CHAPTER THREE

Facility Requirements

3.0 OVERVIEW

Airport planning for facility requirements is based upon addressing any existing issues and accommodating the probable demand that may occur over time. This chapter provides an account of the existing condition of airside and landside facilities at the Chippewa Valley Regional Airport and provides recommendations for facility improvements over the next 20 years based on site inspections, Federal Aviation Administration (FAA) guidance, and the aviation activity forecasts presented in Chapter 2. The recommendations presented in this chapter will provide the basis for development of alternatives related to Airport needs, facilities, staffing, and funding. Facility requirements are presented in the following sections:

- Airside Demand/Capacity
- Runways
- Taxiways
- Aircraft Parking Apron Capacity
- Pavement Management
- Navigational Aids

- Passenger Terminal Building
- Automobile Access, Signage, and Parking
- Fueling Facilities
- Aircraft Deicing
- Aircraft Hangars
- Airport Rescue and Firefighting (ARFF) Facilities
- Maintenance/Snow Removal Equipment (SRE) Building
- Cargo Facilities
- Special Event Requirements

3.1 AIRSIDE DEMAND/CAPACITY ANALYSIS

The purpose of a demand/capacity analysis is to assess the ability of airport facilities to accommodate projected operational demand. Demand/capacity analyses for airside facilities such as runways and taxiways are conducted using methodologies outlined in FAA Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay*. These methodologies determine whether existing airside facilities have adequate capacity to accommodate projected operational demand. The annual aircraft operations forecast presented in Chapter 2 is summarized in **Table 3-1**.

Table 3-1: Annual Aircraft Operations Forecast

Year	Annual Operations
2011	24,981
2016	25,880
2021	27,341
2026	28,538
2031	30,165

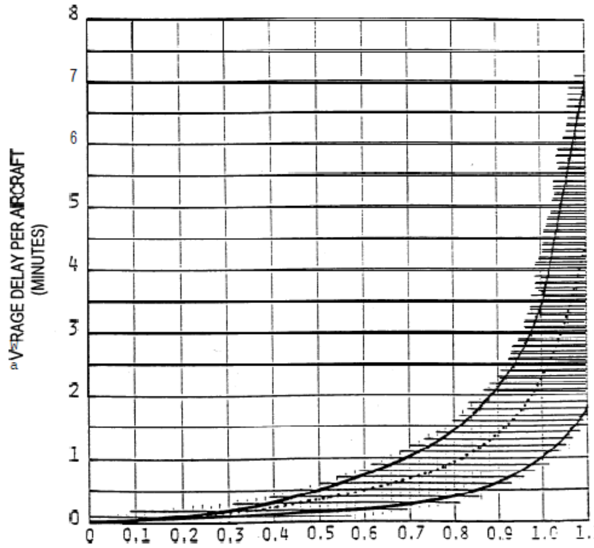
The FAA outlines three broad approaches to calculating airfield capacity: (1) a relatively straightforward capacity chart, (2) a detailed calculation method based on many inputs, and (3) airfield traffic simulation. For airports like EAU where current and future operations are not likely to approach the airfield's annual and peak hour capacity, the simple chart method is often sufficient. This method provides an estimate of an Airport's annual service volume (ASV), which is a measure of an airport's annual operational capacity. Using the methodology contained in AC 150/5060-5, the ASV for the existing runway configuration at EAU is 215,000 aircraft operations. Within the next 20 years, annual aircraft operations are not forecasted to exceed the ASV of the existing runway configuration at EAU.

The relationship between aircraft delay and the ratio of actual annual demand to ASV is shown in **Table 3-2**. **Figure 3-1** depicts the average delay per aircraft based upon the ratio of annual demand to ASV. As the ratio of annual demand to ASV approaches and exceeds 1.0, the estimated average aircraft delay range and the estimated peak delay range for individual aircraft both increase rapidly with relatively small increases in the annual demand. FAA guidance notes that the upper part of the delay range applies to air carrier airports and the full delay range applies to general aviation airports. FAA guidance also notes that peak delays for individual aircraft can be five to ten times the average delay.

Table 3-2: FAA Estimated Delay Ranges		
Ratio of Annual Demand to ASV	**Annual Average Aircraft Delay (min)**	**Peak Delays for Individual Aircraft (min)**
0.1	0.05 - 0.05	0.25 - 0.50
0.2	0.10 - 0.15	0.50 - 1.50
0.3	0.20 - 0.25	1.00 - 2.50
0.4	0.25 - 0.30	1.25 - 3.00
0.5	0.35 - 0.50	1.75 - 5.00
0.6	0.50 - 0.75	2.50 - 7.50
0.7	0.65 - 1.05	3.25 - 10.50
0.8	0.95 - 1.45	4.75 - 14.50
0.9	1.40 - 2.15	7.00 - 21.50
1.0	2.30 - 3.50	11.50 - 35.00
1.1	4.40 - 7.00	22.00 - 70.00

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

Figure 3-1: Annual Demand to ASV



Based on 2011 operational activity at EAU, the current ratio of annual demand to ASV is approximately 0.12. Based on the delay range shown in Figure 3-1, this corresponds to an annual average aircraft delay of approximately 0.05 minutes, and a peak delay for individual aircraft of between 0.25 and 0.50 minutes. Based on projected 2031 operational activity at EAU, the ratio of annual demand to ASV will be approximately 0.14. This projected increase in annual demand is not expected to result in increased average or peak delays.

Planning standards dictate that when annual operations reach 60% of ASV (129,000 operations at EAU), new airfield facilities should be planned. When annual operations reach 80% of ASV (172,000 operations at EAU), new airport facilities should be constructed. The preferred aircraft operations forecast presented in Chapter 2 does not anticipate operational levels of this magnitude within the 20-year planning period. As a result, it is not expected that EAU will reach the 60% capacity planning threshold. It is therefore expected that the Airport will have sufficient runway capacity to handle projected operations throughout the planning period.

Based on the analysis conducted for this Master Plan, it is concluded that the Airport's current airfield layout has adequate capacity for projected aviation activity throughout the 20-year planning period, and that additional runways will not need to be constructed.

3.2 RUNWAYS

Runway requirements are a fundamental component of an Airport Master Plan because runways have far-reaching implications for ultimate airport development and physical layout. This section describes runway requirements at the Chippewa Valley Regional Airport. This analysis will determine the required number, length, and design criteria of runways that will be needed at the airport in the future. Runway requirements are discussed in the following sections:

- Wind Coverage
- Runway 4/22 Length
- Runway 4/22 Declared Distances
- Runway 14/32 Length
- Runway Design Criteria

3.2.1 Wind Coverage

Wind coverage is the percentage of time a runway can be used without exceeding allowable crosswind velocities. Each aircraft type is certified to operate below a maximum crosswind component. Generally, larger, heavier aircraft are able to operate with higher crosswinds. Allowable crosswind velocities vary depending on aircraft size and speed, and are generally grouped into four allowable crosswind components: 10.5 knots (12 mph), 13 knots (15 mph), 16 knots (18 mph), and 20 knots (23 mph). During periods of high crosswinds, traffic may be diverted from the affected runway to a crosswind runway.

As discussed in Chapter 1, Runway 4/22 is the crosswind-preferred runway for most IFR operations, while Runway 14/32 is the crosswind-preferred runway for smaller aircraft in all-weather and VFR conditions. Runway 4/22 does not currently provide adequate annual all-weather, instrument flight rules (IFR), or visual flight rules (VFR) wind coverage when applying a 10.5-knot crosswind component. This is the appropriate crosswind component for small aircraft (less than 12,500 pounds), and therefore a crosswind runway is justified at EAU for these aircraft based on current operational levels. Runway 4/22 provides at least 95% wind coverage for all-weather, IFR, and VFR conditions when applying a 13-knot crosswind component, which is the appropriate crosswind component for based Runway Design Code (RDC) B-II aircraft that operate at the Airport on a regular basis. However, the 13-knot all-weather and VFR wind coverage percentages are very close to 95%, at 95.30% and 95.12%, respectively. A monthly wind coverage analysis was done as part of this Master Plan Update to evaluate seasonal changes in Runway 4/22 wind coverage percentages utilizing the 10.5-knot and 13-knot crosswind components. This analysis is presented in **Table 3-3** on the next page.

As shown in Table 3-3, Runway 4/22 does not provide adequate 13-knot wind coverage three months of the year in all weather conditions, four months of the year in VFR conditions, and one month of the year in IFR conditions. Because Runway 14/32 is the crosswind-preferred runway for all-weather and VFR conditions, it should be designed to accommodate the aircraft that use the runway on a regular basis in these weather conditions. Based on this monthly wind coverage analysis and relatively consistent operational levels over the course of the year, approximately 25% of aircraft operations occur during months which exhibit less than 95% all weather wind coverage for Runway 4/22.

Table 3-3: Runway 4/22 Monthly Wind Coverage Analysis						
	All Weather		VFR		IFR	
Month	**10.5-knot**	**13-knot**	**10.5-knot**	**13-knot**	**10.5-knot**	**13-knot**
January	92.66%	96.30%	92.19%	96.04%	96.91%	98.67%
February	91.27%	95.66%	91.02%	95.51%	93.07%	96.75%
March	89.28%	94.07%	88.92%	93.88%	91.63%	95.27%
April	85.68%	92.35%	85.12%	92.04%	92.40%	95.96%
May	85.19%	92.11%	84.94%	92.00%	89.70%	94.12%
June	92.12%	96.20%	92.01%	96.13%	93.64%	97.35%
July	94.26%	97.07%	94.17%	97.04%	96.28%	97.53%
August	94.91%	97.64%	94.62%	97.50%	94.62%	97.50%
September	91.46%	95.74%	90.88%	95.46%	99.10%	99.37%
October	90.97%	95.40%	90.76%	95.33%	92.26%	95.60%
November	90.86%	95.07%	90.36%	94.81%	94.85%	97.08%
December	92.10%	96.04%	91.74%	95.79%	93.61%	97.18%
Annual	90.89%	95.30%	90.54%	95.12%	94.09%	96.97%

Wind Data Source: EAU ASOS, Period of Record 2000-2009

Note: Highlighted percentages are below the 95 percent minimum recommended by AC 150/5300-13A

Although a B-II crosswind runway is not explicitly justified by the annual wind coverage analysis method, there are several B-II aircraft operating at the Airport on a daily basis and there are several months in which Runway 4/22 does not provide at least 95% wind coverage for B-II aircraft. B-II aircraft utilize the crosswind runway throughout the year during crosswind conditions and periods of peak activity (see Section 3.2.4). Runway 14/32 should remain a B-II runway throughout the 20-year planning period to accommodate these aircraft users.

3.2.2 Runway 4/22 Length Analysis

Runway length requirements should be determined in accordance with AC 150/5325-4B, *Runway Length Requirements for Airport Design.* The goal of the AC is "to construct an available runway length for new runways or extensions to existing runways that is suitable for the forecasted critical design airplanes." AC 150/5325-4B describes a five-step procedure for determining the recommended runway lengths associated with the critical design airplanes at an airport. The following sections describe these steps and provide the necessary information to complete this procedure for EAU.

Critical Design Aircraft

The first step in the FAA's runway length determination procedure is to identify a list of critical design aircraft, which are the most demanding current airplanes that will use or have used the runway on a regular basis over a period of at least five years. The FAA defines regular use as 500 operations a year, or scheduled commercial service. An operation is defined as one takeoff or one landing. Derived from this list, the critical design aircraft consists of a family grouping of airplanes, or a single airplane, resulting in the longest required runway length. The critical aircraft fleet for Chippewa Valley Regional Airport is shown in **Table 3-4** on the next page.

Table 3-4: Critical Aircraft Fleet at Chippewa Valley Regional Airport								
		Runway Length	Annual IFR Operations					
Aircraft	**RDC**	**Category**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
12,500lbs.-60,000lbs. (75% of Fleet)								
Citation II/Bravo	B-II	75% of Fleet	2,598	3,042	3,320	3,042	2,744	2,506
Citation V/Ultra/Encore	B-II	75% of Fleet	144	316	122	34	22	310
Citation Excel	B-II	75% of Fleet	70	88	68	80	108	80
Citation CJ1	B-II	75% of Fleet	64	62	56	40	40	50
Learjet 35	D-I	75% of Fleet	36	96	56	54	56	32
Beechjet 400	C-I	75% of Fleet	40	34	28	14	32	32
Citation Sovereign	B-II	75% of Fleet	10	4	16	18	16	30
Other		75% of Fleet	244	216	186	152	130	130
75% of Fleet Total			***3,206***	***3,858***	***3,852***	***3,434***	***3,148***	***3,170***
12,500lbs.-60,000lbs. (Remaining 25 % of Fleet)								
Citation III	B-II	Remaining 25% of Fleet	202	226	208	156	188	196
Citation X	C-II	Remaining 25% of Fleet	224	216	206	160	172	206
Hawker 800XP	C-II	Remaining 25% of Fleet	82	72	50	68	64	26
Learjet 45	C-I	Remaining 25% of Fleet	32	34	36	24	28	32
Israel 1125 Astra	B-II	Remaining 25% of Fleet	24	44	14	8	14	2
Other		Remaining 25% of Fleet	46	60	56	52	120	60
Remaining 25% of Fleet Total			***610***	***652***	***568***	***468***	***586***	***522***
> 60,000lbs.or Regional Jet (Scheduled Commercial Service)								
Bombardier CRJ-200	C-II	53,000 Pounds	450	176	50	20	1,728	1,560
Boeing 737-800	C-III	> 60,000 Pounds	32	30	44	36	38	36
Bombardier CRJ-700	C-II	> 60,000 Pounds	0	2	28	50	22	14
McDonnell Douglas MD-83	C-III	> 60,000 Pounds	4	0	0	0	0	16
Other		Commercial Aircraft	44	50	50	34	48	50
Scheduled Commercial Service Total			***526***	***258***	***172***	***140***	***1,836***	***1,660***

Sources: Aviation Week Aerospace Source Book 2011; FAA Enhanced Traffic Management System Counts (ETMSC)

Note: VFR operations not included. Typically IFR operations account for 80 to 90 percent of total jet aircraft operations.

For the purpose of determining required runway length, the FAA groups aircraft into three categories: 12,500 pounds or less, greater than 12,500 pounds but less than 60,000 pounds, and greater than 60,000 pounds (and regional jets of any weight). The categorization of the critical design aircraft determines the method that should be used to establish the required runway length. Aircraft weighing less than 12,500 pounds are not shown in Table 3-4, as they typically do not require as much runway length as larger aircraft.

The FAA further divides aircraft greater than 12,500 pounds but less than 60,000 pounds into two family groupings: aircraft that make up 75% of the fleet (75% of fleet), and the remaining 25% of aircraft that make up 100% of the fleet (remaining 25% of fleet). Aircraft within these two family groupings have similar performance characteristics and operating weights. The 75% of fleet aircraft are defined as those requiring less than 5,000 feet of runway at mean sea level and the standard day temperature (SDT) of 59°F. The remaining 25% of fleet aircraft are defined as those requiring at least 5,000 feet of runway at mean sea level and the SDT of 59°F, and make up 100% of aircraft greater than 12,500 pounds but less than 60,000 pounds when combined with the 75% of fleet aircraft.

