Greater Binghamton Airport

DRAFT

Master Plan Update
Interim Report #3 (Revised)

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Submitted by

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Greater Binghamton Airport

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None

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1. Introduction

This Airport Master Plan Update has been undertaken by the County of Broome to assure that the Greater Binghamton Airport (BGM or the Airport) and its environs are safe and efficient, and to evaluate the changing needs of BGM, including the needs of Broome County, the airport users, and passengers.

This planning document will serve as a guide to identifying necessary improvements and "right-sizing" those improvements to meet future Airport needs. This document will serve to:

- Meet the aviation needs of residents and businesses in BGM's service area
- Maintain safe and efficient airside facilities compliant with airport design standards and Federal Aviation Administration (FAA) and New York Start Department of Transportation (NYSDOT) guidance
- Identify opportunities to enhance the economic viabili of G
- Maintain planning flexibility for future changes in the a on du r,

The specific objectives to be accomplished under this Airport Master Plan Update include:

- The development of a flexible, scenario-based model (the Dynamic Analysis Tool) that allows
  adjustments to facility requirements and alternatives
- The development of a plan to meet the changing needs of BGM
- The evaluation and recommendation of alternatives to help with the attraction and retention of commercial airline service
- The evaluation and recommendation of alternatives to maximize utilization of existing facilities
- The identification of sites for potential private aviation related, and non-aeronautical development
- The evaluation and recommendation of alternatives that will enhance and increase the use of BGM by general aviation users
- The determination of the future dimensions and needs of the crosswind runway
- The development of a realistic financial implementation plan that considers local, state and federal funding sources
- The approval from FAA of the resulting Airport Layout plan (ALP)



This Airport Master Plan Update will be ordered into the following chapters:

1. Introduction
2. Inventory
3. Aviation Forecasts
4. Environmental Overview
5. Facility Requirements
6. Alternatives
7. Implementation Plan
8. Financial Feasibility

1.1. AIRPORT BACKGROUND

BGM is a non-hub, primary commercial service airport serving the Southern Tier region of New York State and portions of northeast Pennsylvania. Airports that enplane less than 0.05 percent of all commercial passenger enplanements, but which have more than 10,000 annual enplanements, are categorized as non-hub primary airports[1]. The Airport se[illegible] Br[illegible], Ti[illegible]a, C[illegible] and Chenango Counties in New York, and also serves Susque[illegible]ani[illegible] Br[illegible]d[illegible] in Pennsylvania. BGM is served by Delta Air Lines. Non-stop flig[illegible]re vai[illegible] to [illegible]roit wi[illegible] an average of 2-3 daily departures on 50-seat regional jets operated by SkyWest Airlines and marketed as Delta Connection. The Airport was previously serviced by United Express, with non-stop flights to Newark on Saab 340 turboprops through late 2016 and US Airways Express/American Eagle with non-stop flights to Philadelphia on Dash 8 family turboprops through early 2017, with other airlines having served the Airport over the past decade.

The Airport is owned and operated by Broome County and its Department of Aviation and is included in the National Plan of Integrated Airport Systems (NPIAS) 2017-2021. The NPIAS identifies 3,340 airports that are significant to national air transportation and therefore are eligible to receive federal grants under the Airport Improvement Program (AIP)[2]. The NPIAS includes all commercial service airports, all reliever airports, and selected general aviation airports. Per the NPIAS, BGM is considered a "primary" airport. A primary airport is defined in Federal Aviation Administration (FAA) Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems (NPIAS)*, as a commercial service airport that enplanes more than 10,000 passengers annually. The Airport maintains an operating certificate under Title 14 of the Code of Federal Regulations (CFR), Part 139, *Airport Certification.*

The passenger terminal building offers amenities such as wireless internet access, a business center workplace, rental car counters, a conference center meeting room, and electronic airline check-in kiosks. In the summer of 2017, Binghamton Brewing Company opened a bar inside the departure lounge serving beer, wine, snacks, coffee, and soft drinks. The bar opens about an hour

[1] FAA Report to Congress 2013-2017.
[2] "Report to Congress, National Plan of Integrated Airport Systems (2017-2021)." FAA, 30 Sept. 2016.

and a half before outgoing flights[3].

The Airport is the sole access point of scheduled air service in Broome County, and accommodates general aviation and charter services. The Airport's general aviation activities are located on the West Apron and the North Apron. The fixed base operator (FBO), FirstAIR, which occupies two hangars on the West Apron, provides aircraft services such as maintenance, fueling and deicing, and aircraft parking/tie-downs, as well as pilot services such as a pilot's lounge, kitchen, and weather information room. Aero Techniques, which is based in one of the FBO's hangars, offers flight training at the Airport.

1.1.1. Airport History

The Tri-Cities Airport located in Endicott, New York was the Southern Tier's main airport until the 1940s when the demand for scheduled air service increased. In 1944 the Civil Aeronautics Authority (CAA), now known as the FAA, ruled that the Tri-Cities Airport would not be approved for commercial operations other than clear, daytime flights due to location and terrain. As a result, the location for a new airport was sought and in 1945 construction of Edwin A. Link Airport on Mount Ettrick in Maine, New York began. The new airport was officially dedicated on Sunday, May 27, 1951 and was referred to as the Broome County Airport until the 1970s, when its name was changed to Edwin A. Link Field-Broome County Airport. In the 1990s, the Airport was renamed Binghamton Regional Airport. In 2003 the Airport was again renamed the Greater Binghamton Airport to match the area's new marketing campaign.

The field on which the Airport lies is still named for Edwin A. Link. Link was a pioneer in aviation, having invented the "Blue Box" also known as the "Link Trainer," a flight simulator, which set the standard for the flight simulation industry. Together with his wife, Marion Clayton Link, he managed "Link Aviation, Inc.". Edwin A. Link contributed a great deal to the Binghamton, New York area, where he set up a production facility that at one time employed thousands of workers. There is an original "Blue Box" on display in the Greater Binghamton Airport terminal lobby[4].

1.2. ORGANIZATIONAL PROFILE

The Airport is owned and operated by the Broome County Department of Aviation which is overseen by the Broome County Legislature's Public Works & Transportation Committee. Fifteen members comprise the Greater Binghamton Airport Advisory Board whose members meet monthly. The members are appointed by the Broome County Executive and confirmed by the County legislature for two-year terms. The Commissioner of Aviation oversees the day-to-day operations of the Airport with help from 19 full-time employees, and two part-time parking attendants.

[3] "Binghamton Brewing Co. Opens Bar at Greater Binghamton Airport." BINGHAMTONHOMEPAGE, 27 June 2017, www.binghamtonhomepage.com/news/local-news/binghamton-brewing-co-opens-bar-at-greater-binghamton-airport/752146795.
[4] Greater Binghamton Airport, *Master Plan Update*, McFarland Johnson, 2009

2. Inventory

2.1. INTRODUCTION

The inventory chapter provides an overview of the Greater Binghamton Airport (BGM or the Airport), including its location and ownership, history, catchment and service areas, socioeconomic data, physical facilities, operational characteristics, airspace, land use, and zoning. This information was obtained through on-site investigations of the Airport, interviews with Airport personnel, and review of published information as of the Fall of 2017. Information was also obtained from available planning documents and studies concerning the Airport and surrounding areas. The information presented in this chapter serves as the basis for the development of aviation forecasts as well as the baseline data to be used in the Facility Requirements Chapter.

This chapter is organized into the following sections:

- Airport Background
- Airport Catchment/Service Areas
- Socioeconomic Data
- Airside Facilities
- Landside Facilities
- Support Facilities
- Airspace
- Air Traffic Control
- Land Use and Zoning

2.2. AIRPORT LOCATION

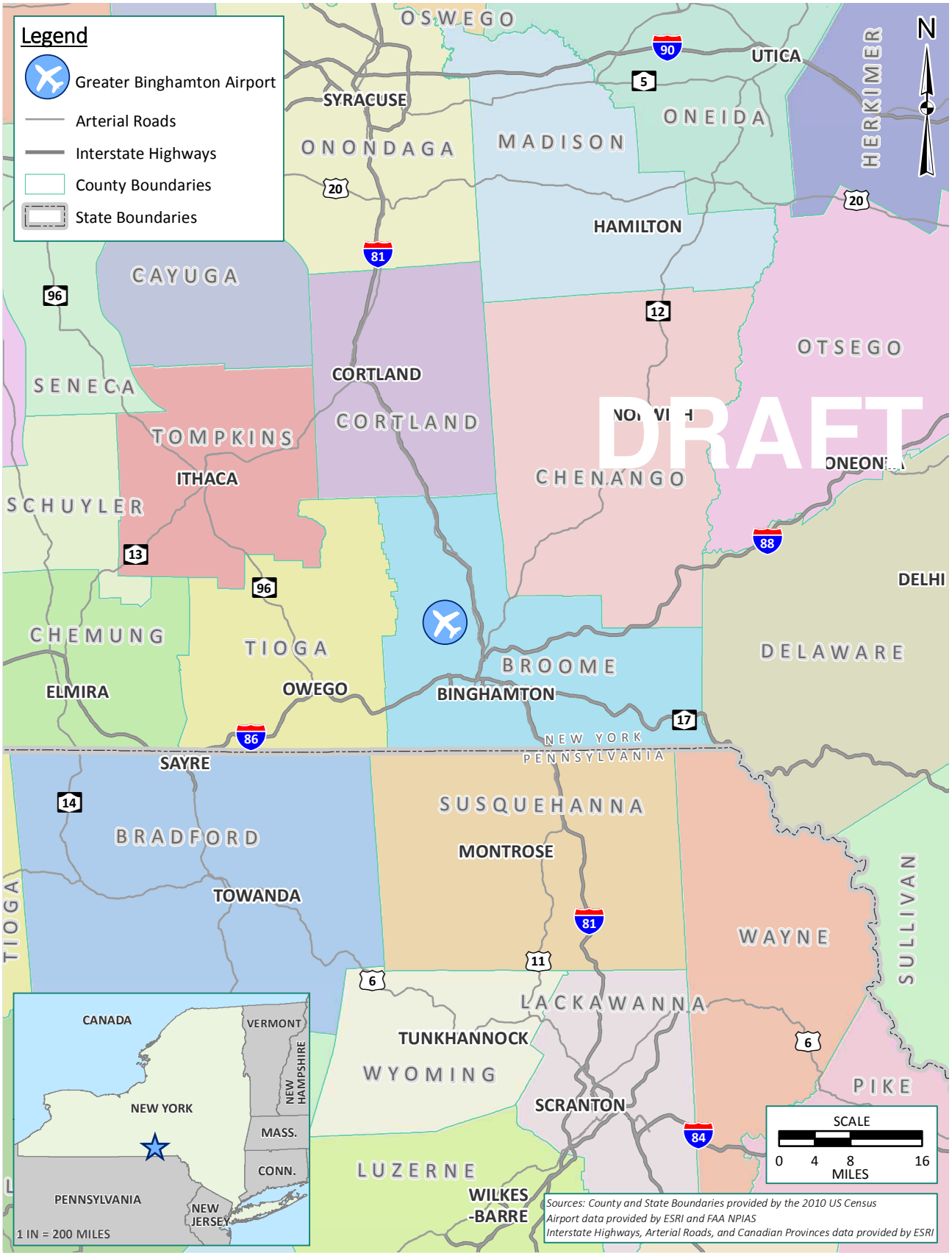
Greater Binghamton Airport is located approximately eight miles north of the city of Binghamton. Major access to the Airport is provided by Interstate Routes 81 and 88 and State Route 17 (Future Interstate 86) to County Route 69, known locally as Airport Road. The entire Airport property is located in the Town of Maine. **Figure 2-1** displays the Airport setting within the region.

The airport reference point (latitude and longitude of the approximate geometric center of the Airport) is located at 42˚ 12’ 30.39” North latitude and 75˚ 58’ 46.59” West longitude. The Airport is situated atop Mount Ettrick with an Airport elevation of 1,636 feet mean sea level (MSL). BGM occupies approximately 1,199 acres in a sparsely settled rural residential area.

In general, the climate of the Southern Tier can be described as “humid continental,” which is characterized by cold (usually not severe) winters and moderately warm summers, with considerable precipitation year-round. Records from the National Weather Service (1981-2010 data) indicate July is the hottest month of the year with an average maximum temperature of 77.8° F and January is the coldest month of the year with an average minimum temperature of 15.7° F.



Figure 2-1: Airport Location Map



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2.3. AVIATION ACTIVITY

According to the Greater Binghamton Airport administrative staff, there are 34 aircraft based on the field, consisting of 24 single-engine aircraft, 6 multi engine aircraft, 3 jets, and 1 helicopter. The number of based aircraft has increased since the last iteration of the Airport Master Plan which reported there were 21 aircraft based on the field (15 single-engine, 5 multi-engine, and 1 jet aircraft) in 2006. Single-engine T-hangar tenants include three Mooney M20F aircraft, three Cessna 172 aircraft, two Cessna 150s, three Cessna 182s, a Cessna 210, four Piper Cherokees, two Piper Comanches, A Piper Tri-Pacer, a Piper Arrow, a Piper Dakota, a Bellanca 17, a Columbia 350, and an Evektor Sportstar Max.

Multi engine aircraft include a Piper Aztek, a Cessna 303, a Beechcraft Baron, and a Piper Seneca as well as two Super King Air 300's. There is a single Bell JetRanger helicopter and based jets include a Lear 45, a Hawker 800, and the largest jet aircraft currently based on the field is a Gulfstream 200.

An aircraft operation is defined as a takeoff or a landing. Operations are broken down into local and itinerant operations. A local operation is a flight that originates and terminates at the same airport, whereas an itinerant operation is one that originates at one airport and terminates at another. FAA Form 5010-1 indicates that there were 15,616 annual operations over a 12-month period, ending on November 30, 2017. These operations were comprised of 19 air carrier, 3,331 air taxi, 2,953 general aviation (GA) local, 9,612 GA itinerant, and 97 military. The military operations can be attributed to practice approaches conducted by the Air National Guard and Navy.

Enplanements are another metric used to describe an airport's operating characteristics. An enplaned passenger is defined as a revenue passenger boarding an aircraft, including originating, stopover, and transfer passengers, in scheduled and non-scheduled services. Enplanement numbers for commercial service airports are available from various sources including the U.S. Department of Transportation (DOT), the FAA, and the airport.

The FAA's Terminal Area Forecast (TAF) system is the official forecast of aviation activity at FAA facilities. These forecasts are prepared to meet the budget and planning needs of the FAA and to provide information for use by state and local authorities, the aviation industry, and the public. The TAF includes forecasts for active airports in the NPIAS.

Table 2-1 compares the number of annual enplanements from the years 2003-2016 according to the U.S. DOT Bureau of Transportation Statistics.

Table 2-1: Historical Passenger Enplanements

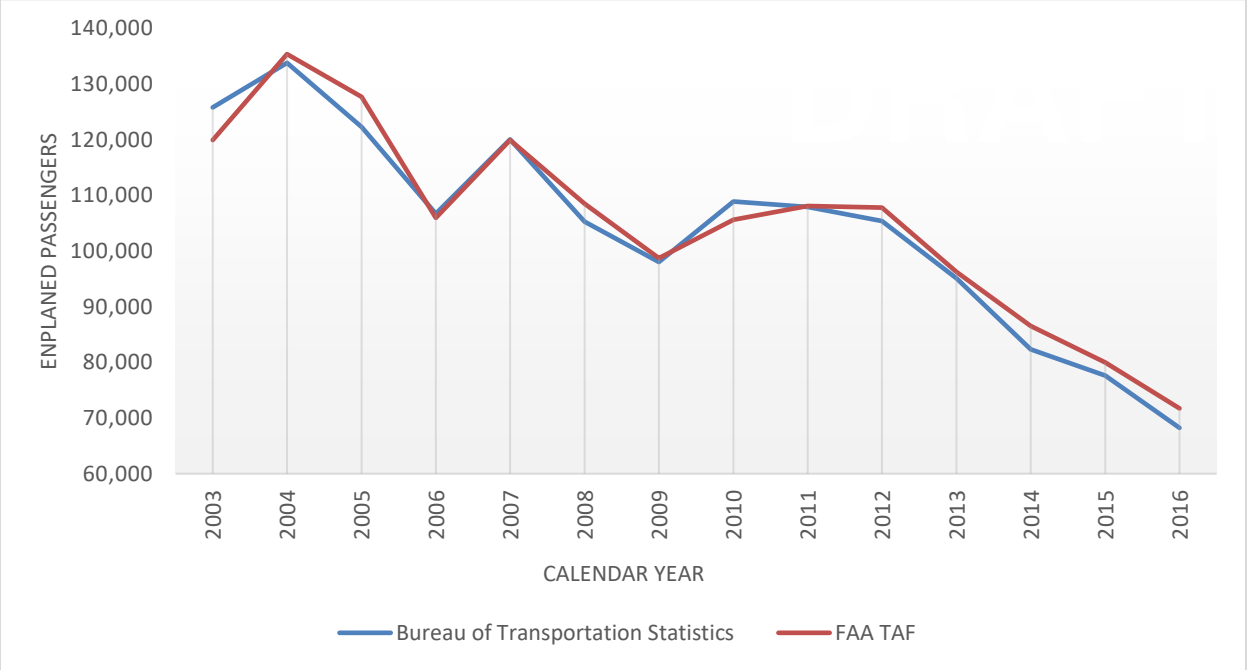
Year	Bureau of Transportation Statistics	FAA TAF
2003	125,834	119,987
2004	133,848	135,425
2005	122,332	127,719
2006	106,740	106,005
2007	120,109	119,948
2008	105,327	108,512

Year	Bureau of Transportation Statistics	FAA TAF
2009	98,040	98,722
2010	108,911	105,634
2011	107,975	108,133
2012	105,447	107,820
2013	95,150	96,252
2014	82,380	86,558
2015	77,632	79,987
2016	68,241	71,739

Source: Bureau of Transportation Statistics, 2017.

Enplanement data can be seen graphically in **Figure 2-2** below.

Figure 2-2: Historical Passenger Enplanements



Source: Bureau of Transportation Statistics, 2017.

Table 2-2 identifies basic the Airport's basic characteristics.

Table 2-2: Airport Characteristics

Element	Airport Information
Owner	Broome County
Acreage	1,199
FAA Categories	Non-hub, 14 CFR Part 139 Class I, ARFF Index B
Based Aircraft	34 (24 single-engine, 6 multi-engine, 3 jets, and 1 helicopter)
Annual Operations	15,616

ARFF is defined as Aircraft Rescue and Fire Fighting.
Source: FAA Form 5010, Airport Master Record, Accessed June 19, 2018.

2.3.1. Recent Projects

The Airport has undergone several construction projects since the last master plan update in 2009. Some of the larger, more notable projects include:

Airside

- In 2013, the EMAS (engineered materials arresting system) on the Runway 34 end was replaced and improvements to the Runway Safety Area were constructed.
- In 2014, the heliport was constructed adjacent to the West Apron.
- In May 2017, the full 7,300-foot Runway 16-34 was rehabilitated, which grounded all commercial flight operations for one month.

Landside

- In 2011, the terminal apron was rehabilitated. As a part of the project, the Airport, in cooperation with Binghamton University and McFarland Johnson, designed and constructed a geothermal snowmelt slab as a prototype for research. The system is also used to cool the terminal building in the summer months.
- In 2013/2014, the West Apron, adjacent to the FBO and other GA facilities, was rehabilitated.
- In 2015/2016, the North Apron, adjacent to Hangar 1 and the T-Hangars, was rehabilitated, including the demolition of the former cargo building.
- In 2017, the Airport connected the existing deicing pad drainage system with the recently constructed sanitary sewer system along Airport Road.

Terminal

- In 2015, the Airport upgraded security features within the terminal and replaced the baggage carousel.
- In 2017, Binghamton Brewing Company constructed a new countertop for food and beverage service within the holdroom.

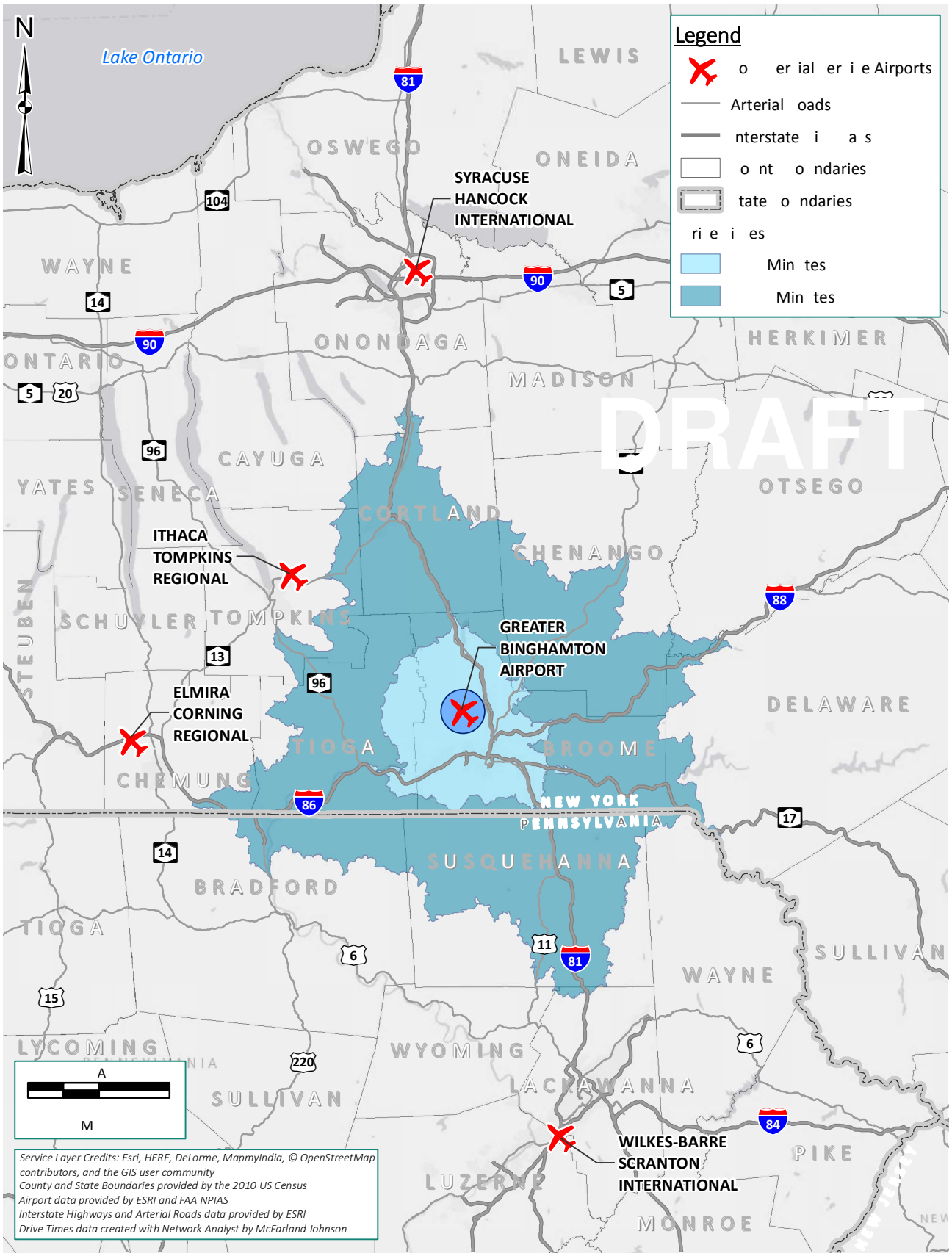
2.4. AIRPORT CATCHMENT/SERVICE AREA

2.4.1. Commercial Service Catchment Area

At commercial service airports such as BGM, the term catchment area is often used to refer to the area/population from which the airport attracts passengers flying commercially. The catchment area generally includes all towns that are closer to the airport than to any other commercial service facility. These areas are generally defined by a 30 and 60-minute uncongested drive-time isochrones which can be seen graphically in **Figure 2-3**.

As shown on this figure, the primary catchment area (0-30 minutes from BGM) is not a perfect circle, but rather, it encompasses a radius around the Airport extending approximately 10 miles to the east, approximately 12 miles to the west, approximately 12 miles to the north, and approximately 14 miles to the south. The primary catchment area includes a majority of Broome County (and the City of Binghamton) as well as a portion of Tioga County.

i re o er ial er i e Airport ri e i e Map



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The secondary catchment area (31-60 minutes from BGM), as shown in **Figure 2-3**, represents a larger non-concentric isochrone around the Airport. The secondary catchment area extends approximately 32 miles to the east, approximately 29 miles to the west, approximately 37 miles to the north, and approximately 32 miles to the south. In addition to those counties previously identified in the primary catchment area, the secondary catchment area also includes portions of Otsego County, Tompkins County, Chenango County, Cortland County, and Delaware County in New York and portions of Bradford County, Susquehanna County, Lackawanna County, and Wayne County in Pennsylvania. There are no other commercial service airports within BGM's primary and secondary catchment area.

There are three commercial service airports that lie just outside of the Commercial Service Catchment Area, namely Ithaca Tompkins Regional, Elmira Corning Regional, and Wilkes-Barre/Scranton International. These airports are shown for comparison purposes in **Table 2-3** and are also identified in **Figure 2-3**.

Table 2-3: Proximate Commercial Service Airports

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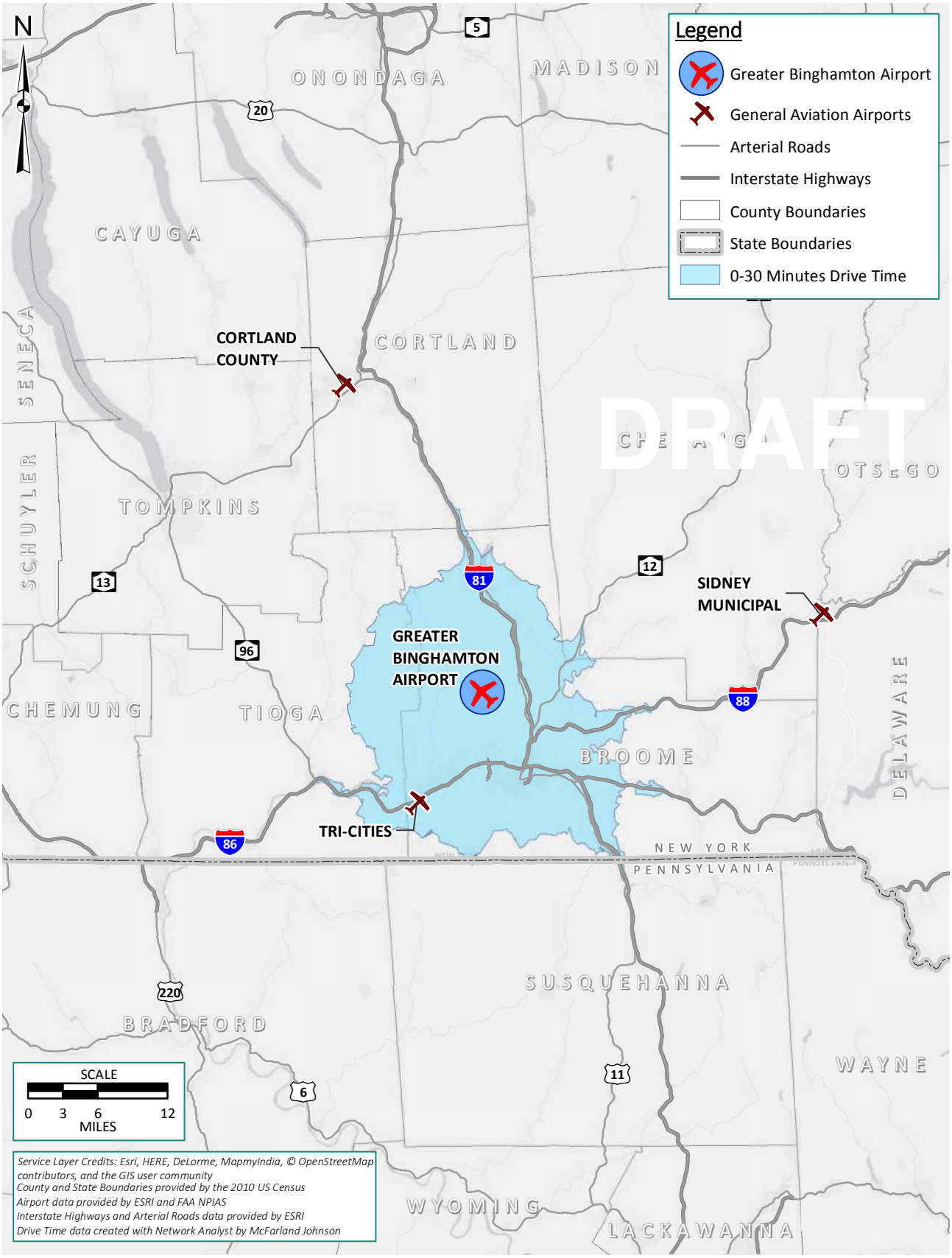
Airport	RWY	RWY Length & Width	Runway Surface	Based Aircraft	Instrument Approaches	Associated City	Distance from BGM (statute miles)
BGM	16-34 10-28	7,304' X 150' 5,001' X 150'	Asphalt/Grooved Asphalt/Grooved	37	Precision Non-Precision	Binghamton	----
Ithaca Tompkins	14-32 15-33	6,977' X 150' 2,018' X 50'	Asphalt/Grooved Turf	52	Precision None	Ithaca	31 NW
Elmira Corning Regional	6-24 10-28 5-23	8,001' X 150' 5,404' X 150' 2,017' X 150'	Asphalt/Grooved Asphalt/Grooved Turf	46	Precision Non-Precision None	Elmira/ Corning	47 W
Syracuse Hancock Int'l	10-28 15-33	9,003' X 150' 7,500' X 150'	Asphalt/Grooved Asphalt/Grooved	43	Precision Non-Precision	Syracuse	63 N
Wilkes-Barre Scranton Int'l	4-22 10-28	7,502' X 150' 4,300' X 150'	Asphalt/Grooved Asphalt/Grooved	42	Precision Non-Precision	Wilkes-Barre/ Scranton	61 S

Source: FAA Form 5010-1, January 23, 2018.

