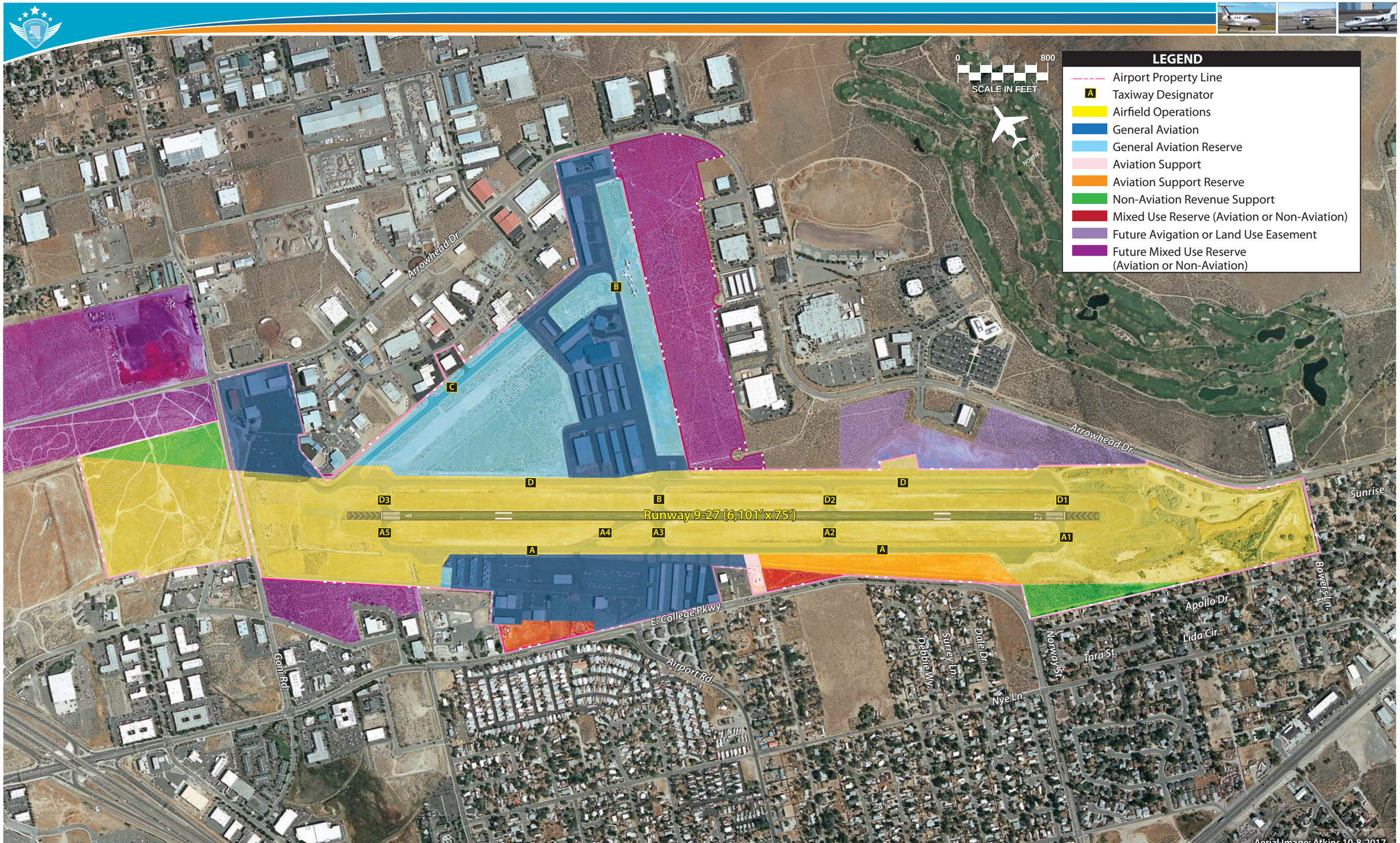
Ultimately, the purpose of the alternatives analysis is to identify specific uses for airport property to create the safest and most efficient operating environment and allows the airport to market itself to developers and businesses so that it can maximize its revenue potential on-airport. Land use planning is a very common practice for communities across the country. The primary purpose of airport land use planning is to adequately plan for future needs in an organized, efficient, and beneficial manner. Airport planning also commonly considers land use planning concepts to ensure that development is orderly, efficient, safe, and maximizes available land inventories.

An airport land use plan has been prepared for future development at CXP. This is a simple plan based on separation of activity levels and historic development, and it should be taken in the intent it was developed – to serve simply a guide for the airport sponsor to consider. It is fully understood that the airport sponsor may modify the plan if necessary to satisfy its intended goals and needs. The airport land use plan depicted on **Exhibit 4H** includes nine broad development categories:

- Airfield Operations
- General Aviation
- General Aviation Reserve
- Aviation Support
- Aviation Support Reserve
- Non-Aviation Revenue Support
- Mixed-Use Reserve (Aviation or Non-Aviation)
- Future Avigation or Land Use Easement
- Future Mixed-Use Reserve (Aviation or Non-Aviation)

Given the importance of airport land use planning and the potential effects of property immediately surrounding the airfield, the airport has expressed interest in exploring land use options for property that is currently outside the airport property boundary. As such, the Future Avigation or Land Use Easement and Future Mixed-Use Reserve (Aviation or Non-Aviation) categories are specifically aimed at property that is adjacent to the airport but is currently unowned.

The **Airfield Operations** land use category is designated to delineate areas not available for landside development. This area has been established based on existing airfield conditions and includes safety areas associated with each runway, as well as the clearances needed for taxiways. This area should


LEGEND
Airport Property Line
Taxiway Designator
Airfield Operations
General Aviation
General Aviation Reserve
Aviation Support
Aviation Support Reserve
Non-Aviation Revenue Support
Mixed Use Reserve (Aviation or Non-Aviation)
Future Avigation or Land Use Easement
Future Mixed Use Reserve (Aviation or Non-Aviation)
0
800
SCALE IN FEET
NORTH
Runway 9-27 (6,101' x 75')
A
B
C
D
D1
D2
D3
A1
A2
A3
A4
A5
Arrowhead Dr.
Arrowhead Dr.
Sunrise
Bowers Ln.
Apollo Dr.
Lida Cir.
Tara St.
Norway St.
Dale Dr.
Surrey Ln.
Debbie Wy.
Nye Ln.
E. College Pkwy.
Airport Rd.
Goni Rd.
Aerial Image: Atkins 10-8-2017

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remain clear of objects except for those fixed by navigational function. If changes are made in line with airside alternatives previously discussed, the airfield operations area would change, thereby changing landside use options as well.

General Aviation represents the full array of general aviation activities and includes users that provide aviation services or house aircraft. A good example of this type of use is a fixed base operator (FBO). These uses will generate a moderate activity level on both the airside and landside, including based aircraft and itinerant aircraft traffic. Facilities typical of general aviation uses range from T-hangars to larger conventional hangars. These users, however, are more commonly those that only have one primary hangar facility and are best suited for flight line access. This use is also characteristic of facilities which simply house based aircraft. The most common use is for T-hangars or executive box hangars. Daily activity for these areas is relatively low as the aircraft owners will commonly operate only sporadically throughout the week, or less often.

General Aviation Reserve includes those areas on airport property that are currently undeveloped and should be dedicated for potential aviation-related development in the future, given their location to the runway and taxiway system. These areas will also be further detailed during this alternatives analysis.

Aviation Support includes those facilities and functions used to support the overall maintenance, safety, and security on the airfield. This includes dedicated airport maintenance facilities that house operations and maintenance personnel and equipment.

Aviation Support Reserve identifies areas on the airfield that could be utilized to expand the existing aviation support facilities serving the airport. Chapter Three identified the need for a dedicated airport maintenance facility as the airport currently utilizes excess space inside and surrounding the electrical vault to store equipment because it does not currently have a building dedicated to maintenance or storage. As such, **Exhibit 4H** identifies a portion of airport property located directly east of the existing aviation support land use, which is specifically for future aviation support. In this space, the airport should consider the addition of a building specifically dedicated to the storage of airport maintenance equipment.

Non-Aviation Related uses are allowed on airports for areas not required for aviation purposes. In some cases, airport land inventories allow for non-aviation uses if the areas are not accessible to the airfield. This use could support commercial, industrial, or business park development and would provide the airport with an opportunity to improve revenue streams on land that would otherwise remain vacant.

Mixed-Use Reserve (Aviation or Non-Aviation) considers airport property that could accommodate a mix of aviation and/or the possibility of non-aviation activity in the future.

Future Avigation or Land Use Easement refers to property that is adjacent to the current airport property boundary and is of interest to airport management to implement a form of control over the property to protect the best interests of the airport.

Future Mixed-Use Reserve (Aviation or Non-Aviation) includes areas adjacent to the airfield that are currently unowned by the airport but could ultimately accommodate a mix of aviation and/or the possibility of non-aviation activity in the future.

The Facility Requirements chapter of this Master Plan identified numerous considerations for improved or expanded facilities, including airfield geometry improvements, terminal facility needs, and new hangar facilities. The land needed to accommodate the 20-year landside facility requirements is not anticipated to exceed the undeveloped/vacant property currently available for development. With a surplus of property that is accessible to/from the airfield system, CXP has a great opportunity to market itself to potential developers and increase land lease revenues. For areas that are not easily accessible to the airfield system, such as land adjacent to the north side of East College Parkway and the west side of Goni Road at the intersection of Arrowhead Drive, these areas will continue to be possibilities for non-aviation-related developments such as industrial parks, business centers, or restaurants that can increase land lease revenues for the airport.

REVENUE SUPPORT LAND USES

Due to the amount of land on airport property exceeding the space needed for forecast aviation demand, consideration is given for CXP to utilize portions of its property for non-aviation purposes to include commercial, industrial, or manufacturing development. It should be noted that the airport does not have the approval to use undeveloped property for non-aviation purposes at this time. Specific approval from the FAA will be required to utilize undeveloped property for non-aviation uses. This planning document does not gain approval for non-aviation uses, even if these uses are ultimately shown in the master plan and on the ALP. A separate request justifying the use of airport property for non-aviation uses will be required. This study can be a source for developing that justification.

An environmental determination will also be required. While FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, states that a release of an airport sponsor from federal obligations is normally categorically excluded and would not normally require an environmental assessment (EA), the issuance of a categorical exclusion is not automatic, and the FAA must determine that no extraordinary circumstances exist at the airport. Extraordinary circumstances would include a potentially significant environmental impact to any of the environmental resources governed by federal law. An EA may be required if there are extraordinary circumstances. The generalized land use alternatives to follow outline areas on the airport which could be planned and ultimately developed for non-aviation related uses.

On-Airport Land Use Obligations

The airport has accepted grants for capital improvements from the FAA. As such, the Carson City Airport Authority (airport sponsor) has agreed to certain grant assurances. Grant assurances related to land use assure that airport property will be reserved for aeronautical purposes. If the airport sponsor wishes to sell (release) airport land or lease airport land for a non-aeronautical purpose (land use change), they

must petition the FAA for approval. The ALP and the Airport Property Map must then be updated to reflect the sale or land use change of the identified property.

Release of Airport Property

A release of airport property would entail the sale of land that is not needed for aeronautical purposes currently or into the future. The following documentation is required to be submitted to the FAA for consideration of a land release:

1. What is requested.
2. What agreement(s) with the United States are involved.
3. Why the release, modification, reformation, or amendment is requested.
4. What facts and circumstances justify the request.
5. What requirements of state or local law or ordinance should be provided for in the language of an FAA-issued document if the request is consented to or granted.
6. What property or facilities are involved.
7. How the property was acquired or obtained by the airport owner.
8. What is the present condition and what present use is made of any property or facilities involved.
9. What use or disposition will be made of the property or facilities.
10. What is the appraised fair market value of the property or facilities. Appraisals or other evidence required to establish fair market value.
11. What proceeds are expected from the use or disposition of the property and what will be done with any net revenues derived.
12. A comparison of the relative advantage or benefit to the airport from sale or other disposition as opposed to retention for rental income.

Each request should have a scaled drawing attached showing all airport property and facilities which are currently obligated for airport purposes by agreements with the United States. Other exhibits supporting or justifying the request, such as maps, photographs, plans, and appraisal reports should be attached as appropriate. There are no areas of airport property currently planned for release from obligation and/or sale.

Land Use Change

A land use change permits land to be leased for non-aeronautical purposes; it does not authorize the sale of airport land. Leasing airport land to produce revenue from non-aeronautical uses allows the land to earn revenue for the airport, as well as serve the interests of civil aviation by making the airport as self-sustaining as possible. Airport sponsors may petition for a land use change for the following purposes:

- So that land not needed for aeronautical purposes can be leased to earn revenue from non-aviation uses. This is land that is clearly surplus to the airport's aviation needs.

- So that land which cannot be used for aeronautical purposes can be leased to earn revenue from non-aviation uses. This is land that cannot be used by aircraft or where there are barriers or topography that prevents an aviation use.

- So that land not presently needed for aeronautical purposes can be rented on a temporary basis to earn revenue from non-aviation uses.

A land use change shall not be approved by the FAA if the land has a present or future airport or aviation purpose, meaning the land has a clear aeronautical use. However, if land is not needed for aeronautical purposes until a long-term condition is met, a land use change may be justified and granted for a short-term use. Ordinarily, land on or in proximity to the flight line and airport operations area is needed for aeronautical purposes and should not be used or planned for non-aviation purposes.

The proceeds derived from the land use change must be used exclusively for the benefit of the airport. They may not be used for a non-airport purpose, and they cannot be diverted to the airport sponsor's general fund or for general economic development unrelated to the airport.

Generally, a land use change of airport property will be reviewed on a case-by-case basis at the time that the change is necessary. However, the airport land use drawing, which is included as part of the ALP set, shows those areas likely eligible to be released from obligation.

AVIATION ACTIVITY LEVELS

The aviation development areas should be divided into high, medium, and low activity levels at the airport. The high activity area should be planned and developed to provide aviation services on the airport. Examples of high activity areas are the airport terminal and administration building and adjoining aircraft parking apron, which provides tiedown locations and circulation for aircraft. In addition, large conventional hangars used for FBOs, corporate aviation departments, or storing a large number of aircraft would be considered high activity use areas. The best location for high activity areas is along the flight line near midfield, for ease of access to all areas on the airfield. All major utility infrastructure would need to be provided to these areas.

The medium activity use category defines the next level of airport use and primarily includes smaller corporate aircraft that may desire their own executive hangar storage on the airport. The best location for medium activity use is off the immediate flight line, but still readily accessible to aircraft including corporate jets. Due to an airport's layout and other existing conditions, if this area is to be located along the flight line, it is best to keep it out of the midfield area of the airport, to not cause congestion with transient aircraft utilizing the airport. Parking and utilities, such as water and sewer, should also be provided in this area.

The low activity use category defines the area for storage of smaller single- and multi-engine aircraft. Low activity users are personal or small business aircraft owners who prefer individual space in linear box hangars or T-hangars. Low activity areas should be in less conspicuous areas. This use category will require electricity, but generally does not require water or sewer utilities.

In addition to the functional compatibility of the aviation development areas, the proposed development concept should provide a first-class appearance for CXP. As previously mentioned, the airport serves as a very important link to the entire region, whether it is for business or pleasure. Consideration to aesthetics should be given high priority in all public areas, as the airport can serve as the first impression a visitor may have of the community.

To allow for maximum development of the airport while keeping with mandated safety design standards, it is very important to devise a plan that allows for the orderly development of airport facilities. Typically, airports will reserve property adjacent to the runway system for aviation-related activity exclusively. This will allow for the location of taxiways, aprons, and hangars.

HANGAR DEVELOPMENT

Analysis in Chapter Three indicated that the airport should plan for the construction of additional aircraft hangars over the next 20 years. Hangar development takes on a variety of sizes corresponding with several different intended uses.

Commercial general aviation activities are essential to providing the necessary services on an airport. This includes privately owned businesses involved with, but not limited to, aircraft rental and flight training, aircraft charters, aircraft maintenance, line service, and aircraft fueling. These types of operations are commonly referred to as FBOs or specialized aviation service operators (SASOs). The facilities associated with businesses such as these include large conventional type hangars that hold several aircraft. High levels of activity often characterize these operations, with a need for apron space for the storage and circulation of aircraft. These facilities are best placed along ample apron frontage with good visibility from the runway system for transient aircraft. Utility services are needed for these types of facilities, as well as vehicle parking areas.

Aircraft hangars used for the storage of smaller aircraft primarily involve T-hangars, shade hangars, or linear box hangars. Since storage hangars often have lower levels of activity, these types of facilities can be located away from the primary apron areas in more remote locations of the airport. Limited utility services are needed for these areas.

Other types of hangar development can include executive hangars for accommodating either one larger aircraft or multiple smaller aircraft. Typically, these types of hangars are used by corporations with company-owned aircraft or by an individual or group of individuals with multiple aircraft. These hangar areas typically require all utilities and segregated roadway access.

Table 4E summarizes the aircraft hangar types and corresponding size and aviation uses that are typically associated with each facility. Currently, there is approximately 744,900 square feet of hangar space (including maintenance area) provided on the airport, made up of a combination of the hangar types previously discussed.

TABLE 4E
Aircraft Hangar Types

Hangar Type	Typical Size	Aviation Uses
Conventional	Clear span hangars greater than 10,000 square feet	FBOs, SASOs, and other commercial aviation activities resulting in high activity uses
Executive	Clear span hangars less than 10,000 square feet	SASOs, corporate flight departments, and private aircraft storage resulting in medium-to-high activity uses
T-Hangar/ Linear Box/ Shade	Individual storage spaces offering 1,200 - 1,500 square feet	Private aircraft storage resulting in low activity uses

FBO – Fixed Base Operator
SASO – Specialized Aviation Service Operator

As depicted on **Exhibit 4H**, there are two large areas dedicated for General Aviation Reserve, which are ideal for future potential general aviation-related development. These areas include airport property east of Taxiway B and the center triangle between Taxiways D and C. Furthermore, the portion of airport property designated as Mixed-Use Reserve near the airport terminal and administration building could also accommodate future potential general aviation-related development, among other land uses. Given the development potential for these portions of airport property, alternatives to follow will detail development options for the areas identified.

TERMINAL AREA ALTERNATIVES

The existing airport terminal area serving CXP is centrally located on the main aircraft apron with automobile parking and access provided on the south side of the terminal building via East College Parkway and Silver Lane. The existing level of airside and landside access serving the terminal area make this portion of airport property an ideal location for future expansion. Moreover, there are some areas adjacent to the terminal area that could ultimately be utilized for non-aeronautical purposes. Alternative analysis presented on **Exhibit 4J** examines potential development options for the terminal area.

Terminal Area Alternative 1

Alternative 1 proposes the construction of a new 100-foot by 100-foot terminal or FBO facility immediately to the west of the existing terminal building. Currently, the existing terminal facility is utilized primarily for administrative and storage functions. The construction of a new terminal or FBO building

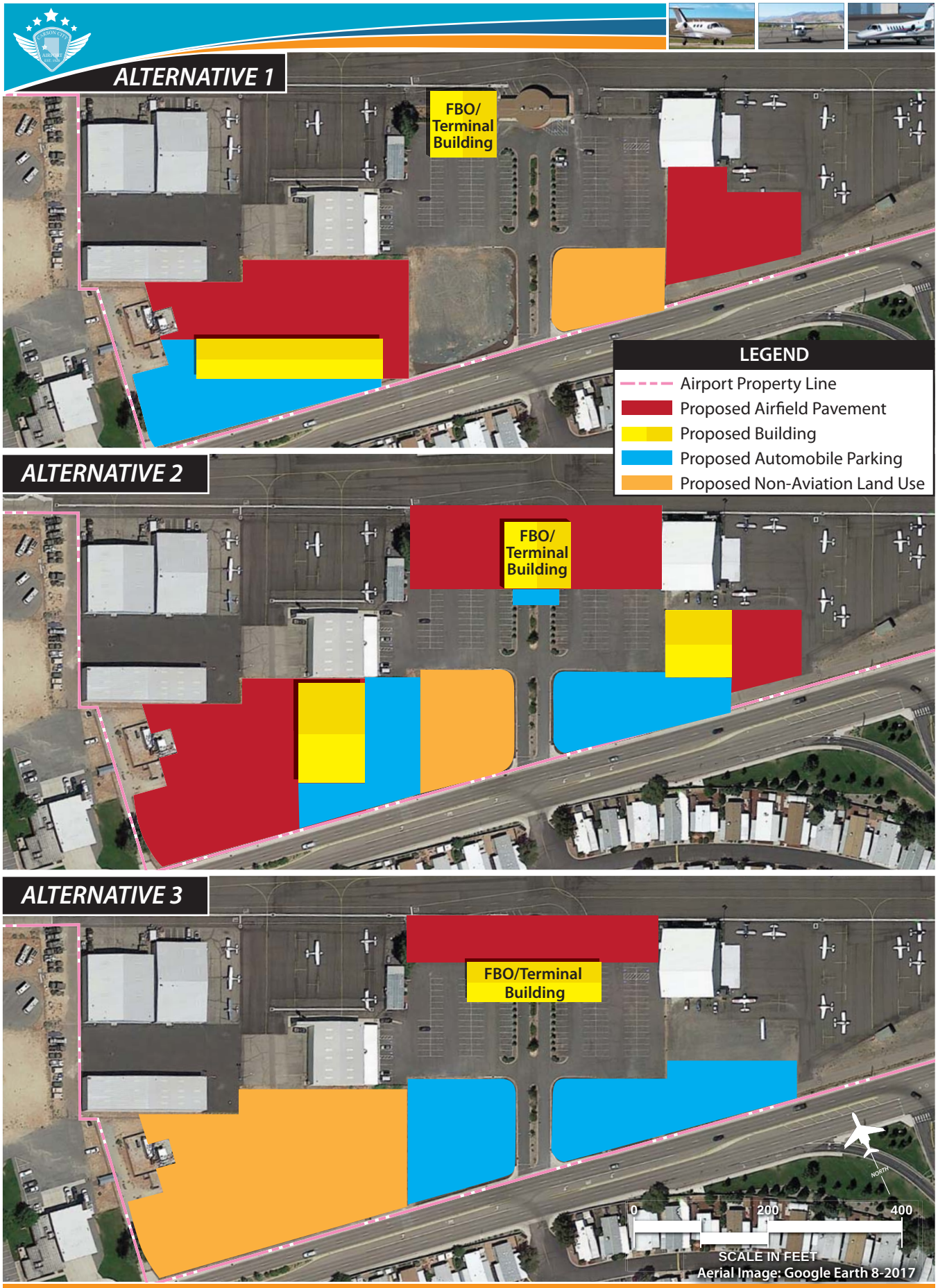


Exhibit 4J
TERMINAL AREA ALTERNATIVES

would allow the existing terminal building to be dedicated completely to administrative and airport storage functions, while the new terminal or FBO building could take on a more active role in accommodating general aviation demands. Under this scenario, the proposed terminal building or FBO would require a portion of the existing automobile parking lot to be removed. As such, approximately 27,000 square feet (sf) of additional automobile parking serving the terminal area could be provided immediately to the south of the existing parking lot, west of Silver Lane.

This alternative also considers the construction of a 60-foot by 280-foot hangar located to the south and west of the proposed terminal or FBO building. The proposed hangar could be served by 4,900 square yards (sy) of apron area as well as approximately 21,800 sf of automobile parking and access. Moreover, on the east side of the terminal area, an additional 2,900 sy of apron area could be provided and a portion of property encompassing approximately 0.4 acres could be designated as a non-aeronautical revenue support land use.

Terminal Area Alternative 2

This alternative also considers the construction of a 100-foot by 100-foot terminal or FBO building; however, this option places the new facility in the existing location of the airport terminal building. In doing so, administrative and storage functions of the existing airport terminal building could be transferred to the proposed facility or elsewhere on the airfield. With the construction of a terminal or FBO facility of this size, it would be in the best interest of the airport to preserve the apron area surrounding the building as much as possible. As such, it is recommended that the pavement in front of, and on either side of, the proposed terminal or FBO building be cleared for aircraft apron use.

In addition, Alternative 2 proposes a 100-foot by 150-foot hangar on the west side of the terminal area and a 100-foot by 100-foot hangar on the east side. Approximately 6,400 sy of apron area and 15,200 sf of automobile parking could serve the hangar on the west side of the terminal area, while approximately 1,200 sy of apron area and 25,400 sf of automobile parking could serve the proposed hangar on the east side. Furthermore, a portion of airport property located immediately north of East College Parkway and west of Silver Lane encompassing approximately 0.6 acres could be designated as a potential non-aeronautical revenue support land use.

Terminal Area Alternative 3

Like Alternative 2, Alternative 3 proposes the construction of a terminal or FBO building in the existing location of the airport terminal building. This alternative maximizes the potential building size of a future terminal or FBO, providing a 60-foot by 280-foot facility. In keeping with the previous alternative, it would be in the airport's best interest to preserve the aircraft apron area available directly in front of the proposed building. As such, the pavement that is currently to the north of the future terminal or FBO facility would be cleared for aircraft apron use. Ultimately, the construction of a building of this size

would require the removal of the northern portion of the existing automobile parking lot; however, approximately 67,600 sf of additional automobile parking area could be provided to the south of the existing automobile parking lot. Furthermore, approximately two acres of airport property is considered for potential non-aeronautical revenue support land use.

NORTHEAST DEVELOPMENT AREA ALTERNATIVES

The northeast development area is positioned north of Taxiway D along the east side of Taxiway B. This development area would provide easy airside access via Taxiway B, while landside access could be provided from Arrowhead Drive located to the north of the airfield. An additional access road could be extended from the northeast development area to Arrowhead Drive if demand warrants. Utilities serving the development area could be extended from existing airport development on the west side of Taxiway B. **Exhibit 4K** presents three alternative development options for the proposed area. It should also be noted that the airport maintains a through-the-fence access agreement with the existing landowner along the eastern side of the airport property boundary along Taxiway B. As such, protection of the land immediately east of the property boundary is of interest to the airport. The alternatives to follow present a variety of options for the northeast development area as well as to protect the best interests of the airport.

Northeast Development Area Alternative 1

Alternative 1 proposes complete hangar buildout of the northeast development area. Hangars in this scenario consist primarily of linear box style hangars and two 100-foot by 120-foot conventional hangars. To protect airport property, Alternative 1 considers acquisition of the uncontrolled property east of the development area by way of avigation or land use easement. Ultimately, existing through-the-fence access could be maintained, and access points could be provided intermittently between hangar development.

Northeast Development Area Alternative 2

Ultimately, this alternative considers outright purchase of the uncontrolled property east of the northeast development area. Under these circumstances, the airport could develop the property in its entirety and maximize the airfield's landside development potential. Alternative 2 examines the possibility for six large conventional style hangars supported by approximately 62,000 sy of additional apron area. Of the conventional hangars, the largest structures could be located closest to the flight line for ease of access. The northern portion of the development area could be reserved for additional linear box hangars. In this configuration, the development area could readily support an additional 12 linear box hangars.

Northeast Development Area Alternative 3

Alternative 3 proposes development consisting primarily of large clear-span conventional style hangars and the potential for three linear box units. Given the location of the conventional hangars to the north of the flight line, these hangars could be used primarily for private uses. Through-the-fence access could be maintained along the eastern side of the development area, providing access points intermittently between hangar development. Unlike Alternatives 1 and 2, this alternative does not recommend acquisition of the adjacent property in easement or fee simple; however, through-the-fence access to the airfield could be strictly limited to the access points provided between hangars. In this way, the airport could avoid the costs of property acquisition while maintaining through-the-fence access to the airfield where desired. The landowner would need to agree to the access points as shown to implement this alternative.

NORTH CENTRAL DEVELOPMENT AREA

The north central development area is located immediately west of the existing hangars along Taxiway D and south of Taxiway C. Easy airside access to the flight line could be provided via Taxiway D. Landside access could be provided from Ryan and Lockheed Way located to the north of the proposed development area. It should be mentioned, however, that any landside access via Ryan or Lockheed Way would require automobiles to cross Taxiway C at minimum. Given that existing automobile access is currently unavailable near the proposed development area, vehicles would be required to drive in designated auto areas on the airfield to gain access to the proposed development. At this time, the airport has already taken steps to coordinate and segregate the mix of automobiles and aircraft on the airfield through the establishment of an on-airport drive plan, presented on **Exhibit 4L**. Alternatives presented on **Exhibit 4M** examine options for proposed development in the north central area. To reduce the amount of automobile traffic on the airfield traveling to and from the proposed development area, alternatives will also consider additional automobile access.

North Central Development Area Alternative 1

Development options for Alternative 1 are representative of a historical planning effort for the area being examined that have not yet materialized. Under this alternative, hangar development would be maximized, arranging hangar rows in a north-south manner extending from Taxiway C to Taxiway D. Hangar development would consist completely of linear box and T-hangar styles.

North Central Development Area Alternative 2

Alternative 2 considers the construction of 14 linear box hangars in the northern portion of the development area aligned with Taxiway C. In addition, three large clear span conventional style hangars could be considered in the southern portion along Taxiway D. An automobile access road could be extended

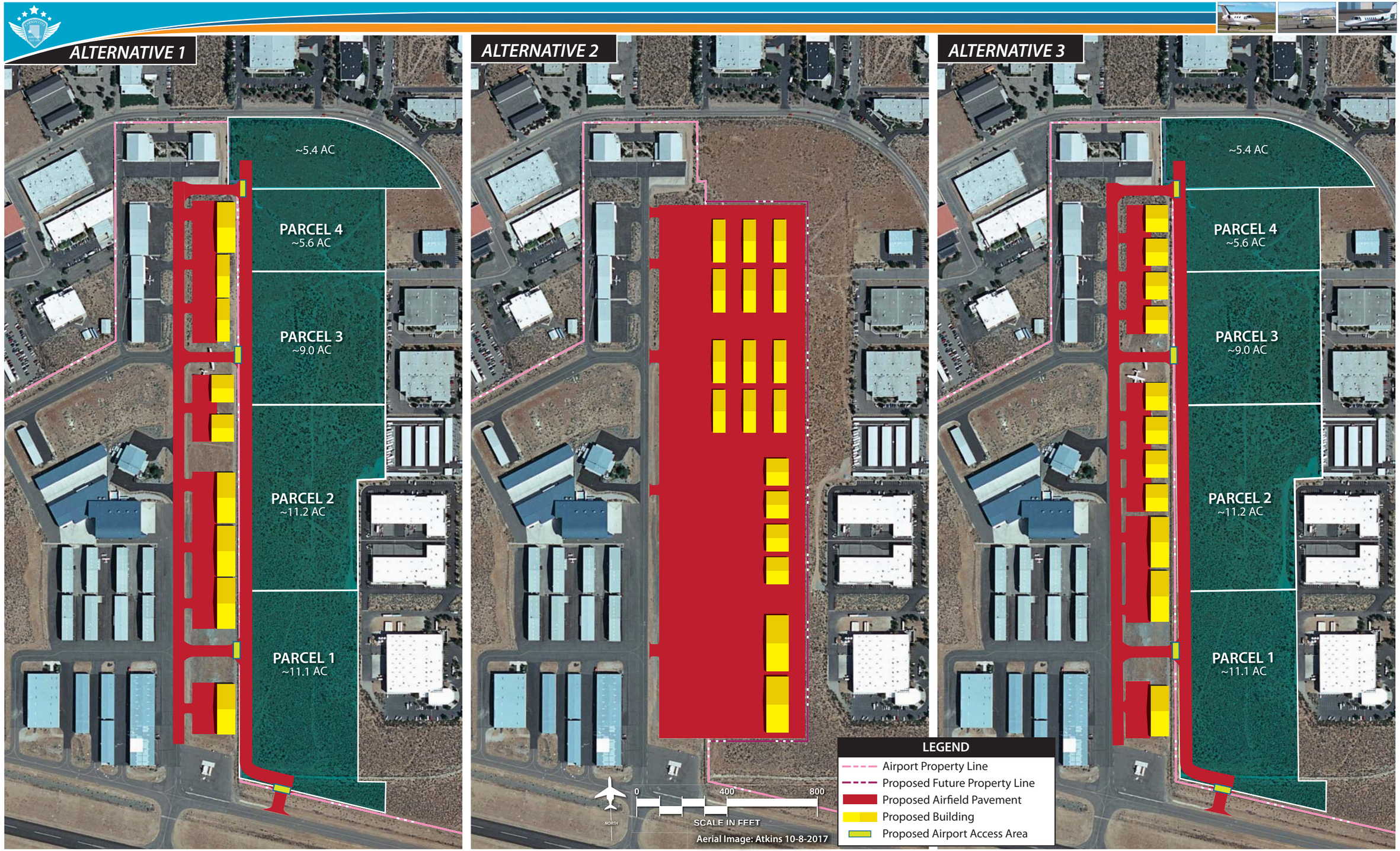
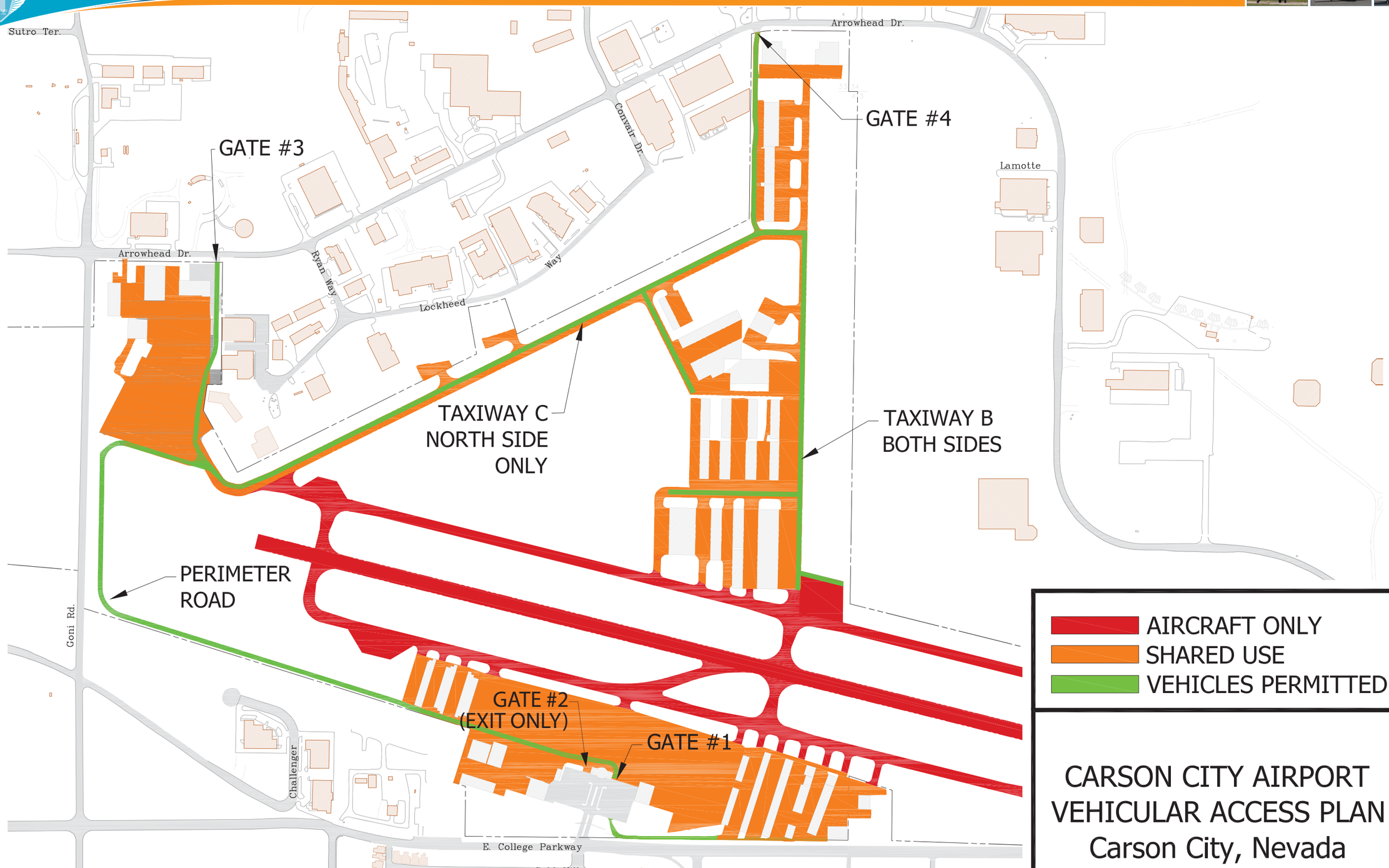
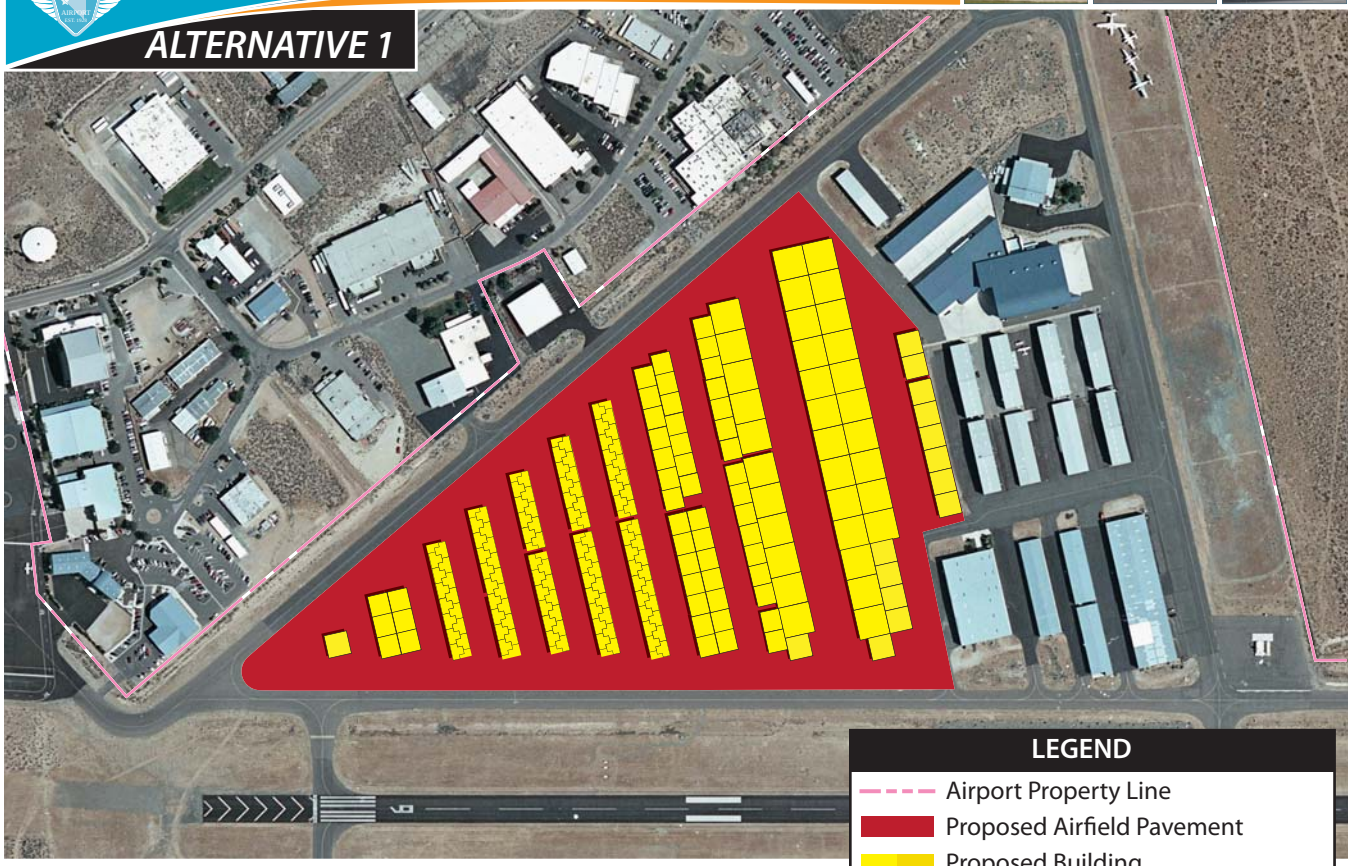


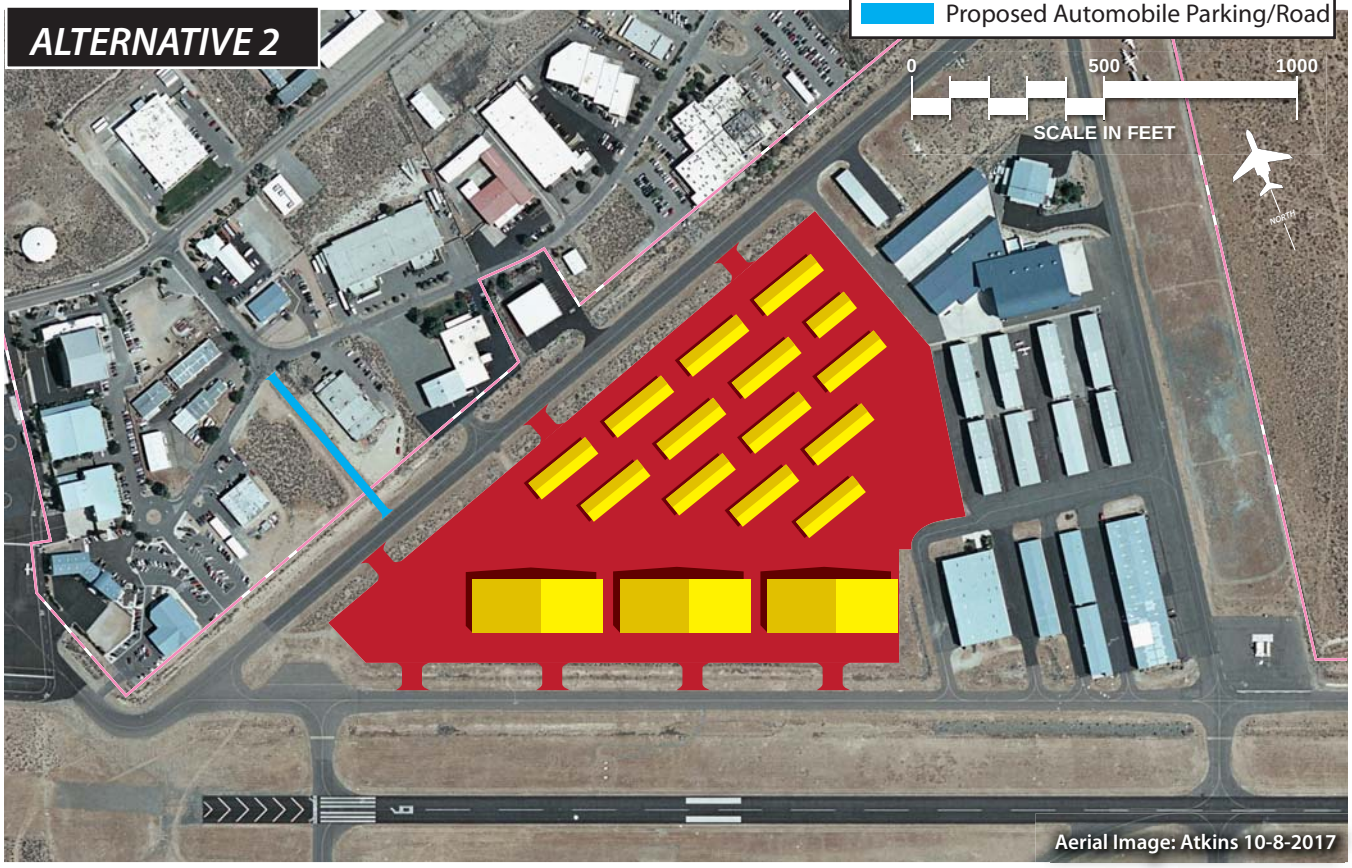
Exhibit 4K
NORTHEAST DEVELOPMENT AREA ALTERNATIVES


Sutro Ter.
Arrowhead Dr.
GATE #3
Ryan Way
Lockheed
Way
Convair Dr.
Arrowhead Dr.
GATE #4
Lamotte
TAXIWAY C
NORTH SIDE
ONLY
TAXIWAY B
BOTH SIDES
PERIMETER
ROAD
Goni Rd.
GATE #2
(EXIT ONLY)
GATE #1
Challenger
E. College Parkway
AIRCRAFT ONLY
SHARED USE
VEHICLES PERMITTED
CARSON CITY AIRPORT
VEHICULAR ACCESS PLAN
Carson City, Nevada

ALTERNATIVE 1



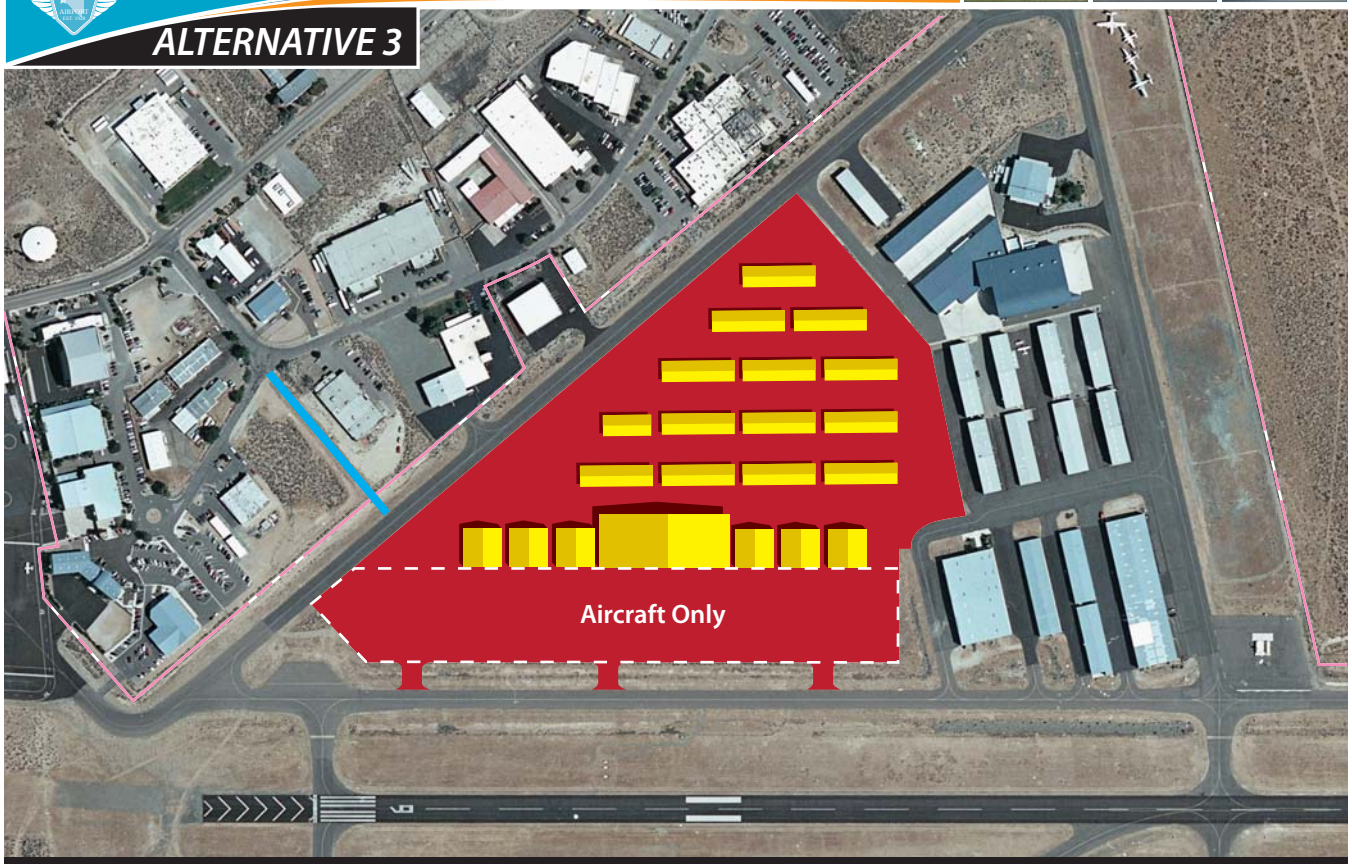
ALTERNATIVE 2



Aerial Image: Atkins 10-8-2017

Exhibit 4M: NORTH CENTRAL DEVELOPMENT AREA ALTERNATIVES

ALTERNATIVE 3



LEGEND

- Airport Property Line
- Proposed Building
- Proposed Airfield Pavement
- Proposed Automobile Parking/Road

NORTH

0 500
SCALE IN FEET

Exhibit 4M: NORTH CENTRAL DEVELOPMENT AREA ALTERNATIVES

from Ryan Way to Taxiway C, bisecting the taxiway, and ultimately alleviating the need for vehicles to drive across the airfield to access the development area. Like other areas designated on the airport drive plan, this alternative considers the north central development area, in its entirety, to be designated for automobiles and aircraft.

North Central Development Area Alternative 3

Like Alternative 2, Alternative 3 considers a mix of linear box hangars and large conventional style hangars. A total of 13 linear box hangars could occupy the area on the north side of the development area, and seven conventional hangars could occupy the south side. Under this scenario, all hangars would be aligned with Taxiway D. Approximately 49,700 sy of additional apron area could serve the proposed conventional hangars immediately north of Taxiway D along the flight line. Like the previous alternative, additional automobile access could be extended from Ryan Way to Taxiway C, bisecting the taxiway. Furthermore, automobile access could also be extended from Lockheed Way, increasing vehicle access to the development area and decreasing the need for automobiles to drive on the airfield. Ultimately, the northern portion of the development area could be designated for automobiles and aircraft, while the proposed apron area along Taxiway D could be designated for aircraft only.

LANDSIDE ALTERNATIVES SUMMARY

The intent of this analysis is to present alternatives that provide straightforward development concepts aimed at meeting the needs of several service levels. Additionally, the alternatives offer separation of activity levels. In some cases, a portion of one alternative could be intermixed with another. Also, some development concepts could be replaced with others. The final recommended plan only serves as a guide for the airport. Many times, airport operators change their plan to meet the needs of specific users. The goal in analyzing these landside alternatives is to focus on future development so that airport property can be maximized.

ALTERNATIVE ANALYSIS SUMMARY

The process utilized in assessing airside, terminal, and general aviation development alternatives involved a detailed analysis of facility requirements, as well as future growth potential. Current airport design standards were considered at each stage of development.

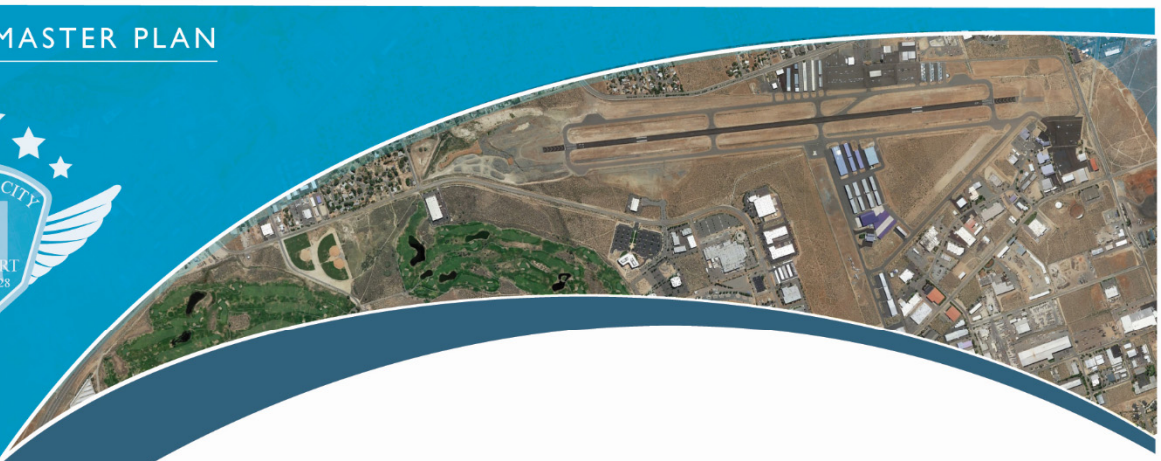
Several development alternatives related to both the airside and the landside have been presented. On the airside, the major considerations involve extending Runway 9-27, increasing approach visibility minimums, and correcting taxiway geometry in areas that do not meet design standards. The alternatives have shown there are several positive and negative impacts that need to be weighed, including potential impacts on surrounding land uses such as residential and commercial uses and public roadways.

On the landside, alternatives were presented to consider additional hangar development, a new terminal building, and potential for aviation-related and non-aviation related revenue support. The alternatives focused on meeting the long-term facility demands of each of the various general aviation activities within the existing airport property boundary.

After review by the Airport Authority, the PAC and public, a recommended concept will be presented in the next chapter. The resulting plan will represent an airside facility that fulfills safety and design standards and a landside complex that can be developed as demand dictates.

CHAPTER FIVE

RECOMMENDED DEVELOPMENT CONCEPT



CHAPTER FIVE

RECOMMENDED DEVELOPMENT CONCEPT

The preparation of the Airport Master Plan has included technical efforts in the previous chapters intended to establish the role of Carson City Airport (CXP), forecast potential aviation demand, establish airside and landside facility needs, and evaluate options for improving the airport to meet those facility needs. The planning process has included the development of draft working papers that have been presented to the Planning Advisory Committee (PAC). The PAC is comprised of stakeholders/constituents with an investment or interest in the airport and surrounding area. This diverse group has provided extremely valuable input into the Master Plan. Additionally, a series of Public Information Workshops have been conducted as part of this planning process, providing the public an opportunity to be involved and educated about the study.

The alternatives that outlined future growth and development scenarios in Chapter Four have been refined into a recommended development concept for the Master Plan, which is included for presentation in this chapter. An overview of environmental conditions that need to be considered when development projects are undertaken is provided later in this chapter.

One of the objectives of the Master Plan is to allow decision-makers the ability to either accelerate or slow development goals based on actual demand. If demand slows, development of the airport beyond routine safety and maintenance projects could be minimized. If aviation demand accelerates, development could be expedited. Any plan can account for limited development, but the lack of a plan for accelerated growth can sometimes be challenging. Therefore, to ensure flexibility in planning and development to respond to unforeseen needs, the Development Concept considers the full and balanced development potential for CXP.

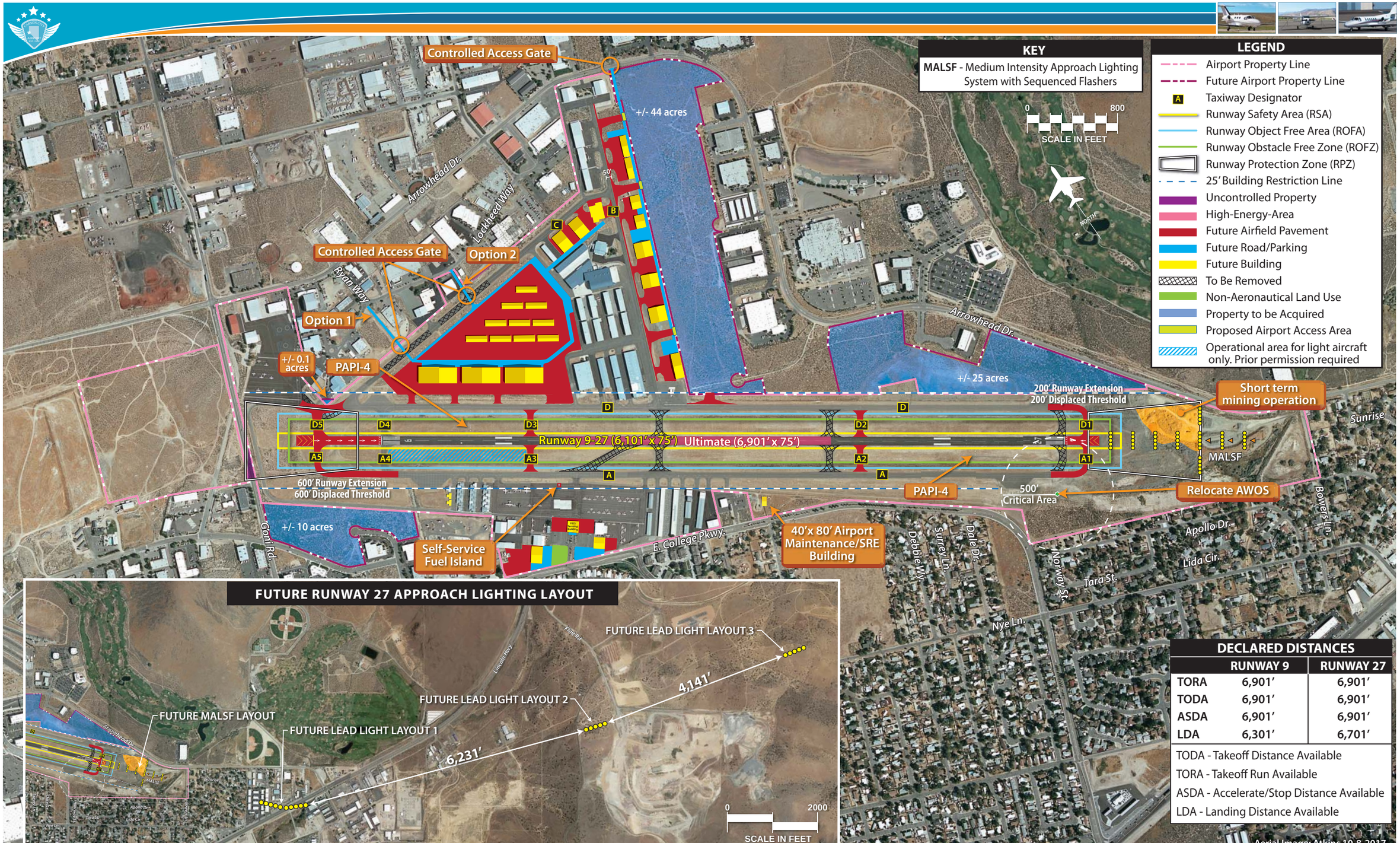
MASTER PLAN DEVELOPMENT CONCEPT

CXP is classified as a regional reliever airport within the Federal Aviation Administration's (FAA) National Plan of Integrated Airport Systems (NPIAS). Most of the airport's operations can be attributed to general aviation activities, including business aviation, as well as some air taxi operations occurring at the airport. NPIAS airports are considered important to the national aviation system and are eligible for development grant funding from the FAA. At the state level, the Nevada Department of Transportation – Aviation Planning Section (NDOT) also classifies CXP as a reliever airport. It is not anticipated that the airport's classifications will change because of the recommendations in this Master Plan. In fact, this plan fully supports the continued and necessary development of the airport to serve in the function of a reliever general aviation role.

The Development Concept, as shown on **Exhibit 5A**, presents the recommended configuration for CXP, which preserves and enhances the role of the facility while meeting FAA design and safety standards to the extent practicable. It is important to note that the concept provides for anticipated facility needs over the next 20 years, as well as establishing a vision and direction for meeting facility needs beyond the 20-year planning period of this study. A phased program to achieve the recommended Development Concept is presented in Chapter Six. When assessing development needs, this chapter has separated the airport into airside and landside functional areas. The following sections describe the recommended Development Concept in detail.

