Chapter 2: Runways & Taxiways

Introduction

This Chapter of the Airport Plan is focused on the Runway and Taxiway system at the airport which is commonly referred to as the airfield where aircraft takeoff, land and maneuver on the ground. Please note that Chapter 3: Terminal Area and Support Facilities will look at the apron, hangars and other facilities supporting the airport. These two chapters will address existing and future facility needs at Riddick Field (UO5).

This chapter analyzes various components of the runway and taxiways at U05. It will review current conditions and any deficiencies that do not meet FAA design standards. It will consider the future critical design aircraft and provide facility requirements to accommodate these aircraft through the planning period. The chapter will further present the alternatives that were considered to meet future needs and the preferred airfield alternative that was chosen. Included in this chapter will be the following elements:

- Meteorological Information
- Runway 16-34
- Taxiways
- Evaluation Process
- Alternatives
- Preferred Alternative

Critical Design Aircraft

As stated in Chapter 1, the critical design aircraft is an aircraft approach category (AAC) A/B, airplane design group (ADG) I Small, and taxiway design group (TDG) 2. The future and ultimate design aircraft fleet mix are determined to be A/B-I, TDG 2. This helps determine the needs and runway and taxiway system. Note that aircraft larger than ADG-I may occasionally use the airport and it is recommended some areas within the taxiway and apron area accommodate the safe maneuvering of ADG-II aircraft. The existing design airplane characteristics for the runway is described in **Table 2-1 – Critical Design Aircraft Summary**.

Table 2-1 – Critical Design Aircraft Summary

Design Characteristics	Existing	Future
Aircraft Make/Model	Various	Various
Airplane Approach Category	B	B
Airplane Design Group	I	I
Taxiway Design Group	2	2
Wingspan	Up to 49'0"	Up to 49' 0"
Length	46' 0"	46' 0"
Height	Up to 20' 0"	Up to 20' 0"
Main Gear Width	20' 0"	20' 0"
Maximum Takeoff Weight	12,500 pounds	12,500 pounds
Landing Gear Configuration	Dual Wheel	Dual Wheel

Source: KLJ Analysis

Meteorological Information

The runway discussion must start with meteorological information. For safety and to maximize performance capabilities, aircraft need to takeoff and land into the wind. In addition, aircraft must often operate in poor weather conditions to deliver passengers and cargo.   For these reasons, weather needs to be addressed early in the discussions.

Weather Reporting

There are two types of weather reporting systems that are certificated for use on an airport. The Automated Surface Observing System (ASOS) and the Automated Weather Observation System (AWOS). The ASOS program was a joint effort between the Federal Aviation Administration and the National Weather Service (NWS). ASOS is maintained by the NWS and serves as a primary climatological observing network in the United States with equipment that provides weather observations every minute. The AWOS is a second-tier system which is maintained locally or by states and contains varying sets of instrumentation packages to provide local weather observations. Riddick Field does not have a weather station on the airfield. Bowman Field Airport, which is 21 nautical miles to the southeast, has the nearest AWOS station. **Table 2-2 – Nearest ASOS/AWOS Stations** has details of weather stations near Riddick Field. **It is recommended an AWOS-III be installed at U05 in the future to provide pilots using the airfield with real time wind and meteorological conditions.** This would be especially useful if instrument approach procedures were established at the airport as conditions during inclement weather can vary considerably in mountainous terrain

Table 2-2 – Nearest ASOS/AWOS Stations

Airport Name	Airport Identifier	City	Distance from U05	Weather Reporting System
Riddick Field	U05	Philipsburg	--	None
Philipsburg Ranger Station	PHGM8	Philipsburg	1 nm SE	RAWS*
Bowman Field	3U3	Anaconda	21 nm SE	AWOS
Deer Lodge-City-County	38S	Deer Lodge	23 nm E	AWOS
Bert Mooney	BTM	Butte	40 nm SE	ASOS

*Source: Airnav.com, KLJ Analysis *RAWS – Remote Automated Weather Station run by USFS*

Wind coverage and weather conditions are evaluated based on the two different flight rules, visual flight rules (VFR) and instrument flight rules (IFR). Visual Meteorological Conditions (VMC) are encountered when the visibility is 3 nautical miles or greater, and the cloud ceiling height is 1,000 feet or greater. Conditions less than these weather minimums are considered Instrument Meteorological Conditions (IMC) requiring all flights to be operated under IFR. To evaluate wind coverage at U05, the Bert Mooney Airport (BTM) was used to determine wind coverage for IMC conditions, while the Philipsburg Ranger Station (PHGM8) was used to determine wind coverage for all-weather conditions. The reason these were separated out was due to the visibility and cloud ceiling sensors available at BTM to determine IMC conditions.

Meteorological conditions that affect the facility requirements of an airport include but are not limited to wind direction, wind speed, cloud ceiling, visibility, and temperature. Hourly metrological data was reviewed from the BTM ASOS through the National Climatic Data Center (NCDC) while PHGM8 was collected from Utah's MesoWest. Periodic "special" weather observations within each hour were removed. This method provides and considers the true average weather trends at an airport without skewing conditions toward IFR where multiple observations may be taken each hour due to changing conditions.

In addition to wind, temperature affects runway length required. From weather reports, the average maximum temperature at U05 in the hottest month has been 80.3 degrees Fahrenheit (August).

WIND COVERAGE

Wind coverage is important to airfield configuration and utilization. Aircraft ideally takeoff and land into a headwind aligned with the runway orientation. Aircraft are designed and pilots are trained to land aircraft in limited crosswind conditions. Small, light aircraft are most affected by crosswinds. To mitigate the effect of crosswinds, FAA recommends runways be aligned so that excessive crosswind conditions are encountered at most 5 percent of the time. This is known as a “95 percent wind coverage” standard.