2.4.2. General Aviation Service Area

General aviation (GA) also plays a key role at BGM. For the purposes of GA, the areas from which tenants/users are most likely to be located is referred to as a service area. The BGM GA service area is approximately a 30-minute drive-time from the airport. The GA service area is shown in **Figure 2-4**. Included in the GA service area is Broome County as well as portions of Tioga County, Tompkins County, Cortland County, and Chenango County in New York and portions of Bradford County and Susquehanna County in Pennsylvania. Service area airports include Tri-Cities Airport, Cortland County Airport, and Sidney Municipal Airport.

Figure 2-4: General Aviation Airport Drive Time Map



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Details associated with these airports can be viewed in **Table 2-4.**

Table 2-4: Proximate GA Airports

Airport	RWY	RWY Length & Width	Runway Surface	Based Aircraft	Instrument Approaches	Associated City	Distance from BGM (statute miles)
BGM	16-34 10-28	7,304' X 150' 5,001' X 150'	Asphalt/ Grooved Asphalt/ Grooved	37	Precision Non-Precision	Binghamton	----
Tri-Cities	3-21	3,900' X 75'	Asphalt	42	Non-Precision	Endicott	11 SW
Cortland County	6-24	3,400' X 75'	Asphalt/ Grooved	45	Non-Precision	Cortland	29 NNE
Sidney Municipal	7-25	4,201' X 75'	Asphalt	24	Non-Precision	Sidney	30 WNW

Source: FAA Form 5010-1, Accessed June 19, 2018.

2.5. SOCIOECONOMIC DATA

In an effort to understand the socioeconomic atmosphere surrounding the Airport, data was collected and placed in multiple tables below. These tables provide a comparison between the United States, the State of New York, Broome County, and surrounding cities and towns that comprise the local area.

The total percent change in population from 2000 to 2016, shows that Greater Binghamton has not experienced a significant change in population. The only large municipality regionally that has increased in population is the city of Ithaca. While the U.S. and the State of New York have seen increases in population, Broome County, Binghamton, and Elmira have seen declines in population as shown in **Table 2-5**.

Table 2-5: Population Change 2000-2016

Area	2000 Population	2010 Population	2016 Population (Estimate)	Total % Population Change (2000-2016)
United States	281,421,906	308,745,538	323,127,513	14.82%
State of New York	18,976,457	19,378,102	19,745,289	4.05%
County of Broome	200,536	200,689	195,334	-2.59%
City of Binghamton	47,380	47,376	45,674	-3.60%
City of Elmira	30,940	29,354	27,962	-9.63%
City of Ithaca	29,287	29,774	30,763	5.04%

Source: U.S. Census Bureau, American Fact Finder 2017.

The majority of municipalities that surround the Airport are below the state and national unemployment and median household income rate, as shown in **Table 2-6**. Only the City of Binghamton has a higher unemployment rate than the nation and the state. Broome County and municipalities near Binghamton all have median household incomes lower than the state and the nation as a whole.

According to the 2015 American Community Survey provided by the U.S. Census American Fact Finder, the County of Broome major industries are educational services and health care and social services (29.9%), retail (12.6%), and manufacturing (10.3%). The top ten employers in the county include aerospace and defense, colleges/universities, medical service providers, hospitals, and retailers such as Walmart and Wegmans Food Markets.

Table 2-6: Employment and Income

Area	Unemployment Rate	Percent in Labor Force	Median Household Income
United States	5.2%	63.7%	$53,889
State of New York	5.2%	63.5%	$59,269
County of Broome	4.6%	58.7%	$46,261
City of Binghamton	6.1%	54.4%	$29,824
City of Elmira	4.3%	48.7%	$29,295
City of Ithaca	3.6%	46.7%	$30,436

Source: U.S. Census Bureau, American Fact Finder 2017 and New York Department of Labor.

2.6. AIRSIDE FACILITIES

Airside facilities enable the arrival and departure of aircraft, including the following:

- Runways
- Taxiways

The locations of the runways and taxiways are depicted in the BGM published airport diagram, Figure 2-5.

2.6.1. Runways

BGM has two runways which consist of a primary, Runway 16-34, and a crosswind, Runway 10-28. Additionally, the Airport has a heliport, H1, located southwest of the terminal building. Pertinent information regarding BGM's runways can be found in Table 2-7.

Analysis of wind data generated at the Airport indicates the Airport is operating in IMC (instrument meteorological conditions) 26.2% of the time, VMC (visual meteorological conditions) 67.3% of the time and is closed due to weather 6.5% of the time. Additionally, winds are reported as calm or 3 knots or less 7.0% of the time.

Runway 16-34

Runway 16-34 is the Airport's primary runway and measures 7,304 feet long by 150 feet wide. It is aligned in a northwest-southeast direction which is consistent with the prevailing wind conditions. The runway is grooved and in excellent condition with high intensity edge lights. Both runway ends are equipped with a medium intensity approach light system with runway alignment indicator lights (MALSR) and a 2-box precision approach path indicator (PAPI). Runway 16-34 has precision instrument markings in excellent condition.

EMAS beds were installed on both ends of the runway in 2002 and declared distances implemented to comply with FAA runway safety area (RSA) requirements, as steep drops on both ends of the runway preclude traditional graded RSA's. The EMAS bed on the south end of the runway is approximately 36,800 square feet (SF) and measures 162' wide by approximately 227' long. It was fitted with a new plastic lid in 2010 which greatly reduced the required regular maintenance. The EMAS bed on the north end of the runway is approximately 50,000 SF and measures approximately 161 feet wide by 311 feet long. It was completely replaced in 2013 with a Zodiac Aerospace EMASMAX system. The EMAS system is capable of stopping a Dornier Dash 8, Canadair CRJ 200, Embraer 145, or a Beech 1900 at up to 70 knots, at maximum takeoff weight, or at 80% of maximum landing weight.

Runway 16-34 was originally constructed in 1951 with two major extensions of 700 feet and 1,100 feet completed in 1967 and 1989, respectively. There have been two asphalt overlays completed as well as a major runway rehabilitation in 2006. The full runway was rehabilitated again in mid-2017 at a cost of approximately $12 million. The most recent reconstruction occurred after a major pavement failure in September 2015 when a large portion of pavement in the Runway 34 touchdown zone delaminated, necessitating emergency repairs that closed the runway for nearly a week.

Runway 10-28

The Airport's crosswind runway measures 5,001 feet long by 150 feet wide. It is aligned in an east-west direction and is grooved in good condition as of the most recent inspection at the end of 2016. It has flashing runway end identifier lights (REIL) for pilots utilizing Runway 28 as well as medium intensity edge lights (MIRL). Both runway ends are served by a visual approach slope indicator (VASI).

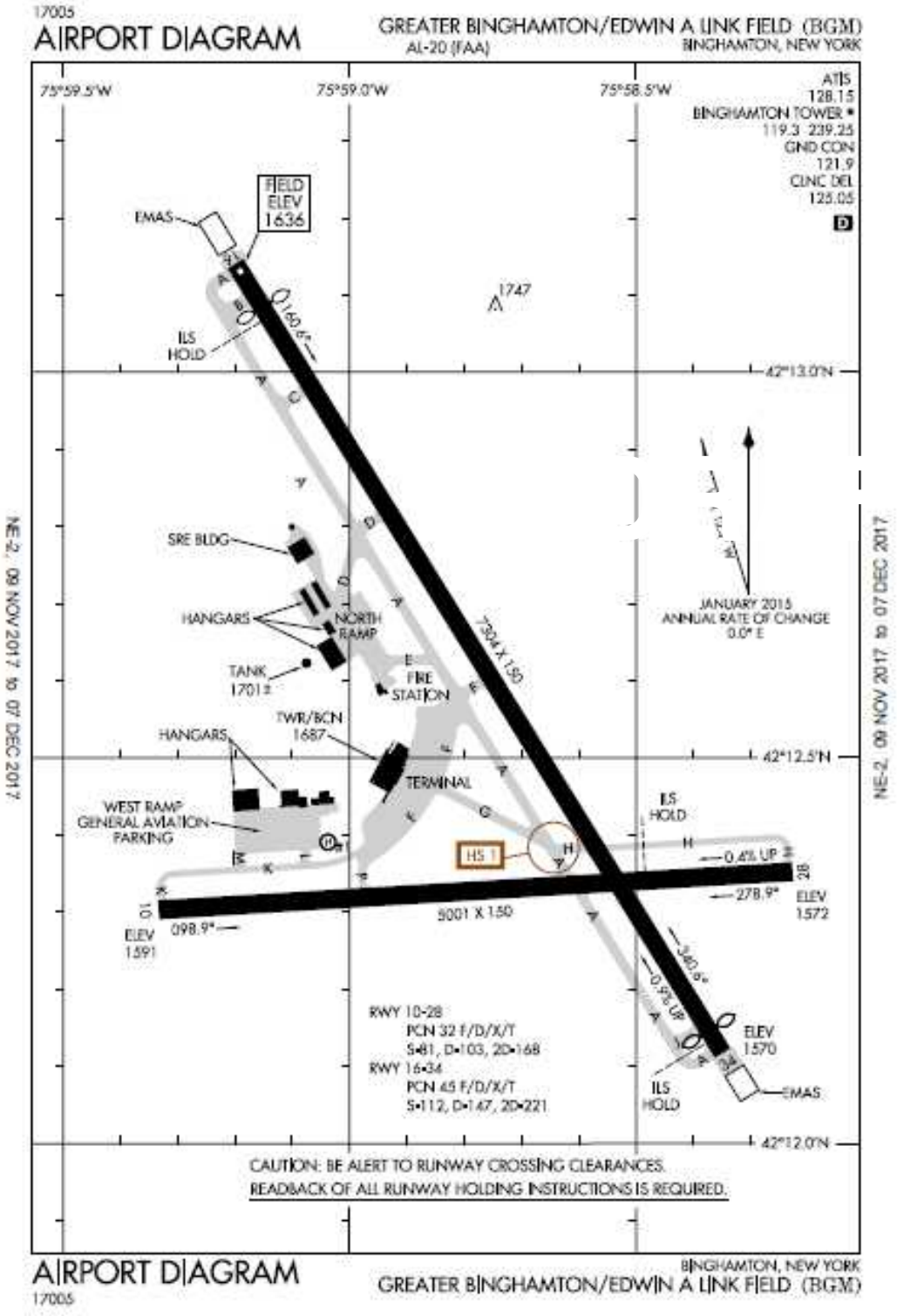
Runway 10-28 has remained at its current length since initial construction and was last rehabilitated (mill and overlay) in 1998. Complete reconstruction of Runway 10-28 is currently in the design phase and anticipated for construction in 2019.

Heliport H1

Heliport H1 was constructed in 2014 and is located at the intersection of Taxiway L and the West Apron. The heliport is comprised of a 54-foot by 54-foot concrete touchdown and lift-off area and is encompassed by a 98 feet by 118 feet asphalt final approach and takeoff area. Heliport H1 was constructed due to an increase in helicopter traffic associated with manufacturing work at a nearby Lockheed Martin facility and activity in the natural gas exploration sector in Northern Pennsylvania.

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Figure 2-5: BGM Airport Diagram



Source: FAA Airport Diagram, effective November 9 – December 7, 2017.

Table 2-7: Runway Data

Runway	16/34	10/28	H1
Surface	Grooved Asphalt	Grooved Asphalt	Portland Cement
Dimensions	7,304' by 150'	5,001' by 150'	54' by 54'
Pavement Condition	Excellent	Good	Good
Runway Design Code	C-III	B-II	
Critical Aircraft (per 2009 MPU)	Embraer 190	Saab 340	
Displaced Threshold	399' /205'	None	N/A
Markings	Precision Instrument	Non-precision Instrument	Basic
Lighting	HIRL	MIRL	Perimeter
End Elevation (MSL)	1,636' / 1,569'	1,591' / 1,572'	1,591'
Part 77 Approach Surface Slope	50:1-40:1 / 50:1-40:1	34:1 / 34:1	N/A
Approach Minimums	½ Mile / 2,400'	ile	N/A
Visual Approach Aids	MALSR, PAPI / MALSR, PAPI	, RE /	N/A
Instrument Approach Aids	ILS, GPS / ILS, GPS, Transmissometer	VOR, GPS / VOR, DME, GPS	N/A
CFR Part 77 Category	Precision Instrument	Non-Precision Instrument	Visual
Declared Distances			
Takeoff Run Available	7,304'	5,001'	N/A
Takeoff Distance Available	7,304'	5,001'	N/A
Accelerate-Stop Distance Available	7,304'	5,001'	N/A
Landing Distance Available	6,905' / 7,099'	5,001'	N/A
Usable Runway Length	7,304'	5,001'	N/A
Pavement Strength (lbs.)			
Single Wheel	112,000	81,000	Unknown
Dual Wheel	147,000	103,000	Unknown
Tandem	221,000	168,000	Unknown
Runway Object Free Area (ROFA)			
Length Beyond Runway End	1,000'	300'	N/A
Width	800'	500'	N/A
Runway Safety Area (RSA)			
Length Prior to Landing Threshold	848' / 410'	300'	N/A
Length Beyond Runway	447'* / 410'*	300'	N/A
Width	500'	150'	N/A

*Mitigated by EMAS and declared distances

Source: 2009 Airport Master Plan Update, 2009 ALP, FAA Form 5010 (Feb. 1, 2018), FAA Digital Terminal Procedures Publication 01 FEB 2018 to 01 MAR 2018.

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Taxiways

BGM has thirteen taxiways designated A through P (the letter "I" is not used to designate taxiways to avoid confusion with the number "1" and the letter "N" is not utilized). All of the taxiways are of asphalt construction and are equipped with blue, omnidirectional medium intensity taxiway lights (MITL).

Taxiway A is a parallel taxiway measuring 75 feet wide which runs full-length of Runway 16-34 including providing access to both runway thresholds.

Taxiway B is a bypass taxiway which measures 92 feet wide at its narrowest point and is near the Runway 16 threshold.

Taxiway C is a 75-foot-wide entrance taxiway approximately 730 feet south of the Runway 16 (displaced) threshold.

Taxiway D is a 75-foot-wide entrance taxiway approximately 1,880 feet south of the Runway 16 (displaced) threshold. Taxiway D intersects Taxiway A and provides access from Runway 16-34 to the North Ramp.

Taxiway E is a 75-foot-wide apron taxiway connecting Taxiway A with the south side of the North Ramp.

Taxiway F is a 75-foot-wide apron taxiway that originates/terminates at Runway 16-34. It intersects Taxiway A and then curves along the southwest side of the Terminal Apron where it originates/terminates on the south end at Taxiway P.

Taxiway G is 75 feet wide crossover taxiway and connects the Terminal Apron with Taxiway A. The intersection of Taxiways A, G, and H is a published hot spot.

Taxiway H is a partial parallel taxiway that parallels Runway 10-28 on east of Taxiway A. It connects the Runway 28 threshold with Taxiway A and intersects Runway 16-34. Taxiway H is 50 feet wide east of Runway 16-34 and 75 feet wide west of Runway 16-34. The intersection of Taxiways A, G, and H is a published hot spot.

Taxiway J is a crossover taxiway approximately 80 feet wide at its narrowest point. It is a stub taxiway that provides access to the Runway 34 displaced threshold and serves as a by-pass to Taxiway A. It remains outside of the instrument landing system (ILS) critical area.

Taxiway K is a 50 foot wide, partial parallel taxiway and connects the Runway 10 threshold with the south end of the Terminal Apron.

Taxiway L is 50 feet wide apron taxiway that connects Taxiway K and the West Ramp including Heliport H1.

Taxiway M is 50 feet wide apron taxiway that connects Taxiway K and the West Ramp.

Taxiway P is 50 feet wide and serves as a stub taxiway for Runway 10-28 approximately 1,620 feet from the Runway 10 threshold.

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2.6.2. Instrumentation

Navigational aids (NAVAIDs) are any electronic or visual devices, airborne or on the ground, which provide point-to-point guidance information or position data to aircraft in flight. All local traffic is controlled by the airport traffic control tower (ATCT), which is operational between 6:00 AM and 12:00 AM daily. BGM has several electronic and visual navigational aids that pilots use to locate, navigate to, and land at the Airport, which are discussed below. Instrument approach procedures utilize the aircraft's onboard equipment, coupled with either terrestrial or space-based components to enable pilots to land in less than ideal meteorological conditions when visibility is compromised.

Instrument Landing System (ILS)

An ILS utilizes both a glideslope antenna and a localizer antennae (LOC) to provide both horizontal and vertical guidance to a specific point where a pilot must decide whether or not to continue the approach visually down to the runway. The localizer provides horizontal guidance, while the glideslope provides vertical guidance. Additionally, outer and middle marker beacons positioned along the approach path and transmit a unique signal when the aircraft flies through, giving the pilot critical distance information throughout the approach.

Approach light systems are used in conjunction with an ILS to assist pilots in the transition from instrument to visual conditions. Runways 16 and 34 are equipped with a MALSR. The Medium Intensity Approach Light System (MALS) portion is a series of steady burning light bars, spaced 200 feet apart, that begin at the runway threshold(s) and extend outward along the extended runway centerline for a distance of 1,400 feet. The RAIL (Runway Alignment Indicator Lights) portion of the MALSR consists of five sequenced flashing lights every 200 feet, aligned with the extended runway centerline for a distance of 1,000 feet. Thus, the entire MALSR system extends for a total of 2,400 feet from the runway threshold.

RNAV (GPS) Approaches

Global positioning system (GPS) approaches utilize satellites to geospatially pinpoint the aircraft position relative to the airport. GPS approaches are typically classified as area navigation (RNAV) and can also include a localizer performance with vertical guidance (LPV) as is the case with BGM's GPS approaches.

Instrument Approach Procedures

There are six published instrument approach procedures at BGM, two of which utilize the ground-based components of the ILS; and the remainder utilize the space-based satellites of the GPS. The approach plates for use between December 7, 2017 and January 4, 2018 are shown in Figure 2-6 through Figure 2-11 below.

Figure 2-6: ILS or LOC Runway 16

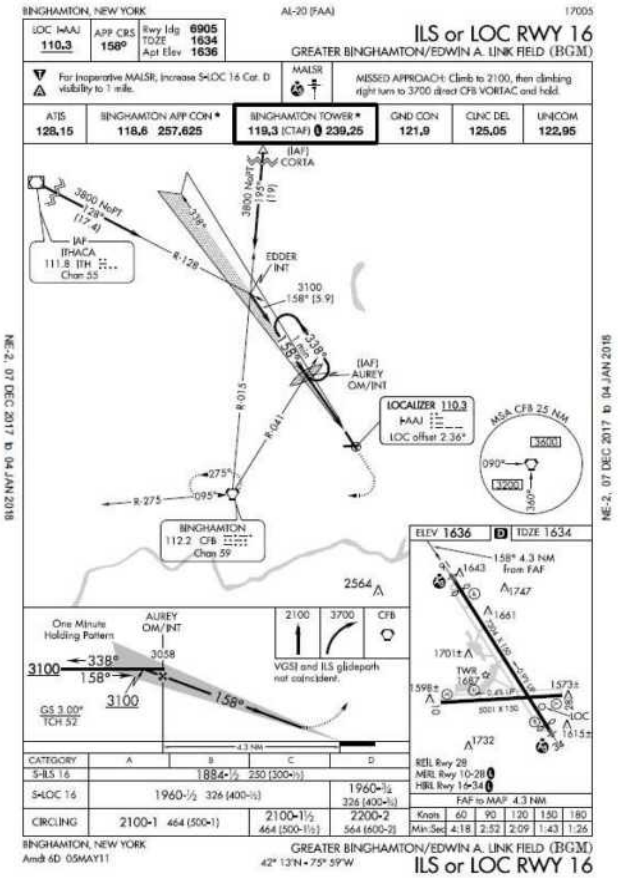
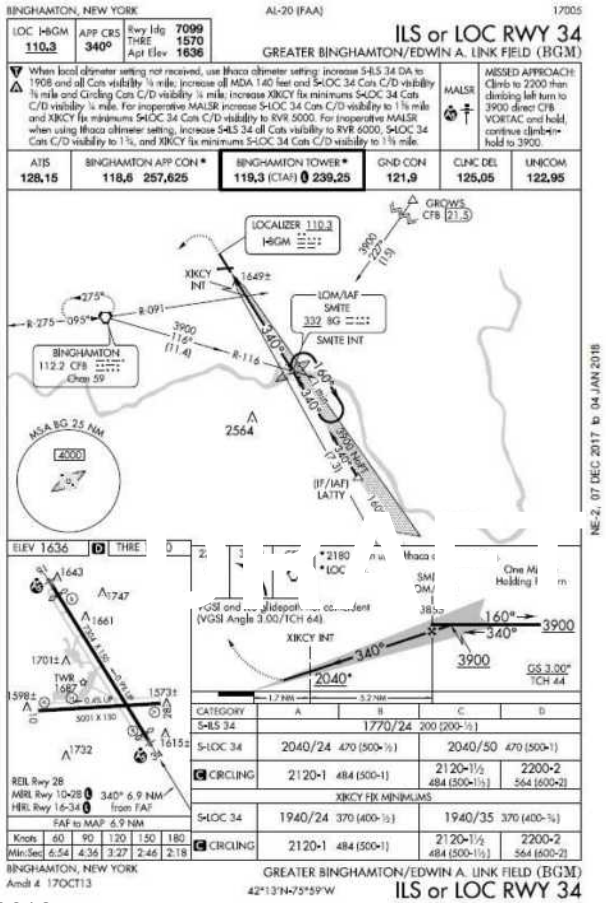


Figure 2-7: ILS or LOC Runway 34



Source: http://aeronav.faa.gov/, Accessed January 10, 2018.

Figure 2-8: RNAV (GPS) Runway 10

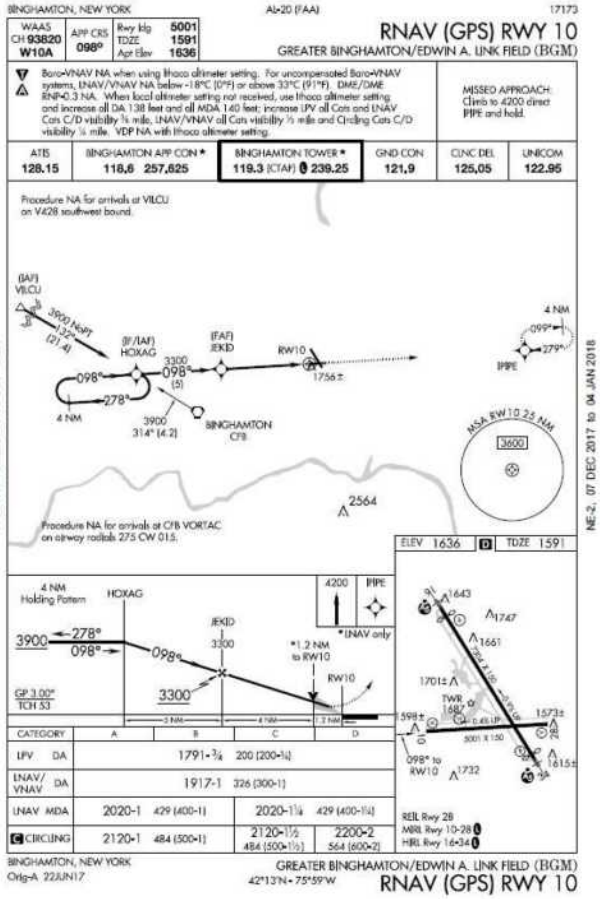
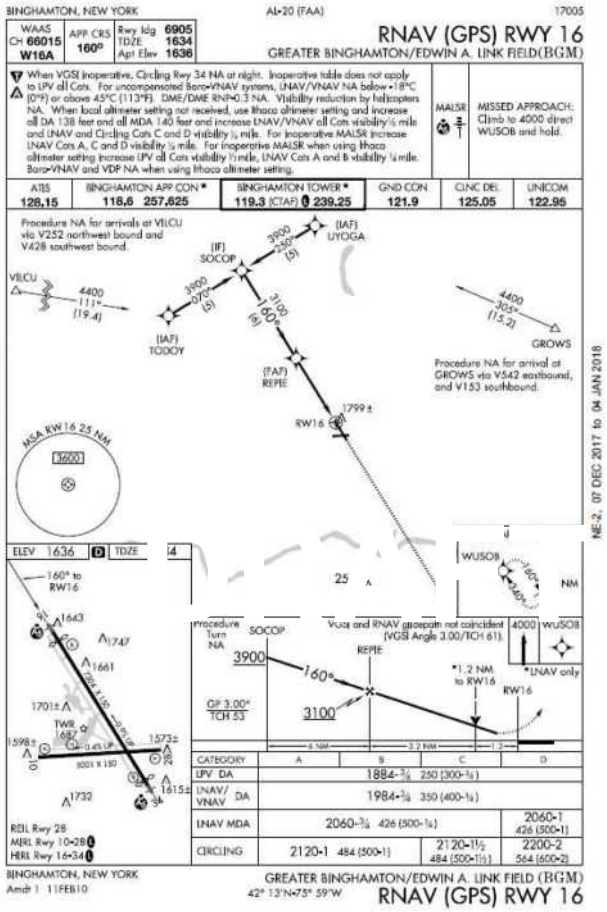


Figure 2-9: RNAV (GPS) Runway 16



Source: http://aeronav.faa.gov/, Accessed January 10, 2018.

Figure 2-10: RNAV (GPS) Runway 28

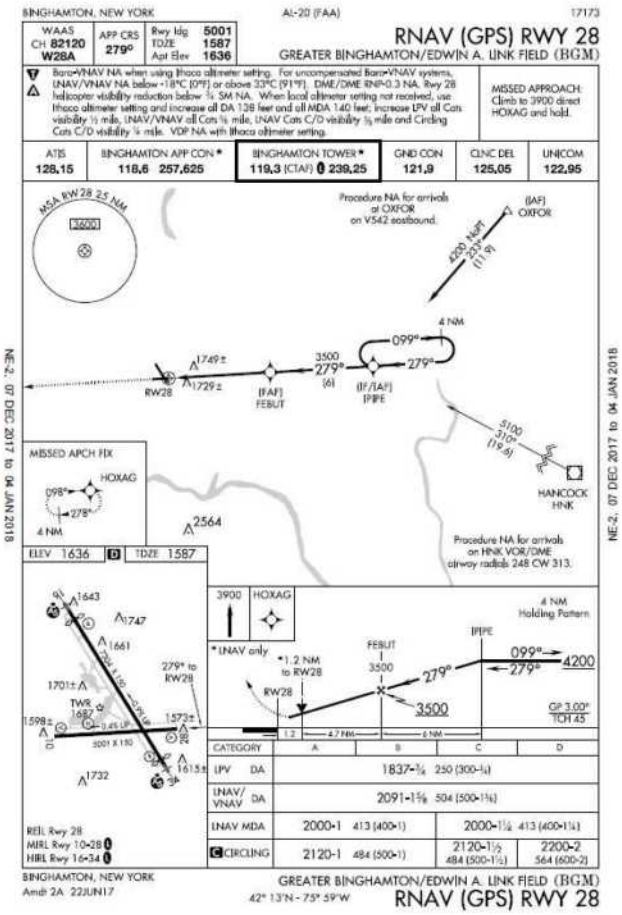
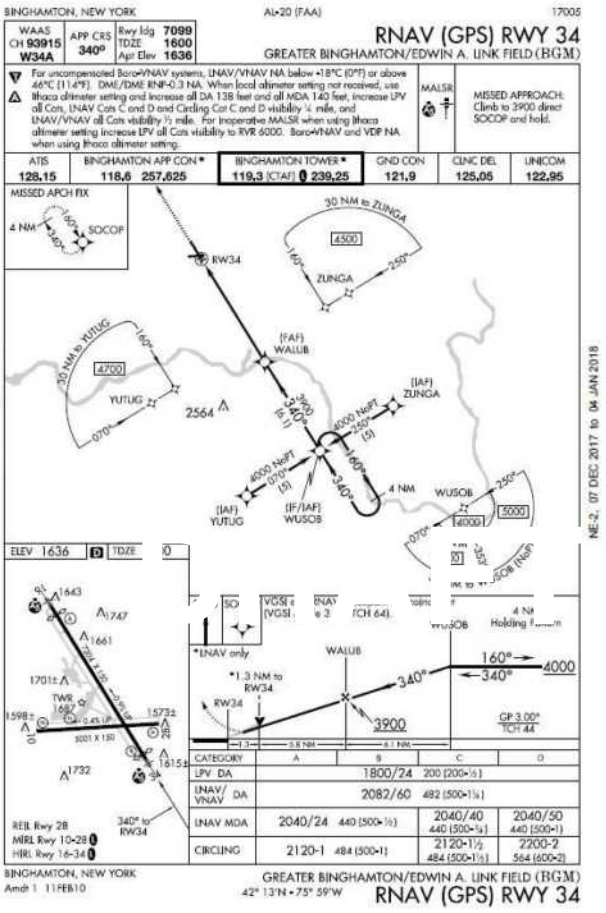


Figure 2-11: RNAV (GPS) Runway 34



Source: http://aeronav.faa.gov/, Accessed January 10, 2018.