AIRSIDE DEVELOPMENT CONCEPT

The airside plan generally considers those improvements related to the runway and taxiway system and often requires the greatest commitment of land area to meet the physical layout of an airport. Operational activity at CXP is anticipated to grow through the 20-year planning horizon of this Master Plan, and the airport is projected to continue to serve the full range of general and business aviation operations, in addition to air taxi activities. The principal airfield recommendations should always focus first upon safety and security. Of key importance is to ensure that proposed airfield improvements will be designed to meet all appropriate FAA airport design standards. Recommendations are then designed to improve the operational efficiency, circulation, and capability of the airfield. The major airside issues addressed in the Development Concept include the following:



DECLARED DISTANCES

	RUNWAY 9	RUNWAY 27
TORA	6,901'	6,901'
TODA	6,901'	6,901'
ASDA	6,901'	6,901'
LDA	6,301'	6,701'

TODA - Takeoff Distance Available
TORA - Takeoff Run Available
ASDA - Accelerate/Stop Distance Available
LDA - Landing Distance Available

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- Adhere to existing and ultimate Runway Design Code (RDC) B-II standards on Runway 9-27.

- Consider runway extension options for Runway 9-27 to better accommodate business jet aircraft operators utilizing the airport, pending further justification and coordination with the FAA.

- Address safety area deficiencies on Runway 9-27, which include incompatible locations for the supplemental windcones serving the runway as well as vegetation obstructions associated with the runway extension.

- Realign non-standard taxiways to meet FAA airfield geometry standards.

- Maintain the existing instrument approach visibility minimums of not lower than one mile serving Runway 9-27 and make necessary improvements to foster establishment of nighttime instrument approach capability.

- Analyze property acquisition needed to protect the runway environment including airspace and safety areas adjacent to and beyond both ends of Runway 9-27.

- Enhance visual approach aids serving the runway with the installation of four-box precision approach path indicator (PAPI-4) systems serving each end of the runway. Install a medium intensity approach lighting system with sequenced flashing lights (MALSF) to serve nighttime instrument approach procedure for Runway 27.

RUNWAY DIMENSIONAL STANDARDS

The FAA has established design criteria to define the physical dimensions of the runways and taxiways, as well as the imaginary surfaces surrounding them which protect the safe operation of aircraft at airports. These design standards also define the criteria for the placement of landside facilities.

As discussed in previous chapters, the design criteria primarily center on an airport's critical design aircraft. The critical design aircraft is the most demanding aircraft or family of aircraft which currently, or are projected to, conduct 500 or more operations (takeoffs or landings) per year at an airport. Factors included in airport design are an aircraft's wingspan, approach speed, tail height, and, in some cases, the instrument approach visibility minimums for each runway. The FAA has established the RDC to relate these design aircraft factors to airfield design standards. The most restrictive RDC is also considered the overall Airport Reference Code (ARC) for an airport.

Analysis in Chapters Two and Three concluded that the existing and ultimate RDC for Runway 9-27 falls in RDC B-II. With a length of 6,101 feet, Runway 9-27 can accommodate most general aviation activity, including small and mid-sized business jet activity. Future planning considers numerous upgrades to the runway (to be discussed) while maintaining an ultimate RDC of B-II for Runway 9-27.

In addition to the physical and operational components of an aircraft, the RDC also considers the instrument approach capabilities of a runway expressed in runway visual range (RVR) values. For Runway 9-27, the existing and ultimate RVR value of 5,000 indicates approach visibility minimums not lower than one mile, which correspond to the GPS approaches serving Runway 9-27 (to be discussed).

RUNWAY 9-27

Runway 9-27 is 6,101 feet long, 75 feet wide, and oriented in an east-west manner. The runway's existing pavement strength is 30,000 pounds single wheel loading (S) and 60,000 pounds dual wheel loading (D). The current runway strength rating should be maintained throughout the planning horizon to accommodate larger aircraft currently operating at CXP, such as business jets, which are forecast to increase in the future. The existing runway length is capable of handling 100 percent of the small aircraft fleet and 100 percent of small airplanes with 10 or more passenger seats. The runway is served by instrument approach visibility minimums not lower than one mile; however, the instrument approach procedures serving CXP are currently unusable during nighttime operations. Improvements to help eliminate the nighttime restrictions are discussed later in this chapter.

In addition, a small operational area for off road aircraft is proposed immediately south of Runway 9-27 between existing Taxiways A4 and A5. This operational area will primarily be limited to based aircraft owners with prior permission granted through a letter of agreement (LOA). Any aircraft operators not based at CXP must have prior permission granted by the airport manager before utilizing this area. It should be noted that the construction of this project will not seek outside funding sources and, therefore, will not be included in the capital improvement program (CIP) in the next chapter.

Given the results of the runway analysis presented in Chapter Three, the length and width of Runway 9-27 is adequate to accommodate the majority of aircraft operating at the airport. However, additional runway length could benefit larger and faster business jet aircraft by making the airport more accessible during hot summer months. Additional runway length would also provide the opportunity for aircraft to depart with more fuel, allowing for longer stage lengths and an increase in usable payload. As such, the recommended plan includes extending Runway 9-27 by 800 feet. The plan considers a 600-foot runway extension to the west and a 200-foot extension to the east. Ultimately, the proposed runway extensions to the east and west will increase the usable runway length to 6,901 feet, accommodating 75 percent of the business jet fleet at 60 percent useful load.

Currently, Runway 9-27 is served by blast pads on each end of the runway to reduce the erosive effect of jet blast and propeller wash. The existing blast pads are dimensioned at approximately 300 feet long and 75 feet wide. FAA RDC B-II design standards maintain that blast pads serving B-II runways should be 150 feet long and 95 feet wide. Therefore, it is recommended that each blast pad serving Runway 9-27 be resized to meet current FAA design standards at the same time the runway extension is constructed.

As shown on **Exhibit 5A**, the runway safety area (RSA) conforms to all clearing and grading criteria under ultimate conditions and should be maintained throughout the planning horizon. Currently, the runway

object free area (ROFA) and runway obstacle free zone (ROFZ) are obstructed by supplemental windcones serving Runways 9 and 27, each located at 190 and 199 feet from the runway centerline, respectively. As stated in Advisory Circular 150/5340-30H, *Design and Installation Details for Airport Visual Aids,* "the supplemental windcone must not be inside the object free area (OFA) unless there is a need; and if so, documentation must be provided to explain the reason for the location. The proposed windcone must not penetrate the obstacle free zone (OFZ) per AC 150/5300-13." Although the preferred location for supplemental windcones is outside of the ROFA and ROFZ, further coordination with the FAA will be required to determine the best location for each obstructing windcone. At present, full-length parallel Taxiways A and D serving the north and south side of Runway 9-27 prohibit supplemental windcone locations immediately outside of the ROFA. Furthermore, landside development located on the north and south sides of the Runway 9 end prohibits a supplemental windcone location outside of parallel Taxiways A and D.

Under ultimate conditions, the ROFA and ROFZ serving the extended Runway 9-27 will be obstructed by vegetation on the western end of the runway. It is recommended that the ROFA and ROFZ be cleared of all obstructing vegetation at the same time the proposed runway extension is constructed.

It should be noted that the runway extension to 6,901 feet would ultimately impose roadway and uncontrolled property incompatibilities to the runway protection zones (RPZs) serving Runways 9 and 27. A 600-foot runway extension to the west would shift the ultimate RPZ serving Runway 9 and would be traversed by Goni Road and Wedco Way. Although the RPZ serving the ultimate Runway 9 would remain on airport property, it would be completely traversed by two public roadways, which are now generally considered incompatible land uses by the FAA and would need to be rerouted around the RPZ. Similarly, the ultimate RPZ serving the extended Runway 27 would encompass approximately 0.2 acres of uncontrolled property as well as a portion of Arrowhead Drive, which would also need to be rerouted around the RPZ. To mitigate the incompatibilities to the ultimate RPZs serving the proposed extensions to Runway 9-27, the implementation of declared distances is suggested to circumvent the imposed roadway and uncontrolled property incompatibilities.

Declared distances are a tool that may be utilized to obtain additional RSA, ROFA, and/or RPZ as they artificially limit or increase operational runway length. In this case, declared distances serving the ultimate Runway 9-27 will ensure that the RPZs will remain in their existing locations, on airport property, and will not introduce any new public roadways. Without declared distances, any newly introduced roadway to the RPZ would likely be considered incompatible and may need to be rerouted around each RPZ. Similarly, all uncontrolled property may have to be acquired by the airport. As a result, a 600-foot displaced threshold is proposed for Runway 9, and a

TABLE 5A
Runway 9-27 Declared Distances
Carson City Airport

Category	Runway 9	Runway 27
LDA	6,301'	6,701'
ASDA	6,901'	6,901'
TORA	6,901'	6,901'
TODA	6,901'	6,901'

LDA: Landing Distance Available
ASDA: Accelerate Stop Distance Available
TORA: Takeoff Run Available
TODA: Takeoff Distance Available
Source: Coffman Associates' analysis.

200-foot threshold displacement is proposed for Runway 27. It should be noted, however, that the existing portion of Goni Road contained within the Runway 9 RPZ will remain unchanged as it is currently a grandfathered condition. As suggested, the ultimate declared distances imposed on Runway 9-27 are presented on **Exhibit 5A** and in **Table 5A**.

Declared distances represent the maximum distances available and suitable for meeting takeoff, rejected takeoff, and landing distance performance requirements for turbine powered aircraft. Declared distances include takeoff run available (TORA) and takeoff distance available (TODA), which apply to takeoff; accelerate stop distance available (ASDA), which applies to a rejected takeoff; and landing distance available (LDA), which applies to landing. Each declared distance can be defined as follows:

- TORA: the distance to accelerate from brake release to lift-off, plus safety factors.
- TODA: the distance to accelerate from brake release past lift-off to takeoff climb, plus safety factors.
- ASDA: the distance to accelerate from brake release to takeoff decision speed and then decelerate to a stop, plus safety factors.
- LDA: the distance from the threshold to complete the approach, touchdown, and decelerate to a stop, plus safety factors.

Although there is no significant property acquisition to mitigate safety area incompatibilities shown on the recommended Development Concept; property acquisition is, however, recommended to protect the ultimate runway environment. As such, it is proposed that approximately 25 acres of uncontrolled property be acquired on the northeast side of Runway 9-27, directly adjacent to the runway. Likewise, the acquisition of approximately 10 acres of property, directly adjacent to Runway 9-27, is proposed on the southwest side of the runway. Additional property acquisition associated with taxiway or landside development will be discussed within later sections of this chapter.

BUILDING RESTRICTION LINE

Although achieving the lowest instrument approach visibility minimums is advantageous for airport operations, there are multiple safety area requirements tied to the minimums associated with the runway's instrument approach procedure(s). As a result, impacts to the airport environment imposed by the ultimate instrument approach visibility minimums need to be addressed. The runway type and capability of the instrument approach minimums contribute to the determination of the building restriction line (BRL), which is a product of 14 CFR Part 77 primary and transitional surface clearance requirements and identifies suitable building locations on the airport.

Given that the strength rating for Runway 9-27 is over 12,500 pounds, it is classified as an "other than utility" runway under Part 77. The width of the primary surface for other than utility visual and non-precision instrument runways having minimums greater than ¾-statute miles is 500 feet (250 feet to each side of runway centerline). The width of the primary surface serving other than utility runways

having minimums of ¾-statute miles or lower is 1,000 feet (500 feet to each side of runway centerline). The recommended concept for current and long-term planning at CXP considers instrument approach procedures having not lower than one-mile minimums. Thus, the primary surface will remain 500 feet wide. The transitional surface then extends out and up from the edge of the primary surface at a ratio of seven feet laterally for every one-foot increase. Based upon these criteria and using a planned building height, the BRL or obstructions to the BRL can be determined. **Exhibit 5A** presents the BRL separation at 425 feet from runway centerline based upon instrument approach capabilities and the selected allowable structure height of 25 feet.

As shown on the Development Concept, there are multiple aircraft hangars located within the existing and ultimate 25-foot BRL. Two of the aircraft hangars located within the 25-foot BRL are positioned immediately north of Taxiway D, west of Taxiway B, and are approximately 20 and 25 feet tall. Moreover, there are six port-a-port hangars located south of Taxiway A and west of the aircraft apron that are located within the 25-foot BRL. Given the structure height and location of the two aircraft hangars located north of Taxiway D, each building should be equipped with red obstruction lighting. Although the six port-a-port hangars located south of Taxiway A are positioned within the existing and ultimate BRL, port-a-port structures range from approximately 10 to 16 feet tall and are not obstructions to the transitional surface.

INSTRUMENT APPROACHES

As discussed earlier, CXP is currently served by non-precision instrument approach procedures including a circling area navigation (RNAV) global positioning system (GPS) instrument approach that provides visibility minimums down to 1¼-mile and cloud ceilings of 1,675 feet above ground level (AGL). Furthermore, Runway 27 is also served by an RNAV GPS non-precision instrument approach that provides visibility minimums down to 1¼-mile and cloud ceilings of 1,198 feet AGL. However, none of the instrument approach procedures currently serving CXP are approved for nighttime operation.

The ultimate instrument approach procedures serving CXP are planned to remain at not lower than one-mile visibility minimums over the long-term planning period; however, efforts will be made to remove the night-time restrictions through the use of improved visual approach aids discussed in the next section.

VISUAL APPROACH AIDS

Future planning considers various enhancements to visual approach aids serving the runway system at CXP, as depicted on **Exhibit 5A**. Currently, each end of Runway 9-27 is served by a two-box precision approach path indicator (PAPI-2) and runway end identifier lights (REILs).

Ultimately, four-box PAPI-4s are planned to serve Runway 9-27 to further enhance the use of the runway as well as overall airfield safety. This system will provide pilots with improved visual approach guidance

information during landings to the runway. The REILs serving Runway 9 should be maintained throughout the long-term planning horizon. Moreover, future planning considers the implementation of an approach lighting system (ALS) serving Runway 27.

Although an ALS can take many different forms and levels of sophistication, it can be generally described as a configuration of lights positioned symmetrically along the extended runway centerline. It begins at the runway threshold and extends toward the approach. The approach lighting is usually controlled by an airport traffic control tower (ATCT), but may be controlled by the airport operator, or by a pilot via very high frequency (VHF) radio. An ALS often supplements electronic NAVAIDs, resulting in lower visibility minimums. All ALSs in the United States use a feature called the Decision Bar, which is always located 1,000 feet from the threshold and serves as a visible horizon to ease the transition from instrument flight to visual flight.

The proposed ALS serving Runway 27 is a medium intensity approach lighting system with sequenced flashing lights (MALSF). This system is 1,400 feet long with medium intensity light stations positioned every 200 feet and includes sequenced flashing lights on the outer three light stations, in line with the extended runway centerline. Ultimately the MALSF serving Runway 27 will enhance non-precision instrument and nighttime visual approaches. In addition, the proposed MALSF will be coupled with an extended light-lane that will extend nearly three miles east/northeast, as presented on **Exhibit 5A**. Ultimately, the extended light-lane will provide added guidance to the GPS instrument approach serving Runway 27 and will enable nighttime capability. The proposed extended light-lane and Nighttime Instrument Approach Feasibility Study, conducted by Lean Engineering, is included as **Appendix D** of this document.

Furthermore, with automatic dependent surveillance-broadcast (ADS-B) operational across the country, pilots in equipped aircraft now have access to services that provide a new level of safety and efficiency. Operators equipped with ADS-B Out will enjoy more efficient spacing and optimal routing in non-radar environments, including the busy airspace in the Gulf of Mexico, some mountainous regions, and the lower altitudes of Alaska.

Aircraft equipped with ADS-B out will enhance air traffic controllers' awareness of aircraft in the airspace. Radars used today can take anywhere from five to 12 seconds to update an aircraft's position. ADS-B equipment provides air traffic control (ATC) with updated aircraft information almost every second. This enables controllers to identify and resolve potentially hazardous situations quickly and effectively. Because of the FAA's requirements for ADS-B service, in many areas of the United States, coverage exists at lower altitudes than current ATC radars. Additionally, pilots of ADS-B In-equipped aircraft can see the location of surrounding aircraft and graphic weather on their cockpit displays. This provides a similar view to what air traffic controllers see, creating an environment of shared situational awareness and crucial see-and-avoid capability. However, due to mountainous terrain in the vicinity of CXP, ADS-B coverage is lacking. Ultimately, efforts should be made to foster the implementation of an ADS-B station in the vicinity of CXP to extend coverage to the Carson Valley area.

TAXIWAY DESIGN AND GEOMETRY ENHANCEMENTS

While no significant airfield capacity improvements should be necessary during the planning period, the Development Concept considers improving airfield safety and efficiency through the implementation of relocated and extended taxiways. The taxiway system is planned to maintain Taxiway Design Group (TDG) 3 standards for Taxiways A, C, and D, which calls for a taxiway width of 50 feet. Taxiway B is currently 35 feet wide which meets TDG 2 standards. Ultimately Taxiway B will be increased to 50 feet wide to meet TDG 3 standards.

At present, the taxiway system serving CXP is found to be adequate in meeting current and future air traffic demand. However, the portions of the existing airfield taxiway geometry conflicts with the current FAA taxiway design standards established in AC 150/5300-13A, *Airport Design*. Currently, Taxiway Connector A3 provides direct access to Runway 9-27 from the taxilane serving hangar units to the south. Direct access connections such as this have been linked to increased risk of a runway incursion and should be considered for modification. Taxiway B, located on the north side of Runway 9-27, directly opposes Connector A3, creating a runway crossing and also providing a direct access link to the runway from the north. The runway crossing provided by Taxiway B and Connector A3 is located within the high-energy area. Similarly, opposing Taxiway Connectors A2 and D2, located on the north and south sides of Runway 9-27, also create a runway crossing through the high-energy area.

Previously discussed in Chapters Three and Four, the high-energy area is defined as the middle third of a runway and is typically the location where aircraft are moving rapidly for takeoff or landing. Within this area, aircraft are more vulnerable to accidents with aircraft crossing through as they cannot readily slow or stop to avoid impacts. Current FAA guidance highly discourages the location of taxiways routing aircraft across a runway through the high-energy area. As such, the Development Concept considers removing and relocating Connectors A2 and D2 approximately 250 feet to the east, out of the ultimate high-energy area. Furthermore, the Development Concept also considers the removal and relocation of Taxiway Connector B and Connector A3 approximately 1,150 feet to the west, which will clear the ultimate high-energy area of runway crossings as well as eliminate direct access to Runway 9-27. At the time this project is constructed, it is recommended that the relocated Taxiway Connector B be renamed to Connector D3 to maintain the existing taxiway connector nomenclature cadence.

Furthermore, Taxiway Connector A4 is acutely angled to Runway 9-27 and is oriented at less than 90 degrees perpendicular to the runway, which limits visibility of the runway environment. In general, taxiway connectors such as this are termed “high-speed” exits, which are common for commercial service airports; however, FAA’s updated geometry recommends avoiding these layouts where practical and implementing them only when airport capacity concerns justify their use. Given the FAA taxiway design criteria, it is recommended that the existing Taxiway Connector A4 be removed to increase pilot visibility and situational awareness of the runway environment.

As a result of the proposed runway extension discussed in the previous section, parallel Taxiways A and D should be extended to the east approximately 200 feet and to the west approximately 600 feet, and new taxiway connectors should be constructed serving the ultimate thresholds of Runway 9 and 27. Given the close proximity of the existing and ultimate taxiway connectors serving the extended Runway

27, the existing connectors should be removed altogether. When Taxiway D is extended to the west to serve the ultimate Runway 9, it is recommended that Taxiway D connect directly with the north aircraft apron. At present, the taxiway providing access to the north apron must turn to the south and immediately north to remain on airport property and maintain taxiway safety area (TSA) and taxiway object free area (TOFA) design standards. Under airplane design group (ADG) II standards, the TSA is 79 feet wide and the TOFA is 131 feet wide. As such, the ultimate Development Concept considers a taxiway alignment that provides access to the north apron directly from, and in line with, parallel Taxiway D. In order to maintain TSA and TOFA clearances on the proposed Taxiway D, approximately 0.1 acres of property currently being used as an automobile parking lot must be acquired and cleared accordingly.

LANDSIDE DEVELOPMENT CONCEPT

The primary goal of landside facility planning is to provide adequate space to meet reasonably anticipated aviation needs, while also optimizing operational efficiency and land use. Achieving these goals yields a development scheme which segregates functional uses, while maximizing the airport's revenue potential. Chapter Three identified several opportunities to improve the existing landside facilities to better accommodate future aviation demand. This section will specify the recommended improvements pertaining to landside facilities. Landside facilities can include terminal buildings, hangars, aircraft parking aprons, and aviation support services, as well as the utilization of remaining airport property to provide revenue support and to benefit the economic well-being of the regional area. Also important is identifying the overall land use classification of airport property to preserve the aviation purpose of the facility well into the future. **Exhibit 5A** presents the planned landside development for CXP.

As a regional reliever airport, most of the landside development proposed within the Development Concept of the Master Plan will accommodate the general aviation owners and operators as well as current and future service providers at CXP. At present, general aviation landside facilities are located on the north, northwest, and south sides of the airfield and include 74 separate hangar facilities providing approximately 744,915 square feet (sf) of hangar capacity, as well as aircraft apron space totaling approximately 109,200 square yards (sy).

Multiple layouts of potential landside facilities were presented in Chapter Four that included hangar development, aircraft apron layouts, and the placement of aviation support services. The Development Concept provides a compilation of proposed landside facilities which attempts to maximize potential aviation development space on the airfield. Primarily, new development is planned near existing facilities to take advantage of existing infrastructure availability and reduce future development costs.

The major landside issues addressed in the Development Concept include the following:

- Additional infrastructure for general aviation terminal facilities to meet future needs.
- Designation of areas that can accommodate aviation development potential near the existing terminal area, on the east side of Taxiway B, and the north central area located between Taxiways C and D. All proposed development includes aircraft storage hangars and aircraft apron space.

- Provide a self-service fueling island located on the south side of Runway 9-27.

- Provide a site for a future airport maintenance and snow removal equipment (SRE) storage facility.

- Construct additional automobile parking and new airport access serving the north side of the airfield that extends from Ryan/Lockheed Way and Arrowhead Drive.

TERMINAL FACILITIES

Chapter Three examined the potential for additional or upgraded general aviation terminal facilities. Currently, general aviation terminal facilities at CXP are provided by FBOs in two locations. Through the acquisition of El Aero Services, Mountain West Aviation is the only terminal service provider located on the airfield. It should be noted, however, that Mountain West Aviation still operates the two businesses as two separate entities. Although CXP maintains its own terminal building, it is primarily being utilized for administrative purposes at this time. The amount of terminal space currently offered at CXP is approximately 10,300 sf. These spaces include designated areas for flight planning, pilots' lounge, restroom facilities, quiet rooms, and other amenities. By the long-term planning horizon, an additional 1,500 sf could be needed, providing an opportunity for the airport to offer its own dedicated terminal or FBO facility. As such, the construction of a new terminal or FBO building that is owned and operated by CXP would allow the airport an opportunity to accommodate general aviation demands.

The ultimate Development Concept considers the construction of a 100-foot by 100-foot terminal or FBO building in the existing location of the airport terminal building. In doing so, administrative and storage functions of the existing airport terminal building could be transferred to the proposed facility or elsewhere on the airfield. With the construction of a terminal or FBO facility of this size, it would be in the best interest of the airport to preserve the apron area surrounding the building as much as possible. As such, the pavement in front and to either side of the terminal or FBO building is cleared for aircraft apron use. It is recommended, however, that additional general aviation terminal facility space be provided on an as-needed basis. Options for additional general aviation terminal space could also be located within the northeast or north central aviation development areas presented on the Development Concept.

AIRCRAFT STORAGE HANGARS AND FUTURE AVIATION DEVELOPMENT

Analysis in Chapter Three indicated that an additional 486,085 sf of aircraft storage hangar capacity may be needed through the long-term planning period in order to meet potential aviation demand. Recommended hangar development is proposed exclusively in the form of linear/executive box and large conventional hangars, except for two proposed port-a-port hangars. Future demand will ultimately dictate the size and type of hangar facilities that could be built.

As presented on **Exhibit 5A**, the Development Concept considers additional aviation-related development located north of Taxiway D along the east side of Taxiway B. The proposed northeast development area provides easy airside access via Taxiway B, while landside access could be provided from Arrowhead Drive located to the north of the airfield. It should be noted that the airport currently is contractually required to maintain and allow for through-the-fence access along its eastern property line that parallels Taxiway B. However, ultimate development considers outright purchase of approximately 44 acres of currently uncontrolled property located along the east side of Taxiway B. Proposed development directly east of Taxiway B considers six large conventional style hangars of varying sizes that could be supported by a combined 10,000 sy of additional aircraft apron and movement area. Of the conventional hangars, the largest structures could be located closest to the flight line for ease of access. In addition, the northern portion of the development area includes two linear box hangars, which are supported by approximately 6,500 sy of aircraft apron space. Proposed conventional style hangar space located in the northeast development area totals approximately 98,400 sf, while linear box style hangars total approximately 35,500 sf of aircraft hangar storage space. The proposed northeast development area is also served by approximately 40,100 sf of automobile parking and access area.

Aviation-related development is also considered immediately west of the existing hangars along Taxiway B and south of Taxiway C. This area is centrally located north of Runway 9-27 and could be accessed easily from Taxiway D. As presented on **Exhibit 5A**, proposed development in the north central area considers a mix of hangar styles including 10 linear box hangars and three large clear span conventional style hangars. The proposed linear box hangar storage space totals approximately 104,500 sf, while the proposed conventional hangar storage space totals approximately 142,800 sf. Given that automobile access is not readily available near the north central development area, an additional automobile access road and parking is recommended on the northern side of the airfield, extending from Ryan/Lockheed Way. Proposed automobile parking and access areas serving the north central development area total approximately 117,250 sf. Authorized airport users could be granted entry using a controlled access gate, ultimately limiting the amount of automobile traffic traversing airfield as well as preventing unauthorized access to the airport.

Under ultimate conditions, the development of the north central area and the additional automobile access road is intended to aid in better segregating automobile and aircraft traffic. To better separate automobile and aircraft traffic, automobiles accessing landside facilities located on the south side of the airfield should be encouraged to enter airport property through the southern entrance. Likewise, tenants accessing facilities located on the northern side of the airfield should be encouraged to enter airport property from northern entrances via the proposed access roads from Ryan Way/Bell Drive or Arrowhead Drive. Airport management has reported automobile traffic crossing the active runway to access landside facilities on the opposite side of the airfield, despite the existence of a paved perimeter road available to tenants as well as access points located on the north and south sides of the airfield. Encouraging tenants to enter and exit the airfield on the same side as their destination could greatly aid the segregation of aircraft and automobile traffic. At this time, the airport has already taken steps to coordinate the mix of automobiles and aircraft on the airfield through the establishment of an on-airport drive plan. However, any additional signage or education provided for tenants would be beneficial.

In addition to the proposed development in the north central development area, it should be noted that private hangar development is currently underway in the Sierra Skyway leasehold located near the intersection of Taxiways B and C. The hangar development consists of three separate hangar structures and a total of 18 hangar units with 56,500 sf of linear/executive box hangar storage space.

Future aviation development is also considered near the proposed terminal building located south of the aircraft apron. As shown on **Exhibit 5A**, the Development Concept proposes a 100-foot by 150-foot conventional hangar on the west side of the terminal area and a 100-foot by 100-foot conventional hangar on the east side. Approximately 6,400 sy of apron area and 15,200 sf of automobile parking serves the hangar on the west side of the terminal area. Likewise, approximately 1,200 sy of apron area and 25,400 sf of automobile parking serves the proposed hangar on the east side of the terminal area. Furthermore, a portion of airport property located immediately north of East College Parkway and west of Silver Lane encompassing approximately 0.6 acres is designated as a non-aeronautical revenue support land use.

As stated in Chapter Four, the airport does not have the approval to use undeveloped property for non-aviation purposes at this time. Specific approval from the FAA will be required to utilize undeveloped property for non-aviation uses. This planning document does not gain approval for non-aviation uses, even if these uses are ultimately shown in the master plan and on the Airport Layout Plan (ALP). A separate request justifying the use of airport property for non-aviation uses will be required. However, this study can be a source for developing that justification.

SUPPORT FACILITIES

As mentioned in Chapters Three and Four, support facilities are integral to the operation of the airport; however, these facilities are not categorized as airside or landside facilities. The facility requirements analysis identified several improvements that will ultimately contribute to the airport's ability to accommodate the forecast aviation activity levels.

Airport Maintenance and Snow Removal Equipment Facility

The airport does not currently have a designated airport maintenance or snow removal equipment (SRE) facility. Currently, the airport utilizes excess space inside and surrounding the electrical vault to store equipment. As such, a 40-foot by 80-foot airport maintenance and SRE building is proposed immediately east of the NDOT hangar. Additionally, a backup generator serving the airfield will be co-located with the airport maintenance and SRE facility. In doing so, the location of these facilities will require the relocation of the automated weather observation system (AWOS). Thus, the relocated AWOS is proposed near the Runway 27 threshold, approximately 500 feet south of runway centerline.

Aviation Fuel Storage

At present, self-service fuel is located on the northern side of the airfield. As a result, airport management often observes aircraft transitioning through the high-energy area on Runway 9-27 to access the self-service fuel. Although the existing full service and self-service fuel storage capacity at CXP meets both existing and forecast capacity needs, it is recommended that an additional self-service fuel island offering 10,000 gallons each of 100LL and Jet A fuel be located on the main aircraft apron, south of Runway 9-27. Ultimately, this will reduce the amount of runway crossings associated with aircraft fueling.

Airport Utilities

At this time, any significant landside development, particularly in the proposed northeast or north-central development areas, could be limited by the existing utility infrastructure, or the lack thereof. Minimum water flow requirements (for sprinkler and firefighting purposes) may vary depending upon the type of hangars and facilities built, requiring water storage and pumping capabilities. All future development should consider enhancements to utility infrastructure that could include increased water storage and pumping capacity, sewer, and improved electrical and natural gas capabilities.

ENVIRONMENTAL OVERVIEW

An analysis of potential environmental impacts associated with proposed airport projects is an essential consideration in the Airport Master Plan process. The primary purpose of this discussion is to review the proposed Capital Improvement Program (CIP) at the airport to determine whether the projects identified in the master plan could, individually or collectively, significantly impact existing environmental resources. The information contained in this section was obtained from previous studies, official internet websites, and analysis by the consultant.

Construction of any and all improvements depicted on the ALP will require compliance with the *National Environmental Policy Act* (NEPA) *of 1969*, as amended. This includes privately funded projects, such as hangars, and those projects receiving federal funding. For projects not categorically excluded under FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, compliance with NEPA is generally satisfied through the preparation of an Environmental Assessment (EA). In instances where significant environmental impacts are expected, as determined by the FAA, an Environmental Impact Statement (EIS) may be required. While this portion of the Airport Master Plan is not designed to satisfy the NEPA requirements, it provides a preliminary review of environmental issues that may need to be considered in more detail within the environmental review processes. It is important to note that the FAA is ultimately responsible for determining the level of environmental documentation required for airport actions.

The environmental inventory included in Chapter One provides baseline information about the airport environs. This section provides an overview of the potential impacts to the existing resources that could result from implementation of the planned improvements outlined in the Master Plan. While this portion of the Master Plan is not designed to satisfy NEPA requirements for a Documented Categorical Exclusion (CatEx), EA, or EIS, it is intended to supply a preliminary review of environmental issues that might affect implementation of the Airport Master Plan.

POTENTIAL ENVIRONMENTAL CONCERNS

The following table (**Table 5B**) summarizes potential environmental concerns associated with implementation of the recommended Development Concept. Analysis under NEPA includes direct, indirect, and cumulative impacts.

TABLE 5B
Summary of Potential Environmental Concerns
Carson City Airport

Environmental Impact Category	FAA Order 1050.1F Significance Threshold/ Factors to Consider	Potential Concern
Air Quality	**Threshold: The action would cause pollutant concentrations to exceed one or more of the National Ambient Air Quality Standards (NAAQS), as established by the United States (U.S.) Environmental Protection Agency (EPA) under the *Clean Air Act*, for any of the time periods analyzed, or to increase the frequency or severity of any such existing violations.** **Threshold: The State of Nevada has an Air Quality Permitting Program requiring air quality permits to stationary and temporary mobile sources, stipulating specific permit conditions designed to limit the amount of pollutants that sources may emit into the air as a regular part of business practices. Thresholds include:** • **Class I – Typically for facilities that emit more than 100 tons per year for any one regulated pollutant or emit more than 25 tons per year total HAP (hazardous air pollutant) or emit more than 10 tons of any one HAP or is a Prevention of Significant Deterioration (PSD) source or major MACT (maximum achievable control technology) source.** • **Class II – Typically for facilities that emit less than 100 tons per year for any one regulated pollutant and emit less than 25 tons per year total HAP and emit less than 10 tons per year of any one HAP.**	**Potential Impact.** Although the projected increase in operations over the 20-year planning horizon of the Master Plan would result in additional emissions, Carson City currently meets federal NAAQS standards. Therefore, general conformity review per the *Clean Air Act* is not required. According to the most recent FAA *Aviation Emissions and Air Quality Handbook* (2015), an emissions inventory under NEPA may be necessary for any proposed action that would result in a reasonably foreseeable increase in emissions due to plan implementation. For construction emissions, a qualitative or quantitative emissions inventory under NEPA may be required, depending on the type of environmental review needed for development projects outlined in the Master Plan. Any process/activity that is an emission source requires an air quality permit through the Nevada Division of Environmental Protection (NDEP). Therefore, it may be necessary to obtain an emissions permit through the NDEP for anticipated operations or projects for airport expansion projects. NRS 445B.155 defines an emission source as "any property, real or personal, which directly emits or may emit any air contaminant"[1]. A General Permit is required when applying for a new Class II General Air Quality Operating Permit

[1] https://ndep.nv.gov/air/

	• **SAD – Surface Area Disturbance greater than five acres.** • **General / COLA (Change of Location Approval) – Temporary portable equipment for road and highway construction at a location for less than 12 months.**	(AQOP) for temporary sources or renewal of an AQOP for temporary sources. If the project requires land disturbance of five acres or more, a SAD permit is required, along with a Class I or Class II permit request.
Biological Resources	**Threshold: The U.S. Fish and Wildlife Service (FWS) determines that the action would be likely to jeopardize the continued existence of a federally listed threatened or endangered species or would result in the destruction or adverse modification of federally designated critical habitat.** FAA has not established a significance threshold for non-listed species. However, factors to consider if an action would have the potential for: • Long term or permanent loss of unlisted plant or wildlife species; • Adverse impacts to special status species or their habitats; • Substantial loss, reduction, degradation, disturbance, or fragmentation of native species' habitats or their populations; or • Adverse impacts on a species' reproductive rates, non-natural mortality, or ability to sustain the minimum population levels required for population maintenance.	*For federally listed species:* **Potential Impact.** Potential habitat for the Lahontan cutthroat trout, a federally threatened fish and native to drainages of the Carson River, has been identified within the vicinity of the airport. Since anticipated development could potentially affect these tributaries, coordination with the USFWS and FAA is necessary to assess potential impacts of airport projects. Potential indirect impacts may also need to be assessed prior to action and may require further consultation with the USFWS. *For designated critical habitat:* **No Impact.** No critical habitat has been identified within the vicinity of CXP. *For non-listed species:* **Potential Impact.** Non-listed species of concern include those protected by the *Migratory Bird Treaty Act*. The potential for impacts to migratory birds should be evaluated on a project-specific basis. This may include pre-construction surveys or scheduling construction outside of nesting seasons.
Climate	FAA has not established a significance threshold for Climate; refer to FAA Order 1050.1F, *Desk Reference,* for the most up-to-date methodology for examining impacts associated with climate change.	**Potential Impact.** An increase in greenhouse gas (GHG) emissions could occur over the 20-year planning horizon of the Master Plan. Project-specific analysis may be required per the FAA Order 1050.1F, *Desk Reference*, based on the parameters of the individual projects.
***Department of Transportation* (DOT) *Act*: Section 4(f)**	**Threshold: The action involves more than a minimal physical use of a Section 4(f) resource or constitutes a "constructive use" based on an FAA determination that the aviation project would substantially impair the Section 4(f) resource. Resources that are protected by Section 4(f) are publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance; and publicly or privately-owned land from an historic site of national, state, or local significance. Substantial impairment occurs when the activities, features, or attributes of the resource that contribute to its significance or enjoyment are substantially diminished.**	**Potential Impact.** Based on a review of local mapping, none of the proposed airport improvements will result in the physical use of Section 4(f) protected resources. However, sites registered on the National Register of Historic Places (NRHP) are identified within the vicinity of the airport, as well as public parks. Therefore, planned airport projects could present constructive use of Section 4(f) resources. One example of constructive use would be how proposed improvements to runways can affect a change in protected runway areas or air traffic patterns. Proposed improvements to runways could affect a change in protected runway areas or air traffic patterns. If it is determined during preparation of NEPA documentation that potential Section 4(f) impacts could occur, the responsible FAA official will consult with all appropriate federal, state, and local officials having jurisdiction over the affected Section 4(f) properties when determining whether project-related impacts would substantially impair the resources.

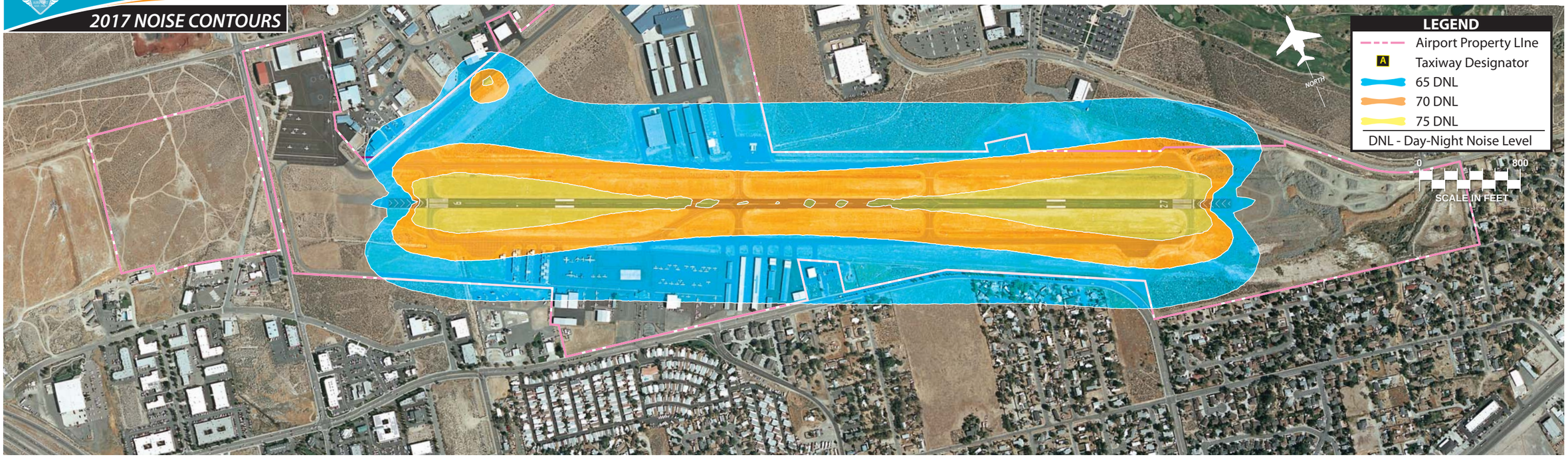
		A neighborhood developed in the 1960s has been identified adjacent to airport property, southeast of Runway 9-27 (Silver Terrace Acres). It is possible the entire neighborhood, or individual structures in this neighborhood, qualify as historical resources and may need to be evaluated for historical significance as part of NEPA documentation for any adjacent airport projects. If necessary, the FAA will consider several types of impacts to historical properties. The Section 4(f) compliance process involves the preparation of a Section 4(f) statement by the airport, which evaluates other feasible alternatives.
Farmlands	**Threshold: The total combined score on Form AD-1006, *Farmland Conversion Impact Rating*, ranges between 200 and 260.** (Form AD-1006 is used by the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) to assess impacts under the *Farmland Protection Policy Act* (FPPA).) Factors to consider are if an action would have the potential to convert important farmlands to non-agricultural uses. Important farmlands include pastureland, cropland, and forest considered to be prime, unique, or statewide or locally important land.	**No Impact.** Approximately 99 acres of airport property is classified as "prime farmland if irrigated." The remaining is classified as "not prime farmland." Some of the proposed projects in the Master Plan are on land identified as prime farmland if irrigated; however, that land is not currently used for agricultural purposes. Per the Master Plan, land acquisition and future avigation easements could potentially include prime farmland, but it does not appear existing airport property or property that may be acquired are currently used for agricultural uses. Because current or future land is not currently used for agricultural purposes, projects would likely be exempt from FPPA requirements.
Hazardous Materials, Solid Waste, and Pollution Prevention	FAA has not established a significance threshold for Hazardous Materials, Solid Waste, and Pollution Prevention. However, factors to consider are if an action would have the potential to: • Violate applicable federal, state, tribal, or local laws or regulations regarding hazardous materials and/or solid waste management; • Involve a contaminated site; • Produce an appreciably different quantity or type of hazardous waste; • Generate an appreciably different quantity or type of solid waste or use a different method of collection or disposal and/or would exceed local capacity; or • Adversely affect human health and the environment.	**Potential Impact.** The airport has self-serve fuel for Jet A and 100 LL fuel and provides opportunity for aircraft maintenance activities that could involve fossil fuels or other types of hazardous materials or wastes. These operations are regulated and monitored by the appropriate regulatory agencies, such as the U.S. EPA, the Nevada Division of Environmental Protection (NDEP), and Carson City Environmental Control Authority. The recommended Master Plan development concept does not anticipate land uses that would produce an appreciably different quantity or type of hazardous waste. However, should this type of land use be proposed, further NEPA review and/or permitting would be required. There are no known hazardous materials or waste contamination sites currently on airport property. Coordination with the NDEP may be necessary to determine water and soil contamination. Since land release is proposed on the concept plan, an Environmental Due Diligence Audit (EDDA) prepared in accordance with FAA Order 1050.19B, *Environmental Due Diligence Audits in the Conduct of FAA Real Property Transactions,* may be required. The need for this report would be determined by FAA.

Historical, Architectural, Archaeological, and Cultural Resources	FAA has not established a significance threshold for Historical, Architectural, Archaeological, and Cultural Resources. Factors to consider are if an action would result in a finding of "adverse effect" through the Section 106 process. However, an adverse effect finding does not automatically trigger preparation of an EIS (i.e., a significant impact).	**Potential Impact.** An Indian/Native American feature, the Carson Colony, has been identified within five miles of the airport. Sacred sites are considered significant cultural resources and are protected under the *American Indian Religious Freedom Act* (AIRFA). Religious and sacred sites are typically identified through consultation with tribes. Per E.O. 13175, *Consultation and Coordination with Indian Tribal Governments*, this coordination is undertaken by FAA as part of government-to-government consultation with federally recognized tribes. As stated, a residential neighborhood developed and constructed in the 1960s is adjacent to airport property and is eligible for NRHP due to age. Evaluation of the neighborhood and individual structures may be necessary to determine historical significance. A Section 106 review under the *National Historical Preservation Act* (NHPA) will be required to determine if any of the airport improvements will have a potential effect on historic properties. This may be required as part of NEPA documentation for these projects. If the undertaking is determined to have an adverse effect on cultural resources under Section 106 of NHPA and may have a significant effect on such resources, under NEPA, the action may constitute an extraordinary circumstance and further coordination or studies may be required. If the undertaking is a type of activity that does not have the potential to cause effect on historic properties, the FAA has no further obligations under Section 106.
Land Use	FAA has not established a significance threshold for Land Use. There are also no specific independent factors to consider. The determination that significant impacts exist is normally dependent on the significance of other impacts.	**Potential Impact.** The proposed development concept plan includes acquisition of avigation easements over the airport runway protection zones to prevent land use compatibility impacts with the airport. Avigation easements will also be required for the land identified for release. Currently, a short-term mining extraction operation is present at the southeast corner of the property along Arrowhead Drive. Continued use of the mine will necessitate compliance with both state and local regulations and permitting requirements.
Noise and Noise-Compatible Land Use	**Threshold: The action would increase noise by Day-Night Average Sound Level (DNL) 1.5 decibel (dB) or more for a noise-sensitive area that is exposed to noise at or above the DNL 65 dB noise exposure level, or that will be exposed at or above the DNL 65 dB level due to a DNL 1.5 dB or greater increase, when compared to the no action alternative for the same timeframe.**	**Potential Impact.** Exhibit 1R identified Carson City's noise corridor around the airport. The noise corridor is an informal boundary which does not have any land use restrictions; it is simply a tool to allow airport staff to communicate with potential developers on a voluntary basis. Sensitive land uses exist within this boundary, such as residential, schools and religious facilities, parks, and environmental justice.

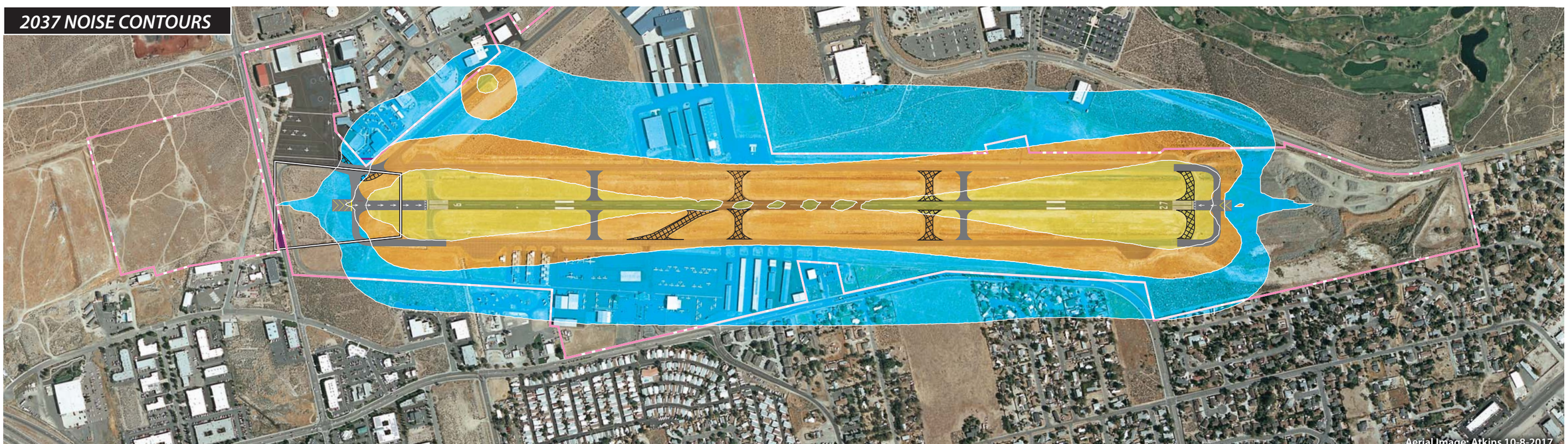
	Another factor to consider is that special consideration needs to be given to the evaluation of the significance of noise impacts on noise-sensitive areas within Section 4(f) properties where the land use compatibility guidelines in Title 14 Code of Federal Regulations (CFR) Part 150 are not relevant to the value, significance, and enjoyment of the area in question.	**Exhibit 5B** demonstrates both the existing and anticipated noise contours for the airport. As delineated on the exhibit for existing conditions, the DNL 65 dB exposure level is beyond the northern and southern boundaries of the airport. The DNL 65dB contour currently affects the manufactured housing development south of the airport. However, in the 2037 condition, the DNL 65 dB noise exposure contour expands. It is projected that an additional area of the manufactured housing development will be affected, as well as a small portion of the single-family residential subdivision located just east of the manufactured housing development. Local land use actions are within the purview of local governments. The FAA encourages local governments to take actions to reduce and prevent incompatible land uses around the airport. Airports receiving grant funding have compatible land use obligations, as outlined in Section 11.5.3, FAA Order 1050.1F. The NEPA document should address actions by local governments regarding compatible land use with their police powers. It is important to note that operational growth, unless tied to a specific project, will not result in noise impacts under FAA Order 1050.1F. Impacts to noise-sensitive land uses are only identified through NEPA documentation for specific projects or through the voluntary Part 150 process.
Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks		
Socioeconomics	FAA has not established a significance threshold for Socioeconomics. However, factors to consider are if an action would have the potential to: • Induce substantial economic growth in an area, either directly or indirectly (e.g., through establishing projects in an undeveloped area); • Disrupt or divide the physical arrangement of an established community; • Cause extensive relocation when sufficient replacement housing is unavailable; • Cause extensive relocation of community businesses that would cause severe economic hardship for affected communities; • Disrupt local traffic patterns and substantially reduce the levels of service of roads serving the airport and its surrounding communities; or • Produce a substantial change in the community tax base.	**Potential Impact.** The proposed development on airport property could potentially encourage economic growth for Carson City, which could result in new construction jobs, new jobs for the airport and other commercial uses, new housing, and an increase the local tax base. The Master Plan does not include any recommendations to acquire residences or relocate businesses. New airfield development east of Runway 9-27 could change the level of service to roads leading to and within the airport, such as along Arrowhead Drive and Lockheed Way. West of Runway 9-27, future development consists of airfield pavement, buildings, parking, and non-aeronautical land use. There is a potential to affect the level of service to E. Graves Lane as a result. The long-term changes to the level of service are determined by the type of use proposed, and a traffic study may be warranted to ensure service is either not substantially impacted or mitigation measures are addressed. In the short-term during construction, there could be temporary disruptions to surface traffic patterns.

Environmental Justice	FAA has not established a significance threshold for Environmental Justice. However, factors to consider are if an action would have the potential to lead to a disproportionately high and adverse impact to an environmental justice population (i.e., a low-income or minority population) due to: • Significant impacts in other environmental impact categories; or • Impacts on the physical or natural environment that affect an environmental justice population in a way that FAA determines is unique to the environmental justice population and significant to that population.	**Potential Impact.** Both low-income and minority populations have been identified in the vicinity of the airport. E.O. 12898, *Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations*, and the accompanying Presidential Memorandum, and Order DOT 5610.2, *Environmental Justice*, require the FAA to provide for meaningful public involvement by minority and low-income populations, as well as analysis that identifies and addresses potential impacts on these populations that may be disproportionately high and adverse. Environmental justice impacts may be avoided or minimized through early and consistent communication with the public and allowing ample time for public consideration. If disproportionately high or adverse impacts are noted, mitigation and enhancement measures and offsetting benefits can be taken into consideration.
Children's Environmental Health and Safety Risks	FAA has not established a significance threshold for Children's Environmental Health and Safety Risks. However, factors to consider are if an action would have the potential to lead to a disproportionate health or safety risk to children.	**Potential Impact.** Per E.O. 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, federal agencies are directed to identify and assess environmental health and safety risks that may disproportionately affect children. These risks include those that are attributable to products or substances that a child is likely to come in contact with or ingest, such as air, food, drinking water, recreational waters, soil, or products to which they may be exposed. Within a close vicinity of the airport, two schools have been identified. Best management practices (BMPs) should be implemented to decrease environmental health risks to children. During construction of the projects outlined in the Master Plan, appropriate measures should be taken to prevent access by unauthorized persons to construction project areas.
Visual		
Visual Effects	FAA has not established a significance threshold for Visual Effects. However, a factor to consider is the extent an action would have on the potential to: • Affect the nature of the visual character of the area, including the importance, uniqueness, and aesthetic value of the affected visual resources; • Contrast with the visual resources and/ or visual character in the study area; and • Block or obstruct the views of the visual resources, including whether these resources would still be viewable from other locations.	**Potential Impact.** Development proposed in the Master Plan Concept could change the overall visual character of the airport with additional roads and structures planned on-site. New development could change the visual character of the area, contrast with the visual character from the Sierra Nevada mountains, and possibly block views from surrounding property. Potential effects could be minimized by preserving as much natural vegetation as possible and integrating development into existing natural surroundings.

2017 NOISE CONTOURS



2037 NOISE CONTOURS



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Water Resources (including Wetlands, Floodplains, Surface Waters, Groundwater, and Wild and Scenic Rivers)		
Wetlands	**Threshold: The action would:** **1. Adversely affect a wetland's function to protect the quality or quantity of municipal water supplies, including surface waters and sole source and other aquifers;** **2. Substantially alter the hydrology needed to sustain the affected wetland system's values and functions or those of a wetland to which it is connected;** **3. Substantially reduce the affected wetland's ability to retain floodwaters or storm runoff, thereby threatening public health, safety or welfare (the term welfare includes cultural, recreational, and scientific resources or property important to the public);** **4. Adversely affect the maintenance of natural systems supporting wildlife and fish habitat or economically important timber, food, or fiber resources of the affected or surrounding wetlands;** **5. Promote development of secondary activities or services that would cause the circumstances listed above to occur; or** **6. Be inconsistent with applicable state wetland strategies.**	**Potential Impact.** No wetlands have been identified on airport property, although this information is based on aerial photography interpretation from 1999. Field surveys and wetland delineations may be required to determine the presence or absence of wetlands in project areas. The City of Carson City's Fulstone Wetlands are approximately 0.60 miles south of the airport, and indirect impacts are possible as a result to airport projects. Due to the distance and indirect nature of the potential impact, BMPs should be implemented to ensure the wetlands are not impacted. If project-specific field surveys identify wetlands that will be affected, removal or relocation of those wetlands may require a Section 404 permit under the *Clean Water Act*, which regulates the discharge of dredged or fill material into waters of the United States, including wetlands.
Floodplains	**Threshold: The action would cause notable adverse impacts on natural and beneficial floodplain values. Natural and beneficial floodplain values are defined in Paragraph 4.k of DOT Order 5650.2, *Floodplain Management and Protection.***	**Potential Impact.** According to FEMA FIRM maps (FIRM panels 3200010103E, 3200010104E, and 3200010112E dated January 16, 2009), 100-year floodplains have been identified on airport property. Extension of Runway 9-27 and taxiways on the west end would occur within the 100-year floodplain. As required in DOT Order 5650.2, further environmental analysis will be needed. Any action located in the base floodplain constitutes floodplain encroachment. For projects with floodplain encroachment, FAA must determine if it is a significant floodplain encroachment. Any proposed project taking place in a FEMA-mapped floodplain must follow the participating community's FEMA-approved floodplain management plan. The expansion of Runway 9 may require a floodplain permit or "no rise" certificate from the city. Determination is project-specific. Carson City does participate in the National Flood Insurance Program (NFIP) and, as of 2016, is listed in the NFIP Community Rating System (CRS)[2]. E.O. 11988 and DOT Order 5650.2 direct agencies to provide the public an opportunity for early public review of any plan or proposal that would encroach on the base floodplain. The FAA may use the NEPA

[2] https://www.fema.gov/media-library-data/1476294162726-4795edc7fe5cde0c997bc4389d1265bd/CRS_List_of_Communites_10_01_2016.pdf

		process to meet the public notification requirements for an action encroaching on a floodplain. There may be indirect impacts (for both permanent and temporary uses) to the floodplain from other proposed airport projects, which should be evaluated. Incorporating best management practices to reduce impacts are recommended.
Surface Waters	**Threshold: The action would:** **1. Exceed water quality standards established by federal, state, local, and tribal regulatory agencies; or** **2. Contaminate public drinking water supply such that public health may be adversely affected.** The Nevada Division of Environmental Protection (NDEP) identifies total maximum daily loads (TMDLs) a waterbody can receive and not violate water quality standards. TMDLs consider pollution from all sources, including discharges from sewage treatment facilities and industry; runoff from farms, forests, and urban areas; and natural sources. TMDLs provide a way to integrate the management of both point and nonpoint sources of pollution through the establishment of wasteload allocations (WLA) for point source discharge and load allocations (LA) for nonpoint sources of pollutions. The NDEP has published multiple approved TMDLs for the Carson River at various survey points along the river. Those monitoring stations closest to the airport specifically identify total phosphorus, total suspended solids (TSS), and turbidity. Due to the northeast flow of the Carson River, the report from Mexican Ditch Gage to the New Empire TMDL site was reviewed and TMDL targets are as follows: Phosphorus – 0.1mg/L TSS – 80 mg/L Turbidity – 37 mg/L	**Potential Impact.** The airport is located within the Carson River Watershed and situated at the base of the Sierra-Nevada Mountain Range. Most likely, runoff from the airport will flow in a south-southwest pattern through residential and commercial development to the Fulstone Wetlands located less than one mile from the airport, which ultimately ends up in the Carson River. Stormwater pollutants are a source of potential adverse effect downstream wetlands and streams. The Carson City Public Works Department manages airport stormwater discharges with a National Pollutant Discharge Elimination System (NDPES) Permit issued and regulated by the Nevada Division of Environmental Protection. Improvements to the airport will require a revised permit to be issued addressing operational and structural source controls, treatment with BMPs, and sediment and erosion control. FAA's Advisory Circular (AC) 150/5370-10G, *Standards for Specifying Construction of Airports, Item P-156, Temporary Air and Water Pollution, Soil Erosion and Siltation Control,* should also be implemented during construction projects at the airport.
Groundwater	**Threshold: The action would:** **1. Exceed groundwater quality standards established by federal, state, local, and tribal regulatory agencies; or** **2. Contaminate an aquifer used for public water supply such that public health may be adversely affected.** Factors to consider are when a project would have the potential to: • Adversely affect natural and beneficial groundwater values to a degree that substantially diminishes or destroys such values; • Adversely affect groundwater quantities such that the beneficial uses and values of	**No Impact.** Proposed projects would not substantially change the amount of water used by the airport. Additionally, the airport property does not serve as a significant source of groundwater recharge and is not located near a sole source aquifer.

	such groundwater are appreciably diminished or can no longer be maintained and such impairment cannot be avoided or satisfactorily mitigated; or • Present difficulties based on water quality impacts when obtaining a permit or authorization.	
Wild and Scenic Rivers	FAA has not established a significance threshold for Wild and Scenic Rivers. Factors to consider are when an action would have an adverse impact on the values for which a river was designated (or considered for designation) through: • Destroying or altering a river's free-flowing nature; • A direct and adverse effect on the values for which a river was designated (or under study for designation); • Introducing a visual, audible, or other type of intrusion that is out of character with the river or would alter outstanding features of the river's setting; • Causing the river's water quality to deteriorate; • Allowing the transfer or sale of property interests without restrictions needed to protect the river or the river corridor; or • Any of the above impacts preventing a river on the Nationwide Rivers Inventory (NRI) or a Section 5(d) river that is not included in the NRI from being included in the Wild and Scenic River System or causing a downgrade in its classification (e.g., from wild to recreational).	**No Impact.** The nearest designated Wild and Scenic River, North Fork American River, is over 30 miles from the airport near Folsom, California. Recommended airport projects would not have adverse effects on the river's outstanding remarkable values (i.e., scenery, recreation, geology, fish, wildlife, and history). The Carson River flows from the southwest to the northeast, draining into the Carson Sink, and will not impact the North Fork American River.

