C. Capacity Analysis and Facility Requirements

Introduction

In efforts to quantify an airport's future facility needs, it is necessary to translate the forecasted aviation activity into specific physical development requirements. This chapter analyzes the actual types and quantities of facilities and/or the required improvements to existing facilities needed to accommodate the projected demand in a safe and efficient manner. For those components determined to be deficient, the type, size, or amount of facilities required to meet the demand is identified and explained in the section conclusion. Two separate analyses are included: those requirements related to airside facilities, and those requirements related to landside facilities.

This analysis uses the forecasts presented in the preceding chapter for establishing future development at Pueblo Memorial Airport (PUB). This is not intended to dismiss the possibility that either accelerated growth or consistently higher or lower levels of activity may occur. Aviation activity levels should be monitored for consistency with the forecasts. Since the facility improvements are identified to resolve existing deficiencies, accommodate projected growth, and satisfy airport development goals, the resulting recommendations respond to demand rather than being planned for a specific year.

Airfield Capacity

Airfield capacity is primarily a function of the amount and configuration of the major aircraft operating surfaces (i.e., runways and taxiways). It is defined in terms of potential excesses and deficiencies. Capacity refers to the number of aircraft operations that a particular runway and taxiway configuration can accommodate either on an hourly or annual basis without incurring excessive delays.

This section estimates PUB's annual operational capacity, compares it to forecasted growth, and determines whether capacity improvements are needed to accommodate forecasted growth.

Airfield Capacity Methodology

Long-term planning requires an airport to assess its ability to meet forecasted demand. One metric used to analyze airfield capacity is Annual Service Volume (ASV). ASV is described in Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay*, as a method of evaluating an airfield's annual operational capacity with acceptable delays. It is used as a metric for planning future improvement projects at an airport and is influenced by several variables. The primary drivers of ASV at PUB include:

- **Weather Conditions.** Weather conditions affect when Visual Flight Rules (VFR) or Instrument Flight Rules (IFR) are required for approach and landing. More frequent occurrences of IFR weather, or more typically more inclement weather conditions, reduces capacity as greater aircraft spacing is required. PUB regularly has clear skies and seldom experiences IFR conditions.
- **Runway Configuration.** The overall placement and use of location of runways at an airport greatly impact its capacity. Parallel runways are more efficient and increase overall capacity than runways that intersect, as they allow for simultaneous use the airfield configuration without delay. PUB's parallel runways, Runway 8L/26R and 8R/26L are both suitable for use by Canadian Aviation Education (CAE)-Doss training aircraft, and both runways may be used with minimal crossings of Runway 17/35.
- **Exit Taxiways Configuration.** Exit taxiways provide opportunities for pilots to exit a runway in a timely fashion, making the runway available for other aircraft operations. The numerous taxiways serving Runway 8R/26L allow for multiple exit points, while the overall length of the runway enables midfield departures (with Airport Traffic Control Tower (ATCT) coordination).
- **Fleet Mix.** Fleet Mix represents the categories of aircraft (A-D) currently using an airport. The categories are based on a combination of maximum takeoff weight, number of engines, and wake turbulence classification (air turbulence trails behind aircraft caused by movement through the air). Larger and heavier aircraft, which tend to create more significant and hazardous wake turbulence require additional spacing between aircraft, and interactions between aircraft of different sizes and approach speeds can also reduce capacity. At PUB, larger commercial service and business jet aircraft maintain a significant presence. However, most operations are conducted by small, homogenous aircraft.
- **Time of Day and Peak Hour.** The number of operations occurring throughout the day or at peak times can affect an airport's overall capacity. Operating under VFR for Runways 8R/26L and 8L/26R yielded the best results for PUB's peak hour period.

- **Percent of Arrivals and Touch-and-Go Operations.** Percent arrivals is the ratio of landing aircraft to all aircraft operations. Aircraft on final approach to a runway are given priority over departures, which increases percentage of arrivals especially during peak periods. Touch-and-go operations also affect the arrival ratio and are factored into the capacity calculation. PUB's touch-and-go percentage was estimated at 25 percent, with the overall arrival percentage approximately 50 percent.

A more detailed description of the ASV and full analysis for this Master Plan is included in **Appendix E**.

Airfield Capacity Conclusion

ASV calculation considers three variables: weighted hourly capacity (C_w), Daily Demand Ratio (D); and Hourly Demand Ratio. C_w blends the different airfield use configurations, touch-and-go factors, exit taxiways, and fleet mix index using charts and formulas contained in FAA AC 150/5060-5. D is the ratio of annual demand to average daily demand during the peak month. H is the ratio of average daily demand to average peak hour demand during the peak month.

Calculation of the existing ASV for PUB is 462,108 annual operations. Comparing this to PUB's total 2019 operations of 217,424 identified in **Chapter B – Aviation Activity Forecasts**, PUB is currently operating at 47 percent of its annual capacity. With the annual operations forecast to exceed 420,500 by 2025, and exceed 440,700 by 2040, and assuming the ASV remains constant, the airfield will be operating at over 90 percent during the planning period. However, as operations increase over time, the ASV will decrease as the peak hour activity levels increase. This indicates PUB's ASV might actually be less than the 2019 calculation.

Current guidelines from the FAA National Plan of Integrated Airport Systems (NPIAS) directs airport sponsors to consider airfield capacity improvements when activity reaches 60 to 75 percent of an airport's ASV. If airfield capacity enhancements are not made, and with the expected increase in annual operations, the level of delay and impact to aircraft operators at PUB is expected to be significant. Therefore, planning for additional airfield capacity improvement alternatives should be evaluated in the Master Plan, and planning and programming improvement decisions should be anticipated during the 20-year planning period. This guidance is considered conservative and allows adequate lead time for environmental reviews, land acquisition, and other necessary actions that can take years to complete.

Airside Facility Requirements

The analysis of airside facility requirements focuses on the determination of needed facilities and spatial considerations related to the actual operation of aircraft at an airport. The FAA is responsible for the overall safety of civil aviation in the United States. Therefore, FAA design standards and policy focus first and foremost on safety, with secondary emphasis on efficiency and utility. The evaluation contained in this section includes the application of appropriate design standards to the aircraft operating surfaces (i.e., runways and taxiways), the desired Instrument Approach Procedure (IAP) improvements, the sufficiency of approach areas, and the resulting navigation and lighting needs.

Overall airside facilities design is based on the specified Runway Design Code (RDC) standards as specified in FAA AC 150/5300-13A, *Airport Design* that was introduced in the previous two chapters. Although the RDC is based on the Critical Aircraft defined in FAA AC 150/5000-17, *Critical Aircraft and Regular Use Determination,* and is used for planning and design, it does not limit the type or size of aircraft that may operate safely at an airport. Critical Aircraft can take the form of one aircraft type or a composite aircraft representing a collection of aircraft with similar characteristics.

A third component of the full expression of the RDC is related to the lowest Instrument Approach Procedure (IAP) visibility minimums. An IAP is a series of predetermined maneuvers designed to transition aircraft under instrument flight conditions from the en route portion of the flight to a point where a landing can be made visually. Runways provide maximum utility when they can be used in less-than-ideal weather conditions. This translates to visibility minimums in terms of the distance to see and identify prominent unlighted objects by day and lighted objects by night. Pilots must be able to see the runway or associated lighting at a certain distance from and height above the runway to land during periods of limited visibility. Ultimate runway development should be designed for one of the following visibility categories:

- **Visual.** Runways that support Visual Flight Rules (VFR) operations only, except circle-to-land approaches.
- **Non-Precision Approach (NPA).** Runways designed to accommodate straight-in approaches with only lateral guidance provided. NPA runways will only support IFR approach operations with visibility minimums of ¾ mile or greater.
- **Approach Procedure with Vertical Guidance (APV).** Runways designed to accommodate approaches where the navigation system provides vertical guidance down to 250 feet above the threshold and visibility minimums of ¾ mile or greater.
- **Precision Approach (PA).** Runways designed to accommodate approaches where the navigation system provides vertical guidance lower than 250 feet above the threshold and visibility minimums lower than ¾ mile.

FAA AC 5300-13A allows for the application of different RDCs to individual runways based on the Critical Aircraft operating or expected to operate on each runway. The previous chapter (and FAA Forecast approval letter in **Appendix D**) identified the existing Critical Aircraft for Runways 8R/26L and 17/35 as the Bombardier CRJ 200, which has a RDC of C-II. The future Critical Aircraft was identified as the Embraer E-175, which has a RDC of C-III. Since Runway 8R is equipped with an Instrument Landing System (ILS) precision approach with visibility minimums as low as ½ mile, the full Runway 8R/26L RDC is expressed as C-III-2400.

Runway 35 is equipped with an Area Navigation (RNAV) Global Positioning System (GPS) non-precision approach with visibility minimums as low as one mile. Therefore, the full Runway 17/35 RDC is expressed as C-III-5000. Should the evaluation of desired instrument approach procedure improvements prove feasible, and the resulting improvements result in lower visibility minimums, the future RDC for Runway 17/35 could change accordingly.

The previous chapter identified the existing Critical Aircraft for Runway 8L/26R as the Diamond DA20 Katana, which has a RDC of A-I. The future Critical Aircraft was identified as the Beechcraft T-6A Texan II, which has a RDC of B-I. However, the current Airport Layout Plan (ALP) indicates the RDC for Runway 8L/26R is B-II. Since the runway was designed and constructed to accommodate aircraft within RDC B-II, and the runway is not equipped with any approach procedures, the continued use of B-II-VIS as the appropriate existing and future RDC is preferred.

Runway Design Standards

Runway design standards are established to assure that runway facilities are designed, constructed, and operated in a safe and efficient manner and represent the minimum standard to be achieved. Runway design standards are determined by applying the dimensional criteria associated with the various RDC design standards.

Runway 8R/26L

TABLE C1 presents the existing dimensions and applicable design standards for Runway 8R/26L. As contained in the table, there are two identified non-standard conditions. First, an FAA-owned equipment building is located within the Runway Object Free Area (ROFA) southwest of the Runway 8R threshold, approximately 260 feet south of the runway centerline. Thus, the ROFA width is deficient by 140 feet, providing only a total width of 660 feet. Second, except for Taxiway A2, all holding position lines marked on each taxiway serving Runway 8R/26L are deficient by 22 feet, with 275-foot separations rather than the defined standard of 297 feet. As noted, the 297-foot standard is calculated on the RDC C-III-2400 standard of 250 feet plus an additional 1-foot for each 100 feet the airport elevation above sea level. Additionally, Taxiway A is not a true parallel taxiway although it does provide access to both runway ends and multiple exit taxiways along the length of Runway 8R/26L. The dogleg between Taxiways A9 and A10 results in varying separation distances from the runway centerline, but the standard separation distance of 400 feet is exceeded.

TABLE C1 Runway 8R/26L Design Standards

ITEM	DESIGN STANDARD (C-III-2400)	EXISTING DIMENSIONS	
		RUNWAY 8R	RUNWAY 26L
Runway Design			
Runway Width	150’	150’	
Shoulder Width	25’	N/A[1]	
Blast Pad Width	200’	N/A[1]	N/A[1]
Blast Pad Length	200’	N/A[1]	N/A[1]
Runway Safety Area (RSA)			
Length Beyond Departure End	1,000’	1,000’	1,000’
Length Prior to Threshold	600’	600’	600’
Width	500’	500’	
Runway Object Free Area (ROFA)			
Length Beyond Departure End	1,000’	1,000’	1,000’
Length Prior to Threshold	600’	600’	600’
Width	800’	**660’**	
Runway Obstacle Free Zone (ROFZ)			
Length	200’	200’	200’
Width	400’	400’	
Precision Obstacle Free Zone (POFZ)			
Length	200’	200’	200’
Width	800’	800’	800’
Runway Separation			
Runway Centerline to:			
Parallel Runway Centerline	700’	1,075’	
Holding Position	297’[2]	**275’**	
Parallel Taxiway/Taxilane Centerline	400’	775’, 500’	
Aircraft Parking Area	500’	1,080’ +	

SOURCE: Mead and Hunt analysis using FAA AC 150/5300-13A, Change 1, *Airport Design*.
NOTES: [1] Runway shoulders and blast pads are recommended, but not required for runways accommodating ADG-III aircraft.
[2] Standard based upon 250 feet plus one foot for each 100 feet above sea level (PUB elevation is 4,729 feet).
N/A = Not Applicable.
Bold = Non-standard conditions that require alteration.

FIGURE C1 provides a graphic depiction of the FAA design standards at PUB.

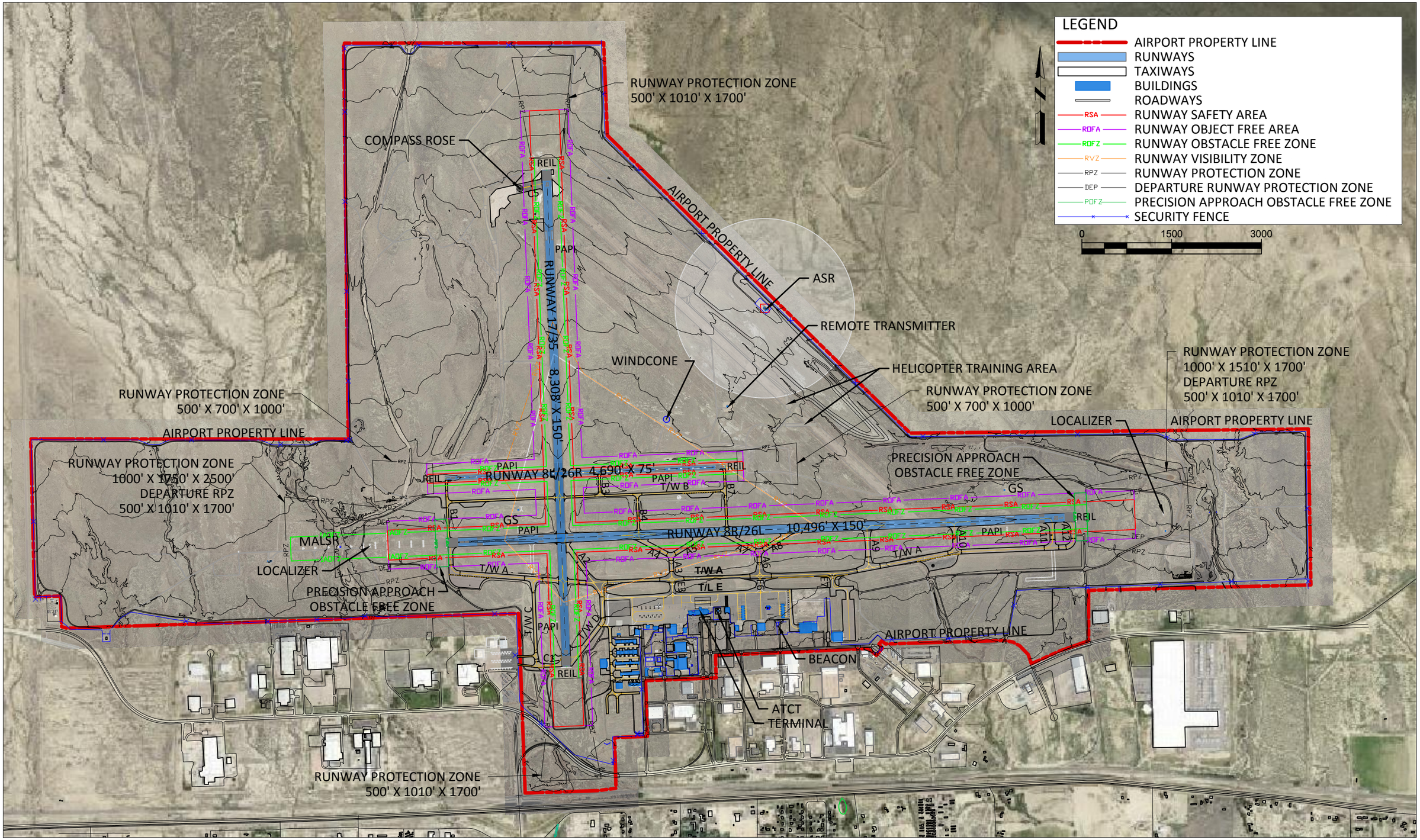


FIGURE C1 **FAA Design Standards**

Runway 17/35

TABLE C2 presents the existing dimensions and applicable design standards for Runway 17/35. Similar to Runway 8R/26L, many of the Runway 17/35 connector taxiways do not meet the 297-foot standard required for holding position lines. Excluding Taxiways D and A, the remaining taxiways' holding position lines are marked at a maximum separation distance of 250 feet, a deficiency of 47 feet. The Taxiway A holding position line located east of Runway 17/35 measures 257 feet from the runway centerline, a 40-foot deficiency. The Taxiway A holding position line located west of Runway 17/35 measures 350 feet from the runway centerline; the Taxiway D holding position line measures 311 feet. Both dimensions exceed the design standard.

