Douglas Municipal Airport

Master Plan Update

PREPARED FOR:

CITY OF DOUGLAS

PREPARED BY:

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Douglas Municipal Airport (DGL)
Master Plan Update

Prepared for:

The City of Douglas, Arizona

Prepared by:

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and

The Genesis Consulting Group, LLC

Final Report

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1 INVENTORY

With grant funding from the Arizona Department of Transportation (ADOT), the City of Douglas prepared a Master Plan Update (MPU) for the Douglas Municipal Airport (DGL or Airport). The purpose of this MPU is to develop a detailed guide for DGL that embodies the Airport's vision, goals, and objectives while providing for safe and efficient aeronautical operations at and around DGL. Further, this MPU was developed with observation given to the local community and the needs and suggestions of the City of Douglas and Cochise County. This MPU highlights the ongoing efforts of DGL to maintain a user-friendly and safe atmosphere that have developed and changed since the previous Master Plan was completed in 1994. In addition to this MPU, DGL developed a complementary Business Plan that is a concurrent element of the MPU and is referenced for support.

1.1 Airport Vision

The City of Douglas, Arizona, was the first city with an international airport in the United States. Douglas also became home to World War II military pilot training and housed Amelia Earhart on a cross-country flight.[1] Having such a profound historical aviation background, the City of Douglas understands and prioritizes the need for continued growth coupled with safety and efficiency of aeronautical operations.

While historically the Airport served commercial airlines, the vision for the Airport is to remain a general aviation (GA) airport.

The Cochise County Comprehensive Plan describes two goals of transportation:

"Provide a safe, appropriate, well-maintained, cost-effective, and energy efficient transportation network for the use and enjoyment of county residents and businesses

Support air travel opportunities while minimizing the impacts on human and natural communities"[2]

The ultimate intent of DGL and the City of Douglas is to develop a Master Plan that embodies the vision of the City and the County by providing a safe, efficient, and environmentally-conscious airport system for the growing aviation community. The Airport vision includes maintaining DGL as a public benefit by serving the local community and attracting new GA users or transient aircraft activity by providing adequate facilities for existing projected future demand.

1.2 Master Plan Goals and Objectives

The previous Master Plan for DGL was completed in 1994 and since that time the aviation industry has experienced significant fluctuation. Shifts in the national economy, changing aircraft trends, new navigation technologies, and changing national airport design and safety standards provided by the Federal Aviation Administration (FAA) have all impacted the aviation sector. This MPU was undertaken to evaluate the Airport's capabilities and role, to forecast

[1] http://visitdouglas.com/index.php?option=com_content&task=view&id=42&Itemid=51
[2] Cochise County Comprehensive Plan

future aviation demand, and to plan for development of new or expanded facilities that may be required to meet projected demand. Specific objectives of the MPU include:

- Examine factors likely to affect air transportation demand in the City of Douglas and surrounding area over the next 20 years, including the substantial growth in population and the regional economy, and develop updated operational and based aircraft forecasts
- Determine project needs of existing and potential Airport users, taking into consideration recent changes to FAA design standards and continued maintenance, as well as necessary improvements to the Airport's infrastructure to ensure maximum utility of public and private facilities at DGL
- Reflect the goals and visions of the surrounding area, especially those related to quality of life, business and development, and land use
- Establish a schedule of development priorities, a financial program for implementation of development, and analyze potential funding sources consistent with the Arizona Department of Transportation (ADOT) and local government
- Maintain safety as an essential consideration in the planning and development of the Airport
- Examine regional demand and current state of nearby airports including Bisbee Municipal Airport (P04), Cochise College Airport (P03), and Bisbee-Douglas International Airport (DUG)

1.3 Baseline Assumptions

The baseline assumptions used throughout the preparation of this MPU include:

- DGL will continue to operate as a general aviation airport through the 20-year planning period
- DGL will continue to seek general aviation and small corporate business aviation based tenants and transient operations
- State aviation programs will be in place throughout the planning period to assist in funding future capital development needs

1.4 Inventory Elements

The initial step of the airport master planning process is development of a thorough inventory of existing conditions and operations at DGL and the surrounding market area. The inventory process incorporated a broad spectrum of information including data on landside and airside facilities, surrounding land uses, weather conditions, area airspace, historical activity levels, and socioeconomic factors. This data establishes the foundation for evaluating future Airport needs and facility requirements. The information summarized in the following sections of this chapter was obtained through on-site visits, discussions with Airport staff, tenants, and stakeholders, review of previous Airport planning documents and FAA records, and review of various local, regional, and statewide planning documents. Inventory data is presented in the following sections:

- Airport Ownership and History
- Airport Location and Access

- Airport Role
- Airport Activity
- Existing Airport Facilities
- Airspace and Instrument Procedures
- Climatic and Meteorological Conditions
- Area Socioeconomic Data
- Area Land Use Patterns and Zoning
- Environmental Considerations
- Other Area Airports
- Near-Term Planned Development

1.5 Airport Ownership and History

The following section on the history of the Airport were obtained from, *"The First 20 Years of Aviation History in Douglas, Arizona"* by Cindy Hayostek.

DGL is owned and maintained by the City of Douglas, which relishes in its rich aviation history that dates back to the early 1900s. DGL was originally constructed as a military base named "Camp Douglas" where Army units were stationed to mitigate Mexican Revolution incursions. Military aircraft began to arrive in 1916 and Camp Douglas was quickly recognized as a site for sustained aviation development. By 1923, Douglas, AZ received mention as a possible federal airmail route stop. Four years later, Douglas residents organized Arizona's first National Aeronautic Association (NAA) Chapter which advocated for Douglas as an airmail stop. Becoming an airmail stop required interstate airline service which, in turn required a separate airport. By 1928, the NAA successfully leveraged six businessmen to buy land for $900 for airport development which was then deeded to the City.

Construction of the new airport got the attention of commercial airlines, and in November of 1928, Frye's Aero Corp and Standard Airlines, Inc., would provide daily flights between Los Angeles and Dallas, which included stops in Douglas and three other cities in Texas. By 1929, Douglas Airport began commercial service using two Fokker monoplanes owned by Standard Airlines.

Aviation activity in Douglas was observed nationwide as the first All Women's Transcontinental Air Race (also known as the Powder Puff Derby) made overnight stops at the Airport. The Air Race brought famous aviators including Amelia Earhart.

The Airport's reputation continued to grow, which provided increased business opportunities. By 1930 it was announced that Douglas, along with Tucson and Phoenix, was on the first, regularly scheduled, coast-to-coast, federal airmail route, prompting the City for immediate hangar construction. The first airmail planes went through Douglas on October 15, 1930 during morning and afternoon hours. The airmail contractor, Southern Air Fast Express, promised "the city that furnished the largest patronage, measured upon the basis of its population, would have its name in the large letters upon one of the planes used in carrying the mail." Douglas beat out every other major city on the east and west coast, picking up its name-sake.

Located near the north entrance of the Airport is the Border Air Museum, which is devoted to the history of aviation at DGL and other nearby airports. The museum was gifted to the City of Douglas by the late Richard Westbrook and his wife Irma in 2002.

1.6 Airport Location and Access

As shown in **Exhibit 1-1,** DGL is located in the southeast corner of Arizona, and is just east of the center of the City of Douglas at an elevation of approximately 4,173 feet.

Exhibit 1-1. DGL Airport Region

The surface transportation network and local community surrounding the Airport are depicted in **Exhibit 1-2**. State Route 80 and U.S. Route 191 provide primary north-south access between Douglas and other cities within the state of Arizona. Access between the major routes and the Airport are primarily provided by 15th Street and 10th Street.

DGL borders W. Airport Rd and E. Geronimo Trail. The southern edge of DGL is located directly on the U.S. – Mexico border.

Exhibit 1-2. Surface Transportation Network and Airport Access

Source: Kimley-Horn and Associates

1.7 Airport Role

The 2008 Arizona State Airports System Plan (ASASP) distinguishes five different roles of airports in the state of Arizona. The roles are defined as follows[3]:

- **Commercial Service Airports**: Publicly owned airports which enplane 2,500 or more passengers annually and receive scheduled passenger air service.

- **Reliever Airports:** FAA-designated airports that relieve congestion at a commercial service airport.

[3] https://www.azdot.gov/docs/default-source/airport-development/azsaspchapterfive-final.pdf?sfvrsn=2

• **GA-Community Airports:** Airports that serve regional economies, connecting to state and national economies, and serve all types of general aviation aircraft.

• **GA-Rural Airports:** Airports that serve a supplemental role in local economies, primarily serving smaller business, recreational, and personal flying.

• **GA-Basic Airports:** Airports that serve a limited role in the local economy, primarily serving recreational and personal flying.

The determination of airport placement among these categories was based on the evaluation of airports using 21 metrics across four major categories, including:

- Development
- Economic Support
- Safety and Security
- Environmental Sensitivity and Stewardship

Based on the criteria defined by the state of Arizona, DGL is listed in the ASASP as a GA-Community Airport.

DGL is not included in the FAA's National Plan of Integrated Airport Systems (NPIAS). Exclusion of an airport from the NPIAS can be attributed to one of the following reasons: 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.[4] DGL's exclusion from the NPIAS is largely attributed to its close proximity to current NPIAS airports (DUG and P04).

Regular aviation-related uses at DGL include:

<u>Recreational:</u> This category involves flying for pleasure or tourism. Generally, pilots in this category are operating light single-engine piston aircraft. However, multi-engine aircraft are sometimes operated in this category.

<u>Personal Transportation:</u> Users in this category value flying on their own schedule instead of commercial airline schedules. Operators in this category frequent non-commercial airports such as DGL to avoid congestion at major commercial service airports. Single-engine, multi-engine, turboprop, and occasionally light jet aircraft are operated in this category.

<u>Corporate/Business Transportation:</u> Businesses often favor flying on their own schedules depending on conducive airport locations to their respective companies. Users in this category that operate or have operated at DGL include Takata, Velcro, and Rubbermaid. A wide range of aircraft types are known to operate in this category including single-engine piston aircraft up to and including narrow body jet aircraft. This user category also includes state and federal agencies and travel by government officials.

[4] http://www.faa.gov/airports/planning_capacity/npias/media/evaluating-formulation-npias-report-to-congress.pdf

1.8 Airport Activity

In addition to providing an understanding of the levels and types of aviation activity that occur at DGL, historic Airport activity can be used to identify recent trends that may impact future activity levels. By analyzing historic data, a better understanding of the Airport's activity and potential future can be deduced. Current and historical data for the aircraft operations and based aircraft components of Airport activity are summarized in the following sections.

1.8.1 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 generally stored at an airport in a hangar building or tied down on an airport apron area.

Data gathered from Airport management and existing users identified 12 based aircraft in September 2016. Five of the fixed-wing based aircraft are stored in t-hangar units, six fixed-wing aircraft are stored in a large box hangar, while a helicopter, operated by Lifeline, is stored in a small box hangar. The current based aircraft at DGL are described in **Table 1-1**.

Table 1-1. Based Aircraft

Aircraft Type	Aircraft Class
Cessna Skylane II	Single-Piston
Centurion II	Single-Piston
Stationair	Single-Piston
Cessna 206	Single-Piston
Aero Pulsar	Single-Piston
Antonov AN2	Single-Piston
Beech Baron	Single-Piston
Cessna 172	Single-Piston
Cessna 172	Single-Piston
Cessna 182	Single-Piston
Piper Seminole	Twin-Piston
Bell 407	Helicopter

Source: Douglas Municipal Airport

Because DGL is a non-NPIAS facility, historical data for based aircraft and aircraft operations is not available from FAA databases such as the Terminal Area Forecasts (TAF). Instead, figures from the previous Master Plan and the 2008 ASASP are used to produce estimates of historical activity. A summary of historical based aircraft at DGL is shown in **Table 1-2**.

Table 1-2. Historical Based Aircraft

Year	Total
2007	27
2008	*25*
2009	*24*
2010	*22*
2011	*20*
2012	*19*
2013	*17*
2014	*15*
2015	*14*
2016	12

Note: Extrapolated years have been italicized
Source: 2008 ASASP, DGL Airport Management, Previous DGL Master Plan

As shown, there were 27 based aircraft identified in 2007, and 12 in 2016, which represents a Compound Annual Growth Rate (CAGR) of -7.79%. It should be noted that data for specific years that were not available have been extrapolated.

1.8.2 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. Transient 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.

It is important to note that at airports that do not have air traffic control towers such as DGL, operational estimates are typically provided by airport management or a fixed-base operator that is located at the airport. These estimates reflect the operator or manager's opinion of activity, but actual counts are typically not available, especially for an entire year.

A summary of estimated total annual aircraft operations for DGL for the period 2007 to 2016 is presented in **Table 1-3**.

Table 1-3. Historical Annual Aircraft Operations

Year	Total Operations
2007	11,000
2008	*10,067*
2009	*9,133*
2010	*8,200*
2011	*7,267*
2012	*6,333*
2013	*5,400*
2014	*4,467*
2015	*3,533*
2016	2,600

Note: Extrapolated years have been italicized
Source: 2008 ASASP, DGL Airport Management, Previous DGL Master Plan

As shown, there were 11,000 operations identified in 2007, and 2,600 in 2016, which represents a Compound Annual Growth Rate (CAGR) of -14.9%. It should be noted that data for specific years that were not available have been extrapolated.

1.9 Existing Airport Facilities

The inventory of existing facilities at the Airport, as of 2016, was completed through an on-site inspection, discussions with Airport management and staff, and review of existing Airport documents, airport layout plans (ALPs), and related studies.

Existing Airport facilities are categorized and examined in the following sections:

- Airport Property
- Airfield Facilities
- Landside Facilities
- Utilities
- Surface Access and Parking System
- Airport Fencing and Security

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.

As defined in FAA Advisory Circular 150/5300-13A, Change 1, the FAA classifies airports by Airport Reference Code (ARC), which identifies the overall planning and design criteria for the Airport. The ARC is assigned based on the size of the largest aircraft that generally records at least 500 operations annually at an airport; this aircraft is known as the airport's "critical aircraft." DGL is currently an Airport Reference Code (ARC) B-II facility. B-II facilities serve aircraft with an approach speed between 91 and 120 knots as well as a wingspan between 49 and 78 feet. Some examples of B-II ARC aircraft are but not limited to: Cessna Citation V, Beech

King Air F90, etc.[5] Additional information regarding the ARC and facilities are included in subsequent chapters of this MPU.

1.9.1 Airport Property

Existing facilities at DGL are located on approximately 640 acres currently owned by the City of Douglas. Current Airport property is identified in **Exhibit 1-3**.

Exhibit 1-3. Current Airport Property

Source: Kimley-Horn and Associates, Google Earth

[5] http://aireform.com/faas-airport-reference-codes/

1.9.2 Airfield Facilities

Airfield (also referred to as airside) facilities are those facilities that accommodate aircraft operations and support the transitioning of aircraft from the air to the ground, and vice versa. These include runways, taxiways, aprons, and navigational aids. The following describes the existing airfield facilities at DGL, which are also depicted in **Exhibit 1-4**.

Exhibit 1-4. Current Airfield Facilities

Source: Kimley-Horn and Associates, Google Earth

Runways and Taxiways

DGL is currently served by a single paved runway, Runway 03-21. Runway 03-21 is 5,760 feet in length and 75 feet in width and is constructed of asphalt. The dimensions, conditions, and weight bearing capacity of the runway are summarized in **Table 1-4.** DGL previously had a second unpaved runway, Runway 18-36. This runway has been closed indefinitely as it was described as having large brush, rocks, and an uneven surface.

Table 1-4. Runway 03-21 Specifications

Runway 03-21	
Length	5,760 feet
Width	75 feet
Surface/Conditions	Asphalt/Very Poor

Source: www.AirNav.com

DGL does not currently have a full parallel taxiway associated with Runway 03-21, though a partial taxiway (Taxiway A) does exist on the northwest side. According to the Arizona Department of Transportation (ADOT), Taxiway A has a pavement condition rating of 100, which is considered to be good. Taxiway A is 35 feet in width and approximately 3,050 feet in length. Taxiway A, and connector Taxiways A3, A4, and A5 were resurfaced in June 2014 through a grant from ADOT. Turnaround Taxiways A1 and A2 are located on the south end of Runway 03-21, providing aircraft the ability to turn and back taxi down the runway to the terminal area. A summary of taxiways is provided in **Table 1-5**.

Table 1-5. DGL Taxiway System

DGL Taxiway System		
Taxiway	Description	Condition
A	Partial Parallel	Excellent
A1	Turnaround (South portion)	Poor
A2	Turnaround (North Portion)	Poor
A3	Connector	Excellent
A4	Connector – Runway to Apron Areas	Excellent
A5	Connector	Excellent

Source: Arizona Department of Transportation, DGL Airport Layout Plan

Aprons and Tie-Downs

Airport apron areas serve a variety of purposes and are generally classified based on the users they are intended to support, the activities conducted on the apron area, and/or their location on the airport. DGL currently has two aprons. The primary apron (A01) has approximately 15,000 square yards of area. According to ADOT, this apron has a pavement condition index (PCI) of 53 which is considered to be poor condition. Currently, the primary apron has nine aircraft tie downs. Tie-down locations are generally used for short-term storage of transient aircraft, but can also be used by based aircraft not stored in hangars.

The secondary apron (A02) is composed of two asphalt areas split by Taxiway A. Including taxilanes, the northern portion of the apron is approximately 15,500 square yards in area and has 18 aircraft tie-downs. The southern portion of the apron including taxilanes is approximately 17,000 square yards in size and has 18 aircraft tie-downs. According to ADOT, the PCI for this apron is 26 which is considered in poor condition. Collectively, DGL's two aprons have 45 aircraft tie-downs.

Lighting, Runway Markings, and Navigational Aids

Airport lighting and runway markings are important to supporting 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 DGL are summarized in **Table 1-6**.

Table 1-6. Runway 03-21 Markings and NAVAIDs

Runway 03-21	
Runway Edge Lighting/Other	Medium Intensity Runway Lighting (MIRL)/Runway End Identifier Lights (REILs)
Runway Marking/Condition	Basic/Poor
NAVAIDs	4-light Precision Approach Path Indicators (PAPI) RWY end 03 and 21, Airport Beacon, NOTAM-D service available, Wind Sock

Sources: FAA Form 5010, www.airnav.com.

1.9.2.1.1 Lighting at the Airport

Medium intensity runway lights (MIRLs) – MIRLs define the lateral limits of a runway and are spaced 200 feet apart.

Runway end indicator lights (REILs) – REILs are located on both ends of Runway 03-21.

1.9.2.1.2 Runway Markings at the Airport

Basic markings – Basic runway markings are used under visual flight rules (VFR). These markings include centerlines and runway designations. The runway markings at DGL are currently in poor condition.

1.9.2.1.3 NAVAIDs at the Airport

Rotating Beacon – The Airport is equipped with a standard rotating white-green beacon that operates from sunset to sunrise. The beacon is located at the far west end of the airfield.

Wind Indicator – The Airport also has a lighted wind indicator. This is used to determine the direction of the wind on the ground as compared to the wind at the altitude a pilot is flying.

PAPIs – Both runway 03 and 21 are equipped with PAPIs, which is a visual aid that provides guidance information to help a pilot acquire and maintain the correct approach (in the vertical plane) to an airport.

1.9.3 Landside Facilities

Landside facilities at airports consist of a wide variety of buildings and equipment that support airport operations. For the purpose of this MPU, the following landside facilities at DGL have been inventoried:

- General Aviation Terminal
- Aircraft Hangars
- Fuel Facility
- Automobile Parking
- Airport Fencing and Security

General Aviation Terminal

DGL currently has three on-airport buildings and a trailer that are owned by the City of Douglas. Portions of the permanent structures have been used for GA terminal services in the past. One structure is 800 square feet while the other is 600 square feet. Currently, the permanent structures are not being used for a specific purpose. The Airport is planning to improve the facades but the City does not intend to use the interior of the structures for aviation needs. The trailer is utilized as an Airport operations office space and a work space for a construction project. The previously mentioned Border Air Museum is on Airport property and is used for meetings; however, there is no pilot lounge or specified Fixed Base Operator (FBO). DGL has expressed a desire to construct a more legitimate GA terminal building in the future; this will be addressed in greater detail in the Facility Requirements Chapter of this MPU.

Aircraft Hangars

DGL has three hangars on the airfield: one large T-hangar, one large conventional hangar, and one small conventional hangar. The large T-hangar has 10 units that are currently all being utilized. The large conventional hangar, approximately 12,500 square feet in area, has six based aircraft, while the small conventional hangar, approximately 2,500 square feet in area, has one Lifeline based helicopter. **Exhibit 1-5** displays the location of the Airport's three hangars.

Exhibit 1-5. Hangars and Fuel Farm

Source: Kimley-Horn and Associates, Google Earth

Fuel Facility

DGL's fuel storage facility is located to the south of the small conventional hangar near the primary apron. On this site, the Airport maintains two above ground storage tanks, one with AvGas and the other with Jet A fuel. Each tank holds approximately12,000 gallons of fuel. Self-serve Jet A fuel is available at the tank site, while AvGas is available on the main apron. The Airport primarily provides self-fueling service, but offers assistance upon request. Airport fuel is provided 24 hours a day. **Exhibit 1-6** displays the location of the Airport's fuel facility.

1.9.4 Utilities

Utilities are provided to the Airport from a variety of sources. **Table 1-7** identifies utilities and providers in greater detail.

Table 1-7. Airport Utilities

Utilities	Source
Electricity	Arizona Public Service Electric Company
Water	City of Douglas
Sanitary	City of Douglas

Source: Douglas Municipal Airport

1.9.5 Automobile Parking

Auto parking at DGL is depicted in **Exhibit 1-6** which displays the 30 paved parking spots just north of the primary apron and large conventional hangar. These spots are also shared with the Border Air Museum, which is also seen in **Exhibit 1-6**. Immediately to the west of the main aircraft parking apron is an unpaved lot outside the western fence that can accommodate approximately 20 vehicles.

Vehicles are frequently parked on the apron near the Lifeline building and near the small hangar away from aircraft parking areas.

Exhibit 1-6. Automobile Parking

Sources: Google Earth, Kimley-Horn and Associates

1.9.6 Airport Fencing and Security

DGL recently began a fencing installation project in an effort to update the Airport's security. Since the beginning of the project, the Airport has installed new three-strand barbed-wire fencing which is six feet tall. This portion of the fencing is approximately 1,100 feet long and runs from the west side of the large conventional hangar to Airport Road, then south past East 9th Street. The remaining Airport boundary has four-foot-tall barbed-wire fence in fair condition. Design for the remaining phase of Airport fencing was in progress at the time of this MPU; construction is anticipated to be completed as a near-term (0-5 year) project. The north entrance to the airfield requires key card access to open the gate.

1.10 Airspace and Instrument Procedures

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.

1.10.1 Airspace Designations

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.

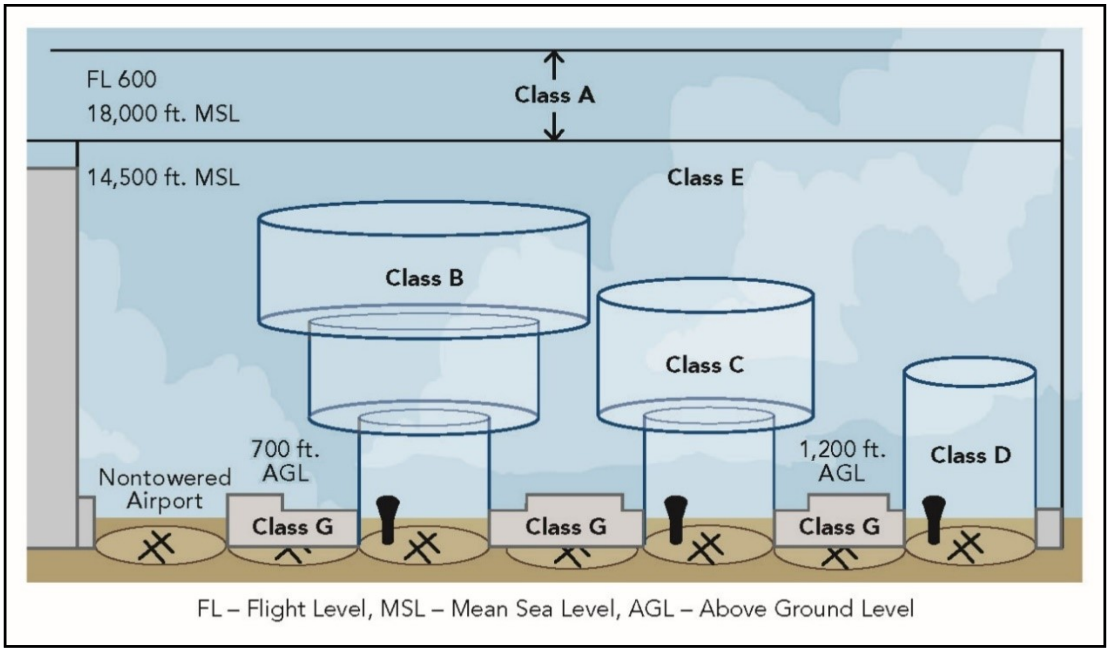
FAR Part 71 and FAR Part 73 establish classifications of airspace with the following characteristics:

- **Class A Airspace** – Class A airspace is not shown on aeronautical charts. It begins at 18,000 feet above mean sea level (MSL) and extends to higher altitudes. This airspace is designated in FAR Part 71.193 for positive control of aircraft. The Positive Control Area allows flights only operating under instrument flight rules (IFR), with a pilot who has an instrument rating, and prior permission is required. Class A airspace does not significantly impact the operation of DGL.
- **Class B Airspace** – Class B airspace is found around major airports. Pilots must get permission to enter this airspace from the controlling agency, typically the Terminal Radar Approach Control (TRACON) facility associated with the airport and region. There is no Class B airspace near DGL.
- **Class C Airspace** – Class C airspace is the airspace from the surface to 4,000 feet above the airport elevation. Although the configuration of each Class C airspace area is individually tailored, the airspace usually consists of a surface area with a five-mile radius, and an outer circle with a one-mile radius that extends from 1,200 feet to 4,000 feet above the airport elevation. An aircraft must establish two-way radio communication with the controlling agency providing air traffic services prior to entering the airspace and thereafter maintain those communications while within the airspace. VFR aircraft are only separated from IFR aircraft within the airspace. There is no Class C airspace identified near Douglas Municipal Airport.
- **Class D Airspace** – Class D airspace exists at any airport with an operating air traffic control tower where Class B or Class C airspace does not exist. Class D airspace typically extends 5 miles from the airport to an altitude of 2,500 feet AGL. Pilots must establish two-way radio communication with the controlling agency, usually the air traffic control tower, before entering this classification of airspace. Class D airspace does not impact operations at DGL.
- **Class E Airspace (with floor 1,200 feet above surface)** – Class E airspace typically surrounds airports having instrument approaches and encompasses portions of the instrument approach paths. The flight requirements within Class E airspace result in increased aircraft separation requirements thereby promoting safety and minimizing potential incidents between IFR and VFR aircraft in this airspace. Class E airspace is located above DGL. Specifically, the Class E Airspace surrounding DGL has a floor

1,200 feet or greater above the surface that abuts Class G Airspace. **Exhibit 1-8** displays the location of DGL within its Class E Airspace.

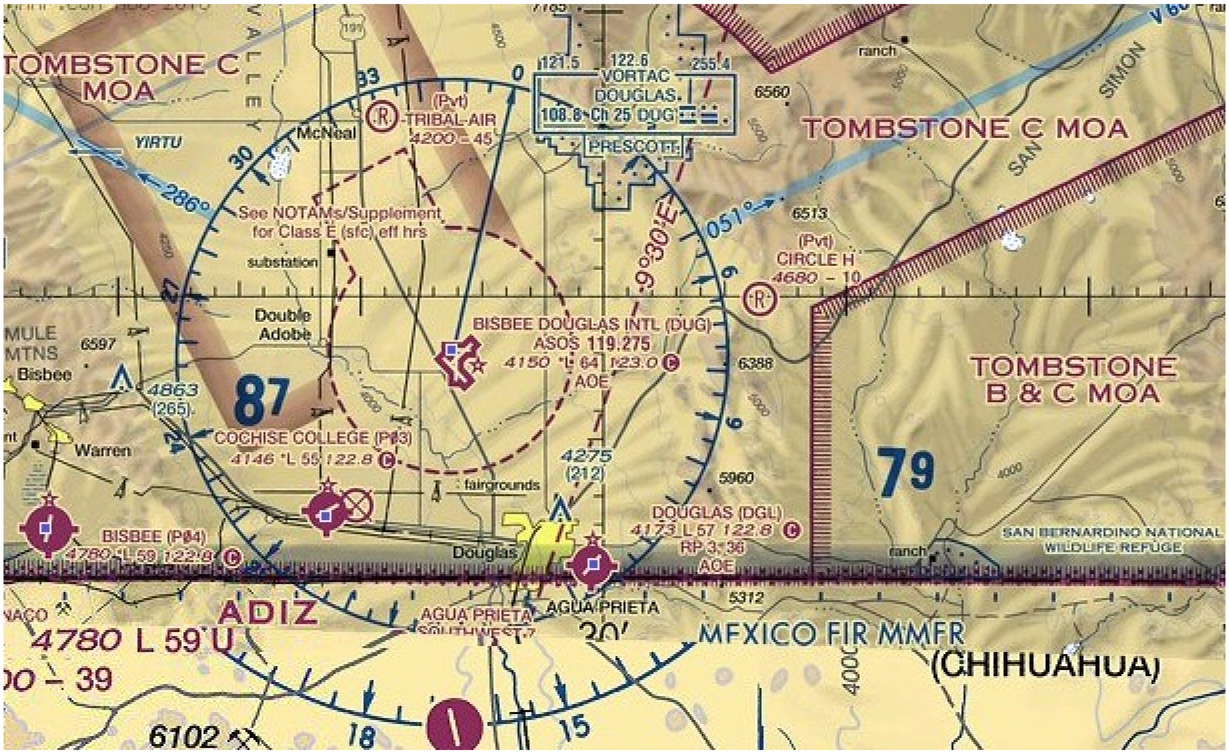
- **Class G Airspace** – Class G airspace is referred to as uncontrolled airspace and is not depicted on aeronautical charts. This classification of airspace comprises all airspace not identified as another class. IFR flights typically do not operate in Class G airspace, as no Air Traffic Control (ATC) services are provided. VFR flights are permitted as long as visibility and cloud clearance minimums are met.

Exhibit 1-7. Airspace Classifications



Source: FAA Aeronautical Information Manual

Exhibit 1-8. DGL Airspace



Note: The faint blue bar running through DGL in this sectional signifies the Class E Airspace with a floor 1,2000 feet above the surface. The dashed red circle around DUG represents standard Class E Airspace.
Source: http://aeronav.faa.gov/content/aeronav/sectional_files/PDFs/Phoenix_95_P.pdf

- **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. The nearest restricted airspace to DGL is located roughly 50 miles west surrounding Fort Huachuca, a U.S. Army base located in the town of Sierra Vista, AZ.
- **Prohibited Areas** – Prohibited areas contain airspace within which the flight of unauthorized aircraft is prohibited. Such areas are established for security or other reasons associated with the national welfare. Prohibited areas are published in the National Register and are depicted on aeronautical charts. There are no areas of prohibited airspace proximate to DGL.
- **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. There are currently no alert areas located near DGL.

- **International Airspace** – Runway end 03 is approximately 1,000 feet from the U.S./Mexico Border. Aircraft that depart to the southwest often enter Mexican airspace. Aircraft operation movements are monitored by Air Traffic Control at Fort Huachuca/Libby Army Airfield. Based on conversations with Airport users and management, aircraft are allowed to traverse one to two miles into Mexican Airspace as long as they display movement back into U.S. Airspace.

As the summary descriptions of airspace classifications indicate and **Exhibit 1-7** and **1-8** show, different classes of airspace have different characteristics, dimensions, altitudes, and requirements based on the types of activity that they are intended to support. Existing airspace classifications in the vicinity of DGL and those that could have the potential to impact aircraft operations at the Airport have been identified.

1.10.2 Military Airspace

Military Operations Airspace (MOA) is a type of special use airspace (SUA), other than restricted airspace or prohibited airspace, where military operations are of a nature that justify limitations on aircraft not participating in those operations. Whenever an MOA is active, pilots operating under VFR should exercise extreme caution while flying within, near, or below the MOA. IFR traffic may be cleared through the area provided ATC can ensure IFR separation. DGL is located within Tombstone C MOA and in relatively close proximity to two separated MOAs: Tombstone A MOA and Tombstone B MOA. Tombstone B MOA is closer to DGL at roughly 10 miles east of the Airport. **Exhibit 1-8** shows the location of DGL within and near the Tombstone MOAs. The Tombstone C MOA covers the surrounding area and includes the airspace from 14,500 feet MSL to 18,000 feet MSL. The Tombstone A and B MOAs include the airspace from 500 feet AGL to 14,500 feet MSL. All Tombstone MOAs are active Monday through Friday from 6:00 a.m. until 9:00 p.m. The controlling agency for the MOAs is Albuquerque Center. Above Tombstone MOA is an Air Traffic Control Assigned Airspace (ATCAA) which extends the Tombstone MOA up to 51,000 MSL.

Military aerial refueling (AR) occurs above Cochise County and may be scheduled independent of Tombstone MOA activation. AR-639A is authorized for refueling between 13,000 and 28,000 feet MSL and AR-639 is authorized for refueling between 16,000 and 28,000 feet MSL. Albuquerque Center is the controlling authority for both. The Airport may also be over flown by VFR or IFR military aircraft at fairly low altitudes transitioning to/from Sierra Vista Municipal Airport-Libby Army Airfield and Tombstone MOA.

1.10.3 Instrument Approach Procedures

An instrument approach procedure is defined as a series of predetermined maneuvers for guiding an aircraft from the beginning of the initial approach to a landing, or a point from which a landing may be made visually. Instrument approach procedures are especially important during instrument meteorological conditions (IMC) when cloud ceilings are lower than 1,000 feet above ground level (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.

Currently, DGL does not have Instrument Approach Procedure. Potential jet traffic may warrant this. An examination of potential instrument approaches will be provided in the Facility Requirements analysis.

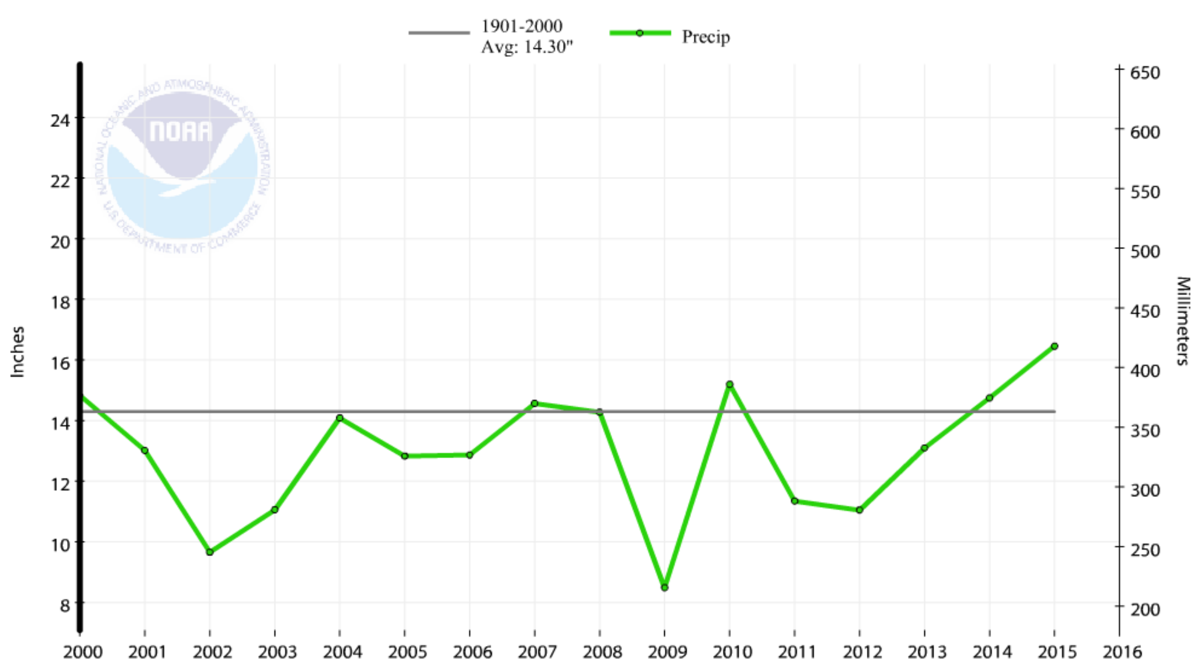
1.11 Climatic and Meteorological Conditions

Climatic and meteorological conditions, particularly temperature and wind speed, are important considerations in the analysis and development of airfield facilities. These factors directly affect the planning and design of runway facilities as well as utility and operational efficiency of the airfield.

1.11.1 Local Climatological Data

DGL is located in southwest Cochise County in an area that receives approximately 1.89 inches of precipitation monthly. According to the National Oceanic and Atmospheric Administration (NOAA), 16.46 inches of precipitation was recorded in 2015 for the Southeast region of Arizona, where DGL is located. **Exhibit 1-9** indicates that the current precipitation levels are following an inclining trend and exceeding the 1901-2000 baseline.

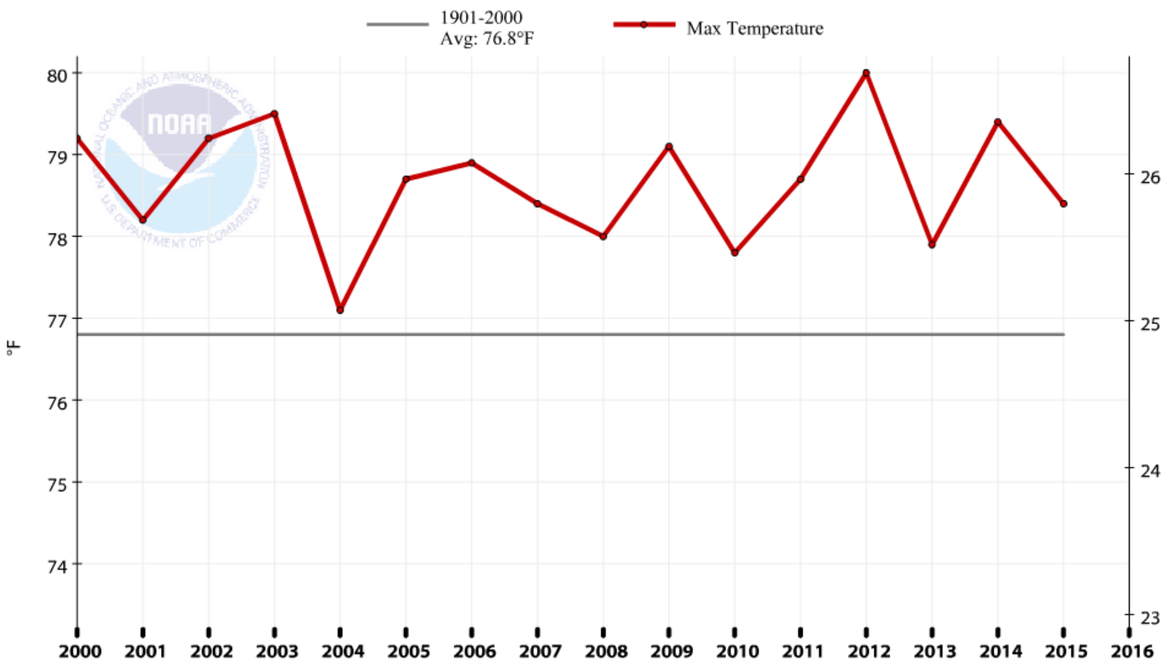
Exhibit 1-9: Southeast Arizona Annual Precipitation Trend



Source: National Oceanic and Atmospheric Administration, National Centers for Environmental Information

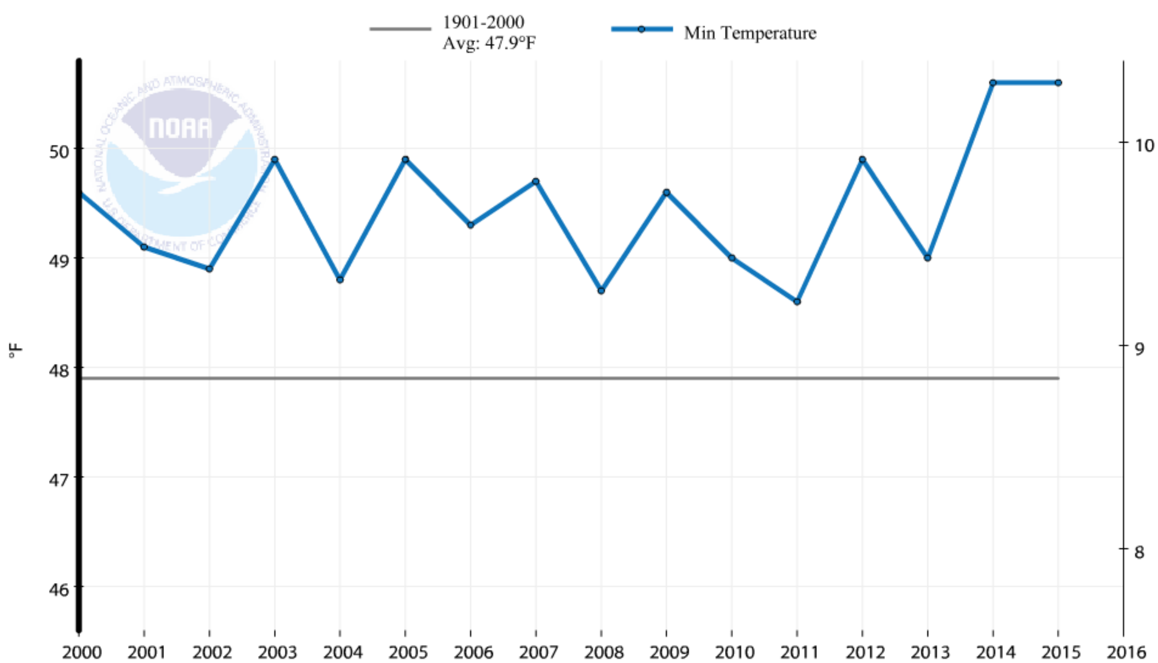
The average maximum temperature of the hottest month, June, is 97.7 degrees Fahrenheit, while the average minimum temperature of the coldest month, December, is 25.2 degrees Fahrenheit. **Exhibits 1-10** and **1-11** display the varying trends of maximum and minimum annual average temperatures. Both exhibits show the consistency of modern temperature levels staying well above the 1901-2000 baseline.