Small Aircraft Crosswind Landing Diagram (faasafety.gov)

For planning purposes, FAA has defined the maximum direct crosswind for small aircraft as 12 miles per hour (10.5 knots). For increasingly larger aircraft, a 15-mile per hour (13 knot) direct crosswind is used up through 23-mile per hour (20 knots) for the largest aircraft. The FAA recommends that primary runways accommodate at least 95 percent of local wind conditions; when this level of coverage is not provided, the FAA recommends development of a secondary (crosswind) runway.

Even when the 95 percent wind coverage standard is achieved for the design airplane or airplane design group, cases arise where certain airplanes with lower crosswind capabilities are unable to utilize the primary runway. The maximum crosswind component for different aircraft sizes and speeds are shown in**Table 2-3 – FAA Wind Coverage Standards**.

Table 2-3 – FAA Wind Coverage Standards

AAC-ADG	Maximum Crosswind Component
A-I & B-I	10.5 knots
A-II & B-II	13.0 knots

Source: FAA AC 150/5300-13A – Change 1, Airport Design

Prevailing winds in the area, reported from the Philipsburg Ranger Station, are from the south and southeast and are generally calm or light winds. **Table 2-4 – All-Weather Wind Coverage** provides the calculated all-weather wind coverage for Riddick Field using the Philipsburg Ranger Station data. From the information, Runway 16-34 meets the 95 percent requirement for the design aircraft along with the 10.5 knot crosswind component to accommodate A/B-I design aircraft.

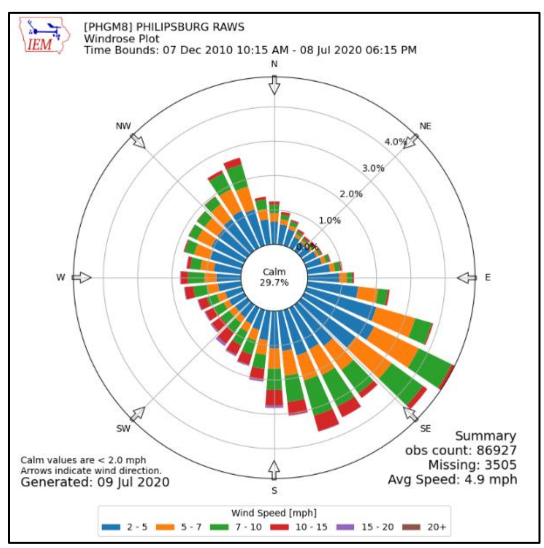


Table 2-4 – All-Weather Wind Coverage

Runway	AAC-ADG	Crosswind Component (Wind Speed)		
		10.5 knots	13.0 knots	16.0 knots
Runway 16-34	A-I	99.34%	99.88%	-

Source: PHGM8 RAWS (2010-2019, HOURLY) from Utah MesoWest, 87,373 total observations

Wind coverage during IMC is evaluated to determine the ideal alignment for runways used during instrument operations. As shown in **Table 2-5 – IMC Wind Coverage**, the wind data from Bert Mooney Airport was applied to the runway alignment at U05 and the 95 percent wind coverage requirement is met along with the 10.5 knot crosswind component to accommodate A/B-I design aircraft.

Table 2-5 – IMC Wind Coverage

Runway	AAC-ADG	Crosswind Component (Wind Speed)		
		10.5 knots	13.0 knots	16.0 knots
Runway 16-34	A-I	97.59%	98.67%	-

Source: BUTTE ASOS (2010-2019, HOURLY) from National Climatic Data Center, 2,775 Total Observations

Based on true hourly weather data summarized in **Table 2-6** – , the airport experiences conditions below the visual weather minimums only 3.20 percent of the time. Without an instrument approach there are approximately 280 hours a year when the airport is not accessible.

Table 2-6 – Existing Airport Utility

Weather Condition	Percentage	Days per Year	Hours per Year
VMC	96.80%	353.3	8,480
Usable IMC	0.00%	0.0	0
Usability	**96.80%**	**353.3**	**8,480**
Below Weather Minimums	3.20%	11.7	280
Total	***100.0%***	*365.0*	***8,760***

Source: BUTTE ASOS (2010-2019, HOURLY) from National Climatic Data Center, 83,999 Total Observations

However, due to the surrounding mountains and the airport's setting in a bowl-shaped valley, aircraft transitioning to the airport from outside the valley will usually need to be higher than the weather minimums for VFR flight. Marginal Visual Flight Rules (MVFR) falls under VMC but is further defined as conditions where the cloud ceiling is between 1,000 feet and 3,000 feet and visibility is between 3 and 5 statute miles. During MVFR conditions aircraft traveling to and from the U05 outside the valley would likely require an instrument approach to transition over the mountain ridge and into the valley. **Table 2-7 – Meteorological Analysis** identifies that MVFR conditions exist 4.67 percent of the time and there is an additional 17.1 days per year where the airport is likely inaccessible to transient aircraft.

Table 2-7 – Meteorological Analysis

Weather Condition	Percentage	Days per Year	Hours per Year
Greater Than MVFR	92.13%	336.3	8,070
MVFR	4.67%	17.1	409
VMC	96.80%	353.3	8,480
IMC	3.20%	11.7	280

Source: BUTTE ASOS (2010-2019, HOURLY) from National Climatic Data Center, 83,999 Total Observations
Note: MVFR occurs when visibility is 3-5 miles and ceiling is 1,000-3,000 feet

An Instrument approach procedure into Riddick Field would not only allow aircraft to operate out of the airport at weather minimums below VMC but would also allow many transient aircraft to access the facility during the MVFR conditions described above. Using the GPS at Deer Lodge with 800-foot ceilings and 1-mile visibility as an example, **Table 2-8** summarizes the accessibility in MVFR and IMC if U05 were to establish an instrument approach.