TABLE C2 Runway 17/35 Design Standards

ITEM	DESIGN STANDARD (C-III-5000)	EXISTING DIMENSIONS	
		RUNWAY 17	RUNWAY 35
Runway Design			
Runway Width	150'	150'	
Shoulder Width	25'	N/A[1]	
Blast Pad Width	200'	N/A[1]	N/A[1]
Blast Pad Length	200'	N/A[1]	N/A[1]
Runway Safety Area (RSA)			
Length Beyond Departure End	1,000'	1,000'	1,000'
Length Prior to Threshold	600'	600'	600'
Width	500'	500'	
Runway Object Free Area (ROFA)			
Length Beyond Departure End	1,000'	1,000'	1,000'
Length Prior to Threshold	600'	600'	600'
Width	800'	800'	
Runway Obstacle Free Zone (ROFZ)			
Length	200'	200'	200'
Width	400'	400'	
Precision Obstacle Free Zone (POFZ)			
Length	200'	N/A	N/A
Width	800'	N/A	
Runway Separation			
Runway Centerline to:			
Parallel Runway Centerline	N/A	N/A	
Holding Position	297'[2]	**250', 257'**, 311', 350'	
Parallel Taxiway/Taxilane Centerline	400'	500', 650'	
Aircraft Parking Area	500'	750' +	

SOURCE: Mead and Hunt analysis using FAA AC 150/5300-13A, Change 1, *Airport Design*.
NOTES: [1] Runway shoulders and blast pads are recommended, but not required for runways accommodating ADG-III aircraft.
[2] Standard based upon 250 feet plus one foot for each 100 feet above sea level (PUB elevation is 4,700 feet).
N/A = Not Applicable.
Bold = Non-standard conditions that require alteration.

Runway 8L/26R

TABLE C3 presents the existing dimensions and applicable design standards for Runway 8L/26R. As noted, this runway meets all standard dimensional criteria for RDC B-II-VIS.

TABLE C3 Runway 8R/26L Design Standards

ITEM	DESIGN STANDARD (B-II-VIS)	EXISTING DIMENSIONS	
		RUNWAY 8L	RUNWAY 26R
Runway Design			
Runway Width	75’	75’	
Shoulder Width	10’	N/A[1]	
Blast Pad Width	95’	N/A[1]	N/A[1]
Blast Pad Length	150’	N/A[1]	N/A[1]
Runway Safety Area (RSA)			
Length Beyond Departure End	300’	300’	300’
Length Prior to Threshold	300’	300’	300’
Width	150’	150’	
Runway Object Free Area (ROFA)			
Length Beyond Departure End	300’	300’	300’
Length Prior to Threshold	300’	300’	300’
Width	500’	500’	
Runway Obstacle Free Zone (ROFZ)			
Length	200’	200’	200’
Width	250’	250’	
Runway Separation			
Runway Centerline to:			
Parallel Runway Centerline	700’	1,075’	
Holding Position	200’	200’	
Parallel Taxiway/Taxilane Centerline	240’	400’	
Aircraft Parking Area	250’	2,160’ +	

SOURCE: Mead and Hunt analysis using FAA AC 150/5300-13A, Change 1, *Airport Design*.
NOTES: [1] Runway shoulders and blast pads are recommended, but not required for runways accommodating ADG-III aircraft.
N/A = Not Applicable.

Runway Design Standards Conclusion

Most of the runway design standards for each of PUB's three runways are met. However, deficiencies in the Runway 8R/26L ROFA width and in the holding positions of taxiways serving Runways 8R/26L and 17/35 were noted. It is recommended that future capital projects be considered that remark the holding position lines on taxiways serving Runways 8R/26L and 17/35. Additionally, alternatives addressing the Runway 8R/26L ROFA width deficiency will be considered in the next chapter.

Runway Line of Sight

Line of sight standards exist to allow pilots to observe runway and taxiway surfaces for assurance that they are clear of aircraft, vehicle, wildlife, and other hazardous objects. According to the longitudinal (i.e., along the length of the runway) line of sight standards contained in FAA AC 150/5300-13A, any two points located five feet above the runway centerline must be mutually visible for the entire length of the runway. However, if the runway is served by a full-length parallel taxiway, the requirement is reduced to one half the runway length.

The longitudinal profile evaluation from each end of Runway 8R/26L and 8L/26R to the individual runway midpoint at five feet above the runway surface indicates a clear line of sight is achieved. The longitudinal profile evaluation from each end of Runway 17/35 indicates a clear line of sight. However, as noted on the ALP, Runway 17/35 exceeds the 0.8 percent longitudinal gradient standard allowed for runways designed to accommodate aircraft in approach categories C, D, and E within the last 25 percent of runway length at both runway ends. Runway 17/35 has an overall longitudinal gradient of approximately 1.0 percent.

When airfield geometry includes intersecting runways, line of sight standards indicate that there must be an unobstructed view from any point five feet above the runway centerline to any other point five feet above the intersecting runway within the Runway Visibility Zone (RVZ). At PUB, the RVZ is defined as an area formed by the imaginary lines connecting the two runways' line of sight points. Because the runway ends are more than 1,500 feet from the runway intersection, the line of sight points are established one-half the distance from the intersecting runway centerline to the runway ends. An analysis was conducted using PUB's GIS survey data collected in 2016 and no obstructions to the RVZ line of sight were found.

Runway Line of Sight Conclusion

While there were no identified line of sight deficiencies, the overall Runway 17/35 gradient of 1.0 percent exceeds the allowable 0.8 percent standard within the last 25 percent of runway length for runways designed to accommodate aircraft in approach categories C, D, and E. It is recommended that consideration be given to addressing this deficiency during the next pavement maintenance or pavement reconstruction project for this runway.

Runway Length

The runway length analysis recommends the length necessary to meet existing and future aircraft demands. The analysis considers aircraft design characteristics and annual activity levels. The determination of runway recommendations for airport planning purposes uses FAA AC 150/5325-4B, *Runway Length Requirements*. This AC states the design objective for primary runways is to provide a runway length for all aircraft that will regularly use the runway without causing operational weight restrictions. AC 150/5000-17, *Critical Aircraft and Regular Use Determination* defines regular use as 500 annual operations, excluding touch-and-go operations.

There are five steps established by the FAA in AC 5325-4B for determining recommended runway lengths. The information from these steps are to be used for airport design and not for flight operations. The five steps are:

- **Identify potential design aircraft**
- **Identify the most demanding aircraft**
- **Determine appropriate methodology**
- **Select the recommended runway length**
- **Apply necessary adjustments as needed.**

Runway Length Design Aircraft

Runways 8R/26L and 17/35 serve air carrier, general aviation, and military aircraft. Runway 8L/26R is the training runway serving smaller general aviation aircraft exclusively. The existing design aircraft (and most demanding aircraft) for Runways 8R/26L and 17/35 is the Bombardier CRJ 200; the future design aircraft (and most demanding aircraft) is the Embraer E-175.

In addition to the selected design aircraft presented above, PUB is used by a variety of aircraft types whose operations are not sufficient for consideration as the design aircraft but do warrant mentioning because of their growing presence and importance to PUB, the City of Pueblo, and the region. United Launch Alliance operates an engineering and propulsion testing center in Pueblo that utilizes several GA aircraft types. The US Forest Service operates at PUB seasonally (i.e., usually two weeks every summer during the fire season). Colorado experienced the worst forest fire season in history during the summer of 2020 and the USFS operated Boeing DC-10-30 Very Large Airtanker (VLAT)at PUB to combat the fires. The Supermax federal prison designated United States Penitentiary, Administrative Maximum Facility (USP Florence ADMAX) located in Florence, CO uses a Boeing B-757 for prisoner transfers, accounting for approximately 50 annual aircraft operations. Military aircraft frequently using PUB include the Boeing C-17A Globemaster and the C-130 Lockheed Hercules aircraft for transporting cargo. Larger GA business jets utilizing PUB include the Gulfstream G500, the Cessna Citation X, the Dassault Falcon 900, and the British Aerospace Hawker 800.

Determine Appropriate Methodology

Following guidance provided in AC 150/5325-4B, individual airport planning manuals (produced and published by the aircraft manufacturers) for the CRJ 200 and E-175 will be used to determine recommended runway lengths for Runway 8R/26L and 17/35. The family grouping of small aircraft will be used to determine a recommended runway length for Runway 8L/26R.

The performance requirements of the design aircraft determine recommended runway length. Factors that affect aircraft performance capabilities include the airport elevation, air temperature, aircraft payload, fuel load, and wind conditions. These factors are explained below.

Elevation

Aircraft performance declines at higher altitudes because the air is less dense. Higher elevations negatively impact thrust produced by the aircraft on takeoff and the aerodynamic performance of the aircraft. PUB has six runway ends, ranging in elevation from 4648 feet above mean sea level (AMSL) to 4,729 feet AMSL. The elevation of 4,729 feet AMSL is used for this analysis.

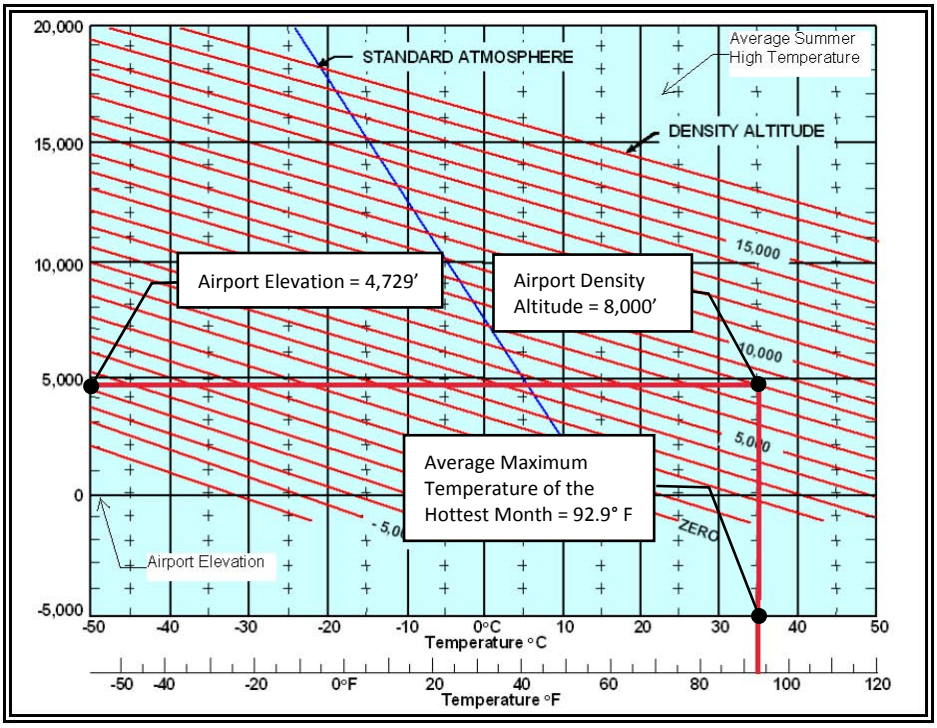
International Standard Atmosphere (ISA)

International Standard Atmosphere (ISA) is a mathematical model that describes how the earth's atmosphere, or air pressure and density, changes relative to altitude. The atmosphere is less dense at higher elevations. ISA is frequently used in aircraft performance calculations because conditions that deviate from ISA will affect aircraft performance. ISA at sea level occurs when the temperature is 59 degrees Fahrenheit. According to the 1976 Standard Atmosphere Calculator, the ISA at PUB's 4,729 feet AMSL occurs when the temperature is 41 degrees Fahrenheit.

Density Altitude (DA)

Density Altitude (DA) compares air density to ISA at a point in time and specific location and is also a critical component of aircraft performance calculations. DA is used to describe how aircraft performance differs from the performance that would be expected under ISA. DA is primarily influenced by elevation and air temperature. **FIGURE C2** illustrates how DA is impacted when factoring in the average maximum temperature of the hottest month. The PUB DA during the hottest month, when the ambient air temperature is 92.9 degrees F, is 8,000 feet AMSL. As a measure of high temperature impacts on aircraft performance, this DA is used in aircraft performance assessment.

FIGURE C2 Density Altitude for PUB



Takeoff Weight

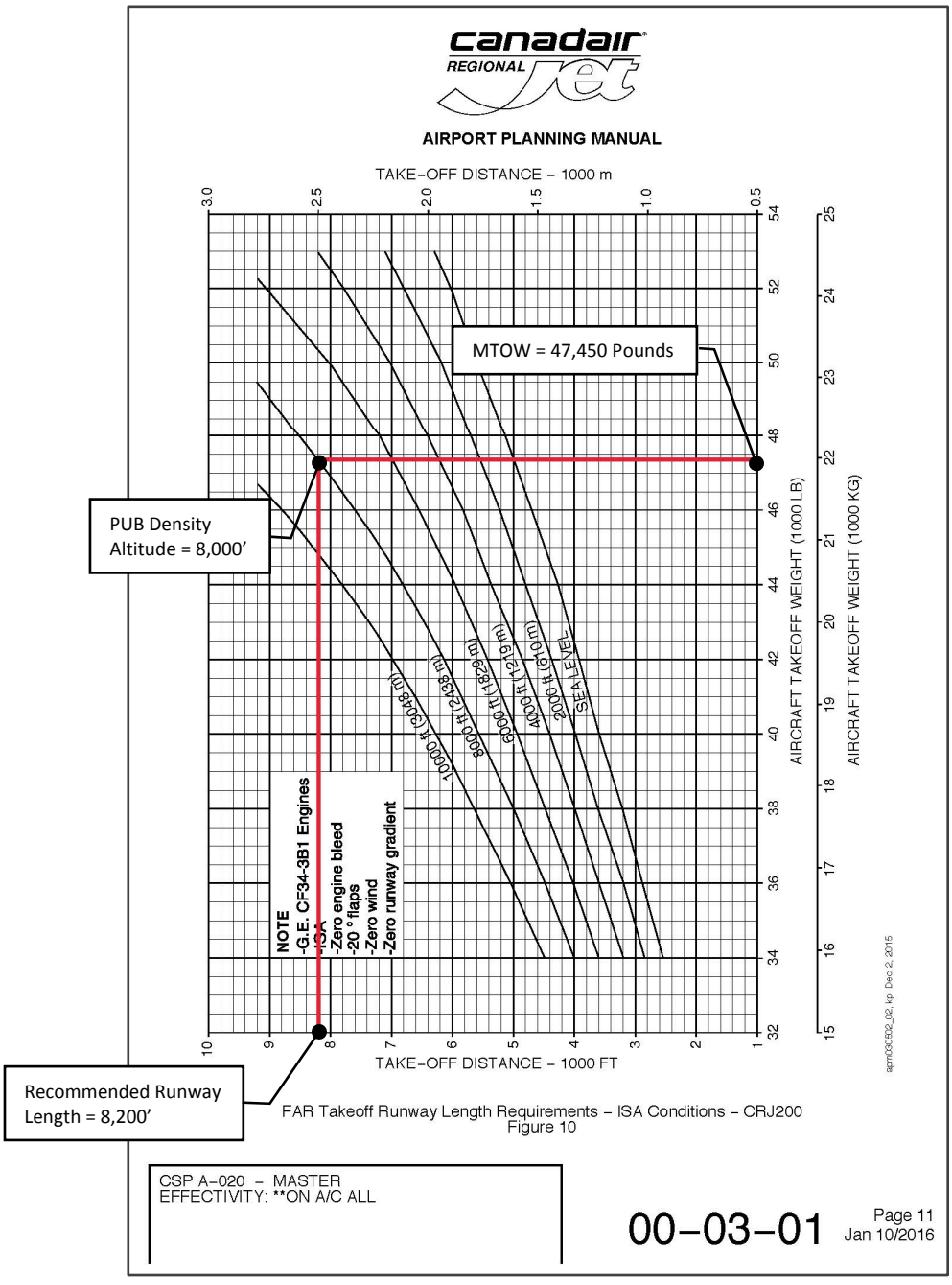
Aircraft takeoff weight is directly related to the distance of the flight and the load that the aircraft is carrying. For shorter distances, aircraft may be able to depart with a full passenger load and less than full fuel tanks. In those instances, the aircraft will typically be departing below Maximum Takeoff Weight (MTOW) and will not require as long of a runway. Aircraft require more fuel for longer trips, and the longest trips may require restrictions on the passengers and cargo that can be carried.

