4. Facility Requirements

This section identifies the airside and landside facility requirements for the Airport through the planning period (2029). Facility requirements for the Airport are based on several factors, including the relationship between demand and capacity for various Airport systems/facilities, deficiencies identified through comparison of existing conditions to applicable planning/design standards, and functional/operational deficiencies identified through discussions with Airport management, tenants, and users.

The methodologies used and described in this section to determine facility requirements and capacity for various Airport systems generally follow industry standards, with adjustments made, as appropriate, to reflect actual use characteristics at the Airport. The determination of facility requirements for the Airport uses information presented in Sections 2 and 3, along with any additional information that more accurately reflects existing or future conditions at the Airport.

The remainder of this section is organized by functional Airport systems, which are identified and summarized as follows:

- **Airfield facilities** – The runway and taxiway system, lighting, markings, navigational aids, and related safety and protection areas. The ability of the airfield system to serve forecast demand is evaluated in terms of runway capacity and design standards.
- **Passenger terminal facilities** – The terminal building, where enplaning and deplaning passenger demand defines the need for various areas such as ticketing, baggage claim, security screening, and holdrooms, among other building spaces. Requirements for the terminal curb and aircraft parking apron are also assessed.
- **Tenant facilities** – General aviation facilities accommodate privately owned and corporate-owned based and itinerant aircraft. Facility requirements evaluated include aircraft aprons/tie-downs and storage hangars. Future facility needs of the BLM, as well as other tenants, are also considered.
- **Support facilities** – ARFF facilities, air traffic control facilities, airport equipment and SRE facilities, and fueling facilities.
- **Ground access facilities** – On-Airport ground transportation and circulation systems, such as access roadways, and vehicular parking areas.
- **Utilities and stormwater facilities –** Utilities include sewer, water, power, and communications. The adequacy of existing and potential need for additional stormwater retention areas is addressed.

4.1 Airfield Facility Requirements

In the following subsections, the existing airfield facilities at the Airport are evaluated to determine whether the Airport's airfield contains adequate facilities for accommodating existing and forecast demand, and that those facilities are appropriately sized and configured, in accordance with FAA design standards.

4.1.1 AIRFIELD DESIGN STANDARDS

The planning and design of an airport and its airfield facilities are typically based on the airport's role and the aircraft types using the airport. Airfield facilities must comply with planning and design standards, such as those set forth in AC 150/5300-13, *Airport Design*, for runway and taxiway widths and clearances to ensure that the range of aircraft projected to operate at the airport can be accommodated.

The Airport Reference Code (ARC) is used to relate airport design criteria to the operational and physical characteristics of the aircraft intended to operate at an airport, and is calculated based on specifications in AC 150/5300-13. The ARC has two components. The first component of the ARC, represented by a letter, is the Aircraft Approach Category (AAC), which is defined by aircraft approach speed,[1] as follows:

- **AAC A** – Approach speed less than 91 knots.
- **AAC B** – Approach speed of 91 knots or greater, but less than 121 knots.
- **AAC C** – Approach speed of 121 knots or greater, but less than 141 knots.
- **AAC D** – Approach speed of 141 knots or greater, but less than 166 knots.
- **AAC E** – Approach speed of 166 knots or greater.

The second component of the ARC, represented by a Roman numeral, is the Airplane Design Group (ADG), which is determined by aircraft wingspan, as follows:

- **ADG I** – Wingspan of less than 49 feet (e.g., Piper PA-48, Learjet 35).
- **ADG II** – Wingspan of 49 feet, up to, but not including 79 feet (e.g., Cessna Citation II, Saab 340).
- **ADG III** – Wingspan of 79 feet, up to, but not including 118 feet (e.g., B-737, MD-80).
- **ADG IV** – Wingspan of 118 feet, up to, but not including 171 feet (e.g., A300, B-757).
- **ADG V** – Wingspan of 171 feet, up to, but not including 214 feet (e.g., B-747, B-777).
- **ADG VI** – Wingspan of 214 feet, up to, but not including 262 feet (e.g., A380).

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1 AC 150/5300-13, *Airport Design*, defines an aircraft's approach speed as 1.3 times its stall speed in landing configuration at that aircraft's maximum certificated weight.

An aircraft's approach speed translates into time and distance factors, which identify criteria for runways and runway dimensional clearances. The aircraft's wingspan is indicative of an aircraft's weight bearing capacity and physical size. These factors dictate requirements for pavement strength and separation standards for wingtip and other obstruction clearances.

The ARC for TWF is currently C-III, indicating that the primary runway (Runway 7-25) and associated taxiways and safety areas should meet FAA design standards to adequately accommodate regular flights of aircraft with approach speeds less than 141 knots and wingspans of up to, but not including 118 feet. The crosswind runway (Runway 12-30) is designated as ARC B-II, meaning that the runway and associated taxiways and safety areas should meet FAA design standards to adequately accommodate aircraft with approach speeds less than 121 knots and wingspans of up to, but not including 79 feet.

The Airport currently accommodates a wide variety of aircraft operations. Based and itinerant general aviation aircraft include small single- and multi-engine aircraft (ARC A-I and B-I) and corporate turboprops and jets (ARC B-II, C-I, and C-II). Commercial air service is provided by commuter turboprop aircraft (ARC B-II), while air carrier jet aircraft (ARC C-III) operated at the Airport from June 2010 through January 2012. Other large aircraft that operate at the Airport include fire-fighting tankers operated by the BLM, as well as military aircraft. These aircraft may be as large as C-130 turboprops (ARC C-IV).

As part of the planning process, the current ARC for the Airport was re-evaluated pursuant to FAA guidance specifying that airport dimensional standards should be selected which are appropriate for the critical (or design) aircraft, defined as most demanding aircraft in terms of size and approach speed that will make substantial use of the airport in the planning period. According to FAA Order 5090.3C, "substantial use" means either 500 or more annual itinerant operations or scheduled commercial service.[2]

Portions of the Airport have been designed and constructed to accommodate the B-727-200 (ARC C-III), which was maintained as the critical/design aircraft in the 2003 Master Plan Update. The most demanding aircraft in terms of size and approach speed that is forecast to make substantial use of the Airport is the MD-80, or equivalent (ARC C-III). Although ARC C-III aircraft are forecasted to account for less than 500 annual operations through the planning period, ARC C-III is the most demanding category of aircraft projected for scheduled commercial service at the Airport and therefore qualifies as the critical/design aircraft type for the Airport under the FAA's "substantial use" definition. However, since no aircraft forecast to make substantial use of the Airport is operationally more demanding than the B-727-200, it is recommended that the B-727-200 be maintained as the critical/design aircraft for the Airport.

Considering the existing and projected future fleet mix, it is recommended that the ARC for the Airport remain C-III over the planning period and that ARC C-III design standards be retained for all areas of the airfield not exclusively used or planned for small general aviation aircraft. Airfield areas exclusively used for small general aviation aircraft may be planned in accordance with ARC B-II design standards. Subsequent subsections assess the runways, taxiways, and airfield safety areas in relation to these standards.

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2 FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport System (NPIAS)*, December 4, 2000.

4.1.2 AIRFIELD DEMAND/CAPACITY ANALYSIS

The purpose of the airfield demand/capacity analysis is to assess the capability of the airfield facilities at the Airport to accommodate existing and forecast aircraft operations. In analyzing the ability of Airport airfield facilities to accommodate operational demand, airfield capacity and aircraft delay were calculated using the methodologies outlined in FAA AC 150/5060-5, *Airport Capacity and Delay*. The assumptions, methodologies, and results of the airfield demand/capacity analysis are presented in **Appendix C**. The results of the analysis are summarized below.

Airfield capacity is defined in AC 150/5060-5 as the maximum number of aircraft operations that an airfield can accommodate during a specific period of time without incurring an unacceptable level of delay. Aircraft delays increase exponentially as the number of aircraft operations (aircraft demand) nears or exceeds airfield capacity under specific operating conditions. Annual service volume (ASV) is a standard measure of airport capacity. The ASV of the Airport was calculated and compared to forecast aircraft operations to determine if additional capacity would be required at the Airport over the planning period. The relationships between the ratio of annual demand to ASV and the average annual aircraft delays for the Airport over the planning period are depicted in **Table 4-1**.

Table 4-1 Annual Demand, Annual Service Volume, and Average Annual Aircraft Delay

YEAR	ANNUAL SERVICE VOLUME	ANNUAL DEMAND	RATIO OF DEMAND TO ASV	ESTIMATED AVERAGE DELAY (MINUTES PER OPERATION)	ESTIMATED TOTAL ANNUAL DELAY (HOURS)
Historical					
2009	200,000	33,424	0.17	--	--
Forecast					
2014	200,000	40,478	0.20	0.1	67
2019	200,000	42,308	0.21	0.1	71
2024	200,000	44,372	0.22	0.1	74
2029	200,000	46,512	0.23	0.1	78

Note: ASV = annual service volume.

SOURCE: Ricondo & Associates, Inc., January 2011, based on Federal Aviation Administration Advisory Circular 150/5060-5, Airport Capacity and Delay.
PREPARED BY: Ricondo & Associates, Inc., January 2011.

Typically, when an airport's annual operations total exceeds 60 percent of its airfield capacity (ASV), some aircraft delay occurs. Therefore, when the airfield is operating at 60 percent of capacity (120,000 operations), planning for new airfield facilities (i.e., runways) should be initiated. When airport activity reaches 80 percent of capacity (160,000 operations), new airfield facilities should be constructed or demand management strategies should be implemented. As depicted in Table 4-1, based on the aviation activity forecasts presented in Section 3, the Airport's annual demand is projected to reach approximately 23 percent of the Airport's ASV by the end of the planning period.

The results of the demand/capacity analysis indicate that the Airport has adequate capacity to efficiently accommodate projected demand throughout the planning period. As a result, no additional runway facilities will be required for purposes of increasing capacity during the planning period. However, if the number of annual operations or the fleet mix serving the Airport should change significantly from the forecasts, capacity may need to be reassessed.

4.1.3 RUNWAY SYSTEM REQUIREMENTS

In addition to the airfield demand/capacity analysis, the Airport's existing runway system has been analyzed from a number of perspectives, including conformance with FAA design criteria and runway orientation, length, and pavement strength. From these analyses, requirements for runway improvements have been determined for the Airport.

4.1.3.1 Runway Design Criteria

The FAA-recommended runway design criteria for ARC B-II and C-III is presented in **Table 4-2**, along with existing runway specifications at the Airport. As shown, the existing runways at the Airport currently meet recommended design criteria, except for runway blast pads. A runway blast pad is a paved surface adjacent to the ends of runways that are provided to reduce the erosive effect of jet blast and propeller wash. Neither end of Runway 7-25 or Runway 12-30 has a paved blast pad. However, the ends of each runway contain native grasses which stabilize the soil and reduce the potential for erosion. If large turboprop and/or jet operations increase significantly, development of blast pads may be evaluated.

Table 4-2 FAA Runway Design Criteria

	ARC C-III DESIGN CRITERIA (FEET)		ARC B-II DESIGN CRITERIA (FEET)	
RUNWAY DESIGN ELEMENTS	**RUNWAY 7-25**	**DESIGN CRITERIA**	**RUNWAY 12-30**	**DESIGN CRITERIA**
Runway width	150	100	75	75
Runway shoulder width	20	20	10	10
Runway blast pad 1/				
Width	--	140	--	95
Length	--	200	--	150
Runway centerline to:				
Taxiway centerline	400 to 525	400	-- 2/	240
Aircraft parking area	625	500	250	250

Notes: ARC = Airport Reference Code.

1/ Soil stabilized with native grasses occur at the ends of each runway, which provides satisfactory protection against erosion.

2/ Runway 12-30 does not have a full-length taxiway parallel to the runway centerline.

SOURCE: Federal Aviation Administration Advisory Circular 150/5300-13, *Airport Design*.
PREPARED BY: Ricondo & Associates, Inc., November 2011.

4.1.3.2 Runway Orientation

The existing runway system at the Airport consists of a primary runway (Runway 7-25), which is oriented in an east-west direction, and a crosswind runway (Runway 12-30), which is oriented in a northwest-southeast direction. Prevailing wind is a significant factor influencing runway orientation. Wind conditions affect all aircraft to some degree, although in general terms, the smaller the aircraft, the more it is affected by wind. As such, crosswind conditions are often a contributing factor in small/light aircraft accidents during takeoff and landing. For the operational safety and efficiency of an airport, it is desirable for the runway system to be oriented such that aircraft take off and land as close as possible to the direction of the prevailing wind for the greatest percentage of time. This reduces the impact of wind components perpendicular to the direction of travel of an aircraft that is landing or taking off (defined as a crosswind).