As shown in Table 3-4, 75% of fleet aircraft made regular use of the Airport from 2006 to 2011 on a consistent basis, exceeding 500 annual IFR operations in each of these six years. Remaining 25% of fleet aircraft also made regular use of the Airport during this period, ranging from 468 to 652 annual IFR operations. As a result, IFR operational levels for both family groupings of aircraft qualify as "regular use" according to FAA criteria. The runway length requirements of the remaining 25% of fleet aircraft are most important to consider because:

- There are at least two remaining 25% of fleet airplane based at the Airport (Citation III and Citation X);
- Based aircraft operators plan to acquire other large aircraft in the future;
- The remaining 25% of fleet aircraft operating at the Airport also include a wide variety of transient users and aircraft types; and
- The operations data that are available and shown in Table 3-4 understate actual aircraft operations because they do not include VFR operations, which typically account for an additional 10% to 20% of operations.

The second step in determining runway length requirements is to identify the airplanes that will require the longest runway lengths at their maximum certified takeoff weights (MTOWs). The combination of the three groups of aircraft types shown in Table 3-4 represents the critical fleet mix at the Airport and forms the basis for which the appropriate runway length should be determined. The FAA has outlined separate methods for determining the appropriate runway length for each of these three groups in AC 150/5325-4B.

The third step in determining runway length requirements is to reference FAA AC 150/5325-4B Table 1-1, and the airplanes identified in Table 3-4 to identify the method that will be used for establishing the recommended runway length. For aircraft greater than 12,500 pounds but less than 60,000 pounds, runway length is determined utilizing runway length charts contained in Chapter 3 of the AC for the two family groupings at both 60% and 90% useful loads. Runway length requirements for both the 75% of fleet and 100% of fleet family grouping of aircraft within the 12,500 to 60,000 pound category were examined. For individual aircraft greater than 60,000 pounds and regional jets, the manufacturer's Airport Planning Manual must be consulted. Runway length requirements for three individual aircraft models in this category – the Boeing 737-800, the McDonnell Douglas MD-83, and the Bombardier CRJ-200 – were also examined utilizing these manuals.

The fourth step in determining runway length requirements is to select the required unadjusted runway length per the process identified in AC 150/5325-4B Chapters 3 and 4. Both unadjusted takeoff and landing runway length requirements must be determined in order to determine the recommended runway length. The fifth and final step is to adjust these runway length requirements for effective runway gradient or wet/slippery runway conditions, as instructed by AC 150/5325-4B. The longest of the resulting takeoff and landing runway lengths for the critical design aircraft under evaluation is the required primary runway length for the airport in question. These last two steps are described for critical design aircraft takeoff and landing operations in subsequent sections below.

Temperature and Elevation Parameters

According to AC 150/5325-4B, the Airport temperature parameter should be set equal to the mean daily maximum temperature of the hottest month at the Airport. According to the National Oceanic and Atmospheric Administration, the hottest month in Eau Claire is typically July, with a mean daily maximum temperature of 82.9ºF. According to its Airport Layout Plan, the elevation of Chippewa Valley Regional Airport is 913 feet above MSL. Elevation and its relationship to Standard Day Temperatures are shown in **Table 3-5**.

Table 3-5: Relationship Between Airport Elevation and Standard Day Temperature

Airport Elevation	Standard Day Temperature
Sea Level	59°F (15°C)
2,000 feet (610 meters) MSL	51.9°F (11.1°C)
4,000 feet (1,220 meters) MSL	44.7°F (7.1°C)
6,000 feet (1,830 meters) MSL	37.6°F (3.1°C)
8,000 feet (2,440 meters) MSL	30.5°F (-0.8°C)
10,000 feet (3,050 meters) MSL	23.3°F (-4.8°C)

Source: Boeing 737-800 Airport Planning Manual

MSL = above mean sea level

GA Jet Fleet Takeoff Length Requirements

Unadjusted required runway lengths for 75% and 100% of the GA jet aircraft fleet at Chippewa Valley Regional Airport are shown in **Table 3-6** below and in **Figure 3-2** on the next page.

Table 3-6: GA Jet Aircraft Fleet – Unadjusted Required Runway Lengths

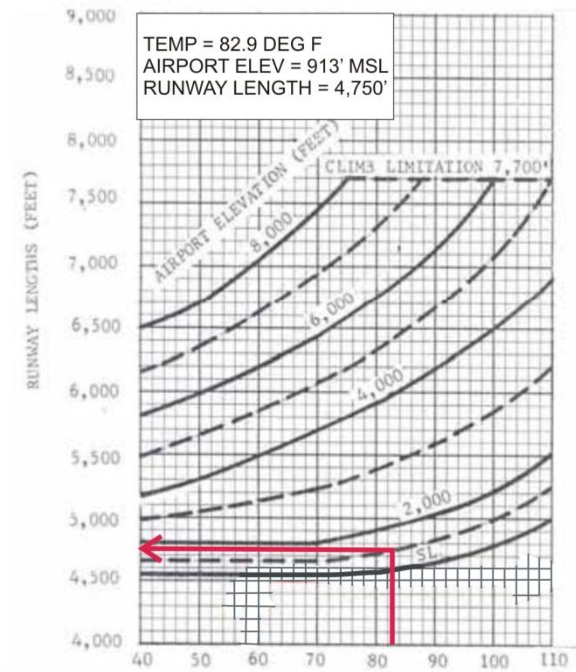
Aircraft Type/Class	Required Runway Length @ 60% Useful Load	Required Runway Length @ 90% Useful Load
75% of GA Jet Fleet	4,750 feet	6,350 feet
100% of GA Jet Fleet	5,400 feet	8,100 feet

Source: FAA AC 150/5325-4B

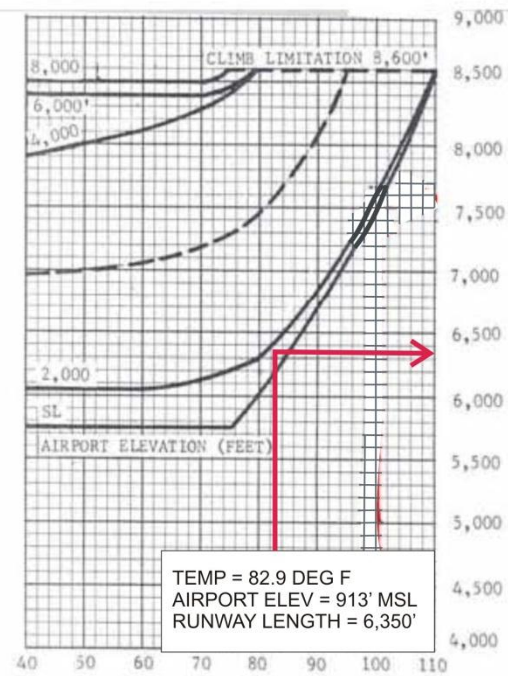
Note: The lengths in this table assume no wind, a dry runway surface, and zero effective runway gradient. Length adjustments for effective runway gradient apply only to takeoff operations, and length adjustments for wet and slippery runway conditions apply only to landing operations. No length adjustment is allowed for wind. In subsequent sections, the lengths in this table are adjusted for actual effective runway gradient to determine required takeoff lengths, and adjusted for wet and slippery runway conditions to determine required landing lengths.

Figure 3-2: Performance Charts – Aircraft Greater than 12,500 Pounds but less than 60,000 Pounds

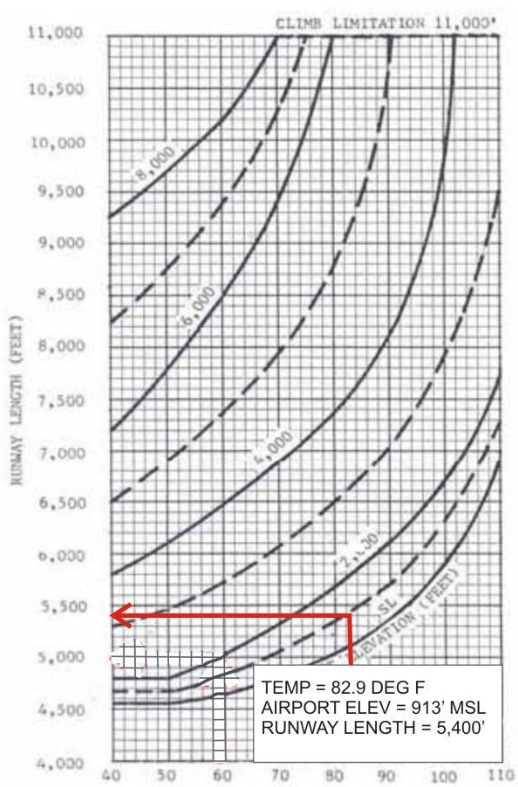
75% OF FLEET AT 60% USEFUL LOAD



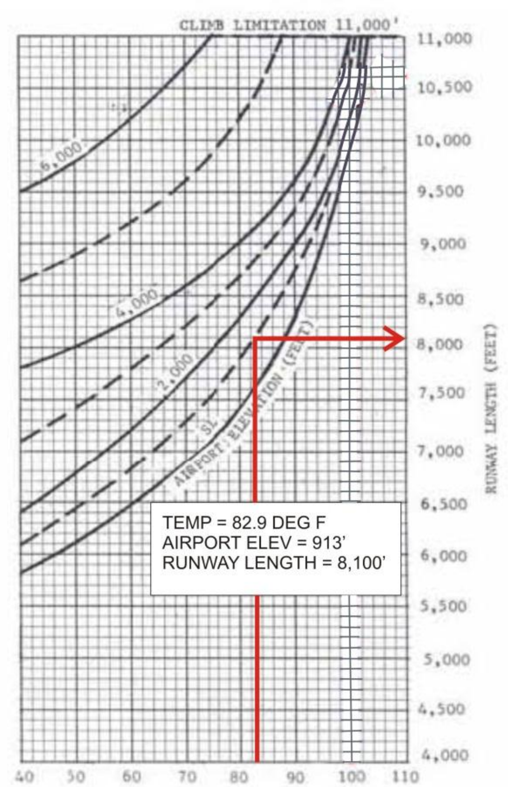
75% OF FLEET AT 90% USEFUL LOAD



100% OF FLEET AT 60% USEFUL LOAD



100% OF FLEET AT 90% USEFUL LOAD



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

Note: X-axis value is mean daily maximum temperature of the hottest month of the year, in degrees Fahrenheit.

As shown in Table 3-6 and Figure 3-2, this method yields required runway lengths for two distinct useful load categories within the 75% and 100% of Fleet family groupings, i.e. 60% and 90% useful load. Useful load is the difference between the maximum allowable structural gross weight and the operating empty weight of an aircraft. In short, useful load consists of pilot, crew, passengers, cargo, and usable fuel. Generally, longer haul lengths require higher useful loads to accommodate fuel carriage and consumption. AC 150/5325-4B, Paragraph 303, states that the 60% useful load curve "is to be used for those aircraft operating with no more than a 60% useful load factor." As a result, the 60% useful load curve should be used for operations with useful loads up to and including 60%, and the 90% useful load curve should be used for operations with useful loads above 60%.

Weight restrictions resulting from inadequate runway length have a significant impact on operators' ability to maximize efficiency by taking off with an ideal fuel, passenger, and cargo load. Reduction in passenger and cargo load reduces operator revenues, and acquiring fuel at another airport en route to the final destination is inconvenient for both the operator and its customers, and results in additional operating costs. For example, based aircraft flight crews carry as much fuel as possible when flying out of EAU because (1) the nature of their daily operations involves time-sensitive round-trip flights to and from various destination airports around the country, and (2) fuel is less expensive to acquire at EAU compared to fuel prices at their destination airports.

AC 150/5325-4B, Paragraph 302, states that required takeoff lengths should be selected "on the basis of the haul length and service needs of the critical design airplanes." Based on this guidance, the 90% useful load required runway lengths for the GA jet fleet were carried forward as the required unadjusted takeoff lengths for GA jet operators at EAU.

Scheduled Commercial Fleet Takeoff Length Requirements

In addition to determining the required takeoff length for the GA jet fleet, takeoff length requirements of the most demanding individual scheduled commercial aircraft operating at the Airport (the Boeing 737-800, MD-83, and CRJ-200) were also examined. Airport Planning Manuals for these aircraft models provide takeoff runway length data for International Standard Atmosphere (ISA) conditions (59° F, 20 degree flaps, zero wind, and a dry runway at mean sea level). When factoring for the Airport elevation and the mean daily maximum temperature of the hottest month, the ISA + 15ºC (82.9ºF) cohort determines required takeoff length at Chippewa Valley Regional Airport.

Based on correspondence with the operator of the Boeing 737-800, it was determined that when filled to capacity with 162 passengers, baggage, and a mission-appropriate fuel load, the aircraft has a takeoff weight of approximately 156,000 pounds. This means that upon takeoff, the aircraft is operating at a useful load factor of approximately 80%. For the purpose of this runway length analysis, it is assumed that other scheduled commercial aircraft operating at EAU typically take off with a similar useful load factor. Unadjusted takeoff length requirements for the Boeing 737-800, MD-83, and CRJ-200 at both maximum certificated takeoff weight (MTOW) and at 80% useful load are shown in **Table 3-7** on the next page.

Table 3-7: Scheduled Commercial Aircraft Fleet – Unadjusted Takeoff Length Requirements				
Aircraft Model	**Maximum Certificated Takeoff Weight (MTOW)**	**Required Runway Length @ MTOW**	**Takeoff Weight @ 80% Useful Load**	**Required Runway Length @ 80% Useful Load**
Boeing 737-800	174,000 lbs.	**11,300 feet**	156,000 lbs.	**7,400 feet**
MD-83	160,000 lbs.	**8,900 feet**	144,000 lbs.	**6,900 feet**
CRJ-200	53,000 lbs.	**7,500 feet**	48,000 lbs.	**5,950 feet**

Source: Airport Planning Manuals, FAA AC 150/5325-4B

Note: These lengths assume no wind, a dry runway surface, and zero effective runway gradient.

As shown in Table 3-7, the required unadjusted takeoff lengths for the scheduled commercial aircraft fleet range from 5,950 feet to 7,400 feet at 80% useful load, and from 7,500 feet to 11,300 feet at MTOW. Because current operating procedures at the Airport are not likely to involve takeoff at MTOW, the 80% useful load takeoff lengths for the scheduled commercial aircraft fleet were carried forward as the required unadjusted takeoff lengths for scheduled commercial operators at EAU. However, it should be noted that these lengths will limit future commercial operations if airline operating procedures change, or if airlines desire to initiate new routes to destinations further afield.

Takeoff Length Requirements Adjusted for Effective Runway Gradient

The fifth step in determining required takeoff length is to apply an adjustment for effective runway gradient to the unadjusted takeoff lengths. A runway whose centerline elevation varies between runway ends produces uphill and downhill conditions, which, in turn, cause certain airplane weight categories to require longer operational lengths. Required takeoff length must be increased by 10 feet per foot of difference in elevation between the high and low points of the runway centerline. The difference between the high and low points of Runway 4/22 at Chippewa Valley Regional Airport is 24.3 feet; as a result, each unadjusted takeoff length should be increased by 243 feet.

Adjusted takeoff length requirements for the GA jet and scheduled commercial aircraft fleets at EAU are shown in **Table 3-8**.