Source: Coffman Associates, Inc. analysis

WASTE REDUCTION AND RECYCLING PLAN

As part of the Carson City Airport Master Plan Update, the following Waste Reduction and Recycling Plan has been provided by Atkins North America.

1. Introduction

In 2012, the FAA Modernization and Reform Act of 2012 was issued and included a new requirement for Airport Master Plans to address recycling by:

- Assessing the feasibility of solid waste recycling at the airport;
- Minimizing the generation of waste at the airport;
- Identifying operations and maintenance requirements;
- Reviewing waste management contracts; and
- Identifying the potential for cost savings or generation of revenue.

Subsequent to the passing of the FAA Reauthorization bill, the FAA issued guidance on preparing recycling, reuse, and waste reduction plans as part of Airport Master Plans. This Recycling, Reuse, and Waste Reduction Plan (RRWRP) includes a review of Carson City Airport's waste management and recycling operations throughout the terminal and airfield, as well as a review of tenant practices.

2. Airport Description and Background

CXP is located approximately 20 miles from the Reno-Tahoe International Airport and 14 miles east of Lake Tahoe. The airport property consists of approximately 531 acres of land within the boundary of Carson City, Nevada. CXP is classified in the NPIAS as a public-use general aviation airport projected to continue serving a reliever role to the state transportation system. CXP experiences a high amount of general aviation traffic with 350 based aircraft and 83,500 operations reported in 2017.

CXP is also home to a vast variety of tenants. Specifically, the airport hosts one fixed base operator (FBO), five specialized aviation service operators, two flight schools, and many other commercial/private operators. With a large amount of land and high level of airport usage, CXP has a large footprint on the surrounding community. Being a prominent entity in Carson City, the airport is developing this waste reduction and recycling plan to align its waste output with the goals and priorities of the local municipality, the state of Nevada, and the federal government.

3. Existing Recycling/Waste Program

Currently, CXP does not implement a formal recycling/waste reduction program. Tenants are responsible for contracting waste operations separately from the airport. However, the airport hosts the resources required for tenants and operators to properly and efficiently dispose of waste. **Figure 5A** displays one of several waste disposal dumpsters that are utilized by tenants for proper disposal at the airport. Additionally, many tenants utilize private 94-gallon cans, also shown in **Figure 5A**, for waste disposal. Most waste at the airport is generated by tenants, making the existing accessibility of dumpsters vital to adequate waste disposal. The primary waste generated on-airport is categorized as Municipal Solid Waste (MSW) which is the typical waste generated on daily-basis by the average consumer.

3.1 Operation and Maintenance (O&M) Requirements

Waste disposal at the airport is the responsibility of each respective tenant. Airport staff does not currently maintain any data pertaining to waste at the airport. The airport office and terminal building waste is collected and disposed of by the airport staff on an as-needed basis and transported to the nearby landfill. This landfill is owned and operated by Carson City and acts as the primary location for Waste Management (WM) to dispose collected waste. WM currently collects tenant-contracted waste on a weekly basis and city recycled waste on a bi-weekly basis. MSW is transported to the city landfill and recycled waste is transported to the WM Eco Center located in Reno.

FIGURE 5A
ON-AIRPORT DUMPSTER AND 94-GALLON CANS

3.2 Review of Waste Management Contracts

CXP is currently under the Municipality of Carson City's exclusive waste management contract with Waste Management (WM). WM is the leading provider for comprehensive waste management services as well as integrated environmental solutions in North America. However, the existing contract with WM reportedly expires in June of 2019. Ahead of the contract expiration, the City's Board of Supervisors has approved the request for proposal (RFP) for franchised solid waste collection services. The RFP requires the provider's services to commercial facilities to include weekly solid waste services, recycling services offered at a reduced rate, and green waste service. The draft agreement with the next waste management collection service provider has a 15-year life and includes an 8% franchise fee.

4. Review of Recycling Feasibility

CXP is in a unique situation that encumbers the justification of typical recycling fees. There is limited financial incentive to recycle because the volume of waste and recycled materials at CXP is low. Additionally, CXP is a small airport with limited staff resources, which can make recycling programs challenging to implement. CXP has a large breadth of many tenants making it logistically challenging to coordinate with everyone. Continual coordination with all tenants would be burdensome for the limited administrative staff.

Currently, the airport staff utilizes the nearby city landfill to manually dump waste on an as-needed basis. The proximity of this landfill, shown in **Figure 5B**, makes dumping waste easy and efficient for the airport. The city landfill offers free recycling drop-off for the following items:

- Aluminum cans
- Tin cans
- Newspaper
- Cardboard
- Plastic Bottles
- Glass bottles
- Motor oil
- Anti-freeze
- Car batteries

Because airport staff already utilizes manual waste drop-off at the landfill, the inclusion of recycled content would add no-additional cost to the operation. Therefore, adding recycling efforts to the existing waste removal system could be financially and logistically feasible.

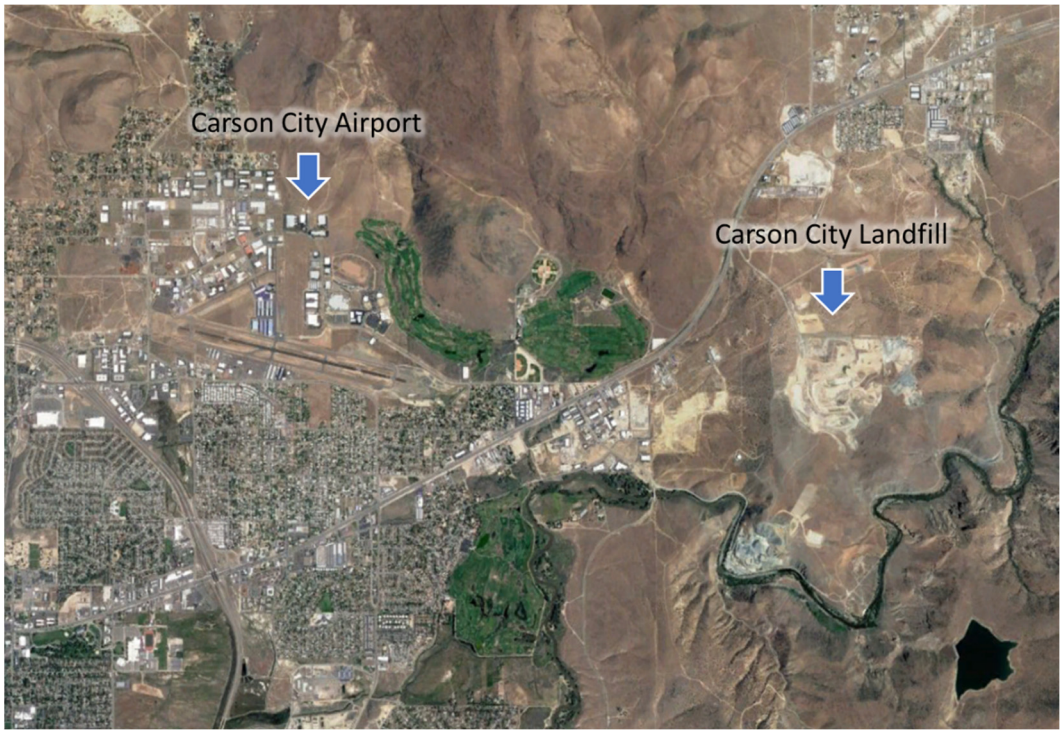


FIGURE 5B
CXP PROXIMITY TO CITY LANDFILL

4.1 Government Guidance

Federal

The FAA provides information and guidance to airport operators for successfully implementing sustainable practices, such as recycling at airports. Specifically, the FAA provides technical guidance on Airport Recycling, Reuse, and Waste Reduction through the form of a technical memorandum, a synthesis document, and collections of ACRP reports. Additionally, in 2009, the Environmental Protection Agency (EPA) completed a large collection of airport-specific recycling information through numerous research studies and data collection efforts: "Developing and Implementing an Airport Recycling Program." The FAA collaborates with the EPA to ensure airports are receiving the best and most accurate information for implementing recycling and waste reduction initiatives.

State

The State of Nevada has a clearly defined outlook for waste and recycling. In 2017, the State completed the Nevada Solid Waste Management Plan[3] which analyzes the current state waste and recycling output as well as the roles and responsibilities within the state. Additionally, the plan proposes future solutions and strategies for mitigating identified challenges. The Nevada Department of Environmental Protection is the authority for solid waste management for most of the state, including Carson City.

Local

In 1991, Assembly Bill (AB) 320 was enacted and influenced Nevada to implement a 25% recycling goal into law for municipalities required to have a recycling program. Since then, Carson City has exceeded the 25% recycling goal and aided in the statewide recycling climb to nearly 29% in 2012.

5. Potential for Cost Savings or Revenue Generation

At this time, it is anticipated that little financial gain would be achieved from increased recycling efforts. Adding recycled waste pick-up to tenant contracts with WM would add a small fee to the tenant's current WM contract fee. However, WM provides its customers with recycled content receptacles, therefore no cost would be assumed for the necessary containers.

1. Implement manual recycling at the terminal building and offices

- Purchase or create recycling receptables to gather recycled content including cardboard, aluminum/tin cans, and plastic/glass bottles
- Manually transport collected recycled content to the nearby city landfill on an as-needed basis or when the MSW is taken to the landfill

2. Reduce the use of non-reusable items

- Encourage staff to use re-usable personal products such as plastic waterbottles and coffee cups
- Pursue other waste-reducing practices such as printing two-sided documents
- Research the practicality of implementing on-airport food composting to be used re-used in landscaping

3. Encourage tenants to pursue recycling

- Discuss the potential for cost-reduction through MSW reduction
- Discuss the feasibility of manually transporting recycled waste to the city landfill

The addition of recycling could reduce the amount of MSW being deposited into the tenant-funded dumpsters. This reduction could result in potentially upgrading to smaller dumpster sizes which typically cost less for waste collection. The cost-savings of smaller dumpsters could offset the added fee of recycled content collection from WM.

[3] https://ndep.nv.gov/uploads/land-waste-solid-swmp-docs/swmp2017-final-8-17.pdf

The most apparent method of increased recycling at little to no cost would be to encourage tenants to manually transport recycled waste to the nearby landfill on an as-need basis. The city landfill currently charges no fee for dropping off recycled material. An upfront cost of purchasing recycling receptacles would quickly be recovered by the savings from no collection fee.

6. Plan to Decrease MSW and Increase Recycled Waste

As previously discussed, the airport staff has no direct control over tenant waste disposal or recycling. However, the airport could implement efforts to be an example to its tenants in reducing its overall MSW and implementing recycling efforts. These efforts are intended to be manageable by the small airport staff and potentially impact the airport tenants in the future. The following are initiatives the airport can pursue to align itself with the recycling goals of the City as well as action steps to achieve them.

Through these initiatives, the airport could become a key player in the City's reputation of exceeding the city recycling goal. The development of a recycling and waste reduction program with these initiatives will be the first step toward longer term initiatives such as waste tracking and monitoring, receptible labeling, and public outreach.

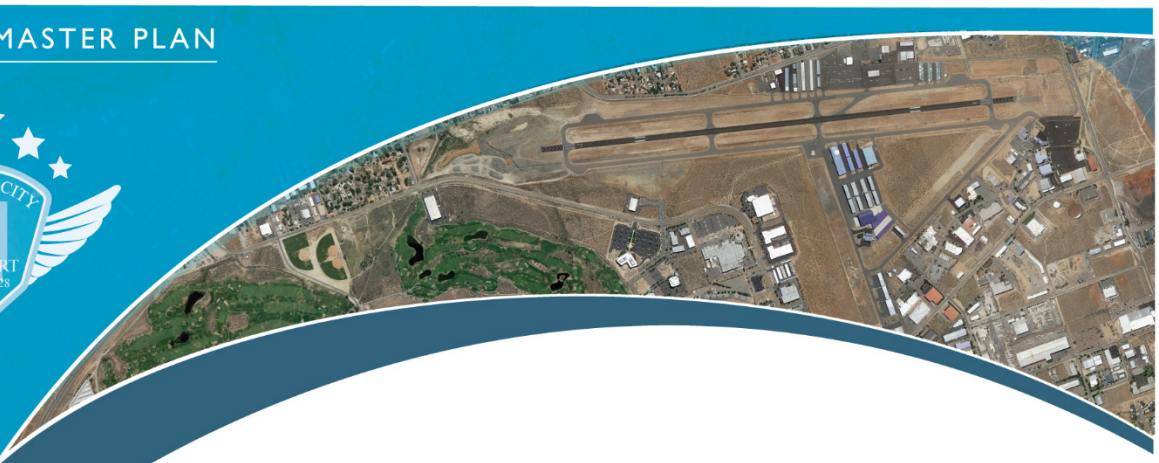
SUMMARY

This chapter has been prepared to help the Carson City Airport Authority in making decisions on the future growth and development of CXP by describing narratively and graphically the Development Concept. The plan represents an airfield facility that fulfills aviation needs for the airport, while conforming to safety and design standards to the extent practicable. It also provides a guide for a landside complex that can be developed as demand dictates.

Flexibility will be very important to future development at the airport, as activity may not occur as predicted. The Development Concept provides airport stakeholders with a general guide that, if followed, can maintain the airport's long-term viability and allow the airport to continue to provide general aviation services for the region. The next chapter of this Master Plan will consider strategies for funding the recommended improvements and will provide a reasonable schedule for undertaking the projects based on safety and demand over the next 20 years.

CHAPTER SIX

CAPITAL PROGRAM



CHAPTER SIX

CAPITAL PROGRAM

The analyses completed in previous chapters evaluated development needs at Carson City Airport (CXP) over the next 20 years based on forecast activity, facility requirements, safety standards, and operational efficiency. Now that the recommended Master Plan Development Concept has been established and specific needs and improvements for the airport have been recognized, the next step is to determine a realistic schedule for project implementation as well as the associated costs for the plan. This chapter will provide a description and overall cost for each project identified in the capital improvement program (CIP) and development schedule. The program has been evaluated from a variety of perspectives and represents a comparative analysis of basic budget factors, demand, and priority assignments.

The presentation of the capital program has been organized into three sections. First, the airport's capital program needs are identified by various categories ranging from meeting safety and design standards to satisfying demand. Second, the airport development schedule and CIP cost estimates are presented in narrative and graphic form. The CIP has been developed following Federal Aviation Administration (FAA) guidelines for master plans and identifies those projects that are likely eligible for FAA and Nevada Department of Transportation – Aviation Planning Section (NDOT) grant funding. Third, capital improvement funding sources on the federal, state, and local levels are identified and discussed.

AIRPORT DEVELOPMENT NEEDS

In an effort to identify capital needs at the airport, this section provides analysis regarding the associated development needs of those projects included in the CIP. While some projects will be demand-based, others will be dictated by design standards, safety, or rehabilitation needs. Each development need is categorized according to this schedule. The applicable category (or categories) included are presented on **Exhibit 6A**. The proposed projects can be categorized as follows:

1) **Safety/Security (SS)** – These are capital needs considered necessary for operational safety and protection of aircraft and/or people and property on the ground near the airport.

2) **Environmental (EN)** – These are capital needs which are identified to enable the airport to operate in an environmentally acceptable manner or meet needs identified in the Environmental Overview outlined in Chapter Five.

3) **Maintenance (MN)** – These are capital needs required to maintain the existing infrastructure at the airport.

4) **Efficiency (EF)** – These are capital needs intended to optimize aircraft ground operations or passengers' use of the terminal building.

5) **Demand (DM)** – These are capital needs required to accommodate levels of aviation demand. The implementation of these projects should only occur when demand for these needs is verified.

6) **Opportunities (OP)** – These are capital needs intended to take advantage of opportunities afforded by the airport setting. Typically, this will involve improvements to property intended for lease to aviation- or non-aviation-related development.

AIRPORT DEVELOPMENT SCHEDULE AND COST SUMMARIES

Now that the specific needs and improvements for CXP have been established, the next step is to determine a realistic schedule and the associated costs for implementing the recommended Master Plan Development Concept. The capital program considers the interrelationships among the projects in order to determine an appropriate sequence of projects, while remaining within reasonable fiscal constraints.

This section will examine the overall cost of each item in the capital program. The CIP, programmed by years, has been developed to cover the first five years of the plan. The remaining projects are grouped into intermediate (years 6-10) and long-term (years 11-20) planning horizons. More detailed information is provided for the five-year horizon, with less detail provided for the longer planning periods. By utilizing planning horizons instead of specific years for intermediate and long-term development, the

	PROJECT NUMBER and DESCRIPTION	PROJECT CATEGORY	FEDERAL FUNDING	STATE/LOCAL SHARE[1,2]	TOTAL PROJECT COST ESTIMATE[3]
SHORT-TERM PROJECT DESCRIPTION					
Planning Year 2020					
1	Replace Perimeter Fence and Access Gates (10,175 LF) (D&C)[2]	SS/MN	$1,049,357	$-	$1,049,357
2	Construct Snow Removal Equipment Building (40' x 80') (Design)[2]	MN	$112,810	$-	$112,810
3	Pavement Rehab - Runway 9-27 (6,101' x 75') (D&C)[2]	MN	$330,106	$-	$330,106
2020 Total			***$1,492,273***	***$-***	***$1,492,273***
Planning Year 2021					
4	Relocate AWOS (D&C)	SS	$281,250	$18,750	$300,000
5	Construct Snow Removal Equipment Building (40' x 80') (Bid and Construct)	MN	$468,750	$31,250	$500,000
6	Acquire Snow Removal Equipment	SS/MN	$210,938	$14,063	$225,000
7	Install Approach Lighting (Planning Study and Aeronautical Survey)	SS/DM	$234,375	$15,625	$250,000
2021 Total			***$1,195,313***	***$79,688***	***$1,275,000***
Planning Year 2022					
8	Install Approach Lighting (Land Acquisition and BLM Land Transfer)	SS	$468,750	$31,250	$500,000
2022 Total			***$468,750***	***$31,250***	***$500,000***
Planning Year 2023					
9	Install Approach Lighting (Final D&C)	DM/SS	$937,500	$62,500	$1,000,000
10	Install Emergency Generator (D&C)	SS	$93,750	$6,250	$100,000
2023 Total			***$1,031,250***	***$68,750***	***$1,100,000***
Planning Year 2024					
11	Pavement Rehab - Runway 9-27 (6,101' x 75')(D&C)	SS/MN	$309,375	$20,625	$330,000
12	Pavement Rehab - Main Apron (57,540 sy) (D&C)	SS/MN	$300,000	$20,000	$320,000
13	Pavement Rehab - North Apron (39,920 sy) (D&C)	SS/MN	$210,938	$14,063	$225,000
14	Pavement Rehab - Taxiway A (7,320' x 50'), Taxiway C (3,400' x 50'), and Taxiway D (6,830' x 50') (D&C)	SS/MN	$468,750	$31,250	$500,000
15	Reconstruct Taxiway B (2,765' x 35') (D&C)	SS/MN	$525,000	$35,000	$560,000
2024 Total			***$1,814,063***	***$120,938***	***$1,935,000***
Planning Year 2025					
16	Construct Taxiway C and Southwest Storm Drain (3,800 LF) (D&C)	SS/MN	$234,375	$15,625	$250,000
2025 Total			***$234,375***	***$15,625***	***$250,000***
TOTAL SHORT-TERM PROGRAM			**$6,236,023**	**$316,250**	**$6,552,273**
INTERMEDIATE-TERM PROJECT DESCRIPTION					
17	Remove and Relocate Midfield Taxiway Connectors	SS	$2,362,500	$157,500	$2,520,000
18	Land Acquisition (Approximately 44 Acres)	DM/OP	$9,075,938	$605,063	$9,681,000
19	Construct Two Port-A-Port Hangars	DM/OP	$-	$161,000	$161,000
20	Construct Self-Service Fuel Island	DM/OP	$524,063	$34,938	$559,000
21	Acquire Approximately 10 Acres West of the Main Apron Area	DM/OP	$-	$2,520,000	$2,520,000
22	Construct Northern Automobile Access Road Extending from Ryan and Lockheed Way	SS/DM	$-	$388,000	$388,000
23	Widen Taxiway B to 50 Feet	SS	$1,067,813	$71,188	$1,139,000
24	Environmental Review for Runway Extensions	EN	$405,938	$27,063	$433,000
25	Install PAPI-4s Serving Runway 9-27	SS	$201,563	$13,438	$215,000
TOTAL INTERMEDIATE-TERM PROGRAM			**$13,637,813**	**$3,978,188**	**$17,616,000**
LONG-TERM PROJECT DESCRIPTION					
26	Construct 200-foot Runway 27 and Parallel Taxiway Extension	SS/DM	$1,703,438	$113,563	$1,817,000
27	Construct 600-foot Runway 9 and Parallel Taxiway Extension. Acquire Approximately 0.1 Acres	SS/DM	$5,631,563	$375,438	$6,007,000
28	Acquire Approximately 25 Acres Northeast of Runway 9-27	DM/OP	$-	$7,269,000	$7,269,000
29	Reconstruct FBO/Terminal Area	DM/OP	$5,543,438	$369,563	$5,913,000
30	Construct Western Terminal Area Hangar Development	DM/OP	$-	$8,058,000	$8,058,000
31	Construct Eastern Terminal Area Hangar Development	DM/OP	$-	$5,392,000	$5,392,000
32	Construct Northeast Development Area Phase 1	DM/OP	$-	$20,669,000	$20,669,000
33	Construct Northeast Development Area Phase 2	DM/OP	$-	$37,316,000	$37,316,000
34	North Central Development Area Phase 1	DM/OP	$-	$28,469,000	$28,469,000
35	North Central Development Area Phase 2	DM/OP	$-	$36,491,000	$36,491,000
TOTAL LONG-TERM PROGRAM			**$12,878,438**	**$144,522,563**	**$157,401,000**
CAPITAL IMPROVEMENT PROGRAM TOTAL			**$32,752,273**	**$148,817,000**	**$181,569,273**

D & C - Design and Construct

[1] State funding is available through the Nevada Fund for Aviation Grant Program providing $100,000 statewide on an annual basis; however, state match grants are not to exceed $50,000.t

[2] The CARES Act, signed March 27, 2020, provides funds to increase the federal share to 100 percent for AIP and supplemental discretionary grants already planned for Fiscal year 2020.

[3] The CIP total has been inflated at three percent per year throughout the intermediate and long-term planning horizons to account for inflation and the rising costs of construction.

CATEGORY LEGEND:

SS - Safety/Security **EF - Efficiency**
EN - Environmental **DM - Demand**
MN - Maintenance **OP - Opportunity**

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Carson City Airport Authority will have greater flexibility to adjust capital needs as demand dictates. **Table 6A** summarizes the key milestones for each of the three planning horizons.

TABLE 6A
Planning Horizon Activity Levels
Carson City Airport

	Base Year	Short Term	Intermediate Term	Long Term
BASED AIRCRAFT				
Single Engine Piston	248	262	282	330
Multi-Engine Piston	44	45	43	37
Turboprop	14	18	20	28
Jet	22	22	28	36
Helicopter	22	28	32	39
TOTAL BASED AIRCRAFT	**350**	**375**	**405**	**470**
ANNUAL OPERATIONS				
Itinerant				
General Aviation	37,500	40,200	43,400	50,400
Air Taxi	2,000	2,000	2,500	3,300
Military	0	0	0	0
Total Itinerant	**39,500**	**42,200**	**45,900**	**53,700**
Local				
General Aviation	38,500	41,300	44,500	51,700
Military	0	0	0	0
Total Local	**38,500**	**41,300**	**44,500**	**51,700**
TOTAL OPERATIONS	**78,000**	**83,500**	**90,400**	**105,400**

A key aspect of this planning document is the use of demand-based planning milestones. The short-term planning horizon contains items of highest need and/or priority. As short-term horizon activity levels are reached, it will then be time to program for the intermediate term based upon the next activity milestones. Similarly, when the intermediate-term milestones are reached, it will be time to program for the long-term activity milestones.

Many development items included in the recommended concept will need to follow demand indicators, which essentially establish triggers for key improvements. For example, the Master Plan Development Concept includes the development of new aircraft hangars. Growth in based aircraft is the trigger for these projects. If growth slows or does not occur as projected, new hangar development can be delayed. As a result, the capital expenditures will be undertaken as needed, which leads to a responsible use of capital assets. Some development items do not depend on demand. Other projects are necessary to enhance the safety of the airport, maintain existing infrastructure, or meet FAA design standards. These types of projects typically are associated with day-to-day operations and should be monitored and identified by airport management regardless of changes in demand indicators.

Because of economic realities, few airports are constructing hangars on their own and are relying on private developers instead. In some cases, private developers can keep construction costs lower, which,

in turn, lowers the monthly lease rates necessary to amortize a loan. The airport sponsor's responsibility related to new hangars can be to provide public access taxiways, typically in conjunction with FAA and/or state development grants. These taxiways are then able to be utilized by hangar tenants for aircraft access to the runway/taxiway system.

Given that a master plan is a conceptual document, implementation of the capital projects should only be undertaken after further refinement of their design and costs through architectural or engineering analyses. Moreover, some projects may require additional infrastructure improvements (i.e., drainage improvements, extension of utilities, etc.) that may increase the estimated cost of the project or increase the timeline for completion.

Once a list of necessary projects was identified and refined, project-specific cost estimates were prepared. The cost estimates also include design, construction administration, and contingencies that may arise on the project. Capital costs presented here should be viewed only as "order-of-magnitude" estimates subject to further refinement during design. Nevertheless, they are considered sufficient for planning purposes. Some projects, particularly those in the short-term period, have been taken from the airport's Five-year Airport Capital Improvement Program (ACIP) currently on file with the FAA. Cost estimates for projects included in the intermediate and long-term CIP were provided by Atkins North America. Cost estimates for each of the development projects have been adjusted with a three percent increase per year throughout the intermediate and long-term CIP to accommodate rising costs of construction and inflation adjustments. As previously stated, each project should only be undertaken after further refinement of their design and costs through detailed architectural or engineering analyses.

Exhibit 6A presents the proposed 20-year CIP for CXP. An estimate of FAA and NDOT funding eligibility has been included, although actual funding is not guaranteed. For those projects that would be eligible for federal funding, Airport Improvement Program (AIP) reauthorization provides for 93.75 percent of the total project cost at the airport. The remaining local match (6.25 percent) is eligible for state funding and could be funded wholly or in part by the Nevada Fund for Aviation, not to exceed $50,000. Under these circumstances, any remaining amount not covered by AIP or the Nevada Fund for Aviation must be funded locally by the Carson City Airport Authority.

As detailed in the CIP, many of the projects listed are eligible for federal funding. Obviously, demand and justification for these projects must be provided prior to a grant being issued by the FAA. **Exhibit 6B** graphically depicts the development staging by overlaying each project onto the aerial photograph of CXP.

The FAA utilizes a national priority rating system to help objectively evaluate potential airport projects. Projects are weighted toward safety, infrastructure preservation, meeting design standards, and capacity enhancement. The FAA will participate in the highest priority projects before considering lower priority projects, even if a lower priority project is considered a more urgent need by the local sponsor. Nonetheless, the project should remain a priority for the airport and funding support should continue to be requested in subsequent years.

DECLARED DISTANCES

	RUNWAY 9	RUNWAY 27
TORA	6,901'	6,901'
TODA	6,901'	6,901'
ASDA	6,901'	6,901'
LDA	6,301'	6,701'

TODA - Takeoff Distance Available
TORA - Takeoff Run Available
ASDA - Accelerate/Stop Distance Available
LDA - Landing Distance Available

LEGEND

- Airport Property Line
- Future Airport Property Line
- Taxiway Designator
- Runway Protection Zone (RPZ)
- 25' Building Restriction Line
- Short Term Project
- Intermediate Term Project
- Long Term Project
- To Be Removed
- Non-Aeronautical Land Use
- Through the-Fence Access
- Operational area for light aircraft only. Prior permission required

MALSF - Medium Intensity Approach Lighting System with Sequenced Flashers

Aerial Image: Atkins 10-8-2017

SHORT-TERM PROJECTS (1-5 YEARS)

Planning Year 2020

1. Replace Perimeter Fence and Access Gates (10,175 LF) (D&C) ***NP***
2. Construct Snow Removal Equipment Building (40' x 80') (Design) ***NP***
3. Pavement Rehab - Runway 9-27 (6,101' x 75') (D&C) ***NP***

Planning Year 2021

4. Relocate AWOS (D&C)
5. Construct Snow Removal Equipment Building (40' x 80') (Bid & Construct)
6. Acquire Snow Removal Equipment ***NP***
7. Install Approach Lighting (Planning Study and Aeronautical Survey) ***NP***

Planning Year 2022

8. Install Approach Lighting (Land Acquisition and BLM Land Transfer)

Planning Year 2023

9. Install Approach Lighting (Final D&C)
10. Install Emergency Generator (D&C)

SHORT-TERM PROJECTS - *continued*

Planning Year 2024

11. Pavement Rehab - Runway 9-27 (6,101' x 75') (D&C) ***NP***
12. Pavement Rehab - Main Apron (57,540 sy) (D&C) ***NP***
13. Pavement Rehab - North Apron (39,920 sy) (D&C ***NP***
14. Pavement Rehab - Taxiway A (7,320' x 50'), Taxiway C (3,400' x 50'), and Taxiway D (6,830' x 50') (D&C) ***NP***
15. Reconstruct Taxiway B (2,765' x 35') (D&C)

Planning Year 2025

16. Construct Taxiway C and Southwest Storm Drain (3,800 LF) (D&C) ***NP***

INTERMEDIATE-TERM PROJECT DESCRIPTION

17. Remove and Relocate Midfield Taxiway Connectors
18. Land Acquisition (Approximately 44 Acres)
19. Construct Two Port-A-Port Hangars
20. Construct Self-Service Fuel Island
21. Acquire Approximately 10 Acres West of the Main Apron Area
22. Construct Northern Automobile Access Road Extending from Ryan and Lockheed Way
23. Widen Taxiway B to 50 Feet
24. Environmental Review for Runway Extensions ***NP***
25. Install PAPI-4s Serving Runway 9-27

LONG-TERM PROJECT DESCRIPTION

26. Construct 200-foot Runway 27 and Parallel Taxiway Extension
27. Construct 600-foot Runway 9 and Parallel Taxiway Extension. Acquire Approximately 0.1 Acres
28. Acquire Approximately 25 Acres Northeast of Runway 9-27

INTERMEDIATE-TERM PROJECT DESCRIPTION

29. Reconstruct FBO/Terminal Area
30. Construct Western Terminal Area Hangar Development
31. Construct Eastern Terminal Area Hangar Development
32. Construct Northeast Development Area Phase 1
33. Construct Northeast Development Area Phase 2
34. North Central Development Area Phase 1
35. North Central Development Area Phase 2

D & C - Design and Construct
NP - Not Pictured
White - Private Development

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Some projects identified in the CIP will require environmental documentation. The level of documentation necessary for each project must be determined in consultation with the FAA and NDOT. There are three major levels of environmental review to be considered under the *National Environmental Policy Act* (NEPA) that include categorical exclusions (CatEx), Environmental Assessments (EA), and Environmental Impact Statements (EIS). Each level requires more time to complete and more detailed information. Guidance on what level of documentation is required for a specific project is provided in FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*. The Environmental Overview presented in Chapter Five addresses NEPA and provides an evaluation of various environmental categories for CXP.

The following sections will describe in greater detail the projects identified for the airport over the next 20 years. The projects are grouped based upon a detailed evaluation of existing and projected demand, safety, rehabilitation needs, and local priority. While the CIP identifies the priority ranking of the projects, the list should be evaluated and revised on a regular basis. It is also important to note that certain projects, while listed separately for purposes of evaluation in this study, could be combined with other projects during time of construction/implementation.

SHORT-TERM PROGRAM

The short-term projects are those anticipated to be needed in years zero through five of the 20-year CIP. The list of projects is further divided into yearly timeframes and are prioritized based on the needs of CXP. Projects related to safety and preservation generally have the highest priority. The short-term program considers 16 projects for the planning period as presented on **Exhibit 6A** and depicted on **Exhibit 6B**. The following provides a detailed breakdown of each project.

FY 2020 Projects

Project #1: Replace Perimeter Fence and Access Gates (10,175 LF) (Design and Construct)
Description: At present, the airport's perimeter is partially enclosed by security fencing of varying heights and is served by multiple controlled access gates. This project is currently underway and provides an additional 10,175 linear feet (LF) fencing to completely enclose the airport's perimeter with a six-foot chain-link fence with three-strand barbed-wire affixed on top.
Cost Estimate: $1,049,357
Funding Eligibility: FAA – 100 percent / State or Local – 0 percent

Project #2: Construct Snow Removal Equipment Building (40' x 80') (Design)
Description: The airport does not currently have a building dedicated to airport maintenance or storage. This project is the design of a dedicated airport maintenance equipment and SRE building.
Cost Estimate: $112,810
Funding Eligibility: FAA – 100 percent / State or Local – 0 percent

Project #3: Pavement Rehabilitation – Runway 9-27 (6,101' x 75') (Design and Construct)
Description: As part of routine airport maintenance, Runway 9-27 is planned to be rehabilitated.
Cost Estimate: $330,106
Funding Eligibility: FAA – 100 percent / State or Local – 0 percent

FY 2021 Projects

Project #4: Relocate AWOS (Design and Construct)
Description: The existing AWOS is located to the east of the NDOT facility and electrical vault, directly north of E. College Parkway. Ultimately, this area could be better used to store airport maintenance and snow removal equipment (SRE). This project also considers the relocation of the AWOS to make room for a dedicated airport maintenance and SRE building.
Cost Estimate: $300,000
Funding Eligibility: FAA – 93.75 percent / State or Local – 6.25 percent

Project #5: Construct Snow Removal Equipment Building (40' x 80') (Bid and Construct)
Description: As previously mentioned, the airport does not currently have a building dedicated to airport maintenance or storage. This project is the bid and construction of a dedicated airport maintenance equipment and SRE building.
Cost Estimate: $500,000
Funding Eligibility: FAA – 93.75 percent / State or Local – 6.25 percent

Project #6: Acquire Snow Removal Equipment
Description: At present, CXP owns very minimal snow removal equipment. This project is the acquisition of larger SRE that will better serve the airport.
Cost Estimate: $225,000
Funding Eligibility: FAA – 93.75 percent / State or Local – 6.25 percent

Project #7: Install Approach Lighting (Planning Study and Aeronautical Survey)
Description: The instrument approach procedures serving CXP are currently not available during nighttime operations due to terrain. Lean Engineering has recently completed a study which analyzes the feasibility of nighttime instrument approach procedures at CXP and makes recommendations on the facilities needed to enable nighttime instrument approach procedures. This project is the planning and aeronautical survey required prior to implementing the approach lighting required to remove the nighttime instrument approach restrictions.
Cost Estimate: $250,000
Funding Eligibility: FAA – 93.75 percent / State or Local – 6.25 percent

FY 2022 Projects

Project #8: Install Approach Lighting (Land Acquisition and BLM Land Transfer)
Description: This project serves as the next step in implementing an approach lighting system, as outlined in Project #7, to remove the nighttime instrument approach restrictions currently in place. When carried out, this project will acquire the land required for the approach lighting system.
Cost Estimate: $500,000
Funding Eligibility: FAA – 93.75 percent / State or Local – 6.25 percent

FY 2023 Projects

Project #9: Install Approach Lighting (Final Design and Construct)
Description: The final design and construction is the third and final project related to the installation of the approach lighting system to remove the nighttime instrument approach restrictions currently in place.
Cost Estimate: $1,000,000
Funding Eligibility: FAA – 93.75 percent / State or Local – 6.25 percent

Project #10: Install Emergency Generator (Design and Construct)
Description: Currently, the airport does not have an emergency generator. As such, this project is the implementation of an emergency generator providing backup power supply.
Cost Estimate: $100,000
Funding Eligibility: FAA – 93.75 percent / State or Local – 6.25 percent

FY 2024 Projects

Project #11: Pavement Rehabilitation – Runway 9-27 (6,101' x 75') (Design and Construct)
Description: As part of routine airport maintenance, Runway 9-27 is planned to be rehabilitated.
Cost Estimate: $330,000
Funding Eligibility: FAA – 93.75 percent / State or Local – 6.25 percent

Project #12: Pavement Rehabilitation – Main Apron (57,540 sy) (Design and Construct)
Description: This project is the rehabilitation of the main aircraft apron area, located south of Runway 9-27, as part of routine airport maintenance. The pavement to be rehabilitated will total approximately 57,540 sy.
Cost Estimate: $320,000
Funding Eligibility: FAA – 93.75 percent / State or Local – 6.25 percent

Project #13: Pavement Rehabilitation – North Apron (39,920 sy) (Design and Construct)
Description: Routine airport maintenance considers the rehabilitation of approximately 39,920 sy of the north aircraft apron area located north of Runway 9-27.
Cost Estimate: $225,000
Funding Eligibility: FAA – 93.75 percent / State or Local – 6.25 percent

Project #14: Pavement Rehabilitation – Taxiways A, C, and D (Design and Construct)
Description: As part of routine airport maintenance, this project is the rehabilitation of approximately 97,500 sy of Taxiways A, C, and D.
Cost Estimate: $500,000
Funding Eligibility: FAA – 93.75 percent / State or Local – 6.25 percent

Project #15: Reconstruct Taxiway B (Design and Construct)
Description: As part of routine airport maintenance, this project is the reconstruction of Taxiway B.
Cost Estimate: $560,000
Funding Eligibility: FAA – 93.75 percent / State or Local – 6.25 percent

FY 2025 Projects

Project #16: Construct Taxiway C and Southwest Storm Drain (3,800 LF) (Design and Construct)
Description: This project is the design and construction of approximately 3,800 linear feet of storm drain serving the airfield.
Cost Estimate: $250,000
Funding Eligibility: FAA – 93.75 percent / State or Local – 6.25 percent

Short-Term Program Summary

The short-term CIP, detailed on **Exhibit 6A**, includes projects that enhance the overall safety, efficiency, and maintenance of the airfield, while also implementing landside improvements. The total investment necessary for the short-term CIP is approximately $6.5 million. Of the total short-term program, approximately $6.2 million is eligible for federal funding assistance. The remaining funding of over $300,000 is to be provided through state or local funding outlets.

INTERMEDIATE-TERM PROGRAM

The intermediate-term projects are those that are anticipated to be necessary in years six through 10 of the Master Plan. These projects are not tied to specific years for implementation; instead, they have been prioritized so that airport management has the flexibility to determine when they need to be pursued based on current conditions. It is not unusual for certain projects to be delayed or advanced based on changing conditions, such as funding availability or changes in the aviation industry. This planning horizon includes nine projects for the five-year timeframe as listed on **Exhibit 6A** and depicted on **Exhibit 6B**. The following section includes a description of each project.

Project #17: Remove and Relocate Midfield Taxiway Connectors
Description: In their current location, Taxiway Connectors A3 and B provide direct access to Runway 9-27. Moreover, the combination of Connectors A2, A3, B, and D2 provide runway crossings through the high-energy area of Runway 9-27, and Connector A4 provides an angled taxiway connection. To comply with current FAA taxiway geometry standards, this project will remove and relocate Connectors A2 and D2 250 feet to the east, out of the ultimate high-energy area. Furthermore, Taxiway Connectors B and A3 will be relocated approximately 1,150 feet to the west, which will clear the ultimate high-energy area of runway crossings as well as eliminate direct access to Runway 9-27. At the time this project is constructed, it is recommended that the relocated Taxiway Connector B be renamed to Connector D3 to maintain the existing taxiway connector nomenclature cadence, and the acutely angled Connector A4 will be removed altogether.
Cost Estimate: $2,520,000
Funding Eligibility: FAA – 93.75 percent / State or Local – 6.25 percent

Project #18: Land Acquisition (Approximately 44 Acres)
Description: Future landside development considers the acquisition of approximately 44 acres located along the east side of Taxiway B and north of Runway 9-27. Landside development of this area will likely be phased as demand warrants. Development phases of this area will be further outlined within the long-term CIP. It should be noted that the FAA will not participate in funding "land banking" activities; however, will provide reimbursement for land acquisition costs once landside development begins.
Cost Estimate: $9,681,000
Funding Eligibility: FAA – 93.75 percent / State or Local – 6.25 percent

Project #19: Construct Two Port-A-Port Hangars
Description: If demand warrants, this project considers the construction of two port-a-port hangars located adjacent to the existing port-a-port hangars on the west side of the main apron area.
Cost Estimate: $161,000
Funding Eligibility: FAA – 0 percent / State or Local – 100 percent

Project #20: Construct Self-Service Fuel Island
Description: At present, self-service fueling is available on the north side of Runway 9-27. Although full service fueling is available, aircraft operators are often observed crossing Runway 9-27 to access the self-service fueling facility. In an effort to reduce the amount of runway crossings associated with fueling operations, it is recommended that a self-service fueling facility offering 100LL and Jet A fuel be located on the main aircraft apron.
Cost Estimate: $559,000
Funding Eligibility: FAA – 93.75 percent / State or Local – 6.25 percent

Project #21: Acquire Approximately 10 Acres West of the Main Apron Area
Description: In an effort to better protect the airport environment from incompatible land uses, it is recommended that the airport acquire approximately 10 acres of property located west of the main aircraft apron and immediately south of the Runway 9 threshold. Given that this property is currently not slated for airside development, funding would need to be provided locally as the FAA does not participate in land banking activities. However, should the airport decide to develop the property, the FAA could then reimburse the airport for the land acquisition.
Cost Estimate: $2,520,000
Funding Eligibility: FAA – 0 percent / State or Local – 100 percent

Project #22: Construct Northern Automobile Access Road Extending from Ryan Way or Bell Drive and Lockheed Way
Description: As a result of the extensive landside development proposed on the north side of the airfield, the airport should consider additional automobile access to reduce the intermixing of automobile and aircraft traffic on the airfield. Unauthorized access could also be prevented through the implementation of a controlled access gate serving the new airport entrance.
Cost Estimate: $388,000
Funding Eligibility: FAA – 0 percent / State or Local – 100 percent

Project #23: Widen Taxiway B to 50 Feet
Description: This project is the design and construction of widening Taxiway B to 50 feet, meeting TDG 3 standards. To help offset costs associated with this project, the widening of Taxiway B could be timed with rehabilitation or reconstruction of the taxiway.
Cost Estimate: $1,139,000
Funding Eligibility: FAA – 93.75 percent / State or Local – 6.25 percent

Project #24: Environmental Review for Runway Extensions
Description: Given the potential environmental impacts associated with the extension of ultimate Runway 9-27, this project provides the environmental documentation required prior to construction of the runway extension.
Cost Estimate: $433,000
Funding Eligibility: FAA – 93.75 percent / State or Local – 6.25 percent

Project #25: Install PAPI-4s Serving Runway 9-27
Description: Prior to extending Runway 9-27, the existing PAPI-2s serving Runway 9-27 should be upgraded to PAPI-4 systems, as these systems are recommended for runways that serve jet operations, which already occur on a frequent basis.
Cost Estimate: $215,000
Funding Eligibility: FAA – 93.75 percent / State or Local – 6.25 percent

Intermediate-Term Program Summary

The total costs associated with the intermediate-term program are estimated at $17.6 million. Of this total, approximately $13.6 million could be eligible for federal funding, and the state or local share is projected at $4.0 million.

LONG-TERM PROGRAM

The long-term planning horizon considers 10 projects for the 10-year period. The improvements are presented on **Exhibit 6A** and depicted on **Exhibit 6B**.

Project #26: Construct 200-Foot Runway 27 and Parallel Taxiway Extensions
Description: Given the results of the runway length analysis presented in Chapter Three, a runway extension could better serve existing and future jet traffic. This project calls for a 200-foot runway extension to the east to a length of 6,301 feet. At the same time, Taxiways A and D should be extended east and Connectors A1 and D1 should be removed and relocated serving the ultimate Runway 27 end.
Cost Estimate: $1,817,000
Funding Eligibility: FAA – 93.75 percent / State or Local – 6.25 percent

Project #27: Construct 600-Foot Runway 9 and Parallel Taxiway Extension and Acquire Approximately 0.1 Acres
Description: As discussed in the previous chapter, a runway length of at least 6,700 feet will accommodate 75 percent of the business jet fleet at 60 percent useful load. The combination of runway extensions to the east and west will bring Runway 9-27 to an ultimate runway length of 6,901 feet. Similar to project #21, the extension of Taxiways A and D and Connectors A5 and D5 should be constructed at this time as well. Furthermore, the extension of Taxiway D requires the acquisition of approximately 0.1 acres of property that should be cleared to maintain the taxiway object free area (TOFA) serving the proposed taxiway.
Cost Estimate: $6,007,000
Funding Eligibility: FAA – 93.75 percent / State or Local – 6.25 percent

Project #28: Acquire Approximately 25 Acres Northeast of Runway 9-27
Description: To better protect the airport environment from incompatible land uses, it is recommended that the airport acquire approximately 25 acres of property located immediately north of the east end of the runway. Given that this property is currently not slated for airside development, funding would need to be provided locally as the FAA does not participate in land banking activities. However, should the airport decide to develop the property, the FAA could then reimburse the airport for the land acquisition.
Cost Estimate: $7,269,000
Funding Eligibility: FAA – 0 percent / State or Local – 100 percent

Project #29: Reconstruct FBO/Terminal Area
Description: This project considers the construction of a 100-foot by 100-foot terminal or FBO building in the existing location of the airport terminal building, with the pavement in front and to either side of the terminal or FBO building cleared for aircraft apron use. In doing so, administrative and storage functions of the existing airport terminal building could be transferred to the proposed facility or elsewhere on the airfield. As such, the construction of a new terminal or FBO building that is owned and operated by CXP would allow the airport an opportunity to accommodate general aviation demands.
Cost Estimate: $5,913,000
Funding Eligibility: FAA – 93.75 percent / State or Local – 6.25 percent

Project #30: Construct Western Terminal Area Hangar Development
Description: If demand warrants, this project considers the construction of a 100-foot by 150-foot conventional hangar on the west side of the terminal area and includes approximately 6,400 sy of aircraft apron area and 15,200 sf of automobile parking area.
Cost Estimate: $8,058,000
Funding Eligibility: FAA – 0 percent / State or Local – 100 percent

Project #31: Construct Eastern Terminal Area Hangar Development
Description: Similar to Project #25, this project considers the construction of a 100-foot by 100-foot conventional hangar on the west side of the terminal area and includes approximately 1,200 sy of aircraft apron area and 25,400 sf of automobile parking area.
Cost Estimate: $5,392,000
Funding Eligibility: FAA – 0 percent / State or Local – 100 percent

Project #32: Construct Northeast Development Area Phase 1
Description: If the airport experiences additional demand for landside development, this project considers the construction of two linear box hangars and two conventional hangars totaling approximately 55,900 sf and 8,500 sy of aircraft apron and movement area. In addition, automobile access could be provided from Arrowhead Drive through a controlled access gate. Proposed automobile parking and access area for the Phase 1 project include approximately 27,600 sf.
Cost Estimate: $20,669,000
Funding Eligibility: FAA – 0 percent / State or Local – 100 percent

Project #33: Construct Northeast Development Area Phase 2
Description: This project is the continued development of the northeast development area and includes the construction of four large clear span conventional style hangars encompassing approximately 78,000 sf of hangar space and 8,000 sy of aircraft apron and movement areas. The proposed development area is also served by approximately 12,500 sf of automobile access and parking areas.
Cost Estimate: $37,316,000
Funding Eligibility: FAA – 0 percent / State or Local – 100 percent

Project #34: Construct North Central Development Area Phase 1
Description: Should CXP experience continued demand for aircraft hangar storage, this project is the first phase of the north central development area and includes the construction of three large clear span conventional style hangars encompassing approximately 142,800 sf of hangar space and additional aircraft apron and automobile parking and movement areas.
Cost Estimate: $28,469,000
Funding Eligibility: FAA – 0 percent / State or Local – 100 percent

Project #35: Construct North Central Development Area Phase 2
Description: This project is the second phase of development for the north central development area and includes the construction of 10 linear box hangars totaling approximately 104,500 sf of hangar space and additional apron and automobile parking and movement areas. It should be noted that private development in the Sierra Skyway leasehold, located at the intersection of Taxiways B and C, is depicted in white on **Exhibit 6B** as it is not being funded by the airport.
Cost Estimate: $36,491,000
Funding Eligibility: FAA – 0 percent / State or Local – 100 percent

Long-Term Program Summary

The total costs associated with the long-term program are estimated at $157.4 million. Of this total, approximately $12.9 million could be eligible for federal funding. The state or local matching share is projected at $144.5 million.

CAPITAL IMPROVEMENT PROGRAM SUMMARY

The list of projects needed to accomplish the vision for CXP has been prioritized and cost estimates have been developed. Projects considered for the short-term planning horizon (years 0-5) have been divided into yearly increments. Projects considered for the intermediate (years 6-10) and long term (years 11-20) have been prioritized and grouped together. The grouping of projects is necessary to provide the needed flexibility for the airport to make adjustments as necessary. In addition, on an annual basis, the airport and FAA assemble and review a five-year CIP. Therefore, the list of projects and the prioritization of the projects can and likely will change in the future.

The total CIP proposes approximately $181.6 million in airport development needs. It is important to note that this total has been inflated at three percent per year throughout the intermediate- and long-term planning horizons to account for inflation and the rising costs of construction. Of this total, approximately $32.8 million could be eligible for federal funding assistance. The state or local funding estimate for the proposed CIP is approximately $148.8 million. The state and/or local funding estimate is largely driven by the construction costs of large linear/executive box and conventional hangar types as well as land acquisition that is not currently slated for aviation use. It should be clearly stated that costs associated with hangar development will likely be offset by the airport in pursuing private developers for

hangar construction. Nonetheless, the CIP can serve as a road map of airport improvements to help guide the Carson City Airport Authority, NDOT, and the FAA.

CAPITAL IMPROVEMENT FUNDING SOURCES

There are generally four sources of funds used to finance airport capital development projects: airport revenues, revenue/general obligation bonds, federal/state/local grants, and passenger facility charges (PFCs), which are reserved for commercial service airports. Access to these sources of financing varies widely among airports, with some large airports maintaining substantial cash reserves and most small commercial service and general aviation airports often requiring subsidies from their sponsors (local and state governments) to fund operating expenses and to finance modest improvements.

Financing capital improvements at CXP will not rely solely on the financial resources of the Carson City Airport Authority. Capital improvement funding is available through various grant-in-aid programs on the federal and state levels. While more federal funding could be available during some years, the CIP for this Master Plan was developed with project phasing to appropriately space projects. The following discussion outlines key sources of funding potentially available for capital improvements at the airport.

FEDERAL GRANTS

Through federal legislation over the years, various grant-in-aid programs have been established to develop and maintain a system of public use airports across the United States. The purpose of this system and its federally based funding is to maintain national defense and to promote interstate commerce. Recent legislation affecting federal funding was enacted on February 17, 2012 and was titled, the *FAA Modernization and Reform Act of 2012*. The law authorized FAA appropriations (AIP) at $3.35 billion for fiscal years 2012 through 2015. In 2016, Congress passed legislation (H.R. 636, *FAA Extension, Safety, and Security Act of 2016*) amending the law to expire on September 30, 2017. Subsequently, Congress passed a bill (H.R. 3823, *Disaster Tax Relief and Airport and Airway Extension Act of 2017*) authorizing appropriations to the FAA through March 31, 2018, and the *Consolidated Appropriations Act, 2018*, extended FAA's funding and authority through September 30, 2018. In October 2018, Congress passed legislation entitled, *FAA Reauthorization Act of 2018*, which will fund the FAA's AIP at $3.35 billion annually until 2023.

Several projects identified in the CIP are eligible for FAA funding through the AIP, which provides entitlement funds to airports based, in part, on their annual enplaned passengers and pounds of landed cargo weight. Additional AIP funds, designated as discretionary, may also be used for eligible projects based on the FAA's national priority system. Although the AIP has been reauthorized several times and the funding formulas have been periodically revised to reflect changing national priorities, the program has remained essentially the same. Public use airports that serve civil aviation, like CXP, may receive AIP funding for eligible projects, as described in FAA's *Airport Improvement Program Handbook.* The airport must fund the remaining project costs using a combination of other funding sources, as discussed further below.

Eligible airports, which include those in the *National Plan of Integrated Airport Systems* (NPIAS), such as CXP, can apply for airport improvement grants. **Table 6B** presents the approximate distribution of the AIP funds as described in FAA Order 5100.38D, Change 1, *Airport Improvement Program Handbook*, issued February 26, 2019. Currently, the airport is eligible to apply for grants which may be funded through several categories.

TABLE 6B
Federal AIP Funding Distribution

Funding Category	Percent of Total	Funds*
Apportionment/Entitlement		
Passenger Entitlements	27.01%	$904,840,000
Cargo Entitlements	3.50%	$117,250,000
Alaska Supplemental	0.67%	$22,450,000
Nonprimary Entitlements	12.01%	$402,340,000
State Apportionment	7.99%	$267,670,000
Carryover	22.85%	$765,480,000
Small Airport Fund		
Small Hubs	2.33%	$78,060,000
Nonhubs	4.67%	$156,450,000
Nonprimary (GA and Reliever)	9.33%	$312,560,000
Discretionary		
Capacity/Safety/Security/Noise	4.36%	$146,060,000
Pure Discretionary	1.45%	$48,580,000
Set Asides		
Noise and Environmental	3.37%	$112,900,000
Military Airports Program	0.39%	$13,070,000
Reliever	0.06%	$2,010,000
Totals	100.00%	$3,350,000,000

* FAA *Modernization and Reform Act of 2018*
AIP: Airport Improvement Program
Source: FAA Order 5100.38D, Change 1, Airport Improvement Program Handbook

Funding for AIP-eligible projects is undertaken through a cost-sharing arrangement in which the FAA share varies by airport size and is generally 75 percent for large and medium hub airports and 90 percent for all other airports. Since the early days of federal participation in airport infrastructure projects, Congress has provided a higher federal share for airports located in states with more than five percent of their geographic acreage comprised of public lands and nontaxable Indian lands. For states that qualify, such as Nevada with approximately 80 percent public/Indian lands, the federal share is increased depending on the airport classification. As a Regional Reliever Airport, the federal share of eligible capital improvement projects for CXP is 93.75 percent. In exchange for this level of funding, the airport sponsor is required to meet various Grant Assurances, including maintaining the improvement for its useful life, usually 20 years.

AIP funds are sourced from the Aviation Trust Fund, which was established in 1970 to provide funding for aviation capital investment programs (aviation development, facilities and equipment, and research

and development). The Aviation Trust Fund also finances the operation of the FAA and is funded by user fees, including taxes on airline tickets, aviation fuel, and various aircraft parts.

Apportionment (Entitlement) Funds

AIP provides funding for eligible projects at airports through an apportionment (entitlement) program. Primary commercial service airports receive a guaranteed minimum level of federal assistance each year, based on their enplaned passenger levels and Congressional appropriation levels. A primary airport is defined as any commercial service airport enplaning at least 10,000 passengers annually. If the threshold is met, the airport receives $1 million annually in entitlement funds. Other entitlement funds are distributed to cargo service airports, states and insular areas (state apportionment), and Alaska airports.

Non-primary airports included in the NPIAS, such as CXP, can receive up to $150,000 each year in non-primary entitlement (NPE) funds. These funds can be carried over and combined for up to four years, thereby allowing for completion of a more expensive project.

The FAA also provides a state apportionment based on a federal formula that takes into account area and population. The FAA then distributes these funds for projects at various airports throughout the state.

Small Airport Fund

If a large or medium hub commercial service airport chooses to institute a passenger facility charge (PFC), which is a fee of up to $4.50 on each airline ticket for funding of capital improvement projects, then their apportionment is reduced. A portion of the reduced apportionment goes to the small airport fund. The small airport fund is reserved for small-hub primary commercial service airports, nonhub commercial service airports, reliever, and general aviation airports. As a Regional Reliever Airport, CXP is eligible for funds from this source.

Discretionary Funds

In a number of cases, airports face major projects that will require funds in excess of the airports' annual entitlements. Thus, additional funds from discretionary apportionments under AIP become desirable. The primary feature about discretionary funds is that they are distributed on a priority basis. The priorities are established by the FAA, utilizing a priority code system. Under this system, projects are ranked by their purpose. Projects ensuring airport safety and security are ranked as the most important priorities, followed by maintaining current infrastructure development, mitigating noise and other environmental impacts, meeting standards, and increasing system capacity.

It is important to note that competition for discretionary funding is not limited to airports in the State of Nevada or those within the FAA Western-Pacific Region. The funds are distributed to all airports in the country and, as such, are more difficult to obtain. High priority projects will often fare favorably, while lower priority projects may not receive discretionary grants.

Set-Aside Funds

Portions of AIP funds are set-asides designed to achieve specific funding minimums for noise compatibility planning and implementation, select former military airfields (Military Airports Program), and select reliever airports. CXP is eligible for this funding category as a Regional Reliever Airport.

FAA Facilities and Equipment (F&E) Program

The Airway Facilities Division of the FAA administers the Facilities and Equipment (F&E) Program. This program provides funding for the installation and maintenance of various navigational aids and equipment of the national airspace system. Under the F&E program, funding is provided for FAA airport traffic control towers (ATCTs), en route navigational aids, on-airport navigational aids, and approach lighting systems.

While F&E still installs and maintains some navigational aids, on-airport facilities at general aviation airports have not been a priority. Therefore, airports often request funding assistance for navigational aids through AIP and then maintain the equipment on their own[1].

STATE FUNDING PROGRAMS

The NDOT recognizes that airports make a valuable contribution to the state's transportation economy. Therefore, NDOT administers a grant program to fund airport planning, construction, and maintenance projects. The Nevada Fund for Aviation (commonly known as the Aviation Trust Fund) was unanimously passed by the 71st session of the Nevada State Legislature and then signed into law on October 1, 2001. It amended Chapter 494 of the Nevada Revised Statutes (NRS) creating a fund to be used for the improvement of the airport system within Nevada. The Fund for Aviation was reestablished by the 2015 legislature through Senate Bill (SB) 514 at $100,000 per year.

[1] Guidance on the eligibility of a project for federal AIP grant funding can be found in FAA Order 5100.38D, *Airport Improvement Program Handbook*, which can be accessed at:
http://www.faa.gov/airports/aip/aip_handbook/media/AIP-Handbook-Order-5100-38D

Ultimately, the Fund for Aviation is intended to assist rural general aviation airports and will not be available to commercial service airports. At present, the Nevada Fund for Aviation will provide funding assistance to airports included within the NPIAS eligible for FAA AIP funding. State grants are provided to match some or all of the 6.25 percent local match not covered by FAA AIP. However, state match grants are not to exceed $50,000 on an annual basis.

The primary purpose of the Nevada Fund for Aviation Grant Program is to improve the safety and utility of the state's aviation system. FAA AIP approved projects will receive the highest priority for state matching funds. Some airport projects may not be eligible for or under current consideration for FAA AIP grants, however, may be considered valuable or a priority to the airport. Since the biggest component of safety at airports is the integrity of the runway surface and runway safety areas, the correction of deficient or non-standard safety conditions will receive the highest priority in awarding grant funds.