Recommended Runway Length

Runways 8R/26L and 17/35

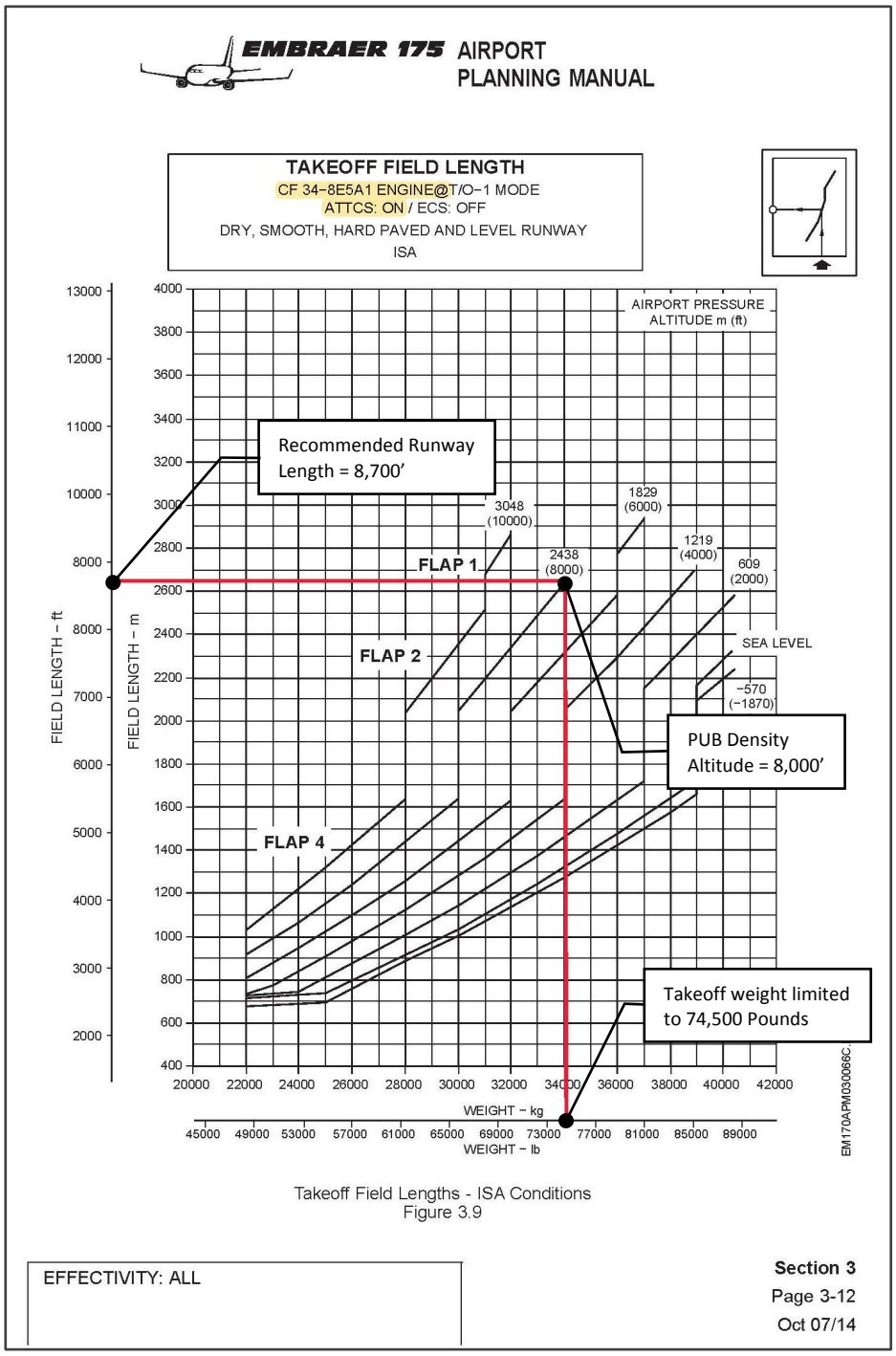
The length assessment for Runways 8R/26L and 17/35 uses the payload and range tables and the takeoff performance charts contained in individual airport planning manuals produced by the aircraft manufacturers. The existing design aircraft (CRJ 200) performance chart presented in **FIGURE C7** indicates that the CRJ 200 requires 8,200 feet of runway length for takeoff at PUB operating at its MTOW of 47,450 pounds. It is understood that the CRJ 200s departing from PUB currently only travel to Denver International Airport (DEN), do not need full fuel capacity, and are not routinely carrying full passenger loads. In other words, the CRJ 200s are not required to operate at MTOW from PUB. Therefore, the runway length requirement would be less than 8,200 feet.

FIGURE C3 CRJ 200 Takeoff Length Requirements



The future design aircraft (E-175) performance chart shown in **FIGURE C4** indicates that the E-175 requires 8,700 feet of runway length to takeoff from PUB at a takeoff weight of 74,500 pounds and the Automatic Takeoff-Thrust Control System (ATTCS) turned on. At a DA of 8,000 feet AMSL, the E-175 is limited to a takeoff weight of 74,500 pounds (MTOW is 82,673 pounds). However, as with the CRJ 200, it is not expected that E-175s departing from PUB will be required to operate at MTOW due to the stage length to Denver.

FIGURE C4 E-175 Takeoff Length Requirements



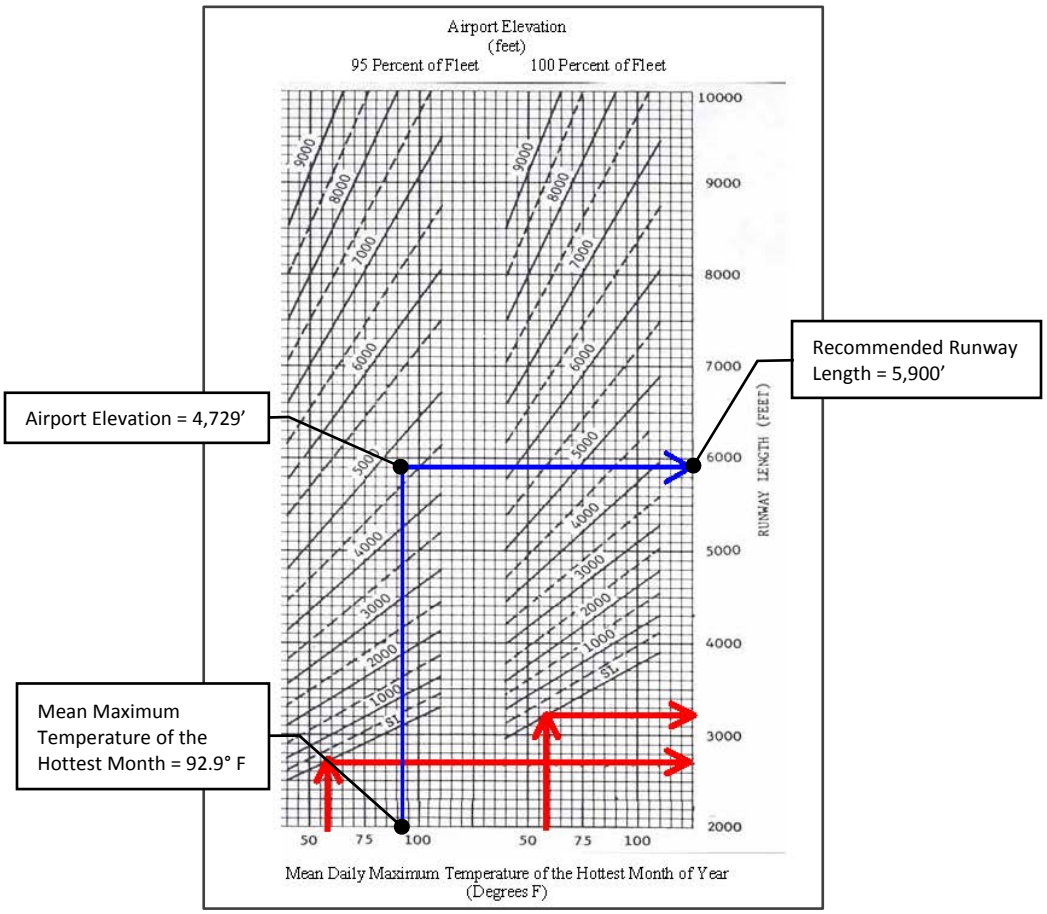
Takeoff Field Lengths - ISA Conditions
Figure 3.9

Runway 8L/26R

Using the guidance for small aircraft (i.e., aircraft with MTOW equal to or less than 12,500 pounds) contained in AC 150/5325-4B, runway length assessment methodology is based on family groupings of aircraft based on approach speed and number of passenger seats. Most aircraft using Runway 8L/26R have approach speeds greater than 50 knots and less than 10 passenger seats excluding crew (i.e., pilot and copilot). This family grouping of small aircraft with less than 10 passenger seats is further dividing according to percentage of the fleet: 1) 95 percent and 2) 100 percent. The differences between the two percentage categories are based on the airport's location and amount of existing or planned aviation activities. The 95 percent of the fleet category is intended to serve medium size population communities with a diversity of usage and a greater potential for increased aviation activities. It also includes those airports that are primarily intended to service low-activity locations, small population communities, and remote recreational areas. The 100 percent of the fleet category is intended to serve communities located on the fringe of a metropolitan area or a relatively large population remote from a metropolitan area. Pueblo and aircraft activity at PUB are best represented by the 95 percent category.

The runway length chart presented in **FIGURE C5** indicates that a runway length of 5,900 feet is recommended for Runway 8L/26R, as shown by the blue lines in the graphic.

FIGURE C5 Small Aircraft with Less Than 10 Passenger Seats Takeoff Length Requirements



Apply Necessary Adjustments

AC 150/5325-4B allows for the adjustment of runway lengths for non-zero effective runway gradients (i.e., runways having a difference in centerline elevation that is not equal to zero). The adjustment increases the takeoff length by 10 feet for every 1-foot of maximum elevation difference of the runway centerline. For Runway 8R/26L an adjustment of 240 feet is added since the maximum centerline elevation difference is 24 feet. For Runway 17/35 an adjustment of 810 feet is provided since the maximum centerline elevation difference is 81 feet. Runway 8L/26 is afforded a 40-foot adjustment since the maximum centerline elevation difference is 4 feet. This translates to the final recommended runway lengths provided in **TABLE C4**.

TABLE C4 Runway Length Summary

RUNWAY	RECOMMENDED RUNWAY LENGTH	MAXIMUM CENTERLINE ELEVATION DIFFERENCE	ADJUSTMENT	FINAL RECOMMENDED RUNWAY LENGTH
Runway 8R/26L				**10,498' (Existing)**
Existing Design Aircraft (CRJ 200)	8,200'	24'	240'	**8,440'**
Future Design Aircraft (E-175)	8,700'	24'	240'	**8,940'**
Runway 17/35				**8,310' (Existing)**
Existing Design Aircraft (CRJ 200)	8,200'	81'	810'	**9,010'**
Future Design Aircraft (E-175)	8,700'	81'	810'	**9,510'**
Runway 8L/26R				**4,690' (Existing)**
Existing and Future Design Aircraft (Diamond DA20)	5,900'	4'	40'	**5,940'**

SOURCE: Mead and Hunt analysis using airport planning manuals and FAA AC 150/5325-4B methodology.

Runway Length Conclusion

The runway length analysis indicates that Runway 8R/26L, with a total length of 10,498 feet is sufficient to accommodate both the existing and future design aircraft and the majority of airport users during most weather conditions. No additional runway length is recommended for this runway.

Runway 17/35, with a total length of 8,310 feet is slightly deficient according to the final recommended runway length provided for both the existing and future design aircraft. However, since this is the crosswind runway, commercial service aircraft normally use it when winds are out of the north during winter months and temperatures are not near the mean maximum temperature used in the runway length calculations. Therefore, it too accommodates the majority of PUB airport users during most weather conditions and no additional runway length is recommended for this runway.

Runway 8L/26R, with a total length of 4,690 feet is also slightly deficient of the final recommended runway length of 5,940 feet. However, since this is the training runway that is most often used by CAE-Doss flight training, the existing length is considered sufficient. No additional runway length is recommended for this runway.

Pavement Condition

The CDOT Division of Aeronautics last conducted a major Pavement Condition Index (PCI) inspection at PUB in July of 2020. According to this 2020 report, the values of airport pavement condition range from 0 to 100. A depiction of the PCIs for the runways and other airfield pavements is included in **Chapter A – Inventory of Existing Conditions.**

The PCI for Runways 8R/26L, 8L/26R, and 17/35 are reported as 64, 86, and 93 respectively. The runway 8L/26R complex was rehabilitated in the 2020 crack seal and sealcoat project, which would indicate a better condition than the reported PCI rating of 86. In general, the existing runway pavement conditions of 8L/26R and 17/35 are adequate and do not suggest a significant state of deterioration. RW 8R-26L is in fair condition with a PCI of 64 and is scheduled to be rehabilitated (Mill and Overlay) in 2023.

Due to deterioration occurring over time, several other areas in the airfield pavement system will likely require rehabilitation to regain and maintain pavement condition in the near future. Pavement with PCI ratings of 40-60 are recommended to be rehabilitated, and pavement with PCI ratings under 40 are advised to incorporate a full pavement reconstruction. Strategic pavement improvements should be considered to the following sections with the lowest PCI ratings:

- **Apron.** With an overall PCI rating of 49, much of the apron pavement was built upon the original World War II era apron, with some areas receiving more recent rehabilitations or reconstructions. Portions of the apron on its easternmost side have been identified with a PCI rating of 0, indicating a need for full reconstruction. This area is largely used by CAE-Doss aircraft for parking and runup to Taxiway A6 and serves as an access point for several hangar spaces. A future Taxiway E is also proposed to branch from this portion of apron and connect with future hangar spaces. Due to low use, some areas of the apron could be marked as non-movement areas and thus do not require full reconstruction. The westernmost sections of the apron pavement around the FBO and terminal remain in reasonable condition.
- **Taxiways A10 and A11.** With a PCI rating of 40 and 64 respectively, Taxiways A10 and A11 are the taxiway connectors between Runway 8R/26L and Taxiway A at the east end of the runway. These connectors may be in better condition currently, as sealcoat applications were applied after the 2020 report. As presented in a later section, Taxiway A11 will be reevaluated according to its importance to PUB due to its low traffic usage and may be removed as a result.
- **Taxiway C5.** With a PCI rating of 41, Taxiway C5 is the back-taxi area for planes landing on Runway 35. The proposed construction of a future bypass taxiway serving Runway 17/35 would require the demolition of Taxiway C5 and subsequent reconstruction as part of two bypass connectors.

Pavement Condition Conclusion

It is recommended that a sizeable portion of the easternmost apron be reconstructed to rectify the 0 PCI rating and improve overall airfield quality. Areas not required for aircraft parking or movement areas will be identified and marked accordingly. The pavement conditions of Taxiways A10, A11, and C5 will be continuously monitored and evaluated, with the recommended scheduling of improvements made according to airport needs and overall taxiway recommendations.

Pavement Strength

FAA pavement design considers the pavement strength needed to accommodate the aircraft fleet expected to frequently use the pavement. No single critical aircraft is designated for pavement strength. Pavement design strength does not necessarily prohibit airport use by heavier aircraft. However, if routine use by an aircraft heavier than the pavement strength is anticipated, then it would be recommended that pavement strength be increased.

Pavement strength ratings are presented for multiple main landing gear configurations by its pavement classification number (PCN). Aircraft with more tires distribute their weight differently than aircraft with fewer tires, and a section of pavement will have a higher strength rating for aircraft with multiple tires than for aircraft with single tires. A full PCN analysis of the airfield pavements at PUB was conducted to identify any areas with understrength pavement, the results of which can be found in **Appendix A**.

Pavement Strength Conclusion

The PCN analysis for PUB did not note any airport pavement of insufficient strength. The analysis concluded that the pavement strength of the runways and their connectors remain suitably fitted to the PUB fleet mix. The published pavement strength should also be updated where necessary in the FAA 5010 and the ALP to the standards currently outlined in PCN analysis.