2.6.3. Visual Approach Aids

Runway 16-34 is equipped with a MALSR and PAPI on both ends. Runway 10-28 has a VASI on both ends and a REIL on the Runway 10 approach end. A summary of instrument approach minima at BGM is shown in **Table 2-8**.

Table 2-8: BGM Instrument Approach Procedures Minima

Runway End	Type of Approach	Approach Minima (Ceiling-Visibility)
Runway 16	ILS or LOC	250’ Above Ground Level (AGL) – ½ Statute Mile
Runway 34	ILS or LOC	200’ AGL – 2,400 feet
Runway 10	RNAV (GPS) - LPV	200’ AGL – ¾ Statute Mile
Runway 16	RNAV (GPS) - LPV	250’ AGL – ¾ Statute Mile
Runway 28	RNAV (GPS) - LPV	250’ AGL – ¾ Statute Mile
Runway 34	RNAV (GPS) - LPV	200’ AGL – 2,400 feet

Source: FAA BGM Terminal Procedures, effective date: November 9 - December 7, 2017.

2.6.4. Airport Systems

Various systems described below are utilized by pilots and controllers in the safe operation of aircraft, and to enhance or increase utilization of the Airport.

Automated Surface Observing System (ASOS)

Weather reporting equipment at BGM consists of an ASOS accessible from Taxiway G and located between Taxiways D and F. An ASOS provides continuous minute-by-minute observations and performs basic observing functions necessary to generate an aviation routine weather report (METAR) and other aviation weather information. An ASOS has the capability to report altimeter setting, wind, temperature/dew point, density altitude, visibility, clouds/ceiling, precipitation, and remarks. It can be accessed by pilots via telephone at (607) 729-8335.

Wind Cones

There are lighted wind cone assemblies adjacent to the appro ch nc of un 16 34.

Airport Surveillance Radar (ASR)

Located on the north end of the Airport is an ASR-11 which is an integrated primary and secondary radar system. It is utilized to detect aircraft within 60 miles of the site, and can also provide weather service detection capabilities to provide increased situational awareness to controllers and pilots operating in the terminal area.

NEXRAD Weather Radar

While not owned, operated, or maintained by the Airport, located on Airport property is a NEXRAD (Next generation Radar) S-band Doppler weather radar station. The WSR 88-D (Weather Surveillance Radar, 1988 Doppler) is one of over 160 radar sites across the U.S. operated by the National Weather Service that provide high resolution weather data for researchers, media outlets, pilots, and private citizens[1].

Airfield Lighting

Airfield lighting for runways, taxiways, lighted directional signs, and other signage is powered from an electrical vault located east of the West Ramp, adjacent to the FirstAIR FBO and the Employee Parking Lot. A 100 Kw emergency generator with a 330-gallon diesel fuel capacity is located adjacent to the vault to provide emergency power.

[1] US Department of Commerce, NOAA, National Weather Service. “About our WSR 88-D Radar.” National Weather Service, NOAA's National Weather Service, 23 Mar. 2015, www.weather.gov/iwx/wsr_88d.

Binghamton VORTAC

A combined very high frequency omnidirectional range (VOR) / tactical air navigation (TACAN), is known as a VORTAC. Three services are provided to aircraft from this single facility. The VOR is used by properly equipped aircraft to navigate. The VOR transmits radio signals outward like the spokes of a wheel. When tuned to the VOR frequency, equipment in the aircraft gives pilots an indication of which spoke they are travelling on or through. Two VOR frequencies can be utilized to provide an exact fix of the aircraft position relative to the ground.

A TACAN is collocated with the VOR and is utilized by military aircraft for navigation, however a portion of the TACAN is available for public use. A distance measuring equipment (DME) can be utilized by properly equipped aircraft to give pilots an indication as to their relative distance to a particular VOR.

While not located on Airport property, the Binghamton VORTAC is a critical piece of infrastructure for pilots operating into the Airport environment and flying in the local area. The Binghamton VORTAC is located approximately nine miles southwest of the Airport, near Schneider Road in the Town of Owego. The Binghamton VORTAC is owned and operated by the FAA.

2.7. LANDSIDE FACILITIES

2.7.1. Airport Buildings

The existing conditions at BGM are depicted in **Figure 2-5** and show the general location of buildings, hangars, and other airport and tenant facilities.

T-Hangars

T-hangars are generally used for the storage of general aviation aircraft (typically based aircraft). At BGM, there are two, ten-unit T-hangars which were constructed in 2013 to replace three previous T-hangar buildings that had reached the end of their useful life. These hangars are owned and operated by Broome County. The T-hangars are located on the North Apron south of the Runway 16 threshold and can be accessed via Taxiways D or E. Concurrent with the construction of the T-hangars, the pavement surrounding the new structures was replaced as well. There are 10 individual units in the two T-hangars which are approximately 80 percent full.

Conventional Hangars

Hangar 1 was constructed on the North Apron in 1994. The hangar measures approximately 28,000 square feet with approximately 7,000 square feet of attached office space. The hangar is owned by the County and has recently been leased to Evolution Jets, an aircraft charter company.

Hangar 2 was constructed in the late 1950's at the western end of the West Apron. It is owned by the County and is used by FirstAIR for aircraft storage. There are additional tenants in Hangar 2 as discussed in **Section 2.7.4**.

Hangar 3 houses the GA terminal building as well as the offices of FirstAIR, BGM's FBO. The building is County owned and was constructed in 1981, comprising approximately 21,670 SF of space. Approximately 16,500 SF is hangar space and the remainder is the GA terminal building.

Rental Car Service Facility

In 2015, a rental car service facility was constructed between Dawes Drive and Knapp Road. The project consisted of construction of a 900-foot long public access road, named Shea Drive, a 16,000-square foot parking lot, a wash bay, service bays, offices, and fueling infrastructure. The facility was constructed by the county utilizing Customer Facility Charges (CFC) to be leased out to the rental car companies based at the Airport.

2.7.2. Passenger Terminal Facilities

Passenger Terminal Building

The terminal building serves as the point of transition for travelers between surface and air transportation utilizing commercial airlines. The first floor encompasses approximately 51,700 SF, of which approximately 21,500 SF is considered sterile, or behind the passenger screening checkpoint. The remaining approximately 30,000 SF is public or before the passenger screening checkpoint. The sterile areas are only accessible to ticketed passengers and/or appropriately badged employees. The breakdown of these areas is depicted on **Figure 2-12.**

The second floor (approximately 13,171 SF) is made up almost entirely of office space as shown on **Figure 2-13**. Second floor tenants include the Broome County Department of Aviation, the FAA, Customs and Border Protection (CBP), SkyWest Airlines, Civil Air Patrol, and the Transportation Security Administration (TSA). A four-story ATCT sits atop the terminal building.

The Airport's original terminal building opened in 1950 but has undergone several expansion and renovation projects. The most recent terminal renovation/expansion was in 2014 and consisted of building security upgrades and replacement of the inbound baggage carousel. Specifically, the terminal building access control system was upgraded to tie in additional Airport owned buildings and replace several access-controlled doors. The existing security cameras were replaced with digital units and additional cameras were installed. All of the cameras were tied into the Airport security system.

In 2012, the terminal restrooms were upgraded, and upgrades added to the TSA screening check point.

In 1999, major passenger facility renovations were necessary to address critical life, safety and building code requirements; address handicap access; and enhance terminal capacity and safety. The project was also necessary to provide needed improvements to the then 50-year-old building's systems, including renovation, replacement, and upgrading of the facility's mechanical and electrical systems.

The 1999 passenger facility renovations were consistent with the preferred terminal concept included in the 1997 Master Plan Update and shown on the Airport's current FAA approved Airport Layout Plan (ALP). According to the Engineer's Design Report (January 6, 1999), the major

items that were included in the terminal renovation project were as follows:

- Expansion and consolidation of ticket counters and airline ticket offices on the south side of the terminal to provide maximum flexibility to accommodate changing airline requirements.
- New baggage claim located on the north side of the terminal to separate enplaning and deplaning passenger flows.
- Consolidated rental car spaces conveniently located opposite the baggage claim area.
- Expanded and dedicated outbound baggage area.
- New and expanded departure lounge.
- New sterile area and non-sterile area restrooms.
- New entry/exit vestibule provided opposite the new baggage claim to enhance vehicular distribution at the curb.
- Relocated restaurant and gift shop to a more visible and centralized location.
- Separate enplaning and deplaning passenger flows, with enhanced enplaning passenger flow through security into the departure lounge.
- Renovated second floor spaces to meet Americans with Disabilities Act (ADA) standards, and satisfy fire exiting and code requirements.
- Provision of a new second floor observation deck at the north end of the building.
- Provision of a new first floor business/conference center.

Careful staging/phasing was needed to ensure that all of the terminal building's functions remained operational to the maximum extent practical during the construction.

Passenger Flow

Enplaning passengers are screened at a centralized security checkpoint and held in a common hold room historically shared by all airlines serving the Airport. The Airport's six aircraft gates are located off an approximately 330-foot long linear concourse along the east side of the building. As of 2018, there are four passenger boarding bridges. Gate 5 is presently utilized by SkyWest Airlines (Delta), while the remaining gates are utilized on an as-needed basis. Deplaning passengers exit the concourse into the lobby and proceed to the baggage claim area, where they can retrieve their luggage on a flat-plate continuous loop claim device.

In front of the terminal building, an approximately 300-foot long covered walkway parallels a multi-lane roadway. Public parking across the roadway to the west is accessible to and from the terminal building by at-grade pedestrian crossings.

Vehicle Parking Facilities

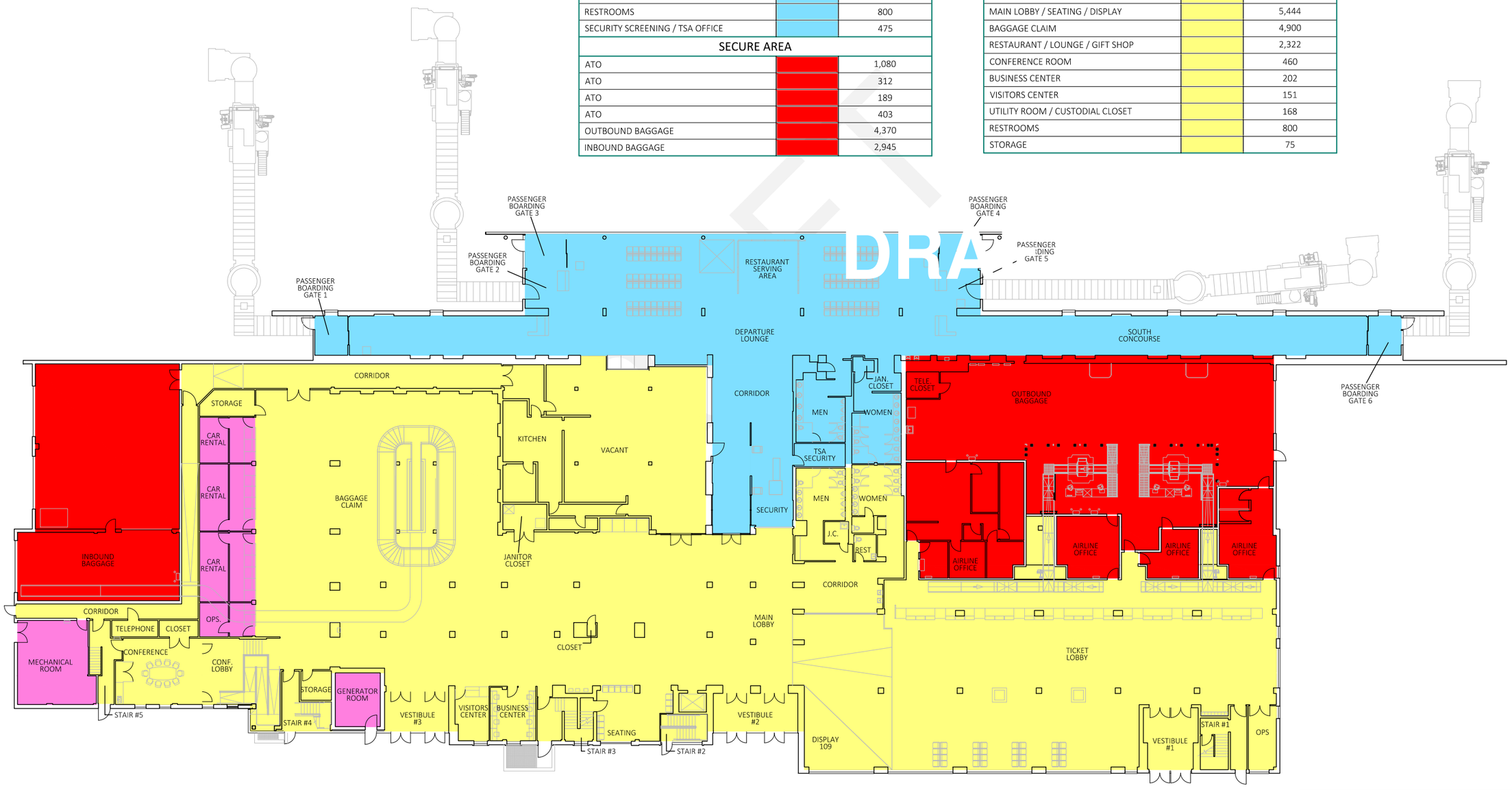
The existing parking lots can be seen in **Figure 2-14**. There are a total of 889 vehicle parking spots available for employees and passengers and rental car agencies. The breakdown is as follows:

- Long-Term Parking: 486
- Short-Term Parking: 125
- Rental Car Lot: 137

Figure 2-12: Terminal Building First Floor

TENANT	SYMBOL	SQUARE FEET
STERILE AREA		
DEPARTURE LOUNGE (WITH GATES)		7,528
RESTROOMS		800
SECURITY SCREENING / TSA OFFICE		475
SECURE AREA		
ATO		1,080
ATO		312
ATO		189
ATO		403
OUTBOUND BAGGAGE		4,370
INBOUND BAGGAGE		2,945

TENANT	SYMBOL	SQUARE FEET
PUBLIC AREA		
TICKETING LOBBY		5,392
MAIN LOBBY / SEATING / DISPLAY		5,444
BAGGAGE CLAIM		4,900
RESTAURANT / LOUNGE / GIFT SHOP		2,322
CONFERENCE ROOM		460
BUSINESS CENTER		202
VISITORS CENTER		151
UTILITY ROOM / CUSTODIAL CLOSET		168
RESTROOMS		800
STORAGE		75



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Figure 2-13: Terminal Building Second Floor

TENANT	SYMBOL	SQUARE FEET
DEPARTMENT OF AVIATION		2,725
FEDERAL AVIATION ADMINISTRATION		4,628
CUSTOMS AND BORDER PATROL		530
MECHANICAL SPACES		1,870
VACANT AREAS		1,853
CIVIL AIR PATROL		792
TRANSPORTATION SECURITY ADMINISTRATION		773
TENANT (1st FLOOR)		867



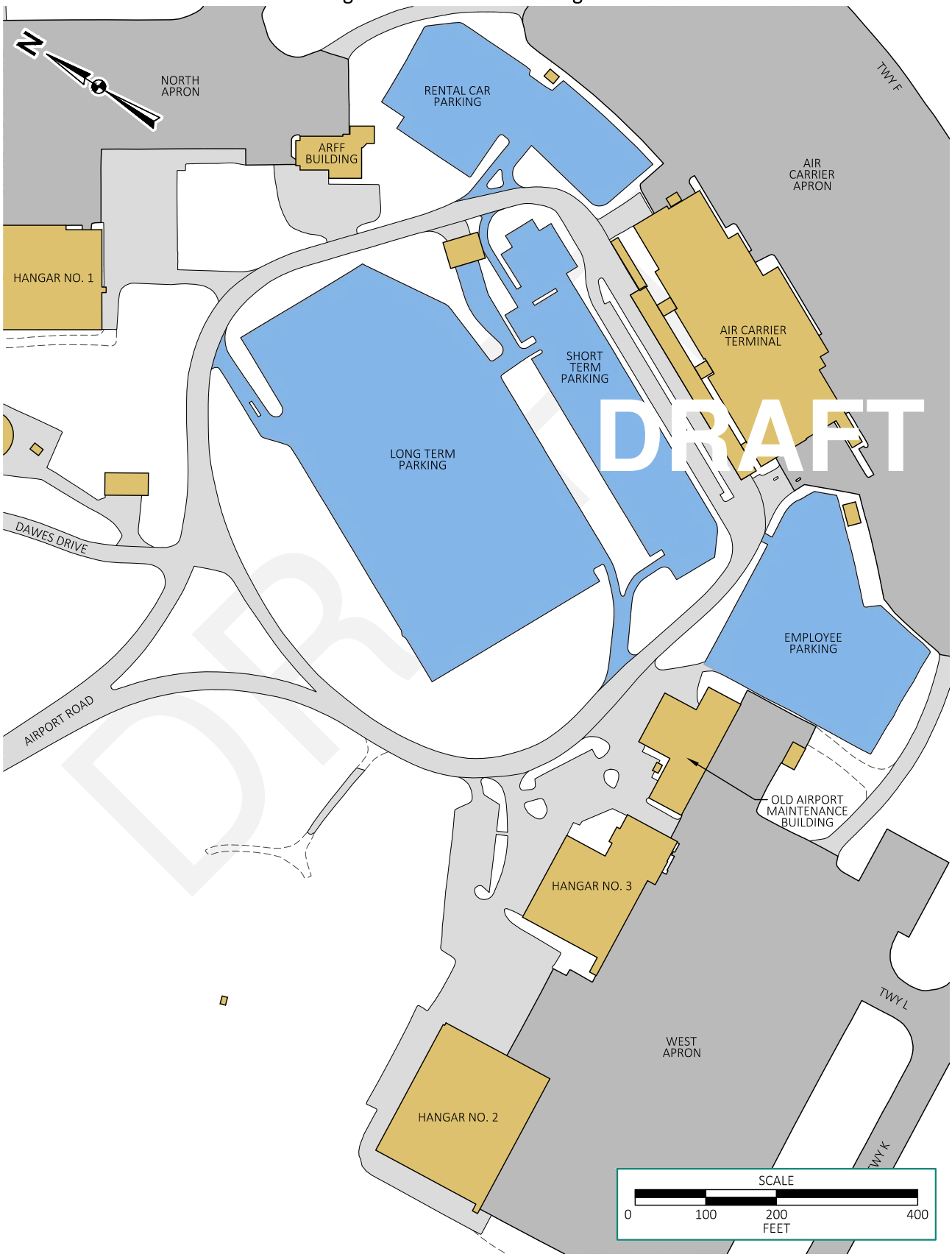
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Figure 2-14: Vehicle Parking Lots



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- Employee Lot: 141

Automatic parking revenue collecting equipment is in place for both the long and short-term parking lots. Additionally, there are two lanes including one with an attended booth and one with a self-serve machine.

Ground Access and Circulation

Airport Road, which provides access to the terminal building, makes a continuous loop around the long-term and short-term parking lots as well as provides access to adjacent GA areas. At the Airport entrance, the road splits into two-lane, one-way traffic. Arriving vehicles are directed to either turn right for GA hangars or employee parking or to align properly for short-term parking, long-term parking, or curbside pick-up and drop-off.

Vehicles that pass along the front of the terminal building have the option to access the rental car lot directly adjacent to, and just beyond the terminal building.

Crosswalks from the short-term and long-term parking lots provide pedestrian access to the terminal building. The entrance road was last rehabilitated in 2017 as part of a larger project completed by Broome County to resurface Airport Road.

Ground Transportation

There is currently no public transportation to and from the Airport. Several private companies and Transportation Network Companies, including Uber and Lyft, provide 24-hour shuttle and limousine services on demand. Broome County currently has a user agreement in place with Lyft and continues to negotiate an agreement with Uber. Taxis and limousines are licensed by Broome County through its Department of Security and must adhere to all local regulations. Several hotels also offer shuttle service to the Airport.

Rental cars are currently available at BGM, with vehicles available through Hertz, Avis, and Budget. Rental car counter hours vary but are typically open during the period of air carrier operations at BGM.

Terminal Apron

The Terminal Apron comprises approximately 33,300 square yards of pavement. The majority of the pavement is comprised of Portland Cement Concrete pavement (PCC). There are nine painted aircraft parking positions, all with a northwest orientation which can be utilized by the four passenger bridges, or lower-level gates that enable passengers to walk out onto the apron to board aircraft. In 2010, the Terminal Apron was rehabilitated.



Source: McFarland Johnson 2012.

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In the spring of 2011, in collaboration with Binghamton University and McFarland Johnson, Inc., the Airport installed a geothermal slab adjacent to the terminal building. The project was the culmination of students and professors from Binghamton University who submitted the project into the FAA Design Competition for Universities 2008-2009. The project won first place and was subsequently designed and installed using FAA research grants and New York State grant funding. The system absorbs underground heat/energy utilizing geothermal heat pump technology and then pumps heated glycol through embedded tubing installed beneath a portion of concrete on the apron. The tubing warms approximately 356 square yards of pavement and a 225-square foot pedestrian walkway to above freezing temperatures to preclude snow and ice accumulation. In the summer months, the glycol flow can be reversed and used to cool the terminal building. Research and monitoring of the system is scheduled to continue into 2018.

2.7.3. Airport Security

Airport security for both passengers and the Airport itself is regulated by Title 49 CFR (Code of Federal Regulations) Part 1542. Many commercial service airport security procedures are considered Security Sensitive information (SSI) and cannot be publicly disclosed, however general information regarding airport security can be discussed.

As a commercial service airport, BGM operates under an Airport Security Plan (ASP) which is approved by the TSA and outlines how the Airport remains in compliance with CFR Part 1542. Items outlined in the ASP include the designation of certain portions of the Airport as follows:

- **Security Identification Display Area (SIDA):** where anyone entering, or present must display proper identification and be appropriately badged or be escorted by someone meeting the requirements.
- **Secured Area:** where commercial service aircraft are enplaned and deplaned. The Secured Area must have access controls to deny access to individuals without proper authorization or operational need to be present in that area.
- **Sterile Area:** where ticked passengers wait to board commercial service aircraft after passing through a passenger screening checkpoint to ensure they aren't carrying any dangerous or prohibited items.

The ASP also identifies how the Airport will comply with other requirements of Part 1542 such as training requirements, law enforcement support of TSA screening operations, recordkeeping, public advisories, incident management, etc.

The TSA is responsible for providing passenger and baggage screening services. In addition, there are numerous gates and fences on and around the Airport, as well as security signage displayed throughout airport property. Patrols by law enforcement also help to maintain a secure environment.

Security services in support of TSA screening operations are provided by the Broome County Government Security Division. According to the Broome County website, the division provides security services for County owned facilities and special events. They have arrest powers and law enforcement authority under the New York State Criminal Procedure and Penal Law.

An additional security measure at the Airport includes CBP. The primary mission of CBP is to prevent terrorists and terrorist weapons from entering the United States. CPB is also responsible for apprehending individuals attempting to enter the United States illegally; stemming the flow of illegal drugs; protecting agricultural and economic interests from harmful pests and diseases; protecting American businesses from theft of their intellectual property rights; regulating and facilitating international trade; collecting import duties; and enforcing U.S. trade laws.

The CBP office at BGM has been open since August 1997 with the designation of BGM as a User Fee Airport (UFA). UFA's are smaller airports that are approved by CBP, after a request by the State Governor, that receive the services of a CBP officer. Unlike a Port of Entry, UFA's are required to pay a fee for this service, typically approximately $123,000 per year for the placement of a CBP officer, and a minimum of approximately $14,000 for automatic data processing machines. The Airport is also required to provide space for the office. Once an airport workload reaches a certain level, such as 15,000 international air passengers, 2,000 scheduled international arrivals, or 2,500 consumption entries (each valued over $2,000), transition to a Port of Entry can occur, when CBP will absorb the necessary costs to operate the office. The CBP office is open Monday through Friday from 9:00 AM to 5:00 PM but these services must be requested 24 hours in advance.

Passenger Screening

All departing passengers are required to pass through the security screening checkpoint located in the center of the passenger terminal. Passengers are screened with either a magnetometer or Advanced Imaging Technology machines. All carry-on baggage is screened through an enhanced imaging x-ray device. Restrictions on what may be transported by passengers through the checkpoint such as liquids, gels, and aerosols are subject to change; a list of the most current restrictions can be found on the TSA website.

Baggage Screening

Baggage screening is conducted on the first level of the terminal in the area behind the airline ticketing counters. All baggage is screened by TSA prior to being loaded on to aircraft.

2.7.4. General Aviation

GA landside facilities support both based and itinerant aircraft operations at BGM. Components of general aviation landside facilities include FBO services, conventional and T-hangars, apron areas, and automobile parking areas.

GA is comprised of all flying with the exception of military and commercial service. GA users at BGM include individuals flying for business or personal reasons, as well as flight training activities.

FBO Services

FirstAIR Group, Inc. is the current FBO at BGM and provides the following services:

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- 100LL/Jet A Fuel
- Ground Handling
- Third Party Aircraft Maintenance
- Aircraft Parking/Tie Downs
- Heated Hangar
- Hangar Leasing/Sales
- Pilot Lounge with Shower and Sleep Room
- Ground Power unit (GPU)/Power Cart
- Flight Planning Room with WSI Weather Brief
- Lavatory Service
- On Site Customs
- Deicing (types 1 & 4)
- Conference Room
- Aerial Tours/Aerial Sightseeing

The majority of FirstAIR's hangar space is used for the storage of aircraft operates out of Hangars 1, 2 and 3, which are located on the Airport's West Apron. These hangars are leased to the FBO by the County. Hangar 2, which is located northeast of the Runway 10 threshold, is an approximately 34,000 square foot conventional truss hangar, with approximately 26,000 SF of maintenance space and approximately 8,000 SF of office space. Hangar 3, which is located adjacent to Hangar 2, has approximately 22,100 SF of space, including approximately 17,000 SF of hangar space and approximately 5,100 SF of general aviation terminal/office space. The general aviation terminal includes a pilot's lounge, kitchen, weather information room, research offices, and a conference room. This hangar also houses deicing equipment.

Airport Tenants

Goodrich Aviation occupies space in Hangar 3 and is described on the BGM website as a, "multifaceted aviation services company offering flight training and aircraft rental, aircraft sales, and aviation maintenance services."

Aero Techniques provides flight instruction, also out of Hangar 3. They have been offering flight instruction since 1981, beginning at Tri-Cities Airport and relocating to BGM in 2001.

National Weather Service has a 5,100 SF facility, which was constructed in 1993, and is located at the north end of Dawes Drive. The facility uses Doppler weather radar equipment to identify wind shears and other severe weather conditions. The Doppler equipment is located on the southern portion of Airport property, near Commercial Drive (NYS Route 112), and is equipped with an obstruction light.

The National Weather Service (NWS) is a component of the National Oceanic and Atmospheric Administration (NOAA). The NWS provides weather, hydrologic, and climate forecasts and warnings for the United States, its territories, adjacent waters and ocean areas, for the protection of life and property and the enhancement of the national economy. NWS data and

products form a national information database and infrastructure which can be used by other governmental agencies, the private sector, the public, and the global community.

Aprons

There are two aircraft parking aprons used for parking general aviation aircraft. The West Apron, which measures approximately 17,000 square yards is comprised of asphalt and is considered the itinerant apron. The Airport's FBO facilities are located on the West Apron, making this the ideal location for transient aircraft. The North Apron measures approximately 20,000 square yards and is also comprised of asphalt. This apron is used for parking based aircraft. The T-hangars which are used primarily for the storage of based aircraft are also located adjacent to the North Apron.