Wind coverage is defined as the percentage of time that crosswind components are below an acceptable velocity. FAA design standards specify that a runway system should be configured to provide at least 95 percent wind coverage for any aircraft forecasted to use the airport on a regular basis (500 or more annual itinerant operations or scheduled commercial service). The 95 percent wind coverage is computed on the basis of crosswinds not exceeding 10.5 knots for ARC A-I and B-I, 13 knots for ARC A-II and B-II, 16 knots for ARC A-III, B-III, and C-I through D-III, and 20 knots for ARC A-IV through D-VI. The wind coverage recommendation can be restated to suggest that the runway system should be oriented in such a way that the applicable maximum crosswind components should not be exceeded more than 5 percent of the time.

To evaluate the crosswind coverage provided by the existing runway system at the Airport, 10 years of hourly weather observations from the Airport’s ASOS were obtained, as discussed previously in Section 2. The weather data was processed using the standard wind analysis module of the FAA’s Airport Design computer program (Version 4.2D), consistent with similar analyses conducted for the 2003 Master Plan Update.

As stated previously, the current and recommended future ARC for the Airport is C-III. Therefore, a maximum crosswind component of 16 knots was included in the analysis. Based on the aircraft fleet mix forecast presented in Section 3, the Airport is expected to continue to regularly serve aircraft smaller than ARC C-III, including a significant number of small single- and multi-engine aircraft (ARC A-I and B-I). Consequently, maximum crosswind components of 10.5 knots and 13 knots were also analyzed. Aircraft subject to a maximum crosswind component of 20 knots (on the basis of FAA design standards) are not forecasted to operate at the Airport on a regular basis through the planning period and therefore, a 20-knot crosswind component was not included in the wind coverage analysis.

For each maximum crosswind category, wind coverage was calculated for each runway individually, as well as the two runways combined. In addition, for each runway (and combined), wind coverage was calculated separately for VMC and IMC, as well as for all weather (VMC and IMC). **Table 4-3** presents the results of the runway wind coverage analysis, which are described in the following subsections.

Given prevailing wind conditions at the Airport, the alignment of the primary runway (Runway 7-25) provides a significant percentage of wind coverage in all weather conditions (VMC and IMC). In all weather wind conditions, Runway 7-25 provides coverage ranging from approximately 88 percent with a maximum crosswind component of 10.5 knots, to 98 percent, with a maximum crosswind component of 16 knots.

Table 4-3 Existing Runway System Wind Coverage

	MAXIMUM CROSSWIND COMPONENT		
WEATHER CONDITIONS BY RUNWAY	**10.5 KNOTS**	**13 KNOTS**	**16 KNOTS**
Runway 7-25			
All weather wind coverage	87.67%	93.31%	98.32%
VMC wind coverage	87.41%	93.18%	98.32%
IMC wind coverage	95.22%	96.93%	98.42%
Runway 12-30			
All weather wind coverage	77.71%	87.11%	95.69%
VMC wind coverage	77.64%	87.08%	95.73%
IMC wind coverage	79.85%	87.90%	94.72%
Combined Runways			
All weather wind coverage	91.26%	96.86%	99.56%
VMC wind coverage	91.07%	96.80%	99.56%
IMC wind coverage	96.63%	98.51%	99.52%

Notes: Knots = nautical miles per hour; VMC = visual meteorological conditions; IMC = instrument meteorological conditions; all weather wind coverage includes both VMC and IMC.

SOURCE: Ricondo & Associates, Inc., January 2011, based on hourly observation data obtained from the National Climatic Data Center for Station 72586 (located at the Airport), in conjunction with the Federal Aviation Administration’s Airport Design computer program, Version 4.2D. Data consists of 82,478 observations from January 1, 2000 to December 31, 2009.

PREPARED BY: Ricondo & Associates, Inc., November 2011.

Because VMC conditions prevail approximately 97 percent of the time, VMC wind coverage provided by Runway 7-25 is similar to all weather wind coverage. In VMC, Runway 7-25 provides less than 95 percent wind coverage with maximum crosswind components of 10.5 knots and 13 knots. In IMC, Runway 7-25 provides over 95 percent coverage in all crosswind conditions.

In cases where a primary runway provides less than 95 percent wind coverage, the FAA recommends a crosswind runway to compliment the primary runway, such that the orientation of all runways combined provide the recommended coverage. Since Runway 7-25 provides less than 95 percent wind coverage in VMC with maximum crosswind components of 10.5 knots and 13 knots, Runway 12-30 serves as a crosswind runway to provide additional VMC wind coverage for aircraft up to ARC B-II.

By itself, Runway 12-30 provides wind coverage ranging from approximately 78 percent to 96 percent in VMC, and from approximately 80 percent to 95 percent in IMC, depending on the maximum crosswind component. Runway 12-30 is not designed as an instrument runway and no instrument approach procedures are published for either runway end. However, pilots executing an approach to either end of Runway 7-25 can circle to land on Runway 12-30 if the runway is in sight when the aircraft reaches the applicable decision height or minimum descent altitude published for the approach procedure. Therefore, Runway 12-30 does provide some theoretical utility during IMC.

As depicted on Table 4-3, when the VMC wind coverage of both runways is combined, the existing runway system provides greater than 95 percent coverage with a maximum crosswind component of 13 knots. However, with a maximum crosswind component of 10.5 knots, the combined VMC (and all weather) wind coverage is approximately 91 percent. This is lower than the 95 percent coverage recommended by the FAA. Output files of the combined runway wind coverage analysis from the FAA's Airport Design computer program are provided in **Appendix D**.

Results of the wind coverage analysis indicate that additional all weather wind coverage is needed at the Airport, assuming a maximum crosswind component of 10.5 knots. Since wind coverage in IMC is sufficient, potential development concepts should focus on realigning the existing crosswind runway to increase VMC wind coverage. This additional coverage would increase the operational safety, efficiency, and availability of the Airport for small general aviation aircraft that are forecast to continue to comprise a significant number of aircraft operations at the Airport through the planning period. The results of this analysis are consistent with and validate a similar analysis conducted in support of the 2003 Master Plan Update, which also documented the need for additional wind coverage for small general aviation aircraft.[3] Potential options for increasing VMC wind coverage at the Airport are identified and evaluated in Section 5.

4.1.3.3 Runway Length

Runway 7-25, the Airport's primary runway, has a length of 8,700 feet. The existing crosswind runway (Runway 12-30) has a length of 3,207 feet. A runway length analysis was conducted to determine if additional runway length is required to meet the needs of aircraft that are forecasted to operate at the Airport through the planning period. The analysis was conducted according to FAA guidance contained in AC 150/5325-4B, *Runway Length Requirements for Airport Design*. This subsection summarizes the runway length analysis, which is detailed in **Appendix E**.

Primary Runway Length Requirements

According to AC 150/5325-4B, the design objective for the primary runway is to provide a runway length for all aircraft that will regularly use it without causing operational weight restrictions. The methodology used to determine required runway lengths is based on the maximum takeoff weight (MTOW) of the aircraft types to be evaluated, which are grouped into the following categories:

- **Small aircraft (MTOW of 12,500 pounds or less)** – Aircraft in this category range in size from ultralight aircraft to small turboprop aircraft.
- **Large aircraft (MTOW over 12,500 pounds, but less than 60,000 pounds)** – For purposes of runway length determinations, this category is comprised primarily of business jets.
- **MTOW of 60,000 pounds or greater** – In addition to typical air carrier and regional/commuter aircraft, this weight category includes all regional jets regardless of their MTOW.

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[3] Weather data analyzed in the 2003 Master Plan Update included 10 years of hourly observations from 1992 to 2001. As a point of comparison, the 2003 Master Plan Update presents a combined all weather wind coverage of 92.29 percent with a maximum crosswind of 10.5 knots. This is slightly higher than the 91.26 percent wind coverage calculated for the current Master Plan Update using more recent weather data (2000-2009), as depicted in Table 4-3.

The majority of operations at the Airport are conducted by general aviation aircraft, including single- and multi-engine piston and turboprop aircraft, as well as business jets. To determine if Runway 7-25 has adequate runway length to accommodate these small and large aircraft (as defined above), the FAA's Airport Design computer program (Version 4.2D) was used. Inputs for the computer program include the Airport elevation (4,154 feet MSL), the mean daily maximum temperature of the hottest month (87.9 degrees Fahrenheit – see Section 2, Table 2-3), and the maximum difference in runway centerline elevation (8 feet for Runway 7-25).

The results of the analysis indicate that Runway 7-25 (8,700 feet) should be able to accommodate all small aircraft, 75 percent of large aircraft (business jets) at a useful load of 90 percent, and 100 percent of large aircraft at a useful load of 60 percent.[4] However, based on weather conditions present during the time of operation, even though Runway 7-25 may not accommodate 100 percent of business jets at 90 percent useful load as a group, this does not mean that at certain times a larger business jet operating at or near its MTOW cannot use the runway. Based on this analysis, no additional runway length for Runway 7-25 is recommended through the planning period to accommodate small general aviation aircraft or business jets.

According to AC 150/5325-4B, the appropriate methodology for determining the required runway length for aircraft with a MTOW greater than 60,000 pounds involves the use of Airport Planning Manuals (APMs) specific to a particular aircraft. For purposes of this analysis, this methodology was used for all types aircraft that are forecast to operate scheduled passenger airline service at the Airport through the planning period (regardless of MTOW). These aircraft include the MD-83, the EMB-120 turboprop, and the Bombardier CRJ-200 regional jet.[5]

Using the applicable charts provided in the APM for each aircraft, in conjunction with inputs of Airport elevation and temperature, as well as the procedures stated in AC 150/5325-4B, an analysis was conducted to determine if the existing length of Runway 7-25 (8,700 feet) is adequate for existing and forecasted operations of these aircraft.

Analysis results indicate that the MD-83 can operate at approximately 90 percent of its MTOW from Runway 7-25, achieving an estimated range of approximately 1,600 nautical miles, given a full load of passengers and baggage. The EMB-120 is able to operate at its MTOW using Runway 7-25, resulting in an estimated range of approximately 800 nautical miles with a full load of passengers and baggage. The CRJ-200 is able to operate at approximately 97 percent of its MTOW from Runway 7-25, resulting in an estimated range of approximately 1,350 nautical miles with a full load of passengers and baggage. U.S. Bureau of Transportation Statistics Passenger Origin and Destination (O&D) Survey data for calendar year 2009 was used to derive the top 10 destination markets for the Airport. Based on the distance from TWF to each of these destinations, it was

4 Aircraft included in the "75 percent of fleet" category include small and mid-size business jets, such as most Cessna Citations, Learjets, the Beech Jet 400A, and the Dassault Falcon 900. Aircraft included in the "100 percent of fleet" category include larger business jets, such as the Citation X, Learjet 60, Dassault Falcon 2000, and the Bombardier 600 Challenger.

5 Because the future fleet mix for the Airport may not comprise these specific aircraft types, these aircraft are representative of the types of passenger airline aircraft (or equivalent charter or other large aircraft) that may operate at the Airport through the planning period.

determined that the aircraft (or equivalent types) included in the analysis could use Runway 7-25 at its existing length without incurring operational restrictions that would limit the ability of the aircraft to serve a reasonable list of destination markets from TWF. Therefore, no additional length to runway 7-25 is recommended during the planning period to adequately accommodate these aircraft.

Crosswind Runway Length Requirements

AC 150/5325-4B recommends that the length of a crosswind runway be determined based on the lower crosswind capable aircraft using the primary runway. The Airport's crosswind runway (Runway 12-30) is primarily used by small general aviation aircraft (ARC A-I and B-I) either for more convenient access to/from the primary general aviation area on the Airport during calm wind conditions, or in wind conditions that are unfavorable for the use of Runway 7-25. Since Runway 12-30 is primarily used by small single-engine aircraft, rather than a group of aircraft types defined by the FAA's "small aircraft" category, AC 150/5325-4B allows for the use of individual aircraft flight manuals to determine appropriate runway lengths for the aircraft to be accommodated.

