5. Facility Requirements

This chapter presents the airside and landside facility requirements necessary to accommodate existing and forecasted demand at Greater Binghamton Airport (BGM or the Airport) in accordance with Federal Aviation Administration (FAA) design criteria and safety standards. The facility requirements are based upon several sources, including the aviation demand forecasts presented in Chapter 3, Aviation Forecasts; FAA Advisory Circular (AC) 150/5300-13A, Airport Design; and 14 Code of Federal Regulations (CFR) Part 77, Objects Affecting Navigable Airspace. The findings of this chapter serve as the basis for the formulation of airport alternatives and development recommendations. The major components of this chapter are listed below:

- Airfield Capacity Analysis
- Airside Facility Requirements
- Passenger Terminal Facility Requirements
- Parking and Roadway Access Facility Requirements
- General Aviation and Landside Facility Requirements
- Utilities and Support Facilities
- Facility Requirements Summary

5.1. AIRFIELD CAPACITY ANALYSIS

Airfield capacity refers to the ability of an airport to safely accommodate a given level of aviation activity. The FAA has prepared a number of publications and computer programs to assist in the calculation of capacity. This report will use the methodologies described in AC 150/5060-5, Airport Capacity and Delay.

Capacity is described through three terms: annual service volume (ASV), visual flight rules (VFR) hourly capacity, and instrument flight rules (IFR) hourly capacity. The ASV is a reasonable estimate of the annual capacity, or the maximum annual level of aircraft operations that can be accommodated, at an airfield. It should be noted that airports could, and often do, exceed their stated ASV. However, delays begin to increase rapidly once the ASV is exceeded.

The VFR and IFR hourly capacities are the maximum number of aircraft operations that can take place on the runway system in one hour under VFR or IFR conditions, respectively. When hourly demand approaches or exceeds the hourly capacity, delays may force traffic into the succeeding hours or cause aircraft to divert to other airports.

5.1.1. Factors Affecting Capacity

It is important to understand the various factors that affect the ability of an air transport system to process demand. Once these factors are identified and their effect on the processing of demand is understood, efficiencies can be evaluated. The airfield capacity analysis considers several factors that affect the ability of the Airport to process aviation demand. These factors include:

- Meteorological Conditions
- Runway/Taxiway Configuration
- Runway Utilization
- Aircraft Fleet Mix
- Percent Arriving Aircraft
- Percent Touch-and-Go operations
- Exit Taxiway Locations
- Peaking Characteristics

Meteorological Conditions

Meteorological conditions specific to the location of an airport not only influence the airfield layout but affect the use of the runway system. As weather conditions change, airfield capacity can be reduced by low ceilings and visibility. Runway usage will change as the wind speed and direction change, also impacting the capacity of the airfield.

To better understand the impact of deteriorating weather on capacity, a brief synopsis of aviation flying conditions is provided. For the purposes of capacity evaluation, these flying conditions are described as VFR conditions, IFR conditions, and poor visibility and ceiling (PVC) conditions. VFR conditions occur whenever the cloud ceiling is at least 1,000 feet above ground level (AGL) and the visibility is at least three statute miles. IFR conditions occur when the reported cloud ceiling is at least 500 feet but less than 1,000 feet AGL and/or visibility is at least one statute mile but less than three statute miles. PVC conditions exist when the cloud ceiling is less than 500 feet and/or the visibility is less than one statute mile. Decreasing cloud ceiling and visibility require an increase in aircraft spacing, as mandated by the FAA. This increase in aircraft spacing causes decreases in the frequency at which aircraft can land and depart the airfield over a specified period of time.

In order to better understand the impact that inclement weather has on BGM, wind data from the onsite automated surface observing system (ASOS) was obtained from the National Climactic Data Center (NCDC) and analyzed to determine the ceiling and visibility characteristics at this site. Based upon this data, VFR conditions occur at the Airport 66.4 percent of the time and IFR conditions occur 27.0 percent of the time. Finally, PVC conditions are present at the Airport approximately 6.6 percent of the time.

Wind direction and speed determine the desired alignment and configuration of the runway system. If possible, pilots desire to take off and land into the wind, taking advantage of aircraft design. On departure into the wind, the air flowing over the wings allows the airplane to become airborne much sooner than under a no-wind or tail-wind condition. An aircraft landing into the wind will be able to slow down on approach much easier and land at a slower ground speed. Runways not oriented to take the most advantage of the prevailing winds at the site will restrict capacity of an airport to varying degrees as aircraft have long takeoff rolls and landings.

Runway/Taxiway Use Configurations

The configuration of the runway system refers to the number, location, and orientation of the active runway(s), the type and direction of operations, and the flight rules in effect at a particular time. BGM has two bi-directional runways including a primary runway (Runway 16-34) and a crosswind runway (Runway 10-28).

Taxiway A runs parallel to the full length of Runway 16-34 and provides access to both ends. While

Runway 10-28 doesn't have a full-length taxiway, the approach end of Runway 10 can be accessed by Taxiway K and the approach end of Runway 28 can be accessed by Taxiway H via Taxiway A or Taxiway G.

Although BGM's Runway 10-28 does not have a full-length parallel taxiway, its exit taxiways allow aircraft to exit/enter the runway in an efficient matter. Using information on recommended exit taxiway locations in FAA AC 150-5300-13A, for aircraft utilizing Runway 10 and exiting at Taxiway A, which is approximately 3,278 feet from the threshold, 98 percent of single engine aircraft can exit in wet conditions, and 100 percent can exit under dry conditions. The same percentages are true for Runway 28 and Taxiway P.

While the exit percentages for twin engine aircraft are lower, they have the option of utilizing the full length of the runway, which in wet or dry conditions, 100 percent of twin-engine aircraft can land and be able to exit.

Runway Utilization

As discussed in the meteorological conditions section, pilots generally desire to take off and land into the wind. Discussions with air traffic control tower (ATCT) personnel indicate that Runway 16-34 is used approximately 94 percent of the time, and Runway 10-28 is used approximately 6 percent of the time. For operations on Runway 16-34, approximately 60 percent utilize Runway 16, and the remaining 40 percent utilize Runway 34. At BGM when winds are calm, both runways are used. Jet aircraft can typically handle stronger crosswinds than non-jet aircraft. Therefore, when winds favor Runway 10-28, operations may be conducted on either runway.

Aircraft Fleet Mix

The capacity of a runway is dependent upon type and size of aircraft that use it, among other factors. Per AC 150/5060-5, aircraft are placed into one of four classes (A through D) when conducting capacity analysis. These classes are based on the amount of wake vortex created by an aircraft's wings when the aircraft passes through the air. They differ from the classes used in the determination of the aircraft approach category (AAC). Small aircraft departing behind larger aircraft must hold longer for wake turbulence separation. The greater the separation distance required, the lower the airfield's capacity.

For the purposes of capacity analysis, Class A consists of single engine aircraft in the small wake turbulence class, with a maximum takeoff weight of 12,500 pounds or less. Class B is made up of aircraft similar to Class A, but with multiple engines. Class C aircraft are in the large wake turbulence class with multiple engines and with takeoff weights between 12,500 pounds and

300,000 pounds. Class D aircraft are in the heavy wake turbulence class and have multiple engines and a maximum takeoff weight greater than 300,000 pounds. Typically, Class A and B aircraft are general aviation single engine and light twin engine aircraft. Classes C and D consist of large jet and propeller driven aircraft generally associated with larger commuter, airline, air cargo, and military use.

The aircraft fleet mix is defined by the percentage of operations conducted by each of these four classes of aircraft at BGM. The approximate percentage of operations forecasted at BGM by each of these types of aircraft is shown in **Table 5-1**.

Table 5-1: Aircraft Fleet Mix

Aircraft Type	2017 Percent of Operations	2037 Percent of Operations
Class A	64%	52%
Class B	10%	8%
Class C	26%	40%
Class D	0%	0%

Source: McFarland Johnson analysis, 2018.

The mix index for an airport is calculated as the percentage of Class C aircraft operations, plus three times the percentage of Class D operations (%C + 3D). At BGM this is approximately 26 percent of existing activity and 40 percent of the forecast activity. At airports with only Class A and B aircraft, the separation distance required for air traffic is lower than at airports with activity by Class C or D aircraft, as small aircraft departing behind larger aircraft must hold longer for wake turbulence separation. The greater the separation required, the lower the airfield's capacity.

Percent Arriving Aircraft

The capacity of the runway is also influenced by the percentage of aircraft arriving at the Airport during the peak hour. Arriving aircraft are typically given priority over departing aircraft; however, arriving aircraft generally require more time to land than departing aircraft need to takeoff. Therefore, the higher the percentage of aircraft arrivals during peak periods of operations, the lower the ASV. Discussions with air traffic control tower personnel indicate that operational activity at BGM is well balanced between arrivals and departures. Therefore, it is assumed in the capacity calculations that arrivals equal departures during the peak period.

Percent Touch-and-Go Operations

A touch-and-go operation refers to an aircraft maneuver in which the aircraft performs a normal landing touchdown followed by an immediate takeoff, without stopping or taxiing clear of the runway. A touch-and-go is counted as two operations. These operations are normally associated with training and are included in the local operations figures reported by the air traffic control tower (ATCT). Based on historical data from the Airport and the ATCT, touch-and-go operations comprise approximately 25 percent of total local operations at the Airport. Given the current flight training situation, and absent any knowledge of an increase in flight training, this number is expected to remain unchanged within the planning period.

Exit Taxiway Locations

A final factor in analyzing the capacity of a runway system is the ability of aircraft to exit the runway as quickly and safely as possible. The location, design, and number of exit taxiways affect the occupancy time of an aircraft on the runway system. The longer an aircraft remains on the runway, the lower the capacity of that runway. FAA AC 150/5300-13A notes that for every additional 100 feet an aircraft is required to remain on a runway prior to exiting, despite its size or category, an additional 0.75 seconds of time on the runway is incurred. In an instance where an aircraft could exit the runway 3,000 feet from the landing threshold, but the closest taxiway is 5,000 feet from the landing threshold, that aircraft will remain on the runway for an additional 15 seconds.

FAA AC 150/5300-13A provides guidance regarding the location of exit taxiways and the percentage of times when a taxiway at a certain distance from threshold can be utilized. Runway exit taxiway utilization percentages are identified per runway end. The capabilities of the current runways at BGM, when considering exit locations, can be seen in **Table 5-2** through **Table 5-5**.

Table 5-2: Runway 16 Approach End Exit Taxiway Cumulative Utilization Percentage

Exit Taxiway	Distance from Displaced Threshold to Exit	Wet Runways Right/Acute Angle Exits			Dry Runways Right Angled Exits		
		A	B	C	A	B	C
A	Prior to Threshold	0	0	0	0	0	0
B	Prior to Threshold	0	0	0	0	0	0
C	700	0	0	0	0	0	0
D	1,900	23	0	0	39	0	0
F	3,400	96	10	0	100	39	0
H	5,000	100	100	12	100	100	49
Runway 10-28	5,300	100	100	12	100	100	49
J	6,700	100	100	71	100	100	98
A	6,900	100	100	71	100	100	98

A – small, single engine (<12,500 pounds); B – small, twin engine (<12,500 pounds); C – large (12,500 pounds to 300,000 pounds)
Source: FAA AC 150/5300-13A (Table 4-13) and McFarland Johnson analysis, 2020.

As depicted in **Table 5-2** through **Table 5-5**, essentially all A and B aircraft landing on Runway 34 could exit at or before Taxiway D under dry conditions and Taxiway C under wet conditions. Further, nearly all C aircraft landing on Runway 34 could exit at Taxiway A, however, a small percentage of C aircraft require runway length greater than is available for landing on Runway 34 in order to exit the runway and can impact types of aircraft and the payload on board when planning flights to BGM. For aircraft landing on Runway 16, all A and B aircraft in wet and dry conditions can exit the runway at or before Taxiway H. However, similar to Runway 34, not all C aircraft can exit within the landing length provided, where 98% of the aircraft can exit at Taxiway A in dry conditions, but only 71% in wet conditions.

On Runway 10-28, all A and B aircraft can exit the runway at the end of the runway. However, only 12% of C aircraft in wet conditions, and 49% of C aircraft in dry conditions, can exit at the runway ends.

Table 5-3: Runway 34 Approach End Exit Taxiway Cumulative Utilization Percentage

Exit Taxiway	Distance from Displaced Threshold to Exit (Feet)	Wet Runways: Right and Acute Angle Exits			Dry Runways: Right Angled Exits		
		A	B	C	A	B	C
A	Prior to Threshold	0	0	0	0	0	0
J	0	0	0	0	0	0	0
Runway 10-28	1,400	4	0	0	6	0	0
H	1,700	23	0	0	39	0	0
F	3,200	96	10	0	100	39	0
D	4,800	100	97	4	100	100	24
C	5,900	100	100	27	100	100	75
B	6,800	100	100	71	100	100	98
A	7,100	100	100	88	100	100	100

A – small, single engine (<12,500 pounds); B – small, twin engine (<12,500 pounds); C – large (12,500 pounds to 300,000 pounds)

Source: FAA AC 150/5300-13A (Table 4-13) and McFarland Johnson analysis, 2020.

Table 5-4: Runway 10 Approach End Exit Taxiway Cumulative Utilization Percentage

Exit Taxiway	Distance from Displaced Threshold to Exit (Feet)	Wet Runways: Right and Acute Angle Exits			Dry Runways: Right Angled Exits		
		A	B	C	A	B	C
K	0	0	0	0	0	0	0
P	1,600	23	0	0	39	0	0
A	3,200	96	10	0	100	39	0
Runway 16-34	3,600	99	41	0	100	81	2
H	5,000	100	100	12	100	100	49

A – small, single engine (<12,500 pounds); B – small, twin engine (<12,500 pounds); C – large (12,500 pounds to 300,000 pounds)

Source: FAA AC 150/5300-13A (Table 4-13) and McFarland Johnson analysis, 2020.

Table 5-5: Runway 28 Approach End Exit Taxiway Cumulative Utilization Percentage

Exit Taxiway	Distance from Displaced Threshold to Exit (Feet)	Wet Runways: Right and Acute Angle Exits			Dry Runways: Right Angled Exits		
		A	B	C	A	B	C
H	0	0	0	0	0	0	0
Runway 16-34	1,300	4	0	0	6	0	0
A	1,700	23	0	0	39	0	0
P	3,400	96	10	0	100	39	0
K	5,000	100	100	12	100	100	49

A – small, single engine (<12,500 pounds); B – small, twin engine (<12,500 pounds); C – large (12,500 pounds to 300,000 pounds)

Source: FAA AC 150/5300-13A (Table 4-13) and McFarland Johnson analysis, 2020.

Peaking Characteristics

Airline peak periods are defined in terms of peak hour operations and peak hour enplanements. General aviation (GA) peak periods are defined in terms of peak month and peak hour operations, with a focus on the number of aircraft accommodated on the apron(s) at any given time.

In addition to peaking characteristics described for airline and GA activity, peaking characteristics are also influenced by annual events that occur at an airport or in the vicinity of an airport that affect air travel, vehicle, and/or aircraft parking, etc. Examples at BGM include increased traffic associated with the Dick's Sporting Goods Open, significant events at Binghamton University, and the Greater Binghamton Air Show.

5.1.2. Capacity Calculations

FAA AC 150/5060-5 provides guidance used to calculate airfield capacity and provide planning estimates on hourly airfield capacity under both VFR and IFR conditions, which are the theoretical maximum number of aircraft operations (takeoffs and landings) that can take place on the runway system in one hour under VFR or IFR conditions, respectively. The various capacity elements are then consolidated into a single figure, the ASV for the airport. The ASV is the theoretical maximum number of aircraft operations that the Airport can support over the course of a year.

VFR/IFR Hourly Capacities

Because characteristics of airports vary so widely, guidance in AC 150/5060-5 is provided for different types of airports, from large commercial service hubs, to small single runway facilities. According to AC 150/5060-5, VFR and IFR capacity calculations are based on certain assumptions such as the previously calculated mix index. These assumptions and their relevance to BGM are described below:

- The Airport is currently used by approximately 74 percent class A/B aircraft, 26 percent by class C aircraft and zero percent class D aircraft. In the future, it is anticipated use will change to include operations by approximately 60 percent class A/B aircraft, 40 percent class C aircraft, and still zero percent operations by class D.
- The Airport currently has a partial parallel taxiway to Runway 10-28 and a full parallel taxiway to Runway 16-34. While Runway 10-28 does not have a full parallel taxiway, no back-taxiing on Runway 10-28 is required to access either runway end.
- The Airport has two runway ends equipped with an instrument landing system (ILS) and necessary air traffic control (ATC) facilities to carry out operations in a radar environment.
- Arrivals equal departures.
- There are no airspace limitations affecting runway use.
- Percentage of touch-and-go operations is currently 25 percent of local operations and is expected to remain about the same throughout the planning period.

Guidance in FAA AC 150/5060-5 was used to determine the ASV. **Table 5-6** presents a summary of the above airfield capacity calculations for BGM compared to the current and forecast level of activity. It is noted that the anticipated change in fleet mix, with an increasing rate of use by Class C aircraft, with a relatively static number of annual operations, will have no measurable impact on capacity. These figures indicate that the Airport is currently operating at six percent of capacity on an annual basis. The utilization of the airfield is expected to climb to approximately ten percent of ASV by 2037. Because most of the Airport's operations are conducted during VFR conditions, the VFR hourly capacity figures are included for comparison purposes. Airfield capacity at BGM does not appear to be constrained at the present, and future capacity is also anticipated to be adequate. FAA guidance recommends that planning for capacity enhancement should begin when capacity reaches the 60 percent level. It is assumed that any runway improvements that are contemplated will be supplemented by taxiway improvements to maintain capacity.

Table 5-6: Airport Service Volume

Year	Demand		Capacity			Percent Peak Hour		Percent ASV
	Annual	Peak Hour	ASV	Hourly VFR	Hourly IFR	VFR	IFR	
2017	12,547	7	200,000	77	57	9	12	6
2022	15,747	8	200,000	77	57	10	14	8
2027	17,578	9	200,000	77	57	12	16	9
2037	19,280	11	200,000	77	57	14	19	10

Source: McFarland Johnson analysis, 2018.

5.2. AIRSIDE FACILITY REQUIREMENTS

Airside facility requirements address the items that are directly related to the arrival and departure of aircraft, primarily runways and taxiways and their associated safety areas. To assure that all runway and taxiway systems are correctly designed, the FAA has established criteria for use in planning and design of airfield facilities. The selection of appropriate FAA design standards for the development of airfield facilities is based on the characteristics of the most demanding aircraft, or group of aircraft, expected to use an airport or that facility at an airport on a regular basis (500 operations per year). Correctly identifying the future aircraft types that will use an airport is particularly important, because the design standards that are selected will establish the physical dimensions of facilities, and the separation distances between facilities that will impact airport development for years to come. Use of appropriate standards will ensure that facilities can safely accommodate aircraft using the Airport today, as well as aircraft that are projected to use the Airport in the future.