2.8. SUPPORT FACILITIES

2.8.1. Aviation Fueling Facilities

Broome County owns the Airport's aviation fuel facilities. First AIR has a fuel delivery agreement with the County for use of their fuel facilities. In 1996, the current fuel farm was constructed immediately north of the T-hangars. This fuel farm contains three tanks including two 25,000-gallon Jet A tanks and one 10,000-gallon tank for Avgas. This fuel farm replaced the Airport's previous fuel facility, which was located near the Airport's former maintenance building. All aircraft at BGM are fueled by trucks which carry the fuel from the aboveground storage tanks to the aircraft.

A second fuel farm (also constructed in 1996) is located on the West Apron. This fuel farm contains two 5,000-gallon tanks for diesel and unleaded gasoline, which is used for airport ground vehicles and equipment.

2.8.2. Aircraft Rescue and Fire Fighting (ARFF)

ARFF equipment/facilities and Airport operations at BGM are housed in the Crash Fire Rescue (CFR) building located on the North Apron between the rental car parking lot and Hangar 1. The CFR building was constructed in 1986 under an FAA Airport Improvement Program (AIP) grant. At that time, the building measured 5,100 square feet and contained two bays for ARFF vehicles, an alert room, two restrooms, kitchen, training room, storage areas, and a mechanical room. In 2004, the CFR building was renovated. The renovations increased the overall building size from 5,100 SF to its current 5,340 SF. The building is currently in satisfactory condition.

BGM's ARFF team consists of thirteen staff members, five airport operations specialists, seven maintenance personnel, and one supervisor. Staffing is provided 24 hours a day, seven days a week, 365 days a year; however, ARFF services are only advertised from 15 minutes before the first scheduled airline flight until 15 minutes after the last scheduled airline flight. All of the Airport operations personnel are cross-trained to become proficient in CFR techniques and procedures. The ARFF staff is equipped and trained to handle the primary response to almost any call; however, they also rely on the support of local fire departments and Broome County Emergency Services. Specifically, Maine, East Maine, and Choconut Center Volunteer Fire Departments provide mutual aid support to the Airport. Response times vary between 12 – 20

minutes depending on which of these locations the emergency response team is coming from and the availability of firefighters.

Federal Aviation Regulation (FAR) Part 139, *Certification and Operations: Land Airports Serving Certain Air Carriers*, Section 139.315, *Aircraft Rescue and Firefighting: Index Determination*, indicates that an index is required for each FAR Part 139 certificate holder. The index is based on the length of air carrier aircraft using the airport and the average number of daily departures. Index B includes aircraft that are at least 90 feet, but less than 126 feet in length. According to Section 139.315, if there are five or more daily departures or air carrier aircraft in a single Index group serving that airport, the longest Index group with an average of five or more daily departures is the Index required for the airport. If there are less than five average daily departures of air carrier aircraft in a single Index group serving the airport, the next lower Index from the longest Index group with air carrier aircraft in it is the Index required for the airport. The minimum designated Index is Index A. BGM was designated with an ARFF Index B in its most recent Airport Certification Manual based on the operations completed by the Bombardier CRJ200 regional jet, as well as other aircraft previously operated at the Airport.

According to FAR Part 139 Section 139.317, *Aircraft Rescue and Firefighting Equipment and Agents*, Index B requires either:

- One vehicle carrying at least 500 pounds of sodium-based dry chemical or halon 1211, 1,500 gallons of water, and Aqueous Film-Forming Foams (AFFF) OR
- One vehicle carrying 500 pounds of sodium-based dry chemical or halon 1211 or 450 pounds of potassium-based dry chemical and water with a commensurate quantity of AFFF to total 100 gallons AND one vehicle carrying water and AFFF so that the total quantity of foam production carried by both vehicles is at least 1,500 gallons.

In 2004 BGM received a new (2002) Oshkosh rapid response vehicle which holds 1,500 gallons of water, 200 gallons of firefighting foam concentrate and 500 pounds of dry chemical agent for an initial attack on fire emergencies. This self-contained vehicle can be operated by just one firefighter. The Airport is waiting on the delivery of a Rosenbauer Panther 4x4 ARFF response vehicle with water capacity and AFFF agent capacities to match their current index. Upon delivery, the 2002 Oshkosh TI-1,500 will remain in service as a reserve vehicle to ensure continuous ARFF index capability.

A complete list of equipment owned by the Airport can be found under the subheading Airfield Maintenance of this chapter.

Deicing

At BGM, the airlines are responsible for deicing their respective aircraft. The FBO provides deicing for other than airline aircraft. The deicing area is located on the North Apron between the T-hangars, Hangar 1, and Runway 16-34. In 1994, a containment area (glycol recovery system) was installed on the North Apron to ensure compliance with State Pollutant Discharge Elimination System (SPDES) permit requirements. In addition, deicing operations are also conducted on the West Apron, which contains a glycol containment area. The deicing area on the North Apron has electrically controlled valves and the deicing area on the West Apron has

manual valves. The deicing area on the West Apron primarily serves as a reliever for the primary deicing area on the North Apron. In 2017, the County connected the containment area adjacent to the North Apron with the recently installed sanitary sewer line serving BGM. This connection will eliminate the requirement for the County to store and truck the spent fluid to a local sewage treatment plant for disposal.

2.8.3. Airfield Maintenance

There are two structures for the storage and maintenance of airfield equipment. The, "old maintenance" building as it is referred to is located between Hangar 3 and the passenger terminal. It is in very poor condition. Construction of the Airport's existing airfield maintenance/snow removal equipment (SRE) storage building, or the, "new maintenance" building as it is known, was completed in 2002. This building measures approximately 25,000 SF and is located at the northernmost corner of the North Apron adjacent to the fuel farm and is in fair condition. The building provides room for vehicle storage as well as a modern maintenance/service area for the Airport's snow removal v[illegible]es, [illegible]erials and [illegible]i[illegible]t. Conversations with airport management indicate it is undersi[illegible]ed [illegible]r [illegible]h[illegible]curr[illegible]n Ai[illegible]rt fle[illegible]t of vehicles and equipment.

The Airport owns multiple pieces of snow removal equipment, including sanders, sweepers, blowers, and plows. A complete list of equipment owned by the Airport can be found in **Table 2-9**. Dawes Drive was extended past the National Weather Service building to the entrance of the SRE building to provide landside access to the facility.

Table 2-9: Full List of Equipment

Vehicle Number	Year	Make/Model	Description	Condition
2	1997	John Deere 544G	Wheel Loader	Good
4	2007	Chevrolet	3/4 Ton Truck with Plow	Fair
5	2002	Chevrolet	Truck with Plow	Poor
6	1998	Oshkosh	Dump, Rollover Plow, Wings & Sander	Fair
7	2005	Chevrolet	Passenger Van	Fair/ good
8	2008	Ford F-250	Truck	Fair
9	1997	Oshkosh	Dump Body Truck, Rollover Plow & 2 Wings	Fair
11	2003	International	Broom Truck	Fair/ poor
12	1998	International	Broom Truck (Parts)	Unusable
13			1998 International Broom Truck (Parts)	Unusable
14	2005	Oshkosh	Plow Truck with Sander	Good
15	1998	Stewart & Stevenson	Rotary Plow Truck	Fair
17	2009	Oshkosh	Plow Truck with Sweeper	Good
18	1997	Stewart & Stevenson	Rotary Plow Truck	Fair
19	2013	MB	Rotary Sweeper	Good
62	2011	Ford Expedition	Operations Vehicle	Fair

Vehicle Number	Year	Make/Model	Description	Condition
Tractor 1	2007	John Deere	Tractor with Plow	Fair/ Poor
Tractor 2	2007	John Deere	Tractor with Blower	Fair/ Poor
Skid Steer	1998	Bobcat	Skid Steer with Bucket/Sweeper	Fair
T2	2010	John Deere 6330	Tractor with Deice Trailer	Good
E 3	2002	Oshkosh TI-1500	ARFF Response Vehicle	Fair
E 1	1992	Oshkosh TA-1500	ARFF Response Vehicle	Fair/ Poor
County Car	2003	Chevy	Airport Administrative Transportation	Poor
	1990	Jacobsen	Mower	Poor
	1995	Case 821	Tractor	Fair
	2007	Case	Front Loader with Plow	Good
			Airless Paint Striper	Fair
			Airless Paint Striper	Poor
	1997	Tennant	Sweeper	Poor
	1997	Lift-a-Loft	Passenger B[illegible]	Po[illegible]r
			Batwing Mowe[illegible]	Fair/ [illegible]ood
		Wausau Everest TAD-1100	Runway Deice Trailer	Good

Source: Greater Binghamton Airport, 2018.

Additionally, there is a sand dome located north of the maintenance facility of approximately 2,000 SF. The sand dome is used to store FAA grade sand which can be used to increase runway friction during winter icing conditions.

Airport Utilities

The Airport's utilities infrastructure including electric, fuel oil, water/sewer, and telephone/cable/internet, were reviewed as part of this Master Plan Update. A comprehensive utility study is included as **Appendix A**.

2.9. AIRSPACE

Airspace in the United States is classified as controlled, uncontrolled, or special use. Examples of

the different types of airspace can be seen in **Figure 2-15**. Controlled airspace covers the five different classes of airspace: Class A, B, C, D, and E and defines which air traffic control (ATC) service is provided to IFR (instrument flight Rules) and VFR (Visual Flight Rules) flights. Class G is uncontrolled airspace where ATC has no authority or responsibility to control aircraft. Typically, special use areas are located around military training facilities. To view the airspace surrounding the Greater Binghamton Airport, refer to **Figure 2-16**.

2.9.1. Controlled Airspace Classes

- **Class A:** Covers all US airspace above 18,000 feet MSL where high altitude airways and jet routes occur. While flying in Class A airspace, aircraft must operate under IFR.

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Figure 2-15: Airspace Classifications



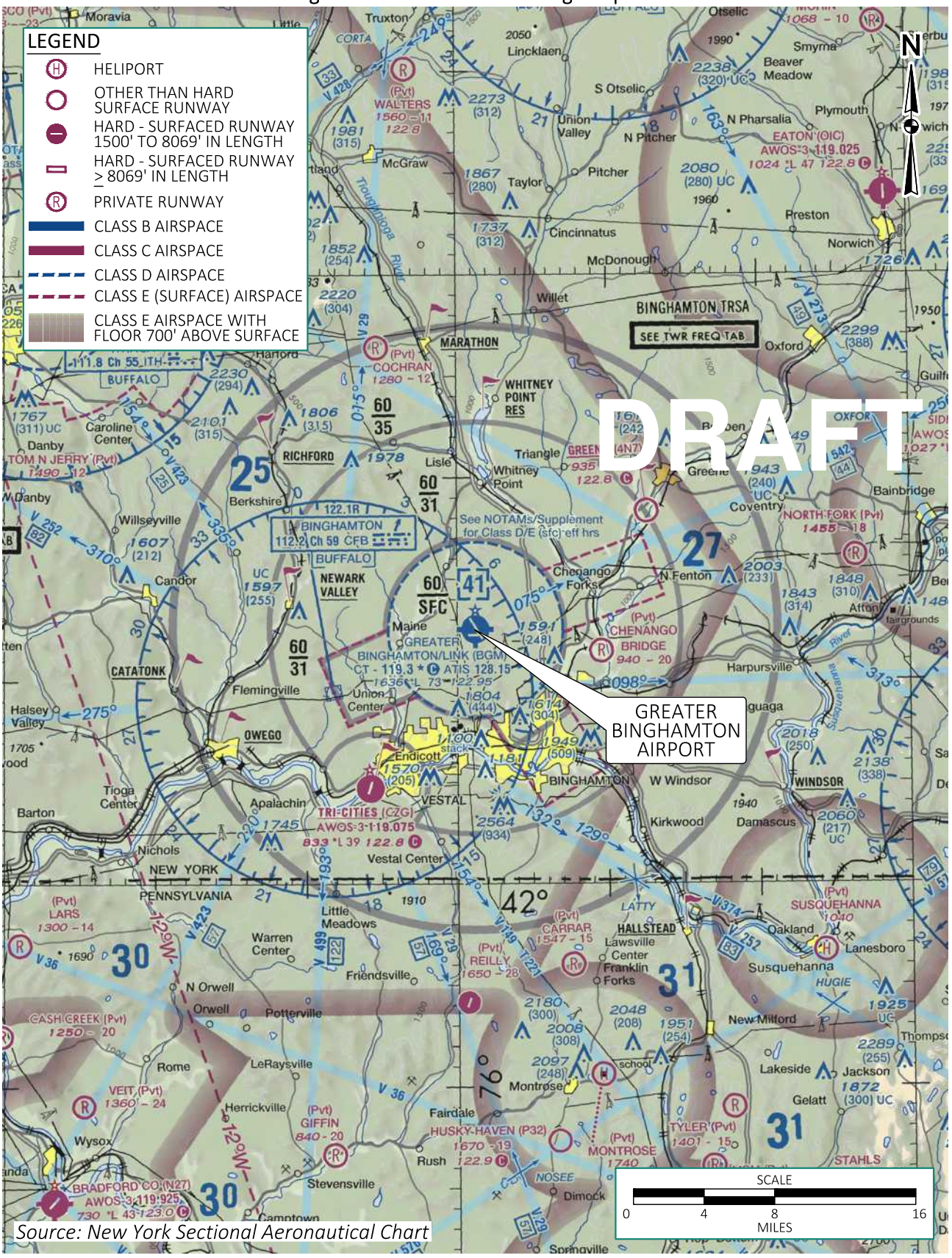
Source: FAA Pilot's Handbook of Aeronautical Knowledge.

- **Class B:** Requires ATC clearance before operating an aircraft within this airspace. All aircraft are subject to IFR or Controlled Visual Flight Rule (CVFR). Class B airspace surrounds the nation's busiest airports and has the appearance of an upside down multi-tier cake that funnels aircraft traffic toward the airport. Generally, Class B airspace is within a 20-nautical mile radius and 10,000 feet MSL from the surface. Boston Logan International (BOS), John F. Kennedy International (JFK), and LaGuardia (LGA) are the closest airports to BGM with Class B airspace surrounding them.
- **Class C:** Similar to Class B, this airspace requires ATC clearance before operating an aircraft within this airspace. All aircraft are subject to IFR or CVFR. Class C airspace starts at 4,000 feet MSL and has two tiers, the top cylinder has a radius of 10 nautical miles and the bottom cylinder has a radius of five nautical miles. The Greater Rochester International Airport (ROC), Syracuse Hancock International (SYR), and Albany International (ALB) are nearby commercial airports surrounded by Class C airspace.
- **Class D:** Extends upward to an altitude of 2,500 feet MSL and is within a five-statute mile radius. Aircraft must maintain two-way radio communication with the control facility while operating in this airspace. The Greater Binghamton Airport is surrounded by Class D airspace while the ATCT is in operation which is currently from 6:00 AM until 12:00 AM daily. During the hours the ATCT is closed, the surrounding airspace converts to Class E.
- **Class E:** Covers all the controlled airspace that is not classified as A, B, C, or D. The airspace is also used as a transitional airspace to and from the terminal and begins at the surface, or at 700 feet or 1,200 feet above ground level (AGL) (or 14,500 feet MSL in remote areas). This class has no special restrictions on pilot qualifications or aircraft equipment rules. Nevertheless, it is still controlled airspace and ATC services can still be provided. The general and enroute airspace that begins at the surface when the ATCT is not in operation at the Greater Binghamton Airport is Class E airspace.

2.9.2. Uncontrolled Airspace Class

Class G: Covers all uncontrolled airspace. VFR minimums apply in this airspace. This includes all low-level airspace below 700 feet or 1,200 feet AGL and it extends up to 14,500 feet MSL in remote areas without airport traffic. When the ATCT is not in operation, Class G airspace is located adjacent to the Airport outside of the five-mile

Figure 2-16: BGM Surrounding Airspace



Source: New York Sectional Aeronautical Chart

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radius and outside of the three extensions that accommodate the Airport's instrument approaches.

2.9.3. Special Use Airspace

- **Special Use Airspace:** Consists of prohibited, restricted, warning, alert, controlled firing, and military operation areas (MOA). Pilots are cautioned to be extra vigilant when transitioning through MOA's; however, restricted airspace is off limits when in use by a controlling agency such as the U.S. military. There are several MOA's adjacent to BGM, including parachute drop zones. The closest restricted airspace is located above Lake Ontario.

2.9.4. 14 CFR Part 77 Surfaces

The intent of 14 CFR Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace,* is to establish standards and notification requirements for objects that could potentially affect flight operations at an airport. It does so through the implementation of a number of surfaces above and around that particular airport, commonly referred to as imaginary surfaces.

If an object or a proposed object or structure penetrates an imaginary surface, an aeronautical study typically must be performed to determine the potential hazard the proposed construction or alteration might have on air navigation. In conducting this study, the FAA can identify mitigating measures to enhance and preserve safe air navigation.

For reference, the Airport's CFR Part 77 surfaces are shown in **Figure 2-17** and can be seen in greater detail in the Airport Layout Plan (ALP) which will be updated as a part of this Master Plan Update.

2.10. AIR TRAFFIC CONTROL

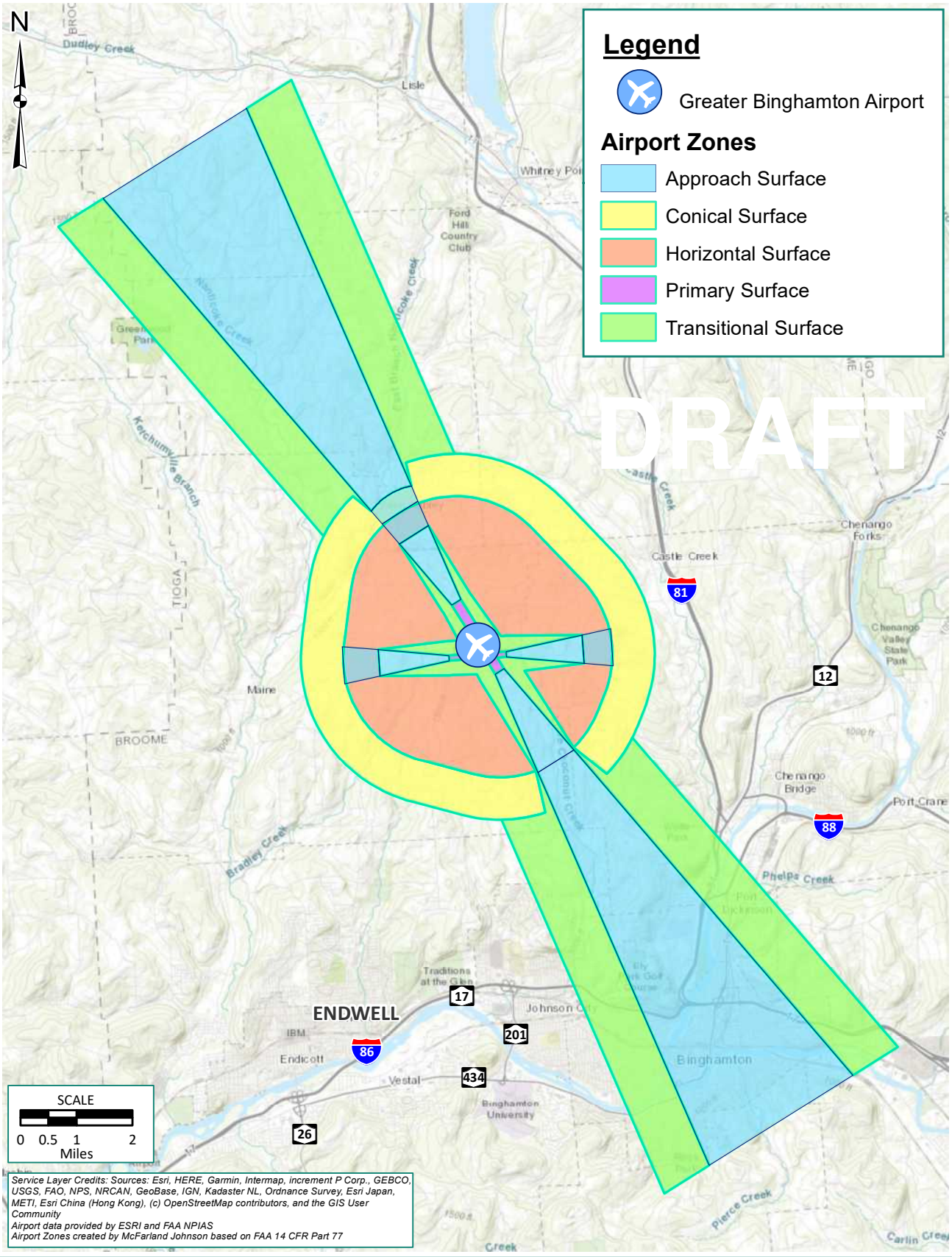
While the ATCT is in operation, aircraft operating within BGM's Class D airspace are provided radar services below 4,100 feet MSL. Prior to operating in BGM's airspace, pilots must establish two-way radio communication with the ATCT and be cleared by the ATCT to enter the Class D airspace. The ATCT at BGM is operated by the FAA and is open each day for 18 hours beginning at 6:00 AM. The facility is split between a local ATCT, responsible for operations into and out of the Airport, and a Terminal Radar Approach Control (TRACON) which guides aircraft within a 30 to 50-mile radius of the Airport, up to 10,000 feet MSL.

2.1. LAND USE AND ZONING

2.1.1. Land Use

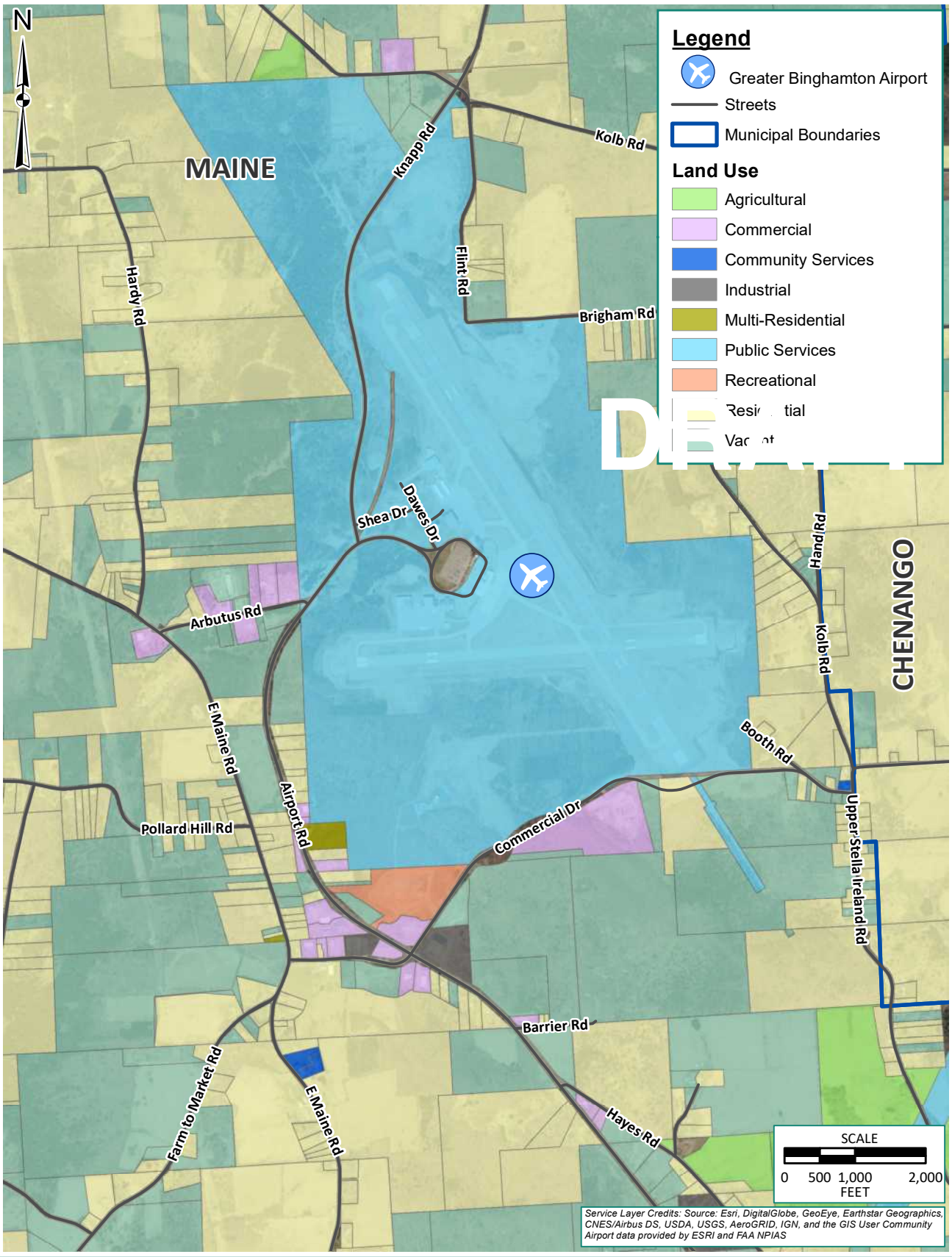
BGM is located in the town of Maine, in Broome County, New York and the area surrounding BGM is generally rural residential and agricultural. Most of the Airport property is designed as within the Public Services zone, which include water, communication, transportation and electric/gas services. According to the *Town of Maine 2017 Comprehensive Plan Update*, Transportation uses account for 80% of the public service land. Land use surrounding BGM can be seen in **Figure 2-18.**

Figure 2-17: Airport Part 77 Map



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Figure 2-18: Land Use Map



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2.1.2. Zoning

The Airport property is currently zoned as Industrial (ID) as can be seen in **Figure 2-19**.

In addition to the zoning ordinances at and around the Airport, Broome County has also implemented a zoning overlay that can be seen in **Figure 2-20**. According to the Town of Maine, NY Codes, *Part II: General Legislation*, *Chapter 450: Zoning*, the ID industrial district in Maine "is

to provide for specific areas in the Town of Maine where those industrial uses needed and beneficial to a community may locate within an environment intended and designed for their use. In promoting the general purpose of this chapter, the specific intent of this section is:

(1) To encourage the development of areas within the Town of Maine where the industry beneficial to and needed in the community may develop.

(2) To permit and encourage industrial uses to develop in a manner compatible with surrounding areas and compatible with the general quality of environment found in the Town of Maine.

(3) To ensure an environment for development which will be free from hazards to and preserve the character of industrial operations insomuch as such industrial operations do not endanger the public health, safety, welfare, or visual environment of the Town of Maine."

The other zoning classifications bordering BGM are defined by the Town of Maine Zoning Ordinance as follows:

R-R, Rural Residential: The Rural Residential District has been established, "to provide for areas in the Town of Maine where low density residential development, agricultural land uses, and general open space land uses can be established in harmony with one another."

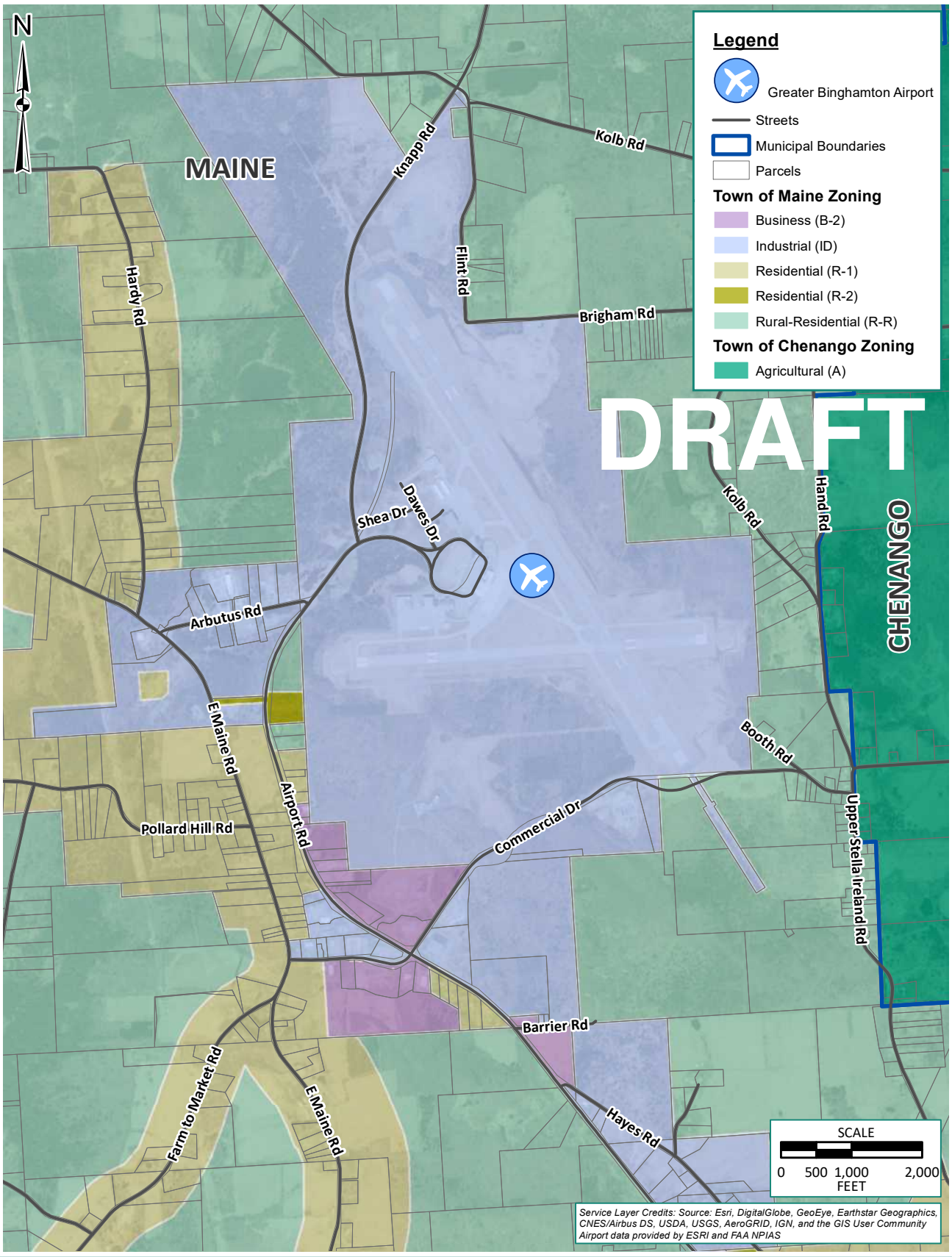
R-1, Residential: The R-1 Residential District has been established, "to provide for areas within the Town of Maine where the living environment associated with single-family and two-family residential development and their related facilities can be preserved and/or where the development of such an environment is encouraged."

