PREPARED FOR:
The City of Tombstone, AZ

PREPARED BY:
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Tombstone Municipal Airport

AIRPORT LAYOUT PLAN UPDATE WITH NARRATIVE

December 2017

2017

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1 INTRODUCTION AND INVENTORY

With grant funding from the Arizona Department of Transportation (ADOT) Multimodal Planning Division's Aeronautics Group and the City of Tombstone, this Airport Layout Plan (ALP) Update with Narrative was prepared to identify existing conditions and develop a 20-year planning document for Tombstone Municipal Airport (P29 or Airport). This Narrative includes a detailed inventory of existing conditions, forecasts of projected aviation demand, existing and future facility needs at the Airport, a financial plan that identifies options for funding facility requirements, and an update to the existing ALP drawings.

Previous planning for the Airport was accomplished in 1999 as part of an Airport Master Plan and ALP Update. The primary difference between an Airport Master Plan and an ALP Update with Narrative is the level of detailed analysis. Given the limited number of changes since the 1999 Master Plan, an ALP Update with Narrative is appropriate for Tombstone Municipal Airport.

The Airport is part of the State of Arizona's airport system and is eligible to apply for airport development grants such as the grant issued for this project. ADOT funds projects including design, construction, safety, security, capacity enhancement, environmental, planning, and land acquisition. P29 is not included in the Federal Aviation Administration's (FAA's) National Plan of Integrated Airport Systems (NPIAS) and is therefore not eligible for FAA funding. FAA guidance, however, on airport development standards is still appropriate for all airports and FAA standards are promoted by ADOT in evaluating eligible projects.

This ALP Update with Narrative has been prepared following the guidelines established in FAA Advisory Circular 150/5300-13A, Change 1, *Airport Design*; the Code of Federal Regulations (CFR) Part 77, "Safe, Efficient Use, and Preservation of the Navigable Airspace", and other state and federal guidance, as appropriate.

Airport Facilities Inventory

A detailed inventory of all Airport facilities and Airport-related information such as land use, weather conditions, area airspace, historical aviation activity, and socioeconomic factors is important to establish a comprehensive understanding of existing conditions. Information was obtained through on-site visits, discussions with Airport staff, review of previous Airport planning documents, review of FAA records, and review of various local and regional planning documents. Inventory data is presented in the following sections:

- Airport Ownership and History
- Airport Location and Access
- Airport Role
- Airport Activity

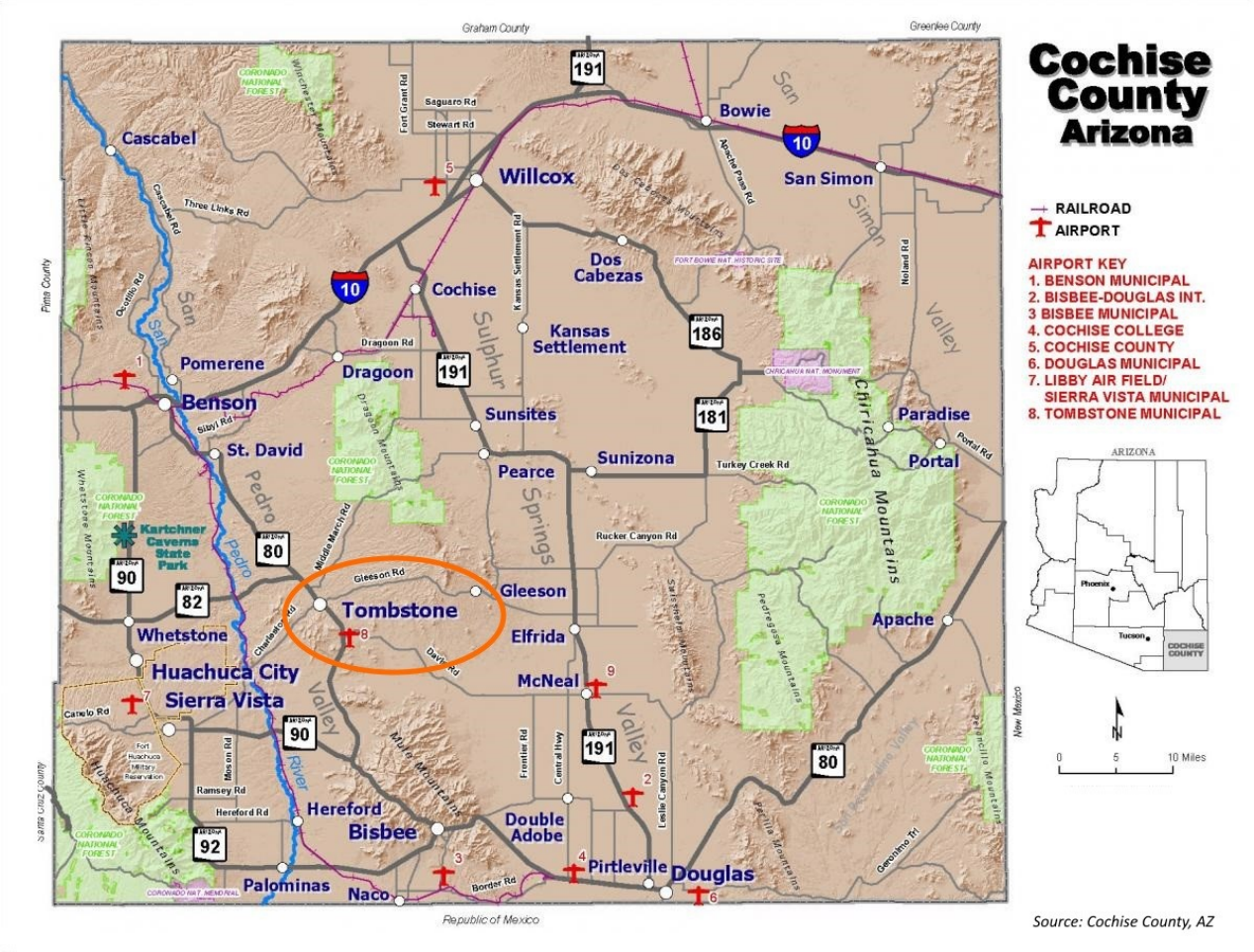
Airport Ownership and History

The Airport is a public facility that is owned and operated by the City of Tombstone, Arizona. According to data from ADOT, the initial construction of the aircraft parking apron and the taxiway that connects it to Runway 06-24 was completed in January 1980. The runway was unpaved until a structural overlay was completed in June 2004 to provide the Airport with a paved runway measuring 4,430 feet long and 60 feet wide.

Airport Location and Access

The Airport is located approximately three miles southeast of the City of Tombstone in Cochise County. Direct access to the Airport is provided by an unpaved road that connects to Arizona State Route 80. The highway is U-shaped and connects Interstate 10 in Benson to the north to Douglas to the south, before reconnecting with Interstate 10 approximately five miles east of the Arizona-New Mexico border. A map of Tombstone Municipal Airport and the surrounding transportation network is identified in **Exhibit 1-1**.

Exhibit 1-1. Airport Location



Sources: Cochise County, Kimley-Horn

Airport Role

From the outset of the planning process, it is important to understand the role of Tombstone Municipal Airport in the national aviation system, as well as in the State of Arizona. One goal of this ALP Update with Narrative is to ensure that the Airport has the necessary facilities to adequately accomplish the various roles that it may play in the local, regional, and national transportation system.

The 2008 Arizona State Airports System Plan (ASASP) identifies Tombstone Municipal Airport as a General Aviation-Basic, Public-Use, non-NPIAS, general aviation facility. The ASASP defines General Aviation-Basic airports as serving a limited role in the local economy, primarily serving recreational and personal flying.

As previously noted, Tombstone Municipal Airport is not included in the FAA's NPIAS. Exclusion of an airport from the NPIAS can be attributed to one of the following reasons: the airport does not meet the minimum NPIAS entry criteria; is located within 20 miles of another NPIAS airport; or the airport owner/operator has chosen not to pursue NPIAS inclusion because they prefer not to be bound by the rules that would accompany federal funding. Tombstone Municipal Airport's exclusion from the NPIAS is attributed to its proximity (17 miles) to Sierra Vista Municipal Airport, a NPIAS airport. Other nearby NPIAS airports include Bisbee-Douglas International Airport – 25 miles and Benson Municipal Airport – 30 miles. Additional information on these airports is provided in a subsequent section.

Airport Activity

In addition to providing an understanding of the levels and types of aviation activity that occur at Tombstone Municipal Airport, historic aviation activity can be used to identify recent trends that may impact future activity levels. Historic data for the aircraft operations and based aircraft components of Airport activity are summarized below. These two components of Airport activity are examined in greater detail in a subsequent section of this Narrative.

Aircraft Operations

A common measure of airport activity is the number of aircraft operations occurring on an annual basis. An aircraft operation is defined as either a landing or a departure (also referred to as a takeoff). For example, a touch-and-go operation, where an aircraft lands and takes off without leaving the active runway, which is typical of training aircraft, counts as two operations.

Aircraft operations are categorized in several ways, one of which is whether the operation is itinerant or local in nature. Itinerant operations are those conducted by aircraft coming from outside the airport's traffic pattern. Local operations are conducted by aircraft remaining in the local traffic pattern, conducting simulated instrument approaches at the airport, or by aircraft

going to or from the airport and a practice area within a 20-mile radius. Touch-and-go training activity is an example of local activity. Once categorized as itinerant or local operations, aircraft activity is further categorized by the nature of the operator. Itinerant aircraft operations are categorized into one of the following groups: air carrier, air taxi, general aviation, or military. Local operations are categorized as either general aviation or military.

According to the 2008 ASASP, 300 aircraft operations were estimated at Tombstone Municipal Airport for 2008, all of which were itinerant general aviation operations. The latest FAA 5010 Airport Master Record identified that in the 12-month period ending April 28, 2014, the Airport had 40 local operations and 300 itinerant operations, for a total of 340 operations.

It should be noted that previous studies referenced in the 1999 Master Plan including the 1995 Arizona State Aviation Needs Study and the 1994 Cochise County Airport System Plan reported that Tombstone Municipal Airport received between 200 and 300 annual operations. Based on an analysis of existing data and previous forecasts, it is estimated that in 2016, there were 350 total aircraft operations; 300 itinerant and 50 local. This estimate is used as a starting point for forecasts of aviation demand in Section 2 of this Narrative.

Based Aircraft

The FAA defines a based aircraft as "an aircraft that is operational and airworthy, which is typically based at an airport for a majority of the year." Based aircraft are stored at an airport in a hangar building or tied down on an airport apron area. According Airport Management, there are two single-engine based aircraft at Tombstone Municipal Airport as of August 2016. The 2008 ASASP also noted two single-engine based aircraft at that point in time. The 1999 Master Plan noted that there were no based aircraft at the Airport in 1998, however, there were five based aircraft in Cochise County registered to aircraft owners in Tombstone. Based on information provided by Airport management, it is confirmed that there were two based aircraft at Tombstone Municipal Airport in 2016.

Existing Airport Facilities

An essential element of the planning process for Tombstone Municipal Airport is identifying the location and characteristics of existing facilities and ultimately determining their ability to meet the future needs of the Airport and its users. The inventory of existing facilities at the Airport was completed through physical inspection, discussions with Airport management and staff, and review of existing Airport documents, airport layout plans, and related studies.

To facilitate the inventory process, existing Airport facilities are categorized and examined in the following sections:

- Airport Property
- Airfield Facilities

- Landside Facilities
- Support Facilities

These inventory categories comprise important components of the Airport's infrastructure. For the Airport to efficiently accommodate future demand, each component must provide sufficient capacity while at the same time seamlessly integrate with other infrastructure components to support general aviation, limited military operations, and tenant needs.

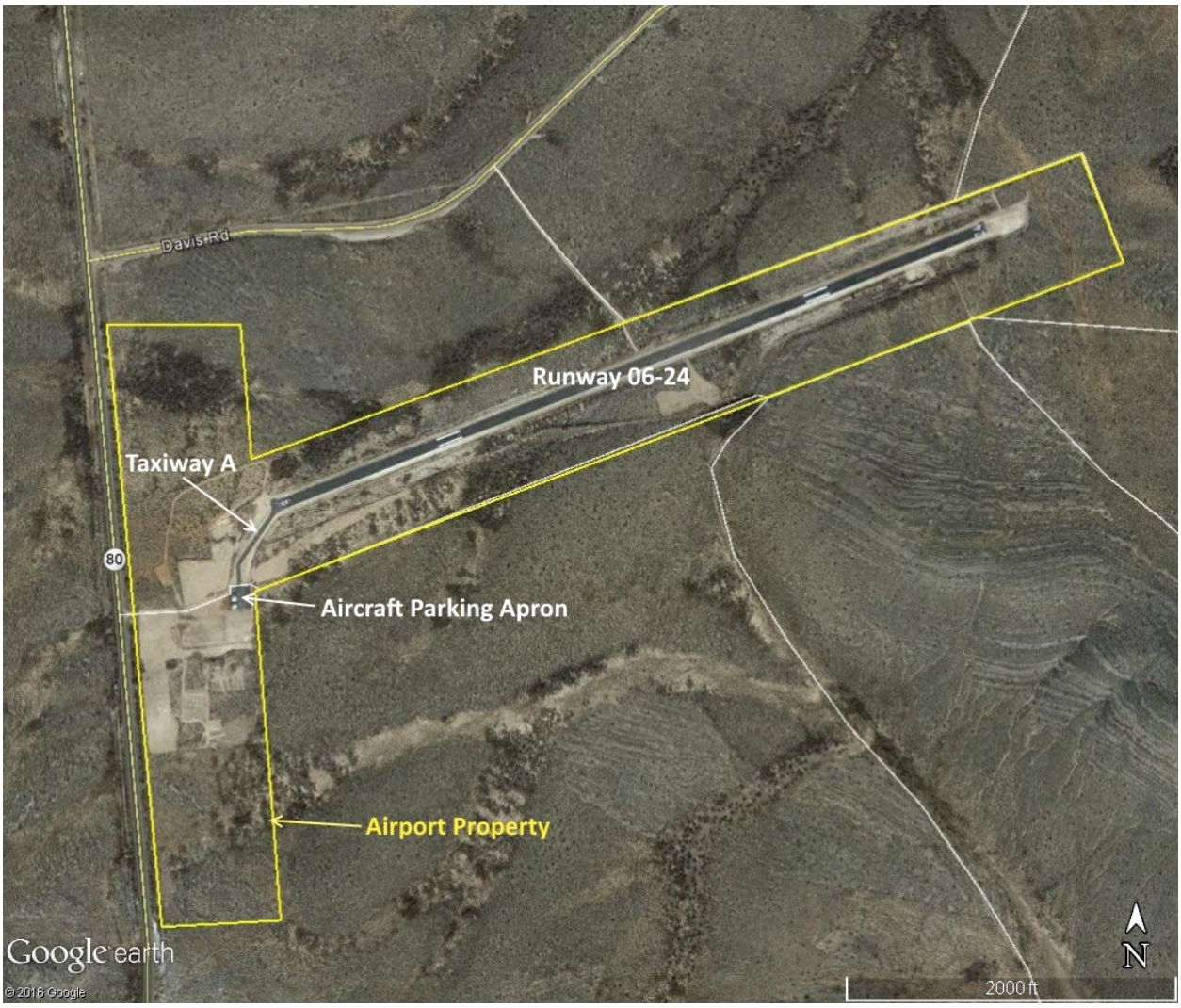
Airport Property

The existing Airport property is approximately 150 acres in size and is surrounded by undeveloped State-owned land. The entire property is fenced, and the previous 1999 Master Plan identified specific parcels of the Runway Protection Zone (RPZ) that were recommended to be acquired, however, this has not been completed to date.

Airfield Facilities

Existing airfield facilities at Tombstone Municipal Airport are shown in **Exhibit 1-2**. The following sections describe Airport facilities in greater detail.

Exhibit 1-2. Existing Facilities



Sources: Google Earth, 1999 Airport Layout Plan, Kimley-Horn

Runway 06-24

Runway 06-24 is an asphalt surface runway that is 60 feet wide and 4,430 feet long. A structural asphalt concrete overlay was completed in June 2004. Prior to that, the runway was unpaved. The most recent pavement inspection was conducted by ADOT in April 2013. The report from this inspection is available through ADOT Aeronautics Group's Airport Pavement Management System website. The website shows an overall Pavement Condition Index (PCI) of 56 for the runway, which on a scale of 1-100 is defined by ADOT as "good". The inspection noted large amounts of low- and medium- severity weathering and longitudinal and transverse cracking. Approximately 1,700 square feet of runway pavement was identified as having high-severity weathering where a significant amount of fine material was missing from the pavement surface. Medium- and high-severity raveling and swelling were also noted near the edge of the runway where vegetation was deteriorating the pavement and creating bulges. In 2014, Kimley-

Horn and Associates conducted a crack-seal project on the Runway which also included herbicide application, crack repairs, full depth pavement patching, placing rubberized asphalt emulsion seal coat, and new striping and pavement markings to Runway 06-24 and to the taxiway and apron at the west end of runway. Specifications of Runway 06-24 are shown in **Table 1-1**.

Table 1-1. Runway 06-24 Specifications

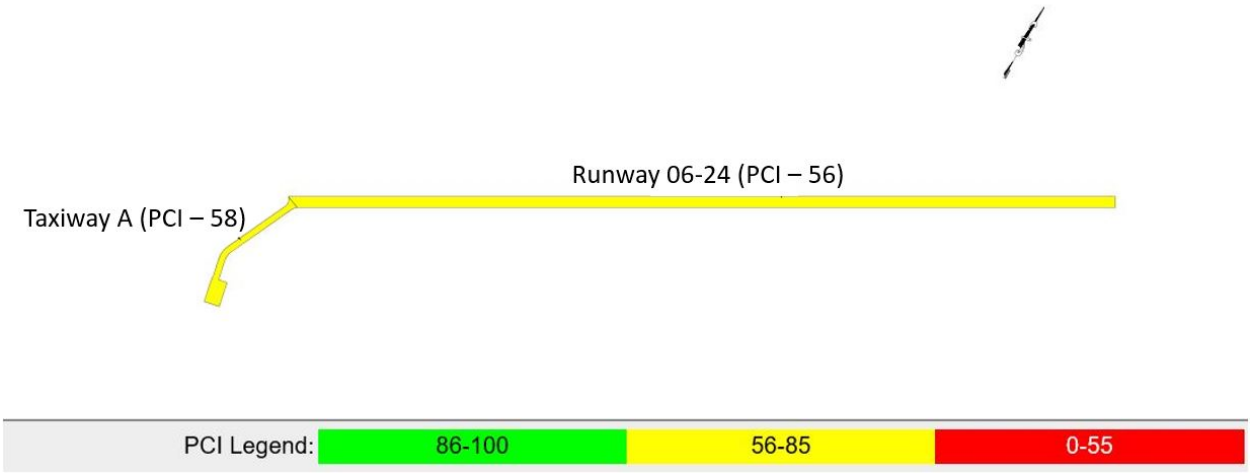
Runway 06-24	
Length	4,430’
Width	60’
Surface/Conditions	Asphalt – Good

Source: FAA Form 5010, Airport Master Record

Taxiway A

Taxiway A is approximately 500 feet long and connects Runway End 06 to the aircraft parking apron. The taxiway was initially constructed in January 1980, and had a PCI of 58 when it was inspected in April 2013. The inspection noted that Taxiway A was in similar condition to Runway 06-24 but also had high-severity longitudinal and transverse cracking in areas of severe spalling. A graphical representation of the PCI ratings for Runway 06-24, Taxiway A, and the aircraft parking apron is provided in **Exhibit 1-3**.

Exhibit 1-3. Pavement Condition



Source: Arizona Department of Transportation

Lighting, Runway Markings, and NAVAIDs

Airport lighting and runway markings are important to support the control and movement of aircraft in the airfield area. They also help pilots visually identify their location relative to the airport and the airfield area. Navigational aids, or NAVAIDs, are electronic or visual devices that

provide guidance to pilots during the landing or takeoff of an aircraft. Existing airfield lighting and NAVAID equipment at Tombstone Municipal Airport are summarized in **Table 1-2**.

Table 1-2. Runway 06-24 Markings and NAVAIDs

Runway 06-24	
Runway Marking/Condition	Basic Markings/Good Condition
NAVAIDs	Wind Cone

Sources: 1999 Airport Layout Plan, FAA Form 5010, Airport Master Record

There is no runway or taxiway lighting at Tombstone Municipal Airport. The 1999 Master Plan recommended that both Runway 06-24 and the taxiway be equipped with lighting systems by 2005, however, this has not occurred to date.

Runway 06-24 has visual runway markings that include the runway end designations, pavement edge striping, runway centerline, and aiming point markings. According to ADOT Aeronautics Group's Airport Pavement Management System website, the basic runway markings at Tombstone Municipal Airport have paint that is flaking off the surface or has worn to a point where portions of the painted surface no longer have paint on them.

The 1999 Master Plan identified several improvements to the NAVAID system at the Airport, however, this has not been completed to date. Recommendations for any NAVAIDs are addressed in Section 3, Facility Requirements.

Landside Facilities

Landside facilities at airports consist of a wide variety of buildings and equipment that support airport operations. For the purposes of this analysis, the following facilities at Tombstone Municipal Airport are categorized and examined as landside facilities:

- Aircraft Hangars
- Aprons and Tie-Downs

Aircraft Hangars

There are two "box" aircraft hangars at Tombstone Municipal Airport. The hangar located on the north section of the aircraft parking apron is approximately 1,400 square feet in size, while the hangar located on the south section of the apron is approximately 1,000 square feet in size. The hangars were constructed in the early 2000's and are considered to be in fair condition.

Aprons and Tie-Downs

Tombstone Municipal Airport has one aircraft parking apron that is approximately 10,500 square feet in size. The apron is located southwest of Runway End 06 and includes a taxilane that is approximately 3,800 square feet. There are four aircraft tie-downs on the aircraft parking apron.

Support Facilities

Support facilities are those elements that aid the functionality and operation of the Airport. The following sections describe existing support facilities at the Airport.

Automobile Parking

The Airport does not have designated parking spaces for automobiles. There is a significant amount of unpaved open space south of the apron that can be utilized for auto parking. It was recommended in the 1999 Master Plan to develop seven auto parking spaces, however, this has not been completed to date. Auto parking facility needs are addressed in Section 3, Facility Requirements.

Airport Fencing and Security

Airport access is provided by U.S. Highway 80. There is a paved turn-off that proceeds to an unpaved access road that extends to the Airport. The Airport is also equipped with a padlocked chain-link security gate. The Airport is fully enclosed with four-foot high barbed wire fencing. Several sections of the fence are damaged.

Utilities

No utilities are currently provided at the Airport. Section 3, Facility Requirements identifies utilities that may be needed based on facility improvements in the future.

Airspace and Approaches

Airspace in the U.S. is classified generally as controlled, uncontrolled, or special use. Controlled airspace encompasses those areas where there are specific certification, communication, and navigation equipment requirements that pilots and aircraft must meet to operate in that airspace. The airspace in the Tombstone region is described further below.