Table 3-8: Adjusted Takeoff Length Requirements		
Aircraft Type/Class	**Unadjusted Takeoff Length**	**Takeoff Length Adjusted for Centerline Elevation**
75% of GA Jet Fleet	6,350 feet	**6,593 feet**
100% of GA Jet Fleet	8,100 feet	**8,343 feet**
Boeing 737-800	7,400 feet	**7,643 feet**
MD-83	6,900 feet	**7,143 feet**
CRJ-200	5,950 feet	**6,193 feet**

Source: Airport Planning Manuals, FAA AC 150/5325-4B

Landing Length Requirements

AC 150/5325-4B provides an adjustment for jet aircraft landing operations under wet or slippery runway conditions, because these conditions negatively affect aircraft braking performance. For GA jet fleet runway lengths obtained from the 60% Useful Load curves shown in Figure 3-2, the increase provided for landing operations is 15% or up to a 5,500-foot length, whichever is less. If the unadjusted runway length exceeds 5,500 feet, no adjustment is provided. For GA jet fleet runway lengths obtained from the 90% Useful Load curves, the increase provided for landing operations is 15% or up to a 7,000-foot length, whichever is less. If the unadjusted runway length requirement exceeds 7,000 feet, no adjustment is provided. The resulting required landing lengths for the GA jet fleet at EAU are presented in **Table 3-9**.

Table 3-9: GA Jet Aircraft Fleet – Landing Length Requirements

Aircraft Type/Class	Required Runway Length @ 60% Useful Load	Required Runway Length @ 90% Useful Load
75% of GA Jet Fleet	5,462 feet	**7,000 feet**
100% of GA Jet Fleet	5,500 feet	**8,100 feet**

Source: FAA AC 150/5325-4B

According to the AC 150/5325-4B methodology, the required landing lengths for 75% of the GA jet fleet are longer than required takeoff lengths. The required landing length for 100% of the GA jet fleet at 60% useful load is longer than the required takeoff length, but less than the required takeoff length at 90% useful load. The existing length of Runway 4/22 is adequate to accommodate landing operations by the GA jet fleet at EAU.

For regional jets and aircraft greater than 60,000 pounds, AC 150/5325-4B instructs that landing length requirements be determined by setting the operating landing weight equal to the maximum certificated landing weight. When provided by the manufacturer's Airport Planning Manual, landing length requirements should be determined by utilizing landing operation performance curves for wet runway conditions. When wet runway performance curves are not provided, the obtained landing weight for dry runway conditions should be increased by 15%. The resulting required landing lengths for the scheduled commercial aircraft fleet at EAU are shown in **Table 3-10**.

Table 3-10: Scheduled Commercial Aircraft Fleet – Landing Length Requirements

Aircraft Model	Landing Weight	Unadjusted Landing Length (Dry)	Landing Length Adjusted for Wet or Slippery Runway Conditions
Boeing 737-800	146,300 pounds	6,216 feet	**7,168 feet**
MD-83	160,000 pounds	5,936 feet	**6,944 feet**
CRJ-200	47,000 pounds	5,600 feet	**6,440 feet**

Source: Airport Planning Manuals, FAA Runway Length Calculator

Notes: Landing lengths were selected from landing charts associated with the highest possible flap setting. These lengths assume maximum landing weight, standard day atmospheric conditions, zero wind, and zero effective runway gradient. The obtained lengths were then adjusted for mean maximum daily temperature of the hottest month using the FAA runway length calculator.

For the Boeing 737-800 and MD-83, the runway length required for landing is less than it is for takeoffs. For the CRJ-200, the landing length is greater than the takeoff length. The existing length of Runway 4/22 is adequate to accommodate landing operations by the scheduled commercial aircraft fleet at EAU.

Runway 4/22 Length Analysis - Conclusion

The takeoff and landing length requirements for the critical aircraft fleet at EAU are summarized in **Table 3-11**. The required takeoff lengths for the critical design aircraft range from 6,193 feet to 8,343 feet, while the required landing lengths range from 6,440 feet to 8,100 feet. Based on balanced consideration of the haul lengths and service needs of GA and scheduled commercial service aircraft operating at the Airport, it is recommended that the primary runway's existing 8,101-foot length be maintained throughout the 20-year planning period.

Table 3-11: Critical Aircraft Fleet Runway Length Requirements Summary

Aircraft Model/Family Grouping	Takeoff Length Requirements	Landing Length Requirements
75% of GA Jet Fleet	6,593 feet	7,000 feet
100% of GA Jet Fleet	8,343 feet	8,100 feet
Boeing 737-800	7,643 feet	7,168 feet
MD-83	7,143 feet	6,944 feet
CRJ-200	6,193 feet	6,440 feet

3.2.3 Runway 4/22 Declared Distances

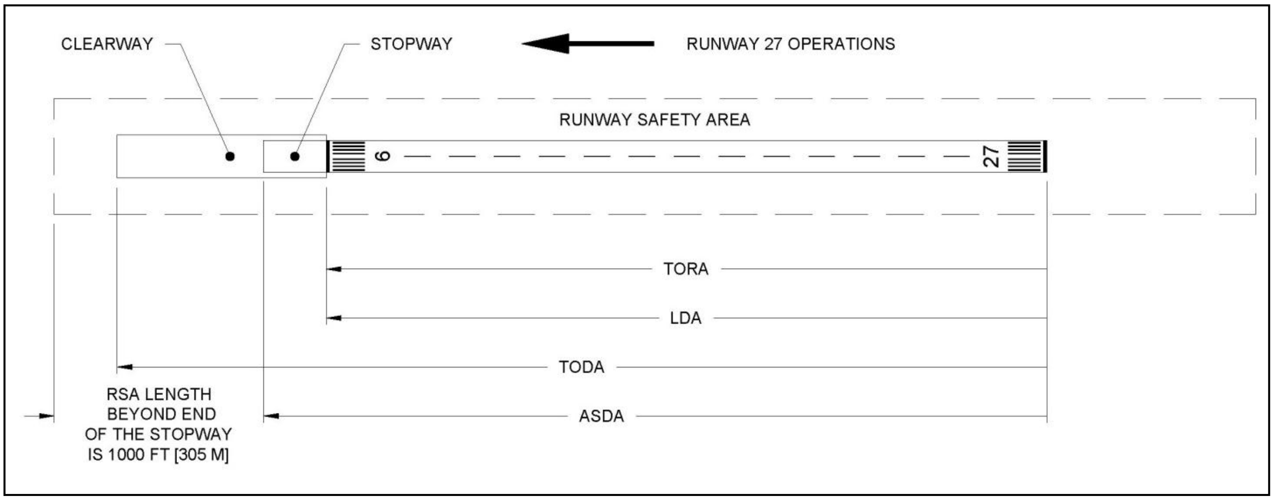
Declared distances are the runway length distances declared by the airport owner as available and suitable for satisfying an aircraft's takeoff run, takeoff distance, accelerate-stop distance, and landing distance requirements. These distances must be FAA-approved and published in the Airport/Facility Directory. Pilots take these distances into account during flight planning to determine whether they are sufficient for their airplane's performance characteristics given the meteorological and runway surface conditions at the time of their flight. The definitions of the four distances are described below and presented in **Figure 3-3**:

- **Takeoff run available (TORA):** The length of the runway declared available and suitable to satisfy acceleration from brake release to lift-off, plus safety factors. This shall not exceed the length of the runway.
- **Takeoff distance available (TODA):** The TORA plus the length of any remaining runway or clearway[1] beyond the TORA declared available for acceleration from brake release past lift-off to start of takeoff climb, plus safety factors. This shall not exceed the length of the runway plus the clearway.

[1] A clearway is an area extending beyond the runway end free of obstructions that allows aircraft to complete takeoffs. The addition of a clearway to a runway increases the TODA. Typically the clearway is at least 500 feet wide, and a maximum of 1,000 feet long. The clearway is required to be under airport control to ensure that the vertical plane is unobstructed.

- **Accelerate-stop distance available (ASDA):** The length of runway plus stopway[2] declared available and suitable to satisfy acceleration from brake release to takeoff decision speed (V_1), and then deceleration to a stop, plus safety factors. This shall not exceed the length of the runway plus the stopway.
- **Landing distance available (LDA):** The distance from the threshold to complete the approach, touchdown, and deceleration to a stop, plus safety factors. This shall not exceed the length of the runway.

Figure 3-3: Visual Representation of Declared Distances



Source: FAA Advisory Circular 150/5300-13A, Airport Design
Note: This diagram is included for informational purposes and does not reflect conditions for Runway 4/22 at EAU.

According to FAA Advisory Circular 150/5300-13A, *Airport Design*, the use of declared distances is limited "to cases of existing constrained airports where it is impracticable to provide the runway safety area (RSA), the runway object free area (ROFA), or the runway protection zone (RPZ)" in accordance with design standards. Prior to 2003, the RSA and ROFA beyond the Runway 4 threshold at Chippewa Valley Regional Airport extended across Airport Road and, as a result, were not in compliance with FAA design standards. In 2003, the Runway 4 threshold was displaced by 800 feet to provide a compliant RSA and ROFA, and Runway 22 was extended by 800 feet, resulting in the current 8,101-foot runway length. Declared distances were then instituted.

In 2011, the Airport's FAA Part 139 Inspector determined that the Runway 4 threshold had actually been displaced by 801 feet rather than the intended 800 feet. Because the published declared distances for Runway 4/22 reflect an 800-foot displacement, this one-foot difference may alter some of the declared distances. As a result, all declared distances for Runway 4/22 were reviewed for this Master Plan Update to assess their accuracy and appropriateness for the existing conditions at the Airport.

[2] A stopway is an area beyond the takeoff runway threshold that can be used by decelerating aircraft during an aborted takeoff. The addition of a stopway to a runway end increases the ASDA. The stopway must be at least as wide as the runway and able to support an aircraft without causing structural damage.

Each declared distance has different requirements with regard to the RSA and ROFA both behind and in front of an aircraft when taking off or landing. These different requirements were compared against existing conditions at the Airport to determine the appropriate declared distances for Runway 4/22.
Based on this analysis it was determined that there are two sets of possible declared distances which could be implemented at EAU in the future. The first set is the current allowable declared distances given existing threshold and navigational aid locations (see **Figure 3-4**). The second set is the longest possible declared distances on the existing Runway 4/22 pavement if the Runway 4 landing threshold and all associated navigational aids were relocated 401 feet to the southwest (see **Figure 3-5**). The current published declared distances for Runway 4/22 are compared to these two possible sets of declared distances in **Table 3-12**.

Table 3-12: Runway 4/22 Declared Distances				
Runway	**TORA**	**TODA**	**ASDA**	**LDA**
Current Published Declared Distances				
4	8,101’	8,101’	8,101’	7,301’
22	7,301’	7,301’	7,301’	7,301’
Current Allowable Declared Distances				
4	8,101’	8,101’	8,101’	**7,300’**
22	**8,101’**	**8,101’**	7,301’	7,301’
Longest Possible Declared Distances				
4	8,101’	8,101’	8,101’	**7,701’**
22	**8,101’**	**8,101’**	7,301’	7,301’

Note: Highlighted distances are those which are different from the current published declared distances.

TORA = Takeoff Run Available *ASDA = Accelerate Stop Distance Available*

TODA = Takeoff Distance Available *LDA = Landing Distance Available*

Source: FAA Airport Facility Directory, 2 MAY 2013 to 27 JUN 2013

This Master Plan Update recommends that development alternatives consider future implementation of the longest possible declared distances. The following sections describe the RSA requirements for each individual declared distance and explain how the two possible sets of declared distances shown in Table 3-12 were determined.

Takeoff Run Available (TORA)

The TORA does not require any RSA either behind or in front of a departing aircraft. In most cases, the TORA equals the length of the runway pavement, regardless of the amount of RSA beyond each runway end. There are no unique circumstances at the Airport that would prevent the TORA from being equal to the runway pavement length. Based on these conditions, the longest possible TORA for both Runway 4 and Runway 22 is 8,101 feet. The Runway 22 TORA should be updated to reflect this longer possible length.