Table 2-8 – Proposed Airport Utility – Runway 16 Approach

Weather Condition	Percentage	Days per Year	Hours per Year
Greater than MVFR	92.13%	336.3	8,070
Usable MVFR & IMC	5.52%	20.1	484
Usability	**97.65%**	**356.4**	**8,554**
Below Weather Minimums	2.35%	8.6	206
Total	**100.00%**	**365.0**	**8,760**

Source: BUTTE ASOS (2010-2019, HOURLY) from National Climatic Data Center, 83,999 Total Observations, www.airnav.com
Note: Proposed approach to Runway 16 based on Deer Lodge RNAV(GPS) 800' and 1-Mile

Runway 16-34

There is currently only one runway at U05, Runway 16-34. Runway 16-34 sits south of the town of Philipsburg to the east of Montana Highway 1. The runway is 3,600 feet long and 60 feet wide. There are no published approaches for either end of the runway and the runway has visual pavement markings. Runway facilities are summarized in **Table 2-9** and the different components will be discussed later in the chapter.

Table 2-9 – Runway Facility Summary

Component	Runway 16-34
Runway Length (feet)	3,600
Runway Width (feet)	60
Runway Surface Material	Asphalt
Runway Surface Treatment	None
Single Wheel Pavement Strength	7,000 Lbs.
Runway Design Code	A/B-I

Source: Airnav.com, KLJ Analysis

RUNWAY DESIGN CODE (RDC)

The design aircraft and instrument approach minimums drive the RDC designation for each runway. The RDC for Runway 16-34 is A/B-I-VIS, indicating the runway is designed to meet the FAA's A/B-I standards with only visual approaches. See **Appendix B: General Aviation Airports 101** for additional information on RDCs.

As discussed in the Critical Design Aircraft section of Chapter 1, the design aircraft for the airfield, based on demand, could be the larger B-II and C-II aircraft. However, due to site limitations the design standards associated with A/B-I(Small) with a non-precision approach is the only one that can reasonably be accommodated. **It is recommended that the Future RDC for Runway 16-34 is A/B-I(Small)-5000.**

DESIGN STANDARDS

Basic Safety Standards

One primary purpose of this plan is to review and achieve compliance with all FAA safety and design standards. The design standards vary based on the RDC and runway reference code (RRC) as established by the design aircraft. Some of the safety standards include:

- Runway Safety Area (RSA)
- Runway Object Free Area (ROFA)
- Runway Obstacle Free Zone (ROFZ)

Other basic design standards include runway width, runway surface gradient, runway shoulder width, blast pad, and required separation distances to markings, objects, and other infrastructure for safety. Critical areas associated with navigational aids as well as airspace requirements are described further in this chapter. More information on RSA, ROFZ and ROFZ can be found in **Appendix B: General Aviation Airports 101**. The existing RSA, ROFA and ROFZ standards for the runway meet existing airport design standards. The basic safety standards dimensional requirements for Runway 16-34 are summarized in **Table 2-10**.

Table 2-10 – Runway Safety Design Standards

Standard	Dimension
Runway Safety Area (RSA)	4,080 feet x 120 feet
Runway Object Free Area (ROFA)	4,080 feet x 250 feet
Runway Obstacle Free Zone (ROFZ)	4,000 feet x 250 feet

Source: KLJ Analysis

Runway Protection Zone

The Runway Protection Zone (RPZ) is a trapezoidal surface prior to the landing threshold and beyond the runway end. The RPZ's function is to enhance the protection of people and property on the ground. The RPZ size varies based on the runway's RDC.

Airport owners should, at a minimum, maintain the RPZ clear of all incompatible activities, such as residential structures, areas of public assembly, and roads. Protection of the RPZ is achieved through airport control over RPZs including fee title ownership or clear zone easement.

There are currently roadways in the RPZs on the Runway 16 and 34 ends but no other incompatible uses. According to current FAA policy, these existing uses can continue if there is no change in the threshold of the runway or a change in the size of the RPZ.

RUNWAY LENGTH

Runway 16-34 has a length of 3,600 feet. FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design* was the current FAA guidance for determining runway lengths at airports. A detailed analysis of the runway length required at Riddick Field is in **Appendix D: Runway Length Evaluation**.

Small Airplanes Up to 12,500 Pounds

The FAA design approach to determine recommended runway length in small aircraft is identified in Chapter 2 of FAA AC 150/5325-4B. The method requires several steps to be performed including identifying percentage of fleet and using airport data to calculate runway length based on curves. Calculations for U05 are identified in **Table 2-11**. The current runway length of 3,600 feet does not meet the FAAs recommend length for small aircraft less than 12,500 lbs. The existing airport site will have significant limitations to meet the recommend length of 6,150 feet**. It is recommended the airport plan to achieve the maximum available runway length possible for the Future and Ultimate conditions.** If achievable, 4,700 feet would meet the runway length needs of the Beechcraft King Air 200 which is a common air medical aircraft.

Table 2-11 – FAA AC 150/5345-4B Runway Length Requirements (< 12,500 lbs.)

Airport and Runway Data	
Airport Elevation	5,212 feet
Mean Daily Maximum Temperature of Hottest Month	80.3°F
Aircraft Classification	**Recommended Runway Length**
Small Airplanes 12,500 Pounds or less	
10 or more passenger seats	6,300 feet
Less than 10 passenger seats at 95 percent of fleet	6,150 feet
Individual Aircraft – 12,500 pounds or less	
Pilatus PC-12 – Accelerate Stop Distance – Flaps 15°	4,020 feet
Pilatus PC-12 – Accelerate Stop Distance – Flaps 30°	3,550 feet
Beechcraft King Air 200 – Accelerate Stop Distance – No Flaps	4,700 feet
Beechcraft King Air 200 – Accelerate Stop Distance – Flaps	4,640 feet

Source: FAA AC 150/5325-4B, KLJ Analysis
Note: Runway length requirements estimated based on charts for airport planning purposes only.

RUNWAY WIDTH

Runway width is driven by the RDC and approach visibility minimums for each runway as identified in FAA AC 150/5300-13A. **The current width meets the A-I (small) standards of 60 feet and is recommended to remain at this width.**

RUNWAY DESIGNATION

Runway designation is determined by the magnetic bearing (azimuth) of the runway centerline which is relative to the location of the magnetic north pole. The runway designator number is the whole number nearest the one-tenth of the magnetic azimuth along the runway centerline.

