Working Paper 2

Demand/Capacity Analysis & Facility Requirements
Alternatives Development & Evaluation (Not Included)

Buckeye Municipal Airport

Airport Master Plan

Prepared for: City of Buckeye

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City Project No: TBD
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Section 4 - Demand/Capacity Analysis & Facility Requirements

The goal of this section is to compare existing capacity to forecast demand to identify any capacity constraints and improvements that may be necessary during the 20-year planning period, effectively conducting a gap analysis. Several FAA advisory circulars were utilized to guide work within this section of the airport master plan, primarily including AC 150/5060-5, *Airport Capacity and Delay*, AC 150/5300-13B, *Airport Design*, and AC 150/5325-4B, *Runway Length Requirements for Airport Design*. The Airport Cooperative Research Program (ACRP) Report 113, *Guidebook on General Aviation Facility Planning* was also used. Other guidance is referenced where appropriate. Subsequent subsections provide technical assessments of the following:

- Airport Role - within national (NPIAS) and statewide (SASP) airport system plans.
- Airport Design Standards - critical aircraft characteristics and airport reference code.
- Long-Range Airport Development Plan (LRADP) - summary of long-range vision for BXK.
- Airfield Facility Requirements - capacity of the runway system, including crosswind runway capabilities, design of runways, taxiways, and aprons, visual aids and NAVAIDs.
- Terminal Area and Landside Facility Requirements - design and capacity of the general aviation terminal building, apron space, aircraft storage space, and automobile parking.
- Support Facility Requirements - design and capacity of fueling, aircraft rescue and firefighting, aircraft maintenance and airport maintenance facilities, as well as other items such as fencing and utilities.
- Land Acquisition - required land acquisition, if any.

Excess capacity and/or shortfalls will be identified for each component. Those will guide development proposed in **Section 5, *Alternatives Development & Evaluation*** and **Section 6, *Implementation Plan***.

Many of the significant improvements needed at an airport are driven by the demand level, not a time frame or a specific year. In AC 150/5070-6B, *Airport Master Plans*, the FAA recommends that planners develop Planning Activity Levels (PALs) based on the forecast. Instead of referring to years as development targets, PALs are selected activity levels that represent a trigger for additional capacity. The use of PALs focuses the airport sponsor and the public on the need to plan for aviation activity levels rather than a specific timeline. For this study, the PALs and their respective anticipated planning horizons (years) are as follows:

- **Base Year**: 2023
- **PAL 1**: 2028 (Short-Term)
- **PAL 2**: 2033 (Mid-Term)
- **PAL 3**: 2043 (Long-Term)

PAL 1, PAL 2, and PAL 3 are defined as the aviation activity levels that are anticipated to occur at the forecast horizon years. **Table 4.1** summarizes the PALs and expected activity levels according to the aviation activity forecasts. The FAA Phoenix ADO approved the forecast and the future critical design aircraft as presented in **Section 3**, ***Aviation Activity Forecasts*** on August XX, 2024.

Table 4.1 - Planning Activity Levels (PALs)

	Base Year	PAL 1	PAL 2	PAL 3
Anticipated Planning Horizon	2023	2028	2033	2043
Activity Indicators				
Based Aircraft	66	90	105	118
Based Aircraft - Jets	0	3	9	13
Annual Aircraft Operations	95,222	140,000	155,000	178,942
Critical Aircraft (AAC - ADG - TDG)	A-II-1A	B-II-2A	B-II-2A	C-II-2A

Source: Dibble, May 2024 analysis

Throughout the following sections, facility requirements will be defined by the level of aviation activity of a specific PAL as defined in **Table 4.1**. Additionally, project-specific PALs may be defined for those major capital improvement projects increasing capacity or storage capabilities. Such projects usually require additional scrutiny and attention, and project-specific PALs will provide more information regarding the levels of aviation activity that need to be reached to initiate and implement the project. For example, the planning process for a parallel runway may need to start at PAL A, and construction may need to start at PAL B - PAL A and PAL B describing operational levels that may fall in-between the levels described by PALs 1, 2 or 3. Or, the need for a runway extension may be triggered by PAL C, which could be defined as 500 annual operations by those aircraft requiring additional runway length. Those project-specific PALs will be tied to actual capacity projects and will be established during the Implementation Plan phase of the AMP.

The use of PALs will enable the airport and other stakeholders to track aviation activity and implement proposed improvements when activity levels actually warrant those improvements, effectively creating a flexible implementation plan. For example, according to the forecast, PAL 2 is expected to occur in 2033, but conservative growth could delay PAL 2 activity levels to 2034 or 2035. On the other hand, faster growth than expected could see PAL 2 activity levels occur in 2032 or 2031.

Additionally, in an effort to provide a comprehensive development framework for the City, attention will be given to the needs of the Airport beyond the 20-year planning horizon. At times, a specific facility, or a component thereof, may not be justified by the forecast but its significance or its likelihood may make it an important component to consider when planning the layout of other facilities over the next twenty years. For example, when considering hangar expansion plans, only some hangars may be justified by the forecast but showing a full built-out development option may be more representative to the sponsor and provide a broader, ultimate framework to work within. Similarly, potential major airport expansion plans, such as runway extensions or new runways, that are not expected to occur within the next twenty years may impact the planning and location of future facilities nonetheless. In terms of nomenclature for this AMP:

- Improvements that are justified by the forecast and expected to occur within the 20-year planning period (or within the demand levels of the PALs) are designated as *Future* throughout this report.
- Improvements that are expected to occur beyond that timeframe are designated as *Ultimate* throughout this report.

4.1 Airport Role

According to the NPIAS 2023-2027 Report, BXK is classified as a Nonprimary General Aviation Airport. Furthermore, the FAA classifies BXK's role in the general aviation category as Local. Additionally, ADOT

Aeronautics has categorized BXK as a GA-Community Airport in the 2018 Arizona SASP Update. While categorization of the Airport may evolve as facilities continue to grow, those classifications are considered adequate given existing conditions.

In the future, increased aviation traffic, expansion of airport facilities, and the publication of instrument approach procedures may eventually satisfy the screening requirements for that of a Nonprimary Airport with a Regional Role as defined in Appendix C of the 2023-2027 NPIAS Report. Additionally, the Airport may eventually satisfy the screening requirements to be included as a Reliever in a future update of the NPIAS. According t0 Order 5090-5, *Formulation of the NPIAS and ACIP* a Reliever airport must maintain 100 or more based aircraft, relieve a large or medium hub primary airport operating at 60 percent of its capacity, and demonstrate a regional or national role in the NAS. The Airport is currently the only GA airport in the Phoenix Metro area not designated as a Reliever for PHX.

4.2 Airport Design Standards

This section provides an overview of applicable FAA design standards for airfield infrastructure based on the existing and future critical design aircraft. Please refer to **Section 2.2.1, *Airport Design Standards*** for a complete definition of FAA design standards, codes, and categories.

4.2.1 Critical Aircraft Characteristics

As determined in **Section 3.7.3, *Critical Design Aircraft***:

- The existing family of critical design aircraft falls within an ADG - AAC aircraft grouping of **A-II** and a TDG of **1A**. A typical aircraft in that grouping is the Cessna 208B Grand Caravan, a type currently based at the airport.
- The future family of critical design aircraft is anticipated to fall within an ADG - AAC aircraft grouping of **B-II** and a TDG of **2A** by PAL 1. A typical aircraft in that grouping is the Beechcraft Super King Air 350i.
- The future family of critical design aircraft is anticipated to fall within an ADG - AAC aircraft grouping of **C-II** and a TDG of **2A** by PAL 3. A typical aircraft in that grouping is the Cessna Citation X. Most GA aircraft in the C-II grouping have TDGs of 1B, but the critical aircraft grouping retains TDG 2A to continue to accommodate half of GA aircraft in the B-II grouping.

The future critical aircraft for PAL 3 will drive design for proposed improvements. **Figure 4.1** depicts those typical aircraft in each grouping. **Table 4.2** summarizes the existing and future critical aircraft characteristics.

Figure 4.1 - Existing & Future Critical Aircraft

Source: Textron Aviation, retrieved May 2022.

Table 4.2 - Existing & Future Critical Design Aircraft Characteristics

Aircraft Type (Typ.)	Approach Speed (kts)	AAC	Wingspan (ft)	Tail Height (ft)	ADG	CMG (ft)	MGW (ft)	TDG	MTOW (lbs)
Cessna 208B Grand Caravan	77	A	52	15	II	13	12	1A	9,000
Beechcraft Super King Air 350i	107	B	58	14	II	16	17	2A	15,000
Cessna Citation X	131	C	64	19	II	29	11	1B[1] (2A)	36,100

Source: FAA, *Aircraft Characteristic Database*. Dibble, May 2024 analysis
Note: [1]: The Cessna Citation X has a TDG of 1B, but the composite critical aircraft grouping for PAL 3 retains TDG 2A to continue to accommodate most B-II aircraft.

Prior to the publication of FAA AC 150/5300-13B, *Airport Design* on March 31, 2022, FAA guidance used the highest RDC, minus the visibility component, to form the ARC. The design standard had been in place since the publication of the original airport design guidance, FAA AC 150/5300-13, *Airport Design*, on September 29, 1989. For years, the ARC had been a familiar component of airport planning and design and allowed easy reference to the largest aircraft that an airport is designed for. The ARC was abandoned with the publication of FAA AC 150/5300-13B, *Airport Design* on March 31, 2022 and is no longer a design standard. Airport planners must now reference each runway's individual RDC. In the case of an airport with multiple runways, reference to the highest RDC, minus the visibility component, is no longer recognized.

This master plan will no longer use the ARC as a facility objective. However, for commonality, the hypothetical ARC for BXK is discussed below. The hypothetical ARC is directly translated into an RDC for the primary runway in **Section 4.2.2, *Applicable Design Standards***. Based on the critical aircraft characteristics specified above, the hypothetical ARC at BXK is as follows:

- The existing critical aircraft at BXK is A-II. However, as specified in **Section 2.2.1, *Airport Design Standards***, BXK's current hypothetical ARC is B-II. Since the PAL 1 critical aircraft is a grouping of B-II aircraft, and runway design standards are identical for A-II and B-II runways, the current hypothetical ARC **B-II** is retained for the short-term.
- The future hypothetical ARC requirement at BXK is **B-II** by PAL 1, and **C-II** by PAL 3.

4.2.2 Applicable Design Standards

4.2.2.1 Runway Design Standards

Table 4.3 presents runway design standards for A/B-II runways, per the existing and future PAL 1 critical design aircraft. All landing runways are currently visual only, which translates into an existing Runway 17-35 RDC of **B-II-VIS**. See **Section 2.2.1 *Airport Design Standards*** for additional information on the existing RDC at BXK. The corresponding column in **Table 4.3** is the *Visual* column (highlighted in solid grey).

The Airport is currently planning to add Non-Precision Approach (NPA) Instrument Approach Procedures (IAPs) to both ends of Runway 17-35 by PAL 1 and has initiated coordination with the FAA for procedure design and implementation. It is anticipated that new NPA IAPs will establish visibility minimums not lower than 1 statute mile on both runway ends, at least initially. Consequently, the future PAL 1 RDC objective for Runway 17-35, or the primary runway at the time, is **B-II-5000**. Instrument Flight Procedures (IFPs) into the airport are further discussed in **Section 4.4.7, *Navigational & Approach Aids***. The corresponding column in **Table 4.3** is the *Not lower than 1 mi* column (highlighted in hatched grey).

Table 4.4 presents applicable runway design standards for C-II runways, per the future PAL 3 critical design aircraft. An Approach Procedure with Vertical Guidance (APV) with not lower than ¾ statute mile visibility minimums is expected to be implemented at the Airport by the end of the planning period. This translates into a future PAL 3 RDC of **C-II-4000** for the primary runway. The corresponding column in **Table 4.4** is the *Not lower than ¾ mi* column (highlighted in hatched grey).