Non-FAA AIP or State grant projects must meet the FAA minimum design safety requirements. Special emphasis will be put on the purpose, costs, economic benefits, and the effect the project has on the environment, safety, security, infrastructure, and capacity of the airport. All airport projects should be complementary to the *Nevada State Airport System Plan* (NASP). A proportional weighting of Nevada state projects to determine matching amounts may be based on grant size or a simple percentage award, weighing all state projects based on funds available at the determination of the NDOT Director and Nevada Aviation Technical Advisory Committee (NATAC).

LOCAL FUNDING

The balance of project costs, after consideration has been given to grants, must be funded through local resources. The goal for the operation of the airport is to generate ample revenues to cover all operating and maintenance costs, as well as the local matching share of capital expenditures. As with many airports, this is not always possible and other financial methods will be needed.

Although state funding could be provided to CXP via the Nevada Fund for Aviation, statewide funding provided on an annual basis is limited. Furthermore, AIP match funding is limited to $50,000 annually. According to **Exhibit 6A**, state or local funding will be needed in each planning horizon. This includes a total of $316,250 in the short-term, $4.0 million in the intermediate-term, and $144.5 million in the long-term. As such, it will be imperative for the Carson City Airport Authority to exercise local funding options to finance future growth at CXP. As previously mentioned, it is anticipated that the costs of hangar development will largely be sourced from private developers.

There are several local financing options to consider when funding future development at airports, including airport revenues, issuance of a variety of bond types, and leasehold financing. These strategies could be used to fund the local matching share or complete a project if grant funding cannot be arranged. Below is a brief description of the most common local funding options:

Leasehold/Third-Party Financing: Leasehold or third-party financing refers to a developer or tenant financing improvements under a long-term ground lease. The obvious advantage of such an arrangement is that it relieves the airport of all responsibility for raising the capital funds for improvements. Many airports use third party funding when the planned improvements will primarily be used by a private business or other organization. Such projects are not ordinarily eligible for federal funding. Projects of this kind typically include hangars, fixed based operator facilities, fuel storage, exclusive aircraft parking aprons, industrial aviation use facilities, non-aviation office/commercial/industrial developments, and other similar projects. Private development proposals are considered on a case-by-case basis. Often, airport funds for infrastructure, preliminary site work, and site access are required to facilitate privately developed projects on airport property. The CIP anticipates third party funding of approximately $136.6 million for several hangar construction projects, including conventional hangars, linear box and executive hangars. In addition, lease revenue generated from third party funded options is a potential revenue source

Bonding: Bonding is a common method used to finance large capital projects at airports. A bond is an instrument of indebtedness of the bond issuer to the bond holders; thus, a bond is a form of loan or IOU. While bond terms are negotiable, typically the bond issuer is obligated to pay the bond holder interest at regular intervals and/or repay the principal at a later date.

General Revenue: The operations of the airport generate revenues, which are secured by federal grant assurances to be utilized at the airport. All receipts, excluding bond proceeds or related grants and interest, are irrevocably pledged to the punctual payment of operating and maintenance expenses, payment of debt service for as long as bonds remain outstanding, or for additions or improvements to airport facilities.

All public-use airports should establish standard basis rates for various leases. All lease rates should be set to adjust to a standard index, such as the Consumer Price Index, to assure that fair and equitable rates continue to be charged into the future. The condition and location of hangar space should also be considered when establishing the lease rates. Standard basis rates should be established for sponsor-owned hangars, terminal building office space, and ground leases. Fuel flowage fees and aircraft tie-down fees should also be uniform.

FUNDING AIRPORT OPERATIONS

The airport is operated by the Carson City Airport Authority through the collection of various rates and charges from general aviation revenue sources. These revenues are generated specifically by airport operations. There are, however, restrictions on the use of revenues collected by the airport. All receipts, excluding bond proceeds or related grants and interest, are irrevocably pledged to the punctual payment of operating and maintenance expenses, payment of debt service for as long as bonds remain outstanding, or to additions or improvements to airport facilities.

Table 6C presents historical operating revenues and expenses for the airport from fiscal year (FY) 2014 to FY 2018. Property tax, charges for miscellaneous services, annual leases, and rock sales from the active on-airport mining operation are the largest revenue centers for the airport. It should be noted that capital

outlay incurred for land and improvements to airport property purchased with pass-through grantor funds with Carson City as the sponsor agency are not capitalized; however, they are reflected in the City's financial statements. As such, grants received are reflected as revenue within the Carson City Airport Authority's financial statements under the "Local Government Shared Revenue" line item category. Capital assets, including grants received, used in operations are accounted for as capital outlay expenditures of the governmental fund upon acquisition.

TABLE 6C
Financial Information
Carson City Airport

	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018
Revenues					
Local Government Shared Revenue	$2,250,294	$1,720,020	$358,879	$2,595,191	$503,604
Miscellaneous Revenue	$282,519	$296,959	$338,486	$434,892	$376,035
Total Revenues	$2,532,813	$2,016,979	$697,365	$3,030,083	$879,639
Expenses					
Airport Operations	$355,577	$297,783	$344,125	$350,051	$327,246
Capital Outlay and Engineering	2,286,646	$1,582,382	$166,674	$2,584,470	$274,862
Debt Service	$6,240	$6,240	$6,240	$6,240	$6,240
Total Expenses	**$2,648,463**	**$1,886,405**	**$517,039**	**$2,940,761**	**$608,348**
Net Income	**($115,650)**	**$130,574**	**$180,326**	**$89,322**	**$271,291**

Source: Carson City Airport Authority Financial Records

Aside from capital outlay and engineering, operations expenses constitute the largest expense for the airport, which consists primarily of maintenance and repairs, contractual services, legal services, and airport administration.

The operation of the airport generates revenues, which are secured by federal grant assurances, to be utilized only on the airport. While these revenues generated are significant, they are oftentimes not enough to fund both airport operating expenditures and capital improvement requirements. Most general aviation airports in the U.S. do not generate enough revenues to cover operating expenses. According to records, CXP has been fortunate enough to cover its expenses with operating revenues in recent years with the exception of 2014. An operating profit, however, should not be taken for granted. All potential revenue sources, including community tax or bonding, should be considered to support future capital expenditures, if necessary.

To ensure the airport maximizes revenue potential in the future, CXP should periodically review aviation services rates and charges (i.e., ground lease rates, rental rates, etc.) at other airports to be sure that rates and charges at CXP are competitive and similar to aviation services at other airports. This can generate more opportunities for the Airport Authority to establish other means of revenue collection or future rates and charges. Additionally, all new leases at the airport should have inflation clauses allowing for periodic rate increases in line with inflationary factors.

AIRPORT RATES AND CHARGES

The FAA places several stipulations on rates and charges establishment and collection; however, two primary considerations need to be addressed. First, the rates and charges must be fair, equally applied, and resemble fair market value. Second, the rates and charges collected must be returned to and used only by and/or for the airport. In other words, the revenues generated by airport operations cannot be diverted to the general use of the City of Carson City. The FAA requires funds to be used at airports, as these funds are many times needed to either support the day-to-day operational costs or offset capital improvement costs.

The following provides several activities that enhance revenue production for an airport, some of which are currently being practiced at CXP.

Aircraft Parking/Tiedowns

Aircraft parking fees, also referred to as tiedown fees, are typically assessed to those aircraft utilizing a portion of an aircraft parking area that is owned by the airport. These fees are most generally assessed on a daily or monthly basis, depending upon the specific activity of a particular aircraft.

Aircraft parking fees can be established in several different ways. Typically, airports assess aircraft parking fees in accordance with an established schedule in which an aircraft within a designated weight and/or size pays a similar fee (i.e., small aircraft, single engine aircraft). Aircraft parking fees may also be charged according to a "cents per 1,000 pounds" basis in which larger aircraft with increased weights would obviously pay more for utilizing the aircraft parking apron. There are also instances in which aircraft parking fees are not assessed on an airport.

An airport sponsor may also include in a lease agreement with an aviation-related commercial operator at the airport to collect aircraft parking fees on portions of an aircraft parking apron in which the airport does not own or is leasing to a commercial operator, such as a SASO. As a result, the airport could directly collect parking fees from an aircraft utilizing this space or allow the commercial operator to collect the parking fee, in which the agreement may allow the commercial operator to retain a portion of the parking fee as an administrative or service fee.

As previously discussed, aircraft parking fees can be assessed on a daily or monthly basis. Daily aircraft parking fees are typically assessed to transient aircraft utilizing the airport on a short-term basis, while monthly fees are charged to aircraft that utilize a particular parking area for the permanent storage of their aircraft. Monthly aircraft parking fees are often assessed at airports that contain a waiting list for aircraft hangar storage space. It is also common practice at many airports to waive a daily aircraft parking fee in the event the aircraft purchases fuel prior to departing the airport.

Previous rates and charges analysis conducted by the consultant outside this study have indicated that daily aircraft parking fees can vary from $3 to $20 depending on the type of aircraft, and monthly aircraft parking fees can range between $20 to $230 per month depending on the type and size of the aircraft. CXP's current

daily and monthly tiedown fees for single engine aircraft are $10 and $55, respectively, and $20 and $75 for multiengine aircraft.

Aircraft Storage Hangars

There are several types of aircraft storage hangars that can accommodate aircraft on an airport. In order to establish hangar fees, an airport typically factors in such qualities as hangar size, location, and utilities. Aircraft hangar fees are most often charged on a monthly basis.

Common aircraft storage hangars are typically categorized as shade hangars, T-hangars, and conventional hangars. Shade hangars consist of tiedown spaces with a protective roof covering. T-hangars provide for separate, single-aircraft storage areas. Conventional hangars provide a larger enclosed space that can accommodate larger multi-engine piston or turbine aircraft and/or multiple aircraft storage. Conventional hangars can also be utilized by aviation-related commercial operators for their business activities on an airport.

Location can also play a role in determining hangar rates. Aircraft storage hangars with direct access to improved taxiways/taxilanes and adjacent to aviation services being offered at an airport can oftentimes be more expensive to rent. In addition, the type of utility infrastructure being offered to the hangar can also help determine storage fees. Smaller aircraft storage hangars, such as a T-hangar or small box hangar, can either be granted access through a manual sliding door or electric door. It is common for hangars that provide electric doors to have higher rental fees, as the cost associated with constructing these hangars would exceed the cost associated with simpler structures.

At some airports, hangar facilities are constructed by the airport sponsor, while at other airports, hangars are built by private entities. In some cases, airports have both public and private hangar facilities available. Hangars can be expensive to construct and offer minimal return on investment in the short-term. In order to amortize the cost of constructing hangars, lease rates should be developed at a minimum to recover development and finance costs.

T-hangars often range from $100 to $450 per month depending on several factors previously listed. Larger conventional-style hangars can be leased per aircraft space or for the entire hangar. Monthly rates similar to those for individual T-hangar units often apply to leased aircraft space in a conventional hangar.

At CXP, the Airport Authority does not own or lease any aircraft storage hangars. All existing hangar facilities have been constructed and are rented or leased by private operators. The Airport Authority does, however, have ground leases, which will be discussed in the next section. In the future, the Airport Authority should ensure that hangar lease or rental rates are in-line with the market should aircraft hangar storage facilities be acquired.

Ground Rental/Lease

Ground rentals can be applied to aviation and non-aviation development on an airport. Also known as a land lease, a ground lease can be structured to meet the particular needs of an airport operator in terms of location, terrain features, amount of land needed, and type of facility infrastructure included.

One of the single most valuable assets available to an airport is the leasable land with access to the runway/taxiway system. For aviation-related businesses, it is critical that they be located on an airport. Airport property is available for long-term lease but, in most cases, it cannot be sold. At the expiration of the lease and any extensions, the improvements on the leased land revert back to the airport sponsor. In order for this arrangement to make financial sense, most ground leases are at least 20 years in length and include extension opportunities. Those who lease land on an airport are typically interested in constructing a hangar for their own private use, for sub-lease, or for operation of an airport business. Therefore, the long-term lease arrangement is important in order to obtain capital funding for the construction of a hangar or other type of facility. It should also be noted that ground leases should include the opportunity to periodically review the lease and adjust the rate according to the consumer price index (CPI). Typical lease agreements range from 20 to 30 years with options for extensions.

Ground leases are typically established on a yearly fee schedule based upon the amount of square feet leased. The amount charged can vary greatly depending on the level of improvements to the land. For example, undeveloped land with readily accessible utilities and taxiway access can generate more revenue than unimproved property. Previous surveys at other airports across the country conducted by the consultant have determined ground lease rates to range from $0.08 per square foot per year to approximately $1.00 per square foot per year. Typically, airports in larger metropolitan areas set land lease rates at approximately $0.25 cents per square foot per year. The current land lease rate at CXP is set at $0.02 cents per square foot per month, or $.24 cents per year. At present, the Airport Authority only maintains ground leases and does not provide leases for developed property.

Some airports will have other leasable space available. For example, airports with a terminal building may have office or counter space available for aviation and non-aviation related businesses. Some example businesses could include SASOs, aircraft sales, flight instruction, aircraft insurance, and a restaurant.

Under certain circumstances, an airport sponsor may utilize portions of the airport for non-aeronautical purposes, such as commercial and/or industrial development if certain areas are not needed to satisfy aviation demand or are not accessible to aviation activity. Prior to an airport pursuing a ground lease with a commercial operator for non-aeronautical purposes, the sponsor must formally request the FAA release the land in question from its federal obligations.

Fuel Sales and Flowage

Fuel sales are typically managed at an airport in one of two ways: the airport sponsor acts as the fuel distributor or fueling operations are sub-contracted to a fixed-base operator (FBO). If the airport sponsor acts

as the fuel distributor, then the airport would receive revenues equal to the difference between wholesale and retail prices. Of course, there are added expenses, such as employing people to fuel the aircraft.

When these services are undertaken by an FBO, which is the case at CXP, the airport sponsor typically receives a fuel flowage fee per gallon of fuel. By way of agreement with the airport sponsor, FBOs would be required to pay a fuel flowage fee for each gallon of fuel sold or received into inventory. In the case of self-fueling entities, a fuel flowage fee could apply for each gallon of fuel dispensed. Fuel flowage fees are typically paid on a "cents per gallon" basis. In some instances, fuel flowage fees will be established based upon the type of aviation activity. For example, commercial airline service operators may be assessed a higher fuel flowage fee than general aviation aircraft, or no fuel flowage fee at all if being assessed a landing fee (to be discussed in the next section). Fuel flowage fees can also be distinguished by type of fuel (100LL or Jet A). At CXP, the Airport Authority receives a flat-rate fuel flowage fee of $0.05 per gallon. Previous surveys conducted by the consultant have determined fuel flowage rates to range from $0.10 per gallon to approximately $0.20 per gallon. As such, CXP should consider increasing the fuel flowage rate up to $0.20 per gallon to maximize potential fuel flowage revenue.

The owner of the fuel farm can also be the airport sponsor or an FBO operator. If the airport sponsor owns the fuel farm and the FBO operator undertakes the fueling activities, then a separate fuel storage fee can be charged or a higher fuel flowage fee may be assessed.

Landing Fees

Landing fees typically only apply to larger aircraft, such as those over 60,000 pounds, for example, and only those involved in commercial airline or air taxi operations. Landing fees are not common on general aviation airports and are generally discouraged due to collection difficulty. Moreover, landing fees are somewhat discouraging to aircraft operators, who will many times elect to utilize a nearby airport that does not collect a landing fee.

When landing fees are assessed, they are most commonly based upon aircraft weight and a "cents per 1,000 pounds" approach. In addition, some airport sponsors may use a flat fee approach wherein aircraft within a specified weight range are charged the same fee.

Landing fees may be collected directly by the airport sponsor, or an airport may have an agreement with a commercial operator to collect landing fees. Similar to what was discussed with aircraft parking fees, under this scenario, the agreement may allow the commercial operator, such as an FBO, to retain a portion of the landing fee as an administrative or service fee.

Similar to most general aviation airports, a landing fee has not been imposed at CXP.

MASTER PLAN IMPLEMENTATION

To implement the Master Plan recommendations, it is key to recognize that planning is a continuous process and does not end with approval of this document. The airport should implement measures that allow them to track various demand indicators, such as based aircraft, hangar demand, and operations. The issues that this Master Plan is based on will remain valid for a number of years. The primary goal is for CXP to best serve the air transportation needs of the region, while striving toward economic self-sufficiency.

The actual need for facilities is best established by activity levels rather than a specified date. For example, projections have been made as to when additional hangars and apron space may be needed at the airport. In reality, the timeframe in which the development is needed may be substantially different. Actual demand may be slower to develop than expected. On the other hand, high levels of demand may establish the need to accelerate development. Although every effort has been made in this master planning process to conservatively estimate when facility development may be needed, aviation demand will dictate timing of facility improvements.

In addition, numerous projects have been identified that will not depend on increased demand. These include enhancing airfield geometry and regular pavement maintenance.

The value of this study is keeping the issues and objectives at the forefront of the minds of managers and decision-makers. In addition to adjustments in aviation demand, when to undertake the improvements recommended in this Master Plan will impact how long the plan remains valid. The format of this plan reduces the need for formal and costly updates by simply adjusting the timing of project implementation. Updating can be done by the Carson City Airport Authority, thereby improving the plan's effectiveness.

In summary, the planning process requires the Airport Authority to consistently monitor the progress of the airport in terms of aircraft operations, based aircraft, and peaking characteristics. Analysis of aircraft demand is critical to the timing and need for new airport facilities. The information obtained from continually monitoring airport activity will provide the data necessary to determine if the development schedule should be accelerated or decelerated.

APPENDIX A

GLOSSARY OF TERMS

Glossary of Terms

A

ABOVE GROUND LEVEL: The elevation of a point or surface above the ground.

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

ADVISORY CIRCULAR: External publications issued by the FAA consisting of nonregulatory material providing for the recommendations relative to a policy, guidance and information relative to a specific aviation subject.

AIR CARRIER: An operator which: (1) performs at least five round trips per week between two or more points and publishes flight schedules which specify the times, days of the week, and places between which such flights are performed; or (2) transports mail by air pursuant to a current contract with the U.S. Postal Service. Certified in accordance with Federal Aviation Regulation (FAR) Parts 121 and 127.

AIRCRAFT: A transportation vehicle that is used or intended for use for flight.

AIRCRAFT APPROACH CATEGORY: A grouping of aircraft based on 1.3 times the stall speed in their landing configuration at their maximum certificated landing weight. The categories are as follows:

- Category A: Speed less than 91 knots.
- Category B: Speed 91 knots or more, but less than 121 knots.
- Category C: Speed 121 knots or more, but less than 141 knots.
- Category D: Speed 141 knots or more, but less than 166 knots.
- Category E: Speed greater than 166 knots.

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

AIRCRAFT OPERATIONS AREA (AOA): A restricted and secure area on the airport property designed to protect all aspects related to aircraft operations.

AIRCRAFT OWNERS AND PILOTS ASSOCIATION: A private organization serving the interests and needs of general aviation pilots and aircraft owners.

AIRCRAFT RESCUE AND FIRE FIGHTING: A facility located at an airport that provides emergency vehicles, extinguishing agents, and personnel responsible for minimizing the impacts of an aircraft accident or incident.

AIRFIELD: The portion of an airport which contains the facilities necessary for the operation of aircraft.

AIRLINE HUB: An airport at which an airline concentrates a significant portion of its activity and which often has a significant amount of connecting traffic.

AIRPLANE DESIGN GROUP (ADG): A grouping of aircraft based upon wingspan. The groups are as follows:

- Group I: Up to but not including 49 feet.
- Group II: 49 feet up to but not including 79 feet.
- Group III: 79 feet up to but not including 118 feet.
- Group IV: 118 feet up to but not including 171 feet.
- Group V: 171 feet up to but not including 214 feet.
- Group VI: 214 feet or greater.

AIRPORT AUTHORITY: A quasi-governmental public organization responsible for setting the policies governing the management and operation of an airport or system of airports under its jurisdiction.

AIRPORT BEACON: A navigational aid located at an airport which displays a rotating light beam to identify whether an airport is lighted.

AIRPORT CAPITAL IMPROVEMENT PLAN: The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

AIRPORT ELEVATION: The highest point on the runway system at an airport expressed in feet above mean sea level (MSL).

AIRPORT IMPROVEMENT PROGRAM: A program authorized by the Airport and Airway Improvement Act of 1982 that provides funding for airport planning and development.

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

AIRPORT LAYOUT PLAN (ALP): A scaled drawing of the existing and planned land and facilities necessary for the operation and development of the airport.

AIRPORT LAYOUT PLAN DRAWING SET: A set of technical drawings depicting the current and future airport conditions. The individual sheets comprising the set can vary with the complexities of the airport, but the FAA-required drawings include the Airport Layout Plan (sometimes referred to as the Airport Layout Drawing (ALD), the Airport Airspace Drawing, and the Inner Portion of the Approach Surface Drawing, On-Airport Land Use Drawing, and Property Map.

AIRPORT MASTER PLAN: The planner's concept of the long-term development of an airport.

AIRPORT MOVEMENT AREA SAFETY SYSTEM: A system that provides automated alerts and warnings of potential runway incursions or other hazardous aircraft movement events.

AIRPORT OBSTRUCTION CHART: A scaled drawing depicting the Federal Aviation Regulation (FAR) Part 77 surfaces, a representation of objects that penetrate these surfaces, runway, taxiway, and ramp areas, navigational aids, buildings, roads and other detail in the vicinity of an airport.

AIRPORT REFERENCE CODE (ARC): A coding system used to relate airport design criteria to the operational (Aircraft Approach Category) to the physical characteristics (Airplane Design Group) of the airplanes intended to operate at the airport.

AIRPORT REFERENCE POINT (ARP): The latitude and longitude of the approximate center of the airport.

AIRPORT SPONSOR: The entity that is legally responsible for the management and operation of an airport, including the fulfillment of the requirements of laws and regulations related thereto.

AIRPORT SURFACE DETECTION EQUIPMENT: A radar system that provides air traffic controllers with a visual representation of the movement of aircraft and other vehicles on the ground on the airfield at an airport.

AIRPORT SURVEILLANCE RADAR: The primary radar located at an airport or in an air traffic control terminal area that receives a signal at an antenna and transmits the signal to air traffic control display equipment defining the location of aircraft in the air. The signal provides only the azimuth and range of aircraft from the location of the antenna.

AIRPORT TRAFFIC CONTROL TOWER (ATCT): A central operations facility in the terminal air traffic control system, consisting of a tower, including an associated instrument flight rule (IFR) room if radar equipped, using air/ground communications and/or radar, visual signaling and other devices to provide safe and expeditious movement of terminal air traffic.

AIR ROUTE TRAFFIC CONTROL CENTER: A facility which provides en route air traffic control service to aircraft operating on an IFR flight plan within controlled airspace over a large, multi-state region.

AIRSIDE: The portion of an airport that contains the facilities necessary for the operation of aircraft.

AIRSPACE: The volume of space above the surface of the ground that is provided for the operation of aircraft.

AIR TAXI: An air carrier certificated in accordance with FAR Part 121 and FAR Part 135 and authorized to provide, on demand, public transportation of persons and property by aircraft. Generally operates small aircraft "for hire" for specific trips.

AIR TRAFFIC CONTROL: A service operated by an appropriate organization for the purpose of providing for the safe, orderly, and expeditious flow of air traffic.

AIR ROUTE TRAFFIC CONTROL CENTER (ARTCC): A facility established to provide air traffic control service to aircraft operating on an IFR flight plan within controlled airspace and principally during the en route phase of flight.

AIR TRAFFIC CONTROL SYSTEM COMMAND CENTER: A facility operated by the FAA which is responsible for the central flow control, the central altitude reservation system, the airport reservation position system, and the air traffic service contingency command for the air traffic control system.

AIR TRAFFIC HUB: A categorization of commercial service airports or group of commercial service airports in a metropolitan or urban area based upon the proportion of annual national enplanements existing at the airport or airports. The categories are large hub, medium hub, small hub, or non-hub. It forms the basis for the apportionment of entitlement funds.

AIR TRANSPORT ASSOCIATION OF AMERICA: An organization consisting of the principal U.S. airlines that represents the interests of the airline industry on major aviation issues before federal, state, and local government bodies. It promotes air transportation safety by coordinating industry and governmental safety programs and it serves as a focal point for industry efforts to standardize practices and enhance the efficiency of the air transportation system.

ALERT AREA: See special-use airspace.

ALTITUDE: The vertical distance measured in feet above mean sea level.

ANNUAL INSTRUMENT APPROACH (AIA): An approach to an airport with the intent to land by an aircraft in accordance with an IFR flight plan when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude.

APPROACH LIGHTING SYSTEM (ALS): An airport lighting facility which provides visual guidance to landing aircraft by radiating light beams by which the pilot aligns the aircraft with the extended centerline of the runway on his final approach and landing.

APPROACH MINIMUMS: The altitude below which an aircraft may not descend while on an IFR approach unless the pilot has the runway in sight.

APPROACH SURFACE: An imaginary obstruction limiting surface defined in FAR Part 77 which is longitudinally centered on an extended runway centerline and extends outward and upward from the primary surface at each end of a runway at a designated slope and distance based upon the type of available or planned approach by aircraft to a runway.

APRON: A specified portion of the airfield used for passenger, cargo or freight loading and unloading, aircraft parking, and the refueling, maintenance and servicing of aircraft.

AREA NAVIGATION: The air navigation procedure that provides the capability to establish and maintain a flight path on an arbitrary course that remains within the coverage area of navigational sources being used.

AUTOMATED TERMINAL INFORMATION SERVICE (ATIS): The continuous broadcast of recorded non-control information at towered airports. Information typically includes wind speed, direction, and runway in use.

AUTOMATED SURFACE OBSERVATION SYSTEM (ASOS): A reporting system that provides frequent airport ground surface weather observation data through digitized voice broadcasts and printed reports.

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

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

AVIGATION EASEMENT: A contractual right or a property interest in land over which a right of unobstructed flight in the airspace is established.

AZIMUTH: Horizontal direction expressed as the angular distance between true north and the direction of a fixed point (as the observer's heading).

B

BASE LEG: A flight path at right angles to the landing runway off its approach end. The base leg normally extends from the downwind leg to the intersection of the extended runway centerline. See "traffic pattern."

BASED AIRCRAFT: The general aviation aircraft that use a specific airport as a home base.

BEARING: The horizontal direction to or from any point, usually measured clockwise from true north or magnetic north.

BLAST FENCE: A barrier used to divert or dissipate jet blast or propeller wash.

BLAST PAD: A prepared surface adjacent to the end of a runway for the purpose of eliminating the erosion of the ground surface by the wind forces produced by airplanes at the initiation of takeoff operations.

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

C

CAPITAL IMPROVEMENT PLAN: The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute Airport Improvement Program funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

CARGO SERVICE AIRPORT: An airport served by aircraft providing air transportation of property only, including mail, with an annual aggregate landed weight of at least 100,000,000 pounds.

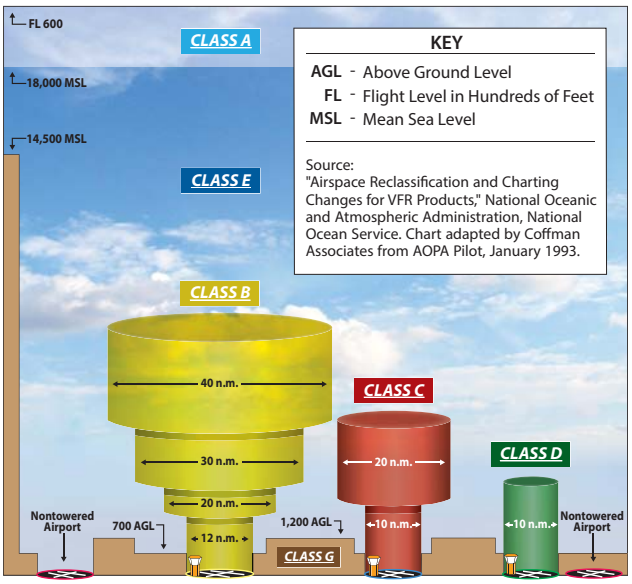
CATEGORY I: An Instrument Landing System (ILS) that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 200 feet above the horizontal plane containing the runway threshold.

CATEGORY II: An ILS that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 100 feet above the horizontal plane containing the runway threshold.

CATEGORY III: An ILS that provides acceptable guidance information to a pilot from the coverage limits of the ILS with no decision height specified above the horizontal plane containing the runway threshold.

CEILING: The height above the ground surface to the location of the lowest layer of clouds which is reported as either broken or overcast.

CIRCLING APPROACH: A maneuver initiated by the pilot to align the aircraft with the runway for landing when flying a predetermined circling instrument approach under IFR.



CLASS A AIRSPACE: See Controlled Airspace.

CLASS B AIRSPACE: See Controlled Airspace.

CLASS C AIRSPACE: See Controlled Airspace.

CLASS D AIRSPACE: See Controlled Airspace.

CLASS E AIRSPACE: See Controlled Airspace.

CLASS G AIRSPACE: See Controlled Airspace.

CLEAR ZONE: See Runway Protection Zone.

COMMERCIAL SERVICE AIRPORT: A public airport providing scheduled passenger service that enplanes at least 2,500 annual passengers.

COMMON TRAFFIC ADVISORY FREQUENCY: A radio frequency identified in the appropriate aeronautical chart which is designated for the purpose of transmitting airport advisory information and procedures while operating to or from an uncontrolled airport.

COMPASS LOCATOR (LOM): A low power, low/medium frequency radio-beacon installed in conjunction with the instrument landing system at one or two of the marker sites.

CONICAL SURFACE: An imaginary obstruction-limiting surface defined in FAR Part 77 that extends

from the edge of the horizontal surface outward and upward at a slope of 20 to 1 for a horizontal distance of 4,000 feet.

CONTROLLED AIRPORT: An airport that has an operating airport traffic control tower.

CONTROLLED AIRSPACE: Airspace of defined dimensions within which air traffic control services are provided to instrument flight rules (IFR) and visual flight rules (VFR) flights in accordance with the airspace classification. Controlled airspace in the United States is designated as follows:

- **CLASS A**: Generally, the airspace from 18,000 feet mean sea level (MSL) up to but not including flight level FL600. All persons must operate their aircraft under IFR.

- **CLASS B**:
  Generally, the airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports. The configuration of Class B airspace is unique to each airport, but typically consists of two or more layers of air space and is designed to contain all published instrument approach procedures to the airport. An air traffic control clearance is required for all aircraft to operate in the area.

- **CLASS C**: Generally, the airspace from the surface to 4,000 feet above the airport elevation (charted as MSL) surrounding those airports that have an operational control tower and radar approach control and are served by a qualifying number of IFR operations or passenger enplanements. Although individually tailored for each airport, Class C airspace typically consists of a surface area with a five nautical mile (nm) radius and an outer area with a 10 nautical mile radius that extends from 1,200 feet to 4,000 feet above the airport elevation. Two-way radio communication is required for all aircraft.

- **CLASS D**: Generally, that airspace from the surface to 2,500 feet above the air port elevation (charted as MSL) surrounding those airports that have an operational control tower. Class D airspace is individually tailored and configured to encompass published instrument approach procedure. Unless otherwise authorized, all persons must establish two-way radio communication.

- **CLASS E**: Generally, controlled airspace that is not classified as Class A, B, C, or D. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. When designated as a surface area, the airspace will be configured to contain all instrument procedures. Class E airspace encompasses all Victor Airways. Only aircraft following instrument flight rules are required to establish two-way radio communication with air traffic control.

- **CLASS G**: Generally, that airspace not classified as Class A, B, C, D, or E. Class G airspace is uncontrolled for all aircraft. Class G airspace extends from the surface to the overlying Class E airspace.

CONTROLLED FIRING AREA: See special-use airspace.

CROSSWIND: A wind that is not parallel to a runway centerline or to the intended flight path of an aircraft.

CROSSWIND COMPONENT: The component of wind that is at a right angle to the runway centerline or the intended flight path of an aircraft.

CROSSWIND LEG: A flight path at right angles to the landing runway off its upwind end. See "traffic pattern."

D

DECIBEL: A unit of noise representing a level relative to a reference of a sound pressure 20 micro newtons per square meter.

DECISION HEIGHT/ DECISION ALTITUDE: The height above the end of the runway surface at which a decision must be made by a pilot during the ILS or Precision Approach Radar approach to either continue the approach or to execute a missed approach.

DECLARED DISTANCES: The distances declared available for the airplane's takeoff runway, takeoff distance, accelerate-stop distance, and landing distance requirements. The distances are:

- **TAKEOFF RUNWAY AVAILABLE (TORA):** The runway length declared available and suitable for the ground run of an airplane taking off.

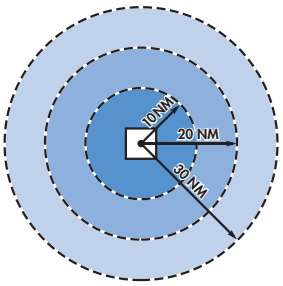
- **TAKEOFF DISTANCE AVAILABLE (TODA):** The TORA plus the length of any remaining runway and/or clear way beyond the far end of the TORA.
- **ACCELERATE-STOP DISTANCE AVAILABLE (ASDA):** The runway plus stopway length declared available for the acceleration and deceleration of an aircraft aborting a takeoff.
- **LANDING DISTANCE AVAILABLE (LDA):** The runway length declared available and suitable for landing.

DEPARTMENT OF TRANSPORTATION: The cabinet level federal government organization consisting of modal operating agencies, such as the Federal Aviation Administration, which was established to promote the coordination of federal transportation programs and to act as a focal point for research and development efforts in transportation.

DISCRETIONARY FUNDS: Federal grant funds that may be appropriated to an airport based upon designation by the Secretary of Transportation or Congress to meet a specified national priority such as enhancing capacity, safety, and security, or mitigating noise.

DISPLACED THRESHOLD: A threshold that is located at a point on the runway other than the designated beginning of the runway.

DISTANCE MEASURING EQUIPMENT (DME): Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.



DNL: The 24-hour average sound level, in Aweighted decibels, obtained after the addition of ten decibels to sound levels for the periods between 10 p.m. and 7 a.m. as averaged over a span of one year. It is the FAA standard metric for determining the cumulative exposure of individuals to noise.

DOWNWIND LEG: A flight path parallel to the landing runway in the direction opposite to landing. The downwind leg normally extends between the crosswind leg and the base leg. Also see "traffic pattern."

E

EASEMENT: The legal right of one party to use a portion of the total rights in real estate owned by another party. This may include the right of passage over, on, or below the property; certain air rights above the property, including view rights; and the rights to any specified form of development or activity, as well as any other legal rights in the property that may be specified in the easement document.

ELEVATION: The vertical distance measured in feet above mean sea level.

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

ENPLANEMENT: The boarding of a passenger, cargo, freight, or mail on an aircraft at an airport.

ENTITLEMENT: Federal funds for which a commercial service airport may be eligible based upon its annual passenger enplanements.

ENVIRONMENTAL ASSESSMENT (EA): An environmental analysis performed pursuant to the National Environmental Policy Act to determine whether an action would significantly affect the environment and thus require a more detailed environmental impact statement.

ENVIRONMENTAL AUDIT: An assessment of the current status of a party's compliance with applicable environmental requirements of a party's environmental compliance policies, practices, and controls.

ENVIRONMENTAL IMPACT STATEMENT (EIS): A document required of federal agencies by the National Environmental Policy Act for major projects are legislative proposals affecting the environment. It is a tool for decision-making describing the positive and negative effects of a proposed action and citing alternative actions.

ESSENTIAL AIR SERVICE: A federal program which guarantees air carrier service to selected small cities by providing subsidies as needed to prevent these cities from such service.

F

FEDERAL AVIATION REGULATIONS: The general and permanent rules established by the executive departments and agencies of the Federal Government for aviation, which are published in the Federal Register. These are the aviation subset of the Code of Federal Regulations.

FEDERAL INSPECTION SERVICES: The provision of customs and immigration services including passport inspection, inspection of baggage, the collection of duties on certain imported items, and the inspections for agricultural products, illegal drugs, or other restricted items.

FINAL APPROACH: A flight path in the direction of landing along the extended runway centerline. The final approach normally extends from the base leg to the runway. See "traffic pattern."

FINAL APPROACH AND TAKEOFF AREA (FATO). A defined area over which the final phase of the helicopter approach to a hover, or a landing is completed and from which the takeoff is initiated.

FINAL APPROACH FIX: The designated point at which the final approach segment for an aircraft landing on a runway begins for a non-precision approach.

FINDING OF NO SIGNIFICANT IMPACT (FONSI): A public document prepared by a Federal agency that presents the rationale why a proposed action will not have a significant effect on the environment and for which an environmental impact statement will not be prepared.

FIXED BASE OPERATOR (FBO): A provider of services to users of an airport. Such services include, but are not limited to, hangaring, fueling, flight training, repair, and maintenance.

FLIGHT LEVEL: A measure of altitude used by aircraft flying above 18,000 feet. Flight levels are indicated by three digits representing the pressure altitude in hundreds of feet. An airplane flying at flight level 360 is flying at a pressure altitude of 36,000 feet. This is expressed as FL 360.

FLIGHT SERVICE STATION: An operations facility in the national flight advisory system which utilizes data interchange facilities for the collection and dissemination of Notices to Airmen, weather, and administrative data and which provides pre-flight and in-flight advisory services to pilots through air and ground based communication facilities.

FRANGIBLE NAVAID: A navigational aid which retains its structural integrity and stiffness up to a designated maximum load, but on impact from a greater load, breaks, distorts, or yields in such a manner as to present the minimum hazard to aircraft.

G

GENERAL AVIATION: That portion of civil aviation which encompasses all facets of aviation except air carriers holding a certificate of convenience and necessity, and large aircraft commercial operators.

GENERAL AVIATION AIRPORT: An airport that provides air service to only general aviation.

GLIDESLOPE (GS): Provides vertical guidance for aircraft during approach and landing. The glideslope consists of the following:

1. Electronic components emitting signals which provide vertical guidance by reference to airborne instruments during instrument approaches such as ILS; or

2. Visual ground aids, such as VASI, which provide vertical guidance for VFR approach or for the visual portion of an instrument approach and landing.

GLOBAL POSITIONING SYSTEM (GPS): A system of 48 satellites used as reference points to enable navigators equipped with GPS receivers to determine their latitude, longitude, and altitude.

GROUND ACCESS: The transportation system on and around the airport that provides access to and from the airport by ground transportation vehicles for passengers, employees, cargo, freight, and airport services.

H

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

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

HIGH-SPEED EXIT TAXIWAY: A long radius taxiway designed to expedite aircraft turning off the runway after landing (at speeds to 60 knots), thus reducing runway occupancy time.

HORIZONTAL SURFACE: An imaginary obstruction-limiting surface defined in FAR Part 77 that is specified as a portion of a horizontal plane surrounding a runway located 150 feet above the established airport elevation. The specific horizontal dimensions of this surface are a function of the types of approaches existing or planned for the runway.

I

INITIAL APPROACH FIX: The designated point at which the initial approach segment begins for an instrument approach to a runway.

INSTRUMENT APPROACH PROCEDURE: A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing, or to a point from which a landing may be made visually.

INSTRUMENT FLIGHT RULES (IFR): Procedures for the conduct of flight in weather conditions below Visual Flight Rules weather minimums. The term IFR is often also used to define weather conditions and the type of flight plan under which an aircraft is operating.

INSTRUMENT LANDING SYSTEM (ILS): A precision instrument approach system which normally consists of the following electronic components and visual aids:

1. Localizer.
2. Glide Slope.
3. Outer Marker.
4. Middle Marker.
5. Approach Lights.

INSTRUMENT METEOROLOGICAL CONDITIONS: Meteorological conditions expressed in terms of specific visibility and ceiling conditions that are less than the minimums specified for visual meteorological conditions.

ITINERANT OPERATIONS: Operations by aircraft that are not based at a specified airport.

K

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

L

LANDSIDE: The portion of an airport that provides the facilities necessary for the processing of passengers, cargo, freight, and ground transportation vehicles.

LANDING DISTANCE AVAILABLE (LDA): See declared distances.

LARGE AIRPLANE: An airplane that has a maximum certified takeoff weight in excess of 12,500 pounds.

LOCAL AREA AUGMENTATION SYSTEM: A differential GPS system that provides localized measurement correction signals to the basic GPS signals to improve navigational accuracy integrity, continuity, and availability.

LOCAL OPERATIONS: Aircraft operations performed by aircraft that are based at the airport and that operate in the local traffic pattern or within sight of the airport, that are known to be departing for or arriving from flights in local practice areas within a prescribed distance from the airport, or that execute simulated instrument approaches at the airport.

LOCAL TRAFFIC: Aircraft operating in the traffic pattern or within sight of the tower, or aircraft known to be departing or arriving from the local practice areas, or aircraft executing practice instrument approach procedures. Typically, this includes touch and-go training operations.

LOCALIZER: The component of an ILS which provides course guidance to the runway.

LOCALIZER TYPE DIRECTIONAL AID (LDA): A facility of comparable utility and accuracy to a localizer, but is not part of a complete ILS and is not aligned with the runway.

LONG RANGE NAVIGATION SYSTEM (LORAN): Long range navigation is an electronic navigational aid which determines aircraft position and speed by measuring the difference in the time of reception of synchronized pulse signals from two fixed transmitters. Loran is used for en route navigation.

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

M

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

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

MILITARY OPERATIONS: Aircraft operations that are performed in military aircraft.

MILITARY OPERATIONS AREA (MOA): See special-use airspace

MILITARY TRAINING ROUTE: An air route depicted on aeronautical charts for the conduct of military flight training at speeds above 250 knots.

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

1. When the aircraft has descended to the decision height and has not established visual contact; or
2. When directed by air traffic control to pull up or to go around again.

MOVEMENT AREA: The runways, taxiways, and other areas of an airport which are utilized for taxiing/hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. At those airports with a tower, air traffic control clearance is required for entry onto the movement area.

N

NATIONAL AIRSPACE SYSTEM: The network of air traffic control facilities, air traffic control areas, and navigational facilities through the U.S.

NATIONAL PLAN OF INTEGRATED AIRPORT SYSTEMS: The national airport system plan developed by the Secretary of Transportation on a biannual basis for the development of public use airports to meet national air transportation needs.

NATIONAL TRANSPORTATION SAFETY BOARD: A federal government organization established to investigate and determine the probable cause of transportation accidents, to recommend equipment and procedures to enhance transportation safety, and to review on appeal the suspension or revocation of any certificates or licenses issued by the Secretary of Transportation.

NAUTICAL MILE: A unit of length used in navigation which is equivalent to the distance spanned by one minute of arc in latitude, that is, 1,852 meters or 6,076 feet. It is equivalent to approximately 1.15 statute mile.

NAVAID: A term used to describe any electrical or visual air navigational aids, lights, signs, and associated supporting equipment (i.e. PAPI, VASI, ILS, etc.)

NAVIGATIONAL AID: A facility used as, available for use as, or designed for use as an aid to air navigation.

NOISE CONTOUR: A continuous line on a map of the airport vicinity connecting all points of the same noise exposure level.

NON-DIRECTIONAL BEACON (NDB): A beacon transmitting nondirectional signals whereby the pilot of an aircraft equipped with direction finding equipment can determine his or her bearing to and from the radio beacon and home on, or track to, the station. When the radio beacon is installed in conjunction with the Instrument Landing System marker, it is normally called a Compass Locator.

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

NOTICE TO AIRMEN: A notice containing information concerning the establishment, condition, or change in any component of or hazard in the National Airspace System, the timely knowledge of which is considered essential to personnel concerned with flight operations.

O

OBJECT FREE AREA (OFA): An area on the ground centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

OBSTACLE FREE ZONE (OFZ): The airspace below 150 feet above the established airport elevation and along the runway and extended runway centerline that is required to be kept clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function, in order to provide clearance for aircraft landing or taking off from the runway, and for missed approaches.

ONE-ENGINE INOPERABLE SURFACE: A surface emanating from the runway end at a slope ratio of 62.5:1. Air carrier airports are required to maintain a technical drawing of this surface depicting any object penetrations by January 1, 2010.

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

OUTER MARKER (OM): An ILS navigation facility in the terminal area navigation system located four to seven miles from the runway edge on the extended centerline, indicating to the pilot that he/she is passing over the facility and can begin final approach.

P

PILOT CONTROLLED LIGHTING: Runway lighting systems at an airport that are controlled by activating the microphone of a pilot on a specified radio frequency.

PRECISION APPROACH: A standard instrument approach procedure which provides runway alignment and glide slope (descent) information. It is categorized as follows:

- **CATEGORY I (CAT I)**: A precision approach which provides for approaches with a decision height of not less than 200 feet and visibility not less than 1/2 mile or Runway Visual Range (RVR) 2400 (RVR 1800) with operative touchdown zone and runway centerline lights.
- **CATEGORY II (CAT II)**: A precision approach which provides for approaches with a decision height of not less than 100 feet and visibility not less than 1200 feet RVR.
- **CATEGORY III (CAT III)**: A precision approach which provides for approaches with minima less than Category II.

PRECISION APPROACH PATH INDICATOR (PAPI): A lighting system providing visual approach slope guidance to aircraft during a landing approach. It is similar to a VASI but provides a sharper transition between the colored indicator lights.

PRECISION APPROACH RADAR: A radar facility in the terminal air traffic control system used to detect and display with a high degree of accuracy the direction, range, and elevation of an aircraft on the final approach to a runway.

PRECISION OBJECT FREE AREA (POFA): An area centered on the extended runway centerline, beginning at the runway threshold and extending behind the runway threshold that is 200 feet long by 800 feet wide. The POFA is a clearing standard which requires the POFA to be kept clear of above ground objects protruding above the runway safety area edge elevation (except for frangible NAVAIDS). The POFA applies to all new authorized instrument approach procedures with less than 3/4 mile visibility.

PRIMARY AIRPORT: A commercial service airport that enplanes at least 10,000 annual passengers.

PRIMARY SURFACE: An imaginary obstruction limiting surface defined in FAR Part 77 that is specified as a rectangular surface longitudinally centered about a runway. The specific dimensions of this surface are a function of the types of approaches existing or planned for the runway.

PROHIBITED AREA: See special-use airspace.

PVC: Poor visibility and ceiling. Used in determining Annual Service Volume. PVC conditions exist when the cloud ceiling is less than 500 feet and visibility is less than one mile.

R

RADIAL: A navigational signal generated by a Very High Frequency Omni-directional Range or VORTAC station that is measured as an azimuth from the station.

REGRESSION ANALYSIS: A statistical technique that seeks to identify and quantify the relationships between factors associated with a forecast.

REMOTE COMMUNICATIONS OUTLET (RCO): An unstaffed transmitter receiver/facility remotely controlled by air traffic personnel. RCOs serve flight service stations (FSSs). RCOs were established to provide ground-to-ground communications between air traffic control specialists and pilots at satellite airports for delivering en route clearances, issuing departure authorizations, and acknowledging instrument flight rules cancellations or departure/ landing times.

REMOTE TRANSMITTER/RECEIVER (RTR): See remote communications outlet. RTRs serve ARTCCs.

RELIEVER AIRPORT: An airport to serve general aviation aircraft which might otherwise use a congested air-carrier served airport.

RESTRICTED AREA: See special-use airspace.

RNAV: Area navigation - airborne equipment which permits flights over determined tracks within prescribed accuracy tolerances without the need to overfly ground-based navigation facilities. Used en route and for approaches to an airport.

RUNWAY: A defined rectangular area on an airport prepared for aircraft landing and takeoff. Runways are normally numbered in relation to their magnetic direction, rounded off to the nearest 10 degrees. For example, a runway with a magnetic heading of 180 would be designated Runway 18. The runway heading on the opposite end of the runway is 180 degrees from that runway end. For example, the opposite runway heading for Runway 18 would be Runway 36 (magnetic heading of 360). Aircraft can takeoff or land from either end of a runway, depending upon wind direction.

RUNWAY ALIGNMENT INDICATOR LIGHT: A series of high intensity sequentially flashing lights installed on the extended centerline of the runway usually in conjunction with an approach lighting system.

RUNWAY DESIGN CODE: A code signifiying the design standards to which the runway is to be built.

RUNWAY END IDENTIFICATION LIGHTING (REIL): Two synchronized flashing lights, one on each side of the runway threshold, which provide rapid and positive identification of the approach end of a particular runway.

RUNWAY GRADIENT: The average slope, measured in percent, between the two ends of a runway.

RUNWAY PROTECTION ZONE (RPZ): An area off the runway end to enhance the protection of people and property on the ground. The RPZ is trapezoidal in shape. Its dimensions are determined by the aircraft approach speed and runway approach type and minima.

RUNWAY REFERENCE CODE: A code signifying the current operational capabilities of a runway and associated taxiway.

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

RUNWAY VISIBILITY ZONE (RVZ): An area on the airport to be kept clear of permanent objects so that there is an unobstructed line of- site from any point five feet above the runway centerline to any point five feet above an intersecting runway centerline.

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

S

SCOPE: The document that identifies and defines the tasks, emphasis, and level of effort associated with a project or study.

SEGMENTED CIRCLE: A system of visual indicators designed to provide traffic pattern information at airports without operating control towers.

SHOULDER: An area adjacent to the edge of paved runways, taxiways, or aprons providing a transition between the pavement and the adjacent surface; support for aircraft running off the pavement; enhanced drainage; and blast protection. The shoulder does not necessarily need to be paved.

SLANT-RANGE DISTANCE: The straight line distance between an aircraft and a point on the ground.

SMALL AIRCRAFT: An aircraft that has a maximum certified takeoff weight of up to 12,500 pounds.

SPECIAL-USE AIRSPACE: Airspace of defined dimensions identified by a surface area wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon aircraft operations that are not a part of those activities. Special-use airspace classifications include:

- **ALERT AREA**: Airspace which may contain a high volume of pilot training activities or an unusual type of aerial activity, neither of which is hazardous to aircraft.
- **CONTROLLED FIRING AREA**: Airspace wherein activities are conducted under conditions so controlled as to eliminate hazards to nonparticipating aircraft and to ensure the safety of persons or property on the ground.
- **MILITARY OPERATIONS AREA (MOA)**: Designated airspace with defined vertical and lateral dimensions established outside Class A airspace to separate/segregate certain military activities from instrument flight rule (IFR) traffic and to identify for visual flight rule (VFR) traffic where these activities are conducted.
- **PROHIBITED AREA**: Designated airspace within which the flight of aircraft is prohibited.
- **RESTRICTED AREA**: Airspace designated under Federal Aviation Regulation (FAR) 73, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Most restricted areas are designated joint use. When not in use by the using agency, IFR/VFR operations can be authorized by the controlling air traffic control facility.
- **WARNING AREA:** Airspace which may contain hazards to nonparticipating aircraft.

STANDARD INSTRUMENT DEPARTURE (SID): A preplanned coded air traffic control IFR departure routing, preprinted for pilot use in graphic and textual form only.

STANDARD INSTRUMENT DEPARTURE PROCEDURES: A published standard flight procedure to be utilized following takeoff to provide a transition between the airport and the terminal area or en route airspace.

STANDARD TERMINAL ARRIVAL ROUTE (STAR): A preplanned coded air traffic control IFR arrival routing, preprinted for pilot use in graphic and textual or textual form only.

STOP-AND-GO: A procedure wherein an aircraft will land, make a complete stop on the runway, and then commence a takeoff from that point. A stop-and-go is recorded as two operations: one operation for the landing and one operation for the takeoff.

STOPWAY: An area beyond the end of a takeoff runway that is designed to support an aircraft during an aborted takeoff without causing structural damage to the aircraft. It is not to be used for takeoff, landing, or taxiing by aircraft.

STRAIGHT-IN LANDING/APPROACH: A landing made on a runway aligned within 30 degrees of the final approach course following completion of an instrument approach.

T

TACTICAL AIR NAVIGATION (TACAN): An ultrahigh frequency electronic air navigation system which provides suitably-equipped aircraft a continuous indication of bearing and distance to the TACAN station.

TAKEOFF RUNWAY AVAILABLE (TORA):
See declared distances.

TAKEOFF DISTANCE AVAILABLE (TODA):
See declared distances.

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

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

TAXIWAY DESIGN GROUP: A classification of airplanes based on outer to outer Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance.

TAXIWAY SAFETY AREA (TSA): A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway.

TERMINAL INSTRUMENT PROCEDURES: Published flight procedures for conducting instrument approaches to runways under instrument meteorological conditions.

TERMINAL RADAR APPROACH CONTROL: An element of the air traffic control system responsible for monitoring the en-route and terminal segment of air traffic in the airspace surrounding airports with moderate to high levels of air traffic.

TETRAHEDRON: A device used as a landing direction indicator. The small end of the tetrahedron points in the direction of landing.

THRESHOLD: The beginning of that portion of the runway available for landing. In some instances the landing threshold may be displaced.

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

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

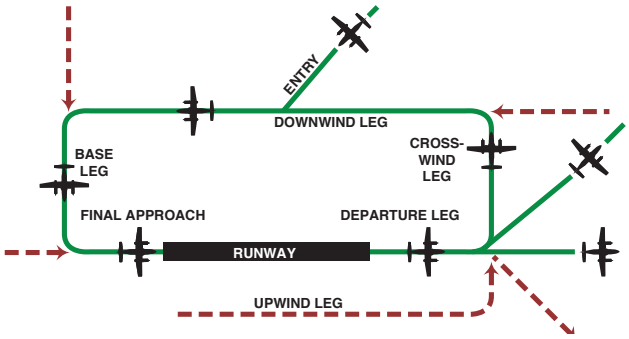
TOUCHDOWN AND LIFT-OFF AREA (TLOF): A load bearing, generally paved area, normally centered in the FATO, on which the helicopter lands or takes off.

TOUCHDOWN ZONE (TDZ): The first 3,000 feet of the runway beginning at the threshold.

TOUCHDOWN ZONE ELEVATION (TDZE): The highest elevation in the touchdown zone.

TOUCHDOWN ZONE (TDZ) LIGHTING: Two rows of transverse light bars located symmetrically about the runway centerline normally at 100- foot intervals. The basic system extends 3,000 feet along the runway.

TRAFFIC PATTERN: The traffic flow that is prescribed for aircraft landing at or taking off from an airport. The components of a typical traffic pattern are the upwind leg, crosswind leg, downwind leg, base leg, and final approach.



U

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

UNCONTROLLED AIRSPACE: Airspace within which aircraft are not subject to air traffic control.

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

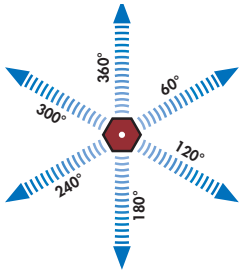
UPWIND LEG: A flight path parallel to the landing runway in the direction of landing. See "traffic pattern."

V

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

VERY HIGH FREQUENCY/ OMNIDIRECTIONAL RANGE (VOR): A ground-based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the national airspace system. The VOR periodically identifies itself by Morse Code and may have an additional voice identification feature.

VERY HIGH FREQUENCY OMNI-DIRECTIONAL RANGE/ TACTICAL AIR NAVIGATION (VORTAC): A navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance-measuring equipment (DME) at one site.



VICTOR AIRWAY: A control area or portion thereof established in the form of a corridor, the centerline of which is defined by radio navigational aids.

VISUAL APPROACH: An approach wherein an aircraft on an IFR flight plan, operating in VFR conditions under the control of an air traffic control facility and having an air traffic control authorization, may proceed to the airport of destination in VFR conditions.

VISUAL APPROACH SLOPE INDICATOR (VASI): An airport lighting facility providing vertical visual approach slope guidance to aircraft during approach to landing by radiating a directional pattern of high intensity red and white focused light beams which indicate to the pilot that he is on path if he sees red/ white, above path if white/white, and below path if red/red. Some airports serving large aircraft have three-bar VASI's which provide two visual guide paths to the same runway.

VISUAL FLIGHT RULES (VFR): Rules that govern the procedures for conducting flight under visual conditions. The term VFR is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.

VISUAL METEOROLOGICAL CONDITIONS: Meteorological conditions expressed in terms of specific visibility and ceiling conditions which are equal to or greater than the threshold values for instrument meteorological conditions.

VOR: See "Very High Frequency Omnidirectional Range Station."

VORTAC: See "Very High Frequency Omnidirectional Range Station/Tactical Air Navigation."

W

WARNING AREA: See special-use airspace.

WIDE AREA AUGMENTATION SYSTEM: An enhancement of the Global Positioning System that includes integrity broadcasts, differential corrections, and additional ranging signals for the purpose of providing the accuracy, integrity, availability, and continuity required to support all phases of flight.

Abbreviations

AC: advisory circular

ADF: automatic direction finder

ADG: airplane design group

AFSS: automated flight service station

AGL: above ground level

AIA: annual instrument approach

AIP: Airport Improvement Program

AIR-21: Wendell H. Ford Aviation Investment and Reform Act for the 21st Century

ALS: approach lighting system

ALSF-1: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT I configuration)

ALSF-2: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT II configuration)

AOA: Aircraft Operation Area

APV: instrument approach procedure with vertical guidance

ARC: airport reference code

ARFF: aircraft rescue and fire fighting

ARP: airport reference point

ARTCC: air route traffic control center

ASDA: accelerate-stop distance available

ASR: airport surveillance radar

ASOS: automated surface observation station

ATCT: airport traffic control tower

ATIS: automated terminal information service

AVGAS: aviation gasoline - typically 100 low lead (100LL)

AWOS: automatic weather observation station

BRL: building restriction line

CFR: Code of Federal Regulation

CIP: capital improvement program

DME: distance measuring equipment

DNL: day-night noise level

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

DTWL: runway weight bearing capacity of aircraft with dual-tandem type landing gear

FAA: Federal Aviation Administration

FAR: Federal Aviation Regulation

FBO: fixed base operator

FY: fiscal year

GPS: global positioning system

GS: glide slope

HIRL: high intensity runway edge lighting

IFR: instrument flight rules (FAR Part 91)

ILS: instrument landing system

IM: inner marker

LDA: localizer type directional aid

LDA: landing distance available

LIRL: low intensity runway edge lighting

LMM: compass locator at middle marker

LOM: compass locator at outer marker

LORAN: long range navigation

MALS: medium intensity approach lighting system with indicator lights

MIRL: medium intensity runway edge lighting

MITL: medium intensity taxiway edge lighting

MLS: microwave landing system

MM: middle marker

MOA: military operations area

MSL: mean sea level

NAVAID: navigational aid

NDB: nondirectional radio beacon

NM: nautical mile (6,076.1 feet)

NPES: National Pollutant Discharge Elimination System

NPIAS: National Plan of Integrated Airport Systems

NPRM: notice of proposed rule making

ODALS: omnidirectional approach lighting system

OFA: object free area

OFZ: obstacle free zone

OM: outer marker

PAC: planning advisory committee

PAPI: precision approach path indicator

PFC: porous friction course

PFC: passenger facility charge

PCL: pilot-controlled lighting

PIW public information workshop

PLASI: pulsating visual approach slope indicator

POFA: precision object free area

PVASI: pulsating/steady visual approach slope indicator

PVC: poor visibility and ceiling

RCO: remote communications outlet

RRC: Runway Reference Code

RDC: Runway Design Code

REIL: runway end identification lighting

RNAV: area navigation

RPZ: runway protection zone

RSA: runway safety area

RTR: remote transmitter/receiver

RVR: runway visibility range

RVZ: runway visibility zone

SALS: short approach lighting system

SASP: state aviation system plan

SEL: sound exposure level

SID: standard instrument departure

SM: statute mile (5,280 feet)

SRE: snow removal equipment

SSALF: simplified short approach lighting system with runway alignment indicator lights

STAR: standard terminal arrival route

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

TACAN: tactical air navigational aid

TAF: Federal Aviation Administration (FAA) Terminal Area Forecast

TDG: Taxiway Design Group

TLOF: Touchdown and lift-off

TDZ: touchdown zone

TDZE: touchdown zone elevation

TODA: takeoff distance available

TORA: takeoff runway available

TRACON: terminal radar approach control

VASI: visual approach slope indicator

VFR: visual flight rules (FAR Part 91)

VHF: very high frequency

VOR: very high frequency omni-directional range

VORTAC: VOR and TACAN collocated

APPENDIX B

FORECAST APPROVAL

U.S. Department
of Transportation
**Federal Aviation
Administration**

Western-Pacific Region
Office of Airports
Phoenix Airports District Office

3800 N Central Ave
Suite 1025
Phoenix, AZ 85012

June 1, 2018

Kenneth G. Moen
Airport Manager
Carson City Airport
2600 College Parkway #6
Carson City, NV 89706

Dear Mr. Moen:

Carson City Airport (CXP), Carson City, Nevada
Aviation Activity Forecast Approval

The Federal Aviation Administration (FAA) has reviewed the aviation forecast for the airport master plan dated May 3, 2018. The FAA approves this forecast and the use of B-II as the existing critical design aircraft and B-II as the future critical design aircraft for airport planning purposes, including Airport Layout Plan development.

