Chapter 3 Facility Requirements

Proper airport planning requires the translation of forecast aviation demand into the specific types and quantities of facilities that can adequately serve the identified demand. This chapter analyzes the existing capacities of Powell Municipal Airport (POY) facilities. The existing capacities are then compared to the forecasted activity levels prepared in Chapter Two to determine the adequacy of existing facilities, as well as to identify whether deficiencies currently exist or may be expected to materialize in the future. This chapter presents the following elements:

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

This exercise is intended to identify the adequacy of existing airport facilities, outline what new facilities may be needed, and determine when these may be needed to accommodate forecast demands. Once the facility needs have been identified, various options for providing these facilities will be detailed for both the airside and the landside. Each option will be evaluated to determine the most feasible, cost-effective, and efficient means for implementation.

The facility requirements for Powell Municipal Airport were evaluated using guidance contained in several Federal Aviation Administration (FAA) publications, including the following:

- Advisory Circular (AC) 150/5300-13B, *Airport Design*
- AC 150/5060-5, *Airport Capacity and Delay*
- AC 150/5325-4B, *Runway Length Requirements for Airport Design*
- Federal Aviation Regulation (FAR) Part 77, *Objects Affecting Navigable Airspace*
- FAA Order 5090.5, *Formulation of the National Plan of Integrated Airport Systems* (*NPIAS) and the Airports Capital Improvement Plan (ACIP)*

DEMAND-BASED PLANNING HORIZONS

An updated set of aviation demand forecasts for Powell Municipal Airport has been established and was detailed in Chapter Two. These activity forecasts include annual aircraft operations, based aircraft, aircraft fleet mix, and peaking characteristics. With this information, specific components of the airfield and landside system can be evaluated to determine their capacity to accommodate future demand.

Cost-effective, efficient, and orderly development of an airport should be based more on actual demand at an airport than on a time-based forecast figure. In order to develop a master plan that is demand-based rather than time-based, a series of planning horizon milestones has been established which takes into consideration the reasonable range of aviation demand projections. The planning horizons are the short term (years 1-5), the intermediate term (years 6-10), and the long term (years 11-20).

It is important to consider that the actual activity at the airport may be higher or lower than what the annualized forecast portrays. By planning according to activity milestones, the resultant plan can accommodate unexpected shifts or changes in the area's aviation demand by allowing airport management the flexibility to make decisions and develop facilities based on need generated by actual demand levels, rather than dates in time. The demand-based schedule provides flexibility in development, as development schedules can be slowed or expedited according to demand at any given time over the planning period. The resultant plan provides airport officials with a financially responsible and needs-based program. **Table 3A** presents the short-, intermediate-, and long-term planning horizon milestones for each aircraft activity level forecasted in Chapter Two.

TABLE 3A | Aviation Demand Planning Horizons

	Base Year (2023)	Short Term (1-5 Years)	Intermediate Term (6-10 Years)	Long Term (11-20 Years)
BASED AIRCRAFT				
Single-Engine	26	28	29	32
Multi-Engine	1	1	1	0
Turboprop	0	0	1	1
Jet	0	0	0	1
Helicopter	0	0	0	1
Other	6	6	7	7
Total Based Aircraft:	**33**	**35**	**38**	**42**
ANNUAL OPERATIONS				
Itinerant				
Air Carrier	0	0	0	0
Air Taxi	61	100	100	100
General Aviation	1,300	1,560	1,760	2,170
Total Itinerant Operations:	**1,361**	**1,660**	**1,860**	**2,270**
Local				
General Aviation	1,985	2,370	2,680	3,320
Total Local Operations:	**1,985**	**2,370**	**2,680**	**3,320**
Total Operations:*	**3,346**	**4,000**	**4,500**	**5,600**

*Total operations have been rounded.

Source: Coffman Associates analysis

AIRFIELD CAPACITY

An airfield's capacity is expressed in terms of its annual service volume (ASV). ASV is a reasonable estimate of the maximum level of aircraft operations that can be accommodated in a year without incurring significant delay factors. As aircraft operations near or surpass the ASV, delay factors increase.

POY's ASV was examined using FAA AC 150/5060-5, *Airport Capacity and Delay*. Several factors were evaluated to calculate the airport's ASV, including the following:

- Runway configuration
- Runway use
- Exit taxiways
- Weather conditions
- Aircraft mix
- Percent arrivals
- Touch-and-go activity
- Peak period operations

Each factor represents an airfield or operational element that can contribute to delay. When these factors are examined together, the ASV at Powell Municipal Airport is approximately 230,000 annual operations. This does not indicate a point of absolute gridlock, but it does represent a point at which delay for each operation increases exponentially and capacity becomes constrained.

Current operational estimates for POY represent less than two percent of the airfield's ASV. By the end of the long-term planning period, total annual operations are expected to represent approximately 2.4 percent of the airfield's ASV. FAA guidance recommends that improvements for airfield capacity purposes should begin to be considered once operations reach 60 to 75 percent of the ASV. At the 80 percent level, planned improvements should be made. As existing and forecast operations remain well below these levels, no significant capacity improvements are planned; however, other options to improve airfield efficiency, such as taxiway geometry improvements, will still be considered.

AIRSIDE FACILITY REQUIREMENTS

Airside facilities include those facilities related to the arrival, departure, and ground movement of aircraft. Airside facility requirements are based primarily on the runway design code (RDC) for each runway. Analysis in Chapter Two identified the existing RDC for primary Runway 13-31 as B-II-5000 and the ultimate RDC as B-II-4000. For turf/dirt Runways 17-35 and 3-21, the existing RDCs are A-I(Small)-VIS in both the existing and ultimate conditions.

RUNWAYS

Runway conditions, such as orientation, length, width, and pavement strength, were analyzed at Powell Municipal Airport. From this information, requirements for runway improvements were determined for the airport.

Runway Orientation

Key considerations in the runway configuration of an airport involve the orientation for wind coverage and the operational capacity of the runway system. FAA AC 150/5300-13B, *Airport Design*, recommends that a crosswind runway should be made available when the primary runway orientation provides less than 95 percent wind coverage for any aircraft forecast to use the airport on a regular basis. **Table 3B** details the allowable crosswind component for each RDC.

TABLE 3B | Allowable Crosswind Component by RDC

RDC	Allowable Crosswind Component
A-I and B-I (includes small aircraft)	10.5 knots
A-II and B-II	13 knots
A-III and B-III	16 knots
C-I through D-III	16 knots
A-IV and B-IV	20 knots
C-IV through C-VI	20 knots
D-IV through D-VI	20 knots
E-I through E-VI	20 knots

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

Exhibit 3A presents the all-weather and instrument flight rules (IFR) wind roses for the airport. The previous 10 years of wind data[1] were obtained from the on-airport automated weather observing system (AWOS) and have been analyzed to identify the wind coverage provided by the existing runway orientations. At POY, the orientation of Runway 13-31 provides 93.02 percent coverage for the 10.5-knot component and greater than 95 percent coverage for 13-, 16-, and 20-knot components in all weather conditions. In IFR conditions, Runway 13-31 provides 98.23 percent coverage for the 10.5-knot crosswind component and greater than 99 percent coverage for 13-knot components and greater. Of the two turf/dirt runways at the airport, Runway 17-35 provides the best coverage for crosswind components, with 83.89 percent coverage during 10.5-knot conditions. Runway 3-21 provides 70.75 percent coverage in a 10.5-knot condition. Combined, the three runways provide 98.52 percent coverage during 10.5-knot conditions and greater than 99 percent coverage at 13 knots and greater.

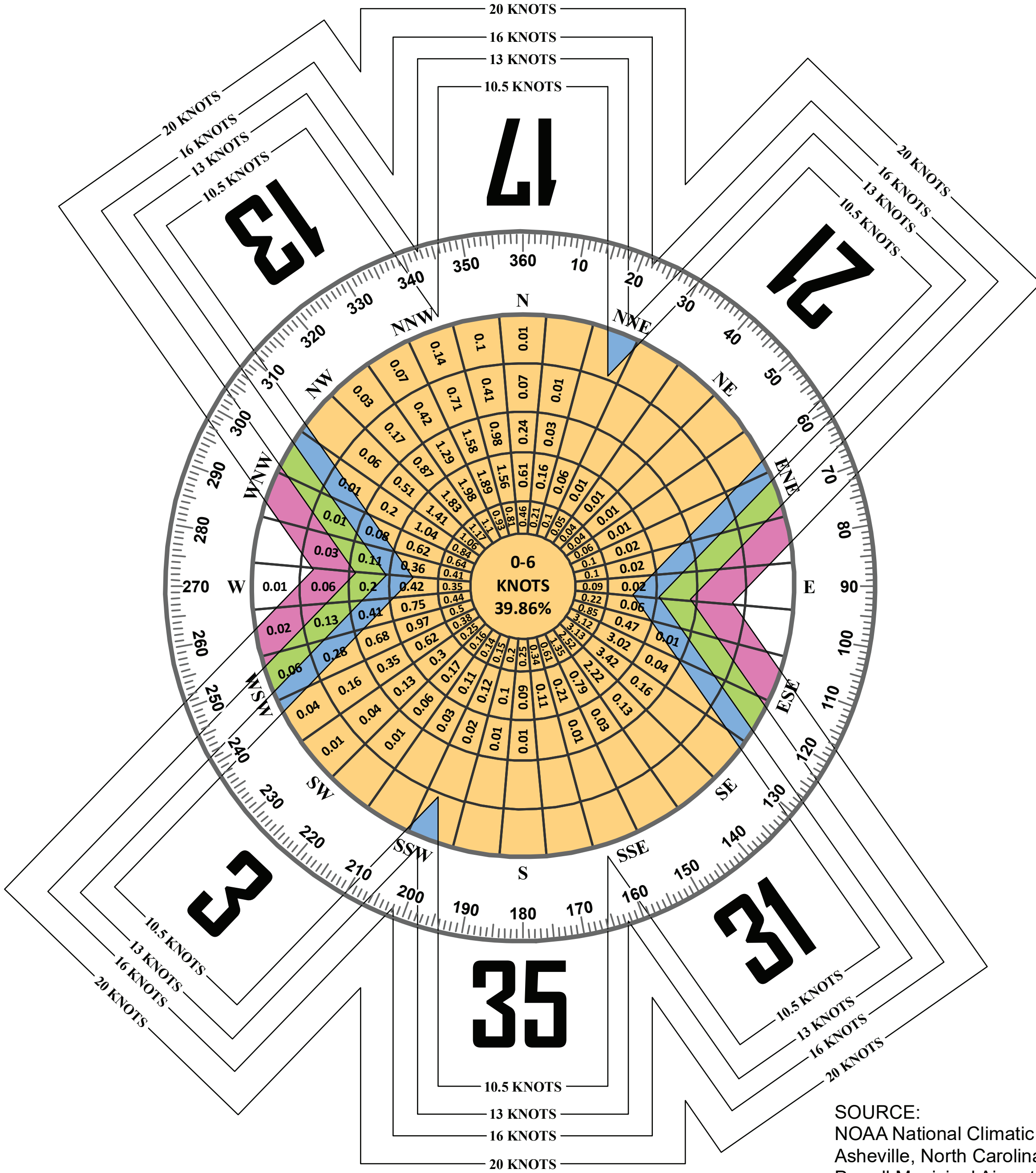
Based on this information, a crosswind runway at POY is eligible for grant consideration, with specific FAA justification analysis needed for federal funding assistance; however, a third runway is not eligible and would not be justified for federal funding. According to FAA Order 5100.38D, *Airport Improvement Program Handbook*, only one runway at any NPIAS airport is eligible for ongoing maintenance and rehabilitation funding, unless the FAA Airports District Office (ADO) has made a specific determination that a crosswind or secondary runway is justified. A runway that is not a primary runway, crosswind runway, or secondary runway is considered an additional runway and is not eligible for FAA funding. It is not unusual for a two-runway airport to have a primary runway and an additional runway, and no crosswind or secondary runway. **Table 3C** presents the eligibility requirements for runway types.