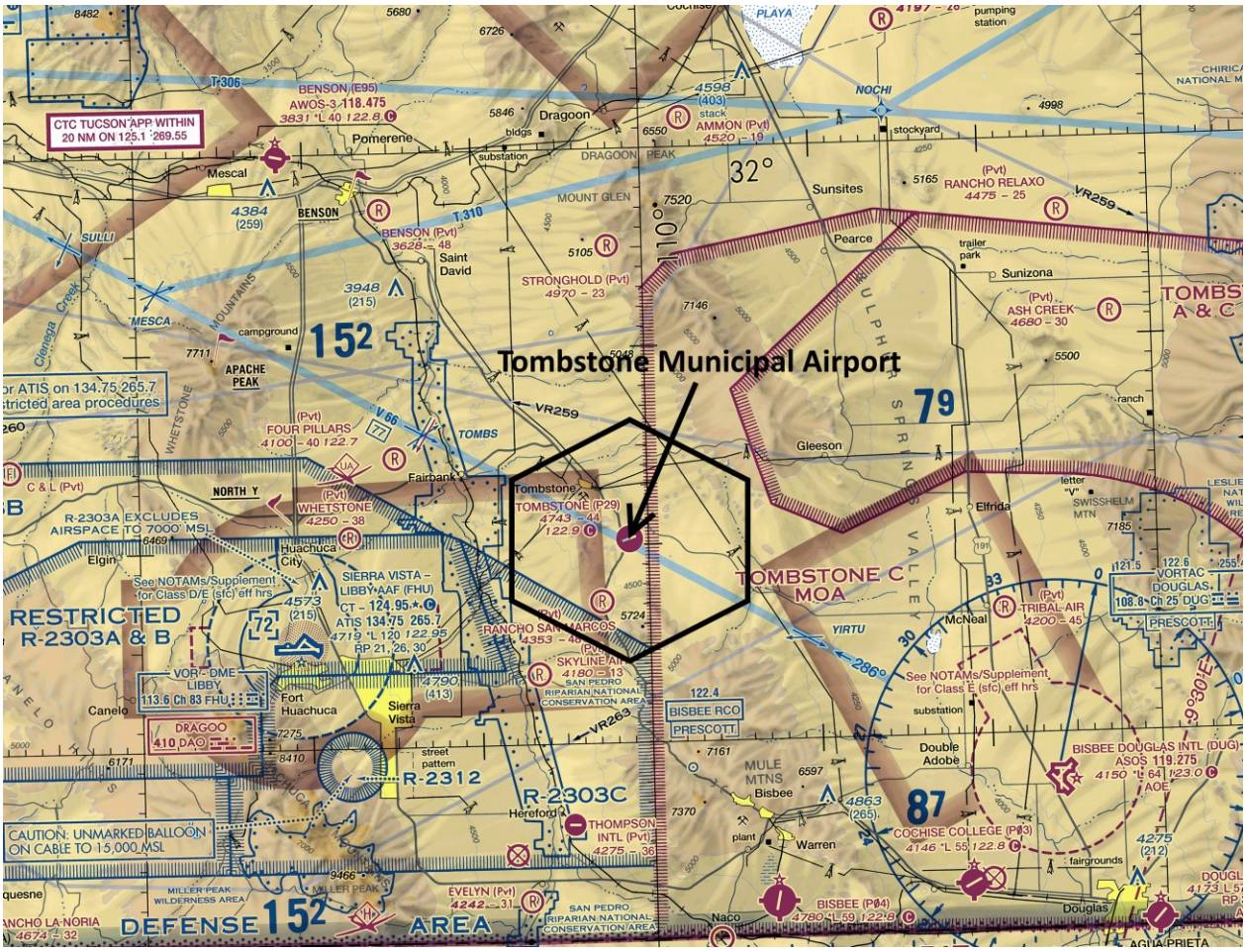
Airspace Designation

Through Federal Aviation Regulations (FARs), airspace classifications have been developed to promote the safe and efficient movement and control of aircraft during flight and approach/departure procedures. Airspace classifications are identified on sectional aeronautical charts published by the FAA's National Aeronautical Charting Office.

A graphical representation of the airspace surrounding Tombstone Municipal Airport is shown in **Exhibit 1-4**.

As shown, there are Restricted Areas, Alert Areas, and Military Operating Areas (MOAs) near the Airport. The following sections identify these designated areas in greater detail.

Exhibit 1-4. Airspace Classifications Near Tombstone Municipal Airport



Source: FAA Sectional Chart

Restricted Areas

Restricted areas contain airspace identified by an area on the surface of the earth within which the flight of aircraft, while not wholly prohibited, is subject to restrictions. Restricted areas denote the existence of unusual, often invisible, hazards to aircraft; examples include artillery firing, aerial gunnery, or guided missiles. Penetration of restricted areas without authorization from the using or controlling agency may be extremely hazardous to the aircraft and its occupants. There are multiple restricted areas within the vicinity of Tombstone Municipal Airport. Approximately 10 miles to the west are Restricted Areas 2303A and 2303B and 6 miles to the south and southwest is Restricted Area 2303C.

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 be particularly alert when flying in these areas. All activity within an alert area shall be conducted in accordance with the Code of Federal Regulations (CFRs), without waiver, and pilots of

participating aircraft as well as pilots transiting the areas shall be equally responsible for collision avoidance. The Tombstone C Military Operations Area (MOA) is located approximately 5 miles east of the Airport and is designated as an alert area.

Military Airspace

A MOA consists of airspace of defined vertical and lateral limits established for the purpose of separating certain military training activities from instrument flight rule (IFR) traffic. Whenever a MOA is being used, nonparticipating IFR traffic maybe be cleared through a MOA if IFR separation can be provided by air traffic control. Otherwise, air traffic control will reroute or restrict nonparticipating IFR traffic. Pilots operating under visual flight rule (VFR) should exercise caution while flying within a MOA when military activity is being conducted. Prior to entering an active MOA, pilots should contact the controlling agency for traffic advisories. The Tombstone C MOA is approximately 5 miles east of the Airport and extends approximately 30 miles to the southeast.

Approach and Departure Procedures

Tombstone Municipal Airport does not have instrument approach capabilities, therefore, does not have any published instrument approaches or departures. The visual approach at the Airport is a standard 20:1 surface meaning that a landing aircraft will approach the landing threshold of the runway at a ratio of 20 horizontal feet to 1 vertical foot.

Airspace Obstacles

Obstacles to airport environs and approach and departure surfaces are important to identify as they impact operational safety at an airport. According to the FAA's Digital Obstacle File, there is one identified obstacle near Tombstone Municipal Airport which is a tower located approximately three miles northwest of the Airport.

Climatic and Meteorological Conditions

Climatic and meteorological conditions are important considerations in the analysis and development of aviation-related facilities. Considerations related to temperature and wind speed help identify facility requirements at specific airports. Effective airport planning and development can minimize the impacts that climatic and meteorological conditions have on aircraft operations and can promote the maximum utilization of airport facilities.

Climate data were collected from the previous Airport Layout Plan and wind data were obtained from Sierra Vista Municipal Airport as it is the nearest facility with weather information that is available from an automated surface observing system (ASOS). Wind data include hourly observations from 2006 to 2015. Climatic and meteorological data relevant to the Airport Layout Plan Update with Narrative can be summarized as follows:

- Over 93 percent of the wind is under 10.5 knots
- Mean daily max temperature at the Airport in the hottest month (June) is 94.7 degrees

Wind coverage for Tombstone Municipal Airport is identified in Table **1-3**. The FAA's Airports Geographic Information System (AGIS) website was used to conduct analysis of the wind data from the Sierra Vista Municipal Airport's ASOS, as there are no weather stations at or near Tombstone Municipal Airport. According to the wind data analysis, the existing runway orientation at the Airport does not provide 95 percent coverage for all aircraft types under both VFR and IFR conditions.

Table 1-3. Runway 06-24 Wind Coverage

	10.5 kt.	13 kt.	16 kt.
All Weather	92.8%	96.3%	99.0%
IFR	76.6%	83.9%	92.0%
VFR	88.0%	93.6%	98.2%

Source: FAA AGIS Website, https://airports-gis.faa.gov/public/windrose_help.html, accessed August 2016

The impacts that these climatic and meteorological conditions have on Tombstone Municipal Airport and the operation of aircraft at the Airport are examined in detail in Section 3, Facility Requirements.

Area Land Use and Zoning

Identifying land use and zoning characteristics in the environs of airports is an important task in the airport planning process because of significant impacts that incompatible development in the airport area can have on the facility's continued operation and development. Working with the relevant planning commissions, counties, municipalities, or other entities to promote compatible land uses and zoning in the environs of the airport can allow the facility to continue to operate and develop in a manner that minimizes the impacts of the airport on non-compatible land uses.

Currently, the Airport property is located outside of City-Zoned parcels. The land surrounding the Airport is undeveloped. As such, there are no designated overlay districts or specific zoning codes that impact the Airport.

As it pertains to Cochise County, Tombstone Municipal Airport is located in an unincorporated area of the County. All of the unincorporated areas of Cochise County have been zoned. Zoning districts specify permitted land uses, minimum lot sizes, and certain site development standards such as setbacks and screening. Because Cochise County encompasses a large and diverse area, there are 34 individual zoning districts. However, for general purposes, the majority of these zoning districts can be classified into three broad groupings: Rural, Residential and Commercial/Industrial.

The Airport is located in a Rural Zoning District (RU). Approximately 90 percent of the unincorporated areas of the County are zoned RU (Rural). These districts allow residential uses on large acreage, as well as some other uses typically found in rural areas. In addition, a wide range of commercial and industrial activities are also possible as Special Uses, which require, on a case-by-case basis, a public hearing and approval by the Cochise County Planning and Zoning Commission.

Environmental Considerations

Various environmental factors can have significant effects on development at Tombstone Municipal Airport. An environmental overview has been developed to identify and note certain environmental factors that may impact development of facilities at the Airport. Because the Airport is located in an isolated area, environmental considerations such as air quality, prime farmland, and parks/natural resource areas are not examined. For the purposes of this Narrative, wetlands, threatened or endangered species, and cultural resources are identified.

Wetlands

Based on data provided by the National Wetlands Inventory, there is one wetland area located on Airport property, and one immediately northeast of the Airport. The wetland on Airport property is a freshwater pond approximately 0.6 acres in size. The second wetland, located approximately one-half mile northeast of Runway End 24, is also categorized as a freshwater pond, approximately 8.3 acres in size. It should be noted that these wetlands are likely dormant for extended periods of time due to arid climatological conditions. These wetland areas are shown in **Exhibit 1-5**.

Exhibit 1-5. Airport Area Wetlands

Source: U.S. Fish and Wildlife National Wetlands Inventory, Downloaded August 2016

Threatened and Endangered Species

According to the U.S. Fish and Wildlife Service, there are no critical habitat areas or threatened and endangered species near Tombstone Municipal Airport. The nearest critical habitat is approximately 10 miles to the west at the San Pedro Riparian National Conservation Area.

Cultural Resources

The National Park Service's Register of Historic Places identifies 6 properties in the City of Tombstone, all of which are in the Tombstone Historic District in the central business district. These properties are all located approximately three miles northwest of the Airport and were not noted to incur any impacts from Airport-related activity.

Other Area Airports

In addition to examining market area characteristics, it is also important to understand the dynamics of aviation activity in the Tombstone area and the impacts that other nearby airports may have on aviation demand. The location of other airports and the level of service and activity that they support is an important consideration in developing a long-range development plan for the Airport. Nearby airports and their relevant characteristics are summarized in **Table 1-4**. A graphical representation of nearby airports is shown in **Exhibit 1-6**.

Table 1-4. Airports within 50 NM of Tombstone Municipal Airport

Airport	FAA ID	Distance from P29	Primary Runway Length	Primary Runway Width	Approach Type	Based Aircraft (2015)	Annual Operations (2015)	Aircraft Fuel
Sierra Vista Municipal Airport-Libby Army Airfield	FHU	17 NM (W)	12,001’	150’	Precision	55	119,274	100 LL Jet A
Bisbee-Douglas International Airport	DUG	25 NM (SE)	6,430’	100’	Non-Precision	5	19,700	100 LL Jet A
Cochise County Airport	P33	35 NM (N)	6,095’	75’	Non-Precision	21	8,500	100 LL Jet A
Benson Municipal Airport	E95	20 NM (NW)	4,002’	75’	Visual	44	16,790	100LL Jet A

Sources: FAA Form 5010, www.airnav.com

Exhibit 1-6. Nearby Airports

Sources: Google Earth, Kimley-Horn

Existing Documentation

The previous Master Plan and ALP Update for Tombstone Municipal Airport was completed in 1999 and included facility planning recommendations through 2020. A summary of Immediate-Term (1999-2000), Short-Term (2001-2005), and Ultimate-Term (2006-2020) facility recommendations from the Study are shown in **Table 1-5**. An analysis of the recommended projects was conducted to determine which action items had been completed. Completed projects in **Table 1-5** are highlighted with blue text, while incomplete projects are highlighted in red.

Table 1-5. 1999 Master Plan Facility Recommendations

Facility	Immediate-Term (1999-2000)	Short-Term (2001-2005)	Ultimate-Term (2006-2030)
Runway 06-24	-Mark or remove FAR Part 77 obstructions -Pave Runway 6-24 with asphalt -Mark Runway 6-24 for visual operations -Acquire land for RPZs	-Install Medium Intensity Runway Lighting (MIRL)	-Extend and widen Runway 06-24 to 6,100' x 75' -Extend/construct MIRL on extension -Land acquisition for ultimate improvements/RPZs
Crosswind Runway			-Develop 4,900' x 60' graded crosswind runway
Taxiways	-Provide centerline pavement markings -Clear TWY shoulders and apply herbicide	-Install Medium Intensity Taxiway Lighting (MITL) -Apply seal coat to taxiway pavement	-Construct paved turnarounds at each runway end -Install MITLs on turnarounds -Reroute existing parking apron access taxiway
Aprons/ Hangars	-Apply crack sealing -Provide taxilane and tie-down markings -Designate land for 7 based aircraft -Construct secured aircraft storage hangar -Install security fencing around terminal area	-Install security floodlighting -Apply seal coat to apron pavement	-Provide tie-downs/hangar storage to accommodate ultimate demand
Airport Fencing		-Refurbish existing property line fencing	-Extend property line fencing for ultimate land acquisitions
NAVAIDs		-Install new rotating beacon -Construct segmented circle and provide lighting for primary wind cone -Remove secondary wind cone -Install Precision Approach Path Indicators (PAPIs) on each Runway end	-Install/relocate PAPIs for both runway ends
Auto Parking & Access Road	-Pave existing access road -Provide 7 auto parking spaces		
Utilities	-Extend phone and electric utilities	-Develop on-site water system and sanitary sewer disposal system	
Fuel System	-Determine site location for potential fuel system		
Terminal Building		-Provide 250 square foot general aviation building	
Recreational Facilities		-Develop an Airport campground with restroom facilities	

Sources: 1999 Master Plan, Kimley-Horn

Summary

The inventory data presented in this section provide a framework from which analysis for the Tombstone Municipal Airport ALP Update with Narrative is based upon. Some inventory data, such as airport role, historic activity, and existing airport facilities are used to develop forecasts of future activity levels at the Airport and to determine future facility requirements. Many of the data presented in this section are used to conduct numerous analyses as the airport planning process works towards identifying a recommended development plan for the Airport.

2 FORECASTS OF AVIATION DEMAND

This section discusses the findings and methodologies used to project or forecast aviation demand at Tombstone Municipal Airport over the next 20 years. It is important to recognize that there can be short-term fluctuations in an airport's activity due to a variety of factors that cannot be anticipated. The forecasts developed in this Airport Layout Plan Update with Narrative provide a meaningful framework to guide analysis for future Airport development needs and recommendations.

The projections of aviation demand developed for Tombstone Municipal Airport are documented in the following sections:

- Socioeconomic Factors
- Historical Airport Activity
- Based Aircraft Forecasts
- Aircraft Operations Forecasts
- Peaking Characteristics and Peak Hour Operations Forecasts
- Forecast Summary

This forecast analysis includes methodologies that consider historical aviation trends at the Airport and throughout the nation. Local historical data was compiled from Airport records, online aviation databases, and the 2008 Arizona State Airports System Plan (ASASP).

Demographic data for Cochise County and the State of Arizona were obtained from Woods and Poole Economics, Inc. These data were analyzed to track local and/or regional trends and conditions to project aviation demand at Tombstone Municipal Airport. Projections of aviation activity for the Airport were based on activity estimated for calendar year 2015 and were prepared for near-term (2020), mid-term (2025), and long-term (2035) timeframes. These projections are generally unconstrained and assume the Airport is able to develop the various facilities necessary to accommodate activity.

Socioeconomic Factors

Tombstone is a small rural city and because of this, Cochise County socioeconomic characteristics are analyzed as they pertain to aviation activity at the Airport. Historical trends and future projections of the region's population, employment, and earnings can provide meaningful input in relationship to airport activity. Socioeconomic factors are important to analyze because the level of activity at an airport typically often emulates the economic condition of the region. Woods and Poole Economics, Inc. data for Cochise County and the State of Arizona were examined to generate projections for Tombstone Municipal Airport through 2035.

Table 2-1 reviews the population growth trends of Cochise County and the State of Arizona over an 8-year period. The compound annual growth rate (CAGR) was calculated for population and other data elements as this metric generates linear annual gains for a particular series of data. It should be noted that CAGR calculates a constant rate of change and dampens the effect of volatility during periods that experience significant change, and is essentially a "smoothed" annual growth rate.

Table 2-1. Comparison of Historical Population Growth Trends

Year	Cochise County	Arizona
2007	127,659	6,140,389
2008	129,020	6,280,360
2009	130,080	6,343,150
2010	131,790	6,413,740
2011	134,154	6,538,126
2012	136,518	6,662,512
2013	138,882	6786,898
2014	141,246	6,911,284
2015	143,610	7,035,670
CAGR 2007-2015	1.48%	1.72%

Source: Woods and Pool Economics, Inc. for years 2000, 2008-2010, and 2015; data between those years were extrapolated

As shown in **Table 2-1**, historical population growth was identified for Cochise County and the State of Arizona. Between the years of 2007 and 2015, the CAGR of population growth in Cochise County was 1.48 percent. In the same timeframe, the State of Arizona experienced a population growth at a CAGR of 1.72 percent, slightly higher than that of Cochise County.

In addition to the population, there are other demographic factors that can significantly impact aviation activity. As stated previously, regional economic factors can play a significant role in the level of activity experienced at an airport. **Table 2-2** summarizes historical Employment and Gross Regional Product (GRP) for Cochise County and the State of Arizona. Similar to Gross Domestic Product (GDP), GRP is defined as the market value of all final goods and services produced within a metropolitan area in a given period of time. It should be noted that data obtained from Woods and Poole Economics, Inc. are reported in constant dollars (year 2015) to adjust for inflation over time.

Table 2-2. Historical Cochise County and State of Arizona Employment and Gross Regional Product

Year	Cochise County		State of Arizona	
	Employment (in thousands)	Total GRP (in millions)	Employment (in thousands)	Total GRP (in millions)
2007	58,508	$4,858.0	3,324,419	$281,230.5
2008	59,670	$5,058.7	3,399,940	$290,140.9
2009	59,120	$5,017.1	3,217,660	$274,524.3
2010	59,200	$5,024.3	3,227,560	$275,543.0
2011	59,880	$5,123.3	3,279,054	$282,366.6
2012	60,560	$5,222.3	3,330,548	$289,190.1
2013	61,240	$5,321.3	3,382,042	$296,013.7
2014	61,920	$5,420.3	3,433,536	$302,837.3
2015	62,600	$5,519.3	3,485,030	$309,660.9
CAGR 2007-2015	0.85%	1.61%	0.59%	1.21%

Source: Woods and Poole Economics, Inc.

As shown in **Table 2-2**, employment in Cochise County grew at an annual rate of almost one percent from 2007-2015. The Cochise County employment growth rate of 0.85 percent exceeds the State of Arizona whose employment growth rate was 0.59 percent during the same timeframe. Similarly, total GRP in Cochise County increased 1.61 percent annually between 2007 and 2015, while the State of Arizona's GRP increased 1.21 percent annually during the same timeframe. Between 2008 and 2010, Cochise County and the State of Arizona experienced declines in GRP, which are likely attributed to the recession that occurred nationally during that time.

Statistical analysis typically indicates that regional earnings is one of the most important demographic factors impacting aviation demand, illustrating an underlying assumption that as earnings, and consequently discretionary income grows, individuals have more income to spend on goods and services, including aviation-related goods and services. Total employment and total GRP growth rates of Cochise County outperformed that of the State. Based on this analysis, the projected economic conditions in the County could support growth at the Airport in the foreseeable future.

Per capita personal income (PCPI) is another way to measure the economic growth of an area. PCPI measures the average income earned per person in a given area (city, region, country, etc.) in a specified year. It is calculated by dividing the area's total income by its total population. **Table 2-3** presents a summary of historical PCPI figures for Cochise County and Arizona. It should be noted that PCPI data obtained from Woods and Poole Economics, Inc. is reported in constant dollars (year 2015) to adjust for inflation over time.

Table 2-3. Historical Cochise County and State of Arizona Per Capita Personal Income

Year	Cochise County PCPI (in 2015 $)	Arizona PCPI (in 2015 $)
2007	$35,698.2	$39,202.2
2008	$36,915.4	$39,724.9
2009	$37,902.1	$38,386.3
2010	$37,733.4	$38,373.0
2011	$37,989.5	$38,663.5
2012	$38,245.5	$38,954.0
2013	$38,501.6	$39,244.6
2014	$38,757.7	$39,535.1
2015	$39,013.8	$39,825.7
CAGR 2007-2015	1.12%	0.20%

Source: Woods and Poole Economics, Inc.

As shown in **Table 2-3**, PCPI in Cochise County has grown at a rate of 1.12 percent annually between 2007 and 2015 while the State of Arizona has grown at a rate of 0.20 percent over the same period. The State of Arizona's PCPI is higher than Cochise County in every year, however, it's growth rate was 0.92 percent less than Cochise County between 2007 and 2015.

Historical Airport Activity

At general aviation airports such as Tombstone Municipal Airport, there are two primary indicators of activity; based aircraft (BAC) and annual operations. Historical based aircraft and operations data for Tombstone Municipal Airport provide the baseline from which future activity at the Airport can be projected. The Airport does not have an Air Traffic Control Tower (ATCT), and it is not included in the FAA's NPIAS, which means that historical data identified in databases such as the FAA's Terminal Area Forecasts (TAF) are not available. As such, base year 2015 data for based aircraft and aircraft operations have been determined by an on-site inventory and information provided by Airport Management.

Historical Based Aircraft

The only resource available to identify historical based aircraft since the 1999 Master Plan for Tombstone Municipal Airport is the Arizona State Airports System Plan (ASASP). The 2008 ASASP identified two based aircraft in 2007. Airport Management has confirmed that there are still two based aircraft at the Airport.

Historical Aircraft Operations

Since Tombstone Municipal Airport does not have an ATCT, historical aircraft operations represent estimates of activity from the 2008 ASASP and information provided by Airport Management for base year 2015.

Based on information provided by the ASASP, it was estimated that 300 operations occurred in 2007. Previous studies referenced in the 1999 Master Plan including the 1995 Arizona State Aviation Needs Study and the 1994 Cochise County Airport System Plan reported that Tombstone Municipal Airport received between 200 and 300 annual operations. Based on an analysis of existing data and previous forecasts, it is estimated that in 2015, there were 350 total aircraft operations. This figure is used as the number of annual operations for base year 2015.

Based Aircraft Forecasts

The 2008 ASASP identified based aircraft forecasts for Tombstone Municipal Airport through 2030 applying an annual growth rate of 1.35 percent. This figure is extrapolated through 2035 and shown in **Table 2-4** to identify based aircraft at the Airport over a 20-year horizon.

Table 2-4. 2008 ASASP Forecast

Historical	ASASP
2015	2
Projected	
2020	2
2025	3
2035	4

Source: 2008 Arizona State Airports System Plan

Although the extension of this forecast may be a reasonable outlook for based aircraft at Tombstone Municipal Airport, additional methodologies have been developed for this Airport Layout Plan Update with Narrative. These methodologies are detailed in the following sections.

It should be noted that certain types of methodologies typically employed for forecasting are not useful for projections presented in this Airport Layout Plan Update with Narrative. Methodologies such as regression or trend analysis utilize historical data to project future activity. With limited change in the historical data, these methodologies do not provide an accurate portrayal of potential future aviation-related activity at Tombstone Municipal Airport. Therefore, additional methodologies to project based aircraft at the Airport have been developed. The following sections identify 20-year forecasts of based aircraft demand using socioeconomic and market share methodologies.

Socioeconomic – Based Aircraft: Population Variable Methodology

Socioeconomic factors of a community do not always impact or reflect aviation-related activity at a nearby airport; however, they can often give direction to the overall health of the local economy and the potential type of aircraft activity that may be occurring at that airport. According to data obtained from Woods and Poole Economics, Inc., an independent firm that specializes in long-term county economic and demographic projections, the population of

Cochise County is anticipated to increase from 143,610 in 2015 to 192,280 in 2035, which reflects a CAGR of 1.47 percent.