Using the Pilot Operating Handbooks for a representative list of aircraft that may use Runway 12-30,[6] an analysis was conducted to determine if the existing length of the runway (3,224 feet) is sufficient to safely accommodate takeoff and landing operations of these aircraft. Inputs for this analysis included the Airport elevation (4,154 feet) and a mean daily maximum temperature of the hottest month of 87.9 degrees Fahrenheit. Results of the analysis indicate that each of the representative aircraft have takeoff and landing runway length requirements less than 3,224 feet, given the stated conditions and assumptions included in the analysis. The existing fleet mix that currently uses Runway 12-30 is not expected to change significantly through the forecast period. Therefore, it is reasonable to conclude that the existing length of Runway 12-30 is appropriate given its role as a crosswind runway for small general aviation aircraft. No extension of Runway 12-30 is recommended in this Master Plan Update.

4.1.3.4 Pavement Strength

Pursuant to AC 150/5320-6D, *Airport Pavement Design and Evaluation*, the runway pavement needs to be able to support frequent operations of aircraft that currently operate at the Airport, as well as aircraft projected to operate at the Airport in future years.

Runway pavement strength can be expressed in terms of its load-bearing capacity under single wheel loading, dual wheel loading, and dual tandem wheel loading conditions. The aircraft gear type and configuration dictates how the aircraft weight is distributed on the pavement and determines pavement response to loading. Examination of gear configuration, tire contact areas, and tire pressure in common use areas indicates that pavement strength is related to aircraft MTOW.

The load bearing capacity of the Runway 7-25 is 75,000 pounds for aircraft equipped with single wheel landing gear, 200,000 pounds for aircraft equipped with dual wheel landing gear, and 250,000 pounds for aircraft equipped with dual tandem landing gear. Aircraft with single wheel landing gear configuration that

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6 Aircraft included in the analysis included the Cessna 152, 172P, 182P, and 208, as well as the Piper Warrior and Seneca.

are forecasted to use the Airport on a regular basis include primarily single- and multi-engine general aviation aircraft, including some business jets. These aircraft generally have a MTOW of less than 60,000 pounds, which is less than the load bearing capacity of Runway 7-25 for single wheel landing gear. The largest aircraft that are forecasted to use the Airport on a regular basis through the planning period with a dual wheel landing gear is the MD-80 (or equivalent). This gear configuration is common for other narrowbody aircraft such as all variants of the B-737, as well as the A319 and A320. Nearly all aircraft in this group have a MTOW of less than 200,000 pounds, such that Runway 7-25 can support the pavement loading imposed by aircraft currently using and projected to use the runway through the planning period. No aircraft with a dual tandem landing gear configuration is forecasted to use the Airport on a regular basis through the planning period.

Runway 12-30 currently has a load bearing capacity of 19,000 pounds with aircraft equipped with single wheel landing gear. This is sufficient for the small general aviation aircraft that use this runway. These aircraft have a MTOW of less than 12,500 pounds.

No additional pavement strength should be required for either runway through the planning period, given the aircraft types forecasted to use the Airport. It should be noted that pavement design typically allows for aircraft weighing more than the design pavement strength to operate occasionally on the pavement. This is of particular importance for large fire-fighting tankers or larger narrowbody charter aircraft that may occasionally use the Airport.

4.1.4 TAXIWAY SYSTEM REQUIREMENTS

The existing taxiway system at the Airport, as described previously in Section 2, was evaluated based on specific FAA taxiway dimensional design criteria, as well in accordance with general taxiway design principles, pursuant to the guidelines detailed in AC 150/5300-13.

As discussed previously in this section, the airfield design criteria that apply to TWF are ARC C-III and B-II. FAA taxiway dimensional design criteria for ARC C-III and B-II are depicted in **Table 4-4**. The ARC C-III design criteria apply to those taxiways that provide access to areas of the airfield not exclusively used or planned for general aviation aircraft. These criteria are, therefore, applicable to taxiways associated with Runway 7-25, which is designed to accommodate ARC C-III aircraft. Parallel Taxiway A, as well as all of the connector taxiways for Runway 7-25, are at least 50 feet wide and currently meet all applicable ARC C-III taxiway design criteria. The remainder of the taxiways and taxilanes on the airfield, which are designed to primarily accommodate general aviation aircraft, currently meet the applicable design up to ARC B-II. In addition, Airport records indicate that all taxiways and taxilanes at the Airport have sufficient pavement strength to support aircraft for which they are designed to accommodate.

In addition to specific dimensional design criteria, AC 150/5300-13 identifies several design principles for taxiway systems, including the following: provide a full-length parallel taxiway for each runway to allow for the most efficient and safe movement of aircraft from the runway to terminal/parking areas; maintain a smooth flow with a minimum number of changes required in an aircraft's taxiing speed; sufficient aircraft queuing areas; provide as direct a route as possible; provide bypass capability or multiple access routes to runway ends; minimize runway crossings; and avoid traffic bottlenecks.

Table 4-4 FAA Taxiway Design Criteria

TAXIWAY DESIGN ELEMENTS	ARC C-III DESIGN CRITERIA (FEET)	ARC B-II DESIGN CRITERIA (FEET)
Taxiway width	50	35
Taxiway Safety Area width	118	79
Taxiway Object Free Area width	186	131
Taxiway centerline to:		
Parallel taxiway/taxilane centerline	152	105
Fixed or movable object	93	65.5
Taxilane centerline to:		
Parallel taxiway/taxilane centerline	140	97
Fixed or movable object	81	57.5

Notes: ARC = Airport Reference Code.

SOURCE: Federal Aviation Administration Advisory Circular 150/5300-13, *Airport Design*.
PREPARED BY: Ricondo & Associates, Inc., November 2011.

In consideration of these design principles, various taxiway improvements are recommended for the Airport, as follows:

- **Taxiway L extension** – Conventional hangars located along Taxiway L currently accommodate a variety of aircraft, including helicopters, as well as propeller and jet aircraft. To access Runway 25, these aircraft must either taxi west to use a taxilane established through the east apron, or a taxilane adjacent to the BLM heliport and fire retardant loading areas. Use of these routes increases the potential to create traffic bottlenecks on the east apron and also increases the potential for interference with BLM aircraft operations. An extension of Taxiway L to the east to provide a direct connection to Runway 25, would significantly enhance the safety and efficiency of aircraft operations on this area of the airfield, and would also provide efficient access for future general aviation development that may occur in this area.
- **Runway 7-25 run-up pads** – As part of standard operating procedures, many pilots of small general aviation aircraft perform run-up procedures prior to takeoff that include running up the engine to a designated speed and testing various aircraft systems. These procedures are typically conducted on a run-up pad/apron adjacent to the end of the primary taxiway before turning onto the active runway and may take several minutes, depending on the type of aircraft. Currently, no run-up pad is available at either end of Runway 7-25. Consequently, pilots typically stop their aircraft at either end of Taxiway A to perform run-up procedures prior to takeoff, which can create delays for aircraft that are ready to depart. Run-up areas are recommended for each end of Runway 7-25.
- **East airfield taxilane construction/expansion** – Construction and expansion of taxilanes on the east side of the Airport should be planned to provide access for future general aviation and/or other aeronautical development.

4.1.5 AIRFIELD LIGHTING REQUIREMENTS

As previously described in Section 2, airfield lighting systems generally include identification lighting, runway lighting, and taxiway/taxilane lighting. The rotating beacon located on top of the ATCT serves as the primary identification lighting for the Airport. The beacon is appropriately positioned and is in good working order.

The types of runway lighting systems installed at an airport are primarily based the type of instrument approaches published for the runway (if applicable). As described in Section 2, Runway 7-25 is currently equipped with a HIRL lighting system, as well as threshold lights on each end. A REIL lighting system provides visual identification of the runway end for pilots approaching Runway 7 at night, or during IMC when executing a non-precision approach to the runway. The MALSR approach lighting system installed off the approach end of Runway 25 supports the ILS precision instrument approach published for Runway 25. These runway and approach lighting systems are appropriate and no lighting improvements should be required for the existing systems, except as necessary to maintain the effectiveness and efficiency of the systems through routine maintenance and technology upgrades, or as necessary to support any future airfield development.

Runway 12-30 is not equipped with runway lighting, which makes the runway unusable at night. While Runway 7-25 has historically accommodated nighttime operations of small general aviation aircraft, installation of an appropriate lighting system would help to maximize the utility of the crosswind runway.

Existing taxiway/taxilane lighting on the airfield is adequate for directing aircraft between Runway 7-25 and aircraft parking areas.

4.1.6 AIRFIELD MARKINGS AND SIGNAGE REQUIREMENTS

Requirements for airfield markings are described in FAA AC 150/5340-1K, *Standards for Airport Markings*. Markings on the airfield include runway markings, taxiway markings, and other markings.

Similar to pavement lighting, runway markings are determined by the type of approach to the runway. Runway 12-30 is categorized as a visual runway, whereby no instrument approach procedures are published specifically for either end of the runway. As such, the runway has only visual approach/basic markings, consisting of runway designation markings and centerline markings. Runway 7 is a nonprecision runway, meaning that nonprecision instrument approach procedures are published for the runway. The designation, centerline, threshold, aiming point, and side stripe markings provided on Runway 7 (as described in Section 2) are called nonprecision approach markings. Runway 25 has precision approach markings, which consist of the same markings as Runway 7, with the addition of touchdown zone markings. These markings are appropriate for the ILS precision approach procedure published for Runway 25.

The type of markings currently on each of the runways is appropriate, given the type of approaches that serve each runway end, and all markings are reported to be in good condition. However, the designation markings on both ends of Runway 7-25 need to be re-marked. As specified in AC 150/5330-1K, the appropriate runway designator number is the whole number nearest the one-tenth of the magnetic azimuth along the runway centerline when viewed from the direction of approach. As of January 2010, Runway 7 had a magnetic azimuth of 77.7° (78°) and Runway 25 had a magnetic heading of 257.7° (258°). In accordance with AC

150/5330-1K, if a magnetic azimuth ends in a number greater than "5", the runway designator number should be rounded up. Given the magnetic azimuth of each runway end, Runway 7 should be re-designated as Runway 8, while Runway 25 should be re-designated as Runway 26.

All other markings on the airfield, such as taxiway markings, hold position markings, and other required markings, are appropriate. Based on discussions with Airport management, a helicopter takeoff and landing area needs to be designated on the east apron. Some helicopters at the Airport are based in hangars located along Taxiway L, adjacent to the east apron. Currently, there is no designated area for the operation of those helicopters, which has resulted in helicopters operating directly on Taxiway L near the base of the ATCT. These operations block Taxiway L for other aircraft users, present a potential safety risk for people walking near the hangars, and cannot be seen easily from the ATCT. Designation of a suitable helicopter operating area may be accomplished through markings on an existing portion of the east apron, or by development of a separate helipad, similar to the facilities constructed for helicopters operating at the BLM airbase.

Guidance for type and location requirements for various airport signage is specified in FAA AC 150/5340-18, Standards for Airport Sign Systems. As described in Section 2, a number of signs are located throughout the airfield to help facilitate the safe operation of aircraft and ground vehicles operating on the airfield. No significant signage improvements should be required, except as necessary to support any future airfield development, unless otherwise directed by the FAA.

4.1.7 NAVIGATIONAL AID REQUIREMENTS

As described in Section 2, navigational aids at the Airport include visual navigational aids, electronic navigational aids, and weather reporting equipment.

Visual navigational aids consist of windsocks and visual slope indicators, neither of which requires the use of onboard receiving equipment. In accordance with FAR Part 139.323, a lighted wind cone is located at each end of Runway 7-25, since the runway is available for day/night air carrier use. The windsock located north of Taxiway A, near the Runway 30 threshold, provides a visual indication of wind direction for pilots operating on Runway 12-30. To provide visual slope guidance for aircraft approaching Runway 7-25, a VASI is installed on the approach end of Runway 7 and a PAPI is installed on the approach end of Runway 25. While these aids are appropriate and helpful, the FAA considers PAPI installations easier to maintain and more precise. Therefore, it is anticipated that the existing VASI on Runway 7 will be eventually replaced with a PAPI. Runway 12-30 is not equipped with a visual slope indictor on either runway end. Installation of such systems would benefit pilots approaching Runway 12-30.

The electronic navigational aid equipment installed at the Airport plays a critical role in providing nonprecision and precision instrument approach capability to Runway 7-25, as well as in providing important enroute navigation capability within the regional airspace system. Satellite based navigation systems augment the physical equipment installed at the Airport, providing additional instrument approach and enroute navigation capabilities. The existing instrument approach procedures published for the Airport (as described in Section 2) are adequate given the type and number of operations forecasted for the Airport. Therefore, no additional electronic navigational aids should be required at the Airport through the planning period. Any future instrument approach procedures developed for the Airport will likely be based on satellite technology, which is unlikely to require the installation of any physical equipment at the Airport. An NDB located 5.2 miles east of the Runway 25 threshold serves as the outer marker for the ILS approach and is the basis for a NDB nonprecision approach for Runway 25. The FAA is phasing out NDB facilities and it is anticipated that the NDB facility that serves TWF will also be phased out at the end of its useful life.