The 2020 magnetic declination at U05 is 12.70° east, changing 0.1° west per year as the location of the magnetic north pole moves over time. **Runway 16/34 should be re-designated in the future to 17/35.** The FAA will make a determination if runways are to be re-designated. Any change to runway designation will be made at the discretion of FAA as it requires the update of national aeronautical publications, procedures and signage. The official FAA published magnetic declination is 17° east from 1985. See **Table 2-12** for details.

Table 2-12 – Runway Designation Requirements

Runway Designation	Existing Magnetic Bearing (2021)	Future Magnetic Bearing (2041)	Recommended Future Designation
Runway 16/34	167.27°/347.27°	169.27°/349.27°	17/35

Source: National Oceanic and Atmospheric Association (NOAA), KLJ Analysis

RUNWAY PAVEMENT STRENGTH & CONDITION

Airport pavements are basic infrastructure components at airports. Airfield pavements need to be maintained in a safe and operable condition for aircraft operations. Pavement condition is comprehensively evaluated by the State every three years for most airports and measured on a 0 to 100 scale known as the Pavement Condition Index (PCI) rating. Pavement evaluation includes runway, taxiway, and apron pavements. The typical useful life of a bituminous pavement ranges from 20 to 30 years if properly maintained.

Runway 16-34 was constructed of asphalt in the 1960s. There have not been PCI ratings completed recently for the airport, but from engineer's observations, the runway is experiencing severe alligator cracking, edge deterioration and spalling. A full depth reconstruction will be needed in the near future.

The published pavement strength is based on the construction materials, thickness, aircraft weight, gear configuration and operational frequency for the pavement to perform over its useful life. The current published strength for Runway 16-34 is 7,000 pounds for a single-wheel gear configuration. Once the pavement is reconstructed the new pavement should accommodate the full range of aircraft weight in the small aircraft category. **The future pavement strength for Runway 16-34 is recommended to be 12,500 pounds for a single-wheel gear configuration.**

FACILITY REQUIREMENTS - RUNWAYS

The following summarizes the recommendations for Runway 16-34. Instrument approach capabilities will be evaluated further in the Airspace section. Please refer to **Table 2-23 – Runway 16-34 Design Standard Matrix** later in the chapter for detailed design requirements for the existing and future conditions.

- Runway Pavement should be reconstructed in the near-term and strengthened to support aircraft up to 12,500 pounds.
- Planning for a runway extension to 4,700 feet is recommended for ultimate layout.
- Runway 16-34 designation is recommended to change to Runway 17-35 in the future. This would be done at the discretion of the FAA

Figure 2-13 Error! Reference source not found. depicts the existing airfield facility.

Figure 2-13 – Airfield Facilities Map

Navigational Aids & Airspace

Navigational aids (NAVAIDs) provide visual and electronic guidance to pilots enabling the airport to accommodate safely, efficiently, and effectively arriving and departing flights. Airspace is a resource that is necessary to allow flights to safely operate and maneuver in the airport environment. **Figure 2-13 – Airfield Facilities Map** identifies visual and electronic navigational aids and weather facilities graphically.

VISUAL NAVIGATION AIDS

Visual aids are installed to provide airport usability during periods of darkness and/or low visibility. Pavement markings and lighting systems available at the airport are summarized in the following sections.

Identification Lighting

U05 has a clear and green rotating beacon, which is a two-sided light that assists pilots in the visual identification of a civilian airport. The clear and green beacon indicates a lighted land airport. The airport beacon is located on the south end of the hangar area, operates sunset to sunrise and is owned by the County.

Pavement Edge Lighting

Pavement edge lighting fixtures are installed off the edges of runway and taxiway pavements to help pilots identify the edges and ends of pavement and facilitate safe operations in darkness and/or low visibility environments. Runway edge lights are white (bi-directional), except for runways with instrument approach where the final 3,000 feet of the runway where the lights change color to yellow then red to warn pilots approaching the end of the runway. The runway end threshold lights (bi-directional) are green when viewing down the runway at the start of takeoff roll and red when approaching the end of the runway. Taxiway edge lights are blue and omni-directional.

The airport has a Medium Intensity Runway Lighting System (MIRL) for Runway 16-34 that is pilot-controlled. The connecting taxiway and existing taxilanes do not have any pavement edge lighting or reflectors to indicate pavement edge. **It is recommended the airport maintain the MIRL for the runway edge lighting system and upgrade when instrument approach is added.** The airport should consider lights for taxiways and reflectors for apron edges and taxilanes.

Visual Guidance Slope Indicator

Visual approach lighting (or visual approach aids) provide vertical descent guidance to pilots for a specific runway end. These approach aids enable the pilot to acquire and maintain the correct glide path for landing. Precision Approach Path Indicator Lights (PAPI) are the current FAA standard equipment installed for this purpose.

Precision approach path indicators project light along a standard glide path to a runway end, with red and white colored lights indicating the aircraft's vertical position (above, below, or on glide path) relative to the defined glide path. Visual approach slope indicators project a beam of light having a white segment in the upper part of the beam and red segment in the lower part of the beam. Riddick Field does not have PAPI approach lighting for either runway end. **Installing a PAPI lighting system is recommended if instrument approach procedures are recommended for either runway end.**

Pilot-Controlled Lighting

Airfield lighting systems allow for pilots to control the complexity and intensity of lights. At U065, the MIRLs for Runway 16-34 are pilot controlled via the Common Traffic Advisory Frequency (CTAF) at 122.9 MHz.

Pavement Markings

Pavement markings provide visual guidance to aircraft to critical areas on the runway and taxiway surface. Runway markings vary in complexity depending on the type of approach. Runway 16-34 at U05 has visual approach pavement markings which include runway designation and runway centerline. **It is recommended pavement markings transition to non-precision markings when an instrument approach is established.** Non-precision runway markings include the runway designation, threshold markings, aiming points, and centerline.