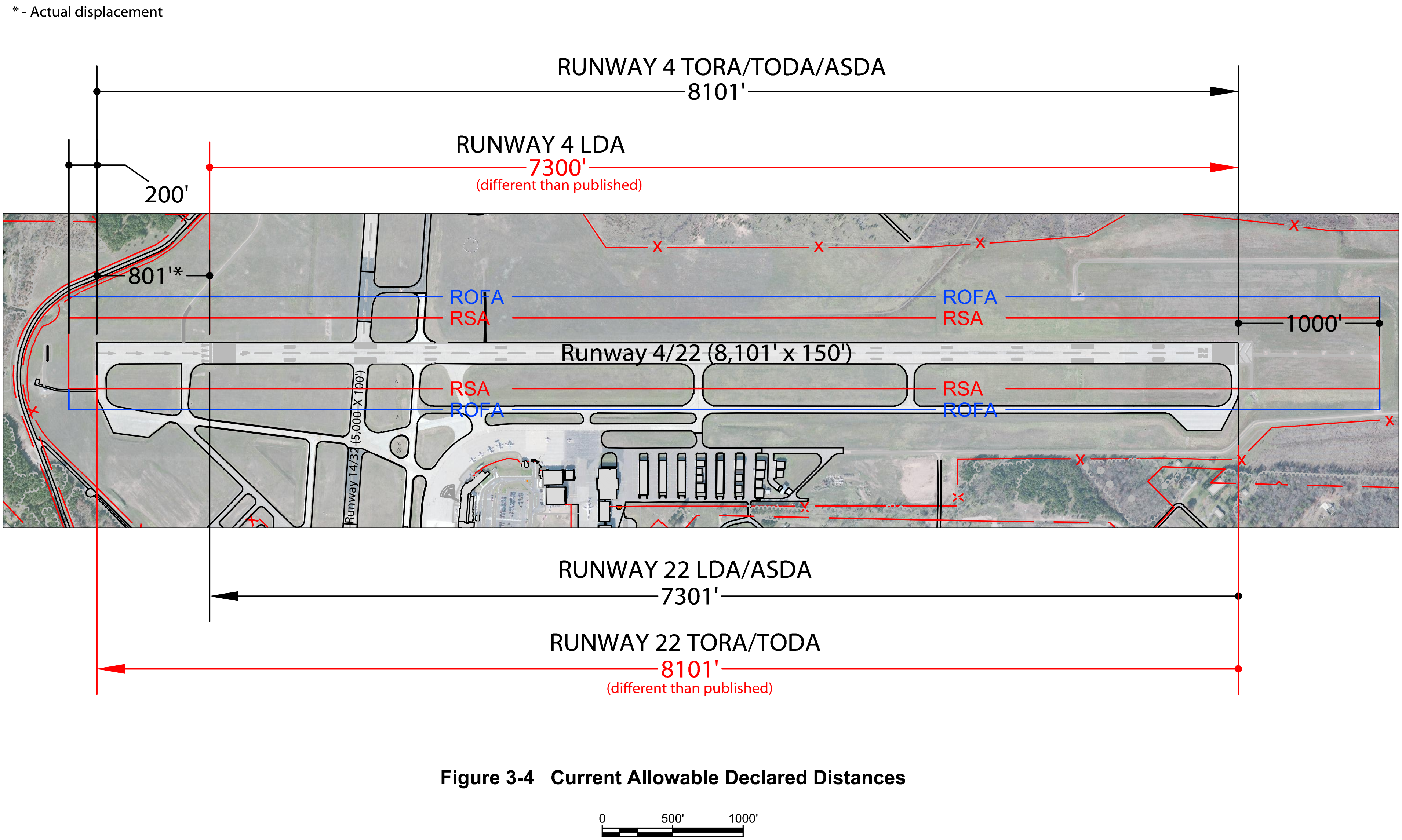


Figure 3-4 Current Allowable Declared Distances

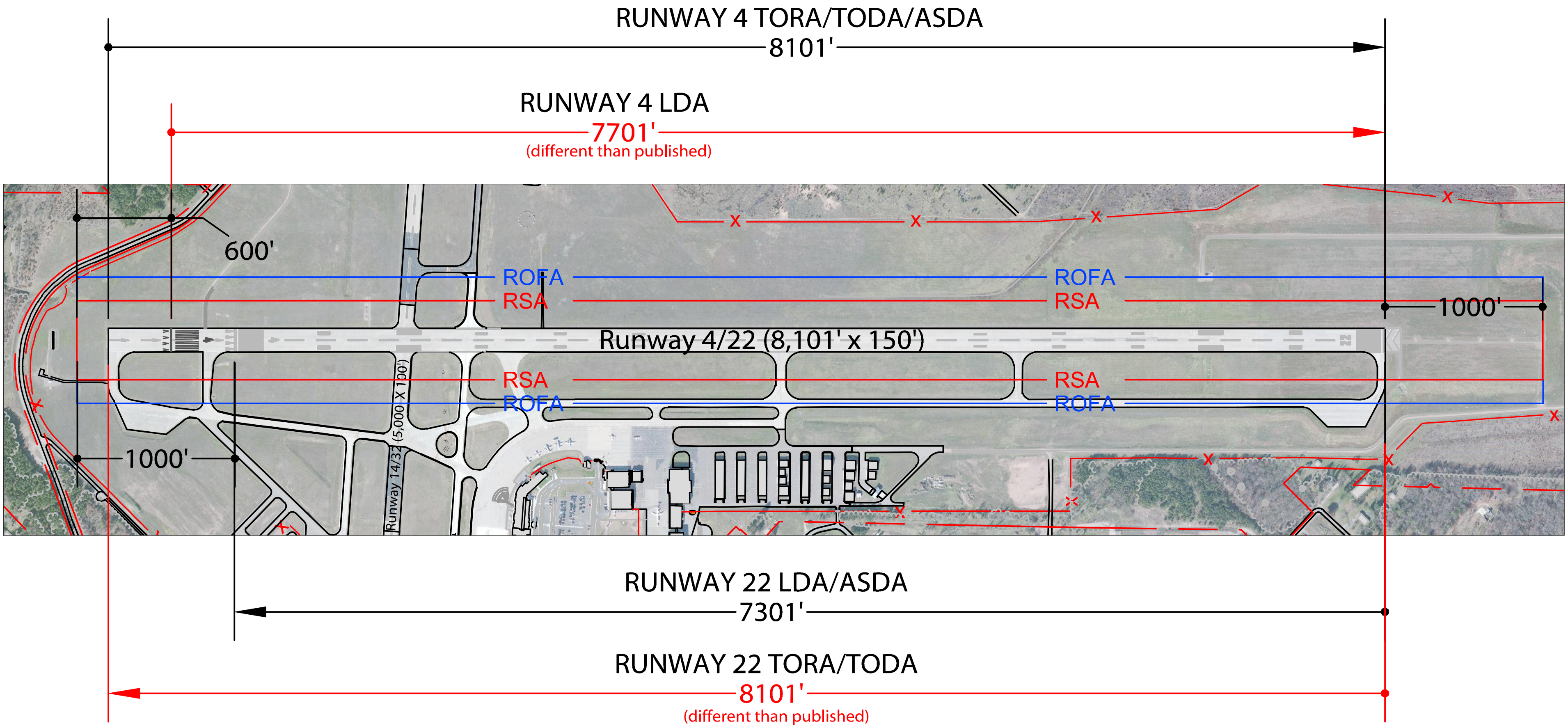


Figure 3-5 Longest Possible Declared Distances

0 500' 1000'

Takeoff Distance Available (TODA)

The TODA also does not require any RSA either behind or in front of a departing aircraft. In the absence of a clearway, the TODA usually equals the length of the runway pavement, regardless of the amount of RSA beyond each runway end. No clearways have been established for Runway 4/22, and there are no unique circumstances at the Airport that would prevent the TODA from being equal to the runway pavement length. Based on these conditions, the longest possible TODA for both Runway 4 and Runway 22 is 8,101 feet. The Runway 22 TODA should be updated to reflect this longer possible length.

Accelerate-Stop Distance Available (ASDA)

The ASDA does not require any RSA behind a departing aircraft, but does require 1,000 feet of RSA in front of a departing aircraft in the event of an aborted takeoff. The 1,000-foot RSA requirement is based on the runway's ultimate D-III Runway Design Code (RDC) and its ½-statute mile approach visibility minimum. There is currently 1,000 feet of RSA in front of the existing Runway 22 pavement end. As a result, an aircraft departing on Runway 4 can use the entire runway pavement length as ASDA. There is currently 200 feet of RSA in front of the existing Runway 4 pavement end, and the existing 801-foot displacement of the Runway 4 threshold provides 1,001 feet of RSA in front of the displaced threshold. As a result, an aircraft departing on Runway 22 can use as ASDA the pavement length starting at the existing Runway 22 pavement end and ending one foot beyond the Runway 4 displaced threshold. Based on these conditions, the appropriate ASDA for Runway 4 is 8,101 feet, and the appropriate ASDA for Runway 22 is 7,301 feet. As a result, no changes are recommended for either ASDA.

Landing Distance Available (LDA)

The LDA requires 600 feet of RSA prior to the landing threshold, and 1,000 feet of RSA in front of the landing aircraft. These RSA requirements are also based on the runway's RDC and approach visibility minimum. The Runway 4 threshold was displaced to provide adequate RSA for landing aircraft, and currently provides 1,001 feet of RSA prior to the landing threshold. This is 401 feet more than the FAA standard requires. Because of this discrepancy between the FAA standard and existing conditions at the Airport, aircraft could theoretically land 401 feet prior to the displaced Runway 4 threshold as marked, assuming a clear obstruction environment in the approach area. Because there is 1,001 feet of RSA in front of the existing Runway 22 pavement end, the longest possible LDA for the existing Runway 4/22 pavement is 7,701 feet. However, declaring as available for landing the 401 feet of pavement prior to the existing displaced threshold would require re-marking the runway pavement and relocating numerous visual and navigational aids on the airfield. Given existing pavement markings and equipment locations, the longest possible LDA for Runway 4/22 is 7,300 feet. Because there is 600 feet of RSA prior to the existing Runway 22 landing threshold and 1,001 feet of RSA in front of the existing Runway 4 displaced threshold, the longest possible LDA for Runway 22 is 7,301 feet. The Runway 4 LDA should be updated to 7,300 feet, to reflect the one-foot difference in the Runway 4 threshold displacement. However, the Airport should consider relocating the displaced threshold in the future to provide the longest possible Runway 4 LDA of 7,701 feet.

3.2.4 Runway 14/32 Length

Windy conditions have a greater effect on general aviation aircraft than the commercial aircraft that operate at EAU, and commercial aircraft typically do not use crosswind Runway 14/32 on a regular basis. As such, required length for Runway 14/32 is based on general aviation aircraft that use the facility during adverse conditions.

The existing length of Runway 14/32 is 5,000 feet. Based on discussions with based users and Airport staff, based jet and turboprop aircraft greater than 12,500 pounds maximum certificated takeoff weight (MTOW) – referred to as "large aircraft" for the remainder of this section – are the most demanding aircraft that use Runway 14/32 on a regular basis (at least 500 annual operations). Large based aircraft operations at EAU fall into one of two categories: operations conducted by charter aircraft, and operations conducted by corporate aircraft. For the purpose of this analysis, it is assumed that approximately 15 percent of annual operations by large based aircraft occur on crosswind Runway 14/32. Instrument Flight Rule (IFR) operations data for the calendar year 2011 was acquired from FlightAware, a company that tracks and records aircraft flight information. Operations and haul lengths for large based aircraft model are shown in **Table 3-13**.

Table 3-13: Large Based Aircraft Operations and Haul Lengths (2011)

Aircraft Model	MTOW	RDC	Operations	Typical Round-Trip Haul Length
Beech 1900D	17,600 lbs	B-II	1,228	600 nm
Embraer 120 Brasilia	26,433 lbs	B-II	380	750 nm
Citation II/Bravo	14,800 lbs	B-II	2,506	1,000 nm
Citation III	22,000 lbs	B-II	182	1,000 nm
Citation Encore	16,630 lbs	B-II	310	1,000 nm
Citation X	36,100 lbs	C-II	206	2,000 nm
Total Large Based Aircraft Operations			4,812	

Source: FlightAware, Inc.
Note: MTOW = Maximum Certificated Takeoff Weight. VFR operations not included. Typically IFR operations account for 80 to 90 percent of total jet aircraft operations. Haul lengths reflect typical round-trip, multi-stop aircraft missions; some routes for these aircraft may be shorter or longer.

Aircraft haul lengths were determined by measuring the round-trip distance of typical routes. Most based aircraft have specific regions they fly to. Typical routes with multiple destinations indicate a loop where the aircraft leaves EAU, and makes multiple landings before returning to the Airport. The haul lengths assume that aircraft have enough fuel upon takeoff from EAU to complete their entire round-trip route without refueling. Individual aircraft payload ranges were examined to verify that this is a valid assumption.

Assuming that based large aircraft operators conduct 15% of their annual operations on Runway 14/32, there were approximately 720 annual operations on Runway 14/32 in 2011 by based large aircraft alone. There are also additional operations conducted on Runway 14/32 by transient large aircraft operators; however the number of these additional operations cannot be estimated with accuracy. Based on this assessment, large aircraft currently use Runway 14/32 on a regular basis, as defined by FAA.

As discussed previously with regard to Runway 4/22, Chapter 3 of AC 150/5325-4B describes runway length requirements for large aircraft greater than 12,500 pounds but less than 60,000 pounds. Based on the aircraft types and typical haul lengths described in Table 3-13, Runway 14/32 should be designed to accommodate 75% of the aircraft fleet at 90% useful load. The unadjusted runway length required for this family grouping is 6,350 feet at EAU. When adjusting for a runway gradient of 0.1%, the recommended length for Runway 14/32 is 6,400 feet.

The existing location and orientation of Runway 14/32 as well as topography and land uses surrounding the runway will make achieving a 6,400-foot crosswind runway length difficult without realigning the runway. However the Airport should seek to maximize the length of the crosswind runway to accommodate existing based and transient users.

3.2.5 Runway Design Criteria

Airport design criteria are based on FAA Advisory Circular 150/5300-13A, *Airport Design*. Criteria should be selected based upon analysis of current and future aircraft operating at the Airport, and are driven largely by the Runway Design Code (RDC) of the most demanding aircraft. As described in Chapter 1 of this Master Plan Update, the RDC considers both aircraft approach category (denoted by a letter between A and E) and the airplane design group (denoted by a roman numeral between I and VI). These elements are the combined to give runways at an airport a unique code. This section defines each element of this code for each runway at EAU.

Aircraft approach categories are determined according to the most demanding aircraft's approach speed. Runway 4/22 is currently designed for category C standards to accommodate classic Boeing 737 models, while Runway 14/32 is currently designed for category B standards to accommodate based and transient general aviation users. However according to the runway length analysis conducted for this Master Plan Update, it is anticipated that the next generation Boeing 737 and the CRJ-200, both category D aircraft, will be the aircraft with the fastest approach speeds that will operate at EAU in the future. As a result, Runway 4/22 should be designed for category D standards in the future, and Runway 14/32 should be designed for category B standards throughout the 20-year planning period.

Aircraft design group relates to aircraft wingspan and tail height, whichever is most restrictive. According to the runway length analysis conducted for this Master Plan Update, it is anticipated that the Boeing 737-800, a category III aircraft, will be the aircraft with the longest wingspan and highest tail height that will operate at EAU in the future. Runway 4/22 is currently designed for group III standards to accommodate the Boeing 737-800 and similar aircraft, while Runway 14/32 is currently designed for group II standards based on the needs of based and transient general aviation operators. Based on anticipated future fleet mix, these design groups should continue to be applied throughout the 20-year planning period.

Based on the characteristics of the aircraft fleet that currently operates and is anticipated to continue operating at Chippewa Valley Regional Airport, **Table 3-14** on the next page describes the appropriate existing Runway Reference Code (RRC) and ultimate Runway Design Code (RDC) designations for primary Runway 4/22 and crosswind Runway 14/32.

Table 3-14: EAU Runway RRC/RDC Assignments				
	Existing		Ultimate	
Runway	RRC	Representative Aircraft	RDC	Representative Aircraft
Runway 4/22	C-III	Boeing 737-300	D-III	Boeing 737-800
Runway 14/32	B-II	Citation II/Bravo	B-II	Citation II/Bravo

Existing and future dimensional requirements for Runway 4/22 and 14/32 are shown in **Table 3-15** based on these existing RRC and future RDC designations, as well as existing and anticipated future instrument approach procedure minimums.

Table 3-15: Runway Dimensional Standards			
	Runway 4/22		Runway 14/32
Design Standard	Existing (C-III)	Future (D-III)	Existing/Future (B-II)
Runway Width	100’	150'	100'
Runway Shoulder Width	20’	25'	10'
Blast Pad Width	140’	200’	95'
Blast Pad Length	200’	200'	150'
Runway Safety Area (RSA) Width	500’	500'	150'
RSA Length Beyond Runway End	1,000’	1,000'	300'
RSA Length Prior to Landing Threshold	600’	600’	300’
Object Free Area (OFA) Width	800’	800'	500'
OFA Length Beyond Runway End	1,000’	1,000'	300'
Obstacle Free Zone (OFZ) Width	400’	400’	400’
OFZ Length Beyond Runway End	200’	200'	200'

Source: FAA AC 150/5300-13A, Airport Design
Note: All standard dimensions shown here are based on the lowest current instrument approach visibility minimums (1/2 mile for Runway 4/22 and visual for Runway 14/32). Design group II and III aircraft do not require stabilized or paved runway shoulder surfaces.

Because the Boeing 737-800 has a maximum certificated takeoff weight (MTOW) greater than 150,000 pounds, the D-III design standards for runway width, shoulder width, and blast pad width are greater than for aircraft less than 150,000 pounds MTOW. Runway 4/22 currently meets the 150’ runway width and 25’ runway shoulder standards for D-III aircraft greater than 150,000 pounds. However, Runway 4/22 does not currently have blast pads on either end to prevent jet blast erosion. Blast pads should be considered for Runway 4/22 in the future. None of the other runway dimensional standards in Table 3-15 increase with the RDC change from C-III to D-III, and Runway 4/22 currently meets these existing standards.

Runway 14/32 currently meets all B-II runway dimensional standards, except that it too does not currently have blast pads on either end. Blast pads should also be considered for Runway 14/32 in the future.

Adequate separation between runways and other aircraft movement areas must be provided to minimize the risk of incidents between aircraft on the runway and aircraft on taxiways and aircraft parking aprons.

Increases in runway separation standards associated with expected ultimate critical design aircraft upgrades are summarized in **Table 3-16**.