Weather equipment installed on the airfield consists of an AWOS and SAWS. These two pieces of equipment allow for the recording and dissemination of weather conditions at the Airport. This equipment meets industry standards and no additional weather reporting equipment is likely to be required through the planning period, except as required to upgrade or replace existing systems.

4.1.8 AIRFIELD SAFETY AND PROTECTION AREAS REQUIREMENTS

The FAA's design standards for the various airfield safety and protection areas, as they relate to the Airport, are presented in this subsection. These areas were introduced in Section 2 and are illustrated on the ALP set presented in Section 9. Airfield safety and protection areas evaluated for the Airport include RSA, OFA, OFZ, RPZ, BRL, navigational aid critical areas, and FAR Part 77 imaginary surfaces.

4.1.8.1 Runway Safety Area

RSAs are rectangular areas centered on runway centerlines, which, under normal (dry) conditions, are capable of supporting aircraft without causing structural damage to the aircraft or injury to its occupants, should an aircraft inadvertently leave the paved runway surface. To serve this function, the FAA requires RSAs to be (1) cleared and graded, (2) drained by grading or storm sewers to prevent water accumulation, and (3) free of objects, except those that need to be located in the RSA because of their function (e.g., approach lighting).

Based on FAA design criteria for ARC C-III the RSA for Runway 7-25 should be 500 feet wide (i.e., 250 feet on either side of the runway centerline) and extend 1,000 feet beyond the runway ends. Design criteria for ARC B-II visual runways (Runway 12-30) specifies an RSA with a width of 150 feet that extends 300 feet beyond the runway ends. Currently, the RSAs for both runways meet the applicable design criteria. Taxiways associated with these runways also meet the Taxiway Safety Area width requirements of 118 feet and 79 feet for ARC C-III and B-II, respectively.

4.1.8.2 Runway Object-Free Area

Runway Object-Free Areas (ROFAs) are rectangular areas centered on runway centerlines that are required to be clear of objects protruding above the RSA edge elevation, with the exception of those objects that are essential to air navigation or aircraft ground maneuvering.

For runways with an ARC of C-III (Runway 7-25), ROFAs must be 800 feet wide (i.e., extending 400 feet on either side of the runway centerline) and extend 1,000 feet beyond the runway ends. For ARC B-II runways (Runway 12-30), the ROGA must be 500 feet wide and extend 300 feet beyond each runway end. The ROFA length beyond the end of the runway never exceeds the standard RSA length beyond the runway end. Both Runway 7-25 and Runway 12-30 meet the applicable ROFA design criteria. No changes except those that may be dictated by future runway development should be required through the planning period. Taxiways associated with these runways also meet the Taxiway Object-Free Area width of 186 feet and 131 feet for ARC C-III and B-II, respectively.

4.1.8.3 Obstacle-Free Zone

An OFZ is a volume of airspace centered on a runway centerline and is defined by the FAA as "the airspace below 150 feet above the established airport elevation and along the runway and extended runway centerline that is required to be clear of all objects, except for frangible navigational aids that need to be located in the OFZ because of their function, in order to provide clearance protection for aircraft landing or taking off from a runway, and for missed approaches." The OFZ is intended to protect an aircraft's transition from ground to airborne operations (and vice versa). Airports with nonprecision instrument approach procedures are only required to comply with the runway component of the OFZ criteria, while airports with precision instrument approach procedures or approach lighting systems are required to comply with additional area requirements. FAA criteria prohibit taxiing, parked aircraft, and object penetrations within OFZs, except for frangible navigational aids with fixed locations. Applicable elements of the Airport's OFZ are described as follows:

- **Runway OFZ** – The runway OFZ is a volume of airspace centered above the runway that supports the transition of ground to airborne aircraft (and vice versa). In general, the required runway OFZ is typically 400 feet wide for runways serving large aircraft (Runway 7-25) and 250 feet wide for nonprecision and visual approach runways serving smaller aircraft (Runway 12-30). All OFZs extend 200 feet beyond the runway ends. Both Runway 7-25 and Runway 12-30 meet these respective runway OFZ design criteria.
- **Inner-approach OFZ** – The inner-approach OFZ is a volume of airspace centered on the approach area that applies only to runways equipped with approach lighting. Therefore, the inner-approach OFZ only applies to Runway 25. The inner-approach begins 200 feet from the runway threshold and extends 200 feet beyond the last unit in the approach lighting system. It has the same width as the runway OFZ and rises at a slope of 50:1 away from the runway end. Any objects that penetrate the inner-approach OFZ are listed on the Airport Obstruction Chart.
- **Inner-transitional OFZ** – The inner-transitional OFZ is a defined volume of airspace along the sides of the runway and inner-approach OFZ. It applies only to runways with lower than ¾ statute mile approach visibility minimums. Several instrument approaches published for Runway 25 have visibility minimums less than ¾ statute mile. Therefore, Runway 25 is the only runway at the Airport subject to inner-transitional OFZ object clearance restrictions. Any objects that penetrate the inner-transitional OFZ are listed on the Airport Obstruction Chart.

4.1.8.4 Runway Protection Zone

The RPZ is a trapezoidal area centered on the extended runway centerline. The length and width of the RPZ are contingent on the size of aircraft operating on the runway as well as the type of approach (i.e., visual or instrument) and the available approach minima. The RPZs are designed to enhance the protection of people and property on the ground. To achieve this goal, the FAA recommends that the airport operator own or otherwise control the property in the RPZ. This area should be free of land uses that create glare and smoke. Additionally, the FAA recommends that airport operators keep the RPZs clear of incompatible land uses, specifically residences, fuel storage facilities, and places of public assembly (e.g., churches, schools, office buildings, and shopping centers). Typically, a single RPZ is associated with each runway end. However, the FAA has suggested that separate approach and departure RPZs be defined for any runway end with a displaced arrival threshold. The Airport does not have any displaced thresholds or declared distances.

The FAA provides dimensional criteria for RPZs that are based on runway approach visibility minimums and the AAC associated with each runway. All RPZ trapezoids begin 200 feet beyond the threshold of a runway. For Runway 7, the RPZ dimensions are 1,000 feet wide at the closest end of the runway (inner width), 1,510 feet wide at the end farthest from the runway end (outer width) and 1,700 feet long. The Runway 25 RPZ has an inner width of 1,000 feet, an outer width of 1,750 feet, and a length of 2,500 feet. Both ends of Runway 12-30 have a RPZ with an inner width of 500 feet, an outer width of 700 feet, and a length of 1,000 feet.

The ALP depicts and describes the existing and planned RPZs for the Airport. Currently, all existing RPZs fall within the Airport property boundary, except for a portion of the RPZ extending northwest from the Runway 12 threshold. However, the land use in this area is agricultural and is compatible. If Runway 12-30 remains in its current alignment, it is recommended that the Airport sponsor obtain an easement on the area of the RPZ extending beyond the Airport property line in order to maintain proper control of the area.

4.1.8.5 Building Restriction Line

The BRL is a line depicted on the ALP that identifies suitable building area locations on airports. For planning purposes, the building height is typically assumed to be 35 feet. However, the BRL is a planning tool and when determining the location of a proposed building, the actual height of the building should be considered. In general, the BRL for the Airport encompasses the RPZs, the ROFA, navigational aid critical areas, areas required for instrument procedures, and ATCT clear line of sight.

4.1.8.6 Navigational Aid Critical Areas

Electronic navigational aids that send signals to aircraft are prone to signal interference from buildings, aircraft, or other objects. For this reason, airport design standards provide for clear or critical areas around these sensitive navigational aids. The following navigational aid critical/clear areas at the Airport are identified on the ALP and described as follows:

- **Localizer and glideslope critical areas** – A critical area is established for the localizer and glideslope equipment to keep moving and stopped aircraft and vehicles from interfering with the navigation signals emitted from the equipment. The critical areas are required to be clear of objects and smoothly graded. Both critical areas at the Airport meet the required dimensions specified in FAA Order 5750.16D, *Siting Criteria for Instrument Landing Systems*. The location and function of these critical areas should be considered when planning for future Airport development.
- **VOR clear area** – VOR/VORTAC signals are susceptible to distortion caused by reflections. AC 150/5300-13 specifies that structures should be at least 1,000 feet from the VOR antenna. Beyond 1,000 feet, metal structures should not penetrate a 1.2 degree angle measured from the antenna base, while nonmetal structures should not penetrate a 2.5 degree angle measured from the antenna base. Metal fences should be at least 500 feet from the antenna and power/telephone lines at least 1,200 feet from the antenna. The clear area surrounding the VORTAC at the Airport overlays a portion of Runway 7-25 and Taxiway A, but is currently free from structures that may cause signal interference. Future planning should ensure that no structures penetrate the VOR clear area.

4.1.8.7 Imaginary Surfaces

Approach threshold siting requirements are controlled by imaginary airspace surfaces that extend from the ends of the runway at specified angles and slopes. These surfaces are described in 14 CFR Part 77, *Objects Affecting Navigable Airspace Subpart C, Obstruction Standards* (referred to herein as Part 77).

Part 77 establishes standards for determining obstructions to air navigation. It applies to existing and proposed man-made objects, objects of natural growth, and terrain. The standards apply to the use of navigable airspace by aircraft, and to existing air navigation facilities, such as navigational aids, airports, federal airways, instrument approach or departure procedures, or approved off-airway routes. Additionally, the standards apply to a planned facility or use, or a change in an existing facility or use.

Part 77 surfaces include five standard surfaces established for each of the runway ends at the Airport, based on the AAC for each runway, as follows:

- **Primary Surface** – A rectangular surface aligned to the runway centerline that extends 200 feet beyond each end of the runway. The elevation of the primary surface is the same as the runway elevation.
- **Horizontal Surface** – An oval-shaped surface drawn 150 feet above the established airport elevation, based on 10,000-foot radius arcs from the center of each end of the primary surfaces.
- **Conical Surface** – A surface drawn based on the horizontal surface that extends outward and upward at a 20:1 slope.
- **Transitional Surface** – A surface drawn based on the primary, horizontal, and conical surfaces, with transitional surfaces extending outward and upward at a 7:1 slope.
- **Approach Surface** – A horizontal surface starting 200 feet beyond each runway end, with its size and width based on the existing and planned instrument approaches available for each runway.

The ALP set contains sheets illustrating the Part 77 surfaces. In addition, the sheets list objects that penetrate any of these surfaces and describe how the penetration may be resolved.

4.2 Passenger Terminal Facility Requirements

As described in Section 2, passenger terminal facilities at the Airport are comprised of the passenger terminal building, terminal curb, and terminal apron. Requirements for these facilities were evaluated separately and are described in this section.

4.2.1 TERMINAL BUILDING REQUIREMENTS

The passenger terminal building was last expanded in 1996 to its current area of approximately 28,000 square feet. An analysis was conducted to derive generalized space requirements for the functional areas of the terminal building, in order to determine if additional space may be needed to accommodate forecast activity through the planning period. For airports with less than 250,000 annual enplaned passengers (such as TWF), the FAA recommends the use of AC 150/5360-9, *Planning and Design of Airport Terminal Building Facilities at Nonhub Locations*, for developing generalized terminal building space requirements. AC 150/5360-9 provides graphs that depict a general relationship between peak hour passengers and generalized space requirements for specific functional areas of the terminal building. Where appropriate, other methodologies and assumptions were also used, based on industry standards.

Using the air carrier and regional/commuter fleet mix projections described in Section 3, it was assumed, for purposes of generalized terminal space planning, that the highest peak-hour enplaned or deplaned passenger load that would need to be accommodated in the terminal through the planning period would be approximately 200 passengers. This is equivalent to simultaneous departures or arrivals of a narrowbody air carrier aircraft (e.g., a 150-seat MD-80) and a regional jet (e.g., a 50-seat CRJ-200). Since January 2012, MD-83 aircraft operated by Allegiant Air no longer serve the Airport. However, the airline experienced strong demand for its service resulting in high load factors. This demonstrates that the Airport's market area is able to support a certain level of demand for air carrier service, which is reflected in the aviation activity forecasts presented in Section 3. Therefore, for long-term planning purposes, assessing terminal space requirements in consideration of this demand is prudent.

The methodologies and assumptions used to develop the generalized space requirements for each functional area are described below.