Therefore, the RDC objective for the primary runway at BXK is as follows:

- Existing RDC: **B-II-VIS**. See the *Visual* column in **Table 4.3** (solid pattern)
- Future PAL 1 & 2 RDC: **B-II-5000**. See the *Not lower than 1 mi* column in **Table 4.3** (hatch pattern)
- Future PAL 3 RDC: **C-II-4000**. See the *Not lower than ¾ mi* column in **Table 4.4** (hatch pattern).

Table 4.3 - Existing & Future PAL 1 & PAL 2 Runway Design Standards

Item	A/B-II			
	Visual (*Existing*)	Not lower than 1 mi (*PAL 1 & 2*)	Not lower than ¾ mi	Lower than ¾ mi
Runway Design				
Runway Width	75'	75'	75'	100'
Shoulder Width	10'	10'	10'	10'
Blast Pad Width	95'	95'	95'	120'
Blast Pad Length	150'	150'	150'	150'
Crosswind Component	13 kts	13 kts	13 kts	13 kts
Runway Protection				
Runway Safety Area (RSA)				
Length Beyond Departure End[1,2]	300'	300'	300'	600'
Length Prior to Threshold	300'	300'	300'	600'
Width	150'	150'	150'	300'
Runway Object Free Area (ROFA)				
Length Beyond Departure End	300'	300'	300'	600'
Length Prior to Threshold	300'	300'	300'	600'
Width	500'	500'	500'	800'
Approach Runway Protection Zone (RPZ)				
Length	1,000'	1,000'	1,700'	2,500'
Inner Width	500'	500'	1,000'	1,000'
Outer Width	700'	700'	1,510'	1,750'
Departure Runway Protection Zone (RPZ)				
Length	1,000'	1,000'	1,000'	1,000'
Inner Width	500'	500'	500'	500'
Outer Width	700'	700'	700'	700'
Runway Separation (Runway Centerline to)				
Holding Position	200'	200'	200'	250'
Parallel Taxiway/Taxilane Centerline[3,4]	240'	240'	240'	300'

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

Notes: [1]: The RSA length beyond the runway end begins at the runway end when a stopway is not present. When a stopway is present, the length begins at the stopway end.

[2]: The RSA length beyond the runway end may be reduced to that required to install an EMAS (the designed set-back of the EMAS included).

[3]: The runway to taxiway/taxilane centerline separation standards are for airports at sea level. For airports at higher elevations, an increase to these separation distances may be required to keep taxiing and holding aircraft clear of the inner-transitional OFZ. This standard cannot be used to justify a decrease in runway to taxiway/taxilane separation.

[4]: For approaches with visibility less than 1/2-statute mile, runway centerline to taxiway/taxilane centerline separation increases to 400 feet.

Table 4.4 - Future PAL 3 Runway Design Standards

Item	C-II			
	Visual	Not lower than 1 mi	Not lower than ¾ mi (*PAL 3*)	Lower than ¾ mi
Runway Design				
Runway Width	100'	100'	100'	100'
Shoulder Width	10'	10'	10'	10'
Blast Pad Width	120'	120'	120'	120'
Blast Pad Length	150'	150'	150'	150'
Crosswind Component	16 kts	16 kts	16 kts	16 kts
Runway Protection				
Runway Safety Area (RSA)				
Length Beyond Departure End[1,2]	1,000'	1,000'	1,000'	1,000'
Length Prior to Threshold[3]	600'	600'	600'	600'
Width	500'	500'	500'	500'
Runway Object Free Area (ROFA)				
Length Beyond Departure End	1,000'	1,000'	1,000'	1,000'
Length Prior to Threshold[3]	600'	600'	600'	600'
Width	800'	800'	800'	800'
Approach Runway Protection Zone (RPZ)				
Length	1,700'	1,700'	1,700'	2,500'
Inner Width	500'	500'	1,000'	1,000'
Outer Width	1,010'	1,010'	1,510'	1,750'
Departure Runway Protection Zone (RPZ)				
Length	1,700'	1,700'	1,000'	1,000'
Inner Width	500'	500'	500'	500'
Outer Width	1,010'	1,010'	700'	700'
Runway Separation (Runway Centerline to)				
Holding Position	250'	250'	250'	250'
Parallel Taxiway/Taxilane Centerline[4]	300'	300'	300'	400'

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

Notes: [1]: The RSA length beyond the runway end begins at the runway end when a stopway is not present. When a stopway is present, the length begins at the stopway end.
[2]: The RSA length beyond the runway end may be reduced to that required to install an EMAS (the designed set-back of the EMAS included).
[3]: This value only applies if that runway end is equipped with electronic or visual vertical guidance. ILS, GLS, LPV, LNAV/VNAV, and RNP lines of minima provide electronic vertical guidance. A PAPI or VASI provides visual vertical guidance. If there is no such guidance for that runway, use the value for "length beyond departure end.
[4]: The runway to taxiway/taxilane centerline separation standards are for airports at sea level. For airports at higher elevations, an increase to these separation distances may be required to keep taxiing and holding aircraft clear of the inner-transitional OFZ. This standard cannot be used to justify a decrease in runway to taxiway/taxilane sep.

4.2.2.2 Taxiway Design Standards

Table 4.5 presents applicable taxiway design standards for the existing grouping of ADG II and TDG 1A aircraft as well as the future grouping of ADG II and TDG 2A aircraft. Future taxiways should be designed using TDG 2A.

Table 4.5 - Existing & Future Taxiway Design Standards

Item	ADG II - TDG 1A (*Existing*)	ADG II - TDG 2A (*Future, all PALs*)
Taxiway & Taxilane Protection		
Taxiway Safety Area (TSA) Width	79’	79’
Taxiway Object Free Area (TOFA) Width	124’	124’
Taxilane Object Free Area ($T_{/L}$OFA) Width	110’	110’
Taxiway & Taxilane Separation		
Taxiway Centerline to:		
Parallel Taxiway/Taxilane Centerline	101.5’	101.5’
Fixed or Moveable Object	62’	62’
Taxilane Centerline to:		
Parallel Taxilane Centerline	94.5’	94.5’
Fixed or Moveable Object	55’	55’
Taxiway & Taxilane Design		
Width (Straight)	25’	35’
Taxiway Edge Safety Margin (TESM)	5’	7.5’
Taxiway Shoulder Width	10’	15’

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

4.3 Long-Range Airport Development Plan

It is not unusual for a master plan to give some attention to development that is not expected to occur within the 20-year planning period. Some infrastructure projects need to be planned over 20 years in advance because of their potential footprint and impacts over the development of some other facilities that may, in contrast, occur within the next 20 years. Typically, those facilities are labelled as *Ultimate* as opposed to *Future* and are depicted on the ALP drawing set using distinct features. As mentioned in the introduction to this section, this AMP uses this distinction in the report and in the ALP drawing set as well. While ultimate development is expected to occur beyond the 20-year planning horizon, ultimate facilities are usually sized for a similar type of airport user and a similar size of critical aircraft as future facilities. Ultimate development usually consists of extensions to existing runways (without a change of RDC), a new parallel runway when the demand is slated to reach the annual service volume, or additional hangars for similar aircraft sizes. In some instances, ultimate development can incorporate an up-gauge for the critical aircraft, but the user class generally remains the same. For example, an airport serving general aviation aircraft, including small and medium business aircraft, may be expecting larger business aviation aircraft beyond the 20-year planning horizon.

The LRADP; however, goes one step further and uses long-range demand scenarios that incorporate the growth of commercial aviation, all cargo carriers, and long-range business aviation at BXK. The objective of the LRADP is to establish a long-range vision for the Airport well beyond the 20-year planning period of AMP. It is being completed in parallel to the AMP effort. From the onset, the focus of the LRADP was to determine the preferred runway layout for large aircraft. The plan investigated long-range development options and considered a variety of factors including nearby airport airspace, nearby instrument approach procedures, land use, noise impacts, wind coverage, surrounding terrain, and development costs. The LRADP included a detailed analysis of surrounding airspace and found that a different alignment to the exiting Runway 17-35 would ultimately be preferable for the operations of large aircraft. In particular, approach and departure procedures for large aircraft operating under IFR are heavily influenced by the airspace and approach/departure control of the nearby Luke Air Force Base (AFB). The LRADP found that a northwest/southeast runway orientation such as Runway 10-28 would be preferable for a primary runway serving large C/D-III and C/D-IV aircraft at BXK. The existing Runway 17-35 would be retained as a crosswind for B-II and smaller aircraft to ensure that those smaller aircraft retain 95 percent wind coverage across the airfield. The LRADP is included in **Appendix I, *Long-Range Airport Development Plan*** and consists of a standalone report and drawing set depicting long-range development, long-range airspace, as well as long range lang use and long-range airport property.

Both ultimate facilities of this AMP and long-range facilities of the LRADP designate development that is slated to occur beyond the 20-year planning period of this AMP. Because it is paramount that stakeholders for BXK are able to understand the progression and rationale of each plan (AMP and LRADP) and understand, visualize which facilities are tied to which plan, a different nomenclature and a separate ALP drawing sheet were used to avoid any confusion:

- *Future* facilities are tied to analyses in this AMP and are depicted on **Sheet 4 of XX, *Future Airport Layout Drawing*** of the ALP drawing set. Those facilities are justified by the FAA-approved forecast contained in this AMP.
- *Ultimate* facilities are also tied to analyses in this AMP and are depicted on **Sheet 5 of XX, *Ultimate Airport Layout Drawing*** of the ALP drawing set. Those facilities are not, however, justified by the forecast.
- *Long-Range* facilities are tied to analyses in the LRADP and are depicted on **Sheet 6 of XX, *Long-Range Airport Development Plan*** of the ALP drawing set. Those facilities are not tied to the forecast contained in this AMP but are tied to the demand scenarios of the LRADP.

As documented in the LRADP, the long-range family of critical design aircraft at BXK is anticipated to fall within an ADG - AAC aircraft grouping of D-IV and a TDG of 5. A typical aircraft in that grouping is the Boeing 767-300ERF. Accordingly, the long-range RDC for the primary runway at BXK is anticipated to be D-IV-4000. **The long-range critical aircraft was solely used to size and plan long-range facilities in the LRADP and was not used to size any of the future and ultimate facilities in the AMP**.

4.4 Airfield Facilities Requirements

4.4.1 Wind Coverage

According to FAA AC 150/5300-13B, *Airport Design* the FAA mandates that primary runways provide over 95 percent in all weather conditions. This applies to the critical aircraft family grouping as well as smaller aircraft categories. For example, if a primary runway has an RDC of B-II-VIS, then it must provide over 95 percent wind coverage to both A/B-I and A/B-II aircraft. Those two aircraft groupings have a maximum allowable crosswind component of 10.5 kts and 13 kts, respectively. The smaller the aircraft, the more sensitive to crosswinds, and the smaller maximum allowable crosswind component. Consequently, primary runways at airports are always deficient for small aircraft first. Similarly, if a primary runway has an RDC of C-II-VIS, then it must provide over 95 percent wind coverage to A/B-I, A/B-II, C-I, and C-II aircraft, and so on.

If a primary runway does not provide the required coverage, a crosswind runway is recommended. As documented in **Section 2.1.7.2, *Wind Coverage*** Runway 17-35 provides 94.87 percent wind coverage for A/B-I aircraft (10.5 knots) in all weather conditions over a 24-hour period (standard FAA analysis) and provides 92.52 percent wind coverage for A/B-I aircraft (10.5 knots) in all weather conditions during the day (refer to **Table 2.4** on page 2-8 for the definition of variable daylight hours). The wind coverage for A/B-I aircraft is insufficient over 24 hours and drops further during the daytime. Furthermore, the wind coverage of Runway 17-35 is marginal for A/B-II aircraft (13 knots) during the day at only 95.67 percent.

As demonstrated, wind coverage for the existing primary runway does not meet the recommended 95 percent threshold for the 10.5-knot crosswind category and is marginal for the 13-knot crosswind category during the day. This master plan report recommends that a crosswind runway be added at the Airport. A future crosswind runway should at a minimum have a RDC of B-I-VIS, as well as a length and a pavement strength that ensures it can accommodate the representative mix of A/B-I aircraft. Potential runway orientations were evaluated in the appended LRADP with regards to wind coverage, surrounding terrain, and airspace constraints, among other factors. The preferred orientation for a crosswind runway was found to be Runway 10-28, with a true north alignment of S 70° E, or true heading 110°. See **Section 4.3, *Long-Range Airport Development Plan*** for further information about the long-range vision for the Airport and the evaluation of a preferred primary runway alignment. The combined wind coverage of Runway 17-35 and Runway 10-28 would be 99.12 percent for A/B-I aircraft (10.5 knots) in all weather conditions over a 24-hour period and 98.81 percent during the day (refer to **Table 2.4** on page 2-8 for the definition of variable daylight hours).