Exhibit 1-10: Southeast Arizona Annual Average Max. Temperature



Source: National Oceanic and Atmospheric Administration, National Centers for Environmental Information

Exhibit 1-11: Southeast Arizona Annual Average Min. Temperature



Source: National Oceanic and Atmospheric Administration, National Centers for Environmental Information

1.11.2 Ceiling and Visibility Conditions

Ceiling and visibility conditions at and around an airport play a major role in the usage and operational efficiency of its facilities. A ceiling is defined as the height above the ground or water of the base of the lowest layer of clouds covering more than half the sky. Low ceiling and/or poor visibility conditions limit the overall effective usage of an airport. During times of poor visibility, pilots must operate under IFR, rather than VFR. Seasonal afternoon thunderstorms are common in southern Arizona with the area averaging 42 annual events. Thunderstorms are often a cause of poor visibility and low ceilings. With no instrument approach procedures at DGL, poor visibility conditions occasionally interfere with aeronautical operations.

1.11.3 Runway Wind Coverage

Wind conditions affect all airplanes in varying degrees. Generally, the smaller the airplane, the more it is affected by wind, particularly crosswind components. Crosswinds are often a contributing factor in small airplane accidents.[6] In FAA Advisory Circular 150/5300-13A, the FAA instructs that a runway orientation should provide at least 95.0 percent wind coverage for the aircraft which are forecasted to use the airport on a regular basis. If the wind coverage is less than 95.0 percent, development of a cross-wind runway should be considered. The allowable crosswind component per Runway Design Code (RDC) is shown in **Table 1-8**.

Table 1-8: Allowable Crosswind Component per Runway Design Code (RDC)

RDC	Allowable Crosswind Component
A-I and B-I	10.5 knots
A-II and B-II	13 knots
A-III, B-III, C-I through D-III, D-I through D-III	16 knots
A-IV and B-IV, C-IV through C-VI, D-IV through D-VI	20 knots
E-I through E-VI	20 knots

Source: FAA AC 150/5300-13A

Wind coverage for DGL is identified in **Table 1-9**. According to the wind data analysis for the Airport as available from the FAA's Airports Geographic Information System (AGIS) website, the existing runway orientation at DGL does not provide 95 percent coverage for all aircraft types under both VFR and IFR conditions. It is important to note that wind samples were gathered from the nearest Airport Automated Surface Observing System (ASOS), which located at Bisbee-Douglas International Airport, approximately 10 miles northwest of DGL. Wind coverage and runway orientation will be addressed in greater detail in the Facility Requirements Chapter of this MPU.

[6] http://www.faa.gov/documentLibrary/media/Advisory_Circular/150_5300_13_part2.pdf

Table 1-9. Runway 03-21 Wind Coverage

	10.5 kt	13 kt	16 kt
All Weather	89.75%	94.4%	98.07%
IFR	81.15%	86.36%	91.52%
VFR	89.89%	94.54%	98.18%

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

1.12 Area Socioeconomic Data

The relationship between socioeconomic factors and an airport's role and activity levels is an important consideration in the master planning process. In addition to providing a general understanding of the existing conditions in an airport area, socioeconomic data is instrumental in developing future projections of aviation activity. The following provides a summary of the socioeconomic data for the City of Douglas, Cochise County, the state of Arizona and the United States. As portrayed in **Table 1-10**, the population decrease in the City and County is well below the population increase of the State and Nation.

Table 1-10. Population Characteristics

Year	City of Douglas	Cochise County	Arizona	United States
2011	17,555	134,154	6,538,126	311,718,857
2012	16,928	136,518	6,662,512	314,102,623
2013	16,788	138,882	6,786,898	316,427,395
2014	16,671	141,246	6,911,284	318,907,401
2015	16,592	143,610	7,035,670	321,418,820
Change (2011-2015)	-5.40%	6.17%	7.07%	3.02%

Source: Woods and Poole, American FactFinder

Table 1-11 summarizes historic data related to employment and unemployment in Cochise County, the state of Arizona, and the United States from 2011 to 2015. It is important to note that Agua Prieta, located immediately south of Douglas in Mexico has a population of approximately 70,000-100,000. Although the majority of residents in Agua Prieta are employed at Maquiladoras and businesses on the Mexico side of the border, the City of Douglas estimates that approximately 70 percent of tax revenues in Douglas are attributed to citizens of Agua Prieta. It is important to note that Maquiladoras are factories in Mexico that produce manufactured goods, several of which are shipped across the border to distribution centers in Douglas.

Table 1-11. Employment Summary

Year	Cochise County % Employed	Arizona % Employed	United States % Employed
2011	44.4%	50.2%	59.40%
2012	44.0%	50.0%	58.80%
2013	43.5%	49.8%	58.20%
2014	43.1%	49.7%	57.60%
2015	43.6%	49.5%	57.70%

Source: Woods and Poole, American FactFinder

Table 1-12 summarizes the average income per capita personal income (PCPI) in Cochise County as well as the state of Arizona for 2015. 2015 per capita personal income data is not available yet for the United States.

Table 1-12. 2015 Per Capita Personal Income

Year	Cochise County	Arizona
2011	$37,989	$38,664
2012	$38,246	$38,954
2013	$38,502	$39,245
2014	$38,758	$39,535
2015	$39,014	$39,826

Source: Woods and Poole

1.13 Area Land Use and Zoning

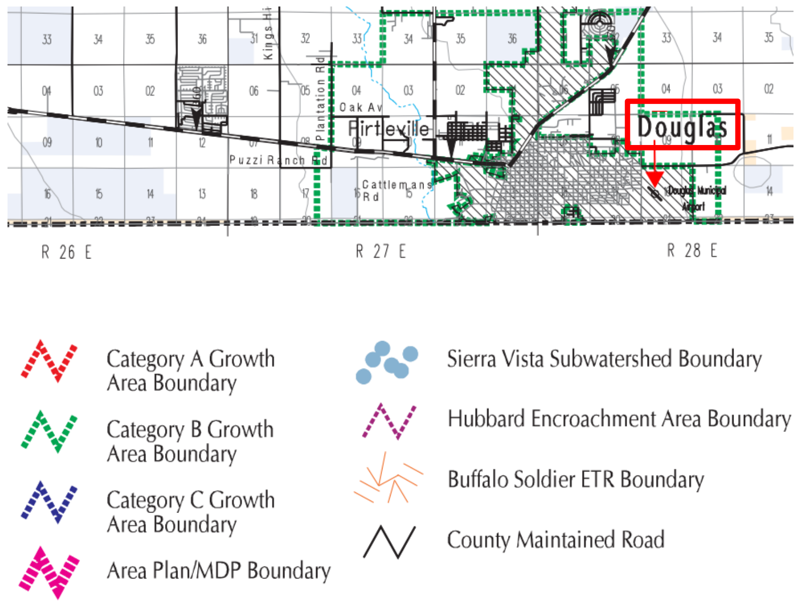
Identifying land use and zoning characteristics in the environs of airports is an important task in the master planning process because of significant impacts that incompatible development in the airport area can have on the facility's continued operation and development. Working with the relevant planning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

The entirety of the Airport property is within the City of Douglas city limits, however the Airport itself does not have a specific zoning classification. The extents of the City of Douglas zoning jurisdiction terminate at Airport Road which serves as the western border of the Airport property. Zoning designations immediately to the west of the Airport property include single family residence and multi-family residence.

Currently, the Airport property is not zoned by Cochise County, nor is the surrounding land to the West side of the Airport property. However, the land surrounding the Airport to the East is zoned by Cochise County as RU-4 (Rural). Cochise County identifies an RU-4 parcel as having a minimum lot size of four acres. Examples of uses in RU-4 parcels include all single and multiple household dwellings.

The Cochise County Comprehensive Plan was adopted in 1984 and last revised in 2015 to promote orderly and well-planned County growth. The most recent adaptation of the Comprehensive Plan lists the area containing DGL as a Category B Growth Area within the incorporated city. **Exhibit 1-12** displays the location of DGL in the Comprehensive Plan map.

Exhibit 1-12: DGL in the County Comprehensive Plan Map



Source: Cochise County Comprehensive Plan

Cochise County defines Category B Growth Areas as, "Areas adjacent to Category A Urban Growth Areas as well as the larger unincorporated communities of the County, which are experiencing growth." These are areas in transition from a traditional rural environment to something more urbanized. Category B Community Growth Areas include the areas presently identified as Category B and any additional areas that have been determined to meet the following criteria:

a. The area to be designated has a moderate level of residential and/or non-residential growth
b. The area serves as a logical transition between urban growth and rural areas and/or has a distinctive community identity
c. The area has adequate water, access, drainage, and sewage disposal capability to accommodate medium to high density development
d. In general, residential lot sizes are one acre or less in size but may transition to larger lot sizes at the fringes of the area. Smaller lot sizes have access to sewer and/or water and are commonly found in established subdivisions and manufactured/mobile home parks or historic town sites
e. Improved streets designated as arterial or collectors can support limited non-residential development
f. There is substantial potential for further development along with opportunities to preserve undeveloped recreational resources, i.e. open space and washes

1.14 Environmental Considerations

Local and regional environmental factors can affect how an airport is developed. Conversely, airport development has the potential to impact those environmental resources. For these reasons, the FAA requires that airport sponsors incorporate environmental considerations into the master planning process. Although this Master Plan is not funded in any part by the FAA, airport master planning recommendations and design standards outlined in FAA *Advisory Circular 150/5300-13A, Airport Design* and *FAA AC 150/5070-6B, Airport Master Plans* are generally followed. While a detailed overview of the various environmental resources near DGL is provided in subsequent chapters of this MPU, the following three resources are considered of significant importance to the ongoing development of the Airport.

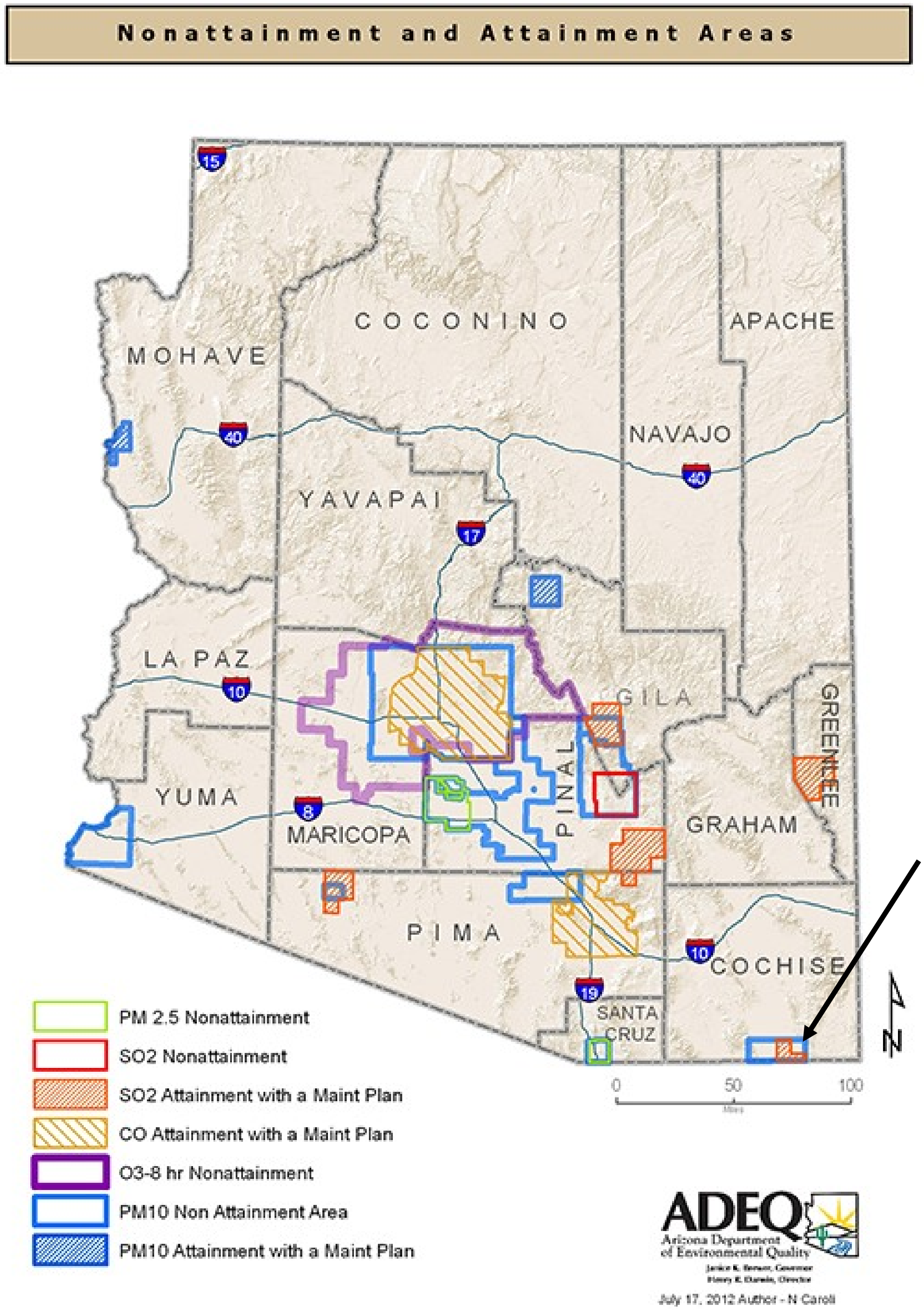
1.14.1 Air Quality

Air quality maps were obtained from the Arizona Department of Environmental Quality (ADEQ) which portray areas of nonattainment & attainment Areas. DGL is located within a non-attainment area that contained higher levels of sulfur dioxide (SO2) which is under maintenance. A nonattainment area is an area considered to have worse air quality than the National Ambient Air Quality Standards.

The classification of sulfur dioxide in the area was changed to an area of maintenance in which the EPA reclassifies the Douglas area with attaining a sulfur dioxide standard. This declares that Douglas, AZ has met the federal health standard for sulfur dioxide and approved the state's plan to maintain healthy levels of SO2 for the next 10 years. The sulfur dioxide that was classified as harmful to the environment was emitted from the now closed Phelps Dodge Douglas Reduction Works smelter.

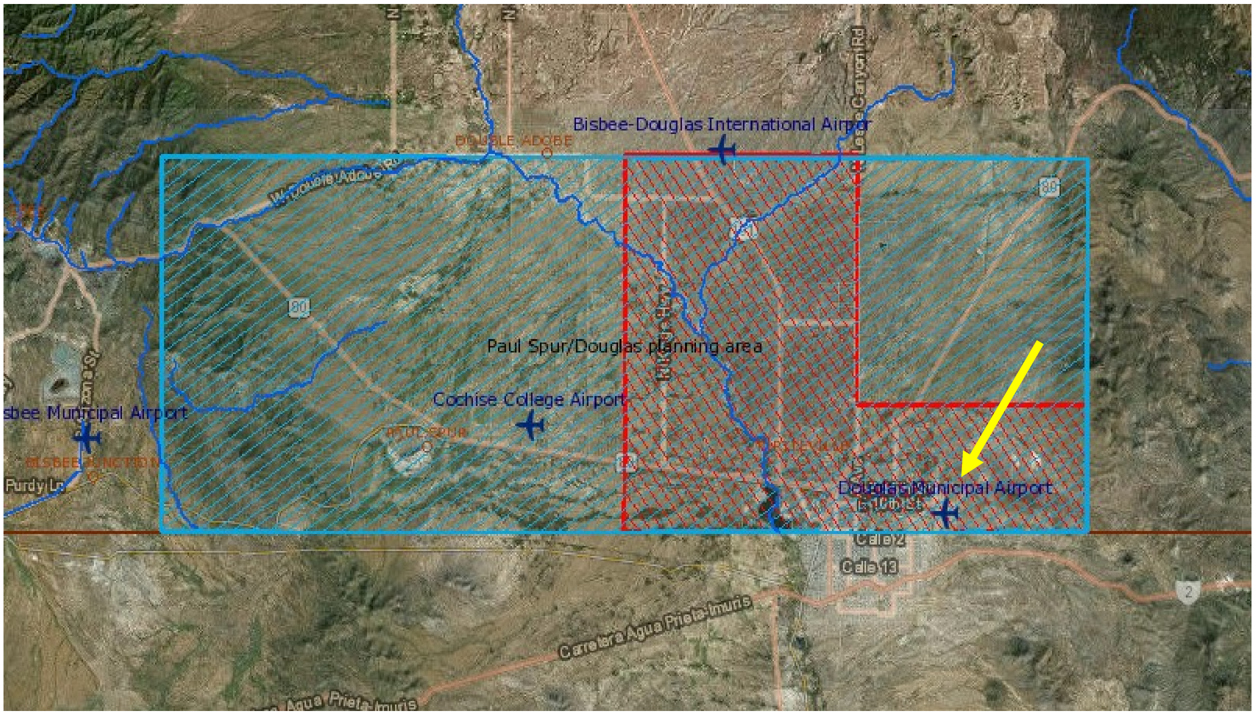
Factors that contribute to the nonattainment classification of the area that DGL is located within include prevalent sunshine, high elevation, and threat of wildfires. In addition, strong winds from California and Mexico bring pollution to Arizona counties. ADEQ is currently developing a maintenance plan and request for re-designation for the Douglas-Paul spur PM10 nonattainment area. **Exhibit 1-13 and 1-14** display the non-attainment designation around Cochise County.

Exhibit 1-13. State Air Quality Map



Source: http://legacy.azdeq.gov/environ/air/plan/notmeet.html

Exhibit 1-14. DGL Within SO2 Area



Source: http://gisweb.azdeq.gov/arcgis/emaps/?topic=nonattain

1.14.2 Fish, Wildlife and Plants

The possibility of any impacts to any threatened and endangered species and candidate species within the DGL environment was based on review of information from the U.S. Fish and Wildlife Service website. A list was obtained of federally threatened or endangered species in Cochise County. The list should be evaluated for any future development projects to determine if any of the species will be impacted. The species listed in **Table 1-13** represent the county as a whole and does not solely represent DGL.

Table 1-13. Cochise County Species List

Group	Common Name	Scientific Name	Status
Amphibians	Sonora tiger Salamander	Ambystoma tigrinum stebbinsi	Endangered
Amphibians	Chiricahua leopard frog	Rana chiricahuensis	Threatened
Amphibians	Arizona Treefrog	Hyla wrightorum	Candidate
Birds	American peregrine falcon	Falco peregrinus anatum	Recovery
Birds	Yellow-billed Cuckoo	Coccyzus americanus	Threatened
Birds	northern aplomado falcon	Falco femoralis septentrionalis	Experimental Population, Non-Essential
Birds	Mexican spotted owl	Strix occidentalis lucida	Threatened
Birds	Southwestern willow flycatcher	Empidonax traillii extimus	Endangered
Fishes	Gila topminnow (incl. Yaqui)	Poeciliopsis occidentalis	Endangered
Fishes	Gila topminnow (incl. Yaqui)	Poeciliopsis occidentalis	Endangered
Fishes	Yaqui catfish	Ictalurus pricei	Threatened
Fishes	Gila chub	Gila intermedia	Endangered
Fishes	Yaqui chub	Gila purpurea	Endangered
Fishes	Loach minnow	Tiaroga cobitis	Endangered
Fishes	Desert pupfish	Cyprinodon macularius	Endangered
Fishes	Beautiful shiner	Cyprinella formosa	Threatened
Fishes	Spikedace	Meda fulgida	Endangered
Flowering Plants	Bartram stonecrop	Graptopetalum bartramii	Under Review
Flowering Plants	Cochise pincushion cactus	Coryphantha robbinsiorum	Threatened
Flowering Plants	Huachuca water-umbel	Lilaeopsis schaffneriana var. recurva	Endangered
Flowering Plants	Beardless chinch weed	Pectis imberbis	Under Review
Flowering Plants	Canelo Hills ladies'-tresses	Spiranthes delitescens	Endangered
Flowering Plants	Wright's marsh thistle	Cirsium wrightii	Candidate
Mammals	Jaguar	Panthera onca	Endangered
Mammals	Ocelot	Leopardus (=Felis) pardalis	Endangered
Mammals	Lesser long-nosed bat	Leptonycteris curasoae yerbabuenae	Endangered
Reptiles	New Mexican ridge-nosed rattlesnake	Crotalus willardi obscurus	Threatened
Reptiles	Northern Mexican gartersnake	Thamnophis eques megalops	Threatened
Snails	Huachuca springsnail	Pyrgulopsis thompsoni	Candidate
Snails	San Bernardino springsnail	Pyrgulopsis bernardina	Threatened

Source: http://ecos.fws.gov/ecp0/reports/species-by-current-range-county?fips=04003

1.14.3 Noise

DGL does not have a substantial amount of operations to model a day-night level (DNL) contour to represent the noise produce from daily operations. Noise is not a significant environmental factor at DGL, however, any increase of future aviation-related activity could have noise impacts on the surrounding environs.

1.15 Other Area Airports

In addition to examining market area demographic and socioeconomic characteristics, it is also important to understand the dynamics of aviation activity in the Douglas 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 DGL. Nearby public use airports and their relevant characteristics are summarized in **Table 1-14**.

Table 1-14: Airports within 20 NM of DGL

Airport	FAA ID	NPIAS Role	Distance from DGL	Runway Dimensions (ft)	Approach Type	Based Aircraft (2016)	Annual Operations (2016)
Douglas Municipal Airport	DGL	N/A	N/A	5,760 x 75	Basic	12	2,600
Cochise College Airport	P03	N/A	9.5 NM	5,551 x 60	Basic	19	54,033
Douglas - Bisbee International Airport	DUG	Local/Basic	8.0 NM	6,430 x 100 4,966 x 60	Non-precision/ Basic	6	2,382
Bisbee Municipal Airport	P04	Local/Basic	19.5 NM	5,929 x 60 2,650 x 110	Basic	11	2,900

Source: Kimley-Horn and Associates

1.16 Near-Term Planned Development

As a part of the Facility Requirements and Alternatives Analysis Chapters of this MPU, near-term (0-5 years), intermediate term (6-10 years), and long-term (11-20 years) development recommendations will be developed. However, there are additional near-term Airport improvement projects that were in the planning and design phase at the time this MPU was developed.

The first improvement project is the previously noted construction of perimeter fencing. Phase 1 of this project has already been completed. At the time this MPU was developed, the City was in the process of identifying if the design for the remaining fence would be completed in one phase (Phase 2) or in multiple phases. The design for the remainder of this project is anticipated to be completed in the 2016-2017 timeframe.

The second near-term planned development for DGL is the reconstruction of Runway 03-21. In June 2016, the Arizona Department of Transportation indicated that a design grant for reconstruction of the existing runway would be issued. At the time this MPU was developed, it was estimated that design for the runway reconstruction would be completed in 2017. Once design for this project is complete, the City may then apply for grants to assist with costs associated with environmental documentation and construction of the project.

2 FORECASTS

This chapter discusses the findings and methodologies used to project aviation demand at Douglas Municipal Airport (DGL). 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 Master Plan Update (MPU) provide a meaningful framework to guide analysis for the future Airport development needs and alternatives.

The projections of aviation demand developed for DGL are documented in the following sections:

- Socioeconomic Factors
- Historical and Current Activity
- National Aviation Trends
- Based Aircraft Projections
- Aircraft Operations Projections
- Critical Aircraft
- Forecast Summary

The forecast analysis includes methodologies that consider historical aviation trends at the Airport and throughout the nation. Local historical data was compiled from Airport records and tenants, as well as 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 trends and conditions to project demand at DGL. Projections of aviation activity for the Airport were prepared for near-term (2021), mid-term (2026), and long-term (2036) timeframes. These projections are generally unconstrained and assume the Airport will be able to develop the various facilities necessary to accommodate based aircraft and future operations.

The two elements that are examined in the forecasts are aircraft operations and based aircraft. A based aircraft is generally defined as an aircraft that is permanently stored at an airport. An aircraft operation represents either a take-off or landing conducted by an aircraft. For example, a takeoff and a landing would count as two operations.

Operations forecasts are further categorized in this MPU as local or itinerant. According to the FAA, local operations are defined as those conducted by aircraft that operate in the local traffic pattern or within sight of the Airport; are known to be departing for, or arriving from, flight in local practice areas located within a 20-mile radius of the Airport; or execute simulated instrument approaches or low passes at the Airport. Itinerant operations are all aircraft operations other than local operations.

2.1 Socioeconomic Factors

Regional socioeconomic trends were identified in the preceding chapter. Where applicable, these data can be used in the MPU process to relate future aviation activity levels at the Airport to local and regional socioeconomic trends. Douglas is a small rural city and because of this, Cochise County is used as the regional market area for Douglas Municipal Airport. The forecast analysis examines historical trends and future projections of the region's population, employment, and earnings to relate to aviation activity. Socioeconomic factors are important to analyze because the level of activity at an airport typically emulates the economic condition of the region. Woods and Poole Economics, Inc. data for Cochise County and the state of Arizona were examined extensively to generate projections for DGL through 2036.

It is important to note that a large majority of tax revenues in the City of Douglas are attributed to the neighboring Mexican City of Agua Prieta. Agua Prieta is a border town adjacent to Douglas with a population of 70,000 to 100,000. Many of the Agua Prieta residents work in Maquiladoras, or factories that produce manufactured goods, several of which are shipped across the border to distribution centers in Douglas. Driven by the large population and economic industry in Agua Prieta, almost 75 percent of the City of Douglas' tax revenues can be attributed to Mexican residents.

Table 2-1 reviews the population growth trends of Cochise County and the state of Arizona over a 10-year period. Using socioeconomic data from Woods and Poole Economics, Inc., the compound annual growth rate (CAGR) was calculated. Compound annual growth rate is a metric that generates linear annual gains for a particular series of data. It should be noted that CAGR calculates a constant rate of change. CAGR 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	127,660	6,140,390
2008	129,020	6,280,360
2009	130,080	6,343,150
2010	131,790	6,413,740
2011	134,150	6,538,130
2012	136,520	6,662,510
2013	138,880	6,786,900
2014	141,250	6,911,280
2015	143,610	7,035,670
2016	146,030	7,162,980
CAGR 2007-2016	**1.51%**	**1.73%**

Note: Any data between those years were extrapolated.
Source: Woods and Pool Economics, Inc. for years 2000, 2008-2010, 2015, and 2020.

As shown in **Table 2-1**, historical population growth was measured for Cochise County and the State of Arizona. Between the years of 2007 and 2016, the CAGR of population growth in

Cochise County was 1.51 percent. In the same timeframe, the state of Arizona experienced population growth at a CAGR of 1.73 percent, slightly higher than that of Cochise County.

In addition to the population growth rate, there are other demographic factors that can significantly impact aviation activity. 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. GRP is defined as the market value of all 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. is 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	58,510	$4,858.0	3,324,420	$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	3,279,050	$282,366.6
2012	60,560	$5,222.3	3,330,550	$289,190.1
2013	61,240	$5,321.3	3,382,040	$296,013.7
2014	61,920	$5,420.3	3,433,540	$302,837.3
2015	62,600	$5,519.3	3,485,030	$309,660.9
2016	63,720	$5,687.1	3,552,770	$318,884.5
CAGR 2007-2016	**0.95%**	**1.77%**	**0.74%**	**1.41%**

Source: Woods and Poole Economics, Inc.

As shown in **Table 2-2**, employment in Cochise County grew at a rate of almost 1 percent from 2007 to 2016. One percent growth outpaces the state of Arizona whose employment growth was 0.74 percent during the same timeframe. Similarly, total GRP increased 1.77 percent annually, while the state of Arizona's GRP increased 1.41 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. The growth of the County and the proximity of DGL to the Mexican border and the adjacent City of Agua Prieta should support the growth of the Airport for 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 (in 2015 $)	Arizona (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
2016	$39,583.2	$40,408.2
CAGR 2007-2016	**1.15%**	**0.34%**

Source: Woods and Poole Economics, Inc.

As shown in **Table 2-3**, personal income in Cochise County has grown at a rate of 1.15 percent annually between 2007 and 2016 while the state of Arizona has grown at a rate of 0.34 percent over the same ten-year period. The state of Arizona's PCPI is higher than Cochise County in every year, however, it's growth rate was 0.81 percent less than Cochise County between 2007 and 2016. If this growth rate persists, Cochise County PCPI will closely match the State of Arizona PCPI through 2036.

2.2 Historical and Current Activity

At general aviation airports such as DGL, there are two primary indicators of activity: based aircraft and annual operations. Historical based aircraft and operations data for DGL provide the baseline from which future activity at the Airport can be projected. DGL does not have an Air Traffic Control Tower (ATCT), and it is not included in the FAA's National Plan of Integrated Airport Systems (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, an examination of historical fuel sales, and information provided by Airport management and tenants.

2.2.1 Historical Based Aircraft

The only resources available to identify historical DGL based aircraft are the previous Airport Master Plan, which was completed in 1994, and the ASASP. The 1994 Master Plan identified 27 based aircraft at DGL in 1993. The 2008 ASASP identified 27 based aircraft in 2007. No other historical data for based aircraft at DGL were available to develop a base year estimate, therefore, a physical inventory count was conducted. The inventory identified 12 based aircraft at DGL in 2016 including 10 single-engine piston aircraft, one twin-engine piston aircraft, and one helicopter.

As shown in **Table 2-4**, based aircraft at DGL decreased from 27 in 2007 to 12 in 2016. This table depicts that DGL experienced a 56% decline in BAC in the 10-year period.

Table 2-4. Historical DGL Based Aircraft

Year	Total
2007	27
2008	*25*
2009	*24*
2010	*22*
2011	*20*
2012	*19*
2013	*17*
2014	*15*
2015	*14*
2016	12
CAGR 2007-2016	**-8.62%**

Note: Values for extrapolated years are italicized
Source: Arizona State Airport System Plan (ASASP)

Because of the significant difference in the number of based aircraft reported by the ASASP compared with the Airport survey data from 2016, forecasts of based aircraft activity in this MPU do not use time-series or historical trend methodologies. Instead, methodologies that compare existing based aircraft to other comparable factors were developed.

2.2.2 Historical Aircraft Operations

As previously defined, local operations are those conducted by aircraft that operate in the local traffic pattern or within sight of the Airport; are known to be departing for, or arriving from, flight in local practice areas located within a 20-mile radius of the Airport; or execute simulated instrument approaches or low passes at the Airport. Itinerant operations are all aircraft operations other than local operations.

Since DGL does not have an ATCT, historical aircraft operations represent estimates of activity from the 2008 ASASP and information provided by Airport management and tenants for base year 2015. It should be noted that historical operations between 2007 and 2015 have been extrapolated (see **Table 2-5**).

Based on information provided by Airport management and Lifeline, the Airport's sole permanent tenant, it was estimated that 2,600 operations occurred in 2016. **Table 2-5** shows that total operations from 2007 to 2016 decreased steadily. Also shown are ASASP forecasts of operations for 2007-2016, which reflects a CAGR of 1.42 percent.

Table 2-5. Historical DGL Aircraft Operational Mix

Year	Commercial Service	General Aviation	Military	Total Operations	SASP Projections
2007	0	11,000	100	11,100	11,100
2008	0	*9,990*	*170*	*10,160*	*11,266*
2009	0	*8,970*	*240*	*9,210*	*11,433*
2010	0	*7,960*	*10*	*8,270*	*11,599*
2011	0	*6,940*	*380*	*7,320*	*11,765*
2012	0	*5,930*	*450*	*6,380*	*11,932*
2013	0	*4,910*	*520*	*5,430*	*12,098*
2014	0	*3,900*	*590*	*4,490*	*12,264*
2015	0	*2,880*	*660*	*3,540*	*12,431*
2016	0	1,870	730	2,600[1]	12,597
CAGR 2007-2016	**0.00%**	**-17.87%**	**24.72%**	**-14.89%**	**1.42%**

Note: Values for extrapolated years are italicized
Sources: 2008 Arizona State Airport System Plan
[1]Lifeline – Airport tenant - August 2016

2.2.3 Historical Fuel Sales

As noted in the Inventory Chapter, DGL offers self-fueling for both Jet A and 100LL. **Table 2-6** depicts fuel sales sold in dollars and gallons from 2007 to 2015. Although this information is not used to project aircraft activity, it is important to identify the frequency of activity at the Airport. The irregularity in annual fuel sales at Douglas Municipal Airport's fuel farm is likely attributed to historical fluctuations in fuel price, the economic instability that occurred between 2008 and 2010, and changes in the number of based aircraft and itinerant operations that occur at DGL. Even though operations cannot directly be determined from the fuel sales information, it can be determined that DGL's fuel farm is a significant asset to the Airport.

Table 2-6. DGL Historical Fuel Sales

Year	100LL	100LL Gallons Sold	Jet A	Jet A Gallons Sold
2007	$0.00		$15,815.50	
2008	$34,278.99		$18,091.63	
2009	$53,035.76	11,960	$35,207.48	4,310
2010	$179,197.52	24,550	$26,048.84	6,010
2011	$69,138.58	16,100	$59,041.73	12,110
2012	$53,124.59	11,600	$26,392.09	5,830
2013	$56,328.70	11,580	$34,478.81	6,140
2014	$74,065.46	15,190	$18,312.81	3,120
2015	$64,387.62	15,210	$20,147.55	3,520

Source: Airport Management

2.3 National Aviation Trends

The preparation of forecasts of aviation-related demand requires a general understanding of recent and anticipated national trends in the aviation industry. Although trends that are occurring nationally don't always significantly impact individual airports, they are important to examine in comparison to recent levels of local activity. Although DGL experiences some military operations, the majority of the activity at the Airport is associated with general aviation (also referred to as GA). As such, this section focuses on past and anticipated trends in the general aviation industry. General aviation aircraft are defined as all aircraft not flown by commercial airlines or the military.

The general aviation industry has experienced significant changes in recent years. At the national level, fluctuating levels of general aviation usage caused by economic upturns/downturns resulting from the nation's business cycle has significantly impacted general aviation demand. This section examines general aviation trends, and the numerous factors that have influenced those trends in the U.S.

2.3.1 General Aviation Overview

There are 19,360 public and private airport facilities located throughout the United States, as reported by the FAA; 3,331 of these airports are included in the FAA's NPIAS, indicating that they are eligible for federal funding assistance. Commercial service airports, those that accommodate scheduled passenger airline service, represent a relatively small portion (514 or roughly 15 percent) of the airports in the NPIAS. General aviation airports, including relievers, comprise 85 percent of the NPIAS.

DGL is not included in the NPIAS. DGL is included in the Arizona system of airports and is eligible for state grant funding.

General aviation activity has declined in recent years. According to the *FAA Aerospace Forecast, Fiscal Years 2016-2036*, since 2000, operations on the national level have declined at an average annual rate of 3.3 percent. According to the FAA, much of this decline can be attributed to economic conditions and fuel prices.

2.3.2 Business Use of Aviation

Based on information provided by local businesses, it has been identified that DGL is occasionally used for business and corporate use. The City of Douglas and Agua Prieta, immediately south of the U.S.-Mexico border, are home to a number of businesses that currently use the Airport for business travel. For the purposes of this MPU, the terms business and corporate aircraft are used interchangeably, as they both refer to aircraft used to support a business enterprise; though as defined by the FAA, they each have their own distinct definition.

The FAA defines business use as:

"Any use of an aircraft (not for compensation or hire) by an individual for transportation required by the business in which the individual is engaged."

The FAA defines corporate transportation as:

"Any use of an aircraft by a corporation, company or other organization (not for compensation or hire) for the purposes of transporting its employees and/or property, and employing professional pilots for the operation of the aircraft."

The FAA estimated in their *2015-2019 Report to Congress* that business aircraft usage comprises 8.7 percent of all aviation activity. An additional 9.7 percent of the nation's general aviation activity is considered corporate. These figures represent a general decline nationally in the use of business/corporate aviation between 2008 and 2012 when they totaled 9.6 percent and 11.9 percent, respectively.

Increasing personnel productivity is one of the most important benefits of using business aircraft. Companies flying general aviation aircraft for business control scheduling capabilities. Itineraries can be changed as needed, and aircraft can fly to destination not served by scheduled airlines.

Business aircraft usage provides the following:

- Employee time savings
- Increased enroute productivity
- Minimized time away from home
- Enhanced industrial security
- Enhanced personal safety
- Management control over scheduling

Many of the nation's employers that use general aviation are members of the National Business Aircraft Association (NBAA). The NBAA's *Business Aviation Fact Book 2014* shows that nationwide business aviation contributes $150 billion to the U.S. economic output. The NBAA Fact Book also indicates that only three percent of business aircraft are flown by Fortune 500 companies; a large spectrum of companies and organizations of various sizes operate the remaining 97 percent. This indicates that the use of business aviation is not exclusive to large companies, and has practicable application for many different types of businesses.

Business use of general aviation aircraft ranges from small, single-engine aircraft to multiple aircraft corporate fleets supported by dedicated flight crews and mechanics. General aviation aircraft use allows employers to transport personnel and air cargo efficiently. Businesses often use general aviation aircraft to link multiple office locations and reach existing and potential customers. Business aircraft use by smaller companies has escalated as various chartering, leasing, time-sharing, interchange agreements, partnerships, and management contacts have emerged.

Though business use of general aviation has declined in recent years nationally, it is expected that the unique business climate within the DGL market area will result in continued growth in the local aviation environment. According to American Fact Finder and the 2010 Census, the City of Douglas has a population of 17,378. While this is a relatively small number, it does not account for the population of the neighboring town of Agua Prieta, Mexico. According to

Douglas City officials, the majority of the City's sales tax (70%) is generated from residents of Mexico.

The city of Agua Prieta, Mexico is home to multiple Maquiladoras (factories) that produce manufactured goods, several of which are shipped across the border to distribution centers in Douglas. From there, they are routed to cities all over the U.S. The Maquiladoras and distribution centers provide employment to thousands of people in Agua Prieta and Douglas. The Port of Entry to Mexico, located on the City of Douglas/Agua Prieta border, provides access to and from each city. Douglas City officials and local Airport stakeholders have identified that demand to pass through the port of entry exceeds its capacity and that significant improvements are needed; however, it continues to be a gateway for local, regional, and international business and trade.

2.3.3 FAA Forecasts

The FAA publishes forecasts on an annual basis that summarize anticipated trends in most components of civil aviation activity. Each published forecast revisits previous activity forecasts and updates them after examining the previous year's trends in aviation and economic activity. Many factors are considered in the FAA's development of forecasts, including U.S. and international economic trends and projected fuel costs. FAA forecasts provide detailed analyses of historical and forecasted aviation trends and provide a general framework for anticipated future level of regional and national aviation activity. Even though DGL is not included in the FAA's NPIAS, the trends and guidelines used by FAA are directly relevant since they represent national activity interests.

Examples of measures of national general aviation activity that are monitored and forecast by the FAA on an annual basis in the FAA Aerospace Forecasts include active pilots, active hours flown, and active aircraft fleet. Historical and projected activity in each of these categories is examined in the following sections. The data presented is based on the most recent available information, contained in *FAA Aerospace Forecasts, Fiscal Years 2016-2036.*

Active Pilots

An active pilot is defined by the FAA as those persons with a pilot certificate and a valid medical certificate. **Table 2-7** presents historical and projected U.S. Active Pilots data by certificate type. Between 2011 and 2016, the total number of active pilots has decreased by 0.63 percent, dropping from a total of 617,128 active pilots to 588,985 active pilots. In the next 20 years, the total number of active pilots is projected to increase by a CAGR of 0.11 percent.