In summary, the FAA TAF and the Carson City Airport forecast update regarding total operations is within the 10 percent and 15 percent allowance for 5 and 10 year planning horizons. The airport forecast update appropriately explains these tolerances due to the most current conditions at the airport and the available data when the forecasts were developed which include an estimated 1.52% compound growth rate due to an increase in based aircraft, and future airport development. Therefore, approval of this forecast doesn't need to be sent to FAA Headquarters for review because the 5 and 10 year forecasts do not exceed benchmarks established in the FAA's Guidance on Review & Approval of Local Aviation Forecasts published in 2008.

The forecast was developed using current data, appropriate methodologies, and is within the acceptable range for TAF tolerance and therefore is approved for planning purposes at Carson City Airport. It is important to note that the approval of this forecast doesn't guarantee funding for large scale capital improvements as future projects will need to be justified by current activity levels at the time the projects are proposed for implementation.

If you have any questions about this forecast approval, please call me at 602-792-1072.

Sincerely,

Jared M. Raymond
Airport Planner

Cc: FAA Grant File
Tyler Stuber - Coffman Associates

APPENDIX C

AIRPORT LAYOUT PLAN

AIRPORT LAYOUT PLAN

CXP - CARSON CITY AIRPORT

Carson City, Nevada

OPERATED BY
CARSON CITY AIRPORT AUTHORITY

FlyCarsonCity.com

PREPARED BY

ATKINS
Member of the SNC-Lavalin Group
10509 Professional Circle
Suite 102
Reno, NV 89521
Tel. (775) 828-1622
Fax (775) 851-1687
www.atkinsglobal.com/northamerica

AUGUST 2020

LOCATION MAP

VICINITY MAP

INDEX OF DRAWINGS		REVISIONS	
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EXISTING FACILITIES	2 OF 12		
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DATA SHEET	4 OF 12		
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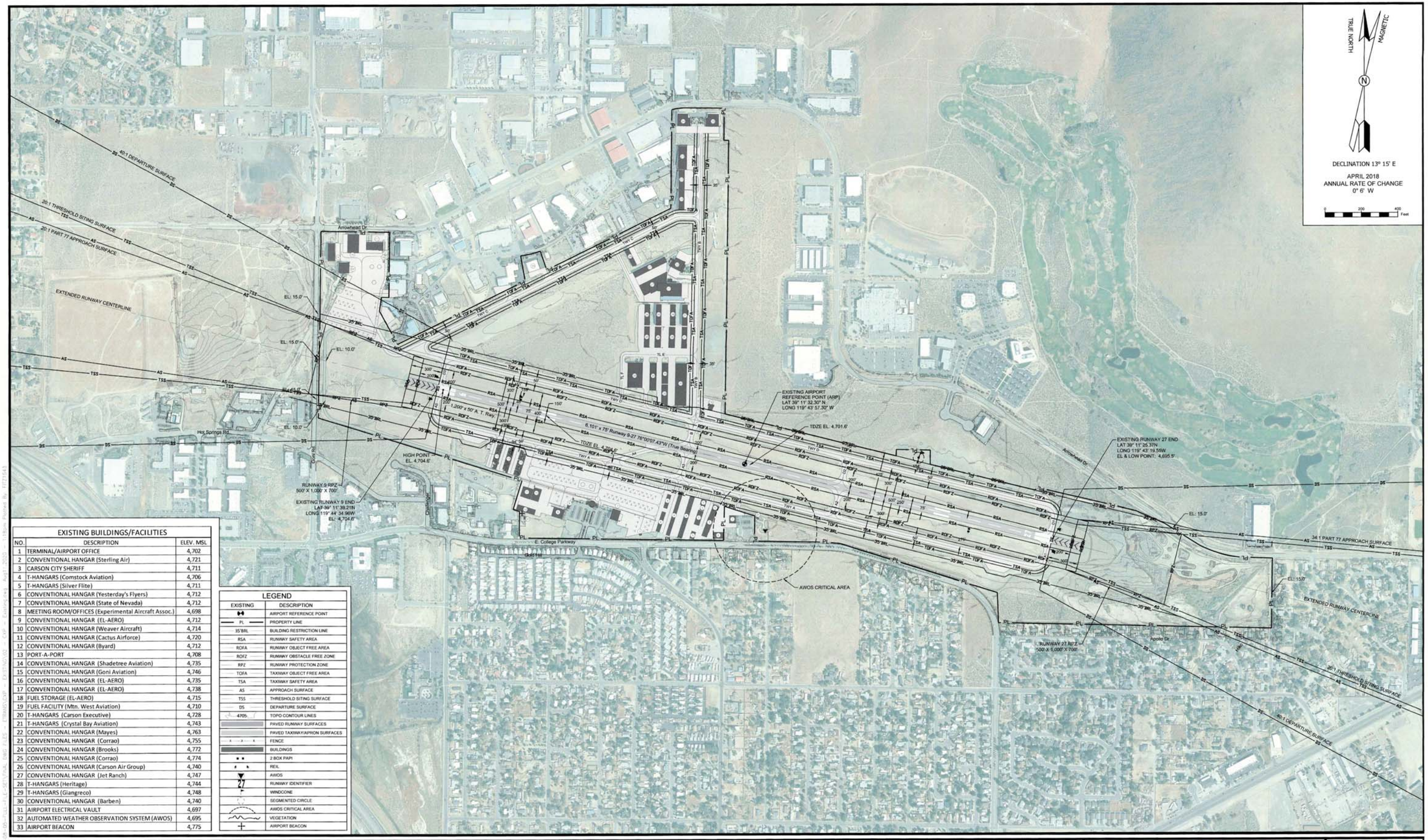
PART-77 AIRSPACE SURFACES PLAN	10 OF 12		
LAND USE MAP	11 OF 12		
AIRPORT PROPERTY MAP	12 OF 12		

AIRPORT SPONSOR APPROVAL

THIS AIRPORT DRAWING IS APPROVED BY
(SIGNATURE) Michael Golden DATE 8-17-20
NAME MICHAEL GOLDEN
TITLE CHAIRMAN - CARSON CITY AIRPORT AUTHORITY



EXISTING BUILDINGS/FACILITIES

NO.	DESCRIPTION	ELEV. MSL
1	TERMINAL/AIRPORT OFFICE	4,702
2	CONVENTIONAL HANGAR (Sterling Air)	4,721
3	CARSON CITY SHERIFF	4,711
4	T-HANGARS (Comstock Aviation)	4,706
5	T-HANGARS (Silver Flite)	4,711
6	CONVENTIONAL HANGAR (Yesterday's Flyers)	4,712
7	CONVENTIONAL HANGAR (State of Nevada)	4,712
8	MEETING ROOM/OFFICES (Experimental Aircraft Assoc.)	4,698
9	CONVENTIONAL HANGAR (EL-AERO)	4,712
10	CONVENTIONAL HANGAR (Weaver Aircraft)	4,714
11	CONVENTIONAL HANGAR (Cactus Airforce)	4,720
12	CONVENTIONAL HANGAR (Byard)	4,712
13	PORT-A-PORT	4,708
14	CONVENTIONAL HANGAR (Shadetree Aviation)	4,735
15	CONVENTIONAL HANGAR (Goni Aviation)	4,746
16	CONVENTIONAL HANGAR (EL-AERO)	4,735
17	CONVENTIONAL HANGAR (EL-AERO)	4,738
18	FUEL STORAGE (EL-AERO)	4,715
19	FUEL FACILITY (Mtn. West Aviation)	4,710
20	T-HANGARS (Carson Executive)	4,728
21	T-HANGARS (Crystal Bay Aviation)	4,743
22	CONVENTIONAL HANGAR (Mayes)	4,763
23	CONVENTIONAL HANGAR (Corrao)	4,755
24	CONVENTIONAL HANGAR (Brooks)	4,772
25	CONVENTIONAL HANGAR (Corrao)	4,774
26	CONVENTIONAL HANGAR (Carson Air Group)	4,740
27	CONVENTIONAL HANGAR (Jet Ranch)	4,747
28	T-HANGARS (Heritage)	4,744
29	T-HANGARS (Giangreco)	4,748
30	CONVENTIONAL HANGAR (Barben)	4,740
31	AIRPORT ELECTRICAL VAULT	4,697
32	AUTOMATED WEATHER OBSERVATION SYSTEM (AWOS)	4,695
33	AIRPORT BEACON	4,775

LEGEND

EXISTING	DESCRIPTION
	AIRPORT REFERENCE POINT
PL	PROPERTY LINE
35'BRL	BUILDING RESTRICTION LINE
RSA	RUNWAY SAFETY AREA
ROFA	RUNWAY OBJECT FREE AREA
ROFZ	RUNWAY OBSTACLE FREE ZONE
RPZ	RUNWAY PROTECTION ZONE
TOFA	TAXIWAY OBJECT FREE AREA
TSA	TAXIWAY SAFETY AREA
AS	APPROACH SURFACE
TSS	THRESHOLD SITING SURFACE
DS	DEPARTURE SURFACE
4705	TOPO CONTOUR LINES
	PAVED RUNWAY SURFACES
	PAVED TAXIWAY/APRON SURFACES
	FENCE
	BUILDINGS
	2 BOX PAPI
	REIL
	AWOS
27	RUNWAY IDENTIFIER
	WINDCONE
	SEGMENTED CIRCLE
	AWOS CRITICAL AREA
	VEGETATION
	AIRPORT BEACON

REVISIONS	
DATE	DESCRIPTION

CLIENT

CARSON CITY AIRPORT AUTHORITY

FlyCarsonCity.com

PROJECT

AIRPORT LAYOUT PLAN UPDATE

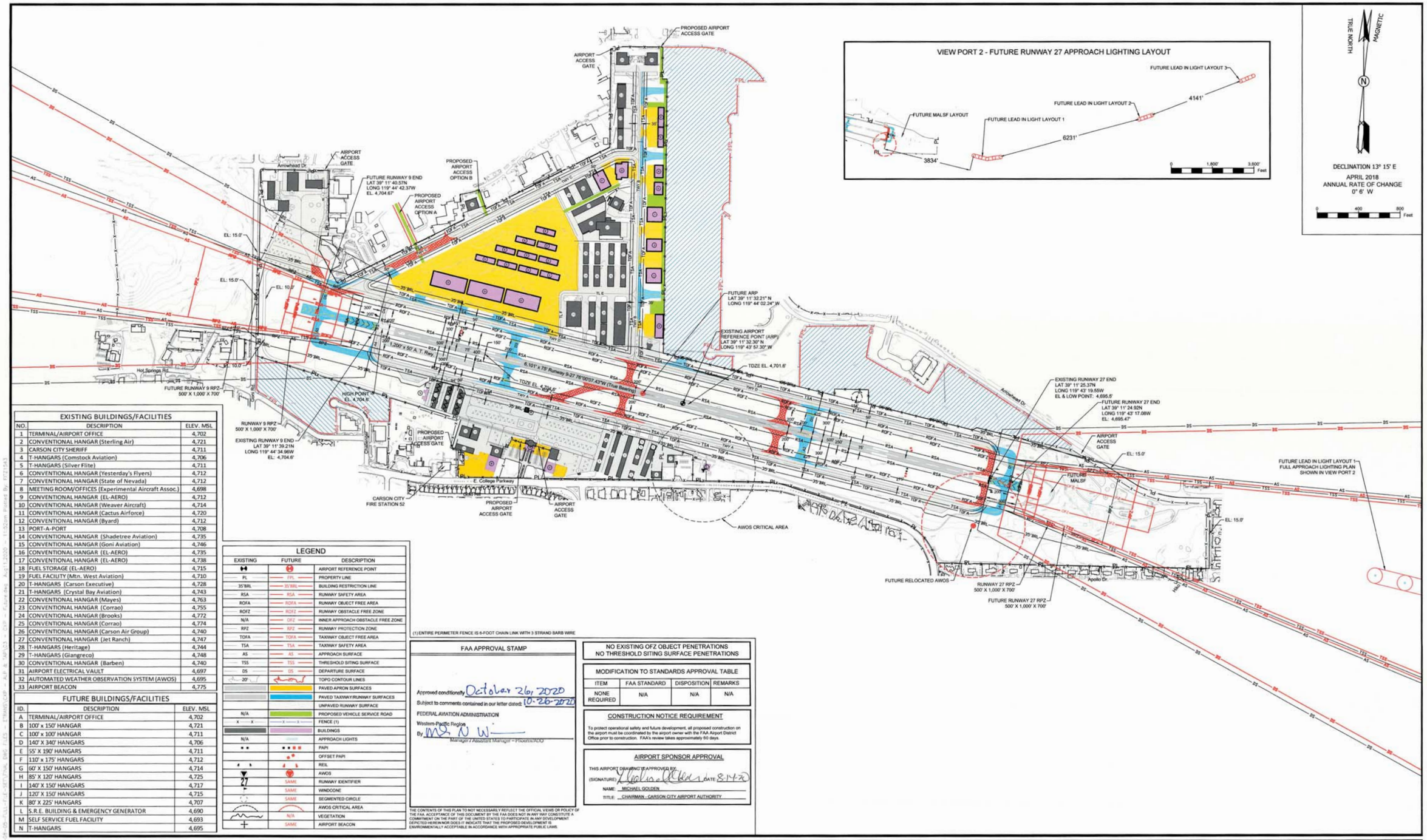
CARSON CITY AIRPORT (CXP)
CARSON CITY, NEVADA

SHEET TITLE

Existing Conditions

ATKINS
Member of the SNC-Lavalin Group
10509 Professional Circle
Suite 102
Reno, NV 89521
Tel. (775) 828-1622
www.atkinsglobal.com/northamerica

JOB NO.:	100056509
DRAWN:	K.A.K.
DESIGN:	A.M.M.
CHECKED:	B.D.F.
DATE:	AUGUST 2020



EXISTING BUILDINGS/FACILITIES

NO.	DESCRIPTION	ELEV. MSL
1	TERMINAL/AIRPORT OFFICE	4,702
2	CONVENTIONAL HANGAR (Sterling Air)	4,721
3	CARSON CITY SHERIFF	4,711
4	T-HANGARS (Comstock Aviation)	4,706
5	T-HANGARS (Silver Flite)	4,711
6	CONVENTIONAL HANGAR (Yesterday's Flyers)	4,712
7	CONVENTIONAL HANGAR (State of Nevada)	4,712
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M	SELF SERVICE FUEL FACILITY	4,693
N	T-HANGARS	4,695

LEGEND

EXISTING	FUTURE	DESCRIPTION
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35'BRL	35'BRL	BUILDING RESTRICTION LINE
RSA	RSA	RUNWAY SAFETY AREA
ROFA	ROFA	RUNWAY OBJECT FREE AREA
ROFZ	ROFZ	RUNWAY OBSTACLE FREE ZONE
N/A	OFZ	INNER APPROACH OBSTACLE FREE ZONE
RPZ	RPZ	RUNWAY PROTECTION ZONE
TOFA	TOFA	TAXIWAY OBJECT FREE AREA
TSA	TSA	TAXIWAY SAFETY AREA
AS	AS	APPROACH SURFACE
TSS	TSS	THRESHOLD SITING SURFACE
DS	DS	DEPARTURE SURFACE
20'		TOPO CONTOUR LINES
		PAVED APRON SURFACES
		PAVED TAXIWAY/RUNWAY SURFACES
		UNPAVED RUNWAY SURFACE
N/A		PROPOSED VEHICLE SERVICE ROAD
X X	X X	FENCE (1)
		BUILDINGS
N/A		APPROACH LIGHTS
		PAPI
		OFFSET PAPI
		REIL
		AWOS
27	SAME	RUNWAY IDENTIFIER
	SAME	WINDCONE
	SAME	SEGMENTED CIRCLE
		AWOS CRITICAL AREA
	N/A	VEGETATION
	SAME	AIRPORT BEACON

(1) ENTIRE PERIMETER FENCE IS 6-FOOT CHAIN LINK WITH 3 STRAND BARB WIRE

FAA APPROVAL STAMP

Approved conditionally October 26, 2020
Subject to comments contained in our letter dated: 10-26-2020
FEDERAL AVIATION ADMINISTRATION
Western-Pacific Region
By: [signature]
Manager / Assistant Manager – Phoenix ADO

THE CONTENTS OF THIS PLAN TO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THIS DOCUMENT BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED HEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.

NO EXISTING OFZ OBJECT PENETRATIONS
NO THRESHOLD SITING SURFACE PENETRATIONS

MODIFICATION TO STANDARDS APPROVAL TABLE

ITEM	FAA STANDARD	DISPOSITION	REMARKS
NONE REQUIRED	N/A	N/A	N/A

CONSTRUCTION NOTICE REQUIREMENT

To protect operational safety and future development, all proposed construction on the airport must be coordinated by the airport owner with the FAA Airport District Office prior to construction. FAA's review takes approximately 60 days.

AIRPORT SPONSOR APPROVAL

THIS AIRPORT DRAWING IS APPROVED BY:
(SIGNATURE) [signature] DATE 8-14-20
NAME: MICHAEL GOLDEN
TITLE: CHAIRMAN - CARSON CITY AIRPORT AUTHORITY

REVISIONS	
DATE	DESCRIPTION

CLIENT
CARSON CITY AIRPORT AUTHORITY
FlyCarsonCity.com

PROJECT
AIRPORT LAYOUT PLAN UPDATE
CARSON CITY AIRPORT (CXP)
CARSON CITY, NEVADA

SHEET TITLE
AIRPORT LAYOUT DRAWING

ATKINS
Member of the SNC-Lavalin Group
10509 Professional Circle Suite 102
Reno, NV 89521
Tel. (775) 828-1622
www.atkinsglobal.com/northamerica

JOB NO.: 100056509
DRAWN: K.A.K.
DESIGN: A.M.M.
CHECKED: B.D.F.
DATE: AUGUST 2020

SHEET 3 OF 12

RUNWAY DATA

ITEM		RUNWAY 9 / 27 EXISTING	RUNWAY 9 / 27 PROPOSED
DESIGN AIRCRAFT		CESSNA CITATION LATITUDE	SAME
RUNWAY DESIGN CODE (RDC)		B-II-5000	SAME
RUNWAY APPROACH REFERENCE CODE (APRC)		B-II(M)-5000	SAME
RUNWAY DEPARTURE REFERENCE CODE (DPRC)		B-II	SAME
PAVEMENT STRENGTH (LBS.)	SINGLE WHEEL	30,000 LBS	SAME
	DUAL WHEEL	60,000 LBS	SAME
	2D WHEEL IN TANDEM	UNKNOWN	SAME
	PCN	UNKNOWN	SAME
RUNWAY SURFACE TYPE		ASPHALT-GROOVED	SAME
RUNWAY SURFACE TREATMENT		GROOVED	SAME
% EFFECTIVE GRADIENT		0.3%	SAME
% MAXIMUM GRADIENT		1.0%	SAME
% WIND COVERAGE (ALL)	11.50 MPH / 10.5 KTS	96.88%	SAME
	14.96 MPH / 13.0 KTS	98.44%	SAME
RUNWAY LENGTH		6,101'	6,901'
RUNWAY WIDTH		75'	SAME
BLAST PAD LENGTH		300' / 300'	150' / 100'
BLAST PAD WIDTH		75' / 75'	75' / 87'
THRESHOLD ELEVATION		4,704.6' / 4,695.5'	SAME
RUNWAY SAFETY AREA (RSA)	BEYOND RWY END	300'	SAME
	WIDTH	150'	SAME
RUNWAY END COORDINATES (NAD 1983)		39°11'39.21" N 119°44'34.96" W / 39°11'25.37" N 119°43'19.55" W	39°11'40.57" N 119°44'42.37" W / 39°11'24.92" N 119°43'17.08" W
ELEVATIONS (NAVD88) OF RUNWAY ENDS		4,704.6' / 4,695.5'	SAME
RUNWAY LIGHTING		MIRL/REIL	SAME
RUNWAY PROTECTION ZONE (RPZ)	LENGTH	1,000' / 1,000'	SAME
	INNER WIDTH	500' / 500'	SAME
	OUTER WIDTH	700' / 700'	SAME
MARKINGS		NON-PRECISION	SAME
PART 77 APPROACH CATEGORY (SLOPE)		20:1 / 34:1	SAME
FAR PART 77 APPROACH TYPE		VISUAL / NON-PRECISION	SAME
APPROACH VISIBILITY MINIMUMS		VISUAL / ≥1 MILE	SAME
AERONAUTICAL SURVEY REQUIRED FOR APPROACH		NVGS	NVGS
RUNWAY DEPARTURE SURFACE		YES / NO	SAME
RUNWAY OFA	BEYOND RWY END	300'	SAME
	WIDTH	500'	SAME
RUNWAY OFZ	BEYOND RWY END	200'	SAME
	WIDTH	400'	SAME
THRESHOLD SITING SURFACE		20:1 NO TSS PENETRATIONS	SAME
NAVIGATIONAL AIDS		GPS	SAME
VISUAL AIDS		PAPI-2L	PAPI-4L
TOUCHDOWN ZONE ELEVATION (TDZE)		4,704.6' / 4,701.6'	SAME

NOTE: ALL LATITUDE AND LONGITUDE COORDINATES ARE DEPICTED IN NAD83 AND NAVD88 COORDINATE SYSTEMS.

AIRPORT DATA TABLE

ITEM		EXISTING	PROPOSED
AIRPORT REFERENCE CODE (ARC)		B-II	SAME
MEAN MAX. TEMP OF HOTTEST MONTH		89.6° F ; JULY	SAME
AIRPORT ELEVATION, MSL		4,704.6'	SAME
NAVAIDS		GPS/BEACON	
AIRPORT REFERENCE POINT (NAD 1983)	LAT.	39° 11 ' 32.30" N	39° 11 ' 32.21" N
	LONG.	119° 43' 57.30" W	119° 44' 02.24" W
MISCELLANEOUS FACILITIES		LIGHTED WIND CONE	
CRITICAL AIRCRAFT		CITATION LATITUDE	SAME
WINGSPAN		72.40'	SAME
MAIN GEAR WIDTH / COCKPIT TO MG		10.00' / 27.00'	SAME
APPROACH SPEED		108 KTS	SAME
MAGNETIC VARIATION		13.17°E / DATE: JULY. 2018 / SOURCE: NGDC	
NPIAS SERVICE LEVEL		GA	GA
STATE EQUIVALENT SERVICE LEVEL		GA	GA

TAXIWAY DATA

	TAXIWAY A EXISTING	TAXIWAY A PROPOSED	TAXIWAY B EXISTING	TAXIWAY B PROPOSED	TAXIWAY C EXISTING	TAXIWAY C PROPOSED	TAXIWAY D EXISTING	TAXIWAY D PROPOSED
TAXIWAY DESIGN GROUP	3	SAME	2	SAME	3	SAME	3	SAME
TAXIWAY & TAXILANE WIDTH	50'	SAME	35'	SAME	50'	SAME	50'	SAME
TAXIWAY EDGE SAFETY MARGIN (TESM)	10'	SAME	7.5'	SAME	10'	SAME	10'	SAME
TAXIWAY SHOULDER WIDTH	N/A	SAME	N/A	SAME	N/A	SAME	N/A	SAME
TAXIWAY & TAXILANE SAFTEY AREA WIDTH	79'	SAME	79'	SAME	79'	SAME	79'	SAME
TAXIWAY OBJECT FREE AREA	131'	SAME	131'	SAME	131'	SAME	131'	SAME
TAXILANE OBJECT FREE AREA	115'	SAME	115'	SAME	115'	SAME	115'	SAME
TAXIWAY / TAXILANE SEPARATION	CLEAR	SAME	CLEAR	SAME	CLEAR	SAME	CLEAR	SAME
TAXIWAY / TAXILANE LIGHTING	MITL	SAME	REFLECT	MITL	REFLECT	MITL	MITL	SAME

DECLARED DISTANCES - EXISTING

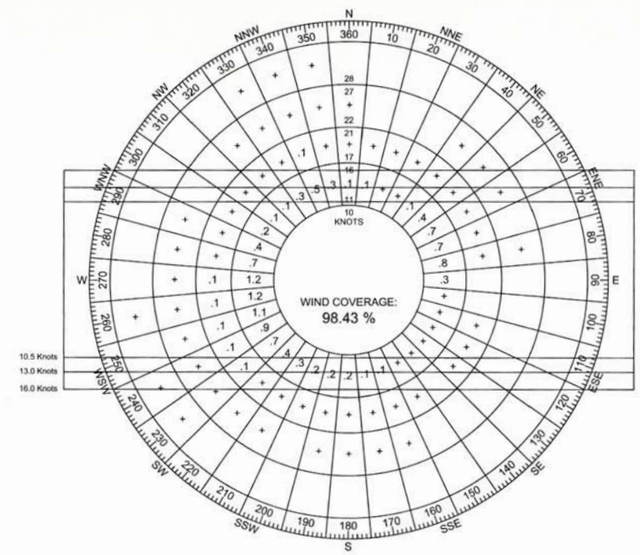
	TODA	TORA	LDA	ASDA
RUNWAY 9	6,101'	6,101'	6,101'	6,101'
RUNWAY 27	6,101'	6,101'	6,101'	6,101'

DECLARED DISTANCES - FUTURE

	TODA	TORA	LDA	ASDA
RUNWAY 9	6,901'	6,901'	6,101'	6,901'
RUNWAY 27	6,901'	6,901'	6,101'	6,901'

MODIFICATIONS TO STANDARDS

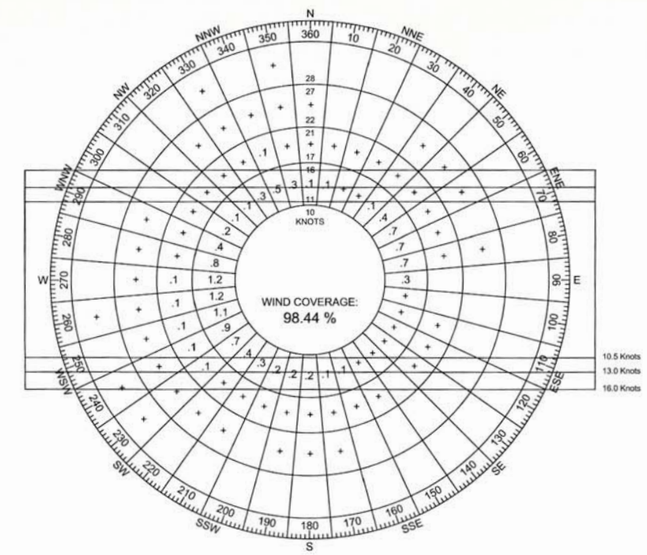
APPROVAL DATE	AIRSPACE CASE	STANDARD TO BE MODIFIED
	NONE REQUIRED	



RUNWAY 9-27 WIND COVERAGE

CROSS WIND COMPONENT	ALL WEATHER COVERAGE
10.5 Knots	96.87%
13.0 Knots	98.43%
16.0 Knots	99.66%

Station: Carson City Airport (720549)
Source: National Climatic Data Center/National Oceanic and Atmospheric Administration



RUNWAY 9-27 WIND COVERAGE

CROSS WIND COMPONENT	VFR COVERAGE
10.5 Knots	96.88%
13.0 Knots	98.44%
16.0 Knots	99.67%

Station: Carson City Airport (720549)
Source: National Climatic Data Center/National Oceanic and Atmospheric Administration

REVISIONS	
DATE	DESCRIPTION

CLIENT: CARSON CITY AIRPORT AUTHORITY — FlyCarsonCity.com

PROJECT: AIRPORT LAYOUT PLAN UPDATE
CARSON CITY AIRPORT (CXP)
CARSON CITY, NEVADA

SHEET TITLE: DATA SHEET

ATKINS
Member of the SNC-Lavalin Group
10509 Professional Circle Tel. (775) 828-1622
Suite 102
Reno, NV 89521
www.atkinsglobal.com/northamerica

JOB NO.: 100056509
DRAWN: K.A.K.
DESIGN: A.M.M.
CHECKED: B.D.F.
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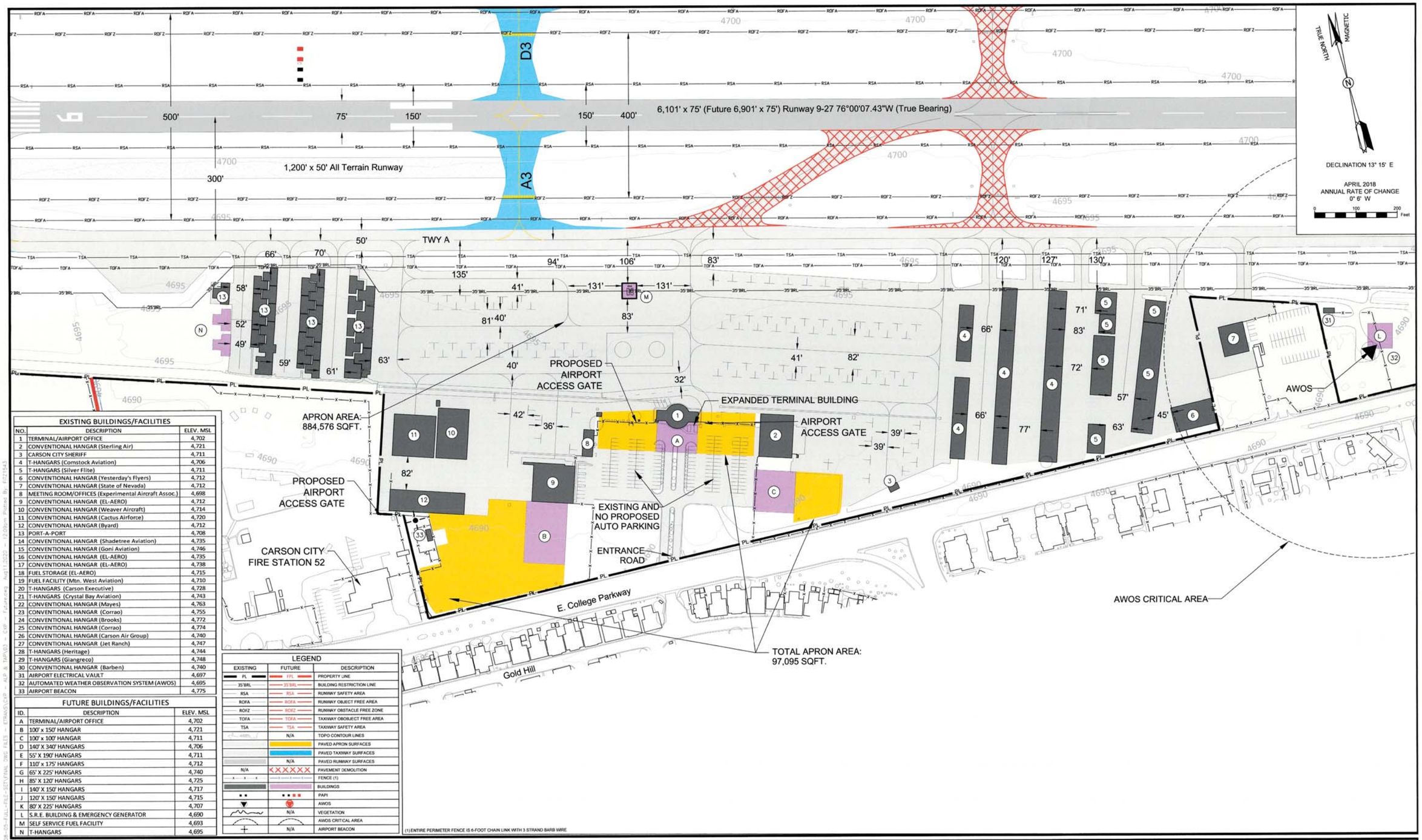

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N	T-HANGARS	4,695

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EXISTING	FUTURE	DESCRIPTION
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TOFA	TOFA	TAXIWAY OBOBJECT FREE AREA
TSA	TSA	TAXIWAY SAFETY AREA
	N/A	TOPO CONTOUR LINES
		PAVED APRON SURFACES
		PAVED TAXIWAY SURFACES
	N/A	PAVED RUNWAY SURFACES
N/A	XXXXXX	PAVEMENT DEMOLITION
		FENCE (1)
		BUILDINGS
		PAPI
		AWOS
	N/A	VEGETATION
		AWOS CRITICAL AREA
	N/A	AIRPORT BEACON

(1) ENTIRE PERIMETER FENCE IS 6-FOOT CHAIN LINK WITH 3 STRAND BARB WIRE

REVISIONS	
DATE	DESCRIPTION

CLIENT

CARSON CITY AIRPORT AUTHORITY

FlyCarsonCity.com

PROJECT

AIRPORT LAYOUT PLAN UPDATE

CARSON CITY AIRPORT (CXP)
CARSON CITY, NEVADA

SHEET TITLE

TERMINAL AREA PLAN - 1

ATKINS
Member of the SNC-Lavalin Group
10509 Professional Circle
Suite 102
Reno, NV 89521
Tel. (775) 828-1622
www.atkinsglobal.com/northamerica

JOB NO.:	100056509
DRAWN:	K.A.K.
DESIGN:	A.M.M.
CHECKED:	B.D.F.
DATE:	AUGUST 2020

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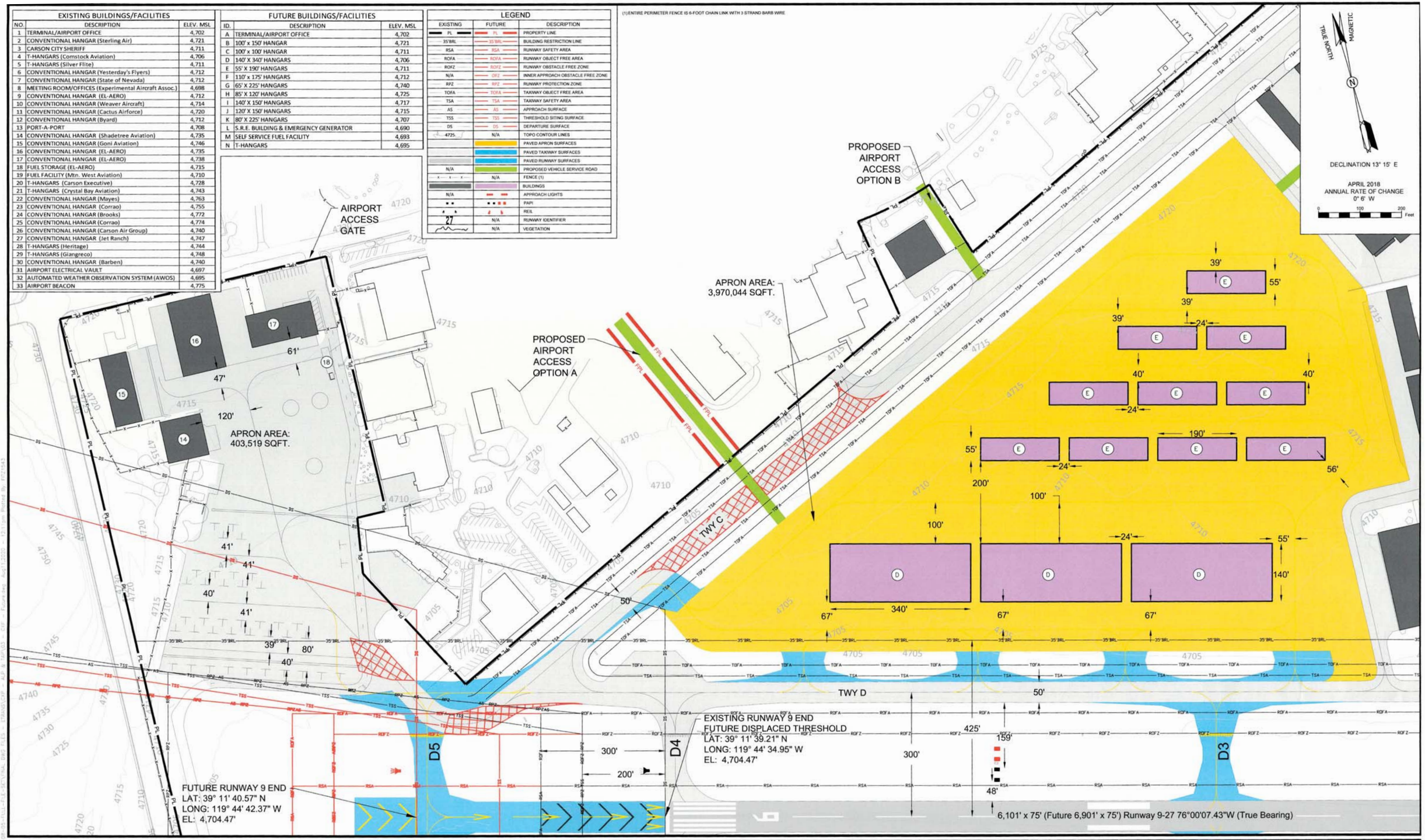
35'BRL	35'BRL	BUILDING RESTRICTION LINE
RSA	RSA	RUNWAY SAFETY AREA
ROFA	ROFA	RUNWAY OBJECT FREE AREA
ROFZ	ROFZ	RUNWAY OBSTACLE FREE ZONE
N/A	OFZ	INNER APPROACH OBSTACLE FREE ZONE
RPZ	RPZ	RUNWAY PROTECTION ZONE
TOFA	TOFA	TAXIWAY OBJECT FREE AREA
TSA	TSA	TAXIWAY SAFETY AREA
AS	AS	APPROACH SURFACE
TSS	TSS	THRESHOLD SITING SURFACE
DS	DS	DEPARTURE SURFACE
4725	N/A	TOPO CONTOUR LINES
		PAVED APRON SURFACES
		PAVED TAXIWAY SURFACES
		PAVED RUNWAY SURFACES
N/A		PROPOSED VEHICLE SERVICE ROAD
N/A	N/A	FENCE (1)
		BUILDINGS
N/A		APPROACH LIGHTS
		PAPI
		REIL
27	N/A	RUNWAY IDENTIFIER
	N/A	VEGETATION

(1) ENTIRE PERIMETER FENCE IS 6-FOOT CHAIN LINK WITH 3 STRAND BARB WIRE



REVISIONS	
DATE	DESCRIPTION

CLIENT

CARSON CITY AIRPORT AUTHORITY

FlyCarsonCity.com

PROJECT

AIRPORT LAYOUT PLAN UPDATE

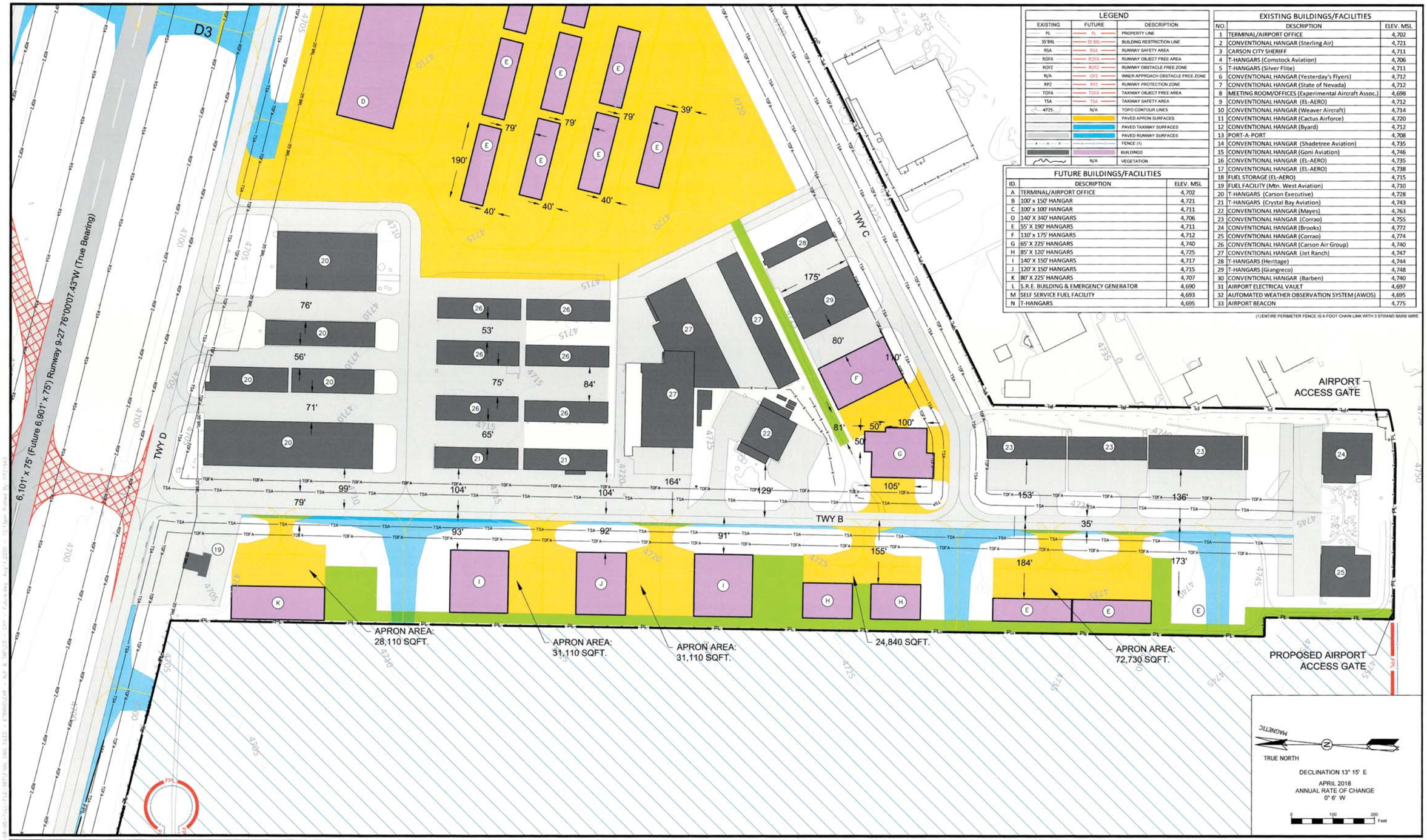
CARSON CITY AIRPORT (CXP)
CARSON CITY, NEVADA

SHEET TITLE

TERMINAL AREA PLAN - 2

ATKINS
Member of the SNC-Lavalin Group
10509 Professional Circle Suite 102
Reno, NV 89521
Tel. (775) 828-1622
www.atkinsglobal.com/northamerica

JOB NO.:	100056509
DRAWN:	K.A.K.
DESIGN:	A.M.M.
CHECKED:	B.D.F.
DATE:	AUGUST 2020



LEGEND

EXISTING	FUTURE	DESCRIPTION
PL	PL	PROPERTY LINE
35'BRL	35'BRL	BUILDING RESTRICTION LINE
RSA	RSA	RUNWAY SAFETY AREA
ROFA	ROFA	RUNWAY OBJECT FREE AREA
ROFZ	ROFZ	RUNWAY OBSTACLE FREE ZONE
N/A	OFZ	INNER APPROACH OBSTACLE FREE ZONE
RPZ	RPZ	RUNWAY PROTECTION ZONE
TOFA	TOFA	TAXIWAY OBJECT FREE AREA
TSA	TSA	TAXIWAY SAFETY AREA
4725	N/A	TOPO CONTOUR LINES
		PAVED APRON SURFACES
		PAVED TAXIWAY SURFACES
		PAVED RUNWAY SURFACES
		FENCE (1)
		BUILDINGS
	N/A	VEGETATION

EXISTING BUILDINGS/FACILITIES

NO.	DESCRIPTION	ELEV. MSL
1	TERMINAL/AIRPORT OFFICE	4,702
2	CONVENTIONAL HANGAR (Sterling Air)	4,721
3	CARSON CITY SHERIFF	4,711
4	T-HANGARS (Comstock Aviation)	4,706
5	T-HANGARS (Silver Flite)	4,711
6	CONVENTIONAL HANGAR (Yesterday's Flyers)	4,712
7	CONVENTIONAL HANGAR (State of Nevada)	4,712
8	MEETING ROOM/OFFICES (Experimental Aircraft Assoc.)	4,698
9	CONVENTIONAL HANGAR (EL-AERO)	4,712
10	CONVENTIONAL HANGAR (Weaver Aircraft)	4,714
11	CONVENTIONAL HANGAR (Cactus Airforce)	4,720
12	CONVENTIONAL HANGAR (Byard)	4,712
13	PORT-A-PORT	4,708
14	CONVENTIONAL HANGAR (Shadetree Aviation)	4,735
15	CONVENTIONAL HANGAR (Goni Aviation)	4,746
16	CONVENTIONAL HANGAR (EL-AERO)	4,735
17	CONVENTIONAL HANGAR (EL-AERO)	4,738
18	FUEL STORAGE (EL-AERO)	4,715
19	FUEL FACILITY (Mtn. West Aviation)	4,710
20	T-HANGARS (Carson Executive)	4,728
21	T-HANGARS (Crystal Bay Aviation)	4,743
22	CONVENTIONAL HANGAR (Mayes)	4,763
23	CONVENTIONAL HANGAR (Corrao)	4,755
24	CONVENTIONAL HANGAR (Brooks)	4,772
25	CONVENTIONAL HANGAR (Corrao)	4,774
26	CONVENTIONAL HANGAR (Carson Air Group)	4,740
27	CONVENTIONAL HANGAR (Jet Ranch)	4,747
28	T-HANGARS (Heritage)	4,744
29	T-HANGARS (Giangreco)	4,748
30	CONVENTIONAL HANGAR (Barben)	4,740
31	AIRPORT ELECTRICAL VAULT	4,697
32	AUTOMATED WEATHER OBSERVATION SYSTEM (AWOS)	4,695
33	AIRPORT BEACON	4,775

FUTURE BUILDINGS/FACILITIES

ID.	DESCRIPTION	ELEV. MSL
A	TERMINAL/AIRPORT OFFICE	4,702
B	100' x 150' HANGAR	4,721
C	100' x 100' HANGAR	4,711
D	140' X 340' HANGARS	4,706
E	55' X 190' HANGARS	4,711
F	110' x 175' HANGARS	4,712
G	65' X 225' HANGARS	4,740
H	85' X 120' HANGARS	4,725
I	140' X 150' HANGARS	4,717
J	120' X 150' HANGARS	4,715
K	80' X 225' HANGARS	4,707
L	S.R.E. BUILDING & EMERGENCY GENERATOR	4,690
M	SELF SERVICE FUEL FACILITY	4,693
N	T-HANGARS	4,695

(1) ENTIRE PERIMETER FENCE IS 6-FOOT CHAIN LINK WITH 3 STRAND BARB WIRE

REVISIONS	
DATE	DESCRIPTION

CLIENT

CARSON CITY AIRPORT AUTHORITY

FlyCarsonCity.com

PROJECT

AIRPORT LAYOUT PLAN UPDATE

CARSON CITY AIRPORT (CXP)
CARSON CITY, NEVADA

SHEET TITLE

TERMINAL AREA PLAN - 3

ATKINS
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JOB NO.:	100056509
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DESIGN:	A.M.M.
CHECKED:	B.D.F.
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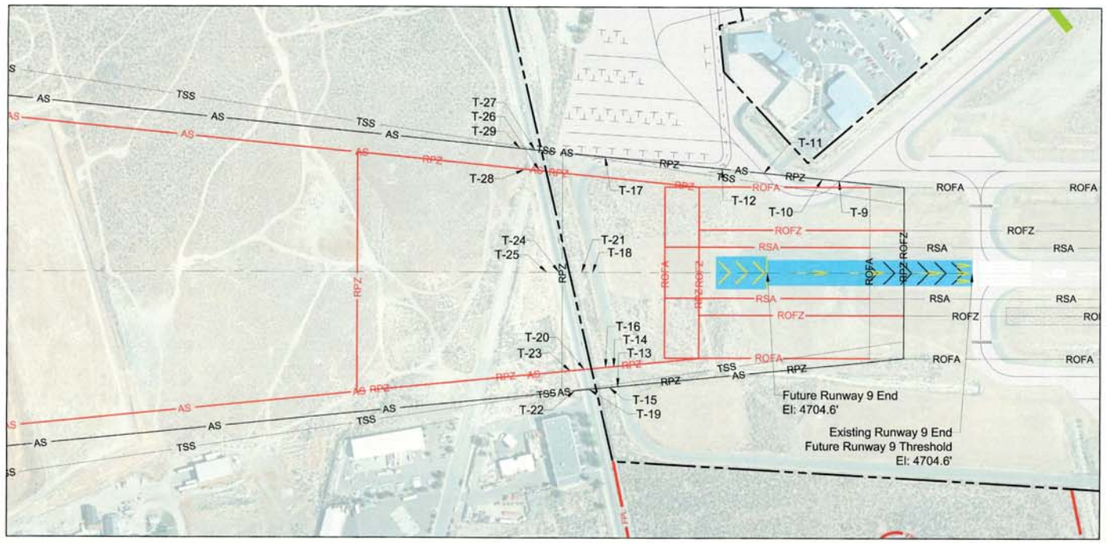
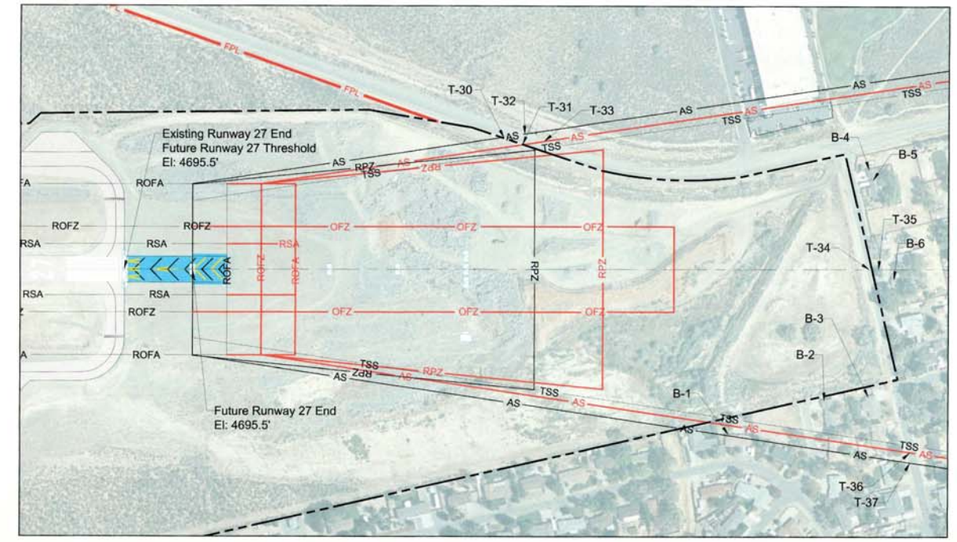
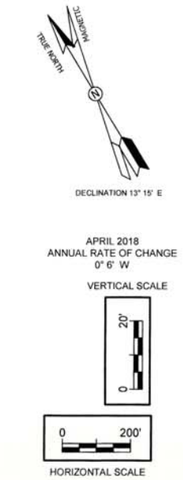






RUNWAY 9 SIGNIFICANT OBJECT AND TRAVERSEWAY TABLE

OBJECT ID	DESCRIPTION	SURVEY DATE	EXISTING 20:1 PART 77 APPROACH SURFACE PENETRATION	FUTURE 20:1 PART 77 APPROACH SURFACE PENETRATION	EXISTING 20:1 THRESHOLD SITING SURFACE PENETRATION	FUTURE 20:1 THRESHOLD SITING SURFACE PENETRATION	FUTURE 50:1 INNER APPROACH OBSTACLE FREE ZONE	GROUND ELEVATION (MSL)	TRAVERSEWAY ELEVATION (MSL)	TRAVERSEWAY ELEVATION (AGL)	TRIGGERING EVENT
T-9	TAXIWAY C	6/18/2018	9.87	N/A	N/A	N/A	N/A	4702.90	4723.82	20.92	NONE
T-10	TAXIWAY C	6/18/2018	7.50	N/A	N/A	N/A	N/A	4703.02	4723.94	20.92	NONE
T-11	TAXIWAY C	6/18/2018	-1.01	N/A	N/A	N/A	N/A	4703.10	4724.02	20.92	NONE
T-12	AIRPORT RD.	6/18/2018	-14.82	N/A	-14.82	-14.82	N/A	4706.30	4716.30	10.00	NONE
T-13	AIRPORT RD.	6/18/2018	-35.01	N/A	-35.01	-35.01	N/A	4701.26	4711.26	10.00	NONE
T-14	AIRPORT RD.	6/18/2018	-35.03	-5.03	-35.03	-35.03	N/A	4701.82	4711.82	10.00	NONE
T-15	AIRPORT RD.	6/18/2018	-35.84	N/A	-35.84	-35.84	N/A	4701.24	4711.24	10.00	NONE
T-16	AIRPORT RD.	6/18/2018	-36.23	-6.23	-36.23	-36.23	N/A	4701.84	4711.84	10.00	NONE
T-17	AIRPORT RD.	6/18/2018	-25.06	N/A	-25.06	-25.06	N/A	4713.15	4723.15	10.00	NONE
T-18	AIRPORT RD.	6/18/2018	-33.30	-3.30	-33.30	-33.30	6.00	4706.70	4716.70	10.00	NONE
T-19	GONI RD.	6/18/2018	-33.63	N/A	-33.63	-33.63	N/A	4701.85	4716.85	15.00	NONE
T-20	GONI RD.	6/18/2018	-33.92	-3.92	-33.92	-33.92	N/A	4702.24	4717.24	15.00	NONE
T-21	AIRPORT RD.	6/18/2018	-34.00	-4.00	-34.00	-34.00	6.26	4707.60	4717.60	10.00	NONE
T-22	GONI RD.	6/18/2018	-35.27	N/A	-35.27	-35.27	N/A	4702.27	4717.27	15.00	NONE
T-23	GONI RD.	6/18/2018	-35.71	-5.71	-35.71	-35.71	N/A	4702.51	4717.51	15.00	NONE
T-24	GONI RD.	6/18/2018	-24.93	5.07	-24.93	-24.93	17.32	4715.00	4730.00	15.00	RWY EXT
T-25	GONI RD.	6/18/2018	-26.53	3.47	-26.53	-26.53	16.80	4715.20	4730.20	15.00	RWY EXT
T-26	GONI RD.	6/18/2018	-23.43	6.57	-23.43	-23.43	N/A	4719.42	4734.42	15.00	RWY EXT
T-27	GONI RD.	6/18/2018	-22.90	N/A	-22.90	-22.90	N/A	4720.64	4735.64	15.00	NONE
T-28	GONI RD.	6/18/2018	-24.09	5.91	-24.09	-24.09	N/A	4720.94	4735.94	15.00	RWY EXT
T-29	GONI RD.	6/18/2018	-23.51	N/A	-23.51	-23.51	N/A	4722.21	4737.21	15.00	NONE

NOTE: ALL PRIVATE ROADS/ROADWAYS/INTERSTATES/RAILROADS ARE DEPICTED 10/15/17/23 FEET, RESPECTIVELY, ABOVE THE SURVEYED LOCATION HEIGHT PER FAA SOP NO. 200
NOTE: TAXIWAT TRAVERSEWAY ELEVATIONS ARE BASED OFF OF THE CRITICAL AIRCRAFT, WHICH HAS A TAIL HEIGHT OF 20.92 FEET

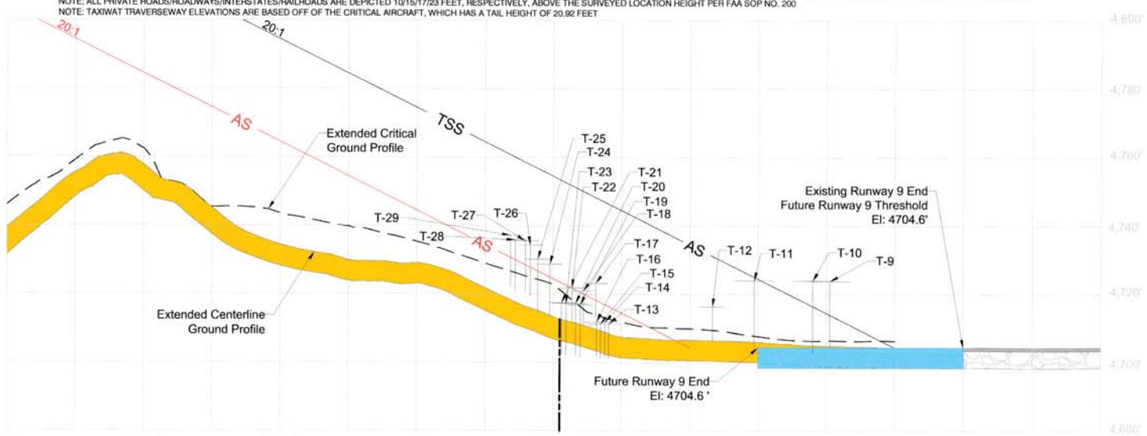
LEGEND

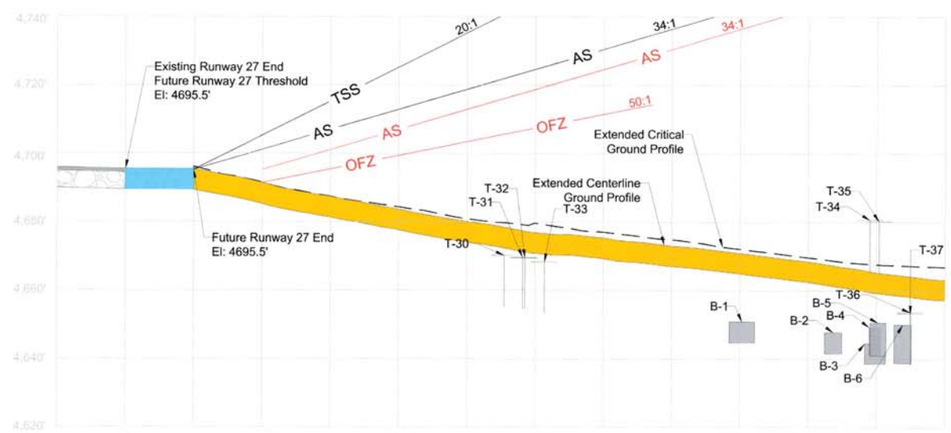
	EXISTING	PROPOSED
AIRPORT PROPERTY		FPL
APPROACH SURFACE	AS	AS
THRESHOLD SITING SURFACE	TSS	N/A
RUNWAY PROTECTION ZONE	RPZ	RPZ
RUNWAY OBJECT FREE AREA	ROFA	ROFA
RUNWAY OBSTACLE FREE ZONE	ROFZ	ROFZ
RUNWAY SAFETY AREA	RSA	RSA
INNER APPROACH OFZ	OFZ	OFZ
EXTENDED RUNWAY CENTERLINE		SAME
EXTENDED CENTERLINE PROFILE		SAME
AIRFIELD PAVEMENT		
CRITICAL GROUND PROFILE		SAME
BUILDINGS		SAME
TRAVERSEWAYS		SAME
APPROACH LIGHTS	N/A	