R-2, Residential: The R-2 Residential District is intended primarily, "to provide for areas within the Town of Maine where one-, two-, three- and four-family dwelling units with their related facilities can be developed in harmony with one another."

B-1, Business: The B-1 Business District is intended to, "provide for areas in the Town of Maine where business and commercial land uses can be developed to a level sufficient to serve the needs of the Town."

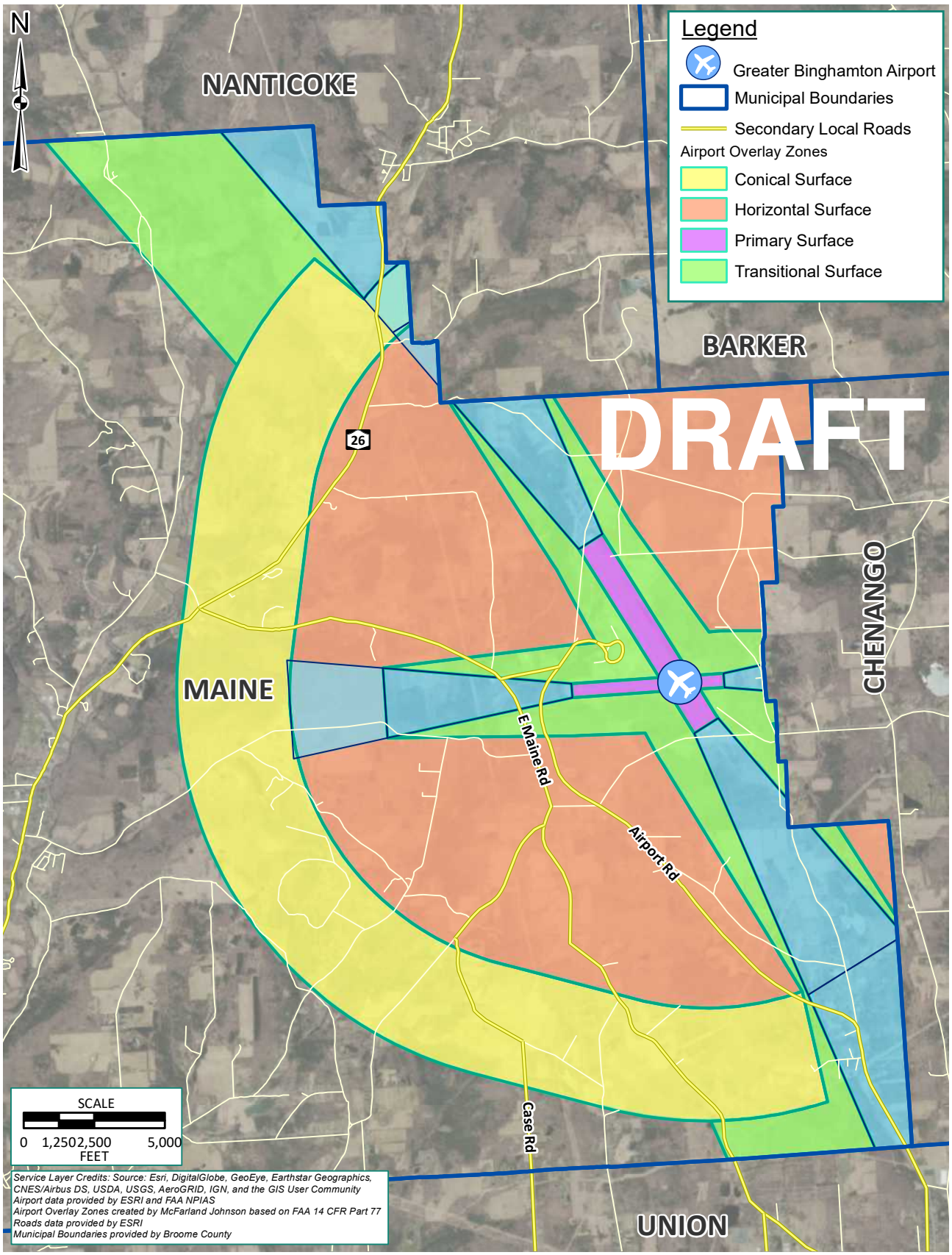
The Town of Maine has codified language (§450-25 Airport Zones – AZ) which implements a zoning overlay to restrict building, structures, and trees within various zones adjacent to the Airport. The requirements for development in this area are designed to protect the imaginary surfaces outlined in 14 CFR Part 77, as discussed above. There are also use restrictions imposed so as to preclude any electrical or radio interference with Airport operations.

Figure 2-19: BGM Zoning Map



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Figure 2-20: Airport Overlay Zones Map



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3. Aviation Forecasts

3.1. INTRODUCTION

The purpose of aviation forecasting is to outline future growth of significant areas of activity over a 20-year period at the Greater Binghamton Airport (BGM or the Airport). The Federal Aviation Administration (FAA) requires that all airport planning efforts be based upon an approved forecast methodology as the resulting analysis assists in determining the facility requirements for meeting future demand.

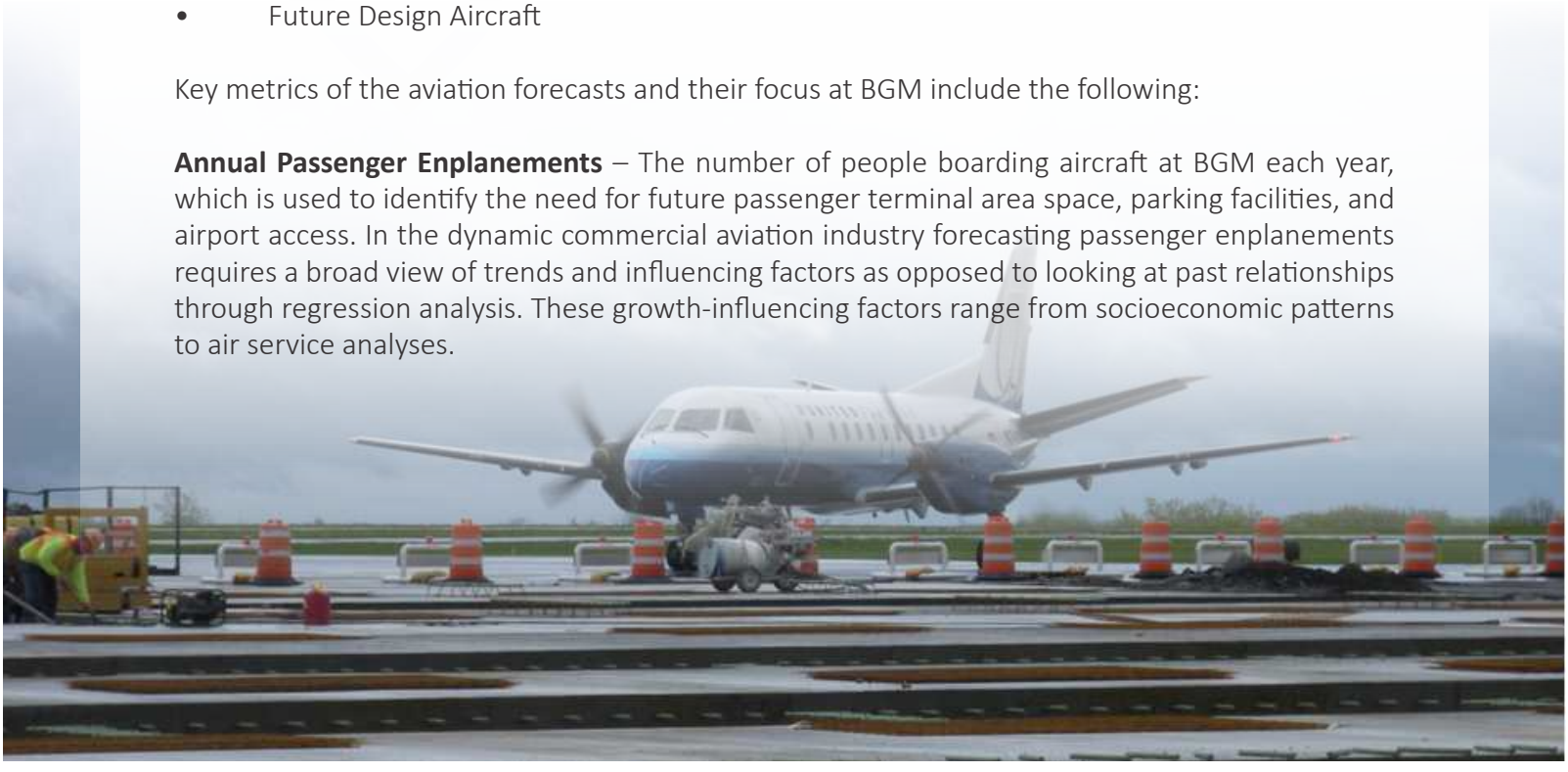
This forecast was prepared prior to the impacts of COVID-19. The forecast approval is based in reference to the data and methodologies used and the conclusions at the time the document was prepared. However, consideration must still be given to the significant impacts of COVID-19 on aviation activity; as a result, there is lower than normal confidence in future growth projections. FAA approval of the forecast does not provide justification to begin airport development. Justification for future projects will be made based on activity levels at the time the project is requested for development, rather than this forecast approval. Further documentation of actual activity levels reaching the planning activity levels will be needed prior to FAA participation in funding for eligible projects.

The key elements of this chapter include:

- Forecast Influencing Factors
- Socioeconomic Trends
- Passenger Enplanements
- Aircraft Operations
- Based Aircraft
- Forecast Summary
- Future Design Aircraft

Key metrics of the aviation forecasts and their focus at BGM include the following:

Annual Passenger Enplanements – The number of people boarding aircraft at BGM each year, which is used to identify the need for future passenger terminal area space, parking facilities, and airport access. In the dynamic commercial aviation industry forecasting passenger enplanements requires a broad view of trends and influencing factors as opposed to looking at past relationships through regression analysis. These growth-influencing factors range from socioeconomic patterns to air service analyses.



Aircraft Operations – The number of takeoffs and landings at BGM each year, which is used to determine the necessary capacity of the airfield and aircraft operating area. A takeoff and landing are each counted individually as one operation.

Based Aircraft by Type – The number and type of general aviation (GA) aircraft maintained at the airport on a permanent basis, which is used to identify the space requirements of future facilities.

General Aviation Operations – The estimated number of GA takeoffs and landings at BGM, which is used to determine the necessary capacity of the airfield and GA support facilities.

The forecast efforts will carefully consider the uses and applications for which the forecast demand will be applied. An emphasis has been placed on activity indicators that drive facility planning such as peak hour enplanements, air cargo, and GA demand.

3.2. FORECAST INFLUENCING FACTORS

The forecast analysis for the BGM master plan reflects a snapshot in time based on historical trends and industry data from the year 2017. Influencing factors presented in this section identify considerations and areas of uncertainty that provide additional color for the BGM forecast. Changing variables and guaranteed uncertainty are underlying reasons for the dynamic master plan approach which includes the scenario-based forecasts and Dynamic Analysis Tool that combine to enhance the utility of the forecast as the industry evolves.

3.2.1. Service Area

As defined in Chapter 2 – *Inventory*, BGM's potential commercial service area encompasses all areas within a 60-minute drive of BGM. The true service area is defined as the area for which BGM is the closest commercial airport up to 60 minutes, meaning the commercial service area ranges from as little as 25 minutes as you approach Elmira and Ithaca and 60 minutes for locations east, after which, New York Metro area airports or Albany, become more likely options. The Airport is the only commercial service airport within a 60-minute drive and within a 90-minute drive there are four commercial service airports: Wilkes-Barre/Scranton (AVP), Ithaca Tompkins Regional (ITH), Elmira/Corning Regional (ELM), and Syracuse (SYR) Airports. A detailed analysis of the other commercial service airports in the region is included in the passenger enplanements section of this chapter

The GA service area is generally defined as within a 30-minute drive from/to BGM. There are three public-owned GA airports within this area). The three GA airports and their proximity to BGM are Tri-Cities Airport (Endicott, NY) – 9 nautical miles (NM) Southwest, Cortland County Airport – Chase Field – 25 NM North and Sidney Municipal Airport - 26 NM East.

Each of these airports have an instrument approach, fuel, and basic aircraft servicing, however each of these facilities are limited in their abilities to accommodate jet and larger turbo-prop aircraft.

For both commercial and GA, changes in facilities or activity at other airports in the service area have the potential to affect demand and activity levels at BGM both positively and negatively.

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Considerations for the local economy are based on existing conditions and past performance. Analysis and speculation regarding possible future economic performance is not part of this master plan. However, any significant future changes in the local economic performance, for better or for worse, would warrant a cursory review of the forecast inputs and assumptions.

3.2.2. Aviation Industry

The airline industry is evolving rapidly to maintain sustained profitability as the economy continues to improve. There have been a number of airline mergers reducing overall system capacity and affecting individual market competition. These mergers have created more efficient airlines with increased load factors and profits, primarily resulting from reduced competition and unbundled products driving new ancillary revenues for things such as checked baggage and seat assignments.

The decreases in fuel price across the country have also facilitated record profits for most US airlines in 2015. As of August 2017, this trend has plateaued, and airlines may be susceptible to the pressure of rising fuel costs once again. Recovery of the economy has led to steady increases in leisure and business travel while the airlines have continued to show growth in seating capacity. The net result between the economy, airline mergers, and the growth in ancillary services and fees is fewer flight options nationwide, moderately higher ticket costs for the passengers, and stronger airline profits. The bulk of the traffic growth has been occurring at large-hub airports where competition is at its greatest.

Some specific aviation industry influencers include:

Pilot Supply – In recent years, the industry has begun to see impacts associated with a reduced number of pilots entering the aviation industry. Reduced pay, with the onset of regional jet flying in the 2000's, and regulatory changes requiring 1,500 hours for first officers have added to an already increasingly expensive training process. These are compounding factors that will likely increase the severity of this issue in the coming years. Some industry groups also predict a similar shortage in qualified aircraft mechanics as well. Limited pilot supply is a contributing factor to the recent aircraft up-gauging trend.

NextGen – For the past 10 years, the FAA has been incrementally implementing new technology with the broader goal of modernizing the nation's air traffic control system. Some of the key objectives involve improving the safety and efficiency of airspace in and around high-volume airport regions such as Atlanta, New York, and Washington. These improvements may not have a noticeable impact on BGM's operational efficiency; however, it may reduce delays to hub airports and provide the opportunity for additional schedule frequencies resulting in an improved passenger experience.

Fuel Prices – Over the past 10 years the aviation industry has demonstrated its sensitivity to fuel prices and their impact on operational cost and ultimately aviation demand. On average, fuel represents approximately one-third of the cost of commercial aviation activity. Thus, during spikes in fuel prices like in 2008, the impacts to both supply and demand are tremendous. Advancements in fuel technology will help reduce industry sensitivity to fuel although it will likely continue to be a key influencer for activity for some time.

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Aircraft Technology – Over the past 20 years there have been significant advances and innovations to aviation and aircraft technology. With global positioning system (GPS) technology, unmanned aerial systems (UAS) and single pilot operations for complex aircraft systems, the next 20 years will likely yield numerous additional advances in technology that could impact various airline business models. Monitoring and maintaining an awareness of technology enhancements and potential applications for BGM will help ensure the Airport is always well-positioned to respond to a changing industry.

3.3. SOCIOECONOMIC TRENDS

This section presents social and economic factors to better understand how each, either separately or in combination with other factors, relates to and influences aviation activity. Key indicators such as population, employment, and personal income per capita were analyzed for areas in the effort to explore for potential correlations to aviation demand.

3.3.1. Population

Population is often a strong indicator of the potential for activity and growth in an airport a the size of the potential user base is one of the key indicators for aviation demand. Population in the Southern Tier of New York has been slowly declining for years, while not at the same pace as enplanements, the two have shared a consistent decline. The population trends for both the Binghamton's metropolitan statistical area (MSA), compared to both Ithaca's and Elmira's MSA are shown in Table 3-1. Binghamton had the highest percentage decline in population, while Ithaca has sustained increases over the past 25 years.

Table 3-1: Metropolitan Statistical Areas - Population Trends

Year	Binghamton	Elmira	Ithaca
1990	264,497	194,283	94,097
1991	263,277	193,835	94,336
1992	262,057	193,386	94,575
1993	260,837	192,938	94,814
1994	259,617	192,490	95,053
1995	258,398	192,042	95,292
1996	257,178	191,593	95,531
1997	255,958	191,145	95,770
1998	254,738	190,697	96,009
1999	253,518	190,248	96,248
2000	252,298	189,800	96,487
2001	252,242	189,603	96,998
2002	252,186	189,407	97,508
2003	252,130	189,210	98,019
2004	252,074	189,014	98,530
2005	252,018	188,817	99,041
2006	251,961	188,620	99,551
2007	251,905	188,424	100,062

2008	251,849	188,227	100,573
2009	251,793	188,031	101,083
2010	251,737	187,834	101,594
2011	250,463	187,072	102,140
2012	249,189	186,310	102,686
2013	247,916	185,548	103,233
2014	246,642	184,786	103,779
2015	245,368	184,024	104,325
2016	244,094	183,262	104,871
1990-2016	-0.31%	-0.22%	0.42%
1990-2001	-0.43%	-0.22%	0.28%
2002-2016	-0.23%	-0.24%	0.52%

Source: New York State Department of Labor, 2017.

3.3.2. Employment/Labor Force

With no single metric to measure the specific economy of the region, several indicators are used to help provide insight into economic performance. Two key areas are unemployment and the size of the labor force. Reviewing unemployment is better for shorter term periods, while the size of the labor force is more telling when reviewing longer periods of time. Table 3-2 displays the size of the labor force for the Binghamton MSA as well as both Ithaca and Elmira. Similar to population, Binghamton has the greatest decline in labor force size of compared to neighboring peers, with Ithaca yielding the strongest labor force growth/stability comparted to Binghamton and Elmira.

Table 3-2: Metropolitan Statistical Areas – Labor Force Size (in thousands)

Year	Binghamton	Elmira	Ithaca
1990	131.6	90.6	49.0
1991	131.5	91.4	48.5
1992	131.1	92.1	48.3
1993	129.8	91.4	48.7
1994	128.4	91.8	48.9
1995	124.3	91.0	49.1
1996	122.6	92.5	49.6
1997	126.4	94.4	50.3
1998	126.1	94.1	50.5
1999	125.8	93.3	52.1
2000	124.1	90.4	50.5
2001	124.6	90.7	51.2
2002	125.5	89.4	52.6
2003	123	86.1	53.3
2004	122.4	84.6	54.0
2005	122.6	85.2	54.6
2006	123.5	85.5	55.4

2007	123.0	85.7	55.4
2008	124.5	87.4	56.2
2009	123.7	87	56.7
2010	124.4	88.9	54.8
2011	120.5	86.9	54.2
2012	119.5	86.4	55.1
2013	116.6	85	55.8
2014	112.3	87.7	55.0
2015	110.5	81.4	50.6
2016	109.1	79.6	50.4
1990-2016	-0.72%	-0.50%	0.11%
1990-2001	-0.50%	0.01%	0.40%
2002-2016	-1.00%	-0.83%	-0.30%

Source: New York State Department of Labor, 2017.

3.3.3. Per Capita Personal Income

Per capita personal income (PCPI) has also been found to be a good indicator of potential growth at an airport, as increases in income can yield a greater ability and desire to travel among the population within the area. The resulting PCPI growth for the same time intervals reveals similar socioeconomic trends for Binghamton, Ithaca, and Elmira with no discernable differences in the trends for each.

3.3.4. Socioeconomic Summary

The trends analyzed reveal consistently weaker socioeconomic trends for the Binghamton area relative to both Ithaca and Elmira, lending credence to sustained decline in activity, especially passenger enplanements over the past 25 years. While the data supports a general decline, no indicators support changes substantially different from peers, nor anything of significance in the past few years, that would lend itself to the sharp decline in scheduled passenger seats at BGM. Additional influencing factors are discussed in the passenger enplanements section that follows.

3.4. PASSENGER ENPLANEMENTS

Passenger enplanements are a key measure in the forecasting efforts for commercial service airports. The enplanements forecast focuses on the total annual enplanements as well as the peak hour characteristics of busier traffic periods. The results of these forecasts are particularly useful in the assessment of the passenger terminal building and associated facilities such as auto parking lots, helping to ensure that they are adequately sized for future demand.

3.4.1. Historical Activity

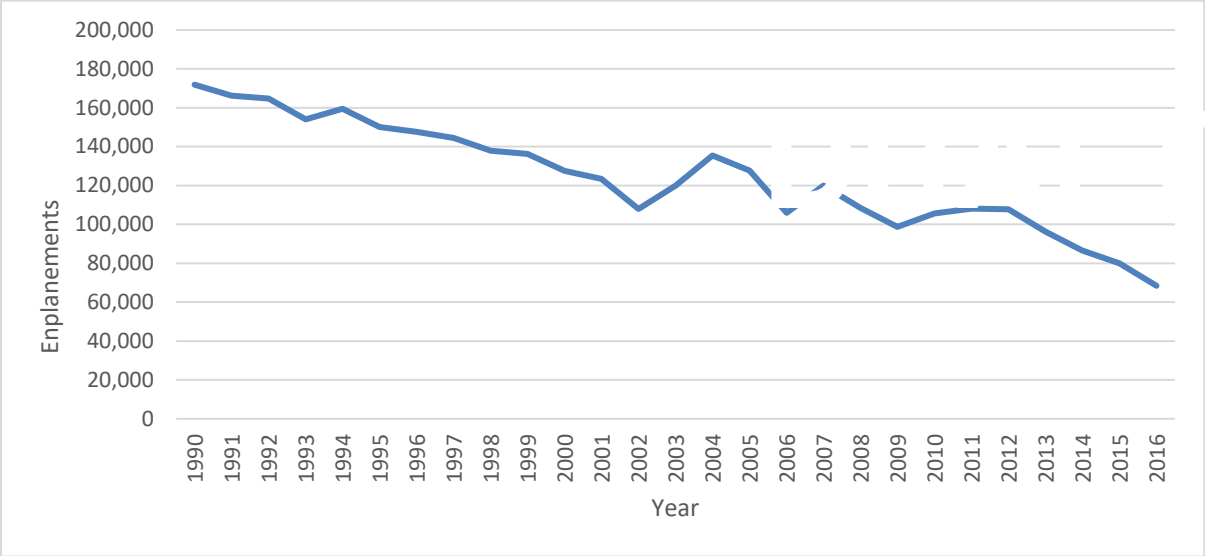
The historical data for passenger enplanements presented in **Figure 3-1** depicts a gradual decline over the past 20 years. The decline in passenger enplanements is likely attributed to the erosion of the local labor force, the relocation of notable local employers and mergers, and acquisitions in the airline industry that has resulted in fewer choices for passengers. In 2017, the Greater

Binghamton Airport reported passenger enplanements totaling 33,666, which is utilized as the base year in the development of forecasts of future passenger enplanements.

3.4.2. Passenger Service Area Dynamics

The socioeconomic indicators previously mentioned lend credence to the prolonged decline in passenger enplanements. However, the local socioeconomic conditions are not dissimilar to those from the Elmira/Corning area or Ithaca. Ithaca's socioeconomic indicators appeared to be the best of the three even though it is the smallest market population wise. Based on these observations, historical service options and low fare choices at other airports in the service area were reviewed for insights into the decline in service at BGM.

Figure 3-1: Historical Passenger Enplanements



Source: BGM Airport Records, 2017.

Service Area Options

A drive time analysis reveals that excluding ITH and ELM, there are nine airports with low fare air service options within a three-hour drive to BGM, this is compared to six for ITH and five for ELM. Table 3-3 compares the drive time options for the three Southern-Tier airports to other airports with low fare options, up to a three-hour drive.

Table 3-3: Airports with Low Fare Air Services

Airport	ELM	SYR	ROC	ALB	SWF	ABE	EWR	PHL	BUF	IAG	Airports <3 hours
BGM	68 mins	80 mins	153 mins	129 mins	132 mins	135 mins	165 mins	170 mins	180 mins	*+3hr*	9
ITH	54 mins	79 mins	109 mins	*176 mins*	*+3hr*	*+3hr*	*+3hr*	*+3hr*	150 mins	178 mins	6
ELM	N/A	120 mins	100 mins	*+3hr*	*+3hr*	*+3hr*	*+3hr*	*+3hr*	140 mins	164 mins	5

Source: Google Maps, 2018.

The availability of low fares at these airports did not happen all at once, but rather over time. The incremental additions of low fares starting in the late 1990's and early 2000's has resulted in incremental pressure on the local BGM market in the form of increased low fare options at other airports. In this analysis, low fare airlines are those who's business model is based on value and low fares to their national customer base; they include Southwest, JetBlue, Spirit, Frontier and Allegiant. Table 3-4 displays the chronological timing of the introduction of low fare options at airports within three hours of BGM.

Table 3-4: Introduction of Low Fare Options to Airports

Year	Airports with Low Fare Airlines
1990	None
1995	None
2000	BUF, ROC
2005	BUF, ROC, SYR, ALB, EWR, PHL, ABE
2010	BUF, ROC, SYR, ALB, EWR, PHL, ABE, SWF, ELM
2015	BUF, ROC, SYR, ALB, EWR, PHL, ABE, SWF, ELM

Source: McFarland Johnson, 2018.

The combination of the prolonged weakness on socioeconomic conditions, particularly the declining population and labor force, along with increased low fare options at twice as many airport choices than other Southern Tier airports, in the face of significantly reduced service creates a challenging environment for the BGM market.

Factors such as the proximity and low fare offerings from others is beyond the control of BGM and represents a new reality for local passenger market. The sharp recent cuts (suspension of service by two of the three airlines serving BGM) from the previous 18 months (since November 2016) are excessive considering the service area choices and socioeconomic conditions over the previous five-year period are not indicative of anything that would result in a 75 percent reduction in capacity. While this correlation supports a near-term rebound, even in a smaller form, the baseline forecast will consider the existing conditions as the minimum core market. Future enplanement levels will likely be the result of air service-based network planning decisions by the airlines. Forecast methodology for enplanements will be based on air-service and consider existing trends of similar airports.

3.4.3. Forecasting Factors

Several industry trends were prominent in the review of air service changes since the last master plan:

Airline and Hub Consolidation – In the mid 2000's, BGM was served by several of the major legacy carriers of the time including Delta, Northwest, United, and US Airways, each of which have since been involved in mergers and acquisitions that reshaped their route networks. For BGM, major hubs like Pittsburgh, which closed as a hub for US Airways in 2005, supported mainline service for many years from BGM. Other former hubs, such as Cincinnati for Delta, have had resources shifted to Detroit as result of the merger with Northwest. United, whose eastern US hub has traditionally been Washington Dulles, inherited Newark as a result of their merger with Continental, reshaping their network in the Northeast.

Low Cost Airline Growth – Low cost and less than daily service has been introduced at dozens of small-hub and non-hub airports throughout the US. As previously displayed, the number of airports with low fare service had increased steadily over time. Low cost and especially ultra-low-cost carriers (ULCC) have commenced service at small and non-hub airports in a less than daily capacity. The most relevant example to BGM is the Allegiant service at ELM which has grown from twice weekly seasonal flights to Orlando over the past 10 years to as many as eight weekly flights serving both Orlando and St. Petersburgh/Clearwater. Allegiant also served AVP for several years up until January 2018.