According to the information provided in **Table 3C**, only one of the turf/dirt runways at POY could be considered the crosswind runway, while the other would be considered an additional runway and would be ineligible for federal funding. Previous planning at POY has included the construction of a new, paved crosswind runway, designated as Runway 5-23; however, the airport sponsor has indicated a local desire to maintain the existing turf/dirt runways in their current condition. This option will be carried into the options chapter, with the understanding that the City of Powell may be responsible for costs associated with maintaining the additional turf/dirt runway.

[1] 243,329 observations were collected for the period from January 1, 2014, through December 31, 2023.

ALL WEATHER WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 17-35	83.89%	92.07%	96.88%	98.90%
Runway 13-31	93.02%	95.28%	97.35%	98.91%
Runway 3-21	70.75%	80.23%	91.88%	97.28%
All Runways	98.52%	99.45%	99.85%	99.97%

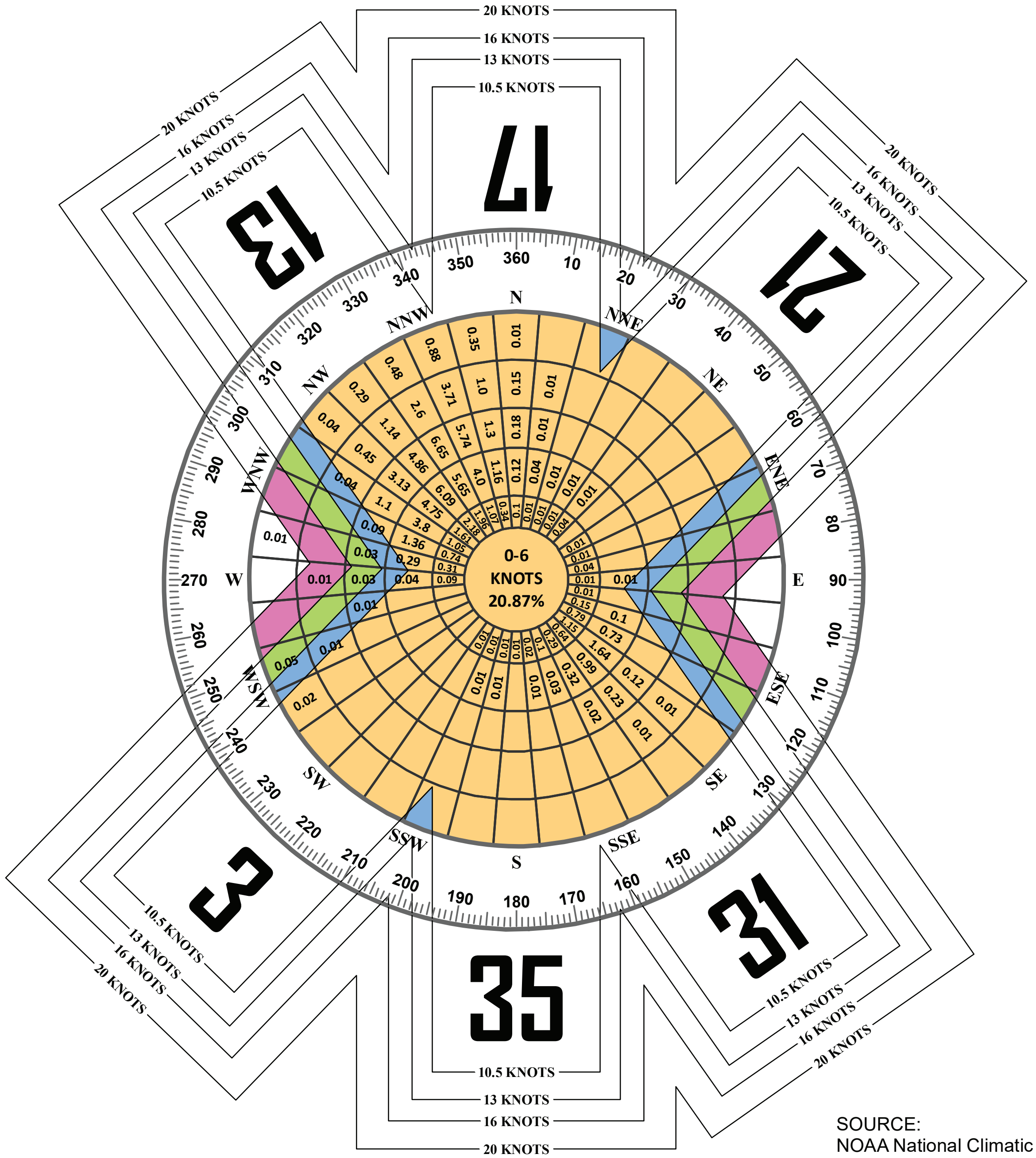


SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Powell Municipal Airport
Powell, Wyoming

OBSERVATIONS:
243,329 All Weather Observations
Jan. 1, 2014 - Dec, 31 2023

Exhibit 3A
WIND ROSES

IFR WIND COVERAGE				
Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 17-35	74.41%	88.48%	96.84%	99.42%
Runway 13-31	98.23%	99.31%	99.71%	99.81%
Runway 3-21	35.95%	48.41%	66.48%	85.87%
All Runways	99.54%	99.82%	99.92%	99.97%



SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Powell Municipal Airport
Powell, Wyoming

OBSERVATIONS:
13,632 IFR Observations
Jan. 1, 2014 - Dec, 31 2023

TABLE 3C | Runway Eligibility

The following runway type...	Must meet all of the following criteria...	And is...
Primary Runway	1. A single runway at an airport is eligible for development consistent with FAA design and engineering standards.	Eligible
Crosswind Runway	1. The wind coverage on the primary runway is less than 95%.	Eligible if justified
Secondary Runway	1. There is more than one runway at the airport. 2. The non-primary runway is not a crosswind runway. 3. Either of the following: a) The primary runway is operating at 60% or more of its annual capacity. b) The FAA has made a specific determination that the runway is required.	Eligible if justified
Additional Runway	1. There is more than one runway at the airport. 2. The non-primary runway is not a crosswind runway. 3. The non-primary runway is not a secondary runway.	Ineligible

Source: FAA Order 5100.38D, AIP Handbook

There is also the potential to decommission one of the turf/dirt runways and maintain the one that offers the best combined wind coverage with primary Runway 13-31. Each turf/dirt runway was examined in relation to the primary runway to determine the best combined crosswind coverage of a two-runway system. **Table 3D** details the results of this analysis for all-weather and IFR conditions. Based on these findings, the preferred combination during all-weather conditions is Runway 13-31 and Runway 3-21, which offers greater than 97 percent coverage during 10.5-knot and higher conditions; however, during IFR conditions, the combination of Runways 13-31 and 17-35 offers greater coverage, with a combined wind coverage of greater than 99 percent in 10.5-knot and higher crosswind conditions. As such, prudent planning would include an option for the continued maintenance of the current three-runway system, with further coordination with FAA necessary to determine if both turf/dirt runways are eligible for funding assistance. If not eligible and/or justified for federal funding, the runway(s) could remain, as long as their operation and upkeep are funded via local resources.