Based on data obtained from the ASASP and Airport Management, there were two based aircraft at Tombstone Municipal Airport in 2015. The Socioeconomic Based Aircraft-Population Variable Methodology for based aircraft forecasts assumes that between 2015 and 2035, the number of based aircraft at the Airport will increase at the same rate as the population of Cochise County. Using this methodology, the number of based aircraft at Tombstone Municipal Airport is projected to increase from two in 2015 to three in 2035. A summary of all methodologies for based aircraft forecasts is provided in **Table 2-5**.

Socioeconomic – Based Aircraft: Employment Variable Methodology

Similar to the Socioeconomic Based Aircraft-Population Variable Methodology, the Socioeconomic Based Aircraft-Employment Variable Methodology assumes that between 2015 and 2035 the number of based aircraft at the Airport will increase at the same rate as the number of employed individuals in Cochise County. According to Woods and Poole Economics, Inc., the number of employed individuals in Cochise County is anticipated to increase from 62,600 in 2015 to 89,315 in 2035, a CAGR of 1.79 percent. As shown in **Table 2-5**, the number of based aircraft at Tombstone Municipal Airport is projected to increase from two in 2015 to three in 2035.

Socioeconomic – Based Aircraft: PCPI Variable Methodology

PCPI can be an indicator of a local population's propensity to travel or own an aircraft. PCPI is examined to project based aircraft at the Airport and the result is depicted in **Table 2-5**. According to the Socioeconomic Based Aircraft-PCPI Variable Methodology, the number of based aircraft at Tombstone Municipal Airport is projected to increase from two in 2015 to three in 2035.

Socioeconomic – Based Aircraft: Total Retail Sales Variable Methodology

The fourth socioeconomic variable examined to project based aircraft at the Airport is Total Retail Sales. Retail sales indicate the spending strength of a given location and include motor vehicle, furniture and home furnishings, electronics and appliances, building materials, food and beverage, and other miscellaneous items. According to Woods and Poole Economics, Inc. data, total retail sales in Cochise County is projected to increase from $1,689.70 (in millions) in 2015 to $2,784.10 in 2035, a CAGR of 2.53 percent. This methodology assumes that from 2015 to 2035, the number of based aircraft at Tombstone Municipal Airport will increase at the same rate as total retail sales in Cochise County (see **Table 2-5**). As shown, the number of based aircraft at the Airport is projected to increase from two in 2015 to three in 2035.

Socioeconomic Methodology – Based Aircraft: Summary of Results

A summary of the results of the socioeconomic methodologies used to project based aircraft at the Airport is shown in **Table 2-5**, including the CAGR for each methodology from 2015-2035. As shown, all socioeconomic methodologies project three based aircraft by 2035.

Market Share Based Aircraft Methodology

The second type of methodology used to project based aircraft at Tombstone is market share. Market share compares an individual component's share (based aircraft at Tombstone Municipal Airport) with a larger market. For this methodology, based aircraft at Tombstone Municipal Airport were compared to based aircraft in the State of Arizona.

According to the FAA's Terminal Area Forecast (TAF), in 2015, there were 5,540 based aircraft at Arizona airports that are part of the NPIAS. The TAF is used as the data is reported by airports and is the only source that summarizes available information on a statewide level. By dividing the amount of based aircraft at Tombstone Municipal Airport (2) by the reported amount of based aircraft in the State of Arizona at NPIAS airports (5,540), a market share of 0.036 percent is generated. FAA TAF projections of based aircraft in Arizona are depicted in **Table 2-5**. The 0.036 percent market share is held constant throughout the projection period and compared to FAA TAF forecasts for based aircraft in Arizona, which results in an increase from two based aircraft at Tombstone Municipal Airport in 2015 to three in 2035.

Summary of Based Aircraft Forecast Methodology Results

Table 2-5 summarizes the six methodologies used to project based aircraft at Tombstone Municipal Airport from 2015 to 2035. Due to the limited amount of based aircraft at the Airport in 2015, accompanied with the limited growth in socioeconomic standing in Cochise County, all based aircraft methodologies project an increase of one or two aircraft in the 20-year timeframe.

Table 2-5. Based Aircraft Forecast - Summary

Historical	Population Variable BAC	Employment Variable BAC	PCPI Variable BAC	Total Retail Sales Variable BAC	AZ Market Share Variable BAC	ASASP Variable BAC
2015	2	2	2	2	2	2
Projected						
2020	2	2	2	2	2	2
2025	2	2	2	3	2	3
2035	3	3	3	3	3	4
CAGR 2015-2035	**1.47%**	**1.79%**	**1.73%**	**2.53%**	**1.58%**	**3.32%**

Sources: Woods and Poole Economics, Inc., Kimley-Horn

Based Aircraft Forecast – Preferred Methodology

Choosing a preferred methodology to project based aircraft at Tombstone Municipal Airport is restrictive based on the limited historical references available. Using the market share and socioeconomic methodologies is difficult as there has been little historical fluctuation in based aircraft at the Airport. Consequently, because it uses a general growth rate that is applied to similar general aviation airports in Arizona, the 2008 ASASP forecast methodology, which projects four based aircraft at the Airport in 2035 is the preferred methodology.

Based Aircraft Fleet Mix Forecast

At most general aviation airports, the majority of the based aircraft fleet are single-piston aircraft with multi-piston, jets, and helicopters comprising the remainder of the fleet. Both of the aircraft at Tombstone Municipal Airport are single-engine piston aircraft. Although the Airport is equipped with adequate runway length to accommodate larger aircraft, given the Airport's location and regional socioeconomic status, it is anticipated that single-engine piston aircraft will continue to comprise the based aircraft fleet mix at Tombstone Municipal Airport.

Aircraft Operations Forecasts

Aircraft operations projections are used to determine design criteria and some facility needs at airports. There are several factors that impact the number of aircraft operations that occur at a particular airport. The number of based aircraft, local demographics, national economic and aviation-related trends, proximity to other airports, capability and existing condition of facilities, business needs, and several other factors influence aircraft operations. At non-towered facilities such as Tombstone Municipal Airport it is difficult to accurately measure historical aircraft operations.

The only recent historical data available to project aircraft operations at Tombstone Municipal Airport is the ASASP who estimated 300 operations in 2007, and the 5010 Airport Master Record, which identified 340 aircraft operations in 2014. Due to the lack of available historical operations data, time series or regression analysis methodologies would not accurately portray projected aviation-related activity. As discussed, aircraft operations data are not readily accessible because of the lack of an ATCT and database estimates from sources such as the FAA TAF. Consequently, a baseline estimate for 2015 operations is based on data provided in the ASASP and 5010 Airport Master Record. It was estimated that 350 operations occurred at Tombstone Municipal Airport in 2015. This figure is used to project operational demand in subsequent sections of this section.

The methodologies utilized for purposes of this Airport Layout Plan Update with Narrative examine operations based on socioeconomic factors, similar to the socioeconomic based aircraft methodologies in the previous section. Additionally, market share and an operations per based aircraft (OPBA) methodology were examined.

Socioeconomic – Operations: Population Variable Methodology

As with based aircraft forecasts, one methodology used to determine projections of annual aircraft operations was an examination of local socioeconomic data. Similar to based aircraft forecasts, aircraft operations forecasts for socioeconomic factors compare data from Woods and Poole Economics, Inc. and assume operations at the Airport will mimic these data. A summary of all methodologies of aircraft operations is shown in **Table 2-6**.

The population of Cochise County is projected to increase from 143,610 in 2015 to 192,280 in 2035. This increase in population over the 20-year period represents a CAGR of 1.47 percent. The estimate of 350 aircraft operations in base year 2015 is applied to the projected population growth rate of Cochise County. As shown in **Table 2-6**, this methodology projects 469 operations will occur at Tombstone Municipal Airport by 2035.

Socioeconomic – Operations: Employment Variable Methodology

Employment in Cochise County is projected to increase from 62,600 in 2015 to 89,315 in 2035, which represents a CAGR of 1.79 percent. By applying the same growth rate to the number of operations reported at Tombstone Municipal Airport in 2015, 499 annual operations are projected by 2035 (see **Table 2-6**).

Socioeconomic– Operations: PCPI Variable Methodology

As stated previously, PCPI can be an indicator of a local population's propensity to travel or own an aircraft. The PCPI of Cochise County was $39,013.80 in 2015, and is projected to increase to $55,020.00 in 2035. This exhibits a CAGR of 1.73 percent during the 20-year projection period. By applying the 1.73 percent growth rate to the 350 operations at Tombstone Municipal Airport in 2015, aircraft operations are projected to be 494 by 2035 (see **Table 2-6**).

Socioeconomic – Operations: Total Retail Sales Variable Methodology

The final socioeconomic methodology used for determining aircraft operations at Tombstone Municipal Airport is the Total Retail Sales Variable. Total retail sales in Cochise County in 2015 were $1,689.7 (millions), and this figure is anticipated to increase to $2,784.1 (millions) in 2035. This increase represents a 2.53 percent CAGR for the 20-year period. By applying the 2.53 percent CAGR to the 350 operations at Tombstone Municipal Airport in 2015, operations are projected to be 577 by 2035 (see **Table 2-6**).

Market Share Operations Methodology

Similar to based aircraft, a market share methodology was used to project aircraft operations. Total general aviation operations for all Arizona airports derived from the FAA TAF are compared with operations at Tombstone Municipal Airport. In 2015, there were 2,561,878 operations in Arizona compared to 350 operations at the Airport, which represents a market

share of 0.014 percent. This percentage is held constant throughout the projection period and results in 375 operations by 2035 (see **Table 2-6**).

Arizona State Airports System Plan Operations Methodology

A baseline estimate for 2015 operations is based on data provided in the 2008 ASASP and latest 5010 Airport Master Record. By applying the ASASP preferred growth rate of 1.90 percent throughout the 20-year projection period, it is estimated that Tombstone Municipal Airport will experience 510 operations in 2035 (see **Table 2-6)**.

Operations per Based Aircraft Methodology

The operations per based aircraft (OPBA) were calculated for use in forecasting future operational activity. With 350 operations and two based aircraft in 2015, the number of operations per based aircraft was 175. It is anticipated that this figure will stay constant through 2035. This figure is applied to based aircraft projections from the preferred based aircraft methodology and results in 700 operations by 2035, a CAGR of 3.41 percent (see **Table 2-6**).

Summary of Aircraft Operations Forecast Methodology Results

Table 2-6 summarizes the results of the seven methodologies used to project operational activity at Tombstone Municipal Airport from 2015 to 2035. The Arizona Market Share methodology represents the lowest estimate of aircraft operations projected at Tombstone Municipal Airport in 2035 at 375 operations. Alternately, the OPBA methodology represents the highest estimate of aircraft operations at the Airport in 2035 at 700 operations.

Table 2-6. Aircraft Operations Forecast - Summary

Historical	Population Variable Operations	Employment Variable Operations	PCPI Variable Operations	Total Retail Sales Variable Operations	AZ Market Share Variable Operations	ASASP Operations	OPBA Operations
2015	350	350	350	350	350	350	350
Projected							
2020	380	381	376	398	360	385	350
2025	409	416	408	451	364	422	525
2035	469	499	494	577	375	510	700
CAGR 2015-2035	**1.47%**	**1.79%**	**1.73%**	**2.53%**	**0.34%**	**1.90%**	**3.41%**

Sources: Woods and Poole Economics, Inc. and Kimley-Horn

Aircraft Operations Forecast – Preferred Methodology

Similar to the based aircraft preferred methodology, choosing a preferred methodology to project aircraft operations at Tombstone Municipal Airport is restrictive based on the limited historical references available. The 2008 ASASP projections held accurate through base year 2015 depicting limited growth in historical aircraft operations. The accuracy of market share, socioeconomic, and OPBA methodologies are difficult to gauge without more solidified historical data for the Airport. Forecasts identified in the 2008 ASASP were based on reasonable growth rates that were anticipated to occur at lower-activity general aviation airports throughout the State. Therefore, the preferred methodology for aircraft operations at Tombstone Municipal Airport is the 2008 ASASP methodology, which projects 510 operations in 2035.

Local/Itinerant Operations

The most accurate source to identify local vs. itinerant operations at Tombstone Municipal Airport is the 2014 5010 Airport Master Record. The 2014 5010 Airport Master Record identified that approximately 14 percent of total aircraft operations in 2014 were itinerant. This figure was applied to total projected operations and held constant throughout the projection period (see **Table 2-7)**. As shown, this methodology projects 435 local operations and 73 itinerant operations in 2035.

Table 2-7. Local/Itinerant Operations Forecast

Historical	Total Operations	Local Operations	% Local Operations	Itinerant Operations	% Itinerant Operations
2015	350	300	85.7%	50	14.3%
Projected					
2020	385	330	85.7%	55	14.3%
2025	422	362	85.7%	60	14.3%
2035	510	435	85.7%	73	14.3%
CAGR 2016-2036	**1.90%**	**1.90%**		**1.90%**	

Sources: 2008 Arizona State Airports System Plan, 2014 5010 Airport Master Record

Peaking Characteristics and Peak Hour Operations Forecast

An important component in the development of forecasts of aviation demand is the identification of peak activity levels. Understanding peaking characteristics assists in facility and capacity planning. The following section presents peak operations forecasts.

Although Tombstone Municipal Airport receives a very low volume of operations, the Airport does have some inflated levels of seasonal activity and when special events occur in Tombstone. Based on an analysis of general aviation airports with similar activity levels as Tombstone Municipal Airport, it is estimated that the peak month accounts for approximately

12 percent of annual operations. Based on this figure, it is estimated that in 2015, the peak month accounted for 42 operations. The 12 percent peak month estimate is held constant throughout the projection period, and results in 61 peak month operations by 2035 (see **Table 2-8).** Based on conversations with City officials, it was determined that during special events such as Wyatt Earp Days (Memorial Day Weekend), it has been observed that as many as 4 daily landings have occurred at the Airport. Although this reflects the absolute peak of daily activity throughout the year, general assumptions have been identified that Peak Month Average Day (PMAD) activity accounted for two operations, Peak Month Peak Day (PMPD) accounted for six operations, and peak hourly activity accounted for three operations in 2015. These estimates for base year peak activity are anticipated to grow at the same rate as annual operations identified in the preferred methodology.

Table 2-8. Tombstone Municipal Airport – Peaking Characteristics

Historical	Annual Operations	Peak Month	PMAD	PMPD	Peak Hour
2015	350	42	2	6	3
Projected					
2020	385	46	2	7	3
2025	422	51	2	7	4
2035	510	61	3	9	4
CAGR 2015-2035	**1.90%**	**1.90%**	**1.90%**	**1.90%**	**1.90%**

Sources: 2008 Arizona State Airports System Plan, Airport Management

Forecast Summary

It is anticipated that Tombstone Municipal Airport will see limited, but steady growth in based aircraft and annual operations throughout the 20-year projection period. Although historical trends in aviation activity at the Airport cannot be directly tied to socioeconomic factors in the County, it is estimated that any growth in activity is tied to increases in population and economic conditions in Cochise County. Projected socioeconomic data show that Cochise County will similarly grow at a slow, steady rate over the next 20 years, similar to projected growth in aviation-related activity at the Airport. **Table 2-9** provides a summary of expected based aircraft and aircraft operations from 2015 to 2035. These forecasts are used to assist with the development of facility needs in the subsequent section of this Airport Layout Plan Update with Narrative.

Table 2-9. Summary of Tombstone Municipal Airport Forecasts

Category	2015	Projected		
		2020	2025	2035
Aircraft Operations	350	385	422	510
Total Based Aircraft	2	2	3	4

Sources: 2008 Arizona State Airports System Plan, and Airport IQ 5010 Airport Master Record, Kimley-Horn

3 FACILITY REQUIREMENTS

This section provides a technical analysis of facility requirements for Tombstone Municipal Airport. The purpose of this analysis is to compare the Airport's existing facilities to the projected aviation-related activity levels and identify any enhancements that may be needed to meet user demand and/or ADOT minimum facility requirements. The following elements of the Airport are addressed:

- Airside Facility Requirements
- Landside Facility Requirements
- Support Facility Requirements
- Summary of Facility Requirements

Airside Facility Requirements

Airside facilities include equipment and standards that pertain to the operational capabilities of an airport. For the purposes of this ALP Update with Narrative, airside facilities that are examined include:

- Approach Capability
- Navigational Aids and Lighting
- Airspace Protection
- Part 77 Requirements
- Airport Reference Code
- Runway Requirements
- Taxiway Requirements

Approach Capability

The ability of an approaching aircraft to land at an airport is predicated on the weather conditions, the level of pilot training, the type of navigation equipment both in the aircraft and on the ground, and the approach procedures established by the FAA. Under Visual Meteorological Conditions (VMC), which are defined as a cloud ceiling greater than 1,000 feet above ground level (AGL) and visibility conditions equal to or greater than 3 statute miles, pilots may approach an airport using only visual standards. These are basic flight maneuvers that can be performed by all pilots at all public-use airports. Instrument Meteorological Conditions (IMC) occur when cloud ceilings are lower than 1,000 feet AGL and visibility becomes less than 3 statute miles. Under these conditions, properly trained pilots with adequately equipped aircraft can follow FAA published Instrument Approach Procedures (IAPs) to land at an airport.

The FAA classifies standard IAPs, and the runways supporting those procedures, based on the type of electronic navigation guidance and the lowest approach minimums (visibility and decision height/HATh) provided by that procedure.

Tombstone Municipal Airport does not have any instrument approaches. The majority of aircraft operations that occur at the Airport are conducted by small, single-engine piston aircraft. In addition, the favorable year-round climate is conducive to VMC operations. Based on these factors, and the relatively low level of aircraft activity at the Airport, it is not anticipated that any instrument approach procedures or equipment are needed in the 20-year planning horizon.

Navigational Aids and Lighting

Navigational aids (NAVAIDS) are any visual or electronic devices airborne or on the surface which provide point-to-point guidance information or position data to aircraft in flight.

The Airport is equipped with a wind cone, which identifies wind speed and direction. Approximately 17 miles west of the Airport is Sierra Vista Municipal Airport-Libby Army Field, which has a Very High Frequency Omni-Directional Range (VOR) navigation system that provides directional and location guidance within the region. Bisbee-Douglas International Airport is located 25 miles southeast and is equipped with a VOR Tactical Air Navigation System (VORTAC).

The 2008 Arizona State Airports System Plan identifies minimum objectives for the State's system of public-use airports. Tombstone Municipal Airport is identified as a General Aviation-Basic facility. One of the recommended objectives for this classification of airport is a rotating beacon. If activity increases in the future, funding for a rotating beacon should be sought. As noted in subsequent sections of this Narrative, the Airport does not have utilities. Installation of electricity would be a precursor to any pursuit of NAVAIDs.

If activity at the Airport increases, it is recommended that the Airport install PAPIs to meet airport design standards. PAPIs increase safety by providing visual glide slope approach guidance in non-precision approaches environment. The systems have an effective visual range of at least three miles during the day and up to 20 miles at night. The installation of PAPIs could potentially increase the occurrence of larger aircraft at the Airport.

Airspace Protection

The safe and efficient operation of aircraft requires that certain areas on and near an airport remain clear of objects that could present a hazard to air navigation. Airports that are listed in the NPIAS and receive federal funding support through the Airport Improvement Program (AIP) are considered "federally obligated" and as such, are subject to FAA Grant Assurances 20 and 21 which require airport sponsors to take appropriate actions to protect the surrounding airspace from incompatible land uses and to prevent/mitigate hazardous obstacles to navigation. Because Tombstone Municipal Airport is not included in the NPIAS, it is not obligated to adhere to airspace protection standards, however, it is recommended that the Airport maintain safe aircraft operation procedure to the extent possible.

The FAA has established two primary sets of airspace protection standards. These include Federal Aviation Regulation (FAR) Part 77 *Safe, Efficient Use, and Preservation of The Navigable Airspace*, and FAA Order 8260.3 *United States Standard for Terminal Instrument Procedures (TERPS)*. While similar in nature and purpose, these standards have specific applications relative to approach procedures and minimums, usable runway length, AIP funding, and compatible land use planning.

An analysis was conducted to identify any airspace obstructions or areas of concern relative to these standards. Based on data available in the FAA's Digital Obstacle File, one obstacle, a tower located approximately three miles northwest of the Airport was identified, which is not in the direct flight pattern of P29.

Part 77 Requirements

As directed by FAR Part 77, *imaginary surfaces* around the airfield are established for determining obstructions to air navigation. These standards are most applicable to promoting compatible land use on and near the airport and are used predominately by the Airports Division of the FAA. These surfaces can vary in shape, size and slope, depending on the available approach procedures to each runway end. Any penetration of these imaginary surfaces, either manmade or natural, are identified as obstructions and must be evaluated by the FAA to determine if they present a hazard to air navigation. If determined to be a hazard, the obstacle should be removed or altered to mitigate the penetration. If not mitigated appropriately, the obstacle could adversely affect approach and departure minimums and/or operational procedures.

Based on the requirements of FAR Part 77, the following section describes the imaginary surfaces as they apply to the existing Runway 06-24. All references to a surface's *slope* is expressed in horizontal feet by vertical feet. For example, a 20:1 slope rises 1 foot vertically for every 20 feet horizontally.

Primary Surface

This surface is longitudinally centered on the runway. The elevation of any point on the surface is the same as the elevation of the nearest point on the runway centerline. For Runway 06-24 this surface is 250 feet wide and extends 200 feet beyond the ends of pavement usable for takeoff and landing. There are no known obstacles to the Primary Surface at Tombstone Municipal Airport.

Approach Surface

This surface is longitudinally centered on the extended runway centerline and extends outward and upward from the end of the Primary Surface. An Approach Surface is applied to each end of each runway, based upon the type of approach available or planned for that runway end. The inner width of the Approach Surface is the same width of the Primary Surface. The Approach

Surface extends at a specific slope to a uniform width and distance based on the approach capabilities of the runway. For Runway Ends 06 and 24 this surface begins 200 feet beyond the end of the runway, is 5,000 feet long, and rises at a slope of 20 to 1 to an outer width of 1,250 feet. Based on an analysis of the FAA's Digital Obstacle File, there are no known obstacles in the Approach Surface at Tombstone Municipal Airport.

Transitional Surface

This surface extends outward and upward from the sides of the Primary Surface and from the sides of the Approach Surfaces at a slope of 7 to 1 up to the height of the Horizontal Surface. There are no known obstacles located in the Transitional Surface for Tombstone Municipal Airport.

Horizontal Surface

This surface is a horizontal plane 150 feet above the established airport elevation, the perimeter of which is constructed by swinging arcs of specified radii from the center of each end of the Primary Surface of each runway and connecting the adjacent arcs by lines tangent to those arcs. At Tombstone Municipal Airport, the Horizontal Surface extends 5,000 feet from the ends of Runway 06-24, at an elevation of 4,893 feet MSL. There are no known obstacles located in the Horizontal Surface at the Airport.

Conical Surface

This surface extends outward and upward from the periphery of the Horizontal Surface. The Conical Surface extends at a slope of 20 to 1 for a horizontal distance of 4,000 feet. One tower, located approximately 3.5 miles northwest of the Airport was identified as an obstruction to this surface. Based on aerial photography obtained from Google Earth, it is assumed that this structure is appropriately marked and lighted.

Airport Reference Code (ARC)

The FAA classifies airports and runways by their current and planned operational capabilities. These classifications are used to determine the appropriate FAA standards, as per FAA Advisory Circular (AC) 150/5300-13A, Change 1, *Airport Design*, to which the airfield facilities are to be designed and built. Although Tombstone Municipal Airport is not mandated to adhere to FAA standards, it is recommended that facilities reflect those identified in FAA AC 150/5300-13A to the extent possible.

An Airport Reference Code (ARC) is an airport designation that represents the Aircraft Approach Category (AAC) and Airplane Design Group (ADG) of the most demanding aircraft that the airfield is intended to accommodate on a regular basis. The ARC is used for planning and design only and does not limit the aircraft that may be able to operate safely at an airport.