Active Hours Flown

Aircraft hours flown is another statistic used by the FAA to measure and project general aviation activity. Hours flown is a valuable measure because it captures a number of activity-related data including aircraft utilization, frequency of use, and duration of use. As shown in **Table 2-8**, single-engine piston hours are anticipated to continue to diminish over the next 20 years as they have since 2011. Multi-engine hours are also projected to decrease, while turboprop and jet hours are projected to increase steadily. The CAGR of U.S. active hours flown from 2011-2016 decreased by -1.06 percent while it is projected to increase from by 1.20 percent between 2016 to 2036.

Active Aircraft Fleet

The FAA tracks the number of active general aviation aircraft in the U.S. fleet annually. Active aircraft are defined by the FAA as those aircraft currently registered in the U.S. and flying at least one hour during the year. **Table 2-9** summarizes recent active aircraft trends as well as future active aircraft by aircraft type from 2011-2036.

Similar to active hours flown, the U.S. single-engine and multi-engine piston aircraft fleets are projected to continually decrease through 2036 while turboprop and jet aircraft are anticipated to increase. The total active fleet decreased at an annual rate of -1.59 percent between 2011 and 2016 but is projected to increase at a CAGR of 0.18 percent through 2036.

FAA Forecast Summary

The cyclical nature of general aviation activity is illustrated in the historical national data presented in this analysis. While national general aviation activity experienced rebounded growth during the mid and late- 1990's, the terrorist attacks of 2001 and the economic downturn of 2008 dampened this nationwide activity. FAA projections of U.S. general aviation activity, including active pilots, active aircraft, and hours flown all showed varied levels of growth and decline through the FAA's forecast horizon of 2036.

Table 2-7. Historical and Projected U.S. Active Pilots

Certificate Type		Historical					Projected				CAGR 2011-2016	CAGR 2016-2036
	2011	2012	2013	2014	2015	2016	2017	2021	2031	2036		
Students	118,657	119,946	120,285	120,546	122,729	123,900	124,650	126,600	130,350	131,800	-3.50%	-0.27%
Recreational	227	218	238	220	190	190	190	185	180	180	7.73%	4.63%
Sport	4,066	4,493	4,824	5,157	5,482	5,900	6,350	8,000	12,450	14,600	-2.60%	-0.63%
Private	194,441	188,001	180,214	174,883	170,718	170,450	168,250	163,600	152,500	150,200	-3.97%	-0.52%
Commercial	120,865	116,400	108,206	104,322	101,164	98,700	96,750	92,200	89,300	88,950	1.69%	0.42%
Transport	142,511	145,590	149,824	152,933	154,730	155,000	155,400	156,600	163,800	168,600	0.46%	2.27%
Rotorcraft	15,220	15,126	15,114	15,511	15,566	15,575	15,645	16,685	21,555	24,420	-1.84%	-0.12%
Glider	21,141	20,802	20,381	19,927	19,460	19,270	19,240	19,025	18,835	18,825	-0.93%	0.07%
Total:	**617,128**	**610,576**	**599,086**	**593,499**	**590,039**	**588,985**	**586,475**	**582,895**	**588,970**	**597,575**	-0.63%	0.11%
Instrument Rated[1]	314,122	311,952	307,120	306,066	304,329	304,400	303,900	304,300	307,700	311,300	0.87%	0.31%

[1]Instrument rated pilots should not be added to other categories in deriving total.
Source: FAA Aerospace Forecasts 2016-2036

Table 2-8. Historical and Projected U.S. Active Hours Flown (in thousands)

Certificate Type	Historical					Projected				CAGR 2011-2016	CAGR 2016-2036
	2011	2012	2013	2014	2015	2016	2017	2021	2031	2036		
Single-engine Piston	11,844	11,442	10,706	10,395	10,312	10,225	10,151	9,879	9,285	9,119	-2.90%	-0.57%
Multi-engine Piston	1,782	1,766	1,646	1,573	1,555	1,541	1,530	1,497	1,496	1,505	-2.86%	-0.12%
Turboprop	2,463	2,733	2,587	2,613	2,582	2,564	2,556	2,589	3,113	3,575	0.81%	1.68%
Jet	3,407	3,418	3,488	3,881	3,913	4,016	4,164	4,771	6,425	7,422	3.34%	3.12%
Rotorcraft	3,411	3,454	2,949	3,242	3,240	3,323	3,417	3,885	4,905	5,430	-0.52%	2.49%
Experimental	1,203	1,243	1,191	1,244	1,260	1,283	1,311	1,418	1,722	1,876	1.30%	1.92%
Sport	278	169	173	165	180	194	208	268	426	505	-6.94%	4.90%
Other	181	180	135	158	154	152	152	152	151	150	-3.43%	-0.07%
Total:	**24,569**	**24,405**	**22,875**	**23,271**	**23,196**	**23,298**	**23,489**	**24,459**	**27,523**	**29,582**	**-1.06%**	**1.20%**

Sources: FAA Aerospace Forecast 2016-2036

Table 2-9. Historical and Projected U.S. Active Aircraft Fleet

Certificate Type	Historical					Projected				CAGR 2011-2016	CAGR 2016-2036
	2011	2012	2013	2014	2015	2016	2021	2031	2036		
Single-engine Piston	136,895	128,847	124,398	126,036	125,050	124,055	119,585	110,685	107,160	-1.95%	-0.73%
Multi-engine Piston	15,702	14,313	13,257	13,146	13,085	13,025	12,760	12,095	11,695	-3.67%	-0.54%
Turboprop	9,523	10,304	9,619	9,777	9,570	9,420	9,215	10,990	12,635	-0.22%	1.48%
Jet	11,650	11,793	11,637	12,362	12,475	12,635	13,975	18,015	20,770	1.64%	2.52%
Rotorcraft	10,082	10,055	9,765	9,966	10,240	10,540	11,985	14,730	16,255	0.89%	2.19%
Experimental	24,275	26,715	24,918	26,191	26,435	26,590	27,690	30,155	31,640	1.84%	0.87%
Sport	6,645	2,001	2,056	2,231	2,410	2,590	3,490	5,275	6,100	-17.18%	4.38%
Other	5,681	5,006	4,277	4,699	4,615	4,570	4,525	4,465	4,440	-4.26%	-0.14%
Total:	**220,453**	**209,034**	**199,927**	**204,408**	**203,880**	**203,425**	**203,225**	**206,410**	**210,695**	**-1.59%**	**0.18%**

*Experimental Light-sport category that was previously shown under Sport Aircraft is moved under Experimental Aircraft category, starting in 2012.
Note: An active aircraft is one that has a current registration and was flown at least one hour during the calendar year.
Source: FAA Aerospace Forecast 2016-2036

2.4 Based Aircraft Projections

The FAA maintains projections of aviation-related activity in its Terminal Area Forecasts (TAF). Terminal Area Forecasts are only available for NPIAS airports, and as DGL is a Non-NPIAS facility, the only previous forecast, other than the dated 1994 Airport Master Plan, is from the 2008 ASASP. As shown in **Table 2-10**, the ASASP projected that there would be 29 based aircraft at DGL in 2016. As previously noted, an on-site inventory identified that there were 12 based aircraft at the Airport in 2016. As such, the previous forecasts from the ASASP are no longer accurate, and additional methodologies to project based aircraft at DGL have been developed. The following sections identify 20-year forecasts of based aircraft demand using a variety of methodologies.

Table 2-10. DGL Based Aircraft Comparison

Historical	ASASP	DGL
2016	29	12
Projected		
2021	30	
2026	31	
2036	33	

Source: 2008 Arizona State Airports System Plan.

2.4.1 Based Aircraft Forecast Methodologies

The 2008 ASASP reports that there were 27 based aircraft at Douglas Municipal Airport in 2007. A physical count of based aircraft was completed in July 2016 and confirmed a total of 12 BAC at DGL. Without accurate historical records between 2007 and 2016, certain types of methodologies typically employed for forecasting are not useful for projections presented in this MPU. Methodologies such as regression or trend analysis utilize historical data to project future activity. Since these methodologies will not provide an accurate portrayal of aviation-related activity at DGL, based aircraft forecasts are derived from two types of forecasting methodologies: socioeconomic and market share.

Socioeconomic Methodology – Population Variable

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 146,034 in 2016 to 194,704 in 2036, which reflects a CAGR of 1.45 percent. The population of Cochise County is anticipated to increase at a slightly lesser rate than the state of Arizona (1.54 percent CAGR).

Based on conversations with Airport management and tenants, the number of based aircraft at DGL in 2016 was 12. The Socioeconomic-Population Variable Methodology for based aircraft forecasts assumes that between 2016 and 2036, the number of based aircraft at the Airport will increase at the same rate as the population of Cochise County (see **Table 2-11**). As shown, the number of based aircraft at DGL is projected to increase from 12 in 2016 to 16 in 2036.

Table 2-11. DGL Socioeconomic – Population Variable Based Aircraft Forecast

Historical	Cochise County Population	DGL Based Aircraft
2016	146,030	12
Projected		
2021	158,180	13
2026	170,410	14
2036	194,700	16
CAGR 2016-2036	**1.45%**	**1.45%**

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

Socioeconomic Methodology – Employment Variable

Similar to the Socioeconomic-Population Variable Methodology, the Socioeconomic-Employment Variable Methodology assumes that between 2016 and 2036 the number of based aircraft at the Airport will increase at the same rate as the number of employed individuals in Cochise County (see **Table 2-12**). According to Woods and Poole Economics, Inc., the number of employed individuals in Cochise County is anticipated to increase from 63,722 in 2016 to 90,922 in 2036, a CAGR of 1.79 percent. As shown, the number of based aircraft at DGL is projected to increase from 12 in 2016 to 17 in 2036.

Table 2-12. DGL Socioeconomic – Employment Variable Based Aircraft Forecast

Historical	Cochise County Employment	DGL Based Aircraft
2016	63,720	12
Projected		
2021	69,450	13
2026	75,780	14
2036	90,920	17
CAGR 2016-2036	**1.79%**	**1.79%**

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

Socioeconomic Methodology – Per Capita Personal Income Variable

Per capita personal income (PCPI) can be an indicator of a local population's propensity to travel or own an aircraft. Commercial service is not provided at Douglas Municipal Airport; however, the Airport has the capabilities to support some jet traffic due to its existing runway length and on-site jet fueling facilities. Per capita personal income is examined to project based aircraft at the Airport and the result is depicted in **Table 2-13**. As shown, per capita income in Cochise County is anticipated to increase from $39,583.20 in 2016 to $56,088.90 in 2036, a CAGR of 1.76 percent. This methodology projects the number of based aircraft at the Airport from 2016 to 2036 to increase at the same rate as per capita income in Cochise County. According to the Socioeconomic-Per Capita Personal Income Variable Methodology, the number of based aircraft at DGL is projected to increase from 12 in 2016 to 17 in 2036. It should be noted that per capita data obtained from Woods and Poole Economics, Inc. is reported in constant dollars (year 2015) to adjust for inflation over time.

Table 2-13. DGL Socioeconomic – Per Capita Personal Income Variable ($2015) Based Aircraft Forecast

Historical	Cochise County PCPI	DGL Based Aircraft
2016	$39,583.2	12
Projected		
2021	$42,573.5	13
2026	$46,274.3	14
2036	$56,088.9	17
CAGR 2016-2036	**1.76%**	**1.76%**

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

Socioeconomic Methodology – Total Retail Sales Variable

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 from $1,735.90 (in millions) in 2016 to $2,849.50 in 2036, a CAGR of 2.51 percent. This methodology assumes that from 2016 to 2036, the number of based aircraft at DGL will increase at the same rate as total retail sales in Cochise County (see **Table 2-14**). As shown, the number of based aircraft at the Airport is projected to increase from 12 in 2016 to 20 in 2036. As with per capita income, total retail sales are reported in constant dollars (year 2015) to adjust for inflation over time.

Table 2-14. DGL Socioeconomic – Total Retail Sales Variable ($2015) Based Aircraft Forecast

Historical	Cochise County Total Retail Sales (Millions)	DGL Based Aircraft
2016	$1,735.9	12
Projected		
2021	$1,971.7	14
2026	$2,231.8	15
2036	$2,849.5	20
CAGR 2016-2036	**2.51%**	**2.51%**

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

Socioeconomic Methodology – Summary of Results

A summary of the results of the socioeconomic methodologies used to project based aircraft at the Airport is shown in **Table 2-15**, including the CAGR for each methodology from 2016-2036. The Population, Employment, and Per Capita Income Methodologies have a relatively similar CAGR. The Total Retail Sales Methodology shows a higher growth rate (2.51 percent) compared to the other three socioeconomic methodologies. This growth is most likely attributed to the sales from Mexican visitors in the City of Douglas and surrounding areas.

Table 2-15. Socioeconomic Forecasts of DGL Based Aircraft

Historical	Population Methodology	Employment Methodology	Per Capita Income Methodology	Total Retail Sales Methodology
2016	12	12	12	12
Projected				
2021	13	13	13	14
2026	14	14	14	15
2036	16	17	17	20
CAGR 2016-2036	**1.45%**	**1.79%**	**1.76%**	**2.51%**

Note: CAGR is based on 2016-2036 projections. 2015 Based Aircraft methodology is derived from the Arizona State Airport System Plan (ASASP) data records extrapolated from 2007.
Sources: Woods and Poole Economics, Inc., Kimley-Horn and Associates

Based Aircraft Forecast - Market Share Methodology

The second type of methodology used to project based aircraft at DGL is market share. Market share compares an individual component's share (based aircraft at DGL) with a larger market. Two markets were compared against based aircraft at DGL; the State of Arizona, and a regional market that includes based aircraft at nearby airports including Cochise College Airport (P03), Bisbee-Douglas International Airport (DUG), and Bisbee Municipal Airport (P04).

As mentioned in previous sections of this MPU, there were 12 based aircraft at the Airport in 2016. According to the FAA TAF, there were 5,540 based aircraft at NPIAS airports in the state of Arizona. With the known based aircraft, DGL accounted for a 0.22 percent market share of based aircraft in Arizona in 2016. FAA TAF projections of based aircraft in Arizona are depicted in **Table 2-16**. The 0.22 percent market share is held constant throughout the projection period, which results in an increase from 12 based aircraft at DGL in 2016 to 16 in 2036.

Table 2-16. DGL Market Share Methodology Based Aircraft Forecast

Historical	Arizona Based Aircraft	DGL Based Aircraft	DGL Market Share
2016	5,540	12	0.22%
Projected			
2021	5,980	13	0.22%
2026	6,470	14	0.22%
2036	7,590	16	0.22%
CAGR 2016-2036	**1.58%**	**1.58%**	

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

The second market share methodology compares based aircraft at DGL to the previously mentioned nearby airports. Existing and projected based aircraft data for P03, DUG, and P04 were obtained from Airport Master Plans and extrapolated through 2036 as necessary. It was determined that based aircraft at DGL accounted for approximately 25 percent of the regional market. This figure is held constant throughout the projection period.

As shown in **Table 2-17**, the sum of 2016 based aircraft at the four airports was 48. Keeping the percent of DGL based aircraft constant at 25 percent, the total number of based aircraft at DGL is projected to be 14 by 2036, which reflects a CAGR of 0.77 percent.

Table 2-17. Douglas and Regional Airport (Market Share) Based Aircraft Forecast

Historical	Douglas Municipal Airport Based Aircraft[1]	Cochise College Airport Based Aircraft[2]	Bisbee-Douglas International Based Aircraft[3]	Bisbee Municipal Based Aircraft[4]	Total Based Aircraft	% DGL Based Aircraft
2016	12	19	6	11	48	25%
Projected						
2021	13	21	6	11	51	25%
2026	13	22	7	11	54	25%
2036	14	24	7	11	57	26%
CAGR 2016-2036	**0.77%**	**1.17%**	**0.77%**	**0.00%**	**1.09%**	

Source:[1]Based Aircraft per Airport Manager July 2016
[2]Extrapolated Based Aircraft per P03 Master Plan Update
[3]Extrapolated Based Aircraft per DUG Master Plan Update
[4]Based Aircraft per FAA TAF projections

Based Aircraft Forecast – Summary

Table 2-18 summarizes the six methodologies used to project based aircraft at DGL from 2016 to 2036. Due the limited growth in socioeconomic indicators in Cochise County, based aircraft, depending on methodology, are projected to increase by two to eight aircraft in the 20-year timeframe.

Table 2-18. Based Aircraft Forecast - Summary

Historical	Population Variable BAC	Employment Variable BAC	PCPI Variable BAC	Total Retail Sales Variable BAC	AZ Market Share Variable BAC	Regional Market Share Variable BAC
2016	12	12	12	12	12	12
Projected						
2021	13	13	13	14	13	13
2026	14	14	14	15	14	13
2036	16	17	17	20	16	14

Historical	Population Variable BAC	Employment Variable BAC	PCPI Variable BAC	Total Retail Sales Variable BAC	AZ Market Share Variable BAC	Regional Market Share Variable BAC
CAGR 2016-2036	1.45%	1.79%	1.76%	2.51%	1.58%	0.77%

Source: Woods and Poole Economics, Inc.

Based Aircraft Forecast – Preferred Methodology

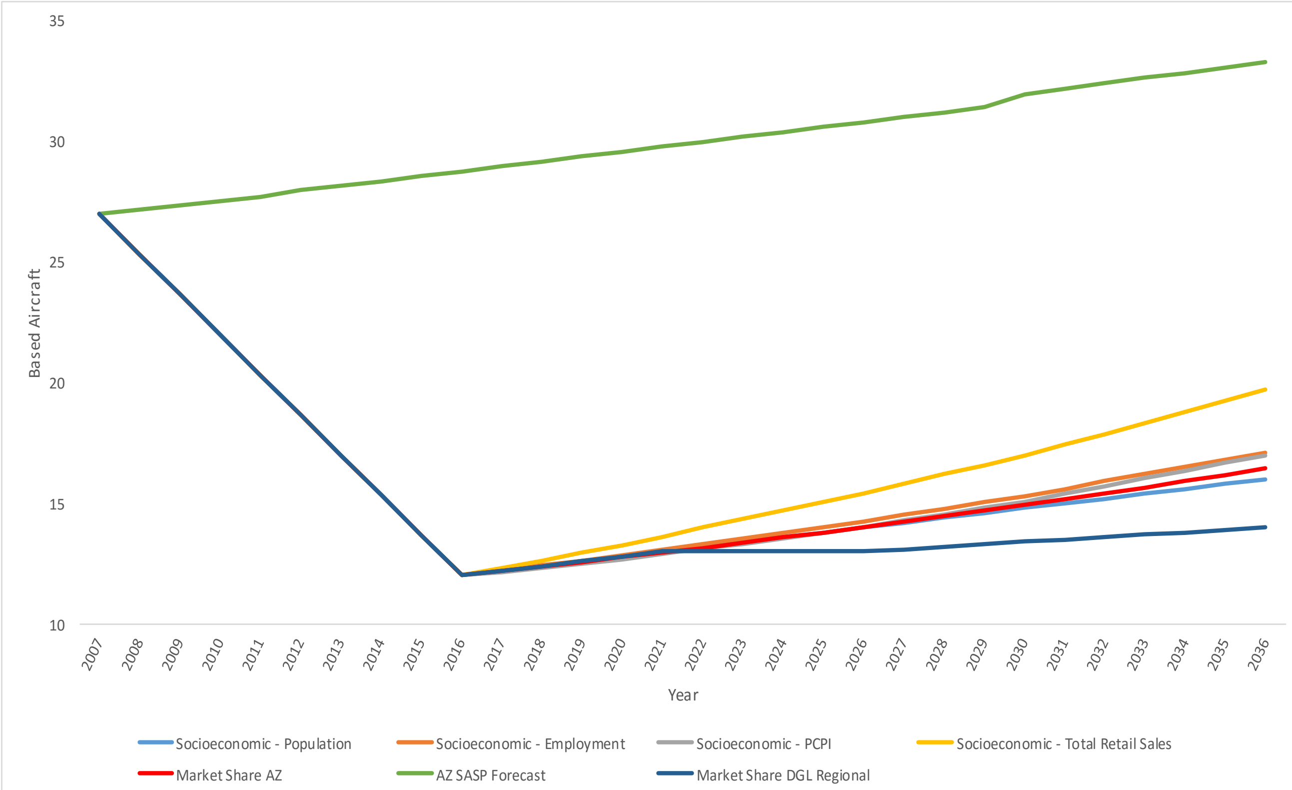
Socioeconomic population, employment, per capita income, and retail sales methodologies all suggest somewhat similar growth rates of based aircraft at DGL through 2036. Due to the regional socioeconomic status of Cochise County and the City of Douglas staying fairly consistent, this data can be referred to, but not used as a preferred methodology. The significant decline in the number of based aircraft at DGL between 2007 and 2016 also suggests that local socioeconomic factors are not the most significant indicator of Airport activity.

Because they do not account for the decline in based aircraft that has occurred in recent years, based aircraft projections based on the ASASP shown in **Table 2-9** are not accurate projections of based aircraft at DGL in 2036. The ASASP projected 27 based aircraft at DGL in 2007 with a CAGR of 0.68 percent. Using this method, DGL would have 29 based aircraft in 2016, which is incorrect based on recent inventory data. As such, the methodology that utilizes the ASASP's projections is not accurate and is not to be used as a preferred method for determining based aircraft at DGL.

Due to the consistent economic climate in Cochise County, it is not anticipated that there will be a significant change in based aircraft at DGL. Consequently, it is reasonable to assume the based aircraft market share of DGL compared to the state of Arizona and region will remain constant over time. The market share methodologies are based on available data and provide a more accurate report of based aircraft than that of the ASASP created in 2008. Because the regional market share methodology relies on actual data reported in airport master plans, and it is assumed that DGL's market share compared with overall demand in the region will remain relatively constant, the regional market share methodology is the preferred methodology for based aircraft. A summary of all methodologies for based aircraft is previously shown in **Table 2-18** and below in **Exhibit 2-1**.

It should be noted that although the regional market share methodology is the preferred forecast for based aircraft at DGL, projections of activity described by other methodologies represent a reasonable range of potential outcomes at the Airport. While the difference in the number of projected based aircraft is relatively small, this range of possible future aircraft at DGL provides a general indication of what the Airport should plan for with respect to facility requirements.

Exhibit 2-1 Based Aircraft Forecast - Summary



Sources: Woods and Poole Economics, Inc., 2008 Arizona State Airports System Plan, Kimley-Horn and Associates.

Based Aircraft Fleet Mix Forecast

As with most general aviation airports, the majority of the based aircraft fleet at DGL is comprised of single-engine piston aircraft. The FAA projects the national based aircraft fleet mix in 2016 to remain fairly stable with little changes throughout the projection period with one exception. National trends and FAA TAF forecasts indicate strong growth in the number of general aviation and air taxi jet aircraft in operation in the U.S. through 2036. The number of jets in operation in the U.S. in anticipated to increase from 12,475 in 2015 to 20,770 in 2036, a CAGR of 2.5 percent. In 2015, there were no based jets at DGL, and despite the recent increase in jet operations nationally, it is anticipated that DGL will not have a based jet by 2036. Although the Airport is equipped with adequate facilities to accommodate jet operations, given the Airport's location and regional socioeconomic status, it is more likely that single-engine prop, rotorcraft, and twin-engine aircraft will continue to dominate the fleet mix at DGL.

In 2016, as noted by the DGL Airport management and stakeholders, there were 10 single-engine aircraft, one multi-engine aircraft, and one helicopter based at the Airport. As shown in **Table 2-19**, single-engine prop aircraft make up 83.33 percent of the fleet mix, while multi-engine and helicopter aircraft each make up 8.33 percent of the entire fleet. Using the preferred based aircraft methodology to project BAC through 2036, and keeping the fleet mix percentage constant throughout the projection period, the fleet mix is projected through 2036. As the total based aircraft fleet is anticipated to increase by 2 aircraft through 2036, the only category that is anticipated to increase in the number of aircraft is single-engine piston aircraft.

Table 2-19. DGL Based Aircraft Fleet Mix Forecast

Historical	Single-Piston	%	Multi-Piston	%	Jet	%	Helicopter	%	Total
2016	10	83.33%	1	8.33%	0	0.00%	1	8.33%	12
Projected									
2021	10	83.33%	1	8.33%	0	0.00%	1	8.33%	13
2026	11	83.33%	1	8.33%	0	0.00%	1	8.33%	13
2036	12	83.33%	1	8.33%	0	0.00%	1	8.33%	14
CAGR	**0.92%**	**0.00%**	**0.00%**	**0.00%**		**0.00%**	**0.00%**	**0.00%**	**0.77%**

Sources: Airport management, Kimley-Horn and Associates

2.5 Aircraft Operations Projections

Aircraft operations projections are used to determine funding and design criteria at airports. At airports with ATCTs, aircraft operations are tracked and recorded by the air traffic controller. Most airport in the United States, including DGL, do not have air traffic control towers. These airports are referred to as non-towered airports, and they make up the vast majority of the airports open to the public for business. Accordingly, unlike with larger towered airports, these non-towered airports do not always have readily available records on aircraft activity.

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 an airport. At non-towered facilities such as DGL it is difficult to accurately measure historical aircraft operations.

The only historical data available to project operations at DGL is from the ASASP which estimated 11,000 operations in 2007. Due to the lack of historical operations data available, time series or regression analysis methodologies would not accurately portray projected aviation-related activity. The methodologies utilized for purposes of this MPU examine operations based on socioeconomic factors, market share, and operations per based aircraft (OPBA).

2.5.1 Aircraft Operations Forecast – Baseline Estimate

As discussed above, 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 2016 operations is based on observations from Airport management and tenants. It was determined that 2,600 operations occurred at DGL in 2016. This figure is used to project operational demand moving forward.

Socioeconomic Methodology – Population Variable - Forecasts

As with based aircraft forecasts, one methodology used to determine projections of aircraft operations was an examination of local socioeconomic data. As shown in **Table 2-20**, based on data provided from Woods and Poole Economics, Inc. the population of Cochise County is projected to increase from 146,034 in 2016 to 194,704 in 2036. This increase in population over the 20-year period represents a CAGR of 1.45 percent. The estimate of 2,600 aircraft operations in base year 2016 is applied to the projected population growth rate of Cochise County. As shown, this methodology projects 3,470 operations will occur at DGL by 2036, which represents a CAGR of 1.45 percent.

Table 2-20. DGL Socioeconomic - Population Variable Operations Forecasts

Historical	Cochise County Population	Total Operations
2016	146,030	2,600[1]
Projected		
2021	158,180	2,820
2026	170,410	3,030
2036	194,700	3,470
CAGR 2016-2036	**1.45%**	**1.45%**

Sources: [1]Airport Management and tenant estimate, Woods and Poole Economics, Inc., Kimley-Horn and Associates

Socioeconomic Methodology – Employment Variable – Forecasts

Using the same socioeconomic methodology, total operations at DGL are developed by applying the CAGR of total employment of Cochise County between 2016 and 2036 to aircraft operations in base year 2016. As shown in **Table 2-21**, employment in the County is projected to increase from 63,722 in 2016 to 90,922 in 2036, which represents a CAGR of 1.79 percent. By applying the same growth rate to the number of operations reported at DGL in 2016, 3,710 annual operations are projected by 2036.

Table 2-21. Socioeconomic – Employment Variable Operations Forecast

Historical	Cochise County Employment	Total Operations
2016	63,720	2,600[1]
Projected		
2021	69,450	2,830
2026	75,780	3,090
2036	90,920	3,710
CAGR 2016-2036	**1.79%**	**1.79%**

Sources: [1]Airport Management and tenant estimate, Woods and Poole Economics, Inc., Kimley-Horn and Associates

Socioeconomic Methodology – Per Capita Personal Income Variable - Forecasts

As stated in a previous section, per capital personal income (PCPI) can be an indicator of a local population's propensity to travel or own an aircraft. As shown in **Table 2-22**, the PCPI of Cochise County was $39,583.20 in 2016, and is projected to increase to $56,088.90 in 2036. This exhibits a CAGR of 1.76 percent during the 20-year projection period. By applying the 1.76 percent growth rate to the 2,600 operations at DGL in 2016, aircraft operations are projected to be 3,680 by 2036.

Table 2-22. Socioeconomic – Per Capita Personal Income Variable ($2015) Operations Forecast

Historical	Cochise County PCPI	Total Operations
2016	$39,583.2	2,600[1]
Projected		
2021	$42,573.5	2,800
2026	$46,274.3	3,040
2036	$56,088.9	3,680
CAGR 2016-2036	**1.76%**	**1.76%**

Sources: [1]Airport Management and tenant estimate, Woods and Poole Economics, Inc., Kimley-Horn and Associates.

Socioeconomic Methodology – Total Retail Sales Variable – Forecasts

The final socioeconomic methodology used for determining aircraft operations at DGL is the Total Retail Sales Variable. As shown in **Table 2-23**, the total retail sales in Cochise County in 2016 was $1,735.9 (millions), increasing to $2,849.5 in 2036. This increase represents a 2.51 percent CAGR for the 20-year period. After applying the 2.51 percent CAGR to the 2,600 operations currently at DGL, operations are projected to be 4,270 by 2036.

Table 2-23. Socioeconomic – Total Retail Sales Variable ($2015) Operations Forecast

Historical	Cochise County Total Retail Sales (millions)	Total Operations
2016	$1,735.9	2,600[1]
Projected		
2021	$1,971.7	2,950
2026	$2,231.8	3,340
2036	$2,849.5	4,270
CAGR 2016-2036	**2.51%**	**2.51%**

Sources: [1]Airport Management and tenant estimate. Woods and Poole Economics, Inc., Kimley-Horn and Associates

Operations Forecast – Market Share Methodology

Similar to based aircraft, two market share methodologies were used to project DGL operations. Two tables were created to show the aircraft operations market share at DGL. **Table 2-23** identifies the market share of aircraft operations at DGL compared to the state of Arizona. **Table 2-24** compares aircraft operations of DGL to the regional market comprised of P03, P04, and DUG.

As shown in **Table 2-24**, in 2016, Arizona general and civil aviation operations were projected to be 2,583,163 compared to 2,600 operations at DGL, which represents a market share of 0.101 percent. This percentage is held constant and results in 2,750 operations by 2036.

Table 2-24. DGL Market Share Methodology Operations Forecast

Historical	Arizona Operations	DGL Operations	DGL Market Share
2016	2,583,163	2,600[1]	0.101%
Projected			
2021	2,616,600	2,630	0.101%
2026	2,651,603	2,670	0.101%
2036	2,726,912	2,750	0.101%
CAGR 2016-2036	**0.27%**	**0.27%**	**0.00%**

Sources: [1]Airport Management and tenant estimate, Woods and Poole Economics, Inc., Kimley-Horn and Associates

The second market share methodology used to project operations at DGL is the regional airport market share methodology. This market share methodology compares the total number of annual operations at DGL in 2016 to annual operations at the surrounding airports consisting of P03, P04, and DUG.

Using forecasts of aircraft operations information from recent Master Plan Updates for DUG and P03, and using FAA TAF records for P04, operations estimates and projected activity was developed for the 2016 to 2036 timeframe.

As shown in **Table 2-25**, in 2016, the total operations of the four regional market airports were 61,920. Of the 61,920 operations, 2,600 operations came from DGL, making up 4.2 percent of the regional airport market share. Using Master Plan and FAA TAF projections and keeping the percentage of DGL operations constant, the number of operations at DGL in 2036 is projected to be 3,580, which is a CAGR of 1.61 percent.

Table 2-25. Douglas and Regional Airport (Market Share) Operations Forecast

Historical	Douglas Municipal Airport Operations	Cochise College Airport Operations[2]	Bisbee-Douglas International Airport Operations[3]	Bisbee Municipal Airport Operations[4]	Total Operations	% DGL Operations
2016	2,600[1]	54,030	2,380	2,900	61,920	4.2%
Projected						
2021	2,860	59,370	3,010	2,900	68,140	4.2%
2026	3,030	63,150	3,230	2,900	72,300	4.2%
2036	3,580	75,490	3,230	2,900	85,200	4.2%
CAGR 2016-2036	**1.61%**	**1.69%**	**1.53%**	**0.00%**	**1.61%**	

Source: [1]Airport Management and tenant estimate – August 2016
[2]Extrapolated Operations per P03 Master Plan Update
[3]Extrapolated Operations per DUG Master Plan Update
[4]Operations per FAA TAF projections

Aircraft Operations Forecast – Operations per Based Aircraft Methodology

As stated in previous sections, because of the significant decline in operations at DGL in recent years, historical data are not taken into account to project future activity. With information from Airport management and primary tenant, the operations per based aircraft (OPBA) was calculated for 2016. As shown in **Table 2-26**, DGL experienced 2,600 operations and had 12 based aircraft in 2016, which calculates to an OPBA of 217. Assuming the OPBA stays constant through 2036, and using the based aircraft projections from the preferred based aircraft methodology, operations are projected to increase from 2,600 in 2016 to 3,030 in 2036, a CAGR of 0.77 percent.

Table 2-26. Operations per Based Aircraft

Historical	DGL Based Aircraft	DGL Operations	DGL OPBA
2016 (est.)	12	2,600[2]	217
Projected			
2021	13	2,820	217
2026	13	2,820	217
2036	14	3,030	217
CAGR 2016-2036	**0.77%**	**0.77%**	

Source: [1]Airport management and tenant - August 2016

Aircraft Operations Forecast – Summary

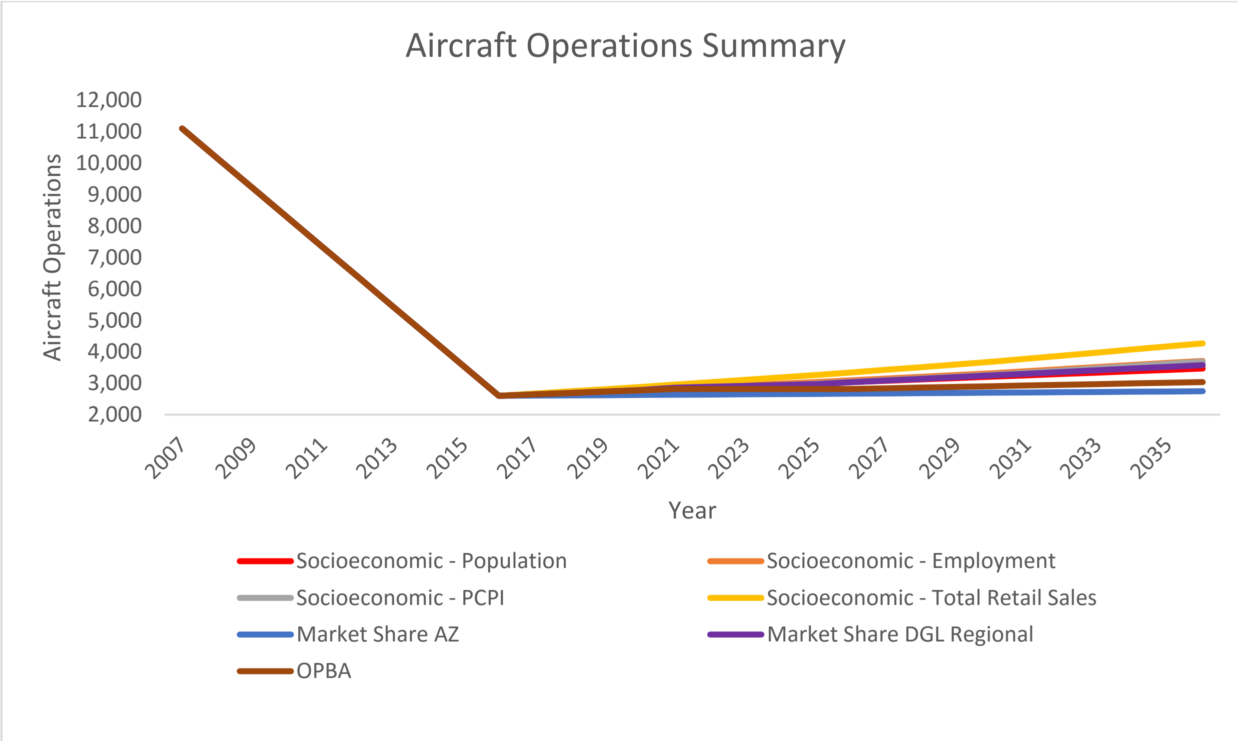
Table 2-27 and **Exhibit 2-2** summarize the seven methodologies used to project operational activity at DGL from 2016 to 2036. The Arizona Market Share Variable represents the lowest estimate of aircraft operations projected at DGL in 2036 at 2,750 operations. Alternately, the Total Retail Sales Variable represents the highest estimate of aircraft operations at the Airport in 2036 at 4,270 operations.

Table 2-27. Aircraft Operations Forecast - Summary

Historical	Population Variable Operations	Employment Variable Operations	PCPI Variable Operations	Total Retail Sales Variable Operations	AZ Market Share Variable Operations	Regional Market Share Variable Operations	OPBA Variable
2016	2,600	2,600	2,600	2,600	2,600	2,600	2,600
Projected							
2021	2,820	2,830	2,800	2,950	2,630	2,860	2,820
2026	3,030	3,090	3,040	3,340	2,670	3,030	2,820
2036	3,470	3,710	3,680	4,270	2,750	3,580	3,030
CAGR 2016-2036	**1.45%**	**1.79%**	**1.76%**	**2.51%**	**0.27%**	**1.61%**	**0.77%**

Sources: Woods and Poole, 2008 ASASP, FAA TAF, Airport Management and Tenant Estimates, Kimley-Horn and Associates

Exhibit 2-2 Aircraft Operations Forecast - Summary



Sources: Woods and Poole Economics, Inc., 2008 Arizona State Airports System Plan, Kimley-Horn and Associates

2.5.2 Aircraft Operations Forecast – Preferred Methodology

All seven of the aircraft operations methodologies presented in this MPU rely on information from the Airport management and the sole tenant on the Airport. Examining the socioeconomic methodologies and choosing the preferred methodology is challenging because similar to based aircraft, it is difficult to identify a link between local socioeconomic trends and operational activity at DGL, especially due to the lack of historical data available.

The Arizona state market share methodology shown in **Table 2-24** is not a preferred methodology because it compares the state of Arizona to DGL. Arizona's airport system is very large and complex, and the traits of the state's airports are not necessarily indicative of activity at DGL. As such, while the market share of DGL to the state of Arizona as a whole may remain relatively constant over time, there is not a strong correlation between local and state activity.

The regional airport market share methodology shown in **Table 2-25** represents the regional airport market share of operations and compares it to DGL. By predicting DGL's regional operations will stay constant at 25 percent of the regional operations between P03, P04, and DUG, it can be determined that DGL will account for 3,580 operations in 2036. Because it is assumed that DGL's share of regional demand will remain constant, and based on the fact that projected activity for the regional market is based on recent forecasts developed in airport master plan updates and the FAA TAF, the regional market share methodology is the preferred methodology for aircraft operations.

Similar to based aircraft forecasts, although the preferred methodology for aircraft operations is used for facility planning in subsequent sections of this document, the additional methodologies presented represent a reasonable range of possible activity in the future.

2.5.3 Aircraft Operations Forecast – Local/Itinerant Operations

The most accurate data to identify local vs. itinerant operations at DGL based on Airport management and tenant observations. Based on this information, it is estimated that DGL experiences approximately 75 percent itinerant and 25 percent local activity. These figures are applied to total projected itinerant operations and held constant throughout the projection period (see **Table 2-28)**.

Table 2-28. DGL Operations Forecast – Local/Itinerant Operations

Historical	Total Operations	Local Operations	% Local Ops	Itinerant Operations	% Itinerant Ops
2016	2,600	650	25%	1,950	75%
Projected					
2021	2,860	715	25%	2,145	75%
2026	3,030	758	25%	2,272	75%
2036	3,580	895	25%	2,685	75%
CAGR 2016-2036	**1.61%**	**1.61%**	**0.00%**	**1.61%**	**0.00%**

Sources: Airport Management and tenant – August 2016

2.5.4 Aircraft Operations Forecast – Operational Fleet Mix

Operational fleet mix projections identify the type of aircraft that currently operate and are anticipated to operate at DGL. These forecasts are calculated based on data obtained from Airport tenants.

As shown in **Table 2-29**, of the 2,600 operations at DGL, 27 percent are from single-engine piston aircraft, 1 percent from multi-engine piston aircraft, 1 percent from jet aircraft, and another 1 percent from turbo prop aircraft. It is assumed that these operational fleet mix percentages will remain constant throughout the 20-year planning horizon.