Table 3-16: Runway Separation Standards			
Dimension	**Runway 4/22**		**Runway 14/32**
	Existing (C-III)	**Ultimate (D-III)**	**Existing/Ultimate (B-II)**
Runway to Hold Line Separation	250’	260’	200’
Runway to Taxiway Separation	400’	400’	240’
Runway to Aircraft Parking Area Separation	500’	500’	250’

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

Note: All standard dimensions shown here are based on the lowest current instrument approach visibility minimums (1/2 mile for Runway 4/22 and visual for Runway 14/32).

The upgrade from C-III to D-III for Runway 4/22 will result in an increase in the runway to hold line separation standard from 250 to 260 feet. This is because, for approach category D aircraft, the 250-foot separation distance must be increased by 1 foot for each 100 feet above sea level. With the exception of the Taxiway Charlie hold line south of Runway 4/22, hold lines for all Runway 4/22 taxiway crossings will need to be relocated to meet the 260-foot standard. Runway 4/22 and Runway 14/32 currently meet all other runway separation standards listed in Table 3-16. Alternatives developed for this Master Plan Update should protect for the ultimate runway separation dimensions shown in Table 3-16.

Unique local conditions sometimes require modifications to airport design standards on a case-by-case basis. According to the Airport Layout Plan updated March 2012, there are no existing modifications to FAA airport design standards.

3.3 TAXIWAYS

Taxiways provide linkages by which aircraft travel between runways and aircraft parking areas. Taxiways require careful planning for optimum airport utility and minimal delays. Taxiway design is established by several factors, most notably the critical aircraft expected to use the taxiway. This section describes taxiway requirements at the Chippewa Valley Regional Airport. Taxiway requirements are discussed in the following sections:

- Taxiway Configuration Analysis
- Taxiway Design Standards
- Aircraft Hold Bays

3.3.1 Taxiway Configuration Analysis

The Chippewa Valley Regional Airport has an extensive taxiway system that supports aircraft operations by connecting the runways to the aircraft parking aprons and hangar areas. A taxiway system should provide for free movement to and from the runways, terminal area, and aircraft parking areas. A smooth flow should be provided with a minimum number of points requiring a change in the airplane’s taxiing speed.

In its current configuration as of 2012, portions of the taxiway system south of Runway 4/22 present operational issues and safety concerns. These concerns are primarily associated with unusual angles and connections between Taxiways 'A', 'B', 'C', and 'D'. Taxiway 'A' runs parallel to Runway 4/22 between Taxiway 'D' and the Runway 22 threshold. However, the taxiway angles away from Runway 4/22 between Taxiway 'D' and Runway 14/32, then angles back towards the Runway 4 threshold southwest of Runway 14/32. This angled configuration results in two operational issues. First, AC 150/5300-13A, *Airport Design*, recommends that all runways with instrument approach procedures have at least one full-length, fully-parallel taxiway. The purpose of this recommendation is to reduce aircraft operator confusion when taxiing during periods of low visibility and at night. The non-parallel segments of Taxiway 'A' do not comply with this full-length parallel taxiway recommendation. Second, the angled configuration results in a confusing triangle of intersections between Taxiway 'A', Taxiway 'B', and Taxiway 'C' immediately southwest of the commercial aircraft apron and immediately northeast of Runway 14/32. This triangle is labeled as a "hot spot" for aircraft incidents on the FAA Airport Diagram due to the close spacing of the taxiway intersections and their close proximity to Runway 14/32.

Taxiway 'D', located between Taxiway 'C' and Taxiway 'A4', historically served as a portion of the parallel taxiway to Runway 14/32. Today, Taxiway 'D' is an acute-angled "stub" taxiway that no longer connects to Runway 14/32. This configuration resulted when portions Taxiway 'D' north of Runway 4/22 were abandoned as part of a Taxiway 'C' realignment project during the 2000s. In 2011, the FAA Runway Safety Action Team (RSAT) for the Airport determined that Taxiway 'D' is in a location and configuration that causes safety concerns. The configuration of Taxiway 'D' causes two operational issues. First, its non-standard acute angle may cause confusion among operators unfamiliar with facilities and procedures at the Airport. Second, it directly connects the aircraft parking apron to Runway 4/22. Both of these issues heighten the potential for runway incursions and other aircraft incidents.

Existing runway/taxiway crossings are limited to those required near the intersection of the two runways, and there are no known traffic bottleneck issues associated with the taxiway system. There are not any existing controller line-of-sight issues for existing aircraft movement areas; however, alternatives developed for this Master Plan Update should protect for controller line-of-sight to all future aircraft movement areas. The Airport should also consider extending Taxiway 'E' to connect with Runway 4/22 in order to provide an additional exit taxiway and reduce aircraft taxiing distances.

3.3.2 Taxiway Design Standards

Taxiway design standards ensure that taxiways can accommodate wing-tip clearances of aircraft with the widest wingspans, as well as wheel tracking paths of the most demanding aircraft landing configurations. Each taxiway may be designed to accommodate the critical aircraft expected to use that taxiway, and may have different standards than other taxiways at the Airport. The applicable design standards for individual taxiways are dependent upon the areas and facilities each taxiway provides access to. Taxiways serving general aviation areas do not necessarily need to be designed to accommodate large commercial aircraft that would only move on taxiways connecting Runway 4/22 to the air carrier apron.

Taxiways design standards are based two separate critical aircraft groupings:

- Taxiway Design Group (TDG), which is based on the main landing gear width and cockpit-to-main-gear distance of the critical design aircraft. Design standards based on TDG include taxiway width, taxiway edge safety margin, taxiway shoulder width, and taxiway fillet dimensions.
- Aircraft Design Group (ADG), which is based on the wingspan and tail height of the critical design aircraft. Design standards based on ADG include taxiway safety area, taxiway object free area, taxiway-to-runway separation, and wingtip clearance requirements.

The most demanding aircraft currently utilizing all taxiways at EAU are TDG 2 and ADG II aircraft. However, taxiways which directly connect Runway 4/22 to the commercial aircraft parking apron, including Taxiways Alpha, Charlie, and Echo, should be designed to accommodate expected use by TDG 3 and ADG III aircraft such as the Boeing 737-800. Taxiways used strictly by general aviation aircraft, such as Taxiway Foxtrot, should be designed to accommodate expected use by TDG 2 and ADG II aircraft such as the Citation II/Bravo. Taxiway design standards associated with these TDGs and ADGs are compared in **Table 3-17**.

Table 3-17: Taxiway Design Standard Comparison

Design Standard	Citation II/Bravo	Boeing 737-800
	TDG 2	**TDG 3**
Taxiway Width	35 feet	50 feet
Taxiway Edge Safety Margin	7.5 feet	10 feet
Taxiway Shoulder Width	10 feet	20 feet
	ADG II	**ADG III**
Taxiway Safety Area Width	79 feet	118 feet
Taxiway Object Free Area Width	131 feet	186 feet
Taxilane Object Free Area Width	115 feet	162 feet

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

The recommended taxiway width for TDG 3 aircraft is 50 feet. All taxiways at EAU are 50 feet in width with the exception of the portion of Taxiway Charlie between Taxiways C2 and C4, as well as connector Taxiways C2, C3, and C4, which are 40 feet wide. The current Airport Layout Plan depicts a future width of 50 feet for all taxiways. An ultimate taxiway width of 50 feet will allow all scheduled service aircraft to taxi uninhibited anywhere on the airfield.

Taxiways are equipped with shoulder areas to prevent jet blast and water erosion. Although shoulders may have the appearance of full-strength pavement, they are not intended for use by aircraft and may be unable to support an aircraft. The taxiway shoulders at EAU are not currently stabilized or paved; however stabilized and paved taxiway shoulders are not required for ADG III aircraft.

Taxiway safety areas (TSAs) and object free areas (TOFAs) are rectangular areas centered on the taxiway centerline that provide wingtip clearance for taxiing aircraft. The TOFA is wider than the TSA. There are currently no TSA or TOFA issues associated with the existing taxiway system at EAU.

3.3.3 Aircraft Hold Bays

Aircraft hold bays are located near the ends of runways to allow aircraft to pass by one another; to perform engine run-ups before departure; and/or to wait for air traffic control departure clearance without blocking other aircraft already cleared for departure. EAU currently has aircraft hold bays located near all four runway ends. The existing hold bays are adequate to accommodate existing demand at the Airport.

As mentioned previously, Runway 4 currently has a displaced threshold located 801' to the northeast of the physical runway pavement end. An aircraft hold bay is located adjacent to Taxiway Alpha at the southwestern end of the taxiway and beyond the Runway 4 displaced threshold (see **Figure 3-6**). This configuration results in conflicts with three separate design criteria prescribed by FAA Advisory Circulars and Orders. These criteria are briefly described below, in approximate order of priority:

1) **Runway Protection Zone (RPZ).** The RPZ is a two-dimensional trapezoidal area beyond the runway end. According to FAA AC 150/5300-13A, the function of the RPZ is "to enhance the protection of people and property on the ground." The Runway 4 hold bay is currently located within the approach RPZ for Runway 4. The AC does not authorize hold bays in the RPZ. When the hold bay was originally designed and constructed, Runway 4 had approach visibility minimums greater than or equal to one statute mile, which were the lowest visibility minimums planned for the runway at that time. A one-statute mile visibility minimum has a much smaller approach RPZ than the runway's current ¾ statute mile minimum for its satellite-based LPV approach. When the LPV approach was published, the reduction in visibility minimums resulted in the hold bay and taxiway entering the RPZ. A ¾ statute mile minimum was not anticipated when the hold bay and taxiway were constructed because the approach improvement potential for satellite-based procedures was not yet recognized within the aviation industry.
2) **TERPS LPV Surface.** FAA Order 8260.3B, *United States Standard for Terminal Instrument Procedures (TERPS)*, prescribes standardized airspace surfaces and design requirements for instrument approach procedures. If taxiway or hold bay pavements constructed as part of the Taxiway 'A' realignment project are located underneath these surfaces for the existing localizer performance with vertical guidance (LPV) approach procedure to Runway 4, TERPS surfaces may be penetrated when large aircraft such as the Boeing 737 are taxiing or holding in the area south of Taxiway 'A5'. These potential penetrations are likely to require an increase in instrument approach procedure minimums for Runway 4, which would make the runway less accessible in periods of inclement weather.
3) **Precision Obstacle Free Zone (POFZ).** The POFZ is a volume of airspace situated above an area beginning at the runway threshold, at the threshold elevation, and centered on the extended runway centerline, 200' long by 800' wide. According to AC 150/5300-13A, neither the fuselage nor the tail of an aircraft may infringe on the POFZ under certain operational and weather conditions; however the wing of an aircraft holding on a taxiway may penetrate the POFZ. The entirety of Taxiway 'A5' is currently within the Runway 4 POFZ, and the proposed realignment of Taxiway 'A' would result in a portion of Taxiway 'A' entering the POFZ if the full length of the taxiway is maintained. Maintaining this configuration would require POFZ pavement hold markings and air traffic control procedures not currently in place. While not specifically required, it is preferable for all aircraft movement areas to be located outside the POFZ.

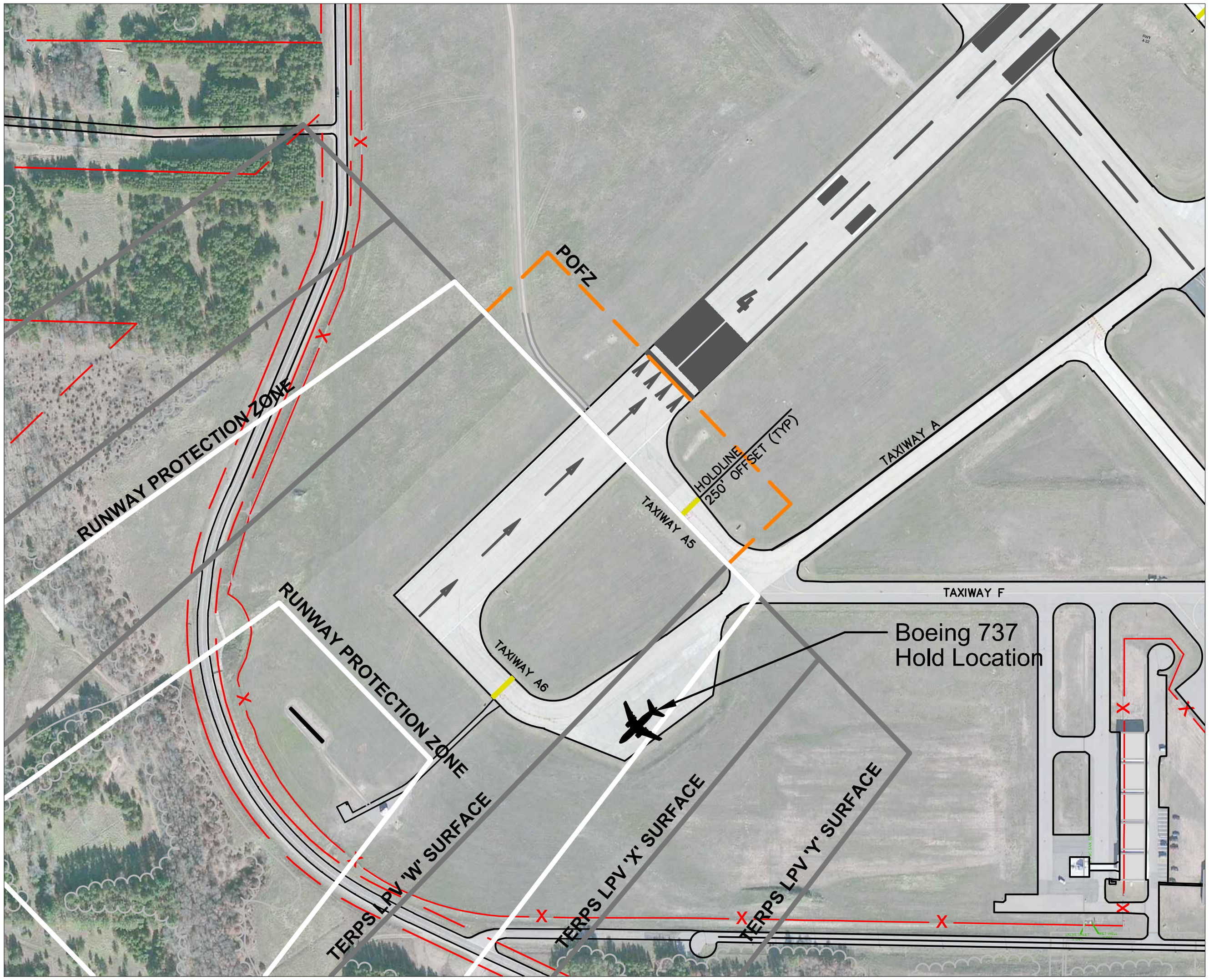


FIGURE 3-6

Pre-2012 Runway 4 Hold Bay Configuration

- Hold Bay Location within RPZ not Consistent with FAA Guidelines
- Hold Bay Location Beneath TERPS LPV Surface May Require Increase in Runway 4 Approach Minimums
- Taxiway A5 Location within POFZ is Undesirable

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Mead & Hunt

In 2012, the taxiway and hold bay pavement south of Taxiway ‘A5’ was closed and the Taxiway ‘A5’ hold short line was relocated to 400’ from the runway centerline (see **Figure 3-7**) to temporarily resolve conflicts with the Runway 4 RPZ, TERPS LPV surface, and POFZ. The realignment of Taxiway Alpha to provide a full parallel taxiway to Runway 4/22, described in Section 3.3.1, will require the repositioning of the Runway 4 hold bay. Alternatives developed for this Master Plan Update should consider repositioning the hold bay such that it is outside the Runway 4 RPZ and clear of the TERPS LPV approach surface.