A future crosswind runway with a RDC of B-II-VIS, and a length and pavement strength that can also accommodate a representative mix of A/B-II aircraft will be further investigated during the development and evaluation of alternatives in order to determine the optimal runway configuration for the long term. Several arguments can be made for a crosswind runway design that matches the existing Runway 17-35 RDC of B-II-VIS (or future Runway 17-35 RDC of B-II-5000; no difference in runway design between the two RDCs):

- Runway 17-35 wind coverage for A/B-II aircraft (13 knots) is marginally above 95 percent during the daytime, and high crosswinds have been reported by pilots as a safety issue,
- The wind coverage offered by a future Runway 10-28 (single runway wind coverage, not composite) will be greater than that of existing Runway 17-35 and will in fact be greater than 95 percent for A/B-I aircraft during the day (See **Figure 2.8** on page 2-13), likely making it the runway of choice by all pilots, and
- The long-range vision for the Airport in the LRADP has Runway 10-28 being the primary runway. The vision is supported by analyses and coordination with Luke AFB and the FAA on future approach and departure airspace for larger aircraft.

Long-term PAL 3 improvements to RDC C-II-4000 should be implemented to the designated primary runway at the time. The long-range vision of the LRADP aligns with a re-designation of the "crosswind" Runway 10-28 as the primary runway when improvements to RDC C-II-4000 become justified.

4.4.2 Airfield Capacity

According to guidance contained in FAA AC150/5060-5, *Airport Capacity and Delay* airfield capacity calculations are based on existing and future airfield layout and aviation demand. There are two primary measures of capacity: the hourly capacity of the runway system, which is the maximum number of aircraft operations that can occur on the runway(s) in one hour, and the Annual Service Volume (ASV), which is an estimate of an airport's annual practical capacity and accounts for variations in runway use, aircraft mix, weather conditions, etc. As activity levels reach the ASV (calculated as a percentage), delays start to occur. According to Order 5090-5, *Formulation of the NPIAS and ACIP* planning for those improvements that increase hourly (and thus annual) capacity should start when activity levels reach 60 percent of the ASV. Planning for capacity improvements usually begins with an update to an airport's master plan and/or ALP to discuss and depict additional runway capacity, usually in the form of a runway extension, a new runway, or even additional exit taxiways that reduce Runway Occupancy Time (ROT). The guidance is conservative and also allows adequate lead time for environmental reviews, land purchases, and other necessary actions that can take up to 10 or more years to complete. Order 5090-5 also specifies that development (design and construction) for those improvements that increase hourly capacity should start when activity levels reach 80 percent of the ASV and are forecast to reach 100 percent of ASV within five years.

Per FAA AC 150/5060-5, aircraft are categorized for air traffic and separation purposes as indicated in **Table 4.6**. The mix index formula is expressed as C+3D where C is the percentage of Class C aircraft and D is the percentage of Class D aircraft, where C and D are the aircraft mix classifications.

Table 4.6 - Aircraft Mix Classification

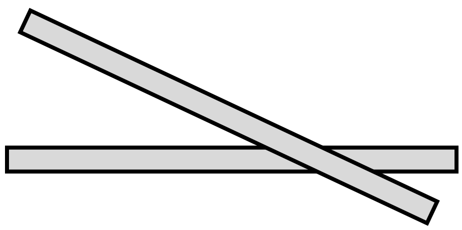
Aircraft Class	Max. Cert. Takeoff Weight (lbs)	Number of Engines	Wake Turbulence Classification
A	12,500 or less	Single	Small (S)
B	12,500 or less	Multi	Small (S)
C	12,500 - 300,000	Multi	Large (L)
D	Over 300,000	Multi	Heavy (H)

Source: FAA AC 150/5060-5, *Airport Capacity and Delay*
Note: Aircraft Classification as defined in this table is different than the Aircraft Approach Category (AAC)

Using the FAA Aircraft Characteristics Database, planners are able to estimate an aircraft's mix classification function of its AAC and ADG. Using the FAA-approved forecast and **Table 3.5** on page 3-42, the mix index was estimated to be between 0 and 20 at BXK. The mix index is anticipated to remain in that range throughout the planning period. The methodology and rationale presented in Chapter 2 of FAA AC 150/5060-5 was used to calculate the ASV for BXK. **Table 4.7** presents hourly capacity and ASV estimates for single runways as well as airfields with two intersecting runways.

According to **Table 4.7**, existing hourly capacity for BXK is 98 hourly operations in VFR and 59 hourly operations in IFR, and the estimated ASV is 230,000 annual operations. Airfield capacity remains identical if a crosswind runway is added within the planning period. **Table 4.8** shows the comparison of aviation demand versus airfield capacity and the evolution of annual activity as a percent of ASV through the planning period.

Table 4.7 - Hourly Capacity and Annual Service Volume

Runway Use Configuration	Mix Index % (C+3D)	Hourly Capacity Ops/Hr		Annual Service Volume Ops/Yr
		VFR	IFR	
	0 to 20	98	59	230,000
Single Runway	21 to 50	74	57	195,000
	51 to 80	63	56	205,000
	81 to 120	55	53	210,000
	121 to 130	51	50	240,000
Two Intersecting Runways	0 to 20	98	59	230,000
	21 to 50	77	57	200,000
	51 to 80	77	56	215,000
	81 to 120	76	59	225,000
	121 to 130	72	60	265,000

Source: FAA, AC 150/5060-5, *Airport Capacity and Delay*

Table 4.8 - Forecast Activity Levels vs Capacity Metrics

	Base Year	PAL 1	PAL 2	PAL 3
Hourly Demand	50	73	81	93
Hourly VFR Capacity	98			
Hourly IFR Capacity	59			
Annual Aircraft Operations	95,222	140,000	155,000	178,942
Annual Service Volume	230,000			
Percent of ASV	41%	61%	67%	78%

Source: FAA, AC 150/5060-5, *Airport Capacity and Delay*. Dibble, May 2024 analysis

As shown on **Table 4.8**, aviation demand is projected to reach 60 percent by PAL 1. Increased annual runway capacity will be further investigated during the development and evaluation of alternatives in order to determine the optimal runway configuration for the long term. Because flight training makes up the majority of aviation demand at BXK and training typically does not occur during IMC, hourly IFR capacity at BXK is considered adequate.

4.4.3 Runway Design

4.4.3.1 Runway Identification

Runway end identification numbers are based on magnetic north. To calculate a runway's magnetic bearing, the magnetic declination (angle between magnetic north and true north) at the runway's location is deducted from its true bearing, then rounded to the nearest multiple of ten degrees. The final zero is then omitted to obtain a runway designation number. By convention, magnetic declination is positive when magnetic north is east (right) of true north, and negative when it is to the west (left) of true north. The result is a number between 1 and 36 for each runway end, with the bearings being 180° apart. As the earth's magnetic field varies over time and the magnetic declination changes, it is possible that re-designation of a runway is required. **Table 4.9** presents calculation for Runway 17 and Runway 35 designations.

Table 4.9 - Runway Designation

Runway	Runway 17	Runway 35
True Bearing[1]	181° 55' 23.82"	01° 55' 23.82"
Current Magnetic Declination (April 2024)[2]	9° 55' East (± 21')	
Magnetic Declination Change Rate (April 2024)[2]	6' West / Year	
Existing Magnetic Bearing (2024)	172° 0' 23.82"	352° 0' 23.82"
Future Magnetic Bearing (2043)	173° 54' 23.82"	353° 54' 23.82"
Existing Runway Designation (2024)	17	35
Future Runway Designation (2043)	17	35

Sources [1]: Runway End Point Coordinates Surveyed, NV5, May 2022.
[2]: NOAA NCEI, *Magnetic Field Calculator*, World Magnetic Model (WMM) (April 2024)

Based on the calculations presented in **Table 4.9**, it is anticipated that the current runway designation will remain adequate throughout the planning period.

4.4.3.2 Runway Length

A complete runway length analysis is contained in **Appendix J, *Runway Length Analysis***. **Table 4.10** summarizes and presents the results of the runway length analysis. The first analysis was performed using the FAA guidance contained in AC 150/5325-4B, *Runway Length Requirements for Airport Design*. A secondary analysis was performed using the Small Aircraft Runway Length Analysis Tool (SARLAT) program in an attempt to validate some of the results obtained through the use of the FAA AC. According to recent FAA guidance, the SARLAT program is now the official tool to use for runway length analyses involving small aircraft. Runway length requirements for a small aircraft fleet at maximum takeoff weight were calculated for dry and wet conditions. A third analysis was performed for two typical medium size business jet aircraft, also for both dry and wet conditions using their respective Part 25 certified Airplane Flight Manual (AFM). All results are presented in **Table 4.10**.

According to the Aircraft Characteristics Database published in September 2023, aircraft types are distributed as follows:

- Aircraft having MTOWs 12,500 pounds or less:
  - A/B-I: 84 percent
  - A/B-II: 13 percent
  - Larger: 3 percent
- Aircraft having MTOWs greater than 12,500 pounds but less than 60,000 pounds:
  - A/B-I: 5 percent
  - A/B-II: 31 percent
  - A/B-III: 20 percent
  - C-I: 13 percent
  - C-II: 26 percent
  - Larger: 5 percent.

Consequently, the following groupings of aircraft can be expected to operate at BXK in the future and are considered the critical aircraft grouping for runway length:

- 97 percent (rounded to 100 percent) of aircraft having MTOWs 12,500 pounds or less, and
- 75 percent of aircraft having MTOWs greater than 12,500 pounds but less than 60,000 pounds. It should be noted that no A/B-III and C-III or larger aircraft are included in Table 3.2 of Chapter 3, *Remaining 25 percent of Airplanes that make up 100 Percent of the Fleet*, of FAA AC AC 150/5325-4B. Those are all B-II and C-II aircraft expected to operate at the airport in the future as designated by the critical aircraft groupings. Attention will be given to both 75 percent and 100 percent of the fleet.

Table 4.10 - Runway Length Analysis Summary

Methodology	Aircraft Group / Runway Conditions	Field Length[1] (ft)
FAA AC 150/5325-4B	12,500 lbs or less - V_{ref} >=50 kts - <10 Seats - 100% of Fleet & Load	4,600
	12,500 lbs or less - V_{ref} >=50 kts - >=10 Seats - 100% of Fleet & Load	4,800
	>12,500 lbs but <= 60,000 lbs - 75% Fleet - 60% Load	5,600[2]
	>12,500 lbs but <= 60,000 lbs - 75% Fleet - 90% Load	8,800[2]
	>12,500 lbs but <= 60,000 lbs - 100% Fleet - 60% Load	7,500[2]
	>12,500 lbs but <= 60,000 lbs - 100% Fleet - 90% Load	11,400[2,3]
SARLAT	Runway Length Required for A-II, Dry Conditions	5,000[4]
	Runway Length Required for A-II, Wet Conditions	5,800[4]
	Runway Length Required for B-II, Dry Conditions	6,700[5]
	Runway Length Required for B-II, Wet Conditions	7,700[5]
AFMs	Cessna Citation X - C-II, MTOW 36,000 lbs - 60% Load	6,100[2]
	Cessna Citation X - C-II, MTOW 36,000 lbs - 90% Load	8,100[2]
	Bombardier Challenger 604 - C-II, MTOW 48,200 lbs - 60% Load	6,200[2,6]
	Bombardier Challenger 604 - C-II, MTOW 48,200 lbs - 90% Load	7,900[2,6]
ADOT	2018 SASP GA-Community Objective[7]	5,550

Source: Dibble, May 2024 analysis
Notes: [1]: All figures rounded to the next multiple of a hundred.
[2]: Adjusted for Effective Runway Gradient at BXK (+380 feet, Runway High Pt - Runway Low Pt = 38.0 feet).
[3]: Climb limitations exist.
[4]: Dictated by the Cessna 421 Golden Eagle.
[5]: Dictated by the Beechcraft Super King Air 350i.
[6]: Aircraft Serial Numbers SN 173 and above.
[7]: Objective for GA-Community airports is to accommodate 75% of Large Aircraft at 60% Useful Load.