TABLE 3D | Dual Runway Wind Coverage

	ALL-WEATHER WIND COVERAGE				IFR WIND COVERAGE			
	10.5 Knots	13 Knots	16 Knots	20 Knots	10.5 Knots	13 Knots	16 Knots	20 Knots
Runways 13-31 & 17-35								
13-31	93.02%	95.28%	97.35%	98.91%	98.23%	99.31%	99.71%	99.81%
17-35	83.89%	92.07%	96.88%	98.90%	74.41%	88.48%	96.84%	99.42%
Combined	94.48%	96.24%	97.89%	99.25%	99.17%	99.72%	99.80%	99.82%
Runways 13-31 & 3-21								
13-31	93.02%	95.28%	97.35%	98.91%	98.23%	99.31%	99.71%	99.81%
3-21	70.75%	80.23%	91.88%	97.28%	35.95%	48.41%	66.48%	85.87%
Combined	97.94%	99.29%	99.82%	99.97%	94.38%	97.71%	99.27%	99.89%

Runway Designations

A runway's designation is based on its magnetic headings, which are determined by the magnetic declination for the area. The magnetic declination near Powell Municipal Airport is 10° 10' E ± 0° 24' W (April 2024). Runway 13-31 has a true heading of 145°/325°. Adjusting for the magnetic declination, the current magnetic heading of Runway 13-31 is 135°/315°, the magnetic heading of Runway 17-35 is 170°/350°, and the magnetic heading of Runway 3-21 is 034°/214°. Given the changes in magnetic declination, consideration should be given to redesignating Runway 13-31 as Runway 14-32 as early as 2026. Any redesignation should be coordinated with the FAA to ensure its necessity and that all appropriate publications are updated. If it is confirmed that the runway should be redesignated, new runway end designation markings can be incorporated concurrently with a future pavement rehabilitation project.

Runway Length

AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides guidance for determining runway length needs. The determination of runway length requirements for the airport is based on five primary factors:

- Mean maximum temperature of the hottest month
- Airport elevation
- Runway gradient
- Critical aircraft type expected to use the runway
- Stage length of the longest nonstop destination (specific to larger aircraft)

The mean maximum daily temperature of the hottest month for Powell Municipal Airport is 85.2 degrees Fahrenheit (°F), which occurs in July. The airport elevation is 5,095.7 feet above mean sea level (MSL). Runway 13-31 has a longitudinal gradient of 1.59 percent, while Runways 17-35 and 3-21 have respective gradients of 0.75 percent and 0.69 percent.

Airplanes operate on a wide variety of available runway lengths. Many factors govern the sustainability of runway lengths for aircraft, such as elevation, temperature, wind, aircraft weight, wing flap settings, runway condition (wet or dry), runway gradient, vicinity airspace obstructions, and any special operating procedures. Airport operators can pursue policies that maximize the sustainability of the runway length. Policies such as area zoning and height and hazard restricting can protect an airport's runway length. Airport ownership (fee simple easement) of land leading to the runway ends reduces the possibility of natural growth or human-made obstructions. Planning for runways should include an evaluation of the aircraft types that are expected to use the airport now and in the future. Future planning should be realistic, supported by the FAA-approved forecasts, and based on the critical aircraft (or family of aircraft).

General Aviation Aircraft

Most operations occurring at Powell Municipal Airport are conducted using smaller GA aircraft that weigh less than 12,500 pounds. Following guidance from AC 150/5325-4B, to accommodate 95 percent of these small aircraft with fewer than 10 passenger seats, a runway length of 6,200 feet is recommended. For 100 percent of these small aircraft, a runway length of 6,400 feet is recommended. For small aircraft with 10 or more passenger seats, 6,400 feet of runway length is recommended.

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

TABLE 3E | Business Jet Categories for Runway Length Determination

Aircraft	MTOW (lbs.)
75 Percent of the National Fleet	
Lear 35	20,350
Lear 45	20,500
Cessna 550	14,100
Cessna 560XL	20,000
Cessna 650 (VII)	22,000
IAI Westwind	23,500
Beechjet 400	15,800
Falcon 50	18,500
75-100 Percent of the National Fleet	
Lear 55	21,500
Lear 60	23,500
Hawker 800XP	28,000
Hawker 1000	31,000
Cessna 650 (III/IV)	22,000
Cessna 750 (X)	36,100
Challenger 604	47,600
IAI Astra	23,500
Greater than 60,000 Pounds	
Gulfstream II	65,500
Gulfstream IV	73,200
Gulfstream V	90,500
Global Express	98,000
Gulfstream 650	99,600
MTOW = maximum takeoff weight	

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

Table 3F presents the results of the runway length analysis for business jets that was developed following the guidance provided in AC 150/5325-4B. To accommodate 75 percent of the business jet fleet at 60 percent useful load, a runway length of 7,600 feet is recommended. This length is derived from a raw length of 6,570 feet, which is then adjusted, as recommended, to accommodate for runway gradient and with consideration given for landing length needs under contaminated (wet and slippery) runway conditions. To accommodate 100 percent of the business jet fleet at 60 percent useful load, a runway length of 10,700 feet is recommended.

TABLE 3F | Runway Length Requirements

Fleet Mix Category	TAKEOFF LENGTHS		LANDING LENGTHS	Final Runway Length
	Raw Runway Length from FAA AC	Runway Length with Gradient Adjustment (+360')	Wet Surface Landing Length for Jets (+15%)*	
75% of Fleet at 60% Useful Load	6,570'	7,555'	5,500'	7,600'
100% of Fleet at 60% Useful Load	9,710'	10,695'	5,500'	10,700'
75% of Fleet at 90% Useful Load	8,600'	9,585'	7,000'	9,600'
100% of Fleet at 90% Useful Load	10,708'	11,693'	7,000'	11,700'

*Max. 5,500' for 60% useful load and max. 7,000' for 90% useful load in wet condition

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

Utilization of the 90 percent useful load category for runway length determination is generally not considered by the FAA unless there is a demonstrated need at an airport, such as documented activity by a business jet operator that flies out frequently with heavy loads, typically those with extended trip lengths. To accommodate 75 percent of the business jet fleet at 90 percent useful load, a runway length of 9,600 feet is recommended. To accommodate 100 percent of business jets at 90 percent useful load, a runway length of 11,700 feet is recommended.

Runway Length Summary

Many factors are considered when determining appropriate runway length for safe and efficient operations of aircraft at Powell Municipal Airport. The airport should strive to accommodate smaller business jets and turboprop aircraft to the greatest extent possible, as demand dictates. Primary Runway 13-31 is currently 6,200 feet long and as detailed in the tables above, can accommodate 95 percent of small aircraft with fewer than 10 passenger seats. Some of the larger aircraft that utilize POY, including turboprops and business jets, may be weight-restricted during warmer months, as longer takeoff lengths are necessary for these aircraft to safely operate.

Justification for any runway extension to meet the needs of turbine aircraft would require regular use (500 annual itinerant operations) by these aircraft, which is the minimum threshold required to obtain FAA grant funding assistance. While the primary runway at POY currently meets the recommended length for 95 percent of the small aircraft fleet, the runway length recommendation per FAA AC 150/5325-4B is 7,600 feet to accommodate at least 75 percent of the business jet fleet at 60 percent useful load. As such, the options in the next chapter will examine potential extension options for Runway 13-31 while considering appropriate safety design standards, which will be detailed later in this chapter.

Turf/dirt Runway 17-35 is currently 2,709 feet long, and turf/dirt Runway 3-21 is 2,623 feet long. These runways only serve small general aviation aircraft that are capable of taking off and landing on short turf runways. As previously stated, local input regarding the use of these runways favors continued maintenance of the unpaved surfaces, and there is no indication that a longer operating surface is desired.

Runway Width

Runway width design standards are primarily based on the critical aircraft but can also be influenced by the visibility minimums of published instrument approach procedures. For primary Runway 13-31, existing (RDC B-II-5000) and ultimate (RDC B-II-4000) design criteria stipulate a runway width of 75 feet. Runway 13-31 is currently 100 feet wide, and while this exceeds the standard, the additional width provides added safety enhancements for aircraft that operate at the airport. The current width should be maintained, if feasible; however, it should be noted that the FAA may only participate in maintaining the recommended width of 75 feet for Runway 13-31, and future maintenance/rehabilitation projects should account for the potential that the airport sponsor may be responsible for maintaining the additional width beyond the 75-foot standard.

For turf/dirt Runways 17-35 and 3-21, the existing and ultimate RDCs are A-I(Small)-VIS, which corresponds to a runway width standard of 60 feet. Both turf/dirt runways are 100 feet wide. These runways should be maintained at their current widths, if feasible.

Pavement Strength

An important feature of airfield pavement is its ability to withstand repeated use by aircraft of varying weights. The FAA reports the pavement strength for primary Runway 13-31 as 15,000 pounds for single-wheel aircraft (S). The strength rating of a runway does not preclude aircraft that weigh more than the published strength rating from using the runway. All federally obligated airports must remain open to the public, and it is typically up to the pilot of an aircraft to determine if a runway can safely support the aircraft. An airport sponsor cannot restrict an aircraft from using the runway simply because its weight exceeds the published strength rating; however, the airport sponsor has an obligation to properly maintain and protect the useful life of the runway, typically for 20 years.

The strength rating of a runway can change over time. Regular usage by heavier aircraft can decrease the strength rating, while periodic runway resurfacing can increase the strength rating. The current runway strength rating of the primary runway is adequate to accommodate the aircraft that currently and are anticipated to operate at the airport. The ultimate critical aircraft, represented by the King Air 350, can weigh 15,000 pounds on dual-wheel main landing gear; therefore, the existing pavement strength rating for Runway 13-31 is sufficient throughout the planning period.

Runway Line-of-Sight and Gradient

The FAA has instituted various line-of-sight requirements to facilitate coordination among aircraft and between aircraft and vehicles that are operating on active runways. This allows departing and arriving aircraft to verify the locations and actions of other aircraft and vehicles on the ground that could create a conflict.

Line-of-sight standards for an individual runway are based on whether a parallel taxiway is available. When a partial-parallel taxiway is available, any point five feet above the runway centerline must be mutually visible with any other point five feet above the runway centerline. Runway 13-31 meets the line-of-sight standard.

The surface gradient of a runway affects aircraft performance and pilot perception. The surface gradient is the maximum allowable slope for a runway. For runways designated for approach categories A and B, the maximum longitudinal grade is 2.0 percent. Runway 13-31 has a longitudinal grade of 1.59 percent, while Runway 17-35 has a longitudinal grade of 0.75 percent and Runway 3-21 has a longitudinal grade of 0.69 percent. All runways at POY conform to FAA design standards for longitudinal gradient.