Aircraft Up-Gauging – Industry wide, and especially at small and medium sized airports, regional jets, and turboprops with 50 seats or less are being consolidated into larger regional aircraft. In most cases, these larger aircraft come at the expense of frequency. This trend has included as a highlight in the FAA's Aerospace Forecast for 2017-2037, which notes "US carrier system capacity measure in available seat miles is forecast to grow in line with the increases in demand. The number of seats per aircraft is getting bigger, especially in the regional jet market, where we expect the number of 50 seat regional jets to fall to just a handful by 2023, replaced by 70-90 seat aircraft." The reports continue on to state "The regional carrier fleet is forecast to decline from 2,156 aircraft in 2016 to 2,027 in 2037 as the fleet shrinks by 1 percent between 2016 and 2025. Carriers remove 50 seat regional jets and retire small older turboprop and piston aircraft, while adding 70-90 seat jets, especially the E-2 family after 2020. By 2025 only a handful of 50 seat regional jets remain in the fleet." The current air service provider, SkyWest (operating as Delta Connection), confirmed this in a letter dated January 9, 2019 and attached within Appendix B.

The upgauging of aircraft has been readily apparent at other airports within a 90-minute drive of BGM. According to the FAA's Traffic Flow Management System Counts for 2018, nearly 2,400 of the 10,100 (approximately 24%) regional jet operations were completed by aircraft with greater than 50 seats at Wilkes-Barre/Scranton International Airport. Additionally, over 5,500 regional jet operations, out of a total of approximately 6,500 (approximately 85%), at Elmira Corning Regional Airport were completed by regional jets with greater than 50 seats. Lastly, at Syracuse Hancock International Airport, with nearly 25,000 annual regional jet operations, over 18,000 (approximately 72%) of those operations were completed by regional jets with greater than 50 seats. When comparing these figures for 2013, the percentage of regional jet operations by aircraft with greater than 50 seats was much less at all of the airports. At Wilkes-Barre/Scranton, aircraft with greater than 50 seats completed over 46% of the regional jet operations, while this figure was 72% at Elmira/Corning and 44% at Syracuse. As a result, the proportion of regional jet flights operated at these nearby airports by aircraft with greater than 50 seats have increased over the past five years and is anticipated to continue increasing based on the national trends identified.

3.4.4. Forecast Methodologies

Several methodologies were explored to create additional forecasts for consideration using FAA guidance, air service dynamics, and historical growth rates.

FAA Aerospace Forecast (2017-2037) – This forecast methodology applies the 1.6 percent average annual growth rate for domestic passenger traffic for US regional carriers scheduled service. While

this is a national forecast with no connection to the BGM market, the long-term patterns are useful for comparison purposes.

High Air Service Growth – As previously mentioned, the existing service levels are considered to be the baseline despite evidence that the recent sharp cuts were not supported by changes in the socioeconomic or catchment area profiles. The high growth scenario introduces the industry trend of up-gauging to larger regional jets in the five-year timeframe, extends the season of the third frequency in the 10-year timeframe, and adds a fourth daily flight, to Detroit or to another market, in 2030.

Low Air Service Growth – The low growth forecast scenario considers greater focus on medium and larger airports and that BGM maintains a schedule similar to the current schedule with incremental up-gauging of aircraft on one of the frequencies every 5 years.

Blended Air Service Growth – This forecast is a blend of the low and high growth forecast scenarios.

Historical Performance – This forecast methodology uses the 26-year (since 1990) historical compounded annual growth rate (CAGR) for BGM of -3.20 percent. This growth rate accounts for the effects of 9/11, three economic recessions, and multiple airline mergers.

The resulting methodologies contain enplanement forecasts ranging from 21,158 to 75,451 as displayed in Table 3-5.

Table 3-5: Forecast Enplanements by Methodology

	FAA Aerospace	High	Low	Blend	Historical
2017 (Existing)	33,666	33,666	33,666	33,666	33,666
2022	38,914	48,206	38,346	43,276	34,462
2027	42,128	53,633	40,629	47,131	29,290
2032	45,608	70,239	47,584	58,912	24,894
2037	49,375	75,451	50,450	62,951	21,158

Source: 2017 (Existing Enplanements) as calculated by Greater Binghamton Airport, McFarland Johnson analysis, 2017.

3.4.5. Selected Forecast

The blended forecast scenario is the selected forecast for enplanements and is displayed in Table 3-6.

Table 3-6: Baseline Enplanement Forecast

Year	Enplanements
2017 (Existing)	33,666
2022	43,276
2027	47,131
2032	58,912
2037	62,951

Source: McFarland Johnson analysis, 2017.

3.4.6. Derivative Forecast Scenarios

The following sections outline additional derivative forecast scenarios that have been developed to address potential market conditions that are reasonably foreseeable but not able to be specifically quantified based on service announcements or contracts. These forecast scenarios are speculative and are not included in the baseline forecast identified in Table 3-6 and utilized as the basis for this Master Plan Update. These scenarios are solely provided for reference should a change in airline service come to fruition. Any scenario identified in this section will be additive to the selected baseline forecast, as identified in Table 3-6, and will be used for future facility planning only should the need arise.

New Regional Airline – This scenario considers the impacts associated with the introduction of a new regional airline offering approximately 12 weekly flights on 50-seat regional jets. Service will increase to 14 weekly flights on 66-seat aircraft in year five, and 19 weekly flights with an average of 70 seats in year 12.

Small Leisure Airline - This scenario considers the impacts associated with the introduction of a small leisure airline offering twice weekly flights on regional jet aircraft for a six-month period for years one and two, nine months in years three through four, and twice weekly year-round for year five. An additional market is added in year 10, growing at the same schedule as the initial market.

ULCC Leisure Airline - This scenario considered the impacts associated with the introduction of a ULCC offering twice weekly flights on mainline sized aircraft (160 seats) for a six-month period for years one and two, nine months in years three through four, and twice weekly year-round for year five. An additional market is added in year 10, growing at the same schedule as the initial market.

Small Business Airline - This scenario considered the impacts associated with the introduction of a small business-oriented airline providing an average of 19 weekly flights on nine-seat aircraft to one or more business markets. An additional business market with a total of 12 weekly flights is added in year five.

Table 3-7 displays the additional service levels of the derivative scenarios associated with new service at BGM.

Table 3-7: New Service Derivative Scenarios

	New Regional		New Small Leisure		New ULCC		Small Business	
Year	Ops.	Enpl.	Ops.	Enpl.	Ops.	Enpl.	Ops.	Enpl.
1	1,248	24,960	104	2,210	104	7,363	1,976	5,780
5	1,456	29,120	208	4,420	208	14,726	3,432	10,039
10	1,456	30,940	312	6,630	312	22,090	3,432	10,039
20	1,976	43,472	520	11,050	520	36,816	3,432	10,039

Source: McFarland Johnson analysis, 2017.

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3.4.7. Peak Hour Enplanements/Peaking Characteristics

When divided equally over the year and throughout the day, annual enplanement numbers will not accurately identify specific facility needs. To accurately identify airport requirements for facility planning, peaking characteristics are broken down into the following elements:

Peak Month – The BGM passenger market is more balanced on an annual basis compared to similar sized airports with no dramatic peaks in activity. Airport records indicate that August is the peak month with approximately 10 percent of the annual total enplanements (equal distribution equates to 8.3 percent).

Average Day Peak Month – The average day of the peak month (ADPM) is the industry standard measure used in planning and analyzing an airport's peaking characteristics. The peak month activity is divided by 30 days.

Peak Hour – Peak hour enplanements is the critical metric when planning for passenger terminal facilities. At small airports like BGM with a single airline, and when operations do not occur simultaneously, the peak hour is based on a single full operation and is based on the largest aircraft utilized by the air carrier. As noted previously, and detailed in the Historical Activity section, SkyWest it is anticipated that the aircraft used will increase in size over the planning period. As a result, the Canadair (Bombardier) Regional Jet 200 (CRJ-200), with 50 seats, was utilized in 2017, and it is assumed that upgauging will occur over the planning period with a CRJ-700 or similar aircraft in 2022 increasing to a CRJ-900 or similar aircraft in 2027. Between 2027 and 2037 it is anticipated that the CRJ-900 or similar aircraft, will continue to be utilized at the Airport, however, larger variants with additional seats are anticipated to be introduced into the market. Peak enplanement characteristics for BGM are displayed in Table 3-8. While the peaking characteristic does not account for a second airline, it is worth noting that BGM has supported peak hours of between 100 and 150 passengers in recent years.

Table 3-8: Peak Enplanement Characteristics

	2017 (Existing)	2022	2027	2032	2037
Enplanements	33,666	43,276	47,131	58,912	62,951
Peak Month	3,367	4,328	4,713	4,890	6,295
Average Day Peak Month	112	144	157	163	210
Peak Hour	50	66	76	76	85

Source: McFarland Johnson analysis, 2017.

3.5. AIRCRAFT OPERATIONS

The FAA defines an aircraft operation as a takeoff or a landing and categorizes the operations by aircraft type and purpose. These categories include commercial (all airline operations at the passenger terminal), GA (both recreational and corporate), and military. The forecasting of these operations by category is used in the planning of terminal buildings, runways, taxiways, and other airport infrastructure.

While historical trends point to a continued decline, recent activity levels indicate that GA at BGM has stabilized. Current levels equate to an approximate average of eight GA itinerant departures

per day and four local departures per day and it is not anticipated that activity will drop below these levels. In addition, Evolution Jets recently announced the opening of a maintenance base in Hangar 1 at BGM. As a result, Evolution Jets will cycle their fleet of Embraer Legacy jets through BGM on a daily basis for maintenance activities. It is anticipated that this will increase GA itinerant operations by an average of up to 16 daily operations through the planning period as documented in a letter provided by Evolution Jets and available in **Appendix B**. Otherwise, activity at BGM is generally expected to follow national GA trends absent any notable changes in the based user profile.

The growth rates used in the most recent FAA National Aerospace Forecast for 2017-2037 result in an operations forecast that is close to the FAA Terminal Area Forecast (TAF) in many categories. The primary differences being in the air carrier operations totals which do not consider the eventually up-gauging to larger aircraft, as well with itinerant GA operations, which do not account for the added frequencies associated with the new activity associated with Evolution Jets. The overall master plan operations forecast is displayed in **Table 3-9**. The growth elements discussed for each operation type below include both local and airline industry factors that could impact aircraft operations at BGM.

3.5.1. Historical Activity

The historical data for aircraft operations, shown in **Figure 3-2**, depicts various trends for each type of operation. Overall activity has declined at consistent rate for many years, with levels being relatively stable in recent years.

Table 3-9: Annual Operations Forecast by Type

Year	Air Carrier	Air Taxi	Itinerant		Local		Total Ops.
			GA	Military	Civil	Military	
2017 (Existing)	19	3,331	5,886	218	2,995	98	12,547
2022	710	2,421	9,260	218	3,040	98	15,747
2027	1,415	1,586	11,175	218	3,086	98	17,578
2032	2,150	790	11,997	218	3,133	98	18,386
2037	2,940	755	12,089	218	3,180	98	**19,280**

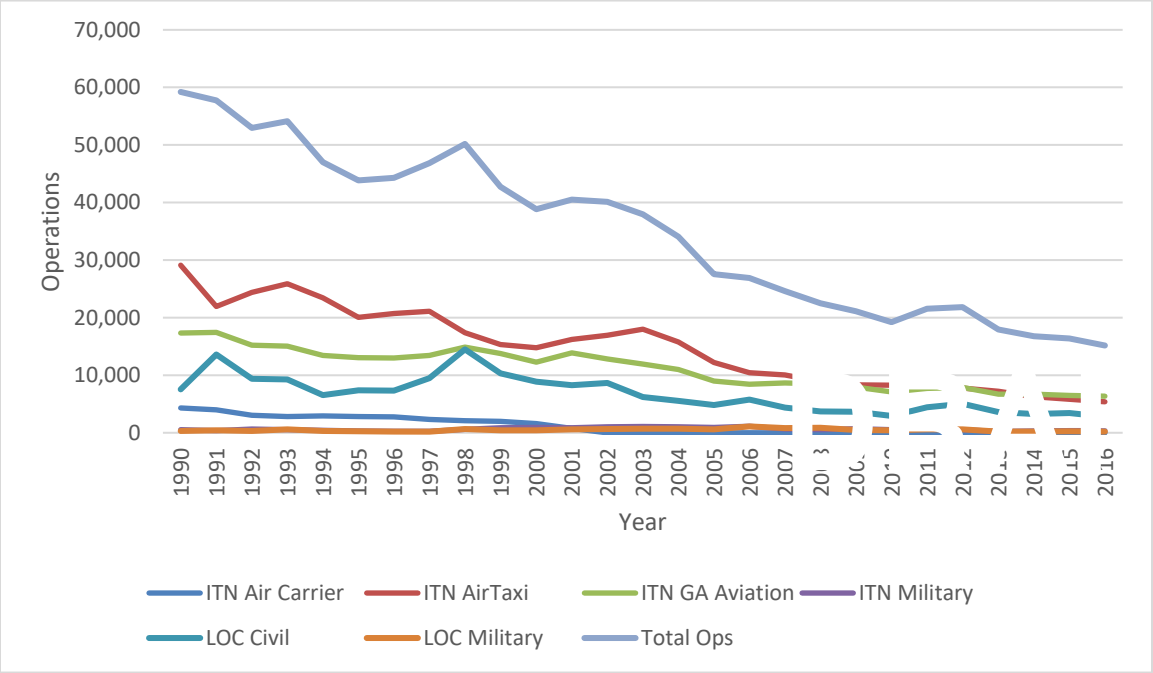
Source: FAA Terminal Area Forecast, 2017 (Existing Conditions); 2022 – 2037 based on McFarland Johnson analysis, 2019.

3.5.2. Air Carrier and Air Taxi

Air Carrier operations are those conducted by aircraft with 60 or greater passenger seats. Air Taxi/Commuter operations include regional and commuter activity and commercial applications within GA such as Part 135 charter activity. Historically, the air taxi element has made facility planning difficult because it includes both airline and GA operations; however, with the rapid retirement in 50-seat regional jet and smaller, many airline operations in future years will be classified as air carrier by the end of the planning period. The FAA TAF does not reflect this transition; there is no net effect on the total airport operations.

New airlines and new markets could be introduced over time, however the timing of introduction of service cannot be predicted and therefore the introduction of a new airline was excluded from this analysis. Derivative forecast scenarios will consider activity from new airlines.

Figure 3-2: Historical Aircraft Operations



Source: FAA TAF, 2017.

3.5.3. General Aviation Operations

Annual itinerant aircraft operations, those flights originating or terminating 20 miles or greater from BGM, similar to air carrier activity, have experienced a slow and steady decline to what is believed to be minimum core activity levels. Unlike commercial activity, GA has been somewhat stable in the recent years. The GA itinerant operations include anticipated growth from the new tenant, Evolution Jets, which is expected to cycle aircraft through BGM on a daily basis for maintenance and grow over time. Aside from this new tenant activity, it is expected that itinerant GA operations at BGM will grow in line with the national forecast outlined over the long term. The opportunity exists to grow above these levels should the airport attract tenants from outside of the region (i.e. New York City metro area).

Local GA operations at BGM are projected to show 0.4 percent growth based on the 2017 FAA Aerospace Forecast. Activity levels will be relatively stable barring the introduction of a new flight school, as training operations typically comprise the majority of local operations.

3.5.4. Military Operations

With constant changes in national security and relief needs, military operations tend to fluctuate over time. At BGM, local and itinerant military operations have been relatively stable over the past 20 years ranging between 200 and 1,000 total operations for both itinerant and local military operations. The FAA TAF reports zero growth in military operations at BGM; it is anticipated the

annual averages will fluctuate within the historical ranges. It anticipated the C-130 aircraft will conduct the majority of the military operations.

3.5.5. Aircraft Fleet Mix

As eluded to previously in **Section 3.2**, both commercial and GA aircraft are getting progressively more fuel efficient with improved engines and aerodynamic design. Engine technology will yield quieter, more fuel-efficient engines, while aircraft design may slightly change the aircraft shape, primarily in the form of increased wingspans. **Table 3-10** contains a representative sample of the existing and anticipated future fleet mix for BGM. It is important to note that aircraft not yet in the market place, such as a large passenger turboprop or a new generation of regional jets is not reflected as they are not in the current manufacturer marketplace but have the potential to exist inside the 20-year horizon.

Table 3-10: Aircraft Fleet Mix

	Existing (2017)	Future (2037)
Commercial Service (Air Carrier)	CRJ-200	[illegible]
		[illegible]
		Embraer 175
	35.30%	37.40%
General Aviation Itinerant (Including Air Taxi)	Falcon 2000 LXS	Gulfstream G-V
	Cessna Citation 525	Embraer Phenom 300
	Hawker 849	Dassault Falcon 5X
	Piper Navajo	Pilatus PC-12
	42.1%	40.80%
General Aviation Local	Cessna Skyhawk (172)	Diamond DA-42
	Piper Seminole	Cessna Skycatcher
	18.50%	18.0%
Other	C-130 (Military)	C-130J (Military)
	4.10%	3.80%

Source: McFarland Johnson, 2017.

3.5.6. Peaking Characteristics – Aircraft Operations

Like the peaking characteristics used for passenger enplanements, annual operations numbers when divided equally over the year and throughout the day will not accurately identify capacity constraints or facility needs during busier periods. To accurately identify airport requirements for facility planning, peaking characteristics are broken down into the following elements:

Peak Month – The BGM passenger market is more balanced on an annual basis compared to similar sized airports. Like with passenger enplanements, there is no significant peak in activity on an annual basis for commercial activity. With GA factored in for the overall airport operational

counts, recreational activity is elevated in the summer and fall months. A peaking factor of 10 percent will be used for planning purposes (equal monthly distribution equates to 8.3 percent).

Average Day Peak Month – The average day of the peak month (ADPM) is the industry standard measure used in planning when planning and analyzing an airport's peaking characteristics. In the case of BGM the peak month activity is divided by 30 days.

Peak Hour – Peak hour operations is a critical metric when planning for airfield capacity. Traditionally the operational peak hour typically represents between 12 percent and 17 percent of the daily operations total. A peaking factor of 15 percent will be applied to the average day of the peak month for peak hour planning at BGM.

Peak operational characteristics for BGM are displayed in **Table 3-11**.

Table 3-11: Peak Hour Operations

	2017 (Existing)	2022	2027	2032	2037
Operations	12,547	15,747	17,578	[illegible]	[illegible]
Peak Month	1,041	1,307	1,459	[illegible]	1,600
Average Day Peak Month	35	44	49	51	54
Peak Hour	6	7	8	8	9

Source: McFarland Johnson, 2017.

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3.6. BASED AIRCRAFT

Forecasting the number and type of based aircraft is critical to planning future GA facilities, especially for the type and size of hangers and aircraft movement and parking areas. The growth elements below discuss the factors that influence the number of based aircraft at BGM.

3.6.1. Growth Elements

As with operations, growth elements affecting based aircraft at BGM are expected to generally follow national trends related to GA fleets. The current breakdown of aircraft by type at BGM is consistent with similar sized airports in the region. The growth rates used in this forecast represent those in the most recent FAA Aerospace Forecast for 2017 to 2037.

Single/Multi Piston –Piston (single and multi) aircraft are forecasted to follow a negative growth rate over the next 20 years while turbine aircraft will grow positively throughout the planning period. As the economic advantage of aircraft leasing, renting, fractional ownership, and flying clubs become more popular, the number of newly purchased piston engine aircraft is decreasing in most regions. While the aircraft counts are negative, the negative aspects are offset from enhanced utilization from a broader user base not burdened by high-entry costs.

Turbine/Jet – Advancements in fuel efficiency and aircraft technology has resulted in a wide variety of new products entering the turbine and jet aircraft market. More aircraft options at lower costs have increased the number of aircraft in the business aviation market not only as a lease/purchase capacity but also more fractional ownership and charter options. With this, and the national

forecast for based turbine aircraft following a positive trend, it is forecasted that turbo propeller and turbo jet aircraft will increase throughout the planning period.

Table 3-12 displays the based aircraft forecast for BGM.

Table 3-12: BGM Based Aircraft Forecast

	Single	Multi	Jet	Rotor	Total
2017 (Existing)	26	6	3	2	37
2022	25	6	3	2	36
2027	24	6	4	2	36
2032	23	7	4	3	37
2037	22	7	5	3	37

Source: Greater Binghamton Airport (2017); Growth rates based on FAA National Aerospace Forecast 2017-2037.

BGM's location relative to the congested and costly New York [illegible] airports could [illegible] in additional jet aircraft being attracted to the Airport to use BGM as [illegible] operating [illegible] for the northeast. A planning scenario will consider the facility ir[illegible]s f a[illegible] addit[illegible] l 12 based turbine/jet aircraft at BGM.

3.7. FORECAST SUMMARY

Table 3-13 presents a summary of the aviation demand forecasts developed for BGM and detailed throughout this chapter. These forecasts are considered reasonable and achievable and will be used throughout the Master Plan Update in the development of facility requirements and the identification of alternatives.

3.7.1. Comparison with FAA Terminal Area Forecast

To confirm validity, master plan aviation forecasts are often compared with other aviation forecasts prepared for the airport and the region. Ideally, this report's forecasts should be reasonably consistent with other forecasts of future airport activity, and compatible with forecasts for the larger region. With master plan forecasts being much more specific to an airport, it is not unusual to see some variation from national forecasts. The most useful forecasts for comparison are those prepared by the FAA with the standard being the TAF and the national and regional forecasts previously referenced in this report. The TAF is prepared annually and includes airport forecasts for all active National Plan of Integrated Airport Systems (NPIAS) airports. Table 3-14 shows the compared results between the selected forecast and that of the FAA's TAF.

The comparison shows that the results of the Master Plan operations forecast exceed the general guidelines identified by the FAA (10 percent within 5 years, 15 percent within 10 years) however this is due to the overall small total numbers which reduces the size of the tolerances. The forecast is below past activity peaks and these forecasts levels, while above the TAF, will not drive any facility requirements as they do not surpass highs in recent years. In the past 20 years, BGM has at its peak handled over 144,508 annual enplanements and 50,174 annual operations. Comparison with the FAA TAF can be seen in Appendix C.

Table 3-13: Aviation Demand Forecast Summary

	FORECAST				
	2017 (Existing)	2022	2027	2032	2037
Enplanements					
Air Carrier/Airline	33,666	43,276	47,131	58,912	62,951
Peak Hour	50	66	76	76	85
Aircraft Operations	**12,547**	**15,747**	**17,578**	**18,386**	**19,280**
Air Carrier/Air Taxi	3,350	3,131	3,001	2,940	3,695
General Aviation					
GA Itinerant	5,866	9,260	11,175	11,997	12,089
GA Local	2,995	3,040	3,086	3,133	3,180
Military	316	316	316	316	316
Peak Hour	6	7	8	8	9
Based Aircraft	**37**	**36**	**3**	**37**	**37**
Single	26	25	2	23	22
Multi	6	6	6	7	7
Jet	3	3	4	4	5
Rotor	2	2	2	3	3

Source: McFarland Johnson 2019.

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3.8. FUTURE DESIGN AIRCRAFT

The Runway Design Code (RDC) used in airport planning is derived from the features of the most demanding aircraft using the airport on a regular basis coupled with the best available instrument approach minimums. The first component, depicted by a letter, is the Aircraft Approach Category (AAC) and relates to aircraft approach speed (operational characteristics). The second component, depicted by a Roman numeral, is the Airplane Design Group (ADG) and relates to either the aircraft wingspan or tail height (physical characteristics), whichever is most restrictive. The third component relates to the visibility minimums expressed by Runway Visual Range (RVR) values. **Table 3-15** displays the RDC criteria used in airport planning to determine AAC and ADG.

For air carrier traffic, the CRJ-200 currently meets the critical aircraft requirement of a minimum of 500 annual itinerant operations at BGM and is classified as a D-II aircraft. However, as regional airlines gradually up-gauge aircraft over time, the critical aircraft is forecast to change to the larger CRJ-900, which is a C-III aircraft due to a longer wingspan. The C-III ADG designation is consistent with previous, as well as ongoing, planning efforts for BGM. The anticipated replacement of the CRJ-200 with the CRJ-900 is confirmed in the letter provided by the current air carrier, SkyWest, which is provided in **Appendix B**. While the timeline for the conversion of air carrier aircraft is undetermined at this time, it is prudent to anticipate this change within the 20-year planning period of the Master Plan Update. Some planning scenarios consider larger aircraft such as the Airbus A320, which is also a C-III aircraft. **Table 3-16** presents the design details for each of these aircraft.

Table 3-14: Aviation Demand Forecast vs. FAA Terminal Area Forecast

	BASELINE	FORECAST				
	2017 (Existing)	2018	2022	2027	2032	Average Annual Growth
FAA TAF (2017)						
Enplanements	41,454	41,454	41,454	41,454	41,454	0.00%
Total Operations	12,547	12,062	12,130	12,215	12,300	-0.08%
Based Aircraft	37	39	42	44	44	0.90%
Master Plan Forecast						
Enplanements	33,666	36,520	43,276	47,131	62,951	4.14%
Total Operations	12,547	13,620	15,747	17,578	18,386	3.10%
Based Aircraft	37	37	36	36	37	0.00%
Pct. Difference From TAF						
Enplanements	-18.79%	-12.19%	4.40%	13.69%	42.11%	-
Total Operations	0.00%	12.92%	29.82%	43.91%	49.48%	-
Based Aircraft	0.00%	-5.12%	-14.29%	-18.18%	-15.91%	-

Source: 2017 FAA TAF, and McFarland Johnson, 2019.

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Table 3-15: FAA Airport Reference Code

FAA Airport Reference Code Parameters				
Category	Approach Speed (kts)	Group No.	Wingspan (ft.)	Tail Height (ft.)
A	<91	I	< 49	< 20
B	91 to <121	II	49 to < 79	20 to < 30
C	121 to < 141	III	79 to < 118	30 to < 45
D	141 to < 166	IV	118 to < 171	45 to < 60
E	166 or more	V	171 to < 214	60 to < 66
		VI	214 to < 262	66 to < 80

Source: FAA AC 150/5300-13A.

Table 3-16: Existing and Future Design Aircraft

	Existing and Future Design Aircraft		
Aircraft Model	CRJ-200	CRJ-900	A320 (Scenario)
Length Overall	87.8 feet	118.9 feet	123 feet 3 inches
Wingspan	69.6 feet	81.6 feet	111 feet 9 inches
Tail Height	20.4 feet	24.6 feet	39 feet 6 inches
Main Gear Width	12.0 feet	16.5 feet	29.4 feet
Cockpit to Main Gear	24.5 feet	55.6 feet	50.2 feet

	Existing and Future Design Aircraft		
Aircraft Model	CRJ-200	CRJ-900	A320 (Scenario)
Maximum Takeoff Weight	51,000 lbs.	84,500 lbs.	17,961 lbs.
Approach Speed Category	D	C	C
Aircraft Design Group	II	III	III

Source: FAA AC 150/5300-13A, FAA Flight Standards Information Management System.

For general aviation traffic, numerous aircraft of all sizes and approach speed capabilities operate at the Greater Binghamton Airport on an annual basis. In review of existing annual operations at the Airport, the representative design aircraft for general aviation operations has been identified as a Swearingen Metroliner and the Beech Super King Air 350, which are categorized with a B-II ADG. Operations levels at present are approaching the threshold of 500 annual operations by general aviation aircraft with an approach speed category of C, which in the future is anticipated to lead to a C-II ADG for general aviation aircraft at BGM, represented by the Embraer Legacy and Gulfstream G200.