The current length of Runway 17-35 is 5,500 feet. Information gathered in **Appendix J** and **Table 4.10** suggest the following minimum recommended runway length for the primary runway at BXK:

- for the existing critical aircraft grouping of **A-II**, the current Runway 17-35 length of **5,500 feet** is sufficient to accommodate all aircraft under 12,500 pounds at 100 percent load as well as 75 percent of the grouping of aircraft having MTOWs greater than 12,500 pounds but less than 60,000 pounds at 60 percent load, as well as representative aircraft for the A-II grouping (Cessna 208B Grand Caravan , Pilatus PC-12, Cessna 421 Golden Eagle) per the SARLAT. A small deficiency exists when the runway pavement is wet. **Figure I.5** in **Appendix J** lists load restrictions for a variety of aircraft for the existing length of Runway 17-35.

- for the future critical aircraft grouping of **B-II**, a primary runway length of **7,700 feet** is recommended by **PAL 1**. This length accommodates 100 percent of the grouping of aircraft having MTOWs greater than 12,500 pounds but less than 60,000 pounds at 60 percent load and the representative aircraft for the B-II grouping (Beechcraft Super King Air 350i, Cessna CitationJet CJ3) per the SARLAT.
- for the future critical aircraft grouping of **C-II**, a primary runway length of **8,800 feet** is recommended by **PAL 3**. This length accommodates 75 percent of the grouping of aircraft having MTOWs greater than 12,500 pounds but less than 60,000 pounds at 90 percent load, 100 percent of the of the aircraft having MTOWs greater than 12,500 pounds but less than 60,000 pounds at 60 percent load, and the representative aircraft for the C-II grouping (Cessna Citation X, Bombardier Challenger 604) at 90 percent load per the AFMs.

The primary runway lengths presented herein pertain to those groupings of aircraft that have been identified as the existing and future critical design aircraft for runway length. Additional primary runway length objectives, such as a runway length that meets the minimum length for diversion of those military aircraft based at Luke AFB, and other runway lengths, will be discussed during the development of airfield alternatives. Per FAA Order 5100.38D, *Airport Improvement Program Handbook* sponsors may not use operations by military aircraft (or other federally owned aircraft) to justify the use of AIP funds for capital improvement projects; however, other sources of funding exist thought Department of Defense (DoD) programs and may be available to the Airport if desired.

Per FAA AC 150/5325-4B, runway length for crosswind runways should be 100 percent of the recommended runway length for the lower crosswind capable aircraft using the primary runway. Consequently, the length of a crosswind runway at BXK should be as follows:

- 4,800 feet if designed for A/B-I aircraft only (10.5 kts maximum allowable crosswind component), or
- 7,700 feet if designed for A/B-II aircraft (13 kts maximum allowable crosswind component).

Runway length and RDC objectives for a future crosswind runway will be further discussed during the development and evaluation of alternatives.

4.4.3.3 Runway Width

The current width of Runway 17-35 is 75 feet, which satisfies the current runway width requirement for RDC B-II-VIS as well as the future PAL 1 runway width requirement for RDC B-II-5000. A primary runway width of 100 feet is required to meet the runway width requirements for the future PAL 3 RDC of C-II-4000.

The runway width requirement for a crosswind runway having an RDC of B-I-VIS is 60 feet, and 75 feet for a crosswind runway having an RDC of B-II-VIS.

4.4.3.4 Runway Shoulders and Blast Pads

FAA AC 150/5300-13B, *Airport Design* requires the presence of turf shoulders (or aggregate-turf, soil cement, lime or bituminous stabilized soil) for runways serving ADG II aircraft. Runway 17-35 currently has no specially prepared shoulders. It is recommended that 10-foot shoulders be added to satisfy the requirements of RDC B-II-5000 and RDC C-II-4000. Those shoulders should at a minimum use a specially prepared stabilized surface such as turf.

FAA AC150/5300-13B, *Airport Design,* requires the presence of turf blast pads (or aggregate-turf, soil cement, lime or bituminous stabilized soil) for runways serving ADG II aircraft. Runway 17-35 currently has paved blast pads 150 feet long by 95 feet wide on bother runway ends. This exceeds FAA standards and recommended practices; however, it is recommended that the Airport retains those paved blast pads. The installation of turf blast pads (or aggregate-turf, soil cement, lime or bituminous stabilized soil) 150 feet long by 120 feet wide is recommended on the primary runway by PAL 3. Installing paved blast pads would exceed FAA recommended practices for ADG II runways.

4.4.3.5 Runway Markings

Runway 17-35 has standard visual (basic) marking schemes on both ends, consisting of runway designator markings, 12-inch-wide runway centerline markings, 18-inch-wide runway edge markings, as well as runway threshold bar markings that delineate the runway from the blast pads. Additionally, Runway 17-35 has aiming point markings on both ends. Aiming point markings are not required for visual runways. In order to comply with future PAL 1 requirements for RDC B-II-5000 and the marking requirements of a Non-Precision Instrument (NPI) runway, threshold marking schemes will need to be added on both runway ends, and centerline markings will need to be widened to 18 inches. The blast pads are marked with standard yellow chevrons. Those markings schemes associated with NPI runways should remain adequate throughout the planning period for the primary runway.

4.4.3.6 Runway Surface Gradients

The longitudinal gradient standards for the centerline of RDC B-II-VIS and RDC B-II-5000 runways, and transverse gradients, are the same for both RDCs and are as follows:

- Longitudinal grades and grade changes should be kept to a minimum.
- Longitudinal grades should remain between ±2.0 percent.
- Longitudinal grade changes should remain between ±2.0 percent.
- Vertical curves for longitudinal grade changes should be parabolic. The required length of vertical curve is a minimum of 300 feet for each 1.0 percent of change.
- The minimum allowable distance between the points of intersection of vertical curves is 250 feet multiplied by the sum of the grade changes (in percent) associated with the two vertical curves.
- Transverse grades should follow a center crown distribution with equal, constant transverse grades on either side that remain between -1.0 and -2.0 percent (negative slopes).
- Transverse grades for any specially prepared stabilized surface shoulders remain between -1.5 and -5.0 percent (negative slopes).

Runway 17-35 satisfies the surface gradient requirements of the existing and future PAL 1 and PAL 2 RDC. Any runway extension should follow those same surface gradient requirements as long as the RDC remains the same.

The longitudinal gradient standards for the centerline of a RDC C-II-4000 runway, and transverse gradients, are as follows:

- Longitudinal grades and grade changes should be kept to a minimum.
- Longitudinal grades should remain between ±1.5 percent, except in the first and last quarter or the first and last 2,500 feet of runway pavement, whichever is less, where they are limited to ±0.8 percent.
- Longitudinal grade changes should remain between ±1.5 percent, except in the first and last quarter or the first and last 2,500 feet of runway pavement, whichever is less, where grade changes are not acceptable.

- Vertical curves for longitudinal grade changes should be parabolic. The required length of vertical curve is a minimum of 1,000 feet for each 1.0 percent of change.
- The minimum allowable distance between the points of intersection of vertical curves is 1,000 feet multiplied by the sum of the grade changes (in percent) associated with the two vertical curves.
- Transverse grades should follow a center crown distribution with equal, constant transverse grades on either side that remain between -1.0 and -1.5 percent (negative slopes).
- Transverse grades for any specially prepared stabilized surface shoulders remain between -1.5 and -5.0 percent (negative slopes).

By PAL 3, the primary runway should conform to RDC C-II-4000 surface gradients standards if the RDC changes.

4.4.3.7 Runway Line of Sight

FAA AC150/5300-13B, *Airport Design,* requires runways with full parallel taxiways to meet the following Line of Sight (LoS) requirements along their individual centerlines: any point 5 feet above the runway centerline must be mutually visible with any other point 5 feet above the runway centerline that is located at a distance that is less than one half the length of the runway. Runway 17-35 satisfies this LoS requirement (See **Sheet 10 of XX**, ***Runway 17-35 Centerline Profile***, of the ALP drawing set).

In addition, intersecting runways have supplemental line of sight requirements between each runway pair. The Runway Visibility Zone (RVZ) is a trapezoidal area established around the intersection of two runways that precludes objects not fixed-by-function (e.g., buildings, structures, and parked aircraft) from residing within the RVZ and from blocking the pilot's view to the intersecting runway. In effect, any point 5 feet above the runway centerline and in the RVZ must be mutually visible with any other point 5 feet above the centerline of the crossing runway and inside the RVZ. The RVZ effectively provides a visual field of view enhancing pilot situational awareness to avoid conflict with aircraft operating on an intersecting runway. There currently are no intersecting runways at BXK; however, a crosswind runway is planned within the planning period. The RVZ criteria will apply whether runways are intersecting or converging but non-intersecting.

4.4.3.8 Runway Safety Areas

In order to protect aircraft during runway excursion events, the FAA requires that a Runway Safety Area (RSA) surround the landing surface of a runway. An RSA enhances the safety of aircraft which undershoot, overrun, or veer off the runway, and provides greater accessibility for firefighting and rescue equipment during incidents. The RSA must be cleared and graded smoothly with no surface variations (humps, ruts, or depressions), drained, capable (under dry conditions) of supporting snow removal equipment, ARFF equipment, and the occasional passage of aircraft without causing structural damage and should be free of objects (except for frangible objects that need to be located in the RSA because of their function). Dimensional and grading standards for existing and future RDC at BXK are as follows:

- RDC B-II-VIS and B-II-5000: 300 feet beyond departure end, 300 feet prior to threshold, and 150 feet in width.
- RDC C-II-4000: 1,000 feet beyond departure end, 600 feet prior to threshold, and 500 feet in width.
- Objects within the RSA with a height greater than 3 inches should be frangible.
- Longitudinal grades for that part of the RSA between the runway ends are the same as the comparable standards for the runway surface.

- Longitudinal grades should be kept between 0.0 and -3.0 percent for the first 200 feet of the RSA beyond the runway ends, with any slope being downward from the ends.
- Maximum allowable positive longitudinal grade should be such that it does not penetrate any applicable approach surface or clearway plane for the remainder of the RSA. The maximum allowable negative longitudinal grade is 5.0 percent and longitudinal grade changes should be a maximum of +/- 2.0 percent per 100 feet.
- Transverse grades should be kept to a minimum but consistent with the drainage requirements.
- RDC B-II-VIS and B-II-5000: Transverse grades should be kept between -1.5 and -5.0 percent for that portion of the RSA that is not paved on each side of the runway and up to 200 feet beyond the runway end (negative slopes).
- RDC C-II-4000: Transverse grades should be kept between -1.5 and -3.0 percent for that portion of the RSA that is not paved on each side of the runway and up to 200 feet beyond the runway end (negative slopes).
- Transverse grades beginning 200 feet beyond the runway end can be between ±5.00 percent with surface smoothness required.
- Construction should include a 1.5-inch drop between paved and unpaved surfaces and maintain a -3.0 to -5.0 percent grade for 10 feet of unpaved surface adjacent to the paved surface.

At BXK, actual field conditions comply with the RSA surface grading requirements of the existing and future PAL 1 and PAL 2 RDC. Any runway extension should follow those same surface gradient requirements as long as the RDC remains the same. By PAL 3, the primary runway should conform to RSA surface grading requirements for RDC C-II-4000 runways if the RDC changes.