SAFETY AREA DESIGN STANDARDS

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

The entire RSA, ROFA, and ROFZ must be under the direct ownership of the airport sponsor to ensure these areas remain free of obstacles and can be readily accessed by maintenance and emergency personnel. RPZs should also be under airport ownership. An alternative to outright ownership of the RPZ is the purchase of avigation easements (acquiring control of designated airspace within the RPZ) or having sufficient land use control measures in place that ensure the RPZ remains free of incompatible development. The various airport safety areas and their dimensions, as sourced from FAA AC 150/5300-13B, *Airport Design*, are presented graphically on **Exhibit 3B**.

Runway Safety Area

The RSA is defined in FAA AC 150/5300-13B, *Airport Design,* as a "defined area surrounding the runway consisting of a prepared surface suitable for reducing the risk of damage to aircraft in the event of undershoot, overshoot, or excursion from the runway." The RSA is centered on the runway and dimensioned in accordance with the approach speed of the critical aircraft using the runway. The FAA requires the RSA to be cleared and graded, drained by grading or storm sewers, capable of accommodating the critical aircraft and fire and rescue vehicles, and free of obstacles that are not fixed by navigational purpose, such as runway edge lights or approach lights.

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

As shown on **Exhibit 3B**, for existing RDC B-II-5000 design standards on primary Runway 13-31, the FAA calls for the RSA to be 150 feet wide and extend 300 feet beyond the runway ends. These dimensions also apply to the ultimate RDC B-II-4000 environment. For each turf/dirt runway in both the existing and ultimate runway environment, the RSA dimensions are 120 feet wide and extend 240 feet beyond the runway ends.

The RSA for Runway 13-31 is fully contained within airport property and is free of obstructions; however, the RSA associated with each turf/dirt runway extends beyond airport property on the south end of each runway. On the Runway 35 end, a small portion of the RSA – approximately 10 feet – extends past the airport boundary, while the southeast corner of the RSA near the Runway 3 end extends just beyond the property line. In both cases, the airport's perimeter fencing also obstructs the RSA in these areas. The options in the next chapter will examine potential mitigative actions.

Runway Object Free Area

The ROFA is "a clear area limited to equipment necessary for air and ground navigation and provides wingtip protection in the event of an aircraft excursion from the runway." It is a two-dimensional ground area surrounding runways, taxiways, and taxilanes that is clear of objects, except for objects with locations that are fixed by function (i.e., airfield lighting). The ROFA does not have to be graded and level like the RSA; instead, the primary requirement for the ROFA is that no object in the ROFA penetrates the lateral elevation of the RSA. The ROFA is centered on the runway, extending out in accordance with the critical aircraft utilizing the runway.

The ROFA design standards associated with primary Runway 13-31 for the existing and ultimate conditions are set at 500 feet wide and extend 300 feet beyond the runway end. For turf/dirt Runways 17-35 and 3-21, the ROFA dimensions are 250 feet wide and extend 240 feet beyond the end of the runway for both the existing and ultimate conditions.

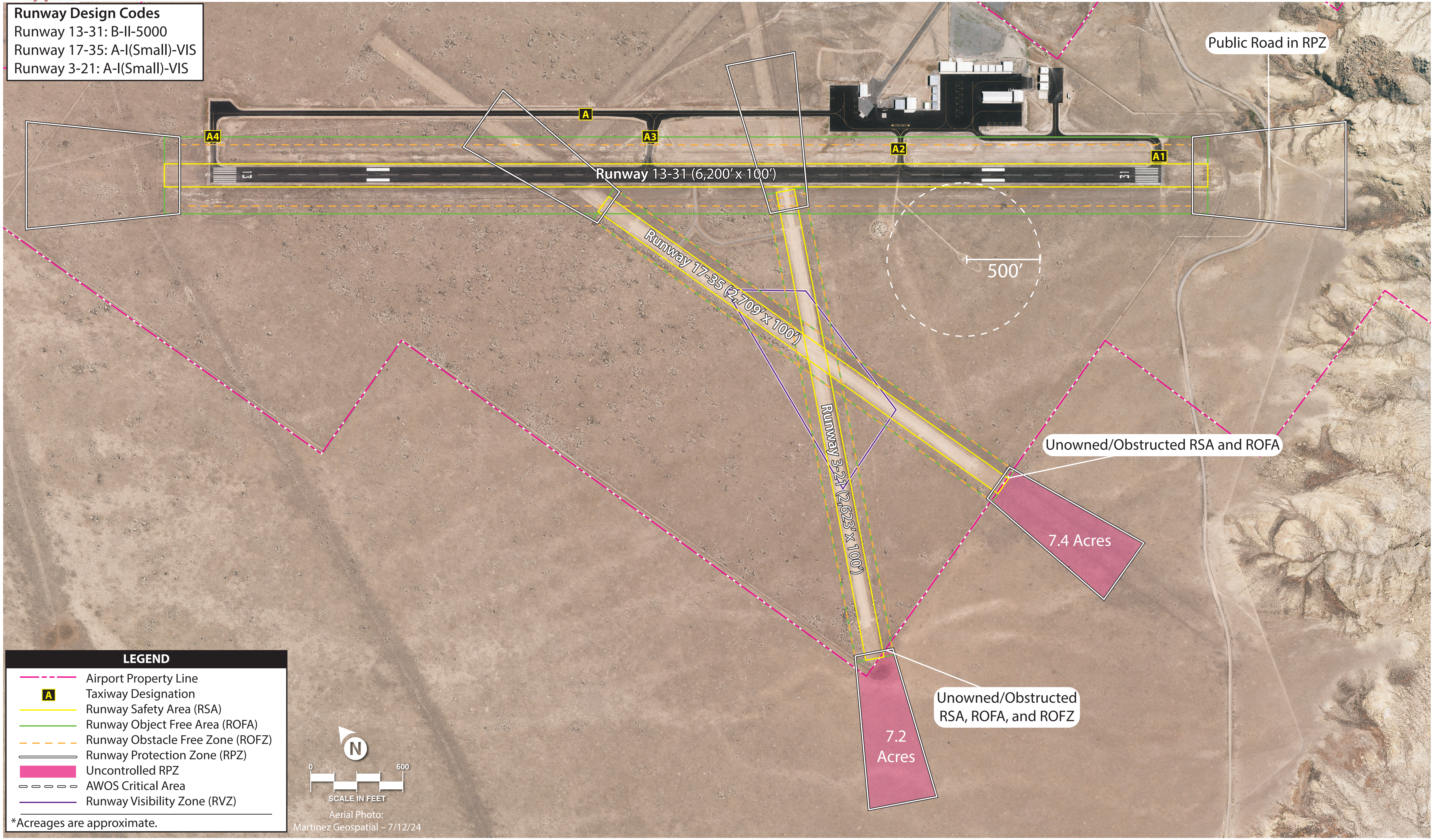


Exhibit 3B
EXISTING SAFETY AREAS

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The ROFA associated with Runway 13-31 is fully contained on airport property and is free of obstructions. The ROFAs associated with each turf/dirt runway extend beyond the airport's property line and encompass the perimeter fencing, which is an obstruction. The options will consider options for mitigating these nonstandard conditions.

Runway Obstacle Free Zone

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

For runways serving aircraft over 12,500 pounds, the ROFZ is 400 feet wide, centered on the runway, and extends 200 feet beyond the runway ends. This standard applies to primary Runway 13-31 at Powell Municipal Airport. For runways serving small aircraft under 12,500 pounds but with approach speeds greater than or equal to 50 knots, the ROFZ is 250 feet wide, centered on the runway, and extends 200 feet beyond the runway ends. This standard applies to turf/dirt Runways 17-35 and 3-21. Under the current evaluation with available data, there are no ROFZ obstructions on Runway 13-31; however, the ROFZ extends beyond airport property near the Runway 3 end and encompasses a portion of the airport's perimeter fence.

Runway Protection Zone

An RPZ is a trapezoidal area centered on the extended runway centerline beginning 200 feet from the end of the runway. This safety area is established to protect the end of the runway from airspace penetrations and incompatible land uses. The RPZ dimensions are based on the established RDC and the approach visibility minimums serving the runway. While the RPZ is intended to be clear of incompatible objects or land uses, some uses are permitted with conditions and other land uses are prohibited. According to AC 150/5300-13B, the following land uses are permissible within the RPZ:

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

In September 2022, the FAA published AC 150/5190-4B, *Airport Land Use Compatibility Planning*, which states that airport owner control over RPZs is preferred. Airport owner control over RPZs may be achieved through one of the following:

- Ownership of the RPZ property in fee simple
- Possessing sufficient interest in the RPZ property through easements, deed restrictions, etc.
- Possessing sufficient land use control authority to regulate land use in the jurisdiction that contains the RPZ
- Possessing and exercising the power of eminent domain over the property
- Possessing and exercising permitting authority over proponents of development within the RPZ (e.g., where the sponsor is a state)

AC 150/5190-4B further states that "control is preferably exercised through acquisition of sufficient property interest and includes clearing RPZ areas (and keeping them clear) of objects and activities that would impact the safety of people and property on the ground." The FAA recognizes that land ownership, environmental, geographical, and other considerations can complicate land use compatibility within RPZs; regardless, airport sponsors must comply with FAA grant assurances, including (but not limited to) Grant Assurance 21, *Compatible Land Use*. Sponsors are expected to take appropriate measures to "protect against, remove, or mitigate land uses that introduce incompatible development within RPZs." For proposed projects that would shift an RPZ into an area with existing incompatible land uses, such as a runway extension or construction of a new runway, the sponsor is expected to have or secure sufficient control of the RPZ, ideally through fee simple ownership. Where existing incompatible land uses are present, the FAA expects sponsors to "seek all possible opportunities to eliminate, reduce, or mitigate existing incompatible land uses" through acquisition, land exchanges, right-of-first-refusal to purchase, agreement with property owners on land uses, easements, or other such measures. These efforts should be revisited during master plan or ALP updates, and periodically thereafter, and should be documented to demonstrate compliance with FAA grant assurances. If new or proposed incompatible land uses impact an RPZ, the FAA expects the airport to take the above actions to control the property within the RPZ, along with adopting a strong public stance opposing the incompatible land uses.