Table 2-29. DGL Total Operational Fleet Mix Forecast

Year	Total Ops	Single-Engine		Multi-Engine		Jet		Helicopter		Turbo-Prop	
2016	2,600	27%	700	1%	30	1%	30	70%	1,810	1%	30
Projected											
2021	2,860	27%	770	1%	40	1%	40	70%	1,970	1%	40
2026	3,030	27%	820	1%	50	1%	50	70%	2,060	1%	50
2036	3,580	27%	920	1%	70	1%	70	70%	2,450	1%	70
CAGR 2016-2036	**1.61%**		**2.93%**		**1.61%**		**5.19%**		**0.91%**		**1.61%**

Note: Operations by aircraft type are rounded to remain consistent with total operations projections
Sources: Airport tenant, Kimley-Horn and Associates

2.5.5 Aircraft Operations Forecast – Military Operations

According to Airport management and tenant observations, it is estimated that approximately two military operations occur daily at DGL, primarily conducted by the Arizona and New Mexico Air National Guard. These military operations are primarily helicopter operations, specifically conducted by UH-60 Blackhawks and EC-145 Eurocopters. Based on two operations per day, military traffic accounts for approximately 28 percent of operations at DGL (see **Table 2-30**). It is anticipated that military operations will continue to account for 28 percent of the operations at DGL. By 2036, military operations at DGL are projected to be 1,000 annually.

Table 2-30. Military Operations at DGL

Historical	General Aviation	Military	% Military	Total Operations
2016	1,870	730[1]	28%	2,600[1]
Projected				
2021	2,060	800	28%	2,860
2026	2,180	850	28%	3,030
2036	2,580	1,000	28%	3,580

Source: [1]Airport management and tenant estimates

2.5.6 Aircraft Operations – Regional Analysis

A specific focus of this MPU is to identify the role DGL plays within the regional setting. As noted, nearby airports include P03, P04, and DUG. While each of these airports is unique and serves different users, they are also a part of a region whose demand is projected to have relatively slow growth in the future. As such, this section provides an analysis of recent historical aircraft operations by aircraft classification based on the FAA's Traffic Flow Management System Counts (TFMSC) Database. This database reports filed flight plan data from the Air Traffic Airspace Lab, typically by users that fly under IFR or are detected by radar, and are captured by the FAA's enroute computers that track aircraft on flight plans. It is important to note that the majority of jet operations and a significant proportion of turbo-prop aircraft operations have filed flight plans. Some non-turbo prop single engine piston aircraft file flight plans for flight training purposes or when aircraft are carrying passengers, however, it is only a small proportion of overall single-engine piston operations and a limited number of VFR flights.

It should also be noted that different classifications of aircraft have significantly different impacts at airports. Jet aircraft and most turbo-prop aircraft use Jet A fuel, and significantly more fuel than piston-powered aircraft, which use lesser amounts of 100LL fuel or AvGas. Jet and turbo-prop aircraft also typically require more apron space for parking, and stronger pavements compared to piston aircraft. Aircraft operations as recorded by FAA's TFMSC by airport and classification are identified in **Table 2-31**.

Table 2-31. Regional Jet and Turbo-Prop Operations

Aircraft Classification	2013 Operations	2014 Operations	% Change	2015 Operations	% Change	% Change 2013-2015
Douglas Municipal Airport						
Turbo-Prop	10	7	-30%	54	671.4%	**440.0%**
Jet	4	28	600.0%	25	-10.7%	**525.0%**
Total	14	35	150.0%	79	125.7%	**464.3%**
Bisbee-Douglas International Airport (DUG)						
Turbo-Prop	38	62	62.3%	35	-43.5%	**-7.9%**
Jet	83	65	-21.7%	58	-10.8%	**-30.1%**
Total	121	127	5.0%	93	-26.8%	**-23.1%**
Bisbee Municipal Airport (P04)						
Turbo-Prop	10	4	-60.0%	4	0.0%	**-60.0%**
Jet		4	100.0%	3	-25.0%	**100.0%**
Total	10	8	-20.0%	7	-12.5%	**-30.0%**
Cochise College Airport (P03)						
Turbo-Prop	0	0	0.0%	7	100.0%	**100.0%**
Jet	0	0	0.0%	0	0.0%	**0.0%**
Total	**0**	**0**	**0.0%**	**0**	**100.0%**	**100.0%**

Source: Based FAA Traffic Flow Management System Counts Database, Downloaded September 2016

As shown in **Table 2-31**, both turbo-prop and jet aircraft operations increased significantly at DGL between 2013 and 2015. This corresponds with a moderate decline in turbo-prop operations and a significant decline in jet operations at DUG during the same timeframe. Neither P03 nor P04 experience significant turbo-prop or jet activity according to TFMSC.

The increase in jet traffic at DGL and corresponding loss at DUG is consistent with DGL users who have stated that they more frequently operate at DGL instead of DUG, where they used to operate. Specifically, several jet operators associated with the Maquiladoras in Agua Prieta have switched to DGL due to its close proximity to the City of Douglas and the U.S.-Mexico border, as well as the availability of self-serve jet fueling capabilities. Representatives from the Maquiladoras have indicated that is a trend that is anticipated to continue with the anticipation that facilities at DGL are conducive to jet operations, specifically, the rehabilitation of Runway 03-21.

This transfer of turbo-prop and jet aircraft from other airports in the Cochise County region to DGL is a very important element to identify in this MPU. Although projections of aviation demand at the Airport indicate slow, steady growth, the impacts and benefits of increased jet and turbo-prop activity indicate that DGL could increase its market share of demand for these types of operations if they are able to maintain and improve existing facilities.

2.6 Critical Aircraft

Facility planning for general aviation airports is impacted by existing and anticipated levels of aviation-related demand, both based aircraft and annual aircraft operations, as well as the size and type of aircraft that currently operate and are projected to operate at an airport.

As defined in FAA Advisory Circular 150/5300-13A, Change 1, the FAA classifies airports by Airport Reference Code (ARC), which identifies the overall planning and design criteria for the Airport. The ARC is assigned based on the size of the largest aircraft that generally records at least 500 operations annually at an airport; this aircraft is known as the airport's "critical aircraft." The critical aircraft can consist of multiple aircraft that are considered collectively. Although this MPU and its recommendations are not specific to FAA regulations and design standards, it is important to identify the critical aircraft in order to measure the operational capabilities of airside facilities at DGL.

The ARC is based on the highest Runway Design Code (RDC) of a particular airport. The RDC is comprised of the Aircraft Approach Category (AAC), the Aircraft Design Group (ADG), and the approach visibility minimums. The AAC is based on the approach speed of the airport's critical aircraft, and the ADG is based on the critical aircraft's wingspan and tail height. The approach visibility minimums expressed by runway visual range values in feet and relate to the lowest visibility minimums with the instrument approach procedure.

The ARC provides the guidelines for pavement surfaces, safety area dimensions, runway lengths, separation standards, and taxiway criteria in an attempt to ensure that the airfield layout and geometry provide a safe and efficient operating environment for the aircraft that typically use the airport. The ARC consists of a letter and a numeric identifier. The first is the letter, which represents the AAC; the second is the number which represents the ADG. The ARC classifications omit the runway visibility identifier used in the RDC. **Table 2-32** summarizes the classifications for determining these components of the RDC and ARC.

Aircraft approach speeds included in categories A and B are typically small, piston-engine aircraft, whereas C, D, and E are normally larger turboprop or turbine powered aircraft. Similarly, the wingspan and tail height of small, piston-engine aircraft normally correspond to design group I. Typical aircraft in design group II would be a Beechcraft King Air, Cessna Citation, or smaller Gulfstream business jets. Design groups III, IV, and V would represent air carrier aircraft, such as Boeing 737, B-757, and B-747, respectively. Group VI would include the largest of aircraft such as Airbus A-380 or C-5 military cargo aircraft.

Identified in the previous ALP Update conditionally approved in 2003, the critical aircraft at DGL was identified as a Beech King Air C-90, which has a B-II ARC. An analysis of aircraft operations from the FAA's TFMSC database at DGL from 2011 to 2016 identified that the Beech 200 Super King should be the existing and future Critical Aircraft.

Although the King Air 200 does not conduct anywhere near 500 annual operations, it is reflective of the type of aircraft that are currently and projected to occur at the Airport. The TFMSC data identified that more demanding aircraft including the Swearingen Merlin Metro 2, Bombardier Lear Jet 35/36, Cessna Excel/XLS, and others that operate at DGL, however, the number of operations are not significant enough to warrant a change in critical aircraft or ARC classification.

Table 2-32. FAA Aircraft Categories and Design Standards

Aircraft Approach Category	Approach Speed	Airplane Design Group	Wing Span (feet)	Tail Height (feet)	Runway Visual Range (feet)
A	Less than 91	I	Less than 49	Less than 20	5000
B	91 to 120	II	49 to 78	21 to 29	4000
C	121 to 140	III	79 to 117	30 to 44	2400
D	141 to 165	IV	118 to 170	45 to 59	1600
E	166 or Greater	V	171 to 213	60 to 65	1200
		VI	214 up to but less than 262	66 up to but less than 80	

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

2.7 Forecast Summary

It is anticipated that DGL will see limited, but steady growth in based aircraft and annual operations throughout the 20-year projection period. This growth is primarily driven by the Airport's advantageous proximity to both Douglas and Agua Prieta, as well as the existing facilities at the Airport. Business and corporate activity has also steadily increased in recent years, which is largely attributed to the Maquiladoras in Agua Prieta. Furthermore, the availability of both Jet A and 100LL fuel at DGL is an attractive facility for itinerant users. Lastly, 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 2-33**, provides a summary of expected based aircraft and aircraft operations from 2016 to 2036. These forecasts will be used to assist with the development of facility needs in the subsequent chapter of this MPU.

Table 2-33. Summary of DGL Forecasts

Category	2016	Projected		
		2021	2026	2036
General Aviation Operations	**2,600**	**2,860**	**3,030**	**3,580**
Itinerant	1,950	2,145	2,272	2,685
Local	650	715	758	895
Total Based Aircraft	12	13	13	14
Single-Engine Piston	10	10	11	12
Multi-Engine Piston	1	1	1	1
Jet	0	0	0	0
Helicopter	1	1	1	1

Sources: Kimley-Horn and Associates

3 FACILITY REQUIREMENTS

This chapter provides a technical analysis of facility requirements for the Douglas Municipal Airport (DGL). 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 Facilities
- General Aviation Facilities
- Support Facilities

3.1 Airside Facility Requirements

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

- Approach Capability
- Navigational Aids and Lighting
- Airspace Protection
- Part 77 Requirements
- Critical Aircraft and Airport Reference Code
- Runway Design Code
- Approach and Departure Reference Codes
- Runway Dimensional Standards
- Runway Orientation
- Runway Length
- Runway Width
- Runway Pavement Strength
- Taxiway System
- Taxiway Configuration
- Taxiway Dimensional Standards

3.1.1 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 or cues. 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. The classifications include Non-Precision (NP), Precision (P), and Approach Procedures with Vertical Guidance (APV). Non-Precision approaches provide only lateral guidance from either ground based or satellite based Global Positioning System (GPS) navigational aids (NAVAIDs). Precision instrument approaches provide both lateral and vertical guidance and are traditionally supported by multiple ground based NAVAIDs collectively called an Instrument Landing System (ILS). An ILS includes a Localizer (providing lateral guidance), a Glideslope (providing vertical guidance) and an approach lighting system (providing close-in visual guidance). Approach Procedures with Vertical Guidance are a relatively recent outcome of the FAA's Next Generation Air Transportation System (NextGen) program. These approach procedures use GPS technology to provide ILS-like approach capability without the need for traditional ground-based ILS NAVAID equipment.

Douglas Municipal Airport does not currently have any IAPs. Most aircraft operations that occur at the Airport are conducted by helicopters or small, single-engine piston aircraft. As noted in the Forecast Chapter, the Airport receives limited jet traffic, however, the numbers are not sufficient to justify development of an IAP. Furthermore, the favorable year-round climate in Douglas is conducive to visual approaches that are conducted under VMC conditions. Based on these factors, and the relatively low level of aircraft activity at the Airport, it is not anticipated that any IAPs or equipment will be needed in the 20-year planning horizon. It is important to note that Airport users and tenants have identified an approach procedure as a desired facility improvement to increase safety. It is recommended that the feasibility of implementing approach capabilities at DGL be re-examined in the next Master Plan Update, particularly if activity increases at the Airport by that point in time.

3.1.2 Navigational Aids and Lighting

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. As described in Chapter 1, Runway 03-21 is equipped with Precision Approach Path Indicators (PAPIs) on both runway ends.

The Airport is also equipped with a wind sock which identifies wind speed and direction, a segmented circle, and a white-green rotating beacon. Runway 03-21 is also equipped with

Medium Intensity Runway Lighting (MIRL), Runway end Indicator Lights (REILs) on both Runway End 03 and 21, and has basic runway markings that are in poor condition. The basic runway markings include runway designation (runway end number), and runway centerline marking, which identifies the center of the runway and provides alignment guidance during takeoffs and landings.

The 2008 Arizona State Airports System Plan (SASP) identifies minimum objectives for the State's airport system that are recommended for airports to fulfill their roles in the statewide system. Douglas Municipal Airport is identified as a General Aviation-Community facility in the SASP. For this airport classification, minimum criteria as they pertain to visual aids and lighting include a rotating beacon, wind cone/segmented circle, MIRLs, and some type of Visual Glide Slope Indicator, such as PAPIs. Based on the type and volume of aircraft operations that occur and are projected to occur at the Airport, the existing NAVAIDs and lighting are anticipated to be adequate and meet the SASP criteria.

Although they do not directly provide guidance for aircraft operations, weather stations provide valuable information to pilots taking off or landing at an airport. DGL does not currently have a weather station, though it has been identified as a need for the Airport. The nearest weather station to the Airport is located at Bisbee-Douglas International Airport, which is 10 miles northwest.

The 2008 SASP recommended that any airport in Arizona should be within 25 nautical miles of an airport weather reporting station. The SASP also cites the 2007 Arizona (Automated Weather Observing System (AWOS) Study that recommended specific airports that should install an AWOS. DGL was not on this list, however, it is anticipated that the trend of larger aircraft and jet aircraft migrating from other area airports will continue in the future. As such, it is recommended that DGL pursue installation of either an Airport Automated Surface Observing System (ASOS) or an AWOS in the intermediate (6-10 year) timeframe. Based on an examination of FAA Airport Improvement Program (AIP) grants from 2016, the overall cost for site preparation and installation of weather reporting equipment at a smaller general aviation airport is between $100,000 and $150,000. The most significant considerations for the installation of a weather reporting station is the initial purchase and installation cost, and operational and maintenance costs of the equipment.

Per FAA Order 6560.20B, the preferred siting of a weather reporting station is adjacent to the primary runway 1,000 feet to 3,000 feet from the runway threshold. The horizontal distance of the facility from the primary runway centerline is 500 feet to 1,000 feet. A specific location for the weather reporting station is identified on the Airport Layout Plan.

Though DGL meets the 2008 SASP requirement of being within 25 nautical miles of an airport weather reporting station, knowledge of accurate, current weather conditions enhances pilot safety, and would be a desirable improvement at the Airport.

3.1.3 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 National Plan of Integrated Airport System (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 Douglas 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 protection of the surrounding airspace to promote safe aircraft operations to the extent possible. It should be noted that these surfaces exist at all airports, regardless if they are included in the NPIAS or not.

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 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.

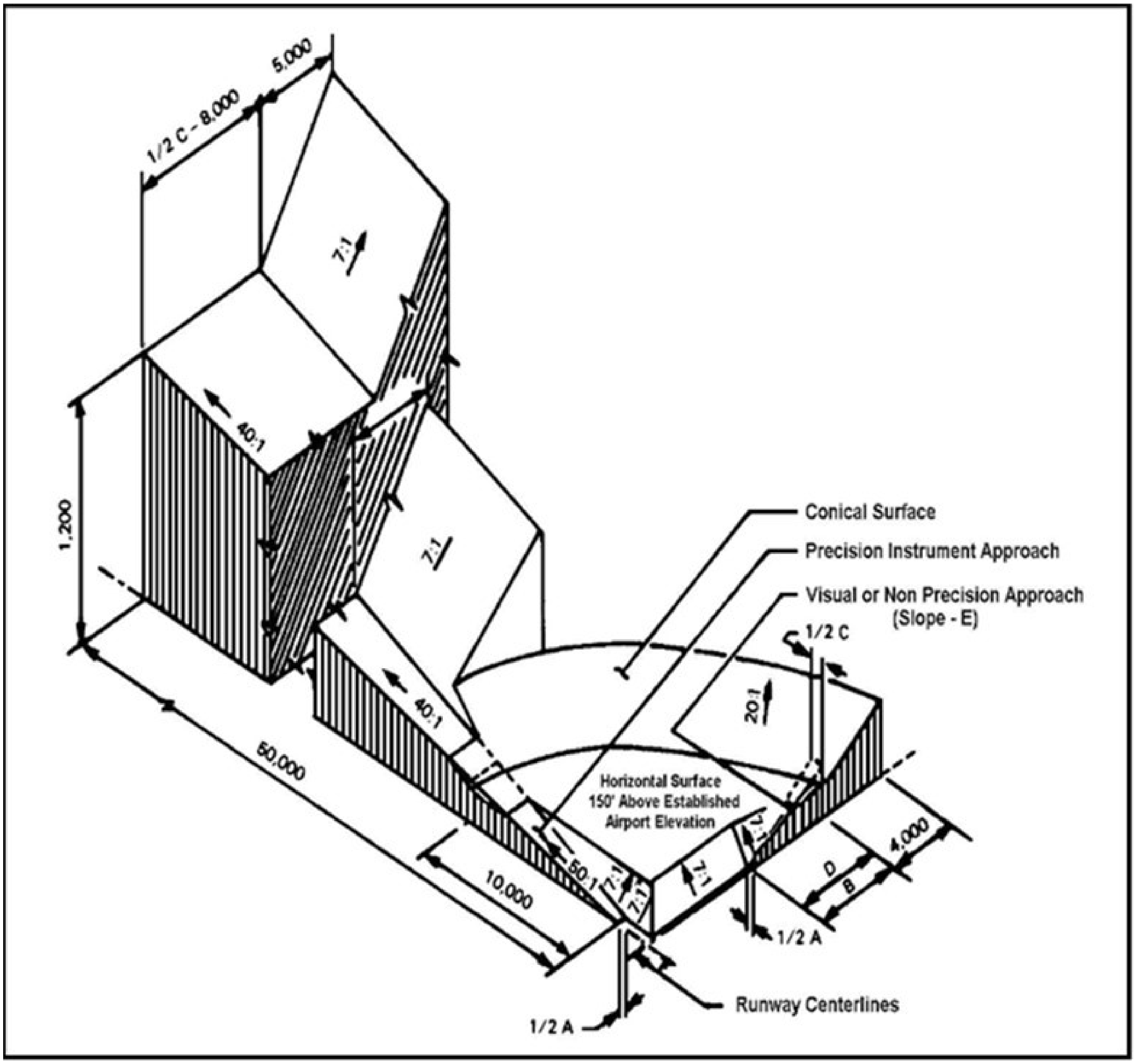
In June 2016, Quantum Spatial, a geospatial service company conducted an aerial observation of the Airport, providing high-resolution imagery and identification of airspace obstacles at DGL. Based on the results of this observation, 33 obstacles to the Part 77 Surfaces were identified. Most of these were identified as terrain, trees, and bushes. There was one tower identified as an obstacle in the Transitional Surface. It is important to note that there were no obstacles identified in the Primary Surface. A graphical representation of obstacles is shown in the Airport Layout Plan (ALP). The following sections identify obstacles and airspace surfaces in greater detail.

3.1.4 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 airports 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 describes the imaginary surfaces as they apply to the existing Runway 03-21 at DGL. All references to a surface's *slope* is expressed in horizontal feet by vertical feet. For example, a 20:1 slope rises one foot vertically for every 20 feet horizontally. A graphical depiction of Part 77 surfaces is shown in **Exhibit 3-1**.

Exhibit 3-1. FAR Part 77 Surfaces



Source: National Oceanic and Atmospheric Administration.

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 03-21 this surface is 500 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.

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 03 and 21 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 1,500 feet.

Based on aerial photogrammetry conducted by Quantum Spatial, there are 17 obstacles in the Approach Surfaces of Runway 03-21, all of which are identified as trees and bushes. It is recommended that these obstacles be cleared and approach areas be regularly maintained.

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 were 5 obstacles identified within the Transitional Surface, including bushes, terrain and one tower.

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 DGL, the Horizontal Surface extends 5,000 feet from the ends of Runway 03-21, at an elevation of 4,323 feet MSL. There are no known obstacles located in the Horizontal Surface.

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.

Ten obstacles, all identified as terrain, are located within the Conical Surface with penetrations ranging from less than 1 foot to 39 feet. These obstacles are not prohibitive to operating aircraft at DGL.

3.1.5 Critical Aircraft and Airport Reference Code (ARC)

The FAA classifies airports and runways by their current and planned operational capabilities. These classifications – described below – along with the aircraft classifications defined in Chapter 1 are used to determine the appropriate FAA standards, as per AC 150/5300-13A, to which the airfield facilities are to be designed and built. Although Douglas 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 defined as at least 250 takeoffs per year. The previous Airport Layout Plan (ALP) identified DGL's Critical Aircraft as a Beech King Air C-90, which has an ARC designation of B-II (small). Based on an analysis of historical operations at DGL using the FAA's Traffic Flow Management System Count database (TFMSC), the most demanding aircraft that regularly operates at DGL is the Beechcraft Super King Air 200.

Although more demanding aircraft including smaller jets do operate at the Airport, this aircraft model is reflective of a more typical, regularly operating aircraft. Though the Super King Air 200 does not conduct 250 annual takeoffs, it is the recommended Critical Aircraft for the Airport. With an approach speed of approximately 103 knots and a wingspan of 54 feet 6 inches, the ARC for the Beechcraft Super King Air 200 is B-II (small), the same ARC that has been maintained on DGL's ALP since 2003.

Consistent with FAA guidance, the Critical Aircraft anticipated to use the facilities over the planning horizon are those with an AAC-ADG of B-II (small), which includes the King Air 200. Based on this, the ARC for Douglas Municipal Airport is anticipated to remain B-II (small) throughout the planning horizon.

3.1.6 Runway Design Code (RDC)

The 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 will be consistent with the highest RDC of any of its runways. The RDC for Douglas Municipal Airport's Runway 03-21 is B-II-VIS.

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*

3.1.7 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 03-21 is B/II/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 03-21 is B/II.

3.1.8 Runway Dimensional Standards

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 previously presented 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 03-21. The FAA design standards for a B-II (small) runway with visual approach minimums are summarized in **Table 3-2.**

As shown, all DGL's runway dimensional standards meet FAA requirements.

Table 3-2. Runway Dimensional Standards

Design Criteria	Runway 03-21	
	Existing Conditions	B-II (small) FAA Standards
Runway Design		
Width	75'	75'
Shoulder Width	20'	10'
Runway Protection		
RSA Length beyond departure end	300'	300'
RSA Length prior to threshold	300'	300'
RSA Width	150'	150'
ROFA Length beyond departure end	300'	300'
ROFA Length prior to threshold	300'	300'
ROFA Width	500'	500'
ROFZ Length beyond runway end	200'	200'
ROFZ Width	400'	400'
RPZ Length	1,000'	1,000'
RPZ Inner Width	250'	250'
RPZ Outer Width	450'	450'
Runway Separation		
Holding Position	200'	200'
Parallel Taxiway/Taxilane Centerline	240'	240'
Aircraft Parking Area	355'	250'

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 03-21, this surface is 150 feet wide and extends 300 feet prior to the landing threshold and 300 feet beyond the departure end of the runway. The existing RSA is clear of obstacles and is entirely located on airport-owned property. 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.

Runway Object Free Area (ROFA)

The ROFA is 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 in the ROFA for air navigation or aircraft ground maneuvering purposes. Object 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 03-21, this surface is 500 feet wide and extends 300 feet prior to the landing threshold and 300 feet beyond the departure end of the runway. It is anticipated that the existing ROFA dimensions are adequate to accommodate existing and projected levels of demand, however, the ROFA off the end of Runway End 03 is penetrated by the Airport's perimeter fence and access road. As an extension or relocation of Runway 03-21 is not a specific recommendation of this Airport Master Plan Update, it is recommended that the City of Douglas acquire an avigation easement for safety areas that extend off the Airport property, including the RSA.

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 RPZs through fee simple acquisition, easement or use restrictions/agreements. Such control includes clearing of RPZ areas of incompatible objects and activities.

As shown in Table 3.2, the RPZs for both ends of Runway 03-21 adhere to FAA standards for a B-II (small) facility. Although portions of the existing and proposed RPZ cross Geronimo Trail, Airport Road, and into Mexico, the existing RPZs do not have buildings or functions that promote large congregations of people, with the exception of approximately 4 to 6 homes located in Agua Prieta, Mexico that are within the RPZ.

The RPZ off the end of Runway end 03 is penetrated by the Airport perimeter fence and an access road. The RPZ off the end of Runway End 21 is penetrated by the perimeter fence as well as East Geronimo Trail. It is recommended that the City of Douglas acquire avigation easements or acquire the property that is encompassed by the RPZs to protect the Airport environment from incompatible land use.

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 03-21, the OFZ is 400 feet wide. Based on existing and projected aircraft activity, it is anticipated that the existing ROFZ dimensions are adequate, however, the ROFZ off the end of Runway End 03 is penetrated by the Airport's perimeter fence and access road. This area is entirely within the ROFA, so the recommendation to acquire an avigation easement for the ROFA will also ensure that the ROFZ is adequately protected.

2.7.1.1.1 Runway Separation Standards

The FAA defines several separation standards that measure from the runway centerline to other airport facilities and are established to ensure operational safety of the airport users. The following are runway separation standards applicable to DGL:

- Runway Centerline to Edge of Aircraft Parking Area – For Runway 03-21, the standard distance is 250 feet. Existing tie-downs on aircraft parking aprons comply with this standard, as the closest distance from any aircraft parking area to the runway centerline is approximately 355 feet.
- Parallel Taxiway/Taxilane – FAA standard for a B-II (small) facility for runway-to-parallel taxiway/taxilane centerline is 240 feet. The centerline of the partial parallel taxiway at DGL is 240 feet from the centerline of Runway 03-21, which complies with this standard.
- Holding Position – FAA standard for a B-II (small) facility for runway centerline distance to aircraft holding position is 125 feet. There is one holding position on Runway end 21 and two holding positions on Runway end 03. All holding positions are 200 feet from the centerline of Runway 03-21, which exceeds to FAA design standards.

3.1.9 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.

Since DGL does not have a weather station, wind data were taken from the nearest Airport Automated Surface Observing System (ASOS), which is located at Bisbee-Douglas International Airport approximately 10 miles northeast of DGL. **Table 3-3** identifies wind coverage for Runway 03-21.

Table 3-3. Runway 03-21 Wind Coverage

	10.5 kt	13 kt	16 kt
All Weather	90.64%	**94.98%**	98.07%
IFR	80.48%	**85.95%**	91.52%
VFR	90.8%	**95.13%**	98.18%

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

For a B-II (small) runway with visual approach minimums, the FAA recommends that 95 percent crosswind coverage be met for a 13-knot crosswind component. As shown in Table 3-3, Runway 03-21 at DGL does not satisfy this requirement for All Weather conditions. Airport tenants and users identified that a crosswind runway is a desirable facility, however, it is not as high of a priority as rehabilitation of the existing runway.

The most recent ALP, which was conditionally approved in 2003, identifies development of a crosswind Runway 12-30. While it is unlikely that the Airport would receive significant funding from the State to construct a crosswind runway, it is recommended that it still be shown on the updated ALP developed for this Master Plan Update as the crosswind runway is justified, just not a high priority given other needs at DGL. It should also be noted that despite the fact that crosswind coverages do not necessarily satisfy FAA criteria, it does not inhibit the Airport from operating as a safe facility. Based on the information provided in this section, it is further recommended that prior to any detailed planning effort pertaining to the installation of a crosswind runway, the City conduct a wind study to determine crosswind coverage specifically at DGL.

3.1.10 Runway Length

FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides guidance for determining runway length needs. 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."

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 95 percent of aircraft within that fleet category, and 100 percent of aircraft within that category.

As noted in previous sections, the B-II critical aircraft for Douglas Municipal Airport is the Beechcraft Super King Air 200, which has a Maximum Takeoff Weight of 12,500 pounds. Also, noted in FAA AC 150/5325-4B, for airport elevations above 3,000 feet, the airport designer must use the 100 percent of fleet calculations for 12,500 pound or lighter aircraft.

Takeoff lengths interpolated from the FAA tables identified in the Advisory Circular are based off an Airport elevation of 4,173 feet above MSL, and the mean maximum temperature of the hottest month, which is 94 degrees according to the previous Master Plan. Based on these inputs, the recommended runway length for Douglas Municipal Airport is 5,750 feet. The published length of Runway 03-21 is 5,760 feet. As noted, 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.

Per FAA AC 150/5325-4B, the length requirements for a crosswind runway are the same as those for the primary runway. As such, it is recommended that the Airport Layout Plan depict a future crosswind runway that is 5,750 feet in length.

3.1.11 Runway Width

The width of Runway 03-21 is 75 feet. The FAA design standard for runway width is based on the AAC and approach visibility minimums to the runway. As indicated previously in **Table 3-2**, the standard runway width for a B-II airport with visual approach minimums is 75 feet. Based on existing and projected activity at the Airport, it is anticipated that a 75-foot wide runway is adequate to accommodate demand. This 75-foot standard is applicable to both existing Runway 03-21 and the future crosswind runway.

3.1.12 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, which does not include DGL) 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.

According to the 2003 ALP, Runway 03-21 has a pavement strength of 12,500 pounds for single-wheel-gear configurations, which is adequate to accommodate existing and projected demand.

According to ADOT, other than minor patching and crack sealing, the last major rehabilitation of Runway 03-21, which was a 5-inch overlay, was conducted in 1997. The Airport was last inspected in April 2013. At that time, the Runway and the turnaround taxiway was given a Pavement Condition Index (PCI) rating of 19. ADOT recommends major rehabilitation, such as a thick overlay or reconstruction when a runway's PCI drops below 55. Notes from that inspection include significant quantities of low-, medium-, and high-severity longitudinal and transverse cracking, bulging areas of pavement, and high potential of Foreign Object Debris (FOD). Airport maintenance staff regularly remove large pieces of dislocated pavement, and Airport users have identified that rehabilitation of Runway 03-21 is the most important facility need at DGL.

Based on the existing condition of Runway 03-21, the increase in turbo-prop and jet aircraft operations, and projected levels of activity, full runway reconstruction is recommended as a near-term improvement. This includes reconstruction of the turnaround taxiway. If funding from State and/or local sources cannot afford a full reconstruction of Runway 03-21, at minimum, a mill and overlay should be considered to maintain the Airport's ability to accommodate aircraft operations.

3.1.13 Taxiway System

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 Douglas Municipal Airport and identifies recommended enhancements to meet the circulation needs of the various based and transient aircraft operators.

Like the runway design standards described in Section 3.1.8, 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 Beechcraft King Air 200 is classified as ADG II and TDG-2. The FAA design standards for these various aircraft classifications are summarized in **Tables 3-4** and **3-5.**

Table 3-4. Taxiway Design Standards Based on ADG

Item	Existing Conditions (ft.)	FAA Standards ADG II (ft.)
Taxiway Safety Area Width	79	79
Taxiway OFA Width	131	131

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

Table 3-5. Taxiway Design Standards based on TDG

Item	Existing Conditions (ft.)	FAA Standards TDG 2 (ft.)
Taxiway Width	35	35
Taxiway Edge Safety Margin	7.5	7.5
Taxiway Shoulder Width	15	15

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

Douglas Municipal Airport has a partial parallel taxiway, Taxiway A, that is approximately 3,050 feet in length. Taxiway A-4 connects Runway 03-21 with aircraft parking aprons and is approximately 1,800 feet in length. Taxiways A-1 and A-2 are turnaround taxiways on Runway end 03. The remaining taxiways, A-3 and A-5, are connector taxiways that join Runway 03-21 and Taxiway A. The 2008 Arizona State Airports System Plan identifies that airports designated as GA-Community, which includes DGL, should have a full or partial parallel taxiway.

Airport tenants and users have identified a full-length parallel taxiway as a need for DGL, although not as high of a priority as rehabilitation of the existing runway. The previous ALP identifies a full-length parallel taxiway, however, based on the volume and type of aircraft operations that are projected at DGL, it is estimated that the existing taxiway configuration is adequate to accommodate demand. It is recommended that a full-length parallel taxiway remain depicted on the ALP, however, it is a facility improvement that should be considered long-term (11-20 years) unless activity significantly increases before that timeframe. A graphical depiction of the taxiway system at DGL is shown in **Exhibit 3-2**.

Exhibit 3-2. Taxiway System

Source: Google Earth, Kimley-Horn and Associates.

Based on the standards identified in Table 3-4 and 3-5, the existing width (35 ft.) of the parallel taxiway and connector taxiways with graded, unpaved shoulders is adequate to accommodate existing and projected activity.

3.2 General Aviation Facilities

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, and aircraft apron space. In this analysis, the following facilities were evaluated:

- Based Aircraft Storage Facilities
- Itinerant Aircraft Storage Requirements
- Apron Requirements
- Helipads
- Automobile Parking Facilities
- Airport Terminal Facility

3.2.1 Based Aircraft Storage Facilities

As noted in previous sections of this MPU, there were 12 based aircraft at the Airport in 2016, and it is projected that this number will increase to 14 by 2036.

At most airports, based aircraft are stored in either conventional hangars, T-hangars, or on the apron (aircraft tie-downs and designated aircraft apron parking spaces). These storage types are explained below.

- Conventional 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. Sometimes an "FBO" designation is included for this type of hangar indicating it is operated by a provider of public aviation services that stores multiple itinerant and based aircraft as part of the business activity. Conventional hangars can also be owned and house 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.

At DGL, five based aircraft are stored in the 10-unit t-hangar, and the remaining seven based aircraft are stored in conventional hangars. There is no waiting list at the Airport for aircraft hangar space. Although there are 5 T-hangar spaces that are not currently housing aircraft, according to the property manager, all units are currently rented out. The two conventional hangars account for approximately 15,000 square feet of aircraft storage area. In the larger conventional hangar, which currently houses six based aircraft, there is approximately 5,000 square feet of space that can be used for additional aircraft. It is anticipated that the existing aircraft storage hangar space is adequate to accommodate projected levels of based aircraft.

It should be noted that Lifeline, the Airport's sole current permanent tenant, indicated that they would potentially require additional hangar space for existing and future aircraft. The current hangar that is used by Lifeline is approximately 2,500 square feet in size. Based on conversations with Lifeline, a new hangar approximately 5,000 square feet in size should be planned for. This facility would likely be funded by Lifeline, and a logical location for the hangar would be between the existing Lifeline hangar and the aircraft fuel tanks to the southeast. This location provides direct access to the main apron and there is adequate space for hangar expansion. Upon expansion, if the tenant no longer requires the old hangar, the Airport could utilize it to accommodate future based aircraft or itinerant aircraft. It is recommended that the Airport continue to monitor tenant activity, and determine if expansion or reconstruction of the current smaller conventional hangar is needed.

3.2.2 Itinerant Aircraft Storage Requirements

As noted, itinerant aircraft are currently, and are projected to be stored at tie-downs on the aircraft parking apron as well as in the large conventional hangar. As identified in Chapter 1, the Airport has a total of 45 aircraft tie-downs, nine of which are located on the primary apron that houses the aircraft hangars and fueling facilities. Although peak operations projections were not developed for this Master Plan Update, based on observed activity levels provided by Airport Management and tenants, the existing aircraft tie-downs and hangar space are more than adequate to accommodate projected levels of itinerant demand. As noted, if Lifeline expands to a new executive hangar and has no use for the old facility, the Airport could preserve the vacated hangar and use for based aircraft or overflow itinerant aircraft.

3.2.3 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 and T-hangars for storage purposes, leaving only itinerant aircraft to regularly utilize apron areas.

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.

As noted in Chapter 1, there are two aprons at DGL that encompass a total area of approximately 47,500 square yards. Although there are 36 aircraft tie-downs located on the northern and southern portions of the apron areas near the T-hangar facility, this area is primarily used by based aircraft taxiing to and from the T-hangars. It is also used infrequently by transient aircraft during special events. A 2013 ADOT inspection identified these apron areas had a PCI of 26, which is considered “poor”. While resurfacing the aprons near existing T-hangars is not as high of a priority as rehabilitation/reconstruction of the runway, it is recommended that the Airport rehabilitate or reconstruct these apron areas. At a minimum, regular maintenance and crack-sealing should be conducted as needed.

The primary apron is used regularly by based aircraft and transient aircraft and is more than adequate to accommodate existing and projected aircraft activity. Any increase in demand for apron space would be associated with an increase in aircraft tie-downs for transient aircraft on the primary apron. As noted in the previous section, it is anticipated that the existing number of aircraft tie-downs is adequate to accommodate projected demand. As such, the existing aircraft parking aprons are also anticipated to accommodate projected levels of demand. The 2013 ADOT inspection identified the PCI of this apron as 53, which is considered “poor”. It is recommended that the Airport pursue rehabilitation of the primary apron and at a minimum, perform regular maintenance and crack-sealing.

3.2.4 Helipads

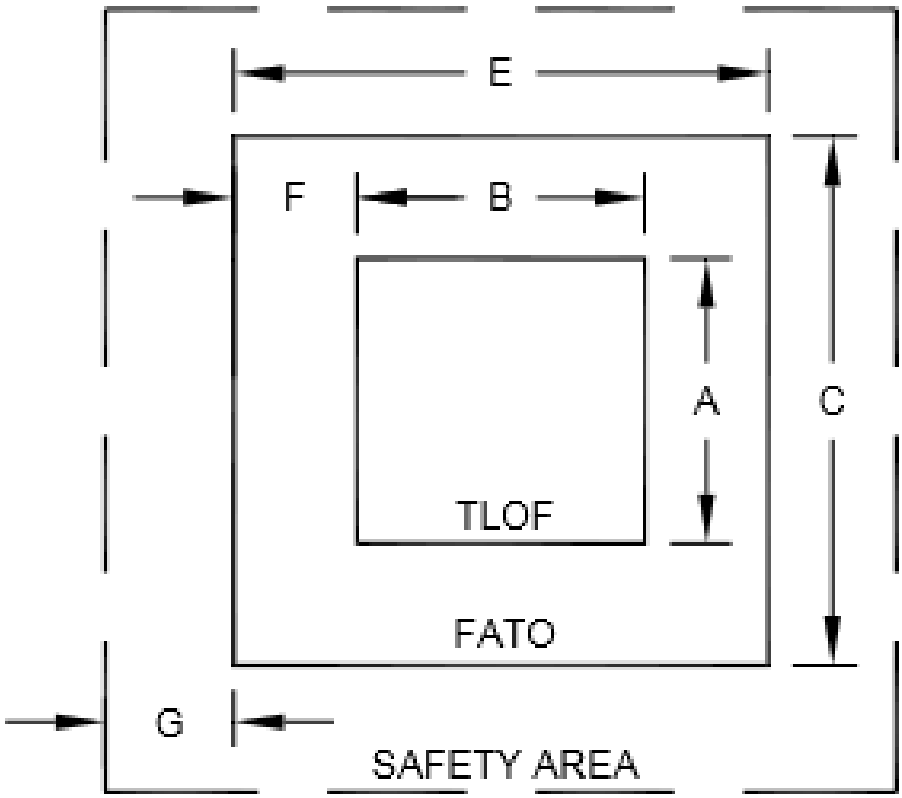
Currently, DGL has a temporary helipad that is located on the eastern portion of the primary aircraft parking apron. The helipad is used frequently by the existing Airport tenant Lifeline, as well as military and other government agency rotorcraft. Based on conversations with Lifeline and other Airport users, a permanent helipad has been identified as a need based on the frequent use of rotorcraft at DGL. The general location of the existing helipad is adequate to accommodate the type of rotorcraft that operate on the main ramp. The associated safety areas for helipads are based on the Rotor Diameter (RD) of the design helicopter, which is currently a Bell 407.

As noted, DGL is a non-NPIAS facility, and is not required to adhere to FAA recommendations, however, it is recommended that a new helipad adhere to FAA standards to the extent possible. Specific site determination recommendations and safety areas for helipads are described in FAA AC 150/5390-2C – Heliport Design. The minimum design standards for a helipad at DGL is depicted in **Exhibit 3-3** and **Table 3-6**.