Runway Protection Zones

Runway Protection Zones (RPZs) are trapezoidal areas beginning 200 feet beyond the threshold of a runway; their dimensions are determined by function (i.e., approach or departure RPZ), Critical Aircraft size, the appropriate AAC, and the lowest instrument approach procedure visibility minimums to each runway end. Their purpose is to enhance the protection of people and property on the ground. This is achieved through airport control of the RPZ areas, preferably exercised through fee simple ownership by the airport sponsor. It is desirable to clear all above ground objects from within RPZs. Where this is impractical, airport sponsors should work with property owners to maintain the RPZ clear of all facilities supporting incompatible activities.

As presented in the Inventory of Existing Conditions chapter, FAA Memorandum entitled *Interim Guidance on Land Uses Within a Runway Protection Zone* outlines interim policy on identifying land uses that may be considered incompatible within RPZs and the measures for protecting, removing, or mitigating incompatible land uses.

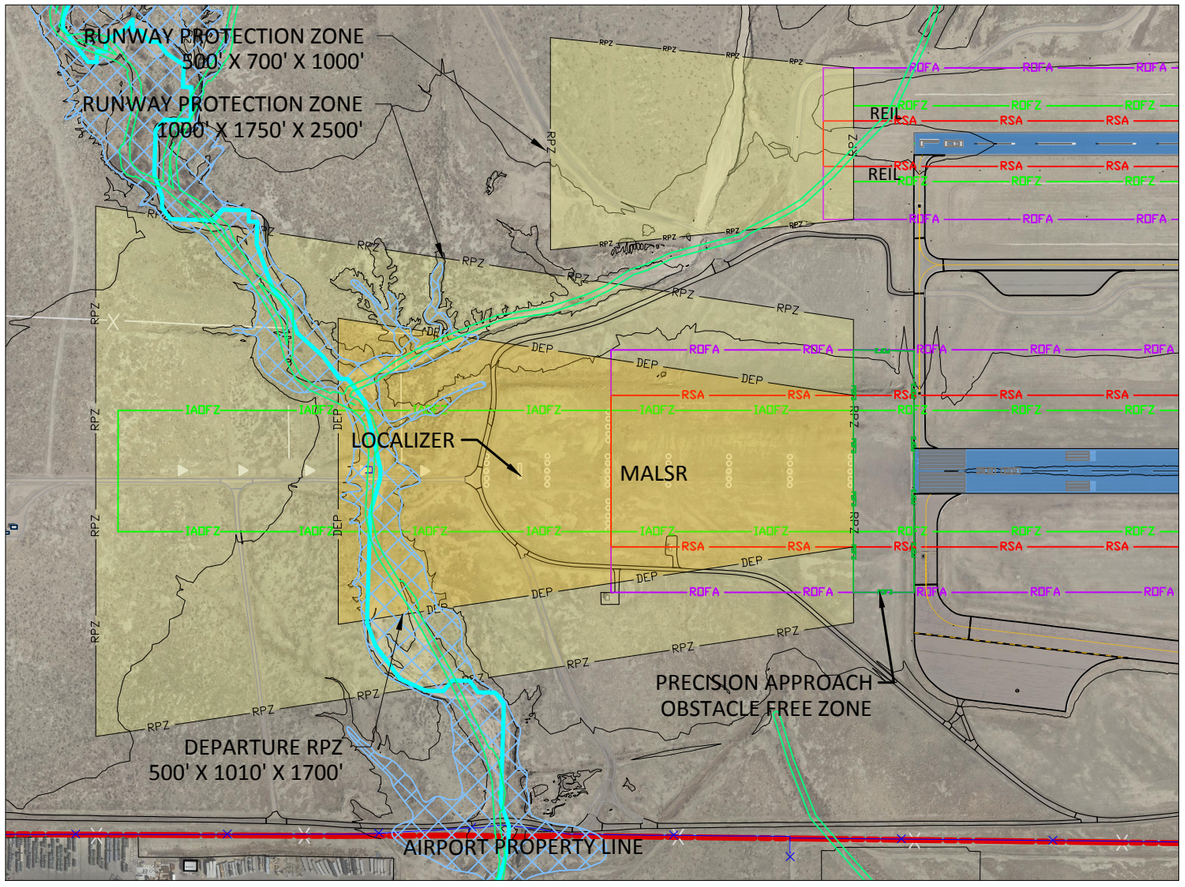
The guidance requires Airport Regional Offices (RO) and Airport District Offices (ADO) staff to consult with the National Airport Planning and Environmental Division (APP-400) when defined land uses would enter the limits of an RPZ as a result of the following actions:

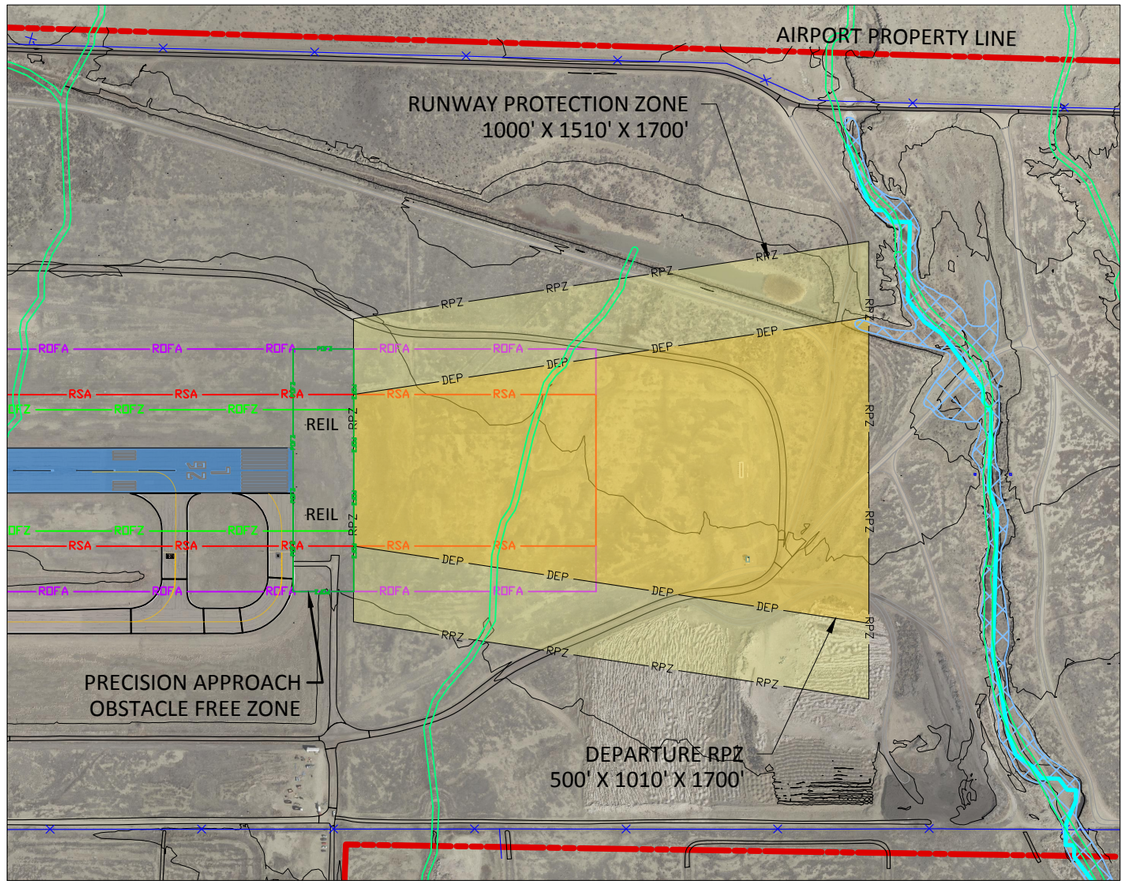
- **Airfield improvements (e.g., runway extensions or shifts)**
- **Change in design aircraft increasing the RPZ dimensions**
- **New or revised IAP increasing the RPZ size**
- **Local development proposals in the RPZ.**

Land uses defined in the memorandum that require consultation include:

- **Buildings and structures (e.g., residences, schools, churches, hospitals or other medical care facilities, commercial/industrial)**
- **Recreational land uses (e.g., golf courses, sports fields, amusement parks, other places of public assembly)**
- **Transportation facilities (e.g., rail facilities, public roads and highways, vehicular parking facilities)**
- **Fuel storage facilities (above and below ground)**
- **Hazardous material storage facilities (above and below ground)**
- **Wastewater treatment facilities**
- **Above ground utility infrastructure (i.e., electrical substations), including any type of solar panel installation.**

In consideration of the existing IAP visibility minimums and aircraft type the runways are designed to accommodate, **TABLE C5** provides a comparison of the existing RPZ dimensions at PUB and the FAA's specified RPZ dimensional requirements. The existing approach and departure RPZs associated with each runway end are located on existing airport property and underlying land uses are compatible with FAA guidance. **FIGURE C6** through **FIGURE C8** provides a graphic depiction of the existing and potential future approach and departure RPZs for each runway at PUB.





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LEGEND

- AIRPORT PROPERTY LINE
- RUNWAYS
- TAXIWAYS
- BUILDINGS
- ROADWAYS
- RSA — RUNWAY SAFETY AREA
- ROFA — RUNWAY OBJECT FREE AREA
- ROFZ — RUNWAY OBSTACLE FREE ZONE
- RVZ — RUNWAY VISIBILITY ZONE
- RPZ — RUNWAY PROTECTION ZONE
- DEP — DEPARTURE RUNWAY PROTECTION ZONE
- POFZ — PRECISION APPROACH OBSTACLE FREE ZONE
- SECURITY FENCE

Runway 8R/26L

FIGURE C6 Runway Protection Zones

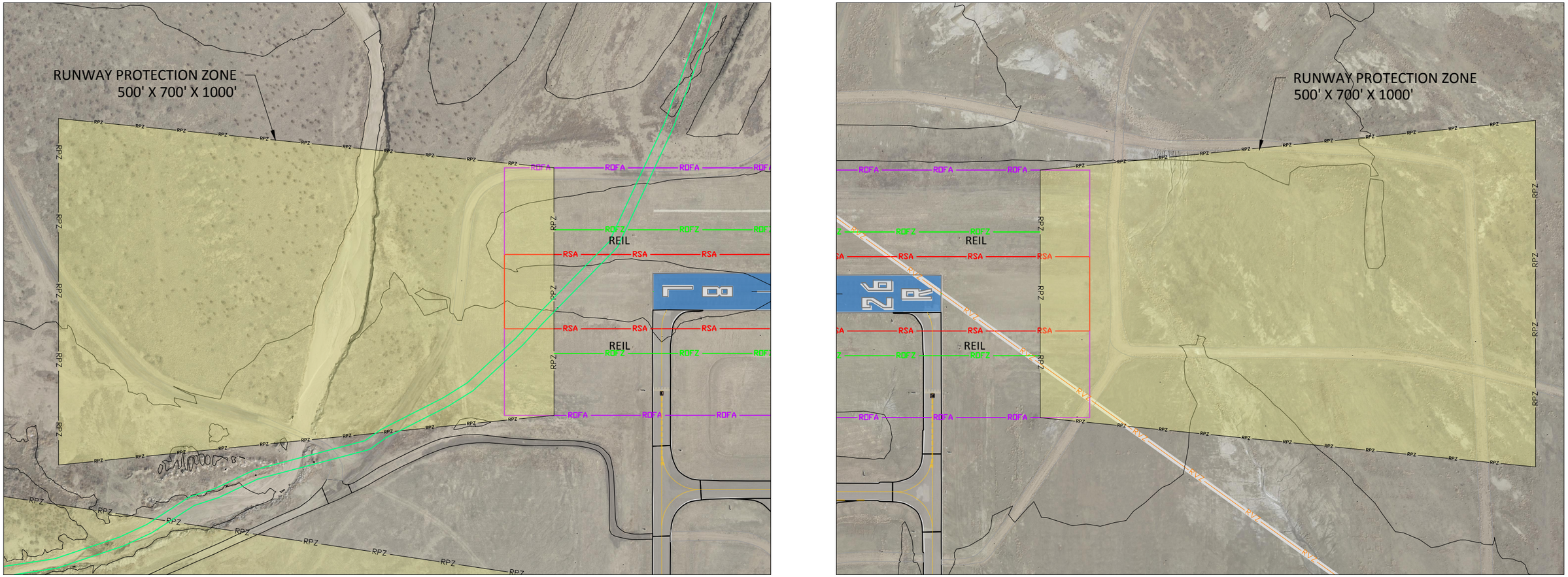
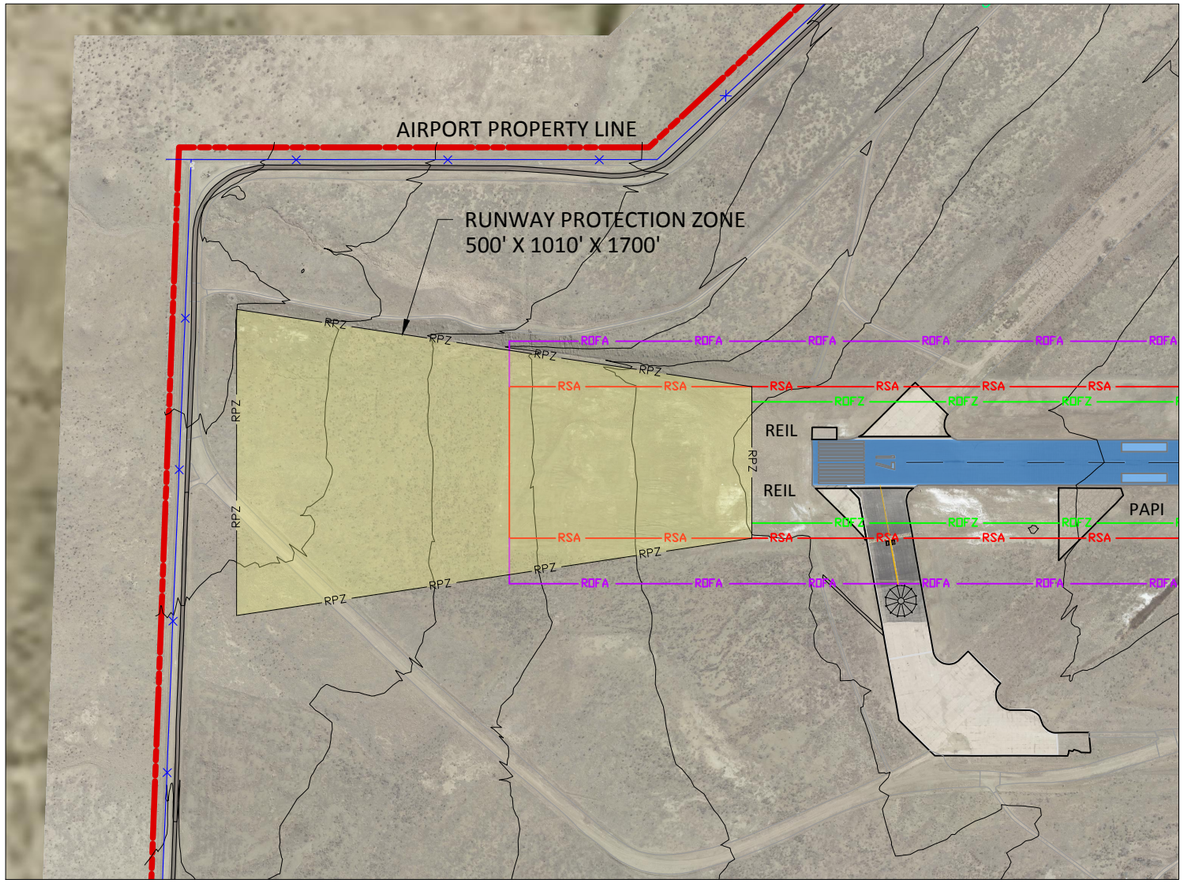
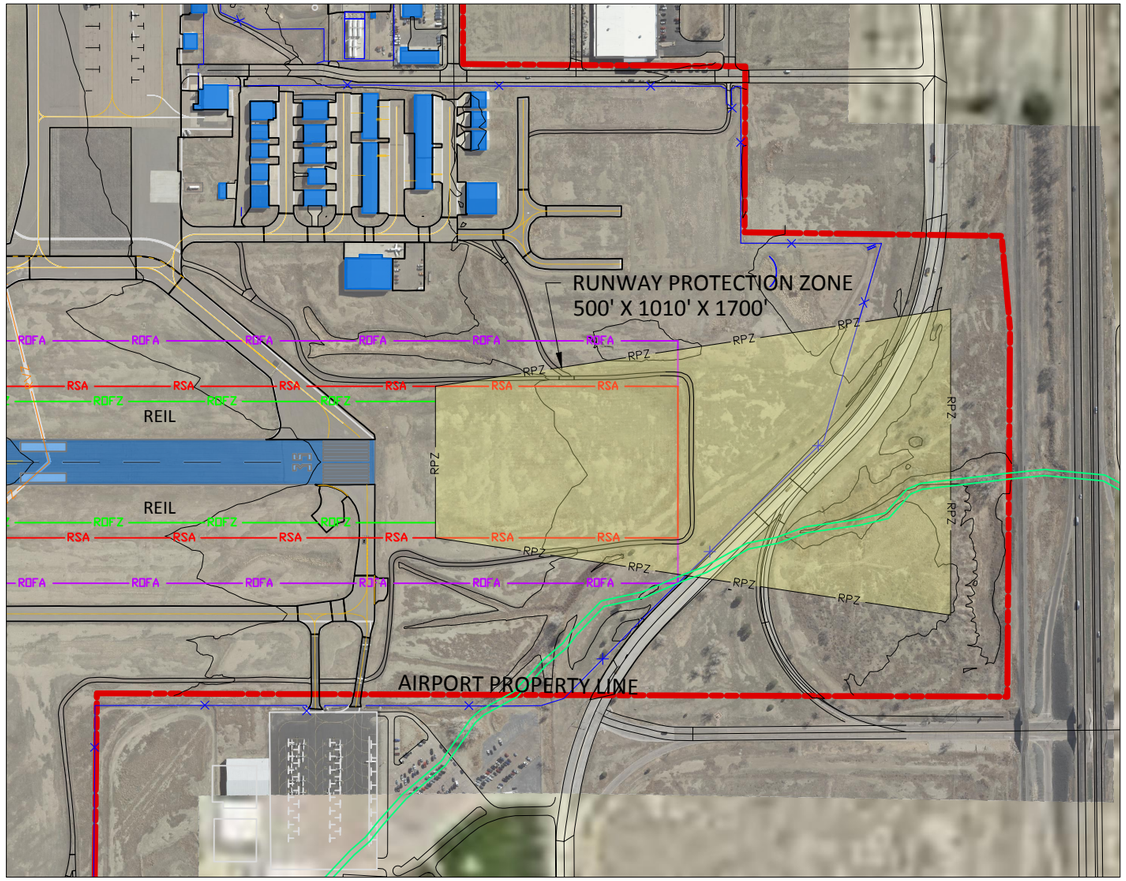
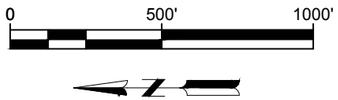