For new incompatible land uses that result from a sponsor-proposed action (i.e., an airfield project such as a runway extension, a change in the critical aircraft that increases the RPZ dimension, or lower minimums that increase the RPZ dimension), the airport sponsor is expected to conduct an alternatives evaluation. The intent of the alternatives evaluation is to "proactively identify a full range of alternatives and prepare a sufficient evaluation to be able to draw a conclusion about what is 'appropriate and reasonable.'" For incompatible off-airport development, the sponsor should coordinate with the Airports District Office (ADO) as soon as the sponsor is aware of the development and the alternatives evaluation should be conducted within 30 days of the sponsor's first awareness of the development within the RPZ. The following items are typically necessary in an alternatives evaluation:

- Sponsor's statement of the purpose and need of the proposed action (airport project, land use change, or development)
- Identification of any other interested parties and proponents

- Identification of any federal, state, and local transportation agencies involved
- Analysis of sponsor control of the land within the RPZ
- Summary of all alternatives considered, including:
    - Alternatives that preclude introducing the incompatible land use within the RPZ (e.g., zoning action, purchase, and design alternatives, such as implementation of declared distances, displaced thresholds, runway shift or shortening, or raising minimums)
    - Alternatives that minimize the impact of the land use in the RPZ (e.g., rerouting a new roadway through less of the RPZ, etc.)
    - Alternatives that mitigate risk to people and property on the ground (e.g., tunnelling, depressing and/or protecting a roadway through the RPZ, implementing operational measures to mitigate any risks, etc.)
- Narrative discussion and exhibits or figures depicting the alternative
- Rough order of magnitude cost estimates associated with each alternative, regardless of potential funding sources
- Practicability assessment based on the feasibility of the alternative in terms of cost, constructability, operational impacts, and other factors

Once the alternatives evaluation has been submitted to the ADO, the FAA will determine whether the sponsor has made an adequate effort to pursue and give full consideration to appropriate and reasonable alternatives. **The FAA will not approve or disapprove the airport sponsor's preferred alternative; rather, the FAA will only evaluate whether an acceptable level of alternatives analysis has been completed before the sponsor makes the decision to allow or disallow the proposed land use within the RPZ.**

In summary, the RPZ guidance published in September 2022 shifts the responsibility of protecting the RPZ to the airport sponsor. The airport sponsor is expected to take action to control the RPZ or demonstrate that appropriate actions have been taken. The decision to permit or disallow existing or new incompatible land uses within an RPZ is ultimately up to the airport sponsor, with the understanding that the sponsor still has grant assurance obligations, and the FAA retains the authority to review and approve or disapprove portions of the ALP that would adversely impact the safety of people and property within the RPZ.

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

As shown on **Exhibit 3B**, the existing RPZs associated with Runways 13, 31, 17, and 3 are entirely controlled by the airport through outright ownership. The Runway 35 and 3 RPZs are largely uncontrolled by the airport sponsor. In terms of potentially incompatible land uses, a public roadway passes through the Runway 31 RPZ. As mentioned previously, public roadways are generally considered incompatible uses within an RPZ; however, the FAA considers existing roads to be grandfathered so that no corrective action is typically necessary. It should be noted that a change to the runway environment that alters the size of the RPZ may negate the grandfathered condition. If an instrument approach with lower visibility minimums were to be implemented on Runway 31 in the future, the size of the RPZ would increase, resulting in additional uncontrolled property and the need to reexamine whether or not the road should remain in the RPZ. If this scenario arises, the airport will have to work in consultation with the FAA to determine if the incompatible land use is acceptable and/or develop a plan of mitigative action.

RUNWAY VISIBILITY ZONE (RVZ)

The RVZ is an area formed by imaginary lines connecting the line-of-sight points of intersecting and converging non-intersecting runways. The purpose of the RVZ is to facilitate coordination among aircraft and between aircraft and vehicles that are operating on active runways. Having a clear line-of-sight allows departing aircraft and arriving aircraft to verify the location and actions of other aircraft and vehicles on the ground that could create a conflict. Within the RVZ, any point five feet above the runway centerline must be mutually visible with any other point five feet above the centerline of the crossing runway. The RVZ associated with the intersecting runways at POY is depicted on **Exhibit 3B**. Currently, there are no obstructions to the RVZ.

SEPARATION STANDARDS

There are several other standards related to separation distances from runways and taxiways. Each is designed to enhance the safety of the airfield.

Runway/Taxiway Separation

The design standard for the separation between runways and parallel taxiways is a function of the critical aircraft and the instrument approach visibility minimum. The separation standard for primary Runway 13-31 in the existing (B-II-5000) and ultimate (B-II-4000) conditions is 240 feet from the runway centerline to the parallel taxiway centerline. Parallel Taxiway A is currently separated from the runway by 240 feet at its closest point to the runway. Taxiway A should be maintained in its current location.

Hold Line Position Separation

Hold line position markings are placed on taxiways leading to runways. When instructed, pilots are to stop short of the holding position marking line. The existing and ultimate design standards for Runway 13-31 call for holding positions to be separated from the runway centerline by 200 feet. The FAA also recommends that hold lines be parallel with the runway so that a pilot is fully perpendicular to the runway with a clear, unobstructed view of the entire runway length.

At Powell Municipal Airport, each hold line position marking on taxiways leading to primary Runway 13-31 is situated 200 feet from the runway centerline; however, the hold lines on Taxiways A1 and A3 are not parallel to the runway, which is a non-standard condition.

Aircraft Parking Area Separation

According to FAA AC 150/5300-13B, aircraft parking positions should be located to ensure that aircraft components (wings, tail, and fuselage) do not:

1. Conflict with the object free area for adjacent runway or taxiways:
   a. Runway object free area (ROFA)
   b. Taxiway object free area (TOFA)
   c. Taxilane object free area (TLOFA)

2. Violate any of the following aeronautical surfaces and areas:
   a. Runway approach or departure surface
   b. Runway visibility zone (RVZ)
   c. Runway obstacle free zone (ROFZ)
   d. Navigational aid equipment critical areas

Existing aircraft parking positions at Powell Municipal Airport are located on three of the airport's five aircraft parking aprons. In their existing locations, each marked aircraft parking position at POY is clear of the safety areas, as well as the aeronautical surfaces and areas detailed above.

TAXIWAYS

The design standards associated with taxiways are determined by the taxiway design group (TDG) or the ADG of the critical aircraft. As determined previously, the applicable ADG for primary Runway 13-31 in the existing and ultimate conditions is ADG II. **Table 3G** presents the various taxiway design standards related to ADG II. The table also shows those taxiway design standards related to TDG. The TDG standards are based on the main gear width (MGW) and cockpit to main gear (CMG) distance of the critical aircraft expected to use those taxiways. Different taxiway and taxilane pavements can and should be planned to the most appropriate TDG design standards, based on usage.

TABLE 3G | Taxiway Dimensions and Standards

STANDARDS BASED ON WINGSPAN	ADG II
Taxiway and Taxilane Protection	
Taxiway Safety Area Width (TSA)	79'
Taxiway Object Free Area Width (TOFA)	124'
Taxilane Object Free Area Width (TLOFA)	110'
Taxiway and Taxilane Separation	
Taxiway Centerline to Parallel Taxiway Centerline	101.5'
Taxiway Centerline to Fixed or Moveable Object	62'
Taxilane Centerline to Parallel Taxilane Centerline	94.5'
Taxilane Centerline to Fixed or Moveable Object	55'
Wingtip Clearance	
Taxiway Wingtip Clearance (feet)	22.5'
Taxilane Wingtip Clearance (feet)	15.5'
STANDARDS BASED ON TDG	**TDG 2A/B**
Taxiway Width Standard	35'
Taxiway Edge Safety Margin	7.5'
Taxiway Shoulder Width	15'

ADG = airplane design group
TDG = taxiway design group

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

The current design for all paved taxiways at POY is TDG 2A, which dictates a width of 35 feet. Taxiway A and three of its connectors (Taxiways A2, A3, and A4) are currently 35 feet wide, meeting the standard. These taxiway widths should be maintained through the planning period. Taxiway A1, which serves Runway 31, is 50 feet wide. While the 50-foot width of this threshold connector provides an added safety margin for aircraft operating at the airport, the FAA may elect not to fund regular pavement maintenance for the portions of taxiway pavement that exceed the standard. If the airport chooses to maintain this taxiway at its current width, the costs may need to come from a local funding source, rather than federal or state grant monies.

Exhibit 3C depicts the TOFA and TLOFA, which are based on ADG II standards. The TOFA for taxiways serving Runway 13-31 is 124 feet wide, while the TLOFA for taxilanes serving hangar areas is 110 feet wide. Like the ROFA, these areas should be cleared of objects and parked aircraft, except for objects needed for air navigation or aircraft ground maneuvering purposes. The TOFAs associated with the airfield taxiways and TLOFAs associated with hangar areas are clear of obstructions.

Exhibit 3C – Taxiway and Taxilane Design

Taxiway and Taxilane Design Considerations

FAA AC 150/5300-13B, *Airport Design*, provides guidance on recommended taxiway and taxilane layouts to enhance safety by avoiding runway incursions. A runway incursion is defined as "any occurrence at an airport involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft." The following is a list of the taxiway design guidelines and the basic rationale behind each recommendation included in the current AC, as well as previous FAA safety and design recommendations.