4.2.1.1 Airline Areas

Airline areas include facilities and space specifically related to processing enplaning and deplaning passengers, along with associated baggage.

Ticket Lobby

The ticket lobby is intended to provide queuing area for passengers waiting to check in for a flight and should provide adequate space for circulation around the ticketing area. AC 150/5360-9 specifies that the depth of passenger queuing space in front of the ticket counters should be no less than 20 feet. The existing ticket lobby provides a depth of approximately 25 feet from the ticket counters to the back wall of the lobby. Assuming 200 peak-hour enplaned passengers, approximately 1,100 square feet of queuing/circulation area should be provided, based on AC 150/5360-9. Although the existing usable lobby area is approximately 1,390 square feet, which exceeds the generalized requirement, some congestion in the ticket lobby occurred during peak periods when Allegiant Air was operating at the Airport. Therefore, it is recommended that the ticket lobby be maintained at its existing usable area (at a minimum) through the planning period.

Airline Counters and Offices

The existing terminal is designed to accommodate three airline ticket counter positions, along with associated office space. SkyWest Airlines occupies the center ticket counter position. The southernmost ticket counter position has been modified to accommodate baggage screening equipment. The northernmost ticket counter position was occupied by Allegiant Air until January 2012 and is currently vacant.

AC 150/5360-9 recommends that approximately 8-10 feet should be provided between the front of the ticket counter and the back wall of the ticket counter to accommodate the counter itself, airline personnel, and baggage conveyers. Currently, only about 6 feet is provided between the front of the ticket counters to the back wall of the ticket counters, which provides adequate space for airline personnel, but not enough space for a baggage conveyer system running parallel to the ticket counters. Future baggage system requirements may require additional space between the ticket counters and the back wall of the ticket counters to accommodate a baggage conveyer system.

Airline office space is provided behind each ticket counter position. The use of this space may vary by airline, but is generally designed to accommodate break room facilities, operations planning, storage, or other similar uses. According to AC 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities*, airline office space is typically provided for the length of the ticketing position at a depth of approximately 20 feet. The two available ticketing positions at the Airport (combined) are approximately 50 feet long, equating to a generalized office space requirement of approximately 1,000 square feet, which is roughly equivalent to the existing airline office space provided at the Airport.

Baggage Sortation/Makeup

Each airline ticketing position at the Airport has an associated baggage sortation/makeup area adjoining the provided airline office space. Once baggage is checked in and screened, it is conveyed from the ticket counter area to the baggage sortation/makeup area of the respective airline. From this area, baggage is sorted by size (as necessary) and prepared for loading onto baggage carts which transport the baggage to the terminal apron. For airports the size of TWF, industry standards suggest that approximately 500 square feet of baggage sortation/makeup space is reasonably appropriate for each airline. For two airline positions, this equates to 1,000 square feet, which is equivalent to the existing space available at the Airport. Additional baggage sortation/makeup space may be required within the planning period depending on the future location, equipment types, and processes used to screen baggage.

Baggage Claim

Baggage claim facility requirements are a function of the number of passengers departing an aircraft (or multiple aircraft simultaneously). The baggage claim facility is therefore subject to surges of passengers, as deplaning passengers at the Airport generally leave the aircraft and arrive at the baggage claim area approximately 10 to 20 minutes before the bags are delivered to the claim facility. Assuming 200 peak-hour deplaning passengers, AC 150/5360-9 estimates a general space requirement of approximately 1,400 square feet. The existing baggage claim area at the Airport measures approximately 2,350 feet, although the effective area is larger since it is connected to the general waiting lobby of the terminal. In general, the baggage claim function of the terminal works well given existing and recent historical passenger activity, and should be adequate to accommodate forecast activity through the planning period.

Baggage Claim (Unloading)

An enclosed area is located adjacent to the exterior wall of the baggage claim area to facilitate the unloading of baggage onto the claim ramps. This area accommodates a baggage tractor with attached baggage carts. The function and existing size of this area should be adequate through the planning period.

Holdroom

A holdroom is provided at the Airport for passengers to wait after passing through the security screening checkpoint and prior to boarding the aircraft. Due to passenger security screening processes and equipment requirements that have been implemented subsequent to the events of September 11, 2001, the security screening checkpoint footprint has increasingly expanded into the existing holdroom, effectively reducing the usable holdroom space at the Airport to approximately 1,400 square feet. Additional passenger screening equipment is anticipated within the planning period, including a whole-body imaging device, which would further reduce usable holdroom space. Future holdroom space requirements were based on accommodating 200 enplaned passengers. It was assumed that all passengers would be seated in the holdroom, equating to a space factor of 20 square feet per passenger, as recommended in AC 150/5360-9. The resulting area requirement equates to 4,000 square feet, suggesting that additional holdroom space should be provided within the planning period.

In its current configuration, the existing holdroom can accommodate a full complement of passengers departing on an EMB-120 aircraft. However, when Allegiant Air was serving the Airport, the holdroom space was not adequate to comfortably accommodate a full flight load of passengers. Due to this space limitation, it was common practice for passengers to proceed through the boarding gate immediately after passing through the screening checkpoint to reduce congestion within the holdroom. Future initiation of similar airline service, increased aircraft size for existing service, and/or multiple simultaneous departures, could result in significant congestion within the existing holdroom. Periodic large charter flights, as well as diversions, have also exposed the need for a larger holdroom.

Another issue with the existing holdroom facility is the lack of amenities in the holdroom. No concessions or restroom facilities are located past the passenger security screening checkpoint. The need for post-security restroom facilities (in particular) has been often cited by Airport Management and passengers as a highly desired amenity. Currently, screened passengers needing to use the restroom facilities or purchase food and beverages, are required to exit the holdroom area (with their carry-on bags) and proceed through the security checkpoint again prior to re-entering the holdroom.

These issues indicate the need for a larger holdroom area, ideally with adequate space for restroom facilities and, possibly, provision for a small food and beverage concession (e.g., snack bar). Through observation, the small size of the holdroom, along with its lack of amenities, has resulted in some passengers waiting as long as possible before proceeding through the security checkpoint. This behavior increases the queue length/time of the screening process, thereby potentially affecting the on-time departure of an aircraft.

4.2.1.2 Public Areas

For purposes of this analysis, public areas of the terminal building are defined as areas that are generally designed to accommodate both enplaning and deplaning passengers, along with visitors. These areas include the waiting lobby, general circulation areas, and restroom facilities.

Waiting Lobby

The general waiting lobby forms the core of the terminal building at the Airport and is appropriately located adjacent to all major functional areas of the terminal, such the ticket lobby, security screening checkpoint, baggage claim, restrooms, and concessions. Because the waiting lobby is used by both enplaning and deplaning passengers, along with visitors, AC 150/5360-9 specifies generalized area requirements for waiting lobbies based on total peak-hour passengers. For purposes of this analysis, a total of 400 peak-hour passengers were assumed (200 enplaning passengers and 200 deplaning passengers), equating to a generalized space requirement of approximately 3,200 square feet. This estimate includes allowances for visitors and circulation. The existing waiting lobby occupies approximately 4,150 square feet of space in the terminal building, which should be adequate to accommodate peak demand through the planning period.

Circulation

Circulation space is a key element to a functional terminal building. According to AC 150/5360-9, the amount of circulation space with respect to the gross terminal building area typically varies from approximately 20 percent to 30 percent, depending on the layout, degree of centralization of facilities, and size of the overall building. Areas within the TWF terminal building that are assumed to be dedicated to circulation comprise approximately 8 percent of the gross terminal area. However, other functional areas of the terminal, such as the waiting lobby and ticket lobby, also serve an important circulation function and increase the overall circulation area. Additional circulation space should not be required through the planning period.

Restrooms

Existing public restroom facilities in the terminal building comprise approximately 1,550 square feet and are grouped in a centralized location adjacent to the waiting lobby. AC 150/5360-9 does not provide estimates for restroom facility requirements. Such requirements are often based on local building codes that may specify the number of fixtures based on maximum occupancy of the building. For planning purposes, an accepted industry factor of 1,500 square feet per 500 peak-hour passengers was used, which equates to a generalized space requirement of 1,200 feet. No additional restroom space should be required through the planning period. However, as discussed previously, the provision of restroom facilities in the secured holdroom area may be considered to accommodate passengers who have passed through the security screening checkpoint. Decisions regarding the ultimate sizing of such restroom facilities would be made at the local level based on applicable building codes and other considerations.

4.2.1.3 Concessions

The type and size of concessions that are economically feasible for nonhub airports are primarily dependent on traffic volumes. Concessions facilities include food and beverage establishments, gift shops, and rental car facilities. For purposes of this analysis, generalized facility requirements were derived for two concessions categories: food/gift shop and rental car.

Food/Gift Shop

A full-service restaurant located in the terminal building provides the primary food and beverage concessions for enplaning and deplaning passengers at the Airport, and also attracts/accommodates people not using the Airport. The restaurant also sells gifts/souvenirs. For an activity level of 400 peak-hour passengers, AC 150/5360-9 specifies a general space requirement of approximately 3,000 square feet for food, beverage, and miscellaneous concessions, such as gift shops. The existing restaurant facility comprises approximately 3,130 square feet. Additional food and beverage concessions are provided by vending machines located adjacent to the public restroom facilities. No additional food, beverage, or gift shop concession space should be required through the planning period.

Currently, four rental car companies serve the Airport and lease counter/office space within the terminal building. AC 150/5360-9 specifies that a minimum space of 8 feet in depth and 6 feet in width (48 square feet) should be provided for each rental car company, with a minimum of 10 feet provided for queues in front of the counters. The existing rental car area in the terminal measures approximately 680 square feet, or about 170 square feet per rental car company, with at least 15 feet of queuing space available in front of each counter position. This area is sufficient to accommodate demand through the planning period.

4.2.1.4 Security

Security space and procedural requirements within passenger terminal buildings have changed significantly as a result of the events of September 11, 2001. In response to those events, the Aviation and Transportation Security Act was signed into law on November 19, 2001. This legislation created the TSA and mandated the screening of 100 percent of all checked baggage using explosive detection equipment. The processes and equipment used by the TSA to screen baggage and passengers at the Airport has required interior modifications to the terminal building, which have reduced the ability of the terminal building to efficiently accommodate future passenger demand. Security functions for which space requirements were evaluated include baggage screening, passenger screening, and TSA office space.

Baggage Screening

Pursuant to the Aviation and Transportation Security Act, two ETD devices were installed at the Airport, which are currently used for primary baggage screening. The location of equipment and processes used by the TSA to screen baggage at the Airport has created the following issues within the terminal:

- **Loss of airline ticket counter/operations space** – When the terminal building was expanded and reconfigured in 1996, three airline ticket counters and associated operations areas were constructed to accommodate airline tenants. When it became necessary to accommodate the ETD equipment and TSA personnel, one of the airline ticket counters and associated operations areas was reconfigured for this purpose, leaving only two available airline positions. SkyWest Airlines occupies one of these areas. From June 2010 to January 2012, the second airline area was occupied by Allegiant Air, leaving no room for additional airline tenants. While only one airline currently serves the Airport, given forecast demand, it is reasonable to anticipate that one or more additional airlines could operate at the Airport through the planning period. Relocation of the baggage screening equipment is recommended to make the third ticket counter position available for a future airline tenant.
- **Loss of ticket lobby space** – In order to maintain an adequate sterile area for baggage that is going through the screening process, a portion of the existing ticket lobby has been sectioned off, thereby reducing the available space for passengers waiting to check in at the ticket counter currently occupied by SkyWest Airlines. Queuing space for passengers waiting to check in for SkyWest Airlines flights is further restricted by self check-in kiosks that are located in the ticket lobby. During peak periods, congestion can occur in the ticket lobby. If the baggage screening equipment were to be relocated away from the ticket lobby, approximately 400 square feet of additional lobby area could be made available for queuing passengers during peak periods.

The loss of ticket lobby space may become an even greater issue in the future, as the TSA has indicated its preference for explosives detection system (EDS) devices over the less sophisticated ETD technology. EDS devices require more space than ETD devices and could further reduce available space in the ticket lobby. Alternatively, the operation of an EDS device at the Airport may require that the equipment be located in the central waiting area adjacent to the ticket lobby. Such a configuration could reduce seating capacity in the waiting area and negatively affect the circulation of people throughout the terminal.