5.2.1. Critical Design Aircraft/Runway Design Code

Airport design standards are described in AC 150-5300-13A, *Airport Design.* This document provides criteria for grouping of aircraft into runway design codes (RDC). The RDC consists of a letter representing an aircraft approach category (AAC) which is based on approach speed, a number representing an airplane design group (ADG) which is based on tail height and/or wingspan, and a number representing the visibility minimums associated with the runway (based on corresponding runway visual range (RVR) values in feet). These groupings are presented in Table 5-7 below.

Table 5-7: Runway Design Code Characteristics

Aircraft Approach Category (AAC)	
Category	**Approach Speed**
A	Approach speed less than 91 knots
B	Approach speed 91 knots or more but less than 121 knots
C	Approach speed 121 knots or more but less than 141 knots
D	Approach speed 141 knots or more but less than 166 knots
E	Approach speed 166 knots or more

Airplane Design Group (ADG)	
Group	**Tail Height (and/or) Wingspan**
I	< 20′ // < 49′
II	20′ - < 30′ // 49′ - < 79′
III	30′ - < 45′ // 79′ - < 118′
IV	45′ - < 60′ // 118′ - < 171′
V	60′ - < 66′ // 171′ - < 214′
VI	66′ - < 80′ // 214′ - < 262′

Visibility Minimums (VIS)	
RVR (FT)	**Flight Visibility Category (statute mile)**
VIS	Visual Approaches
4000	Lower than 1 mile but not lower than ¾ mile (APV ≥ 3/4 but < 1 mile)
2400	Lower than 3/4 mile but not lower than 1/2 mile (CAT-I PA)
1600	Lower than 1/2 mile but not lower than 1/4 mile (CAT-II PA)
1200	Lower than 1/4 mile (CAT-III PA)

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

Review of Chapter 3, *Aviation Forecasts*, indicates that the existing design aircraft is the Canadair (Bombardier) CRJ-200 series and the future design aircraft for BGM is the Canadair (Bombardier) CRJ-900 series. The CRJ-200 has an AAC-ADG of D-II while the CRJ-900 has an AAC-ADG of C-III.

While the CRJ-900 will be used in the analysis for the design aircraft, it is important to note that the characteristics of the CRJ-900 are equal to or more demanding than other potential aircraft that may use BGM during the planning period. Other aircraft that can be accommodated include, but are not limited to: Airbus 319, Airbus 320, Boeing 737-700, Boeing 737-800, Boeing 717-200, Bombardier C-Series, Embraer 170 and all other regional airline aircraft. On a less frequent basis, the airport may see operations from Boeing B757, and B767 aircraft.

Although the CRJ-900 is forecast to reach 500 annual operations, it is anticipated that the aircraft will exclusively use Runway 16-34 at the Airport due to the instrument landing systems and other navigational aids associated with that runway. Currently, the aircraft type, or a composite of aircraft types conducting at least 500 annual itinerant operations on the crosswind runway are the

Swearingen Metroliner and the Beechcraft Super King Air 350, which are categorized with an RDC of B-II. Based on these use characteristics, the crosswind runway at BGM currently has a B-II design designation based on the most demanding aircraft characteristics. Operations are currently approaching the threshold of 500 operations by GA aircraft with an approach category of C, and it is anticipated the future design aircraft for Runway 10-28 will be C-II AAC-ADG represented by the Embraer Legacy and the Gulfstream 200 and other business class jet aircraft.

Not all Airport facilities will be designed to accommodate the most demanding aircraft at the Airport. Certain airside facilities and landside facilities, such as taxiways and general aviation areas that are not intended to serve large aircraft, may be designed to accommodate less demanding aircraft, where necessary, to ensure cost effective development. Designation of the appropriate standards for all proposed development on the Airport is shown on the Airport Layout Plan.

Airfield facility requirements are covered in this section as follows:

- Runway Length
- Runway Width
- Runway Strength
- Runway Orientation
- Runway Safety Areas
- Runway Object Free Areas
- Runway Protection Zones
- Runway Visibility Zones
- Runway Pavement Markings
- Taxiways
- Potential Hot Spots and Geometry Requirements
- Passenger Terminal Apron
- Airfield Lighting and Signage
- Visual Approach Aids
- Airfield Facility Requirements Summary

5.2.2. Runway Length

A wide variety of aircraft use BGM on a daily basis. These aircraft, both large and small, have different runway requirements. In some cases, smaller or older aircraft may require more runway length than larger or more efficient aircraft. A significant number of factors go into determining the runway performance of an aircraft such as airport elevation, aircraft weight, temperature, flap settings, payload or runway condition (wet/dry), which then dictate the runway requirements that must be met in order for an aircraft to utilize that runway.

The FAA has published AC 150/5325-4B, *Runway Length Requirements for Airport Design*, to assist in the determination of the required runway length for both the primary and crosswind runways. The requirements for both the primary and crosswind runways are based on the performance of a specific aircraft or a family of similar aircraft.

Existing services and operations at the Airport operate safely and efficiently from both Runways 16-34 (7,305 feet long), 10-28 (5,001 feet long), and Heliport H1 (98' by 118'). Runway length charts and calculations are included in Appendix F.

Runway 16-34

As previously mentioned, the existing and future design aircraft for Runway 16-34 are the Bombardier CRJ-200, and the Bombardier CRJ-900, respectively. All regional jets, including the Bombardier CRJ-200 and CRJ-900 are considered in chapter 4 of AC 150/5325-4B for runway lengths for regional jets and aircraft with an MTOW of more than 60,000 pounds and will be reviewed accordingly.

Bombardier CRJ-200 – Considering an average maximum temperature of 77.8° F in July at the Greater Binghamton Airport, and at an elevation of over 1,600 feet MSL, the CRJ-200 Airport Planning Manual identifies a recommended runway length of 5,700 feet to accommodate operations at maximum takeoff weight (MTOW) at a temperature of International Standard Atmosphere (ISA) + 15 degrees Celsius (86 degrees Fahrenheit). At ISA (59 degrees Fahrenheit), a runway length of 5,600 feet was identified as necessary at MTOW. In addition, the charts in the Airport Planning Manual assume zero effective runway gradients. Runway 16-34 has an effective runway gradient of 66 feet. Per AC 150/5325-4B, a factor of 10 feet of runway length per foot of difference in elevation is added, indicating an addition of 660 feet of runway length. This indicates an ultimate requirement of 6,260 feet at ISA, and 6,360 at ISA + 15 degrees Celsius. While below the runway length requirement at ISA, the existing 7,305-foot runway will sufficiently serve the CRJ-200 at BGM.

Bombardier CRJ-900 - Aircraft performance for the Bombardier CRJ-900 varies depending on the weight variant used. The current approximately 7,300-foot runway accommodates takeoff weights of up to 82,000 pounds in the summer, which translates into a range of approximately 2,000 nautical miles (NM) depending on weather conditions and direction of travel. This range allows for operations to destinations as far as Arizona, Nevada, and Washington State. When considering potential airline service to destinations within 700 NM of BGM, including major hubs in Detroit, Atlanta, Charlotte, and Chicago, takeoff performance assumptions include the aircraft departing with a takeoff weight of approximately 77,000 pounds. This weight would be achieved by maximizing the aircraft zero fuel weight and limiting overall takeoff weight by reduction in fuel weight to meet the reduced stage length while providing for the required fuel reserves. At ISA, the CRJ-900 Airport Planning Manual identifies a recommended runway length of 6,000 feet, while at ISA + 15 degrees Celsius, the manual recommends a length of 6,500 feet. When including considerations for effective runway gradient, this increases the recommend runway length to 6,660 feet at ISA, and 7,160 feet at ISA + 15 degrees Celsius. The existing runway length will sufficiently accommodate the CRJ-900 at BGM.

Runway 10-28

The existing design aircraft for general aviation facilities and Runway 10-28 are the Sweringen Metroliner, and the Beechcraft Super King Air 350, and the proposed design aircraft for the general aviation facilities and Runway 10-28 are the Embraer Legacy, and the Gulfstream 200. Per AC 150/5325-4B, all existing general aviation design aircraft should be reviewed as part of the 12,500-60,000-pound group.

Swearigen Metroliner / King Air 350– Per AC150/5325-4B, the Swearigen Metro, as well as other frequent users of the Airport including the Beechcraft King Air family, are within the small airplanes having 10 or more passenger seats fleet mix less than 12,500 pounds. As such, the runway length requirement for these aircraft is 4,300 feet. No adjustment for effective runway gradient is required for aircraft with MTOW less than 12,500 pounds. As a result, sufficient runway length is available on both Runway 16-34 and Runway 10-28 to accommodate operations by this group of aircraft.

Embraer Legacy - Most Embraer Legacy models (including the Legacy 450, 550 and 650E) fall within the 75 percent of the fleet mix between 12,500 and 60,000 pounds. Per AC 150/5325-4B, the runway length requirement at BGM's unique location to serve this group of aircraft at 60 percent useful load is 4,825 feet. At 90 percent useful load, the runway length requirement is 6,175 feet. AC 150/5325-4B further recommends added consideration towards effective runway gradient and wet and slippery runways, utilizing the calculation that requires the greatest runway length. For effective runway gradient, similar to the regional jets, the recommended runway length is increased at a rate of 10 feet per each foot of elevation difference. At BGM, this will account for an additional 660 feet. At 60 percent useful load, this will lead to a runway length requirement of 5,485 feet, and at 90 percent useful load, this will lead to a runway length requirement of 6,835 feet. For wet and slippery runways, the runway length identified is increased by 15 percent, or up to 5,500 feet at 60 percent useful load, and 7,000 feet at 90 percent useful load. Under both circumstances, the additional 15 percent will exceed the maximum lengths identified, therefore the recommended length will be capped at 5,500 feet at 60 percent useful load and 7,000 feet at 90 percent useful load. As the runway length adjustments for wet and slippery runways exceed those for effective runway gradient, the recommended runway length for Embraer Legacy operations is 7,000 feet.

Gulfstream 200 – Per AC150/5325-4B, the Gulfstream 200 (formerly known as the IAI Galaxy 1126), as well as other frequent users of the Airport including the Hawker 800 and Lear 45, are within the 100 percent of the fleet mix between 12,500 and 60,000 pounds. As such, the runway length requirement for these aircraft with a 60 percent useful load is 5,450 feet. The runway length for these family of aircraft at 90 percent useful load is 7,950 feet. An adjustment for wet and slippery runways was not considered in this scenario, as the maximum adjusted length below the currently recommended length at 90 percent useful load and is only 50 feet greater than at 60 percent useful load. When considering the runway length adjustment for effective gradient, the runway length requirement at 60 percent useful load will increase to 6,110 feet. At 90 percent useful load, the runway length requirement will increase to 8,610 feet. With a current runway length of approximately 7,300 feet, Runway 16-34 can accommodate this class of aircraft at greater than 60 percent useful load, but less than at 90 percent useful load.

Recommendation: The existing and future design aircraft can safely takeoff and land at BGM. However, the 7,305-foot length does not fully accommodate the future airline and general aviation design aircraft at maximum takeoff weight, and other aircraft incur weight penalties on certain days of the year. While no runway extension is recommended, the existing 7,305-foot runway length should be preserved to provide maximum available utility through the planning period.

5.2.3. Runway Width

Runways 16-34 and 10-28 are both 150 feet wide, which meets FAA standards for an RDC of C-III.

The existing width of Runway 16-34 exceeds the existing RDC of D-II which the FAA recommends a width of 100 feet. The width of Runway 16-34 also exceeds the future RDC of C-III when the critical aircraft has a maximum takeoff weight of less than 150,000 pounds, where the FAA also recommends a width of 100 feet.

The width of Runway 10-28 exceeds the standards for B-II runways of 75 feet. Runway 16-34 was rehabilitated at its existing width in 2017 and Runway 10-28 was rehabilitated in 2019. As a result, further rehabilitation is not anticipated within the planning period.

Recommendation: No changes are recommended for the width of Runways 16-34 and 10-28.

5.2.4. Runway Strength

Pavement strength requirements are related to three primary factors: 1) the weight of aircraft anticipated to use an airport, 2) the landing gear type and geometry, and 3) the volume of aircraft operations. Airport pavement design, however, is not predicated on a particular weight that is not to be exceeded. The current methodology used in FAA's FAARFIELD airfield pavement design program analyzes the damage to the pavement for each airplane operation and determines a final thickness to ensure a 20-year lifespan, with adequate recurring maintenance, per AC 150/5320-6E.

Design is based on the mix of aircraft that are expected to use the runway over the anticipated life of the pavement (usually 20 years). The methodology used to develop the runway pavement design considers the number of operations by both large and small aircraft and reduces this data to a number of "equivalent annual operations" by a design aircraft, which is the most demanding in terms of pavement loading expected to use an airport. This may or may not be the design aircraft for planning purposes and its selection considers the configuration of landing gear and tire pressure in addition to weight. The outcome of the design process is a recommended pavement section that will accommodate operations by the forecast fleet mix and withstand weather stresses without premature failure of the pavement.

The current pavement at the Airport is rated for 112,000 pounds single-wheel, 147,000 pounds dual wheel, and 221,000 pounds dual tandem for Runway 16-34 and 81,000 single-wheel, 103,000 pounds dual wheel, and 168,000 pounds dual tandem for Runway 10-28 according to the Airport's FAA 5010 Form, *Airport Master Record*. Both runways and Helipad H1 are listed in good condition as of the last airport inspection conducted on December 5, 2017. Runway 16-34 was reconstructed in 2017 and is in excellent condition and rehabilitation of Runway 10-28 is currently underway as of the writing of this document. The two future critical aircraft, the CRJ-900 and Gulfstream 200/Embraer Legacy, have maximum takeoff weights of 84,500 and 20,200/53,600 pounds, respectively.

The pavement classification number (PCN) is a standardized International Civil Aviation Organization (ICAO) designation indicating the strength of a runway pavement. After technical evaluation, a PCN of 45/F/D/X/T has been issued for Runway 16/34, in which the number is a relative indication of the load-carrying capacity of the pavement in terms of a standard single wheel load at a tire pressure of 181 pounds per square inch (PSI). The "F" indicates it is constructed of flexible pavement, in this case bituminous asphalt. The "D" denotes the subgrade strength category which for this runway is Ultra Low. The "X" denotes the allowable tire pressure, which in this case engineering tests have concluded the allowable tire pressure should be limited to medium, or up to 218 PSI. And finally, the "T" denotes that the PCN was derived through a technical study, rather than observed aircraft operations.

At the time of the writing of this document, Runway 10/28 is being rehabilitated and as such, currently has no PCN.

Recommendation: Runway 16-34 was just recently reconstructed and with Runway 10-28 currently in the process of rehabilitation, no changes to pavement strength are recommended at this time. As a part of this Master Plan Update, an airfield pavement management study was conducted and is included as **Appendix E**. Recurring maintenance, as recommended in the airfield pavement management study, will be required to ensure the lifespan of the runway pavements at BGM.

5.2.5. Runway Orientation

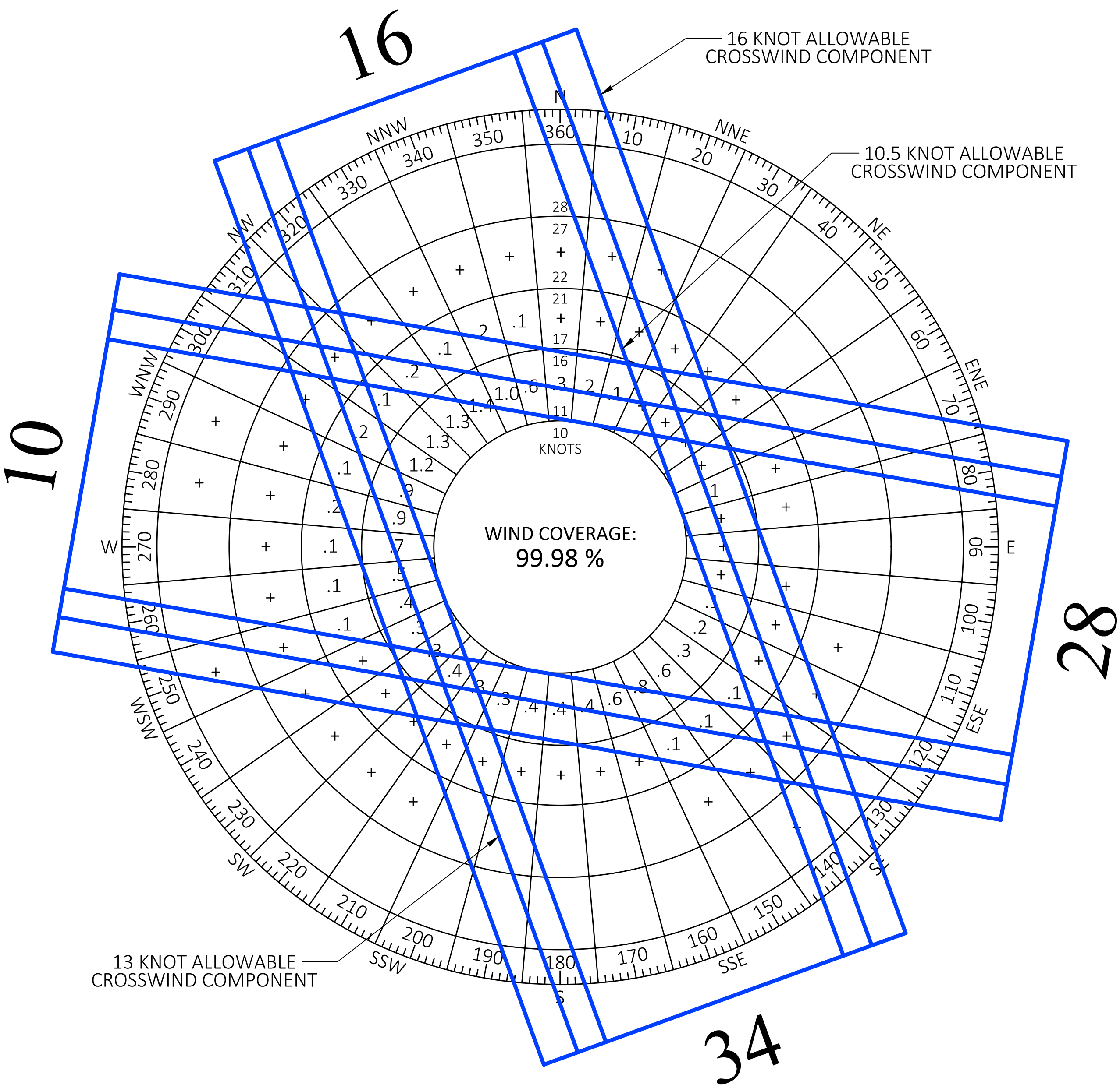
A significant factor in evaluating a runway's orientation is the direction and velocity of the prevailing winds. Ideally, all aircraft take off and land in the direction of the wind. A runway alignment that does not allow an aircraft to go directly into the wind creates what is known as a crosswind component (i.e. winds at an angle to the runway in use), which makes it more difficult for a pilot to guide the airplane down the intended path. The commonly used measure of degree to which a runway is aligned with the prevailing wind conditions is the wind coverage percentage, or the percent of time crosswind components are below an acceptable velocity. This measure indicates the percentage of time aircraft within a particular design group will be able to safely use the runway. Current FAA standards recommend that airfields provide 95 percent wind coverage.