RUNWAY 27 SIGNIFICANT OBJECT AND TRAVERSEWAY TABLE

OBJECT ID	DESCRIPTION	SURVEY DATE	EXISTING 34:1 PART 77 APPROACH SURFACE PENETRATION	FUTURE 34:1 PART 77 APPROACH SURFACE PENETRATION	EXISTING 20:1 THRESHOLD SITING SURFACE PENETRATION	FUTURE 20:1 THRESHOLD SITING SURFACE PENETRATION	FUTURE 50:1 INNER APPROACH OBSTACLE FREE ZONE	GROUND ELEVATION (MSL)	TRAVERSEWAY ELEVATION (MSL)	TRAVERSEWAY ELEVATION (AGL)	TRIGGERING EVENT
B-1	BUILDING	6/18/2018	-123.08	N/A	-123.08	-123.08	-71.99	4644.74	4650.88	6.14	NONE
B-2	BUILDING	6/18/2018	-140.20	-130.20	-140.20	-140.20	-37.74	4641.65	4647.74	6.09	NONE
B-3	BUILDING	6/18/2018	-149.87	-139.87	-149.87	-149.87	-40.95	4638.69	4644.53	5.84	NONE
B-4	BUILDING	6/18/2018	-148.11	-138.11	-148.11	-148.11	-35.47	4638.86	4650.01	11.15	NONE
B-5	BUILDING	6/18/2018	-144.40	-134.40	-144.40	-144.40	-34.86	4641.00	4650.62	9.62	NONE
B-6	BUILDING	6/18/2018	-145.24	-135.24	-145.24	-145.24	-36.24	4641.37	4649.24	7.87	NONE
T-30	ARROWHEAD DR.	6/18/2018	-70.69	N/A	-70.69	-70.69	-15.18	4655.30	4670.30	15.00	NONE
T-31	ARROWHEAD DR.	6/18/2018	-74.47	N/A	-74.47	-74.47	-15.93	4654.55	4669.55	15.00	NONE
T-32	ARROWHEAD DR.	6/18/2018	-74.06	-64.06	-74.06	-74.06	-15.85	4654.63	4669.63	15.00	NONE
T-33	ARROWHEAD DR.	6/18/2018	-78.50	-68.50	-78.50	-78.50	-17.11	4653.37	4668.37	15.00	NONE
T-34	BOWERS LN.	6/18/2018	-139.59	-129.59	-139.59	-139.59	-30.55	4639.93	4654.93	15.00	NONE
T-35	BOWERS LN.	6/18/2018	-141.36	-131.36	-141.36	-141.36	-30.98	4639.50	4654.50	15.00	NONE
T-36	BOWERS LN.	6/18/2018	-146.84	N/A	-146.84	-146.84	-31.84	4638.64	4653.64	15.00	NONE
T-37	BOWERS LN.	6/18/2018	-147.23	-137.23	-147.23	-147.23	-32.24	4638.24	4653.24	15.00	NONE

NOTE: ALL PRIVATE ROADS/ROADWAYS/INTERSTATES/RAILROADS ARE DEPICTED 10/15/17/23 FEET, RESPECTIVELY, ABOVE THE SURVEYED LOCATION HEIGHT PER FAA SOP NO. 200
NOTE: TAXIWAT TRAVERSEWAY ELEVATIONS ARE BASED OFF OF THE CRITICAL AIRCRAFT, WHICH HAS A TAIL HEIGHT OF 20.92 FEET





REVISIONS	
DATE	DESCRIPTION

CLIENT

CARSON CITY AIRPORT AUTHORITY

FlyCarsonCity.com

PROJECT

AIRPORT LAYOUT PLAN UPDATE

CARSON CITY AIRPORT (CXP)
CARSON CITY, NEVADA

SHEET TITLE

INNER APPROACH PLAN & PROFILES

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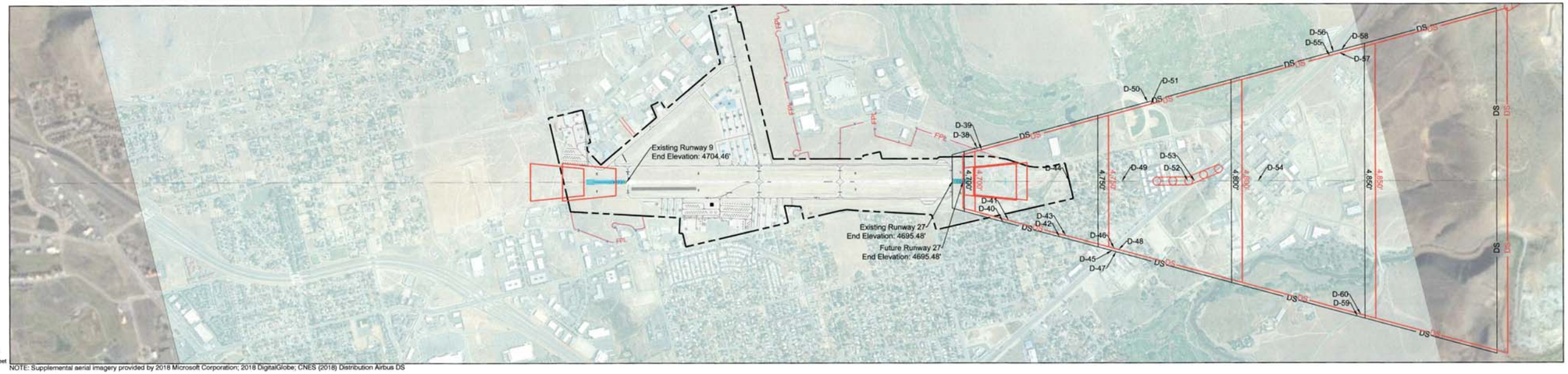

NOTE: Supplemental aerial imagery provided by 2018 Microsoft Corporation; 2018 DigitalGlobe; CNES (2018) Distribution Airbus DS

LEGEND	EXISTING	PROPOSED
AIRPORT PROPERTY		SAME
DEPARTURE SURFACE	DS	DS
EXTENDED RUNWAY CENTERLINE		SAME
EXTENDED CENTERLINE PROFILE		SAME
AIRFIELD PAVEMENT		
CRITICAL GROUND PROFILE		SAME
LEAD-IN LIGHTS	N/A	

RUNWAY 27 SIGNIFICANT OBJECT AND TRAVERSEWAY TABLE

OBJECT ID	DESCRIPTION	SURVEY DATE	EXISTING 40:1 DEPARTURE SURFACE PENETRATION	PROPOSED 40:1 DEPARTURE SURFACE PENETRATION	TRAVERSEWAY ELEVATION (MSL)	TRAVERSEWAY ELEVATION (AGL)	TRIGGERING EVENT	PROPOSED DISPOSITON
D-38	ARROWHEAD DR.	6/18/2018	-33.16	-28.16	4678.06	15.00	NONE	NONE
D-39	ARROWHEAD DR.	6/18/2018	-36.40	-31.40	4676.85	15.00	NONE	NONE
D-40	APOLLO DR.	6/18/2018	-59.20	-54.20	4663.86	15.00	NONE	NONE
D-41	APOLLO DR.	6/18/2018	-64.65	-59.65	4661.13	15.00	NONE	NONE
D-42	E NYE LN.	6/18/2018	-94.01	-89.01	4655.46	15.00	NONE	NONE
D-43	E NYE LN.	6/18/2018	-97.16	-92.16	4655.32	15.00	NONE	NONE
D-44	BOWERS LN.	6/18/2018	-104.53	-99.53	4654.73	15.00	NONE	NONE
D-45	LINCOLN HWY.	6/18/2018	-137.52	-132.52	4636.56	17.00	NONE	NONE
D-46	LINCOLN HWY.	6/18/2018	-138.86	-133.86	4636.28	17.00	NONE	NONE
D-47	LINCOLN HWY.	6/18/2018	-140.77	-135.77	4635.20	17.00	NONE	NONE
D-48	LINCOLN HWY.	6/18/2018	-142.38	-137.38	4634.90	17.00	NONE	NONE
D-49	SUNRISE DR.	6/18/2018	-137.30	-132.30	4646.59	15.00	NONE	NONE
D-50	CENTENNIAL PARK DR.	6/18/2018	-128.23	-123.23	4662.82	15.00	NONE	NONE
D-51	CENTENNIAL PARK DR.	6/18/2018	-131.17	-126.17	4661.36	15.00	NONE	NONE
D-52	LINCOLN HWY.	6/18/2018	-220.39	-215.39	4645.30	17.00	NONE	NONE
D-53	LINCOLN HWY.	6/18/2018	-223.08	-218.08	4644.83	17.00	NONE	NONE
D-54	N DEER RD.	6/18/2018	-228.17	-223.17	4661.55	15.00	NONE	NONE
D-55	LINCOLN HWY.	6/18/2018	-149.43	-144.43	4726.84	17.00	NONE	NONE
D-56	LINCOLN HWY.	6/18/2018	-148.17	-143.17	4729.92	17.00	NONE	NONE
D-57	LINCOLN HWY.	6/18/2018	-146.53	-141.53	4734.55	17.00	NONE	NONE
D-58	LINCOLN HWY.	6/18/2018	-146.14	-141.14	4735.83	17.00	NONE	NONE
D-59	N DEER RUN RD.	6/18/2018	-211.77	-206.77	4677.27	15.00	NONE	NONE
D-60	N DEER RUN RD.	6/18/2018	-214.19	-209.19	4676.38	15.00	NONE	NONE

NOTE: ALL PRIVATE ROADS/ROADWAYS/INTERSTATES/RAILROADS ARE DEPICTED 10/15/17/23 FEET, RESPECTIVELY, ABOVE THE SURVEYED LOCATION HEIGHT PER FAA SOP NO. 200

REVISIONS	
DATE	DESCRIPTION

CLIENT

CARSON CITY AIRPORT AUTHORITY

FlyCarsonCity.com

PROJECT

AIRPORT LAYOUT PLAN UPDATE

CARSON CITY AIRPORT (CXP)
CARSON CITY, NEVADA

SHEET TITLE

DEPARTURE SURFACE PLAN & PROFILES

ATKINS
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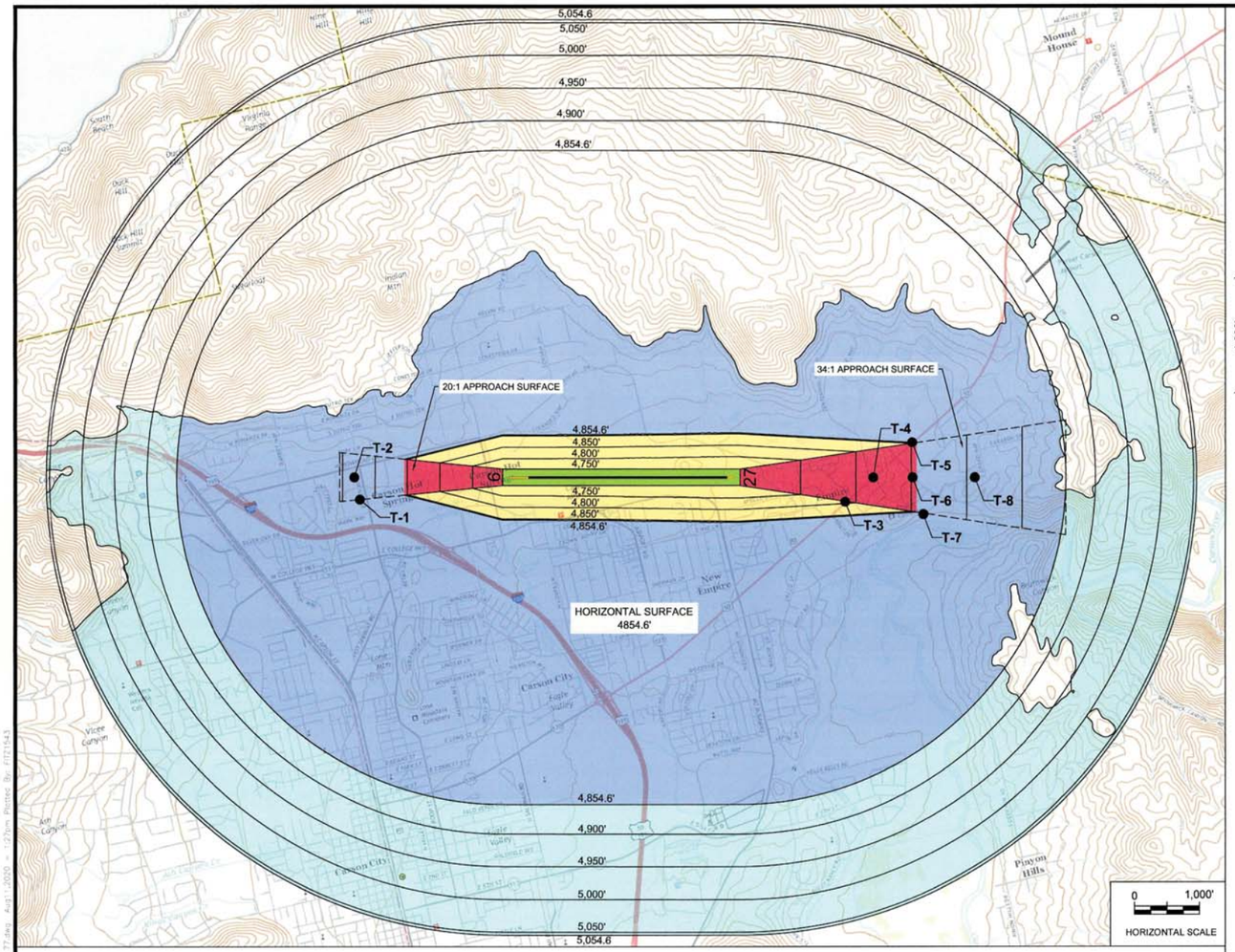
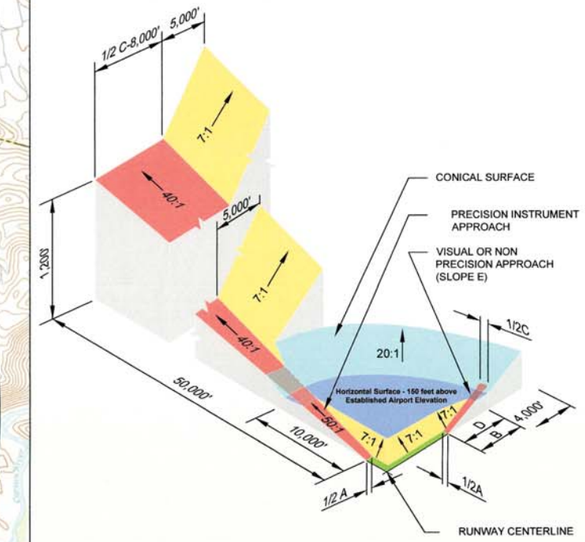
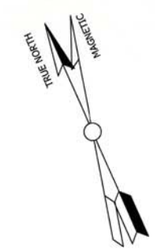


SAMPLE ISOMETRIC VIEW OF SECTION



DIM	ITEM	DIMENSIONAL STANDARDS (FEET)					
		VISUAL RUNWAY		NON-PRECISION INSTRUMENT RUNWAY			PRECISION INSTRUMENT RUNWAY
		A	B	A	B: C	B: D	
A	WIDTH OF PRIMARY SURFACE AND APPROACH SURFACE WIDTH AT INNER END	250	500	500	500	1,000	1,000
B	RADIUS OF HORIZONTAL SURFACE	5,000	5,000	5,000	10,000	10,000	10,000
		VISUAL RUNWAY		NON-PRECISION INSTRUMENT RUNWAY			PRECISION INSTRUMENT RUNWAY
		A	B	A	B: C	B: D	
C	APPROACH SURFACE WIDTH AT END	1,250	1,500	2,000	3,500	4,000	16,000
D	APPROACH SURFACE LENGTH	5,000	5,000	5,000	10,000	10,000	*
E	APPROACH SLOPE	20:1	20:1	20:1	34:1	34:1	*
	APPROACH FLARE	0:1:1	0:1:1	0:15:1	0:15:1	0:15:1	0:15:1

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



DECLINATION 13° 15' E
APRIL 2018
ANNUAL RATE OF CHANGE
0° 6' W

- Approach Surface
- Horizontal Surface
- Primary Surface
- Transitional Surface
- Conical Surface

NOTES:

FEDERAL AVIATION REGULATIONS PART 77, STATES THAT A STRUCTURE IS PRESUMED TO HAVE A SUBSTANTIAL ADVERSE EFFECT UPON THE SAFE AND EFFICIENT USE OF NAVIGABLE AIRSPACE IF ITS HEIGHT EXCEEDS THE FOLLOWING STANDARDS:

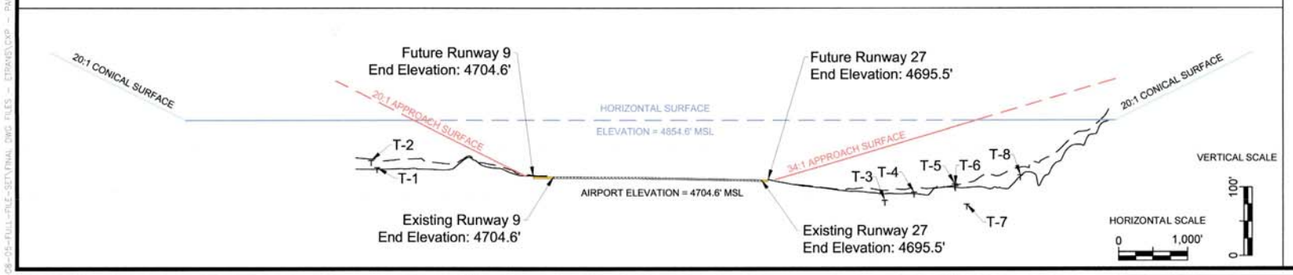
1. A HEIGHT OF FIVE HUNDRED (500) FEET ABOVE GROUND LEVEL AT THE SITE OF THE OBJECT ANYWHERE IN THE STATE.
2. A HEIGHT THAT IS TWO HUNDRED (200) FEET ABOVE GROUND LEVEL OR ABOVE THE ESTABLISHED AIRPORT ELEVATION, WHICHEVER IS HIGHER, WITHIN THREE (3) NAUTICAL MILES OF THE ESTABLISHED REFERENCED POINT OF A PUBLIC-USE AIRPORT, EXCLUDING HELIPORTS, AND THE HEIGHT INCREASES IN THE PROPORTION OF ONE HUNDRED (100) FEET FOR EACH ADDITIONAL NAUTICAL MILE OF DISTANCE FROM THE AIRPORT UP TO A MAXIMUM OF FIVE HUNDRED (500) FEET.
3. A HEIGHT WITHIN A TERMINAL OBSTACLE CLEARANCE AREA, INCLUDING AN INITIAL APPROACH SEGMENT, A DEPARTURE AREA, AND A CIRCLING APPROACH AREA, AS DEFINED BY FEDERAL LAWS AND REGULATIONS, WHICH WOULD RESULT IN THE VERTICAL DISTANCE BETWEEN ANY POINT ON THE OBJECT AND AN ESTABLISHED MINIMUM INSTRUMENT FLIGHT ALTITUDE WITHIN THAT AREA OR SEGMENT TO BE LESS THAN THE REQUIRED OBSTACLE CLEARANCE.
4. A HEIGHT WITHIN AN EN ROUTE OBSTACLE CLEARANCE AREA, AS DEFINED BY FEDERAL LAWS AND REGULATIONS, INCLUDING TURN AND TERMINATION AREAS, OF A FEDERAL AIRWAY OR APPROVED OFF-AIRWAY ROUTE, THAT WOULD INCREASE THE MINIMUM OBSTACLE CLEARANCE ALTITUDE.
5. THE SURFACE OF A TAKEOFF AND LANDING AREA OF A PUBLIC-USE AIRPORT OR ANY IMAGINARY SURFACE AS ESTABLISHED BY FAR PART 77. HOWEVER, NO PART OF THE TAKEOFF OR LANDING AREA ITSELF WILL BE CONSIDERED TO BE AN OBSTRUCTION.

NOTE: FAR PART 77 IMAGINARY SURFACES ARE AS SHOWN ON THIS SHEET FOR THE CARSON CITY AIRPORT. THESE SURFACES ARE DEPICTED BASED UPON EXISTING AND ULTIMATE AIRPORT DEVELOPMENT.

RUNWAY 9-27 LINE-OF-SIGHT ANALYSIS

HORIZONTAL SCALE 0 1,000'
VERTICAL SCALE 0 50'

NOTE: AN EXAGGERATED VERTICAL SCALE HAS BEEN APPLIED TO AID IN DISPLAYING THE LINE-OF-SIGHT ANALYSIS.



RUNWAY 9 TRAVERSEWAY TABLE

OBJECT ID	DESCRIPTION	SURVEY DATE	20:1 PART 77 APPROACH SURFACE PENETRATION	GROUND ELEVATION (MSL)	TRAVERSEWAY ELEVATION (MSL)	TRAVERSEWAY ELEVATION (AGL)	PROPOSED DISPOSITON
T-1	EMERSON DR.	7/17/2018	-133.95	4715.93	4730.93	15	NONE
T-2	EMERSON DR.	7/17/2018	-134.15	4721.85	4736.85	15	NONE

RUNWAY 27 TRAVERSEWAY TABLE

OBJECT ID	DESCRIPTION	SURVEY DATE	34:1 PART 77 APPROACH SURFACE PENETRATION	GROUND ELEVATION (MSL)	TRAVERSEWAY ELEVATION (MSL)	TRAVERSEWAY ELEVATION (AGL)	PROPOSED DISPOSITON
T-3	LINCOLN HWY. (US 50)	7/17/2018	-232.50	4619.26	4634.26	17	NONE
T-4	LINCOLN HWY. (US 50)	7/17/2018	-266.92	4628.14	4643.14	17	NONE
T-5	LINCOLN HWY. (US 50)	7/17/2018	-302.03	4652.54	4667.54	17	NONE
T-6	N DEER RUN RD.	7/17/2018	-308.55	4646.75	4661.75	15	NONE
T-7	MORGAN MILL RD.	7/17/2018	-378.99	4592.93	4607.93	15	NONE
T-8	MORGAN MILL RD.	7/17/2018	-372.04	4678.42	4693.42	15	NONE

NOTE: ALL PRIVATE ROADS/ROADWAYS/INTERSTATES/RAILROADS ARE DEPICTED 10/15/17/23 FEET, RESPECTIVELY, ABOVE THE SURVEYED LOCATION HEIGHT PER FAA SOP NO. 200

REVISIONS	
DATE	DESCRIPTION

CLIENT
CARSON CITY AIRPORT AUTHORITY
FlyCarsonCity.com

PROJECT
AIRPORT LAYOUT PLAN UPDATE
CARSON CITY AIRPORT (CXP)
CARSON CITY, NEVADA

SHEET TITLE
AIRPORT AIRSPACE

ATKINS
Member of the SNC-Lavalin Group
10509 Professional Circle Tel. (775) 828-1622
Suite 102
Reno, NV 89521
www.atkinsglobal.com/northamerica

JOB NO.: 100056509
DRAWN: K.A.K.
DESIGN: A.M.M.
CHECKED: B.D.F.
DATE: AUGUST 2020

LEGEND

LOCAL ZONING

- PR - PUBLIC REGIONAL
- LI - LIMITED INDUSTRIAL
- GIA - GENERAL INDUSTRIAL AIRPORT
- GI - GENERAL INDUSTRIAL
- SF-1A - SINGLE FAMILY - 1 ACRE
- RC - RETAIL COMMERCIAL
- PN - PUBLIC NEIGHBORHOOD
- SF6 - SINGLE FAMILY - 6,000 SQ. FT.
- MH6 - MOBILE HOME - 6,000 SQ. FT.
- MH12 - MOBILE HOME - 12,000 SQ. FT.
- MHP - MOBILE HOME PARK
- SF12 - SINGLE FAMILY - 12,000 SQ. FT.
- AIP - AIRPORT INDUSTRIAL PARK
- EAGLE VALLEY GOLF COURSE

ON AIRPORT LAND USE

- AIRFIELD USE
- AIRPORT COMPATIBLE NON-AVIATION DEVELOPMENT
- GENERAL AVIATION

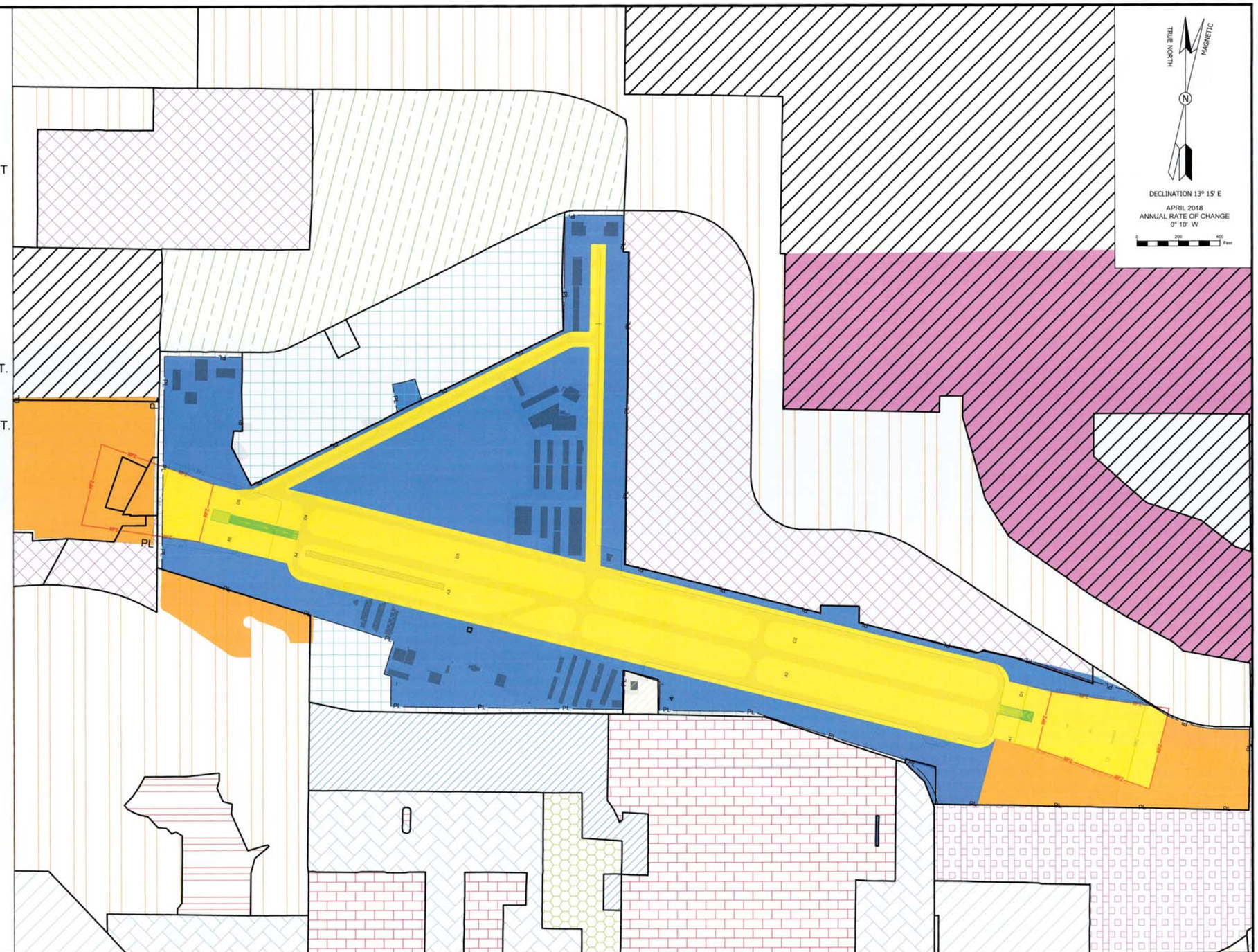
EXISTING CLEARANCES

- RPZ — RUNWAY PROTECTION ZONE
- PL — PROPERTY LINE

FUTURE CLEARANCES

- RPZ — RUNWAY PROTECTION ZONE
- FPL — PROPERTY LINE

NOTE: MORE INFORMAITON REGARDING LOCAL ZONING IS LOCATED AT WWW.CARSON.ORG



REVISIONS	
DATE	DESCRIPTION

CLIENT

CARSON CITY AIRPORT AUTHORITY

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PROJECT

AIRPORT LAYOUT PLAN UPDATE

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CARSON CITY, NEVADA

SHEET TITLE

LAND USE PLAN

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JOB NO.:	100056509
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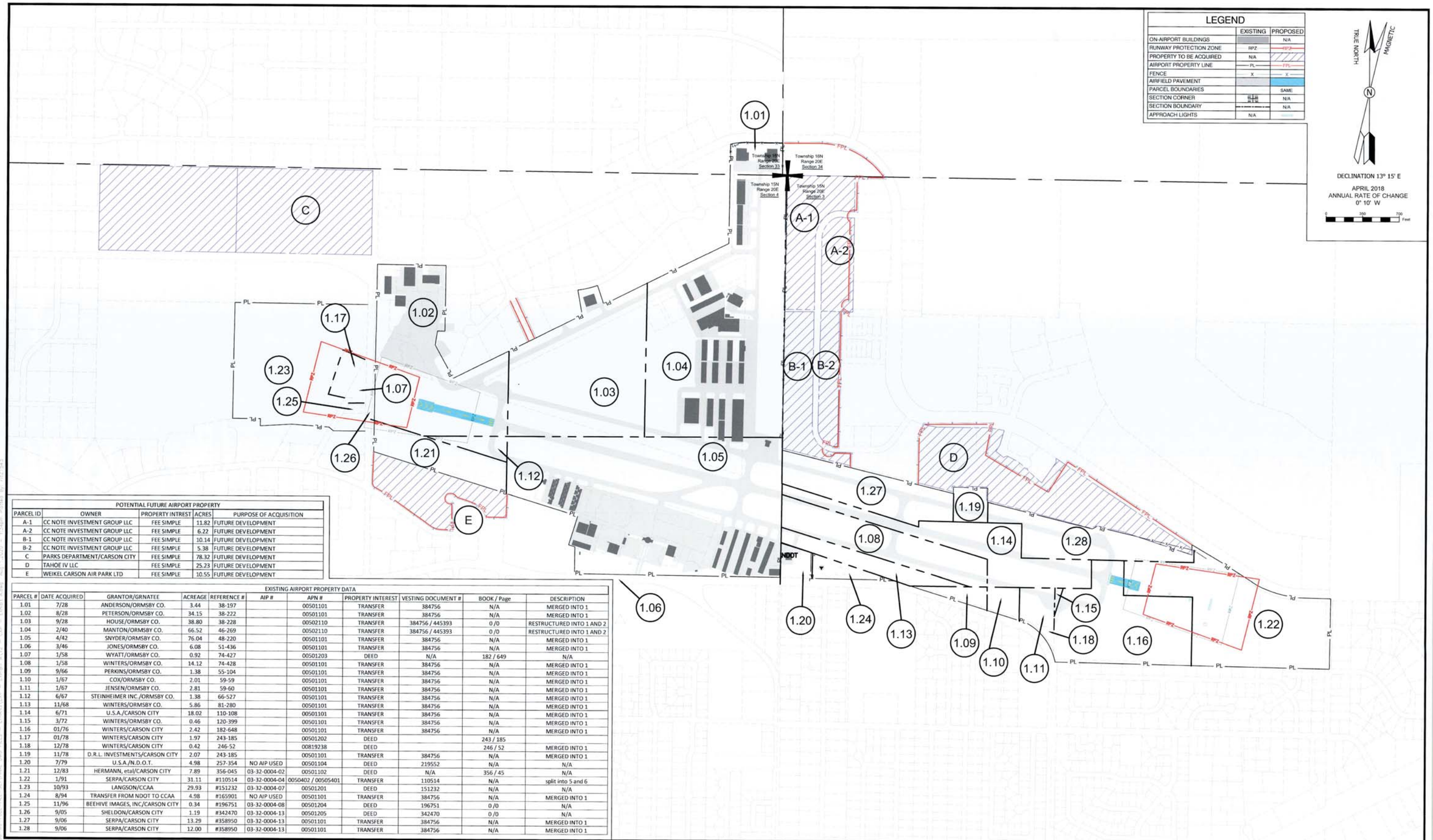

POTENTIAL FUTURE AIRPORT PROPERTY

PARCEL ID	OWNER	PROPERTY INTREST	ACRES	PURPOSE OF ACQUISITION
A-1	CC NOTE INVESTMENT GROUP LLC	FEE SIMPLE	11.82	FUTURE DEVELOPMENT
A-2	CC NOTE INVESTMENT GROUP LLC	FEE SIMPLE	6.22	FUTURE DEVELOPMENT
B-1	CC NOTE INVESTMENT GROUP LLC	FEE SIMPLE	10.14	FUTURE DEVELOPMENT
B-2	CC NOTE INVESTMENT GROUP LLC	FEE SIMPLE	5.38	FUTURE DEVELOPMENT
C	PARKS DEPARTMENT/CARSON CITY	FEE SIMPLE	78.32	FUTURE DEVELOPMENT
D	TAHOE IV LLC	FEE SIMPLE	25.23	FUTURE DEVELOPMENT
E	WEIKEL CARSON AIR PARK LTD	FEE SIMPLE	10.55	FUTURE DEVELOPMENT

EXISTING AIRPORT PROPERTY DATA

PARCEL #	DATE ACQUIRED	GRANTOR/GRNATEE	ACREAGE	REFERENCE #	AIP #	APN #	PROPERTY INTEREST	VESTING DOCUMENT #	BOOK / Page	DESCRIPTION
1.01	7/28	ANDERSON/ORMSBY CO.	3.44	38-197		00501101	TRANSFER	384756	N/A	MERGED INTO 1
1.02	8/28	PETERSON/ORMSBY CO.	34.15	38-222		00501101	TRANSFER	384756	N/A	MERGED INTO 1
1.03	9/28	HOUSE/ORMSBY CO.	38.80	38-228		00502110	TRANSFER	384756 / 445393	0 /0	RESTRUCTURED INTO 1 AND 2
1.04	2/40	MANTON/ORMSBY CO.	66.52	46-269		00502110	TRANSFER	384756 / 445393	0 /0	RESTRUCTURED INTO 1 AND 2
1.05	4/42	SNYDER/ORMSBY CO.	76.04	48-220		00501101	TRANSFER	384756	N/A	MERGED INTO 1
1.06	3/46	JONES/ORMSBY CO.	6.08	51-436		00501101	TRANSFER	384756	N/A	MERGED INTO 1
1.07	1/58	WYATT/ORMSBY CO.	0.92	74-427		00501203	DEED	N/A	182 / 649	N/A
1.08	1/58	WINTERS/ORMSBY CO.	14.12	74-428		00501101	TRANSFER	384756	N/A	MERGED INTO 1
1.09	9/66	PERKINS/ORMSBY CO.	1.38	55-104		00501101	TRANSFER	384756	N/A	MERGED INTO 1
1.10	1/67	COX/ORMSBY CO.	2.01	59-59		00501101	TRANSFER	384756	N/A	MERGED INTO 1
1.11	1/67	JENSEN/ORMSBY CO.	2.81	59-60		00501101	TRANSFER	384756	N/A	MERGED INTO 1
1.12	6/67	STEINHEIMER INC./ORMSBY CO.	1.38	66-527		00501101	TRANSFER	384756	N/A	MERGED INTO 1
1.13	11/68	WINTERS/ORMSBY CO.	5.86	81-280		00501101	TRANSFER	384756	N/A	MERGED INTO 1
1.14	6/71	U.S.A./CARSON CITY	18.02	110-108		00501101	TRANSFER	384756	N/A	MERGED INTO 1
1.15	3/72	WINTERS/ORMSBY CO.	0.46	120-399		00501101	TRANSFER	384756	N/A	MERGED INTO 1
1.16	01/76	WINTERS/CARSON CITY	2.42	182-648		00501101	TRANSFER	384756	N/A	MERGED INTO 1
1.17	01/78	WINTERS/CARSON CITY	1.97	243-185		00501202	DEED		243 / 185	
1.18	12/78	WINTERS/CARSON CITY	0.42	246-52		00819238	DEED		246 / 52	MERGED INTO 1
1.19	11/78	D.R.L. INVESTMENTS/CARSON CITY	2.07	243-185		00501101	TRANSFER	384756	N/A	MERGED INTO 1
1.20	7/79	U.S.A./N.D.O.T.	4.98	257-354	NO AIP USED	00501104	DEED	219552	N/A	N/A
1.21	12/83	HERMANN, etal/CARSON CITY	7.89	356-045	03-32-0004-02	00501102	DEED	N/A	356 / 45	N/A
1.22	1/91	SERPA/CARSON CITY	31.11	#110514	03-32-0004-04	0050402 / 00505401	TRANSFER	110514	N/A	split into 5 and 6
1.23	10/93	LANGSON/CCAA	29.93	#151232	03-32-0004-07	00501201	DEED	151232	N/A	N/A
1.24	8/94	TRANSFER FROM NDOT TO CCAA	4.98	#165901	NO AIP USED	00501101	TRANSFER	384756	N/A	MERGED INTO 1
1.25	11/96	BEEHIVE IMAGES, INC/CARSON CITY	0.34	#196751	03-32-0004-08	00501204	DEED	196751	0 /0	N/A
1.26	9/05	SHELDON/CARSON CITY	1.19	#342470	03-32-0004-13	00501205	DEED	342470	0 /0	N/A
1.27	9/06	SERPA/CARSON CITY	13.29	#358950	03-32-0004-13	00501101	TRANSFER	384756	N/A	MERGED INTO 1
1.28	9/06	SERPA/CARSON CITY	12.00	#358950	03-32-0004-13	00501101	TRANSFER	384756	N/A	MERGED INTO 1

REVISIONS

DATE	DESCRIPTION

CLIENT

CARSON CITY AIRPORT AUTHORITY

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PROJECT

AIRPORT LAYOUT PLAN UPDATE

CARSON CITY AIRPORT (CXP)
CARSON CITY, NEVADA

SHEET TITLE

Exhibit "A"

ATKINS
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Suite 102
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JOB NO.: 100056509
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DESIGN: A.M.M.
CHECKED: B.D.F.
DATE: AUGUST 2020

SHEET 12 OF 12

APPENDIX D

NIGHTTIME INSTRUMENT APPROACH FEASIBILITY STUDY

Board Presentation

20FEB19

Carson City, NV (KCXP) Nighttime Feasibility Study

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CARSON CITY AIRPORT EST. 1928

FlyCarsonCity.com

Feasibility Study

- Nighttime Operations Challenge
- Potential Solution(s)
- Benefits
- Cost and Schedule
- Likelihood of FAA Approval

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Not included in this Feasibility Study

x Environmental Analysis

x Design

x Funding

x FAA Review

- ❑ Future analysis required to examine NEPA
- ❑ Exhibits are provided for ROM cost estimation and criteria considerations
- ❑ Mechanisms to obtain funding would be addressed via other processes
- ❑ Study still needs to be reviewed with FAA Stakeholders

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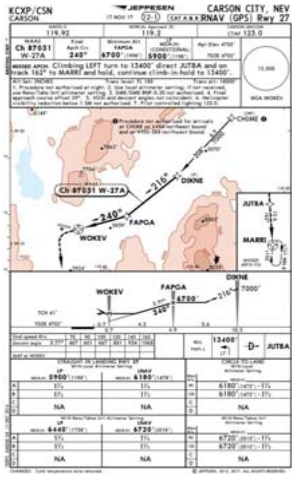
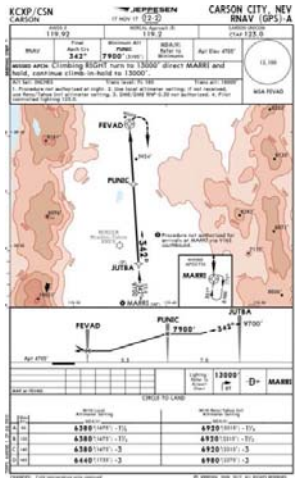
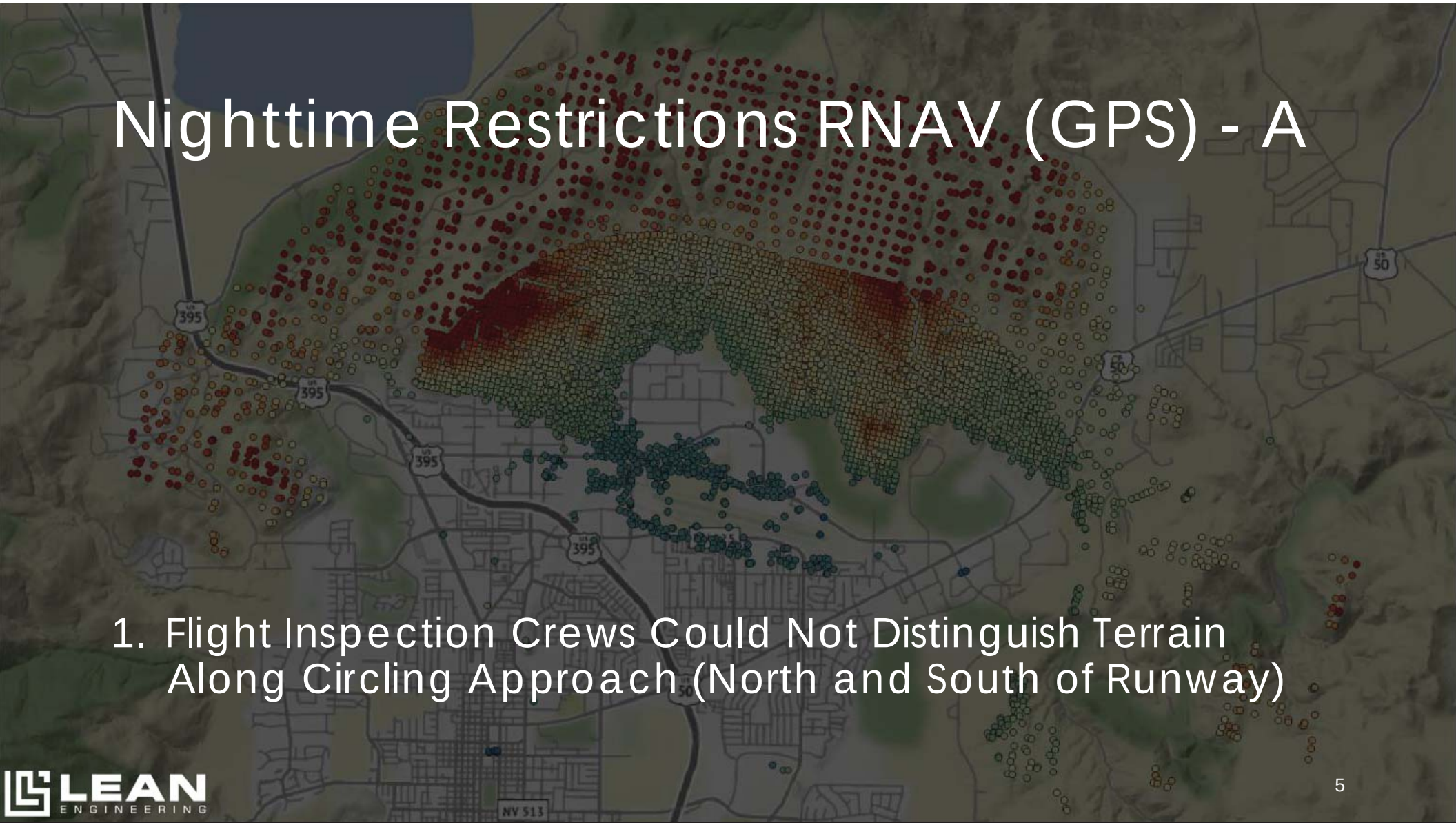
Nighttime Restrictions Flight Inspection

- (SP-07-268-15) Special request for night evaluation at Carson, Carson City NV. Evaluation completed UNSAT for SIAP use at night. Both the RNAV (GPS)-A AMDT 1 and RNAV (GPS) RWY 27 ORIG-A were evaluated and determined to have insufficient visual references at night with regard to surrounding unlit, high terrain. These environmental factors do not provide a pilot with the proper visual cues necessary to "see and avoid obstacles" as stated in the Aeronautical Information Manual section 5-4-20.b.1 once below the MDA. Conditions unique to the night time environment present a significant hazard during the visual maneuvering segment to execute a safe landing at night from an instrument approach. Runway 09 PAPIs are currently prohibited from night use.





Nighttime Restrictions RNAV (GPS) - A



1. Flight Inspection Crews Could Not Distinguish Terrain Along Circling Approach (North and South of Runway)

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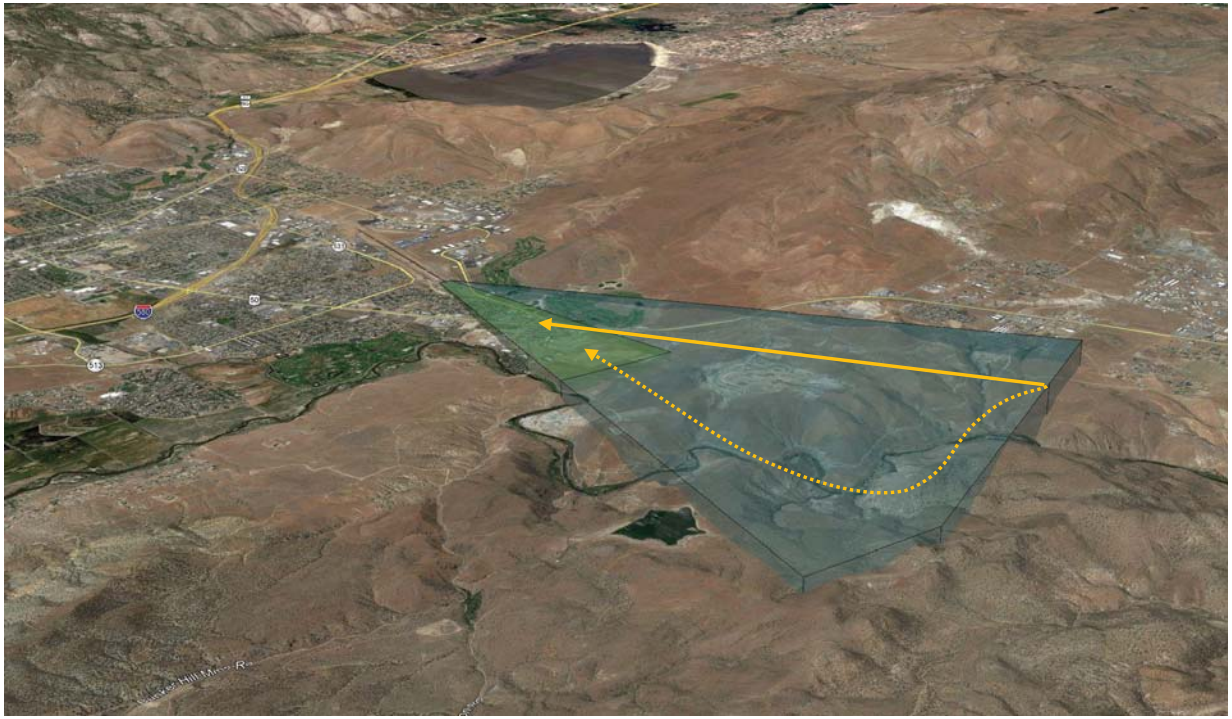


Nighttime Restrictions RNAV (GPS) - 27

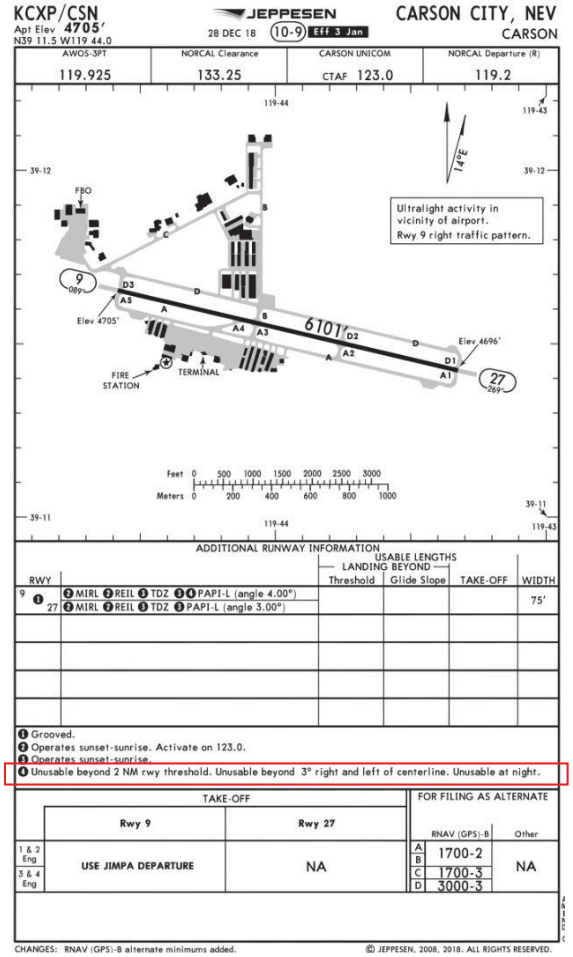
2. Flight Inspection Crews Could Not Distinguish Terrain Along Visual Portion of Offset Approach

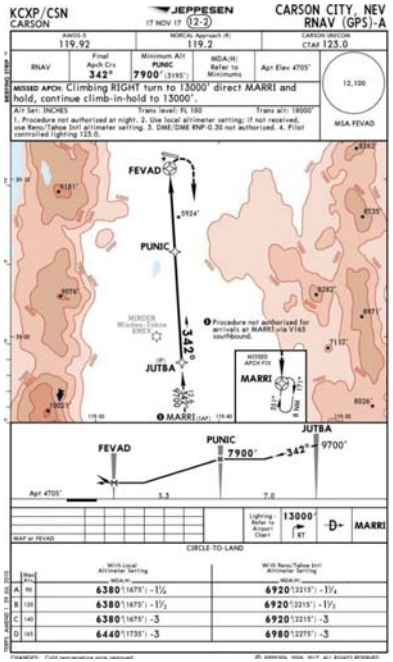
3. No positive course guidance along circling or offset approach to assist pilots in avoiding terrain

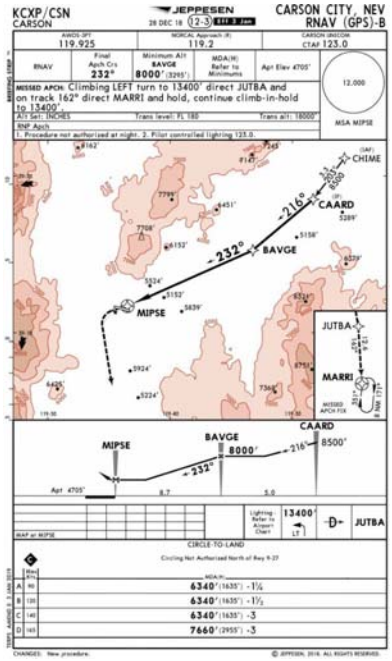
Aeronautical Data and Flight Procedures

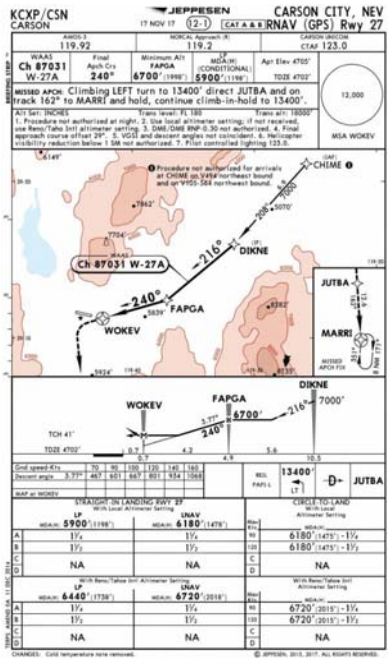
Aeronautical Data

- ✓ Runway 09/27 is marked and lighted to accommodate nighttime operations
- ✓ REILs create additional safety for nighttime ops
- ✓ AWOS-3PT enables 24/7/365 local weather reporting
- ✓ VGSI (PAPI) on runway 27 is sufficient for straight-in obstacle/terrain separation
- x VGSI (PAPI) on runway 09 is not sufficient for straight-in obstacle/terrain separation at night

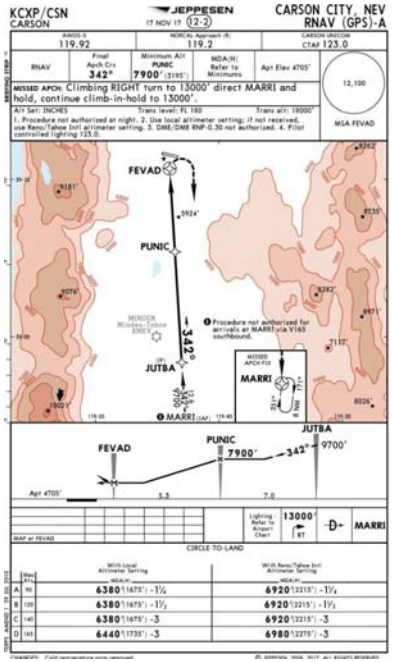








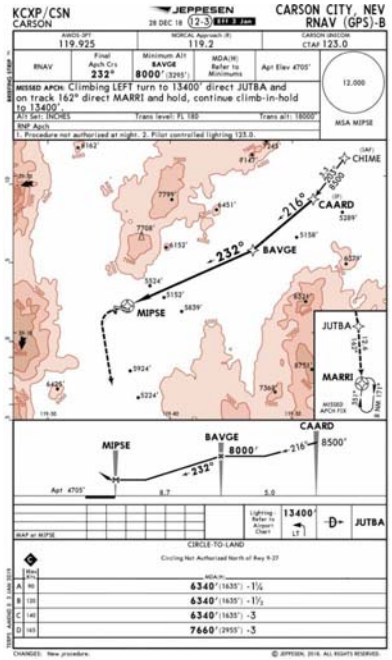
Existing Approaches



x Old Circling Criteria

x No limitation on Circling Extent

❑ Explore Obstacle Lighting or Circling Lights (ICAO Only)

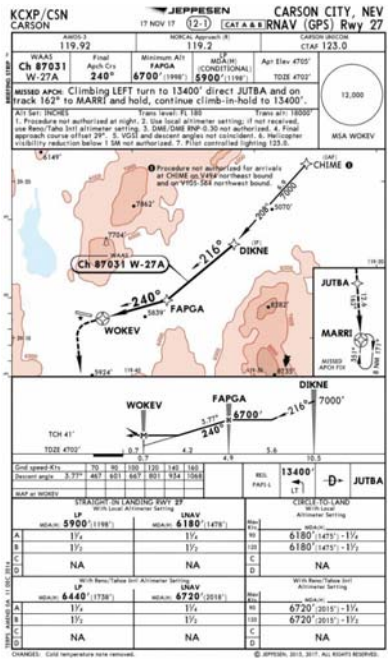


✓ New Circling Criteria

✓ Limited Circling Extent

❑ Explore Obstacle Lighting

❑ Explore Extended Approach Lighting System



✓ CAT A-B Criteria Compliant

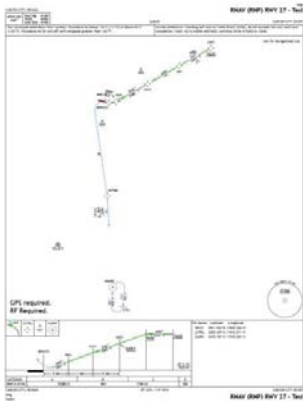
x CAT C-D Can not be added due to offset >20 Deg

x Old Circling Criteria

❑ Explore Extended Approach Lighting System

Future Approaches

- ✓ CAT A – C Capable
- ✓ Supports 700ft – 2 Miles
- x RNP-AR Will Limit Utilization
- x **Missed Approach Limited**
- x Runway TCH Needs to Increase
- ❑ Would benefit from MALS or MALSF
- ❑ Would benefit from extended approach light system



- ❑ Potential to Consider LNAV to Extended Approach Light System "Fly Visual to Airport When Established on RLLS"

Geospatial Considerations

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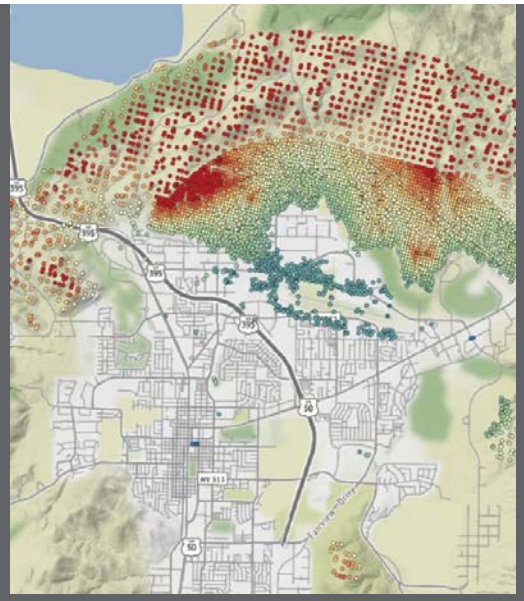

Geospatial

FAA AC-150-5300-18B VGA Survey
- Existing Obstacles

FAA DDOF
- Deconflicted Obstacles

FAA OE/AAA
- Windfarm

Carson City GIS
- Building Heights
- Zoning

Possible Extended Approach Light System

- Used current and future approach centerlines as the basis for site exploration
- Explored current airport lighting and vault for solutions close to threshold
- Investigated offsite for available power and elevation