The FAA identifies a Critical Aircraft as the most demanding airplane or group of airplanes that utilize a runway on a regular basis, which is considered to be at least 250 takeoffs per year. The previous Airport Layout Plan identified the Critical Aircraft as a Beechcraft BE65 Queen Air, which has an ARC designation of A-I, Small (S), indicating the aircraft is less than 12,500 pounds. Based on an analysis of historical operations at Tombstone Municipal Airport using the FAA's Traffic Flow Management System Count database (TFMSC), the most demanding aircraft that regularly operates at the Airport is a Cessna 172 Skyhawk. Although this aircraft model does not conduct 250 annual takeoffs, it is the recommended Critical Aircraft for the Airport. The Cessna 172 Skyhawk also has an ARC of A-I(S).

Consistent with FAA guidance, the critical aircraft anticipated to use the facilities over the planning horizon are those with an Aircraft Approach Category (AAC) of A and an Airplane Design Group (ADG) of I and weighing less than 12,500 pounds which includes the Cessna 172. Based on this, the ARC for Tombstone Municipal Airport is anticipated to remain A-I(S) throughout the planning horizon. It should be noted that for all practical purposes, both an airport and an aircraft can be referred to by their ARC.

Runway Design Code (RDC)

An RDC is used to signify the design standards to which each specific runway is to be planned and built. This classification has three components: AAC, ADG, and the highest approach visibility minimums that either end of the runway is planned to provide. Within these classifications, instrument approach visibility minimums are expressed in runway visual range (RVR) values of 1200, 1600, 2400, 4000 and 5000 feet, as described in **Table 3-1**. An airport's ARC is consistent with the highest RDC of any of its runways. The RDC for Tombstone Municipal Airport's Runway 06-24 is A-I(S)-VIS and intended for use by small aircraft only (i.e. ≤ 12,500 lbs. Maximum Takeoff Weight - MTOW).

Table 3-1. Instrument Approach Visibility Minimums

RVR (ft)	Corresponding Visibility Category (statute mile)
VIS	Visual Conditions (including instrument circling)
5000	Not lower than 1 mile
4000	Lower than 1 mile but not lower than ¾ mile
2400	Lower than ¾ mile but not lower than ½ mile (CAT-I ILS)
1600	Lower than ½ mile but not lower than ¼ mile (CAT-II ILS)
1200	Lower than ¼ mile (CAT-III ILS)

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

Approach and Departure Reference Codes (APRC & DPRC)

Approach and Departure Reference Codes (APRC and DPRC) describe the *current* operational capabilities of a runway and adjacent taxiways where no special operating procedures are

necessary. In contrast, the RDC is based on *planned* development and has no operational application.

Like the RDC, the APRC is composed of three components: AAC, ADG, and visibility minimums. The APRC indicates which aircraft can operate on taxiways adjacent to a runway under particular meteorological conditions. The APRC classification is also used to identify several critical design standards including runway lighting and marking, threshold siting criteria, obstacle free zones, and other FAA obstacle identification surfaces. The APRC for Runway 06-24 is A-I(S)-VIS.

The DPRC represents those aircraft that can take off from a runway while any aircraft are present on adjacent taxiways, under particular meteorological conditions with no special operational procedures necessary. It is similar to the APRC, but is composed of two components, AAC and ADG. The DPRC for Runway 06-24 is A-I(S).

Runway Requirements

FAA AC 150/5300-13A, Change 1, *Airport Design,* identifies dimensional standards pertaining to runways and runway-related separations that are essential to provide clearance from potential hazards affecting routine aircraft movements on the airfield. Application of these standards is determined by the RDC and relates to separation distances for parallel runways, hold lines, parallel taxiways, aircraft parking areas, obstacle free areas, and safety areas. The following describes the specific safety or runway protection areas as they apply to Runway 06-24.

The FAA design standards and existing conditions for Runway 06-24 are summarized in **Table 3-2**. As shown, all runway dimensional standards meet or exceed FAA requirements. As noted, Tombstone Municipal is not eligible to receive FAA AIP grants, however, it is recommended that the Airport adhere to FAA design standards to the extent possible.

Table 3-2. Runway Dimensional Standards

Design Criteria	Runway 06-24	
	Existing Conditions	FAA Design Standard
Runway Design		
Width	60	60
Shoulder Width	20	10
Blast Pad Width	N/A	N/A
Blast Pad Length	N/A	N/A
Runway Protection		
RSA Length beyond departure end	240	240
RSA Length prior to threshold	240	240
RSA Width	120	120
ROFA Length beyond departure end	240	240
ROFA Length prior to threshold	240	240
ROFA Width	250	250
ROFZ Length beyond runway end	200	200
ROFZ Width	250	250
RPZ Length	1,000	1,000
RPZ Inner Width	250	250
RPZ Outer Width	450	450
Runway Separation		
Holding Position	N/A	125
Aircraft Parking	500	125

Sources: FAA Advisory Circular 150/5300-13A, 1999 Approved Airport Layout Drawing

Runway Safety Area (RSA)

The RSA is described by FAA as “a defined surface surrounding the runway prepared or suitable for reducing the risk of damage to aircraft in the event of an undershoot, an overshoot, or excursion from the runway.” For Runway 06-24, this surface is 120 feet wide and extends 240 feet prior to the landing threshold and 240 feet beyond the departure end of the runway. Based on the type of aircraft that currently use and are projected to use the Airport, the existing RSA is adequate to accommodate projected demand and is currently clear of any obstructions.

Runway Object Free Area (ROFA)

The FAA defines the ROFA as an area centered on the runway centerline that is provided to enhance the safety of aircraft operations by clearing all above ground objects that protrude above the RSA edge elevation, except for objects that need to be located in the ROFA for air navigation or aircraft ground maneuvering purposes. Objects that must remain on the ROFA are constructed on frangible mounts, to minimize potential damage to aircraft in the event of an errant mishap.

For Runway 06-24, this surface is 250 feet wide and extends 240 feet prior to the landing threshold and 240 feet beyond the departure end of the runway. It is estimated that the existing ROFA dimensions are adequate to accommodate existing and projected levels of demand and there are no penetrations in the ROFA.

Runway Protection Zone (RPZ)

The RPZ is a trapezoidal area beginning 200 feet beyond the runway end and centered on the extended runway centerline. The RPZ is a compatible land use measure meant to enhance the protection of people and property on the ground. Airports should maintain positive control of the RPZs through fee simple acquisition, easement or use restrictions/agreements. Such control includes clearing of RPZ areas of incompatible objects and activities.

For both ends of Runway 06-24, with visual approach minimums, the inner width of the RPZ is 250 feet, the outer width is 450 feet and the length is 1,000 feet. This equates to approximately 8 acres of land area.

The previous ALP recommended fee simple land acquisition for parcels of land within the RPZs on both Runway Ends (06 and 24) that are currently not owned by the City. There is a small parcel, approximately 1 acre in size west of U.S. Highway 80 and a second parcel east of Runway End 24, approximately 4 acres in size that are undeveloped, State-owned land that the RPZ extends over. To promote the highest level of public safety near the airfield, it is recommended that the City pursue fee simple acquisition of all off-airport RPZ areas or at the minimum – an easement that provides sufficient control of the property's use and development. The current land uses within the RPZs do not include buildings or large congregations of people. It is also recommended that the Airport acquire the land north of the Airport extending the property line and fencing up to Davis Road. The land is undeveloped and can be used for any Airport improvement projects.

Runway Obstacle Free Zone (OFZ)

The OFZ is defined by FAA as a volume of airspace centered above the runway centerline that extends 200 feet beyond each end of the runway surface that precludes taxiing or parked airplanes and object penetrations, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function. For Runway 06-24, the OFZ is 250 feet wide. Based on existing and projected aircraft activity, the existing dimensions of the OFZ are adequate to accommodate demand and has no penetrations.

Runway Separation Standards

The FAA defines separation standards related to the runway's location in terms of the distance between the runway centerline and other airport facilities established to ensure operational safety of the airport. At Tombstone Municipal Airport, the only runway standard is runway

centerline to the edge of the aircraft parking area. For Runway 06-24, the standard distance is 150 feet. Existing tie-downs on the aircraft parking apron comply with this standard.

Runway Orientation

Ideally, a runway is oriented with the prevailing wind, as taking off and landing into the wind enhances aircraft performance. The FAA recommends that the primary runway have at least 95 percent wind coverage, which means that 95 percent of the time, the wind at an airport is within acceptable crosswind limitations. Crosswind coverage is calculated using the highest crosswind component that is acceptable for the types of aircraft expected to use the runway system. Larger aircraft have a higher tolerance for crosswind than smaller aircraft due to their size, weight and operational speed. If 95 percent coverage cannot be met by the primary runway, an additional "crosswind runway" may be needed to safely accommodate the aircraft needing the additional crosswind coverage. **Table 3-3** provides the FAA's standard crosswind component by aircraft size.

Table 3-3. Standard Crosswind Components

Aircraft Category	Maximum Crosswind Component
A-I and B-I	10.5 knots
A-II and B-II	13.0 knots
A-III, B-III, C-I through C-III D-I through D-III	16.0 knots
A-IV, B-IV, C-IV through C-VI, D-IV through D-VI E-I through E-VI	20.0 knots

Source: FAA AC150/5300-13A, *Airport Design*

The FAA considers three weather classifications: all weather, VFR conditions, and IFR conditions. As noted in Section 1, Runway 06-24 has 93 percent wind coverage for 10.5 knot-crosswind. Although this does not meet the criteria identified by the FAA, it is important to note that wind samples were obtained from the nearest ASOS to the Airport, which is located approximately 20 miles southwest at Sierra Vista Municipal Airport. While it is not anticipated that future activity will merit the need for a crosswind runway, other improvements may increase traffic at the Airport, so it is recommended that a crosswind runway be depicted on the ALP. The previous ALP also depicted a crosswind runway.

Runway 06-24 Length

FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides guidance for determining runway length. Factors that affect needed runway length include temperature, airport elevation, runway gradient, critical aircraft expected to use the airport, and the stage

length or distance of the longest nonstop destination. Specific aircraft performance is a key factor in determining the runway length needed for takeoff and landing.

According to the FAA AC, the following criteria are identified for critical aircraft:

> "The recommended length for the primary runway is determined by considering either the family of airplanes having similar performance characteristics or a specific airplane needing the longest runway. In either case, the choice should be based on airplanes that are forecast to use the runway on a regular basis. A regular basis is considered to be at least 250 takeoffs a year."

FAA AC 150/5325-4B contains exhibits that calculate runway length requirements based on families of airplanes having similar performance characteristics and utilizing inputs from the airport regarding temperature and elevation. The runway length requirement results are categorized for small aircraft less than or equal to 12,500 pounds, aircraft weighing over 12,500 pounds but less than 60,000 pounds, and large aircraft more than 60,000 pounds. The 12,500 to 60,000-pound category or less is further subdivided into groups that compose 75 percent of aircraft within that fleet category, and 100 percent of aircraft within that category.

As noted in previous sections of this Narrative, the A-I(S) critical aircraft for Tombstone Municipal Airport is the Cessna 172 Skyhawk, which falls into the category of Small Airplanes with Approach Speeds of 50 Knots or more with Maximum Certified Takeoff Weights of 12,500 Pounds or Less.

Takeoff lengths interpolated from the FAA tables identified in the AC are based off of an Airport elevation of 4,743 feet above MSL, and the mean maximum temperature of the hottest month, which is 95 degrees according to the previous Master Plan. Based on these inputs, the recommended runway length for Tombstone Municipal Airport is 6,250 feet. The published length of Runway 06-24 is 4,430 feet. It should be noted that the runway length calculation accounts for 100 percent of the fleet that falls into the "less than 12,500 Pounds" category, which includes small turbo-prop aircraft. Based on the relatively low levels of activity that occur at the Airport, and the types of aircraft that operate there, it is estimated that the existing runway length is adequate to accommodate existing and projected levels of demand. However, if demand at the Airport increases, and larger, more demanding aircraft begin to operate there, it is recommended that additional land to the east of Runway End 24 be preserved for a potential runway extension. It is also noteworthy that the previous ALP identifies an ultimate runway length of 6,100 feet.

Runway Width

The current width of Runway 06-24 is 60 feet. The FAA design standard for runway width is based on the AAC and approach visibility minimums to the runway. As indicated in **Table 3-3**, the standard runway width for an A-I airport with visual approach minimums is 60 feet. Based

on existing and projected activity at the Airport, it is anticipated that a 60-foot wide runway is adequate to accommodate demand.

Runway Pavement Strength

Pavement design strength is related to three primary factors:

- The operating weight of aircraft anticipated to use the airport;
- The landing gear type and geometry; and
- The volume of annual aircraft operations, by type.

Pavement strength rating is not the same as maximum weight limit. Aircraft weighing more than the certified strength can operate on the runways on an infrequent basis, however, frequent activity by heavier aircraft can reduce the useful life of the pavement. Also, FAA regulations state that all federally obligated airports (these are airports that have accepted FAA funding and the associated grant assurances) must remain open to the public and cannot restrict an aircraft from using the runway due only to its weight exceeding the published pavement strength rating. The pilot of the aircraft decides which airports to use based on their determination that the airport can support their aircraft in a safe manner.

Runway 06-24 was initially paved in 2004 with a 1.5-inch asphalt overlay. There are no known resources that identify the pavement strength of the runway, however, this type of overlay is typically employed at airports that accommodate small (less than 12,500 lbs.) aircraft. It should be noted that the most recent pavement inspection was conducted in April 2013 and Runway 06-24 received a Pavement Condition Index (PCI) rating of 56. The connector taxiway and apron area received a rating of 58. ADOT notes that when a PCI rating is 55 or less, major rehabilitation, such as a thick overlay or reconstruction are the only viable alternatives due to substantial damage to the pavement structure. As such, based on results of the next pavement inspection, runway, taxiway, and/or apron rehabilitation may be needed.

Runway Lighting

Runway lighting is installed or recommended when the airport is equipped with precision approach guidance systems. Tombstone Municipal Airport does not fall under that category, but interest in Medium Intensity Runway Lighting (MIRL) has been shown by the Airport sponsor and management. Until the Airport can install electrical lines to its facilities, MIRLs are not recommended. Though MIRLs are recommended as a long-term facility need, runway edge reflectors are recommended as a near-term temporary improvement. Runway edge reflectors are not useful for night time operations as there is no light to reflect, however they are useful and effective for operations during the evening hours when visibility is reduced but some natural light is still present.

Taxiway Requirements

The taxiway system links the runway and other operational areas at an airport. An effective taxiway system allows for the orderly movement of aircraft and enhances operational efficiency

and safety by reducing the potential for congestion, runway crossings and pilot confusion. The following evaluates the taxiway infrastructure at Tombstone Municipal Airport and identifies recommended enhancements to meet the circulation needs of the various based and itinerant aircraft operators.

Taxiway Configuration

Tombstone Municipal Airport has one connector taxiway that joins Runway End 06 with the aircraft parking apron. Although parallel taxiways greatly enhance safety at airports, based on the level of activity at the Airport, it is not a required feature. However, an appropriate safety enhancement would be the inclusion of taxiway turnarounds and an additional direct connector taxiway to the aircraft parking apron in order to minimize potential for incursion. According to FAA AC 150/5300-13A, "At low traffic general aviation airports, turnarounds may be considered during initial runway development as an alternative to a full or partial parallel taxiway." The inclusion of taxiway turnarounds at both ends of Runway 06-24 would reduce the time an aircraft would remain on the runway when taxiing and would also provide aircraft holding positions in the event that multiple aircraft are utilizing the runway at the same time. It should be noted that the 1999 ALP also identified taxiway turnarounds for both runway ends. Based on the type and volume of activity at the Airport, taxiway turnarounds are recommended for both runway ends.

Taxiway Dimensional Standards

Like the runway design standards described previously, FAA AC 150/5300-13A identifies dimensional standards pertaining to taxiways and taxiway-related separations that are intended to provide adequate operational clearance between other aircraft and fixed and moveable objects.

These standards are based on both the ADG and the Taxiway Design Group (TDG) of the aircraft intended to use the facilities. The TDG is established by the overall Main Gear Width (MGW) and the Cockpit to Main Gear Distance (CMG) of the Airport's critical aircraft. The Cessna 172 Skyhawk is classified as ADG I and TDG-1A. The FAA design standards for these various aircraft classifications are summarized in **Table 3-4** and **Table 3-5.**

Not all taxiways on an airport may necessarily need to be designed to the same critical aircraft standards. For example, taxiways or taxilanes leading to hangar areas capable of accommodating only smaller aircraft may be designed to smaller standards whereas the main parallel taxiway, which supports all aircraft types, should be designed to the larger aircraft standards.

Table 3-4. Taxiway Design Standards Based on ADG

Item	ADG I (ft.)
Safety Area Width	49
Taxiway OFA Width	89
Taxilane OFA Width	79
Taxiway Centerline to:	
Parallel Taxiway/Taxilane Centerline	70
Fixed or Moveable Object	44.5
Taxilane Centerline to:	
Parallel Taxiway/Taxilane Centerline	64
Fixed or Moveable Object	39.5

Source: FAA Advisory Circular 150/5300-13A, Change 1

Taxiway Lighting

Airport management and the sponsor have shown interest in Medium Intensity Taxiway Lighting (MITL). Similar to MIRL, MITL is not recommended until the Airport gains electrical power. Taxiway edge reflectors are a recommended alternate to MITL until the Airport installs electricity. Similar to runway reflectors**,** the taxiway reflectors are not useful for night time operations, but are useful and effective for operations during the evening hours when visibility is reduced but some natural light is still present.

Table 3-5. Taxiway Design Standards based on TDG

Item	TDG 1A (ft.)
Taxiway Width	25
Taxiway Edge Safety Margin	5
Taxiway Shoulder Width	10

Source: FAA Advisory Circular 150/5300-13A, Change 1

Based on these standards, the existing width (25 ft.) of the connector taxiway with graded, unpaved shoulders is adequate to accommodate existing and projected activity. It should be noted that many of the design standards identified in the tables above pertain to elements that are not at or are not anticipated to be at Tombstone Municipal Airport. These elements, such as runway centerline to parallel taxiway centerline separation distance are intended to provide guidance in the event that activity in the future increases significantly and additional facilities may be needed.

Landside Facility Requirements

The purpose of the landside facility evaluation is to determine the capacity of the existing general aviation facilities and their ability to meet forecast levels of demand during the

planning period. The term "General Aviation Facility" refers to a facility that provides aviation services to airport users and aircraft operators such as hangar space, terminal space, fuel sales, and aircraft apron space. In this analysis, the following facilities were evaluated:

- Aircraft Storage Requirements
- Automobile Parking Facility requirements

Aircraft Storage Requirements

As noted in previous sections of this ALP Update with Narrative, there were two based aircraft at the Airport in 2015, and it is projected that this number will increase to four by 2035. At most airports, based aircraft are stored in conventional hangars, T-hangars, and on the apron (aircraft tie-downs and designated aircraft apron parking spaces). These storage types are explained below.

- Conventional FBO Hangar - This type of hangar is a large building which can house multiple aircraft in protective storage, and usually contains a large door through which aircraft can pass. The "FBO" designation of this type of hangar indicates it is operated by a provider of public aviation services, and can store multiple itinerant and based aircraft.
- Conventional Non-FBO Hangar - This type of hangar is structurally similar to a Conventional FBO Hangar, but only houses aircraft operated by or in conjunction with the owner/operator of the hangar. Examples of operators of this type of hangar space include governmental aviation divisions, private aviation companies, or corporate aviation departments. These operators would only house their own aircraft in these hangars, not itinerant aircraft.
- T-hangar - This type of hangar is an individual storage unit for a small aircraft, usually a single-engine or light twin aircraft classified under ADG I. The "T" designation corresponds to the overall shape of the unit, which is similar to a T. These individual hangars are generally grouped into linear buildings containing multiple units in a row.
- Aircraft Tie-down - An aircraft tie-down is typically an on-apron parking space that includes fixed points, typically concrete, where an aircraft can be secured using straps or cables. There can also be tie-downs on grass or non-apron areas. Although tie-downs do not provide covered protection from weather elements, they do prevent an aircraft from moving and minimize damage attributed to high winds.

The two based aircraft at Tombstone Municipal Airport are stored in conventional hangars, while itinerant aircraft are stored on the aircraft parking apron on tie-downs. Based on projected levels of activity, it is anticipated that all future based aircraft will be stored in conventional hangars, and itinerant aircraft will be stored at tie-downs on the apron. The following sections describe the facility type and area needed to fulfill future demand.

Aircraft Hangar Storage Requirements

The demand for storage hangars is dependent upon the number and type of aircraft based at an airport, as well as local climate conditions, airport security, availability, rates and charges, and owner preferences. The percentage of based aircraft stored in hangars varies from state to

state, and from airport to airport, but is usually greatest in regions subject to extreme weather conditions.

As noted, both of the based aircraft at Tombstone Municipal Airport are stored in conventional hangars. It is assumed that future based aircraft at the Airport will also be stored in conventional hangars.

One of the conventional hangars at the Airport is approximately 1,500 square feet, while the second hangar is approximately 1,000 square feet. It is assumed that any additional based aircraft will be small (less than 12,500 lbs.) single-engine piston aircraft. As such, a conventional hangar sized at 1,000 square feet would provide enough space to house most of these aircraft types. Based aircraft storage requirements are identified in **Table 3-6**. As shown, an additional 2,000 square feet of aircraft storage hangar space is recommended by 2035.

Table 3-6. Aircraft Storage Hangar Facility Requirements

Historical	Total Aircraft Stored in Hangars	Conventional Hangar Units			
		Existing Hangars	Total Hangars Required	Additional Hangars Required	Additional Hangar Area Required (sf.)
2015	2	2	2	0	0
Projected					
2020	2	2	2	0	0
2025	3	2	3	1	1,000
2035	4	2	4	2	2,000

Sources: 2010 Airport Layout Drawing, Kimley-Horn

Apron Tie-Downs

As noted, itinerant aircraft are currently, and are projected to continue to be stored on tie-downs on the aircraft parking apron. Tie-down demand is based off of peaking characteristics identified in Section 2. Based on these forecasts, there were six aircraft operations during the peak month peak day (PMPD), and three operations in the peak hour in 2015. By 2035, PMPD operations are anticipated to increase to nine, and peak hour operations are projected to increase to four. As noted, peak activity at the Airport typically occurs during special events, which would be entirely itinerant activity. It is assumed that the existing four tie-downs are able to accommodate existing peak levels of itinerant aviation demand, and that projected PMPD operations that exceed current levels will require additional aircraft tie-downs. As shown in **Table 3-7**, an additional three aircraft tie-downs are recommended by 2035.

Table 3-7. On-Apron Based Aircraft Facility Requirements

Historical	Existing Tie-Downs	PMPD Operations	Tie-Downs Required	Additional Tie-Downs Required
2015	4	6	4	N/A
Projected				
2020	4	7	5	1
2025	4	7	5	1
2035	4	9	7	3

Source: Kimley-Horn

Apron Requirements

Apron areas are intended to accommodate based and itinerant aircraft parking. Itinerant aircraft typically require a greater area for shorter amounts of time (usually less than 24 hours). Typically, based aircraft require a smaller area for longer amounts of time as this represents their storage or base location at an airport. However, it has been determined that existing and projected based aircraft will utilize conventional hangars for storage purposes, leaving only itinerant aircraft to regularly utilize apron areas.

The apron currently does not have lighting which poses a safety and security risk. It is recommended that when the Airport installs electricity, it also installs security floodlighting on the apron area. The floodlighting should satisfy aspects of safety, energy, and cost-efficiency. Apron lighting will particularly benefit itinerant aircraft that park on the ramp overnight, and for pilots tugging their aircraft in or out of the hangar during times when there is a lack of natural light.

For itinerant aircraft, consideration must be made for the aircraft parking area, taxilanes leading into and out of the parking positions, and circulation areas. Typically, itinerant apron requirements are contingent on the number and type of aircraft that will use the facility. Because accurate historical itinerant operations data are not available for analysis, it is assumed that the existing ratio of itinerant apron space and circulation areas to annual itinerant operations is suitable for projecting future demand.

As noted in a previous section, there are currently four itinerant aircraft tie-downs at Tombstone Municipal Airport. The square footage of the aircraft parking apron (taxilanes, tie-downs, and circulation areas) is anticipated to increase at the same rate as the increase in the projected number of tie-downs needed. Apron facility requirements are shown in **Table 3-8**.