FIGURE C7 **Runway 8L/26R Runway Protection Zones**







LEGEND

- AIRPORT PROPERTY LINE
- RUNWAYS
- TAXIWAYS
- BUILDINGS
- ROADWAYS
- RSA — RUNWAY SAFETY AREA
- ROFA — RUNWAY OBJECT FREE AREA
- ROFZ — RUNWAY OBSTACLE FREE ZONE
- RVZ — RUNWAY VISIBILITY ZONE
- RPZ — RUNWAY PROTECTION ZONE
- DEP — DEPARTURE RUNWAY PROTECTION ZONE
- POFZ — PRECISION APPROACH OBSTACLE FREE ZONE
- SECURITY FENCE

FIGURE C8 **Runway 17/35 Runway Protection Zones**

TABLE C5 Runway Protection Zone Dimension Criteria

ITEM	INNER WIDTH	LENGTH	OUTER WIDTH	AIRPORT CONTROLS ENTIRE RPZ
Existing RPZ Dimensional Requirements				
Runway 8R/26L				
Runway 8R (Approach)	*1,000'*	*2,500'*	*1,750'*	*Yes*
Runway 8R (Departure)	*500'*	*1,700'*	*1,010'*	*Yes*
Runway 26L (Approach)	*1,000'*	*1,700'*	*1,510'*	*Yes*
Runway 26L (Departure)	*500'*	*1,700'*	*1,010'*	*Yes*
Runway 17/35				
Runway 17 (Approach)	*500'*	*1,700'*	*1,010'*	*Yes*
Runway 17 (Departure)	*500'*	*1,700'*	*1,010'*	*Yes*
Runway 35 (Approach)	*500'*	*1,700'*	*1,010'*	*Yes*
Runway 35 (Departure)	*500'*	*1,700'*	*1,010'*	*Yes*
Runway 8L/26R				
Runway 8L (Approach)	*500'*	*1,000'*	*700'*	*Yes*
Runway 8L (Departure)	*500'*	*1,000'*	*700'*	*Yes*
Runway 26R (Approach)	*500'*	*1,000'*	*700'*	*Yes*
Runway 26R (Departure)	*500'*	*1,000'*	*700'*	*Yes*
Standard Approach RPZ Dimensions for Various Visibility Minimums				
Visual and Not Lower Than 1-Mile, Small Aircraft Only	250'	1,000'	450'	
Visual and Not Lower Than 1-Mile, AACs A and B	500'	1,000'	700'	
Visual and Not Lower Than 1-Mile, AACs C and D	500'	1,700'	1,010'	
Not Lower Than ¾-Mile, All Aircraft	1,000'	1,700'	1,510'	
Lower Than ¾-Mile, All Aircraft	1,000'	2,500'	1,750'	
Standard Departure RPZ Dimensions				
Small Aircraft Only, AACs A and B	250'	1,000'	450'	
Large Aircraft, AACs A and B	500'	1,000'	700'	
Large Aircraft, AACs C, D, and E	500'	1,700'	1,010'	

SOURCE: FAA AC 150/5300-13/A, Change 1, *Airport Design*.

Runway Protection Zones Conclusion

PUB currently owns the entirety of property within every existing RPZ. However, with the possible consideration of improved IAPs that reduce visibility minimums to Runway 35, the alternatives evaluation should include an analysis for the portion of the RPZ that extends beyond airport property and encompasses U.S. Highway 96 and any other incompatible land uses.

Runway End Siting Surfaces

Criteria contained in FAA AC 150/5300-13A, provides guidance for the proper siting of runway ends and thresholds. The criteria are in the form of imaginary evaluation surfaces that are typically trapezoidal shaped and extend away from the runway ends along the centerline at specific slopes, expressed in horizontal feet by vertical feet (e.g., a 20:1 slope rises one foot vertically for every 20 feet horizontally). The specific size, slope, and starting point of the trapezoid depends upon the visibility minimums and the type of IAP associated with the runway end.

Threshold Siting Surfaces

Thresholds are located to provide property clearance over obstacles for landing aircraft on approach to a runway end. When an object obstructs this imaginary surface required for aircraft to land at the beginning of the runway, and it is beyond the airport sponsor's ability to remove, relocate, or lower, the landing threshold may require a location other than the end of the pavement (i.e., a displaced threshold). The existing criteria and analysis prepared for PUB are presented in **TABLE C6**. According to analysis of the AGIS data, there are no obstructions to the threshold siting surfaces.

TABLE C6 Threshold Siting Surface Dimensions

RUNWAY END	DISTANCE FOM RUNWAY END	INNER WIDTH	LENGTH	OUTER WIDTH	SLOPE	EXISTING OBSTRUCTION
8R	200'	800'	10,000'	3,400'	34:1	None
26L	200'	400'	10,000'	3,400'	20:1	None
17	200'	400'	10,000'	3,400'	20:1	None
35	200'	400'	10,000'	3,400'	20:1	None
8L	0'	400'	10,000'	1,000'	20:1	None
26R	0'	400'	10,000'	1,000'	20:1	None

SOURCE: Mead and Hunt analysis using FAA Engineering Brief No. 99A, Changes to Tables 3-2 and 3-4 of Advisory Circular 150/5300-13A, *Airport Design*.

IAPs With Vertical Guidance Surfaces

Runway ends equipped with IAPs providing vertical guidance require an additional level of approach surface analysis. When objects penetrate this imaginary surface that cannot be mitigated, then an approach with vertical guidance is not authorized. The size, shape, slope, and criteria for these surfaces, and the analysis conducted for Runways 8R and 26L are presented in **TABLE C7**. Runways 8R and 26L are the only runway ends currently equipped with IAPs providing vertical guidance. There are no objects that penetrate these surfaces; therefore, no threshold relocations or displacements are recommended.

TABLE C7 IAPs With Vertical Guidance Threshold Siting Surface Dimensions

RUNWAY END	DISTANCE FOM RUNWAY END	INNER WIDTH	LENGTH	OUTER WIDTH	SLOPE	EXISTING OBSTRUCTION
8R	0’	350’	10,000’	1,520’	30:1	None
26L	0’	350’	10,000’	1,520’	30:1	None

SOURCE: Mead and Hunt analysis using FAA Engineering Brief No. 99A, Changes to Tables 3-2 and 3-4 of Advisory Circular 150/5300-13A, *Airport Design*.

Departure Runway End Surfaces

Departure ends of runways normally mark the end of the full-strength runway pavement available and suitable for departures. Departure surfaces, when clear of obstacles, allow pilots to follow standard departure procedures. If obstacles penetrate the departure surface, then the obstacles must be evaluated through the Obstruction Evaluation/Airport Airspace Analysis (OE/AAA) process. After the OE/AAA process, departure procedure amendments such as non-standard climb rates, non-standard (higher) departure minimums, or a reduction in the length of takeoff distance available may be required. The size, shape, slope, and criteria of the departure surfaces, as well as the analysis conducted for Runways 8R, 26L, 17, and 35 are presented in **TABLE C8**. Obstructions were observed north of Runway 17 (i.e., the Runway 35 departure surface). Terrain penetrates the departure surface between 1,000 and 2,000 feet from the departure runway end. Two electrical transmission towers penetrate the surface roughly 6,800 feet from the departure runway end.

TABLE C8 Departure Runway Surface Dimensions

RUNWAY END	DISTANCE FOM DEPARTURE RUNWAY END	INNER WIDTH SECTION ONE	INNER WIDTH SECTION TWO	LENGTH	OUTER WIDTH	SLOPE	EXISTING OBSTRUCTION
8R	0’	150’	1,000’	12,152’	7,512’	40:1	None
26L	0’	150’	1,000’	12,152’	7,512’	40:1	None
17	0’	150’	1,000’	12,152’	7,512’	40:1	None
35	0’	150’	1,000’	12,152’	7,512’	40:1	Terrain, Electrical Transmission Towers

SOURCE: Mead and Hunt analysis using FAA Engineering Brief No. 99A, Changes to Tables 3-2 and 3-4 of Advisory Circular 150/5300-13A, *Airport Design*.

Runway End Siting Conclusion

There were no obstructions identified in the threshold siting or IAP evaluation surfaces. Three obstructions, existing terrain and a pair of electrical transmission towers, penetrate the Runway 35 departure surface. Alternatives that improve visibility minimums or change runway ends in any fashion will incorporate runway end siting analysis in the alternatives evaluation. Alternatives that evaluate the departure surface obstructions will be considered in the following chapter.

Instrument Approach Procedures, Navigational Aids, and Visual Landing Aids

Instrument Approach Procedures

Increased airport access can be improved by reducing the ceiling and visibility minimums associated with IAPs. PUB currently has seven published IAPs as presented in **TABLE C9**.

TABLE C9 Existing Instrument Approach Procedures

RUNWAY END	PROCEDURE	PROCEDURE TYPE	AIRCRAFT CATEGORIES	MINIMUM DESCENT ALTITUDE (FEET AGL)	VISIBILITY MINIMUMS (STATUTE MILE)
8R	ILS or LOC	PA	A, B, C, D, E	4,871' (200')	1/2
8R	RNAV (GPS)	PA	A, B, C, D	4,871' (200')	1/2
26L	ILS or LOC	APV	A, B, C, D	4,859' (200')	3/4
26L	RNAV (GPS)	APV	A, B, C, D	4,850' (200')	3/4
26L	VOR	NPA	A, B, C, D	5,120' (461')	1
17	RNAV (GPS)	NPA	A, B, C, D	5,640' (911')	1-1/4
35	RNAV (GPS)	NPA	A, B, C, D	4,980' (303')	1

SOURCE: Mead and Hunt analysis using FAA AC 150/5300-13/A, Change 1, *Airport Design*.
NOTES: PA = Precision Approach. APV = Approach Procedure with Vertical Guidance, NPA = Non-Precision Approach.

Based upon an analysis of PUB's existing climatological conditions presented in **Chapter A – Inventory of Existing Conditions**, the existing IAPs provide adequate IFR accessibility. As presented in **TABLE C10**, the Instrument Flight Rules (IFR) wind analysis indicates that Runway 8, followed by Runway 35 provide the best wind coverage during IFR weather conditions. The existing ALP indicates IAPs with visibility minimums as low as ½-mile are planned for implementation on Runways 26L and 35. Implementation of an IAP with visibilities not lower than ¾-mile is planned for Runway 17. Runway 8L/26R is intended to remain a visual runway with no planned IAPs. PUB would benefit from an IAP providing reduced visibility minimums to Runway 17/35.

TABLE C10 IFR Wind Coverage by Runway End

RUNWAY	10.5 KNOTS	13 KNOTS	16 KNOTS
8/26	**89.55%**	**91.93%**	**93.90%**
8	85.40%	87.47%	89.15%
26	57.98%	58.92%	59.28%
17/35	**90.49%**	**94.38%**	**98.10%**
17	75.99%	78.76%	81.69%
35	84.44%	87.88%	91.11%
Combined	**98.34%**	**99.33%**	**99.72%**

SOURCE: NOAA Integrated Surface Database, ASOS Station 724640 - Pueblo Memorial Airport, 2009-2019 data.
NOTE: Runways 8R/L and 26R/L are aligned to the same true bearing, thus wind coverage for both is the same.

Navigational Aids

FAA AC 150/5070-6B defines Navigational Aids (NAVAIDS) as aids to navigation that provide pilots with information that assist in locating an airport and to provide horizontal and/or positional guidance during landing. The type, mission, and volume of aeronautical activity, in association with airspace, meteorological conditions, and capacity data determine the need and eligibility for NAVAIDS. NAVAID requirements are based on guidelines contained in FAA Handbook 7031.2C, *Airway Planning Standard Number One* and FAA AC 150/5300-13A, Change 1.

As presented above, Runways 8R and 26L are equipped with Instrument Landing System (ILS) IAPs. Two antennae comprise the ILS and work in tandem to provide both vertical and horizontal guidance. The localizer antenna provides the horizontal guidance, and the glide slope antenna provides the vertical guidance. The localizer antenna east of Runway 26L is located approximately 1,470 feet from the threshold and the localizer antenna west of Runway 8R is located approximately 1,300 feet from the threshold. The Runway 8R glide slope antenna is located approximately 1,175 feet east of the threshold and 500 feet north of the centerline. The Runway 26L glide slope antenna is located approximately 1,135 feet west of the threshold and 500 feet north of the centerline.

A Very High Frequency Omni-Directional Range/Tactical Air Navigation (VORTAC) station is located approximately 3.2 miles east of PUB that is utilized for en route navigation for airways as well as the non-precision IAP to Runway 26L. An Airport Surveillance Radar (ASR-11) is located approximately 2,700 feet north-northeast of Runway 26R.

For many years, the FAA has been transitioning away from IAPs that use ground-based NAVAIDS to those that utilize the satellite-based Global Positioning System (GPS). As presented above, PUB has GPS IPAs that have no associated ground-based facilities or equipment. It is anticipated that any future IAP improvements will be implemented using GPS technology and no ground-based NAVAIDS will be utilized at PUB.

Visual Landing Aids

Currently, PUB is equipped with an excellent variety of visual landing aids, including:

Runway 8R/26L

- **High Intensity Runway Lights (HIRLS)**
- **4-Light Precision Approach Path Indicators (PAPIs) – both runway ends**
- **Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) – Runway 8R**
- **Runway End Identifier Lights (REIL) – Runway 26L**
- **Precision markings – both runway ends.**

Runway 17/35

- **Medium Intensity Runway Lights (MIRLS)**
- **4-Light PAPIs – both runway ends**
- **REIL – both runway ends**
- **Non-precision markings – both runway ends.**

Runway 8L/26R

- **MIRLS**
- **4-Light PAPIs – both runway ends**
- **REIL – each runway end**
- **Basic markings – both runway ends.**

According to FAA AC 150/5300-13A, Change 1, an Approach Lighting System (ALS) is recommended, but not required for IAPs with visibility minimums not less than ¾ mile. Unless the ALS is a requirement to achieve lower visibility minimums based on credit for lighting, they are not normally eligible for FAA Airport Improvement Program (AIP) funding. Future ALS improvements, if any, will be evaluated in conjunction with the IAP alternatives development analysis presented in the next chapter.