The following acronyms are used in the exhibit and table below:

- D = Overall length of the design helicopter
- RD = Rotor diameter of the design helicopter
- TLOF = Touchdown and Liftoff Area
- FATO = Final Approach and Takeoff Area

Exhibit 3-3. Helipad Design Criteria for General Aviation Airports



Source: FAA AC 150/5390-2C Heliport Design

Table 3-6. Helipad Safety Areas and Minimum Dimensions

Exhibit Element	Item	Design Standard	Recommended Length (ft.)
A	Minimum TLOF Length	**1 RD**	35
B	Minimum TLOF Width	**1 RD**	35
C	Minimum FATO Length*	**1 ½ RD**	182.5
E	Minimum FATO Width*	**1 ½ RD**	182.5
F	TLOF/FATO Minimum Separation	**¾ D – ½ RD**	17.5
G	Minimum Safety Area Width	**Varies**	20

Source: FAA AC 150/5390-2C Heliport Design. *Note: FATO dimensions include adjustments for elevation as described in Figure 2-5 of FAA AC 150/539-2C. FATO is not required to be paved.

Based on feedback provided by Airport Management and the Airport Master Plan Advisory Committee, several locations have been identified for the installation of a permanent helipad; all of which are on or near the primary aircraft parking apron. The location of the existing helipad allows for the recommended FAA safety areas and separation criteria to be met, does not require additional pavement, and is in close proximity to the current tenant, Lifeline, who is the primary user of the helipad facility. As such, it is recommended that a new helipad be situated in its existing location in the near-term, and if the tenant or other helicopter operators prefer it be moved long-term, that a new facility be located in a convenient location designated for aviation-related development as identified on the Airport Layout Plan.

3.2.5 Automobile Parking Facilities

As noted in Chapter 1, the Airport has 30 paved and approximately 20 unpaved automobile parking spaces available for use. There are no designated parking spaces inside the fenced aircraft parking apron area, however, tenants and Airport Staff often park vehicles in this area, away from the existing tie-downs and aircraft taxiing areas. The aircraft parking apron is enclosed by a chain-link fence and has a security gate, although the gate is rarely closed. Because the Airport tenant Lifeline is stationed at the Airport 24 hours a day, there is no perceived security threat from people or vehicles entering and leaving the apron area. Because the security gate remains open constantly, Airport users can park their vehicles in either of the designated lots and walk to buildings and facilities that access the apron.

Based on projections of aircraft operations and based aircraft, it is estimated that the existing parking spaces are adequate to accommodate future demand, however, if an FBO or additional tenants are established at the Airport, additional automobile parking facilities may be needed. Future landside development and additional parking should be located on or near Airport-owned structures west of the primary apron.

3.2.6 Airport Terminal Facility

Currently, the Airport does not have any terminal facility. Often, at a general aviation airport such as DGL, the airport sponsor or an FBO will provide a facility that has services such as restrooms and a pilot lounge. Based on conversations with Airport tenants and users, a terminal facility is considered a need at DGL. It is recommended that the Airport develop a small terminal facility as an intermediate (6-10 year) improvement.

In January 2017, Airport Management and the Master Plan Advisory Committee conducted a meeting to identify specific locations for facility improvements at the Airport. The area west of the primary apron that currently houses several City-owned buildings was the preferred location for a new terminal facility. Based on discussions with the City, it has been determined that construction of a new terminal building is a more viable option compared to renovation of any existing structures. While this Master Plan Update does not recommend a specific type of terminal structure, several airports with similar characteristics and activity levels have trailer/mobile home units that serve as terminals. These structures are typically sized 1,600 square feet, and are a relatively economical alternative to brick-and-mortar facilities.

As an interim action item prior to a permanent terminal facility, it may be beneficial for the Airport to provide portable toilets near the main apron for Airport users and pilots. Representatives for Lifeline have indicated that pilots frequently mistake their office as a terminal facility and request to use their restrooms. Because Lifeline employees can be stationed 24 hours a day and have regimented work/sleep schedules, such interruptions can pose a safety hazard to their medical evacuation operations.

3.3 Support Facilities

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

3.3.1 Airport Access and Circulation

The Airport is currently accessed from West Airport Road, with one access point on the west side of the parking lot through a secure gate. An unsecured access point at the southernmost point of West Airport Road is often used by U.S. Customs and Border Patrol to monitor the Airport's border with Mexico, however, the areas that are accessed are fenced off from the airfield. Any proposed development at the Airport is anticipated to be near existing facilities rather than on these undeveloped portions of the airfield. As such, general aviation activity at the Airport is not anticipated to increase enough to plan and develop another access point or access road for general aviation purposes. However, additional access and circulation may be needed based on non-aviation development. The current facility circulation provides safe and sufficient accessibility to Douglas Municipal Airport users, tenants, and maintenance personnel.

3.3.2 Aviation Fuel Storage Facilities

Douglas Municipal Airport offers 24-hour, self-fueling with one 12,000-gallon above-ground tank of AvGas and one 12,000-gallon above-ground tank of Jet A fuel. While the Airport does not have a fueling truck, it does provide assistance with fueling upon request.

Based on projected aircraft operations throughout the planning period and historical fuel sales data at DGL, the current fuel tank capacity is adequate to support aviation operations. The date that these tanks were installed was unknown at the time this Master Plan Update was conducted, however, the City has identified that they are compliant with EPA requirements for fuel storage facilities.

3.3.3 Airport Maintenance Facilities

The Airport houses some maintenance equipment in the large conventional hangar adjacent to the primary aircraft parking apron. This equipment includes a riding lawnmower, an open-air vehicle to transport equipment, and various tools and chemical agents for typical maintenance activities. Larger equipment such as sweepers for the runways and taxiways, or tractors for hauling and lawn maintenance are housed in an off-Airport facility and are requested from the City as needed. It is estimated that even if projected based aircraft are all stored in the large conventional hangar, there will be adequate space for the required maintenance equipment to be stored. As noted in previous sections, if the Airport tenant relocates its aircraft storage hangar, the existing hangar may become available for general Airport use. This facility could also provide additional maintenance equipment storage space.

3.3.4 Utilities

Utilities at Douglas Municipal Airport are provided by a variety of sources which include electricity by the Arizona Public Service Electric Company, and water and sewer provided by the City of Douglas. Based on projected aircraft operations and capacity at DGL, additional utilities or expansion of existing services are not anticipated to be needed, however, there may need to be potential expansion of utilities infrastructure for non-aviation development in the future.

3.4 Summary of Facility Requirements

Based on the facility requirements identified in this section, **Table 3-7** presents a summary of recommended improvements to the Airport's existing facilities throughout the planning period. Facility requirements are categorized as high-priority or low-priority. High-priority improvements are specific recommendations based on the analysis described in this Master Plan Update. Low-priority improvements include long-term projects that may be outside of the 20-year planning horizon, or projects that are desirable, but not necessarily feasible based on projected levels of aviation demand.

Table 3-7. Facility Requirements - Summary

Airside Facilities	Priority Level	General Aviation Facilities	Priority Level	Support Facilities	Priority Level
Remove obstacles from airspace surfaces, and ensure those that cannot be removed are properly marked or lit	High	Construct a permanent helipad useable by medium and large rotorcraft	Medium	Expansion of utility infrastructure for non-aviation use	Low
Install a weather reporting station (AWOS or ASOS)	Medium	Construct a terminal facility that houses restroom facilities and pilot lounge	High		
Expand Runway Protection Zones (RPZs) to FAA standard for a B-II facility	High	Reconstruct T-hangar apron areas	Medium		
Reconstruct Runway 03-21 to a pavement strength of 12,500 lbs. for single-wheel gear configuration (if full reconstruction cannot be achieved, a full mill and overlay is recommended)	High	Rehabilitate primary apron area	Medium		
Reconstruct turnaround taxiways on Runway end 03 (if full reconstruction cannot be achieved, a full mill and overlay is recommended)	Medium	Rehabilitate T-hangar apron area	Medium		
Install crosswind runway to satisfy FAA recommended 95% wind coverage	Low				
Examine potential for instrument approach procedures to enhance safety	Low				
Construct full-length parallel taxiway	Low				

Source: Kimley-Horn and Associates

4 ALTERNATIVES ANALYSIS

To satisfy user needs and facility requirements identified in the previous chapter of this Master Plan Update, numerous development options and site configurations were considered for proposed improvements. Some of these recommended improvements identified in the Facility Requirements Chapter are major components of the long-term development strategy for the Airport and warrant further evaluation. In most cases, recommended alternatives, or options, will consist of the scenario that provides the highest benefit to the Airport with minimal impacts. In order to evaluate various alternative improvement concepts and identify the preferred development strategy, the following items were addressed:

- Review of previous Airport planning recommendations
- Evaluation of the airside facility alternatives
- Evaluation of the general aviation facility alternatives
- Evaluation of the support facility alternatives

Alternatives were analyzed based on estimated project cost, construction and environmental impacts, consistency with existing airfield configuration and facilities, impacts to safety and efficiency of Airport users, and overall project feasibility. A phased development plan and cost estimates of recommended alternatives are presented in the subsequent chapter, "Airport Development and Financial Plan."

4.1 Review of Previous Airport Plans

The 1994 Airport Master Plan Update for DGL evaluated facility requirements through the 2014 planning horizon and identified the following recommended improvements:

- Airside
  - Extension and widening of runway (03-21) to an ultimate length of 6,710 feet
  - Strengthening of the runway overlay to 25,000 pounds single-wheel gear (SWG)
  - Development of a 4,600-foot long, unpaved crosswind runway (13-31) with a strength of 12,500 pounds SWG
  - Extension of partial parallel taxiway to runway 03-21 to full length
  - Installation of REILs to Runway 03-21 and future crosswind Runway 13-31
  - Apron extension
- Landside
  - Construction of two new conventional hangars including additional tie-downs
  - Installation of a nondirectional beacon

These physical airport improvements are depicted on the 2003 ALP, which was conditionally approved by ADOT Aeronautics in May 2003. It should be noted that many of the recommended developments depicted on the 2003 ALP have yet to be initiated and as such, some will remain depicted in the updated ALP associated with this Master Plan Update.

4.2 Baseline Recommended Improvements

There are several improvements for which alternatives are limited. Because of minimal requirements associated with development, or because the alternatives include only a build or a no-build scenario, the following recommended projects are recommended and are not subject to alternatives analyses:

- Remove obstacles from airspace surfaces, and ensure those that cannot be removed are properly marked or lit
- Land easements to accommodate FAA-standard B-II runway protection zones (RPZs)
- Expansion of utility infrastructure for non-aviation use
- Rehabilitation and maintenance of aircraft parking apron areas

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 as described in the Facility Requirements Chapter of this Master Plan Update.

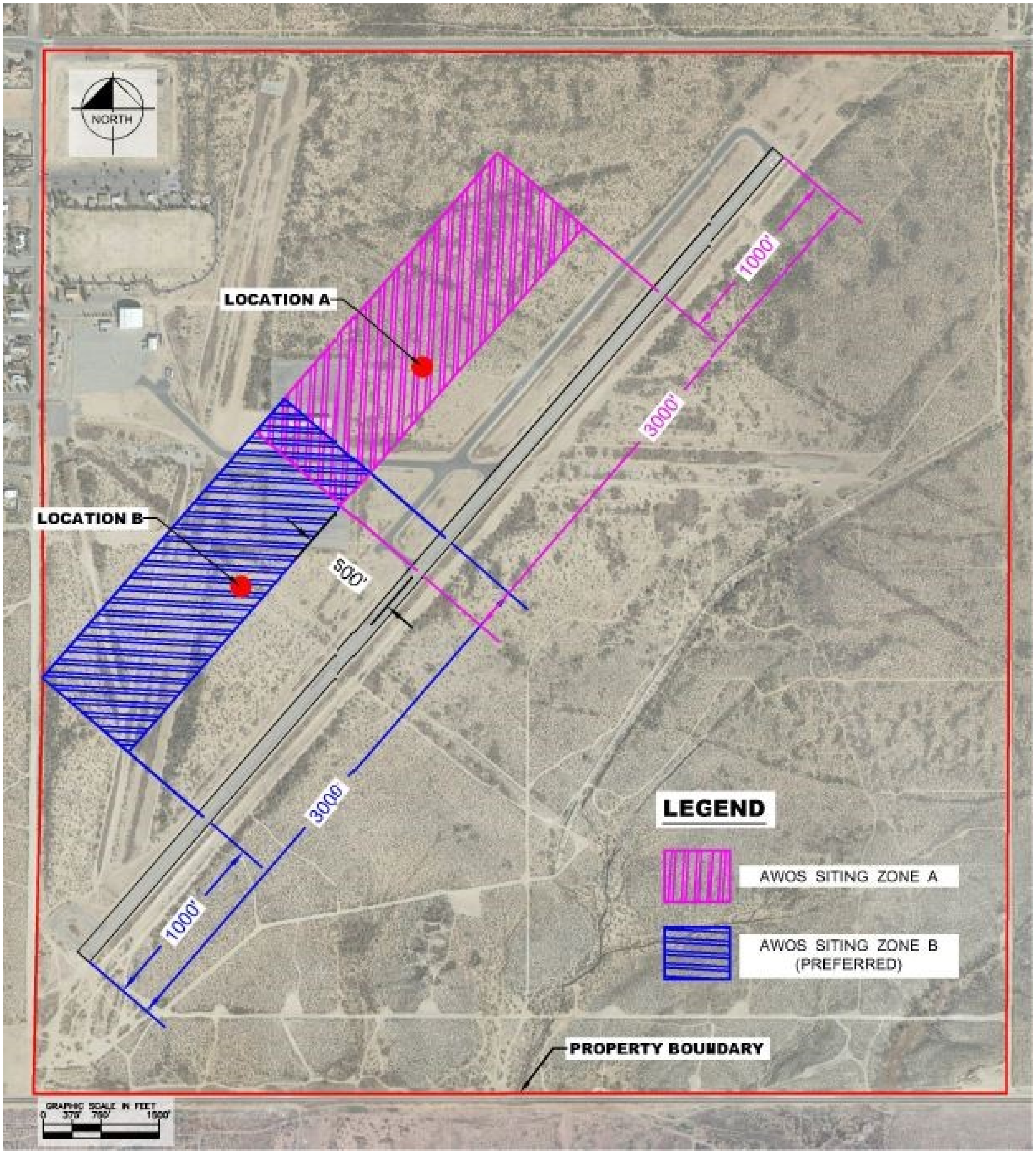
4.3 Airside Facility Alternatives

The following discusses alternatives for airside improvements recommended in the Facility Requirements Chapter. These alternatives also include a “no-build” scenario in which the Airport refrains from developing or implementing projects as recommended. The following alternatives include the recommended installation of an Automated Weather Observing System (AWOS), runway maintenance, taxiway maintenance and construction, and the development of a crosswind runway.

4.3.1 Automated Weather Observing System (AWOS)

An AWOS collects weather data at airports and disseminates these data via radio and/or landline. A weather reporting station at the Airport is a facility that can improve safety in the form of accurate weather readings which pilots rely on. Accurate weather reporting can also be used to justify or verify the need for additional improvements such as a crosswind runway. This section describes alternatives for an AWOS at DGL and the alternative locations are depicted in **Exhibit 4-1**. It should be noted that based on an examination of existing conditions at DGL, and a comparison of similar projects in Arizona and in the U.S., the construction of an AWOS (or similar weather reporting station) is estimated to be $150,000. Routine maintenance for weather stations typically occurs on an annual basis and weather information is disseminated by radio frequency as well as by a computer-generated voice message available by a telephone dial-up modem service. AWOS maintenance can be outsourced to independent companies, or training courses are available to direct airports how to conduct the maintenance themselves.

Exhibit 4-1. AWOS Alternatives



Sources: Google Earth, Kimley-Horn, FAA Order 6560.20B – Siting Criteria for Automated Weather Observing Systems

No-Build Alternative

The most significant impacts associated with the installation of an AWOS are cost of construction and maintenance, and pilot safety. In a no-build scenario, the Airport would save approximately $150,000 in construction costs and subsequent maintenance costs, however, the surrounding community has shown interest in increasing revenue potential at the Airport. An on-site AWOS or similar type weather reporting station provides a benefit that enhances pilot and aircraft safety, which could potentially increase operations and fuel sales. Accurate wind data is crucial for providing safe approaches at the Airport and is required to justify the need for a crosswind runway. The following summarize the benefits and impacts of not installing an AWOS at DGL.

4.3.1.1.1 Benefits of a No-Build Alternative

- No construction or installation cost

4.3.1.1.2 Impacts/Issues of a No-Build Alternative

- Limits pilot knowledge of existing weather conditions
- Lack of weather data to justify/verify the need for crosswind runway
- Problematic for providing safe approaches

Install AWOS at Location A

As depicted in **Exhibit 4-1**, Location A was established according to FAA criteria. According to the FAA's Order 6560.20B – Siting Criteria for Automated Weather Observing Systems (AWOS) for airports with visual and non-precision approaches, "the preferred siting of the cloud height, visibility, and wind sensors and associated data collection platform (DCP) is adjacent to the primary runway 1,000 feet to 3,000 feet down runway from the threshold . . . The minimum distance from runway centerline shall be 500 feet. The maximum distance from the runway shall be 1,000 feet." The proposed location of the AWOS facility within the preferred siting area of Location A was determined based on proximity to Runway 03-21 (shorter distance to the runway provides most accurate weather information) and availability of flat, undisturbed land that is clear of all runway and taxiway safety areas.

The west side of Runway 03-21 is the most logical side to locate an AWOS because the electrical vault is located on the west side of the airfield near the primary aircraft parking apron. Positioning the AWOS east of Runway 03-21 would require additional extension of electrical lines beneath the runway, which would incur unnecessary added expenses.

Location A positions the planned AWOS west of the partial parallel taxiway, and east of the north apron. This location satisfies FAA AWOS siting preferences, however, positioning the AWOS at "Location A" could potentially require digging under or around the north apron to extend and connect electrical lines to the facility. The following summarize the benefits and impacts of installing an AWOS in Location A.

4.3.1.1.3 Benefits of AWOS Location A

- Enhances pilot safety at the Airport and provides on-site recorded data for potential justification of future crosswind runway
- No impacts to aircraft operations during installation
- Satisfies FAA AWOS siting requirements
- Potential trenching under existing pavements

4.3.1.1.4 Impacts/Issues of AWOS Location A

- Requires trenching electrical lines to main electrical vault

- Up-front construction costs
- Installation of AWOS requires routine maintenance and operational costs

Install AWOS at Location B

Also, shown in **Exhibit 4-1** is Location B which also satisfies FAA AWOS siting preferences, positioning the AWOS southwest of the south apron, approximately 2,000 feet north of Runway End 03 and 600 feet from the runway centerline. Positioning the AWOS in this location allows for the extension of electrical lines to the main apron electrical vault without interference with the existing pavement of the south apron. This location is closer to the main apron than Location A, reducing the distance of the electrical lines needed and minimizing construction and trenching impacts. Similar to Location A, the proposed location of the AWOS facility within the preferred siting area of Location B was determined by its proximity to Runway 03-21, and the site's availability of flat, undisturbed land that is clear of all runway and taxiway safety areas. The following summarize the benefits and impacts of installing an AWOS in Location B.

4.3.1.1.5 Benefits of AWOS Location B

- Enhances pilot safety at the Airport and provides on-site recorded data for potential justification of future crosswind runway
- No impacts to aircraft operations during installation
- Minimal impacts to existing facilities
- Satisfies FAA AWOS siting requirements
- Shortest distance to main electrical vault while adhering to FAA siting criteria
- No trenching under existing pavements

4.3.1.1.6 Impacts/Issues of Location B

- Requires trenching electrical lines to main electrical vault
- Shorter distance to electrical vault compared with Location A – saves on trenching and electrical line costs
- Up-front construction costs
- Installation of AWOS requires routine maintenance and operational costs

Recommended Location for AWOS

After a thorough analysis of the airport layout and the impacts incurred from installing an AWOS at DGL, it is recommended that the Airport install and position the AWOS at Location B. While the recommended location satisfies FAA siting criteria and is in an area of flat terrain, free of all runway and taxiway safety areas, the AWOS could be located elsewhere within AWOS siting area B shown in Exhibit 4-1 if desired. The exact location should primarily take into account construction costs associated with trenching and extending utility lines. Location B is the preferred location because while both sites enhance overall safety at the Airport, minimally impact existing facilities and operating aircraft, satisfy FAA AWOS siting requirements, and record wind data for future use; Location B requires the least amount of trenching to connect electrical lines to the main electrical vault. Decreasing the distance of the electrical lines reduces the overall project cost.

4.3.2 Runway Maintenance

This section identifies the alternatives to runway improvements that were described in the Facility Requirements Chapter. The runway is the most vital facility at an airport, and without routine maintenance, the runway's condition deteriorates. Routine maintenance is essential to sustain operations at an airport. As stated in FAA AC 150/5380-6C – Guidelines and Procedures for Maintenance of Airport Pavements, pavement repairs should be made as quickly as possible after the need for them arises to help ensure continued and safe aircraft operations. Airports should perform repairs at early stages of distress, even when the distresses are considered minor. A delay in repairing pavements may allow minor distresses to progress into major failures. The following sections discuss the alternatives to the runway recommendations in the previous chapter.

No-Build Alternative

This alternative details the effects of not repairing Runway 03-21. As noted previously, the runway pavement condition index (PCI) was determined by ADOT to be 19 in 2013 on a scale of 0 to 100. Another PCI inspection was scheduled to occur in 2017 but had not been conducted at the time this analysis was completed. Despite the Airport's efforts to maintain runway pavements and remove foreign object debris (FOD), it is estimated that the PCI of Runway 03-21 has declined since the 2013 inspection.

While a no-build scenario would save both the City and State significant investment dollars, the level of deterioration to Runway 03-21 has already diverted significant fixed-wing activity to other nearby airports, and aircraft operators, particularly itinerant operators, will likely continue to be reluctant to use the Airport until the condition of the runway improves.

Because the runway is in such poor condition, it is assumed that if the Airport and State do not invest in the repair of the runway, aircraft operators will choose to use other local airports. This will result in a decrease in Airport usage from local and itinerant operators resulting in decreased AvGas and Jet A fuel sales. Current based aircraft owners could also decide to base their aircraft elsewhere, and the already limited revenue stream from tenant and hangar leases could diminish.

In sum, if the Airport does not improve runway conditions, operations at DGL will likely decrease, aircraft owners and tenants may be forced to relocate, and revenues from hangar leases and fuel sales will likely diminish. The Airport has seen a decline in itinerant operation activity in the recent past, specifically jet aircraft that have landed at other nearby airports with runways that are in better condition. Representatives of some of these jet operators have identified that they prefer to fly into DGL due to its proximity to the City and availability of self-fueling facilities, however, the condition of Runway 03-21 has forced them to operate elsewhere on multiple occasions. Furthermore, the existing tenant at DGL has expressed interest in operating a fixed-wing aircraft in the future, but cannot do so until the condition of Runway 03-21 is improved. If the tenant deems that operation of a fixed wing aircraft is necessary in the future and the runway is not improved, the likelihood that they relocate to another airport would increase, and the City would lose a valuable business. Failure to mitigate the damaged pavement on Runway 03-21 could ultimately lead to closure of the Airport to fixed-wing operators entirely. The following summarize the benefits and impacts of not improving the condition of the runway at DGL.

4.3.2.1.1 Benefits of a No-Build Alternative

- Cost savings of up-front design and construction of runway improvements

4.3.2.1.2 Impacts/Issues of a No-Build Runway Alternative

- Increased threat to safety of aircraft operations
- Potential relocation of tenants, based aircraft owners
- Potential loss of hangar lease and fuel sale revenue streams
- Diversion of operations to other airports
- Potential ultimate closure of Airport
- Increased costs for sweeping and maintenance as runway condition worsens

Runway Rehabilitation

Another alternative is to perform rehabilitation of Runway 03-21. A runway rehabilitation in this case consists of a mill and overlay which removes the top layer of the runway and replaces it with a new asphalt layer. This type of runway project is typically recommended for runways with a base course in good condition because cracks in the base course eventually cause cracking at the surface. Based on the extremely low PCI of Runway 03-21, paired with the relatively shallow depth of the runway pavement, estimated from approximate weight bearing capacity, it is evident that a mill and overlay would provide temporary improvement, however, conditions that have caused deterioration of the pavement exist in the base course and fill layers of the runway, which would negate any benefits of a mill and overlay within a relatively short timeframe.

Although it would provide temporary relief, this option is less expensive and intrusive compared to a full reconstruction of Runway 03-21. Construction costs (excluding design) of a mill and overlay of the runway are estimated to be approximately $1,000,000. Construction time for a project of this nature is typically less than a full reconstruction. The runway has cracking in the base course, which means that currently visible cracks will likely re-emerge in the new overlay within an approximate five-year horizon. A mill and overlay will repair the current potholes, surface cracks, and remove asphalt FOD, but it will not repair the base course cracking. The following summarize the benefits and impacts of rehabilitating the runway.

4.3.2.1.3 Benefits of a Runway Rehabilitation

- Enhanced safety at the Airport by removing FOD and cracked/potholed pavements
- Runway repair could increase operations and fuel sales at the Airport
- Lower estimated construction cost compared to a full reconstruction
- Existing tenant could continue to operate during construction

4.3.2.1.4 Impacts/Issues of a Runway Rehabilitation

- Potential runway closures for milling and overlay settling
- Relatively high project cost for temporary benefit
- Runway would require a full reconstruction within five years

Runway Conversion

Another alternative for improving Runway 03-21 would be to convert it to an unpaved/gravel runway. While this option would essentially prohibit jet aircraft from operating at DGL, it would provide a relatively cost-effective option for Runway 03-21 to remain operational without a full reconstruction or rehabilitation that would require additional improvements in the near-term. This alternative would entail milling the existing runway pavements (estimated at 3-inch depth), removing the milled pavements, and replacing the surface with compacted gravel.

This option provides a long-term solution for improving the runway at an estimated cost of approximately $650,000 ($150,000 for milling and removal of existing pavement, and $500,000 for grading and installation of runway surface). The primary drawback with converting Runway 03-21 to an unpaved facility is that it limits the size and type of aircraft that can operate. While gravel runways are safe for the operation of most propeller aircraft and rotorcraft, the small rocks can damage turbines.

The following summarize the benefits and impacts of rehabilitating the runway.

4.3.2.1.5 Benefits of a Runway Conversion

- Enhanced safety at the Airport by mitigating damaged runway pavements
- Runway repair could increase operations and AvGAS sales at the Airport
- Lowest estimated construction cost of runway alternatives
- Existing tenant could continue to operate during construction

4.3.2.1.6 Impacts/Issues of a Runway Conversion

- Potential runway closures for milling, grading, and installation of runway surface
- Would prohibit jet aircraft from operating at DGL
- Could reduce sales of Jet A fuel (several rotorcraft types use Jet A fuel)

Runway Reconstruction

This alternative entails a full reconstruction of Runway 03-21. A complete runway reconstruction would rebuild the entire runway from base course to pavement surface and could take anywhere from one to three months to complete, likely requiring the Airport to temporarily close for fixed-wing operations during construction. This alternative is the most expensive of those presented, but the only alternative that promotes a long-term solution to the continuously deteriorating runway pavement.

A runway reconstruction would replace the existing base course, fill material, and surface pavements to restore the runway's PCI to 100 and establish a pavement strength of 12,500 pounds. Assuming that routine maintenance is conducted on the new runway, a full asphalt runway reconstruction has a lifespan of approximately 20 years. As noted, some Airport users including jet operators have had to divert to other airports due to the level of deterioration on Runway 03-21. Restoring the runway to a safer, more operable condition would likely lead to an increase in activity at the Airport, including itinerant and jet operations. Furthermore, the existing tenant at the Airport who flies helicopters would still be able to operate during construction. Construction costs, excluding design for a full reconstruction of Runway 03-21, are estimated to be approximately $2,500,000. The following summarize the benefits and impacts of a full reconstruction of Runway 03-21.

4.3.2.1.7 Benefits of a Runway Reconstruction

- Enhances Airport safety by eliminating FOD, potholes, and cracks while increasing the runway PCI from <19 to 100
- Increases the runway's lifespan by approximately 20 years, assuming routine maintenance is conducted
- Runway reconstruction would likely eliminate/reduce diverted operations, leading to increased fuel sales
- Existing tenant could continue to operate during construction

4.3.2.1.8 Impacts/Issues of a Runway Reconstruction

- Highest cost of proposed alternatives
- Significant disruption to Airport operations attributed to runway closure during construction

Recommended Runway Alternative

The primary objective of the Airport is to provide safe, efficient facilities that should, in turn promote an increase in airport users, operations, and revenue sources. In order to accomplish this, the most viable solution is a complete reconstruction of Runway 03-21. While this alternative carries a relatively high cost to design and construct, it is the best solution for the Airport to continue to operate as an airport with a paved runway that does not start instantly experiencing cracks and can be maintained. A no-build option would undoubtedly lead to a continued decline in pilot safety due to increasing deterioration of the runway and a rehabilitation of Runway 03-21 would only provide temporary relief, which would result in additional investment in the future. While converting the runway to an unpaved facility could be a long-term solution if funding is not available for a full reconstruction, it does limit the type of aircraft that would be able to operate at DGL. As such, it is recommended that the runway reconstruction alternative be pursued and placed as the highest priority facility need of the Airport currently and in the future.

If the City of Douglas is unable to secure the funds to conduct a full runway reconstruction, it is recommended that at a minimum, it pursue funding to rehabilitate Runway 03-21 as a temporary improvement to keep the facility operational in the short-term or examine the option to convert the Runway to an unpaved facility. Project cost estimates and funding mechanisms are identified in the next chapter.

4.3.3 Crosswind Runway

As noted in the Facility Requirements Chapter of this Master Plan Update, DGL does not satisfy the requirement of 95 percent crosswind coverage. A crosswind runway is recommended when the primary runway orientation provides less than 95 percent wind coverage. Wind conditions affect all aircraft in varying degrees. Generally, the smaller the aircraft, the more it is affected by wind, particularly crosswind components, which are often a contributing factor in small aircraft accidents. As such, a crosswind runway provides improved landing and take-off conditions and increases safety.

Because DGL does not have an AWOS to evaluate wind conditions, wind data were obtained from the nearest weather reporting station, which is the Automated Surface Observing Systems

(ASOS) located at Bisbee-Douglas International Airport, approximately 10 miles northeast of DGL. While this distance is relatively short, pilots operating in the area have noted there can be significant differences in wind patterns and weather conditions within this range, necessitating the need for an on-site weather reporting system at DGL.

It is recommended that prior to any detailed design effort of a crosswind runway at the Airport, the City conduct a wind study to determine crosswind coverage. If the wind study at the Airport confirms DGL does not meet the 95 percent crosswind component, a crosswind runway is recommended, although, this should be considered a long-term pursuit.

It is also important to note that design and construction of a crosswind runway should only be pursued once improvements have been made to Runway 03-21. It is unlikely that the Airport would receive adequate funding from the State to construct a crosswind runway. As such, a crosswind runway design and construction project is a recommendation for the long-term if crosswind coverage is confirmed to be less than 95 percent.

Cost estimates have been identified for construction of both a paved and an unpaved crosswind runway. An asphalt runway that meets FAA runway length criteria is estimated to cost approximately $2.5 million while an unpaved gravel runway would cost approximately $500,000. Based on the relatively low level of activity at DGL, if a crosswind runway is ever constructed, it is recommended that an unpaved/gravel type surface is used. Consideration of the fact that the development of a crosswind runway would limit the amount of Airport-owned land available for non-aviation use should also be given. As the Airport seeks to enhance its revenue stream, a crosswind runway could impede these efforts.

4.3.4 Construct Full-Length Parallel Taxiway

A full-length parallel taxiway eliminates use of a runway for taxiing, thus increasing airfield capacity and protecting the runway under low visibility conditions. DGL has a partial parallel taxiway, approximately 3,000 feet in length that connects Runway End 21 to Taxiway A4, which accesses the aircraft parking aprons. The following sections present development alternatives for a full-length parallel taxiway.

No-Build Alternative

The No-Build scenario would mean the airfield continues to be served by the partial parallel taxiway. A partial parallel taxiway is acceptable, however, this does not mitigate the safety threat of back-taxiing aircraft. While DGL experiences a relatively low level of activity, the threat is still present, especially in low visibility conditions. The following summarize the benefits and impact of not extending the partial parallel taxiway to a full-length parallel taxiway.

4.3.4.1.1 Benefits of a No-Build Alternative

- No construction or maintenance costs
- No impact to aircraft operations associated with construction

4.3.4.1.2 Impacts/Issues of a No-Build Alternative

- Requires aircraft to back-taxi on Runway 03-21
- Limits airfield capacity

Construct Full-Length Parallel Taxiway

This alternative identifies the impacts of constructing a full-length parallel taxiway. As stated previously, a full-length parallel taxiway increases safety by providing a route for aircraft to taxi as an alternative to taxiing on the runway. Completion of the segment of taxiway to connect Runway End 03 to the existing partial parallel taxiway will incur an estimated $500,000 in construction fees, however, this alternative improves operational safety and increases airfield capacity. The following summarize the benefits and impacts of constructing a full-length parallel taxiway.

4.3.4.1.3 Benefits of Constructing a Full-Length Parallel Taxiway

- Enhances Airport safety and eliminates back-taxiing on Runway 03-21
- Increases airfield capacity

4.3.4.1.4 Impacts/Issues of Constructing a Full-Length Parallel Taxiway

- Relatively high design and construction costs compared to existing and projected levels of activity
- Moderate disruption to Airport operations during construction

Recommended Parallel Taxiway Alternative

It is recommended that the City extend the existing partial parallel taxiway to a full-length parallel taxiway to mitigate the threat of back-taxiing aircraft, while simultaneously increasing runway capacity. As noted previously, addressing the condition of Runway 03-21 should be the Airport's primary action item. Construction of the full-length parallel taxiway is a lesser priority and is justifiable in the intermediate- to ultimate term, if and when improvements have been made to Runway 03-21. In the unlikely event that the City secured funds to both reconstruct Runway 03-21 and extend the existing taxiway to a full-length parallel taxiway, it would be beneficial to construct the taxiway extension in conjunction with Runway 03-21 improvements to limit disruption of aircraft operations during construction.

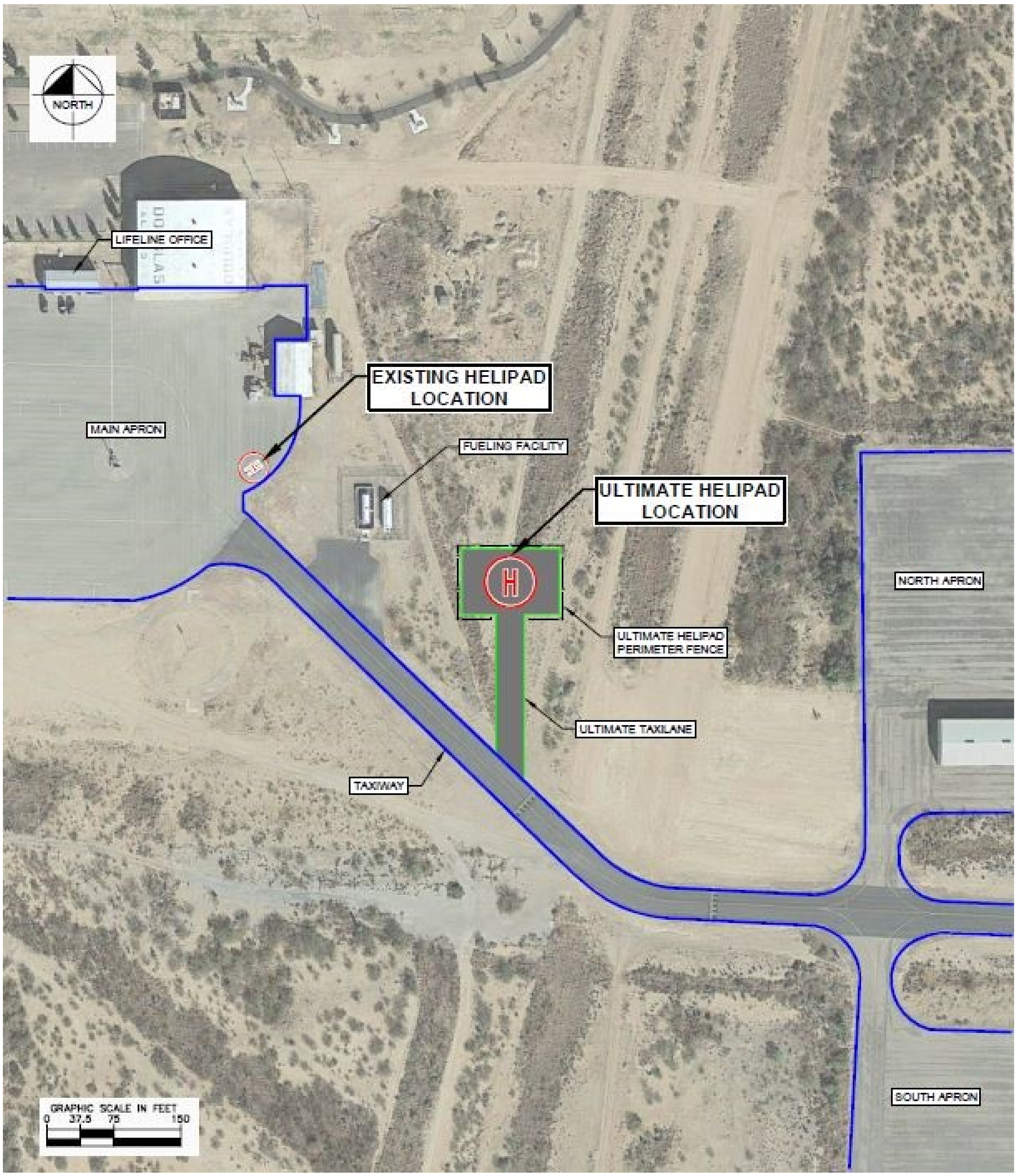
At low traffic general aviation airports such as DGL, turnarounds are considered during initial runway development as an alternative to a full or partial parallel taxiway.

DGL is equipped with a turnaround taxiway at the end of Runway 21, however, it is in same physical condition as the existing runway. A "do-nothing" approach would leave the turnaround taxiway in a condition that is hazardous to aircraft and operators. In the event that the Airport decides not to pursue a full-length parallel taxiway, the recommended alternative to this would be rehabilitation of the turnaround taxiway in conjunction with Runway 03-21. Similar to the runway, the condition of the existing turnaround taxiway merits a full reconstruction, which has a construction cost of approximately $150,000. A rehabilitation (mill and overlay) of these pavements would cost approximately $50,000 but the effective life of the pavement would be much less. It is recommended that if a full parallel taxiway is not pursued, a full reconstruction of the turnaround taxiway be completed in conjunction with runway improvements.

4.3.5 Helipad

The Airport's helipad is located at the southeast corner of the main apron, north of Taxiway A-4. This facility is frequently utilized by Lifeline and occasionally by itinerant rotorcraft operators. Based on feedback provided at MPU Planning Advisory Committee meetings, it was identified that a permanent helipad capable of accommodating small and medium-sized rotorcraft was a facility need. **Exhibit 4-2** below depicts the location of the proposed future helipad and the location of the existing helipad, with discussion of the impacts of a no-build scenario. It should be noted that other potential helipad locations were initially examined, but they were excluded from further analysis because they interfered with existing facilities or were located too far from the tenant's office and hangar.

Exhibit 4-2. Helipad Alternatives



Sources: Google Earth, Kimley-Horn

Lifeline currently lands their rotorcraft on the temporary helipad space located west of the Jet A fuel tanks, on the east side of the main apron. This location is conveniently positioned within a short distance of the Lifeline quarters. It has been recommended that the City construct an official permanent helipad at DGL because of the large proportion of rotorcraft operations that take place at the Airport. Having a permanent, lighted, fenced-off helipad will increase safety at the Airport as the rotorcraft will not be landing in a temporary zone on the main apron, near hangars, vehicles, or personnel.

Initial alternatives for a new permanent helipad included locating the facility in its existing location and the location east of the main apron identified in **Exhibit 4-2**. While the existing location is adequate for current levels of activity and would cost approximately $50,000 to upgrade, Lifeline has indicated that future expansion of hangar facilities would encroach toward the helipad, which would cause spatial constraints on the east side of the main apron.

While there is adequate space on the southwest portion of the main apron, and the cost associated with this improvement would also be approximately $50,000, relocating a permanent helipad to this location would eliminate aircraft tie-downs or require reconfiguration of the apron to accommodate additional taxilane and movement areas.

Exhibit 4-2 displays the recommended location of the future helipad, positioning the structure between the existing Jet A fuel station and the north apron where T-hangars are situated. The recommended location was determined based on tenant feedback and helipad siting criteria identified in *FAA AC 150/5390-2C – Heliport Design*. This location provides access to the taxiway flowing into both the main apron to the existing Lifeline quarters and Runway 03-21. Additionally, constructing the helipad in this location does not impact future development around the existing apron, nor will it impact operations at the Airport during construction. In order to provide safe and efficient access, the proposed helipad would require a taxilane approximately 150' in length. While the helipad will frequently be used by Lifeline, it will also be available for public use. The construction costs associated with this option, which includes pavements, taxilane, lighting, and fencing is estimated to be approximately $200,000.