1. **Taxiing Method**: Taxiways are designed for cockpit-over-centerline taxiing with pavement that is wide enough to allow a certain amount of wander. On turns, sufficient pavement should be provided to maintain the edge safety margin from the landing gear. When constructing new taxiways, existing intersections should be upgraded to eliminate judgmental oversteering, which is when a pilot must intentionally steer the cockpit outside the marked centerline to ensure the aircraft remains on the taxiway pavement.

2. **Curve Design**: Taxiways should be designed so the nose gear steering angle is no more than 50 degrees, which is the generally accepted value to prevent excessive tire scrubbing.

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

4. **Channelized Taxiing**: To support visibility of airfield signage, taxiway intersections should be designed to meet standard taxiway width and fillet geometry.

5. **Designated Hot Spots and Runway Incursion Mitigation (RIM) Locations**: A hot spot is a location on the airfield with elevated risk of a collision or runway incursion. Mitigation measures should be prioritized for areas the FAA designates as hot spots or RIM locations.

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

7. **Runway Incursions**: Design taxiways to reduce the probability of runway incursions.

   - *Increase Pilot Situational Awareness*: Pilots who know where they are on the airport are less likely to enter a runway improperly. Complexity leads to confusion. Keep taxiway systems simple by using the three-path concept.

   - *Avoid Wide Expanses of Pavement*: Wide pavements require placement of signs far from a pilot's eye. This is especially critical at runway entrance points. Where a wide expanse of pavement is necessary, avoid direct access to a runway.

   - *Limit Runway Crossings*: The taxiway layout can reduce the opportunity for human error. The benefits are twofold: through a simple reduction in the number of occurrences and a reduction in air traffic controller workload.

   - *Avoid High-Energy Intersections*: These are intersections in the middle third of runways. By limiting runway crossings to the first and last thirds of the runway, the portion of the runway where a pilot can least maneuver to avoid a collision is kept clear.

   - *Increase Visibility*: Between both taxiways and runways, right-angle intersections provide the best visibility. Acute-angle runway exits provide greater efficiency in runway usage but should not be used as runway entrance or crossing points. A right-angle turn at the end of a parallel taxiway is a clear indicator of approaching a runway.

- *Avoid Dual-Purpose Pavements*: Runways used as taxiways and taxiways used as runways can lead to confusion. A runway should always be clearly identified as a runway, and only a runway.

- *Direct Access*: Do not design taxiways to lead directly from an apron to a runway. Such configurations can lead to confusion when a pilot typically expects to encounter a parallel taxiway.

- *Hot Spots*: Confusing intersections near runways are more likely to contribute to runway incursions. These intersections must be redesigned when the associated runway is subject to reconstruction or rehabilitation. Other hot spots should be corrected as soon as practicable.

8. **Runway/Taxiway Intersections**

- *Right Angle*: Right-angle intersections are the standard for all runway/taxiway intersections, except where there is a need for an acute-angled exit. Right-angle taxiways provide the best visual perspective to a pilot approaching an intersection with the runway to observe aircraft in both the left and right directions. They also provide optimal orientation of the runway holding position signs so the signs are visible to pilots.

- *Acute Angle*: Acute angles should not be larger than 45 degrees from the runway centerline. A 30-degree taxiway layout should be reserved for high-speed exits. The use of multiple intersecting taxiways with acute angles creates pilot confusion and improper positioning of taxiway signage. The construction of high-speed exits is typically only justified for runways with regular use by jet aircraft in approach categories C and above.

- *Large Expanses of Pavement*: Taxiways must never coincide with the intersection of two runways. Taxiway configurations with multiple taxiway and runway intersections in a single area create large expanses of pavement, making it difficult to provide proper signage, marking, and lighting.

9. **Taxiway/Runway/Apron Incursion Prevention**: Apron locations that allow direct access onto a runway should be avoided. Increase pilot situational awareness by designing taxiways in a manner that forces pilots to consciously make turns. Taxiways originating from aprons and forming a straight line across runways at mid-span should be avoided.

- *Wide-Throat Taxiways*: Wide-throat taxiway entrances should be avoided. Such large expanses of pavement may cause pilot confusion and make lighting and marking more difficult.

- *Direct Access from Apron to a Runway*: Avoid taxiway connectors that cross over a parallel taxiway and directly onto a runway. Consider a staggered taxiway layout or a no-taxi island that forces pilots to make a conscious decision to turn.

- *Apron to Parallel Taxiway End*: Avoid direct connection from an apron to a parallel taxiway at the end of a runway.

The taxiway system at Powell Municipal Airport generally provides for the efficient movement of aircraft, and there are no FAA-designated hot spots at the airport. The full-length parallel taxiway completed in 2020 has eliminated the need for pilots to back-taxi when departing Runway 13 or arriving on Runway 31, which had previously resulted in a dual use of Runway 13-31 (i.e., the runway being used as a taxiway). Similarly, the inclusion of a no-taxi island at the entrance to Taxiway A2 has mitigated the direct access point that would otherwise exist in this area. Presently, the only non-standard taxiway design features (identified on **Exhibit 3C**) at POY include the following:

1. *Non-standard holding bay serving Runway 13* | The FAA has updated the recommended design for holding bays to include islands (either grass or properly marked pavement) between the parking positions to assist pilots with situational awareness by providing visual cues, or a queuing taxiway and an access taxiway with marked centerlines.

2. *Angled connection between Taxiway A3 and Runway 13-31* | The FAA recommends that taxiways connect to runways at a right angle. Taxiway A3 connects to the primary runway at an angle.

3. *Non-standard taxiway fillets* | Taxiway fillets are areas of additional pavement designed to maintain the taxiway edge safety margin (TESM) by widening taxiways at the insides of turns. The fillets on the turns of the connector taxiways do not meet design standards, with the exception of the fillets on the northeast side of Taxiway A3.

Taxilane Design Considerations | Taxilanes are distinguished from taxiways in that they do not provide access to or from the runway system directly. Taxilanes typically provide access to hangar areas and can be planned to varying design standards, depending on the type of aircraft utilizing the taxilane, as previously described.

NAVIGATIONAL AND APPROACH AIDS

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

Instrument Approach Aids | Powell Municipal Airport has two published instrument approaches. A localizer performance with vertical guidance (LPV) via an area navigation (RNAV) global positioning system (GPS) instrument approach is available to each end of Runway 13-31. This approach provides visibility minimums of not lower than one-mile for all civilian aircraft. These approaches are considered adequate for primary Runway 13-31 at this time; however, for planning purposes, a reduction in the visibility minimums to lower than one-mile, but not below ¾-mile, should be considered to meet increased usage by cabin class aircraft. This change would result in an increase to the RPZ dimensions for the affected runway end(s).

Exhibit 3D presents a comparison of the RPZs currently serving Runways 13 and 31 versus what they would be if visibility minimums not lower than ¾-mile were to be implemented. As can be seen in the graphic, the RPZs would increase significantly in size, resulting in additional areas of uncontrolled property (pink shading) on each end of Runway 13-31. For planning purposes, the options to follow in the next chapter will depict instrument approaches with not lower than ¾-mile minimums on Runway 13-31, which correlates to the ultimate B-II-4000 environment.

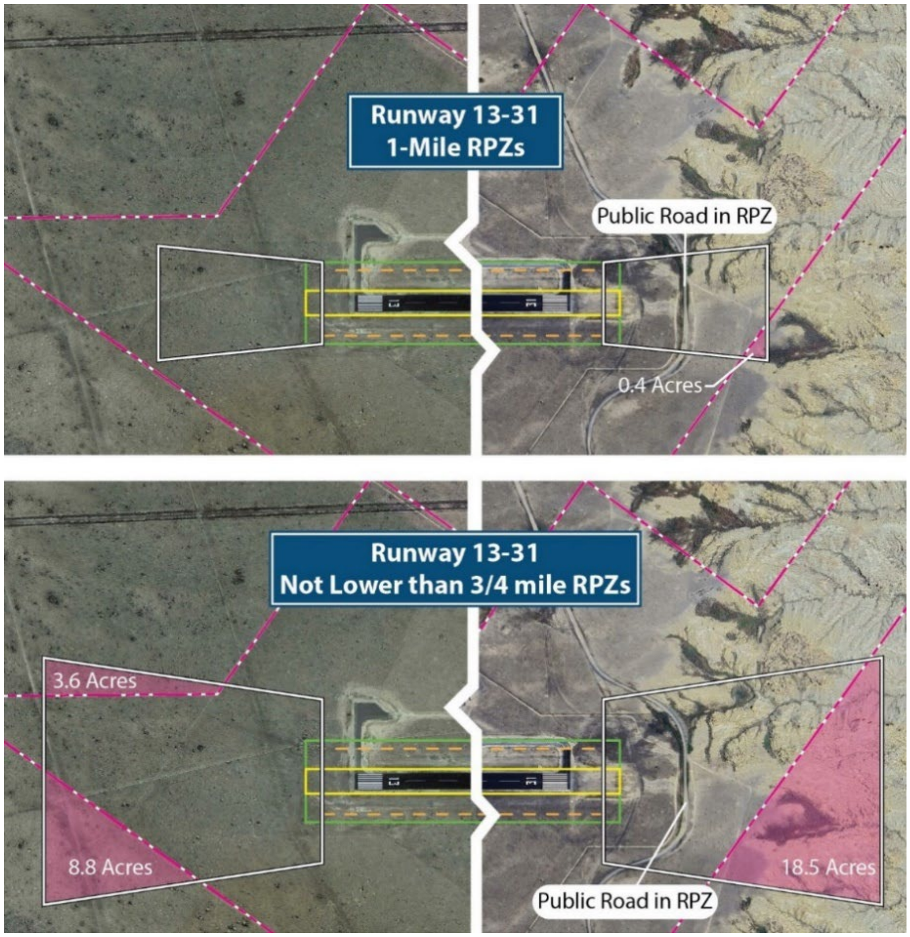

Exhibit 3D – RPZ Dimension Comparison

Visual Approach Aids | In most instances, the landing phase of any flight must be conducted in visual conditions. Electronic visual approach aids are commonly provided at airports to provide pilots with visual guidance information during landings to the runway. Each end of primary Runway 13-31 is currently equipped with a two-box precision approach path indicator (PAPI-2). As more turbine aircraft begin to operate at the airport, consideration should be given to upgrading the PAPI-2 to a PAPI-4 (four-box system) on each runway end.