Airfield Guidance Signs

Guidance signs provide location, direction, and guidance information to pilots on the ground to enhance awareness. Signs are placed around the airfield to identify runway and taxiway intersections, runway hold positions and other guidance. Mandatory signs are red and identify an intersection with a runway or critical safety zone. Other types of signs include location, direction, destination, and distance remaining signs. U05 does not have any guidance signs on the airfield.

Wind Indicator(s)

Wind direction indicators provide an immediate visual indication of the wind direction and velocity. A segmented circle provides a visual indication of the wind direction and velocity together with runway alignment and/or traffic pattern information.

Riddick Field's primary wind cone is southeast of the apron area and is surrounded by a segmented circle. There is a second wind cone north of the connecting taxiway and east of the runway. The segmented circle shows a standard left traffic pattern for Runway 34 End and a right traffic pattern for Runway 16 end.

ELECTRONIC NAVIGATION AIDS

Electronic navigational aids are installed to provide critical guidance information when operating in the airport environment. These navigational aids often provide horizontal and/or vertical guidance in conjunction with published navigation procedures. Electronic navigation aids available at the airport are summarized below:

Very High Frequency Omni-Directional Range (VOR)

This ground-based navigational aid projects an omni-directional signal that allows equipped aircraft to navigate to and from the station. There is no VOR at U05. The nearest one is Coppertown, which is 28 nautical miles southeast of the airport.

Global Positioning System (GPS)

GPS is a satellite-based navigation system that allows location to be triangulated from space-based satellites. Equipped aircraft can navigate between user-defined or FAA waypoints with lateral and vertical guidance. With ground-based transmitters known as Wide Area Augmentation System (WAAS) the system can provide accuracy down to a few feet. GPS is widely becoming the preferred aircraft navigation system and FAA is establishing en-route and approach procedures using this satellite-based technology. There are no published GPS approaches for U05.

COMMUNICATION FACILITIES

Communication facilities allow aircraft to transmit and receive clearances to air traffic control to navigate the national airspace system safely and effectively. Communications in the local area around U05 are limited to CTAF which is 122.9 MHz.

Aircraft on the ground at U05 are unable to communicate by radio with an air traffic control facility. The nearest facility that provides communications to Salt Lake City Air Route Traffic Control Centers (ARTCC) is Butte Remote Communications Air to Ground (RCAG), located approximately 50 NM to the southeast. At approximately 8,000 feet above mean sea level, Salt Lake ARTCC may be contacted on 132.4 MHz. Pilots can also contact Great Falls Flight Service Station (FSS) through the Coppertown Remote Communication Outlet (RCO) at 122.65 MHz.

FACILITY REQUIREMENTS – NAVAIDS

The recommend improvements to navigational aids is summarized in **Table 2-14** below**.**

Table 2-14 – Navigational Aid Summary

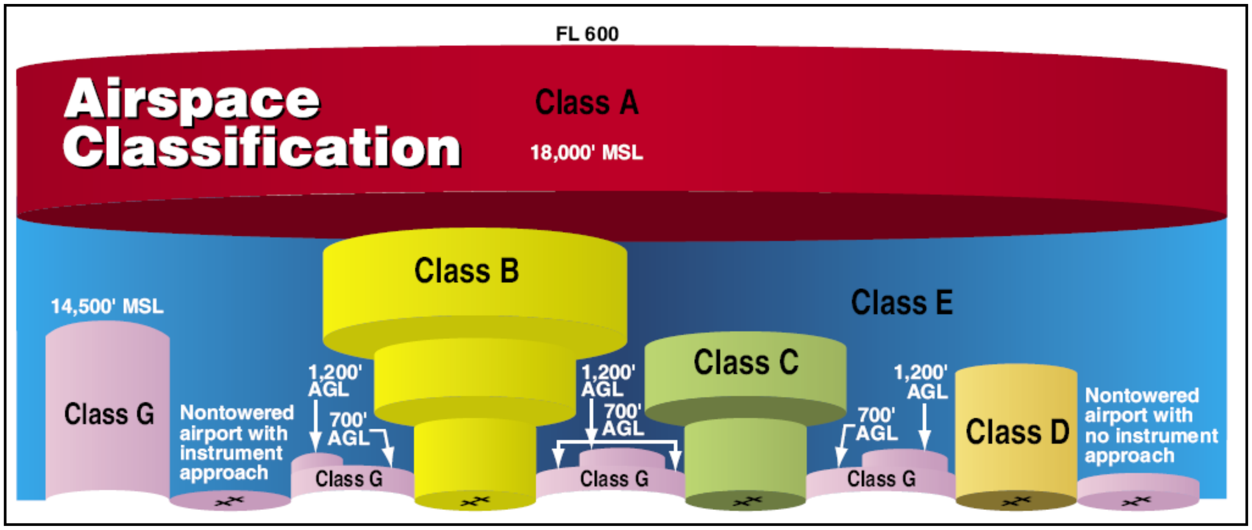
Component	Existing	Recommended-Future
Pavement Markings	Visual	Non-Precision
Runway Lighting	MIRL	MIRL
Taxiway Lighting	None	MITL/Reflectors
Visual Slope Indicator	None	PAPI
Instrument Approach Procedures	N/A	1-Mile GPS Approach
Navigational Aids	Rotating Beacon	Rotating Beacon
Meteorological Facilities	Wind Cones, Segmented Circle	Wind Cones, Segmented Circle, AWOS

Source: KLJ Analysis

Airspace

Airspace is an important resource around airports that is essential for safe flight operations. Airspace is segregated into controlled, uncontrolled, special use or other airspace. Each airspace class has different operating rules. U05 is classified as Class G with Class E beginning at 1,200 AGL airspace which means radio communication is not required and it is uncontrolled.