Wind data for the Airport was obtained from the National Climactic Data Center in Asheville, North Carolina through the onsite ASOS, for a 10-year period from 2009 through 2018 at Greater Binghamton Airport. It was compiled into all weather and IFR wind roses presented in **Figure 5-1** and **Figure 5-2**, respectively. The wind roses show the percentage of time winds at the Airport originated from different directions at various velocities. These percentages were then analyzed based on runway orientation and can be seen in **Table 5-8**. Ideally, the primary instrument runway at an airport should be the runway that has the highest percentage of wind coverage under IFR conditions, during which an approach procedure is needed.

According to the runway wind analysis, the current runway alignment at the Airport provides the recommended minimum 95 percent coverage. The RDC of D-II and C-III coverage is shown by the 16-knot coverage percentages as smaller aircraft cannot withstand crosswinds as strong as larger aircraft can. The 16-knot crosswind coverage allows operations at the Airport approximately 99 percent of the time. Crosswind coverage of 20 knots was not shown, as it does not apply at the Airport. Coverage for B-II aircraft is based on 13-knot crosswind maximums and is provided 97 to 98 percent of the time.

Recommendation: Wind coverage meets 95 percent for both runways in both all-weather and IFR conditions. There is no recommendation for change.

Figure 5-1: All Weather Wind Rose



ALL WEATHER WINDROSE

ALL CEILING AND VISIBILITIES

Source: Greater Binghamton Airport 2009-2018 (725150)

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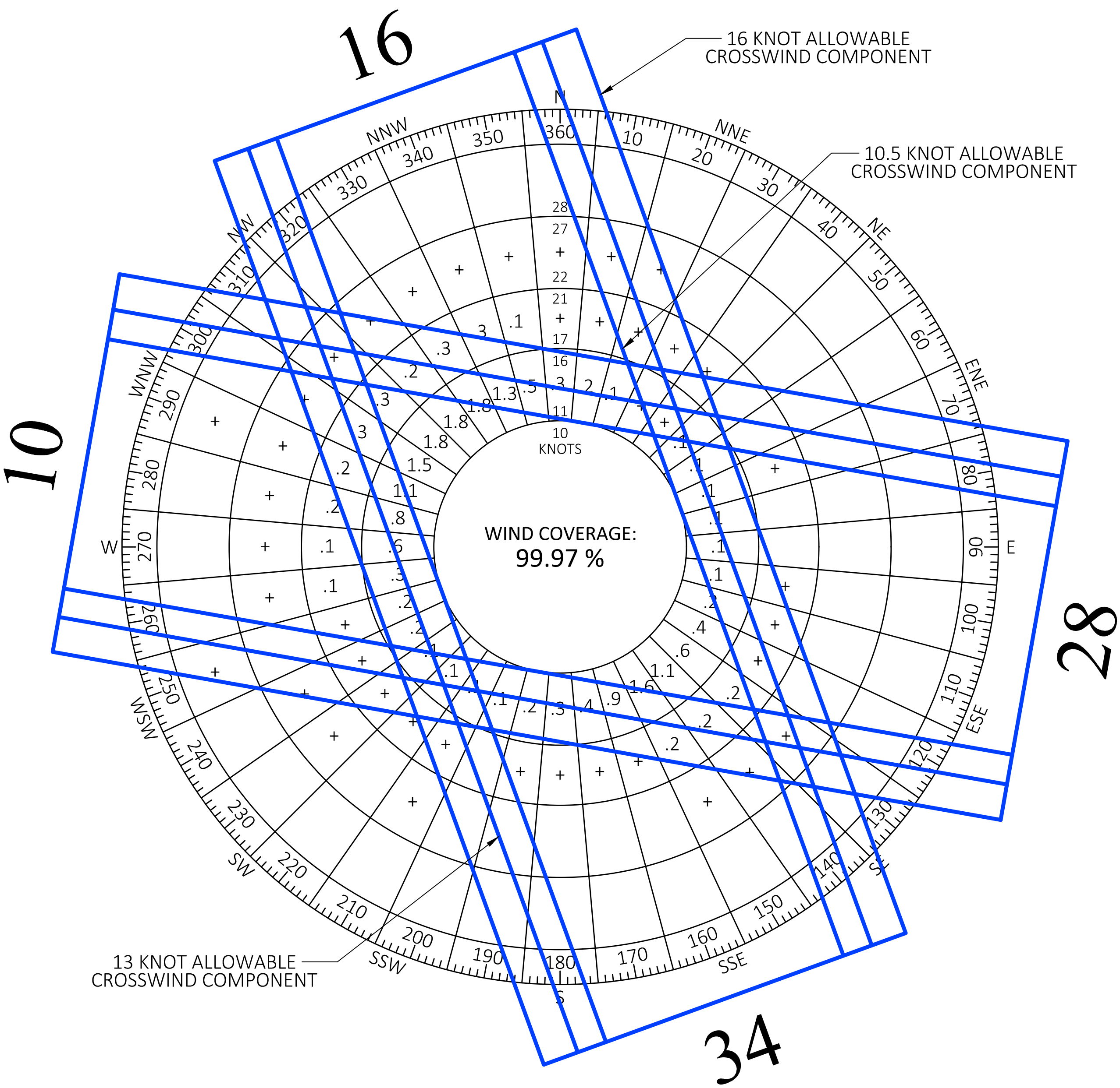
Figure 5-2: IFR Wind Rose



IFR WINDROSE

CEILING < 1000' AND / OR VISIBILITY < 3 MILES BUT CEILING ≥ 200' AND VISIBILITY ≥ ½ MILES

Source: Greater Binghamton Airport 2008-2018 (725150)

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Table 5-8: Runway Wind Coverage Analysis

Runway	All Weather Wind Coverage[1]			IFR Wind Coverage[2]		
	10.5 Knot	13 Knot	16 Knot	10.5 Knot	13 Knot	16 Knot
Runway 16-34	94.80%	97.43%	99.36%	95.33%	97.78%	99.36%
Runway 16	48.43%	49.29%	49.095%	48.99%	49.57%	49.96%
Runway 34	53.45%	55.23%	56.52%	53.09%	54.96%	56.16%
Runway 10-28	92.96%	96.90%	99.47%	92.09%	96.67%	99.28%
Runway 10	34.82%	36.21%	37.21%	40.39%	42.39%	43.49%
Runway 28	65.26%	67.81%	69.41%	58.45%	61.03%	62.54%
Both	99.13%	99.82%	99.98%	99.51%	99.88%	99.97%

[1] All Weather Conditions: all ceiling and visibility conditions

[2] IFR Weather Conditions: ceiling less than 1,000 feet and below three statue miles but greater than or equal to 200 feet and one statute mile

Source: National Centers for Environmental Information – Greater Binghamton Airport 2009-2018.

5.2.6. Runway Grade

There is differential in the runway grade that exceeds the FAA standard grade of 2 percent. It is a steady incline along the entirety of the runway and increases in elevation toward the north. Correcting the non-standard grade would require either increasing or decreasing the elevation along the runway to modify one of the ends, likely increasing the Runway 34 approach end. This would result in required adjustments to the Engineered Materials Arrestor System (EMAS), approach light system, navigation aids, and taxiway system to meet standards and adjustments creating by the changes in elevation of the runway. Runway 10-28 meets FAA grading requirements

Recommendation: There are no recommendations for correcting the non-standard runway gradient at this time as the cost to correct this minor issue would outweigh the benefits.

5.2.7. Runway Safety Areas

Runway safety areas (RSAs) are defined by the FAA as surfaces surrounding a runway that are prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway. RSAs consist of a relatively flat graded area free of objects and vegetation that could damage aircraft. According to FAA guidance, the RSA should be capable, under dry conditions, of supporting aircraft rescue and firefighting equipment, and the occasional passage of aircraft without causing structural damage to the aircraft. The FAA design standards for RSAs surrounding runways serving D-II and C-III aircraft (Runway 16-34) is a width of 500, a length that exists 600 feet prior to the landing threshold, and a length that extends 1,000 feet beyond the runway end. These standards are met, with one exception, for Runway 16-34 with the use of declared distances and engineered materials arresting systems () on both ends of the runway as steep drop offs in terrain preclude traditional RSA dimensions longitudinally prior to and beyond the runway ends. The Runway 34 Departure End EMAS was installed in 2002 (with new top boards installed in 2010), while the Runway 16 Departure End EMAS was installed in 2011. While EMAS is used to mitigate RSA deficiencies beyond the runway end, displaced thresholds are in place to provide RSA prior to the landing threshold.

The Runway 16 departure end EMAS is approximately 227 feet long and 162 feet wide. It has been designed to stop an aircraft mix of the CRJ-200/Dornier Dash-8/Embraer 145/Gulfstream 200 at 70 knots or less. It is set back approximately 373 feet from the Runway 34 displaced threshold to create a full 600-foot RSA for undershoot protection for aircraft landing on Runway 34. For arriving aircraft, the Runway 16 displaced threshold and EMAS provides a landing distance available (LDA) of 6,905 feet, while aircraft departing from Runway 16 have an Accelerate Stop Distance Available (ASDA) of 7,305 feet. The EMAS compensates for the lack of a 1,000-foot RSA at the end of the runway. An October 2020 FAA Airport certification inspection revealed the Runway 16 departure end EMAS has degraded and could be near the end of its useful life. The plastic lid designed to prevent water infiltration appeared to be damaged during the inspection. However, airport personnel have since repaired the damage The EMAS is scheduled to be inspected by Runway Safe personnel in Spring 2021 to assess the immediate viability of the EMAS. The Airport is presently planning to replace the EMAS in 2024.

The Runway 34 departure end EMAS is approximately 313 feet long and 161 feet wide. It has been designed to stop an Embraer 145 at 70 knots. It is set back approximately 473 feet from the Runway 16 displaced threshold. This provides for 786 feet of undershoot protection for aircraft landing on Runway 16. The lack of a 1,000-foot RSA is mitigated by the EMAS, and the LDA for Runway 34 is 7,099 feet. Aircraft departing from Runway 34 have an ASDA of 7,305 feet due to the presence of the EMAS.

One noted exception to the maintenance of standard runway safety areas includes the presence of an FAA-owned electrical vault northeast of the Runway 16 approach end. The vault powers aspects of the instrument landing system and is a required component. Due to the terrain at the Runway 16 approach end, relocation of the vault outside of the RSA will require the use of fill as the terrain drops at least 70 feet adjacent to the vault. As a result, the FAA has not relocated their vault and presently does not have any plans identified for the relocation. Per information provided by the FAA's New York Airports District Office, an analysis was previously completed by FAA noting that it was infeasible to relocate the vault and permitting its continued presence at its existing location.

Another exception to RSA standards exists along the lateral edges of Runway 16-34. Some areas of the RSA are slightly above, and slightly below FAA standards for RSA grading. The RSAs and grades can be seen in **Figure 5-3** and **Figure 5-4**. The areas where the differential is notable are generally along Taxiway A.

RSA standards for runways serving B-II aircraft, with approach visibility minimums of not lower than ¾ statute mile (Runway 10-28) include a width of 150 feet, and 300 feet beyond the departure end and prior to the threshold. RSAs that meet these requirements are presently available along Runway 10-28. However, the future general aviation design aircraft, the Embraer Legacy and the Gulfstream 200, are categorized with a runway design group of C-II and as a result, require RSAs similar to Runway 16-34 including a width of 500 feet, a length that exists 600 feet prior to the landing threshold, and a length that extends 1,000 feet beyond the runway end. This magnitude of RSA is not presently available on Runway 10-28.

Due to the presence of the displaced thresholds to ensure adequate RSA prior to landing, Runway 16-34 has published declared distances, as shown in **Table 5-9**. Declared distances provide for

Figure 5-3: Runway Safety Areas

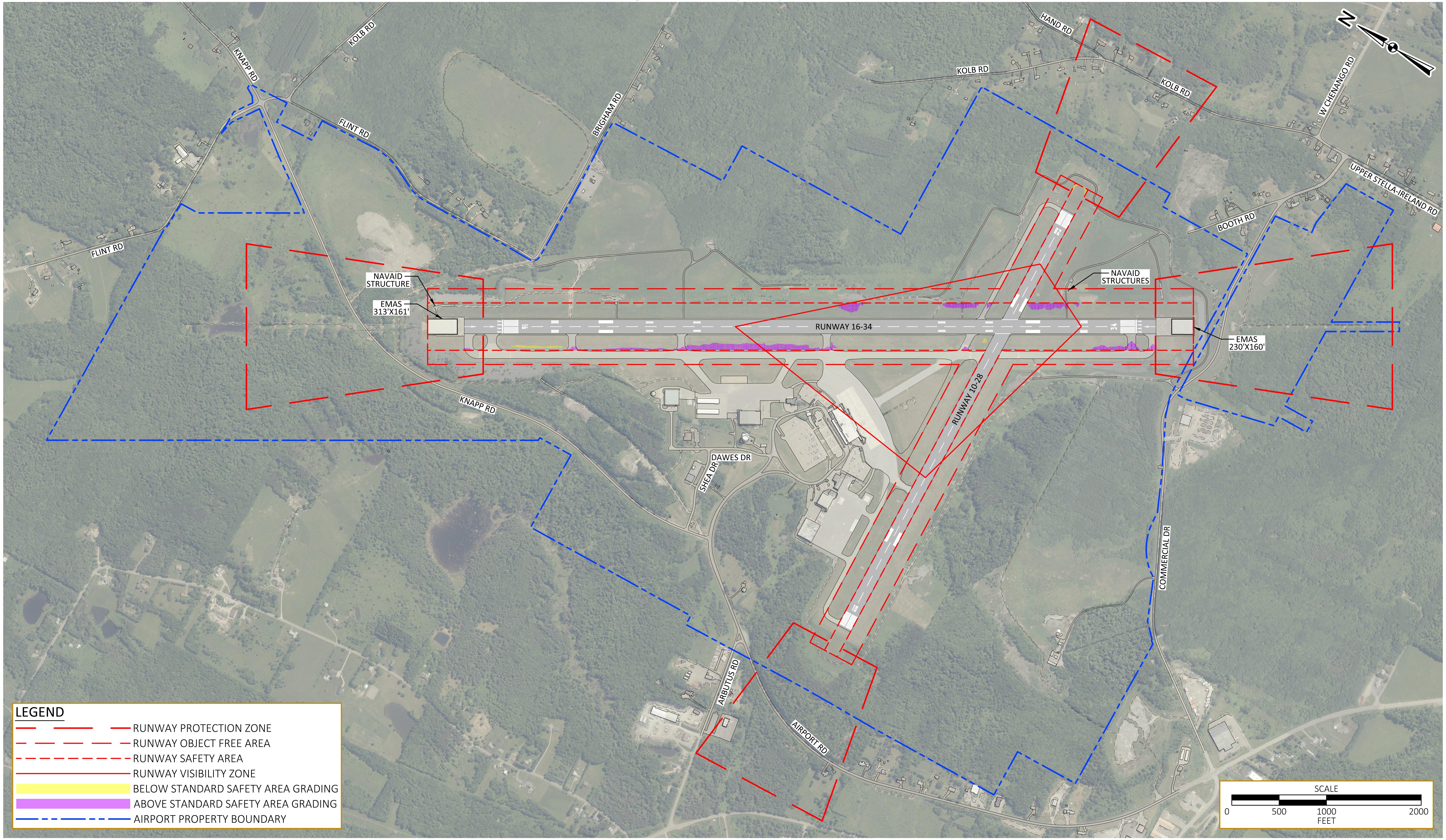

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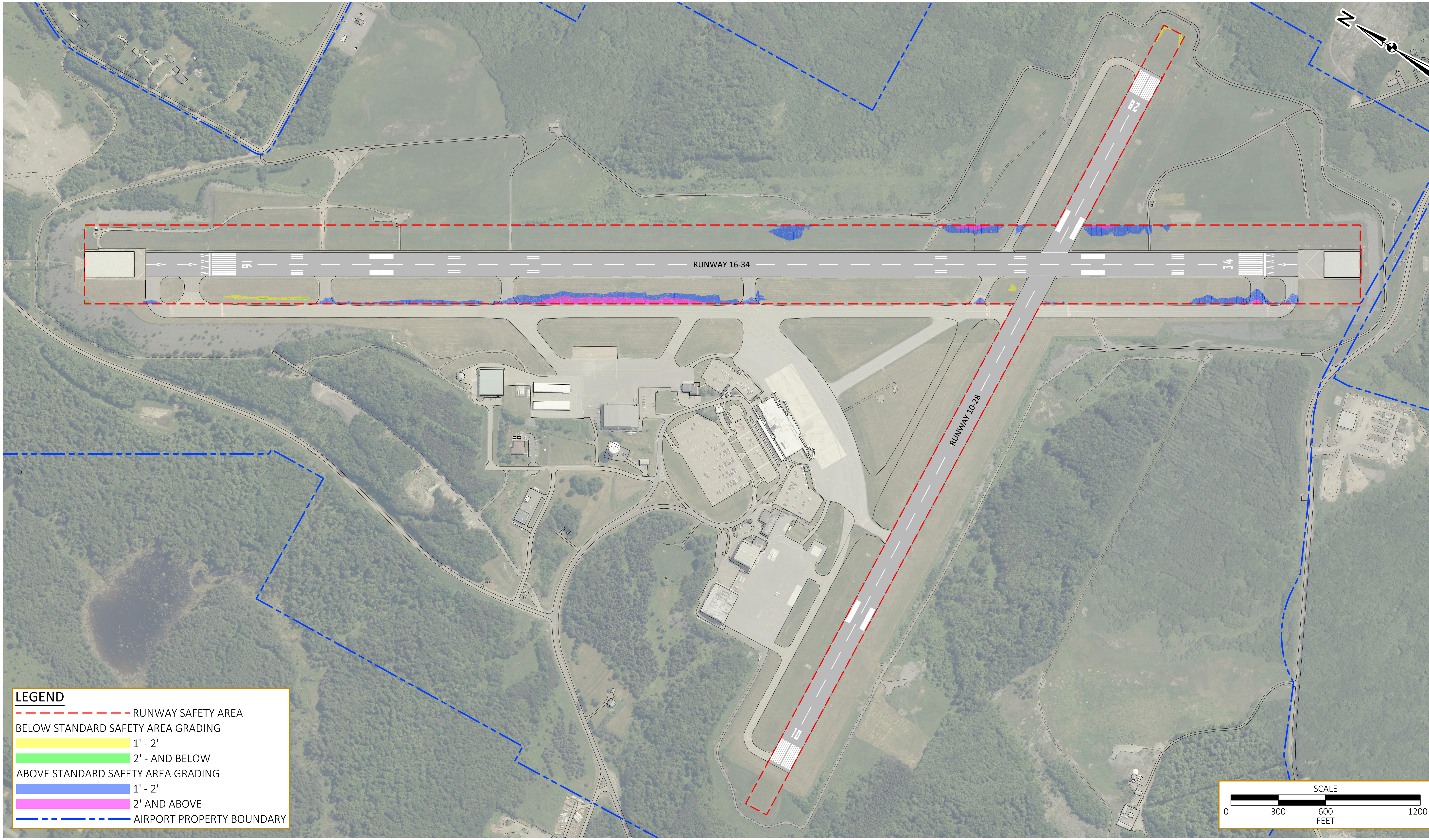
Figure 5-4: Runway Safety Area Elevations



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meeting FAA RSA requirements when a standard dimensional RSA is not possible due to existing circumstances. **Figure 5-5** graphically depicts the declared distances at the Airport.