Prior to construction, it is recommended that the City further evaluate the implementation of the helipad. The proposed location for the future helipad positions the pavement immediately adjacent to a former runway which could require specific grading design.

4.4 General Aviation Facility Alternatives

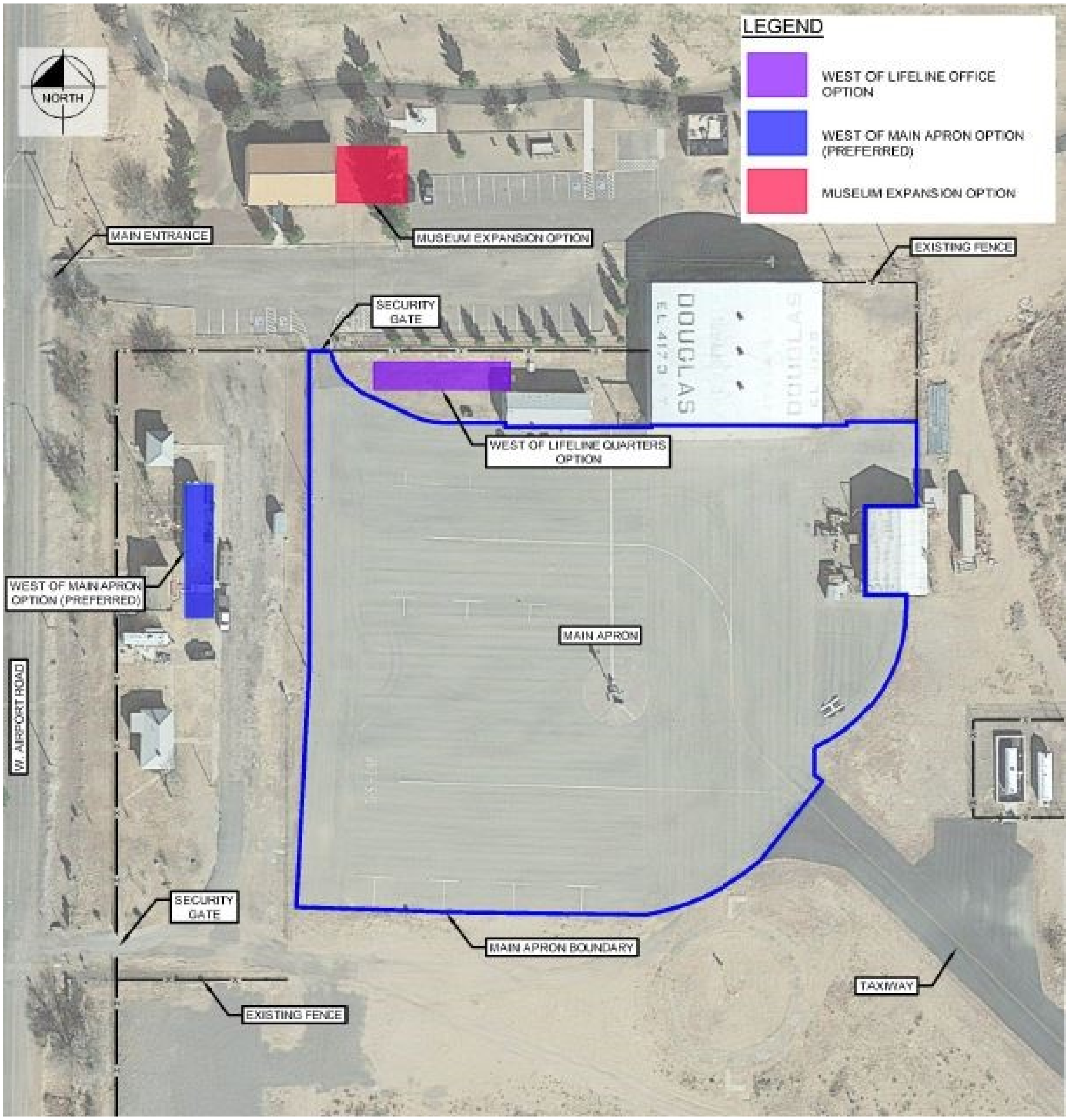
This section outlines the alternatives for the recommended general aviation terminal building and detail the benefits and impacts of each location.

4.4.1 Terminal Building

DGL has had a terminal building in the past, however, such a facility has not been operational for several years. There is a trailer west of the main apron with a restroom that can be accessed when the Airport Operations Manager is available, however, a facility that can be accessed by pilots during hours that the Airport is operational has been identified as a need. As noted in the Facility Requirements Chapter, a typical terminal for a facility such as DGL would be sized approximately 1,600 square feet, and in the event of a new structure (as opposed to redevelopment or expansion of an existing building), could be developed as a trailer/mobile home unit.

Many airports maintain a terminal building to provide amenities to airport users such as an internet connection, food and beverage accommodations, pilot lounges, and restrooms. After discussions with the Airport tenant, Airport users have been inadvertently entering the Lifeline quarters, mistaking their facility for a terminal building. In efforts to deter Airport users from inadvertently entering Lifeline quarters while simultaneously increasing value at the Airport, it is recommended that the Airport construct a general aviation terminal facility in the vicinity of the main apron. The following examines siting criteria and alternatives for development of a terminal building (see **Exhibit 4-3**).

Exhibit 4-3. General Aviation Terminal Building Alternatives



Sources: Google Earth, Kimley-Horn

No-Build Alternative

This alternative identifies the benefits and impacts if a terminal building is not constructed. As noted previously, the Airport's tenant has identified safety and security issues as they pertain to the lack of a terminal building. The tenant's quarters are used as both an office and a place to rest between shifts and flights. A no-build option could continue to pose a safety risk to the Airport tenant.

In addition to the safety concerns at the Airport, the City has goals to increase activity and revenue at the Airport. The lack of a terminal facility to be used by pilots could significantly cap these goals. A terminal building can draw interest from local and itinerant pilots which, in turn, provides the opportunity for aircraft operators to re-fuel at DGL. The following summarize the benefits and impacts of not constructing a terminal building.

4.4.1.1.1 Benefits of a No-Build Alternative

- No cost to construct a terminal building
- No need for staffing/maintenance of facility
- Preserves space for potential non-terminal facility needs or non-aviation development

4.4.1.1.2 Impacts/Issues of a No-Build Alternative

- Airport users may continue to disrupt tenant operations
- Potential decrease in activity without terminal facility to accommodate pilots

Border Air Museum Expansion

This alternative develops the terminal building as an extension to the existing Border Air Museum and is depicted in red in **Exhibit 4-3**. Expansion of the museum would further utilize an existing facility and potentially create increased museum exposure, which could draw more interest in the Airport. Another benefit of expanding the Museum would be the utilization of existing utilities, parking areas, and proximity to the main entrance and W. Airport Rd. Construction costs for this option are estimated to be approximately $15,000, which does not include maintenance and staffing. While this alternative has the lowest up-front cost, it also requires the highest maintenance and staffing needs due to being situated outside the Airport security fence. Additionally, closure of the facility may be required for safety of museum visitors during construction.

Expansion of the Border Air Museum as a terminal facility would require that security gates remain open during operational hours, which poses a security risk. Because the Museum is outside the secure portion of the Airport, it would require either on-site staffed personnel or someone to frequently monitor the Museum/Terminal. A terminal building located inside the security fencing could remain open during hours that the Airport is not open without constant staffing if needed. While the existing tenant operates at the Airport 24 hours a day, it is optimal to keep security gates closed except to actual Airport users. The following summarize the benefits and impacts of constructing a terminal building as a museum expansion.

4.4.1.1.3 Benefits of an Airport Museum Expansion

- Potential to use existing utility infrastructure
- Possible increased museum exposure
- Provides adequate space for future terminal building expansion
- Improvements remain on Airport property
- No direct impacts to immediately adjacent offsite development or roadways
- Least expensive development alternative

4.4.1.1.4 Impacts/Issues of an Airport Museum Expansion

- Design and construction cost
- Outside Airport security fencing

- Would require maintenance and/or frequent check-ins by staffed individual
- Potential closure of museum during terminal building construction

North of Main Apron

This alternative develops the terminal building north of the main apron and west of the Lifeline's existing quarters and is depicted in purple in **Exhibit 4-3**.

Potential expansion beyond forecast requirements should be taken into consideration when determining the appropriate location of a terminal facility at an airport. In this case, developing a terminal building west of Lifeline's quarters only offers enough space for the development of the recommended terminal building, however, it limits building or auto parking expansion potential of the existing tenant. Additionally, while this alternative positions the terminal building close to the existing parking lot and main entrance, the terminal building would be separated by a security fence, limiting accessibility.

This alternative also situates the terminal structure close to the security gate, which could impact access to and from the main apron. The structure itself would likely be a mobile/trailer unit approximately 1,600 square feet in size that would cost approximately $40,000 for delivery, construction, and connection to utilities. It should be noted that this assumes that the terminal is a new mobile unit rather than a used structure. The following summarize the benefits and impacts of construction of a terminal building on the north side of the main apron.

4.4.1.1.5 Benefits of Locating North of Main Apron

- Proximity to main apron and general aviation facilities
- Proposed facility within Airport security fence
- Improvements remain on Airport property
- Utilities provided within the proposed location

4.4.1.1.6 Impacts/Issues of Locating North of Main Apron

- Limits potential expansion of auto parking and tenant
- Proximity to security gate
- Requires new construction rather than expanding existing infrastructure

West of Main Apron

This alternative examines the impacts of developing the terminal building west of the main apron. Developing the terminal building in this location provides many benefits in regard to location and minimizing impacts to surrounding infrastructure.

As shown in blue in **Exhibit 4-3**, positioning the terminal building west of the main apron provides immediate access to W. Airport Rd with space for Airport user parking. This location also provides access to the security gate along Airport Rd.

In addition, locating the terminal building west of the main apron creates an area free of any movement/airside obstacles. This alternative situates the terminal building outside the fencing that provides protection to the apron, but within Airport security fencing, limiting the impact to airside operations and maintaining safety and security to non-Airport users. The primary impact of this alternative is that a 1,600-square-foot structure would require the relocation or removal of existing structures. There are three unoccupied buildings in this location that the City has identified as unusable. A new terminal facility in this area would likely require demolition, an action that the City has already indicated it would likely do in the future. As with the north apron alternative, the structure itself would likely be a mobile/trailer unit that would cost approximately $40,000 for delivery, construction, and connection to utilities. It is estimated that demolition of an existing structure and removal of materials would cost an additional $2,000 bringing the total project cost to approximately $42,000. It should be noted that this assumes that the terminal is a new mobile unit rather than a used structure. The following summarize the benefits and impacts of constructing a terminal building west of the main apron.

4.4.1.1.7 Benefits of Locating West of Main Apron

- Surrounded by Airport security fencing
- Utilities provided within the proposed location
- No disruption to aircraft operations during construction
- No direct impacts to immediately adjacent offsite development

4.4.1.1.8 Impacts/Issues of Locating West of Main Apron

- Highest cost of terminal building alternatives
- Demolition of existing structures

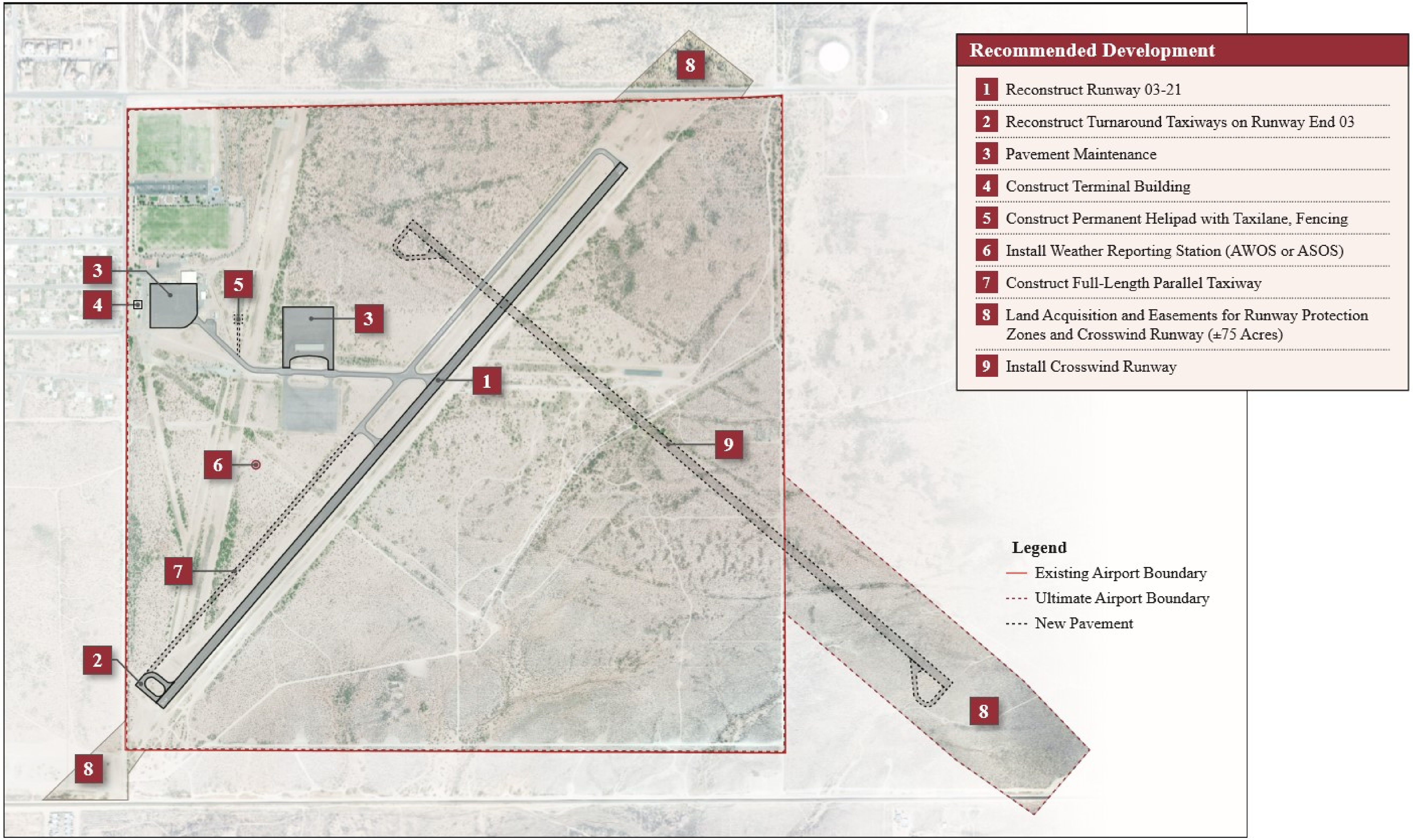
Recommended Terminal Building Alternative

Based on the analyses above and feedback provided by the Airport Master Plan Advisory Committee, the recommended development of the general aviation terminal building is west of the main apron. This location is recommended not only because of the many associated benefits compared to the other proposed alternatives; but the minimal impacts associated with placement of a terminal building west of the main apron. Positioning the terminal building west of the main apron satisfies FAA terminal building siting requirements, provides the opportunity for future expansion if needed, incurs minimal impacts to airside facilities, and provides immediate ground access to W. Airport Rd while being located within the Airport's security fence. It should be noted that the location identified in **Exhibit 4-3** is merely suggested. Based on potential removal of structures and other associated implementation costs, a terminal building could be located anywhere on the west side of the main apron that incurs minimal impacts.

4.5 Alternatives Summary

A summary of all recommended facility improvements and their preferred locations is shown in **Exhibit 4-4**. A recommended phased development plan and cost estimates for these improvements is described in the subsequent chapter.

Exhibit 4-4. Alternatives Development Summary



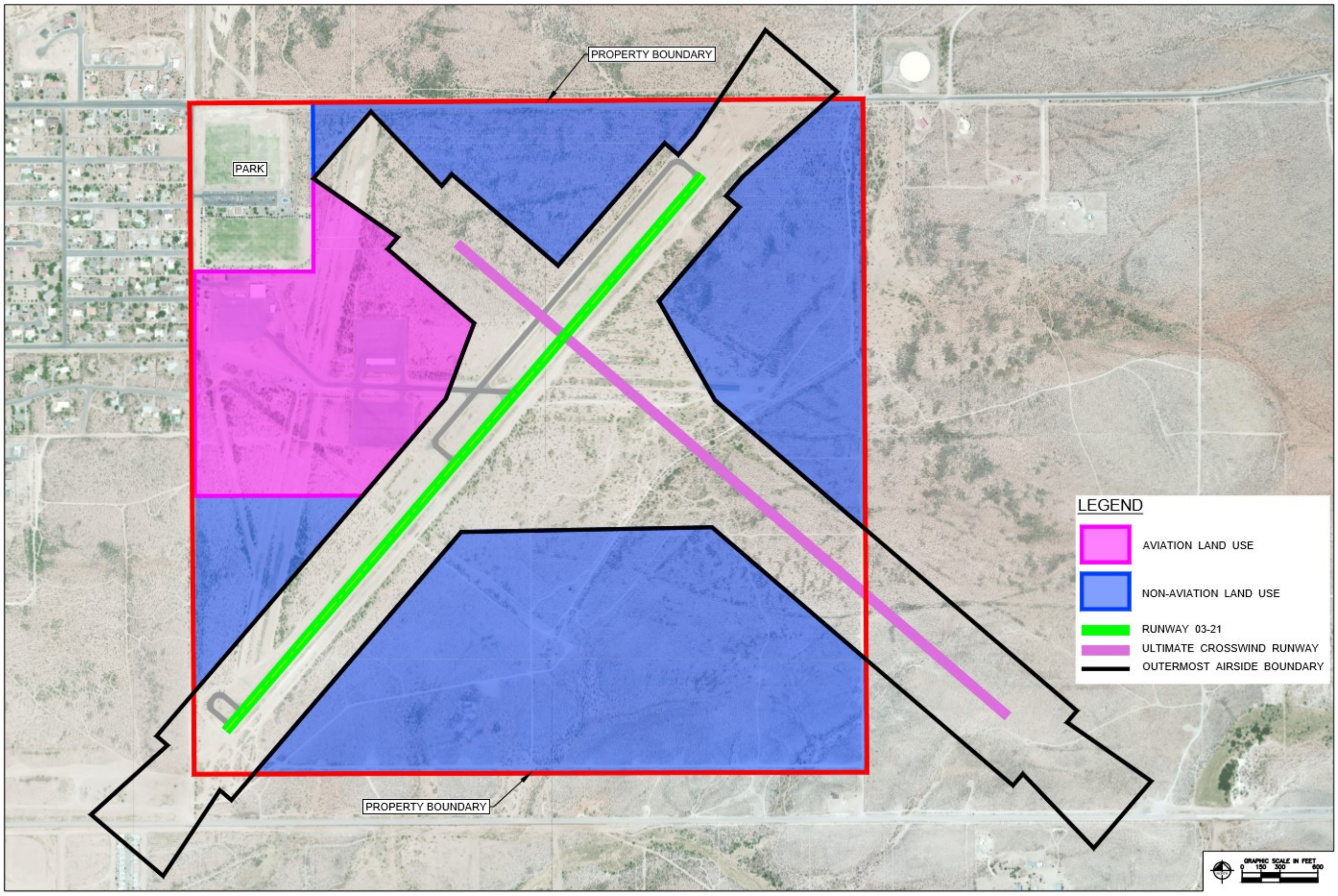
Source: Kimley-Horn

Aviation vs. Non-Aviation Airport Land Use

The previous chapter of this Master Plan Update identified facility requirements based on forecasts of aviation demand and the condition of existing facilities. This chapter identified specific locations of these facility needs based on evaluation criteria such as compatibility, project cost, and other factors. While future aviation-related facilities are anticipated to increase the overall footprint of developed land on Airport property, there will be a significant amount of space that may be used for non-aviation development.

Exhibit 4-5 depicts areas of Airport-owned land that are needed for existing and future aviation development. These areas include all airside and landside facilities as well as required safety areas that surround them. The Airport's existing property encompasses approximately 643 acres and the acquisition of parcels for the future crosswind runway and RPZs will expand this footprint to approximately 714. Existing and future aviation uses and associated safety areas are anticipated to require a total of 385 acres (shown in Exhibit 4-5 as areas within the outermost airside boundary or highlighted in pink). These parcels of land follow the outermost airside restriction areas including the Building Restriction line (BRL) and Runway Protection Zones (RPZs) and extends to the Airport property line. It should be noted that areas recommended to be designated for aviation-use include buffers that to accommodate aviation demand at DGL for a 50-year planning horizon. Airport Park, located on the northwest portion of the property encompasses approximately 26 acres. All areas that are not designated as current park space, or existing or future aviation-related development are identified for non-aviation related development. Utilization and development of these available Airport properties can generate future revenues and should be examined thoroughly prior to development. Potential uses for these areas (highlighted in blue), which total approximately 304 acres, are identified in the Airport Business Plan, which is included as Appendix B in this Master Plan Update.

Exhibit 4-5. Airport Land Use



Source: Google Earth, Kimley-Horn

5 AIRPORT DEVELOPMENT AND FINANCIAL PLAN

This chapter provides a summary of projects identified in the Facility Requirements chapter, recommended developments described in the Alternatives chapter, 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. To foster additional revenue generation potential, an Airport Business Plan was developed in conjunction with the Master Plan Update. This document is included as an appendix.

5.1 Introduction

As noted previously, Douglas 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.

5.2 Airport Development Plan

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 chapter 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.

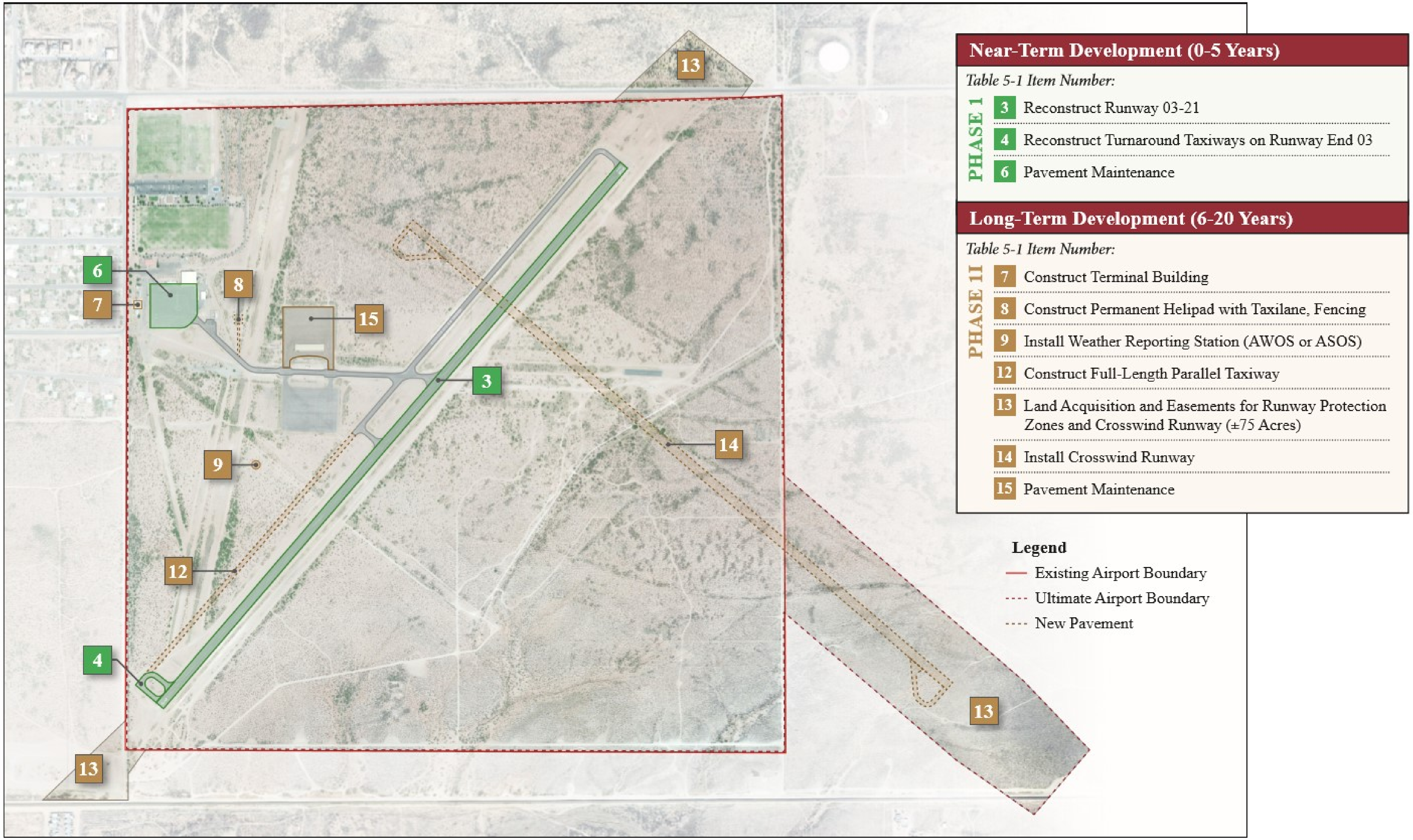
Phasing of proposed improvements assists both the airport sponsor and ADOT in the prioritization of projects in terms of need and funding significance. Proposed improvements and associated studies are shown by phase in **Table 5-1**. As noted in earlier chapters, the highest priority of the long-term sustainability of the Airport lies with reconstruction of Runway 03-21. Securing funding for this project should take precedence over all other recommended improvements. A graphical depiction of physical improvements listed in Table 5-1 is identified in **Exhibit 5-1**.

Table 5-1. Airport Capital Improvement Plan

Item #	Phase I: Near-Term Development (0-5 Years)	Total Project Cost	State Grant	Local Match
1	Conduct environmental documentation (Categorical Exclusion) for reconstruction of Runway 03-21	$60,000	$54,000	$6,000
2	Obstacle removal, brush clearing	$5,000	$4,500	$500
3	Reconstruct Runway 03-21	$2,500,000	$2,250,000	$250,000
4	Reconstruct turnaround taxiways on Runway End 03	$150,000	$135,000	$15,000
5	Conduct study for implementation of an instrument approach	$50,000	$45,000	$5,000
6	Main Apron Pavement Maintenance	$150,000	$135,000	$15,000
	Total Phase I Costs	**$2,915,000**	**$2,623,500**	**$291,500**
Item #	**Phase II: Long-Term Development (6-20 Years)**	**Total Project Cost**	**State Grant**	**Local Match**
7	Construct Terminal Building	$42,000	$37,800	$4,200
8	Construct Permanent Helipad with taxilane, fencing	$200,000	$180,000	$20,000
9	Install weather reporting station (AWOS or ASOS)	$150,000	$135,000	$15,000
10	Crosswind Runway Feasibility Study	$70,000	$63,000	$7,000
11	Update Airport Layout Plan	$150,000	$135,000	$15,000
12	Construct full-length parallel taxiway	$500,000	$450,000	$50,000
13	Land Acquisition for Runway Protection Zones and Crosswind Runway (± 75 acres)	$350,000	$315,000	$35,000
14	Install Unpaved/Gravel Crosswind Runway	$500,000	$450,000	$50,000
15	T-Hangar Apron Pavement Maintenance	$150,000	$135,000	$15,000
	Total Phase II Costs	**$2,159,000**	**$1,943,100**	**$215,900**
	TOTAL DEVELOPMENT COSTS	**$5,074,000**	**$4,566,600**	**$507,400**

Sources: Kimley-Horn and Associates.

Exhibit 5-1. Phased Development Plan



Source: Kimley-Horn

5.3 Development Funding Mechanisms

The following sections describe State and local funding mechanisms to potentially assist with implementation of projects identified in **Table 5-1**. As shown, in order to implement all recommended projects over the 20-year timeframe, the Airport would be responsible for approximately $500,000 of the remaining balance not covered by ADOT grants.

5.3.1 State Grant Funding

ADOT issues grants that cover 90 percent of project costs for improvements related to maintenance, safety, capacity enhancement, or are projects related to environmental studies, planning, or land acquisition. All the recommended improvements identified in Table 5-1 could be eligible for ADOT grants, however, as noted, ADOT has suspended State/Local grants through fiscal year 2020, meaning the Airport may need to determine alternative means to secure funding for needed near-term improvements.

Another State-sponsored funding mechanism includes grants administered based on the results of ADOT's Airport Pavement Management System (APMS) Program. The APMS uses the Army Corps of Engineers' Micropaver program as a basis for generating a Five-Year Arizona Pavement Preservation Program (APPP). The APMS consists of visual inspections of all airport pavements. Evaluations are made of the types and severities observed and entered into a computer program database. Pavement Condition Index (PCI) values are determined through the visual assessment of pavement condition in accordance with the most recent FAA Advisory Circular 150/5380-6 and range from 0 (failed) to 100 (excellent). Every three years, a complete database update with new visual observations is conducted. It should be noted that specific facilities that are eligible for this funding include runways, taxiways, and aircraft aprons.

Every year the Aeronautics Group, utilizing the APMS, identifies airport pavement maintenance projects eligible for funding for the upcoming five years. These projects will appear in the State's Five-Year Airport Development Program. Once a project has been identified and approved for funding by the State Transportation Board, the airport sponsor may elect to accept a state grant for the project and not participate in the APPP, or the airport sponsor may sign an inter-government agreement (IGA) with the Aeronautics Group to participate in the APPP.

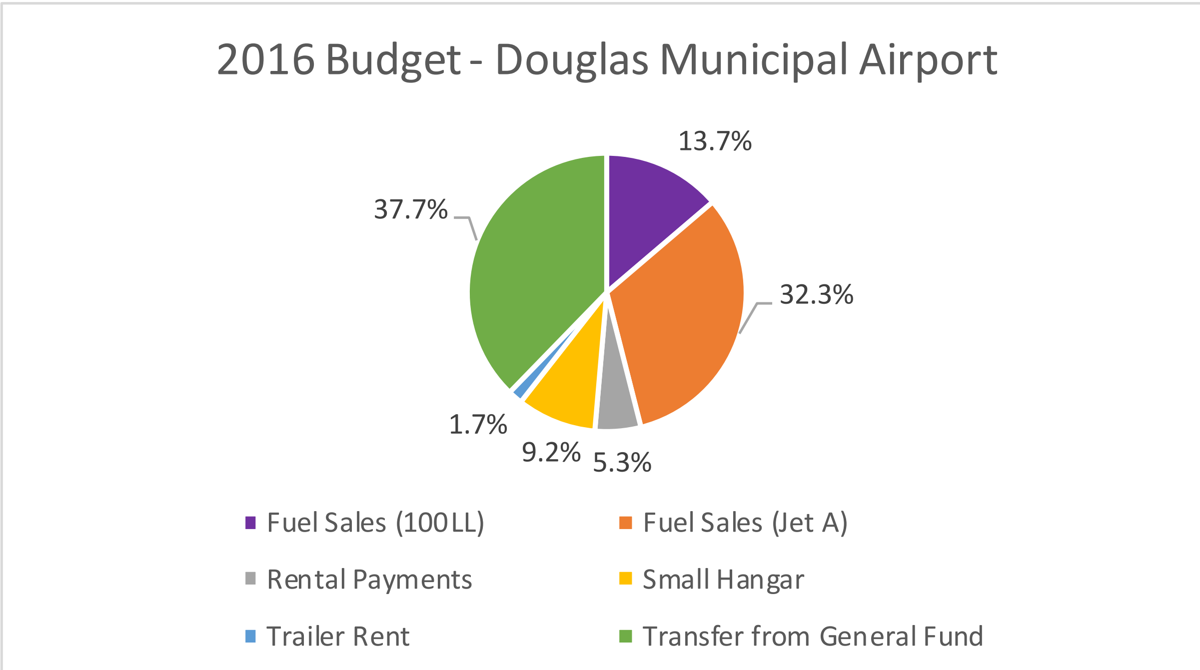
Eligible projects for APMS funding undergo additional analysis to determine a final project list. Projects at DGL that could be eligible for APMS grants include #6 and #16 in **Table 5-1**. It should be noted that ADOT has suspended the administration of APMS grants through fiscal year 2019.

5.3.2 Local City and Airport Funding Sources

The City generates Airport revenue primarily through ground and facility leases and fuel flowage fees. Typically, such revenues are used to cover operating and maintenance expenses, however, any surplus revenues can be applied directly to the ACIP. While the Airport strives to be financially self-sufficient, as needed, the City also supports Airport expenses with allocations from its General Fund.

According to the 2015-2016 Airport Budget, approximately 46 percent of revenues were derived from 100LL (AvGAS) and Jet A sales in 2016. Approximately 16 percent of Airport revenues were obtained via rental payments, hangar leases, and lease revenues from the trailer unit on the west end of the main apron. The remaining revenue (approximately 38 percent) was identified as a transfer from the City's General Fund (see **Exhibit 5-2**).

Exhibit 5-2. Airport Operating Budget



Sources: City of Douglas. Kimley-Horn and Associates.

In addition to revenues generated by leases and fuel sales, there are other options that the Airport can use to fund projects. The most common of these are described in the Business Plan and summarized below:

Taxation and Government Subsides - In many cases, general aviation airports receive subsidies from the airport sponsor to cover operating deficits or provide matching funds required to receive state grants. Some airports may also receive subsidies from other municipalities or counties that benefit from the presence of the airport. Douglas Municipal Airport receives support from the City of Douglas for matching funds and other resources, as appropriate.

Investment Income - Investment income is associated with interest or gains directly tied to the investment of airport funds. While the Airport does not currently report outside investment income, the City of Douglas may pursue such investments in the future. The ability to utilize investment income requires up-front funds with which to invest, which can often be a deterrent for some airports.

***Sale of Surplus Assets* -** An airport's vehicles, equipment, tools, and other capital assets should be evaluated periodically to identify items that may no longer be needed, are beyond useful life, or have become obsolete. Such assets should be sold in accordance with airport policies and procedures. The sale of surplus assets may require the reimbursement or reinvestment of the state share of grant monies used for the initial acquisition.

Debt Financing - Long-term loans are typically used to finance the acquisition of land; the purchase of vehicles, equipment, or tools; and the development of infrastructure, improvements, or facilities not eligible for grant funding. Short-term loans or lines of credit are typically used to supplement working capital to cover operating expenses during cash flow short falls. Douglas Municipal Airport has no capacity to incur debt directly, but the City of Douglas does in its capacity as the Airport sponsor.

***Bonding* -** Various bonding mechanisms can be used to raise funds for projects not eligible for grants. A general obligation bond is typically backed by the general tax revenues of an airport sponsor. However, the airport's revenue stream, not the tax revenues of the airport sponsor or revenues specifically associated with the bonding project, is typically used to service the debt associated with revenue bonds. Special facility bonds can be used to fund the development of a single or multi-tenant facility and the revenue generated through leasing the facility can then be used to service the debt.

5.3.3 Third Party Investment

Many airports use private, third party investment when the planned improvements will be primarily used by a private business or other organization. Such projects are not ordinarily eligible for state funding. Projects of this kind typically include hangars, fixed-based operator facilities, fuel storage, exclusive-use aircraft parking aprons, industrial aviation-use facilities, non-aviation office/commercial/industrial developments, and other similar projects.

Private development proposals at DGL should be considered on a case-by-case basis and coordinated directly with the City. Often, Airport funds for enabling infrastructure, preliminary site work and site access are required to facilitate private development projects on airport property. Even if the project is not funded by ADOT, the development must be in accordance with the approved Airport Layout Plan (ALP) and be consistent with ADOT airport design and airspace protection criteria. Within the recommended improvements identified in Table 5-1, the construction of a new helipad (Item #8) could be eligible as a third-party investment opportunity.

5.4 Development Summary

While current limitations on ADOT S/L grant funding present a temporary setback to near-term Airport development, the suspension of matching grants is anticipated to lift in fiscal year 2020 and additional options for project funding in the meantime may be available. The Airport may need to pursue one or a combination of the funding mechanisms outlined in this Chapter to secure funding for needed improvements. The Airport Business Plan, included in the appendices of this Master Plan Update details additional revenue generating options and funding mechanisms that the Airport may wish to pursue.

5.5 Airport Layout Plan

The recommended developments identified in the Facility Requirements, Alternatives Analysis, and Airport Development and Financial Plan chapters of this Master Plan Update are graphically represented in the Airport Layout Plan (ALP), which is included in the Appendix. The ALP has been prepared to graphically depict the recommended airfield layout, disposition of obstructions and uses of land within the proposed Airport property. The ALP is intended to represent existing and future conditions on the Airport and can be used as a "map" for recommended improvements. The ALP has been developed in accordance with ADOT standards and in conformance with *FAA AC 150/5070-6B, "Airport Master Plans"* to the extent reasonable. This set includes the following sheets:

Airport Layout Plan (ALP) Drawing Set

- 1 Cover Sheet - A separate cover sheet, with approval signature blocks, airport location maps, and other pertinent information.
- 2 Airport Layout Plan - A drawing depicting the existing and future airport facilities. This sheet includes required facility identifications, description labels, imaginary surfaces, runway protection zones, runway safety areas and basic airport and runway data tables.
- 3 Data Sheet – Identifies specific runway, taxiway, climatic, and Airport data.
- 4 Terminal Area Plan - Present a large-scale depiction of areas with significant terminal facility development.
- 5 Existing Airspace Drawing – Identifies existing airspace surfaces and obstacle information and dispositions.
- 6 Ultimate Airspace Drawing – Identifies future airspace surfaces and obstacle information and dispositions.
- 7 Inner Portion of the Approach – Runway 03-21 - Depicts profile view of the inner portion of the approach surface to Runway 03-21 and a tabular listing of all surface penetrations. The drawing also depicts the obstacle identification approach surfaces contained in 14 CFR Part 77, Objects Affecting Navigable Airspace.
- 8 Inner Portion of the Approach – Runway 12-30 – Includes profile view of inner portion of the approach surface to future crosswind runway 12-30 as well as surface penetrations.
- 9 Airport Land Use Map - Depicts land uses within existing and ultimate Airport property boundary.
- 10 Airport Property Map - Depicts the existing and ultimate Airport property boundary, various tracts of land that have been or will be acquired to develop the Airport, and the method of acquisition.