Exhibit 2-15 – FAA Airspace Classifications



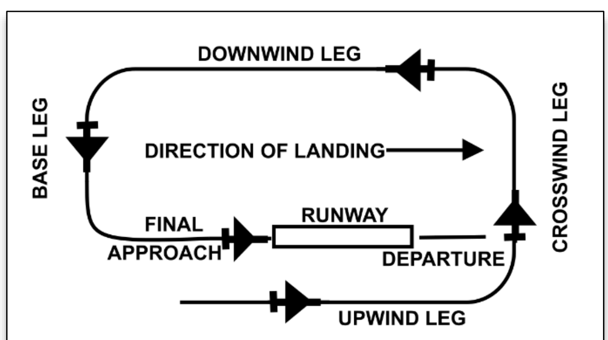
Source: [Federal Aviation Administration (FAA) Pilot's Handbook of Aeronautical Knowledge (2016)]

AUTOMATIC DEPENDENT SURVEILLANCE-BROADCAST (ADS-B)

ADS-B is a satellite-based surveillance technology in which aircraft transmit GPS position information to other aircraft and to ATC facilities. ADS-B will supplement primary ground-based radar. FAA has required all aircraft operating within airspace requiring a transponder to have ADS-B transmitting equipment installed by the year 2020 as part of the Next Generation Air Transportation System (NextGen) initiative. Various ground stations have been located nationwide to provide ADS-B coverage.

APPROACH/DEPARTURE PROCEDURES

Aircraft operate under either Visual Flight Rules (VFR) or Instrument Flight Rules (IFR) depending on weather conditions and/or operational standards.



Standard VFR Airport Traffic Pattern (Source: FAA)

Visual Approach/Departure Procedures

Under VFR, pilots are advised to utilize a standard rectangular traffic pattern around the runway to approach or depart an airport. Standard traffic pattern legs include upwind, crosswind, downwind, base, and final. Departures are typically straight-out from a departing runway, a 90-degree crosswind, or 180 degree downwind. Arrivals typically enter a traffic pattern 45 degrees to a downwind leg for landing. Runway 34 follows the standard left traffic pattern for approach. Runway 16 follows a right traffic pattern. This is due to the terrain to the east of the runway.

Instrument Approach and Departure Procedures

Under IFR, pilots use instrument approach procedures to fly into an airport using electronic navigational aids such as GPS. Instrument Approach Procedures are developed and maintained by the FAA to allow aircraft to still fly into an airport even when the weather limits the cloud ceiling and visibility. There are currently no instrument approach procedures for U05 while instrument approaches do exist for some surrounding airports as shown in **Table 2-16 – Surrounding Airport Instrument Approach Procedures**.

Table 2-16 – Surrounding Airport Instrument Approach Procedures

Airport	ID	Location from U05	Instrument Approach	Runway	Ceiling	Visibility
Riddick Field	U05	-	No		-	-
Bowman Field	3U3	21 SE	GPS	Circling	1,200 Feet	1 ¼ miles
Deer Lodge	38S	22 NE	GPS	Circling	800 Feet	1 mile
Hamilton	6S5	34 W	GPS	Circling	1,100 Feet	1 ¼ miles
Bert Mooney	BTM	40 E	ILS	Rwy 15	300 Feet	½ mile

Source: FAA Instrument Approach Procedures

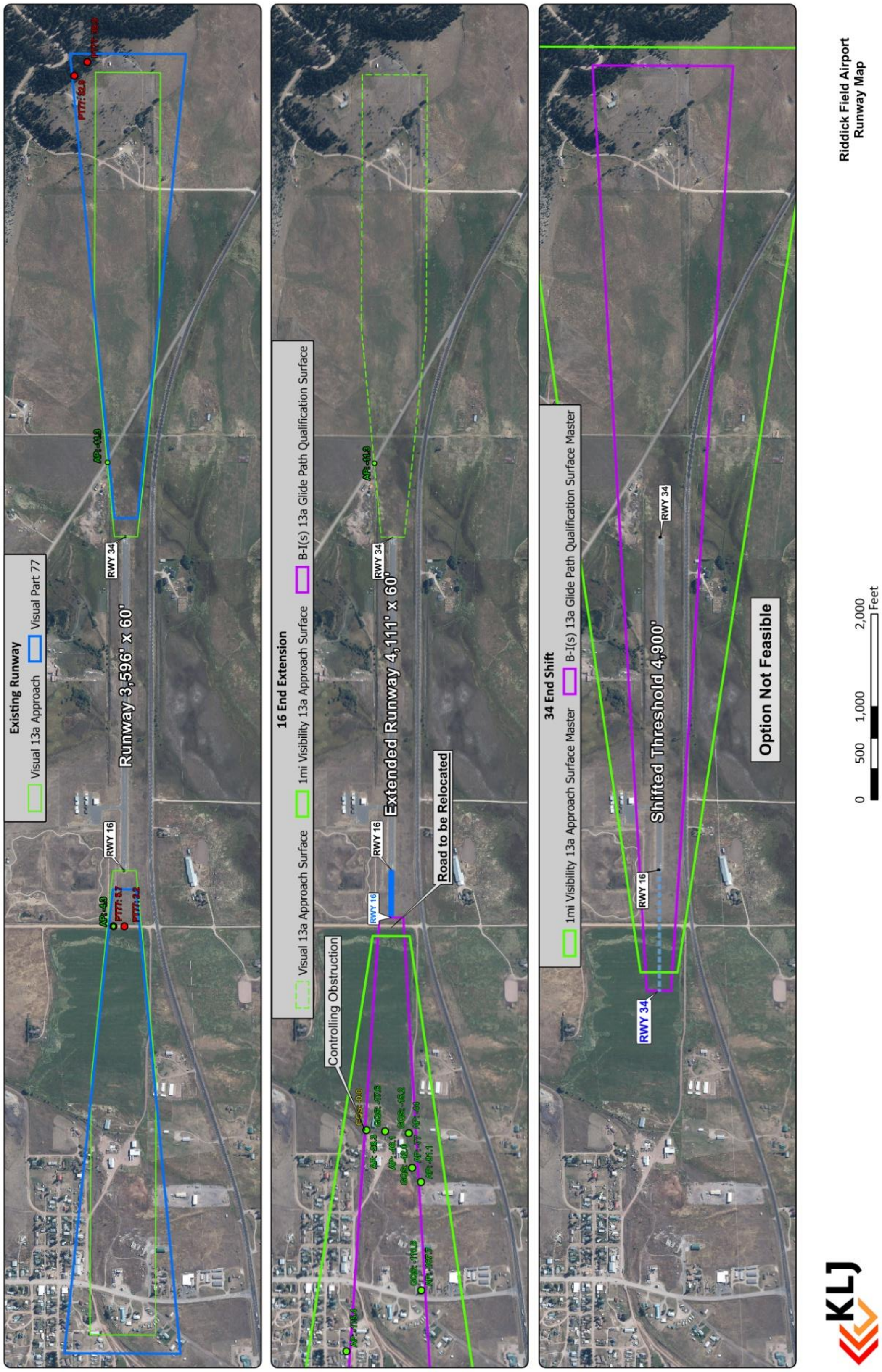
The potential for an instrument approach was examined based on the FAA threshold siting surfaces for the 30:1 Glide Path Qualification Surface (GQS) surface in Table 3-2 of FAA AC 150/5300-13A. The findings of analyzing obstructions to the 30:1 GQS is summarized in **Table 2-17 – Instrument Approach Potential** which shows that a Runway 16 approach is feasible but a straight in approach for Runway 34 will not be feasible. There is a possibility of a circling procedure for either runway end, but that would be examined by the FAA when a request for an instrument approach procedure is filed. **Figure 2-18** shows the options for a Runway 16 and Runway 34 straight in approach with the 30:1 GQS as the controlling surface.