Table 3-8. Apron Facility Requirements

Historical	Tie-Downs Required	Existing Apron (sf.) *	Required Apron (sf.)	Additional Apron Required (sf.)
2015	4	14,000	14,000	N/A
Projected				
2020	5	14,000	17,500	3,500
2025	5	14,000	17,500	3,500
2035	7	14,000	24,500	10,500

Sources: 2010 Approved Airport Layout Drawing, Kimley-Horn and Associates
*Includes taxilane

As shown in Table 3-8, it is estimated that an additional 10,500 square feet of apron space are required to accommodate seven total aircraft tie-downs, circulation area, and taxilane by 2035. It should be noted that in order to accommodate the installation of a fuel facility (addressed in the subsequent Support Facility Requirements section) without interfering with existing aircraft taxiing areas and tie-downs, the existing apron will likely need to be expanded prior to this installation.

Automobile Parking Facilities

The Airport does not currently have designated auto parking spaces. Vehicles typically park on the aircraft parking apron near the hangars, or off the apron on unpaved areas. While it is desirable to have designated parking spaces, the volume of aircraft activity at the Airport does not necessarily merit it. Based on projections of aircraft operations and based aircraft, it is estimated that ultimately, seven designated paved auto parking spaces should be constructed as a long-term improvement if activity increases in the future.

Support Facility Requirements

This section examines the requirements of support facilities essential to the daily operation of the Airport. These facilities include airport access and circulation, aviation fuel storage facilities, airport maintenance facilities, utilities, and recreational facilities.

Airport Access and Circulation

The only connection point to the Airport is by an unpaved access road. Direct access to the Airport is provided via a padlocked security gate. Based on projections of aviation demand, it is not anticipated that improvements to Airport access will be required, however, the Airport should continue to monitor activity, and if significant increases occur, a paved access road and/or an automated security gate may be needed.

The Airport currently lacks signage on Arizona Highway 80, making it easy to miss. It is recommended that the City of Tombstone and the Arizona Department of Transportation provide adequate airport signage to more clearly define the entry point to the Airport.

Aviation Fuel Storage Facilities

The Airport does not currently have any aircraft fueling facilities. The nearest Airport with fueling capabilities is Sierra Vista Municipal Airport, approximately 20 miles to the west. A fueling facility would provide a service to both based aircraft at the Airport, and could increase itinerant activity as well. Based on projections of aviation demand, the installation of a fueling facility at Tombstone Municipal Airport is not required, however, it is recommended that a location for a potential fuel facility be identified, and fuel tanks offering AvGas be considered in the near-term future.

As noted previously, the installation of a fuel facility on or near the existing apron would interfere with aircraft taxi areas and/or existing aircraft tie-downs. As such, a new fueling facility should be located off of the existing apron which will likely require an expansion of the apron prior to the installation of a fuel facility.

Although infrequent use of such a facility may cause concern about the shelf life of stored fuel, an article published in General Aviation News notes, "If 100 Low Lead (AVGAS) fuel is properly stored and not contaminated, it can properly maintain its octane for many years." The article goes on to state, "Leaded fuels can lose some octane over time because the lead additive can settle. This is not a rapid loss, but rather a decrease of a few numbers over a few years. Several high lead level lead AvGas samples have been tested, and there was an observed loss of several numbers after two to three years, however, most 100LL fuels are blended above the standard."[1] As this article points out, if fuel is properly stored and avoids contamination, it can maintain an effective shelf life for several years.

Airport Maintenance Facilities

There is not a designated maintenance facility at the Airport. All maintenance is performed by the City of Tombstone, as needed. Based on projected levels of activity, it is estimated that the City can continue to provide maintenance without an on-site storage facility, however, if improvements such as a fuel facility are constructed in the future, the City may wish to have an on-site hangar or structure large enough to accommodate small spill cleanup and equipment for other basic maintenance services. The Airport has expressed interest in establishing on-site personnel who would perform general maintenance on a regular basis and assist with any future services. Although this is not a specific recommendation of this Narrative, having on-site maintenance personnel would provide benefit to the existing facilities and itinerant operators.

Utilities

There are no utilities currently provided at the Airport. Because there are no services provided at the Airport for based and itinerant aircraft, there is not an immediate need for utilities.

[1] http://generalaviationnews.com/2011/05/15/how-long-can-fuel-be-safely-stored-2/ Published May 15, 2011

However, if the Airport does wish to provide an aircraft fueling facility, electric security gate, or other facility improvements, at a minimum, electricity and water will be needed. It is recommended that the Airport continue to monitor activity at the Airport and examine options for providing electricity and water in the future. Based on conversations with utility providers, electric lines would need to extend to the Airport from a substation approximately 3.5 miles to the south. Water service would require construction of an on-site well.

Solar power can be a viable alternate method to reduce expenditures. While electric lines will be beneficial for the Airport's long term future, solar power for all forms of lighting could be a cheaper, short term method to accommodate the Airport's needs. It is recommended that the Airport identify cost estimates for providing electricity and implement this utility as a high-priority facility improvement.

Recreational Facilities

The Airport has expressed interest in development of an on-site campground facility with restrooms to utilize available land within the Airport's property line. A campground could generate revenue and operations for the Airport and could be a significant addition to the Airport, as long as it's located on Airport property within standard guidelines. Although not a specific recommendation of this Narrative, it is recommended that the Airport pursue this and other potential revenue-generating opportunities for land not needed for existing or future aviation uses.

Summary of Facility Requirements

Based on the facility requirements identified in this section, the following is a summary of recommended improvements to the Airport's existing facilities throughout the planning period (see **Table 3-9**).

Table 3-9. Summary of Facility Needs

Facility	High Priority (0 to 5 Years)	Medium Priority (6 to 10 Years)	Low Priority (11 to 20 Years)
Runway 06-24		-Acquire land for RPZs -Install runway reflectors -Apply seal coat to runway	-Replace reflectors with MIRL -Land acquisition for existing runway extension -Extend and widen runway to 6,250' X 60' and construct MIRL on extension
Crosswind Runway			-Land acquisition for crosswind runway -Develop 4,900' X 60' graded crosswind runway
Taxiways		-Install taxiway reflectors	-Replace reflectors with MITL -Construct paved turnarounds at each runway end and Install MITL on turnarounds -Reroute existing connector taxiway
Aprons/Hangars	-Expansion of an additional 10,500 square feet of apron/taxilane to accommodate fuel facility	-Apply seal coat to apron pavement -Install security floodlighting	-Install three aircraft tie-downs and construct 2,000 square feet of hangar storage to accommodate ultimate demand
Airport Fencing		-Refurbish existing property line fencing	-Extend property line fencing for ultimate land acquisitions up to Davis Rd.
NAVAIDs		-Construct segmented circle and provide lighting for primary wind cone -Install PAPI to meet design standard -Install new rotating beacon	-Relocate PAPIs in conjunction with runway extension and widening
Auto Parking & Access Road	-Provide airport signage	-Pave existing access road -Provide auto parking spaces (7)	
Utilities	-Extend electric lines -Develop on-site water system (well) and sanitary sewer disposal		
Fuel System	-Provide small fuel tanks (100LL and/or automobile gas)		
Terminal Building		-Provide 250 square foot terminal building	
Recreational Facilities		-Develop an Airport campground with restroom facilities	

Source: Kimley-Horn, 1999 Tombstone Municipal Airport Master Plan

4 ALTERNATIVES ANALYSIS

To satisfy the safety objectives, user needs, and facility requirements identified in the previous sections of this Airport Layout Plan Update with Narrative, numerous airfield, storage facility, and support facility configuration alternatives were considered. Some of the recommended improvements identified in the Facility Requirements Section are components of the long-term development strategy for the Airport and warrant further evaluation. In most cases for this Airport Layout Plan Update with Narrative, recommended alternatives include the option or alternative that provides the highest benefit to the Airport with the fewest perceived impacts. In order to evaluate various alternative improvement concepts and identify the preferred development strategy, the following items are addressed:

- Alternatives Without Additional Analysis
- Airfield Alternatives
- Storage Facility Alternatives
- Support Facility Alternatives

Alternatives Without Additional Analysis

Because of minimal requirements, the following projects are not evaluated with alternatives because they are projects that do not require a safety analysis or the justification of location:

- Airport access signage
- Extension of electric lines
- On-site water system (well) and sanitary sewer disposal
- Land acquisition for crosswind runway and RPZs
- Application of seal coat to Runway 06-24 and existing apron
- Installation of security floodlighting
- Refurbishment of existing property line fencing
- Installation of PAPIs to meet ASASP recommended airport design
- Paving of existing access road and auto parking spaces (7)
- Development of an Airport campground with restroom facilities

It should be noted that while the projects listed above do not require an alternatives analysis, they are equally important to develop, acquire, and/or install at the Airport, and should be considered as recommended in the previous section of this Airport Layout Plan with Narrative. Also of note is that some of these recommended projects require environmental documentation. A phasing plan with planning-level cost estimates for these projects and others presented in the remainder of this section are summarized in Section 5.

Airfield Alternatives

The following sections describe alternatives of airfield facilities as recommended in the Facility Requirements Section. This alternatives analysis details the options for the extension of runway 06-24 and the construction of a crosswind runway (02-20). Many factors are examined in determining the recommended alternative. These factors include criteria such as safety (including placement of RPZ), impacts on existing facilities, ability of improvements to remain on Airport-owned property, implementation cost, direct impacts to surrounding environs including businesses and roadways, and Airport development potential. Recommended alternatives are addressed at the end of each section.

Extension of Existing Runway 06-24

Existing Runway 06-24 is 4,430 feet long. Section 3 identified that the runway length is adequate to accommodate existing and future demand, however, if the Airport experiences higher traffic volume than projected, it is recommended that the Airport extend the runway by 1,820 feet to an ultimate length of 6,250 feet. The following sub-sections describe the options for a runway extension.

No-Build Alternative

This alternative describes the event in which the Airport defers the option to extend the runway upon evidence that future demand will require lengthening the runway. If demand warrants an extension and it is not constructed, the Airport would limit its potential to serve a greater flying community. The Airport would not be able to cater to larger aircraft such as large turboprop and small jet aircraft, even if the Airport installed instrument approaches. Serving larger aircraft typically indicates the potential for increased Airport revenues, however, declining to extend the runway will save the City a significant amount of money from the design and construction costs.

As noted, based on existing and projected levels of activity at the Airport, an extension of Runway 06-24 will likely not be needed, however, it is recommended that a depiction of an extension remain on the Airport Layout Plan in the event that future activity warrants such a need. As such, a no-build option does not preserve land for an extension and associated safety areas that would be needed if demand in the future merits such improvements. The following bullets summarize the benefits and impacts of No-Build alternative.

Benefits of a No-Build Alternative

- No construction or land acquisition costs
- No direct impacts to immediately adjacent offsite development or roadways
- Monies can be allotted elsewhere to fund higher priority projects

Impacts/Issues of a No-Build Alternative

- Limits potential to serve larger aircraft and greater flying community
- Future expansion potential limited as State land would not be acquired

East/West Runway Extension Alternative

This runway extension alternative proposes extending each end of the existing runway 910 feet to achieve an ultimate length of 6,250 feet. As shown in blue hatching in **Exhibit 4-1**, this option would require the City to acquire approximately 10 to 12 acres of land on the east and west ends of the runway prior to construction; ultimately increasing the cost to extend the runway. Additionally, a 910-foot extension to the west would extend the runway up to Highway 80. Public roads are not permitted within the RSA which would create design standard conflicts and require rerouting Highway 80 to flow outside of the ultimate RSA. Extending each end of the runway would increase capacity at the Airport, however, it would have many expensive impacts that could be avoided. The following bullets summarize the benefits and impacts of an east/west runway extension alternative.

Benefits of East/West Extension Alternative

- Increases ultimate length of runway providing service to a larger diversity of aircraft
- No change in the size of runway protection areas
- Enhances safety and increases Airport capacity

Impacts/Issues of East/West Extension Alternative

- Significant disruption to Airport operations including potential extended Airport closure from construction at both runway ends
- Requires the relocation of Highway 80 to avoid incursions with the RSA
- Requires land acquisition on both sides of the runway (approx. 10 acres to east, 12 acres to west)
- Extensions would require additional taxiways to connect at runway ends

West Extension Alternative

As shown in red in **Exhibit 4-1**, this option extends the runway off runway end 24. An 1,820-foot extension to the west would require the acquisition of approximately 20 acres of State land and the rerouting of Highway 80 to divert vehicle traffic from the airside facilities. Because of the impact to the highway, this extension is not feasible. While the runway extension would increase capacity at the Airport, the impacts of rerouting Highway 80 and acquisition of State land would not be ideal. The following bullets summarize the benefits and impacts of a west runway extension alternative.

Benefits of West Extension Alternative

- Increases length of runway providing service to a larger diversity of aircraft
- Enhances safety and increases airfield capability
- No change in the size of runway protection areas

Issues/Impacts of West Extension Alternative

- Extensive grading with varying terrain to the west
- Significant disruption to Airport operations during construction
- Requires significant land acquisition (approx. 20 acres) including areas currently occupied by Highway 80
- Requires the relocation of Highway 80, increasing project cost and impacts to surrounding community
- Extension would require additional taxiways to connect at ultimate runway end

East Extension Alternative

This alternative extends the runway off Runway End 06. As shown in green in **Exhibit 4-1**, an extension to the east would require the acquisition of approximately 25 acres of State land, however, more importantly, an easterly extension would not impact highway 80. Also, a runway extension to the east satisfies airport design safety standards as there would not be any RSA, ROFA, or RPZ conflicts associated with the extension. The following bullets summarize the benefits and impacts of an east extension alternative.

Benefits of East Extension Alternative

- Lowest estimated project cost of proposed alternatives (except no-build)
- No change in the size of runway protection areas
- No direct impacts to immediately adjacent offsite development or roadways
- Enhances safety and increases airfield capability
- No impacts to Highway 80
- Relatively level topography within proposed runway extension area; minimal grading efforts
- Minimal runway closure time

Issues/Impacts of East Extension Alternative

- Significant disruption to Airport operations during construction
- Requires significant land acquisition (approx. 25 acres)
- Extension would require relocation of end-around taxiway on Runway End 24 if it is constructed

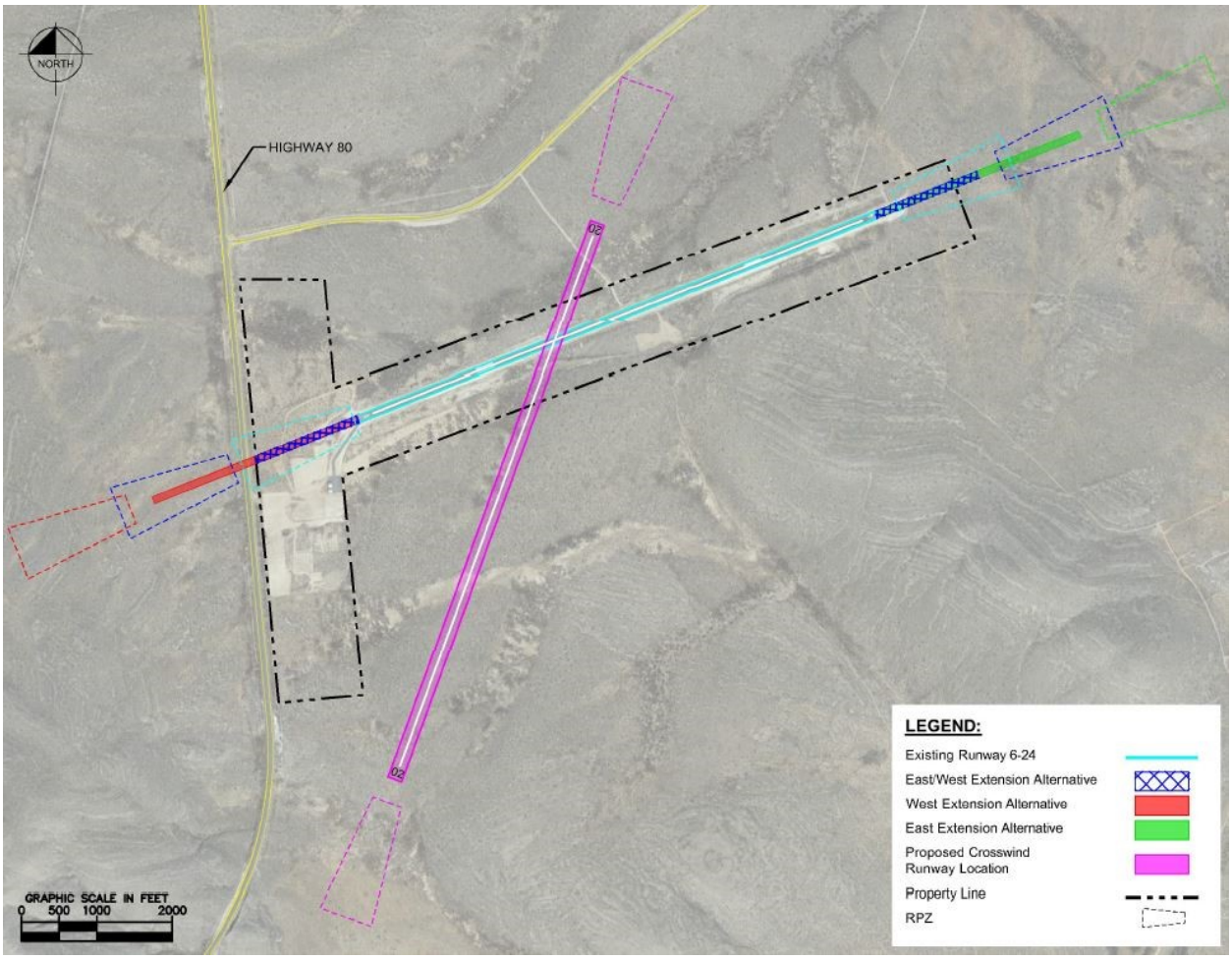
Recommended Alternative

Based on the four options listed above, it is recommended that the City continue to evaluate demand at the Airport in the future and only construct a runway extension if evidence supports it. However, for the purposes of long-range planning, and inclusion of a runway extension option on the Airport Layout Plan, the East Extension Alternative is recommended because of the development limitations to the west from Highway 80. Development to the east does require the acquisition of State land, however, it does satisfy safety standards.

Crosswind Runway

The following section discusses the development of a graded (unpaved) crosswind runway. Crosswind runways are recommended if 95 percent coverage cannot be met by the primary runway. As noted, FAA AC 150/1300-13A recommends a full-length crosswind runway for airports that cannot meet the 95 percent crosswind component. While it is unlikely that the Airport will need a crosswind runway in the future, it is recommended to remain on the ALP in the event that future demand increases. The previous ALP and Master Plan identified a location for an ultimate crosswind runway, however, based on an analysis of existing topography, construction impacts, associated runway safety and protection areas, and impacts to the surrounding transportation network, a new location has been selected on the ALP. It should be noted that the orientation of the crosswind runway to obtain ideal wind coverage has not changed, but now is depicted as a full-length crosswind runway that is shifted approximately 300 feet to the east to minimize encroachment of safety areas to US 80. **Exhibit 4-1** depicts the location of a potential future 4,900’ x 60’ graded crosswind runway. Further evaluation is recommended if the need for a crosswind runway becomes evident.

Exhibit 4-1. Airside Alternatives



Sources: Google Earth, Kimley-Horn

Storage Facility Alternatives

As discussed in a previous section, forecasts of aviation demand at P29 indicate the need for additional apron/hangar space to accommodate projected itinerant and based aircraft growth. There are currently four tie-down spaces on the apron, and according to forecasts of itinerant operational demand and based aircraft through 2035, an additional three tie-down spaces and two conventional hangars are needed. As such, an additional 10,500 square feet of apron space is recommended to satisfy the projected growth. The following describes the alternatives and optional placements of the apron and conventional hangar facilities and the relative issues with each alternative.

Apron Expansion in New Area

Many airports construct aprons near the center of the runway to facilitate activity coming from both directions. At P29, this option would require the installation of an additional access point from the existing runway and potential land acquisition to accommodate the development of

aprons, hangars, terminal buildings, and any other necessary landside facility. While the optimal airport design includes a centralized apron/hangar location, the existing apron/hangars are located on the west of the Airport property, and in efforts to limit additional spending, it is recommended that the Airport continue to expand around the existing apron area.

Apron Expansion in Existing Area

The following section outlines the alternatives or options for expanding the apron adjacent to the existing apron area and analyzes the ideal positioning of the apron, considering cost, accessibility, and potential future development. Options include a northern, western, eastern, and southern apron expansion (see **Exhibit 4-2**).

Northern Expansion Alternative

As shown in red in **Exhibit 4-2**, this alternative expands the apron area north of the existing apron and west of the existing taxiway. While this option decreases the distance from the apron area to the runway and feeder taxiway, it significantly disrupts the flow of the Airport and impacts the existing transitional surfaces. Typically, apron areas provide a location for hangars to be constructed for aircraft storage. If the apron was expanded to the north, it would be within the building restriction line (BRL) which, as defined by FAA AC 150/1300-13A, is a line that indicates where airport buildings can and cannot be located, limiting building proximity to aircraft movement areas. The location of the BRL is dependent upon the selected allowable structure height. A typical allowable structure height is 35 feet. As such, it is not recommended to construct hangars within the BRL.

In addition to conflicts within the BRL, development of a northern expansion taxiway would impact the existing Taxiway Object Free Area (TOFA). According to FAA AC 150/1300-13A, the TOFA clearing standards prohibit service vehicle roads, parked aircraft, and other objects, except for objects that need to be located on the OFA for air navigation or aircraft ground maneuvering purposes. Vehicles may operate within the OFA provided the give right of way to oncoming aircraft by either maintaining a safe distance ahead or behind the aircraft or by exiting the OFA to let the aircraft pass. As such, positioning the apron expansion north of the existing apron would intrude on the existing TOFA. To accommodate projected aviation-related demand, the apron expansion would need to increase in size by 4,400 SF to make up for the area lost to the TOFA. The following bullets summarize the benefits and impacts of the northern expansion alternative.

Benefits of Northern Expansions Alternative

- Accommodates projected levels of aviation-related demand
- Proximity to runway and taxiway access

Impacts/Issues of Northern Expansion Alternative

- Creates conflicts with the BRL and TOFA
- Disrupts the flow of taxiing aircraft
- Would require significant relocation of pavement and/or taxiway markings
- Construction of the apron would create significate disruption to Airport operations

Western Expansion Alternative

This alternative expands the apron west of the existing apron, as shown in green in **Exhibit 4-2.** Similar to a northern expansion, a west apron option would also disrupt the natural flow of the Airport. Currently, the existing apron has two conventional hangars located on the western side. Expanding the apron west of the existing apron would require relocating the existing conventional hangars to allow for proper apron circulation. Additionally, westward expansion would impact the existing access road and auto parking area. Apron expansion to the west would require the relocation of the parking lot and the subsequent rerouting of the access road. The following bullets summarize the benefits and impacts of the western apron expansion alternative.

Benefits of Western Expansion Alternative

- Accommodates projected levels of aviation-related demand
- Construction of the apron would minimally impact operations at the Airport

Impacts/Issues of Western Expansion Alternative

- Creates conflicts with the BRL
- Reduces auto parking space capacity
- Would require rerouting the existing parking area and access road
- Disrupts the flow of the existing apron as existing hangars would need relocated to allow for the safe mobility of aircraft on the apron

Eastern Expansion Alternative

As shown in pink in **Exhibit 4-2**, this alternative expands the apron east of the existing apron. Expansion to the east would require the City to acquire State land as the existing property line runs along the east side of the existing apron. This option would also require additional funds to either relocate the existing tie-down spaces or to construct a taxilane from the eastern apron expansion to the existing taxiway. If the apron were expanded to the east but did not relocate the existing tie-downs or construct a taxilane from the east apron expansion, current accessibility to the expanded apron would be significantly disrupted. In the event that aircraft are stored at the existing tie-down spaces, accessibility from an eastern apron expansion to the existing taxiway would be blocked, increasing the possibility of aircraft collisions within the

movement area. The following bullets summarize the benefits and impacts of the eastern apron expansion.