- **Inefficient baggage screening operations** – SkyWest Airlines occupies the ticketing position directly next to the TSA baggage screening area. When passengers check a bag with the airline, TSA personnel take the bag to the screening area where the bag is screened and subsequently delivered to the baggage sortation/makeup area. This process is inefficient, particularly during peak periods when several bags may be awaiting the screening process. Contributing factors to this inefficiency include the relatively slow throughput speed of ETD equipment (e.g., compared to EDS equipment), as well as the need for personnel to physically move each bag to/from the screening area.

  The inefficiency of the existing baggage screening process was exacerbated when Allegiant Air was serving the Airport. Due to the location of the baggage screening equipment, Allegiant Air had to occupy the airline ticketing area closest to the east vestibule. From this ticketing location, checked bags for Allegiant Air were transported on a cart through the ticket lobby to the baggage screening area. Once screened, the bags would be reloaded onto a cart and transported back to the airline area for delivery to the baggage sortation/makeup area.

The issues described above indicate the need for the baggage screening process to be relocated to an area that has convenient access to the airline areas (baggage check-in and sortation/makeup areas), but does not take up public space within the terminal or otherwise restrict the flow of people throughout the terminal. Ideally, the baggage screening function would be relocated behind the ticket counter wall, with the screening equipment located in the baggage sortation/makeup area. The existing space and configuration of this area within the terminal building cannot adequately accommodate the baggage screening function.

Space requirements for baggage screening equipment vary depending on the type of screening system that is used. The system currently in use at the Airport is called a stand-alone ETD system, where ETD equipment is used for primary screening of all checked baggage. This system uses the least amount of space, but is labor intensive and results in the lowest throughput rate of any screening system. The existing baggage screening area comprises approximately 300 square feet.

According to Airport Management, the TSA may desire, in the short-term, to replace the ETD equipment with EDS equipment. EDS screening systems can be deployed as either a stand-alone system or as part of an integrated inline system. Under either system, the EDS equipment is used for primary screening, with one or more ETD machines provided for secondary screening (or primary screening for oversized bags). To determine generalized space requirements for baggage screening equipment, a spreadsheet model was used that was developed in support of an Airport Cooperative Research Program (ACRP) report on airport terminal planning.[7] With regard to security screening requirements, the ACRP model incorporates the latest requirements, assumptions, and recommendations specified by the TSA. Based on discussions with a TSA official, the most likely type of EDS machine to be installed at the Airport would be the CT-80, with a throughput rate of 110-130 bags per hour.[8] Assuming a throughput rate of 110 bags per hour, the ACRP model estimates that one EDS machine and one ETD machine would be adequate for existing demand, with a total space requirement of approximately 900 square feet. While a single EDS machine such as the CT-80 could be used to screen bags generated by forecast peak period passenger activity, the ACRP model estimates that two CT-80 (or equivalent) EDS machines and one ETD machine would be required to process checked bags at a similar throughput rate, resulting in a total area requirement of approximately 1,700 square feet.

The space requirements described above correspond to a stand-alone EDS system configuration. If determined to be feasible/economical given forecast demand, a mini-inline system could also be considered. In this configuration, a system of conveyors would transport checked bags to and through the EDS equipment and then transport the screened bags to the appropriate baggage makeup area for loading onto baggage carts. Space requirements for such a system would depend on the planned routing of conveyors and the location and type of screening equipment deployed. For generalized space planning purposes, an area of 3,000 square feet would likely be adequate to accommodate a mini-inline system.

Ultimately, the equipment and processes used by the TSA to screen checked baggage at the Airport through the planning period will dictate space requirements for this terminal functional area. According to this analysis, such requirements may range from approximately 900 square feet to 3,000 square feet. Any future terminal modifications or development should be done in close coordination with the TSA to ensure that adequate space and locations are provided for baggage screening functions.

Passenger Screening

The passenger security screening checkpoint area in the Airport terminal building includes a pre-screening area to accommodate queuing and tables, the actual screening checkpoint comprised of a walk-through metal detector, carry-on baggage screening equipment, and a passenger search and post-screening area with tables for collecting personal items, as well as an ETD machine. In total, the passenger screening area comprises approximately 1,570 feet. As described previously, a portion of the screening area extends into the secure holdroom area, thereby restricting the amount of space available for passengers waiting to board an aircraft. In the short-term, the TSA may implement additional security equipment, such as a whole-body imaging device, which would be accommodated in the existing holdroom area.

The existing passenger security screening checkpoint area is configured as a single lane operation, which is adequate for existing demand. Generalized future requirements were developed using the previously

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7 Airport Cooperative Research Program, *Airport Passenger Terminal Planning and Design, Volume 2: Spreadsheet Models and User's Guide*, March 18, 2010.

8 Steve Bentley, Senior Transportation Security Manager for Idaho, Transportation Security Administration, Interviewed by Jason Apt, Ricondo & Associates, Inc., at Joslin Field, Magic Valley Regional Airport, March 30, 2011.

described ACRP model. Given forecast demand, the ACRP model estimates that two screening lanes would be required to maintain an acceptable level of service during peak periods. A standard two-lane security screening checkpoint consists of two x-ray machines for screening carry-on bags, a walk-through metal detector, a whole-body imaging device, a passenger search area, an ETD machine, and associated tables, chairs, and operator equipment. According to the ACRP model, such a configuration, along with a queuing area and an area for gathering personal belongings, would comprise approximately 1,750 square feet.

TSA Office

TSA personnel currently utilize approximately 860 square feet of converted airline office/operational space to accommodate a break room and administrative activities. The TSA does not publish specific office space requirements for its personnel, leaving such determinations to local/regional TSA officials in charge of security at specific airports. For general planning purposes, industry standards suggest that an area of approximately 400 square feet could be a reasonable estimate. Therefore, no additional TSA office space should be required through the planning period.

4.2.1.5 Other Areas

As described in Section 2, other areas within the terminal building include entrances and exits, arrival and departure gates, electrical and mechanical systems, storage space, Airport administration offices, and other miscellaneous areas. Existing entrances, exits, and aircraft gates are adequate for existing and forecast demand. AC 150/5360-9 specifies that electrical and mechanical systems typically require about 15 percent of total gross terminal area. This space in the terminal currently occupies approximately 10 percent of total gross terminal area. Given increased efficiencies in mechanical systems since AC 150/5360-9 was published, this percentage is currently adequate and should be maintained if additional terminal area is added through the planning period. General storage space and Airport administration offices are currently adequate, with future requirements based on local determinations.

4.2.1.6 Summary of Passenger Terminal Building Requirements

Overall, most of the functional areas in the terminal building have adequate existing space to accommodate forecast demand. The terminal building facility requirements analysis suggests that the following issues should be addressed:

- **Baggage screening** – Relocating the baggage screening equipment behind the ticket counter wall would increase the usable area of the ticket lobby, improve efficiency of the baggage screening process, and, combined with relocation of the TSA offices, would allow use of the southernmost ticketing position for a future airline tenant. Space requirements for this relocation are dependent on the type and configuration of the screening equipment to be used.
- **Holdroom** – The existing holdroom does not provide adequate space to accommodate forecast peak demand through the planning period at a desired level of service and lacks certain amenities that passengers may expect or appreciate.

While critical to accommodating forecast peak demand through the planning period, addressing these issues in the short-term would enhance overall passenger experience at the Airport, improve the operational efficiency of airline and TSA activities, and position the Airport to attract/accommodate additional air service.

Table 4-5 summarizes the generalized space requirements for the terminal functional areas and compares the estimated requirements to existing space in order to determine any need for additional space.

Table 4-5 Generalized Terminal Building Space Requirements

		GENERALIZED SPACE REQUIREMENT (SQUARE FEET)		PRACTICAL SPACE REQUIREMENT (SQUARE FEET) [1/]	
FUNCTIONAL AREA	**EXISTING SPACE (SQUARE FEET)**	**ESTIMATED SPACE**	**SURPLUS / (SHORTAGE)**	**ESTIMATED SPACE**	**ESTIMATED ADDITIONAL SPACE**
Airline Areas					
Ticket lobby	1,400	1,100	300	1,400	--
Airline counters & offices	1,100	1,000	100	1,100	--
Baggage sortation/makeup	1,000	1,000	--	1,000	--
Baggage claim	2,300	1,400	1,000	2,300	--
Baggage claim (unloading)	800	800	--	800	--
Holdroom	1,400	4,000	(2,600)	4,000	2,600
Total airline areas	8,000	9,300	(1,300)	10,600	2,600
Public Areas					
Waiting lobby	4,200	3,200	1,000	4,200	--
Circulation/other	2,200	2,200	--	2,200	--
Restrooms	1,500	1,200	300	1,500	--
Total public areas	7,900	6,600	1,300	7,900	--
Concessions					
Food/gift shop	3,100	3,000	100	3,100	--
Rental car	700	200	500	700	--
Total concessions	3,800	3,200	600	3,800	--
Security					
Baggage screening	300	900 / 3,000	(600) / (2,700)	900 / 3,000	600 / 2,700
TSA office	900	400	500	900	--
Passenger screening	1,600	1,800	(200)	1,800	200
Total security	2,800	3,100 / 5,200	(300) / (2,400)	3,600 / 5,700	800 / 2,900
Other Areas	5,400	5,400	--	5,450	--
Total Building Area	**27,900**	**27,600 / 29,700**	**300 / (1,800)**	**31,300 / 33,400**	**3,400 / 5,500**

Notes: TSA = Transportation Security Administration.

1/ Practical space requirements assume that functional areas with adequate space retain their existing space, while accounting for the functional areas requiring additional space within the planning period.

SOURCES: Ricondo & Associates, Inc., March 2011; Federal Aviation Administration, Advisory Circular 150/5360-9, *Planning and Design of Airport Terminal Building Facilities at Nonhub Locations*, April 4, 1980; Airport Cooperative Research Program, *Airport Passenger Terminal Planning and Design, Volume 2: Spreadsheet Models and User's Guide*, March 18, 2010.

PREPARED BY: Ricondo & Associates, Inc., November 2011.

As shown in Table 4-5, a comparison of the overall gross area of the existing terminal to generalized future space requirements suggests that future demand could theoretically be accommodated within the existing footprint of the terminal building, assuming a stand-alone baggage screening configuration with one EDS machine. To preserve the existing space and functionality of appropriately sized areas within the existing terminal building, the table also presents practical generalized space requirements, which assumes that functional areas with adequate space retain their existing space, while accounting for the functional areas requiring additional space within the planning period. Under this scenario, future additional space requirements may range from approximately 3,400 square feet to 5,500 square feet, depending on baggage screening configuration.

4.2.2 TERMINAL CURB REQUIREMENTS

As described in Section 2, the terminal curb is approximately 145 feet long, stretching nearly the length of the terminal building. According to AC 150/5360-9, the length of curb at nonhub airports is typically a function of the length of the terminal building, which is generally adequate for normal vehicular traffic. Convenient free parking located close to the terminal building entrance reduces curbside traffic at the Airport, which is generally comprised of personal vehicles. Taxis generally only operate on an on-call basis.

The existing terminal curb at the Airport is expected to be adequate through the planning period. If usage rates of the curb increases significantly and/or the vehicle mix results in larger vehicles using the curb with extended dwell times, the length of the curb may need to be reassessed trough the planning period.

4.2.3 TERMINAL APRON REQUIREMENTS

Terminal apron area requirements are based on the number and type of aircraft to be accommodated on the apron during the peak hour of operations. When Allegiant Air was serving the Airport, the terminal apron would frequently accommodate simultaneous parking of the MD-80 operated by Allegiant air and the EMB-120 operated by SkyWest Airlines. Substitution of one or more EMB-120 flights with a regional jet (i.e., CRJ 200) is forecast within the planning period. The existing apron area is approximately 6,600 square yards and could accommodate a MD-80 and CRJ 200 simultaneously. Additional terminal apron area is not anticipated to be required through the planning period.

The terminal apron is constructed of asphalt, with a pavement strength designed to accommodate a B-272-200. The load bearing strength of the pavement is adequate to support any air carrier or regional/commuter aircraft forecast to use the Airport on a regular basis through the planning period. However, over time, sharp power turn procedures used by EMB-120 aircraft departing the apron area have caused rutting of the apron pavement. In addition, oil and fuel deposits have acted to degrade the pavement. Application of a concrete overlay over all or critical portions of the terminal apron is recommended within the planning period to improve the condition and longevity of the apron.

4.3 Tenant Facility Requirements

Facility requirements were determined for tenants that own, lease, and/or operate facilities at the Airport. These tenant facilities include general aviation facilities, BLM facilities, and other tenant facilities.