Table 5-9: Declared Distances

Runway	16/34	10/28
Takeoff Run Available (TORA)	7,305' / 7,305'	5,001' / 5,001'
Takeoff Distance Available (TODA)	7,305' / 7,305'	5,001' / 5,001'
Accelerate-stop Distance Available (ASDA)	7,305' / 7,305'	5,001' / 5,001'
Landing Distance Available (LDA)	6,905' / 7,099'	5,001' / 5,001'

Source: Federal Aviation Administration (FAA) 5010-1, effective 2/1/2018.

Recommendation: BGM should continue to monitor the condition of the EMAS beds. As the Runway 34 Departure end EMAS bed is approaching 20 years since installation, its longevity and useful life should be assessed and plans for replacement should be considered within the planning period. Consideration should be made to increase the size of the RSA to accommodate C-II aircraft on Runway 10-28. Minor grading issues on the side RSA should be corrected during the next rehabilitation efforts on Taxiway A and Runway 16-34. If, during engineering design, correction of the grading cannot occur, or is not feasible, an MOS should be requested from the FAA.

5.2.8. Runway Object Free Areas

In addition to the RSA, a runway object free area (ROFA) is also defined around runways in order to enhance the safety of aircraft operations. The FAA defines ROFAs as an area cleared of all

objects except those that are related to navigational aids and aircraft ground maneuvering. However, unlike the RSA, there is no physical component to the ROFA. Thus, there is no requirement to support an aircraft or emergency response vehicles. Not unlike the RSA, FAA design standards for ROFAs surrounding runways serving RDC C-II, D-II and C-III aircraft are a width of 800 feet, a length that exists 600 feet prior to the landing threshold, and a length that extends 1,000 feet beyond the runway end. Runways serving RDC B-II aircraft have a width of 500 feet and protect 300 feet beyond the runway end and prior to the threshold. The dimensions of the ROFA for Runway 16-34 are not anticipated to change during the planning period, however, the dimensions for the ROFA for Runway 10-28 could increase with the change in the future general aviation design aircraft and the increase in RDC from B-II to C-II. There are currently no objects in the ROFA other than the supplemental wind cones for Runway 16-34, which are frangible. The supplemental wind cones could be moved outside of the ROFA, however siting the supplemental wind cone on the south end of Runway 16-34 could be problematic due to the glideslope and localizer antennas. Locations for relocating the supplemental wind cones will be explored in the alternatives chapter. Should a site not be identified as feasible in the alternatives chapter, the supplemental wind cones are permitted to remain in their existing locations in the ROFA if necessary, as noted in FAA AC 150-5340-30J, with documentation provided to explain the reason for the location.

Recommendation: Ensure that future development considers the expanded future ROFA and assess sites to relocate the supplemental wind cones outside of the ROFA during the planning period.

5.2.9. Runway Protection Zones

RPZs are large trapezoidal areas on the ground off each runway end that are aligned with aircraft approach and departure paths. The RPZ begins 200 feet beyond the departure end of the runway, or 200 feet in advance of the approach threshold (including displaced thresholds) of a runway. The dimensions of the RPZ for each runway end are dependent on the type of aircraft and the approach visibility minimums associated with operations on that runway.

The RPZ is intended to enhance the protection of people and property on the ground. Many land uses (i.e. residential, places of public assembly, fuel storage) are prohibited by FAA guidelines within these areas. However, these limitations are only enforceable if the RPZ is owned or controlled by the Airport sponsor. Airport control of these areas is strongly recommended and is primarily achieved through Airport property acquisition but can also occur through easements or zoning to control development and land use activities.

The dimensions of the RPZ for each runway end are a function of the type of aircraft and the approach visibility minimums associated with operations on that runway. The RPZ begins 200 feet beyond the end of the area usable for takeoff and landing for all runways. The existing approach visibility minimums are shown in **Table 5-10**.

Table 5-10: Existing RPZ Dimensions Per Runway End

Runway	Minimums	Length	Inner Width	Outer Width	Acreage
Runway 16	½ Mile	2,500’	1,000’	1,750’	78.914
Runway 34	RVR 2,400’	2,500’	1,000’	1,750’	78.914
Runway 10	¾ Mile	1,700	1,000	1,510’	48.978
Runway 28	¾ Mile	1,700	1,000	1,510’	48.978

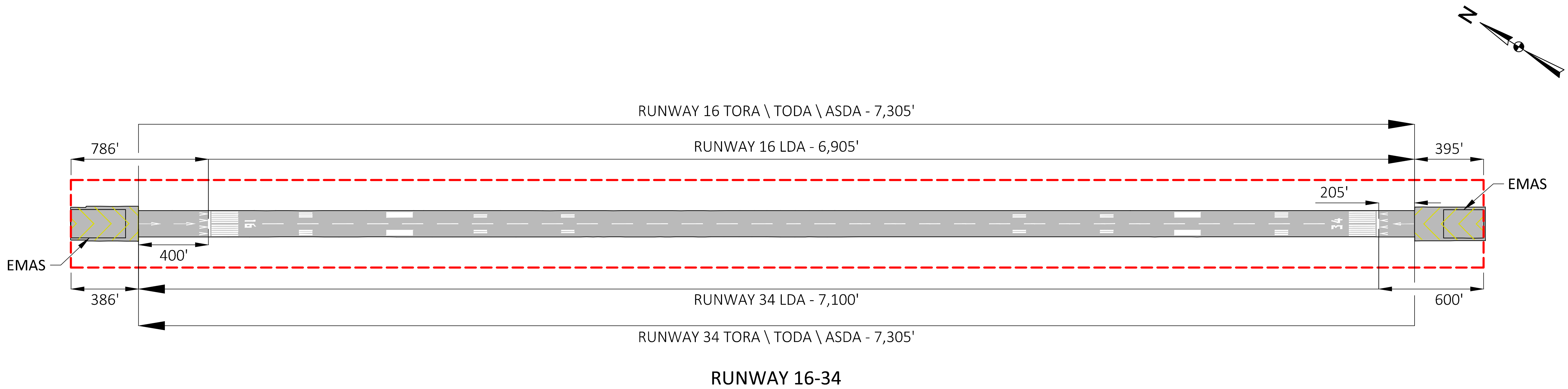
Source: FAA AC 150/5300-13A.

The Airport currently owns land in fee or easement off all runway ends to control portions of the Airport’s RPZs as well as to prevent the construction of obstructions to the 14 Code of Federal Regulations (CFR) Part 77 approach surfaces. It is recommended that the Airport acquire interest for all areas within RPZs that are not currently under Airport control. These areas include the southern portion of the Runway 34 approach RPZ, and portions of the RPZs on both ends of Runway 10-28. These areas are zoned as Rural Residential and Industrial and include some land uses that are not compatible for presence within RPZs, including residential.

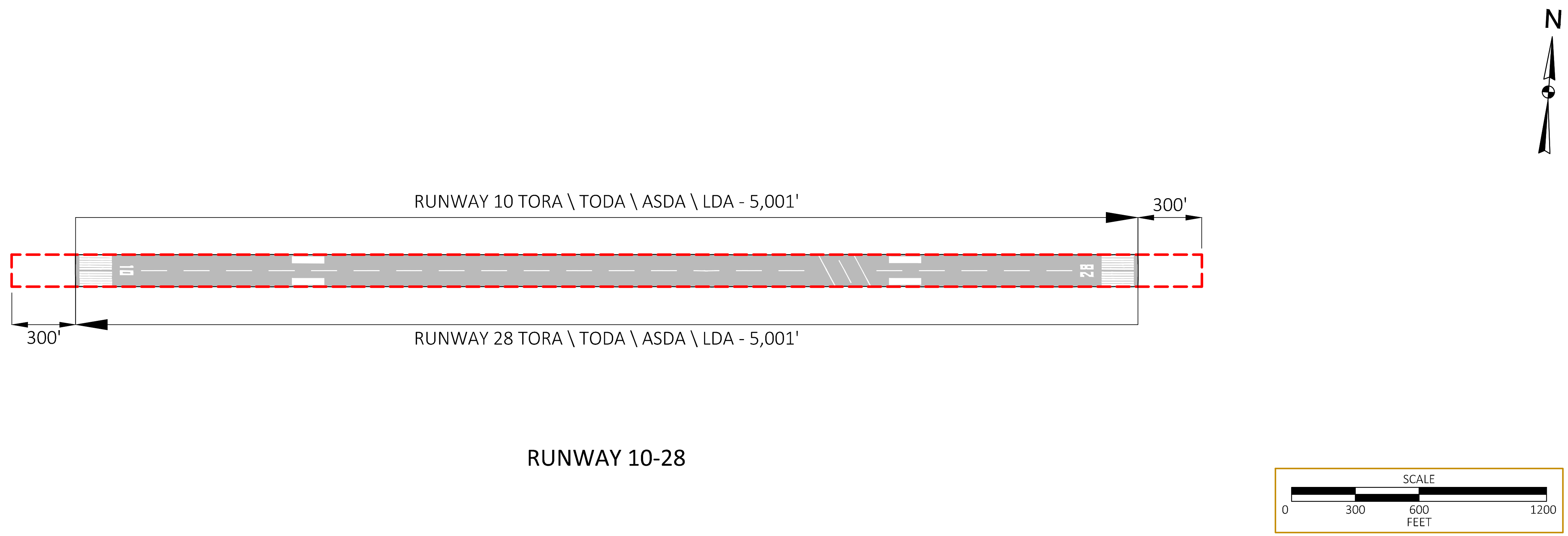
As previously noted, there are several public roads located within the RPZs. According to recently published guidance by the FAA, public roads are not considered compatible land uses within RPZs and are not recommended. The current FAA guidance does not require relocation of existing roadways within RPZs unless a change in geometry of the runway or a roadway occurs. Changes in geometry of the runways at BGM are not anticipated as a result of this Master Plan.

Recommendation: Acquire control of all land uses within existing RPZs (through fee simple acquisition or avigation easements) for those properties not currently under Airport control or owned by a public entity.

Figure 5-5: Declared Distances



RUNWAY 16-34



RUNWAY 10-28

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5.2.10. Runway Visibility Zones

Standards have been developed for pilot visibility along runways, and between intersecting runways, which is known as the runway visibility zone (RVZ). The RVZ is an area formed by imaginary lines which are five feet above runway centerline, connecting the two runway's visibility points, which are located half of the length between each runway end and the runway intersection. In cases where one of the runways intersects at less than or equal to 750 feet, then the end of the runway is used instead.

The current standard for intersecting runways requires a clear line of sight between aircraft on the runways and within the defined RVZ. According to FAA AC 150/5300-13A, terrain needs to be graded and permanent objects need to be designed or sited so that there will be an unobstructed line of sight from any point five feet above one runway centerline to any point five feet above an intersecting centerline, within the RVZ. The RVZ can be seen in **Figure 5-6**.

The RVZ at BGM is currently obstructed by a portion of the aircraft rescue and firefighting (ARFF)/rental car parking lot north of the terminal building. The parking lot itself isn't necessarily an issue, however cars parked along the easternmost row of parking spots would present an obstruction to the RVZ. Further, the terminal building extends into the RVZ by approximately 31 feet and depending on the placement of the northernmost passenger boarding bridge (PBB), that too would present an additional obstruction to pilot visibility between the two runways. Also, most aircraft parked at the passenger terminal will obstruct the visibility between pilots on each runway.

Recommendation: As the remediation of the RVZ penetration would require a significant overhaul of the terminal area, including the relocation of the passenger terminal and associated apron, it is recommended a Modification of Standard (MOS) be requested from the FAA. It is recommended that any future construction remains outside the RVZ.

5.2.11. Runway Pavement Markings

Both ends of primary Runway 16-34 have precision instrument approach runway markings. Both ends of Runway 10-28 have non-precision instrument runway markings. There are no plans for the establishment of a precision approach to either end of Runway 10-28, nor are they recommended. There is one known issue with runway painted markings that exists at the Airport. The runway hold short line for Taxiway H west of Runway 16-34 is located inside the RSA. The holdline marking is currently planned for relocation to a standard offset as part of a project to improve Taxiway H in 2020. The runway markings at the Airport are appropriate for their current and future approach requirements, respectively. Further, the current FAA Form 5010 reports the markings in good condition.

Runway designations on Runway 16-34 and Runway 10-28 are based on the magnetic heading of each particular runway. A shifting earth magnetic field requires a prudent examination of the runway designations to ensure they are within 10 degrees of the current and future magnetic heading given magnetic declination.

The magnetic azimuth is determined by correcting the runway's true bearing for magnetic declination. To accomplish this calculation, westerly magnetic declination values are added to a runway's true bearing, while easterly magnetic declination values are subtracted.

According to the National Oceanographic and Atmospheric Administration (NOAA), the current magnetic declination at BGM is 12° 1' W and is changing by 0° 2' E per year. Since the magnetic declination is westerly, the magnetic azimuths associated with the runways at the Airport are determined by adding the declination value to the true bearing values.

The true bearing information, shown in **Table 5-11** for all runways, is obtained from actual survey data, and taken from the most recent Airport Layout Plan (ALP).

As seen in **Table 5-11**, the existing and future runway designations are within 10 degrees of the existing and future magnetic bearings and as such, there is no need to change the runway designation markings.

Recommendation: There are no recommendations with respect to airfield painted markings.

Table 5-11: Magnetic Declination Calculations

Factor	Value
Runway 16-34 True Runway Bearing	147.92°
Magnetic Declination	12° 1' = 12.02°
Existing Runway Magnetic Bearing	147.92° + 12.02° = 159.94°
20-Year Declination Change	2' East per year = -2/60*20 = -0.67
Future Runway 16-34	159.94° - 0.67° = 159.27°
Factor	Value
Runway 10-28 True Runway Bearing	086.15°
Magnetic Declination	12° 1' = 12.02°
Existing Runway Magnetic Bearing	086.15° + 12.02° = 098.17°
20-Year Declination Change	2' East per year = -2/60*20 = -0.67
Future Runway 10-28 Magnetic Bearing	098.17° - 0.67° = 97.5°

Source: BGM Airport Layout Plan, 2008, NOAA, McFarland Johnson calculations, 2020.

5.2.12. Taxiways

There are currently 13 taxiways at the Airport. Runway 16-34 is served by a full parallel taxiway and Runway 10-28 is served by a partial parallel taxiway. Planning standards for taxiways include taxiway width, taxiway safety areas, taxiway object free areas, taxiway shoulders, taxiway gradient, and for parallel taxiways, the distance between the runway and taxiway centerlines. The dimensions of each standard vary based on the identified airplane design group (ADG) and taxiway design group (TDG) for each taxiway. The ADG is based on the wingspan and tail height of an aircraft, while the TDG is based on the distance between an aircraft's cockpit to main gear, as well as the width of the main gear. There are six ADG groups, and seven TDG groups. Details regarding the various dimensions follow in **Table 5-12** and **Table 5-13**.

Figure 5-6: Runway Visibility Zone

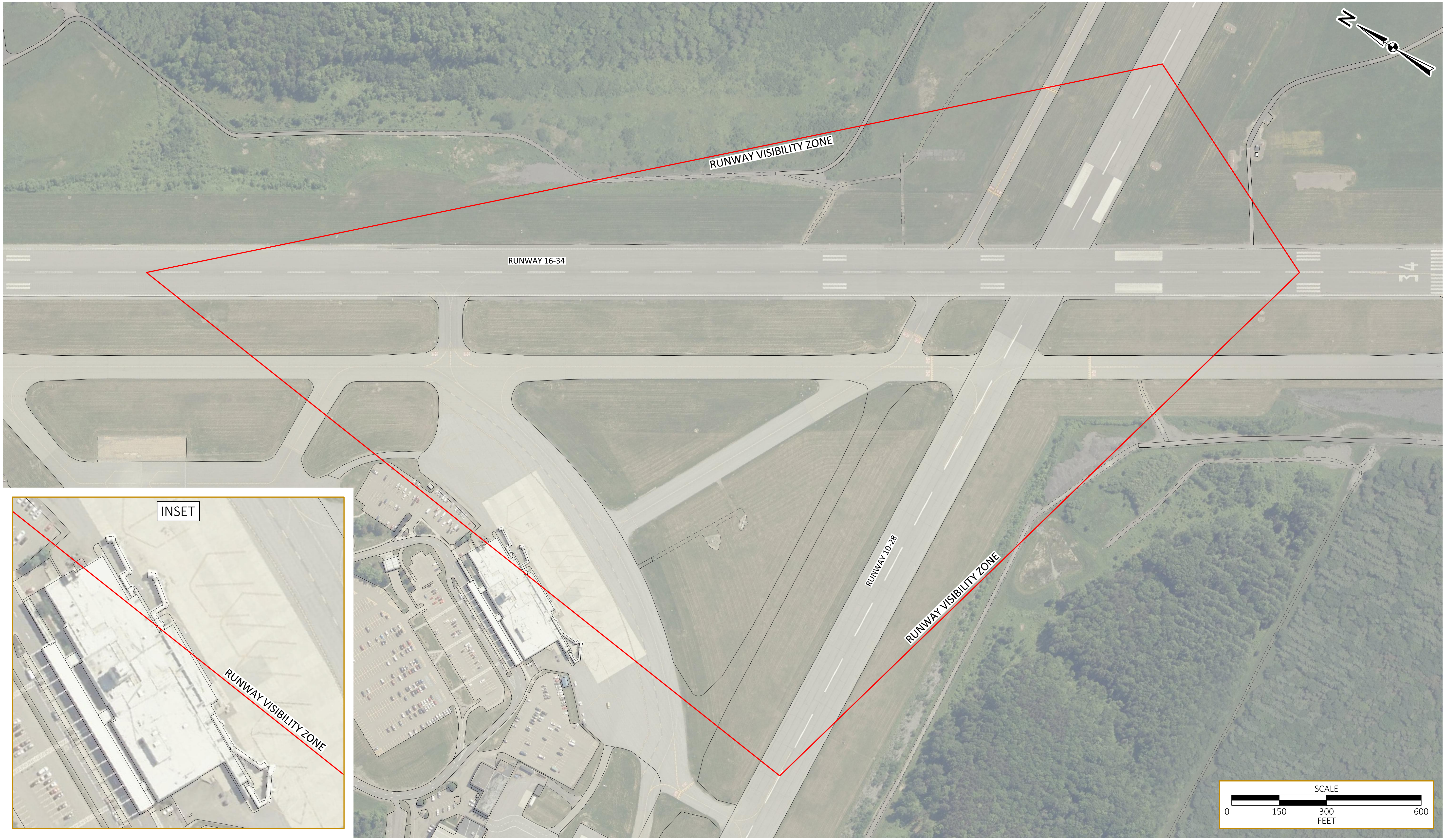

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Table 5-12: Taxiway Requirements – Airplane Design Group

Design Standard	ADG I	ADG II	ADG III	ADG IV	ADG V	ADG VI
Taxiway Safety Area	49’	79’	118’	171’	214’	262’
Taxiway Object Free Area	89’	131’	186’	259’	320’	386’
Runway/Taxiway Separation	225’ – 400’*	240’ – 400’*	400’	400’	400’	500’*

* Runway/taxiway separation vary based on approach visibility minimums
Source: FAA AC 150/5300-13A.