APPENDIX A – AIRPORT LAYOUT PLAN

The recommended developments identified in the Facility Requirements, Alternatives Analysis, and Airport Development and Financial Plan chapters of this Master Plan Update are graphically represented in the Airport Layout Plan (ALP). This set includes the following sheets:

Airport Layout Plan (ALP) Drawing Set

- 1 Cover Sheet
- 2 Airport Layout Plan
- 3 Data Sheet
- 4 Terminal Area Plan
- 5 Existing Airspace Drawing
- 6 Ultimate Airspace Drawing
- 7 Inner Portion of the Approach – Runway 03-21
- 8 Inner Portion of the Approach – Runway 12-30
- 9 Airport Land Use Map
- 10 Airport Property Map

DOUGLAS MUNICIPAL AIRPORT

AIRPORT LAYOUT PLAN DRAWINGS
COCHISE COUNTY, ARIZONA

JULY 2017

STATE MAP
(Not to Scale)

MAP SOURCE: OPEN STREET MAP, © OpenStreetMap (and) contributors, CC-BY-SA

VICINITY MAP
(Not to Scale)

ADOT APPROVAL STAMP

CITY OF DOUGLAS APPROVAL	
RECOMMENDED BY:	DATE:
Lynn Kartchner Airport Engineer	
Luis Pedroza Finance Director	

SHEET INDEX

	REVISIONS	BY	APPROVED	DATE

CITY OF DOUGLAS
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Mesa, AZ 85210
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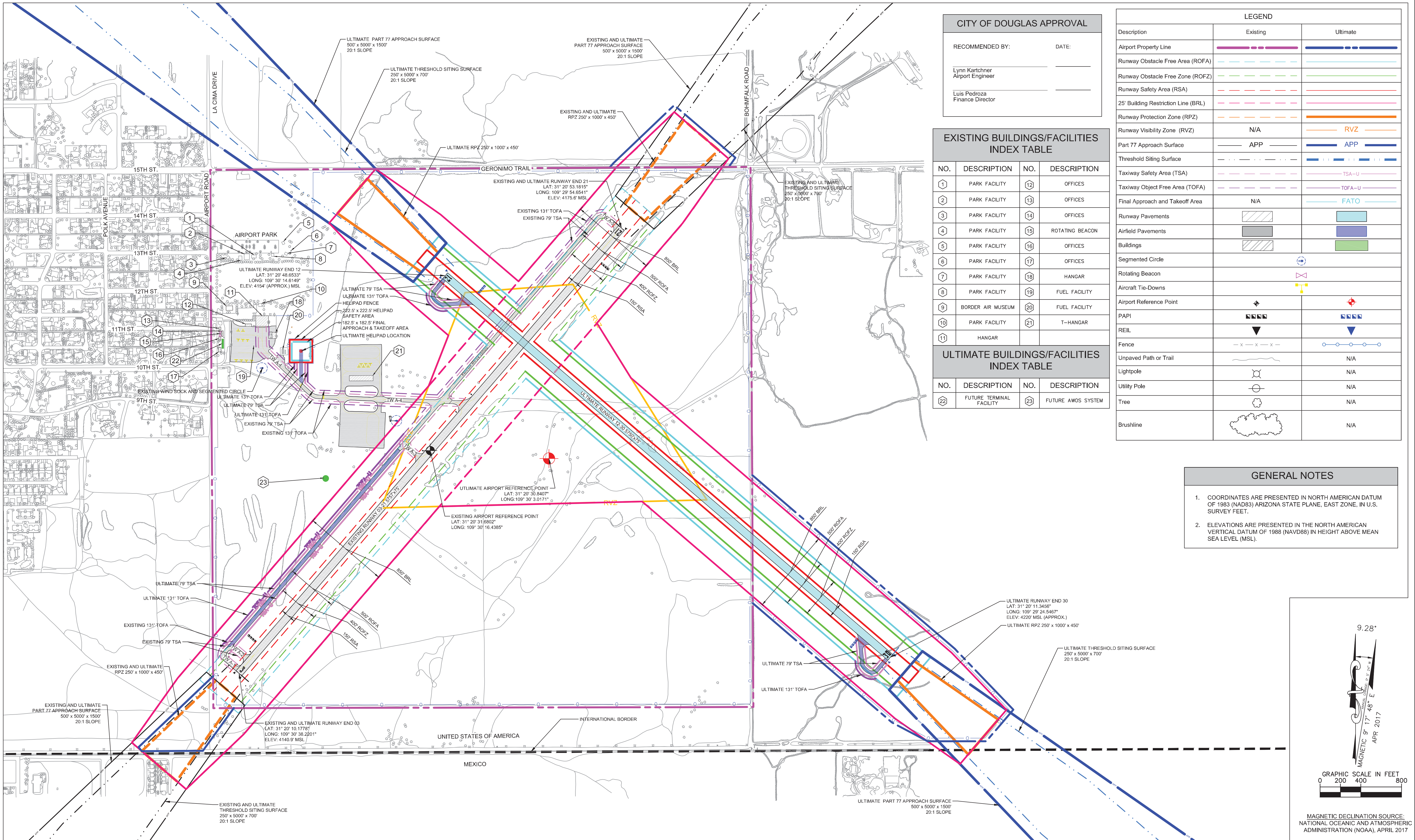
AIRPORT LAYOUT PLAN
COVER SHEET
SHEET 1 OF 10 SHEETS

K:\NVA_Aviation\Douglas (DGL)\CAD\PlanSheets\1 COVER SHEET.dwg Jul 03, 2017 Tommy.Cook
XREFS: xBORDER_1-098243903 xLEGEND



MAGNETIC DECLINATION SOURCE:
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA), APRIL 2017

CITY OF DOUGLAS APPROVAL

RECOMMENDED BY: DATE:

Lynn Kartchner
Airport Engineer

Luis Pedroza
Finance Director

EXISTING BUILDINGS/FACILITIES INDEX TABLE

NO.	DESCRIPTION	NO.	DESCRIPTION
1	PARK FACILITY	12	OFFICES
2	PARK FACILITY	13	OFFICES
3	PARK FACILITY	14	OFFICES
4	PARK FACILITY	15	ROTATING BEACON
5	PARK FACILITY	16	OFFICES
6	PARK FACILITY	17	OFFICES
7	PARK FACILITY	18	HANGAR
8	PARK FACILITY	19	FUEL FACILITY
9	BORDER AIR MUSEUM	20	FUEL FACILITY
10	PARK FACILITY	21	T-HANGAR
11	HANGAR		

ULTIMATE BUILDINGS/FACILITIES INDEX TABLE

NO.	DESCRIPTION	NO.	DESCRIPTION
22	FUTURE TERMINAL FACILITY	23	FUTURE AWOS SYSTEM

LEGEND

Description	Existing	Ultimate
Airport Property Line		
Runway Obstacle Free Area (ROFA)		
Runway Obstacle Free Zone (ROFZ)		
Runway Safety Area (RSA)		
25' Building Restriction Line (BRL)		
Runway Protection Zone (RPZ)		
Runway Visibility Zone (RVZ)	N/A	RVZ
Part 77 Approach Surface	APP	APP
Threshold Siting Surface		
Taxiway Safety Area (TSA)		TSA-U
Taxiway Object Free Area (TOFA)		TOFA-U
Final Approach and Takeoff Area	N/A	FATO
Runway Pavements		
Airfield Pavements		
Buildings		
Segmented Circle		
Rotating Beacon		
Aircraft Tie-Downs		
Airport Reference Point		
PAPI		
REIL		
Fence		
Unpaved Path or Trail		N/A
Lightpole		N/A
Utility Pole		N/A
Tree		N/A
Brushline		N/A

GENERAL NOTES

1. COORDINATES ARE PRESENTED IN NORTH AMERICAN DATUM OF 1983 (NAD83) ARIZONA STATE PLANE, EAST ZONE, IN U.S. SURVEY FEET.
2. ELEVATIONS ARE PRESENTED IN THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) IN HEIGHT ABOVE MEAN SEA LEVEL (MSL).

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REVISIONS	BY	APPROVED	DATE

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

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

SHEET 2 OF 10 SHEETS

2_AIRPORT LAYOUT PLAN.dwg Monday, Jul. 03 2017 4:06pm

RUNWAY DATA

ITEM		RW 03-21 (EX.)	RW 12-30 (ULT.)
APPROACH REFERENCE CODE		B/II/VIS	
DESIGN AIRCRAFT	CRITICAL AIRCRAFT	BEECHCRAFT SUPER KING AIR 200	
	APPROACH SPEED (KNOTS)	103	
	WINGSPAN/LENGTH	54' 6"	
	MAX. CERTIFIED TAKEOFF WEIGHT (LBS.)	12,500	
APPROACH MINIMUMS		VISUAL	
APPROACH TYPE		VISUAL	
FAR PART 77 APPROACH SLOPE		20:1	
RUNWAY PROTECTION ZONES (RPZ)	LENGTH	1000'	
	INNER WIDTH	250'	
	OUTER WIDTH	450'	
RUNWAY LENGTH		5757' (PUBLISHED)	5750'
RUNWAY WIDTH		75'	75'
RUNWAY PAVEMENT		ASPHALT	ASPHALT
PAVEMENT STRENGTH		12,500 lbs. SWG (Est.)	
RUNWAY LIGHTING		MIRL	MIRL
APPROACH LIGHTING		REIL	REIL
RUNWAY MARKINGS		BASIC, IN POOR CONDITION	TBD
% EFFECTIVE GRADIENT		0.6%	1.1%
VISUAL APPROACH AIDS		PAPI	PAPI
NAVIGATIONAL AIDS		WIND SOCK, SEGMENTED CIRCLE, ROTATING BEACON	AWOS, WIND SOCK, SEGMENTED CIRCLE, ROTATING BEACON
RUNWAY SAFETY AREA (RSA)	LENGTH BEYOND RUNWAY END	300'	
	WIDTH	150'	
RUNWAY OBJECT FREE AREA (ROFA)	LENGTH BEYOND RUNWAY END	300'	
	WIDTH	500'	
RUNWAY OBJECT FREE ZONE (ROFZ)	LENGTH BEYOND RUNWAY END	200'	
	WIDTH	400'	

AIRPORT DATA

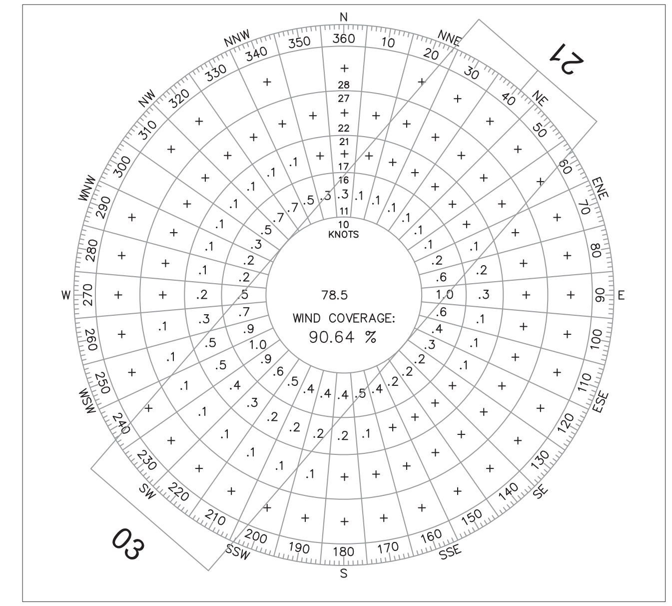
ITEM		EXISTING	ULTIMATE
AIRPORT ELEVATION (NAVD88) (MSL)		4175.6'	4220' (APPROX.)*
AIRPORT REFERENCE POINT (ARP) COORDINATES (NAD83)	LATITUDE	31° 20' 31.6802"	31° 20' 30.8407"
	LONGITUDE	109° 30' 16.4385"	109° 30' 3.0171"
MEAN MAX. TEMP - HOTTEST MONTH (JUNE)		97°F	
AIRPORT REFERENCE CODE		B-II (SMALL)	B-II (SMALL)
NPIAS ROLE		NONE	
MAGNETIC VARIATION		09° 16' 48" E changing by 0.09° W per year	
AIRPORT & TERMINAL NAVAIDS		WIND SOCK, SEGMENTED CIRCLE, ROTATING BEACON, REILs, PAPIs	AWOS, WIND SOCK, SEGMENTED CIRCLE, ROTATING BEACON, REILs, PAPIs

* - ULTIMATE AIRPORT ELEVATION REFLECTS APPROXIMATE EXISTING GROUND ELEVATION AT ULTIMATE RUNWAY END 30

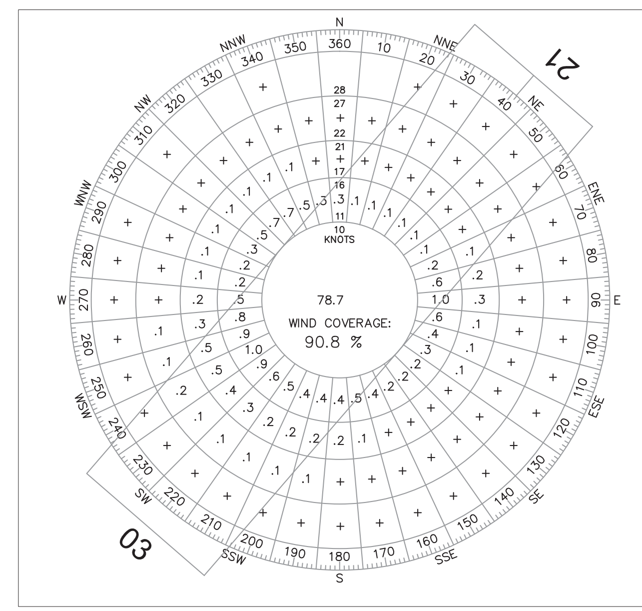
RUNWAY END COORDINATES AND ELEVATIONS

RUNWAY		LATITUDE	LONGITUDE	ELEVATION (MSL)
RW 3	EXISTING & ULTIMATE	31° 20' 10.1778"	109° 30' 38.2201"	4140.9'
RW 21	EXISTING & ULTIMATE	31° 20' 53.1815"	109° 29' 54.6541"	4175.6'
RW 12	ULTIMATE	31° 20' 48.6533"	109° 30' 14.6149"	4154' (approx.)
RW 30	ULTIMATE	31° 20' 11.3456"	109° 29' 24.5467"	4220' (approx.)

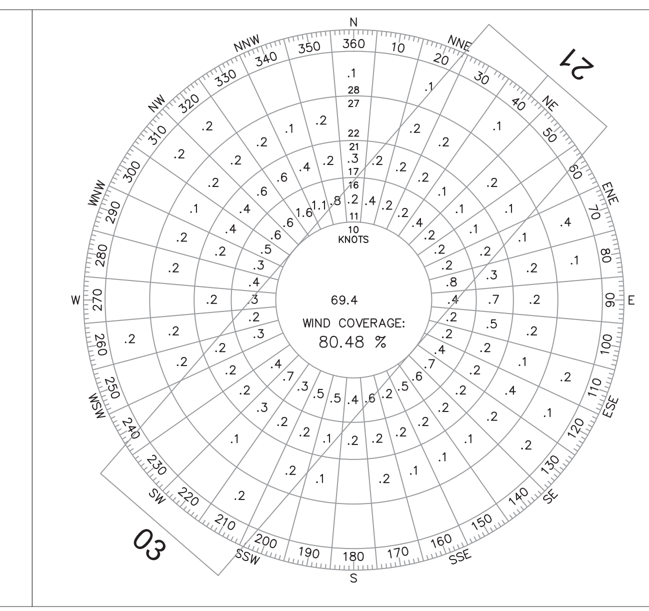
ALL-WEATHER WIND ROSE, 10.5 KNOTS



VFR WIND ROSE, 10.5 KNOTS



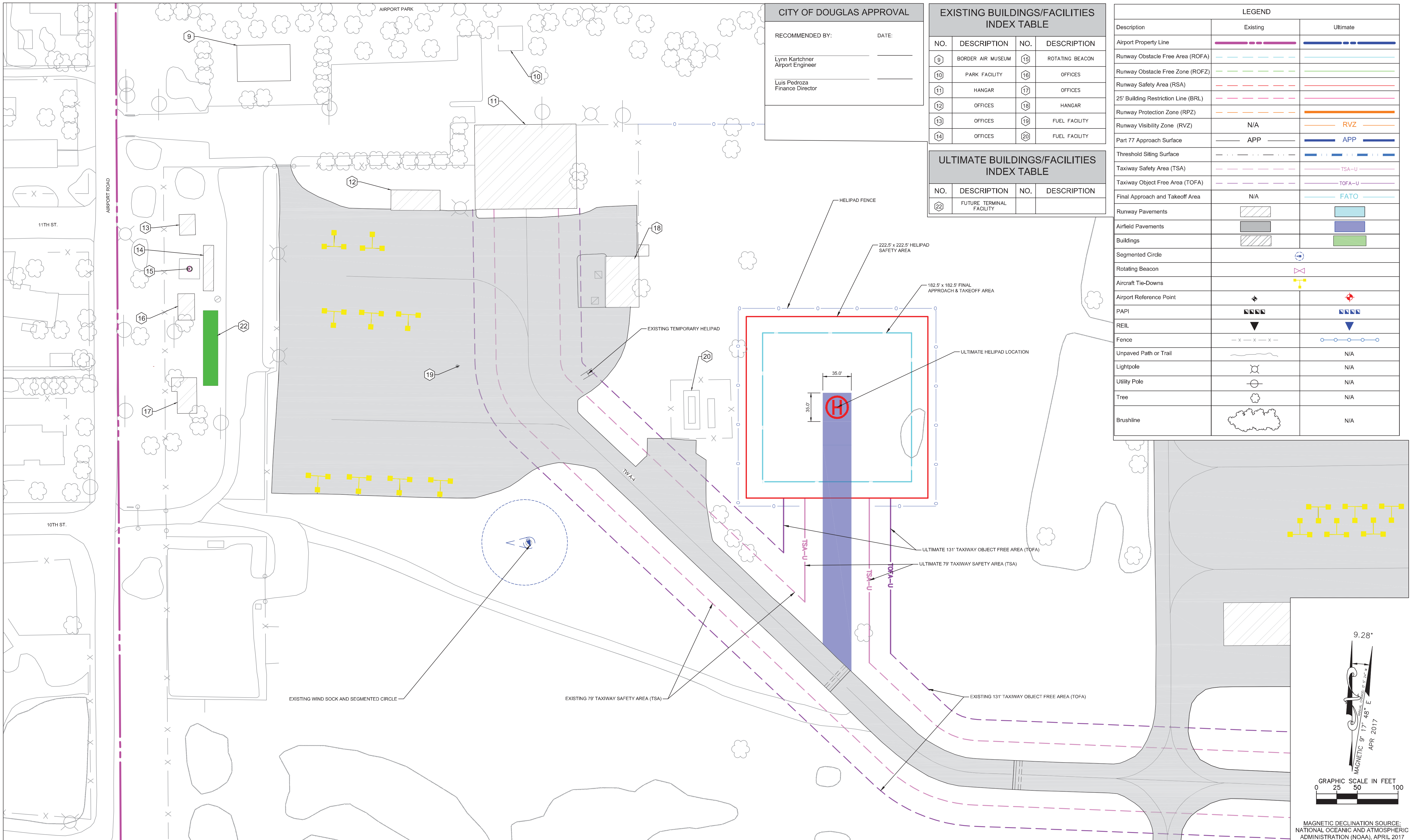
IFR WIND ROSE, 10.5 KNOTS



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
EXISTING RUNWAY 3-21	90.6%	95.0%	90.8%	95.1%	80.5%	86.0%
ULTIMATE RUNWAY 12-30	88.7%	92.8%	88.7%	92.8%	86.6%	90.8%
ULTIMATE COMBINED	97.6%	99.3%	97.6%	99.3%	94.7%	97.4%

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



CITY OF DOUGLAS APPROVAL

RECOMMENDED BY: DATE:

Lynn Kartchner
Airport Engineer

Luis Pedroza
Finance Director

EXISTING BUILDINGS/FACILITIES INDEX TABLE

NO.	DESCRIPTION	NO.	DESCRIPTION
9	BORDER AIR MUSEUM	15	ROTATING BEACON
10	PARK FACILITY	16	OFFICES
11	HANGAR	17	OFFICES
12	OFFICES	18	HANGAR
13	OFFICES	19	FUEL FACILITY
14	OFFICES	20	FUEL FACILITY

ULTIMATE BUILDINGS/FACILITIES INDEX TABLE

NO.	DESCRIPTION	NO.	DESCRIPTION
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LEGEND

Description	Existing	Ultimate
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Runway Obstacle Free Zone (ROFZ)		
Runway Safety Area (RSA)		
25' Building Restriction Line (BRL)		
Runway Protection Zone (RPZ)		
Runway Visibility Zone (RVZ)	N/A	RVZ
Part 77 Approach Surface	APP	APP
Threshold Siting Surface		
Taxiway Safety Area (TSA)		TSA-U
Taxiway Object Free Area (TOFA)		TOFA-U
Final Approach and Takeoff Area	N/A	FATO
Runway Pavements		
Airfield Pavements		
Buildings		
Segmented Circle		
Rotating Beacon		
Aircraft Tie-Downs		
Airport Reference Point		
PAPI		
REIL		
Fence		
Unpaved Path or Trail		N/A
Lightpole		N/A
Utility Pole		N/A
Tree		N/A
Brushline		N/A

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DOUGLAS MUNICIPAL AIRPORT
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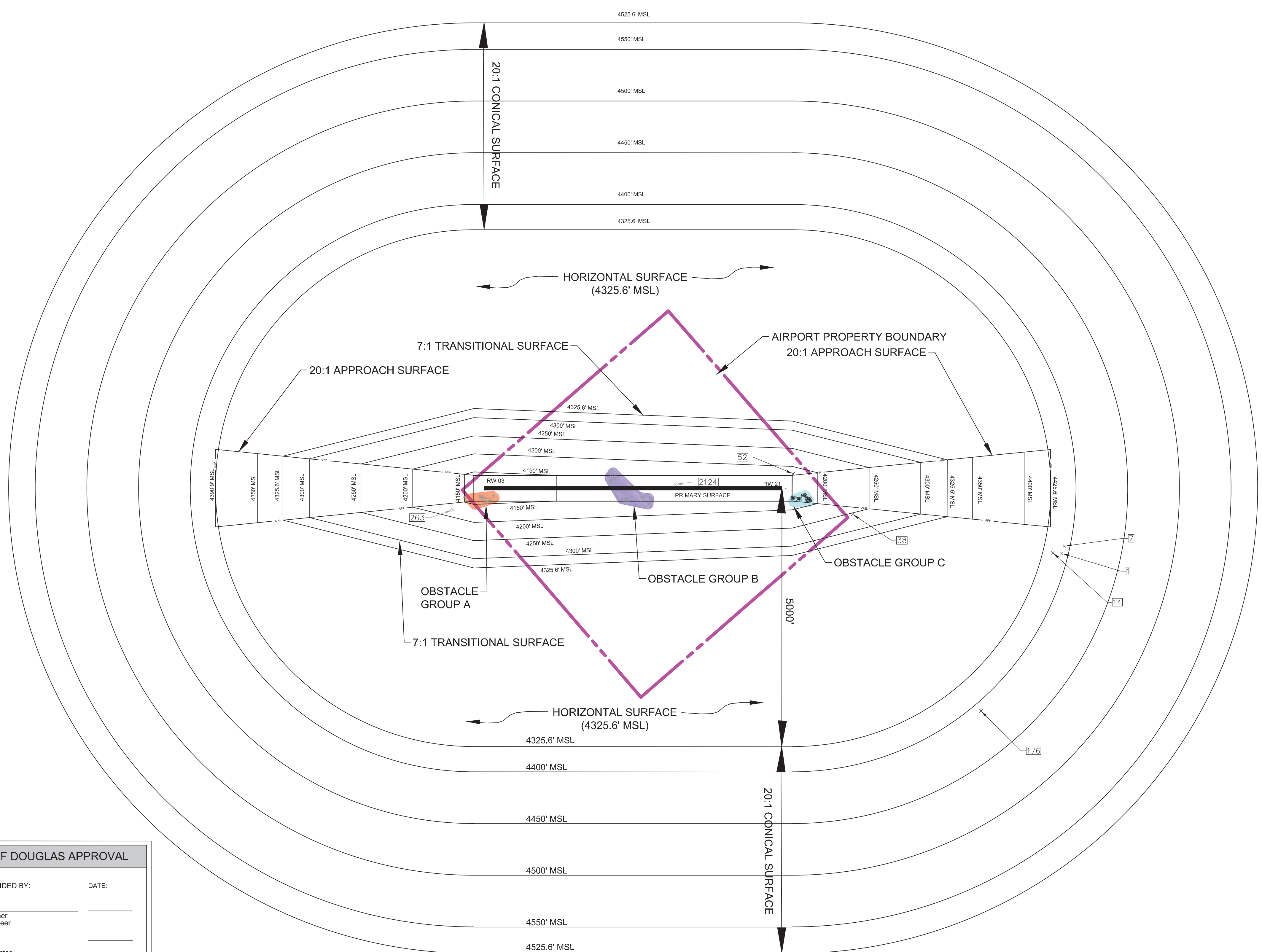
AIRPORT LAYOUT PLAN DRAWINGS
TERMINAL AREA PLAN

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

SHEET 4 OF 11 SHEETS

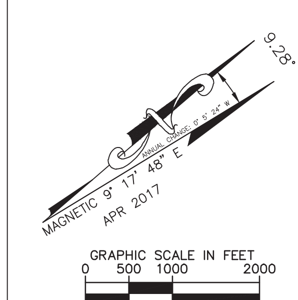
4 TERMINAL AREA PLAN.dwg Monday, Jul. 03 2017 4:07pm



PART 77 OBSTRUCTION DATA

OID	Group	Description	Object Height [ft MSL]	Penetrated Surface	Penetration	Disposition	FAA STUDY/ID#
1		GROUND	4365.7	CONICAL	21.6	NO ACTION	
7		GROUND	4363.0	CONICAL	18.0	NO ACTION	
14		GROUND	4344.8	CONICAL	9.3	NO ACTION	
38		TOWER	4258.8	TRANSITIONAL	5.4	MARK AND LIGHT	
52		BUSH	4183.5	TRANSITIONAL	3.2	REMOVE	
97	C	TREE	4195.0	APPROACH (RW 21)	3.4	REMOVE	
98	C	TREE	4201.9	APPROACH (RW 21)	11.0	REMOVE	
99	C	TREE	4192.8	APPROACH (RW 21)	3.3	REMOVE	
100	C	TREE	4196.5	APPROACH (RW 21)	4.9	REMOVE	
101	C	TREE	4193.6	APPROACH (RW 21)	0.8	REMOVE	
102	C	TREE	4192.9	APPROACH (RW 21)	3.2	REMOVE	
103	C	BUSH	4190.8	APPROACH (RW 21)	2.6	REMOVE	
104	C	BUSH	4189.7	APPROACH (RW 21)	1.9	REMOVE	
105	C	BUSH	4189.0	APPROACH (RW 21)	3.4	REMOVE	
106	C	BUSH	4193.8	APPROACH (RW 21)	0.3	REMOVE	
108	C	BUSH	4190.9	APPROACH (RW 21)	9.6	REMOVE	
109	C	BUSH	4190.0	APPROACH (RW 21)	7.9	REMOVE	
110	C	BUSH	4189.6	APPROACH (RW 21)	6.1	REMOVE	
111	C	BUSH	4189.0	APPROACH (RW 21)	11.5	REMOVE	
112	C	BUSH	4188.4	APPROACH (RW 21)	12.1	REMOVE	
113	C	BUSH	4188.6	APPROACH (RW 21)	13.0	REMOVE	
176		TOWER	4465	CONICAL	106.9		2011AWP08325OE
263		LIGHT_POLE	4182.8570	TRANSITIONAL	3.1	MARK AND LIGHT	
1910	B	TREE	4173.3890	TRANSITIONAL	7.1	REMOVE	
1913	B	TREE	4175.4340	TRANSITIONAL	1.7	REMOVE	
1915	B	TREE	4172.9350	PRIMARY	15.7	REMOVE	
1918	B	TREE	4172.9920	TRANSITIONAL	2.3	REMOVE	
1929	B	TREE	4172.8780	PRIMARY	15.4	REMOVE	
1940	B	TREE	4175.9450	PRIMARY	16.7	REMOVE	
1941	B	TREE	4176.5130	PRIMARY	17.2	REMOVE	
1942	B	TREE	4174.4690	PRIMARY	16.3	REMOVE	
1943	B	TREE	4173.5030	PRIMARY	15.9	REMOVE	
1944	B	TREE	4173.7870	PRIMARY	16.1	REMOVE	
1948	B	TREE	4177.0810	PRIMARY	17.5	REMOVE	
1949	B	TREE	4176.7410	PRIMARY	16.5	REMOVE	
2024	A	TREE	4148.9330	APPROACH (RW 3)	0.1	REMOVE	
2034	B	TREE	4162.2940	PRIMARY	5.9	REMOVE	
2035	B	TREE	4162.4870	PRIMARY	6.7	REMOVE	
2037	B	TREE	4163.9610	TRANSITIONAL	5.1	REMOVE	
2038	B	TREE	4164.0660	TRANSITIONAL	5.1	REMOVE	
2042	B	TREE	4161.9560	PRIMARY	6.1	REMOVE	
2043	B	TREE	4162.0040	PRIMARY	6.1	REMOVE	
2085	A	TREE	4145.5470	PRIMARY	4.2	REMOVE	
2086	A	TREE	4145.7880	PRIMARY	4.1	REMOVE	
2087	A	TREE	4150.6160	PRIMARY	9.0	REMOVE	
2124		TREE	4172.2970	PRIMARY	9.2	REMOVE	
2139	A	TREE	4146.3670	PRIMARY	4.4	REMOVE	
2171	A	TREE	4147.4780	PRIMARY	4.8	REMOVE	
2172	A	TREE	4147.7190	PRIMARY	5.2	REMOVE	
2173	A	TREE	4146.2230	PRIMARY	1.2	REMOVE	
2174	A	TREE	4147.0920	PRIMARY	4.4	REMOVE	

OBSTACLE DATA FROM FAA DOF DATED 3.26.2017



MAGNETIC DECLINATION SOURCE:
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA), APRIL 2017

CITY OF DOUGLAS APPROVAL

RECOMMENDED BY: DATE:

Lynn Kartchner
Airport Engineer

Luis Pedroza
Finance Director

CITY OF DOUGLAS
425 E. 10TH ST, DOUGLAS, TOMBSTONE, AZ, 85607

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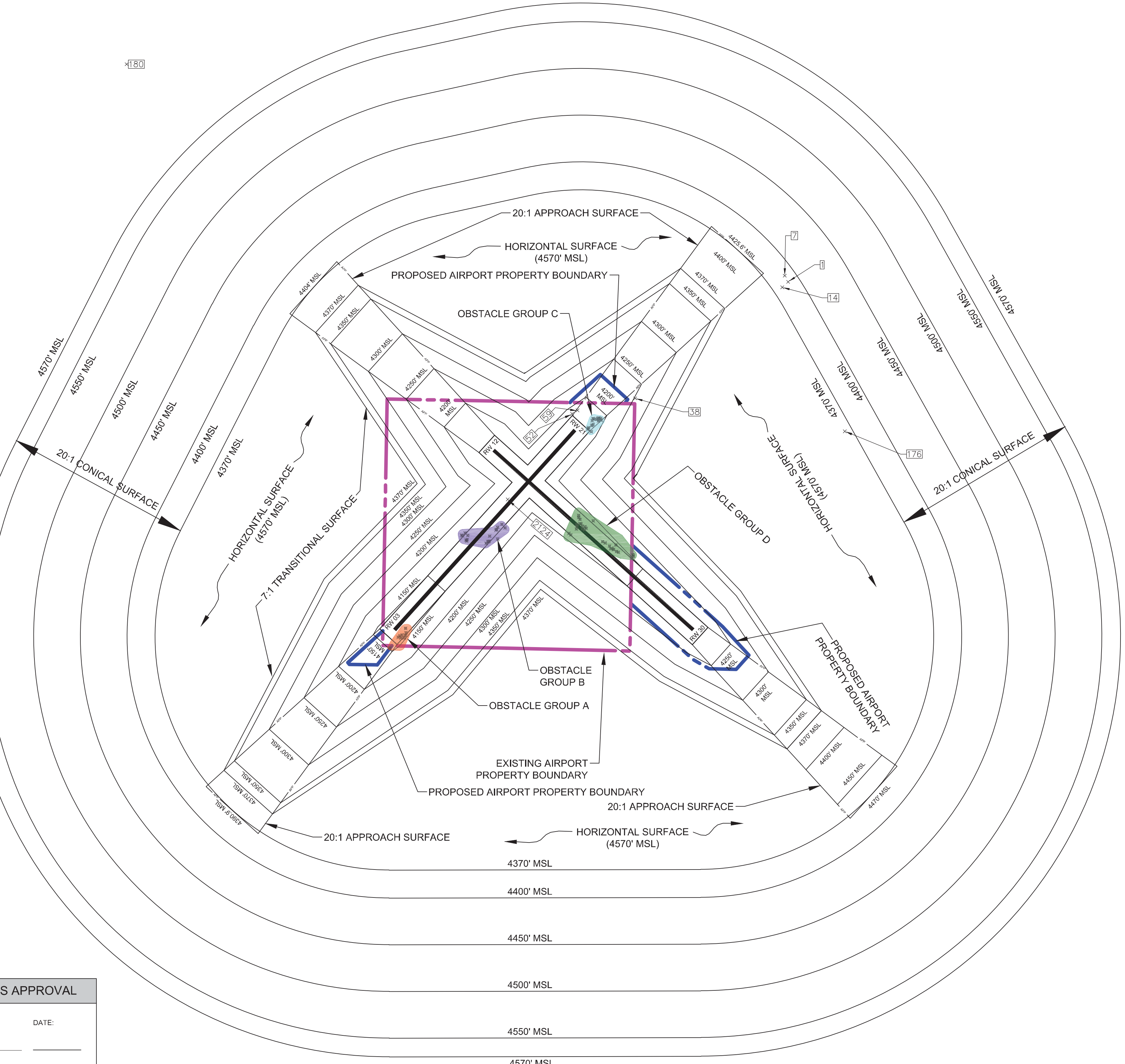
REVISIONS	BY	APPROVED	DATE

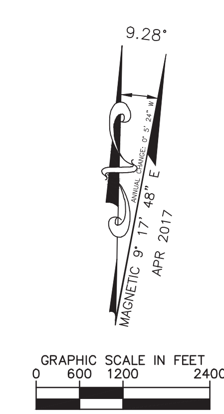
DOUGLAS MUNICIPAL AIRPORT
A COCHISE COUNTY AVIATION FACILITY - DOUGLAS, ARIZONA
AIRPORT LAYOUT PLAN DRAWINGS
EXISTING AIRSPACE DRAWING

SCALE: HOR. 1"=1000' VERT. N/A

SHEET 5 OF 10 SHEETS

AIRSPACE PLAN.dwg Monday, Jul. 03 2017 4:07pm





MAGNETIC DECLINATION SOURCE:
NATIONAL OCEANIC AND ATMOSPHERIC
ADMINISTRATION (NOAA), APRIL 2017

PART 77 OBSTRUCTION DATA

OID	Group	Description	Object Height [ft MSL]	Penetrated Surface	Penetration	Disposition	FAA STUDY/ID#
1		GROUND	4365.7	NONE	NONE	NO ACTION	
7		GROUND	4363.0	NONE	NONE	NO ACTION	
14		GROUND	4344.8	NONE	NONE	NO ACTION	
38		TOWER	4258.8	TRANSITIONAL	5.4	RK AND LIGHT	
52		BUSH	4183.5	TRANSITIONAL	3.2	REMOVE	
97	C	TREE	4195.0	APPROACH (RW 21)	3.4	REMOVE	
98	C	TREE	4201.9	APPROACH (RW 21)	11.0	REMOVE	
99	C	TREE	4192.8	APPROACH (RW 21)	3.3	REMOVE	
100	C	TREE	4196.5	APPROACH (RW 21)	4.9	REMOVE	
101	C	TREE	4193.6	APPROACH (RW 21)	0.8	REMOVE	
102	C	TREE	4192.9	APPROACH (RW 21)	3.2	REMOVE	
103	C	BUSH	4190.8	APPROACH (RW 21)	2.6	REMOVE	
104	C	BUSH	4189.7	APPROACH (RW 21)	1.9	REMOVE	
105	C	BUSH	4189.0	APPROACH (RW 21)	3.4	REMOVE	
106	C	BUSH	4193.8	APPROACH (RW 21)	0.3	REMOVE	
108	C	BUSH	4190.9	APPROACH (RW 21)	9.6	REMOVE	
109	C	BUSH	4190.0	APPROACH (RW 21)	7.9	REMOVE	
110	C	BUSH	4189.6	APPROACH (RW 21)	6.1	REMOVE	
111	C	BUSH	4189.0	APPROACH (RW 21)	11.5	REMOVE	
112	C	BUSH	4188.4	APPROACH (RW 21)	12.1	REMOVE	
113	C	BUSH	4188.6	APPROACH (RW 21)	13.0	REMOVE	
176		TOWER	4465	CONICAL	95.0		2011AWP08325OE
1910	B	TREE	4173.3890	TRANSITIONAL	4.3	REMOVE	
1915	B	TREE	4172.9350	PRIMARY	13.6	REMOVE	
1918	B	TREE	4172.9920	TRANSITIONAL	0.3	REMOVE	
1929	B	TREE	4172.8780	PRIMARY	13.2	REMOVE	
1940	B	TREE	4175.9450	PRIMARY	14.6	REMOVE	
1941	B	TREE	4176.5130	PRIMARY	15.0	REMOVE	
1942	B	TREE	4174.4690	PRIMARY	14.5	REMOVE	
1943	B	TREE	4173.5030	PRIMARY	13.6	REMOVE	
1944	B	TREE	4173.7870	PRIMARY	13.7	REMOVE	
1948	B	TREE	4177.0810	PRIMARY	15.4	REMOVE	
1949	B	TREE	4176.7410	PRIMARY	14.1	REMOVE	
1950	D	TREE	4195.1680	PRIMARY	12.1	REMOVE	
1951	D	TREE	4191.5750	PRIMARY	9.1	REMOVE	
1952	D	TREE	4194.3190	TRANSITIONAL	3.2	REMOVE	
1955	D	TREE	4194.3840	PRIMARY	13.7	REMOVE	
1956	D	TREE	4194.0580	PRIMARY	13.7	REMOVE	
1957	D	TREE	4194.9720	PRIMARY	13.8	REMOVE	
1958	D	TREE	4195.9520	PRIMARY	14.2	REMOVE	
1959	D	TREE	4196.1480	PRIMARY	14.2	REMOVE	
1960	D	TREE	4204.7050	PRIMARY	12.3	REMOVE	
1961	D	TREE	4204.6290	PRIMARY	11.7	REMOVE	
1962	D	TREE	4201.7700	PRIMARY	10.5	REMOVE	
1963	D	TREE	4201.1680	PRIMARY	10.2	REMOVE	
1964	D	TREE	4204.9310	PRIMARY	13.3	REMOVE	
1968	D	TREE	4201.5440	PRIMARY	10.1	REMOVE	
1970	D	TREE	4193.8620	PRIMARY	12.6	REMOVE	
1981	D	TREE	4194.3330	PRIMARY	11.4	REMOVE	
1982	D	TREE	4196.3470	PRIMARY	14.1	REMOVE	
1983	D	TREE	4196.2420	PRIMARY	12.7	REMOVE	
1984	D	TREE	4192.2290	PRIMARY	10.5	REMOVE	
1985	D	TREE	4194.9290	PRIMARY	11.5	REMOVE	
1989	D	TREE	4193.1350	PRIMARY	11.5	REMOVE	
1991	B	TREE	4162.1220	PRIMARY	0.1	REMOVE	
2024	A	TREE	4148.9330	APPROACH (RW 3)	0.1	REMOVE	
2034	B	TREE	4162.2940	PRIMARY	6.1	REMOVE	
2035	B	TREE	4162.4870	PRIMARY	6.8	REMOVE	
2037	B	TREE	4163.9610	TRANSITIONAL	5.3	REMOVE	
2038	B	TREE	4164.0660	TRANSITIONAL	5.4	REMOVE	
2042	B	TREE	4161.9560	PRIMARY	6.3	REMOVE	
2043	B	TREE	4162.0040	PRIMARY	6.2	REMOVE	
2085	A	TREE	4145.5470	PRIMARY	3.9	REMOVE	
2086	A	TREE	4145.7880	PRIMARY	3.9	REMOVE	
2087	A	TREE	4150.6160	PRIMARY	8.7	REMOVE	
2124		TREE	4172.2970	PRIMARY	9.7	REMOVE	
2139	A	TREE	4146.3670	PRIMARY	4.1	REMOVE	
2155	D	TREE	4215.7520	TRANSITIONAL	10.8	REMOVE	
2156	D	TREE	4211.3110	TRANSITIONAL	3.8	REMOVE	
2160	D	TREE	4200.3400	PRIMARY	11.2	REMOVE	
2161	D	TREE	4203.2000	PRIMARY	12.8	REMOVE	
2162	D	TREE	4201.9200	PRIMARY	13.5	REMOVE	
2164	D	TREE	4210.0920	PRIMARY	28.1	REMOVE	
2171	A	TREE	4147.4780	PRIMARY	4.4	REMOVE	
2172	A	TREE	4147.7190	PRIMARY	5.0	REMOVE	
2173	A	TREE	4146.2230	PRIMARY	1.0	REMOVE	
2174	A	TREE	4147.0920	PRIMARY	4.3	REMOVE	

OBSTACLE DATA FROM FAA DOF DATED 3.26.2017

CITY OF DOUGLAS APPROVAL

RECOMMENDED BY: DATE:

Lynn Kartchner
Airport Engineer

Luis Pedroza
Finance Director

CITY OF DOUGLAS
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REVISIONS	BY	APPROVED	DATE

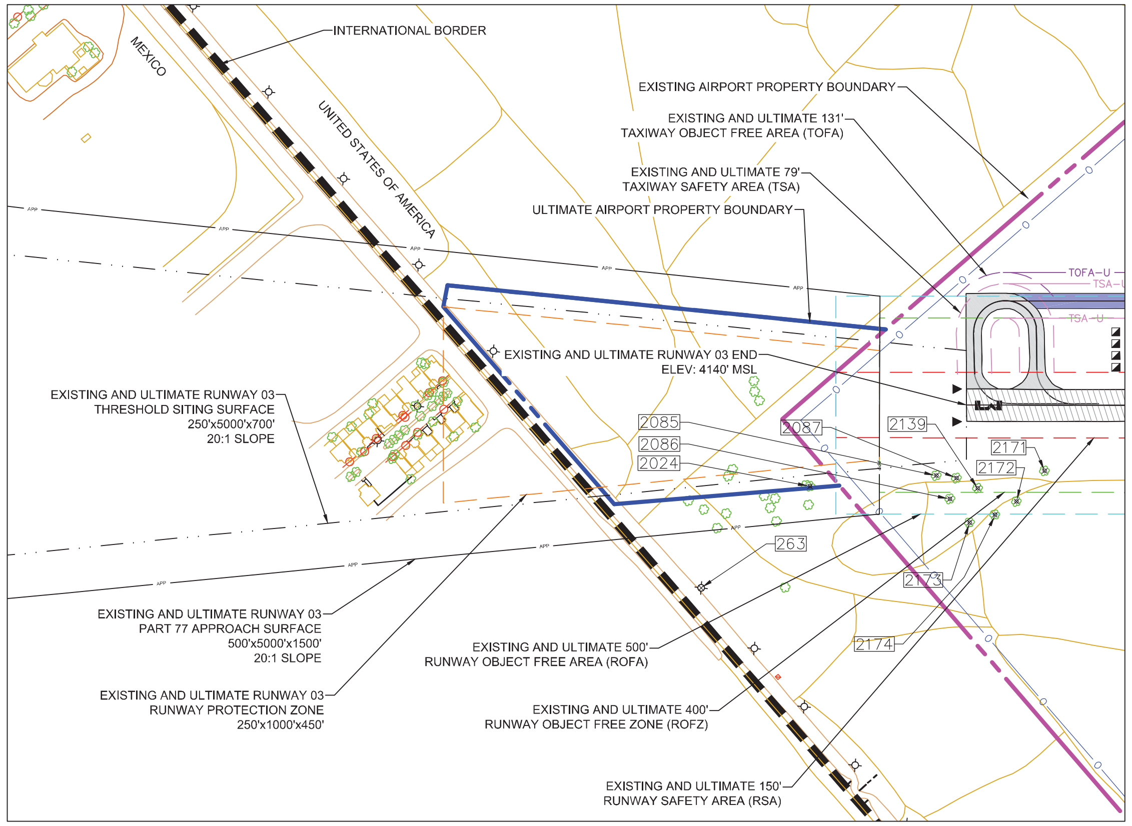
DOUGLAS MUNICIPAL AIRPORT
A COCHISE COUNTY AVIATION FACILITY - DOUGLAS, ARIZONA
AIRPORT LAYOUT PLAN DRAWINGS
ULTIMATE AIRSPACE DRAWING