4.3.1 GENERAL AVIATION FACILITIES REQUIREMENTS

General aviation facilities at the Airport include aircraft buildings/hangars and aircraft parking apron. While some FBO and other aviation-related commercial business facilities at the Airport may be (at least partially) used for administrative/office and related storage needs, the facilities are primarily used for aircraft storage. Storage requirements for general aviation aircraft reflect local climatic conditions and the size and sophistication of the Airport's based aircraft fleet. At TWF, based aircraft are primarily stored in hangar facilities, while itinerant aircraft utilize the available aircraft parking apron.

4.3.1.1 General Aviation Hangar Requirements

As described in Section 2, existing general aviation hangar facilities at the Airport consist of 46 conventional hangars that total approximately 178,800 square feet and 7 T-hangar units that total approximately 62,000 square feet. T-hangars at the Airport primarily accommodate single-engine aircraft, while conventional hangars accommodate single-engine, multi-engine, and jet aircraft, as well as helicopters.

As described in Section 3, 128 aircraft are forecast to be based at the Airport by 2029, representing an increase of 20 aircraft compared to 2009. For purposes of this analysis, the following assumptions were used to determine the number of hangar facilities required through the planning period:

- All future based aircraft will be stored in hangar facilities, rather than parked on an apron.
- Future hangar development will consist of conventional hangars designed to accommodate a single aircraft per hangar.
- At the time an aircraft owner bases an aircraft at the Airport, existing hangar facilities are at capacity; each additional aircraft to be based at the Airport will require a new hangar facility to be constructed.

These assumptions result in the most conservative estimate of future space required to accommodate forecast based aircraft. For example, while additional T-hangar development is possible through the planning period, conventional hangars require more space per aircraft storage unit.

Conventional hangar storage requirements were estimated based on the area needed to support the increased number of based aircraft by aircraft type (i.e., single-engine, multi-engine, business jet, and helicopter). Hangar requirements are primarily a function of the wingspan and length of the specific aircraft to be stored in the facility. To account for a broad range of potential aircraft that could be based at the Airport through the planning period, a list of representative aircraft for each aircraft type was compiled from the FAA's ETMSC database for the year 2010 for TWF. For each representative aircraft, aircraft wingspan (plus 10 feet for clearance) was multiplied by aircraft length (plus 10 feet for clearance) and averaged to derive a planning factor for each aircraft type. The planning factor for each aircraft type was multiplied by the corresponding increase in based aircraft from 2009 and increased by 20 percent to account for additional space within the hangars for offices, maintenance area, equipment storage, and other uses. In addition, based on the ratio of existing conventional hangar space to associated lease area, a development area allowance of 90 percent was included to account for such requirements as automobile parking, landscaping, building setbacks, and open area surrounding the building. Estimated conventional hangar development area requirements through the planning period are shown in **Table 4-6**.

Table 4-6 Conventional Hangar Development Requirements

	2014	2019	2024	2029
Single-engine				
Increase in based aircraft from 2009	2	6	10	14
Hangar building area (square feet)	4,057	12,170	20,284	28,397
Development allowance (square feet)	3,651	10,953	18,255	25,558
Total hangar development area (square feet)	7,708	23,124	38,539	53,955
Multi-engine				
Increase in based aircraft from 2009	0	0	2	4
Hangar building area (square feet)	0	0	6,792	13,585
Development allowance (square feet)	0	0	6,113	12,226
Total hangar development area (square feet)	0	0	12,905	25,811
Business jets				
Increase in based aircraft from 2009	0	0	1	1
Hangar building area (square feet)	0	0	5,339	5,339
Development allowance (square feet)	0	0	4,805	4,805
Total hangar development area (square feet)	0	0	10,145	10,145
Helicopters				
Increase in based aircraft from 2009	0	0	1	1
Hangar building area (square feet)	0	0	2,874	2,874
Development allowance (square feet)	0	0	2,586	2,586
Total hangar development area (square feet)	0	0	5,460	5,460
Total additional area required (square feet)	7,708	23,124	67,049	95,371

Notes:

1/ Required hangar building area derived by multiplying number of based aircraft by an applicable planning factor: single-engine = 2,038 square feet per aircraft; multi-engine = 3,396 square feet per aircraft; business jets = 5,339 square feet per aircraft; helicopters = 2,874 square feet per aircraft. Planning factors include space for offices, maintenance area, equipment storage, and other uses.

2/ Development allowance is calculated by multiplying the required hangar building area by 90 percent to allow area for automobile parking, landscaping, building setbacks, and open area surrounding the building.

SOURCE: Ricondo & Associates, Inc., March 2011.
PREPARED BY: Ricondo & Associates, Inc., November 2011.

As shown in Table 4-6, approximately 95,000 square feet of additional hangar development area is anticipated to be needed to accommodate forecast growth in based aircraft through the planning period. Section 5 identifies how and where required hangar areas may be developed at the Airport.

4.3.1.2 General Aviation Apron Requirements

At TWF, requirements for general aviation apron space are driven primarily by the demand for parking area to accommodate itinerant aircraft. Itinerant aircraft aprons are intended to accommodate relatively short-term aircraft parking, usually less than 24 hours. Such aprons should be located to provide easy access to the FBO/terminal, fueling, and ground transportation facilities, and configured to allow for safe and efficient taxiing movements between parking positions and the airfield.

The requirements for itinerant aircraft parking were derived by using the guidelines provided in AC 150/5300-13. Using peaking activity forecasts presented in Section 3, peak month average day itinerant operations for the Airport were used to calculate the number of aircraft parking positions that would be needed to accommodate itinerant aircraft based on projected demand. The itinerant parking demands for the Airport are presented in **Table 4-7**.

Table 4-7 Itinerant Aircraft Parking Position Demand

YEAR	ANNUAL ITINERANT GENERAL AVIATION OPERATIONS	PEAK MONTH OPERATIONS 1/	PEAK MONTH AVERAGE DAY OPERATIONS 2/	TOTAL REQUIRED PARKING POSITIONS 3/
2014	13,580	1,601	52	28
2019	14,810	1,747	56	31
2024	16,160	1,905	61	34
2029	17,630	2,079	67	37

Notes:

1/ Peak month represents 11.8 percent of annual operations (see Section 3, "Aviation Activity Forecasts."

2/ Peak month operations divided by 31.

3/ Assumes that 50 percent of itinerant aircraft require parking positions at any one time plus 10 percent reserve.

SOURCE: Ricondo & Associates, Inc., March 2011.
PREPARED BY: Ricondo & Associates, Inc., November 2011.

The itinerant aircraft parking area requirement is calculated by multiplying the number of required parking spaces by the average amount of ramp area needed to accommodate one aircraft. When determining apron area requirements, provision must be made for the aircraft parking area as well as the taxilanes leading to the parking positions. To determine the area required for movement of aircraft between parking positions, half the width of the respective ADG taxilane OFA and a 10-foot clearance between each aircraft parking position was applied. A list of representative aircraft types derived from the FAA's ETMSC database for the year 2010 for TWF was used to calculate average length and wingspan for each aircraft type.

Using this approach, a ramp area of approximately 4,500 square feet was assumed for each ADG I aircraft (primarily single- and small multi-engine aircraft, and a limited number of small business jets). ADG II aircraft include most small, mid-size, and heavy business jets, with an average apron requirement of approximately 8,300 square feet per aircraft. ADG III aircraft include large business jets, such as the Gulfstream V or Global Express, which require an apron area of approximately 19,500 square feet per aircraft. It was assumed that throughout the planning period, 70 percent of the itinerant aircraft would be ADG I, 25 percent would be ADG II, and 5 percent would be ADG III. The resulting itinerant aircraft apron requirements for the Airport are presented in **Table 4-8**.

Table 4-8 Itinerant Aircraft Parking Requirements

	APRON REQUIREMENT BY AIRPLANE DESIGN GROUP (SQUARE FEET)			
YEAR	ADG I	ADG II	ADG III	TOTAL
2014	89,037	58,875	27,688	175,599
2019	97,134	64,229	30,206	191,569
2024	105,955	70,062	32,949	208,966
2029	115,605	76,442	35,949	227,997

Note: ADG = Airplane Design Group.

SOURCE: Ricondo & Associates, Inc., March 2011.
PREPARED BY: Ricondo & Associates, Inc., November 2011.

By 2029, approximately 228,000 square feet of apron area is anticipated to be required to accommodate itinerant aircraft parking demand at the Airport. As described in Section 2, the east and west apron areas comprise approximately 681,300 square feet of pavement, suggesting that additional general aviation apron area is not required through the planning period.

While the overall apron area at the Airport is in excess of the theoretical requirement based on PMAD operations, the combination of peak seasonal activity and poor weather conditions in the region often results in a large volume of itinerant aircraft that need to be accommodated at the Airport. The location, geography, runway length, and available instrument approach procedures at TWF make the Airport a desirable alternative for aircraft destined for Friedman Memorial Airport, which serves the resort area of Sun Valley, Idaho. In particular, during the winter months, when visibility, wind, and/or precipitation may restrict operations at Friedman Memorial Airport, those operations are frequently diverted or directly routed to TWF. According to TWF ATCT personnel, during these periods, the available apron area can become congested with aircraft; especially mid-size business jets and other charter aircraft transporting tourists bound for Sun Valley. Fueling records obtained from the FBO confirm the historical presence of a comparatively high number of business jets operating at the Airport during the winter months, as compared to other periods of the year.

To adequately accommodate peak period operations of diverted aircraft, along with the overall forecast growth of itinerant aircraft operations, expansion of apron areas at the Airport should be considered during the planning period.

4.3.2 BUREAU OF LAND MANAGEMENT FACILITY REQUIREMENTS

Existing facilities operated by the BLM on the east side of the Airport are described in Section 2. The BLM's Twin Falls Airbase plays a critical role in dispatching fire-fighting resources to respond to fires on Federal and State lands throughout South Central Idaho. BLM officials have expressed the need to expand the BLM Airbase to accommodate future needs of the BLM's fire-fighting operations. Specifically, the following needs have been identified:

- **Administration/operations building expansion** – The existing administration/operations building is comprised of 5,800 square feet and includes a full kitchen, pilot's lounge, conference room, restrooms, laundry room, offices, a crew readiness area, and vehicle maintenance room. The need for additional area within the building has been identified to adequately accommodate future operational personnel.
- **Aircraft apron expansion** – Existing apron areas at the BLM Airbase include two 8,000-square-foot pads for loading fire retardant onto aircraft, as well as a helicopter parking area. However, apron area for BLM-related aircraft parking/storage is minimal. To adequately accommodate additional aircraft operations, including operations of large fire-fighting tanker aircraft, development/expansion of a suitable apron area is needed.
- **Vehicle parking lot expansion** – Vehicle parking is currently accommodated north of the administration/operations building. Expansion of the vehicle parking lot is anticipated to be needed to better accommodate both existing and future parking demand.

4.3.3 OTHER TENANT FACILITY REQUIREMENTS

4.3.3.1 Other Facility Requirements

As described in Section 2, other tenants also maintain facilities at the Airport, including the U.S. Army Reserve, the Civil Air Patrol, and the Magic Valley Speedway. These facilities adequately serve existing demand and operational requirements. Significant expansion or modification of these facilities is not anticipated to be required through the planning period. Should expansion or modification of these facilities occur, it is not anticipated that such expansions or modifications would significantly interfere with the operation or potential development of aviation-related facilities at the Airport.

4.3.3.2 Air Cargo Facility Requirements

TWF does not currently have a designated facility for air cargo, as discussed in Section 2. Rather, delivery vans/trucks drive onto the apron where cargo is sorted and loaded directly onto cargo aircraft. Although this operation is anticipated to be adequate given the forecast of air cargo volume presented in Section 3, future air cargo screening/security requirements or a significant increase in air cargo demand, could result in the requirement or preference for a dedicated air cargo facility to be developed at the Airport.

A dedicated air cargo facility is not proposed for the Airport as part of this Master Plan Update. However, it is recommended that a location for such a facility be identified for long-term planning purposes. Based an evaluation of air cargo facilities at other Idaho airports and the forecast of air cargo volume at TWF presented in Section 3, a land area of approximately 1-2 acres could accommodate a single tenant facility or a consolidated/shared facility. This area would comprise various facilities, including a cargo building, access/parking, and an aircraft parking apron.

4.4 Support Facility Requirements

Support facilities at the Airport include an ARFF station, the ATCT, snow removal and Airport equipment storage facilities, and fueling facilities. Future requirements associated with these facilities are discussed in the following subsections.