Table 2-17 – Instrument Approach Potential

Runway	Surface	Controlling Obstruction	Surface Penetration	Impact on Runway Threshold
16 (Existing)	20:1 Visual	Road	5.7’	
16 (IAP)	30:1 GQS	Power Lines	-	Relocate Threshold 611 Feet north (Extending Runway to 4,111 Feet)
34 (Existing)	20:1 Visual	Hill	39.9’	
34 (IAP)	30:1 GQS	Trees	-	Relocate Threshold 4,900 Feet north (Eliminating Runway)

Source: KLJ Analysis

Figure 2-18 – Instrument Approach – Runway 16-34



FAA AERONAUTICAL SURVEYS

The FAA has implemented Aeronautical Survey requirements per FAA AC 150/5300-18B: *General Guidance and Specifications for Submission of Aeronautical Data to NGS: Field Data Collection and Geographic Information System (GIS) Standards*. FAA airport survey requirements require obstruction data to be collected using assembled aerial imagery for the airport. This data is used in aeronautical publications and to develop instrument approach procedures.

An aeronautical survey is currently in progress with this planning effort as required by FAA. Imagery was acquired in September 2020. When safety-critical data is needed to update runway end data or enhance an instrument approach then a new aeronautical survey is required.

AIRSPACE OBSTRUCTIONS

There are established standards to identify airspace obstructions around airports. Title 14 CFR (Code of Federal Regulations): Part 77 *Safe, Efficient Use, and Preservation of the Navigable Airspace* establishes various airspace surfaces near airports. Part 77 is used to determine if an object is an obstruction that penetrates an "imaginary" three-dimensional surface. Surfaces include the primary, approach, transitional, horizontal, and conical surfaces each with different standards. Details can be found in **Appendix B: General Aviation Airports 101.**

When evaluating objects, the FAA determines whether an obstruction is a hazard to air navigation. FAA subsequently evaluates the obstruction using more in-depth minimum airspace standards. These include FAA Approach/Departure Surfaces from FAA AC 150/5300-13A, *Airport Design* or instrument procedure surfaces identified in FAA Order 8260.3E, *U.S. Standard for Terminal Instrument Procedures (TERPS)*. Corrective action is then recommended. Examples of corrective action include removing, lowering, or obstruction lighting an object. The combination of the approach type and the runway classification defines the dimensional criteria for each approach. The Part 77 airspace dimensional criteria for the U05 is identified in **Table 2-19**.

Table 2-19 – Existing Part 77 Approach Airspace Standards

Runway End	Approach Standards	Distance From Runway End	Inner Width*	Outer Width	Length	Slope
16	Visual Utility	200'	250'	1,250'	5,000'	20:1
34	Visual Utility	200'	250'	1,250'	5,000'	20:1

Source: 14 CFR Part 77, FAA Airport Master Record
**Inner width is also the Primary Surface width driven by the most demanding approach to a runway.*

According to previous obstacle data, on the Runway 34 End there is a hill about 4,400 feet from the end of the runway, 263 feet above the runway end, and creates a 15:1 clearance slope rather than a 20:1 Part 77 standard approach. See **.**

Table 2-20 for more details.

Table 2-20 – Critical Part 77 Airspace Obstacles

Runway End	Surface	Object Type, Height Above End	Distance From End	Location from Centerline	Slope to Clear (Required)
34	Approach	Hill, 263'	4,400'	545' Right	15:1 (20:1)

Source: Airport IQ 5010
*Notes: Penetration value estimated based. **RED** indicates does not meet current standards.*

A more detailed obstruction analysis will be completed using data from the Aeronautical Survey, which is part of this planning process. This detailed obstruction identification and mitigation will be identified in the Airport Layout Plan developed at the end of this planning study located in **Chapter 5: Airport Layout Plan**.

FACILITY REQUIREMENTS - AIRSPACE

Terrain around Riddick Field and surrounding uses limits the options for airport expansion and improvements to approaches to runway ends. The airport has expressed the desire to establish an instrument approach to the airport as it would increase overall utility and provide greater capability for air medical flights to operate during inclement weather. An approach to Runway 16 with visibility minimums 1-mile or greater would be the most feasible option with the least amount of impacts due to terrain. **It is recommended U05 consider establishing an instrument approach procedure for Runway 16.**

Taxiways

Taxiways provide for the safe and efficient movement of aircraft between the runway and other operational areas of the airport. The taxiway system should provide critical links to airside infrastructure, increase capacity and reduce the risk of an incursion with traffic on the runway. The taxiway system should meet the standards design requirements identified in [FAA AC 150/5300-13A](FAA AC 150/5300-13A).