According to AC 150/5300-13A, a hold bay “should be provided when runway operations reach a level of 30 per hour.” Runway 4/22 does not currently meet this operational threshold. However, several key airport users utilize the existing Runway 4 hold bay for a variety of operational reasons, including the airlines, corporate operators, and small general aviation operators.

As of November 2012, SkyWest Airlines conducts two daily departures from EAU to Chicago O’Hare International Airport (ORD). The majority of airline departures from EAU occur on Runway 4. The airline frequently parks its CRJ-200 in the Runway 4 hold bay while awaiting departure clearance. Once receiving departure clearance, the flight crew has a limited window of opportunity for departing the Airport so that it can retain its arrival slot into ORD. If the Runway 4 hold bay were not reconstructed as part of the Taxiway ‘A’ realignment project, the flight crew would have to wait on the commercial apron for departure clearance, after which it would need to taxi approximately 3,000 feet to depart Runway 4. Along the way, the flight crew would have to cross Runway 14/32. In some situations, this taxi distance and runway crossing may result in the airline losing its departure slot by the time it reaches the end of Runway 4. In such cases, the aircraft would then have to taxi over 1,000 feet down Runway 4/22 in order to exit the runway environment and return to the commercial apron to receive another departure clearance. These new operational procedures would result in flight delays, particularly during periods of inclement weather.

Corporate operators are very active at the Airport nearly every day during the early morning and evening hours. During periods of peak departure activity, as many as 10 corporate aircraft depart Runway 4/22 within a span of a half hour. Smaller corporate aircraft use the holding bay during these periods to run up their engines prior departure, which allows larger aircraft to bypass them as needed. If the Runway 4 hold bay were not reconstructed as part of the Taxiway ‘A’ realignment project, the efficiency of corporate departures would be compromised during peak periods. As a result, corporate users would be required to sit idle for longer periods of time and would incur delays in arriving at their destinations.

Small general aviation users such as the Civil Air Patrol have also indicated that the Runway 4 hold bay is often useful for engine run-ups and bypassing other holding aircraft. The Runway 4 hold bay improves both operational efficiency and safety for these operators.

Based on the operational procedures of key airport users described in this section, the Runway 4 hold bay is integral to daily operations at the Airport. Consequently, the Airport should seek to reconstruct the hold bay in a location which eliminates design criteria operational hazards described earlier in this section.

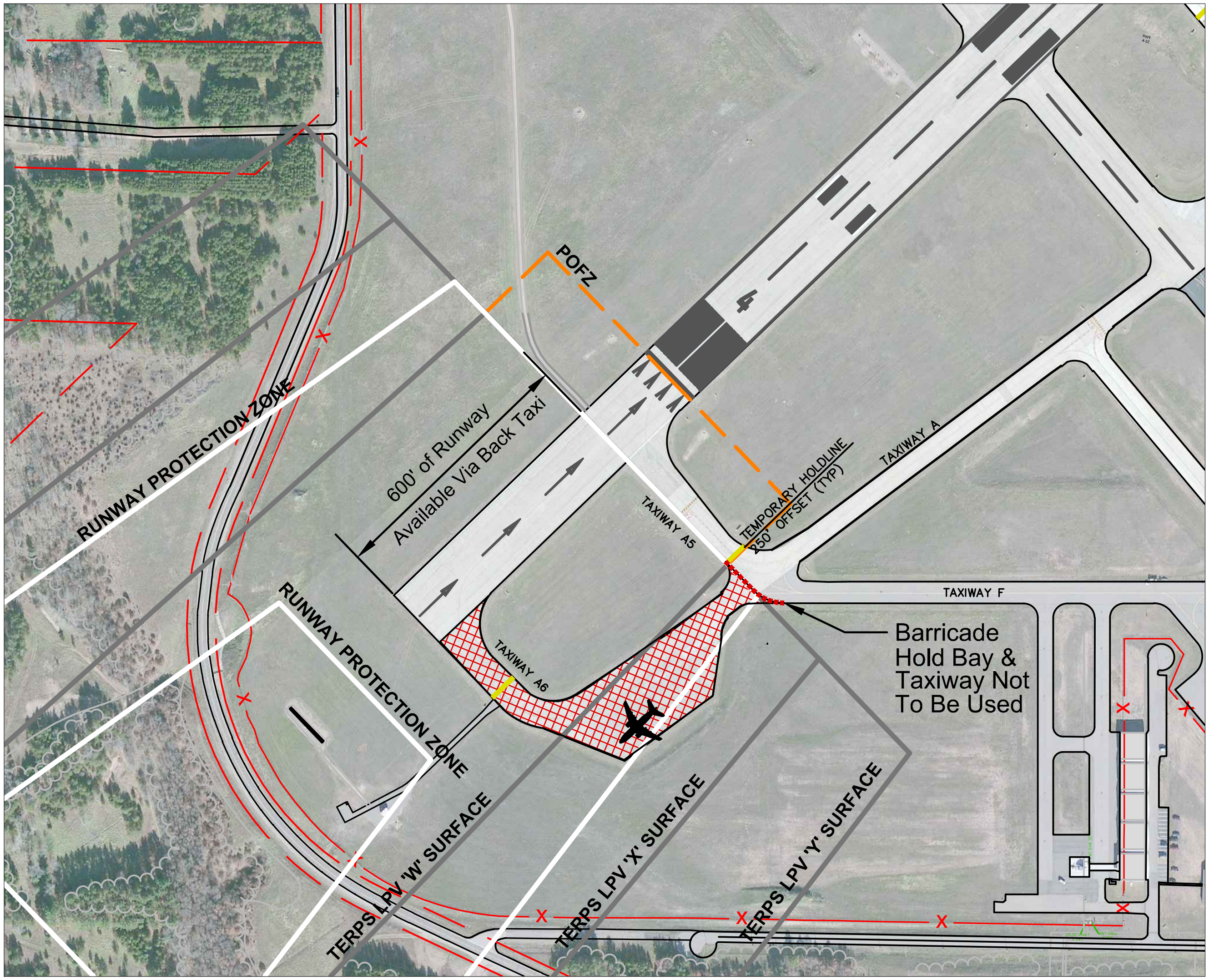

FIGURE 3-7

Existing Runway 4 Hold Bay Configuration with Barricades (installed Summer 2012)

- Aircraft May No Longer Taxi Southwest of Taxiway 'A5'
- No Acceptable Holding Location for Aircraft Waiting for Departure Clearance from Runway 4
- Aircraft Must Back-Taxi on the Runway to Utilize the Full Runway Length for Takeoff

NORTH

0 200' 400'

PREPARED BY:

Mead & Hunt

MASTER PLAN
CHIPPEWA VALLEY REGIONAL AIRPORT (EAU)
EAU CLAIRE/CHIPPEWA FALLS, WI
May 2013

Chippewa Valley REGIONAL AIRPORT

3.4 AIRCRAFT APRON PARKING CAPACITY

The main aircraft parking apron encompasses approximately 47,000 square yards and is split into air carrier and general aviation apron areas. An additional general aviation apron is located near the south GA hangar area, and encompasses approximately 8,700 square yards. The following sections describe aircraft parking requirements in these areas.

3.4.1 Air Carrier Apron

The air carrier apron is located to the immediate south and west of the passenger terminal building and accounts for approximately 14,250 square yards of the total ramp area. Based on projections of aviation demand described in Chapter 2, it is not anticipated that there will be more than two commercial passenger aircraft on the air carrier apron at any given time. The two largest aircraft that would be on the apron simultaneously would be the Boeing 737-800 and the CRJ-200. With the recent addition of nearly 3,700 square yards of apron south of the passenger terminal building in 2010, the air carrier apron is anticipated to accommodate projected levels of aviation demand throughout the planning period.

3.4.2 General Aviation Apron

The main general aviation apron is connected to the air carrier apron, surrounds the FBO terminal building, and is west and north of the passenger terminal building. This apron encompasses approximately 32,750 square yards. An additional 8,700 square yards of general aviation apron is located near the south GA hangar area. General aviation ramp space requirements are typically based on itinerant aircraft activity. Based on projections of aviation demand described in Chapter 2, it is anticipated that itinerant general aviation activity will increase from 15,677 operations in 2011 to 18,584 operations in 2031. It should be noted that the Airport experienced 19,862 itinerant operations in 2007 with the same amount of apron space that currently exists. Based on projections of aviation demand, it is not anticipated that additional general aviation apron space will be needed by 2031.

3.5 PAVEMENT MANAGEMENT

In 2009, a Pavement Management Report was completed for the Chippewa Valley Regional Airport. During a pavement condition index (PCI) inspection, the types, severities, and amounts of distress present in a pavement section are quantified. This information is used to develop a composite index that represents the overall condition of the pavement in numerical terms from 0 (failed) to 100 (excellent). All paved surfaces including runways, taxiways, taxilanes, shoulders, holding areas, and aircraft parking areas were divided into 65 segments and assessed using the PCI procedure. The PCI for the entire Airport was 84, which dictates preventative maintenance of pavements. Based on ratings described in the 2009 report and on-site observations by airport engineers, **Table 3-18** identifies existing deficiencies by segment and any scheduled plans for repair.

Table 3-18: Pavement Condition			
Area	**Segment**	**Description**	**Disposition**
Taxiway	TWDCV-10	Runway 14/32 Parallel Taxiway C	Current ALP shows future widening of Taxiway C
Taxiway	TWD2CV-10	Runway 14/32 Connector	Current ALP shows future widening of Taxiway
Taxiway	TWACV-60	Parallel Taxiway A	To be repaired in TWY A Phase II
Taxiway	TWCCV-40	GA Apron Taxiway	Rehab scheduled 2012-2013
Taxilane	TH01CV-10	GA Apron Connector	Reconstruction scheduled 2012
Apron	A01CV-40	GA Apron	Reconstruction scheduled 2012
Apron	A01CV-50	GA Apron	Reconstruction scheduled 2012
Apron	A01CV-60	GA Apron	Reconstruction scheduled 2012
Apron	A01CV-80	GA Apron	Reconstruction scheduled 2012
Apron	A01CV-90	GA Apron	Reconstruction scheduled 2012

Sources: 2009 Wisconsin Pavement Management Report, EAU ALP 2012

A localized preventative maintenance plan was developed for those pavement sections that were above their critical PCI. This plan includes the following general recommendations for pavement maintenance:

1. Conduct an aggressive campaign against weed growth through timely herbicide applications. Vegetation growing in movement cracks is destructive and significantly increases the rate of pavement deterioration.
2. Implement a periodic crack sealing program. Sealing cracks is a proven method for cost-effectively keeping water and debris out of the pavement system and extending its life.
3. Ensure that dirt does not build up along edges of the pavements. This can create a “bathtub” effect, reducing the ability of water to drain away from the pavement system.
4. Closely monitor heavy equipment, such as construction equipment, emergency equipment, and fueling equipment, to make sure that it is only operating on pavement designed to accommodate the heavy loads this type of equipment often applies. Failure to restrict heavy equipment to appropriate areas may result in the premature failure of airport pavements.

3.6 NAVIGATIONAL AIDS

Navigational aids (NAVAIDs) provide guidance to pilots during flight preparation and operation, and are important to aircraft visibility, navigation, and safety. The type and number of navigational aids required at an airport is determined by type and volume of aviation activity, airspace surrounding the airport, prevailing meteorological conditions, safety considerations, and operational needs. The FAA describes NAVAID recommendations in FAA Order 7031.2, *Airway Planning Standard Number One*, and AC 150/5300-13A, *Airport Design*. Four categories of NAVAIDs are discussed in the following sections:

- Terminal Area NAVAIDs
- Electronic Approach NAVAIDs
- Electronic Surveillance NAVAIDs
- Visual NAVAIDs

3.6.1 Terminal Area NAVAIDs

Terminal area NAVAIDs are designed to maintain an orderly flow of air traffic, prevent aircraft incursions onto runways, and support ground maneuvering operations. Terminal area NAVAIDs at EAU include a 65-foot tall Air Traffic Control Tower (ATCT) built in in 2005 and opened in 2006. There are no existing line-of-sight issues between the ATCT and any aircraft movement areas on runways, taxiways, or aprons. The ATCT also provides adequate visibility of approaches to all four runway ends. It is anticipated that the ATCT will accommodate projections of aviation demand throughout the projection period. Alternatives developed for this Master Plan Update should seek to avoid introducing new controller line-of-sight issues.

3.6.2 Electronic Approach NAVAIDs

Electronic approach NAVAIDs assist aircraft during an instrument approach procedure. There are two types of instrument approaches available to airports – precision and non-precision. A precision navigational aid provides electronic descent, alignment (course), and position guidance. An example of a precision navigation aid is an Instrument Landing System (ILS). However, GPS-based approaches have advanced to the point where they can now provide performance comparable to a CAT-I ILS. Non-precision instrument approaches provide only horizontal alignment and position information. For example, a very high frequency omnidirectional range (VOR) approach is a non-precision approach.

Runway 22 is equipped with a CAT-I ILS which allows precision instrument approach and landing with a decision height not lower than 200 feet above touchdown zone elevation and a visibility not less than ½ statute miles. This instrument approach capability minimizes times when the Airport must cease operations due to poor visibility and adverse weather conditions. However, there is potential for improving the visibility minimums for Runway 22 through implementation of a Special Authorization CAT I procedure. This type of procedure may require navigational equipment upgrades for which a Benefit Cost Analysis would have to be completed. Existing ILS equipment should be analyzed to determine whether a Special Authorization procedure is feasible given current conditions.

Runway 4 has a localizer backcourse approach that provides only horizontal guidance, and a Global Positioning System (GPS) approach procedure that provides both horizontal and vertical guidance. Based on current operational levels, Runway 4 is unlikely to be eligible for installation of an ILS.

Runway 14/32 is currently a visual runway, which means it does not have any instrument approach capabilities. However, this runway may be eligible for a non-precision GPS instrument approach procedure based on the existing facilities in place. Accommodating an instrument approach procedure to Runway 14/32 would require an aeronautical survey to ensure the approaches can meet the more stringent obstacle clearance criteria associated with such procedures.

3.6.3 Electronic Surveillance NAVAIDs

Ground surveillance systems are increasingly being installed at airports to reduce the risk of ground incidents, incursions, and accidents by providing detailed coverage of aircraft and ground vehicle movements on runways and taxiways. Over the last decade, the nation's busiest airports have been outfitted with the most advanced of these systems, Airport Surface Detection Equipment, Model X (ASDE-X). ASDE-X tracks transponder-equipped aircraft and ground vehicles in movement areas using a combination of surface movement radar located on the ATCT, multilateration sensors, Automatic Dependent Surveillance-Broadcast (ADS-B) sensors, and terminal automation systems. Tracking information, overlaid on a map of the airfield and its approach corridors is displayed electronically to controllers in the ATCT. The first deployment of an ASDE-X system took place in 2003 at General Mitchell International Airport in Milwaukee, and a total of 35 airports nationwide have received the system as of 2011. ASDE-X has been integrated with automated Runway Status Light (RWSL) systems, with deployment of RWSL at 22 airports scheduled for completion in 2012.