4.4.3.9 Runway Object Free Areas

The FAA also requires that a Runway Object Free Area (ROFA) surround the paved surface and be clear of above-ground objects protruding above the nearest point of the RSA. The ROFA is a clear area that provides wingtip protection during runway excursion events. Some fixed-by-function objects may be located in the ROFA. To the extent practicable, those objects located in the ROFA should meet the same frangibility requirements of those located in the RSA. Dimensional and grading standards for existing and future RDC at BXK are as follows:

- RDC B-II-VIS and B-II-5000: 300 feet beyond departure end, 300 feet prior to threshold, and 500 feet in width.
- RDC C-II-4000: 1,000 feet beyond departure end, 600 feet prior to threshold, and 800 feet in width.
- Objects within the ROFA that exceed the elevation of the nearest point on the RSA should be frangible to a practical extent.
- Transverse grades from the edge of the RSA into the ROFA should be zero or negative (unlimited) to drain water away from the RSA. If not practical, a maximum allowable positive slope of 8:1 must be maintained for 40 feet from the edge of RSA, then apply a 4:1 positive slope to the edge of the ROFA.

At BXK, actual field conditions comply with the ROFA surface grading and object clearing requirements of the existing and future PAL 1 and PAL 2 RDC. Any runway extension should follow those same surface gradient requirements as long as the RDC remains the same. By PAL 3, the primary runway should conform to ROFA surface grading requirements for RDC C-II-4000 runways if the RDC changes.

4.4.3.10 Runway Obstacle Free Zones

The Obstacle Free Zone (OFZ) is a volume of airspace, centered on the runway, which is intended to protect aircraft operating on the runway by precluding aircraft and other object penetrations, except for frangible NAVAIDs that need to be located in the OFZ because of their function. Its shape is dependent on the approach minimums for a specific runway end and the aircraft on approach, and thus, the OFZ for a particular operation may not be the same shape as that used for design purposes.

Several surface sub-components can make up an OFZ for a runway. At BXK, existing and future planned visibility minimums only warrant the Runway Obstacle Free Zone (ROFZ) sub-component to be active at any time. No visibility minimums reductions are planned that would trigger the activation of the Inner-approach OFZ (IA-OFZ), the Inner-transitional OFZ (IT-OFZ), and/or the Precision Obstacle Free Zone (POFZ).

- *Runway Obstacle Free Zone (ROFZ)*: The ROFZ dimensions for either the existing or future RDC is a 400-foot-wide surface, centered on the runway centerline, and extending 200 feet beyond each runway end. The ROFZ is the airspace above said surface, which has an elevation at any point that is the same as the elevation of the nearest point on the runway centerline.

Runway 17-35 meets the ROFZ requirements listed above.

4.4.3.11 Runway Protection Zones

The Runway Protection Zone (RPZ) is a two-dimensional area that is designed to enhance the protection of people and property surrounding an airport. According to the FAA, this is best achieved through fee simple control by the airport sponsor over the land encompassed by RPZs. Some land uses are deemed incompatible and cannot be located inside an RPZ.

Runway 17-35's RPZs satisfy the existing length, width, and land use requirement of the existing and future PAL 1 RDC. Land use inside the existing approach and departure RPZs is clear, open land or existing agricultural uses outside of the airport fence. The Airport sponsor possesses fee simple ownership over the full Runway 17 RPZ; however, only 26 percent (3.57 acres) of the Runway 35 RPZ is under fee simple control. Additionally, the City owns an avigation over 51 percent of the Runway 35 RPZ that is not under fee simple control. In total, 77 percent of the Runway 35 RPZ are under some form of City control. In order to prevent the introduction of any incompatible land use, this study recommends a continued effort to purchase the remainder of the Runway 35 RPZ in fee simple. At a minimum, the City should seek an avigation easement over the remaining uncontrolled portions. Additionally, this study recommends the fee simple purchase of any RPZ associated with PAL 3 RDC requirements, or for new or extended runway projects.

4.4.4 Taxiway Design

4.4.4.1 Taxiway Layout

Taxiways offer access from the runway to terminal areas, aprons, and hangar areas, and vice-versa. In order to ensure a safe and efficient design of taxiways, the FAA has developed design methods, presented in FAA AC 150/5300-13B, *Airport Design*, that include the following:

- Taxi Method - taxiways are designed for "cockpit over centerline" taxiing with a pavement buffer to allow for wander, as well as aircraft asymptotic realignment in curves and intersections. Curve and fillet radii and fillet lead-in length were designed in order to ensure a Taxiway Edge Safety Margin (TESM).

- Curve Design - design should be such that the nose gear steering angle is no more than 50 degrees. Design turns less than 90 degrees in a way that allows pilots to maintain an efficient taxi speed. Design turns to be 90 degrees wherever possible; when not possible, intersections should use standard angles of 30, 45, 60, 120, 135, and 150 degrees.
- Three-Path Concept - avoids complex intersections by limiting the number of choices at an intersection: left, right, and forward.
- Channelized Taxiing - abide by standard taxiway widths and fillet design and avoid large expanses of pavements. Taxiway widths wider than the standard result in signs being located further from the centerline and from the pilot's eye.
- Runway Access from Apron - avoid connecting an apron directly with a runway as this layout can lead to loss of situational awareness and a runway incursion. Design these taxiways to make at least one right-angle (or near right-angle) turn prior to reaching a runway hold line.

The current taxiway system at BXK is adequate and follows all FAA design methods. The runway is served by a full-length parallel taxiway and most taxiway connectors intersect the runway at a 90-degree angle. Two angled runway exit-only taxiways intersect the runway at 45-degree angles. They are not true High-Speed Exits (HSE) that follow FAA design standards for HSE. Most taxiway fillets do not follow current FAA design standards because they were built before TDG standards were introduced. No direct apron-to-runway access exists.

There are currently no capacity issues within the taxiway system and there are no hot spots identified by the FAA.

4.4.4.2 Taxiway Designation

The current taxiway designation at BXK does not follow FAA standards and recommendations set forth in FAA AC 150/5340-18G, *Standards for Airport Sign Systems* as well as FAA Engineering Brief (EB) No. 89A, *Taxiway Nomenclature Convention*. Current FAA guidance recommends the use of single-letter designations for primary taxi routes as well as the use of alphanumerical designations for those stub taxiways connecting a parallel taxiway to a runway. The master plan recommends a re-designation of taxiways at BXK. Taxiway H should be to be renamed Taxiway A, Taxiway J should be renamed Taxiway B, and connector taxiways should be renamed using alphanumerical characters A1, A2, A3, etc. from south to north. Some other taxiways may retain their single-letter designations. A tentative taxiway designation plan will be proposed during the evaluation of alternatives.

4.4.4.3 Runway-to-Parallel-Taxiway Separation

Runway-to-taxiway separation standards are predicated on the RDC and the existing/future visibility minimums expected. The higher the RDC and the lower the visibility minimums, the greater the runway to taxiway separation distances. Please refer to **Section 4.4.7 *Navigational & Approach Aids*** for a discussion of future visibility minimums at BXK. The runway-to-parallel-taxiway separation requirements are listed below for the existing and future RDC:

- Existing RDC B-II-VIS and Future PAL 1 RDC B-II-5000: Separation is 240 feet.
- Future PAL 3 RDC C-II-4000: Separation is 300 feet.

The existing runway-to-parallel-taxiway separation between Runway 17-35 and Taxiway H is 400 feet, which exceeds existing and future requirements.

4.4.4.4 Entrance / Exit Taxiway Locations

There are no capacity issues related to the taxiway system. Exit taxiway locations usually have some impact on the runway occupancy time, thence affecting capacity. At BXK, the location of exit taxiways is adequate for small to medium-size GA aircraft. The number, location, and spacing of future taxiway exits for any additional runway or runway extension should be carefully investigated in order to provide an adequate level of service.

4.4.4.5 Taxiway and Shoulder Width

The future TDG 2A requirement for the width of straight section of taxiways is 35 feet. FAA AC 150/5300-13B, *Airport Design,* requires the presence of turf shoulders (or aggregate-turf, soil cement, lime or bituminous stabilized soil) for taxiways serving ADG II aircraft. Taxiways at BXK currently have no specially prepared shoulders. It is recommended that 15-foot shoulders be added to satisfy the requirements of the existing and future ADG and TDG combinations. Those shoulders should at a minimum use a specially prepared stabilized surface such as turf.

4.4.4.6 Taxiway Markings

Current taxiway markings are standard and satisfy the requirements of the existing and future RDCs. Although the standard runway-to-parallel-taxiway separation will remain less than 400 feet (existing separation) in Future PAL 3, existing holding positions markings would need to be relocated further back to comply with PAL 3 RDC C-II-4000. While not required for airports not certified under 14 CFR Part 139, this report recommends enhanced taxiway centerline markings be retained on all connectors taxiways and relocated jointly with the runway holding position markings when necessary.

4.4.4.7 Taxiway Fillet

New standards for taxiway fillets were introduced with the publication of the 13A edition of FAA AC 150/5300-13, *Airport Design* in 2014, and continued with the publication of the 13B edition of the AC in 2022. The new standards used the computer trace of main gear wheels during turns and defined a Taxiway Edge Safety Margin (TESM) function of the TDG that needs to be observed at all times during cockpit-over-centerline taxiing. The new standards focus on increased safety of taxiing aircraft and efficiency but are more demanding than older taxiway fillet practices that were in place beforehand. The result is that most taxiways and taxilanes built before the new 13A standards have a deficient pavement geometry. At BXK, most taxiways were built before the 2014 standards, and fillets are deficient at taxiway-to-taxiway intersections. The exception to this is Taxiway C between Taxiway H and the GA apron, which was recently reconstructed using then-new TDG 2 (now TDG 2B) fillet standards. Taxiway J is scheduled for reconstruction using TDG 2B at major intersections and TDG 1A at intersections with T-hangar taxilanes, although this report recommends TDG 2A for the future critical aircraft. This report recommends that the geometry of all remaining taxiways be updated to match current FAA fillet design standards for TDG 2A. Future taxiways should be designed and built to current standards for TDG 2A.

4.4.4.8 Taxiway Safety Areas

Taxiway Safety Areas (TSA) are designed to provide room for rescue and fire-fighting operations. Like an RSA, a TSA must be cleared and graded smoothly, drained, capable (under dry conditions) of supporting snow removal equipment, ARFF equipment, and the occasional passage of aircraft without causing structural damage to the aircraft, and free of objects (except for frangible objects that need to be located in the TSA because of their function). The width of the TSA must be increased at intersections and turns where curved taxiway or taxilane centerline pavement markings, reflectors, or lighting are provided, meaning that TSA standards must be met for the same distance from the taxiway/taxilane edge in straights and within intersections and curves.

All existing taxiways at BXK satisfy current TSA requirements for ADG II and TDG 2A. The TSA at taxiway-to-taxiway intersections where fillets are not standard still provide standard distance from the existing edge of pavement to the edge of the TSA. Any proposed taxiway should be built using the most current TSA standards.

4.4.4.9 Taxiway Object Free Areas

Taxiway Object Free Areas (TOFA) are designed to provide clearing standards. Like a ROFA, a TOFA prohibits service vehicle roads, parked aircraft, and other objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

All existing taxiways at BXK satisfy current TOFA requirements for ADG II and TDG 2A. Any proposed taxiway should be built using the most current TOFA standards.

4.4.5 Pavement Strength & Condition

Pavement strength and condition for each branch (runway, taxiway, and apron branches) is assessed below. Pavement maintenance and repair recommendations from ADOT's APPP will be incorporated into the short-term CIP as necessary. The runway was rehabilitated in December 2023 and the recommended maintenance and repairs schedule for that branch is outdated.

Pavement strength requirements are as follows:

- **Runway Pavements**: Runway 17-35 pavement surfaces are rated to accommodate aircraft with Single-Wheel Main Gear (S) configuration weighing up to a maximum of 30,000 pounds. Heavier aircraft in the B-II and C-II categories (future critical aircraft) such as the Cessna Citation X have Dual Wheel Main Gear (D) configurations and MTOWs up to 50,000 pounds for the representative segment of those categories. Runway 17-35 pavement surfaces should be re-evaluated and redesignated for Dual Wheel Main Gear (D) aircraft. In the event that the (D) rating of Runway 17-35 is below 50,000 pounds, this report recommends Runway 17-35 be strengthened to accommodate Dual Wheel Main Gear (D) configuration weighing up to a maximum of 50,000 pounds. A (S) rating of 30,000 pounds should remain adequate throughout the planning period for the existing and future critical aircraft fleet mix. Primary and crosswind runways should have similar strength ratings unless the crosswind runway is designed for smaller aircraft than those of the primary runway's RDC. A (S) rating of 15,000 pounds should be sufficient for a crosswind runway designed for A/B-I aircraft, and ratings of 20,000 pounds (S) and 30,000 pounds (D) should be sufficient for a crosswind runway designed for A/B-II aircraft.