DESIGN STANDARDS

FAA identifies the design requirements for taxiways. The design standards vary based on individual aircraft geometric and landing gear characteristics. The Taxiway Design Group (TDG) and Airplane Design Group (ADG) are the basis of the safety standards which include:

- Taxiway Width
- Taxiway/Taxilane Safety Area (TSA)
- Taxiway/Taxilane Object Free Area (TOFA)

The Connecting Taxiway is a 175-foot-long by 30-foot-wide bituminous asphalt connector from the runway to the apron area. It is categorized as a Taxiway Design Group (TDG) 1A based on the design aircraft in **Chapter 1: Overview**. The taxiway does not have lighting or reflectors. It currently meets all ADG-I and TDG-1A standards.

Table 2-21 and **Table 2-22** describes the specific FAA taxiway design standards for various ADG and TDG design aircraft.

U05 does not have turn-around taxiways on either end of the runway. Most airports will install taxiway turn-arounds at a runway end to allow aircraft to safely hold away from the active runway environment. **It is recommended that taxiway turn-arounds are installed at each runway end when Runway 16-34 is reconstructed.**

Table 2-21 – FAA Taxiway Design Standards Matrix (ADG)

Design Standard	Airplane Design Group (ADG)

	ADG-I	ADG-II
Taxiway Safety Area	49 feet	79 feet
Taxiway Object Free Area	89 feet	131 feet
Taxiway Centerline to Fixed or Movable Object	64 feet	97 feet

Source: FAA AC 150/5300-13A, Change 1, KLJ Analysis
NOTE: Taxiways include respective entrance taxiways to runways

Table 2-22 – FAA Taxiway Design Standards Matrix (TDG)

Design Standard	Airplane Design Group (TDG)	
	TDG-1A	TDG-2
Taxiway Width	25 feet	35 feet
Taxiway Edge Safety Margin (TESM)	5 feet	7.5 feet
Taxiway Shoulder Width	10 feet	15 feet

Source: FAA AC 150/5300-13A, Change 1, KLJ Analysis
NOTE: Taxiways include respective entrance taxiways to runways

TAXIWAY PAVEMENT STRENGTH & CONDITION

Taxiways should generally be designed to accommodate the design aircraft to serve that area. The taxiway pavement is in the same condition as Runway 16-34 and will need full depth reconstruction in the near future. **When reconstructed it is recommended the Taxiway pavement strength match the runway requirements.**

FACILITY REQUIREMENTS – TAXIWAY

Current taxiway facilities meet current standards. When Runway 16-34 is reconstructed it is recommended that taxiway match the runway pavement strength and turn-arounds are added at each end of the runway.

Facility Requirements

The following **Table 2-23** provides summary data of the facility requirements and recommendations associated with Runway 16-34 and associated taxiways. Note that for the Future and Ultimate, Runway 16-34 is renumbered as 17-35 based on the changes in magnetic declination mentioned previously in the chapter.

Table 2-23 – Runway 16-34 Design Standard Matrix

Design Standard	Actual Condition	Facility Requirement or Recommendation		
		Existing	Future	Ultimate
Runway Identification	16/34	16/34	17/35	17/35
Runway Design Code (RDC)	B-I(Small)-VIS	B-I(Small)-VIS	B-I(Small)-5000	B-I(Small)-5000
Pavement Strength (Wheel Loading)	7,000 (SW)	12,500 (SW)	12,500 (SW)	12,500 (SW)
Pavement Surface Type	Asphalt	Paved	Paved	Paved
Runway Length	3,600’	3,600’	4,700’	4,700’
Runway Width	60’	60’	60’	60’
Runway Safety Area (RSA) Width	120’	120’	120’	120’
RSA Length Past Departure End	240’	240’	240’	240’
RSA Length Prior to Threshold	240’	240’	240’	240’
Runway Lighting Type	MIRL	MIRL	MIRL	MIRL
Approach RPZ Start from Runway	Roads in RPZ (16 & 34)	200’	200’	200’
Approach RPZ Length		1,000’ (Both)	1,000’ (Both)	1,000’ (Both)
Approach RPZ Inner Width		250’ (Both)	250’ (Both)	250’ (Both)
Approach RPZ Outer Width		450’ (Both)	450’ (Both)	450’ (Both)
Runway Marking Type	Visual	Visual	Non-Precision	Non-Precision
14 CFR Part 77 Approach Category	20:1 (Both)	20:1 (Both)	20:1 (Both)	20:1 (Both)
Approach Type	Visual (Both)	Visual (Both)	NPI (17) Visual (35)	NPI (17) Visual (35)
Visibility Minimums	Visual (Both)	Visual (Both)	1 mile (17) Visual (35)	1 mile (17) Visual (35)
ROFA Width	250’	250’	250’	250’
ROFA Length Past Departure End	240’	240’	240’	240’
ROFA Length Prior to Threshold	240’	240’	240’	240’
ROFZ Length Past Runway	200’	200’	200’	200’
ROFZ Width	250’	250’	250’	250’
Threshold Siting Surface (TSS) Type from Table 3-2 Engineering Brief 99A	2 (Both)	2 (Both)	4 (17) 2 (35)	4 (17) 2 (35)
Visual and Instrument NAVAIDs	None	None	PAPI	PAPI

- *Note: RED indicates a known deficiency to existing minimum design standards*
- *Source: FAA AC 150/5300-13A – Change 1, Airport Design, FAA Engineering Brief 99A, KLJ Analysis*

Alternative Evaluation Process

A wide range of alternatives are evaluated to determine the best solution for the airport to meet facility needs. In many cases the process is iterative to react to new information and input. Please refer to the alternative analysis process in Chapter 1 for details on the factors considered.

A range of alternatives were prepared for consideration and those initial alternatives were reviewed by the Planning Advisory Committee to create a narrower slate of alternatives for further review. In the end a preferred alternative was selected and portrayed at the end of this chapter.

ALTERNATIVES SECTION TO FOLLOW