However, small and medium-sized airports continue to rely on controller and pilot "out-the-window" sight and voice communication to avoid runway conflicts. The effectiveness of this system is limited in periods of bad weather, low visibility, and at night. ASDE-X systems are not scheduled for installation at small and medium-sized airports, as they are not generally cost-effective at non-hub airports. An FAA pilot program is currently underway to develop and test potential Low Cost Ground Surveillance (LCGS) systems at selected airports around the country. The LCGS program is testing the viability of multiple candidate LCGS technologies for integration with current Air Traffic Control procedures, as well as with automated RWSL systems. Following evaluation of pilot sites and investment analysis, the FAA may select one or more LCGS systems for deployment at airports nationwide.

3.6.4 Visual NAVAIDs

Visual NAVAIDs and airfield lighting provide aircraft guidance once the aircraft is within sight of the Airport or maneuvering on the ground. Visual facilities at EAU include a wind cone and segmented circle; additional wind cones at each runway end; a rotating beacon; high intensity runway lights (HIRL) for Runway 4/22; medium intensity runway lights (MIRL) for Runway 14/32; a medium intensity approach lighting system with runway alignment indicator lights (MALSR) for Runway 22; runway end identifier lights (REILs) for Runways 4 and 14; precision approach path indicator (PAPI) lights for all runway ends; and medium intensity taxiway lights (MITL) for all taxiways.

Runway 4 does not currently have an approach lighting system. According to AC 150/5300-13A, an approach lighting system is recommended for runways with non-precision approaches. An approach lighting system may reduce existing Runway 4 visibility minimums below ¾ statute miles, thereby enhancing its utility and accessibility. Alternatives developed for this Master Plan Update should consider protecting for an ultimate approach lighting system for Runway 4.

3.7 PASSENGER TERMINAL BUILDING

As mentioned in Chapter 1, the airport terminal was expanded, renovated, and reconfigured in 2010 to better accommodate new security rules and provide adequate secure passenger holding areas. As of 2012, the current total building footprint is approximately 45,500 square feet. Future passenger terminal facility requirements are presented in the following sections. These facility requirements are based on analysis of the existing terminal plan, discussions with airport and airline staff and other tenants, and industry planning guidelines for airports with similar levels of activity. These requirements are then compared to existing conditions to determine deficiencies and future requirements. The following passenger terminal functional areas are evaluated in this section:

- Public Spaces
- Airline and Rental Car Agency Spaces
- Security Spaces
- Airport Administration Spaces
- Mechanical and Structural Spaces

3.7.1 Public Spaces

Public spaces include general circulation space, the passenger hold room, baggage claim, restaurant and bar, concessionaire spaces, restrooms, vending, and conference rooms. Approximately 21,000 square feet of terminal building is currently devoted to public spaces, approximately 3,500 of which is secure passenger holding space and 17,500 of which is non-secure space. FAA Advisory Circular (AC) 150/5360-9, *Planning and Design Guidelines for Airport Terminal Facilities*, indicates that 15 square feet of secure space and 150 square feet of total space per peak hour passenger should be provided for efficient passenger flow and general passenger comfort. Based on these general rules, the secure area can comfortably accommodate about 235 passengers at one time, and overall public space in the passenger terminal is designed to accommodate about 140 passengers at one time.

As noted in the passenger peaking analysis in Chapter 2, the peak month at EAU is August, with an estimated 62 peak hour passengers in 2011. The passenger activity forecast for 2031 indicates an expected peak hour activity level of 119 passengers in 2031. This activity level is less than the estimated capacity of passenger terminal secure space and overall public space. This indicates that the recent reconfiguration of the passenger terminal building resolved previous functional issues related to public spaces. Based on the peak passenger activity forecast, it is likely that no additional public spaces will be required during the 20-year forecast period.

3.7.2 Airline and Rental Car Agency Spaces

Airline and rental car agency spaces include airline ticketing counters and offices, inbound/outbound baggage handling areas, and car rental counters and offices. The recent expansion of the passenger terminal did not substantially increase airline and rental car agency spaces. EAU currently has a single commuter airline serving the Airport on a daily basis. The preferred forecast presented in Chapter 2 predicts an increase in passenger enplanements in the future, from 19,062 in 2011 to 34,262 in 2031. This increase in enplanements is likely to include the addition of a second airline operating at the Airport on a daily basis. As a result, the Airport should plan for providing additional ticketing counter, office, and inbound/outbound baggage handling space for a second airline.

The existing ticket counter length for the airline is approximately 30 feet. AC 150/5360-9 recommends roughly 55 linear feet of ticket counter length per airline; however this AC was written before electronic ticketing kiosks and other ticketing technology improvements, which have affected ticketing operational space requirements, resulting in a reduction in the amount of space needed for both airline offices and ticketing queuing. Consequently, two counters at approximately 30 linear feet each would meet future demand associated with two airlines providing daily scheduled service. An additional 30 linear feet of counter space should be provided in the future for additional carriers. In addition, it is recommended that the space for automated ticketing kiosks be provided near the ticketing queue area, since this location has the benefit of being accessible to both passengers and airline agents.

Airline functions should be centralized in the space located behind the ticketing counter to maximize operational efficiencies. Airline ticketing offices (ATOs) are typically located here and are often used by staff to handle related administrative and operational duties, such as accounting, management and communications. It is also common for storage and break rooms to be included in these spaces. Current airline business operations, as well as online and kiosk options for passengers, have resulted in a reduced need for airline office space. The existing area for ATOs is 795 square feet. A consolidated baggage handling system, which is now typical for airports of this size, removes the baggage make-up area from the individual ATOs and places it in an outbound tug drive, which is shared by all of the airlines. In addition, changes in technology and operations have reduced the airline's need for space in the terminal building. With a consolidated baggage handling system, this Master Plan Update recommends that a total of 1,200 square feet of space be provided for ATO requirements associated with two airlines operating at the Airport on a regular basis.

The inbound/outbound baggage make-up area is used for sorting and loading of baggage onto carts to be towed to and from enplaning and deplaning aircraft. Transportation Security Administration (TSA) regulations require that all baggage be screened by the TSA prior to being brought into the baggage make-up area and loaded onto an aircraft. TSA encourages the use of a centralized bag screening area for airports of this size, resulting in a single outbound baggage room, which is shared by all airlines. This enclosed area is minimally conditioned and acts as a weather lock, preventing conditioned air from escaping the building as well as fumes from aircraft and Ground Service Equipment (GSE) from entering the building. The terminal building currently has a centralized airline outbound baggage/baggage make-up area of approximately 3,100 square feet. This area is adequate for accommodating passenger activity levels predicted by this Master Plan Update.

There are currently three rental car counters in the passenger terminal, each of which is currently occupied and approximately nine feet long. Each counter has a 120 square foot rental car agency office behind it. These areas are expected to be adequate to serve long-term demand for rental car space.

3.7.3 Security Spaces

Security spaces include the security checkpoint, TSA baggage screening areas, and TSA offices. These areas were expanded significantly as part of the recent terminal renovation project, and currently meet all TSA guidelines and recommendations. However, additional space for TSA baggage screening may be required with the addition of a second airline serving the Airport on a daily basis. This Master Plan Update recommends that the Airport double the size of the TSA baggage screening room in the future, from 270 to 540 square feet, to accommodate the addition of a second airline. There are likely no additional security spaces required during the 20-year forecast period.

3.7.4 Airport Administration Spaces

Airport administration spaces include administrative offices, storage, and non-public circulation areas. These spaces are adequate for anticipated needs during the 20-year planning period.

3.7.5 Utility Spaces

Existing utility spaces include 3,800 square feet for chases, walls, and building structures; 4,600 square feet for mechanical, electrical, and HVAC systems; and 300 square feet for custodial needs. FAA guidelines recommend that 15-20 percent of the building's overall area for is allocated for building support space. Existing utility spaces in the passenger terminal building are expected to meet this target throughout the 20-year planning period.

3.8 AUTOMOBILE ACCESS, SIGNAGE, AND PARKING

Airport automobile parking facilities were reconstructed in 2009, including new parking lot pavement, installation of a Parking Access and Revenue Control System (PARCS), and new directional signage. At the time of this Master Plan Update, there were a total of 565 automobile parking spaces. Parking demand is anticipated to increase at the same rate as annual passenger enplanements (see **Table 3-19**). The proportion of short-term, long-term, rental car, and employee parking needs should remain constant throughout the projection period.

Table 3-19: Parking Space Requirements Forecast						
		Parking Space Needs				
Year	Enplanements	Short-Term	Long-Term	Rental Car	Employee	Total
2011	19,062	95	348	72	50	**565**
2016	24,376	121	445	92	64	**723**
2021	28,062	140	512	106	74	**832**
2026	31,291	156	571	118	82	**927**
2031	34,262	171	625	129	90	**1,016**

The passenger terminal building currently has a curbfront length of approximately 200 feet, which can accommodate up to 10 passenger vehicles at one time. The curbfront is separated from the main traffic flow such that other vehicles can pass temporarily stopped vehicles. The existing curbfront is expected to be adequate for passenger enplanement levels throughout the 20-year planning period.

3.9 FUELING FACILITIES

In 2011, Airport and Mead & Hunt staff began discussing a potential new location for the airport's fuel farm, and a fuel farm relocation analysis was conducted for the Chippewa Valley Regional Airport in early 2012. At that time, the fuel farm location was not ideal because it is difficult for tanker trucks to access. Tanker trucks currently access the secure side of the Airport at the gate next to Heartland Aviation fixed base operator (FBO) terminal, and have to be let inside the fence by FBO personnel. The trucks then travel across the GA aircraft parking apron in front of the FBO. This raises safety and security concerns as the trucks are co-mingled with aircraft on the ramp. In addition, the FAA has recently proposed that Part 139 airport certification standards be updated to establish minimum standards for training of personnel who access non-movement areas on airports (ramps and aprons). If this proposal were to be adopted, it would require that tanker truck drivers receive recurrent training in order to continue this practice.

Given the limited frequency with which tanker trucks access the non-movement areas, it is not practical to provide recurrent training for tanker truck drivers. As a result, it would be beneficial for the fuel farm to be enclosed with a dedicated fence that restricts access to the airfield and provides easier access to tanker truck drivers. Such an arrangement is not possible at the existing fuel farm site due to space constraints associated with tanker truck turn geometry. In addition, there is no secondary containment around the existing tank site which increases the risk of contamination in the event of spillage during fuel transfer or rupture of the tanks. Furthermore, the tanks are highly visible from Starr Avenue and Melby Street, which presents potential for vandalism and tampering.

Heartland Aviation has expressed an interest in possibly obtaining a larger above-ground storage tank (AST) for Jet A storage. Future growth in aircraft operations forecasted by the Airport's Master Plan is expected to result in the need for additional fuel storage capacity. However the current fuel farm location does not have adequate space for future AST additions.

The fuel farm relocation analysis considered several alternative relocation sites, and resulted in selection of a preferred fuel farm relocation site. These alternatives are presented in Chapter 4.

3.10 AIRCRAFT DEICING

Airlines and airports conduct chemical deicing and anti-icing operations on aircraft and airfield pavements to ensure safety of aircraft operations during the winter months. Deicing involves the removal of frost, snow, or ice from aircraft surfaces or from paved areas including runways, taxiways, and gate areas. Anti-icing refers to the prevention of accumulation of frost, snow, or ice on these same surfaces. The use of deicing and anti-icing chemicals is critical under certain operating conditions and is mandated by the FAA under federal law. The need for aircraft deicing and associated activities is dictated by natural processes beyond human control and is a function of fleet mix, frequency of aircraft operations, and the role and location of the airport in question.

In recent decades, airport deicing operations have been increasingly studied throughout the aviation industry. This is because airport deicing operations can result in environmental impacts when performed without proper wastewater discharge controls in place. Potential impacts associated with improper discharge include aquatic life and human health effects resulting from deicing chemical toxicity. The biodegradation of propylene or ethylene glycol (the base chemical of deicing fluid) into surface waters such as rivers and lakes can impact overall water quality, which includes significant reduction in dissolved oxygen levels and can ultimately lead to fish kills. As a result, airports, airlines, and fixed base operators have an important responsibility to employ best practices during deicing operations, and to collect, contain, recover, and/or treat wastewater containing deicing agents. Although compliance with environmental regulations and requirements associated with deicing/anti-icing operations may be shared between airports, airlines, and fixed base operators, the airport is ultimately responsible for the management of the wastewater that is generated.

The following sections describe current aircraft deicing procedures and drainage patterns at EAU, discuss new deicing effluent limitation guidelines recently released by the U.S. Environmental Protection Agency (EPA), and present potential improvements to deicing processes and systems which may be implemented in the future at EAU.

3.10.1 Current Aircraft Deicing Procedures

Chippewa Valley Regional Airport does not conduct chemical deicing for airfield pavements, but does host deicing operations for commercial and general aviation aircraft. The deicing season at CVRA is from November through March. Glycol-based deicing fluids are applied to aircraft to eliminate or prevent ice build-up on the wings and fuselage of aircraft. Deicing fluid are typically stored in drums or totes, and are generally applied by spraying the aircraft with a 50/50 mixture of hot water and a glycol-based fluid. To both reduce runoff and conserve de-icing agent, the FBO and airlines apply the minimal necessary amount of de-icing fluids to aircraft. Airport staff also takes care to make sure that snow containing deicing fluid is placed in grass filter strips and detention areas not directly connected to the Chippewa River. The volume of de-icing fluids is relatively low compared to larger airports, and runoff from de-icing operations is typically negligible. In most cases, the runoff evaporates on the aircraft parking apron pavement before it can flow into sewer drains or infiltration basins.

There are two areas on the Airport that are utilized for deicing operations. The first deicing area is to the immediate south of the passenger terminal on the commercial aircraft parking apron, where airline staff conducts de-icing operations for commercial aircraft. This area of the ramp is designed to drain into a catch basin that drains to a detention/infiltration basin located south of the SRE/maintenance building, where the water infiltrates on site. During heavy rain or snow melt events, occasional back-up may occur and some water may flow in the opposite direction. Flows in this opposite direction are piped to the ditch on the west side of the property that drains under Airport Road and in to the Chippewa River.

The second deicing area is next to the Heartland Aviation maintenance hangar, where FBO staff conducts deicing operations for general aviation and charter aircraft. The apron on the northeast side of this hangar drains into a detention/infiltration basin located to the south of the hangar, while the apron on the northwest side of this hangar drains into a ditch that flows into the Chippewa River north of Runway 4/22. To prevent drainage of glycol-based fluids into the river or City sewer system, FBO staff must visually monitor the deicing area during deicing operations.

3.10.2 New Effluent Limitation Guidelines

In April 2012, the Administrator of the U.S. Environmental Protection Agency (EPA) signed new technology-based effluent limitation guidelines and new source performance standards to control discharges of pollutants from airport deicing operations. These effluent guidelines set industry wide standards for the control of discharges of deicing pollutants to surface waters. The guidelines are implemented in Wisconsin by the discharge permitting program administered by the Wisconsin Department of Natural Resources (WDNR) known as the Wisconsin Pollutant Discharge Elimination System (WPDES). The new effluent limitation guidelines require all airports with more than 1,000 annual jet departures per year to either certify that they do not use urea for pavement deicing or conduct storm sewer outfall sampling to show compliance with a daily maximum ammonia concentration of 14.7 mg/l. As mentioned previously, EAU does not use urea for pavement deicing. Requirements for managing aircraft deicing fluids, on the other hand, will continue to be established in general permits, or for individual permits on a site-specific, best professional judgment basis.