Table 5-13: Taxiway Requirements – Taxiway Design Group

Design Standard	TDG 1A/1B	TDG 2	TDG 3	TDG 4	TDG 5	TDG 6	TDG 7
Taxiway Width	25’	35’	50’	50’	75’	75’	82’
Taxiway Shoulder Width	10’	15’	20’	20’	30’	30’	40’

Source: FAA AC 150/5300-13A.

As taxiways are constructed or rehabilitated, design should carefully consider the guidance for taxiway design as published in FAA AC 150/5300-13A. The requirements include the design of taxiways for cockpit over centerline taxiing as opposed to judgmental oversteering. This standard particularly impacts curves and intersections, which will require changes to accommodate the cockpit over centerline taxiing. The dimensions of intersection fillets and taxiway curves are based on the associated TDG for each taxiway.

As noted in AC 150/5000-17, different aircraft can define separate elements of airport design and multiple critical aircraft can be identified for different factors of airport planning, including taxiway design group. While the critical aircraft for RDC and related to runway length were previously identified and discussed, the driving factors for taxiway design as discussed above can lead to a selection of a separate critical aircraft for taxiway design. When reviewing the taxiway design standards for the critical aircraft identified for Runway 16-34 under existing conditions, the CRJ-200, this aircraft is identified as TDG 1B and the critical aircraft identified for Runway 10-28 is the King Air 350, identified as TDG 2. However, there are numerous aircraft that operate at BGM that do not have greater RDC requirements than the CRJ-200 but do have different TDG characteristics. In reviewing the FAA’s Traffic Flow Management System Counts (TFMSC) for 2019, there were more than 500 operations completed at BGM by aircraft within TDG 2 or greater. These aircraft are listed in **Table 5-14**.

Table 5-14: 2019 TDG 2 and Greater Operations

Aircraft	Annual Operations (2019)
Beech Super King Air 350	254
Beech 200 Super King	36
Raytheon 300 Super King Air	52
Cessna Citation CJ3	14
Cessna Citation I	4
Cessna Citation II	20
Cessna Citation V	78

Aircraft	Annual Operations (2019)
Bombardier CRJ-700	14
Bombardier CRJ-900	12
Embraer ERJ 135/140/Legacy	4
Gulfstream IV	12
Gulfstream V	24
Gulfstream VI	10
Bombardier DHC8-200	2
Embraer Brasilia	2
Falcon F7X	2
Total	**540**

Source: FAA TFMSC, Calendar Year 2020.

These aircraft will be used for planning infrastructure improvements until there has been a change to the future design aircraft which is the CRJ-900 and Embraer Legacy, which are both TDG 2 aircraft.

Taxiway A is a full-length parallel taxiway to Runway 16-34 providing access to both ends of the runway. Access to Taxiway A is provided by Taxiways F and G from the terminal apron, and Taxiways D and E from the North Ramp. The taxiway width is 75 feet and therefore meets TDG 2 standards. The runway centerline to taxiway centerline distance between Taxiway A and Runway 16-34 is 300 feet, which does not meet the standard separation distance of 400 feet for AAC-ADG D-II and C-III according to FAA Advisory Circular (AC) 150/5300-13A.

Taxiway B is a bypass taxiway near the approach end of Runway 16. The taxiway width is 92 feet at the narrowest point which meets TDG 2 standards for aircraft taxiing to Runway 16-34. With the planned renaming of Taxiway H and Taxiway K to Taxiway B, former Taxiway B will be renamed Taxiway G in 2020.

Taxiway C is a stub taxiway south of Taxiway B with a width of 75 feet which meets which meets TDG 2 standards for aircraft taxiing to Runway 16-34. It also serves as an entrance/exit taxiway.

Taxiway D is an exit taxiway that intersects Taxiway A and provides access to Runway 16-34 from the North Ramp. It is 75 feet wide which meets TDG 2 standards for aircraft taxing to Runway 16-34.

Taxiway E is an apron taxiway that connects the south side of the North Ramp and Taxiway A. It is 75 feet wide which meets TDG 2 standards for aircraft taxing to Runway 16-34.

Taxiway F is an apron taxiway that provides access from the terminal apron to Taxiway A, Taxiway P and Runway 16-34. The taxiway width is 75 feet and meets TDG 2 standards for aircraft taxing to Runways 10-28 and 16-34. A project is currently planned for construction in 2020 that will convert this taxiway to an apron taxilane and provide all access to runways via the parallel taxiways to both Runway 10-28 and Runway 16-34.

Taxiway G is a75 foot wide crossover taxiway that connects the Terminal Apron with Taxiway A. The intersection of Taxiways A, G, and H is a published hot spot due to the potentially confusing geometry at the intersection. Taxiway G is 75 feet wide and meets TDG 2 standards for aircraft taxing to Runway 16-34. A project is currently planned for construction in 2020 that will remove this taxiway.

Taxiway H is a partial parallel taxiway that connects Taxiway G, Taxiway A, and Runway 16-34 to the Runway 28 threshold. It is 75 feet wide which meets TDG 2 standards for aircraft taxing to Runway 16-34. A project is currently planned for construction in 2020 that will extend Taxiway H to a new terminus at Taxiway K, creating a full parallel taxiway to Runway 10-28. The new full-length parallel taxiway will be named Taxiway B.

Taxiway J is a crossover taxiway, approximately 80 feet wide at its narrowest point which meets TDG 2 standards for aircraft taxing to Runway 16-34. It is a stub taxiway that provides access to the Runway 34 displaced threshold and serves as a by-pass to Taxiway A.

Taxiway K is a 50-foot-wide, partial parallel taxiway which meets TDG 2 standards for aircraft taxiing to Runway 10-28. It connects the Runway 10 threshold with the south end of the Terminal Apron. A project is currently planned for construction in 2020 that will extend Taxiway H to a new terminus at Taxiway K, creating a full parallel taxiway to Runway 10-28. The new full-length parallel taxiway will be named Taxiway B.

Taxiway L is an apron taxiway which is 50 feet wide and connects Taxiway K to the West Ramp, including Heliport H1. It meets TDG 2 standards for aircraft taxiing to Runway 10-28.

Taxiway M is 50-foot-wide apron taxiway that connects Taxiway K and the West Ramp. It meets TDG 2 standards for aircraft taxiing to Runway 10-28.

Taxiway P is 50 feet wide and meets TDG 2 standards for aircraft taxiing to Runway 10-28. It serves as an entrance/exit taxiway for Runway 10-28 approximately 1,620 feet from the Runway 10 threshold. With the planned renaming of Taxiway H and Taxiway K to Taxiway B, former Taxiway P will be renamed Taxiway B2 in 2020.

Recommendation: The following design and geometry issues were found and should be investigated:

Given the runway to taxiway separation of 300 feet between Runway 16-34 and Taxiway A, and the requirement of 400 feet of separation, Taxiway A should be relocated, or an MOS should be sought from the FAA for the deficit in runway/taxiway separation. The feasibility of relocating the taxiway will be further assessed in the Alternatives chapter.

Taxiways G, H and A intersection: This is a published hotspot which is planned to be addressed in 2020 with the removal of Taxiway G and the construction of an extension of Taxiway H to Taxiway K to provide a full parallel taxiway to Runway 10-28. The hot spot was identified due to the confusing geometry at the existing taxiway intersection, with five directions of traffic possible, in conjunction with the close proximity to Runway 28 and Runway 34.

Additionally, any pavement condition in failed, serious, very poor, and poor condition should be rehabilitated in the short-term. Pavement assessed as fair should be rehabilitated within the planning period.

If any changes to the taxiways occur, Engineering Brief No. 89, *Taxiway Nomenclature Convention*, dated March 29, 2012, should be used to ensure clear taxiway nomenclature.

5.2.13. Potential Hot Spots and Geometry Requirements

A hot spot is defined by the FAA as, "a location on an airport movement area with a history of potential risk of collision or runway incursion, and where heightened attention by pilots and drivers is necessary."[1]

Between 1983 and 2007 there were thirteen accidents at the Airport, and there were nineteen runway incursions between 2002 and 2017.[2] Eleven of the incursions were classified as category D in the FAA's Runway Incursion Severity Scale which is defined as an, "Incident that meets the definition of runway incursion such as incorrect presence of a single vehicle/person/aircraft on the protected area of a surface designated for the landing and take-off of aircraft but with no immediate safety consequences", and three of these incursions were classified as category C or, "An incident characterized by ample time and/or distance to avoid a collision" (six of the incursions had a category of, "N/A")

Geometry Requirements

FAA AC 150/5300-13A has multiple criteria in the design of taxiways. These geometry criteria are as follows:

- Three Node Concept: The three-node concept means that any taxiway intersection has no more than three choices – ideally left, straight, and right. Any more decision points make it potentially confusing to a pilot and does not allow for the proper placement of airfield markings, signage, and lighting. The three-node concept helps pilots maintain situational awareness.
- Taxiway Intersection Angles: Taxiway intersections are preferred to be 90-degrees whenever possible. Standard angles including 30, 45, 60, 90, 120, 135, and 150 degrees are preferred over other, non-standard, angles.
- Wide Expanse of Pavement: Wide pavements require placement of signs far from the pilot's eye which can be missed during low visibility conditions and should be avoided. This is especially critical at runway entrance points.
- Limit Runway Crossings: Limiting runway crossings reduces the opportunity for human error and reduces air traffic controller workload.
- Avoid "High Energy" Intersections: These intersections are located in the middle third of runways. This portion is where the pilot can least maneuver to avoid a collision.
- Runway Intersection Angles/Increase Visibility: Right (perpendicular) intersection angles between taxiways and taxiways and taxiways and runways provide the best visibility to the left and right for a pilot. A right angle at the end of a parallel taxiway is a clear indication of approaching a runway. Acute angle runway exits (high-speed taxiways) provide for

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[1] Runway Safety – Hot Spot List, accessed March 21, 2018 <http://www.faa.gov/airports/runway_safety/hotspots/hotspots_list/>.

[2] FAA Runway Incursion Database, accessed March 22, 2018 <http://www.asias.faa.gov/pls/apex/f?p=100:28:0::NO:28::>.

greater efficiency in runway usage but should not be used as a runway entrance or crossover point.

- Avoid "Dual Purpose" Pavement: Runways used as taxiways and taxiways used as runways can lead to confusion. A runway should always be clearly identified as a runway and only a runway.
- Indirect Access: Taxiways leading directly from an apron to a runway without requiring a turn can lead to confusion when a pilot typically expects to encounter a parallel taxiway but instead accidentally enters a runway.
- Multiple Taxiway Crossings Near Runway: A taxiway crossing a high-speed taxiway or multiple taxiways crossing each other between the hold line and the runway could cause confusion, additional time on the runway, and wrong turns/loss of pilot situational awareness.
- Taxiway Intersecting Multiple Runways: Taxiways must never coincide with the intersection of two runways. This creates a large expanse of pavement making it difficult to provide proper signage, marking and lighting. These could lead to pilot disorientation and potential wrong runway use.
- Aligned/Inline Taxiway: An aligned taxiway is one whose centerline coincides with a runway centerline. This places taxiing aircraft in direct line with aircraft landing or taking off therefore closing the runway for other traffic and potentially causing loss of situational awareness. Existing aligned taxiways should be removed as soon as practicable.
- "Y" Shaped Taxiway Crossing a Runway: Any runway crossing, or runway exit that requires a pilot to make a decision prior to exiting the runway may cause a delay in the aircraft existing the runway and loss of situational awareness.
- Multiple Runway Thresholds in Close Proximity to One Another: If possible, safety areas of runway ends should not overlap, since work in the overlapping area would affect both runways. Configurations where runway thresholds are closer together should be avoided, as they can be confusing to pilots, resulting in wrong-runway takeoffs. The angle between extended runway centerlines should not be less than 30 degrees to minimize confusion.
- Short Taxi Distance: A short distance between the terminal and the runway requires flight crews to complete the same number of checklist items in a shorter timeframe and requires more heads-down time during taxi. Many of the event reports mentioned that the flight crew members were rushing to complete their checklists or to expedite their departures.
- Taxiway Stubs: Short taxiway stubs including overlapping holdlines or holdlines too close together to accommodate the length of an aircraft can create confusion and may cause runway incursions or accidents.
- Unexpected Holdlines: Holdlines located on a parallel taxiway or other unexpected location are more likely to be overlooked and cause a runway incursion or accident and should be avoided.
- Intersection Departures: Airports with a single runway layout were not immune to airplanes taking off on the wrong runway, especially when intersection departures were made. In these events, the flight crew taxied onto the runway and turned in the wrong direction, taking off 180 degrees from the intended direction.

The following elements or contributing factors are historically associated with wrong runway uses and should have the highest priority in resolving: [3,4]

- Multiple runway thresholds located in close proximity to one another.
- A short distance between the airport terminal and the runway.
- A complex airport design.
- The use of a runway as a taxiway.
- A single runway that uses intersection departures.
- A single taxiway leading to multiple runways.
- More than two taxiways intersecting in one area.
- A short runway (less than 5,000 feet).
- Joint use of a runway as a taxiway.

Table 5-15 shows geometry issues at BGM by geometry requirement.

Recommendation: Geometry issues should be resolved as much as practicable. Priority should be set to resolve the following geometry requirements in **Table 5-15**: Runway crossings (Runway 16-34 and Runway 10-28), high energy intersections, and increase visibility.

Table 5-15: Geometry Issues at Greater Binghamton Airport

Geometry Requirement	Taxiway/Taxiway Int.	Runway/Taxiway Int.
Three Node Concept	None	None
Taxiway Intersection Angle	Taxiway A & D (48°)	See, "Increase visibility"
Wide Expanse of Pavement	Taxiways A & D Taxiways A & F Taxiways K, F & P	None
Runway Crossings	N/A	RWY 16-34: 1 RWY 10-28: 1
High Energy Intersections	N/A	RWY 16-34 & TWY F RWY 10-28 & TWY A
Increase Visibility	See "Taxiway Intersection Angle"	RWY 16-34 & TWY H RWY 10-28 & TWY A
Dual Purpose Pavement	None	None
Indirect Access	N/A	None
Multiple Taxiways Crossing	N/A	None
Taxiway Intersecting Multiple Runways	N/A	None
Aligned Taxiway	N/A	None
Y-Shaped Runway Crossing	None	N/A

[3] Wrong Runway Departures, Aviation Safety Information Analysis and Sharing, July 2007.
[4] Preventing Wrong Runway Departures, FAA Runway Safety, September 2009, accessed March 21, 2018 <https://www.faa.gov/airports/runway_safety/publications/media/wrong%20runway%20FINAL%20draft%20sept09.pdf>.

Geometry Requirement	Taxiway/Taxiway Int.	Runway/Taxiway Int.
Multiple Runway Thresholds in Close Proximity	N/A	None
Short Taxi Distance	None	N/A
Taxiway Stubs	None	N/A
Unexpected Holdline(s)	None	None
Intersection Departure	N/A	Yes, when beneficial for ATCT or upon pilot request (all)

N/A – not applicable; RWY – runway; TWY – taxiway
Source: McFarland Johnson analysis, 2018.

5.3. LANDSIDE FACILITY REQUIREMENTS

5.3.1. Passenger Terminal Apron

The terminal apron at BGM is approximately 33,000 square yards (297,000 square feet) and extends approximately 226 feet from airfield side of the terminal building to Taxiway F at its widest point north of the terminal building. South of the terminal building, the terminal apron narrows to a distance of approximately 205 feet from the terminal building to Taxiway F. The usable area of the terminal apron is reduced by a designated taxilane that traverses the south and east end of the apron, connecting the FBO apron on the south end via Taxiway K, and the North Ramp via Taxiways A and then E. The remaining terminal apron area is available for use by airline aircraft, which has a usable length of approximately 1,200 feet. This area of the terminal apron will be utilized to determine the number of aircraft parking positions for this Master Plan Update.

Aircraft Parking Positions

The capacity of a terminal apron to accommodate aircraft parking positions is determined by the type of aircraft utilizing the terminal, guidance for wingtip separation and nose-to-building clearances and considers the type of passenger loading bridges in use. Published guidance utilized to determine terminal apron capacity are AC 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities*, and Air Transport Association of America, *Safety Guidelines SG 908, Revision 2010.1.*

As detailed in Section 3.8, *Future Design Aircraft*, and Section 5.3, *Passenger Terminal Facility Requirements*, the critical aircraft forecasted to utilize the terminal apron through the planning period is the Bombardier CRJ-900 which is a C-III aircraft. The terminal apron is currently configured to accommodate nine parking positions with ground level gates and four jetways for scheduled passenger service, which indicates that both the terminal and the apron have the capacity to accommodate more aircraft during peak periods than are in use today.

The usable width of the terminal apron can accommodate up to four parking positions by aircraft in ADG III (CRJ-900/A320, or similar), and up to eight positions for aircraft in ADG II (CRJ-200) under taxi-in, power/push-out procedures. Taxi-in/out procedures will reduce the total number of parking positions; however, not to an extent that the terminal apron's existing size will be deficient over the long term.

FAA guidance delineates four different gate types, A through D, which relate to the wing spans and fuselage lengths of the aircraft they are designed to accommodate. Gate type A is the FAA standard for aircraft in ADG III. Design guidelines for this gate type call for minimum wingtip clearances of 15 feet between parked aircraft. Nose-to-building clearance varies from 15-30 feet if the aircraft are positioned perpendicular to the building but is greater for taxi-in/taxi-out procedures. The parking positions at BGM are configured so aircraft park with the fuselage at an acute angle to the terminal building, due to the close proximity of Taxiway F behind the parked aircraft. As previously mentioned, a project is planned for 2020 that will connect Taxiways H and K and create a full parallel taxiway to Runway 10-28. At that juncture, it is anticipated that Taxiway F will be designated as a taxilane, which will reduce the taxiway object free area from 93' on each side of the centerline to a taxilane object free area at 81' on each side of the centerline.