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Site Assessment Existing Shelter and Transformer Vicinity

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Site Assessment Array 1 and 2 Vicinity

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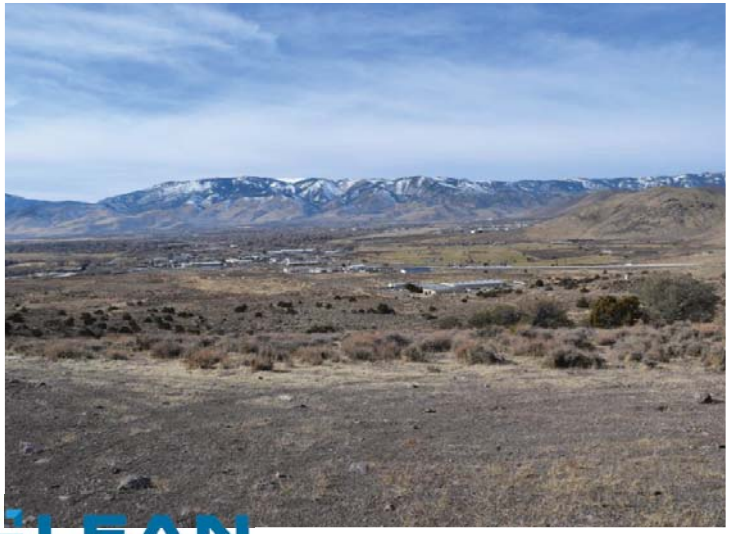

Site Assessment Array 3 Vicinity

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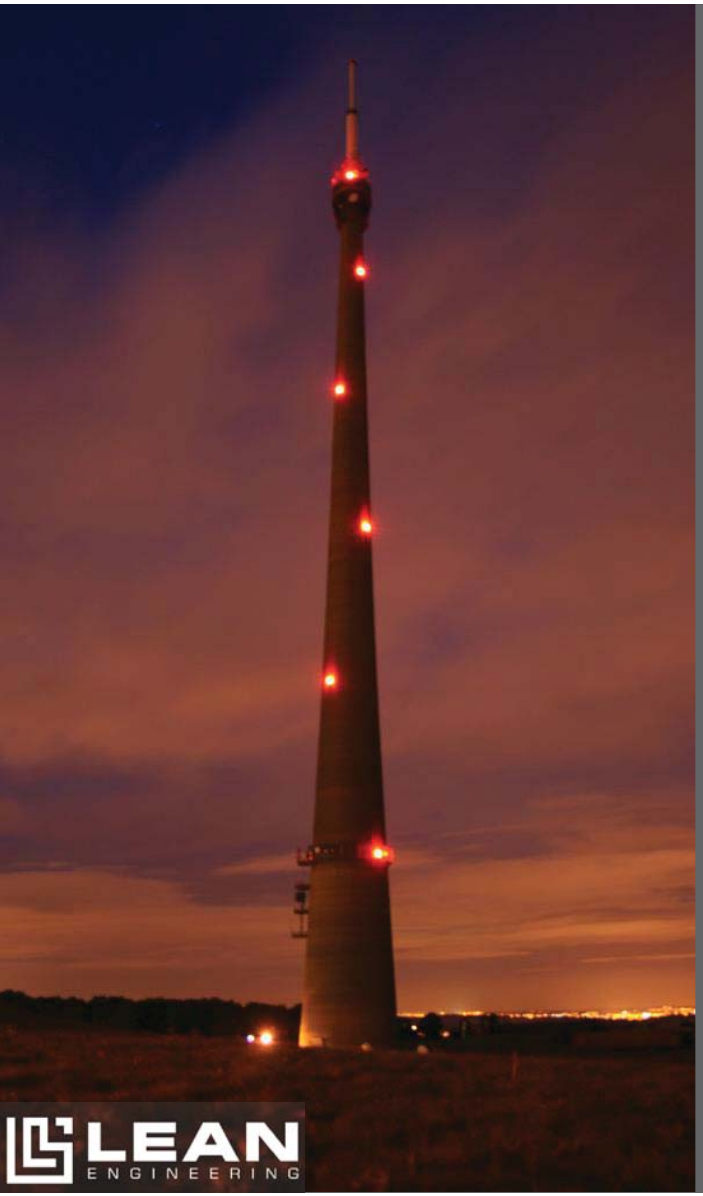
Site Assessment Array 4 Vicinity

LEAN ENGINEERING

Lighting Solutions



Obstacle Lights

Obstacle Lights

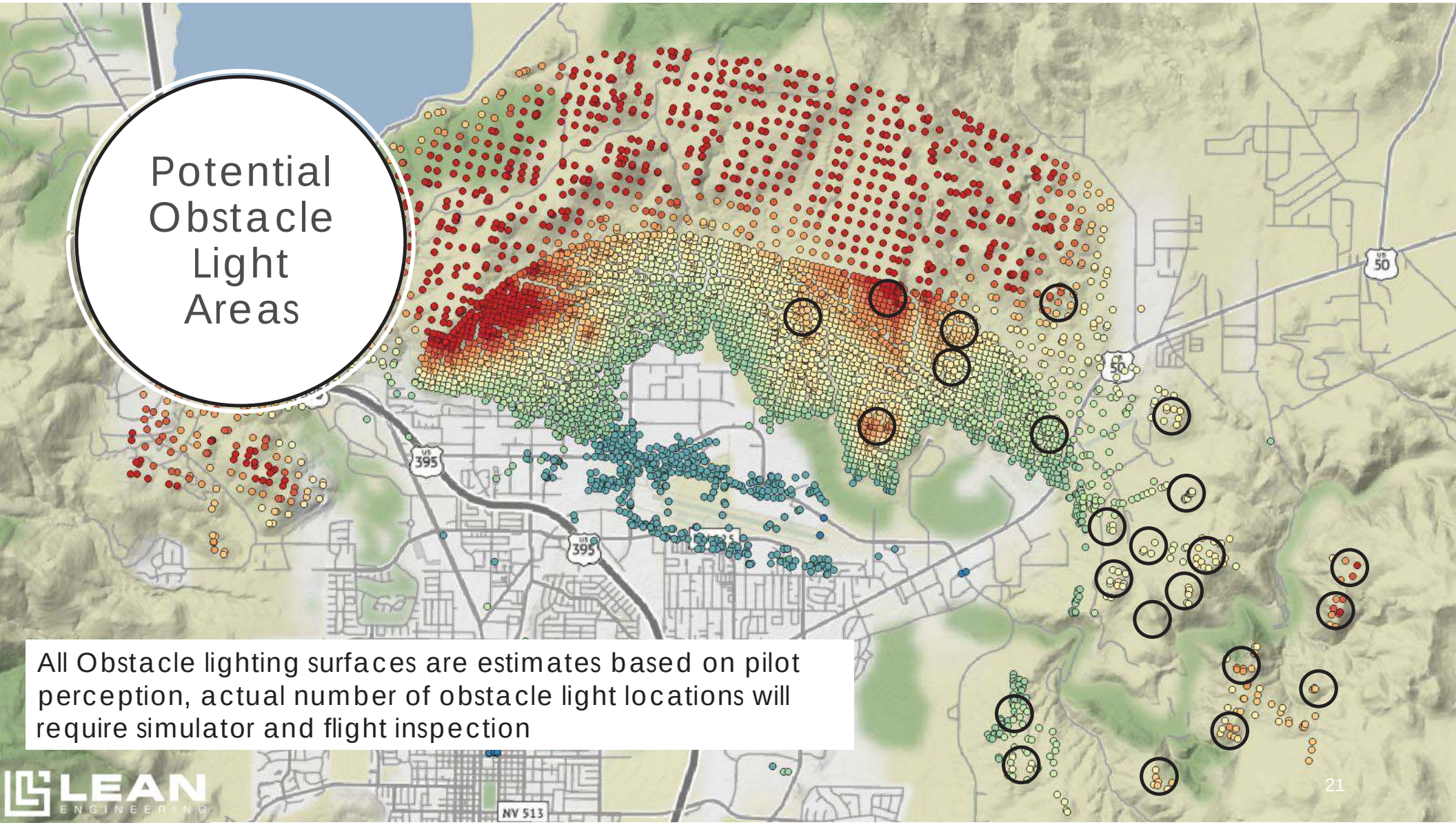
- 16 Obstacle Light Areas (Initial Estimate)
- Solar/LED
- 5 Year Replacement

Benefits

- Illuminates highest terrain in visual segment of approach
- Provides terrain awareness in terminal area

Drawbacks

- Does not cover entire circling or terminal area
- Does not create obvious path to runway
- May not result in SAT for nighttime operations
- Can not be monitored from airport, without substantial cost
- Land must still be acquired for pole mount above vegetation



All Obstacle lighting surfaces are estimates based on pilot perception, actual number of obstacle light locations will require simulator and flight inspection

LEAN ENGINEERING

Extended Approach Light System

Runway Lead-In Light System (RLLS)

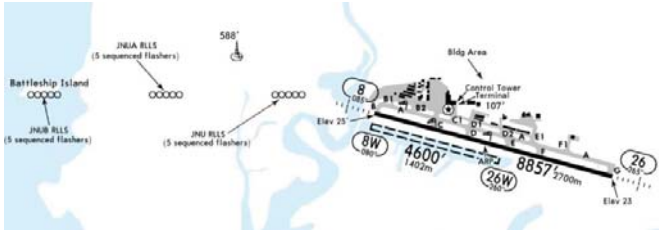
- Sequence of Lead-In (LDIN) Light arrays
- Used for challenging terrain separation, urban deconfliction and noise abatement

Benefits

- FAA can consider approach light credit with an RLLS, if applicable to procedure
- Can be used with by all pilot skill level
- Creates positive course guidance to runway

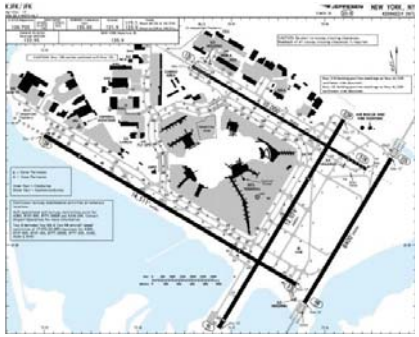
Challenges

- Off airport design
- Does not typically put terrain into perspective



Active FAA RLLS Installations

- 12 Active US RLLS Installations
- Most famous is New York (KJFK) Canarsie Approach
  - YouTube Approach at Night
- Juneau (PAJN) has one of the oldest continuous RLLS for offset LDA and RNAV approach to runway 08



Airport	RWY	Lights	Visibility Credit	Off Airport
KRID	24	5 (ODALS Flashing)	Yes	N
PAGB	13	Unknown	Unknown	N
KHQZ	18	3	No	N
KHQZ	36	5	No	N
KSRB	4	4	Yes	N
PAJN	8	5, 5, 5 to MALSF	Yes (LNAV Only)	Y
KPWK	16	21 (Arranged in MALSF Pattern)	No	N
KJFK	13L	7, 21, 5, 5 to ALSF-II	No	Y
KJFK	13R	7	No	Y
KTRL	17	6	No	N
KMDW	13C	3	No	N
KMDW	31C	3	No	N
KMSY	2	5	No	N
KDPA	10	5	No	N
KSUE	2	3	No	N

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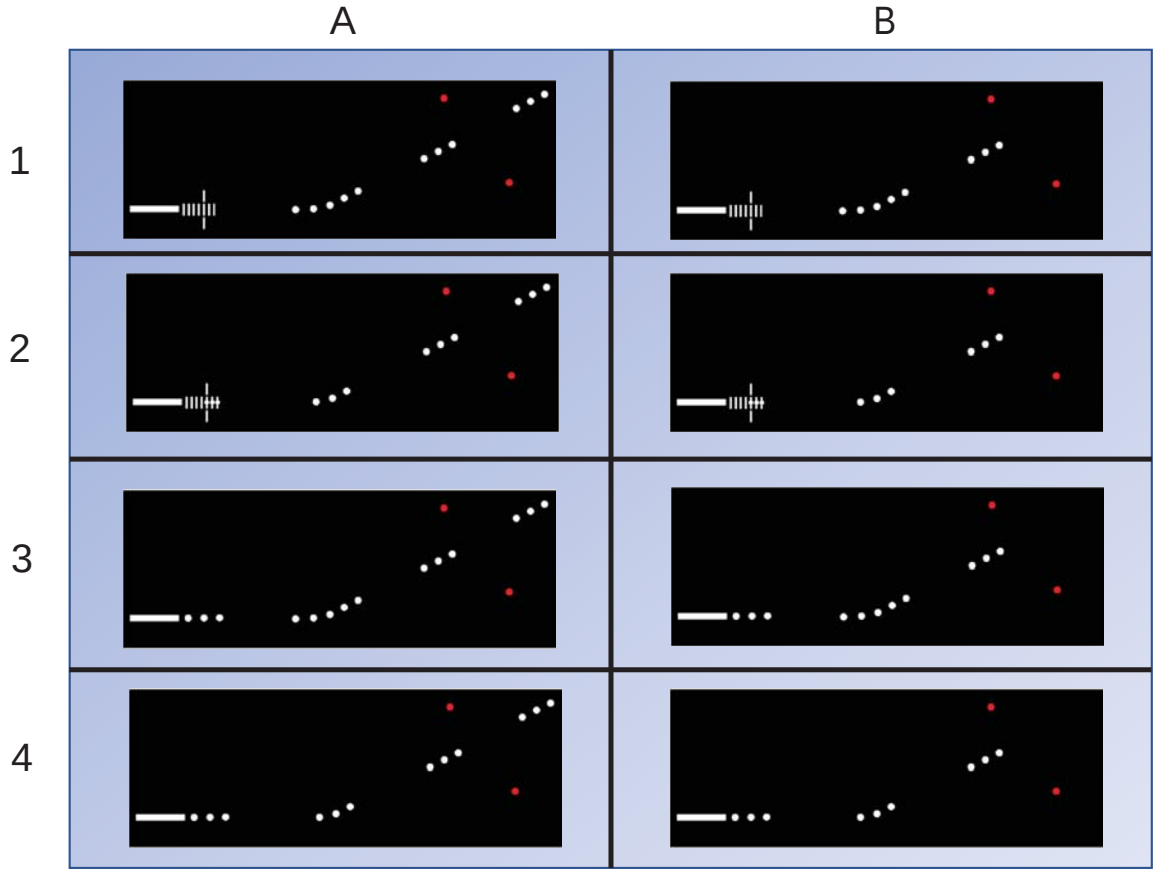
Lighting Solutions: RLLS Options

- All RLLS Options Consider
  - LDIN or MALS at Runway Threshold
  - 1 LDIN Array at Offset Flight Procedure Juncture
  - 1 LDIN Near MDA
  - 2 Obstacle Lights
- Primary Variations (1 – 4)
  - At Runway Threshold
    - MALS
    - MALSF
    - 3 Light LDIN
  - At Offset Flight Procedure Juncture
    - 3 Light LDIN
    - 5 Light LDIN
- Secondary Variations (A and B)
  - Additional 3 Light LDIN at Future MDA for CAT C/D



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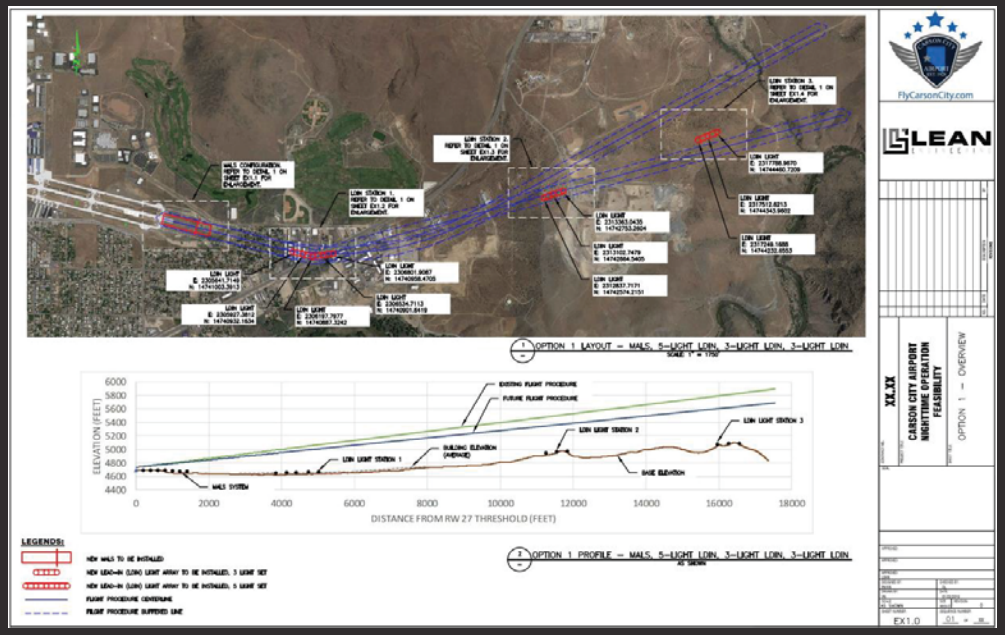
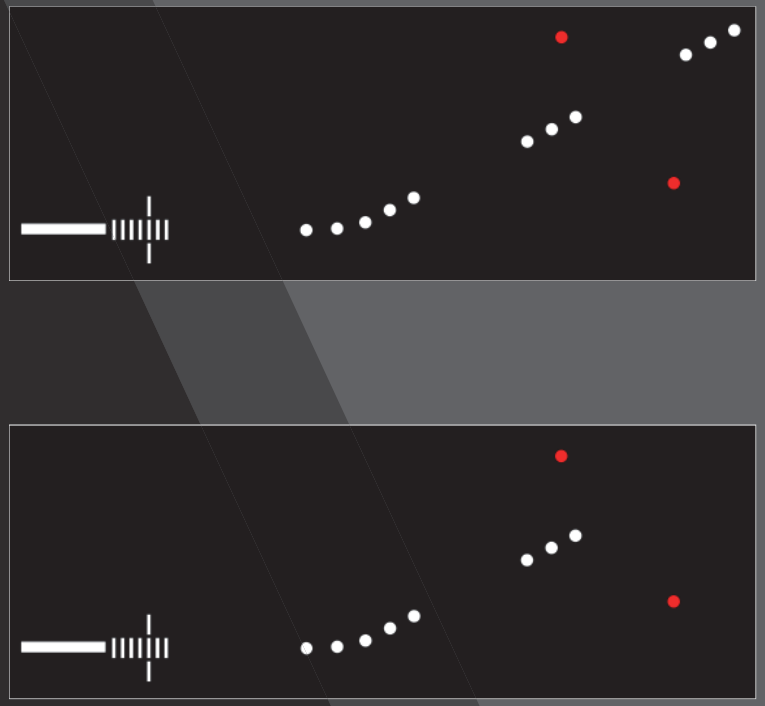
Option A1: MALS, 5xLDIN, 3xLDIN, 3xLDIN
Option B1: MALS, 5xLDIN, 3xLDIN

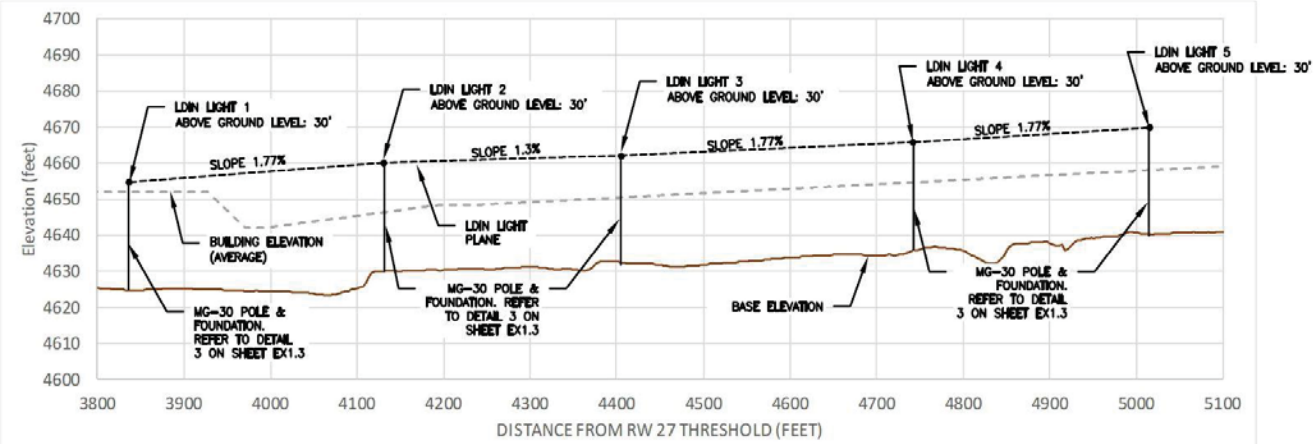




LEGENDS:

- 2" CONDUIT
- 2W-4"C DUCTBANK
- NEW MALS/MALSF 11-LIGHT BAR TO BE INSTALLED
- NEW MALS/MALSF 5-LIGHT BAR TO BE INSTALLED
- NEW MALSF FLASHING LIGHT TO BE INSTALLED
- NEW LDIN LIGHT TO BE INSTALLED
- NEW SHELTER
- NEW TRANSFORMER
- EXISTING UTILITY POLE
- EXISTING HANDHOLE

1 LDIN STATION 1 ENLARGEMENT
SCALE: 1" = 150'



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CARSON CITY AIRPORT NIGHTTIME OPERATION FEASIBILITY

OPTION 1 – LDIN STATION 1 ENLARGEMENT

26

ROM Cost Estimation

Direct Cost

- Power Elements
  - Lights
  - Cabling
  - Ductbank
  - Transformers
  - NV Energy Connections
- Control Elements
- Shelters/Fencing
- Foundations/Poles
- Solar Obstacle Lights

Design and Implementation Cost

- Testing and Commissioning
- Design and CM
- Flight Inspection
- Contingency

Limitations

- No estimated cost for property easements
- Final number, position and orientation of LDIN arrays will directly effect overall cost

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Likelihood of FAA Nighttime Approval

Nighttime Approval Scale

- 10 – FAA is likely to issue nighttime operations with no additional cost or operational restrictions
- 7 – FAA is likely to issue nighttime operations with some additional cost or operational restrictions
- 5 – FAA may issue nighttime operations with some additional cost or operational restrictions
- 3 – FAA is unlikely to issue nighttime operations without additional design modification or restrictions
- 1 – FAA is Unlikely to issue nighttime operations

Limitations

- This scale is based on Lean's experience working on similar airspace and flight procedures challenges
- FAA has the final authority on whether nighttime flight operations can occur
  - Nighttime approval is granted based on the skill of the least trained/least experienced pilot that can fly to KCXP
  - There are few examples of RLLS in the US used for terrain separation with reduced obstacle lighting (PAJN)
- FAA Stakeholder Meeting is critical to further refine these estimates

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Feasibility Option	Drawing Set	RLLS Configurations		ROM Cost	Easement Area (ft^2 / Acre)	Likelihood of Nighttime Approval	
		Components	Graphic			CAT A - B	CAT C - D
A1	1	MALS, 5xLDIN, 3xLDIN, 3xLDIN		$4,718,640	27475 / 0.63	9	8
A2	2	MALSF, 3xLDIN, 3xLDIN, 3xLDIN		$4,464,360	21575 / 0.49	9	8
A3	3	3xLDIN, 5xLDIN, 3xLDIN, 3xLDIN		$3,949,560	27475 / 0.63	8	6
A4	4	3xLDIN, 3xLDIN, 3xLDIN, 3xLDIN		$3,678,900	21575 / 0.49	8	6
B1	1	MALS, 5xLDIN, 3xLDIN		$4,112,580	18850 / 0.43	9	7
B2	2	MALSF, 3xLDIN, 3xLDIN		$3,858,300	12950 / 0.29	9	7
B3	3	3xLDIN, 5xLDIN, 3xLDIN		$3,343,500	18850 / 0.43	6	5
B4	4	3xLDIN, 3xLDIN, 3xLDIN		$3,072,840	12950 / 0.29	6	5
OL	NA	Obstacle Lights on Terrain	16 Areas	$2,122,800	25600 / 0.58	4	3

Overall Feasibility

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Historical Weather and Operational Benefit

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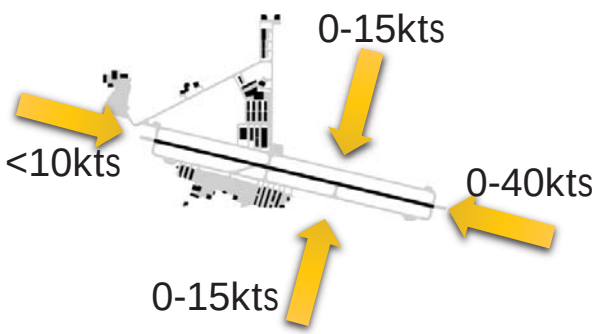
RWY 09 Wind



RWY 09 Capable of Supporting Operations

Local Time (HH:MM)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0:00	95.88%	92.40%	91.75%	90.83%	95.73%	95.03%	99.15%	99.55%	97.73%	94.78%	95.52%	93.10%
1:00	94.82%	93.31%	90.90%	91.55%	97.94%	95.23%	99.76%	100.00%	98.87%	96.07%	92.26%	92.16%
2:00	94.88%	92.37%	90.63%	93.53%	97.33%	96.58%	99.59%	99.28%	98.59%	96.42%	92.67%	92.33%
3:00	95.15%	90.93%	91.66%	91.41%	97.85%	98.01%	100.00%	98.66%	98.31%	95.81%	93.01%	92.28%
4:00	95.89%	93.65%	90.90%	91.83%	96.86%	96.70%	99.86%	99.86%	98.73%	95.37%	92.67%	92.56%
5:00	96.38%	93.48%	90.66%	93.47%	97.40%	97.48%	100.00%	99.86%	98.60%	96.77%	91.76%	92.07%
6:00	97.78%	93.13%	91.95%	93.86%	97.17%	97.14%	99.90%	99.72%	98.45%	97.67%	92.90%	93.10%
7:00	98.05%	94.33%	91.08%	94.18%	95.38%	95.97%	100.00%	99.86%	99.02%	97.64%	94.64%	92.86%
8:00	96.84%	92.32%	89.79%	90.46%	93.57%	93.57%	99.73%	99.73%	98.59%	96.84%	93.44%	91.81%
9:00	96.23%	91.31%	86.75%	85.30%	88.90%	89.53%	99.19%	99.04%	95.02%	95.97%	90.63%	90.55%
10:00	93.74%	86.86%	82.39%	85.33%	83.82%	84.71%	97.51%	98.08%	94.39%	93.94%	89.17%	89.17%
11:00	91.60%	82.44%	74.75%	78.13%	75.34%	78.19%	91.63%	95.03%	88.76%	90.13%	87.27%	89.58%
12:00	89.28%	78.97%	69.20%	70.76%	64.62%	65.17%	77.74%	87.62%	80.97%	84.92%	82.75%	86.38%
13:00	87.45%	77.53%	61.22%	60.53%	57.02%	52.92%	61.92%	70.27%	72.26%	78.60%	81.36%	85.85%
14:00	88.43%	75.12%	52.43%	53.66%	48.38%	41.16%	44.13%	49.66%	63.86%	74.31%	80.58%	84.82%
15:00	87.47%	72.96%	52.43%	45.37%	46.08%	34.61%	31.18%	32.96%	57.64%	71.31%	81.27%	86.71%
16:00	90.20%	77.44%	49.97%	43.81%	42.03%	30.27%	24.42%	24.31%	53.84%	72.14%	84.47%	88.72%
17:00	92.28%	82.36%	58.16%	43.71%	42.22%	28.80%	24.50%	22.98%	54.82%	77.73%	88.27%	91.34%
18:00	92.67%	87.00%	68.42%	53.34%	49.56%	32.72%	31.96%	37.31%	64.55%	86.76%	91.58%	92.94%
19:00	93.71%	90.61%	80.59%	65.36%	64.06%	49.79%	56.79%	62.57%	80.56%	90.68%	92.95%	94.32%
20:00	94.68%	91.64%	86.94%	74.56%	77.85%	71.53%	80.73%	87.82%	90.38%	93.03%	95.57%	94.14%
21:00	94.96%	92.56%	89.60%	82.57%	87.16%	82.49%	92.65%	95.09%	94.01%	91.43%	95.72%	95.77%
22:00	95.10%	91.57%	92.91%	89.21%	90.33%	88.94%	98.09%	98.17%	96.49%	93.89%	94.71%	93.76%
23:00	95.50%	92.09%	92.43%	88.60%	94.68%	92.95%	98.60%	99.59%	96.49%	95.40%	96.03%	93.72%

Day	91.93%	82.93%	69.83%	67.05%	67.73%	63.07%	67.19%	69.94%	76.98%	84.87%	86.56%	88.64%
Night	**94.98%**	**91.22%**	**88.41%**	**87.23%**	**93.31%**	**93.71%**	**96.84%**	**97.79%**	**95.60%**	**94.16%**	**93.26%**	**93.11%**
24 HR	93.71%	87.77%	79.90%	77.14%	78.39%	74.56%	79.54%	81.54%	86.29%	89.90%	90.47%	91.25%

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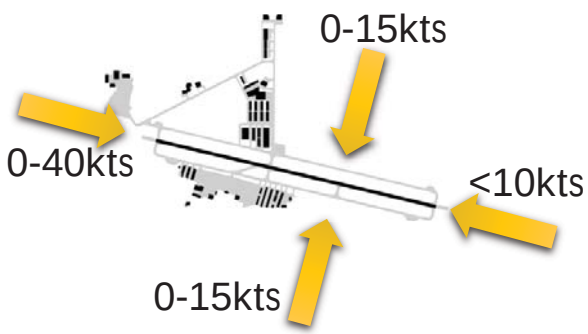
RWY 27 Wind



RWY 27 Capable of Supporting Operations

Local Time (HH:MM)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0:00	96.83%	94.55%	94.46%	95.18%	98.25%	99.30%	99.46%	99.86%	99.57%	96.84%	96.61%	93.71%
1:00	96.01%	94.92%	94.13%	95.11%	97.43%	98.46%	99.60%	100.00%	99.58%	97.54%	95.92%	93.94%
2:00	96.63%	94.07%	95.53%	96.08%	98.24%	99.69%	99.86%	99.86%	99.01%	97.83%	96.48%	93.05%
3:00	97.51%	93.58%	95.07%	95.42%	97.85%	99.13%	99.90%	99.45%	99.30%	97.67%	95.84%	93.00%
4:00	95.54%	96.05%	93.94%	95.00%	98.78%	99.13%	100.00%	99.76%	99.44%	96.36%	95.93%	93.40%
5:00	97.34%	95.56%	92.31%	95.44%	98.89%	99.16%	100.00%	100.00%	99.72%	97.90%	94.09%	93.66%
6:00	97.65%	95.08%	93.70%	96.43%	99.06%	99.30%	100.00%	100.00%	99.58%	97.78%	94.20%	94.98%
7:00	96.61%	96.17%	93.86%	96.49%	97.44%	98.23%	100.00%	99.86%	99.72%	98.09%	94.71%	94.62%
8:00	95.99%	93.98%	92.72%	93.17%	97.06%	96.41%	99.76%	99.59%	99.30%	97.15%	93.03%	93.73%
9:00	94.83%	92.38%	87.88%	87.20%	94.03%	93.43%	99.59%	99.04%	97.63%	95.41%	91.09%	90.71%
10:00	91.61%	89.39%	85.24%	89.39%	90.34%	89.90%	99.32%	99.14%	95.91%	92.21%	89.34%	86.69%
11:00	90.00%	85.12%	83.42%	84.68%	87.42%	90.98%	98.50%	98.17%	94.87%	89.89%	84.84%	85.38%
12:00	85.18%	76.50%	81.98%	82.15%	87.56%	90.89%	97.02%	95.74%	91.14%	83.33%	74.20%	79.89%
13:00	78.71%	77.37%	78.98%	77.75%	86.44%	91.59%	96.19%	95.20%	82.23%	75.86%	66.55%	75.03%
14:00	70.68%	72.57%	74.56%	79.47%	84.34%	87.40%	94.75%	96.24%	81.29%	75.24%	63.10%	72.47%
15:00	68.96%	73.66%	74.73%	78.72%	87.15%	88.93%	93.51%	93.91%	81.87%	66.79%	69.19%	71.64%
16:00	78.85%	76.32%	75.81%	79.11%	86.59%	90.22%	92.90%	93.27%	80.67%	68.35%	79.35%	85.61%
17:00	90.72%	85.08%	78.28%	78.72%	85.82%	91.78%	94.14%	96.07%	81.31%	72.34%	89.66%	91.60%
18:00	94.73%	90.04%	84.19%	83.20%	88.78%	92.24%	95.14%	96.71%	86.98%	83.62%	92.78%	93.88%
19:00	96.19%	91.87%	90.21%	87.11%	94.03%	94.37%	97.71%	97.88%	93.70%	92.00%	94.69%	95.10%
20:00	95.99%	94.56%	93.14%	90.52%	94.50%	96.32%	96.85%	98.12%	98.22%	96.26%	95.12%	93.51%
21:00	97.21%	93.64%	93.91%	93.99%	95.48%	97.43%	99.73%	99.14%	97.59%	95.87%	94.48%	95.24%
22:00	96.40%	94.53%	95.63%	92.81%	96.00%	98.74%	99.42%	99.59%	98.44%	97.31%	95.23%	94.21%
23:00	97.41%	94.28%	95.52%	93.65%	95.97%	98.50%	99.73%	100.00%	98.58%	96.95%	95.93%	93.46%

Day	85.14%	83.35%	82.50%	84.17%	90.43%	92.80%	97.04%	97.20%	89.41%	83.15%	80.54%	83.58%
Night	**96.15%**	**93.41%**	**93.21%**	**93.90%**	**97.14%**	**98.84%**	**99.45%**	**99.58%**	**98.56%**	**95.69%**	**94.78%**	**93.77%**
24 HR	91.57%	89.22%	88.30%	89.03%	93.23%	95.06%	98.04%	98.19%	93.99%	89.94%	88.85%	89.52%

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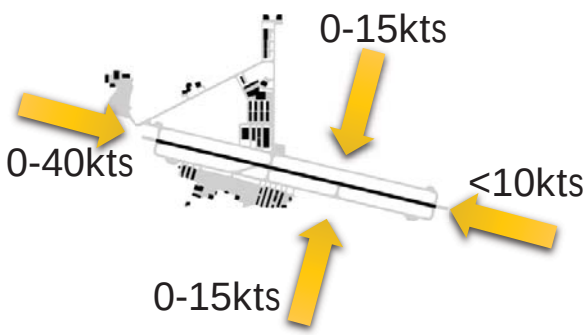
Likelihood That Aircraft Will Land

CAT B - 1500ft – 1 1/2 Miles



RWY 27 LNAV Overall Efficiency (CAT B)

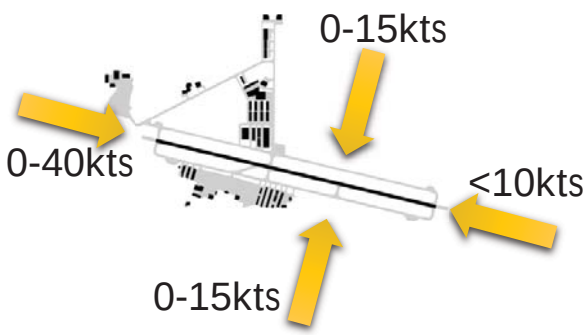
Local Time (HH:MM)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0:00	91.93%	92.40%	92.97%	95.04%	97.85%	99.30%	99.46%	99.86%	99.57%	96.57%	95.63%	91.88%
1:00	91.65%	92.32%	92.17%	95.11%	97.02%	98.46%	99.60%	100.00%	99.58%	97.26%	94.84%	90.94%
2:00	91.20%	91.14%	92.76%	95.37%	98.11%	99.69%	99.86%	99.86%	99.01%	97.42%	94.63%	90.46%
3:00	91.56%	90.05%	92.94%	94.75%	97.72%	99.13%	99.90%	99.45%	99.30%	96.70%	94.24%	90.45%
4:00	89.99%	92.68%	91.68%	94.16%	98.24%	99.13%	100.00%	99.76%	99.44%	94.86%	94.51%	89.79%
5:00	89.97%	92.44%	90.29%	95.30%	97.94%	99.16%	100.00%	100.00%	99.72%	96.39%	92.87%	89.64%
6:00	90.01%	92.82%	92.18%	96.43%	98.52%	99.30%	100.00%	99.72%	99.58%	96.80%	93.07%	89.78%
7:00	88.44%	93.07%	91.15%	95.79%	97.14%	98.23%	99.73%	98.66%	99.72%	96.19%	93.13%	88.61%
8:00	87.79%	91.09%	90.27%	92.75%	96.41%	96.41%	99.35%	98.22%	99.30%	94.71%	91.64%	87.27%
9:00	87.95%	89.28%	86.32%	86.78%	93.76%	93.43%	99.46%	97.52%	97.63%	93.31%	90.53%	84.79%
10:00	85.14%	86.78%	83.44%	88.97%	90.34%	89.90%	99.32%	98.18%	95.91%	91.14%	88.74%	81.93%
11:00	83.16%	84.34%	81.79%	83.80%	87.42%	90.84%	98.37%	98.17%	94.87%	89.75%	84.11%	81.62%
12:00	79.96%	75.73%	81.17%	81.17%	87.43%	90.65%	96.88%	95.74%	91.14%	83.06%	73.21%	76.56%
13:00	73.56%	76.44%	78.03%	77.32%	86.30%	91.59%	95.64%	95.20%	82.09%	75.31%	65.72%	72.08%
14:00	66.89%	72.22%	72.74%	79.33%	84.03%	87.12%	94.47%	95.83%	81.15%	75.10%	62.36%	68.46%
15:00	64.26%	73.50%	72.71%	78.54%	86.75%	88.93%	93.24%	93.64%	81.87%	66.52%	68.91%	66.09%
16:00	73.35%	74.62%	74.70%	78.86%	86.35%	89.80%	92.49%	92.99%	80.67%	68.22%	79.07%	81.56%
17:00	88.24%	83.70%	77.74%	78.44%	85.68%	91.64%	93.19%	95.66%	81.03%	72.20%	88.79%	90.25%
18:00	92.67%	87.43%	82.46%	82.78%	88.78%	92.24%	95.14%	96.30%	86.98%	83.62%	92.22%	92.00%
19:00	93.54%	90.18%	88.99%	87.11%	93.93%	94.37%	97.03%	97.34%	93.70%	92.00%	94.13%	92.34%
20:00	93.18%	92.25%	91.12%	90.52%	94.50%	96.32%	96.34%	97.71%	98.22%	96.26%	94.70%	90.54%
21:00	93.05%	92.41%	91.45%	93.99%	95.48%	97.43%	99.73%	99.14%	97.59%	95.87%	93.61%	93.08%
22:00	93.52%	92.99%	93.76%	92.55%	96.00%	98.74%	99.42%	99.59%	98.44%	97.31%	94.21%	92.81%
23:00	93.86%	92.13%	94.31%	92.98%	95.83%	98.50%	99.73%	100.00%	98.58%	96.81%	94.68%	92.03%

Day	79.05%	81.71%	80.91%	83.71%	90.20%	92.72%	96.74%	96.66%	89.36%	82.32%	79.74%	78.90%
Night	**91.74%**	**91.07%**	**91.31%**	**93.61%**	**96.87%**	**98.84%**	**99.40%**	**99.54%**	**98.56%**	**95.22%**	**93.72%**	**91.14%**
24 HR	86.45%	87.17%	86.55%	88.66%	92.98%	95.01%	97.85%	97.86%	93.96%	89.31%	87.90%	86.04%

LEAN ENGINEERING

Likelihood That Aircraft Will Land

CAT B - 1200ft – 1 1/2 Miles



RWY 27 LP Overall Efficiency (CAT B)

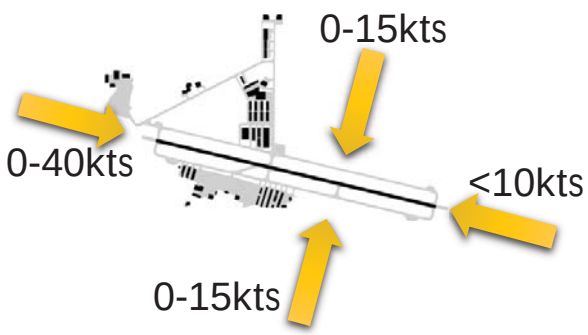
Local Time (HH:MM)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0:00	92.61%	92.40%	93.10%	95.04%	98.25%	99.30%	99.46%	99.86%	99.57%	96.57%	95.63%	92.04%
1:00	92.33%	92.32%	92.17%	95.11%	97.02%	98.46%	99.60%	100.00%	99.58%	97.40%	94.84%	91.10%
2:00	92.16%	91.29%	92.76%	95.37%	98.11%	99.69%	99.86%	99.86%	99.01%	97.42%	95.05%	90.46%
3:00	92.65%	90.35%	93.34%	95.03%	97.72%	99.13%	99.90%	99.45%	99.30%	96.70%	94.66%	90.75%
4:00	90.71%	92.80%	92.08%	94.58%	98.24%	99.13%	100.00%	99.76%	99.44%	94.86%	94.96%	90.17%
5:00	91.61%	92.59%	90.29%	95.30%	98.89%	99.16%	100.00%	100.00%	99.72%	96.39%	92.98%	89.75%
6:00	91.10%	92.82%	92.18%	96.43%	98.65%	99.30%	100.00%	99.72%	99.58%	96.80%	93.46%	90.91%
7:00	88.99%	93.07%	91.15%	95.79%	97.14%	98.23%	99.73%	98.79%	99.72%	96.32%	93.23%	90.38%
8:00	88.07%	91.09%	90.27%	92.75%	96.92%	96.41%	99.35%	98.22%	99.30%	95.12%	91.64%	88.18%
9:00	88.77%	89.62%	86.45%	87.20%	93.89%	93.43%	99.46%	97.52%	97.63%	93.45%	90.53%	85.70%
10:00	85.69%	87.25%	83.44%	89.39%	90.34%	89.90%	99.32%	98.18%	95.91%	91.14%	88.74%	82.38%
11:00	84.42%	84.65%	81.79%	83.80%	87.42%	90.84%	98.37%	98.17%	94.87%	89.75%	84.11%	81.62%
12:00	80.64%	76.04%	81.57%	81.17%	87.43%	90.65%	96.88%	95.74%	91.14%	83.06%	73.35%	76.56%
13:00	74.28%	76.75%	78.03%	77.32%	86.30%	91.59%	95.64%	95.20%	82.09%	75.45%	65.86%	72.08%
14:00	67.02%	72.57%	73.05%	79.33%	84.03%	87.12%	94.47%	95.83%	81.15%	75.10%	62.36%	68.46%
15:00	64.95%	73.50%	73.11%	78.54%	86.75%	88.93%	93.24%	93.64%	81.87%	66.52%	68.91%	66.24%
16:00	73.76%	74.62%	74.70%	78.86%	86.35%	89.80%	92.49%	92.99%	80.67%	68.22%	79.07%	81.71%
17:00	89.07%	83.70%	77.74%	78.58%	85.68%	91.64%	93.19%	95.66%	81.03%	72.20%	88.93%	90.25%
18:00	93.49%	87.58%	82.46%	83.06%	88.78%	92.24%	95.14%	96.30%	86.98%	83.62%	92.22%	92.30%
19:00	94.37%	90.18%	88.99%	87.11%	93.93%	94.37%	97.03%	97.34%	93.70%	92.00%	94.13%	92.49%
20:00	94.00%	92.25%	91.12%	90.52%	94.50%	96.32%	96.34%	97.71%	98.22%	96.26%	94.98%	90.73%
21:00	93.87%	92.41%	91.45%	93.99%	95.48%	97.43%	99.73%	99.14%	97.59%	95.87%	93.75%	93.08%
22:00	93.79%	92.99%	93.76%	92.55%	96.00%	98.74%	99.42%	99.59%	98.44%	97.31%	94.35%	93.00%
23:00	94.41%	92.13%	94.31%	93.37%	95.97%	98.50%	99.73%	100.00%	98.58%	96.81%	94.82%	92.03%

Day	79.66%	81.92%	81.03%	83.82%	90.26%	92.72%	96.74%	96.67%	89.36%	82.39%	79.78%	79.33%
Night	**92.58%**	**91.13%**	**91.39%**	**93.70%**	**97.02%**	**98.84%**	**99.40%**	**99.54%**	**98.56%**	**95.23%**	**93.91%**	**91.36%**
24 HR	87.20%	87.29%	86.64%	88.76%	93.07%	95.01%	97.85%	97.86%	93.96%	89.35%	88.02%	86.35%

LEAN ENGINEERING

Likelihood That Aircraft Will Land

CAT C - 700ft – 2 Miles



RWY 27 RNP or Future Approach to LDIN Overall Efficiency

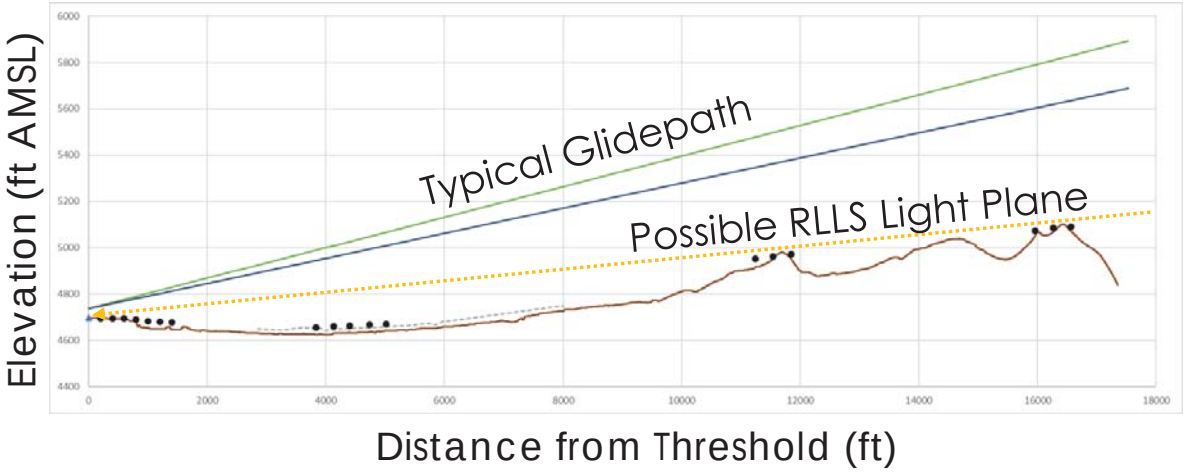
Local Time (HH:MM)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0:00	93.43%	92.86%	93.24%	95.04%	98.25%	99.30%	99.46%	99.86%	99.57%	96.57%	95.73%	92.53%
1:00	93.29%	92.47%	92.62%	95.11%	97.43%	98.46%	99.60%	100.00%	99.58%	97.40%	95.11%	92.31%
2:00	92.85%	91.64%	93.15%	95.37%	98.24%	99.69%	99.86%	99.86%	99.01%	97.42%	95.05%	91.22%
3:00	93.10%	90.97%	93.34%	95.03%	97.85%	99.13%	99.90%	99.45%	99.30%	96.70%	94.83%	91.44%
4:00	91.71%	94.19%	92.18%	94.58%	98.78%	99.13%	100.00%	99.76%	99.44%	94.99%	94.96%	90.51%
5:00	93.24%	93.06%	90.29%	95.44%	98.89%	99.16%	100.00%	100.00%	99.72%	96.53%	93.26%	90.51%
6:00	92.56%	93.55%	92.32%	96.43%	98.79%	99.30%	100.00%	99.45%	99.58%	96.80%	93.46%	91.37%
7:00	90.77%	93.53%	91.42%	95.90%	97.17%	98.23%	99.73%	98.21%	99.72%	96.32%	93.41%	91.02%
8:00	89.81%	90.78%	90.27%	92.75%	96.92%	96.41%	99.35%	97.81%	99.30%	95.12%	91.81%	89.20%
9:00	90.31%	89.78%	86.35%	87.20%	93.89%	93.43%	99.46%	96.83%	97.63%	93.45%	90.81%	86.65%
10:00	87.35%	87.40%	83.58%	89.39%	90.34%	89.90%	99.32%	97.77%	95.91%	91.27%	89.03%	82.80%
11:00	85.95%	84.65%	81.93%	83.70%	87.42%	90.84%	98.37%	97.90%	94.87%	89.89%	84.11%	81.92%
12:00	82.28%	76.31%	81.57%	81.35%	87.43%	90.65%	96.88%	95.74%	91.14%	83.06%	73.35%	76.40%
13:00	75.24%	76.44%	78.44%	77.32%	86.17%	91.59%	95.64%	95.20%	82.09%	75.45%	65.75%	72.08%
14:00	67.44%	72.41%	73.46%	79.33%	83.90%	87.12%	94.47%	95.83%	81.15%	74.69%	62.22%	68.65%
15:00	64.95%	73.04%	72.98%	78.54%	86.75%	88.93%	93.24%	93.64%	81.87%	66.52%	69.05%	66.50%
16:00	74.31%	74.62%	74.70%	78.86%	86.45%	89.80%	92.49%	92.99%	80.67%	68.22%	79.07%	81.45%
17:00	88.93%	83.70%	77.74%	78.58%	85.41%	91.64%	93.05%	95.66%	81.03%	71.93%	88.93%	90.55%
18:00	93.49%	88.04%	82.70%	83.06%	88.78%	92.24%	95.14%	96.30%	86.84%	83.62%	92.22%	92.42%
19:00	94.64%	89.99%	89.13%	87.11%	93.93%	94.37%	97.03%	97.34%	93.70%	92.00%	94.13%	93.23%
20:00	93.96%	92.25%	91.12%	90.52%	94.50%	95.90%	96.34%	97.71%	98.22%	96.26%	94.98%	91.40%
21:00	94.45%	92.56%	91.45%	93.99%	95.48%	97.43%	99.73%	99.14%	97.59%	95.87%	93.75%	93.53%
22:00	94.62%	93.15%	94.17%	92.70%	96.00%	98.74%	99.42%	99.59%	98.44%	97.31%	94.60%	93.15%
23:00	94.95%	92.59%	94.31%	93.37%	95.97%	98.50%	99.73%	100.00%	98.58%	96.81%	94.95%	92.14%

Day	80.84%	81.90%	81.13%	83.83%	90.24%	92.69%	96.73%	96.48%	89.35%	82.36%	79.86%	79.67%
Night	**93.23%**	**91.50%**	**91.54%**	**93.73%**	**97.14%**	**98.84%**	**99.40%**	**99.54%**	**98.56%**	**95.25%**	**94.00%**	**91.88%**
24 HR	88.07%	87.50%	86.77%	88.78%	93.11%	95.00%	97.84%	97.75%	93.96%	89.34%	88.11%	86.79%

Benefits

- ✓ Increase overall airport operations from traffic that typically needs to land at night
- ✓ Enable aircraft to avoid operating during daytime high wind periods
- ✓ RLLS Solution provides additional level of vertical flight path protection due to placement along terrain



LEAN ENGINEERING

Implementation

Stakeholder Review (FAA, NVDOT,AOPA, NBAA)	Weeks
Master Plan Appendix / ALP	Months
EA/NV Energy/Funding	Months - Years
FAA IFP Gateway Request	Month
30% Design For Costing and FAA Flight Simulation	Months
100% Design and SRM	Months
Construction	1 Year
Flight Test and Publication	2 Months

2 Years

LEAN ENGINEERING

Summary

1. Is there a solution?	• Yes
2. What are the benefits?	• Nighttime Operations • Improved Safety
3. How much will it cost and how long might it take?	• $3 - $5M • 2 – 4 Years (Depending on Funding)
4. Will the FAA Approve Nighttime Ops?	• To Be Determined

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Questions?