Benefits of Eastern Expansion Alternative

- Accommodates projected levels of aviation-related demand
- Land parcel for expansion would require minimal grading efforts
- No direct impacts to immediately adjacent offsite development or roadways

Impacts/Issues of Eastern Expansion Alternative

- Significant disruption to Airport operations
- Requires land acquisition
- Requires relocation of existing tie-downs or construction of additional taxilane

Southern Expansion Alternative

As shown in blue in **Exhibit 4-2**, this alternative expands the apron south of the existing apron. It is recommended that hangars be developed and installed adjacent to the existing hangars to limit the sporadic placement around landside facilities. Keeping hangar complexes together promotes the safe mobility of similarly sized aircraft within movement areas as it funnels hangar bound aircraft to the same location, respectively. The following bullets summarize the benefits and impacts of expanding the apron to the south.

Benefits of Southern Expansion Alternative

- Lowest estimated construction cost of proposed alternatives
- Two recommended additional conventional hangars can be erected in continuation with the existing hangars
- Additional tie-down spaces can be installed in continuation with the existing tie-downs
- Construction of a southern apron would not impact existing landside or airside facilities, including daily operations during construction
- Developments would remain on Airport property
- Provides space for future development, including the installation of a fuel facility

Impacts/Issues of Southern Expansion Alternative

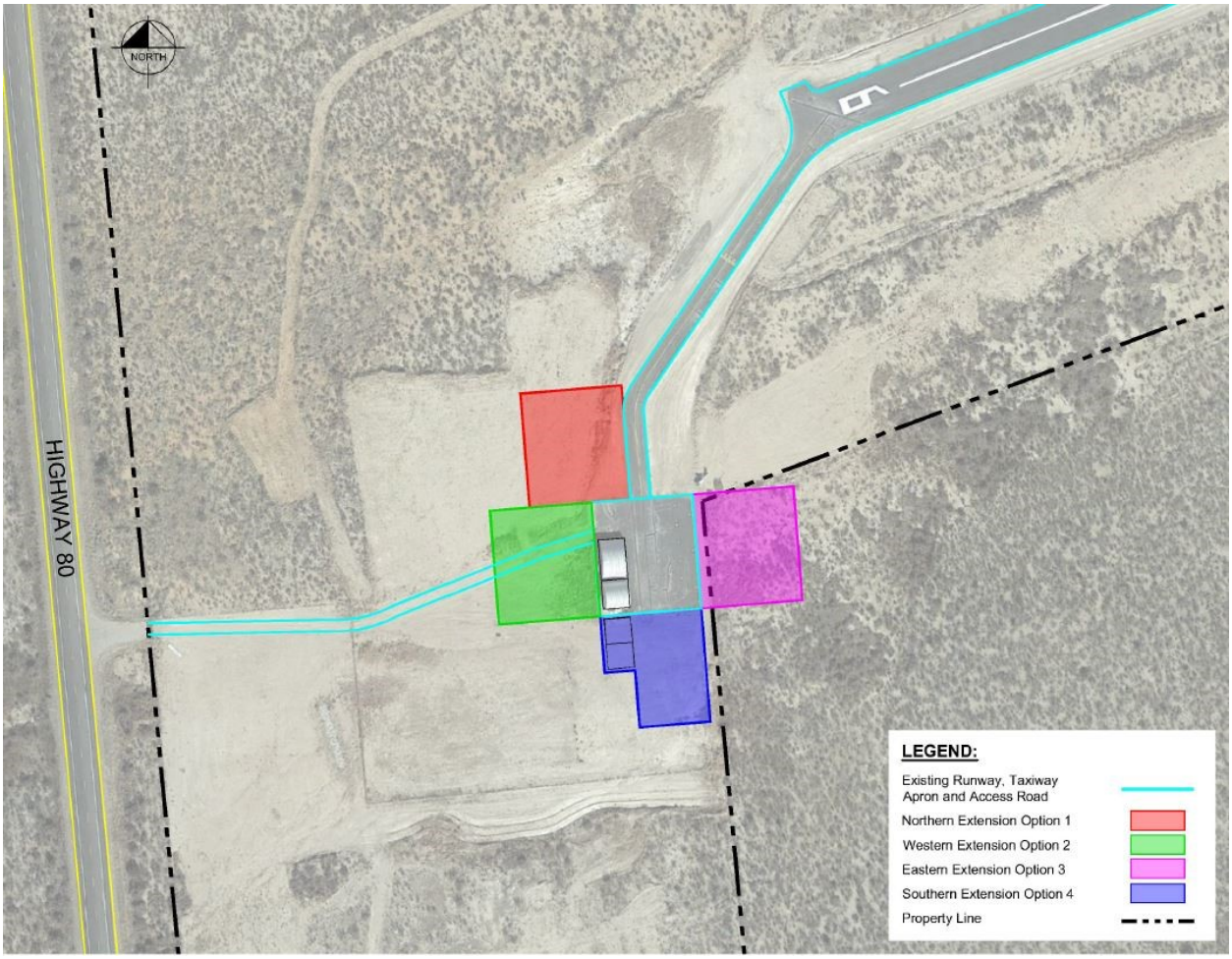
- Design and construction costs

Recommended Apron Expansion Alternative

As stated previously, the recommended location is based on the scenario that least impacts the current layout and design, limits cost, and provides future expansion opportunity. Based on the alternatives listed above, it is recommended that apron expansion occur to the south of the

existing apron. Expansion to the south does not require the acquisition of State land, promotes future expansion, does not impact existing facilities, and adheres to FAA airport design standards.

Exhibit 4-2. Landside Alternatives



Source: Google Earth, Kimley-Horn

Support Facility Alternatives

The following section discusses the options for the construction and development of support facilities in the form of a fuel system and landside facilities in the form of a general aviation terminal building. Both facilities provide individual benefits to the Airport and are evaluated for effective use and optimal placement.

Fuel System

There are many ways to conduct fueling operations at airports. Fuel trucks can service parked aircraft or general aviation aircraft can be pushed, towed, or taxied to fuel pumps that may be located either at a fuel island or along the apron edges. As discussed previously, to provide

additional service to existing based and itinerant aircraft, and to potentially increase revenue and demand at P29, it is recommended that the Airport invest in a fuel system. The following section discusses fuel system location alternatives around the Airport.

Fuel System on Existing Apron

This alternative positions the fuel system on the existing apron. Positioning a fuel system requires careful planning, taking apron circulation, environmental impacts, and future growth into consideration. The fuel system should be easily accessible and leave enough room for non-fueling aircraft to operate safely within the vicinity of a fueling aircraft. The existing apron has limited available space for the placement of a fuel system due to the conventional hangars on the west side of the apron, and the tie-down spaces along the east side of the apron.

Locating the fuel system on the north side of the apron is not optimal as it would act as an obstacle for aircraft entering and exiting the taxi lane. Another option would be to have a fuel island in the middle of the existing apron area. Similarly, this is not ideal because of the already limited apron size. A fuel island would not provide enough space for aircraft to safely operate around the facility, and could create collision hazards with nearby hangars and aircraft stored on tie-down spaces. The last option would be to construct a small platform on the outside southern edge of the existing apron. Placement in this location would allow other aircraft to move without blocking aircraft on the movement area. Placement of the fuel facility on the southern edge of the existing apron is the most viable option, however, it would limit the options for future apron expansion to the south.

Fuel System on Planned Apron Expansion

This alternative positions the fuel system on the recommended southern apron expansion. As stated previously, providing small fuel tanks (100LL and/or automobile gas) is recommended as a high priority project (2015-2020) to generate revenue in the near-term. In order to install the fuel system in an ideal location that doesn't impact future expansion, a southern apron would need constructed prior to, or during the installation of the fuel system.

The recommended location for future apron expansion is to the south of the existing apron which includes the construction of hangars to the west and tie downs to the east. Placement of the fuel system using this layout will have similar impacts as noted within the existing apron. As such, it is recommended that the fuel system be placed on the western side of the planned apron, south of the planned hangar facilities. Placement in this location maximizes mobility on the apron and provides the opportunity for future apron expansion to the south. The recommended location of the fuel system is identified below in **Exhibit 4-3**.

Terminal Building

A terminal building at the Airport would provide amenities to users such as restrooms, pilot lounge, and flight planning workspace. This section discusses the potential locations for the recommended 250-square foot terminal building.

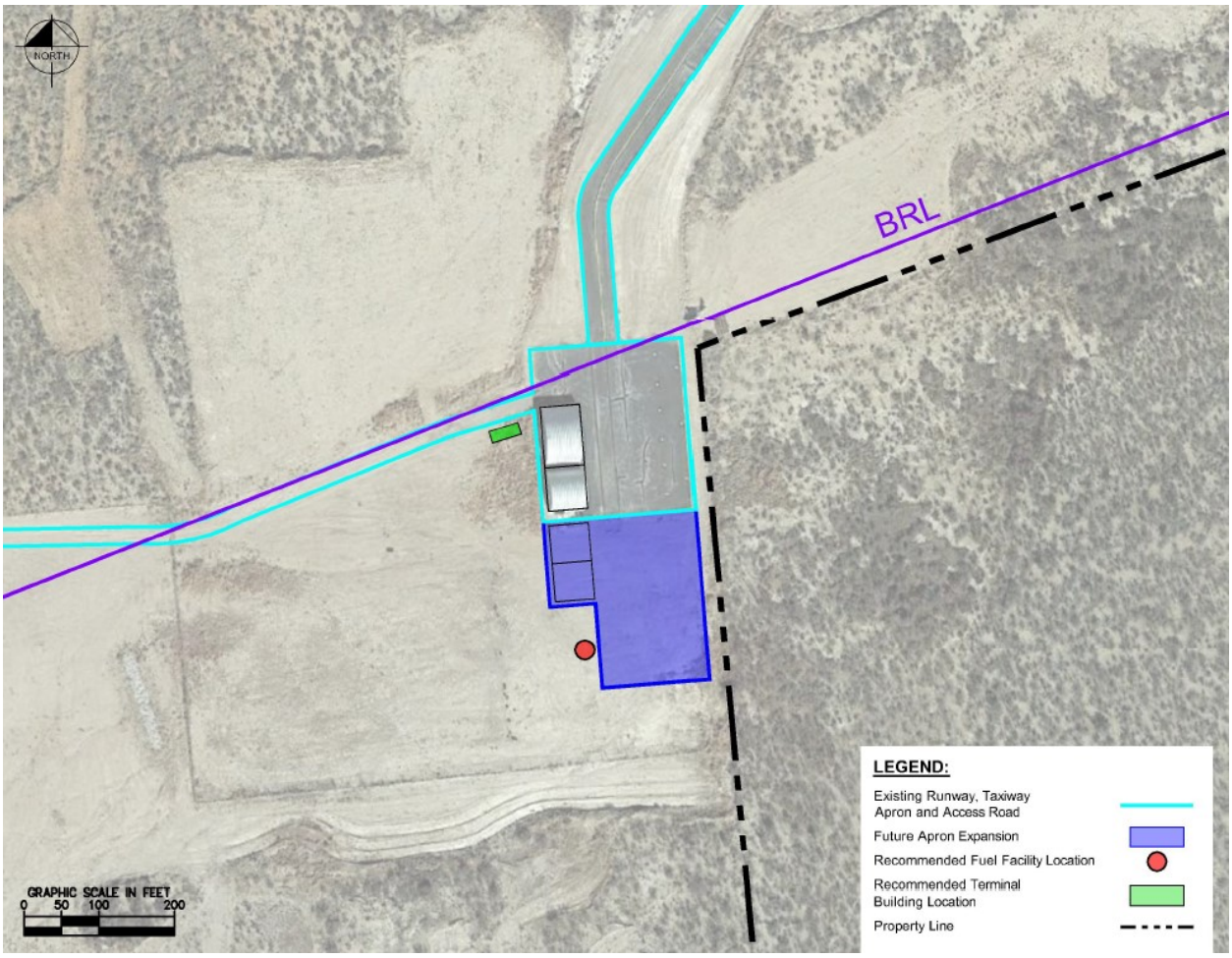
Similar to the strategic positioning of an apron area at an Airport, typically the terminal building should be located in a central location to provide ease of access to aircraft coming from both runway directions. In this case, because the terminal/landside area has already been developed on the west side of the Airport property, it is recommended that the Airport continue to develop landside facilities where development has already been established. Continuing to develop the established landside area will limit the excess spending that comes with developing an area from scratch. As such, it is recommended to construct an approximately 250-square foot terminal building near the existing apron area.

Deciding where to construct the terminal building is dependent on safety and accessibility to Airport users. The terminal building should be erected in an area near landside facilities that provides access to the hangars, tie-downs, auto parking lot, and Airport access road, while not interfering with the functionality of these facilities. Existing landside facilities are located south of the Airport access road, and to maximize available space near existing facilities, the terminal building should also be positioned near existing aviation-related facilities.

A 250-square foot terminal building is relatively small, and can most effectively be placed west of the existing hangars to the south of the access road, which is slated to be paved in the future. Placement of the terminal building in this location provides centralized access to the landside facilities and promotes an effective utilization of Airport facilities.

The recommended placement of the fuel facility and terminal building are depicted below in **Exhibit 4-3**.

Exhibit 4-3. Support Facility Alternatives



Sources: Google Earth, Kimley-Horn

5 AIRPORT DEVELOPMENT AND FINANCIAL PLAN

This Section provides a summary of projects identified in the Facility Requirements section, recommended developments described in the Alternatives section, as well as possible additional studies that may be required throughout the 20-year planning horizon. This summary also includes planning-level cost estimates and potential funding mechanisms.

As noted previously, Tombstone Municipal Airport is not a NPIAS facility, meaning it is not eligible to receive FAA AIP grants. As such, the primary financial channel for Airport improvements other than local monies is through grants issued by the Arizona Department of Transportation – Multimodal Planning Division (ADOT-MPD) Aeronautics Group. Grant-eligible projects require a 10 percent local match to obtain 90 percent State funding. Projects are typically eligible for ADOT grants if they are related to maintenance, safety, capacity enhancement, or are projects related to environmental studies, planning, or land acquisition.

ADOT Airport Development Grant Status

In Spring 2017, ADOT announced that it would be suspending State/Local (S/L) grants through fiscal year 2020, essentially placing a “freeze” on funding of non-FAA eligible development. Taking this into account, the Airport Capital Improvement Plan (ACIP) developed in this Section separates recommended improvements into two phases. Phase I includes all improvements and studies that are recommended for a 1 to 5-year completion period, while Phase II includes those projects that should be considered for completion in the 6 to 20-year timeframe. Typically, projects identified in the first 5 years of an ACIP would have specific years associated with these improvements, however, due to the uncertain nature of potential funding, these projects are classified as “near-term” improvements, meaning they should be pursued within a 5-year period.

Proposed Airport Development Plan

Phasing of proposed improvements assists both the airport sponsor and ADOT in the prioritization of projects in terms of need and funding significance. Proposed improvements and associated studies that comprise the proposed ACIP are shown by phase in **Table 5-1**. A graphical depiction of physical improvements listed in **Table 5-1** is presented on the ALP.

Table 5-1. Airport Capital Improvement Plan

Item #	Phase I: Near-Term Development (0-5 Years)	Total Project Cost	State Grant	Local Match
1	Extension of City utilities to Airport property (Design/install electric from nearest City line, estimated at 3.5 miles above ground)	$265,000	N/A	$265,000
2	Airport access signage (2 signs)	$500	N/A	$500
3	Design terminal building (± 250 sf with water and electricity)	$40,000	$36,000	$4,000
4	Construct terminal building (Phase 1-construct water well and electrical from property line)	$80,000	$72,000	$8,000
5	Construct terminal building (Phase 2-construct building)	$50,000	$45,000	$5,000
6	Fuel System (design/construction)	$425,000	N/A	$425,000
7	Pave access road and 7 paved auto parking spaces (Design/construction)	$120,000	$108,000	$12,000
8	Aircraft parking apron expansion (10,500 sf)	$200,000	$180,000	20,000
	Total Phase I Costs	**$1,180,500**	**$441,000**	**$739,500**
Item #	**Phase II: Long-Term Development (6-20 Years)**	**Total Project Cost**	**State Grant**	**Local Match**
9	Design and construction of Runway 06-24 extension (1,820’)	$750,000	$675,000	$75,000
10	Design, construction, and CATEX for turnaround taxiway and reconfiguration of 06 connector taxiway	$460,000	$414,000	$46,000
11	Design and installation of PAPI’s on Ultimate Runway End 06 and 24	$175,000	$157,500	$17,500
11	CATEX, design, and construction of 4,900’ x 60’ graded (unpaved) runway	$525,000	$472,500	$52,500
12	Land acquisition for crosswind runway and 06-24 RPZs (240.2 acres)	$480,400	$432,360	$48,040
13	Design and seal coat for Runway 06-24 (29,500 SY)	$80,000	$72,000	$8,000
14	Refurbish/Enclose property line fence (existing)	$120,000	$108,000	$12,000
15	Security floodlighting on apron	$5,000	$4,500	$500
	Total Phase II Costs	**$2,595,400**	**$2,335,860**	**$259,540**
	TOTAL DEVELOPMENT COSTS	**$3,600,900**	**$2,619,360**	**$981,540**

Source: Kimley-Horn

6 AIRPORT LAYOUT PLAN

The recommended developments identified in the Facility Requirements, Alternatives Analysis, and Airport Development and Financial Plan sections of this Airport Layout Plan Update with Narrative are graphically represented in the ALP drawing set. This set includes the following sheets:

ALP Drawing Set

- 1 Title Sheet
- 2 Airport Layout Plan
- 3 Data Sheet
- 4 Terminal Area Plan
- 5 Existing Airspace Drawing
- 6 Future Airspace Drawing
- 7 Inner Portion of the Approach – Runway 06
- 8 Inner Portion of the Approach – Runway 24
- 9 Inner Portion of the Approach – Ultimate Runway 02-20
- 10 Airport Land Use Map
- 11 Airport Property Map

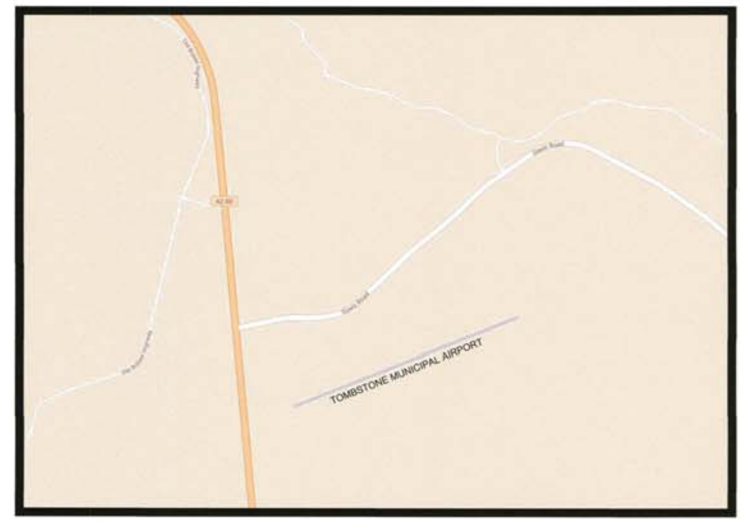
TOMBSTONE MUNICIPAL AIRPORT

AIRPORT LAYOUT PLAN DRAWINGS

COCHISE COUNTY, ARIZONA

DECEMBER 2017

STATE MAP
(Not to Scale)



VICINITY MAP
(Not to Scale)

ADOT
Multimodal Planning

This Airport Layout Plan has been reviewed by ADOT MPD Aeronautics staff and is approved.

Donald J. Kriz, P.E., State Airport Engineer — Date: 12/22/17

The contents of this plan do not necessarily reflect the official views or policy of ADOT Aeronautics Group. Acceptance of these documents by ADOT Aeronautics does not in anyway constitute a commitment on the part of the State of Arizona to participate in any development depicted herein nor does it indicate that the proposed development is environmentally acceptable in accordance with appropriate public or state laws.

CITY OF TOMBSTONE APPROVAL	
RECOMMENDED BY:	DATE:
Dusty Escapule Mayor	1/4/18
Michael McMillan Building Official	1/5/18

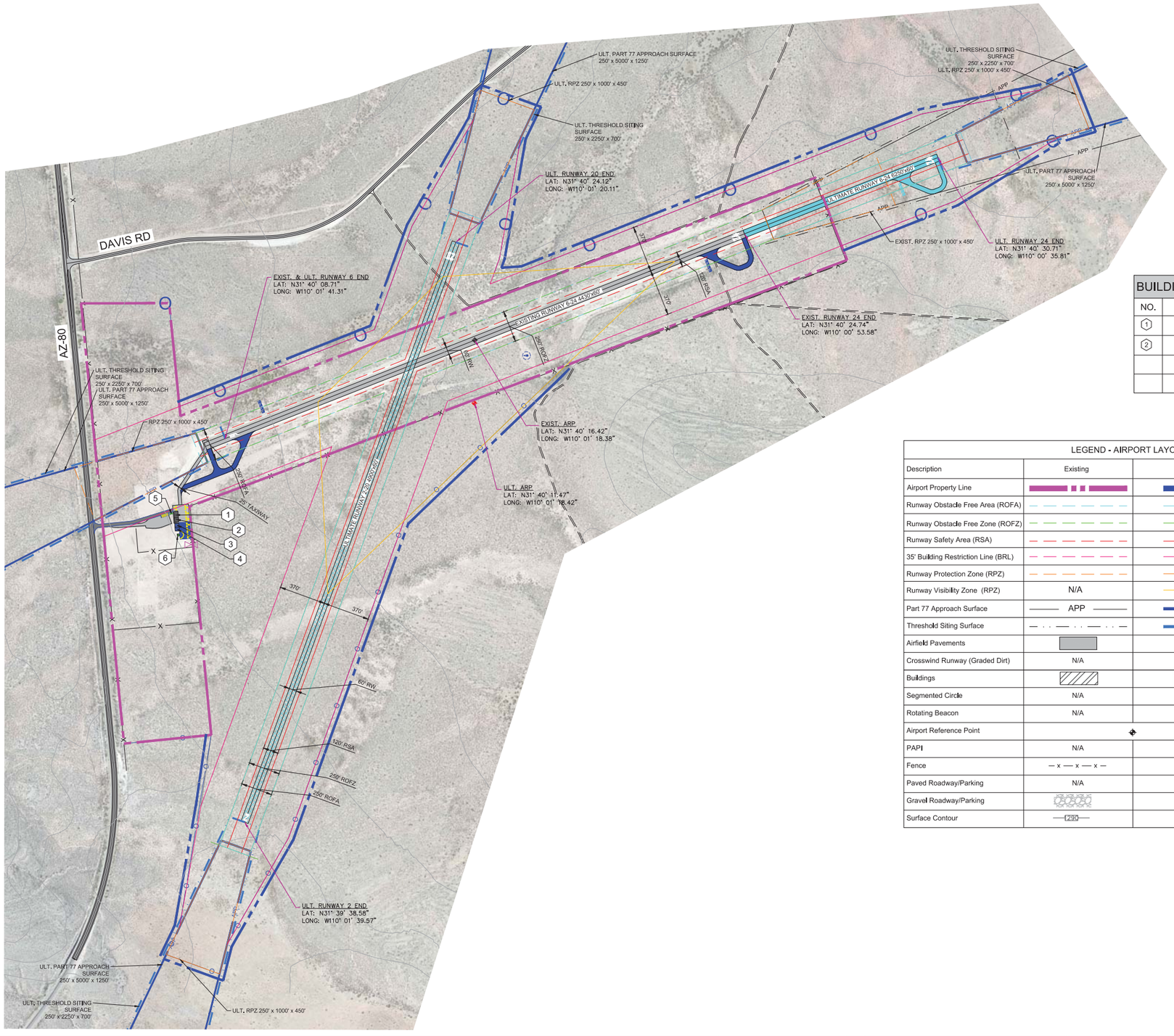
SHEET INDEX

REVISIONS	BY	APPROVED	DATE

CITY OF TOMBSTONE
DEPARTMENT OF PUBLIC WORKS
611 E ALLEN ST, PO BOX 339, TOMBSTONE, AZ, 85638

Kimley»Horn
1855 W Baseline Rd #200
Mesa, AZ 85202
www.kimley-horn.com

AIRPORT LAYOUT PLAN
TITLE SHEET
SHEET 1 OF 11 SHEETS



CITY OF TOMBSTONE APPROVAL

RECOMMENDED BY: DATE:

Airport Engineer Name
Airport Engineer

Sonny Adams
Airport Manager

APPROVED BY:

Approver Name
Director of Airports

BUILDINGS/FACILITIES INDEX TABLE

NO.	EXISTING	NO.	FUTURE
1	HANGAR	3	HANGAR (~1000 SF)
2	HANGAR	4	HANGAR (~1000 SF)
		5	GENERAL AVIATION BUILDING (~250 SF)
		6	FUEL FACILITY

GENERAL NOTES

1. PROTECTION ZONES WERE DETERMINED USING THE FAA RUNWAY DESIGN STANDARDS PRESENTED IN AC 150/5300-13A USING THE PUBLISHED RUNWAY END POINTS AS THE BASE POINTS.
2. COORDINATES ARE PRESENTED IN NORTH AMERICAN DATUM OF 1983 (NAD83) ARIZONA STATE PLANES, EAST ZONE, IN U.S. SURVEY FEET.
3. ELEVATIONS ARE PRESENTED IN THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) IN HEIGHT ABOVE MEAN SEA LEVEL (MSL).