  Runway pavement surfaces are eight years old and have estimated PCI ratings of 82 and 77 (Satisfactory) as of 2024. The area-weighted average age of the runway branch is eight, and its area-weighted average PCI score is 81 (Satisfactory) as of 2024. The *2022 Airport Pavement Management Report* from the ADOT APMS recommended a 1-inch mill and overlay (pavement repairs) on all runway pavement surfaces in 2025. However, only a seal coat was applied when the runway was rehabilitated in December 2023. While the seal coat temporarily rejuvenated the pavement, a complete mill-and overlay will be needed in the near-term. The APPP is not recommending major rehabilitation on runway pavements as of 2024 (2022 Report).

- **Taxiway Pavements**: Strength ratings for taxiway pavement surfaces are unknown, but it is assumed that they are on-par with the runway pavement surface ratings and thus deemed adequate. The age of taxiway pavements ranges from 38 years old for the oldest section to five years old for the most recent section, as of 2024. Estimated PCI ratings range from 21 (Serious) to 97 (Good). The area-weighted average age of the taxiway branch is 31, and its area-weighted average PCI score is 50 (Poor).

The *2022 Airport Pavement Management Report* from the ADOT APMS recommends major rehabilitation on sections of Taxiway E (Section 10), Taxiway H (Section 20), and Taxiway J (Section 10) as soon as 2023. Taxiway J (Section 10) is slated for reconstruction in 2024. The report also recommends pavement repairs on sections of Taxiway C (Section 10) in 2023, Taxiway H (Section 30) in 2025, and Taxiway C (Section 10) in 2029. Please refer to Exhibit 2.13 on Page 2-22 for a map of pavement sections.

- **Apron & Taxilane Pavements**: Strength ratings for apron and taxilane pavement surfaces are unknown, but it is assumed that they are on-par with the runway pavement surface ratings and thus deemed adequate. The age of apron pavement surfaces ranges from 24 years old for the oldest section to one year old for the most recent section, as of 2024. Estimated PCI ratings range from 32 (Very Poor) to 99 (Good). The area-weighted average age of the apron branch is six, and its area-weighted average PCI score is 80 (Satisfactory).

  The *2022 Airport Pavement Management Report* from the ADOT APMS recommends major rehabilitation on sections of Apron (Section 20 and 30) and the helicopter parking pad in 2023. The report also recommends pavement repairs on sections of Apron (Section 10) in 2023 and 2029, as well as on both hold pads. Please refer to **Exhibit 2.13** on Page 2-22 for a map of pavement sections.

4.4.6 Lighting, Markings, & Signage

Lighting, markings, and signage are currently adequate at the Airport. Runway lighting and markings for Runway 17 and Runway 35 are consistent with those of a visual runway and include runway designator markings, runway centerline markings, and runway edge markings. All other lighting, markings, and signage are standard for blast pads and taxiways supporting a RDC B-II-VIS runway as set forth in FAA AC 150/5300-13B, *Airport Design,* FAA AC 150/5340-30J, *Design and Installation Details for Airport Visual Aids*, AC 150/5340-1M, *Standards for Airport Markings*, and AC 150/5340-18G, *Standards for Airport Sign Systems*. Most MIRL & MITL light fixtures and signs are in good condition; however, some of the cans and circuit components are in fair condition due to being direct bury.Pilot-controlled lighting (PCL), which is a system that allows pilots to activate and/or increase the intensity of the airfield lighting and taxiway lights from the aircraft with the use of the aircraft's radio transmitter, is available for Runway 17-35 MIRLs. This system should be maintained through the planning period. The visual approach aids should be added to the PCL system, along with the taxiway lighting.

Runway aiming point marking schemes were added to both runway ends in December 2023 as part of an ADOT APMS project. The objective was to upgrade the runway marking types to NPI runway markings on both runway ends prior to the implementation of RNAV (GPS) approaches; however, funding ran out before runway threshold marking schemes could be added. A complete set of NPI runway markings are necessary prior to the implementation of non-precision approaches on both runway ends, expected by PAL 1. In addition, a fourth runway end light must be added on each side of the runway centerline, in line with the existing groups of threshold lights, to comply with NPI runway lighting standards. Additionally, yellow-emitting lights towards the instrument approach are required in the caution zone (the last 2,000 feet, or half of the runway – whichever is less) for runways other than visual runways. The yellow lights indicate caution on rollout after landing.

This report recommends that full NPI runway marking types be implemented, and that threshold lights and caution zone lights be upgraded to support future RNAV (GPS) IAPs on both runway ends (Please refer to **Section 4.4.7 *Navigational & Approach Aids*** for further information on future instrument approaches).

Future improvements should include lighting, marking and signage that is standard as recommended by the most current FAA and ADOT guidance. Efforts should include upgrades to LED fixtures wherever and wherever possible. There currently are no light fixtures or lighted signs using LED technology at the Airport; however, the Taxiway & South Apron Reconstruction Phase II project will install new LED MITLs along Taxiways J and D3 by the end of 2024.

4.4.7 Navigational & Visual Approach Aids

Visual aids are currently adequate for a visual-only airport and include an airport beacon, one segmented circle, one primary lighted wind cone, four unlit supplemental wind cones, one two-box PAPI (PAPI-2L) for Runway 17, one four-box (PAPI-4L) for Runway 35, as well as an AWOS-III. In general, PAPI-2L are installed on runways that serve mostly pistons or turboprop aircraft. Conversely, PAPI-4L are typically installed on runways serving jet aircraft. This master plan recommends upgrading both visual guidance systems to LED PAPI-4L as traffic, in particular jet aircraft traffic, continues to grow. Additionally, an upgrade to an AWOS-III P/T system is planned. There are no electronic NAVAIDs on the airfield; however, the Terminal VORTAC (T-VOR) Buckeye is located eight miles west/northwest of the Airport and provides terminal guidance in the area.

The City has submitted a formal request for the development of IAPs to the FAA, and the FAA has indicated a preliminary publication date in October 2025 for straight-in RNAV (GPS) approaches to both runway ends. Depending on FAA procedure design, the RNAV (GPS) IAPs may include Non-Precision Approach (NPA) types of minima such as LNAV or may include Approach with Vertical Guidance (APV) types of minima such as LNAV/VNAV or even LPV. The resulting approach visibility minimums on either runway ends will depend not only on FAA IAP design criteria but also on several other airport design criteria and may be as low as one SM and could be as low as ¾ SM with an LPV. Because runway design criteria are identical between *Visual* runway and *Not lower than 1 mi* runways (See **Section 4.2.2.1, *Runway Design Standards***) it is likely that the first RNAV (GPS) IAPs published by the FAA will be limited to 1 SM because of runway requirements. Lower minimums, typically 7/8 or 3/4 of a SM require larger RPZs and the FAA prefers full control over RPZs when any changes from existing conditions are made.

As documented in **Section 2.1.7.2 *Wind Coverage***, Runway 17-35's wind coverage during IMC is low and the runway does not achieve 95 percent wind coverage for the 10.5 kts, 13 kts, and 16 kts maximum allowable crosswind components. The need for RNAV (GPS) approaches on a potential crosswind runway will need to be evaluated at the time of conceptual design.

Runway End Identifier Lights (REIL) usually enhance situational awareness, improve safety, and should be installed in conjunction with any NPA or APV. Any new lighting system should use LED technology wherever possible. An Approach Lighting System (ALS) will not be required during the planning period. Please refer to **Section 4.2.2.1 *Runway Design Standards*** for a discussion pertaining to visibility minimums and RDCs.

4.5 Terminal Area & Landside Facilities Requirements

4.5.1 General Aviation Terminal Building

The general aviation terminal facilities provide space that caters to the needs of general aviation pilots, passengers, and visitors to the Airport. The Airport Cooperative Research Program (ACRP) Report 113: *The Guidebook on General Aviation Facility Planning*, published in 2014, recommends using 100 to 150 square feet per design hour passenger to estimate demand for general aviation terminal space. For BXK, a 150-square foot per passenger value was used for a greater passenger level of service. Counts of peak hour itinerant passengers were estimated in **Section 3.7.2.5, *Peaking Activity***.

Table 4.11 provides a summary of the GA terminal space requirements following ACRP recommendations. The ACRP space calculation does not include secondary space such as exterior walkways, entrance plazas, landscaping, etc.

Table 4.11 - General Aviation Terminal Building Area Requirements

Item	Base Year	PAL 1	PAL 2	PAL 3
Peak Hour Itinerant Passengers	29	54	59	82
Required Terminal Capacity (sf)	4,367	8,026	8,886	12,311
Existing Terminal Capacity (sf)	**1,200**			
Net surplus/(Deficiency) (sf)	**(3,167)**	**(6,826)**	**(7,686)**	**(11,111)**

Source: ACRP Report 113. Dibble, June 2024 analysis. Numbers may not exactly add up due to rounding.

Table 4.11 shows that the current GA terminal building is undersized. Plans for a new building and pilot's lounge should be incorporated into the development concepts. A new building with a floor area between 12,000 and 15,000 square feet should meet the forecast need over the planning period.

4.5.2 Aircraft Hangars & Storage

General aviation airports typically store aircraft by one of three methods: open-air tie-down parking stalls (tie-downs), T-hangars, or conventional style (sometimes referred to as box) hangars. Different types of aircraft have different storage requirements. For example, T-hangars and tie-downs are well suited for small piston engine aircraft; however, turboprops and turbojets are almost always stored in a conventional hangar. Shade hangars, a less expensive but less desired option than hangars, can provide additional storing space as well.

Future storage splits for all three storage methods will be kept on par with current splits.

4.5.2.1 T-Hangars

Table 4.12 details the existing and future needs for T-hangar space. There are 40 existing T-hangar units available at BXK that provide storage for 40 single-engine piston aircraft and LSA (on average, numbers fluctuate) which represents 68 percent of all single-engine piston aircraft and LSA currently based at the Airport. Future T-hangar space requirements assume the following space allocations per aircraft type:

- 70 percent of future **SE pistons** (including LSA) to be stored in T-hangars in the future.

  SE pistons currently stored on the apron will remain on the apron
- 0 percent of existing and future aircraft other than SE pistons to be stored in T-hangars in the future.

Table 4.12 - T-Hangar Space Requirements

Item	Base Year	PAL 1	PAL 2	PAL 3
Additional T-Hangar Units Required				
Single-Engine (SE) Piston & LSA	0	18	24	31
Stored in T-Hangars	0	13	17	22
Net surplus/(Deficiency) (Units)	**0**	**(13)**	**(17)**	**(22)**

Source: ACRP Report 113. Dibble, June 2024 analysis. Numbers may not exactly add up due to rounding.

4.5.2.2 Conventional Hangars

Table 4.13 presents future demand for conventional hangars and their associated apron space. Future hangar space requirements assume the following space allocations per aircraft type:

- 92 percent of total hangar space is assumed to be hangar floor space
  - 5 percent of future **SE pistons** to be stored in conv. hangars 1,400 square feet per aircraft
    SE pistons currently stored on the apron will remain on the apron
  - 100 percent of future **ME pistons** to be stored in conv. hangars 1,700 square feet per aircraft
    One ME piston currently stored on the apron will require conventional/box hangar storage
  - 100 percent of future **Jets** to be stored in conv. hangars 4,100 square feet per aircraft
    No jets are currently based at the Airport
  - 100 percent of future **Turboprops** to be stored in conv. hangars 4,100 square feet per aircraft
    One turboprop currently stored on the apron will require conventional/box hangar storage
  - 100 percent of future **Rotorcrafts** to be stored in conv. hangars 1,900 square feet per aircraft
    One rotorcraft currently stored on the apron will require conventional/box hangar storage.
- 8 percent of the total hangar space is assumed to be office space
- Hangar floor space + office space = total hangar space

Table 4.13 - Conventional Hangar Space Requirements

Item	Base Year	PAL 1	PAL 2	PAL 3
Additional Conventional Hangar Space Required				
Single-Engine (SE) Piston & LSA	0	1,260	1,680	2,170
Multi-Engine (ME) Piston	0	1,700	1,700	1,700
Jet	0	12,300	36,900	53,300
Turboprop	0	16,400	24,600	32,800
Rotorcraft	0	1,900	3,800	3,800
Total Hangar Floor Area (sf)	0	33,560	68,680	93,770
Hangar Office Area (sf)	0	2,918	5,972	8,154
Total Hangar Area (sf)	**0**	**36,478**	**74,652**	**101,924**
Net surplus/(Deficiency) (sf)	**0**	**(36,478)**	**(74,652)**	**(101,924)**
Additional Apron Space Required				
Apron Space Required (sy)	0	4,053	8,295	11,325

Source: ACRP Report 113. Dibble, June 2024 analysis. Numbers may not exactly add up due to rounding.