SCALE: HOR. 1"=1200' VERT. N/A

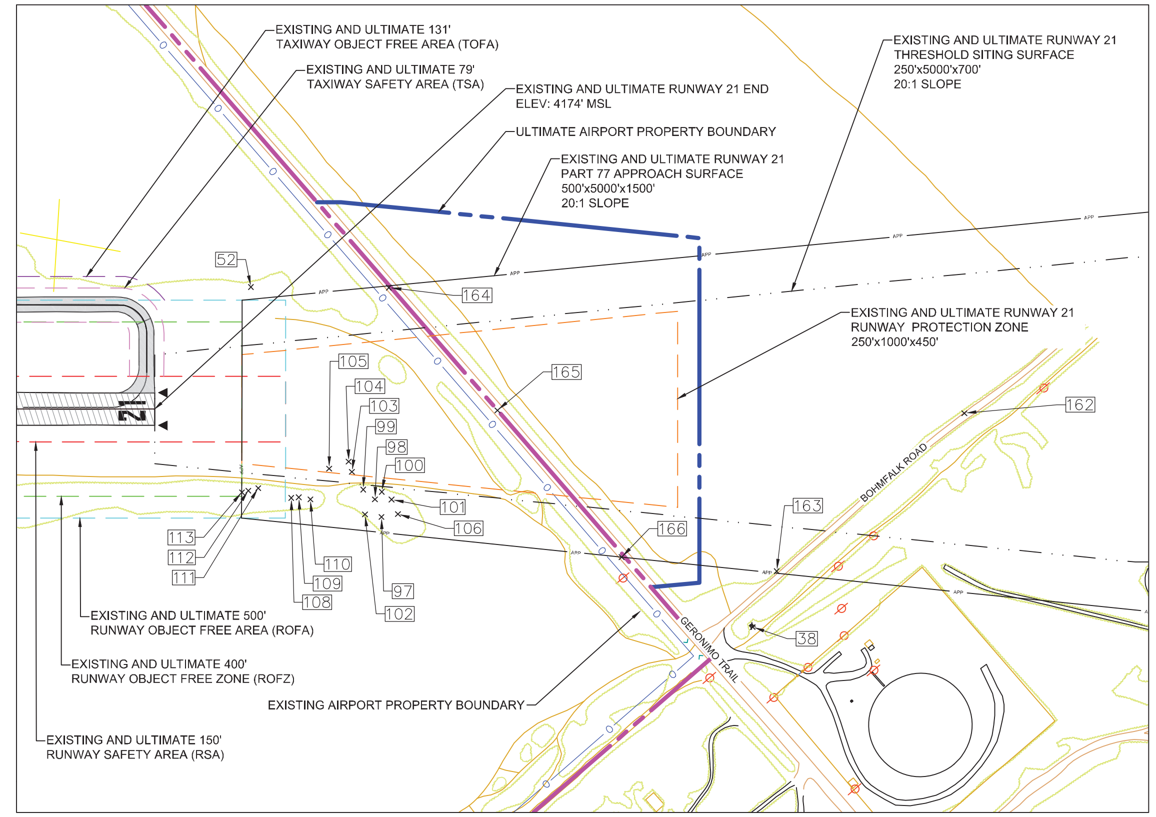
SHEET 6 OF 10 SHEETS

AIRSPACE PLAN.dwg Monday, Jul. 03 2017 4:07pm

RUNWAY 03

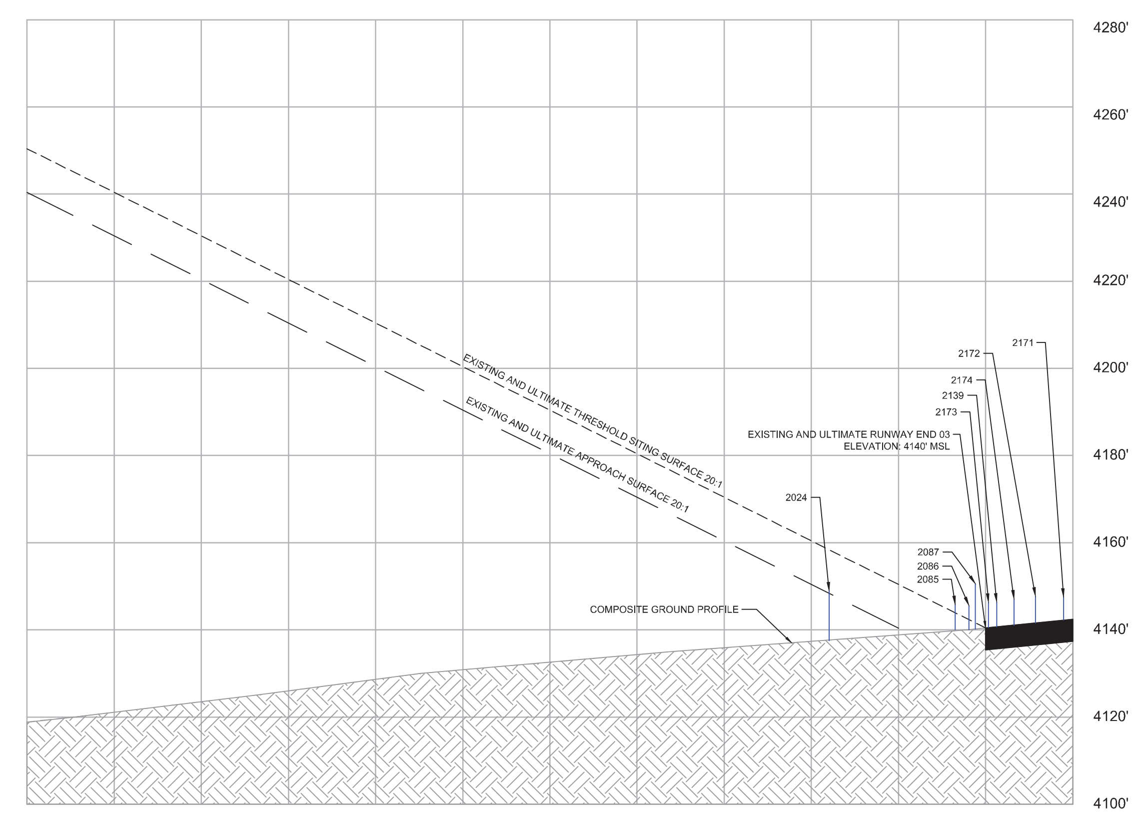


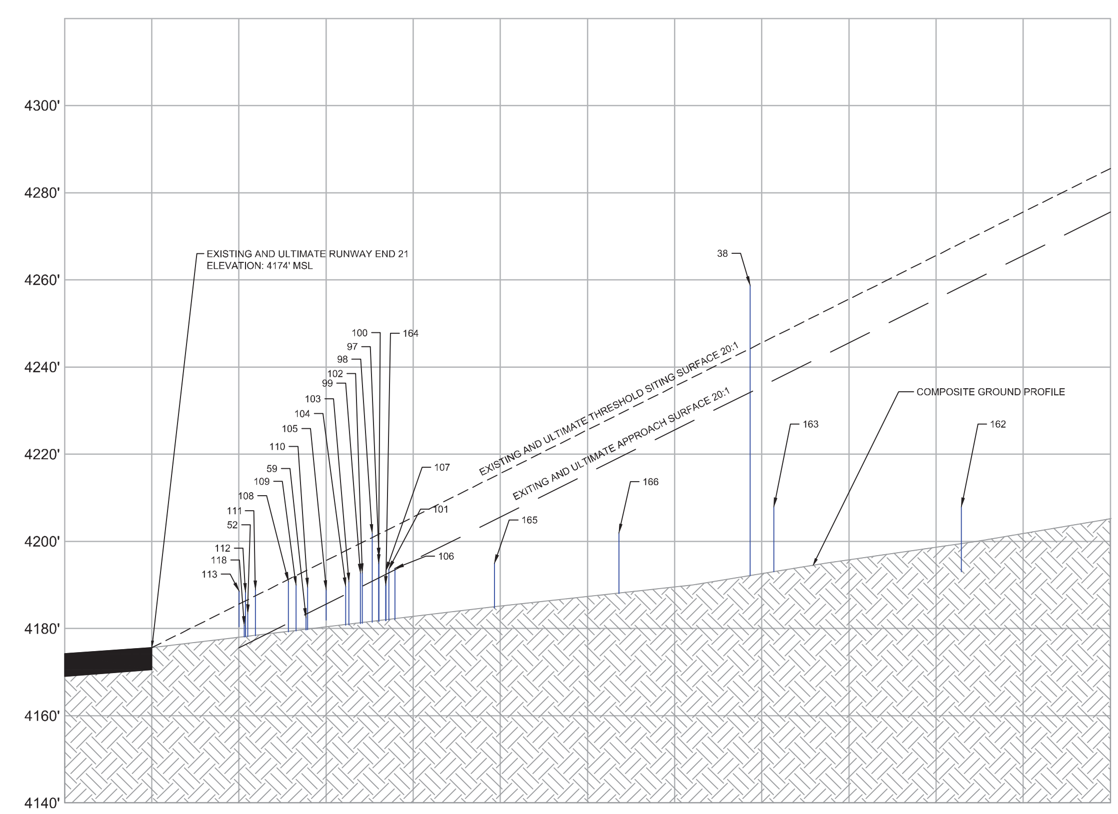
RUNWAY 21



LEGEND

Description	Existing	Ultimate
Airport Property Line		
Runway Obstacle Free Area (ROFA)		
Runway Obstacle Free Zone (ROFZ)		
Runway Safety Area (RSA)		
25' Building Restriction Line (BRL)		
Runway Protection Zone (RPZ)		
Runway Visibility Zone (RVZ)	N/A	RVZ
Part 77 Approach Surface	APP	APP
Threshold Siting Surface		
Taxiway Safety Area (TSA)		TSA-U
Taxiway Object Free Area (TOFA)		TOFA-U
Final Approach and Takeoff Area	N/A	FATO
Runway Pavements		
Airfield Pavements		
Buildings		
Segmented Circle		
Rotating Beacon		
Aircraft Tie-Downs		
Airport Reference Point		
PAPI		
REIL		
Fence		
Unpaved Path or Trail		N/A
Lightpole		N/A
Utility Pole		N/A
Tree		N/A
Brushline		N/A

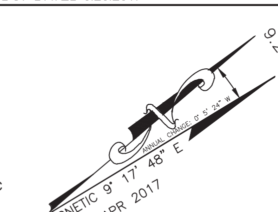




OBSTRUCTION DATA - INNER PORTION OF THE APPROACH						
OID	Description	Object Height [ft MSL]	Penetrated Surface	Penetration	Disposition	FAA STUDY/ID#
38	TOWER	4258.8	TRANSITIONAL	5.4	RK AND LIGHT	
97	TREE	4195.0	APPROACH (RW 21)	3.4	REMOVE	
98	TREE	4201.9	APPROACH (RW 21)	11.0	REMOVE	
99	TREE	4192.8	APPROACH (RW 21)	3.3	REMOVE	
100	TREE	4196.5	APPROACH (RW 21)	4.9	REMOVE	
101	TREE	4193.6	APPROACH (RW 21)	0.8	REMOVE	
102	TREE	4192.9	APPROACH (RW 21)	3.2	REMOVE	
103	BUSH	4190.8	APPROACH (RW 21)	2.6	REMOVE	
104	BUSH	4189.7	APPROACH (RW 21)	1.9	REMOVE	
105	BUSH	4189.0	APPROACH (RW 21)	3.4	REMOVE	
106	BUSH	4193.8	APPROACH (RW 21)	0.3	REMOVE	
108	BUSH	4190.9	APPROACH (RW 21)	9.6	REMOVE	
109	BUSH	4190.0	APPROACH (RW 21)	7.9	REMOVE	
110	BUSH	4189.6	APPROACH (RW 21)	6.1	REMOVE	
111	BUSH	4189.0	APPROACH (RW 21)	11.5	REMOVE	
112	BUSH	4188.4	APPROACH (RW 21)	12.1	REMOVE	
113	BUSH	4188.6	APPROACH (RW 21)	13.0	REMOVE	
162	BOHMFALK_ROAD	4205 (EST.)	NONE	NONE	NONE	
163	BOHMFALK_ROAD	4206 (EST.)	NONE	NONE	NONE	
164	GERONIMO_TRAIL	4207 (EST.)	NONE	NONE	NONE	
165	GERONIMO_TRAIL	4208 (EST.)	NONE	NONE	NONE	
166	GERONIMO_TRAIL	4209 (EST.)	NONE	NONE	NONE	
263	LIGHT_POLE	4182.8570	TRANSITIONAL	2.9		
2024	TREE	4148.9330	APPROACH (RW 3)	0.1	REMOVE	
2085	TREE	4145.5470	PRIMARY	3.9	REMOVE	
2086	TREE	4145.7880	PRIMARY	3.9	REMOVE	
2087	TREE	4150.6160	PRIMARY	8.7	REMOVE	
2139	TREE	4146.3670	PRIMARY	4.1	REMOVE	
2171	TREE	4147.4780	PRIMARY	4.4	REMOVE	
2172	TREE	4147.7190	PRIMARY	5.0	REMOVE	
2173	TREE	4146.2230	PRIMARY	1.0	REMOVE	
2174	TREE	4147.0920	PRIMARY	4.3	REMOVE	
OBSTACLE DATA FROM FAA DOF DATED 3.26.2017						

GRAPHIC SCALE IN FEET
0 100 200 400

MAGNETIC DECLINATION SOURCE:
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA), APRIL 2017



CITY OF DOUGLAS
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Mesa, AZ 85210
www.kimley-horn.com

REVISIONS	BY	APPROVED	DATE

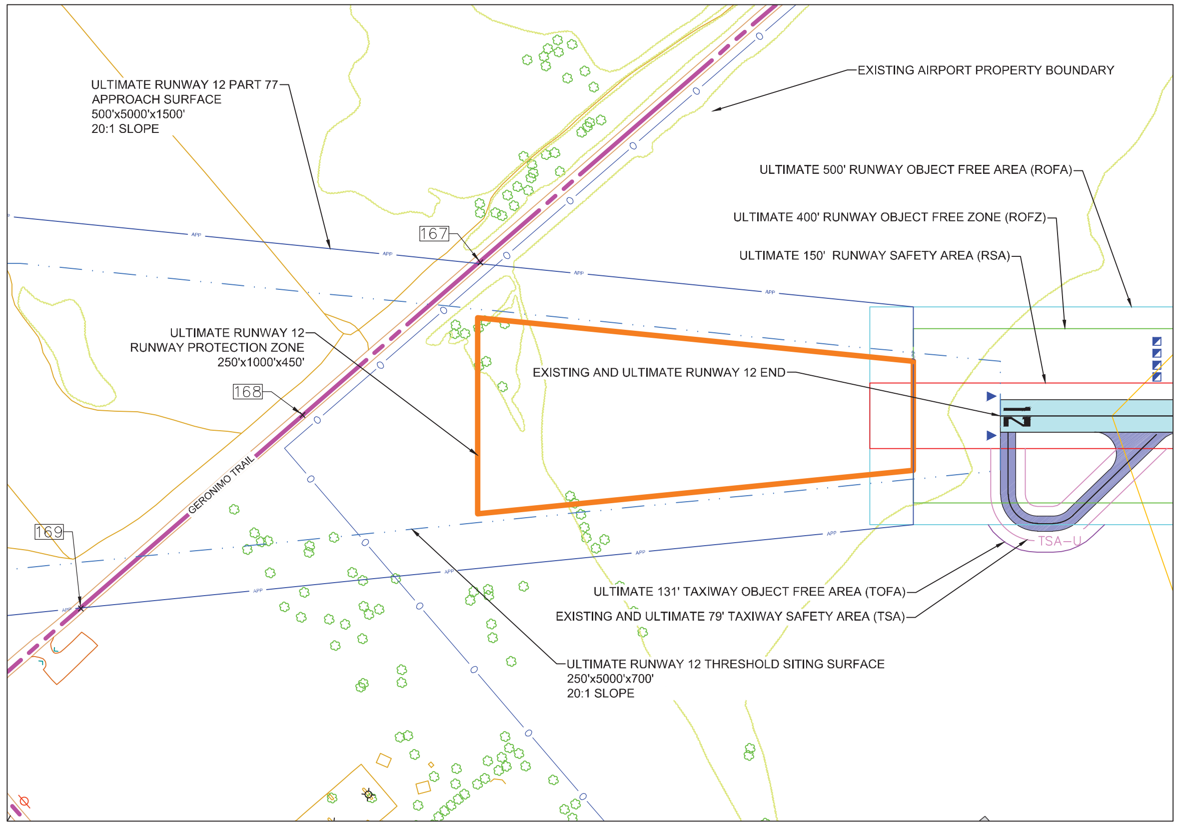
DOUGLAS MUNICIPAL AIRPORT
A COCHISE COUNTY AVIATION FACILITY - DOUGLAS, ARIZONA
AIRPORT LAYOUT PLAN DRAWINGS
INNER PORTION OF THE APPROACH - RW 03-21

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

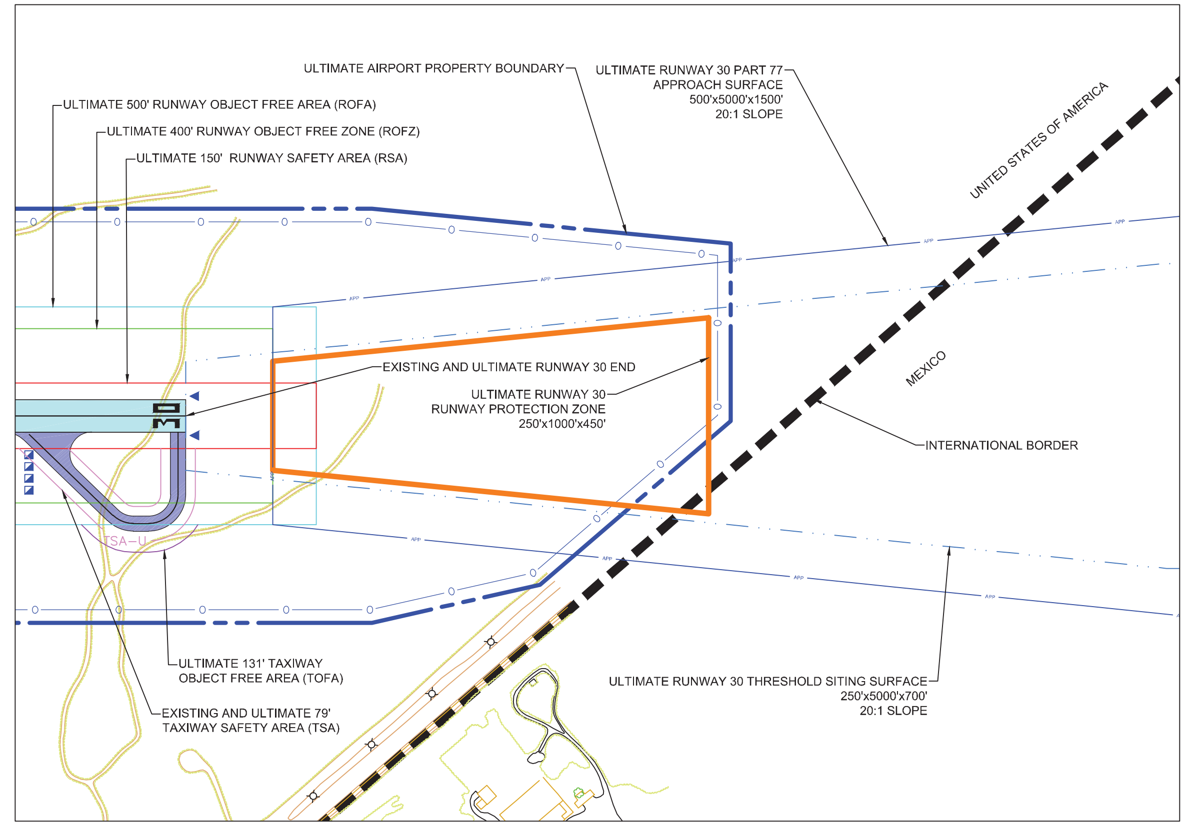
SHEET 7 OF 10 SHEETS

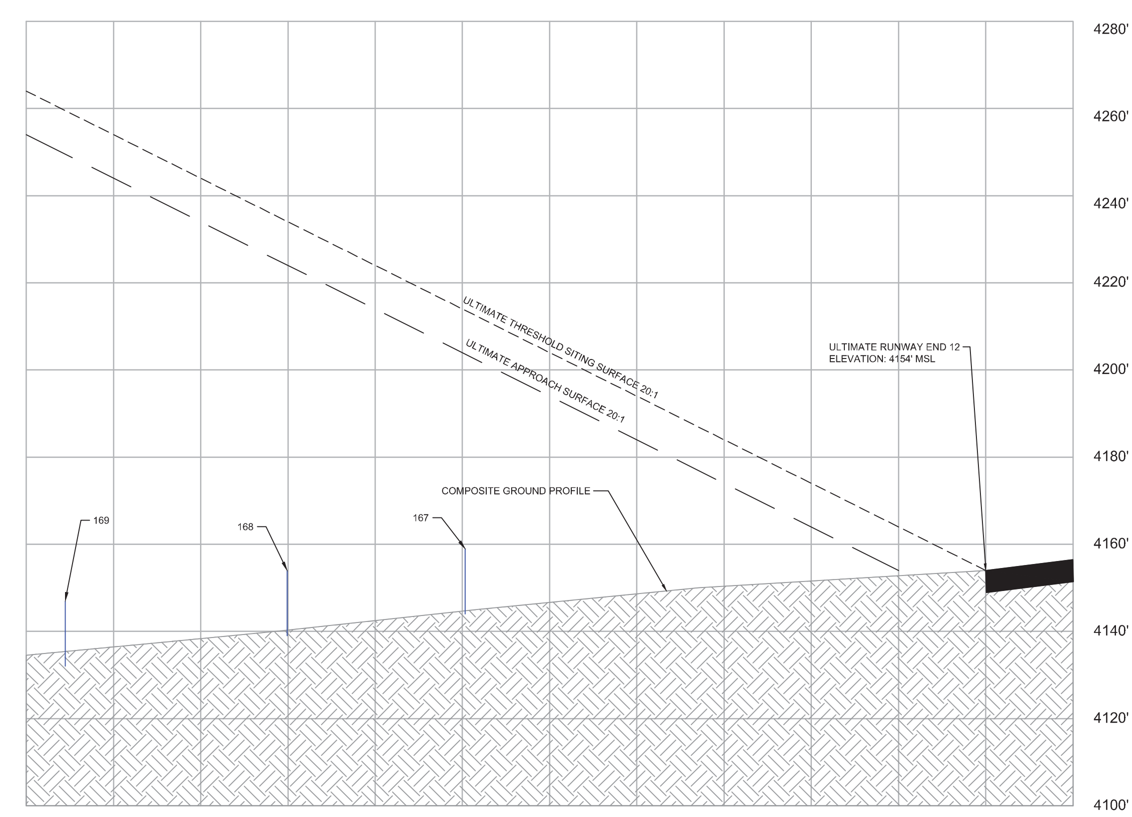
IPASD.dwg Monday, Jul. 03, 2017 4:08pm

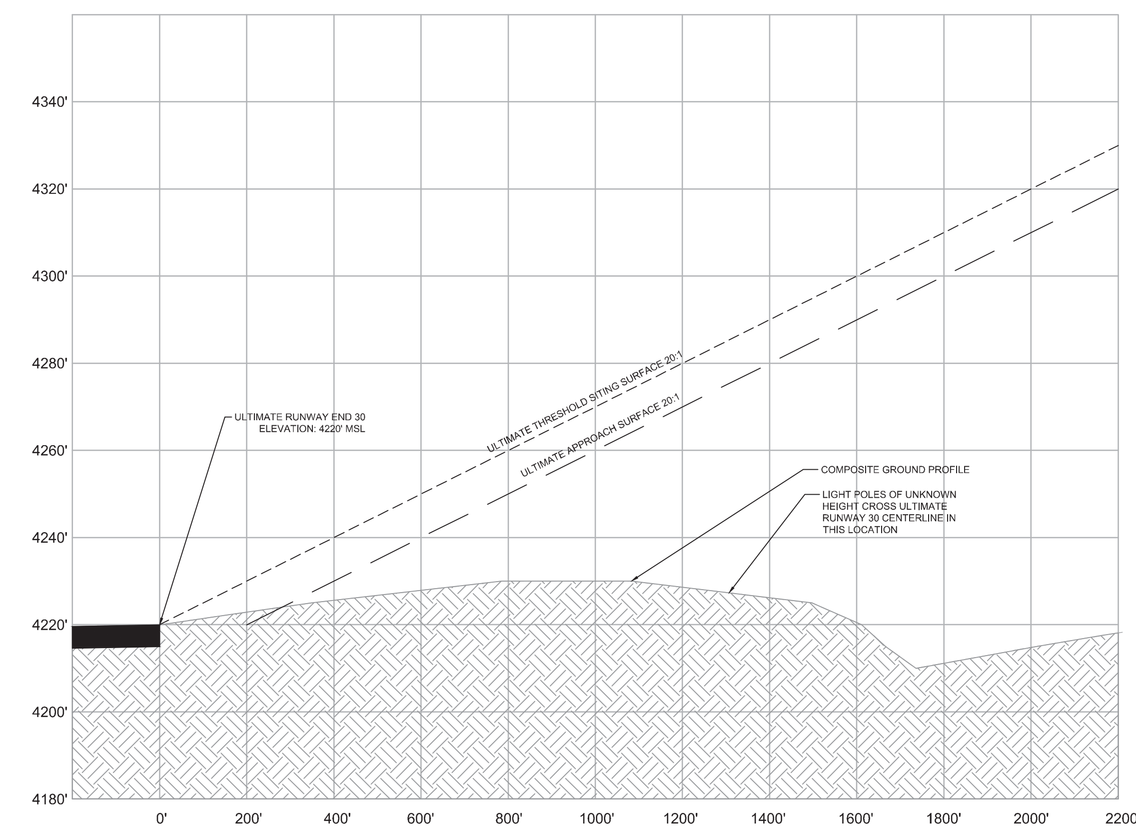
RUNWAY 12



RUNWAY 30







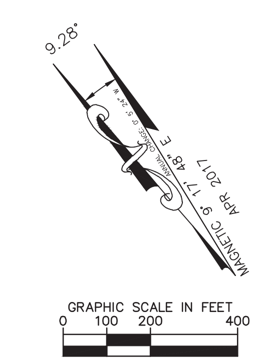
LEGEND

Description	Existing	Ultimate
Airport Property Line		
Runway Obstacle Free Area (ROFA)		
Runway Obstacle Free Zone (ROFZ)		
Runway Safety Area (RSA)		
25' Building Restriction Line (BRL)		
Runway Protection Zone (RPZ)		
Runway Visibility Zone (RVZ)	N/A	RVZ
Part 77 Approach Surface	APP	APP
Threshold Siting Surface		
Taxiway Safety Area (TSA)		TSA-U
Taxiway Object Free Area (TOFA)		TOFA-U
Final Approach and Takeoff Area	N/A	FATO
Runway Pavements		
Airfield Pavements		
Buildings		
Segmented Circle		
Rotating Beacon		
Aircraft Tie-Downs		
Airport Reference Point		
PAPI		
REIL		
Fence		
Unpaved Path or Trail		N/A
Lightpole		N/A
Utility Pole		N/A
Tree		N/A
Brushline		N/A

OBSTRUCTION DATA - INNER PORTION OF THE APPROACH

OID	Description	Object Height [ft MSL]	Penetrated Surface	Penetration	Disposition	FAA STUDY/ID#
167	GERONIMO_TRAIL	4210 (EST.)	NONE	NONE		
168	GERONIMO_TRAIL	4211 (EST.)	NONE	NONE		
169	GERONIMO_TRAIL	4212 (EST.)	NONE	NONE		

OBSTACLE DATA FROM FAA DOF DATED 3.26.2017



MAGNETIC DECLINATION SOURCE:
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA), APRIL 2017

CITY OF DOUGLAS
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REVISIONS	BY	APPROVED	DATE

DOUGLAS MUNICIPAL AIRPORT
A COCHISE COUNTY AVIATION FACILITY - DOUGLAS, ARIZONA
AIRPORT LAYOUT PLAN DRAWINGS
INNER PORTION OF THE APPROACH - RW 12-30

SCALE: HOR. 1"=200' VERT. 1"=20'
SHEET 8 OF 10 SHEETS

IPASD.dwg Monday, Jul. 03 2017 4:08pm

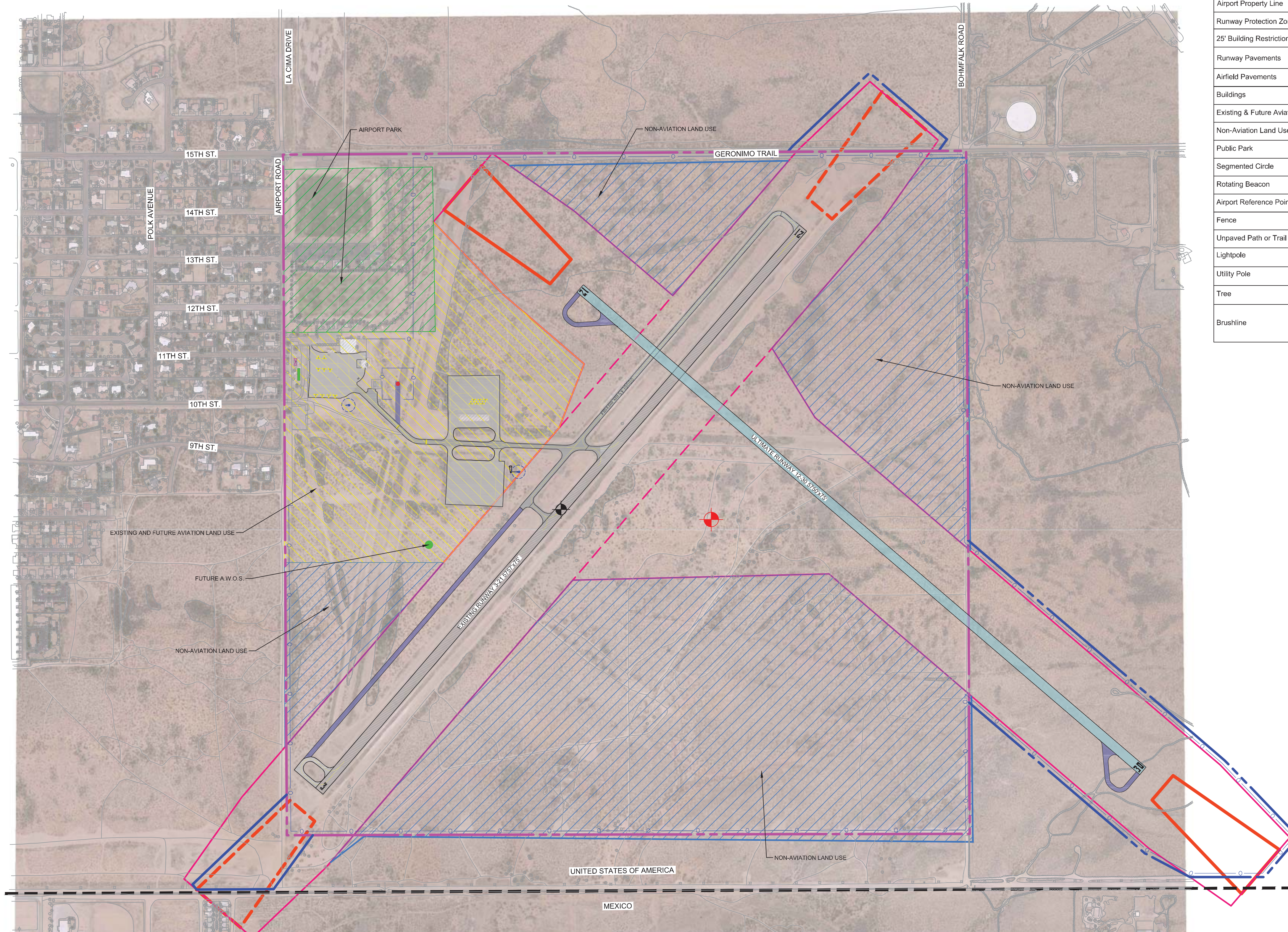
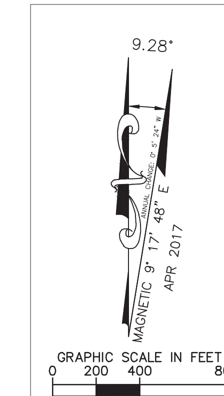


IMAGE SOURCE: QUANTUM SPATIAL, COMPILED BY PHOTOGRAMMETRIC METHODS FROM AERIAL POTOGRAPHY DATED 5-11-2016

LEGEND - AIRPORT LAND USE MAP

Description	Existing	Ultimate
Airport Property Line		
Runway Protection Zone (RPZ)		
25' Building Restriction Line (BRL)		
Runway Pavements		
Airfield Pavements		
Buildings		
Existing & Future Aviation Land Use		
Non-Aviation Land Use		
Public Park		
Segmented Circle		
Rotating Beacon		
Airport Reference Point		
Fence		
Unpaved Path or Trail		N/A
Lightpole		N/A
Utility Pole		N/A
Tree		N/A
Brushline		N/A



MAGNETIC DECLINATION SOURCE:
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA), APRIL 2017

CITY OF DOUGLAS
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REVISIONS	BY	APPROVED	DATE

DOUGLAS MUNICIPAL AIRPORT
A COCHISE COUNTY AVIATION FACILITY - DOUGLAS, ARIZONA
AIRPORT LAYOUT PLAN DRAWINGS
AIRPORT LAND USE MAP

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

SHEET 9 OF 10 SHEETS

LAND USE MAP.dwg Monday, Jul. 03 2017 4:10pm

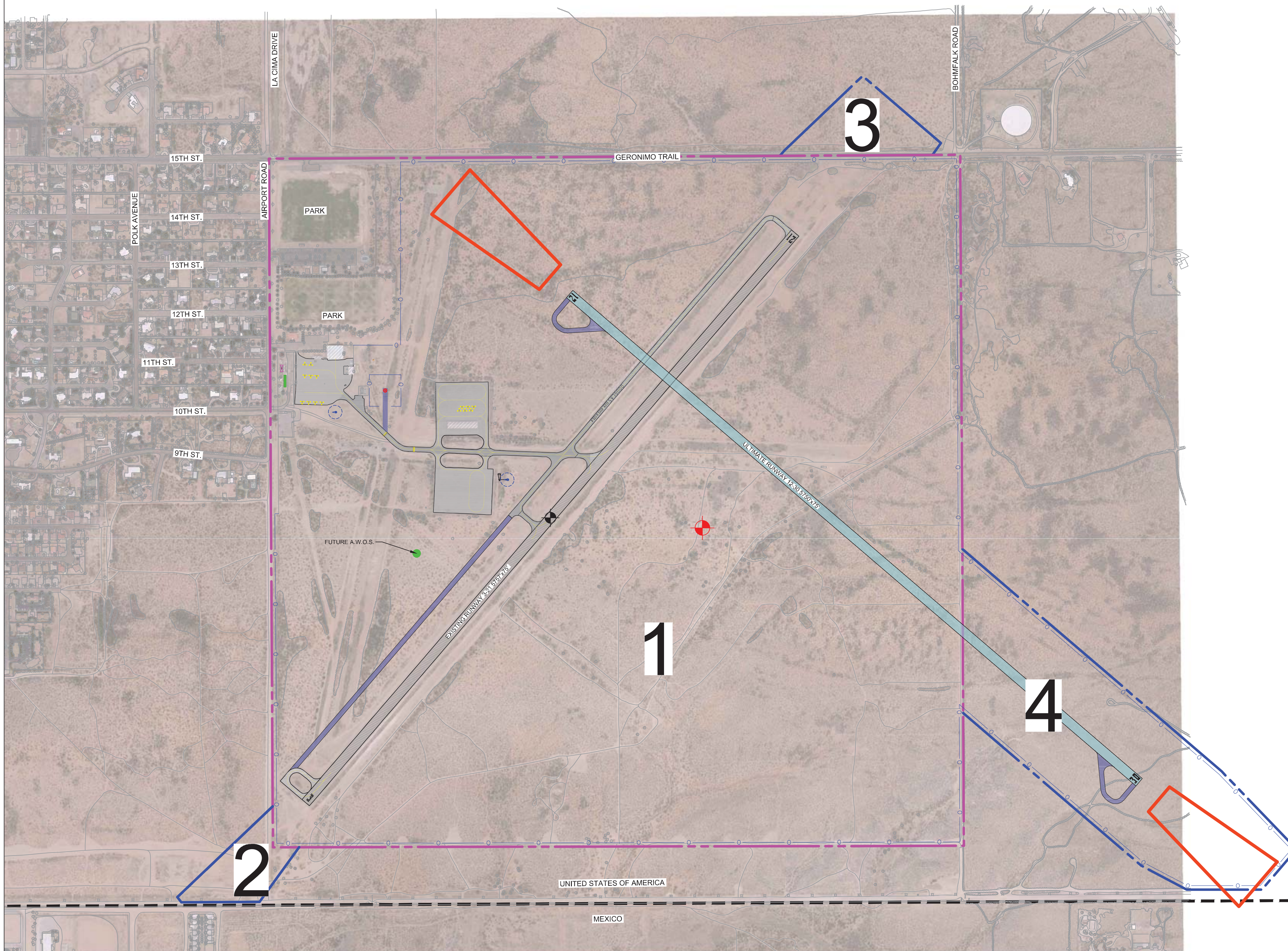
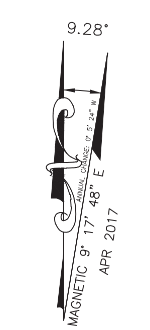


IMAGE SOURCE: QUANTUM SPATIAL, COMPILED BY PHOTOGRAMMETRIC METHODS FROM AERIAL POTOGRAPHY DATED 5-11-2016

LEGEND - AIRPORT LAND USE MAP		
Description	Existing	Ultimate
Airport Property Line		
Runway Protection Zone (RPZ)		
25' Building Restriction Line (BRL)		
Runway Pavements		
Airfield Pavements		
Buildings		
Existing & Future Aviation Land Use		
Non-Aviation Land Use		
Public Park		

EXISTING AIRPORT PROPERTY					
MAP NUMBER	DATE OF ACQUISITION	GRANTOR	TYPE OF ACQUISITION	ACREAGE	TAX PARCEL NUMBER
1				643.2	410-01-005

EXISTING AIRPORT PROPERTY					
MAP NUMBER	DATE OF ACQUISITION	GRANTOR	TYPE OF ACQUISITION	ACREAGE	TAX PARCEL NUMBER
2	FUTURE		FEE ACQUISITION	9.2	
3	FUTURE		AVIGATION EASEMENT	11.0	
4	FUTURE		FEE ACQUISITION	62.2	



GRAPHIC SCALE IN FEET
0 200 400 800

MAGNETIC DECLINATION SOURCE:
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA), APRIL 2017

PROPERTY MAP.dwg Monday, Jul. 03 2017 4:10pm

CITY OF DOUGLAS
425 E. 10TH ST, DOUGLAS, TOMBSTONE, AZ, 85607

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REVISIONS	BY	APPROVED	DATE

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

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

SHEET 10 OF 10 SHEETS