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4. Environmental Overview

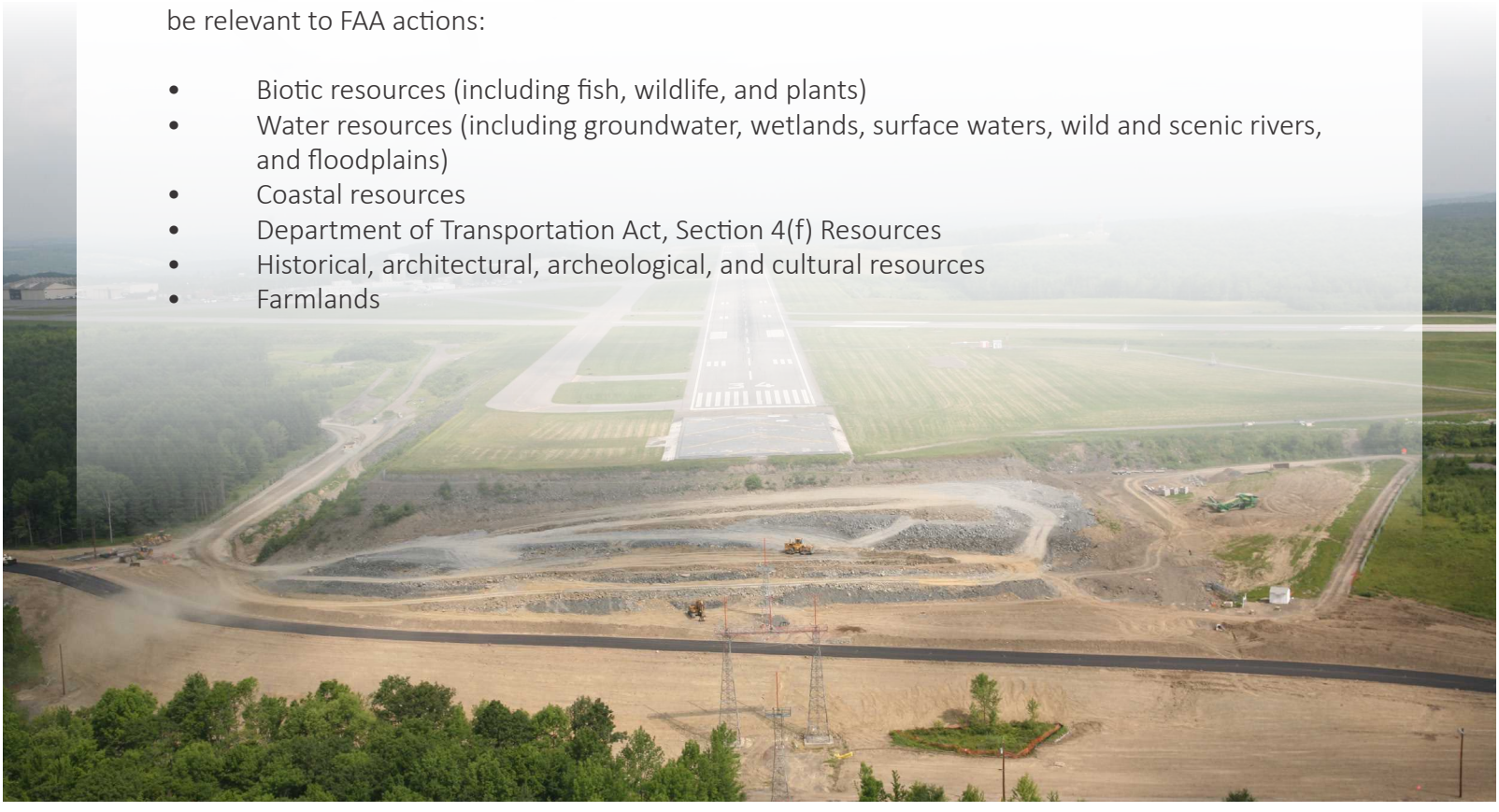
4.1. INTRODUCTION

The operation and development of an airport has the potential to affect neighboring land-uses and natural and human environments, which are of fundamental concern in the airport planning process. Therefore, it is imperative to identify the resources and potential impacts to the environment and surrounding community during the initial stages of the planning process. This allows airport planners and engineers to incorporate measures in accordance with federal, state, and local rules and regulations to avoid, minimize, or mitigate potential impacts to the environment.

The National Environmental Policy Act (NEPA) of 1969 requires that all federal agencies consider the potential impacts their projects and policies have on the e vi ro nm nt. The Fed ral Aviation Administration (FAA), an agency of the United States Departm nt o T ns ort ti n (OT), has issued Order 1050.1F, Environmental Impacts: Policies and Pro ures (ef ct ve d te July 17, 2015), which ensures all FAA actions comply with NEPA. The FAA has also issued Order 5050.4B, National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions (effective date April 28, 2006). FAA Order 5050.4B guides NEPA compliance specifically for major federal actions at public-use airports.

FAA Orders 1050.1F and 5050.4B identify environmental categories that must be considered in relation to a proposed action to determine whether a significant impact would result and determine what actions would be appropriate to avoid or minimize an impact's effect. FAA Order 1050.1F specifies the threshold of significance for each of the categories addressed.
The following is a list of environmental impact categories, identified in Order 1050.1F, that may be relevant to FAA actions:

- Biotic resources (including fish, wildlife, and plants)
- Water resources (including groundwater, wetlands, surface waters, wild and scenic rivers, and floodplains)
- Coastal resources
- Department of Transportation Act, Section 4(f) Resources
- Historical, architectural, archeological, and cultural resources
- Farmlands



- Land use
- Noise and noise-compatible land use
- Visual effects (including light emissions)
- Air quality
- Hazardous materials, solid waste, and pollution prevention
- Energy supplies and natural resources
- Climate
- Socioeconomics, environmental justice, and children's environmental health and safety risks

This chapter provides a summary of the environmental conditions and constraints at the Greater Binghamton Airport (BGM or the Airport). The information provided in this chapter will be carefully considered as part of the alternatives analysis that will be completed for this Master Plan Update (MPU). Future airport development proposed in this MPU will be reviewed in further detail in the subsequent environmental documentation to satisfy the requirements of NEPA. The information provided in this chapter is based on information obtained from the Airport and appropriate federal, state, and local agencies.

4.2. BIOTIC RESOURCES

Biotic resources refer to the various types of flora (plants) and fauna (fish, birds, reptiles, amphibians, mammals, etc.), including state and federally listed threatened and endangered species, in a particular area. It also encompasses the habitats supporting the various flora and fauna including rivers, lakes, wetlands, forests, and other ecological communities. Airport projects can affect these ecological communities and thereby affect vegetation and wildlife populations.

4.2.1. Ecological Communities

Most of the Airport and adjacent areas have been disturbed by airport and commercial development, or past quarry, agricultural or forestry operations. The major ecological community cover types on Airport property consist of maintained grassland, scrub/ shrubland, mixed forest, quarry lands, and paved/ gravel surfaces. All habitats identified at the Airport are common and secure within the region.

There are no habitats located on the site that are designated as "critical habitat" for any state or federally listed threatened or endangered species, or species of special concern. State or federally listed threatened or endangered species or species of special concern are discussed in **Section 4.2.2.1**. Further information regarding state and federally regulated waterways and wetlands is presented in **Section 4.3.2** and **Section 4.3.3**.

4.2.2. Flora and Fauna

The Airport property is comprised of predominately maintained grasslands that are dominated by cool season grasses and forbs such as Kentucky bluegrass (*Poa pratensis*), red fescue (*Festuca rubra*), meadow fescue (*Schedonorus pratensis*), quack grass (*Elymus repens*), perennial ryegrass (*Lolium perenne*), common dandelion (*Taraxacum officinale*), white clover (*Trifolium repens*), red clover (*Trifolium pratense*), hedge bedstraw (*Galium mollugo*), English plantain (*Plantago lanceolata*), and birdsfoot trefoil (*Lotus corniculatus*). The undeveloped portions of Airport

property consist primarily of mixed forest dominated by northern red oak (*Quercus rubra),* white oak (*Quercus alba*), red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), white ash (*Fraxinus americana*), green ash (*Fraxinus pennsylvanica*), eastern hemlock (*Tsuga canadensis*), white pine (*Pinus strobes*), red pine (*Pinus resinosa*), white spruce (*Picea glauca*), Norway spruce, (*Picea abies*), quaking aspen (*Populus tremuloides*), and eastern cottonwood (*Populus deltoides*) with interspersed streams and forested, scrub-shrub, and emergent wetlands. Additional habitats include maintained grasslands and old field communities.

Based on a review of the Airport's 2005 *Wildlife Hazard Assessment* (WHA) conducted by the US Department of Agriculture- Wildlife Services, the most common bird species found on Airport property were American crow (*Corvus brachyrhynchos*), European starling (*Sturnus vulgaris*), barn swallow (*Hirundo rustica*), tree swallow (*Tachycineta bicolor*), mourning dove (*Zenaida macroura*), and killdeer (*Charadrius vociferus*), while observed mammals included striped skunk (*Mephitis mephitis*), woodchuck (*Marmota monax*), eastern cottontail (*Sylvilagus floridanus*), and red fox (*Vulpes vulpes*). Based on onsite observations, the Airport's unfenced outparcels support the same species, as well as other common mammal species such as white-tailed deer (*Odocoileus virginianus*), eastern grey squirrel (*Sciurus carolinensis*), Virginia opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), beaver (*Castor canadensis*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), fisher (*Pekania pennant*), and many species of rodents. The Airport's outparcels contain a mix of habitats that are supportive of a variety of grassland, shrubland and woodland bird species.

Information on potential rare, threatened, and endangered species on, or in the vicinity of, the Airport is provided in the following sub-section.

4.2.2.1. Threatened and Endangered Species

The Endangered Species Act (ESA) directs all federal agencies to work to conserve federally listed endangered and threatened species and to use their authorities to further the purposes of the ESA. Section 7 of the ESA, titled "*Interagency Cooperation*," is the mechanism by which federal agencies ensure the actions they take, including those they fund or authorize, do not jeopardize the existence of any federally listed species. Endangered species are those which are in danger of extinction throughout their range or a significant portion of its range. Threatened species are those which are likely to become endangered within the foreseeable future throughout all or a significant portion of their range. Candidate species are species for which the United States Fish and Wildlife Service (USFWS) has sufficient information on the biological vulnerability and threats to support issuance of a proposal list, but issuance of a proposed rule is currently precluded by higher priority listing actions. Candidate species do not receive substantive or procedural protection under the ESA. However, USFWS does encourage federal agencies and other appropriate parties to consider these species in the planning process.

New York State regulation 6 NYCRR Part 182 prohibits the take or engagement in any activity that is likely to result in a take of any state-listed threatened or endangered species. Species listed as endangered in New York are native species in imminent danger of extirpation or extinction in New York, or are species listed as threatened or endangered by the USFWS. Species listed as threatened in New York are native species that are likely to become an endangered species within the foreseeable future in New York. Species listed as species of special concern are native species that are at risk of becoming threatened in New York. Fauna classified as species of special concern do

not qualify as either endangered or threatened but have been determined by the New York State Department of Environmental Conservation (NYSDEC) to require some measure of protection to ensure that the species does not become threatened in the future. Species of special concern are considered "protected wildlife" under Article 11 of the Environmental Conservation Law (ECL).

In accordance with FAA CertAlert No. 06-07, *Requests by State Wildlife Agencies to Facilitate and Encourage Habitat for State-Listed Threatened and Endangered Species and Species of Special Concern on Airports*, the Airport should not consider any request by state agencies to adopt habitat management techniques that may increase wildlife hazards and be inconsistent with safe Airport operations.

McFarland Johnson conducted a review of the NYSDEC Environmental Resource Mapper on January 15, 2019. The review did not indicate any known state or federally listed threatened or endangered species, or species of special concern, in the vicinity of the Airport.

An Official Species List from the USFWS was obtained on November 1, 2019 and is included in **Appendix D.** The list indicates that there are no threatened, endangered, or candidate species within the area.

As specific Airport development alternatives are identified and considered, the potential to affect State or federally listed rare, threatened, and endangered species will be re-assessed on an individual basis and in consultation with the NYSDEC, USFWS, and FAA.

4.3. WATER RESOURCES

This section discusses potential affects to water resources including groundwater, wetlands, surface waters (streams, rivers, ponds, and lakes), and floodplains.

4.3.1. Groundwater

Groundwater serves as an important potable water supply for many individual households, small communities, and larger municipalities. Potential impacts from airport development projects can include reduced groundwater recharge and potential contamination through chemical, toxin, or other pollutant releases.

The Environmental Protection Agency (EPA) Sole Source Aquifer (SSA) program was established under the Safe Drinking Water Act (SDWA). According to the EPA, an SSA is defined as one that supplies at least 50 percent of the drinking water for its service area, and wherein there is no reasonably available alternative drinking water sources should the aquifer become contaminated. The SSA program allows for EPA review of federally funded projects that have the potential to affect designated SSAs and their source areas.

New York has several programs designed to protect groundwater, most notably the Water Quality Standards Program (6 NYCRR Parts 700-706) and the Aquifer Vulnerability Assessment requirement under New York's State Environmental Quality Review Act (SEQR). In addition, the NYSDEC protects designated Primary and Principal Aquifers as defined under Section 2.1.3 of the Division of Water Technical & Operational Guidance Series. A Primary Aquifer is one that is highly

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productive and is currently being utilized as a source of water supply by a major municipal water supply system. A Principal Aquifer is defined as an aquifer that is or could potentially be highly productive but is not currently intensely used as a source of water for a major municipal water system.

The Airport is situated over the "Clinton Street Ballpark Aquifer," an EPA designated sole-source aquifer pursuant to Section 1424(e) of the SDWA. The Airport does not overly any state designed Primary or Principle Aquifers as defined by the NYSDEC under Section 2.1.3 of the Division of Water Technical & Operational Guidance Series.

Future proposed projects will take measures in design and construction to avoid, minimize or mitigate any possible adverse impacts to these groundwater aquifers. Future projects at the Airport that have the potential to affect groundwater resources, including federally designated aquifers, will be evaluated in coordination with the EPA and FAA.

4.3.2. Wetlands

The United States Army Corps of Engineers (USACE) regulates activities in wetlands that have a significant nexus to Traditional Navigable Waters of the United States (TNWs) under Section 404 of the Clean Water Act (CWA). The USACE requires that an area have hydrophytic vegetation primacy, hydric soils, and wetland hydrology present in order to be considered a wetland.

The NYSDEC also regulates certain wetlands within New York State under Article 24 of the Environmental Conservation Law (ECL), often referred to as the "Freshwater Wetlands Act." The NYSDEC regulates those wetlands within the state that are larger than 12.4 acres (5 hectares) in size, and certain smaller wetlands of unusual local importance. The NYSDEC also regulates an adjacent area of 100 feet to provide protection for the wetland. The Freshwater Wetlands Act requires the NYSDEC to map those wetlands protected by the state on New York State Freshwater Wetland Maps in order to be provided protection.

In addition, Executive Order (EO) 11990 - *Protection of Wetlands*, states that federal agencies shall provide leadership and shall act to the destruction, loss, or degradation of wetlands, and to preserve and enhance natural and beneficial values of wetlands in carrying out the agency's responsibilities. Under EO 11990, wetlands are defined as those areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Review of the New York State Freshwater Wetland mapping of the Airport and adjacent lands indicates there are no wetlands regulated by the NYSDEC under Article 24 of the Environmental Conservation Law located on or immediately adjacent Airport property.

A wetlands and surface waters delineation of Airport owned property was performed by McFarland Johnson over a period of time from the fall of 2017 to the spring of 2019. The wetlands were delineated through field investigations of vegetation, soils, and hydrology in accordance with the 1987 *United States Army Corps of Engineers Wetlands Delineation Manual* (1987 USACE Manual) and 2012 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* (2012 Regional Supplement).

Numerous wetlands and surface waters were identified during the delineation effort. The overall location of wetlands and streams on Airport owned property is shown as **Figure 4-1**. Also, the approximate locations of the identified wetland and surface water resources are shown in **Figure 4-2A**, **Figure 4-2B**, and **Figure 4-2C**, Delineated Wetlands and Waterways Maps.

The jurisdictional statuses and boundaries for all wetlands will need to be determined by the USACE. However, it is the opinion of McFarland Johnson that majority of the identified wetlands would likely be considered to have significant nexuses to a TNW and are likely jurisdictional under Section 404 of the CWA.

Future proposed projects will take measures in design and construction to avoid, minimize, or mitigate any possible adverse impacts to wetland resources to the degree possible. The use of Best Management Practices (BMPs) during construction projects will minimize indirect impacts to wetland resources. Projects that have no practicable alternatives to avoid direct impacts to federally regulated wetlands will require a Section 404 permit from the USACE and Section 401 WQC from the NYSDEC. In addition, when impacts to wetlands cannot be avoided, an EO 11990 "Wetland Finding" must be prepared to document compliance with the order that the wetland impacts are justified.

Compensatory wetland mitigation may be required as a permit condition depending on the specific details of the proposed project(s). Mitigation is required by the USACE when impacts to federally regulated wetlands exceed 0.10 acres. Wetland mitigation can come in the form of restoration, establishment, enhancement, and/or preservation of wetlands. Typical mitigation ratios recommended by the USACE are shown in **Table 4-1**.

Table 4-1: Typical USACE Recommended Wetland Mitigation Ratios

Wetland Type	Restoration (Re-Establishment)	Creation (Establishment)	Enhancement (Rehabilitation)	Preservation (Protection/ Management)
Open Water (PUB)	1:1	1:1	Project Specific	Project Specific
Emergent (PEM)	2:1	2:1 to 3:1	3:1 to 10:1	15:1
Scrub-Shrub (PSS)	2:1	2:1 to 3:1	3:1 to 10:1	15:1
Forested (PFO)	2:1 to 3:1	3:1 to 4:1	5:1 to 10:1	15:1

Source: Excerpted from USACE's "New England District Compensation Mitigation Guidance" dated July 20, 2010

Based on regulations promulgated by the Department of Defense and Environmental Protection Agency in *Mitigation for Losses of Aquatic Resources; Final Rule* (Fed. Reg. Vol. 73, No. 70, April 10, 2008) a graphic presenting the hierarchy of preferred wetland mitigation options for impacts to federally regulated wetlands is presented as **Figure 4-3**.

Figure 4-1: Overall Wetlands and Streams Delineation Map

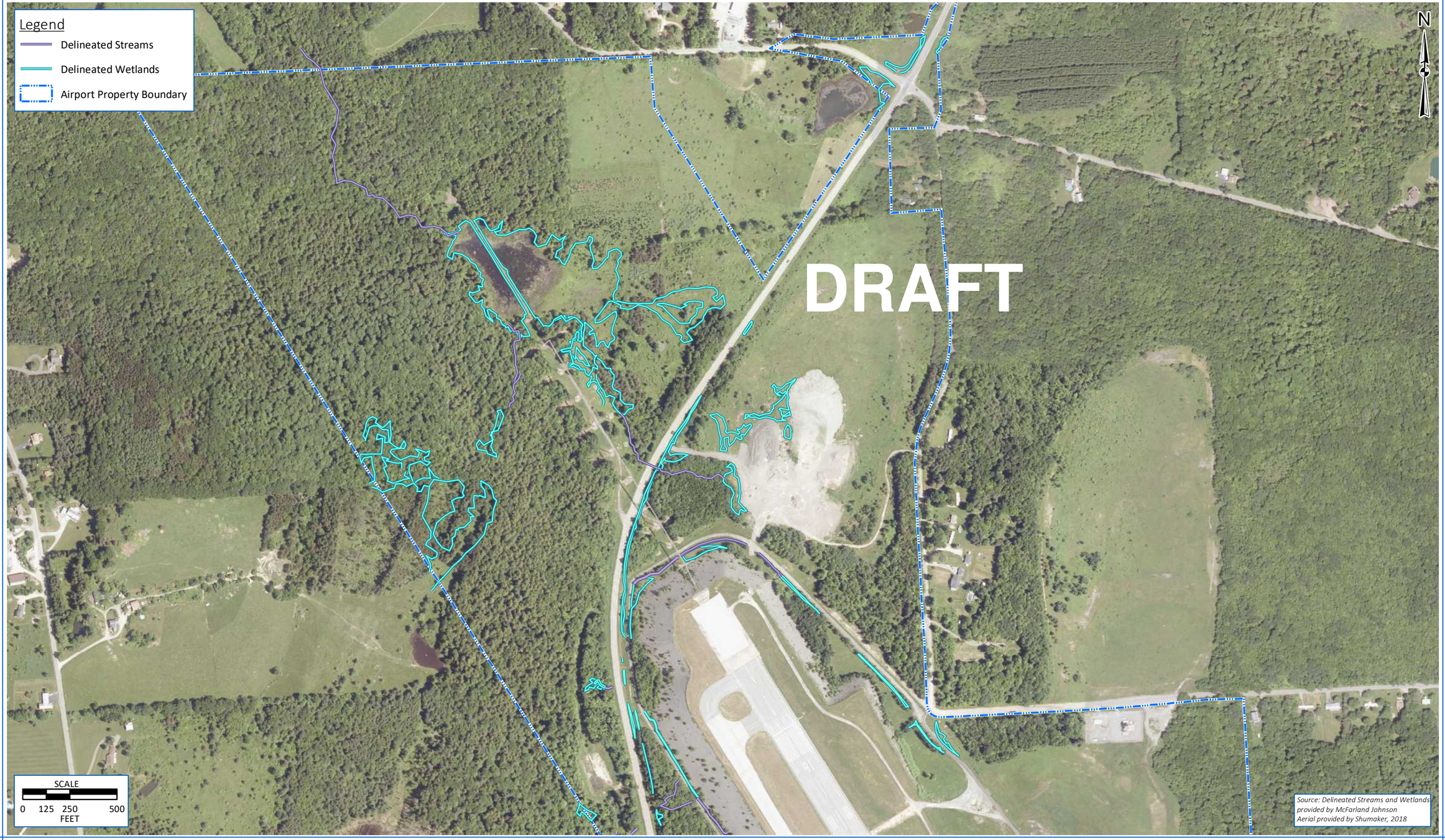


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Figure 4-2A: Wetlands and Streams Delineation Map

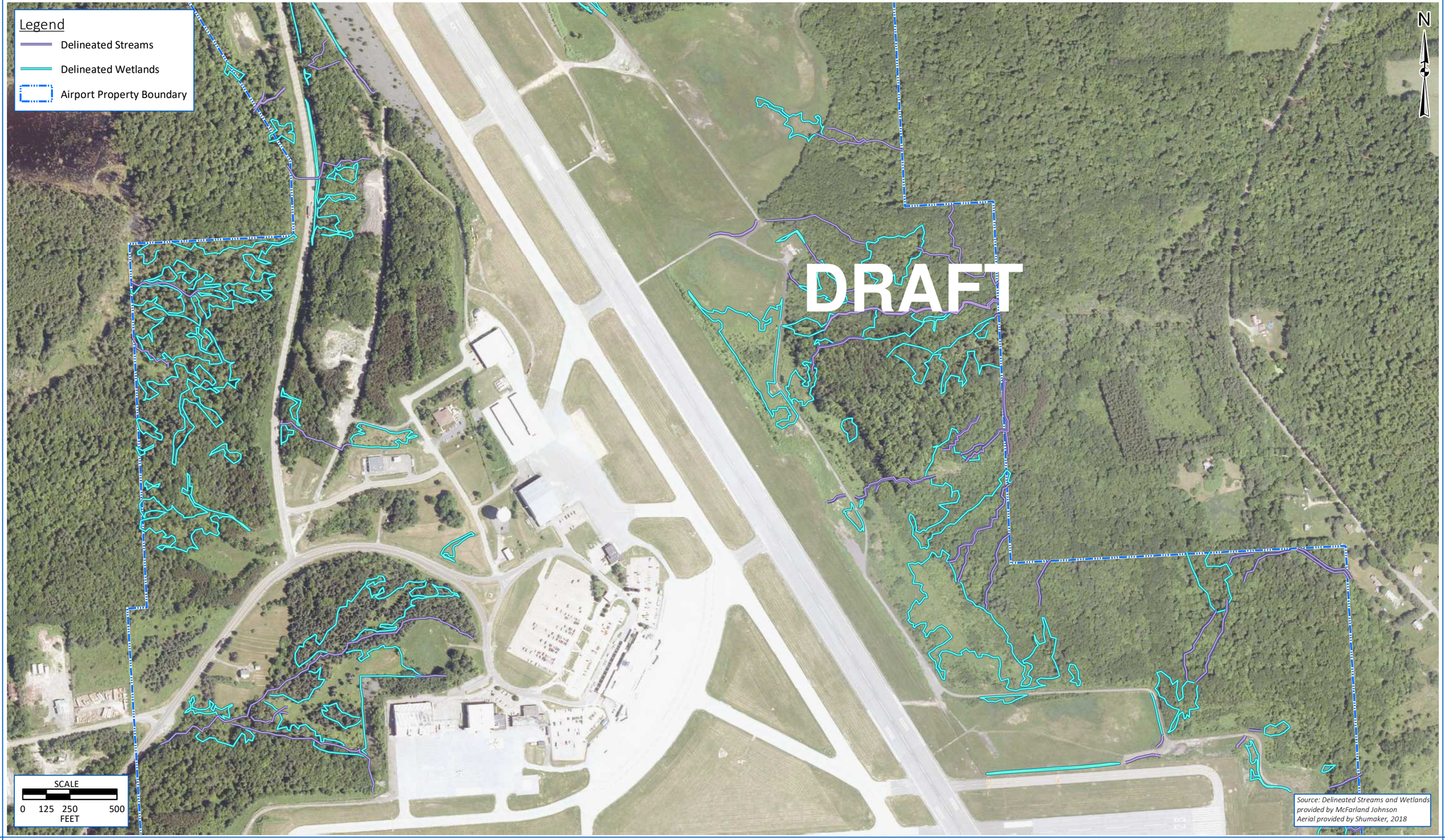


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Figure 4-2B: Wetlands and Streams Delineation Map

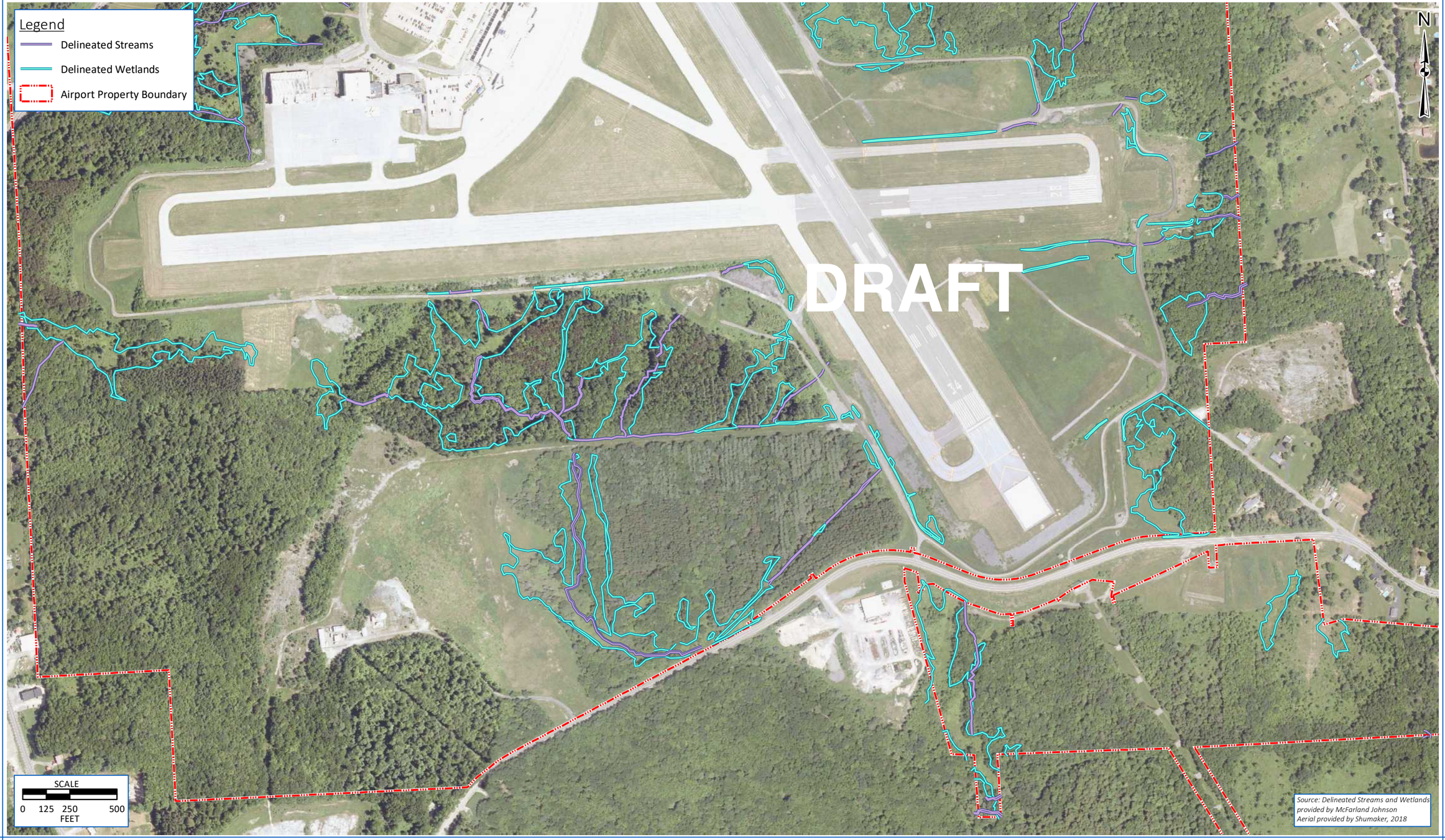


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Figure 4-2C: Wetlands and Streams Delineation Map

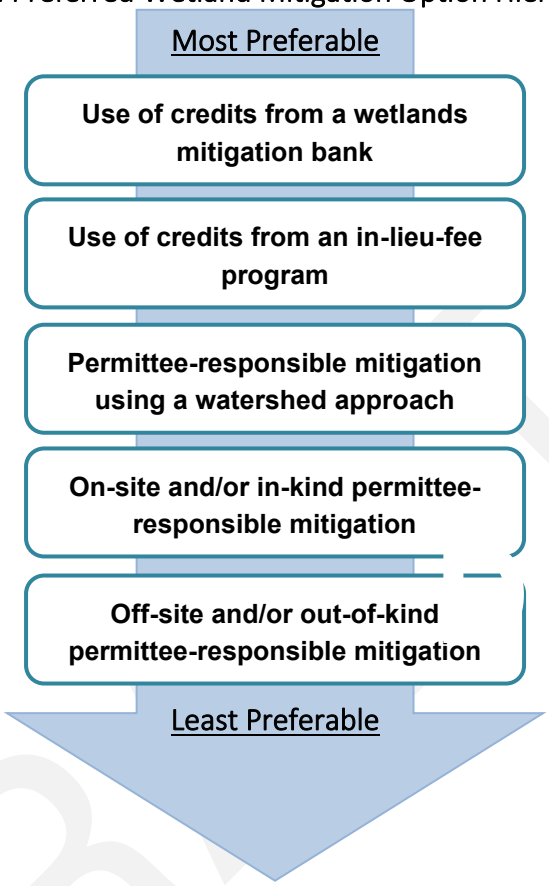


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Figure 4-3: Preferred Wetland Mitigation Option Hierarchy



Five federal agencies, including the FAA and USACE, signed a Memorandum of Agreement (MOA) in July 2003 to facilitate interagency cooperation on aircraft-wildlife strikes related issues, including wetland management at airports. As part of the MOA, the signatory agencies are required to diligently consider the siting criteria recommendations as stated in FAA Advisory Circular (AC) 150/5200-33B, *Hazardous Wildlife Attractants on or Near Airports*.