Instrument Approach Procedures, Navigational Aids, and Visual Landing Aids Conclusion

The operational capacity for each runway regarding wind coverage, navigational aids, and visual aids is sufficient to enable an unincumbered system to support existing and future airport operations. However, the ability to implement improved future GPS-based IAPs providing reduced visibility minimums to Runway 26L (½ mile), Runway 35 (½ mile) and Runway 17 (¾ mile) would enhance PUB's access during adverse weather conditions. It is recommended that PUB continue to plan and program for these improved IAPs, the implementation of appropriate ALS required in conjunction with the desired IAPs, continue to coordinate with the FAA Flight Procedures office, and provide precision markings to Runway 35.

Taxiway/Taxilane System

Taxiways provide defined movement corridors for aircraft between the runway system and the various functional landside areas on an airport. Some taxiways are necessary simply to provide access between aircraft parking aprons and runways, whereas other taxiways become necessary to provide more efficient and safer use of the airfield. Parallel taxiways eliminate the use of a runway for taxiing, referred to as back taxiing, thus increasing an airport's capacity and protecting the runway under low visibility conditions. Taxiway turns and intersections are designed for safe and efficient taxiing by aircraft while minimizing excess pavement.

Taxilanes are provided for low speed, precise taxiing of aircraft that are usually, but not always, located outside the movement area. They normally provide aircraft access from taxiways to apron parking positions or hangar areas.

Taxiway/Taxilane Design Standards

Taxiways and taxilanes are designed for cockpit over centerline taxiing, with enough pavement width to allow for a certain amount of wander. Potential runway incursions should be minimized by using design criteria contained in FAA AC 150/5300-13A, Change 1. Taxiway and taxilane clearance standards are based on wingspan and wingtip clearance criteria determined by the ADG of the Critical Aircraft. Taxiway and taxilane pavement design standards are based on the landing gear dimension determined by the Taxiway Design Group (TDG).

PUB's existing Critical Aircraft, the Bombardier CRJ 200, has an ADG designation of II and a TDG designation of 1B. However, utilizing data from the FAA's Traffic Flow Management System Counts (TFMSC) at PUB for FY 2019, there are sufficient operations by aircraft in TDG 2 (i.e., more than 500 operations) to apply the design standards to PUB. Furthermore, the future Critical Aircraft (Embraer E-175) has an ADG III and TDG 3 designation, so the design standards associated with ADG III and TDG 3 will be evaluated for taxiways serving Runways 8R/26L and 17/35.

TABLE C11 presents the design criteria, design standards, and existing conditions for taxiways serving Runways 8R/26L and 17/35. **FIGURE C9** provides a graphic depiction of the occurrences of PUB's existing taxiway geometry not meeting current FAA design methodology concepts, which include:

- **Taxiway A2.** The intersection of Taxiway A2 with two runways tends to increase pilot confusion and decrease situational awareness. The taxiway also leads directly from the aircraft parking apron to the runway environment without requiring a turn, which increases potential runway incursions. Finally, the non 90-degree angle intersection with both runways does not maximize pilot visibility to both the left and right of the aircraft.
- **Taxiway A.** Taxiway A intersects Runway 17/35 at a non 90-degree angle, so pilot visibility to both the left and right of the aircraft is not optimized.

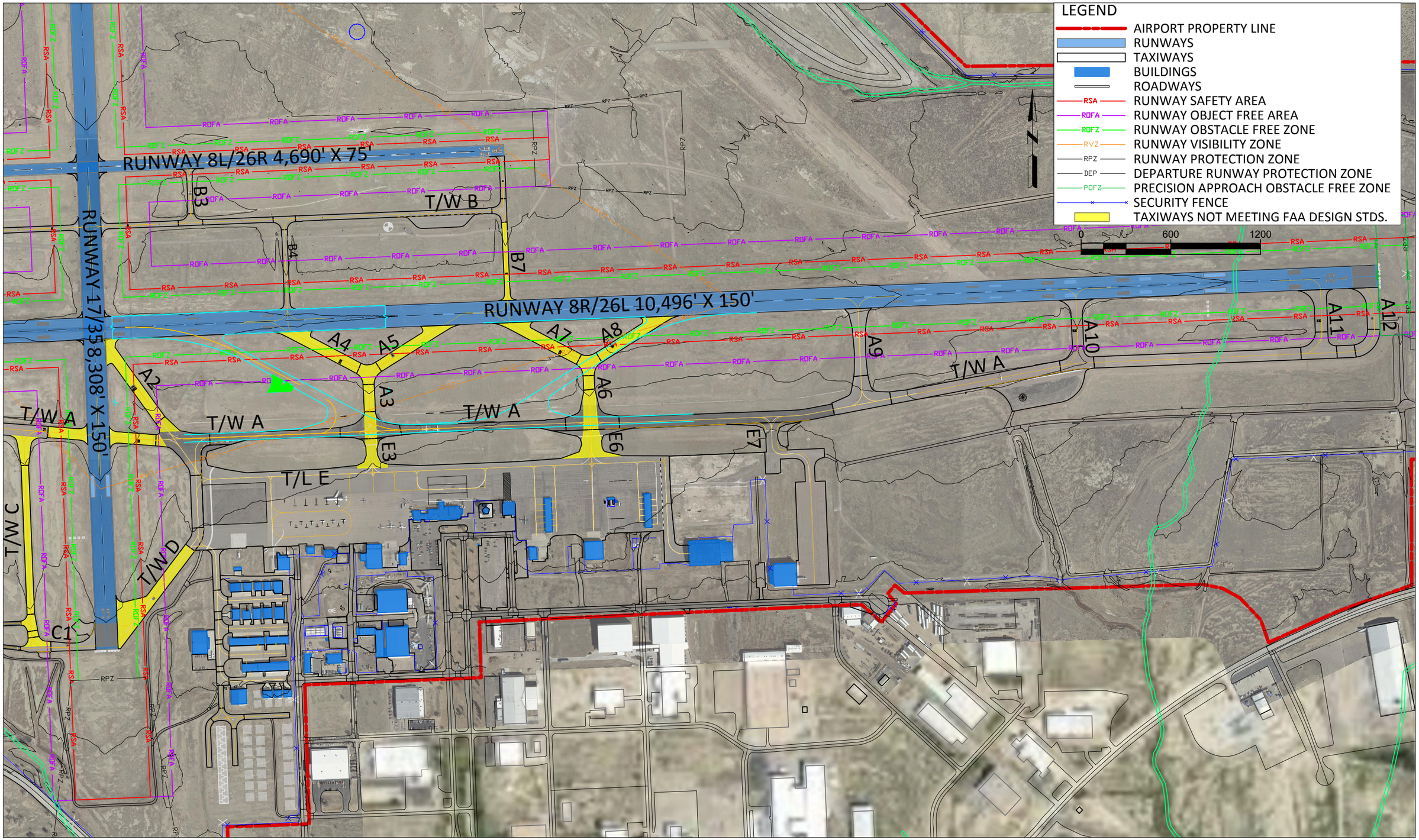


FIGURE C9 Taxiway Geometry Deficiencies

- **Taxiways A4, A5, A7, and A8.** The non 90-degree intersections of Taxiways A4, A5, A7, and A8 with Runway 8R/26L do not maximize pilot visibility to both the left and right of the aircraft. However, the difference in elevation between the Runway 8R/26L centerline and Taxiway A centerline at the Taxiway A3 intersection is 16 feet; the difference in elevation between the runway centerline and the Taxiway A centerline at the Taxiway A6 intersection is 20 feet. As stated previously, Taxiway A is located 775 feet from the Runway 8L/26L centerline. Providing 90-degree intersections with the runway by direct extensions of Taxiways A3 and A6 would result in gradients of approximately 2.1 percent and 2.6 percent, respectively. The added length of the "Y" shaped segments of Taxiways A4, A5, A7, and A8 are needed to meet the longitudinal taxiway gradient standard of 1.50 percent for runways accommodating AAC C, D, and E aircraft.
- **Taxiways A7 and B7.** Aircraft crossing Runway 8R/26L at the Taxiway A7 and B7 intersection do so within the middle third of Runway 8R/26L. This "high energy" intersection crosses the runway where aircraft taking off or landing can least maneuver and avoid collisions in the event of a runway incursion. However, since PUB is under ATCT control for 16 hours per day, and the crossing of Runway 8R/26L most often occurs when CAE-Doss aircraft are operational (i.e., from 30 minutes before sunrise to 30 minutes after sunset), this intersection is expected to remain until additional taxiway access is provided to serve Runway 8L/26R.
- **Taxiways A3/E3 and A6/E6.** Taxiways A3/E3 and A6/E6 provide direct access from the aircraft parking apron to Runway 8R/26L without making a turn (notwithstanding the 45-degree turns required of the "Y" shaped segments of Taxiways A4, A5, A7, and A8 presented above).
- **Taxiway C.** Taxiway C is only a partial parallel taxiway serving Runway 17/35 south of Taxiway A. Aircraft accessing Runway 17/35 north of Runway 8L/26R must do so by back taxiing on Runway 17/35. ATCT personnel report underutilizing Runway 17/35 because of the required back taxiing for takeoffs to the south and landings from the south.
- **Taxiway D.** Taxiway D intersects the Runway 35 threshold at an approximate 40-degree angle, which is not at the optimum 90-degree angle providing maximized pilot visibility to both the left and right of the aircraft.
- **Taxiway A11.** Airport personnel report that Taxiway A11 is seldom used. Based on its proximity to the Runway 26L end and entrance Taxiway A12, it could be considered a bypass taxiway. Bypass taxiways provide ATCT personnel flexibility in runway use when bottlenecks occur at busy airports. Bottlenecks happen when aircraft that are not ready for departure block access to the entrance taxiway. The ability to bypass aircraft in this situation and give aircraft that are ready for departure access to the runway increases traffic flow and overall airfield capacity. PUB could close Taxiway A11 if it is not needed for capacity, thus reducing its overall airfield pavement area and lowering future pavement maintenance expenses.

TABLE C11 Taxiway Design Standards for Taxiways Serving Runways 8R/26L and 17/35

DESIGN CRITERIA	DESIGN STANDARD	EXISTING DIMENSIONS			
		TAXIWAY A	TAXIWAYS A1 – A12	TAXIWAY C	TAXIWAYS C1 AND C5
ADG III Design Standard					
Taxiway Safety Area	118’	118’	118’	118’	118’
Taxiway Object Free Area	186’	186’	186’	186’	186’
Taxiway Centerline to:					
Parallel Taxiway/Taxilane Centerline	152’	270’	350’ +	N/A	8,060’
Fixed or Movable Object	93’	93’	93’	93’	93’
TDG 3 Design Standard					
Taxiway Width	50’	75’/50’[1]	75’	50’	50’
Taxiway Shoulder Width[2]	10’	N/A	N/A	N/A	N/A

DESIGN CRITERIA	DESIGN STANDARD	EXISTING DIMENSIONS		
		TAXIWAY D	TAXIWAY E	TAXIWAYS E3, E6, AND E7
ADG III Design Standard				
Taxiway Safety Area	118’	118’	118’	118’
Taxiway Object Free Area	186’	186’	186’	186’
Taxiway Centerline to:				
Parallel Taxiway/Taxilane Centerline	152’	N/A	270’	725’ +
Fixed or Movable Object	93’	93’	93’	93’
TDG 3 Design Standard				
Taxiway Width	50’	75’	50’	75’
Taxiway Shoulder Width[2]	10’	N/A	N/A	N/A

SOURCE: Mead and Hunt analysis using FAA AC 150/5300-13A, Change 1, *Airport Design*.
NOTES: [1] Taxiway A width between Taxiways A2 and A6 is 50 feet.
[2] Taxiway shoulders are recommended, but not required for taxiways accommodating ADG-III aircraft.
N/A = Not Applicable.

The Runway 8L/26R existing Critical Aircraft (Diamond DA20 Katana) and the future Critical Aircraft (Beechcraft T-6A Texan II) are within the ADG I and TDG 1A categories. As presented earlier, the current ALP indicates this runway has an ADG II category. Since the runway was designed and constructed to accommodate aircraft within RDC B-II, and approximately half of the RDC B-II aircraft have a corresponding TDG 2 category, TDG 2 is preferred for taxiways serving Runway 8L/26R. **TABLE C12** presents the design criteria, design standards, and existing conditions for taxiways serving Runway 8L/26R.

TABLE C12 Taxiway Design Standards for Taxiways Serving Runway 8L/26R

DESIGN CRITERIA	DESIGN STANDARD	EXISTING DIMENSIONS	
		TAXIWAY B	TAXIWAYS B1, B4, AND B7
ADG II Design Standard			
Taxiway Safety Area	79’	79’	79’
Taxiway Object Free Area	131’	131’	131’
Taxiway Centerline to:			
Parallel Taxiway/Taxilane Centerline	105’	1,450’	2,100’ 2,560’
Fixed or Movable Object	65.5’	65.5’	65.5’
TDG 2 Design Standard			
Taxiway Width	35’	35’	35’
Taxiway Shoulder Width[1]	15’	N/A	N/A

SOURCE: Mead and Hunt analysis using FAA AC 150/5300-13A, Change 1, *Airport Design*.
NOTES: [1] Taxiway shoulders not required for taxiways accommodating ADG I aircraft
N/A = Not Applicable.

Taxiway/Taxilane System Conclusion

The existing taxiway/taxilane system in place at PUB meets most FAA standards. However, the following existing non-standard conditions need to be considered in the alternatives analysis in the next chapter.

- Non 90-degree taxiway to runway intersections at the Taxiway A2 intersection with Runways 8R/26L and 17/35, Taxiway A at the intersection with Runway 17/35, and the Taxiway D intersection at the Runway 35 threshold.
- Direct taxiway access from apron to a runway without turns at Taxiways A3/E3 and A6/E6.
- The “Y” shaped, acute angled exit Taxiways A4, A5, A7, and A8 will be further studied in the next chapter through the development of an alternative concept that compares the feasibility of providing standard airfield geometry (i.e., non 90-degree taxiway and runway intersections and a true parallel Taxiway A) with the ability to provide standard taxiway gradients between Runway 8R/26L and Taxiway A.
- The removal of Taxiway A11 will be considered in the following chapter.

The need for additional exit taxiways and a full- length parallel taxiway serving Runway 17/35 will be considered as part of the alternatives analysis in the following chapter to determine if improvements might be implemented to reduce runway occupancy times for arriving aircraft and increase airfield capacity.

Holding Bays

Holding bays enhance capacity by providing space for aircraft awaiting departure clearance to remain clear of taxiways and allow pilots to perform pre-takeoff checks without impeding other aircraft already cleared for departure to proceed to the runway takeoff position. The most beneficial location is adjacent to the taxiways serving the runway ends and as near the runway ends as possible.

PUB is equipped with three existing holding bays: one at the west end of Taxiway A serving Runway 8R; one near the west end of Taxiway B, and one near the east end of Taxiway B. The Runway 8R holding bay provides sufficient space capable of accommodating up to four CRJ 200 or E-175-sized aircraft stacked nose to tail. The holding bays adjacent to Taxiway B could accommodate approximately seven Diamond DA20-sized aircraft also stacked nose to tail.

Current FAA preferred holding bay design includes clearly marked entrances and exits that allow independent usage of the parking positions for access directly to the runway. This design allows aircraft to bypass one another and assure taxiway wingtip clearances. There is not sufficient space on the existing holding bays to reconfigure aircraft parking positions to meet this preferred layout.

Holding Bays Conclusion

The adequacy of the existing holding bays and the need for additional bays is dependent on the capacity analysis conducted previously. When the capacity alternatives are evaluated in the next chapter, the need for additional or reconfigured holding bays will also be considered.

Landside Facility Requirements

Landside facilities are those facilities that support the airside facilities but are not actually a part of the aircraft operating surfaces. These consists of such facilities as the passenger terminal building, aircraft parking aprons, corporate and general aviation hangars, Fixed Based Operator (FBO) facilities, Aircraft Rescue and Fire Fighting (ARFF) facilities, fuel storage facilities, utilities, perimeter security, and access roads. Following an analysis of these existing facilities, current deficiencies can be noted in terms of accommodating both existing and future needs.