The ACRP Report 113 recommends, as a planning guideline, that apron space be allocated directly in front of the hangar at a ratio of 1:1 to allow maneuvering, cleaning, and refueling of aircraft outside the hangar but clear of TOFAs and $T_{/L}$OFAs. Those apron areas are directly related to hangar space and thus are not included in any apron space requirements in the following subsection.

4.5.3 General Aviation Terminal Apron

The main ramp areas at GA airports are used by both visiting (transient) aircraft and based aircraft. They provide space for storage, maneuvering, and servicing of aircraft. At BXK, the existing apron covers approximately 39,700 square yards. However, only 11,500 square yards are available for aircraft parking; the remainder of the apron includes taxilanes and the modular hangar. There are 50 tie-downs available. It is estimated that 40 percent of apron space and tie-downs are reserved for based aircraft, with the remaining 60 percent are reserved for transient aircraft.

4.5.3.1 Based Aircraft

Table 4.14 presents tie-down requirements for based aircraft at BXK. Future apron space requirements assume the following space allocations per aircraft type:

- 25 percent of future **SE pistons** (including LSA) to be stored on tie-down parking in the future.

  SE pistons currently stored on the apron will remain on the apron. Includes LSAs from Mesa Airlines.
- No existing and future aircraft other than SE pistons to be stored on tie-down parking in the future.

Table 4.14 - Based Aircraft Apron Space Requirements

Item	Base Year	PAL 1	PAL 2	PAL 3
Existing & Additional Tie-Downs Required				
Single-Engine (SE) Piston & LSA	17	37[4]	39[4]	41[4]
Multi-Engine (ME) Piston	4[1]	0	0	0
Jet	0	0	0	0
Turboprop	1[2]	0	0	0
Rotorcraft	1[3]	0	0	0
Total Based Aircraft Tie-Downs	19	37	39	41
Existing Based Aircraft Tie-Downs	20			
Net surplus/(Deficiency)	**1**	**(17)**	**(19)**	**(21)**

Source: ACRP Report 113. Dibble, June 2024 analysis. Numbers may not exactly add up due to rounding.
Note: [1]: One aircraft currently stored on the apron, assumed to be stored in a box hangar in the future. Three aircraft currently stored at the Lauridsen site. Those three aircraft are excluded from the total demand.
[2]: One aircraft currently stored on the apron, assumed to be stored in a box hangar in the future.
[3]: One aircraft currently stored on the apron, assumed to be stored in a box hangar in the future.
[4]: Includes 18 LSAs from Mesa Pilot Development Program Flight Club starting operation in late 2024.

4.5.3.2 Transient Aircraft

Transient pilots will typically park their aircraft on an apron adjacent to the general aviation terminal to use the terminal facilities and services provided by the terminal or Fixed Base Operator (FBO). There are 30 tie-downs available to secure transient aircraft overnight. To calculate the required apron space for transient aircraft, the following assumptions and factors were applied:

- 400 square yards per tie-down for single-engine aircraft
- 650 square yards per tie-down for multi-engine aircraft
- 850 square yards for turboprop, jet aircraft, and rotorcraft

- The number of itinerant arrivals using Airport facilities is per **Table 3.3** on page 3-39.
- 100 percent of transient aircraft using the ramp will require parking stalls at the same time
- The mix of transient aircraft requiring parking stalls to follow the PAL 3 based aircraft fleet mix and is 75 percent SE piston, 5 percent ME piston, 10 percent jet, 5 percent turboprop, and 5 percent rotorcraft

The 100 percent factor for parking stall usage assumes that transient aircraft will use the apron for several hours during the ADPM and that they will all require parking simultaneously. This is consistent will behavior observed with day-long visitors at BXK. **Table 4.15** summarizes the transient apron parking requirements.

Table 4.15 - Transient Aircraft Apron Space Requirement

Item	Base Year	PAL 1	PAL 2	PAL 3
Total Transient Parking Demand (sy)	**7,315**	**10,755**	**11,907**	**13,747**
Existing Transient Parking Capacity (sy)		**6,900**		
Net surplus/(Deficiency) (sy)	**(415)**	**(3,855)**	**(5,007)**	**(6,847)**

Source: ACRP Report 113. Dibble, June 2024 analysis. Numbers may not exactly add up due to rounding.

4.5.4 Aircraft Servicing & Maintenance Facilities

Aerosecure Avionics provides minor aircraft maintenance services such as repair, diagnostic services, and inspection services to based and transient aircraft, as well as avionics repair and installation services. Aerosecure is currently leasing the Common Hangar (Facility ID #5 on **Figure 2.20, *Terminal Facilities & Buildings***) that offers 11,900 square feet of hangar floor space for maintenance activities. The hangar has an additional 2,100 square feet of office and workshop space that is not currently being leased to Aerosecure Avionics. This level of maintenance is considered adequate for the planning period. As traffic continues to grow, more on-airport maintenance services may be needed by future tenants, such as airframe, powerplant, and component shop maintenance services. Separate hangar facilities (usually a conventional hangar) will be required to house any additional maintenance facilities

The Airport currently does not have an aircraft wash rack. Because of the local climate and winds, dust continuously builds up on aircraft fuselage, control surfaces, and windshields. Consideration should be given to constructing an aircraft wash facility at the airport to collect wash runoff.

4.5.5 Automobile Parking & Airport Access

Automobile parking for hangar and terminal facilities should be integral to planning each of the facilities. Sound planning ensures that automobile parking avoids restricting future airfield development. Safety considerations should be part of the planning process, notably ensuring that no active airfield pavements are crossed by roads, that vehicles do not have to back out of the stall directly into a primary road, or that pedestrians do not have to cross a road to reach their destination. Providing adequate safe parking will also create a positive impression of the facility and create opportunities for landscaping.

The access road into the terminal area is currently paved and in good condition. Existing automobile parking near the GA terminal provides approximately 25 parking spaces. **Table 4.16** presents a summary of the general aviation automobile parking requirement for the general aviation terminal (transient passengers), conventional hangars, T-hangars, and based aircraft apron. The ACRP Report 113 recommends that 320 square feet be allocated for each vehicle parking stall and that the number of stalls for each facility follow those guidelines:

- General Aviation Terminal
  - 2.5 stalls per itinerant peak-hour operations using the GA Terminal
  - Assume 35 percent of general aviation terminal is office space
  - One stall per 200 sf of office space. Minimum allocation is 5 stalls
- Conventional Hangars
  - One stall per 2,000 square feet of hangar floor space (92 percent of total). Min. 5 stalls
  - One stall per 200 square feet of office space (8 percent of total). Minimum 5 stalls
- T-Hangars and Based Aircraft Apron
  - One stall for 50 percent of T-hangar units and tie-downs

Table 4.16 - Automobile Parking Requirement

Item	Base Year	PAL 1	PAL 2	PAL 3
GA Terminal/FBO Parking Required				
Auto Parking Stalls Required	44	68	75	90
Parking Area Required (sf)	14,092	21,617	23,933	28,780
Conventional Hangars Parking Required				
Auto Parking Stalls Required	15	47	80	103
Parking Area Required (sf)	4,800	14,968	25,474	32,979
T-Hangars Parking Required				
Auto Parking Stalls Required	20	27	29	32
Parking Area Required (sf)	6,419	8,624	9,296	10,080
Based Aircraft Apron Parking Required				
Auto Parking Stalls Required	9	10	10	11
Parking Area Required (sf)	3,021	3,080	3,320	3,600
Totals				
Total Auto Parking Stalls Required	89	151	194	236
Total Parking Area Required (sf)	28,332	48,289	62,023	75,438
Existing Capacity - Stalls	25			
Existing Capacity - Area (sf)	1,300			
Stalls Net Surplus/(Deficiency)	**(64)**	**(126)**	**(169)**	**(211)**
Area Net Surplus/(Deficiency) (sf)	**(27,032)**	**(46,989)**	**(60,723)**	**(74,138)**

Source: ACRP Report 113. Dibble, June 2024 analysis. Numbers may not exactly add up due to rounding.

Calculations presented in **Table 4.16** suggest a high number of parking spaces are required. Most tenants that are currently leasing hangar space park in their respective hangars, reducing the actual demand for automobile parking in the base year.

4.6 Support Facilities Requirements

4.6.1 Air Traffic Control Facilities

The Airport currently does not have an operational ATCT; therefore, no formal terminal air traffic control services are available at the Airport. Because of the continued growth of traffic, the City is currently pushing for ATC services to be available at the Airport. Benefits of an ATCT include, among others, the prevention of aircraft collisions, the prevention of other types of preventable accidents, reduced flying time, emergency response notification, and general security oversight. The City has been exploring the following options for ATC services:

- FAA Control Tower: Traditional ATC facilities are owned and operated by the FAA. Those facilities are typically found at commercial service airports or large GA airports with heavy jet activity. The FAA has the authority to establish FAA control towers or discontinue control tower services through the National Airspace System when activity levels and safety considerations merit such action. General qualifications requirements are contained in 14 CFR Part 170, *Establishment and Discontinuance Criteria for Air Traffic Control Services and Navigational Facilities* as well as FAA-issued guidance. An airport that meets the requirements for a FAA tower is not; however, guaranteed to receive an FAA ATC facility, and the decision to construct and operate an ATCT lies with the FAA.
- FCT Program Control Tower: The FCT Program was established in 1982 to allow the FAA to contract the operation of certain towers to third party companies. The program allows safe, efficient, and cost-effective ATC services at airports throughout the United States. Minimum requirements for entry into the program stipulate that a BCA needs to be conducted by the FAA to determine the eligibility for ATC services prior to acceptance into the program, and that a sponsor-provided Air Traffic Control Tower (ATCT) that meets certain minimum requirements is available or will be made available. Sponsors are granted a five-year period from the BCA determination to complete all necessary actions including siting analyses, environmental clearance, design and construction of an ATCT that passes an Operational Readiness Inspection (ORI). While ATCT facilities have to be provided by the Sponsor, some FAA grants are available under the Airport Improvement Program (AIP) or the Bipartisan Infrastructure Law (BIL) FCT Competitive Grant Program for siting, environmental clearance, and construction of the facilities.
- Military Control Tower: The City has offered Luke AFB the opportunity to train military controllers at BXK.

Installation of an ATCT at BXK would result in the formation of Class D airspace around the airport. Class E airspace extensions could potentially be used for departures and arrivals along the extended runway centerline. The exact size and boundaries of such Class D airspace would depend on future IAPs at BXK, but also on Class D airspace associated with GYR, Class D airspace associated with Luke AFB, as well as that Special Air Traffic Rules (SATR) Part 93 airspace established as the Luke AFB Terminal Area and under the control of Luke AFB Radar Approach Control (RAPCON). Luke RAPCON currently handles approach and departure control into BXK and is anticipated to retain approach and departure control with the addition of an ATCT at BXK. Additional information pertaining to a future ATCT, and future controlled airspace is contained in **Appendix K, *Airspace Analysis***. For planning purposes, this master plan will establish a general location for a new ATCT facility at BXK, and the new facility will be depicted on the ALP. Siting analyses will be limited to calculation of the required cab elevation that is necessary to meet the required LoS angle of incidence of 0.80 degrees to all movement area pavements. Attention will be given to visibility (unobstructed view) from the tower cab without conducting quantitative analyses.