Recommendation: No deficiency in the existing terminal apron area is forecasted for the long term. However, if scheduled passenger service increases significantly, or changes to the type of aircraft utilizing the terminal occur, reconfiguration of the terminal apron may be required.

5.3.2. Airfield Lighting and Signage

Approach Lighting

The existing precision approaches to Runways 16 and 34 are equipped with 1,400-foot medium intensity approach lighting systems with an additional 1,000 feet of five runway alignment indicator lights (MALSRs). Due to the terrain in the vicinity of BGM, many of these fixtures are located on towers.

The current approach lighting systems on Runways 16 and 34 meet the standards for an ILS category (CAT) I approach and meet existing needs at the Airport. Wind conditions predominantly favor Runway 34 during IFR conditions (56 percent).

Presently, no approach lighting systems are available for Runway 10 and Runway 28 is equipped with runway end identifier lights (REILs).

Recommendation: The Airport should pursue the installation of REILs for Runway 10.

Runway and Taxiway Lighting

Runway and taxiway edge lights are provided on Runways 16-34 and 10-28 and all taxiways. High intensity runway edge lights (HIRLs) are provided on Runway 16-34 and medium intensity runway edge lights (MIRLs) on Runway 10-28. Heliport H1 is equipped with perimeter lighting. All taxiways are currently equipped with medium intensity taxiway edge lights (MITLs). Airfield lighting is controlled by the on-site airfield electrical vault located adjacent to the fuel farm and is activated by ATCT personnel, or directly by pilots when the tower is closed through communications radios. The existing vault was constructed well over 40 years ago and has served its useful life at BGM. Discussions with airport staff indicate frequent failures in equipment and a need to replace the facility to modern equipment.

Recommendation: There are no recommendations for runway and taxiway lighting. The airport should plan to replace the airfield electrical vault and should consider locations for future siting to ensure the facility does not impede future development. Locations for the lighting vault will be considered in the alternatives chapter.

Airfield Signage

There have been no complaints about missing or confusing airfield signage. Runway hold short signs along Taxiway A should be aligned with the hold short markings, however due to the proximity of Taxiway A to Runway 16-34, this is difficult. The Airport Signage and Marking Plan has been approved by the FAA, despite the location of the hold short signs. To remedy the non-standard location of the hold short signs, analysis regarding the feasibility of relocating at least one taxiway hold sign with each taxiway will be completed in the Alternatives chapter, as well as a review related to the feasibility of relocation of Taxiway A to a standard off-set. Should it be impossible to relocate the signs or infeasible to relocate the taxiway, the Airport should pursue a MOS.

Recommendation: An analysis will occur in the Alternatives chapter to review the potential to relocate the nonstandard runway hold-short signs, or to relocate Taxiway A to a standard offset.

5.3.3. Visual Approach Aids

Visual approach aids provide visual cues to aid pilots during the landing phase of flight.

Visual Glide Slope Indicators (VGSI)

A Precision Approach Path Indicator (PAPI) and a visual approach slope indicator (VASI) are very similar lighting approach aid systems utilizing special lenses to inform a pilot whether they are on, above or below the specified glide path for that runway end. Presently, Runways 16 and 34 have a two-box PAPI system on the left side of each end with a standard 3-degree glide path. Runways 10 and 28 each have a 4-box VASI on the left side with a standard 3-degree glide path. If any of the VGSIs are replaced in the planning period, it is recommended they be replaced with 4-box PAPIs. All PAPIs and VASIs, similar to the ILS and MALSRs, are owned and maintained by the FAA.

Wind Cones

Wind cones provide current wind direction and speed information for arriving pilots. There are two supplemental wind cone assemblies at both ends of Runway 16-34, and two supplemental wind cone assemblies at both ends of Runway 10-28, however these is no primary wind cone assembly and per the requirements of CFR Part 139, a primary wind cone is required. As previously noted, the supplemental wind cones for Runway 16-34 are in the ROFA and relocation is recommended.

Recommendation: The Airport should install a primary wind cone. Locations for the primary wind cone, and the supplemental wind cones for Runway 16-34, can be assessed in the alternatives.

5.3.4. Airfield Facility Requirements Summary

Several requirements for airside facilities have been discussed throughout this section. A summary of the key requirements identified can be found in **Table 5-16**. Geometry issues are identified in

Table 5-15.

Table 5-16: Summary of Airside Facility Requirements

Item/Facility	Existing Facility or Capacity	Ultimate Requirement	Deficit
Heliport H1	98’ by 118’	98’ by 118’	None
Runways	16-34 / 10-28	16-34 / 10-28	-
Length	7,305’ / 5,001’	7,305’ / 5,001’	None
Width	150’	150’ / 100’	None
RSA Width	500’ / 150’ Minor Grading Issues	500’	350’ Runway 10-28 (Future); Minor grading issues
RSA Length Prior to Threshold	600’ / 300’	600’	300’ Runway 10-28 (Future)
RSA Beyond Threshold	1,000’ / 300’	1,000’	700’ Runway 10-28 (Future)
ROFA Width	800’ / 500’ Supplemental Wind Cones Within ROFA	800’ Clear of Objects	300’ Runway 10-28 (Future); Supplemental Wind Cones
ROFA Beyond Threshold	1,000’ / 300’	1,000’	700’ Runway 10-28 (Future)
RPZ	Not Airport Owned / Not Airport Owned	Fee Simple or Avigation Easements	Acquire Land in Fee or Easements
Lighting	HIRL / MIRL	HIRL / MIRL	None
Runway Visual Aids	Runway 16 – MALSR Runway 34 – MALSR Runway 10 – VASI Runway 28 – VASI/REIL	Runway 16 – MALSR Runway 34 – MALSR Runway 10 – VASI Runway 28 – VASI/REIL	None
Instrument Approaches	Runway 16 – ILS Runway 34 – ILS Runway 10 – LPV Runway 28 – LPV	Runway 16 – ILS Runway 34 – ILS Runway 10 – LPV Runway 28 – LPV	None
Taxiways	Runway 16-34 – full parallel Runway 10-28 – partial parallel; 320 feet	Runway 6-24 – partial parallel; 400 feet Runway 2-20 – partial parallel; 240 feet	Address airfield geometry concerns and meet FAA standards
Taxiway Width	50 – 92 feet	50 – 75 feet	None
Taxiway Lighting	All taxiways – MITL	All taxiways – MITL	None

Sources: FAA Form 5010-1; McFarland Johnson analysis, 2018.

5.4. PASSENGER TERMINAL FACILITY REQUIREMENTS

This section summarizes the methodology, assumptions, and general planning-level factors used to analyze facility requirements for key functional areas of the BGM passenger terminal. Requirements were analyzed based on a multitude of factors. The primary tool for the analysis was ACRP Report 25, *Airport Passenger Terminal Planning and Design, Volume 2: Spreadsheet Models and User's Guide (Model)*. Additionally, guidelines published in the following publications were included: International Air Transport Association's (IATA) *Airport Development Reference Manual (ADRM, 10th Edition)*; FAA AC 150/5360-13A, *Airport Terminal Planning*; and FAA AC 150/5300-13A, *Airport Design*.

5.4.1. Existing Passenger Terminal

As described in Chapter 1, *Inventory*, the existing terminal building at BGM was opened in 1950 and has had several expansions and upgrades since its construction. In 1999, the terminal building was upgraded to improve life safety functions, as well as expanded in areas to include ticket counters, baggage claim and outbound baggage areas, the departure lounge, and restrooms, as well as renovated second floor spaces to meet Americans With Disabilities (ADA) requirements. A second-floor observation deck was also added along with a first-floor business/conference center.

In 2012, the terminal restrooms and the Transportation Security Administration (TSA) security screening checkpoint were upgraded.

The most recent terminal renovations occurred in 2014 and included security upgrades as well as a new baggage claim device.

Despite these and other challenges, the existing terminal building has been maintained in good repair and functions relatively well in terms of passenger flow from ticketing through boarding. Based on conversations with Airport management and operations staff, the terminal building is poised for future growth of air service.

The sections that follow detail and summarize the methodology used to assess the requirements for the BGM terminal building through the planning period.

5.4.2. Methodology

Utilizing the ACRP Model and FAA and industry standards guidance listed above, the following passenger processing functions were examined:

- Gates
- Terminal Curb Length
- Passenger Check-In and Ticketing
- Outbound Baggage Screening and Make-Up
- Passenger Security Screening Checkpoint
- Passenger Lounges/Holdrooms
- Inbound Baggage Handling and Baggage Claim
- Concourse Circulation/Concessions
- Other Terminal Support Functions

The terminal building analysis was performed under the blended forecast scenario as set forth in Chapter 3, *Aviation Forecasts*. Application of the Model under this scenario is presented in the following sections.

Application of ACRP Model

The Model is designed to determine terminal requirements by functional area based on historical and forecasted annual enplanements, departures, and gates. The Model uses these inputs (along with a variety of assumptions) to identify peak hour activity. From this point, the Model relies on peak hour activity levels to produce space requirements that can accommodate demand as it grows. In this way, the Model serves as "top down" analysis, starting with annual demand to estimate peak activity demand.

Table 5-17 below details available aircraft seats by aircraft type, as well as estimated peak period activity.

Table 5-17: Aircraft Seats and Scheduling Peaking Characteristics

Forecast Period	Aircraft	Enplanements	60 Min. Pax. Peak
Existing	CRJ-200	33,666	50
Future – 2022	CRJ-900	47,131	66
Future – 2032	CRJ-900	58,912	76
Future – 2037	CRJ-900	62,951	85
Maximum Capacity Scenario	CRJ-200 + CRJ-900	62,951	126

Source: McFarland Johnson analysis, 2020.

For the purposes of this analysis, enplanements and passenger peaks from Chapter 3, *Aviation Forecasts* can be seen above in **Table 5-17**. The 60-minute passenger peak can be assumed to be when a majority of departing passengers arrive and utilize the terminal building. For prudent planning purposes, a total of 126 passengers will be used as a 60-minute passenger peak which assumes the simultaneous departures of a CRJ-200 and a CRJ-900 and can be considered a maximum capacity scenario for terminal congestion.

Building on the Model, the analysis includes a range of other estimates for areas associated with the primary functional spaces determined by the Model. These estimates will be described in the sections that follow.

Level of Service (LOS) Standards

The IATA has published the ADRM, a comprehensive guide with standards for planning various passenger processing functions for airport terminal buildings. These standards reflect the dynamic nature of terminal operations and throughput (passenger processing rate from check-in through enplanement) and have the goal of increasing infrastructure efficiency. The ADRM sets forth two variables, which jointly dictate a LOS. These variables are space and maximum waiting time. This space-time concept is the LOS framework for measuring the performance of passenger processing through each functional area of an airport terminal building and corresponding waiting areas. The measurement yields an indication of existing performance within four categories: under-provided, sub-optimum, optimum, and over-design.

Figure 5-7 illustrates how the space-time concept of LOS performance in airport terminals is evaluated.

As indicated in **Figure 5-7**, the space axis defines the amount of space available per occupant, and the time axis denotes the maximum waiting time for passengers in the queue. The objective of the space-time concept in ADRM is the provision of optimum passenger facilities and the avoidance of both over- or under-providing for passengers and the airport, airline, regulatory, or tenant staff doing the work of processing arriving and departing passengers to and from aircraft.

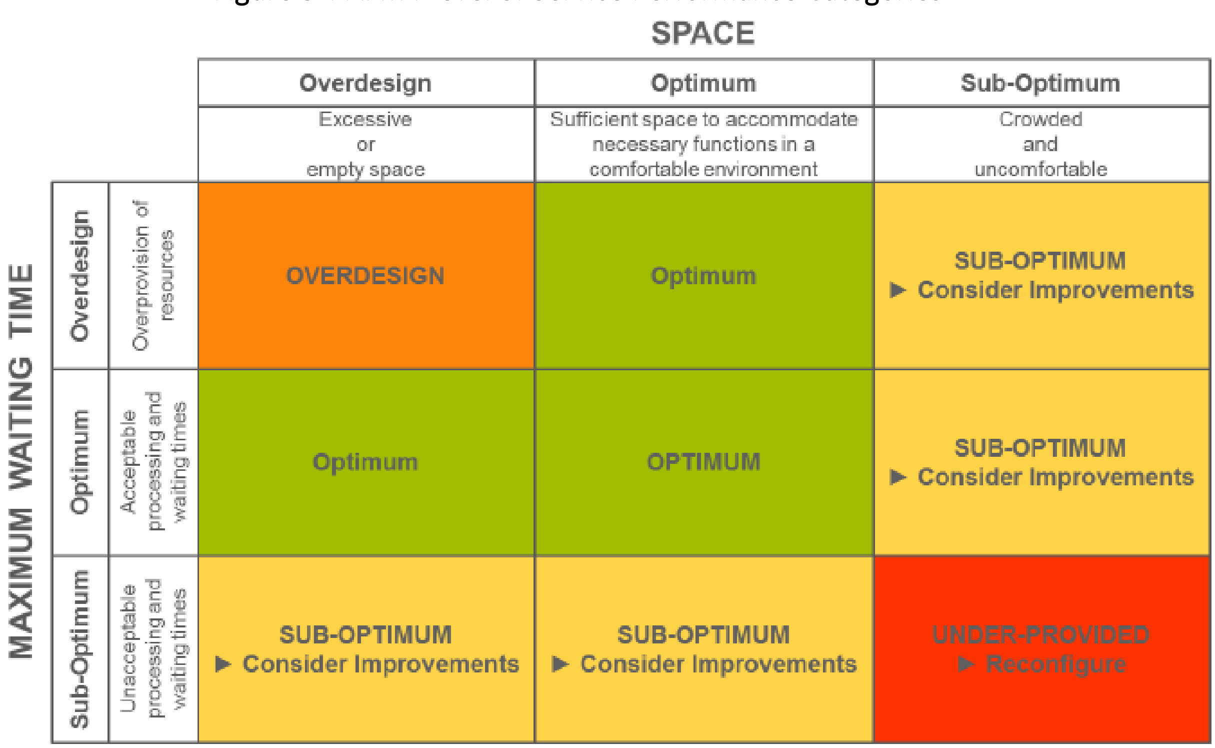
5.4.3. Assumptions

This section summarizes the assumptions utilized for the assessment of the existing Airport terminal building. While the existing gross area of the first floor of the terminal building is approximately 51,700 square feet (SF), nearly 3,000 SF is comprised of interior walls, building equipment and other unusable space, and not counted as functional space. As such the existing functional area of the first floor of the terminal building is approximately 48,700 SF.

Percentage of Originating Passengers

For purposes of analyzing passenger terminal space requirements, it is assumed that 100 percent of enplaned passengers are originating at BGM. The originating passenger percentage is used to determine the number of passengers to be processed through check-in/ticketing and security screening, along with associated demands on outbound baggage functions, holdroom usage, and gate/boarding area egress.

Figure 5-7: IATA Level of Service Performance Categories



Source: IATA and ACI, 2014.

Vehicle Demand at Terminal Curb

Vehicle demand in the Model is comprised of a range of types utilized by passengers as ground transport to an airport for departing flights. These include everything from private automobiles carrying one to three passengers to tour buses carrying large groups of passengers. For this analysis, a focus was placed on private autos, taxis, and hotel shuttles. **Table 5-18** illustrates the assumed breakdown of peak vehicle demand at the curb.

Table 5-18: Peak Hour Vehicle Volume Assumptions

Vehicle Type	Peak Hour Vehicles	Total Passengers by Vehicle
Private Autos	42	55
Rental Car Shuttles	1	3
Taxis/Rideshare	2	2
Limousines	2	3
Hotel/Airport Shuttles	1	3
Buses	0	0
Total	48	76

Source: McFarland Johnson analysis, 2020.

The number of vehicles assumes that private autos will average 1.2 passengers each, hotel, airport and rental car shuttles will carry an average of 2.5 passengers, taxis and rideshare vehicles will transport one passenger per vehicle, limousines will transport 1.5 passengers each, and buses will average over 10 passengers. In speaking with Airport management, busses sometimes utilize the terminal curb, but only for chartered flights, and as such busses will not be figured into the required terminal curb length.

The Model then applies an assumption that a peak 15-minute period will require the curb to accommodate about 17 vehicles, each making one stop and dwelling from two to four minutes for all vehicles. The Model requirements for the terminal curb are in linear feet (LF). The existing curb length is approximately 380 linear feet.

Passenger Check-In/Ticketing

Passenger check-in/ticketing includes the functions of full-service staffed airline counter positions, self-serve kiosks, active check-in area, passenger queue area, airline ticket office areas, circulation area, and public restrooms. Assumptions for these areas include the following:

- Airline Staffed and Kiosk Check-In Area: Includes active check-in, passenger queue, counter areas, and office areas for a total of 1,985 SF.
- Circulation Area: Assumes an area requirement of 25 percent of total check-in area.
- Restrooms: Assumes an area requirement of 15 percent of total check-in area.

It is also assumed that 60 percent of passengers will utilize staffed airline counters, 40 percent of passengers will opt for self-serve kiosks.

Outbound Baggage Make-Up and Screening

Outbound baggage screening and make-up functions include operations by TSA to screen checked baggage and airline staff to collect and disperse bags to carts and the appropriate aircraft prior to departure. For outbound baggage volume the following assumptions in **Table 5-19** were used.

The Model assumes two departures per peak hour, and that the volume of checked baggage can be accommodated utilizing four baggage carts. The Model suggests that each cart requires 600 SF of space. An additional 35 percent of square footage is included for baggage train circulation and 20 percent for mechanical and support space.

In terms of Explosive Detection Systems (EDS), On-Screen Resolution (OSR), and Explosives Trace Detection (ETD) equipment requirements, the analysis assumed a Level 1 EDS screening rate of 220 bags per hour, with an alarm rate of 20 percent. Level 2 OSR processing ration was set at 120 bags per hour. For Level 3 ETD screening, the TSA suggests 24 bags per hour per operator.

Table 5-19: Outbound Baggage and Screening System Assumptions

Item for Analysis	Assumption
Peak Hour Passengers Checking Bags 1/	80%
Checked Bags per Passenger 2/	1.0
Bag Size – Standard	95%
Bag Size – Oversized	5%

1/ Number of checked bags remains constant over the period, should the trend of reduced checked baggage not continue.
2/ It has been identified that certain legacy airlines are currently observing lower "checked bag per passenger" quantities; for planning purposes, the higher quantity has been used.
Source: McFarland Johnson analysis, 2018.

Baggage screening space requirements contained in the Model were utilized here, and are as follows:

- Level 1 Area: 800 SF per EDS Unit
- Level 2 Area: 175 SF per OSR Station

An additional 35 percent of space is added for circulation area, and 15 percent to allow for future equipment changes and any required reconfiguration or renovations.

Passenger Security Screening Checkpoint

The following assumptions were utilized to analyze the future demand for security screening of departing passengers. The assumed processing rate for the analysis is 175 people per hour for a two-lane screening module configuration. TSA recommends 2,800 SF of space for a two-lane screening module (two lanes are recommended for redundancy). The percentage assumed for non-passenger traffic, such as employees and crew, is 10 percent, which was added to the design peak hour passenger screening demand and is based on recent experience at other airports.