LEGEND - AIRPORT LAYOUT PLAN

Description	Existing	Future	Ultimate
Airport Property Line			
Runway Obstacle Free Area (ROFA)			
Runway Obstacle Free Zone (ROFZ)			
Runway Safety Area (RSA)			
35' Building Restriction Line (BRL)			
Runway Protection Zone (RPZ)			
Runway Visibility Zone (RPZ)	N/A		
Part 77 Approach Surface	APP	APP	
Threshold Siting Surface			
Airfield Pavements			
Crosswind Runway (Graded Dirt)	N/A	N/A	
Buildings			
Segmented Circle	N/A		
Rotating Beacon	N/A		
Airport Reference Point			
PAPI	N/A		
Fence			
Paved Roadway/Parking	N/A		
Gravel Roadway/Parking		N/A	
Surface Contour	1230		

9.5167°
MAGNETIC 9° 31' E
JUN 2013

GRAPHIC SCALE IN FEET
0 200 400 800

OCTOBER 2007
MAGNETIC DECLINATION

SOURCE:
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA), OCTOBER 2007

CITY OF TOMBSTONE
DEPARTMENT OF PUBLIC WORKS
611 E ALLEN ST, PO BOX 339, TOMBSTONE, AZ, 85638

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	REVISIONS	BY	APPROVED	DATE

TOMBSTONE MUNICIPAL AIRPORT
A COCHISE COUNTY AVIATION FACILITY - TOMBSTONE, ARIZONA
AIRPORT LAYOUT PLAN DRAWINGS
AIRPORT LAYOUT PLAN

SCALE: HOR. 1"=400' VERT. N/A

SHEET 2 OF 11 SHEETS

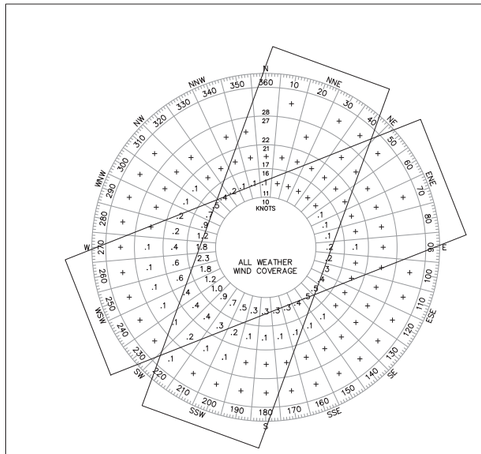
2_AIRPORT LAYOUT PLAN.dwg Wednesday, Dec. 06 2017 10:31am

RUNWAY DATA

ITEM		RW 6-24 (EX)	RW 6-24 (ULT)	RW 2-20 (ULT)
RUNWAY DIMENSIONS & SURFACES				
APPROACH REFERENCE CODE		A/B-I-SMALL	A/B-I-SMALL	A/B-I-SMALL
DESIGN AIRCRAFT	CRITICAL AIRCRAFT	CESSNA 172 SKYHAWK		
	APPROACH SPEED (KNOTS)	54 KNOTS		
	WINGSPAN/LENGTH	36'-1"		
	MAX. CERTIFIED TAKEOFF WEIGHT (LBS)	2450		
APPROACH MINIMUMS		1,000'/3 MILES	1,000'/3 MILES	1,000'/3 MILES
APPROACH TYPE		VISUAL	VISUAL	VISUAL
FAR PART 77 APPROACH SLOPE		20:1	20:1	20:1
RUNWAY PROTECTION ZONES (RPZ)	LENGTH	1000'	1000'	1000'
	INNER WIDTH	250'	250'	250'
	OUTER WIDTH	450'	450'	450'
RUNWAY LENGTH		4430'	6250'	4900'
RUNWAY WIDTH		60'	60'	60'
RUNWAY PAVEMENT		ASPHALT	ASPHALT	GRADED DIRT
PAVEMENT STRENGTH		TBD	TBD	TBD
RUNWAY LIGHTING		NONE		
APPROACH LIGHTING		NONE		
RUNWAY MARKINGS		BASIC	BASIC	NONE
% EFFECTIVE GRADIENT		1.0%	TBD	TBD
VISUAL APPROACH AIDS	RW 6	NONE	PAPI	NONE
NAVIGATIONAL AIDS		NONE	SEGMENTED CIRCLE, ROTATING BEACON	SEGMENTED CIRCLE, ROTATING BEACON
DESIGN AIRCRAFT	CRITICAL AIRCRAFT	CESSNA 172 SKYHAWK		
	APPROACH SPEED (KNOTS)	54 KNOTS		
	WINGSPAN/LENGTH	36'-1"		
	MAX. CERTIFIED TAKEOFF WEIGHT (LBS)	2450		
RUNWAY SAFETY AREA (RSA)	LENGTH BEYOND RW END	240'		
	WIDTH	120'		
RUNWAY OBJECT FREE AREA (ROFA)	LENGTH BEYOND RW END	240'		
	WIDTH	250'		
RUNWAY OBSTACLE FREE ZONE (ROFZ)	LENGTH BEYOND RW END	200'		
	WIDTH	250'		

AIRPORT DATA

ITEM		EXISTING	ULTIMATE
AIRPORT ELEVATION (NAVD88) (MSL)		4733.20'	4754' (EST.)
AIRPORT REFERENCE POINT (ARP) COORDINATES (NAD83)	LATITUDE	31° 40' 16.7" N (EST.)	31° 40' 11.47" N (EST.)
	LONGITUDE	110° 01' 17.5" W (EST.)	110° 01' 18.42" W (EST.)
MEAN MAX. TEMP - HOTTEST MONTH (JUNE)		93.7° F	SAME
AIRPORT REFERENCE CODE		A/B-1 (SMALL)	A/B-1 (SMALL)
NPIAS ROLE		NONE	NONE
MAGNETIC VARIATION		Mag. Dec. = 9° 31' E ± 0° 20' changing by 0° 6' W per year	
AIRPORT & TERMINAL NAVAIDS		NONE	SEGMENTED CIRCLE, ROTATING BEACON



WIND DATA SOURCE: FHU (STATION #722730) YEARS 2007-2016 FAA AGIS WEBSITE HTTPS://AIRPORTS-GIS.FAA.GOV/WINDROSE, ACCESSED FEBRUARY 2017

CROSSWIND COVERAGE TABLE

	ALL WEATHER		VFR WIND COVERAGE		IFR WIND COVERAGE	
	10.5 KNOTS	13 KNOTS	10.5 KNOTS	13 KNOTS	10.5 KNOTS	13 KNOTS
RUNWAY 6-24	93.2%	96.4%	93.3%	96.5%	88.9%	93.8%
RUNWAY 2-20	85.8%	91.9%	86.2%	92.3%	72.5%	80.3%
COMBINED	96.5%	98.8%	96.6%	98.8%	92.3%	96.5%

RUNWAY END COORDINATES AND ELEVATIONS

RUNWAY		LATITUDE	LONGITUDE	ELEVATION (MSL)
RW 6	EXISTING	31° 40' 8.71" N	110° 01' 41.31" W	4733.20'
	ULTIMATE	NO CHANGE	NO CHANGE	NO CHANGE
RW 24	EXISTING	31° 40' 24.74" N	110° 00' 53.60" W	4688.37'
	ULTIMATE	31° 40' 30.71" N	110° 00' 35.86" W	4681' (EST.)
RW 2	ULTIMATE	31° 39' 38.58" N	110° 01' 39.59" W	4754' (EST.)
RW 20	ULTIMATE	31° 40' 24.12" N	110° 01' 20.11" W	4688' (EST.)

NOTES:

1. AIRPORT AND RUNWAY DATA SOURCE IS AIRPORT IQ 1050 WEB FORM (LAST INSPECTION APRIL 2014).

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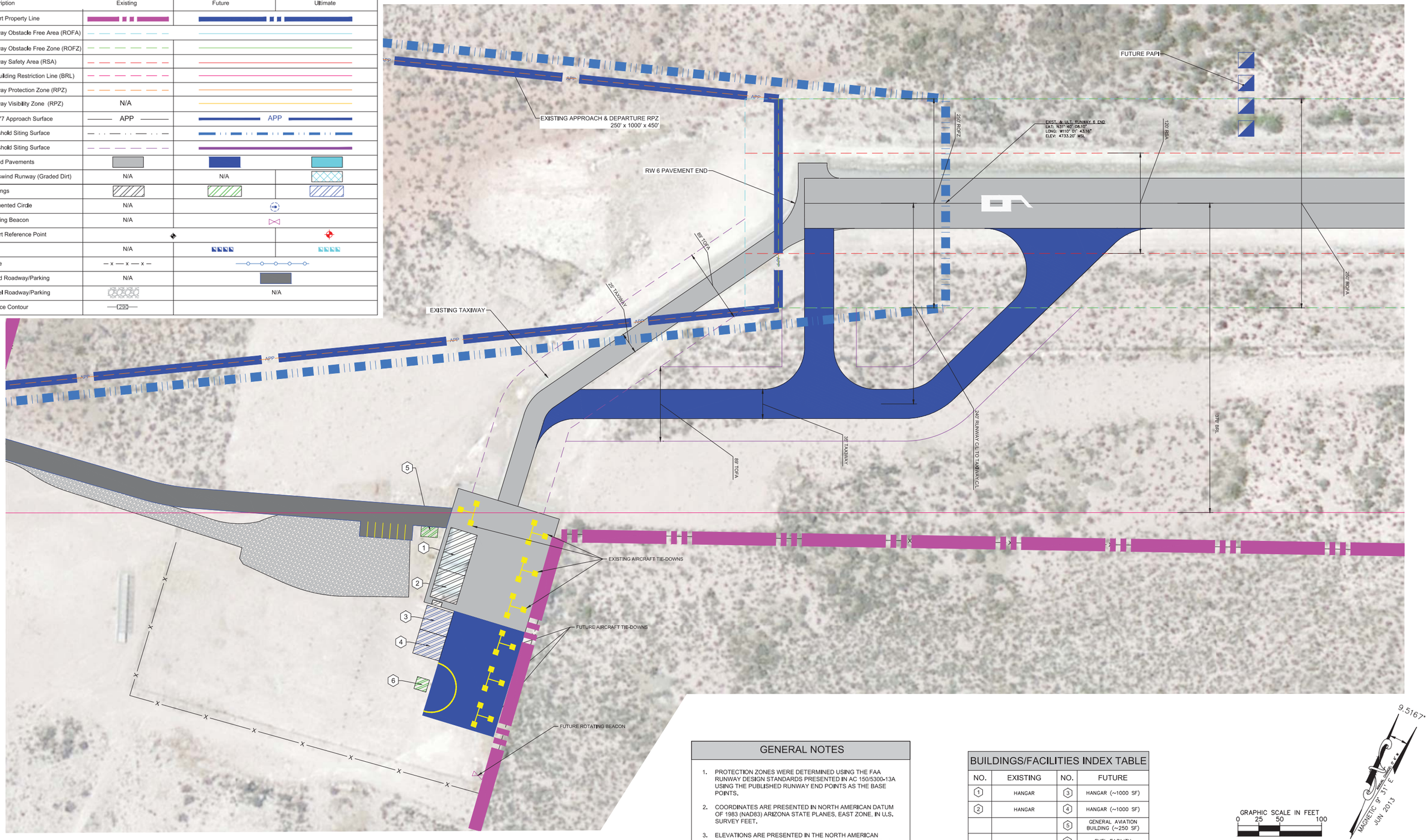
TOMBSTONE MUNICIPAL AIRPORT
A COCHISE COUNTY AVIATION FACILITY - TOMBSTONE, ARIZONA
AIRPORT LAYOUT PLAN DRAWINGS
DATA SHEET

SCALE: HOR. N/A VERT. N/A

3 DATA SHEET.dwg Wednesday, Dec. 06 2017 10:31am

LEGEND - AIRPORT LAYOUT PLAN

Description	Existing	Future	Ultimate
Airport Property Line			
Runway Obstacle Free Area (ROFA)			
Runway Obstacle Free Zone (ROFZ)			
Runway Safety Area (RSA)			
35' Building Restriction Line (BRL)			
Runway Protection Zone (RPZ)			
Runway Visibility Zone (RPZ)	N/A		
Part 77 Approach Surface	APP	APP	
Threshold Siting Surface			
Threshold Siting Surface			
Airfield Pavements			
Crosswind Runway (Graded Dirt)	N/A	N/A	
Buildings			
Segmented Circle	N/A		
Rotating Beacon	N/A		
Airport Reference Point			
PAPI	N/A		
Fence			
Paved Roadway/Parking	N/A		
Gravel Roadway/Parking		N/A	
Surface Contour	250		



GENERAL NOTES

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BUILDINGS/FACILITIES INDEX TABLE

NO.	EXISTING	NO.	FUTURE
1	HANGAR	3	HANGAR (~1000 SF)
2	HANGAR	4	HANGAR (~1000 SF)
		5	GENERAL AVIATION BUILDING (~250 SF)
		6	FUEL FACILITY

GRAPHIC SCALE IN FEET
0 25 50 100

9.5167°
MAGNETIC 9° 31' E
JUN 2013

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TOMBSTONE MUNICIPAL AIRPORT
A COCHISE COUNTY AVIATION FACILITY - TOMBSTONE, ARIZONA
AIRPORT LAYOUT PLAN DRAWINGS
TERMINAL AREA PLAN

SCALE: HOR. 1"=50' VERT. N/A

SHEET 4 OF 11 SHEETS

4 TERMINAL AREA PLAN.dwg Wednesday, Dec. 06 2017 10:32am

PART 77 OBSTRUCTION DATA

OID	DESCRIPTION	Object Height [ft MSL]	PENETRATED SURFACE	Penetration [ft]	DISPOSITION	FAA STUDY/ID#
1	TOWER	4825	N/A	N/A	LIGHTED	2012AWP90940E
OBSTACLE DATA FROM FAA DOF DATED 4.24.2016						

AZ-80

20:1 CONICAL SURFACE

5083.20' MSL
5050' MSL
5000' MSL
4950' MSL
4900' MSL
4883.20' MSL

20:1 APPROACH SURFACE

7:1 TRANSITIONAL SURFACE

4883.20' MSL
4860' MSL
4800' MSL
4700' MSL 4750' MSL
4760' MSL 4700' MSL
4800' MSL
4850' MSL
4883.20' MSL

4900' MSL
4850' MSL
4800' MSL
4750' MSL
4700' MSL
4750' MSL
4800' MSL
4850' MSL
4900' MSL
4938.27' MSL
4883.20' MSL

20:1 APPROACH SURFACE

HORIZONTAL SURFACE
(4883.20' MSL)

DAVIS RD

4883.20' MSL
4900' MSL
4950' MSL
5000' MSL
5050' MSL
5083.20' MSL

20:1 CONICAL SURFACE

AZ-80

9.5167°

MAGNETIC 9° 31' E
JUN 2013

GRAPHIC SCALE IN FEET
0 750 1500 3000

EXISTING AIRPORT ELEVATION: 4733.20' MSL

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TOMBSTONE MUNICIPAL AIRPORT
A COCHISE COUNTY AVIATION FACILITY - TOMBSTONE, ARIZONA
AIRPORT LAYOUT PLAN DRAWINGS
EXISTING AIRSPACE DRAWING

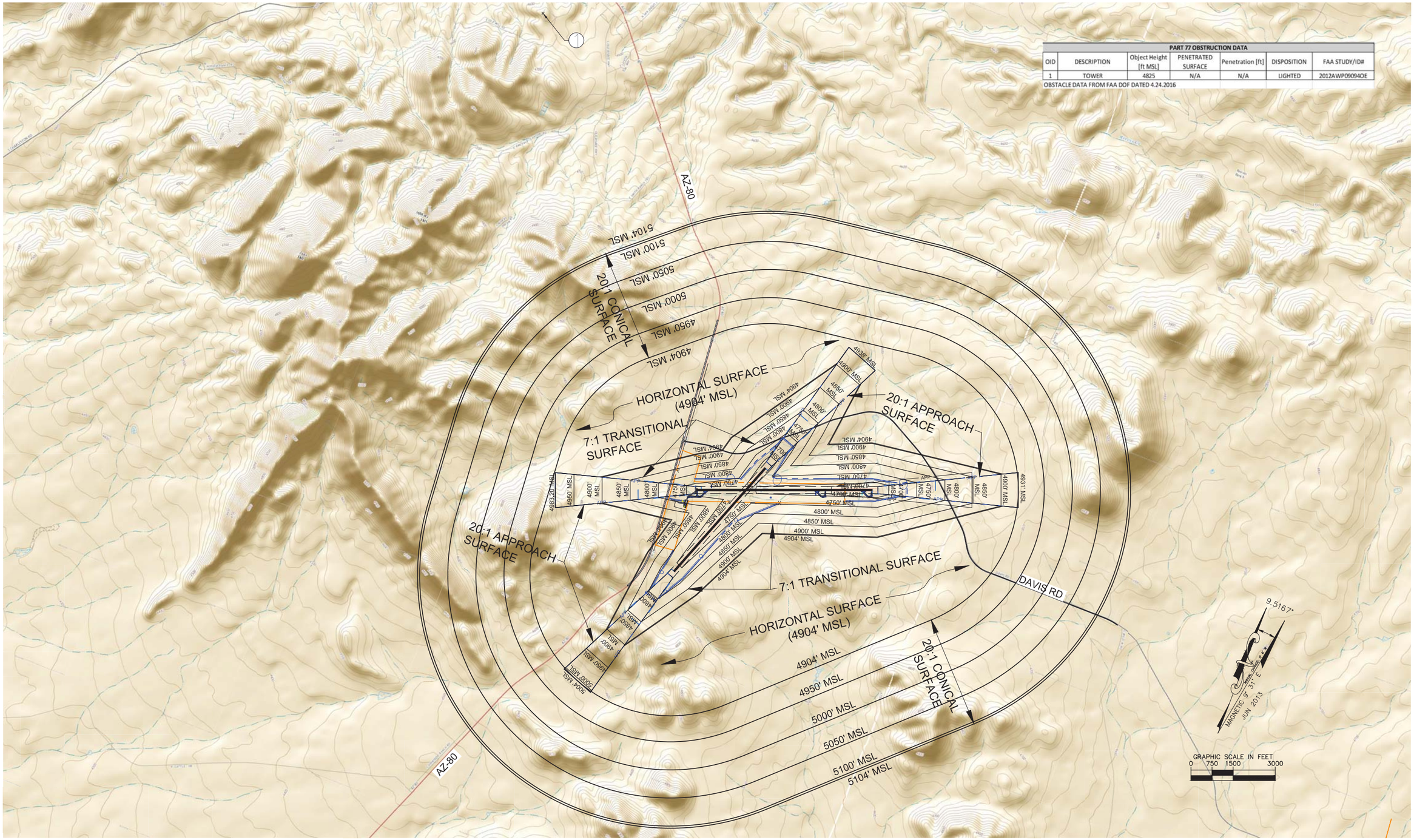
SCALE: HOR. 1"=1500' VERT. N/A

SHEET 5 OF 11 SHEETS

5--6 AIRSPACE DRAWINGS.dwg Wednesday, Dec. 06 2017 10:32am

PART 77 OBSTRUCTION DATA						
OID	DESCRIPTION	Object Height [ft MSL]	PENETRATED SURFACE	Penetration [ft]	DISPOSITION	FAA STUDY/ID#
1	TOWER	4825	N/A	N/A	LIGHTED	2012AWP09094OE

OBSTACLE DATA FROM FAA DOF DATED 4.24.2016



ULTIMATE AIRPORT ELEVATION: 4753.82' MSL

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TOMBSTONE MUNICIPAL AIRPORT
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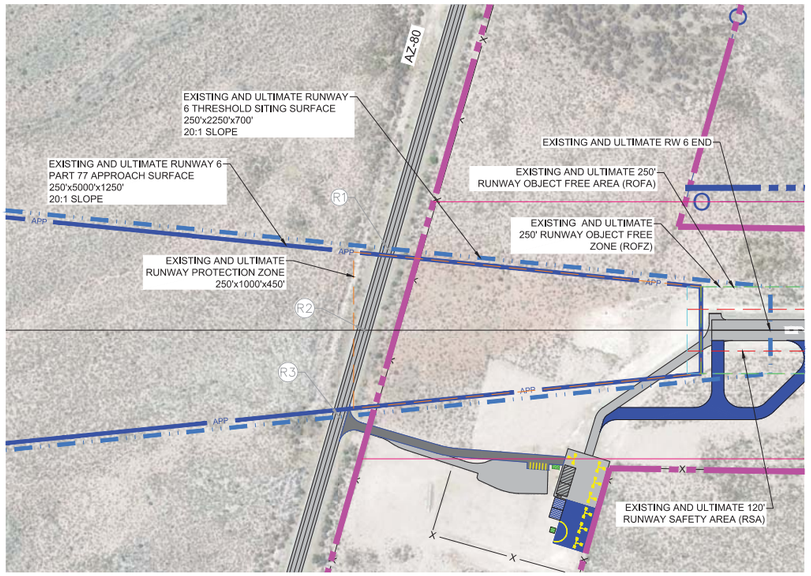
AIRPORT LAYOUT PLAN DRAWINGS
FUTURE AIRSPACE DRAWING

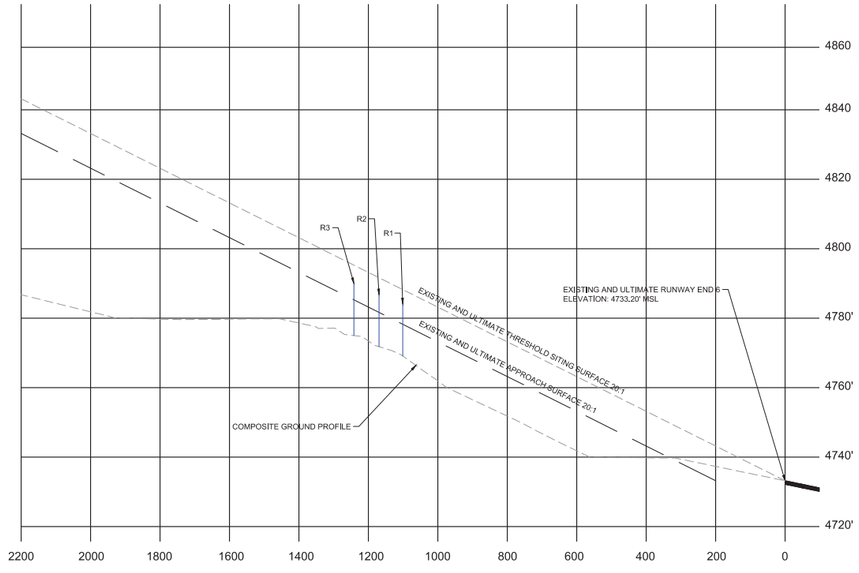
SCALE: HOR. 1"=1500' VERT. N/A

SHEET 6 OF 11 SHEETS

5-6 AIRSPACE DRAWINGS.dwg Wednesday, Dec. 06 2017 10:32am

RUNWAY 6 - EXISTING AND ULTIMATE





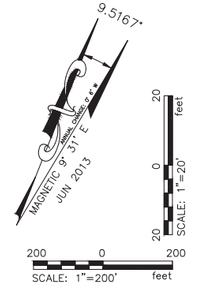
INNER APPROACH OBSTRUCTION DATA

OBJECT ID #	DESCRIPTION	OBJECT HEIGHT (MSL)	PENETRATION	SURFACE	DISPOSITION
R1	AZ-80	4784.15'	5.90'	PT. 77 APPROACH	REMAIN
R2	AZ-80	4786.80	5.14'	PT. 77 APPROACH	REMAIN
R3	AZ-80	4790.01	4.74'	PT. 77 APPROACH	REMAIN