Runway end identification lights (REILs) are flashing lights located at the runway threshold end that facilitate rapid identification of the runway end at night and during poor visibility conditions. REILs provide pilots with the ability to identify the runway thresholds and distinguish the runway end lighting from the other lighting on the airport and in the approach areas. The FAA indicates that REILs should be considered for all lighted runway ends that are not planned for more sophisticated approach lighting systems. Runway 31 is equipped with REILs, which should be maintained, and consideration should be given to the installation of REILs on Runway 13.

Weather Reporting Aids | Powell Municipal Airport has a lighted wind cone and wind tee co-located with a segmented circle, which are centrally located southwest of Runway 13-31 (previously identified on Exhibit 1C). These aids provide information to pilots regarding wind speed and direction and should be maintained through the planning period. The segmented circle consists of a system of visual indicators that are designed to provide traffic pattern information to pilots. This equipment should be maintained.

The airport is also equipped with an automated weather observation station (AWOS-3), which provides weather observations 24 hours per day. The system updates weather observations every minute, continuously reporting significant weather changes as they occur in real time. This information is transmitted via a designated radio frequency at regular intervals. FAA siting criteria indicate that the AWOS should be located between 1,000 and 3,000 feet from the runway threshold and between 500 and 1,000 feet perpendicular to the runway centerline. The AWOS also has a 500-foot radius critical area, which must be kept free of obstructions that could interfere with its sensors. The AWOS at Powell Municipal Airport is properly located and should be maintained in its current location through the planning period.

AIRFIELD LIGHTING, MARKING, AND SIGNAGE

Several lighting and pavement marking aids serve pilots using the airport. These aids assist pilots in locating the airport and runway at night or in poor visibility conditions. They also serve aircraft navigating the airport environment on the ground when transitioning to/from aircraft parking areas to/from the runway.

Airport Identification Lighting | Powell Municipal Airport's rotating beacon is located on the east side of the airport property, south of the airport access road and adjacent to the hangar area. The beacon should be maintained in its current location.

Runway and Taxiway Lighting | Runway 13-31 is equipped with a medium intensity runway lighting (MIRL) system. This system is adequate and should be maintained. Turf/dirt Runways 17-35 and 3-21 are equipped with retro-reflectors at each runway end, and these should be maintained. Taxiway A and its associated connector taxiways are equipped with edge reflectors. Consideration should be given to upgrading the edge reflectors to a medium intensity taxiway lighting (MITL) system.

Airfield Signs | Airfield identification signs assist pilots in identifying their locations on the airfield and directing them to their desired locations. Lighted signs are installed on the runway and taxiway systems on the airfield. The signage system includes lighted runway and taxiway designations and routing/directional signage. All of these signs should be maintained throughout the planning period.

Many airports are transitioning to light emitting diode (LED) systems. LEDs have many advantages, including lower energy consumption, longer lifespan, increased durability, reduced size, greater reliability, and faster switching. While a larger initial investment is required up front, the energy savings and reduced maintenance costs outweigh any additional costs in the long run. At Powell Municipal Airport, airfield lighting includes incandescent bulbs, rather than LEDs. When these systems need to be repaired/replaced, consideration should be given to upgrading them to LED systems.

Pavement Markings | Runway markings are typically designed to the type of instrument approach available on the runway. FAA AC 150/5340-1K, *Standards for Airport Markings*, provides guidance necessary to design airport markings. Runway 13-31 is equipped with non-precision markings in support of the LPV GPS instrument approach to each end. The non-precision markings should be maintained throughout the long-term planning horizon.

UNCREWED AIRCRAFT SYSTEMS CONSIDERATIONS

Currently, Powell Municipal Airport is home to one unmanned aircraft system (UAS) manufacturer, GT Aeronautics, which develops fixed-wing UAS aircraft for military and commercial uses. GT Aeronautics also offers UAS flight training. A joint-use UAS operations area located adjacent to the airport allows for use of the airspace by both UAS aircraft and manned aircraft. This three-nautical-mile by three-nautical-mile area is used by GT Aeronautics for the testing and training of UAS aircraft, up to 8,000 feet mean sea level (MSL). When in use by GT Aeronautics, a Notice to Airmen (NOTAM) is issued to alert pilots operating in the vicinity that UAS aircraft are operating nearby. As mentioned in Chapter Two, UAS is an emerging entrant that has experienced rapid growth in the U.S. and across the globe. The FAA anticipates continued growth in this segment of the industry, and POY is well-positioned to continue to be able to accommodate UAS activity.

REFERENCE AIRCRAFT

The design criteria established in *Vertiport Design* are intended for eVTOL aircraft that meet the performance criteria and design characteristics of the reference aircraft. The reference aircraft denotes an eVTOL aircraft that integrates certain performance and design features of the nine previously mentioned emerging aircraft. These aircraft models are evolving rapidly, and manufacturers are approaching aircraft certification with a wide range of designs. Furthermore, new eVTOL aircraft have not yet received FAA airworthiness certification and do not have established safety records. This makes it impractical for the FAA to categorize these aircraft the way fixed-wing and helicopter aircraft have been; however, the feedback from eVTOL manufacturers revealed common characteristics, which the FAA used to produce *Vertiport Design*. These preliminary design characteristics, expected performance capabilities, and assumptions regarding takeoff and landing area design for eVTOL aircraft are summarized in **Table 3H** and on **Exhibit 3E**.

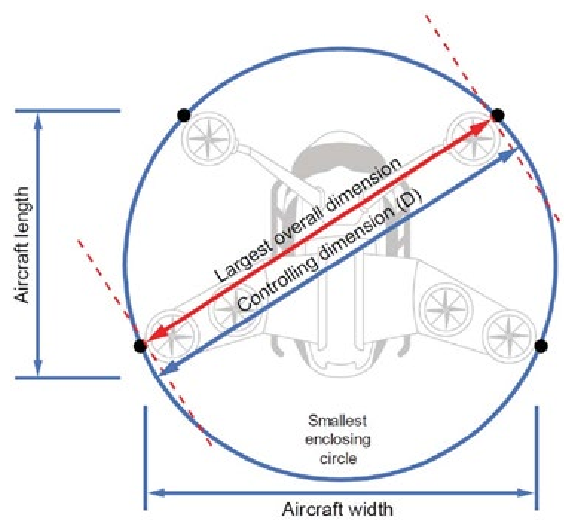

Exhibit 3E – Reference Aircraft Controlling Dimensions

TABLE 3H | Reference Aircraft

DESIGN CHARACTERISTICS	CRITERIA
Propulsion	Electric battery driven, utilizing distributed electric propulsion
Propulsive Units	Two or more
Battery Systems	Two or more
Maximum Takeoff Weight (MTOW)	12,500 pounds (5,670 kg) or less
Aircraft Length	50 feet (15.2 meters) or less
Aircraft Width	50 feet (15.2 meters) or less
Operating Conditions	
Operation Location	Land-based (ground or elevated) – no amphibian or float operations
Pilot	On board
Flight Conditions	VFR
Performance	
Hover	Hover out of ground effect (HOGE) in normal operations
Takeoff	Vertical
Landing	Vertical
Downwash/Outwash	Must be considered in TLOF/FATO sizing and ingress/egress areas to ensure no endangerment to people/property in the vicinity, and no impact to safety critical navigational aids and surfaces, supporting equipment, nearby aircraft, and overall safety

TLOF = touchdown and liftoff area
FATO = final approach and takeoff area

Source: FAA Engineering Brief 105, Vertiport Design

LANDSIDE FACILITY REQUIREMENTS

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

- General aviation terminal facilities and auto parking
- Aircraft storage hangars
- Aircraft parking aprons
- Airport support facilities

Projections made for aircraft storage hangars, aircraft parking aprons, and marked parking positions are based on the number of aircraft currently based and forecast to base on the airport property over the 20-year planning horizon. Terminal facilities, auto parking, and other airport support facilities are based on the annual number of itinerant operations projected to occur over the planning period.

In addition to landside facility requirements, potential non-aeronautical land uses will be evaluated in subsequent chapters. These are portions of airport property that are suitable for non-aviation purposes and can generate revenue for the airport, such as agricultural or industrial uses. While airport property is generally subject to Airport Improvement Program (AIP) grant assurances, an airport can request a release from aeronautical federal obligations for certain areas of property that are not necessary for aviation uses. These requests are facilitated under the *FAA Reauthorization Act of 2018*, Section 163, which governs the FAA's authority over non-aeronautical development.

GENERAL AVIATION TERMINAL SERVICES

The general aviation terminal facilities at an airport often provide corporate officials and visitors with their first impression of the community. General aviation terminal facilities at an airport typically provide space for passenger waiting, a pilots' lounge, flight planning, concessions, management, storage, and many other various needs. This space is not necessarily limited to a single, separate terminal building, but can include space offered by fixed base operators (FBOs) and other specialty operators for these functions and services. At Powell Municipal Airport, general aviation terminal services are provided in the terminal building located at the north end of the airport's landside facilities. The terminal includes a lobby area, a pilots' lounge, a kitchen, vending machines, and restrooms.

The methodology used in estimating general aviation terminal facility needs was based on the number of airport users expected to utilize general aviation facilities during the design hour. This methodology is a general airport planning practice and is not considered exacting, as each airport terminal serves unique functions. The space requirements for terminal building facilities were based on providing 125 square feet (sf) per design hour itinerant passenger. A multiplier of 3.0 in the short term, increasing to 4.0 in the long term, was applied to terminal facility needs to better determine the number of passengers associated with each itinerant aircraft operation. This increasing multiplier indicates an expected increase in larger aircraft operations through the long term. These operations typically support larger turboprop and jet aircraft, which can accommodate an increasing passenger load factor. Such is the case at Powell Municipal Airport, where an increasing number of turbine operations are anticipated.