As with other functional areas, allowances were also included for future equipment changes (10 percent) or reconfigurations and TSA support space (eight percent).

Passenger Lounges/Holdrooms

Holdroom space planning typically accounts for seating a certain percentage of passengers, with the remaining passengers standing. For this analysis, seating area was included for 80 percent of passengers to allow for adequate space for future holdroom configuration changes or shared holdrooms among multiple flights. Additionally, the analysis assumed 17 SF per seated passenger and 12 SF per standing passenger. The Model also includes some flexibility to account for amenities (e.g., children's play area, telephones, work areas, charging stations, etc.), and high utilization and holdroom sharing, when the holdroom is utilized for passengers waiting for more than one flight or is shared between gates.

The Model recommends approximately 230 SF to accommodate one airline gate podium and agents, as well as 240 SF for boarding corridor space per gate. Both are added to holdroom space requirements in the analysis.

Allowances for amenities, circulation, and restrooms are assumed to be 5 percent, 35 percent, and 15 percent, respectively.

Inbound Baggage Handling and Baggage Claim

Inbound baggage handling includes the unloading of baggage from aircraft and transferring them to the baggage claim unit for circulation to the baggage claim hall. It is assumed that a four-cart baggage train will accommodate the number of bags through the planning period, which requires an area of 850 SF, and allowances for baggage train circulation (35 percent) and conveyor belts and equipment (20 percent) are included. A baggage service office area is included for support of the inbound baggage handling operation, as well as 25 percent for circulation and 15 percent for restrooms.

The Model calculates baggage claim requirements assuming that a certain percentage of passengers will deplane in a peak 20-minute period. For BGM, it is assumed that 100 percent of passengers will be terminating at the Airport. As previously noted, it is also assumed that 80 percent of passengers will check one bag.

The Model also recommends adding square footage to the baggage claim area to account for passengers accompanying their travel party to the baggage claim area, which was assumed to be 15 percent.

Concourse Circulation/Concessions

In terms of area required for passenger circulation on the secure side of the terminal building, the Model considers whether the Airport operates as a hub for connecting passengers, the type of concourse design (e.g., single- versus double-loaded, with or without moving walkways), and includes assumptions for percentage of the concourse length that is usable (e.g., concourses with holdrooms at the end are not 100 percent usable). For this analysis, a single-loaded concourse with no moving walkways and no connecting flights was used, making 100 percent of the concourse usable by passengers.

Terminal concessions include both non-secure and secure area retail establishments to service departing and arriving passengers. For this assessment, it is assumed that 20 percent of peak hour passengers will utilize pre-secure concessions and 80 percent of peak hour passengers will patronize post-secure area concessions. Based on conservative planning factors for square footage per passenger, about 238 SF is estimated for pre-secure concessions and support areas. Post-secure concession and support area is estimated to be 956 SF. Internal circulation area allowance of 15 percent is also included for terminal building concession areas.

Other Terminal Support Functions

The final consideration of passenger terminal functional areas includes allowances for the following:

- Airline Support Operations: This assumption includes 433 additional SF based upon airline operations.
- Airport Support Operations: This assumption includes additional space allowances of 2,273 SF for ground handling services, operations and maintenance, and facilities support services.
- Building Design and Mechanicals Allowance: 6,277 SF is estimated for building structure and design variations, mechanical/electrical/utility systems, and stairwells and elevators.

5.4.4. Results of Analysis

The results the BGM terminal capacity assessment are summarized in **Table 5-20**.

Table 5-20: Terminal Functional Area Requirements

Functional Area	Current Status	Ultimate Requirement	Ultimate Deficit
Gates			
Gates	6	3	None
Curb Length			
Curb Length (LF)	380	86 to 102	None
Check-In/Ticketing			
Staffed Counter Positions	18	3	None
Check-In Ticket Counter Area	961	180	None
Active Check-In Area	467	150	None
Passenger Queue Area	964	635	None
Kiosk Positions	2	2	0
Kiosk Check-In Area	203	120	None
Kiosk Active Check-In Area	127	100	None
Kiosk Queue Area	263	423	160
Airline Ticket Office Area	2,195	375	None
Check-In/Ticketing Circulation Area	8,074	496	None
Restrooms Area	816	298	None

Functional Area	Current Status	Ultimate Requirement	Ultimate Deficit
Subtotal Check-In/Ticketing	**14,070**	**2,777**	**None**
Outbound Baggage Screening and Make-Up			
Level 1 EDS Screening Area	389	800	411
Level 2 OSR Screening Area	0	175	175
Level 3 Area for ETD Screening	0	100	100
Equipment Area & Support Area Allowance	466	376	None
Allowance Area for Future Equipment	648	218	None
Make-Up Area	858	2,400	1,542
Allowance Area for Baggage Train Circulation	1,496	840	None
Allowance Area for Mechanical/Support	1,213	648	None
Subtotal Outbound Baggage	**5,070**	**5,557**	**487**
Passenger Security Screening Checkpoint			
Screening Lanes	2	2	0
Security Screening Module Area	699	1,800	1101
Passenger Queue Area	300	816	516
Allowance Area for Future Equipment	611	262	None
TSA Support Space Area	1,358	230	None
Subtotal Passenger Screening Checkpoint	**2,968**	**3,108**	**140**
Passenger Lounges/Holdrooms			
Seated Passenger Area	1,448	1,457	9
Standing Passenger Area	1,459	257	None
Seating Circulation Area	0	1,764	1,764
Ticketing Podiums	460	690	230
Boarding Corridor Area	3,182	720	None
Allowance Area for Amenities	0	244	244
Holdroom Circulation Area		1,796	1,796
Restrooms Area	771	733	None
Subtotal Holdrooms	**7,320**	**7,661**	**379**
Inbound Baggage Handling and Claim			
Baggage Claim Units	1	1	None
Baggage Claim Unit Area	951	1,250	299
Passenger Queue & Bag Retrieval Area	1,934	1,552	None
Baggage Service Office Area	181	420	239
Allowance Area for Meeters/Greeters	738	420	None
Baggage Claim Area Circulation	3,483	911	None
Restrooms Area	0	683	683
Take-Off Belts	1	1	0

Functional Area	Current Status	Ultimate Requirement	Ultimate Deficit
Take-Off Belt Area	193	850	657
Allowance Area for Baggage Train Circulation	2,698	298	None
Allowance Area for Conveyor	212	60	None
Subtotal Baggage	**10,390**	**6,444**	**None**
Concourse Circulation/Concessions			
Pre-Secure Concession Area	2,903	207	None
Post-Secure Concession Area	732	831	None
Circulation Area	0	156	86
Subtotal Concessions	**3,635**	**1,194**	**None**
Other Terminal Function Allowances			
Airline Operations Support Area	0	422	422
Airport Operations/Maintenance/Facilities	1,432	2,217	785
Utility/Mechanicals/Stairwells/Elevators	4,488	6,122	1,634
Subtotal Other	**5,920**	**8,761**	**2,841**
Total Terminal Building Area Requirement	**49,373**	**35,724**	**None**

Source: McFarland Johnson analysis, 2020.

Based on the analysis performed, and as shown in **Table 5-20**, the existing footprint of the passenger terminal building is 51,700 SF with 2,327 SF of unusable space (i.e. interior walls). The net total 49,373 SF appears to be adequate for the planning period in terms of total square footage required. While some specific areas show a deficit, others show a surplus and managing the spaces to meet the functional requirements could simply be a matter of moving walls and reconfiguring any spaces that might be deficient by utilizing surplus spaces in adjacent areas.

Recommendations: It is recommended that the existing terminal space be preserved and maintained. If specific areas are deemed to be insufficient, opportunities to reconfigure those spaces by allocating adjacent surplus spaces should be explored. Considerations should be made to capitalize on surplus spaces by leasing them out to potential tenants, thereby enhancing the Airport's financial position wherever possible.

5.5. PARKING AND ROADWAY ACCESS FACILITY REQUIREMENTS

To determine future parking and roadway access facility requirements at BGM, the performance of existing facilities was assessed via discussions with Airport personnel. Based on these discussions of existing facilities performance and capacity-related data and information presented in Chapter 1, *Inventory,* this section presents an analysis of parking and roadway requirements to accommodate future levels of terminal area activity as presented in Chapter 3, *Aviation Forecasts.* The analysis and results are presented in the following sections:

- Parking and Roadway Facilities Assessment
- Parking and Roadway Facilities Performance Key Findings
- Forecast of Peak Period Passenger Parking Demand

- Forecast of Rental Car Parking Demand

5.5.1. Parking and Roadway Facilities Assessment

The following summarizes the facilities considered:

Airport Entrance Road and Circulation: The west Airport entrance road is comprised of a single 24-foot-wide entrance lane which splits to two lanes for ingress. The left lane is dedicated to vehicles destined for long- and short-term parking, and the right lane for passenger pick up and drop off as well as access to the GA terminal and FBO, as well as Hangar 2. The passenger pick-up and drop-off lane splits again with the left lane for taxis and busses and the right lane for passenger pick-up and drop-off with an entrance to employee parking on the right. Finally, the passenger pick-up and drop-off lane splits into two lanes, with the inner lane and a marked, "No Parking" lane adjacent to the curb under a covered canopy to protect passengers from the elements as they are dropped off and picked up.

The exit lane(s), beginning at the terminal curb is a two-lane 24-foot-wide roadway. Immediately following the terminal building, there is an entrance to the rental car parking lot and ARFF building. Directly across from that entrance is a second entrance to the short-term parking lot and then the exit lane with an attendant booth for the long-term parking lot on the left. Shortly after that, there is a separate entrance on the right to the ARFF facility with a small parking area. As the exit road continues around a curve to the left, there is a curb cut on the right for a parking area for vehicles at Hangar 3 and the T-hangars and another entrance/exit to the long-term parking lot on the left. Finally, the roadway splits with vehicles leaving the Airport heading off to the right and a single lane roadway for vehicles to continue back around to the entrance of the Airport and parking areas. The existing condition of the Airport entrance/circulatory roadway is excellent condition, having been rehabilitated in 2017.

The terminal curb is approximately 380 feet in length, of which 300 feet has a partially covered roadway as previously mentioned and an additional 80 feet of covered sidewalk for passenger pick-up and drop-off.

Access to the airport property is through Airport Road (County Route 69) which connects directly to Johnson City and Greater Binghamton. 15 mile-per-hour signs are posted at the beginning of the circulation roadway, including a warning sign that motorists are about to enter a speed zone.

Terminal Area Parking[5]: As presented in Chapter 2, *Inventory*, BGM maintains a long-term parking lot containing 486 spaces, one short-term parking lot with 125 spaces, one rental car lot with 121 spaces and an employee lot with 141 spaces. These lots include 27 spaces for handicapped users. In total, there are 873 spaces, including 611 spaces for use by passengers. The employee lot is dedicated to personnel for the ATCT, TSA, law enforcement, Delta Airlines, concessions and rental car employees. There is no cell phone lot at BGM. The condition of surface parking facilities in the terminal area is fair to poor condition, with sections exhibiting longitudinal, transverse, and

[5] Terminal area parking utilization is based on visual/on-site observations and information from Airport personnel.

alligator cracking. Pavement drainage is good, with some ponding of water in parking lots. The parking lot markings have been upkept well with fresh paint every other year.

Airport personnel have reported that parking lot lighting is inadequate with some intermittency and unlighted signage sometimes contributes to driver confusion as to where the exits and entrances are. There are revenue control devices which are aging and prone to failure, particularly during inclement weather.

5.5.2. Parking and Roadway Facilities Performance Key Findings

Table 5-21 summarizes the key findings made via field observations of Airport parking and entrance/circulatory roadway performance.

Table 5-21: Parking and Roadway Facilities Performance Key Findings

Facility	Performance Key Findings
Airport Entrance/Circulatory Roadway	
Operating Speeds	Posted Speed Limit of 15 miles-per-hour
Geometric Issues	The short-term and long-term exits can confuse motorists due to inadequate lighting; the short-term entrance near the exit gates can be difficult for motorists to find/use.
Multi-Modal Path Conflicts	Potential for vehicle/pedestrian conflicts at crosswalks within drop off/loading area; detectable warning surfaces should be provided on the curb ramps as required by Americans with Disabilities Act (ADA).
Access Control Issues	Revenue control devices are very old and prone to constant failure. Despite being rated as outdoor equipment, the ticket machine fails regularly during inclement weather.
Terminal Area Parking	
Parking Lot Utilization	Short Term - 35-45 percent utilized Long Term - 35-45 percent utilized Rental Car Lot - 65-75 percent utilized Employee Lot - 55-65 percent utilized
Other Facilities	
Lighting - Location and Effectiveness	Incandescent single arm stick lighting along circulation road; incandescent dual arm stick lighting in parking lots. According to reports from Airport personnel, lighting appears to be inadequate and sometimes intermittent.
Pedestrian Accommodation	Concrete sidewalks line the parking lots and the circulatory roadway at the terminal area. A majority of the sidewalks are in good condition. Three striped crosswalks between the terminal and parking lots do not have detectable warning surfaces as required by ADA.
Sign and Wayfinding	Airport personnel have reported that the signs are beginning to fade, and some signs should be reworded to reduce confusion as drivers get lost trying to exit the parking lots.

Facility	Performance Key Findings
Security Issues	Vehicles allowed to park close to the terminal for an extended period of time. Short term parking area has the first 15 minutes free, but vehicles do not utilize this lot. The addition of a cell phone lot would inhibit vehicles parking at the curb.

Source: McFarland Johnson analysis, 2018.

5.5.3. Forecast of Peak Period Passenger Parking Demand

Drawing on the forecast of annual enplanements in Chapter 3, *Aviation Forecasts*, and recent counts of vehicles parked in short and long term lots at the Airport, an estimate of peak parking demand for the 20-year planning period was determined.

Table 5-22 presents recent counts of vehicles parked and forecast levels of annual and peak passenger enplanements.

Table 5-22: Passenger Parking Demand Factors

Factor	Demand	
Passenger Parking Facility	**Vehicles Parked**	
Average Month - Short Term Lot/Long Term Lots	1,836	
Enplanements	**2017**	**2037**
Average Month	2,754	5,151
Peak Month	3,367	6,295
Average Day/Peak Month	112	210
Peak 60-Minute	50	85
Passengers per Parked Vehicle	**Variables**	
Peak Month Enplanements	6,295	
Peak Month Parked Vehicles	4,842	
Peak Month Passengers per Parked Vehicle	1.3	

Source: Greater Binghamton Airport management; McFarland-Johnson analysis, 2018.

The forecast of peak period passenger parking demand was calculated using the ratio of 1.3 passengers per parked vehicle. **Table 5-23** presents the forecast of peak passenger parking demand at BGM.

Table 5-23: Peak Period Passenger Parking Demand

Year	60-Minute Vehicle Demand	90-Minute Vehicle Demand
2017	38	57
2022	50	75
2027	57	88
2037	64	96

Source: McFarland-Johnson analysis, 2018.

Considering that existing parking facilities at BGM consist of 611 passenger parking spaces, and peak hour demand is forecasted to be between 64 and 96 spaces, and it is assumed that the average car remains three days in the peak month, the Airport will require 480 spaces. Existing passenger parking capacity should be sufficient to accommodate peak parking demand through the 20-year planning period, however factors that affect parking demand at airports should be monitored if scheduled passenger service offerings change at BGM. These factors include:

- Originating Passengers: The ratio of originating to terminating passengers is a key metric for auto parking because only originating passengers have the ability to park at the airport. The inverse of this ratio, which represents terminating passengers is helpful in planning for rental car facilities and ground transportation. For this analysis, it is assumed that all passengers enplaned at BGM are originating passengers, since the Airport does not function as a hub for connecting flights. If service changes and the volume of terminating passengers at BGM increases significantly, parking demand could increase.
- Impacts of ULCC Service: The average number of passengers per vehicle could increase if service by a ULCC is added at BGM, as leisure markets typically experience higher travel party size compared to business markets. ULCC service will also increase the duration of parked vehicles at BGM, and ULCC flights that operate once per day should limits space turnover since passengers departing on the one daily flight will arrive to the airport before arriving passengers on the inbound flight can vacate parking spaces. In the event that significant increases to weekly available seats to leisure markets are added at BGM, parking duration should be monitored to ensure that peak hour demand can be accommodated.

Recommendations: It is recommended that existing auto parking capacity in passenger lots within the terminal area at BGM be maintained through the planning period. For the Airport entrance/circulatory roadway, it is recommended that existing lane widths, through-lane(s) and parking lane capacities at the terminal curb be maintained. Additionally, specific operational improvements described in **Table 5-23** should be addressed, including: geometry and sight distance issues; compliance with MUTCD and ADA; signage; drainage; upgrade or replacement of revenue control devices; and adding a cell phone lot. If modifications, improvements, and/or expansions to the terminal building are made, the existing circulation patterns and roadway capacity should be maintained and/or replicated, and options considered to accommodate existing passenger parking facility capacity if passenger activity and demand increases.

5.5.4. Forecast of Rental Car Parking Demand

The terminal area also must accommodate parking required for rental cars agencies at BGM. The existing rental car parking capacity is shown in **Table 5-24**.

Table 5-24: Existing Rental Car Parking Capacity

Agency	Rental Car Parking Lot
Budget	26
Hertz	46
Avis	49
Total	**121**

Source: McFarland Johnson analysis, 2020.

As shown in **Table 5-24**, rental car agencies share the 121 parking spaces in the rental car lot and there is currently sufficient parking available. It is anticipated the available rental car parking will be adequate throughout the planning period. Should overflow be necessary during peak periods, additional rental cars can be parked in the main parking lot.

Based on this analysis, it is forecasted that no additional spaces are required to accommodate peak period demand for rental cars in the rental car parking lot.

Recommendations: It is recommended that existing rental car parking capacity in the main storage lot within the terminal area at BGM be maintained through the planning period.

5.6. GENERAL AVIATION AND LANDSIDE FACILITY REQUIREMENTS

The existing general aviation areas are located on north and south sides of the terminal area. This section discusses the requirements for each of the general aviation elements while Chapter 6, *Alternatives* will explore the future location of the required facilities. Requirements for GA facilities at BGM were calculated on the basis of data collected during the inventory, forecasts of aviation demand, consultation with Airport staff, as well as FAA standards. The following facilities were examined:

- Aircraft Hangars
- Aircraft Parking Aprons
- Airport Administrative/Operations Offices
- Aviation Fuel Storage and Distribution
- General Aviation Auto Parking
- Non-Aviation Use Areas

5.6.1. Aircraft Hangars

There are five GA hangars at the airport for both based and itinerant aircraft, three larger box hangars and two nested T-hangars for light GA aircraft. Requirements are calculated based on the size and quantity of aircraft based at the Airport. While each aircraft will vary in size, the following planning factors were used to calculate the approximate hangar space requirements for aircraft based at Greater Binghamton Airport:

- 1,200 SF for Single Engine and Rotor Aircraft
- 1,600 SF for Multi Engine Aircraft
- 3,200 SF for Jet Aircraft

The forecast for based aircraft reflects a one percent growth of total based aircraft predicated on the market share or based aircraft in the area. Existing hangar space is shown in **Table 5-25**. The overall hangar requirements are displayed in **Table 5-26**. It should be noted that all hangars at BGM are owned by Broome County.