Terminal Area Requirements

Components of the terminal area include the passenger terminal building, gate/aircraft parking positions, and the apron area. FAA AC 150/5360-13A, *Airport Terminal Planning* provides general guidance for sizing terminal area facilities.

Passenger Terminal Building

The passenger terminal building is the face of PUB to the community and the front door for many visitors to Pueblo. Available amenities encourage visitors and the local community to use PUB, add value to the passenger experience, and improve the perception of PUB. Façade and aesthetic improvements to both the exterior of the terminal as well as the interior are recommended during the planning period to property maintain this gateway to the community.

The objective of noting facility requirements for the passenger terminal building is to identify the type, quality, and quantity of the facilities that are required for the terminal to operate safely and efficiently through the planning period. While some of the recommendations made for PUB intend to address specific shortfalls, others are to improve general performance. This section analyzes the existing state of the passenger terminal building and considers the future needs based on forecasted activity levels.

Given the relatively low level of future enplanements presented in the previous chapter (less than 15,000 by 2040), the passenger terminal building is generally sufficient. Therefore, the passenger terminal building requirements analysis consists of a limited evaluation based on known issues. Airport management have noted three select areas to be considered:

- **Security Check Point**
- **Restrooms**
- **Gate hold-room areas.**

Airport staff have also noted a desire to update the interior spaces to fit a more modern aesthetic. An interior renovation of the passenger terminal building is thereby also recommended. **FIGURE C10** provides a floorplan of the existing passenger terminal building.

Security Screening Check Point

The Security Screening Check Point (SSCP) at PUB is undersized to adequately accommodate passenger enplanements during the planning period. The existing checkpoint is atypical, as the present layout, configuration, and length of the SSCP does not meet Transportation Security Administration (TSA) standards for a standard checkpoint layout. The existing SSCP is approximately 680 square feet.

Guidance in the *Program for Applied Research in Airport Security (PARAS) 0002 – Companion Design Guide to US Customs and Border Protection's Airport Technical Design Standards* recommends an average of 13.2 square feet per peak hour passenger for a security checkpoint. Given the 50 passenger commercial aircraft that currently serve PUB, the check point is adequately, but additional space should be planned for the change is critical aircraft to the 76 passenger E-175 which would require closer to 1,000 square feet.

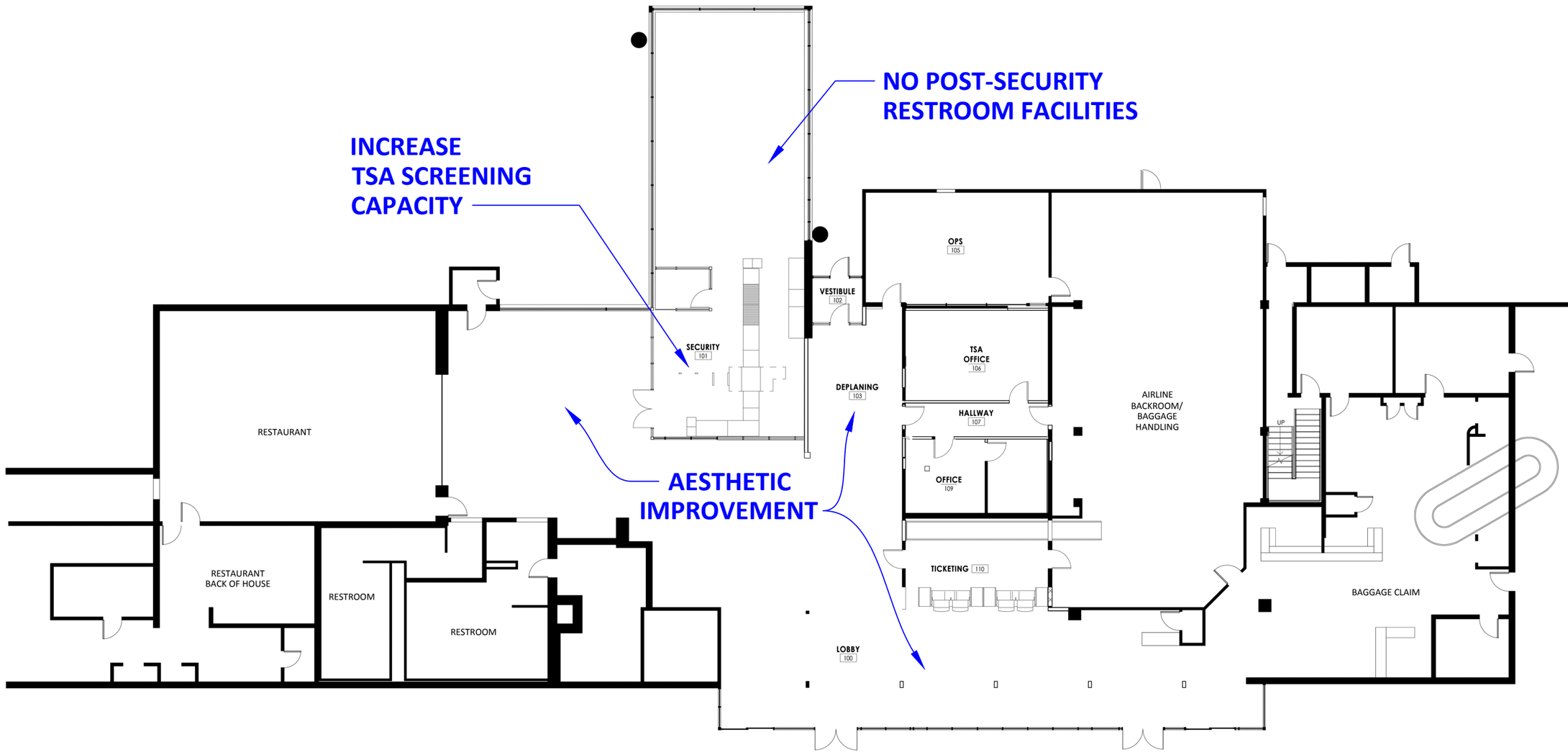


FIGURE C10 Terminal Floorplan

Restrooms

The existing public access restroom facility has one female and one male restroom located adjacent to the pre-security seating area and the restaurant. The existing square footage and fixture counts will serve the pre-security landside area for the next 20 years. Possible additions to each restroom facility would be a mother's room and a flip down step to facilitate children's handwashing, or a family/unisex facility. Additional considerations should be made for the inclusion of a post-security restroom facility of similar size and function as the pre-security area. There are currently no restroom facilities in the terminal gate hold room area, and users are required to leave the secured portion of the terminal to use the pre-security restroom facilities.

Gate Hold-Room Areas

Except for the lack of restroom facilities, the existing gate hold-room areas are sufficient to accommodate the peak hour with the current commercial aircraft type. However, additional square footage will be needed when the critical commercial aircraft changes. Additional square feet would also be beneficial during larger aircraft charter flights that occasionally utilize the terminal.

Aircraft Gates

Given the anticipated commercial operations at PUB throughout the planning period, no additional changes are required to the aircraft gates.

Vehicle parking

The existing vehicle parking area provides free parking to PUB passengers. The vehicle parking is adequate; however, the parking area pavement needs rehabilitation within the short-term planning period.

Passenger Terminal Apron

PUB currently has four commercial daily flights to and from Denver International Airport (DEN): two arriving flights and two departing flights. The passenger terminal apron has one aircraft parking space accommodating the CRJ 200 aircraft (ADG II) located north of the passenger terminal building and accessed via a ground-loaded gate system. Guidance under AC 150/5360-13A recommends rightsizing the terminal apron to accommodate peak hour commercial service aircraft operations. The forecasts do not anticipate any change in the total commercial service aircraft operations during the planning period, nor are any significant changes to peak hour enplanements expected. However, the aircraft providing the commercial service operations is anticipated to change to an E-175 (ADG III) during the planning period. The existing passenger terminal apron provides sufficient space for accommodating larger wingspan aircraft in the future but remarking and relocating the aircraft parking position and taxilane centerline will be required.

Terminal Area Conclusion

The terminal area will not require major changes to meet forecast demand, but instead needs only minor changes intended to facilitate a more effective, efficient, and modern terminal layout, as well as enhance the overall passenger experience well into the future. Recommended changes to the terminal area include additional restrooms in the sterile portion of the passenger terminal building, additional SSCP and hold-room square footage, and aesthetic renovations of the exterior and the interior public areas. Remarking and relocation of the terminal apron aircraft parking area and taxilanes may also be required to accommodate any potential change of commercial service aircraft to ADG III aircraft.

General Aviation and Support Facilities

General aviation (GA) facilities at PUB support the based and transient aircraft fleet. Support facilities serve various functions in support of aircraft operations.

Fixed Based Operators

FBOs are businesses providing aircraft services such as fuel sales, aircraft maintenance, flight training, and aircraft storage that cater to GA aircraft owners and pilots primarily. Currently, Rocky Mountain Flower Aviation is the sole FBO at PUB. Multiple FBOs tend to keep prices consistent with other airports, which benefits aircraft owners and pilots. The facility requirements for FBOs depend on staffing and equipment needs to keep up with an anticipated increase in demand. New or expanded FBO buildings might be necessary as existing facility reach capacity.

Aircraft Hangar Storage

Based on the high investment cost of owning and operating aircraft, hangars are generally the most desired option for both short- and long-term aircraft storage. Aircraft hangar storage at PUB consists of 20 T-hangar spaces, seven large executive box hangars, and 16 smaller GA box hangars. T-hangar spaces house one aircraft, while box hangars generally can hold multiple aircraft. Most of the hangars are located adjacent to the apron, with two 10-unit T-hangar structures located on the east side apron and 16 box hangars located on the west side apron. **FIGURE C11** provides the location of these hangars.

There are 0.72 hangar spaces available for every based aircraft at PUB, confirming that box hangars are storing multiple aircraft since PUB personnel indicate no based aircraft utilize apron tiedown storage. This ratio is used to estimate future storage recommendations, as it is expected that future storage facilities will reflect many of the existing characteristics of the current storage patterns. **TABLE C13** presents the estimated aircraft hangar storage demand throughout the planning period.

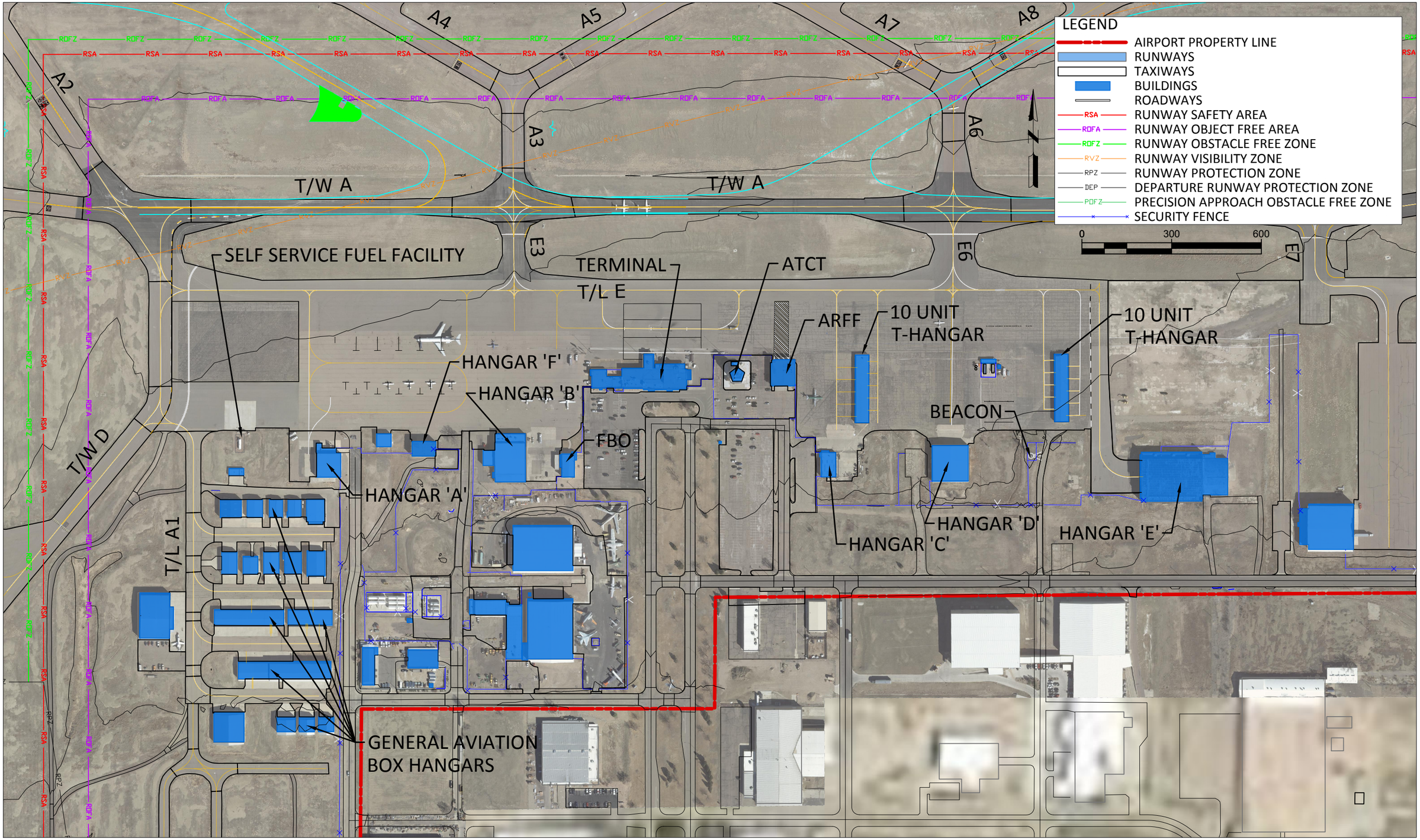


FIGURE C11 Storage Hangar Locations

TABLE C13 Hangar Storage Requirements, 2019-2040

YEAR	BASED AIRCRAFT	T-HANGAR UNITS	BOX HANGARS
2019	60	20	23
2025	66	23	24
2030	72	27	25
2035	77	29	26
2040	84	33	27

SOURCE: Mead and Hunt analysis using forecast projections.

The based aircraft forecast presented in **Chapter B – Aviation Activity Forecast** projected an increase of 17 single-engine aircraft, three multi-engine aircraft, two jet aircraft, and two helicopters between 2019 and 2040. In consideration of similar storage preference characteristics, it is expected that additional T-hangar units will be needed to correspond with the increase in single-engine aircraft. Box hangars should be added to accommodate any additional single-engine aircraft as well as the other aircraft types. The actual number, size, and location of future hangars will depend on user needs and financial feasibility at the time demand occurs.

Apron Storage

There is one main apron with approximately 18 aircraft tiedowns at PUB. These areas are almost entirely used for transient aircraft visiting PUB. According to PUB staff, these tiedowns are seldom, if ever, used for parking-based aircraft. Due to adverse climate conditions such as hail and the expense involved in owning aircraft, owners of the based aircraft at PUB will almost unilaterally choose to store their aircraft in a hangar.

GA apron storage requirements typically are based on the estimated amount of itinerant and based aircraft using tiedowns or apron storage spaces. Itinerant aircraft typically only require short-term, temporary storage on the apron, while based aircraft typically use tiedowns for a longer term and require more permanent apron storage. Space calculations for based aircraft use 360 square yards of apron for each aircraft tiedown. Calculations for iterant aircraft use 500 square yards of apron for each itinerant aircraft.

There are two reasons for the larger space requirements for itinerant aircraft. First, itinerant aircraft users will not be as familiar with the layout of and circulation patterns at PUB, and additional maneuvering space is essential. Second, whereas typically smaller, single-engine based aircraft use apron storage, various sized itinerant aircraft do and will continue to use temporary apron storage at PUB, and it occasionally accommodates large military aircraft and helicopters on the apron. Therefore, it is necessary to provide additional space to accommodate larger aircraft.

As presented in **TABLE C14**, the amount of anticipated demand for GA apron space is not expected to exceed existing capacity during the planning period.

TABLE C14 Apron Storage Requirements, 2019-2040

AREA	2019	2025	2030	2035	2040
Itinerant GA Apron (square yards)	23,425	24,509	25,941	27,462	29,077
Based GA Apron (square yards)	0[1]	0[1]	0[1]	0[1]	0[1]
Total Apron (square yards)	23,425	24,509	25,941	27,462	29,077
Existing Apron Area (square yards)	39,250[2]	39,250[2]	39,250[2]	39,250[2]	39,250[2]

SOURCE: Mead and Hunt Forecast Projections.
NOTES: [1] No based aircraft currently stored or projected to be stored on the apron.
[2] GA apron area available for aircraft parking.