Table 3J outlines the space requirements for general aviation terminal services at Powell Municipal Airport through the long-term planning period. The amount of space currently offered in the terminal building is approximately 4,000 sf. Based on the number of itinerant operations forecast to occur at the airport, the current terminal size is adequate through the long-term planning period.

TABLE 3J | General Aviation Terminal Area Facilities

	Currently Available	Short-Term Need	Intermediate-Term Need	Long-Term Need
Terminal Building (sf)	4,000	500	600	900
General Aviation Design Hour Passengers	–	4	5	7
Passenger Multiplier	–	3.0	3.5	4.0
Terminal Parking	7	9	15	17
Tenant Vehicle Parking	0	26	29	32

Source: Coffman Associates analysis

General aviation vehicle parking demands have also been determined for the airport. Space determinations for passengers were based on an evaluation of existing airport use, as well as standards set forth to help calculate projected terminal facility needs. There are currently seven marked individual vehicle spaces provided at the airport, all of which are located adjacent to the terminal building. There are no dedicated parking areas for based aircraft owners, who park near their hangars. As can be seen in the table, total vehicle parking offered at POY, including dedicated parking for based aircraft owners, is anticipated to be needed as early as the short-term period.

AIRCRAFT HANGARS

Utilization of hangar space varies as a function of local climate, security, and owner preference. The trend in general aviation aircraft is toward more sophisticated (and consequently, more expensive) aircraft; therefore, many aircraft owners prefer enclosed hangar space, as opposed to outside tiedowns.

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

While most aircraft owners prefer enclosed aircraft storage, some will still use outdoor tiedown spaces, usually due to lack of available hangar space, high hangar rental rates, or operational needs; therefore, enclosed hangar facilities do not necessarily need to be planned for each based aircraft.

Hangar types vary greatly in size and function. T-hangars, box hangars, and shade hangars are popular with aircraft owners who need to store single private aircraft. These hangars often provide individual spaces within a larger structure or in standalone portable buildings. There is approximately 10,000 sf of T-hangar storage space at the airport. For determining future aircraft storage needs, a planning standard of 1,200 sf per aircraft is utilized for this type of hangar.

Executive box hangars are open-space facilities with no interior supporting structure. These hangars can vary in size from 1,500 and 2,500 sf to nearly 10,000 sf. They are typically able to house single-engine, multi-engine, turboprop, and jet aircraft, as well as helicopters. Executive box hangar space at Powell Municipal Airport is estimated at 50,800 sf. For future planning, standards of 3,000 sf per turboprop, 5,000 sf per jet, and 1,500 sf per helicopter are utilized for executive box hangars.

Conventional hangars are large, open-space facilities with no supporting interior structure. These hangars provide for bulk aircraft storage and are often utilized by airport businesses, such as FBOs or aircraft maintenance operators. Conventional hangars are generally larger than executive box hangars and can range in size from 10,000 sf to more than 20,000 sf. Often, a portion of a conventional hangar is utilized for non-aircraft storage needs, such as maintenance or office space. There are no conventional hangars at Powell Municipal Airport. For planning purposes, the same aircraft sizing standards utilized for executive hangars are also utilized for conventional hangars.

Future hangar requirements for the airport are summarized in **Table 3K**. While most based aircraft owners prefer enclosed hangar space, it is assumed that some will use tiedowns on the apron. The analysis shows that future hangar requirements indicate a potential need for almost 28,000 sf of new hangar storage capacity through the long-term planning period. This includes a mixture of hangar types, with the largest need projected in the executive/conventional hangar category. Due to the projected increase in based aircraft, the existing demand for hangar space, annual general aviation operations, and hangar storage needs, facility planning will consider additional hangars at the airport. It is expected that the aircraft storage hangar requirements will continue to be met through a combination of hangar types.

TABLE 3K | Aircraft Hangar Requirements

	Currently Available	Short-Term Need	Intermediate-Term Need	Long-Term Need	Difference
Total Based Aircraft	33	35	38	42	+9
Hangar Area Requirements					
T-Hangar Area (sf)	10,000	19,600	25,600	26,700	+16,700
Executive Box/Conventional Hangar Area (sf)	50,800	50,700	55,200	61,700	+11,000
Total Hangar Area (sf):	**60,800**	**70,300**	**80,800**	**88,400**	**+27,700**

Source: Coffman Associates analysis

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

AIRCRAFT PARKING APRONS

The aircraft parking apron is an expanse of paved area intended for aircraft parking and circulation. Typically, a main apron is centrally located near the airside entry point, such as the terminal building or FBO facility. Ideally, the main apron is large enough to accommodate transient airport users, as well as a portion of locally based aircraft. Smaller aprons are often available adjacent to FBO or specialty aviation service operator (SASO) hangars and at other locations around the airport. The apron layout at Powell Municipal Airport generally follows this typical pattern, with aprons adjacent to the terminal building (terminal apron and central apron, as identified previously on Exhibit 1G). Three additional apron areas are located east of the central apron.

To determine future apron needs, the FAA-recommended planning criterion[2] of 805 square yards (sy) was used for single- and multi-engine itinerant aircraft, while a planning criterion of 1,508 sy was used to determine the area for transient turboprop and jet aircraft. A parking apron should also provide space for locally based aircraft that require temporary tiedown storage. A planning standard of 705 sy per position is utilized for locally based tiedowns.

The total apron parking requirements are presented in **Table 3L**. The existing apron pavement area at Powell Municipal Airport currently encompasses approximately 32,700 sy of space, divided among the five apron areas. Approximately 4,100 sy of this space is used exclusively for aircraft parking, with 23 marked tiedowns. Using the planning standards described above and factoring in assumptions regarding operational and based aircraft growth, the apron capacity is adequate throughout the planning period.

There are currently 23 marked parking positions available for based and itinerant fixed wing aircraft at the airport. There is no helicopter parking. As shown in the table, there may be a need for additional aircraft parking in the future, including parking for small to mid-sized corporate jets and helicopters.

[2] Refer to FAA AC 150/5300-13B, Airport Design, Appendix E.

TABLE 3L | Aircraft Parking Apron Requirements

	Available	Short Term	Intermediate Term	Long Term
Aircraft Parking Positions				
Based/Local GA Aircraft	–	2	2	2
Transient GA Aircraft	–	24	23	26
Corporate Jet Aircraft	–	1	2	3
Helicopter	–	1	2	2
Total Parking Positions:	**23**	**28**	**29**	**33**
Total Apron Area (sy):	**32,700**	**22,700**	**24,200**	**28,300**

Source: Coffman Associates analysis

SUPPORT FACILITIES

Various other landside facilities that play a supporting role in overall airport operations have also been identified. These support facilities include aviation fuel storage and a perimeter fencing and gate system.

Aviation Fuel Storage

The airport's fuel storage tanks are located underground adjacent to the central apron. There is one 9,500-gallon tank for 100LL Avgas and one 9,500-gallon tank for Jet A fuel. Fuel flowage records for the airport were not available, so it is unclear whether existing capacity meets demand. As the fleet mix transitions to include more frequent operations by turbine aircraft, fuel storage and capacities should be evaluated to ensure an adequate supply of fuel is available. Planning should also consider an additional tank to store unleaded aviation fuel (100UL). The FAA has recently approved the use of 100UL in piston-powered aircraft, although some details regarding infrastructure and distribution remain unknown; nevertheless, the options will include placeholders for these facilities.

Perimeter Fencing and Gates

Perimeter fencing is used at airports primarily to secure the aircraft operational area. The physical barrier of perimeter fencing:

- Gives notice of legal boundary of the outermost limits of the facility or security-sensitive areas;
- Assists in controlling and screening authorized entries into a secured area by deterring entry elsewhere along the boundary;
- Supports surveillance, detection, assessment, and other security functions by providing a zone for installing intrusion detection equipment and closed-circuit television (CCTV);
- Deters casual intruders from penetrating the aircraft operations areas on the airport;
- Creates a psychological deterrent;

- Demonstrates a corporate concern for facilities; and

- Limits inadvertent access to the aircraft operations areas by wildlife.

As detailed in Chapter One, Powell Municipal Airport operations areas are completely enclosed by eight-foot wildlife fencing, with one controlled access gate to allow entry to authorized personnel. All fencing and gates should be maintained throughout the planning period and should be regularly inspected to ensure they are functioning properly and are undamaged.

A summary of the overall general aviation landside facilities is presented on **Exhibit 3F**.

SUMMARY

This chapter has outlined the safety design standards and facilities required to meet potential aviation demand projected at Powell Municipal Airport for the next 20 years. In an effort to provide a more flexible master plan, the yearly forecasts from Chapter Two have been converted to planning horizon levels. The short term roughly corresponds to a five-year timeframe, the intermediate term is approximately 10 years, and the long term is 20 years. By utilizing planning horizons, airport management can focus on demand indicators for initiating projects and grant requests, rather than on specific dates in the future.

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

	Available	Short Term	Intermediate Term	Long Term
Aircraft Storage Hangar Requirements 				
Aircraft to be Hangared	33	33	36	40
T-Hangar Area (sf)	10,000	19,600	25,600	26,700
Executive/Conventional Hangar Area (sf)	50,800	50,700	55,200	61,700
Total Hangar Storage Area (sf)	60,800	70,300	80,800	88,400
Aircraft Parking Apron 				
Aircraft Parking Positions	23	28	29	33
Total Public Apron Area (sy)	32,700	22,700	24,200	28,300
General Aviation Terminal Facilities and Parking 				
Building Space (sf)	4,000	500	600	900
Terminal and Tenant Vehicle Parking	7	35	44	49

Exhibit 3F
LANDSIDE FACILITY REQUIREMENTS