4.4.1 AIRPORT RESCUE AND FIRE-FIGHTING FACILITY REQUIREMENTS

The FAA assigns specific ARFF requirements for airports certified under 14 CFR Part 139 based on the airport's ARFF index. The index is based on the longest air carrier/commercial aircraft that serves the airport with five or more average daily departures. Existing ARFF equipment at TWF, as described in Section 2, currently meets the requirements for Index B, which applies to aircraft at least 90 feet long, but less than 126 feet long (e.g., ERJ-145 and B-737-300). Based on fleet mix and operations projections presented in Section 3, the Airport should continue to maintain Index B requirements through the planning period.

In accordance with 14 CFR Part 139, airport ARFF stations must be located such that the first responding piece of ARFF equipment can reach the mid-point of the furthest air carrier runway from its assigned post within three minutes from the time the alarm is sounded, to have all onboard personnel to be in full protective gear, and to begin application of the applicable fire-fighting agent. The location of the existing TWF ARFF station allows ARFF crews to satisfy this requirement.

The existing ARFF station is in good condition and adequately accommodates all required ARFF equipment and personnel. No ARFF upgrades or additional ARFF facilities/equipment are anticipated to be required during the planning period, except for any necessary vehicle replacement or facility maintenance. The Airport anticipates receiving a new ARFF vehicle in 2015 to replace existing equipment that is near the end of its useful life.

4.4.2 AIR TRAFFIC CONTROL FACILITY REQUIREMENTS

Proper siting of an ATCT is based on criteria described in FAA Order 6480.4, *Airport Traffic Control Tower Siting Criteria*. Mandatory siting requirements include maximum visibility of airborne traffic patterns, complete visibility of all airport surface areas utilized for movement of aircraft which are under the control of the ATCT, sufficient area to accommodate required personnel, vehicle parking, and other facilities, as dictated by location requirements, compliance with FAR Part 77, Objects Affecting Navigable Airspace, and located such that there is or will be no degradation of existing or planned electronic navigational aids. The Order also states that depth perception of all surface areas to be controlled should be available.

The location and height of the ATCT at the Airport currently meets FAA siting requirements. Modifications to or relocation of ATCT facilities at the Airport is not anticipated to be required through the planning period. Line-of-site and depth perception issues should be examined for any future runway/taxiway modifications.

4.4.3 SNOW REMOVAL EQUIPMENT AND EQUIPMENT STORAGE FACILITY REQUIREMENTS

Airport maintenance and operations personnel operate a variety of equipment for maintaining the airfield and grounds, including snow plows, mowers, tractors, hand tools, and other equipment. For snow removal and other equipment, adequate storage and maintenance is required to protect and service snow and ice control equipment, as well as other airport maintenance vehicles.

The basic requirements for snow removal equipment buildings are to provide a warm sheltered environment for equipment repair and service, protect and shield equipment and stored materials from moisture, contaminants, and composition change, and provide a centralized facility for airport maintenance personnel and their service operations. As described in Section 2, the Airport's snow removal equipment (and other Airport equipment) currently occupies half of a 4,000-square-foot sand storage building on the east side of the Airport along Taxiway L. This facility was originally constructed to store sand for winter operations and is not ideally sized or equipped to store the Airport's snow removal equipment. Consequently, a new snow removal equipment facility has been designed, with construction anticipated in 2013.

A 3,300-square-foot equipment facility located north of the passenger terminal building and adjacent to the public parking lot is adequate for storing lawn mowers, tractors, hand tools, and other equipment used to maintain the airfield and grounds.

4.4.4 FUELING FACILITY REQUIREMENTS

Fueling facilities at the Airport are described in Section 2. The existing fuel farm includes underground storage tanks with a capacity of 40,000 gallons of Jet A fuel and 20,000 gallons of avgas. The fuel farm is in good condition and fuel capacity is anticipated to be adequate to serve the needs of forecast aircraft operations through the planning period.

To facilitate the orderly development of the Airport, Airport Management has indicated a need to identify a location near the west building area to store bulk aviation fuels for tenant use.

4.5 Airport Ground Access Requirements

Ground access facilities include the regional and local roadways, Airport access roadways, vehicle circulation roads and parking facilities, and rental car facilities. Facility requirements and improvements have been identified, where applicable, for each of these functional areas, and are discussed in the following subsections.

4.5.1 REGIONAL AND LOCAL ROADWAY ACCESS REQUIREMENTS

Primary access to the Twin Falls area from the east and west is provided by I-84. Primary access to the City from I-84 is via U.S 93, which provides north/south access to Twin Falls. No modifications to these highways are currently planned that would significantly impact access to the Airport.

The Airport is located on the southern edge of the City, with local roadway access provided by a network of arterial and collector roadways, as described in Section 2. According to the *Twin Falls Master Transportation*

Plan, several roadway modification projects are either underway or anticipated to be completed through 2030. The majority of these projects involve bringing existing roadways up to proposed master plan width standards through curb and gutter, sidewalk, and landscaping modifications.[9] Proposed roadway modifications do not include roadways adjacent to or that would otherwise affect access to the Airport.

4.5.2 AIRPORT ROADWAY ACCESS REQUIREMENTS

Primary vehicle access to the terminal building, public parking areas, and tenant facilities at the Airport is provided by Airport Road, which crosses the High Line Canal. The bridge crossing the High Line Canal serves as the only point of public vehicle access for the Airport. In addition, this point of access does not allow for direct access of the Airport via Blue Lakes Boulevard, which is the primary commercial arterial roadway running north/south through the City. Construction of a new access road to supplement the existing access road to the Airport is recommended within the planning period.

4.5.3 VEHICLE CIRCULATION AND PARKING FACILITY REQUIREMENTS

On Airport property, Airport Road is configured as a loop roadway in which inbound vehicles dropping off or picking up passengers proceed counterclockwise around the loop, which provides access to the terminal curb and public parking areas. The configuration of the loop roadway allows for efficient vehicle access and is not frequently congested. Given the modest growth in enplaned passengers forecast for the Airport, vehicle circulation in the vicinity of the passenger terminal is expected to be adequate through the planning period.

As described in Section 2, the loop roadway provides access to several automobile parking areas, comprising a total of approximately 525 public parking spaces that are available to the traveling public, Airport employees, tenants, and other users. These spaces include approximately 95 designated short-term spaces, with the remaining spaces available for long-term use.[10]

For planning purposes, AC 150/5360-13 recommends that the number of parking spaces provided at an airport is equal to 1.5 times the number of peak hour passengers. As described previously, the highest peak-hour enplaned or deplaned passenger load that would need to be accommodated in the terminal through the planning period would be approximately 200 passengers. This equates to approximately 300 public parking spaces. In addition, AC 150/5360-13 suggests increasing the derived number of parking spaces by 15 percent to minimize the amount of time required to find a parking space. This methodology estimates that a total of 345 public parking spaces should be provided at the Airport. Available parking spaces at the Airport currently exceed this requirement.

Although existing parking spaces at the Airport exceed the calculated requirement, the Airport has historically experienced periods of high parking demand requiring use of the adjacent overflow parking area. Such periods may result from long parking dwell times (several days or more) combined with seasonal peaks in passenger activity, typically associated with strong demand for leisure travel. The southern portion of the

9 City of Twin Falls, *Twin Falls Master Transportation Plan*, January 2009.

10 The Airport currently does not charge a fee for either short-term or long-term parking. Consequently, when convenient, some long-term parking spaces located closest to the terminal building may be used on a short-term basis.

overflow area has recently been paved and marked to accommodate periods of excess demand. For long-range planning purposes, it is recommended that the remaining unpaved/unmarked overflow area be reserved for ultimate vehicle parking facilities.

In addition to determining the overall parking requirement for the Airport, the split between short-term and long-term parking spaces was evaluated. According to AC 150/5360-13, short-term parking lot users (those parking for less than three hours) make up approximately 70-85 percent of total parking lot users, but account for only about 20-30 percent of total parking requirements (on average). Conversely, long-term parking lot users (the remaining 15-30 percent of parking lot users) typically occupy approximately 70-80 percent of the available parking spaces.[11] Currently, the 95 available short-term parking spaces at the Airport represent approximately 18 percent of total parking spaces, with long-term parking spaces accounting for approximately 82 percent of the total. These ratios are generally consistent with the data provided in AC 150/5360-13 and therefore, the existing split between short-term and long-term parking spaces at the Airport is adequate and should be maintained through the planning period.

4.5.4 RENTAL CAR FACILITY REQUIREMENTS

As described in Section 2, four rental car companies lease space in the passenger terminal building and operate car wash facilities on the Airport. These facilities are appropriately sized given existing and projected future activity levels at the Airport. For airports with low passenger volumes, AC 150/5360-9 specifies that a minimum of 10 parking spaces should be provided for each rental car agency having a counter in the terminal. Therefore, approximately 40 rental car parking spaces should be provided at the Airport. A total of 42 parking spaces are provided for rental cars in a lot adjacent to and west of the passenger terminal building, which adequately serves rental car demand.

4.6 Utilities and Stormwater Requirements

Utility services available at the Airport are described in Section 2 and include sewer, water, power, and communications. These utilities serve the major facilities at the Airport, such as the passenger terminal building, BLM facility, FBO facilities, and others. Utility providers including the City (sewer and water), Idaho Power (electricity), and CenturyLink (communications), continually assess development and capacity issues throughout their service areas to ensure adequate system capacity.

Water service at the Airport is provided by an on-Airport City-operated well/storage system. The system provides adequate water supply to major Airport facilities, but supply limits on-Airport water-intensive industrial and agricultural uses. The City is in the process of constructing a loop system for water system redundancy. Sewer service is adequate for major Airport facilities, including potential continued hangar development within the west building area. Major development on the west building area (e.g., second FBO terminal), would require installation of a lift station due to grade issues.

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[11] Federal Aviation Administration, Advisory Circular 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities*, April 22, 1988.

Water runoff from the airfield and other pavement areas is funneled into several stormwater retention basins located primarily on the north side of the Airport along the High Line Canal. These basins capture and retain excess water until it can be filtrated into the existing soil or evaporated. The existing stormwater retention basins are adequate for retaining excess water from existing pavement areas. Potential taxiway and apron development on the east side of the Airport may require establishment of stormwater retention areas on the east side of the Airport, likely along the High Line Canal.

4.7 Summary of Facility Requirements

Based on the facility requirements described throughout this section, the following improvements/actions are recommended for the Airport over the planning period through 2029:

Airfield Facilities

- Relocate the existing crosswind runway (Runway 12-30) to increase VMC wind coverage such that the crosswind runway and Runway 7-25 provide a combined all-weather wind coverage factor of 95 percent, in accordance with FAA guidelines.
- Extend Taxiway L east to provide a direct connection with Runway 25 for purposes of enhancing the safety and efficiency of aircraft operations on the east side of the airfield, along with providing access for future general aviation development.
- Construct run-up pads on each end of Runway 7-25 to allow pilots to perform engine run-ups systems checks prior to takeoff, without obstructing Taxiway A.
- Construct and expand taxilanes on the east side of the Airport to accommodate future general aviation and/or other aeronautical development
- Re-designate Runway 7-25 to Runway 8-26 in consideration of the current magnetic azimuth of each runway end.
- Replace the VASI system on Runway 7 with a PAPI system for enhanced visual approach guidance accuracy to the runway.

Passenger Terminal Facilities

- Identify or construct area for accommodating baggage screening equipment to free up airline ticket counter space and relieve congestion in the ticket lobby.
- Increase holdroom space to accommodate forecast peak demand, with consideration for restrooms and other passenger amenities.
- Apply a concrete overlay to all or critical portions of the terminal apron to improve the condition and longevity of the apron.

Tenant Facilities

- Identify location(s) for future hangar development to accommodate forecast based aircraft.

- Identify location(s) for apron expansion to accommodate peak operations of diverted aircraft, along with the overall forecast growth of itinerant aircraft operations.
- Implement planned expansion of on-Airport BLM facilities, including additional administration/operations building space, aircraft parking apron development, and vehicle parking lot expansion.
- Identify area for future air cargo facility development.

Support Facilities

- Construct a new storage facility to properly house and maintain snow removal equipment and related equipment/materials.
- Identify an area for supplemental general aviation fuel storage.

Ground Access Facilities

- Develop a secondary Airport access road to supplement the existing access road.
- Maintain/reserve existing overflow parking area for ultimate vehicle parking facilities.

Utilities and Stormwater Facilities

- Expand or tie into existing utilities, as appropriate, to accommodate future general aviation hangar development.
- Establish a stormwater retention area on the east side of the Airport to collect excess water runoff from planned and potential pavement development.