NOTE: ROADWAY ELEVATIONS INCLUDE 15' BUFFER PER PART 77 GUIDELINES

LEGEND - AIRPORT LAYOUT PLAN

Description	Existing	Future	Ultimate
Airport Property Line			
Runway Obstacle Free Area (ROFA)			
Runway Obstacle Free Zone (ROFZ)			
Runway Safety Area (RSA)			
35' Building Restriction Line (BRL)			
Runway Protection Zone (RPZ)			
Runway Visibility Zone (RPZ)	N/A		
Part 77 Approach Surface	APP	APP	
Threshold Siting Surface			
Airfield Pavements			
Crosswind Runway (Graded Dirt)	N/A	N/A	
Buildings			
Segmented Circle	N/A		
Rotating Beacon	N/A		
Airport Reference Point			
PAPI	N/A		
Fence			
Paved Roadway/Parking	N/A		
Gravel Roadway/Parking		N/A	
Surface Contour	730		



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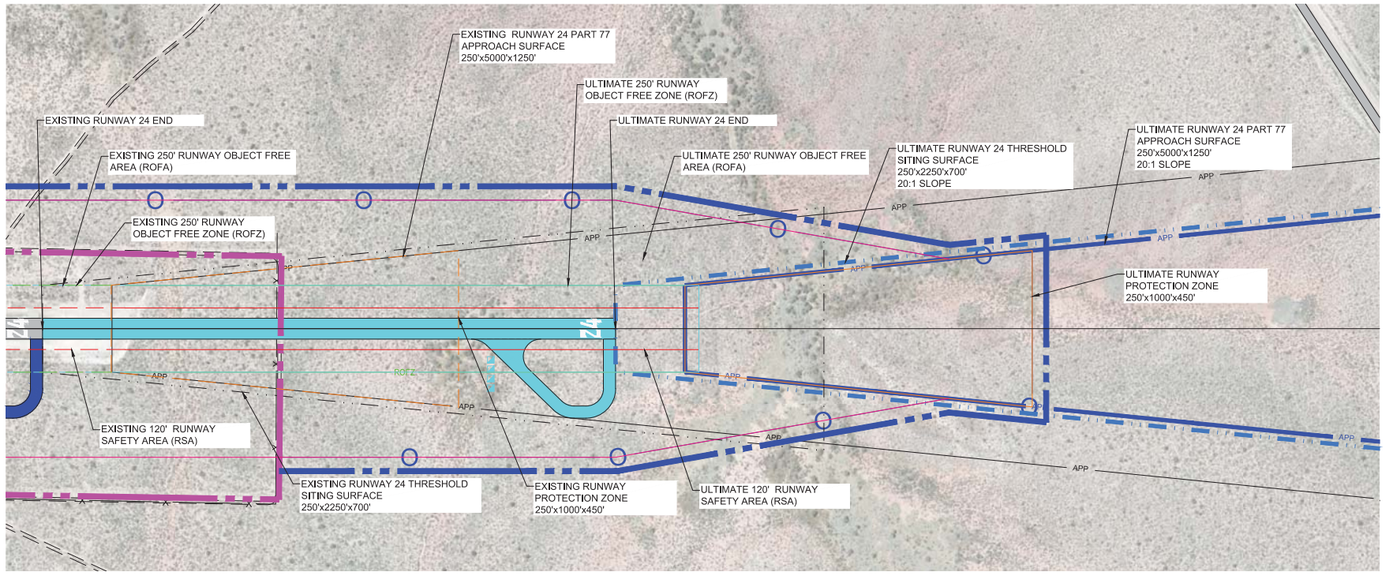
TOMBSTONE MUNICIPAL AIRPORT
A COCHISE COUNTY AVIATION FACILITY - TOMBSTONE, ARIZONA
AIRPORT LAYOUT PLAN DRAWINGS
INNER PORTION OF THE APPROACH - RW 6

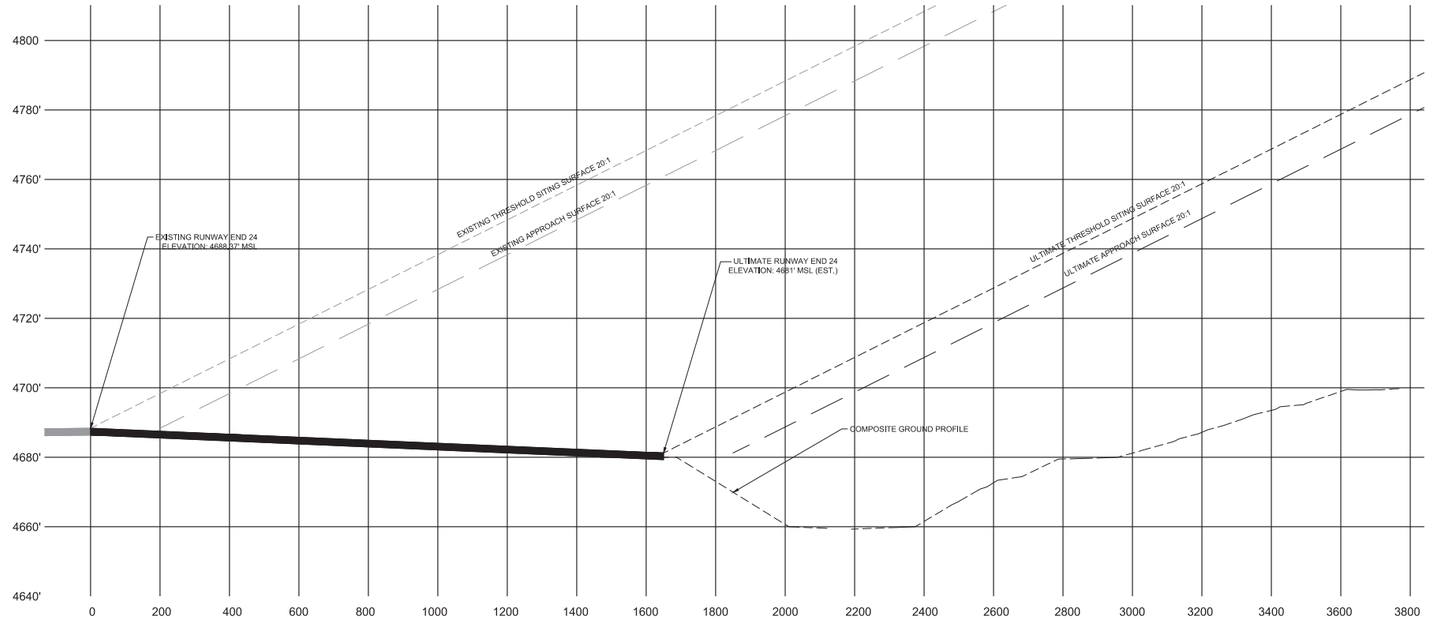
SCALE: HOR. 1"=200' VERT. 1"=20'

SHEET 7 OF 11 SHEETS

7--8 IPASD.dwg Wednesday, Dec. 06 2017 10:33am

RUNWAY 24 - EXISTING AND ULTIMATE



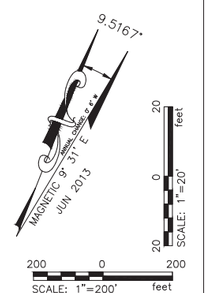


INNER APPROACH OBSTRUCTION DATA

OBJECT ID #	DESCRIPTION	OBJECT HEIGHT (MSL)	PENETRATION	SURFACE	DISPOSITION
NO OBSTACLES IDENTIFIED					

LEGEND - AIRPORT LAYOUT PLAN

Description	Existing	Future	Ultimate
Airport Property Line			
Runway Obstacle Free Area (ROFA)			
Runway Obstacle Free Zone (ROFZ)			
Runway Safety Area (RSA)			
35' Building Restriction Line (BRL)			
Runway Protection Zone (RPZ)			
Runway Visibility Zone (RPZ)	N/A		
Part 77 Approach Surface	APP	APP	
Threshold Siting Surface			
Airfield Pavements			
Crosswind Runway (Graded Dirt)	N/A	N/A	
Buildings			
Segmented Circle	N/A		
Rotating Beacon	N/A		
Airport Reference Point			
PAPI	N/A		
Fence	— x — x — x —		
Paved Roadway/Parking	N/A		
Gravel Roadway/Parking		N/A	
Surface Contour	290		



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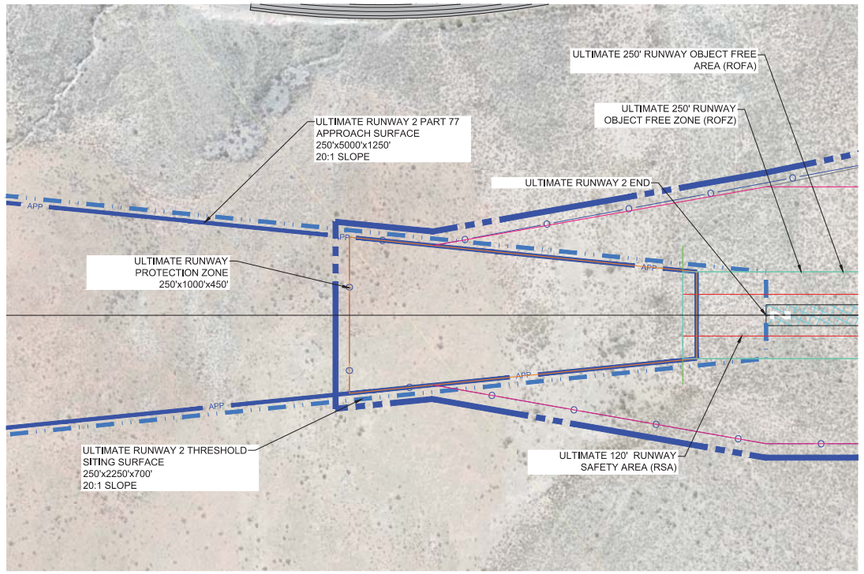
AIRPORT LAYOUT PLAN DRAWINGS
INNER PORTION OF THE APPROACH - RW 24

SCALE: HOR. 1"=200' VERT. 1"=20'

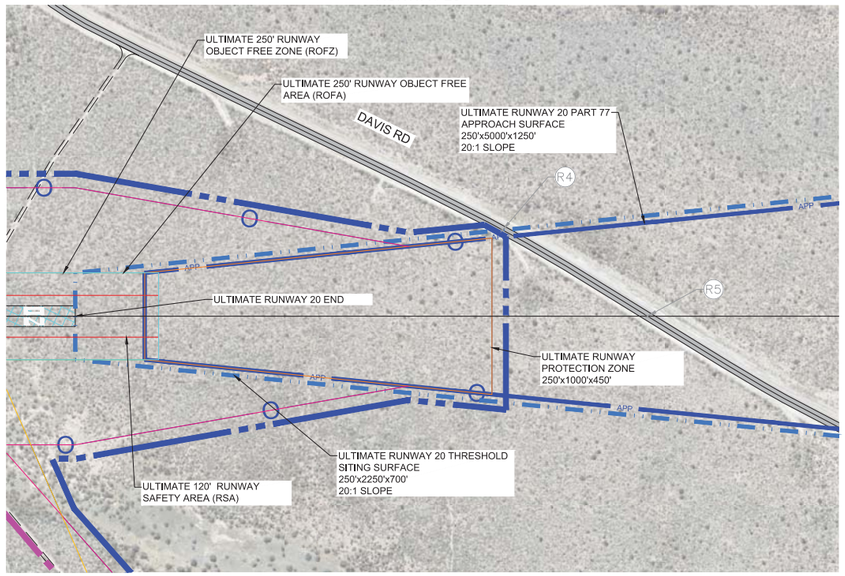
SHEET 8 OF 11 SHEETS

7-8 IPASD.dwg Wednesday, Dec. 06 2017 10:33am

RUNWAY 2



RUNWAY 20



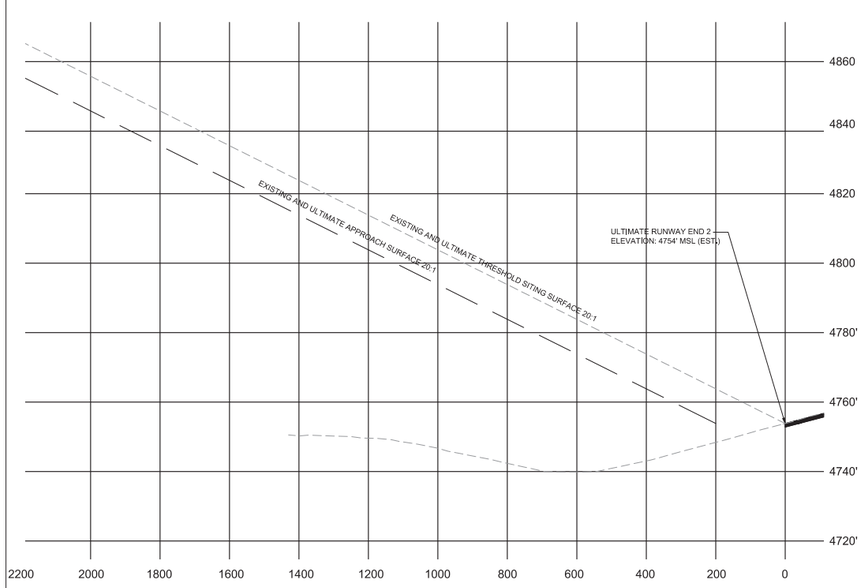
INNER APPROACH OBSTRUCTION DATA

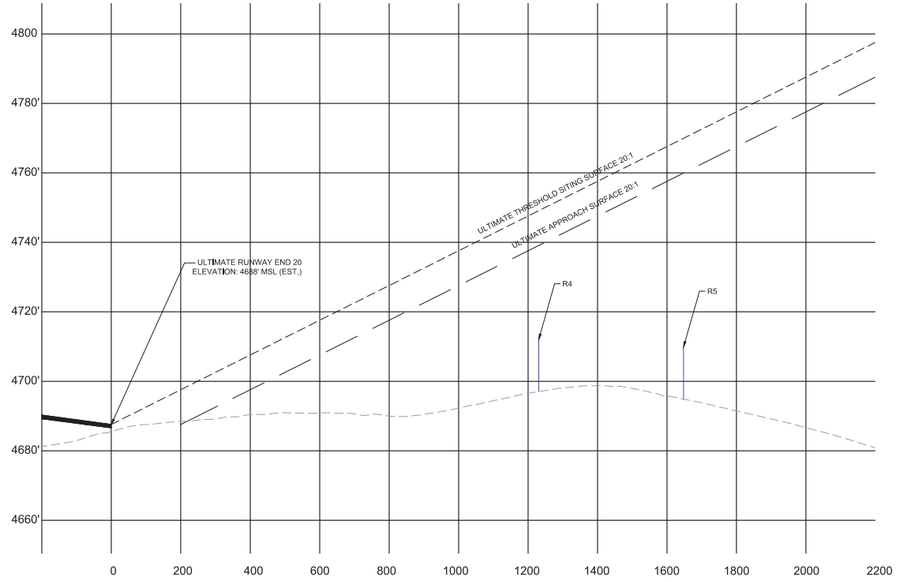
OBJECT ID #	DESCRIPTION	OBJECT HEIGHT (MSL)	PENETRATION	SURFACE	DISPOSITION
R4	DAVIS RD	4712.02'	NONE	N/A	REMAIN
R5	DAVIS RD	4709.87'	NONE	N/A	REMAIN

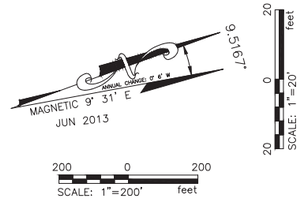
NOTE: ROADWAY ELEVATIONS INCLUDE 15' BUFFER PER PART 77 GUIDELINES

LEGEND - AIRPORT LAYOUT PLAN

Description	Existing	Future	Ultimate
Airport Property Line			
Runway Obstacle Free Area (ROFA)			
Runway Obstacle Free Zone (ROFZ)			
Runway Safety Area (RSA)			
35' Building Restriction Line (BRL)			
Runway Protection Zone (RPZ)			
Runway Visibility Zone (RPZ)	N/A		
Part 77 Approach Surface	APP	APP	
Threshold Siting Surface			
Airfield Pavements			
Crosswind Runway (Graded Dirt)	N/A	N/A	
Buildings			
Segmented Circle	N/A		
Rotating Beacon	N/A		
Airport Reference Point			
PAPI	N/A		
Fence			
Paved Roadway/Parking	N/A		
Gravel Roadway/Parking		N/A	
Surface Contour	290		







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TOMBSTONE MUNICIPAL AIRPORT
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AIRPORT LAYOUT PLAN DRAWINGS
INNER PORTION OF THE APPROACH - RW 2-20

SCALE: HOR. 1"=200' VERT. 1"=20'

SHEET 9 OF 11 SHEETS

7--8 IPASD.dwg Wednesday, Dec. 06 2017 10:33am

LEGEND - AIRPORT PROPERTY MAP			
Description	Existing	Future	Ultimate
Airport Property Line			
Runway Protection Zone (RPZ)			
Building Restriction Line (BRL)			
Airfield Pavements			
Crosswind Runway (Graded Dirt)	N/A	N/A	
Buildings			
Paved Roadway/Parking	N/A		
Gravel Roadway/Parking		N/A	
Surface Contour	290		

UNDEVELOPED STATE LAND

DAVIS RD

OLD BISBEE RD

AZ-80

UNDEVELOPED STATE LAND

UNDEVELOPED STATE LAND

FUTURE NON-AVIATION DEVELOPMENT

FUTURE MIXED AVIATION AND NON-AVIATION DEVELOPMENT

GENERAL AVIATION DEVELOPMENT

UNDEVELOPED STATE LAND

UNDEVELOPED STATE LAND

9.5167°

MAGNETIC 9° 31' E
JUN. 2013

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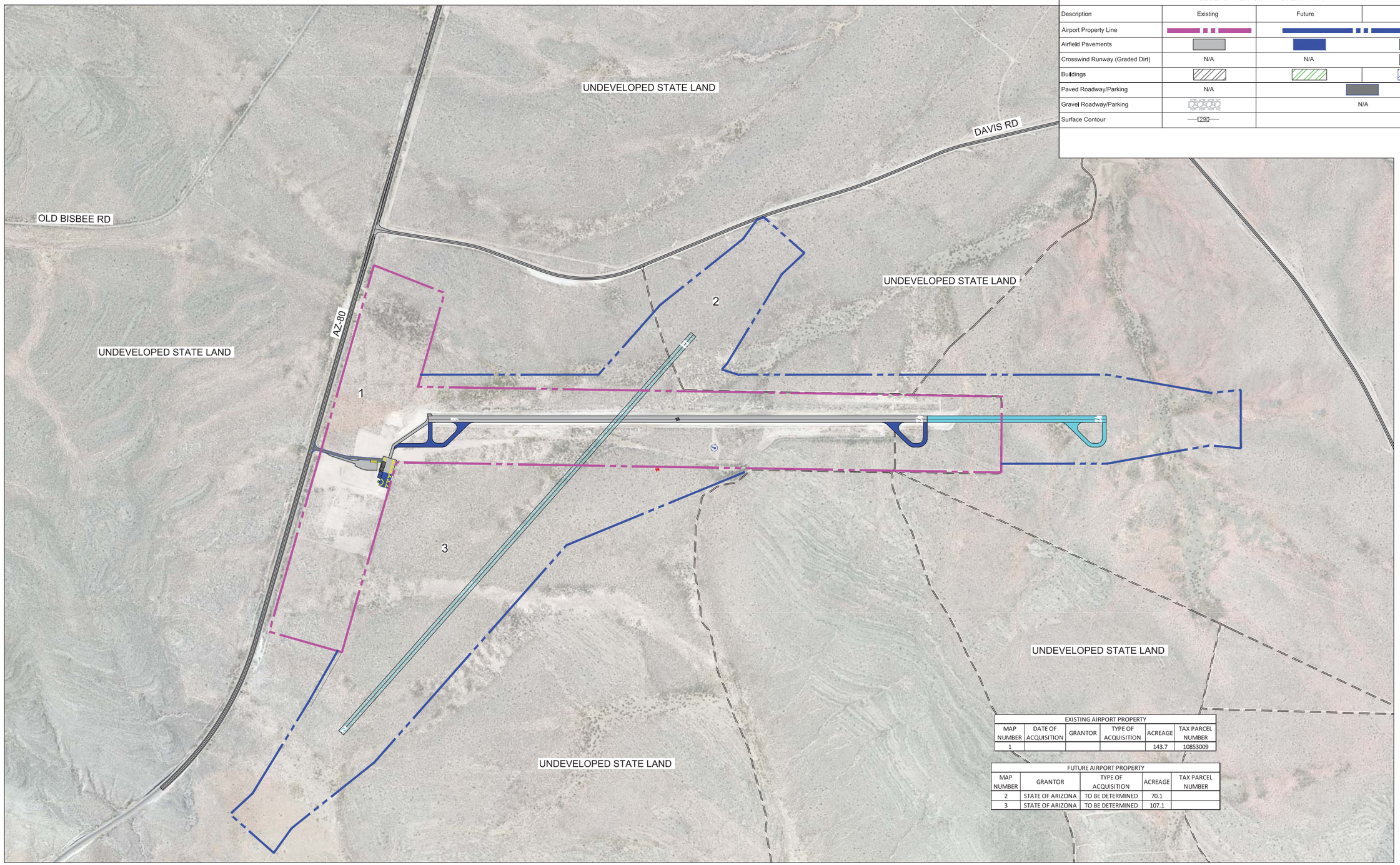
AIRPORT LAYOUT PLAN DRAWINGS
AIRPORT LAND USE MAP

SCALE: HOR. 1" = 400' VERT. N/A

SHEET 10 OF 11 SHEETS

9 AIRPORT LAND USE MAP.dwg Wednesday, Dec. 06 2017 10:33am



LEGEND - AIRPORT PROPERTY MAP

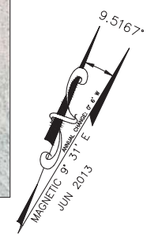
Description	Existing	Future	Ultimate
Airport Property Line			
Airfield Pavements			
Crosswind Runway (Graded Dirt)	N/A	N/A	
Buildings			
Paved Roadway/Parking	N/A		
Gravel Roadway/Parking		N/A	
Surface Contour	2350		

EXISTING AIRPORT PROPERTY

MAP NUMBER	DATE OF ACQUISITION	GRANTOR	TYPE OF ACQUISITION	ACREAGE	TAX PARCEL NUMBER
1				143.7	10853009

FUTURE AIRPORT PROPERTY

MAP NUMBER	GRANTOR	TYPE OF ACQUISITION	ACREAGE	TAX PARCEL NUMBER
2	STATE OF ARIZONA	TO BE DETERMINED	70.1	
3	STATE OF ARIZONA	TO BE DETERMINED	107.1	



CITY OF TOMBSTONE
DEPARTMENT OF PUBLIC WORKS
611 E ALLEN ST, PO BOX 339, TOMBSTONE, AZ, 85638

Kimley»Horn
1855 W Baseline Rd #200
Mesa, AZ 85202
www.kimley-horn.com

	REVISIONS	BY	APPROVED	DATE

TOMBSTONE MUNICIPAL AIRPORT
A COCHISE COUNTY AVIATION FACILITY - TOMBSTONE, ARIZONA
AIRPORT LAYOUT PLAN DRAWINGS
AIRPORT PROPERTY MAP

SCALE: HOR. 400' VERT. N/A

SHEET 11 OF 11 SHEETS

10 AIRPORT PROPERTY MAP.dwg Wednesday, Dec. 06 2017 10:33am