General Aviation Facilities Conclusion

To accommodate the projected growth in single-engine aircraft, T-hangar structures should be increased by 13 over the planning period. Box hangars should be increased by six to account for the forecasted growth in other based aircraft types and the remaining single-engine aircraft. It is not anticipated that additional GA apron will be required. As indicated earlier, portions of the east apron may be identified for marking as non-movement areas and eliminated from use.

Aircraft Rescue and Fire Fighting Facility

The ARFF facility serving PUB is located on the apron adjacent to the air traffic control tower east of the terminal building. According to Code of Federal Regulations (CFR) Part 139.317, ARFF equipment and staff requirements are based upon the length of the largest air carrier aircraft that serves an airport with an average of five or more daily departures. **TABLE C15** presents the ARFF Index, aircraft length criteria, and representative air carrier aircraft.

TABLE C15 ARFF Support Requirements

ARFF INDEX	AIRCRAFT LENGTH	REPRESENTATIVE AIRCRAFT
A	Less than 90’	ERJ 135; **CRJ 200**^{E}
B	Between 90’ and 126’	CRJ 900; A319/A320; **E175**^{F}
C	Between 126’ and 159’	ERJ 195; MD-80; 737-800
D	Between 159’ and 200’	B757; B767; A330
E	Greater than 200’	B747; B777

SOURCE: FAA Part 139.315 ARFF Index Determination.
NOTES: **Bold** = PUB Critical Aircraft; ^{E} – Existing, ^{F} – Future.

PUB currently holds an ARFF index designation of A. This is due to the average commercial operations of two departures daily of the CRJ 200. As no projected growth in commercial operations is forecasted over the planning period, PUB will retain its A ARFF index. The CRJ 200 and the E175 are the existing and forecasted critical aircrafts at PUB. The existing ARFF facility is centrally located on the apron adjacent to the Airport Traffic Control Tower (ATCT). It provides approximately 6,350 square feet and is in good functioning condition. However, a recent building assessment conducted by the City of Pueblo concluded that the building is nearing the end of its useful life and a recommendation was made to provide a replacement facility in the next several years. PUB's ARFF facility operates three vehicles, which were detailed in **Chapter A – Inventory of Existing Conditions**. The existing equipment can accommodate the necessary requirements for its current ARFF index. However, due to age two response vehicles may require replacement during the planning period.

ARFF Facility Conclusion

As PUB is anticipated to retain its ARFF Index A designation throughout the planning period, no changes to ARFF equipment or staffing will be required. Two of the three ARFF vehicles may require replacement due to their age. Consideration for siting a new ARFF facility will be considered in this Master Plan Study.

Snow Removal Equipment (SRE) and Airport Maintenance Facility

Airport maintenance handles the upkeep, protection, and preservation of airport facilities, and the snow and ice removal from pavements. Currently, an approximate 15,800-square foot building and adjacent storage yard located south of the main aircraft apron houses the snow removal equipment (SRE) and maintenance equipment. FAA AC 150/5220-20A, *Airport Snow and Ice Control Equipment*, provides guidance in the purchase of AIP eligible SRE. FAA AC 150/5220-18A, *Buildings for Storage and Maintenance of Airport Snow and Ice Control Equipment and Materials*, provides siting factors and space allocation calculations for SRE facilities. **Appendix F** contains the detailed analysis for the SRE and maintenance facility requirements.

SRE Requirements

SRE requirements are primarily based on the total square footage of designated Priority 1 paved area, the airport's service classification, and the amount of annual snowfall. Priority 1 paved area is defined as the primary runway, parallel taxiway, terminal ramp, control tower access, and ARFF access identified in an airport's winter storm management plan for removal of snow, ice, and/or slush within 30 minutes (the standard time allowed for commercial service airports with greater than 40,000 annual operations). Runway 8R/26L and the Taxiway A loop have over 2,739,000 square feet of pavement. With an additional 10,000 square feet of area for ARFF access to Taxiway A and an additional 106,000 square feet of terminal apron, the total Priority 1 paved area at PUB equals over 2,855,000 square feet. Thus, PUB is classified as a very large airport, which influences SRE needs, building configuration and size, material storage needs, and personnel requirements.

Commercial service airports with over 40,000 aircraft operations that receive more than 12 inches of annual snowfall have a minimum SRE requirements of one high-speed rotary plow supported by two snowplows of equal snow removal capacity. PUB currently meets this minimum equipment requirement. However, the existing SRE inventory at PUB does not have the capacity to meet the 30-minute snow clearing time as determined by the commercial service airport operations level, amount of Priority 1 paved areas, and annual snowfall amount (according to National Weather Service data, Pueblo receives an average of 31.3 inches of annual snowfall). PUB is eligible for additional AIP fundable equipment available at their discretion. It is recommended that PUB replace or supplement the existing SRE vehicles that do not meet the requirements or that have exceeded the expected useful lifespan (i.e., generally 10 to 15 years). The existing SRE vehicle inventory that does not meet the recommendations could be used to clear secondary and tertiary paved areas such as GA aprons, access roads, taxilanes, hangar areas, and off-airside surfaces. **TABLE C16** provides the SRE recommendations based on the combination of parameters and calculations using guidance from AC 150/5220-20A.

TABLE C16 AIP Eligible SRE Recommendations

EQUIPMENT	EXISTING[1]	AIP-ELIGIBLE RECOMENDATION[2]
Rotary Plows	1994 Steward and Stevenson rotary plow (medium Class II rotary plow)	Two Class V rotary plows (casting distance at least 100'and 4,000 tons of snow per vehicle per hour
Plows	1987 Chevrolet dump truck, 8' plow (small snowplow)	Four very large plow trucks equipped with 25' blades
	Two 2006 International 7500 dump trucks, 14' plow and sander (intermediate snowplows)	
	1998 Kenworth dump trunk, 22' Viking plow (large snowplow)	
	2001/02 John Deere tractor, 9' pull behind blade (small snowplow)	
	2000 CAT grader (intermediate snowplow)	
	2015 Ford F250, 8' Western plow (small snowplow)	
Multi-Purpose Equipment	2009 John Deere loader and attachment	One large swath 25' wide sweeper broom, equipped with airblast system
	2008 Skid Steer and attachments	One solid material spreader with 6-cubic yard hopper capacity with 75' swath

SOURCE: [1] Pueblo Memorial Airport, Snow and Ice Control Plan, Revision dated August 17, 2018.
[2] Mead and Hunt analysis using FAA AC 150/5220-20A.

SRE and Airport Maintenance Facility Requirements

SRE are costly pieces of complex and technologically advanced equipment. To protect and service the equipment and protect local and federal investment, specifically designed maintenance and storage buildings are needed. SRE should be housed in a building capable of maintaining 50 degrees Fahrenheit to prolong the useful life of the equipment and to enable more rapid response to operational needs.

Total space allocation for a SRE facility is based on the total of three individual areas determined necessary to meet different functional purposes: storage area (including equipment parking, snow and ice control materials, and equipment parts); support area (including administrative and equipment maintenance areas); and special equipment area (including heating, ventilation, air conditioning steam generation, emergency power, and machine rooms). Space allocation for each area is determined by local building codes and ordinances, values provided by tables in AC 150/5220-18A, and applying equipment clearance values as determined by using equipment safety zone concepts.

Using the guidance contained in AC 150/5220-18A, a total SRE and airport maintenance facility consisting of approximately 20,000 square feet is required. Thus, the existing facility, with a total area of approximately 15,800 square feet is limited in providing adequate space for the recommended equipment. Additionally, the existing garage doors might not have sufficient width to accommodate the larger recommended SRE. When consideration is given to expanding, remodeling, or replacing the existing facility, consultation with a specialized engineering and architectural firm is needed to design the facility using AC 150/5220-18A design and construction standards.

SRE and Airport Maintenance Facility Conclusion

It is recommended that PUB program for the replacement of the existing SRE vehicles that do not meet the recommendations presented here or have exceeded their useful lifespans with SRE that are eligible for AIP funding. Additionally, when an expansion, remodel, or replacement of the existing facility is required, it is recommended that PUB engage an engineering and architectural firm to right-size the building space and layout that conforms to FAA guidance and local codes and ordinances.

Fuel Storage Facility

PUB has its own fuel storage facility providing both Jet A and 100LL AVGAS, which is owned by the City of Pueblo. According to fuel sales records provided by PUB, the past three years of fuel sales have averaged between 230,000- and 273,000-gallons of Jet A and 1,240,000 and 1,500,000 gallons of 100LL AVGAS per year. Based on the 2019 total aircraft operations, this equates to approximately 177 gallons of Jet A fuel sold per turbine-powered aircraft operation and 13.1 gallons of 100LL AVGAS fuel sold per piston-powered aircraft operation. Typically, as operations increase, fuel storage requirements can be expected to increase proportionately. Increasing the ratio of gallons sold per operation yields an estimate of a two-week supply for future fuel storage needs during the peak month of operations. **TABLE C17** presents the demand for fuel storage compared to the existing capacity.

TABLE C17 Summary Fuel Storage Requirements, 2019-2040

FUEL TYPE	2019	2025	2030	2035	2040
Jet A					
Average Day of Peak Month Turbine-Powered Aircraft Operations	26	25	26	28	29
Two Weeks of Operations	368	346	363	386	411
Gallons Per Operation	176.8	177.5	179.0	182.0	185.0
Actual Fuel Storage (gallons)	200,000[1]	200,000[1]	200,000[1]	200,000[1]	200,000[1]
Future Fuel Storage Requirements (gallons)	65,000	61,470	64,935	70,285	76,080
100LL AVGAS					
Average Day of Pek Month Piston-Powered Aircraft Operations	54	59	62	65	67
Two Weeks of Operations	763	827	867	904	943
Gallons Per Operation	13.1	13.1	13.5	14.0	14.5
Actual Fuel Storage (gallons)	60,000[2]	60,000[2]	60,000[2]	60,000[2]	60,000[2]
Future Fuel Storage Requirements (gallons)	9,967	10,835	11,710	12,650	13,770

SOURCE: Mead and Hunt analysis.
NOTES: [1]Existing Jet A fuel storage capacity (80 percent of storage tank capacity is considered full).
[2]Existing 100LL AVGAS fuel storage capacity (80 percent of storage tank capacity is considered full).

Fuel Storage Facility Conclusion

The existing fuel storage capacity appears to be more than sufficient to accommodate the anticipated demand throughout the planning period.

Airport Access and Circulation

The existing access roads provide easy landside access to the passenger terminal building and other use areas at PUB. Located north of and adjacent to US Highway 50 (US-50) and less than 10 miles east of Interstate 25 (I-25), PUB remains easily accessible to airport visitors. United Avenue provides PUB with immediate access to US-50. Keeler Parkway, the main approach to the passenger terminal building, terminates at Bryan Circle and provides access to the vehicle parking areas. At two lanes each direction and 35 feet in width, Keeler Parkway appears suitable to accommodate any future growth. Additional airport roads connect the GA areas with United Avenue and William White Boulevard. This includes Doss Aviation, PUB's largest user, which has its own access point along William White Boulevard. The number, size, and location of access roads appear sufficient to support projected GA development.

Airport Access and Circulation Conclusion

PUB's existing road network appears capable of providing sufficient vehicular access and circulation throughout the planning period.

Airport Perimeter Security

The existing security fence that surrounds the terminal area and surrounding buildings is an eight-foot chain link topped with three strands of barbed wire. In summer 2020, 34,000 linear feet of 10-foot chain link wildlife fence topped with three-strands of barbed wire was installed around most of the north, west, and east perimeters of airport property. In the terminal area there are six automated access gates providing entry to the airfield through magnetic gate card readers. Two pedestrian gates – one by Rocky Mountain Flower Aviation and one by the ARFF facility – are operated via a programmable keypad lock. Five emergency vehicle access gates are also provided through the security fence, one is between the passenger terminal building and the ATCT, and two each located on the southeast and southwest perimeter fence lines. PUB staff indicate the security perimeter fencing and access gates are adequate for existing and future needs.

Airport Perimeter Security Conclusion

PUB's existing security and wildlife perimeter fencing is sufficient to maintain proper operational security measures. Additional gates or fencing may be installed during the planning period as needs arise.

Utilities

Water, sewer, electricity, natural gas, and telephone/internet services are currently available at PUB. Airport buildings, particularly the FBO and terminal building, are fully serviced by the existing utility network. PUB is sufficiently served by each of these utilities and is likely to remain so throughout the planning period.

Utilities Conclusion

No immediate changes are required to PUB's utilities infrastructure. PUB should coordinate with the City of Pueblo for future extensions, expansions, and upgrades in utility services.

Summary

The information provided in this chapter provides the basis for understanding the facility improvements that are needed at PUB to accommodate future aviation demand efficiently and safely. Following are the major improvement considerations that have been identified in this chapter.

Airside Considerations

Airfield Capacity

- Evaluate taxiway, taxilane, apron and holding bay configuration changes to enhance capacity.
- Evaluate additional runway capacity.

Runway Design Standards

- Evaluate the remediation of the deficient Runway 8R/26L ROFA width.
- Plan and program for the relocation of the taxiway holding position lines on taxiways serving Runways 8R/26L and 17/35.

Runway Line of Sight

- Evaluate correcting the Runway 17/35 gradient of 1.0 percent exceeding the allowable 0.8 percent standard.

Pavement Condition

- Reconstruct a sizeable portion of the easternmost apron.
- Future rehabilitation of Taxiways A10, A11, and C5 due to lower PCI ratings.

Runway Protection Zones

- In conjunction with an improved IAP to Runway 35 that reduces visibility minimums, evaluate impacts and potential mitigation measures to the Runway 35 RPZ extending beyond airport property that will encompass any incompatible land uses.

Runway End Siting

- Evaluate alleviating the existing terrain and a pair of electrical transmission towers that penetrate the Runway 35 departure surface.
- Evaluate future runway end siting requirements in conjunction with possible IAP improvements.

Instrument Approach Procedures, Navigational Aids, and Visual Landing Aids

- Evaluate implementing improved GPS-based IAPs providing reduced visibility minimums to Runway 26L (½ mile), Runway 35 (½ mile), and Runway 17 (¾ mile) that enhance PUB's access during adverse weather conditions.
- Evaluate ALS requirements in conjunction with the proposed IAP improvements.

Taxiway/Taxilane System

- Evaluate solutions to non 90-degree taxiway to runway intersections at the Taxiway A2 intersection with Runways 8R/26L and 17/35, Taxiway A at the intersection with Runway 17/35, and the Taxiway D intersection at the Runway 35 threshold.
- Evaluate solutions that alleviate the direct taxiway access from an apron to a runway without turns at Taxiways A3/E3 and A6/E6.
- Evaluate solutions to the "Y" shaped, acute angled exit Taxiways A4, A5, A7, and A8 that include 90-degree runway intersections and provide standard taxiway gradients.
- Evaluate the ability to remove the dogleg of Taxiway A between Taxiways A9 and A10 in conjunction with an alternative evaluating the resolution of the "Y" shaped, acute angled exit Taxiways A4, A5, A7, and A8.
- In conjunction with the capacity enhancement alternatives evaluation, include the evaluation of a full-length parallel taxiway serving Runway 17/35 and additional exit taxiways.

Holding Bays

- Evaluate reconfiguration of the existing holding bays or the provision of additional bays in conjunction with the capacity enhancement alternatives evaluation.

Landside Considerations

Terminal Area

- Plan and program for the modernization of the interior aesthetic of the terminal building.
- Plan and program for additional restrooms in the sterile portion of the passenger terminal building.
- Plan and program for the remarking and relocation of the terminal apron aircraft parking area and taxilanes to accommodate potential change of service to ADG III aircraft.

General Aviation Facilities

- Reserve ample space to accommodate the projected growth in based aircraft through additional T-hangars and box hangars.
- Reserve ample space for potential new or expanded FBO facilities as demand dictates.

ARFF Facility

- Consider replacement of two of the three ARFF vehicles due to their age.
- Evaluate the siting of a replacement ARFF facility.

SRE and Airport Maintenance Facility

- Plan and program for the replacement of existing SRE vehicles that do not meet AIP funding eligibility recommendations or have exceeded their useful lifespans.
- Plan and program for the expansion, remodel, or replacement of the existing SRE facility.