The new effluent guidelines also require the Aviation industry to develop and promote a voluntary pollution prevention plan (VPPP) to address aircraft deicing fluids. The goal of the VPPP program is to achieve, "on a national basis, substantial adoption of pollution reduction technologies that will reduce discharges to the environment associated with aircraft deicing activities, enhancing our nation's waters and aquatic systems." Potential new technologies include improved deicing and anti-icing fluids and materials; new systems and processes for applying, collecting, storing, treating, recycling, and otherwise managing deicing fluid and associated runoff; enhanced training for deicing staff; and new weather forecasting technologies that may allow for more efficient use of deicing fluid. The VPPP has the following six components:

- Outreach to members of the aviation industry.
- Encourage development, testing and deployment of new deicing fluid conservation techniques.
- Characterize the environmental benefits of the VPPP.
- Develop a quantitative VPPP goal for the reduction in discharge of aircraft deicing fluids.
- Prepare an inventory of pollution prevention technologies that may be used in the aviation industry.
- Produce a report comparing the use of aircraft deicing fluids with the VPPP reduction goal.

The VPPP is administered by a coalition of aviation industry organizations including A4A, ACI-NA, AAAE, and RAA. The following is a summary of key dates associated with the VPPP:

- September 30, 2012: Establish/Initiate Voluntary Program
- November 30, 2012: Initial Report
- September 30, 2014: Phase I Report
- September 30, 2017: End Voluntary Program
- September 30, 2017: Phase II Report

Participation in the VPPP is strictly voluntary and does not impose or imply any new unique or specific obligation on individual airports, airlines, and fixed base operators. However, the VPPP presents an opportunity for members of the aviation industry to assess current aircraft deicing procedures and evaluate potential improvements to deicing processes and facilities.

3.11 AIRCRAFT HANGARS

Demand for hangar space is typically related to the local climate and the type of based aircraft. Areas with more severe weather conditions, such as winter weather at Chippewa Valley Regional Airport, have a higher demand for hangar storage facilities. The significant investment injet and turboprop aircraft also increases the demand for enclosed storage.

There are two GA aircraft storage hangar areas located on the Airport. One is located to the northeast of the Heartland Aviation FBO facilities, and the other is located on the south central portion of Airport property east of Runway 4/22 and west of Runway 14/32. The following sections describe hangar facility requirements for corporate, FBO, and small general aviation aircraft.

3.11.1 Corporate and FBO Aircraft Hangars

Corporate tenants and the FBO comprise the majority of large general aviation turboprop and jet aircraft operators at the Chippewa Valley Regional Airport. These types of aircraft need significantly more hangar storage space than other based aircraft. A breakdown of the projected large general aviation fleet and required hangar space requirements are shown in **Table 3-20**.

Table 3-20: Large GA Based Aircraft Fleet and Hangar Requirements

	Number of Based Aircraft by Year									
Aircraft Make/Model	**2011**	**Hangar Space (SF)**	**2016**	**Hangar Space (SF)**	**2021**	**Hangar Space (SF)**	**2026**	**Hangar Space (SF)**	**2031**	**Hangar Space (SF)**
Citation Mustang	0	0	0	0	1	2,250	2	4,500	3	6,750
Citation Bravo	5	20,150	4	16,120	4	16,120	3	8,060	2	8,060
Citation III	1	5,625	1	5,625	0	0	0	0 sf.	0	0
Citation Sovereign	0	0	1	5,625	1	5,625	2	11,250	3	16,875
Citation Encore	1	4,030	2	8,060	3	12,090	3	12,090	3	12,090
Citation X	1	5,625	2	11,250	2	11,250	3	16,875	3	16,875
Beech 1900	3	12,090	3	12,090	4	16,120	4	16,120	5	20,150
Embraer 120 Brasilia	2	11,250	2	11,250	2	11,250	2	11,250	3	16,875
Total Aircraft	**13**		**15**		**17**		**19**		**22**	
Total Hangar Space		**58,770**		**70,020**		**74,705**		**80,145**		**97,675**

Source: Vail HangAir, LLC

As of 2012, there is approximately 80,000 square feet of large corporate and FBO hangar space at Chippewa Valley Regional Airport. However, it should be noted that some of this hangar space is utilized for office and equipment storage functions, and not for aircraft storage. Based on projections of based aircraft demand, the Airport will require 97,675 square feet of large general aviation aircraft hangar space by 2031. Hangar expansion is conditional upon the size and quantity of aircraft that corporate users operate in the future. Corporate and FBO hangar expansion is addressed further in Chapter 4.

3.11.2 Small General Aviation Aircraft Hangars

At the time this Master Plan Update was being completed, aircraft storage hangars at Chippewa Valley Regional Airport were at capacity. As noted in Chapter 2, ten additional small single-engine and multi-engine aircraft are projected to be based at the Airport by 2031. Small aircraft hangar storage demand can be fueled by several factors including availability of and proximity to FBO services, hangar leasing rates, and convenience of airfield access.

Chippewa Valley Regional Airport currently has four 10-unit T-hangars and 16 individual hangars. Assuming that hangar storage is at capacity, approximately 75% of based aircraft are stored in T-hangars and 25% are stored in individual hangars. This figure is held constant throughout the projection period, and applied to based aircraft projections described in Chapter 2. T-hangar and individual hangar requirements are shown in **Table 3-21**.

Table 3-21: Aircraft Storage Hangar Requirements				
	T-Hangar Units		Individual Hangars	
Year	Required	Deficit	Required	Deficit
2011	50	0	16	0
2016	51	1	16	0
2021	53	3	17	1
2026	54	4	18	2
2031	55	5	19	3

It should be noted that changes in aircraft hangar demand can occur over time and that it is important to identify specific areas for general aviation facility expansion when an increase in the number of based aircraft is anticipated. Potential areas for general aviation hangar development are identified in Chapter 4.

3.12 AIRCRAFT RESCUE AND FIREFIGHTING (ARFF) FACILITIES

Aircraft Rescue and Fire Fighting (ARFF) is charged with serving and protecting airport users. The Chippewa Valley Regional Airport is currently classified as an ARFF Index A Airport. The ARFF Index of an airport is based on the longest air carrier aircraft with five or more average daily departures. When there are fewer than five average daily departures of the longest air carrier aircraft serving the airport, the Index required for the airport is the next lower Index group than the Index group prescribed for the longest aircraft. The Index in turn determines the required number and extinguishing agent carrying capacities of ARFF vehicles. EAU currently meets ARFF requirements associated with Index A.

The Boeing 737-800 is the ultimate design aircraft for EAU. The Boeing 737-800 is 130 feet long and is an ARFF Index C aircraft. However, neither the moderate or rapid growth forecast predicts five or more average daily departures by the Boeing 737-800 in the near-term. As a result, the Airport may require reclassification to Index B. EAU also currently meets ARFF requirements associated with Index B; therefore no vehicle or equipment purchases would be required for this potential reclassification.

For emergency response purposes, an ARFF building should be located as close as possible to all runway ends at an airport. The ARFF building is currently located near the intersection of Runway 4/22 and Runway 14/32, and is capable of responding to aircraft incidents within the timeframes required under FAA regulations. In addition, the current location of the ARFF observation room provides good visibility to the primary runway, air carrier apron, and general aviation apron. Therefore it is recommended that the ARFF building remain in its current location for the foreseeable future, if possible.

However, there are a few functional issues associated with the existing ARFF building and location. Although the Airport owns and operates two different ARFF vehicles, the existing ARFF building has only one vehicle bay. As a result, one of the ARFF vehicles must be stored in the maintenance/snow removal equipment (SRE) building. In addition, the ARFF building vehicle bay does not provide adequate depth for the Airport's current vehicles. Alternatives developed for this Master Plan Update should seek to provide extended and co-located vehicle bays within the ARFF building.

Airport maintenance staff are cross-trained in ARFF procedures and must be present in the ARFF observation room when air carrier aircraft are operating at the Airport. However, staff must travel from the maintenance/SRE building to the ARFF building each time an air carrier aircraft arrives and must remain there until they depart. Co-location of the ARFF building with the maintenance/SRE building may provide some efficiency enhancement for Airport staff procedures by eliminating these periodic trips to and from the ARFF building.

3.13 MAINTENANCE/SNOW REMOVAL EQUIPMENT (SRE) BUILDING

The existing airport maintenance and SRE building is located southwest of the passenger terminal building and has 13,500 square feet of floor space. Ample space for maintenance and SRE facilities should be maintained throughout the 20-year planning period. AC 150/5220-18A, *Buildings for Storage and Maintenance of Airport Snow and Ice Control Equipment and Materials*, provides guidance on storing maintenance and SRE equipment. Maintenance/SRE building needs are related to paved areas, activity levels, and climate. Increases in runway, taxiway, and apron pavement, as well as increases in activity levels, result in additional need for maintenance/SRE storage space. Maintenance and SRE should be housed in a heated building to prolong the useful life of the equipment and to enable more rapid response to operational needs. Additionally, facilities should be available within the building for on-site equipment maintenance and repair during the winter season.

The maintenance/SRE building location is ideal for its operational requirements, as it is physically separated from aviation-related uses on the airport while also providing good access to aircraft movement areas. The Airport's CIP should allow for replacement of vehicles and equipment as existing vehicles and equipment reach the end of their useful lives. The Airport's 5-year CIP currently on file with the WisDOT Bureau of Aeronautics (October 2012) shows several equipment purchases scheduled for the years 2014 and 2018. The commercial aircraft operations forecast presented in Chapter 2 is not expected to result in the need for additional SRE equipment, or additional maintenance and SRE building space.

3.14 CARGO FACILITIES

The Wisconsin State Aviation System Plan 2020 designated Chippewa Valley Regional Airport as one of ten air carrier/air cargo (AC/C) airports in the State. AC/C airports are "designed to accommodate virtually all aircraft up to and, in some cases, including, wide-body jets and large military transports." These airports have runway lengths between 6,500 and 9,800 feet, are capable of serving approach category C and D aircraft, and have a service area radius of approximately 60 miles. Although there currently is limited cargo activity at the Airport, it is recommended that a site be reserved for long-term cargo planning purposes. This will be addressed further in Chapter 4.

3.15 SPECIAL EVENT REQUIREMENTS

Periodically, the Airport hosts special events such as airshows. These events take place on and surrounding crosswind Runway 14/32, to the immediate southeast of Taxiway Alpha. Airshows typically include static aircraft displays, informational booths for aviation-related organizations, display areas for local businesses and clubs, and concession stands. Special events often attract several thousand attendees, as well as numerous concessions workers. Seating areas are set up near Taxiway Alpha for viewing aerobatic demonstrations on Runway 4/22. During these events, a large number of passenger vehicles are parked in several temporary parking areas northwest of the maintenance/SRE building, southeast of Runway 32, and next to the south GA hangar area. The National Guard Armory near the south GA hangar area is utilized as an emergency shelter for special events. Alternatives developed for this Master Plan Update should seek to preserve areas and facilities utilized for special events as much as possible.

Because Runway 14/32 must be closed during special events, all aircraft operations must occur on Runway 4/22. These types of special events sometimes involve more demanding aircraft than those that ordinarily use the Airport, including military aircraft like the C-130 Hercules transport and the KC-135 Stratotanker aerial refueler. Due to the size of these aircraft, they must be parked on the general aviation apron in front of the ARFF building and cannot be part of the static aircraft displays on Runway 14/32. The gross weight of the C-130 is 155,000 pounds, which is similar to the Boeing 737-800. The gross weight of the KC-135 however is 322,500 pounds, which is much heavier than any other aircraft operating at the Airport. The current pavement strength of Runway 4/22 for aircraft with dual-tandem landing gear like the KC-135 is 320,000 pounds. Therefore the KC-135 should not operate on Runway 4/22 at its gross weight, but instead at a weight of 320,000 pounds or below. Although the KC-135 exceeds the pavement design strength of existing apron areas at EAU, occasional use of the aprons by the KC-135 is not expected to result in apron pavement damage.

The aircraft design group (ADG) for both the C-130 and the KC-135 is ADG IV. However, the taxiway design group (TDG) for the C-130 is TDG 5, while the TDG for the KC-135 is TDG 7. Current airfield geometry is not technically adequate to accommodate these aircraft, particularly for the taxiway turning radii and wingtip clearances for the KC-135. An aircraft maneuvering analysis conducted for this Master Plan Update determined that Runway 4/22 and its associated taxiways are not designed to the standards required under FAA guidance for the C-130 and KC-135. However, this analysis also determined that the existing airfield can safely accommodate the turning radii and wingtip clearances of the C-130, but not the KC-135 because it belongs to a more demanding TDG. There is little margin for pilot error when turning these aircraft onto and off of Runway 4/22, which may result in aircraft wheels entering non-paved areas. Furthermore, the engine configuration for the KC-135 introduces potential for damage to airfield lights and signage due to inadequate taxiway width.

Due to the limitations of the current taxiway geometry at EAU, as well as limitations associated with runway, taxiway, and apron pavement strength, this Master Plan Update recommends that the Airport not permit use of the Airport by the KC-135. However, continued use of the C-130 may be permitted, although special care should be taken to accommodate the unique needs of these demanding aircraft.

3.16 FACILITY REQUIREMENTS SUMMARY

This section presents a summary of the facilities identified for development or in need of additional study within the 20-year planning period.

- Runway 4/22 should be reclassified from an RRC C-III to an RDC D-III runway, and Runway 14/32 should remain an RDC B-II runway throughout the 20-year planning period.
- The current 8,101-foot Runway 4/22 length should be maintained throughout the planning period, and consideration should be given to relocating the Runway 4 threshold and associated navigational aids to provide the longest possible declared distances given the existing Runway 4/22 pavement.
- The Airport should seek to maximize the length of Runway 14/32 within the constraints presented by its location, orientation, and surrounding topography and land uses.
- Taxiway 'A' should be realigned to provide a full parallel taxiway to Runway 4/22 and eliminate the triangle intersection "hot spot" of Taxiways 'A', 'B', and 'C'. Realignment of Taxiway 'A' will require the repositioning of the Runway 4 hold bay. Care should be taken to locate the Runway 4 hold bay outside the RPZs and TERPS approach surfaces for Runway 4.
- Taxiway 'D' should be removed to eliminate its non-standard acute angle and direct apron-to-runway access. Consideration should also be given to extending Taxiway 'E' to provide an additional exit taxiway for Runway 4/22.
- Special Authorization CAT-I ILS approach procedures should be considered for Runway 22, and a non-precision instrument approach procedure should be considered for Runway 14/32. An approach lighting system should be considered for Runway 4 to achieve lower approach visibility minimums.
- To accommodate the potential addition of a second airline providing daily scheduled service, the passenger terminal should be reconfigured or expanded to provide additional ticketing, ATO, and TSA baggage screening spaces.
- Airport automobile parking facility expansion alternatives should be considered in order to accommodate expected increases in passenger enplanements and associated parking needs.
- The fuel farm should be relocated to allow easier access for tanker truck drivers and future fuel system expansion.
- The feasibility of potential improvements to deicing procedures and facilities should be considered to reduce potential for surface water pollution.
- Potential areas for future corporate, FBO, and small general aviation hangar development should be identified and evaluated.
- The ARFF building should be expanded or relocated in order to provide adequate vehicle bays for the Airport's current ARFF fleet.
- A specific site should be reserved for long-term air cargo facility development.