Table 5-25: Existing Hangar Facilities

Hangar Name	Lessee/Owner	Individual Hangar Units	Conventional Hangar Space (Aircraft Storage)
T-Hangars	Individuals/Broome County	20	N/A

Hangar Name	Lessee/Owner	Individual Hangar Units	Conventional Hangar Space (Aircraft Storage)
Hangar 1	First Air Group/Broome County	1	28,000 SF
Hangar 2	Evolution Jets/Broome County	1	25,000 SF
Hangar 3	First Air Group/Broome County	1	15,400 SF

Source: McFarland Johnson analysis, 2018.

As of 2018, 100 percent of jet and multi-engine aircraft are housed within First Air's conventional hangar space. It is anticipated that any additional jet and multi-engine aircraft will require additional conventional hangar space.

Ideally, 100 percent of aircraft are stored in hangars. For planning purposes, it is assumed that 50 percent of single-engine aircraft will be stored in individual hangars, 25 percent in conventional hangars, and 25 percent on tiedowns. Additionally, 25 percent of multi-engine aircraft will be stored in individual hangars, 25 percent on tiedowns, and 50 percent in conventional hangars. Jet aircraft will be stored in conventional hangars. A seen in **Table 5-25**, there 23 total hangars and T-hangar units at the Airport. Further, total conventional hangar space of approximately 68,400 SF is used for hangar storage, while the remaining portions of these hangars are being used for aircraft maintenance, offices, etc. In addition, nearly all of this space is reserved for based aircraft tenants, leaving little to no space available on a regular basis for transients.

All hangars are county owned and the conventional hangars are leased to the FBO. **Table 5-26** shows the break-down of anticipated hangar usage. Within the planning period, current hangars are adequate to meet demand, however, space within the conventional hangars must be made available for lease to future tenants. Should demand exceed the forecast or the use of hangars change, private entities should coordinate with Airport management to identify where additional hangars can be constructed.

Recommendations: The Airport should plan for the construction of additional conventional hangar units to accommodate new based tenants, as well as transient aircraft, at BGM. Chapter 6, *Alternatives*, should identify potential locations for the construction of these facilities. As additional demands arise during the planning period, private parties should coordinate with Airport management to determine exactly where to construct additional hangars.

Table 5-26: Aircraft Hangar Demand

Year	Current Provision	Facility Demand	Shortage
2017			
Individual/T-Hangars	20	17	None
Conventional Hangars	68,400 SF	22,200 SF	None
2022			
Individual/T-Hangars	20	16	None
Conventional Hangars	68,400 SF	23,418 SF	None
2027			
Individual/T-Hangars	20	16	None
Conventional Hangars	68,400 SF	24,855 SF	None
2037			

Year	Current Provision	Facility Demand	Shortage
Individual/T-Hangars	20	15	None
Conventional Hangars	68,400 SF	28,495 SF	None

Source: McFarland-Johnson analysis, 2018.

5.6.2. Aircraft Parking Apron

There are four components that typically determine the required apron area for general aviation uses. They are: 1) based-aircraft parking, 2) itinerant aircraft parking (transient apron), 3) aircraft fueling apron, and 4) staging and maneuvering areas. The sum of these components determines the total area of apron required to meet the forecasted level of general aviation activity at the Airport.

Based-aircraft apron tiedown requirements were developed in the *Aircraft Hangars* section because they are a factor in determining hangar requirements. Pavement conditions will be assessed at a later portion of this master plan.

There are currently 12 tiedowns available on the West Ramp, eight of which are leased by the FBO and intended for transient users. During the planning period, it is anticipated that 7-8 based aircraft will be stored on tiedowns, and as such, an additional 4-5 tie-downs for based aircraft must be considered.

An additional important apron need is parking space for itinerant aircraft. FAA AC 150/5300-13A suggests one methodology for determining apron space requirements for transient aircraft. This methodology has been adjusted as outlined below to reflect current conditions at the Airport and is used to project future transient apron space requirements.

- Calculate the total design day operations for all itinerant GA operations
- Calculate itinerant arrivals on the design day assuming that half of the operations are arrivals.
- Assume that approximately 75 percent of these aircraft will require transient parking space during the course of the day. The other 25 percent of the itinerant arrivals are based aircraft that will return to their assigned spaces.
- Assume that up to 75 percent of these transient aircraft will be on the apron at the same time during peak events.
- Allow an area of 400 square yards (3,600 SF) per transient airplane, due to the need for taxiing space and aircraft of different sizes.

Table 5-27 presents the results of these computations. According to the above methodology, approximately 1,833 square yards (SY) of apron space is currently required for transient parking. By the end of the planning period this need is forecast to increase to approximately 3,778 SY.

Table 5-27: Transient GA Aircraft Apron Area Demand

Year	Design Day Itinerant GA Operations	Itinerant Arrivals per Design Day	Itinerant Aircraft on Apron	Peak Hour Transient Parking Demand	Required Transient Apron Space
2017	16	8	6	5	1,833 SY

Year	Design Day Itinerant GA Operations	Itinerant Arrivals per Design Day	Itinerant Aircraft on Apron	Peak Hour Transient Parking Demand	Required Transient Apron Space
2022	26	13	10	7	2,894 SY
2027	31	16	12	9	3,492 SY
2037	34	17	13	9	3,778 SY

Source: McFarland-Johnson analysis, 2018.

Transient aircraft are parked on the FBO and private user aprons. Total apron area for the tiedown and other apron areas is approximately 37,000 SY. The sum of based and transient aircraft anticipated to use tiedowns is 13 in 2017 and 16 in 2037. To accommodate the 16 tie-downs for based and transient aircraft, an additional four tiedowns should be installed within existing aprons, where space is available to accommodate the additional parked aircraft.

Based and transient aircraft demands, and current provisions are shown in **Table 5-28**.

Recommendations: Identify space within existing aprons for the installation of up to four (4) additional tie-down spaces.

Table 5-28: Tiedown Demand

Year	Current Provision	Facility Demand	Shortage
2017			
Based and Transient	12	13	1
SY	37,000	5,200	None
2022			
Based and Transient	12	15	3
SY	37,000	6,000	None
2027			
Based and Transient	12	17	5
SY	37,000	6,800	None
2037			
Based and Transient	12	16	4
SY	37,000	6,400	None

Source: McFarland Johnson analysis, 2018.

Staging and Maneuvering Areas

Adequate space for the safe maneuvering of aircraft to and from aprons, hangars, and taxiways must also be included in any forecast of apron requirements. Staging and maneuvering is most closely associated with the provision of space in front of conventional hangars and between rows of box and T-hangars. Currently, the separation between the two T-hangars is approximately 60 feet. **Table 5-29** shows the taxiway and taxilane object free area requirements (TOFA and TLOFA, respectively).

Table 5-29: Taxiway/Taxilane Object Free Area Requirements by ADG

ADG	I	II	III
Taxiway OFA	89’	131’	186’
Taxilane OFA	79’	115’	162’

Source: FAA AC 150/5300-13A.

These T-hangars are constructed for small, general aviation aircraft; however, they do not meet ADG I taxiway and taxilane object free area requirements. This is likely due to terrain limitations within the area. Enough space is provided in front of conventional hangars and tiedowns for required clearances.

Recommendations: As T-hangars are reconstructed, minimum separation standards for taxilane centerlines to fixed or movable objects in accordance with AC 150/5300-13A should be observed. Aircraft taxiing between the T-hangars should be limited to a maximum of 30 feet wingspan and an MOS should be sought from the FAA for this non-standard condition.

5.6.3. Airport Administrative/Operations Offices

Airport administrative and operations offices are located on the second floor of the terminal building. Maintenance offices are located in the airfield maintenance/snow removal equipment (SRE) building on Dawes Drive which was constructed in 2002. Conversations with Airport personnel reveal that all of the Airport offices are in good repair and are adequately sized for the operation.

Recommendations: There are no recommendations for office space dedicated to the management and operation/maintenance of the Airport.

5.6.4. Aviation Fuel Storage and Distribution

The Airport currently has 50,000 gallons of Jet-A capacity and 10,000 gallons of 100LL capacity. Additionally, there are two 5,000-gallon tanks, one for unleaded gasoline and one for diesel.

Recommendations: While the Airport reports there is adequate storage capacity currently, the Airport would benefit from additional 100LL storage so as to capitalize on economies of scale by purchasing full fuel loads.

5.6.5. General Aviation Auto Parking

As all of the structures on the Airport are owned by Broome County, and all of the parking areas are the Airports to maintain. The T-hangars have nine vehicle parking spots adjacent to Hangar 1. Also, GA tenants can park their vehicles inside their hangar while the aircraft is out flying.

Each of the three corporate hangars has adjacent vehicle parking. Hangar 1 has an adjacent parking lot with 46 spaces. Hangar 2 has a row of parking with approximately 18 spaces behind the hangar. Hangar 3 has a parking area with approximately 28 parking spaces. Additionally, there are two parking lots that are shared by Hangars 2 and 3 which comprise approximately 53 total spaces.

The methodology used below is based on a previously completed Aircraft Owners and Pilots

Association (AOPA) survey that found an average of 2.5 persons aboard the average general aviation operation. Automobile parking requirements for GA operations are displayed in **Table 5-30**:

- Determine the number of peak hour operations from Chapter 3, *Aviation Forecasts*.
- Determine the number of peak-hour pilots and passengers by multiplying the number of peak hour operations by 2.5.
- Estimate the number of parking spaces in use by assuming that parking demand will be half the number of pilots and passengers, since parking spaces will be utilized only by departing pilots and passengers.
- Multiply by a contingency factor of 1.10.

As shown, a need of 25 parking spaces has been identified for based and transient GA operations at Greater Binghamton Airport through 2037. Each of the conventional hangars can meet forecast demand, and while the parking area for the T-hangars has only nine spots, tenants are able to park their vehicles inside their hangar while out flying as previously mentioned.

Table 5-30 Automobile Parking Requirements

Year	Peak Hour Operations	Pilot and Passenger Parking Demand	Contingency	Total Parking Demand
2017	6	15	1.1	17
2022	7	18	1.1	20
2027	8	20	1.1	22
2037	9	23	1.1	25

Source: McFarland-Johnson analysis, 2016.

Recommendations: There are no GA parking recommendations. Any parking requirements that may arise should be resolved by private parking construction as coordinated with Airport management.

5.6.6. Non-Aviation Use Areas

The National Weather Service (NWS) operates a facility on Airport property, which is the only existing non-aeronautical use at the Airport. Airport property without direct airside access has been determined to be non-aviation use areas. Existing and proposed non-aeronautical use areas will be further reviewed in a later portion of this Master Plan Update (MPU) as part of the land use drawing.

Recommendations: The Airport should assess available land for future compatible non-aeronautical use. Potential land may be available along Commercial Drive, Airport Road, and Knapp Road.

5.7. UTILITIES AND SUPPORT FACILITIES

5.7.1. Air Traffic Control Tower (ATCT)

The current ATCT is located on top of the terminal building; it is operated between 6:00 AM and midnight local time. As noted in Chapter 2, *Inventory*, of this MPU, the building was opened in 1950. In 2020, the FAA Terminal Radar Approach Control facility (TRACON), which was co-located in the ATCT was relocated to a nearby airport. BGM handles traffic below 10,000 feet mean sea level (MSL) and the Boston Air Route Traffic Control Center (ARTCC) controls above 11,000 feet MSL. There are no know violations or penetrations to the ATCT line of sight.

Recommendation: The ATCT should be updated within the planning period to meet current equipment needs and meet height standards.

5.7.2. Aircraft Rescue and Fire Fighting (ARFF)

As discussed in Chapter 1, *Inventory*, of this MPU, the ARFF station (known at BGM as the Crash, Rescue, Firefighting, CRF, Building) at the Airport is an Index B station under its FAR Part 139 certificate, and is located just north of the passenger terminal with access to Taxiway A via Taxiways D and E. This is despite the operations at BGM supporting categorization under Index A. The ARFF facility was last renovated in 2004 and is in sufficient working condition but needs rehabilitation work. The Airport is waiting on a new Rosenbauer Panther 4X4 ARFF Response Vehicle which would become the primary ARFF vehicle. Upon delivery, the Oshkosh TI-1500 will remain in service as a backup vehicle to ensure continuous ARFF index capability. The station includes the following vehicles:

- Oshkosh TI-1500 – ARFF Response Vehicle
- Oshkosh TA-1500 – ARFF Response Vehicle (to be retired in 2020)

Recommendation: There are no recommendations with respect to ARFF equipment. Regular replacement of equipment at the completion of its useful life, 15 years, should occur. With regards to the ARFF Building, rehabilitation of building, including the replacement of significant mechanical and electrical systems within the building, should be considered.

5.7.3. Airfield Maintenance Facility and Snow Removal Equipment (SRE)

The Airport operations staff performs the day-to-day responsibilities of maintaining and inspecting the airfield facilities, including the removal of snow during winter months.

As noted in Chapter 1, *Inventory*, the Airport has 27 vehicles for maintenance and snow removal. To clear the Priority 1 Snow Removal Clearance Area as defined in the Airports Snow & Ice Control Plan, the Airport maintains the following equipment in service:

- 1997 Stewart & Stevenson (Rotary)
- 1998 Stewart & Stevenson (Rotary)
- 1997 Oshkosh Dump/Rollover (Displacement)
- 1998 Oshkosh Dump/Rollover (Displacement)
- 2009 Oshkosh Plow (Displacement)
- 2018 MB5 Multi-Purpose (Displacement/Sweeper)
- 2009 Oshkosh Sweeper (Sweeper)
- 2013 MB Sweeper (Sweeper)
- 1998 Oshkosh Sander (Spreader)
- 1997 John Deere 544G (Loader)

- 821 Case (Loader)

In reviewing AC 150/5220-20, *Airport Snow and Ice Control Equipment* and AC 150/5200-30, *Airport Winter Safety and Operations,* the airport is allowed one (1) hour to clear one inch of snow within the approximately 2,300,000 square feet that encompass the Priority 1 Snow Removal Clearance Area. As a result, the FAA's Airport Improvement Program considers up to two rotary plows, four displacement plans, four sweepers, four spreaders, and one front end loader as eligible and required. In review of the available SRE, the airport is eligible for one additional sweeper and three additional spreaders. Further, the airport currently operates one additional loader beyond what is considered required.

Once the equipment has exceeded ten years of service life is eligible for consideration for replacement. The Airport is planning to replace the 1997 rotary plow in 2020 and has additional plans for replacement equipment over the planning period, as all but two units (the 2018 MB5 Multi-Purpose and the 2013 MB Sweeper) have exceeded, and in some instances significantly exceeded, its useful life.

The Airport maintenance facility was constructed in 2002 and is in good condition. It has bays for vehicle maintenance and repair as well as storage capability for the entire fleet of Airport vehicles.

Recommendation: Airfield maintenance and SRE equipment should be maintained or replaced, as needed, throughout the planning period.

5.7.4. Utilities

As part of this MPU, a full utility survey was completed and is included as **Appendix A**. Based on information provided **Appendix A**, *Utility Survey*, the Airport's utility services – electric/natural gas, water, telecommunications, storm drainage, and sewer – is adequate to meet the existing needs of the facility. In the event there are additional developments throughout the planning period, a review of the utilities and their respective capacities should be considered, including the potential development of hangar facilities or non-aeronautical developed related to the necessity of electricity, telephone, sanitary sewer, and cable.

Recommendation: There are no recommendations for utilities.

5.7.5. Air Cargo

Should an air cargo operator, beyond the existing feeder service provided by Ameriflight, start service at BGM within the planning period, a new dedicated air cargo facility should be constructed at the Airport, including conventional hangar space, apron area, and landside access. It is anticipated that this construction would be done by private parties and should be coordinated with Airport management and Broome County. It is anticipated that the existing Ameriflight service will maintain status quo throughout the planning period, including the transfer of packages directly on the apron.

5.8. FACILITY REQUIREMENTS SUMMARY

The facility requirements recommended for BGM are summarized in **Table 5-31**. Although not all of the improvements recommended throughout this chapter are provided in **Table 5-31**, the table highlights the key improvements that are recommended for future development at BGM.

Table 5-31: Summary of Facility Requirements

Item/Facility	Existing		Ultimate Requirement		Deficit
Heliport H1	98’ by 118’		98’ by 118’		None
Runways	**16-34**	**10-28**	**16-34**	**10-28**	-
Length	7,305’	5,001’	7,305’	5,001’	None
Width	150’	150’	100’	100’	None
RSA Width	500’	150’	500’	500’	350’ Runway 10-28 (Future); Minor grading issues
RSA Length Prior to Threshold	600’	300’	600’	600’	300’ Runway 10-28 (Future)
RSA Beyond Threshold	1,000’	300’	1,000’	1,000’	700’ Runway 10-28 (Future)
ROFA Width	800’	500’	800’	800’	300’ Runway 10-28 (Future)
ROFA Beyond Threshold	1,000’	300’	1,000’	1,000’	700’ Runway 10-28 (Future)
RPZ	Not Airport Owned	Not Airport Owned	Fee Simple or Avigation Easements		Acquire Land in Fee or Easements
Lighting	HIRL	MIRL	HIRL	MIRL	None
Runway Visual Aids	MALSR, PAPI	MALSR, PAPI	VASI, REIL	VASI, REIL	REIL RWY 10
Instrument Approaches	Runway 16 – ILS Runway 34 – ILS	Runway 10 – LPV Runway 28 – LPV	Runway 16 – ILS Runway 34 – ILS	Runway 10 – LPV Runway 28 – LPV	None
Approach Minimums	½ Mile	2,400’	¾ Mile		None
Taxiways	A, B, C, D, E, F, G, J		-		-
Width	≤ 75’		75’		None
Separation (if applicable)	≤ 300’		400’		100’ or MOS
Lighting	MITL		MITL		None
Taxiways	H, K, L, M, P				
Width	≤ 50’		50’		None
Separation (if applicable)	275’		400’		125’ or MOS

Item/Facility	Existing	Ultimate Requirement	Deficit
Lighting	MITL	MITL	None
Terminal Apron	33,000 SY	33,000 SY	None
Passenger Terminal Facilities	-	-	-
Curb Length	380	86 to 102	None
Gates	6	3	None
Passenger Parking	-	-	-
Passenger Vehicle Parking	611	480	None
Rental Car Parking	121	121	None
GA Terminal Facilities	-	-	-
GA Auto Parking	153	25	None
Individual T-Hangars	20	15	None
Conventional Hangars	68,400 SF	28,495 SF	None
Tiedowns	12	16	4

NA – not applicable
Source: McFarland Johnson analysis, 2020.