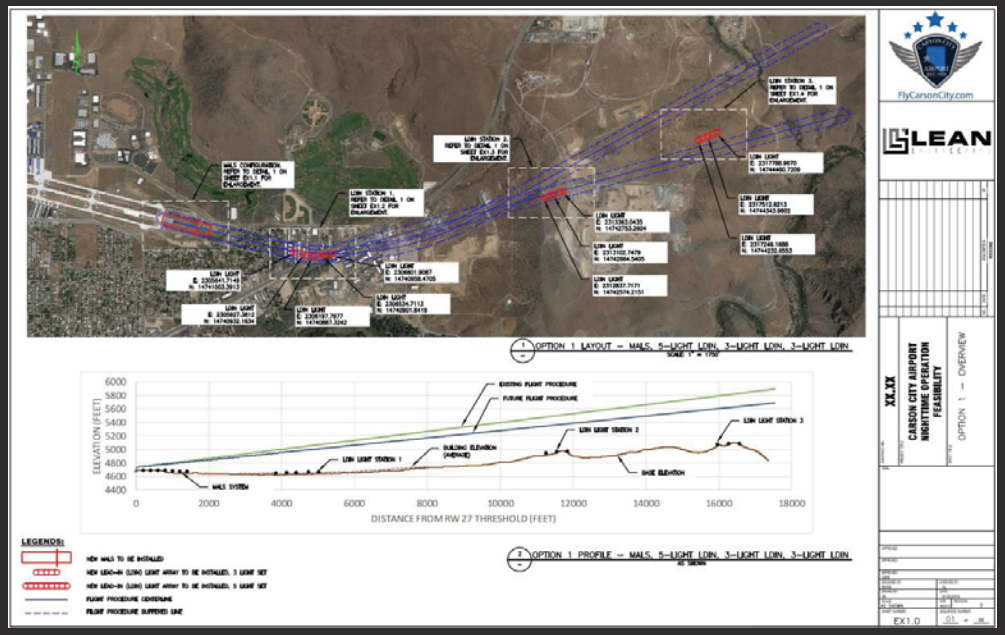
Paul Hannah

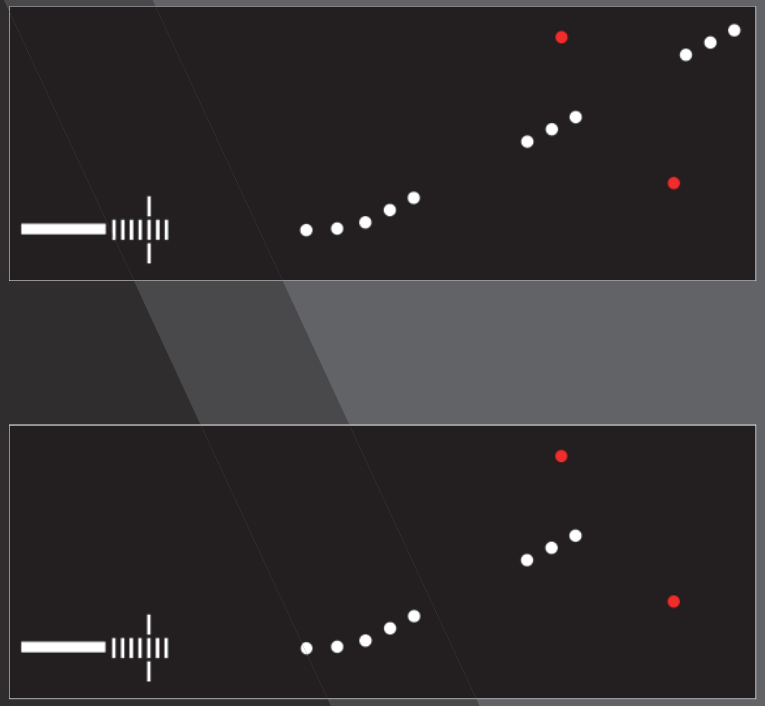
Chief Airspace and Flight Operations Engineer

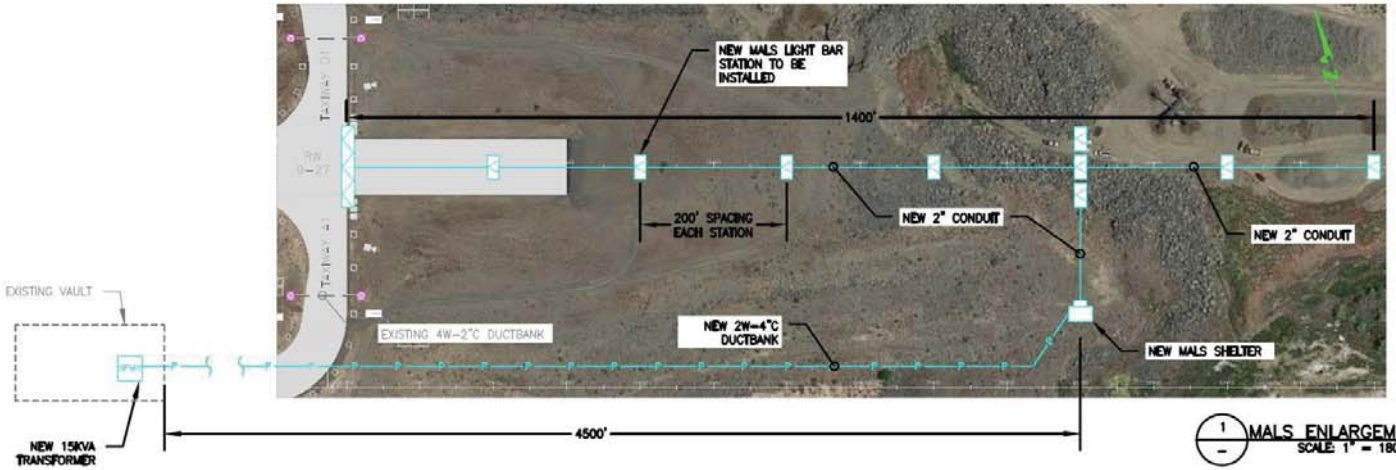
Lean Engineering

phannah@leancorp.com

Option A1: MALS, 5xLDIN, 3xLDIN, 3xLDIN
Option B1: MALS, 5xLDIN, 3xLDIN



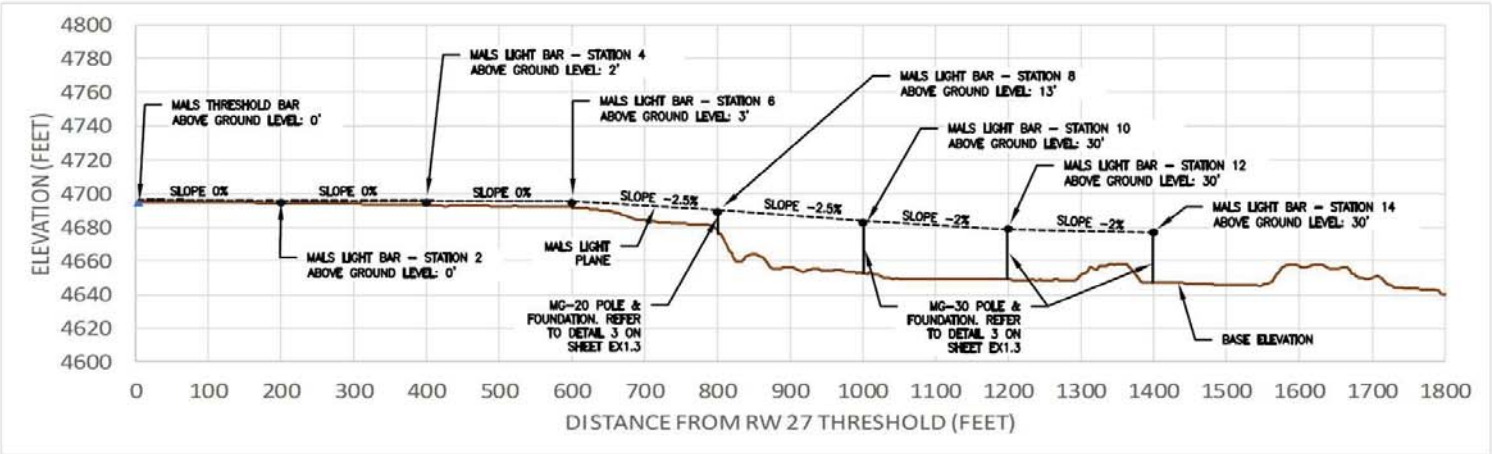




LEGENDS:

- 2" CONDUIT
- 2W-4"C DUCTBANK
- NEW MALS/MALSF 11-LIGHT BAR TO BE INSTALLED
- NEW MALS/MALSF 5-LIGHT BAR TO BE INSTALLED
- NEW MALSF FLASHING LIGHT TO BE INSTALLED
- NEW LDIN LIGHT TO BE INSTALLED
- NEW SHELTER
- NEW TRANSFORMER
- EXISTING UTILITY POLE
- EXISTING HANDHOLE

1 MALS ENLARGEMENT
SCALE: 1" = 180'



2 MALS PROFILE
AS SHOWN

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LEAN ENGINEERING

NO.	DATE	DESCRIPTION	BY

CONTRACT NO. XX.XX

PROJECT TITLE CARSON CITY AIRPORT NIGHTTIME OPERATION FEASIBILITY

SHEET TITLE OPTION 1 – MALS ENLARGEMENT

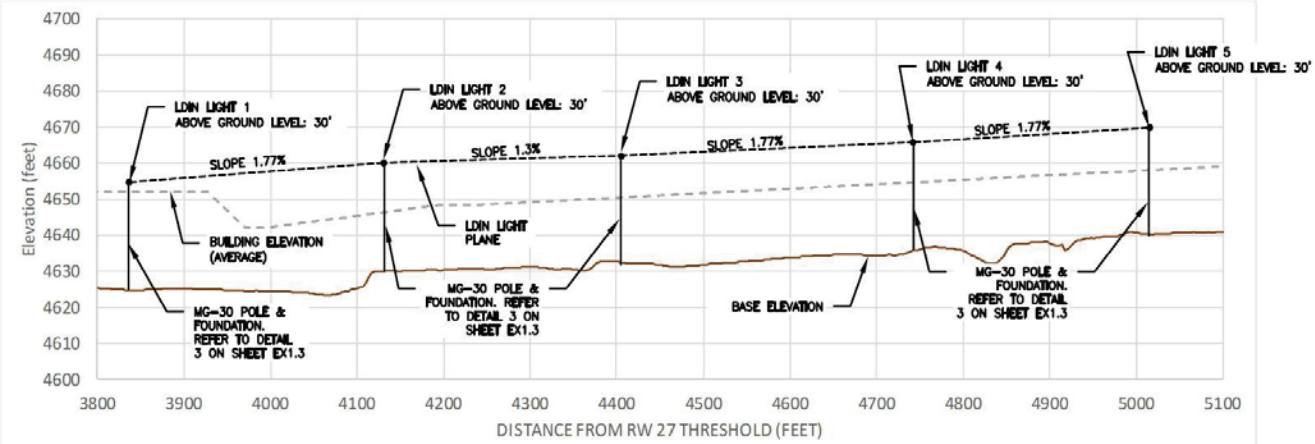
SEAL

APPROVED:

LEGENDS:

- 2" CONDUIT
- 2W-4"C DUCTBANK
- NEW MALS/MALSF 11-LIGHT BAR TO BE INSTALLED
- NEW MALS/MALSF 5-LIGHT BAR TO BE INSTALLED
- NEW MALSF FLASHING LIGHT TO BE INSTALLED
- NEW LDIN LIGHT TO BE INSTALLED
- NEW SHELTER
- NEW TRANSFORMER
- EXISTING UTILITY POLE
- EXISTING HANDHOLE

1 LDIN STATION 1 ENLARGEMENT
SCALE: 1" = 150'



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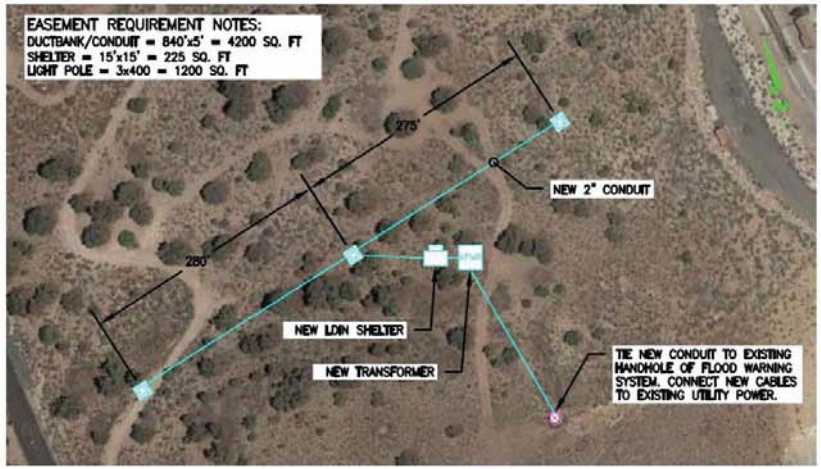
LEAN ENGINEERING

XX.XX

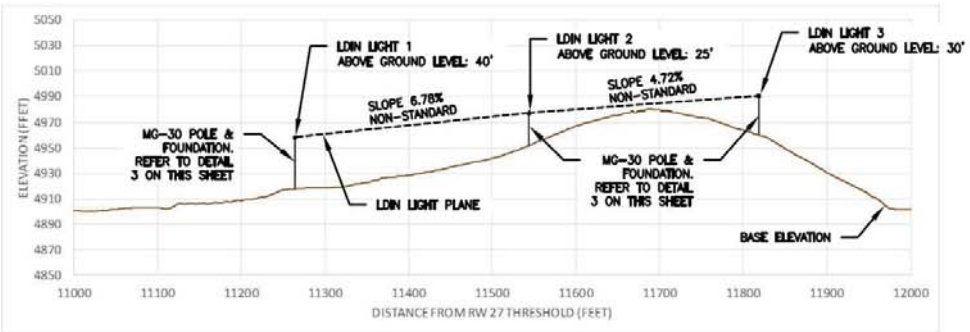
CARSON CITY AIRPORT NIGHTTIME OPERATION FEASIBILITY

OPTION 1 – LDIN STATION 1 ENLARGEMENT

42



1 / – LDIN STATION 2 ENLARGEMENT
SCALE: 1" = 150'



LEGENDS:

- 2" CONDUIT
- 2W-4"C DUCTBANK
- NEW MALS/MALSF 11-LIGHT BAR TO BE INSTALLED
- NEW MALS/MALSF 5-LIGHT BAR TO BE INSTALLED
- NEW MALSF FLASHING LIGHT TO BE INSTALLED
- NEW LDIN LIGHT TO BE INSTALLED
- NEW SHELTER
- NEW TRANSFORMER
- EXISTING UTILITY POLE
- EXISTING HANDHOLE

3A / – MG-20 POLE
NTS

3B / – MG-30 POLE
NTS

3 / – MG-20 & MG-30 POLES
NTS

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LEAN ENGINEERING

NO.	DATE	DESCRIPTION	BY
		REVISIONS	

CONTRACT NO.: XX.XX

PROJECT TITLE: CARSON CITY AIRPORT NIGHTTIME OPERATION FEASIBILITY

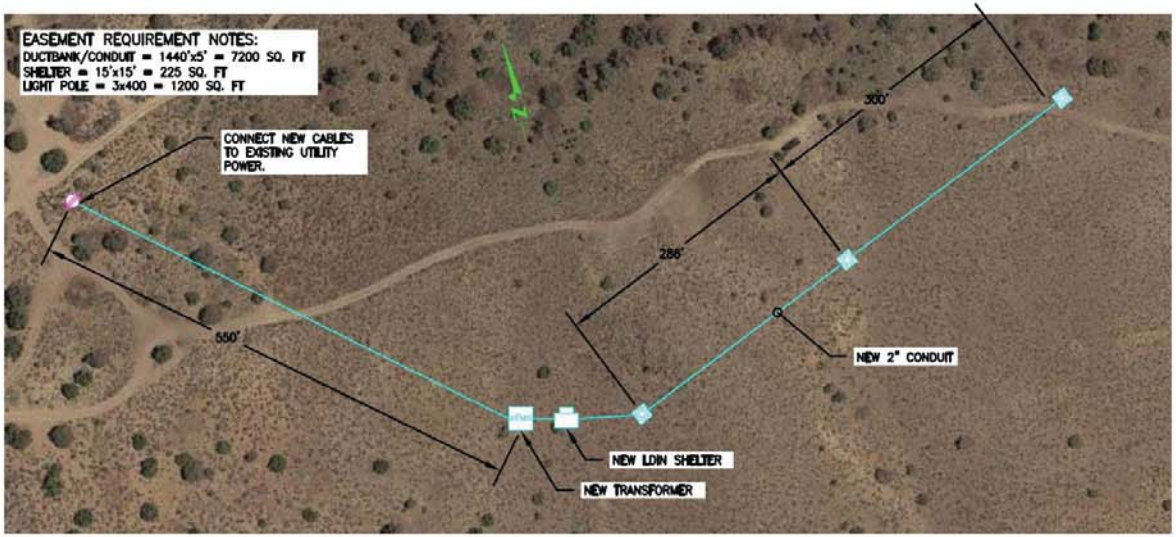
SHEET TITLE: OPTION 1 – LDIN STATION 2 ENLARGEMENT

SEAL

43

APPROVED:

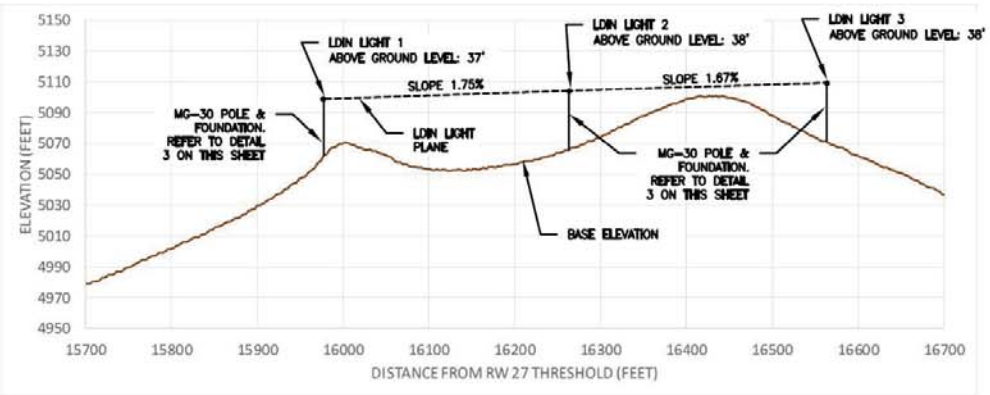
APPROVED:



1 LDIN STATION 3 ENLARGEMENT
SCALE: 1" = 150'

LEGENDS:

- 2" CONDUIT
- 2W-4"C DUCTBANK
- NEW MALS/MALSF 11-LIGHT BAR TO BE INSTALLED
- NEW MALS/MALSF 5-LIGHT BAR TO BE INSTALLED
- NEW MALSF FLASHING LIGHT TO BE INSTALLED
- NEW LDIN LIGHT TO BE INSTALLED
- NEW SHELTER
- NEW TRANSFORMER
- EXISTING UTILITY POLE
- EXISTING HANDHOLE



3A MG-20 POLE
NTS

3B MG-30 POLE
NTS

3 MG-20 & MG-30 POLES

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LEAN ENGINEERING

NO.	DATE	DESCRIPTION	BY
		REVISIONS	

CONTRACT NO.

PROJECT TITLE: CARSON CITY AIRPORT NIGHTTIME OPERATION FEASIBILITY

SHEET TITLE: OPTION 1 – LDIN STATION 3 ENLARGEMENT

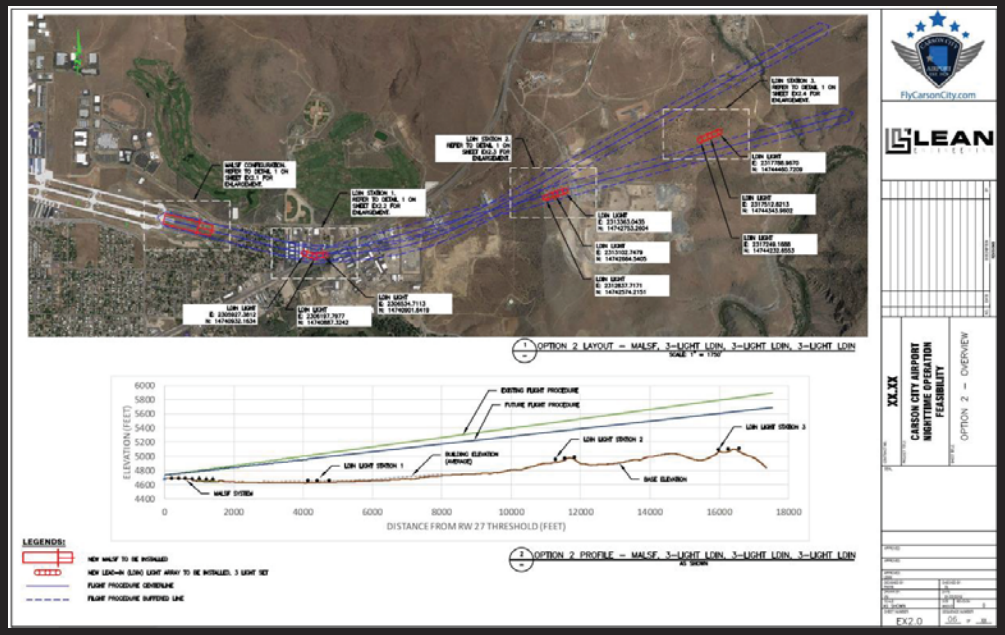
XX.XX

GEAL

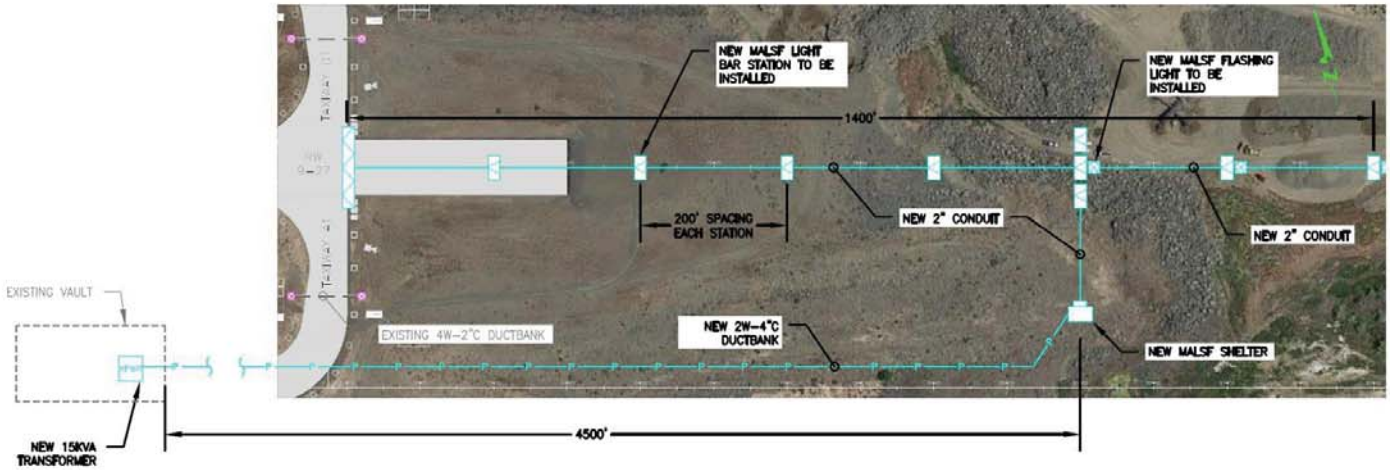
44

APPROVED

Option A2: MALSF, 3xLDIN, 3xLDIN, 3xLDIN
Option B2: MALSF, 3xLDIN, 3xLDIN



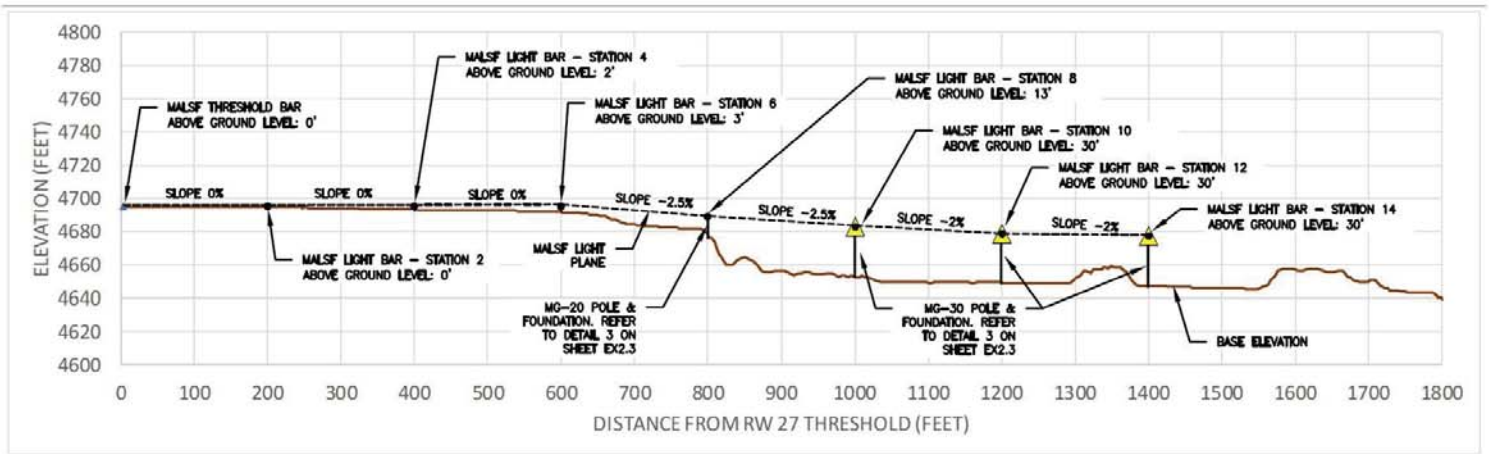
LEAN ENGINEERING



LEGENDS:

- 2" CONDUIT
- 2W-4"C DUCTBANK
- NEW MALS/MALSF 11-LIGHT BAR TO BE INSTALLED
- NEW MALS/MALSF 5-LIGHT BAR TO BE INSTALLED
- NEW MALSF FLASHING LIGHT TO BE INSTALLED
- NEW LDIN LIGHT TO BE INSTALLED
- NEW SHELTER
- NEW TRANSFORMER
- EXISTING UTILITY POLE
- EXISTING HANDHOLE

1 / - MALSF ENLARGEMENT
SCALE: 1" = 180'



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LEAN ENGINEERING

NO.	DATE	DESCRIPTION	BY

CONTRACT NO: XX.XX

PROJECT TITLE: CARSON CITY AIRPORT NIGHTTIME OPERATION FEASIBILITY

SHEET TITLE: OPTION 2 – MALSF ENLARGEMENT

SEAL

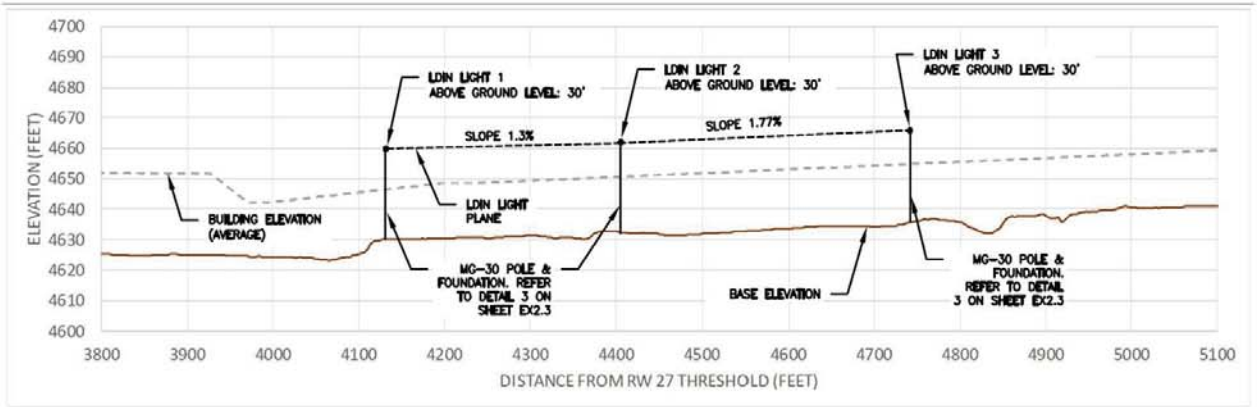
APPROVED

SIGNATURE

LEGENDS:

- 2" CONDUIT
- 2W-4"C DUCTBANK
- NEW MALS/MALSF 11-LIGHT BAR TO BE INSTALLED
- NEW MALS/MALSF 5-LIGHT BAR TO BE INSTALLED
- NEW MALSF FLASHING LIGHT TO BE INSTALLED
- NEW LDIN LIGHT TO BE INSTALLED
- NEW SHELTER
- NEW TRANSFORMER
- EXISTING UTILITY POLE
- EXISTING HANDHOLE

1 LDIN STATION 1 ENLARGEMENT
SCALE: 1" = 150'



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LEAN ENGINEERING

NO.	DATE	DESCRIPTION	BY

REVISIONS

CONTRACT NO: XX.XX

PROJECT TITLE: CARSON CITY AIRPORT NIGHTTIME OPERATION FEASIBILITY

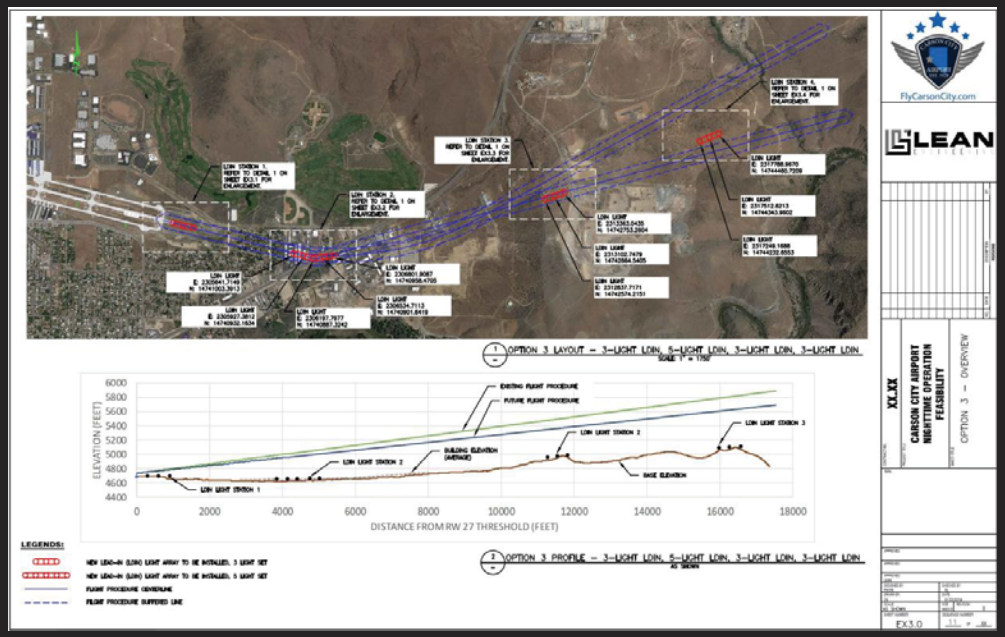
SHEET TITLE: OPTION 2 – LDIN STATION 1 ENLARGEMENT

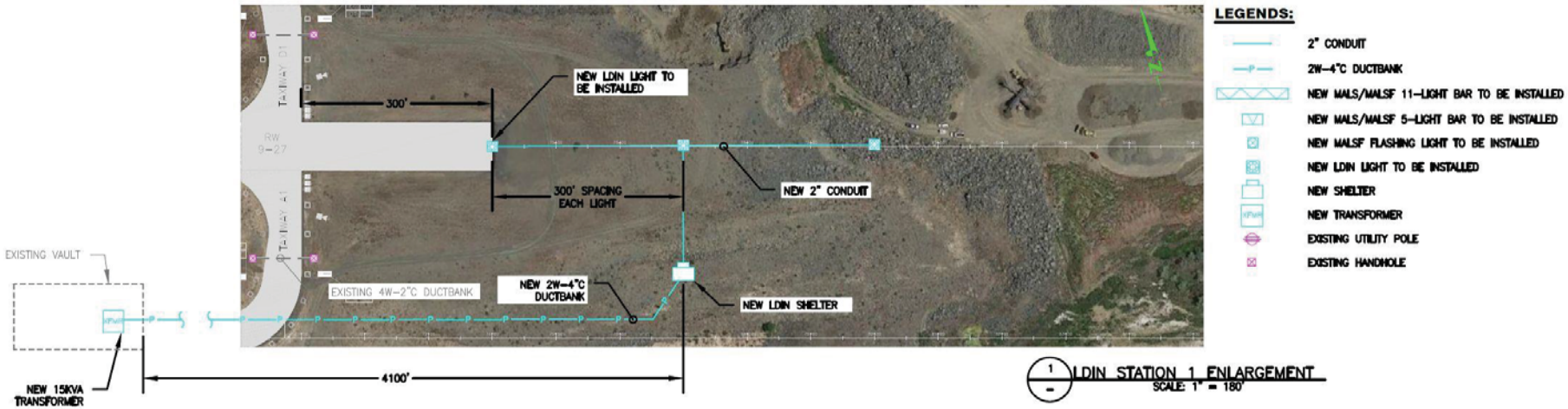
GEAL

47

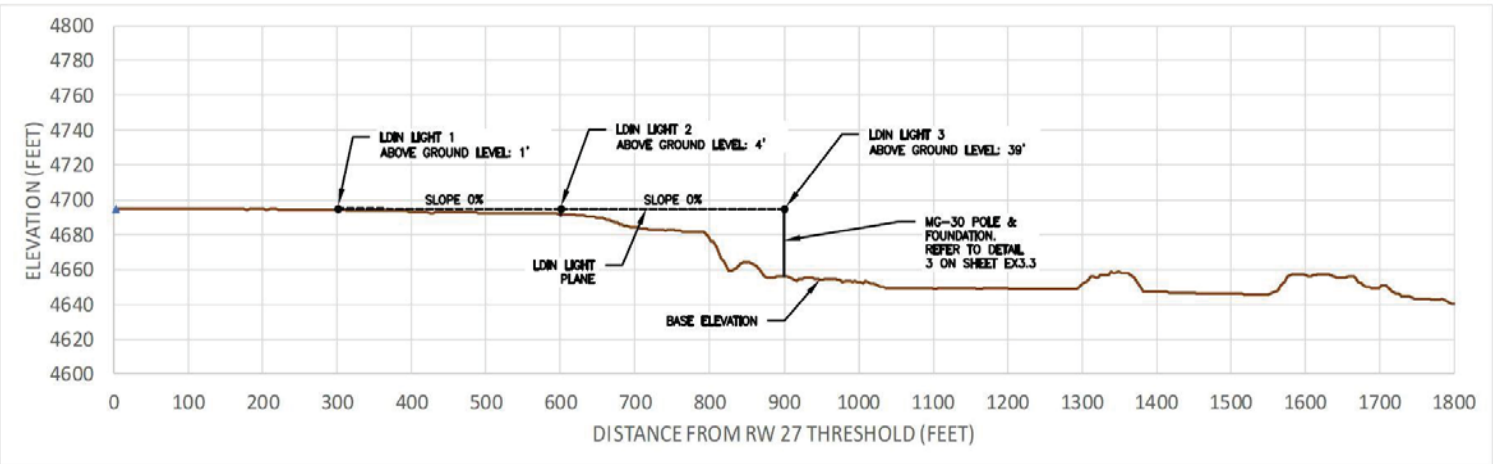
APPROVED

Option A3: 3xLDIN, 5xLDIN, 3xLDIN, 3xLDIN
Option B3: 3xLDIN, 5xLDIN, 3xLDIN





1 LDIN STATION 1 ENLARGEMENT
SCALE: 1" = 180'



2 LDIN STATION 1 PROFILE

FlyCarsonCity.com

LEAN ENGINEERING

NO.	DATE	REVISIONS	BY

CONTRACT NO. XX.XX

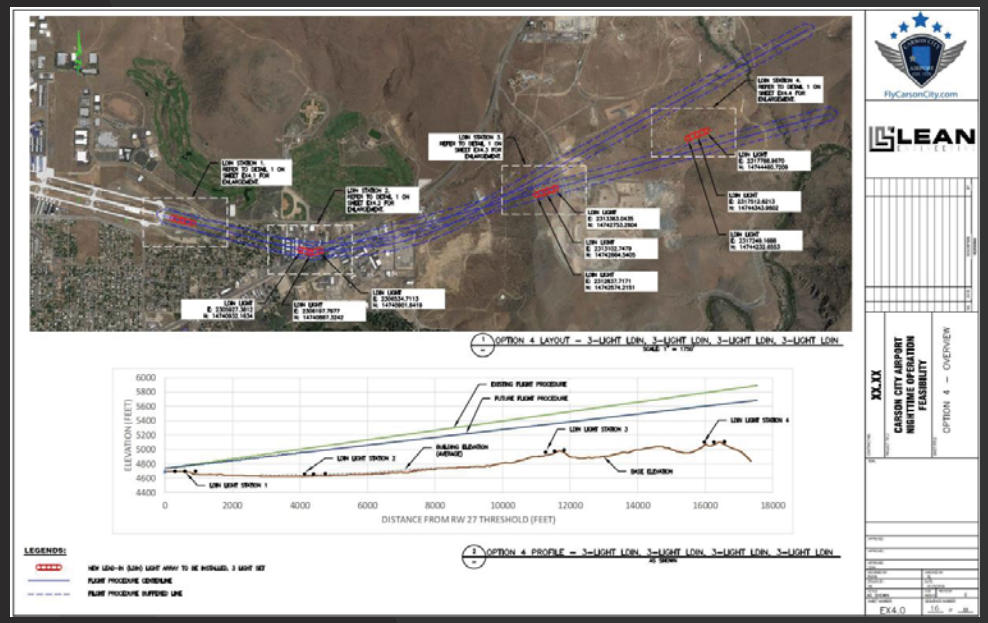
PROJECT TITLE CARSON CITY AIRPORT NIGHTTIME OPERATION FEASIBILITY

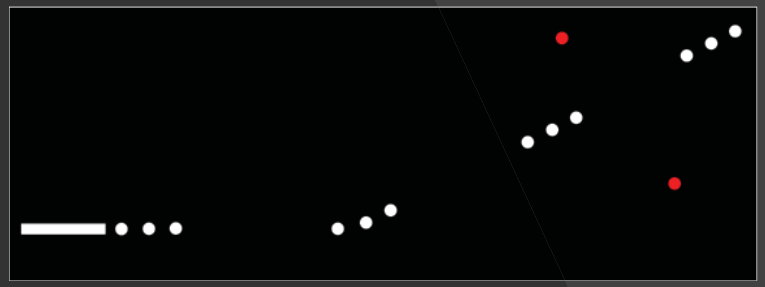
SHEET TITLE OPTION 3 – LDIN STATION 1 ENLARGEMENT

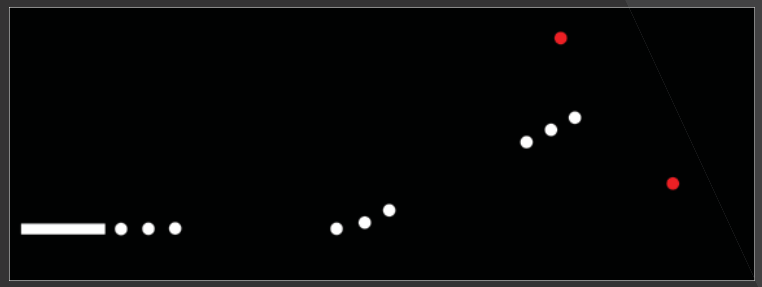
SEAL

APPROVED:

Option A4: 3xLDIN, 3xLDIN, 3xLDIN, 3xLDIN
Option B4: 3xLDIN, 3xLDIN, 3xLDIN



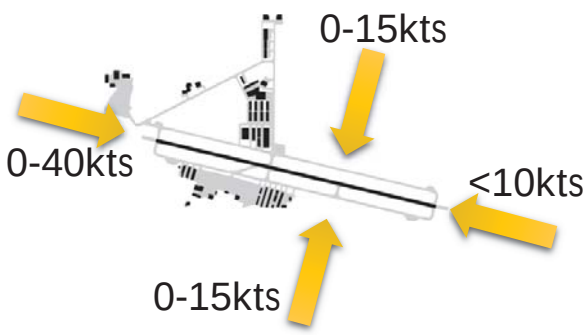




LEAN ENGINEERING

Likelihood That Aircraft Will Land

CAT D - 1800ft – 3 Miles



RWY 27 RNAV GPS-A Overall Efficiency

Local Time (HH:MM)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0:00	90.70%	91.78%	92.70%	94.65%	97.71%	99.30%	99.46%	99.69%	99.43%	96.57%	95.49%	91.08%
1:00	90.43%	92.32%	92.04%	94.79%	96.89%	98.46%	99.60%	100.00%	99.58%	96.68%	94.70%	90.60%
2:00	90.68%	90.68%	92.35%	94.95%	97.84%	99.27%	99.86%	99.73%	99.01%	97.28%	94.49%	89.89%
3:00	90.16%	89.58%	92.53%	94.33%	97.18%	98.71%	99.90%	98.48%	99.30%	96.70%	93.26%	89.38%
4:00	89.03%	91.71%	91.27%	94.02%	97.70%	99.13%	100.00%	98.79%	99.44%	94.58%	94.09%	88.80%
5:00	89.15%	92.01%	89.62%	95.30%	97.94%	99.16%	100.00%	98.76%	99.72%	95.84%	92.60%	88.50%
6:00	89.22%	92.20%	91.91%	95.59%	97.85%	99.30%	100.00%	97.79%	99.16%	96.80%	91.77%	88.88%
7:00	87.76%	91.54%	90.74%	95.19%	96.46%	98.23%	99.73%	96.14%	99.16%	96.05%	91.87%	87.11%
8:00	87.04%	90.28%	89.86%	92.61%	95.74%	95.99%	99.08%	95.22%	98.70%	94.40%	90.95%	85.50%
9:00	87.50%	88.48%	85.68%	86.53%	93.35%	93.29%	99.32%	94.21%	97.35%	92.79%	89.86%	82.32%
10:00	83.77%	86.51%	83.17%	88.72%	90.34%	89.90%	99.32%	95.61%	95.63%	90.86%	88.04%	79.95%
11:00	81.66%	84.19%	81.22%	83.70%	87.15%	90.70%	98.23%	96.79%	94.45%	88.63%	83.25%	80.73%
12:00	77.91%	74.92%	80.33%	80.89%	87.16%	90.65%	96.88%	95.19%	91.14%	81.65%	72.37%	75.15%
13:00	72.04%	75.97%	76.77%	77.04%	85.19%	91.45%	95.64%	94.68%	81.67%	74.48%	64.33%	71.06%
14:00	65.37%	71.64%	72.23%	79.05%	83.12%	86.98%	94.20%	95.01%	80.59%	74.10%	61.41%	67.74%
15:00	63.12%	72.58%	71.26%	78.26%	86.35%	88.79%	93.10%	93.64%	81.73%	65.83%	68.42%	64.84%
16:00	71.39%	73.39%	74.16%	78.57%	85.68%	89.66%	92.36%	92.58%	80.39%	67.39%	78.37%	79.80%
17:00	86.86%	82.47%	77.34%	78.02%	84.06%	91.64%	92.92%	94.84%	80.89%	71.65%	88.65%	89.50%
18:00	91.98%	86.81%	82.16%	82.78%	87.30%	92.24%	95.01%	95.88%	86.27%	83.21%	91.94%	91.40%
19:00	92.85%	89.23%	88.41%	86.69%	93.12%	94.37%	97.03%	96.93%	93.27%	91.72%	93.85%	91.74%
20:00	91.77%	92.10%	90.71%	90.38%	94.37%	95.90%	96.34%	97.71%	98.22%	95.70%	94.53%	90.54%
21:00	91.59%	91.95%	91.05%	93.51%	95.48%	97.43%	99.73%	99.14%	97.59%	95.04%	93.23%	92.63%
22:00	92.04%	92.07%	93.49%	92.55%	95.87%	98.74%	99.42%	99.59%	98.44%	96.62%	93.86%	91.75%
23:00	92.46%	91.51%	94.04%	92.98%	95.43%	98.08%	99.73%	100.00%	98.58%	96.53%	93.84%	91.28%

Day	77.76%	80.95%	80.25%	83.45%	89.49%	92.61%	96.63%	95.32%	89.00%	81.62%	78.88%	77.42%
Night	**90.64%**	**90.46%**	**90.94%**	**93.31%**	**96.64%**	**98.70%**	**99.40%**	**99.19%**	**98.48%**	**94.87%**	**93.31%**	**90.43%**
24 HR	85.27%	86.50%	86.04%	88.38%	92.47%	94.89%	97.79%	96.93%	93.74%	88.80%	87.30%	85.01%

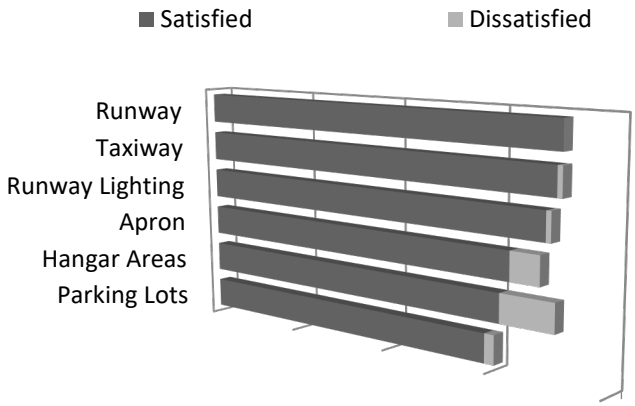
APPENDIX E

CARSON CITY STRATEGIC PLAN

3. Survey Highlights and SWOT Analysis

A. Maintain airport infrastructure in top condition.

When surveyed, users of the Airport indicated that they were satisfied with the current condition of the infrastructure.

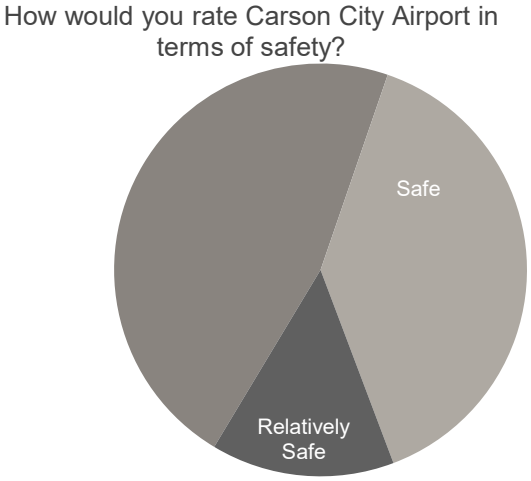


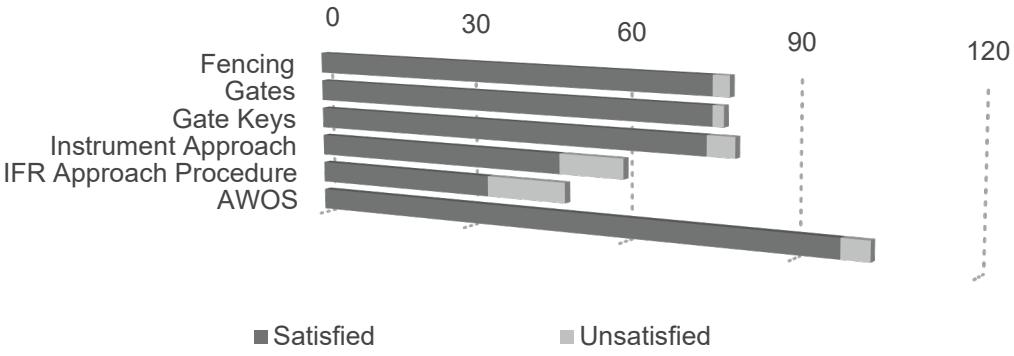
SWOT Analysis

		Infrastructure Strengths	Infrastructure Weaknesses
Maintain airport infrastructure in top condition.		Most infrastructure in good condition. Good working relationship with the FAA.	Aging maintenance equipment. No maintenance facility. Limited staffing. Lack of non-airfield Capital Plan.
Infrastructure Opportunities	FAA Granting opportunities. Availability of land.	**Initiatives** : **Develop a 5 - 10-year Capital Plan that includes development of a maintenance facility.**	
Infrastructure Threats	Wear and tear of equipment due to weather.		

B. Provide for the safety and security of airport users.

When surveyed, users of the Airport indicated that they were satisfied with the current safety and security features.





SWOT Analysis

		Safety and Security Strengths	Safety and Security Weaknesses
Provide for the safety and security of Airport users.		Good perception by users of the safety and security of the Airport.	Lack of nighttime instrument approach. No crosswind runway. Lack of single access point. Lack of all-terrain runway for sport aircraft.
Safety and Security Opportunities	FAA grant availability for safety and security features.	**Initiatives** : **Go forward with the nighttime instrument approach project.** **Determine if an all-terrain runway can be developed.**	
Safety and Security Threats			

C. Support economic activity in the region.

The University of Nevada, Reno, Center for Economic Development recently published a Technical Report titled, “Estimation of Economic Impacts of Operation and Construction Activities of the Carson City Airport on the Economy of Carson City”. The following two tables summarize the economic impact of the Airport.

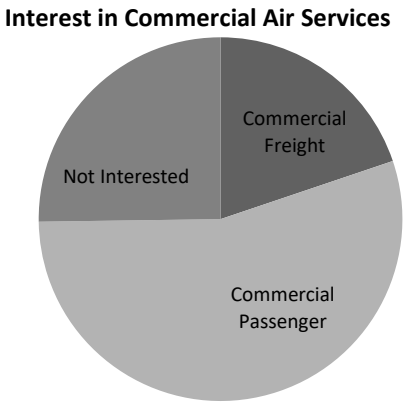
· **Table 12. Summary of CCA Expenditures, Tenants and Visitor Economic Activity, Employment and Labor Income Impacts on the Carson City Economy.**

Impact	Value of Output	Employment	Labor Income
Direct	$25,869,907	188.4	$6,294,197
Indirect and Induced	$9,834,004	81.2	$3,480,684
Total	$35,703,911	269.6	$9,774,881

Table 13. Summary of CCA Operation and Construction Impacts on Economic Activity, Employment, and Labor Income on the Carson City Economy.

Impact	Value of Output	Employment	Labor Income
Direct	$48,087,283	344.5	$16,066,543
Indirect and Induced	$19,074,323	147.00	$6,289,092
Total	$67,161,606	491.5	$22,355,635

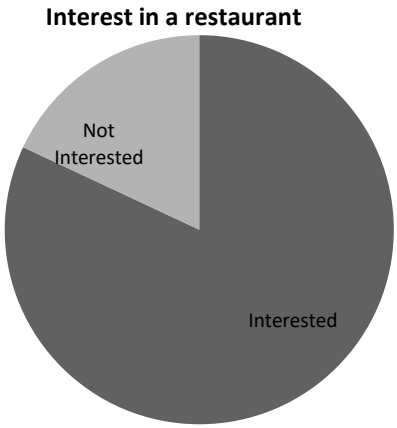
The Community and Airport Users were surveyed regarding their interest in Commercial Air services being developed at the Airport.
There was great interest in seeing some type of Commercial Passenger Service.



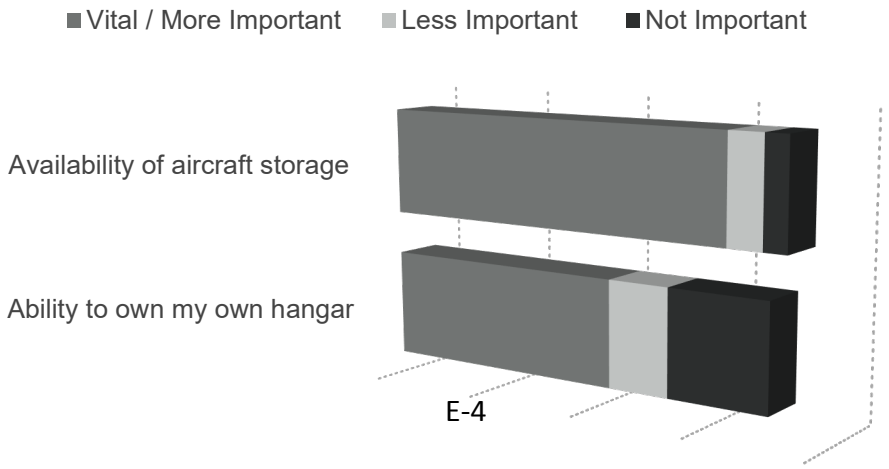
Part of the mission of the Carson City Airport Authority is to use the airport to support economic activity in the city and region. Attracting aviators, providing access to the community for tourists and, making land available for complimentary business development, supports and diversifies the local and regional economy.

Community members and airport users participating in an airport survey expressed their interest in the development of commercial air services at the airport.

In terms of the development of commercial property fronting the airport, respondents to the survey indicated an interest in seeing a restaurant on airport property to serve pilots and the general public.



Surveyed pilots were asked to identify important aspects of the airport. Pilots identified aircraft hangar storage and the ability to own their own private hangar as “Vital/More Important”.



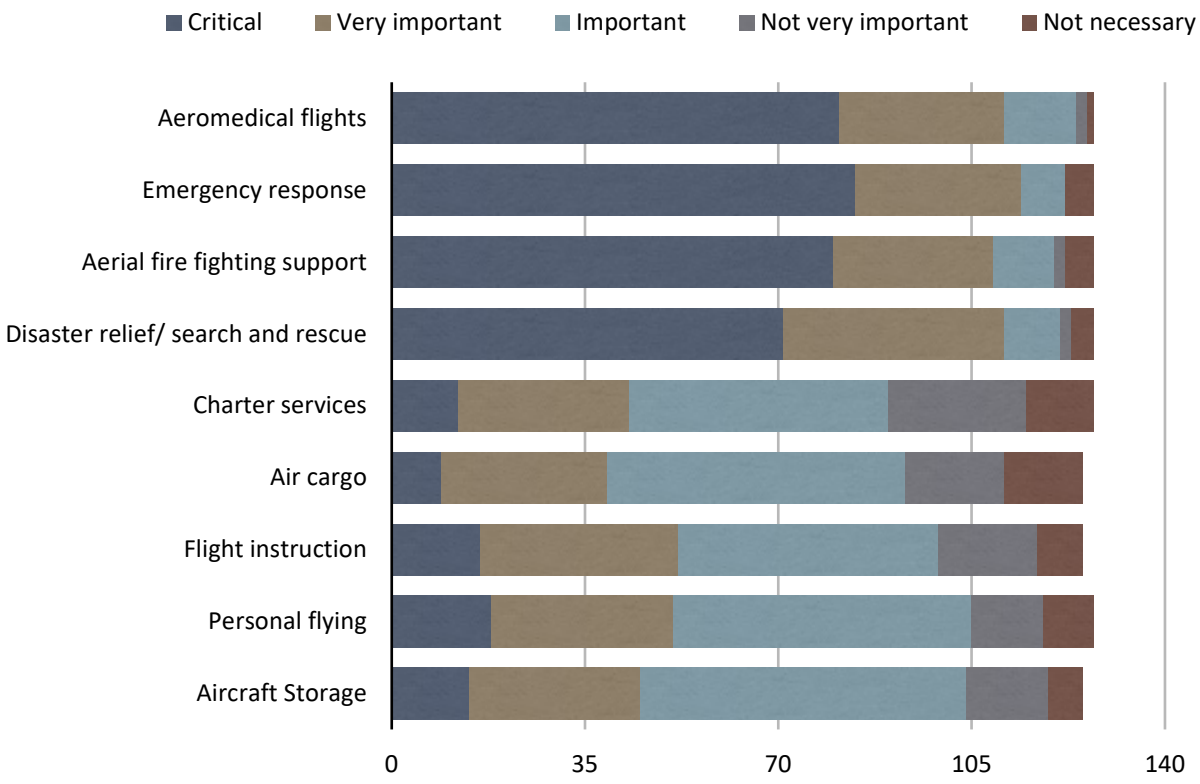
SWOT Analysis

		Economic Development Strengths	Economic Development Weaknesses
Support economic activity in the region.		Commercially developable land on College Parkway. Location Easy freeway access. Developable interior property. Inexpensive for users.	Unattractive frontage. Business expectations of some current hangar owners. Old terminal facility.
Economic Development Opportunities	-Demand for commercial air service. -Strong local economy. -Interest in Airport Restaurant. -Pilots in the region looking for hangar space. -Tourism marking efforts by Tourism Authority. -Proximity to Lake Tahoe.	**Initiatives** : **Pursue commercial development on College Parkway frontage.** **Go forward with a feasibility study on commercial passenger service.** **Work with tourism officials to promote the Airport.** **Look for opportunities for overnight hangars for visitors.** **Look for areas for new hangars through the Master Planning Process.** **Investigate cooperative marketing opportunities with hangar owners.** **Actively market the Carson City Airport to the wider aviation community.** **Examine re-naming the Airport to the Carson-Tahoe Airport.**	
Economic Development Threats	-Leasing process required by NRS. -Competition from other Airports. -Aging pilot community. -Hangar owners not interested in growing their business. -Aging pilot community -FAA Regulations.		

D. Maintain positive relationships with the community.

The surrounding airport community was asked to participate in a survey about the airport. The survey sought responses to questions about various topics relating to the airport and the airports' function in the community. Answering a question about community engagement, 41% of respondents cited the annual airport open house as the main reason they came to the airport. The airport received favorable comments about the open house and respondents suggested more opportunities for future events.

The chart details responses to survey questions about the airport's importance in the community. The airport's role in emergency response was overwhelmingly identified as "important". State agencies participating in the survey overwhelmingly cited the airport's role in emergency operations as "most important" to their respective operations.



Other concerns identified by residential neighbors in the survey included hours of operation and adherence to flight path restrictions. Airport management and the Airport Authority is sensitive the topic of airport noise.

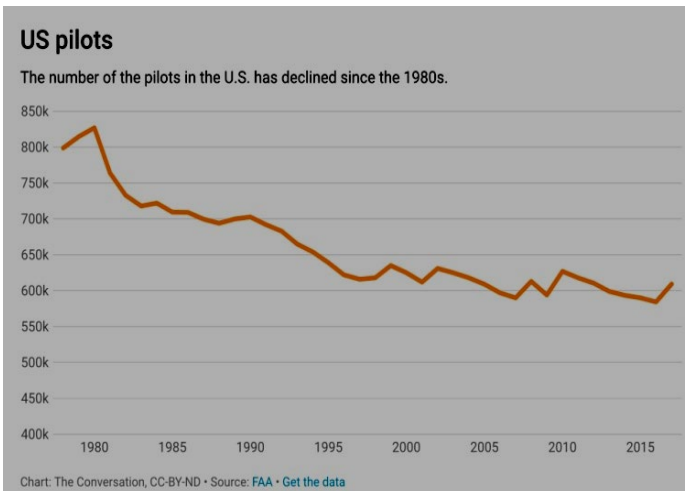
Overall, survey responses indicated general support of the Airport.

SWOT Analysis

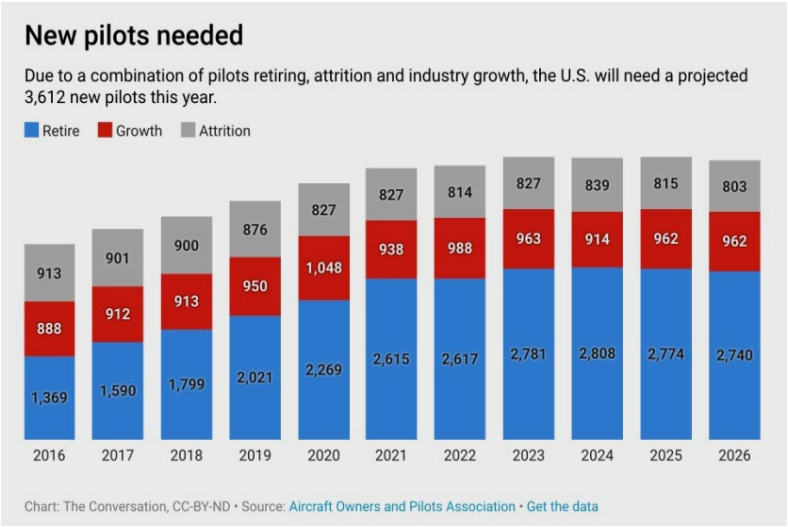
Maintain positive relationship with the community.		Community Relations Strengths	Community Relations Weaknesses
		Good working relationship with Carson City government. Good tenant relationships. .	Unattractive frontage.
Community Relations Opportunities	Positive response to annual open house. Acceptance and support of the Airport by the community. Community support for a restaurant at the Airport.	**Initiatives** : **Look for opportunities to hold additional public events.** **Develop College Parkway frontage with Restaurant.** **Improve the appearance of Airport frontage.**	
Community Relations Threats	Lower interest in aviation.		

E. Promote aviation to current and future generations.

Several studies by the Aircraft Owners and Pilots Association (AOPA), the National Association of Business Aviation (NBAA), Airline Pilots Association (ALPA) and the FAA have verified a decrease in the number of pilots and registered general aviation aircraft with the FAA. Airline and corporate aircraft operators are vocal about the shortage of qualified pilots to replace retiring pilots and meet growing air travel demands. The reduction in the number of pilots, aircraft owners, hangar tenants and will ultimately put the long-term future of general aviation airports at risk of closing. In order to ensure long term viability of the Airport, interest in aviation must be supported and enhanced. Various studies done by the AOPA, the NBAA, ALPA and the FAA have demonstrated a decrease in the number of pilots and general aviation aircraft registered with the FAA. The airlines have been vocal about the shortage of qualified pilots to replace retiring pilots and meet growing air travel demands. The result is a reduction in the number of aviation enthusiasts, aircraft owners, hangar tenants and ultimately put the long-term future of GA airports at risk.



The following charts were published in the *MarketWatch* article, "Opinion: The U.S. has a shortage of pilots — and it's going to get worse" by Peter Gall, a teaching assistant professor of mechanical and aerospace engineering at West Virginia University.

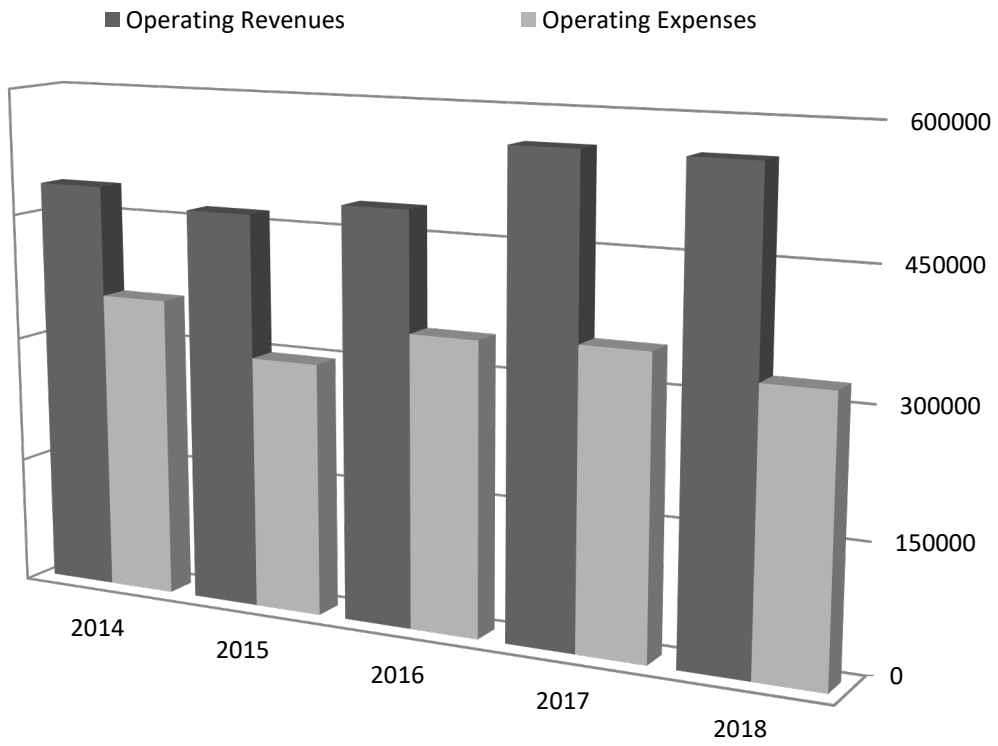


SWOT Analysis

Promote aviation to current and future generations.		Aviation Promotion Strengths	Aviation Promotion Weaknesses
		Popular existing event to use for additional promotion.	Limited manpower to manage promotion.
Aviation Promotion Opportunities	Educational opportunities for youth groups. Innovative aircraft development that may stir new interest in aviation.	**Initiatives** : **Promote aviation at additional Airport events.** **Hold special events when tourism events are taking place in the region.** **Look for opportunities to showcase the latest in aviation to youth groups.**	
Aviation Promotion Threats	Lower interest in aviation among youth. FAA Regulations		

F. Maintain financial stability.

The following chart represents a 5-year history of operating revenues and expenses of the airport.



The difference between operating revenues and expenses represents funds available for local match requirements for FAA AIP grants, which are critical to the Airport.

Total FAA grant revenue and airport capital expenditures is over $35M since 2010.

SWOT Analysis

Maintain financial stability	Financial Strengths	Financial Weaknesses
	Airport does not own buildings, limiting maintenance expenses. Good current financial condition. Property tax funding provides a stable source of funding. Good grant performance. Growth opportunities on airport property.	Lack of diversity in funding sources. Limit to development property long term.
Financial Opportunities	Per NRS, a property tax could be levied to support the Airport. Developable property provides and opportunity for revenue growth.	**Initiatives** : **Seek out development of commercial (restaurant) and aviation related property (hangars).** **Grow the number of airport users.** **Codify receipt of airport related City property taxes.**
Financial Threats	Competition from other airports. Reduced interest in aviation. FAA Regulations	

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