Other facilities such as a Remote Transmitter/Receiver (RTR) and an Airport Surveillance Radar (ASR) are usually required to support ATC facilities at an airport and provide radio and secondary radar coverage in the vicinity of the Airport. Those facilities will be depicted on the ALP as well. Currently, there are no ASRs or military radars west of the White Tank Mountain and Sierra Estrella Mountain Ranges. Lapses of radar and radio coverage exist at lower altitudes.

4.6.2 Aircraft Fuel Storage

Annual fuel flowage amounts were provided by Airport management for 2023. An average daily fuel flowage per based aircraft was subsequently calculated for both Aviation Gasoline (AvGas) and Jet A fuel for 2023. This average daily fuel flowage per based aircraft was held constant throughout the planning period to estimate future average daily flows.

As discussed in the forecast, an estimated 72 percent of operations at BXK are touch-and-go operations that are mostly performed by flight school aircraft. In addition to flight training, students and instructors sometimes perform full stop landings and use the GA terminal facilities at BXK. Even though the City of Buckeye usually keeps AVGAS prices competitive compared to surrounding GA airports such as GYR or GEU, flight school aircraft do not purchase fuel. This is because AVGAS is only available as a self-service at the Airport. However, instructors have indicated that they would happily purchase fuel should the Airport add full service fueling. This option is currently being implemented by the City of Buckeye by purchasing/leasing a fuel truck and dedicating a City employee to fuel service full-time. This is expected to boost AVGAS sales at BXK. To reflect this in the AVGAS fuel storage requirements calculations shown in **Table 4.17** below, the following was assumed:

- 98 percent of touch-and-go operations at BXK are conducted by flight school aircraft.
- 10 percent of flight school aircraft conduct full stop landings. Divide by 2 to exclude takeoffs.
- 40 percent of flight school aircraft that conduct full stop landings purchase fuel.
- Each fueling aircraft purchases an average of 50 gallons of AVGAS.
- Daily AVGAS fuel flowage is the daily average of annual fuel flowage (divide by 365).

Results of the fuel storage requirements analysis are presented in **Table 4.17** and **Table 4.18**.

Table 4.17 - AvGas Fuel Storage Requirements

Item	Base Year	PAL 1	PAL 2	PAL 3
Annual Fuel Flow (gal)	33,087	-	-	-
Average Daily Flow (gal)	91	-	-	-
Based Piston Aircraft	63	81	87	94
Average Daily Flow/Based Aircraft (gal)	1.44	1.44	1.44	1.44
Average Daily Flow (gal)	91	117	125	135
Average Daily Flow from Flight School (gal)	184	271	300	346
Storage Required for 30-day Supply (gal)	8,242	11,616	12,745	14,435
Existing Fuel Storage Capacity (gal)	10,000			
30-day Supply Net Surplus/(Deficiency) (gal)	**1,758**	**(1,616)**	**(2,745)**	**(4,435)**

Source: Dibble, June 2024 analysis.

Table 4.18 - Jet A Fuel Storage Requirements

Item	Base Year	PAL 1	PAL 2	PAL 3
Annual Fuel Flow (gal)	31,792	-	-	-
Average Daily Flow (gal)	87	-	-	-
Based Turbine Aircraft	3	9	18	24
Average Daily Flow/Based Aircraft (gal)	29.03	29.03	29.03	29.03
Average Daily Flow (gal)	87.10	261.30	522.61	696.81
Storage Required for 30-day Supply (gal)	**2,613**	**7,839**	**15,678**	**20,904**
Existing Fuel Storage Capacity (gal)	12,000			
30-day Supply Net Surplus/(Deficiency) (gal)	**9,387**	**4,161**	**(3,678)**	**(8,904)**

Source: Dibble, June 2024 analysis.

Table 4.17 and **Table 4.18** suggest that the existing fuel storage facilities will need to be expanded before PAL 1 for AVGAS and between PAL 1 and PAL 2 for Jet A fuel in order for the City to maintain a 30-day fuel supply schedule.

4.6.3 Aircraft Rescue & Fire Fighting

The Airport is not a Part 139 Certificated Airport. Consequently, there are no requirements for ARFF. There is no fire station at the Airport.

The closest fire department is the Buckeye Valley Fire District Station 328, located 5 minutes away to the north in West Phoenix Estates, an area of the City of Buckeye. It is anticipated that such emergency response availability should remain adequate throughout the planning period.

4.6.4 Aircraft Deicing Facilities

The Airport currently has no deicing facilities. According to NOAA NCEI data, the mean daily low temperature of the coldest month of the year (December) is 35.6°F (See **Section 2.1.7.1, *Temperature & Precipitation***). Consequently, the probability of icing, snow, or other frozen precipitations is very low at BXK and deicing facilities are unnecessary.

4.6.5 Airport Maintenance Facilities

The City stores airport maintenance equipment on the Airport. Equipment mainly consists of an operation truck and building maintenance. Vegetation does not warrant mowing. Snow removal at the Airport is not required and therefore no equipment is present. The Airport recently reclassified a 4,000 square feet conventional hangar as a storage shed and will begin renovations on the building soon. This storage space is anticipated to remain adequate for maintenance throughout the planning period.

4.6.6 Airport Fencing and Security

The airfield is protected by contiguous chain-link security fencing. The existing fence around the airfield is six feet in height and is topped by 3 barbed wires. Several pedestrian, vehicles, and aircraft gates provide secure access to the airfield. No deficiencies exist. This report recommends implementing a gate numbering system and signage installation for easy identification by airport personnel, tenants, and emergency responders.

Over the summer of 2024, a new access control system updated all gates in the terminal area with keypads, automated locks, and updated aircraft and vehicle gates with operators/actuators for automation. New sections of fencing were also constructed. Perimeter gates, as well as gates near the modular hangar, remained manual operation.

4.6.7 Utilities

All utility lines serving the Airport provide service to the terminal building, hangar area, airfield facilities, lighting, and navigation aids. Utilities at BXK include water (on-airport city-owned water wells, underground mains), electric (APS, overhead transmission line running along S. Palo Verde Rd), communications (CenturyLink), sewer (septic systems), waste and recycling (Republic Services), and storm water. The current utilities at the Airport are adequate for the existing infrastructure as well as for airfield expansion. For future hangar and/or landside development, the water lines and wells would need to be analyzed for capacity and/or limitations to the current system. It should also be noted that the airport lacks natural gas lines and sewer lines, with the existing facilities being on septic systems. In order for development to continue on the east side of the Airport, additional utility infrastructure will be required that is dependent on the nature of future development.

It is recommended that BXK maintain the utility infrastructure to meet current demand within the 20-year planning period. As future landside and hangar development occurs, utility locations and capacity would have to be analyzed for limitations to the current infrastructure.

4.7 Land Acquisition

The City is currently in the process of securing land parcels for the Runway 17 extension (north). Approximately 38 acres of land are being purchased in fee simple from three adjacent parcels to allow for future infrastructure, runway protection surfaces (RSA & ROFA) as well as the future Runway 17 RPZ. In continuation with the current land acquisition effort, it is recommended that the remaining property within the existing Runway 35 RPZ be purchased in fee simple. The Airport currently owns an avigation easement over a portion of the land situated under the RPZ. Existing land use within the existing Runway 35 RPZ is off-airport agricultural and is generally compatible with airport operations within an RPZ.

Additional land acquisition may be identified in the alternatives for the development of airfield facilities and general aviation facilities, as appropriate.

4.8 Summary of Facility Requirements

Table 4.19 presents a summary of the facility airfield requirements and improvements throughout the planning period. Similarly, **Table 4.20** presents a summary of the terminal, landside, and support facilities requirements and improvements throughout the planning period.

Table 4.19 - Summary of Airfield Facility Requirements

Item		Facility Requirements			
		Base Year	**PAL 1**	**PAL 2**	**PAL 3**
Airport Role					
NPIAS Category		Nonprimary GA	Same	Same	Reliever
NPIAS Role		Local	Same	Regional	Same
Arizona SASP		GA-Community	Same	Same	Reliever
Airport Design Standards					
Critical Aircraft Grouping		A-II	B-II	Same	C-II
Critical Aircraft (Typ.)		Cessna 208B Grand Caravan	Beechcraft Super King Air 350i		Cessna Citation X
ARC[2]		B-II	Same	Same	C-II
RDC Primary Runway		B-II-VIS	B-II-5000	Same	C-II-4000
RDC Crosswind Runway		-	B-II-VIS[3]	Same	Same
TDG		1A	2A	Same	Same[2]
Airfield Capacity					
Percent of ASV		41%	61%	67%	78%
Additional Runway Capacity		Not Needed	Planning Stage	Same	Same
Airfield Facility Requirements					
Primary Runway	Length (ft)	Adequate	7,700	Same	8,800
	Width (ft)	Adequate	Same	Same	100
Crosswind Runway	Length (ft)	-	7,700[3]	Same	Same
	Width (ft)	-	75[3]	Same	Same
Visibility Minimums	Primary	Adequate	Not Lower 1 SM	Same	Not Lower ¾ SM
	Crosswind	-	Visual	Same	Same
Pavement Strength	Primary	Adequate	Same	Same	30,000 (S) 50,000 (D)
	Crosswind	-	20,000 (S)[3] 30,000 (D)	Same	Same
Taxiway Layout		Adequate	Update Designations, Fillets Develop taxiways per recommended standards		
Lighting	Primary	Adequate	LED MIRL, NPI	Same	Same
	Crosswind	-	LED MIRL, Visual	Same	Same
Markings	Primary	Adequate	NPI	Same	Same
	Crosswind	-	Visual	Same	Same
Signage		Adequate	Same	LED Signage	Same
Visual Aids	Primary	Adequate	LED REIL, PAPI-4L	Same	Same
	Crosswind	-	LED PAPI-2L	Same	Same
NAVAIDs		Adequate	AWOS-III P/T	Same	Same

Source: Dibble, August 2024 analysis

Note: [1]: This is not a requirement, but an estimate based on the anticipated level of aviation activity at BXK. Reclassification is done at the discretion of the FAA and ADOT when updating their respective plans.

[2]: The ARC is no longer an airport designs standard. See Section 4.2.1, *Critical Aircraft Characteristics*.

[3]: Those values correspond to an RDC of B-II-VIS. If the design RDC is B-I-VIS for the crosswind runway, the runway length requirement decreases to 4,800 feet, the runway width decreases to 60 feet, and the pavement strength rating decreases to 15,000 (S). Options for the crosswind's RDC will be evaluated in the alternatives.

Table 4.20 - Summary of Terminal, Landside, and Support Facility Requirements

Item	Facility Requirements			
	Base Year	PAL 1	PAL 2	PAL 3
Terminal Area & Landside Facility Requirements				
GA Terminal Total Space (sf)	4,367	8,026	8,886	12,311
T-Hangar Space (Unit)	-	+13	+17	+22
Conventional Hangar Space (sf)	-	+36,478	+74,652	+101,924
Based Aircraft Tie-Downs (Unit)	-	+17	+19	+21
Transient Apron Space (sy)	+445	+3,855	+5,007	+6,847
Aircraft Maintenance Facilities	Adequate	Add additional aircraft maintenance services, wash rack		
Automobile Parking (Stalls)	+64	+126	+169	+211
Support Facility Requirements				
ATC Facilities	Adequate	New ATCT, RTR & ASR Facilities		
Aircraft Fuel Storage	Adequate	Need additional AVGAS and Jet A fuel storage		
Aircraft Rescue & Fire Fighting	Adequate	Adequate		
Aircraft Deicing Facilities	Not Needed	Same		
Airport Maintenance Facilities	Adequate	Same		
Airport Fencing & Security	Adequate	Implement gate numbering system		
Utilities	Adequate	Expand as needed		
Land Acquisition				
Proposed Land Acquisition	Areas for airfield and general aviation facilities development Areas within existing and future RPZs			
Proposed Easements	-			

Source: Dibble, August 2024 analysis