FAA AC 150/5200-33B recommends separation distances between the AOA and potential wildlife hazards, including proposed wetland mitigation sites. These siting distances are:

- 5,000 feet of a runway that serves piston-powered aircraft
- 10,000 feet of a runway that serves turbine-powered aircraft
- 5 statute miles if the attractant could cause hazardous wildlife movement into or across the approach or departure airspace

The above siting criteria will also be taken into consideration when considering potential wetland mitigation options and site selection.

4.3.3. Surface Waters

The USACE regulates surface waters under Section 10 of the Rivers and Harbors Appropriation Act (RHA) that are considered to be a TNW as defined specifically there within. The USACE also

regulates surface water bodies through Section 404 of the CWA that have a significant nexus to a TNW as defined in Section 10 of the RHA or a TNW as defined Section 404 of the CWA. A significant nexus is generally defined as having more than an insubstantial or speculative effect on the chemical, physical, or biological integrity of a downstream TNW. Surficial open waterbodies, including streams, ponds, and lakes, are delineated by their Ordinary High-Water Mark (OHWM) as defined in Title 33, Code of Federal Regulations, Part 328 (33 CFR 328).

The NYSDEC regulates activities in water bodies that are considered to be “protected streams” or "Navigable Waters of the State" under the Article 15 of the ECL. Waters in New York State are assigned a classification based on their existing or expected best usage. The classification of AA or A is assigned to waters used as a source of drinking water. Classification B indicates a best usage for swimming and other contact recreation, but not for drinking water. Classification C is for waters supporting fisheries. The lowest classification is D. Waters with a classification of A, B, or C may also have a standard of (T) or (TS), indicating the capacity to support trout or trout spawning. Streams and small water bodies located in the course of a stream that are designated as C(T) or higher (i.e., C (T), C(TS), B, or A) are collectively referred to as “protected streams.” “Navigable Waters of the State” are defined as all lakes, rivers, streams and other bodies of water in the state that are navigable in fact or upon which vessels with a capacity or size of more than can be operated notwithstanding interruptions to navigation by artificial structures, shallows, rapids or other obstructions, or by seasonal variations in capacity to support navigation. NYSDEC regulated waters protected under the Article 15 of the ECL are delineated by their Mean High-Water Mark (MHWM) as defined in in Title 6 of the Codes, Rules, and Regulations of the State of New York, Part 608, Use and Protection of Waters (6 NYCRR 608).

Section 401 of the CWA provides states with the authority to ensure that federal agencies do not issue permits or licenses that violate their water quality standards. The NYSDEC implements Section 401 compliance through a certification process called Water Quality Certification (WQC). The NYSDEC has issued blanketed WQC for many of the NWPs, providing certain special conditions are met. Individual WQCs are required from the NYSDEC for USACE LOPs, Standard Permits, and for those NWPs where the NYSDEC as not issued blanketed WQCs, and on projects qualifying for an NWP, but where the blanket WQC special conditions cannot be met.

As previously mentioned, a wetlands and surface waters delineation of Airport owned property was performed by McFarland Johnson over a period of time from the Fall of 2017 to the Spring of 2019. Surface waters identified on Airport property included numerous ephemeral, intermittent and perennial streams. The approximate locations of these identified streams are shown in **Figure 4-2A**, **Figure 4-2B**, and **Figure 4-2C**, Delineated Wetlands and Waterways Maps.

The jurisdictional statuses and regulatory limits for all identified streams will need to be determined by the USACE. However, it is the opinion of McFarland Johnson that majority of the identified streams would likely be considered to have significant nexuses to a TNW and are likely jurisdictional under Section 404 of the CWA.

All the identified streams are considered to have a NYSDEC water classification of C or D, and therefore none are considered protected streams under Article 15 of the ECL. In addition, none of the identified streams are considered navigable by NYSDEC standards, and therefore none are considered "Navigable Waters of the State" under Article 15 of the ECL.

Future proposed projects will take measures in design and construction to avoid, minimize, or mitigate any possible adverse direct impacts to regulated surface water resources to the degree possible. The use of Best Management Practices (BMPs) during construction projects will minimize indirect impacts to regulated surface water resources at the Airport.

4.3.4. Wild and Scenic Rivers

The National Wild and Scenic Rivers Act (Public Law 90-542) provides protection for several of the nation's free-flowing rivers that exhibit exceptional natural, cultural, and recreational values.

New York State's Wild, Scenic and Recreational Rivers Act provides for protection of rivers of the state that possess outstanding scenic, ecological, recreational, historic, and scientific values as defined in Article 15 of the ECL.

There are no state or federally designated wild, scenic, or recreational rivers on or adjacent to Airport property.

4.3.5. Floodplains

Floodplains are low lying land areas typically associated with bodies of water that are likely to become inundated during a flooding event. Floodplains serve an important function in retaining storm waters to protect against downstream flooding, property damage, and potential loss of life.

EO 11988, *Floodplain Management,* directs all federal agencies to avoid the direct and indirect support of floodplain development wherever there is a practicable alternative.

The area or magnitude of a floodplain will vary according to the magnitude of the storm event as determined by the storm interval occurrences. For example, a five-year storm has a magnitude that can be expected once every five years. The Federal Emergency management Agency (FEMA) utilizes a 100-year storm interval for flood preparation. Flooding related to a 100-year storm statistically has a one-percent chance of occurring during any given year. The 100-year period has been selected as having special significance for floodplain management because it is the maximum level of flooding that can reasonably be expected and planned for during a project's expected life span.

According to the most current FEMA Flood Insurance Rate Maps (FIRM), there are no mapped 100-year floodplain areas located on Airport property.

4.4. COASTAL RESOURCES

The federal Coastal Barrier Resources Act provides for review of federally funded projects undertaken within the Coastal Barrier Resources System (CBRS). The CBRS contains undeveloped coastal barriers along the coasts of the Atlantic Ocean, the Gulf of Mexico, and the Great Lakes.

The Coastal Zone Management Act is a federal program that provides for management and protection of all of the nation's ocean and Great Lakes coasts. In New York State the management authority has been delegated to the NY Department of State (NYDOS). New York's Coastal Management Program is implemented under Executive Law Article 42, Waterfront Revitalization of Coastal Areas and Inland Waterways. The NYDOS is tasked with establishing a coastal program,

develop coastal policies, define the coastal boundaries, and establish state consistency requirements. Executive Law Article 42 also provides for additional protection of certain inland waterways in communities who have adopted local waterfront revitalization programs. All federal actions must undergo consistency reviews to ensure they comply with the New York's Coastal Management Program.

The Airport is not located within a CBRS or Coastal Zone Management Area. As a result, Coastal Zone Management Act and Coastal Barrier Resources Act will not apply to any proposed improvements at the Airport.

4.5. DEPARTMENT OF TRANSPORTATION SECTION 4(F) RESOURCES

Section 4(f) of the Department of Transportation Act of 1966 protects publicly owned parks, recreation areas, wildlife and waterfowl refuges, and historic sites of national, state, or local significance from development unless there are no feasible alternatives.

There are no publicly owned parks, recreation areas, or wildlife and waterfowl refuges on or immediately adjacent to Airport property.

An impact to historic sites of national, state, or local significance on or near the Airport may be considered a use under Section 4(f). The State Historic preservation office (SHPO) receives new data on a continual basis, any future proposed projects at BGM will require new consultations to evaluate potential impacts to avoid historic or cultural resources.

When a specific airport development is proposed, the required documentation, including detailed descriptions and pictures of structures to be affected, will be sent to SHPO for a determination of that project's potential effect on historic resources or other resources protected under Section 4(f) as part of future studies to comply with NEPA.

4.6. HISTORIC, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

According to 36 CFR Part 800, a historic property is "any prehistoric or historic district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places (NHRP)". Section 106 of The National Historic Preservation Act (NHPA) requires that federal agencies, such as the FAA, consider the effects of their actions on historic properties via consultation with SHPO.

These consultations identify historic or cultural resources they may be impacted by a specific project. As previously mentioned, SHPO receives new data on a continual basis, any future proposed projects at BGM will require new consultations to evaluate potential impacts to avoid historic or cultural resources.

When a specific airport development is proposed, the required documentation, including detailed descriptions and pictures of structures to be affected, will be sent to SHPO for a determination of that project's potential effect on historic or cultural resources as part of future studies to comply with NEPA.

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4.7. FARMLANDS

The Farmland Protection Policy Act (FPPA), 7 CFR Part 658, requires federal agencies to consider project alternatives that will minimize unnecessary and irreversible conversion of farmland to nonagricultural uses. For the purposes of the FPPA, farmland refers to soils classified as prime farmland, unique farmland, and farmland of statewide or local importance.

According to the U.S. Natural Resource Conservation Service (NRCS) *Web Soil Survey,* accessed on November 1, 2019, approximately 66.1 percent (722.3 acres) of Airport property is classified as Farmland of Statewide Importance. The remaining soils on Airport property are identified as not prime farmland.

The FPPA does not apply to lands already committed to "urban development or water storage" (i.e. airport developed areas). Current Airport property has already been previously committed to urban development or current airport utilization and development, has been subject to FPPA review, and would not be subject to the FPPA regulations. Any future land acquisitions would be subject to FPPA regulations and will be evaluated as part of th[illegible]

4.8. LAND USE

When considering improvement projects that meet an airport's development goals, it is important early in the planning process to identify potential impacts to existing land uses on airport property and in the surrounding area and to determine how potential airport projects will affect future land use and development patterns. This will enable the project to incorporate measures into the future design and layout of airport developments that will avoid or minimize land use conflicts as well as improve on existing conflicts when practicable.

Some land uses that are considered more susceptible to impacts from airport development include, but are not limited to, residential areas, public schools, religious institutions, hospitals, and certain public places such as parks, recreational areas, and cemeteries, where quiet is an expected part of the user experience.

The area surrounding the Airport is mostly consists predominately of undeveloped lands with scattered residential and commercial land uses.

There are currently no parks, public schools, religious institutions, hospitals, or cemeteries located adjacent the Airport. However, there are adjacent residential properties located in the vicinity of the Airport that may be considered noise sensitive.

Alternatively, there are some land uses that can negatively impact the operation of the Airport and are considered incompatible with Airport activity. These land uses can include park and recreational areas, golf courses, landfills, open water areas, and other land uses that have the potential to serve as wildlife attractants, and commercial and industrial facilities that generate high-voltage electricity, utilize bright lights, or create a significant amount of glare, smoke, or steam.

FAA AC 150/5200-33B, *Hazardous Wildlife Attractants on or Near Airports*, provides guidance on certain land uses that have the potential to attract hazardous wildlife on or near airports. Potential wildlife attractants and congregation areas can include areas such as shopping malls, agricultural fields,

livestock operations, golf courses, parks, waste handling facilities, waterbodies, wetlands, and water management facilities.

As future improvements are considered as part of this MPU, the presence of incompatible land uses within the vicinity of the Airport will be considered as part of the NEPA documentation process.

4.9. NOISE AND NOISE-COMPATIBLE LAND USE

Aircraft noise emissions, inherent to the operation of an airport, can adversely impact land use compatibility between an airport and surrounding properties, particularly in the presence of noise-sensitive receptors. Churches, hospitals, schools, amphitheaters, and residential districts are receptors that are sensitive to elevated noise levels. Recreational areas and some commercial uses are moderately sensitive to elevated noise levels. Therefore, it is important to predict any change in noise levels associated with airport development, to determine the significance, if any, of the impact to noise sensitive land-uses. Then, abatement measures can be incorporated into airport development plans to avoid or minimize the impacts.

In order to evaluate the noise impacts of aviation activity on surrounding areas, the FAA has developed the Aviation Environmental Design Tool (AEDT), Version 3C. The noise modeling component within AEDT identifies locations that are exposed to specific levels of aircraft-generated noise and is based on algorithms which use aircraft specific data to estimate noise accounting for specific operation mode, thrust setting, and source-receiver geometry, acoustic directivity and other environmental factors. Inputs into AEDT can include aviation activity forecasts and runway configurations for various scenarios, as well as terrain and weather information. This computer model calculates cumulative aircraft noise at ground level expressed in decibels (dB), using the Day-Night Average Level (DNL). The DNL is the yearly day-night average sound level. All operations that occur between 10:00 pm and 6:59 am, also known as nighttime operations, incur an additional 10 dB weight within the model. Decibels are measured in A-weighted units, which approximate the range of human hearing. The FAA considers the 65 dB DNL level to be the threshold of impact for noise-sensitive areas. In order to help put the 65 dB DNL into perspective, the typical ambient noise level in suburban residential areas is 55 dB DNL. Table 4-2 shows the typical noise levels associated with specific areas commonly encountered every day. Table 4-3 presents the day-night average noise levels (DNL, dB), that are used by the FAA to evaluate land use compatibility with respect to airports.

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Table 4-2: Typical Outdoor Day-Night Noise Levels

DNL Day-Night Noise Level (dB)	Location
50 dB	Small town residential area or quiet suburban area
55 dB	Suburban residential area
60 dB	Urban residential
65 dB	Noisy urban residential area
70 dB	Very noisy urban residential area
80 dB	City noise (downtown of a major metropolitan area)
80 dB	3rd floor apartment in a major city next to a freeway

Source: Noise Fundamentals Training Document, Highway Noise Fundamentals, U.S. Department of Transportation, Federal Highway Administration

A review of aerial photography, along with land use maps of the area, indicates that much of the land surrounding the Airport would not be considered noise sensitive as much of the land are vacant, categorized as agricultural land use, or are developed with commercial uses. There are several noise sensitive land uses, predominately scattered residential land uses, along Booth Road, Kolb Road, Brigham Road, Flint Road, and Airport Road in the vicinity of the Airport.

A noise analysis will be completed as part of the Land Use Plan included in the Airport Layout Plan (ALP) set. This analysis will include the forecasted number of future operations and will utilize a fleet mix anticipated to occur at the Airport, as well as account for the final infrastructure improvements recommended as part of this MPU. The Land Use Plan will identify land uses of adjacent properties and the noise contours generated will be utilized to identify any potential impacts associated with the proposed development.

4.10. VISUAL EFFECTS

A visual effect refers to the potential effects due to light emissions, as well as the potential effects to visual resources and character.

4.10.1. Light Emissions

Airport improvements may include the installation of additional lighting or change the location of lighting on airport property to accommodate the construction of the infrastructure improvements. These installations can alter the existing lighting conditions both on-airport and in the vicinity of an airport. Light emissions are typically one of the greatest concerns for residents in neighborhoods, as well as users of other incompatible land uses, adjacent to an airport that could be directly impacted by a change in lighting.

Further analysis will be required during the NEPA evaluation process to ensure that potential light emission effects of Airport development projects do not significantly negatively affect adjacent landowners.

Table 4-3: Land Use Compatibility

Land Use	Yearly Day-Night Average Noise Level (DNL, dB)		
	Compatible Below 65	Compatible Between 65 and 70	Compatible Between 70 and 75
Residential	YES	NO*	NO*
Mobile Home Parks	YES	NO	NO
Transient Lodgings	YES	NO*	NO*
Schools	YES	NO*	NO*
Hospitals/Nursing Homes	YES	YES*	YES*
Churches/Auditoriums	YES	YES*	YES*
Governmental Services	YES	YES	YES*
Transportation/Parking	YES	YES*	YES*
Offices/Business/Professional	YES	YES	YES*
Wholesale and Retail	YES	YES	YES*
Utilities	YES	YES	YES*
Communications	YES	YES	YES*
Manufacturing	YES	YES	YES*
Photographic/Optical	YES	YES	YES*
Agriculture and Forestry	YES	YES*	YES*
Livestock Farming	YES	YES*	YES*
Mining/Fishing	YES	YES	YES
Outdoor Sports Arenas	YES	YES*	YES*
Outdoor Music Shells	YES	NO	NO
Nature Exhibits/Zoos	YES	YES	NO
Amusements/Parks/Camps	YES	YES	YES
Golf Courses/Stables	YES	YES	YES*

Source: 14 CFR 150, Airport Noise Compatibility Planning

**Measures must be incorporated into the design of the structure or use that will allow this activity to continue at the indicated noise exposure level*

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4.10.2. Visual Resources and Character

The Airport is located within an area of undeveloped land, light commercial land uses, and residential development. There are no buildings, sites, traditional cultural properties, or other natural or manmade landscape features that are visually important or have unique characteristics in the vicinity of the Airport. Any potential development at the Airport would be in character with the existing surrounding area land uses and would not negatively affect the visual character of the surrounding area.

4.11. AIR QUALITY

An increase in vehicle exhaust emissions, caused by development related increases in aircraft activity and automobile traffic, may affect air quality. However, the air quality impact attributable to potential development is expected to be negligible at the Airport.

Under Section 176(c) of the Clean Air Act (CAA) Amendments of 1977, the FAA is responsible for ensuring that federal airport actions conform to the State Implementation Plan (SIP), which protects against regional air pollution impacts. The criteria and procedures for implementing this conformity are detailed in Title 40 CFR, Part 93, *Determining Conformity of Federal Actions to State or Federal Implementation Plans.* Many federal actions on an airport are considered to be general conformity actions. Presently, the general conformity rules only apply in areas that have been determined by the United States EPA to be in nonattainment or maintenance for the CAA's National Ambient Air Quality Standards (NAAQS) of the six priority pollutants (ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, and lead). Under NEPA, the FAA may be required to prepare detailed air quality analysis for proposed projects whose air quality emissions have the potential to cause violations of the NAAQS or the six criteria pollutants.

The EPA does not currently list Broome County as an area of nonattainment or maintenance for NAAQS. Most Airport projects will not cause or create a reasonably foreseeable emission increase, which can be sufficiently documented and disclosed through a qualitative air quality assessment to satisfy the requirements of the CAA and NEPA. If large scale projects are proposed that may create an increase in emissions, a full emissions inventory will be required.

4.12. HAZARDOUS MATERIALS, SOLID WASTE, AND POLLUTION PREVENTION

4.12.1. Hazardous Waste

A Hazardous Waste/Contaminated Material (HWCM) desktop screening was conducted to determine the potential for the presence of HWCM on or within ¼ mile of Airport property. The screening involved the review of online governmental databases and the Environmental Radius Database Report (ERDR) provided by National Environmental Title Research, LLC (NETR) through their Online Environmental Database Network. An environmental regulatory agency records review of this nature is based on publicly available information from state and federal agencies.

Review of the USEPA Envirofacts Database or NYSDEC Remedial Site Database did not indicate the potential for the release of chemical, hazardous, or petroleum materials at or in the immediate vicinity of the Airport. The ERDR indicated eight NYSDEC spill files associated with Airport property. Subsequent review of the NYSDEC Spills Database indicates that in addition to the eight spill files identified in the ERDR report, and additional 14 spill files are associated with the Airport property. The NYSDEC Spills Database indicates that all 22 spill files associated with the Airport property have been closed. According to the NYSDEC, closed spill files can be because either; a) the records and data submitted indicate that the necessary cleanup and removal actions have been completed and no further remedial activities are necessary, or b) the case was closed for administrative reasons (e.g., multiple reports of a single spill consolidated into a single spill number). The NYSDEC however reserves the right to require additional remedial work in relation to the spill, if in the future it determines that further action is necessary.

It is possible that there were incidents on or near the Airport property involving chemical, hazardous, or petroleum related materials that were not reported. If previously unidentified chemical, hazardous, or petroleum related wastes are encountered during the construction of any future proposed projects, direct consultation will occur with the NYSDEC and the wastes will be handled and disposed of in accordance with all applicable federal, state, and local regulations.

4.12.2. Solid Waste

Currently, Airport generated municipal solid waste is transported approximately 0.7 miles north to the Broome County Sanitary Landfill (BCSL), a NYSDEC Part 360, and USEPA and RCRA Subtitle D landfill. According to the Broome County Draft Solid Waste Management Plan Update dated February 2010, the BCSL is a County owned and operated landfill and has been in operation since 1969. The landfill is currently the primary disposal site for the County's solid waste. The landfill is located in the Towns of Nanticoke, Barker, and Maine and occupies an area of approximately 1,300 acres.

According to the NYSDEC, the BCSL is permitted to accep[illegible] to [illegible]000 [illegible]ons [illegible]of residential/institutional and commercial municipal solid [illegible]ast[illegible]), c[illegible]nst[illegible]on and demolition debris, asbestos (friable), petroleum contaminated [illegible]s. As [illegible]D[illegible]e [illegible]be[illegible] 2[illegible]15, the CSL had an estimated remaining capacity of 9,712,275 tons.

Based the permitted annual intake limit, the anticipated life span of the landfill is approximately 39.9 years, while based on the 2015 intake (186,426 tons), the estimated life span of the landfill is approximately 50.1 years. Based on the permitted landfill capacity and estimated landfill life span, adequate space for the disposal of solid waste attributable to any Airport development is available.

Further however, airports generate various types of solid waste that could be reduced, reused, or recycled. Increased recycling and the reduction in the amount of solid waste produced is an important consideration when exploring future growth at an airport. Presently, the Airport does provide several recycling bins in the commercial passenger terminal and throughout other Airport buildings. However, the recycling containers within the terminal are generally located within offices, with only three located on the first floor within areas typically accessed by passengers.

Although a waste audit was not prepared for this study, the 2016 *Sustainable Management Plan* was reviewed and referenced. It is most likely that the type of recyclable waste generated at the Airport is similar to that which would be generated in a residential community and in volumes that would not be excessive or put undue burden on the Broome County Landfill. However, a number of recommendations were included within the 2016 *Sustainable Management Plan* related to waste management, which include:

- Establish a Formal Waste Management & Recycling Program
    - Establish a formalized program with procedures and protocols for Airport staff. Include monitoring/measurement forms for use by Airport staff. Include calculation of baseline measurement of trash and recycling volumes generated by the Airport that can be monitored and measured over time.
- Identify Airport Staff Person as Waste Management & Recycling Program Lead
    - Ensure commitment of/engagement with Airport staff to reach performance targets. Collaborate as liaison with all Airport tenants.

- Consider Centralized Recycling Tracking for All On-Airport Tenants
    - Encourage and/or incentivize non-terminal (general aviation and other) Airport tenants to participate in coordinated recycling monitoring, measurement, and tracking programs.
- Expanded Recycling Education Efforts
    - Educate passengers, employees, contractors, and tenants via posted placards and regular (i.e. quarterly) diversion reporting to encourage participation.
- Initiate Contractor Recycling Monitoring & Reporting
    - Encourage contractors to monitor and report materials diverted from the landfill. Establish procedures and requirements to be included and followed and incorporate into the Waste Management & Recycling Program.

4.12.3. Pollution Prevention

The Clean Water Act authorizes the EPA and states, which are delegated the authority by EPA, to regulate point sources that discharge pollutants into waters of the United States through the National Pollutant Discharge Elimination System (NPDES) permit program. So-called "point sources" are generated from a variety of municipal and industrial operations including treated wastewater, process water, cooling water, and stormwater runoff from drainage systems. In New York, the NPDES program is delegated to NYSDEC. See Section 4.12.4 for further information specific to stormwater discharges.

The Airport maintains six aboveground petroleum storage tanks in accordance with NYSDEC petroleum Bulk Storage Regulations (6NYCRR Part 613). Regular inspections are performed by the Airport to ensure compliance with 6 NYCRR Part 613. The regular inspections and compliance with 6 NYCRR Parts 612-614 minimizes potential risks of accidental spills.

Pollution may also arise during construction activities. Construction activities may produce temporary environmental impacts such as dust, soil erosion, and negative effects on water quality. Potential pollution sources during construction can be effectively mitigated through the incorporation of appropriate erosion and sediment control, stormwater management, and fuel/ chemical storage and handling best management practices during design and construction of the project.

4.12.4. Stormwater

Airport development projects may potentially affect surface and groundwater quality. The implementation of stormwater management measures, designed to avoid or minimize the impacts to water quality during a project's construction and operation phase, is required for many types of development projects. The specific stormwater management measures required are dependent upon the magnitude of the impact.

Turbidity is the water quality parameter that is of the greatest concern during the construction period. NYSDEC regulations do not allow an increase in the visible turbidity of water when compared to preconstruction conditions. If one or more acres of land are disturbed during construction, a State Pollutant Discharge Elimination System (SPDES) General Permit for Construction Activities, issued by the NYSDEC, is required. During the construction period, erosion and sediment control measures would be implemented, as prescribed in a Stormwater Pollution

Prevention Plan (SWPPP), to avoid or minimize impacts to water quality. As part of the SWPPP, all SPDES permit sites must develop an Erosion and Sediment Control Plan (ESCP) to control stormwater discharge during the construction phase.

The ESCP consists of temporary and permanent BMPs intended to reduce erosion, control siltation and sedimentation, and ensure that sediment-laden water does not leave the site. As each proposed project is progressed to the final design phase, an ESCP will be developed for implementation during construction to address water quality concerns and avoid significant impacts on water quality. The plans will incorporate acceptable BMPs, which will serve to protect the water quality of wetlands and other bodies of water in the area.

If the ground disturbance is greater than five acres, a full SWPPP including a Water Quality and Quantity Control plan must be implemented for the project. The Water Quality and Quantity Control portion of the SWPPP consists of permanent BMPs intended to enhance water quality and provide water quantity control through peak flow attenuation. To meet the goal of no net increase in peak stormwater runoff from pre-project conditions, BMPs must compensate for the increase in runoff resulting from additional impervious surfaces.

The full SWPPP would be implemented during construction and properly maintained thereafter. This would ensure that water quality standards are met. The increase in runoff resulting from the expansion or creation of impervious surfaces during development would be mitigated by the SWPPP. Any proposed BMPs would be designed to accommodate an increase in stormwater volume. BMPs designed to accommodate an increase in quantity of runoff, generally meet water quality objectives by default. The SWPPP will comply with FAA Order 150/5200-33B, *Hazardous Wildlife Attractants on or Near Airports.*

4.13. ENERGY SUPPLIES AND NATURAL RESOURCES

Use of energy supplies and natural resources is closely linked to construction of airport improvements and operations. Anticipated growth and development at the Airport are likely to increase the use of energy and natural resources. However, energy and natural resources are relatively abundant in Southern Tier of New York State and planned growth at the Airport is not of sufficient magnitude to alter regional energy demand or limit natural resource availability.

Each proposed project, including those that will lead to an increase in aircraft operations, will be evaluated for the potential effect upon these resources and methods to reduce potential energy uses will be developed and considered during the review process.

4.14. CLIMATE

Climate change is a global phenomenon that has been attributed to increasing concentrations of greenhouse gases (GHGs) in the atmosphere. GHGs include carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6).

Under EO 13693, *Planning for Federal Sustainability*, federal agencies must make efforts to measure, report, and reduce their GHGs emissions from direct and indirect activities.

The FAA has not identified a significance threshold for GHG emissions as there is no current accepted method of determining the level of significance applicable to airport projects given the

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small percentage of emissions they contribute. Any increase in emissions of GHGs as the result of a proposed action at the Airport would be considered negligible in comparison with U.S. annual emissions and therefore would not have a significant impact on global climate change.

4.15. SOCIOECONOMICS, ENVIRONMENTAL JUSTICE, AND CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISKS

Under the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR Part 1502.1), federal agencies are required to consider the effects to the area population's health, safety risks to children, and socioeconomic impacts. Under 40 CFR 1508.14, the CEQ requires that the human environment be considered for federal projects to address the relationship of people with their natural and physical environments.

4.15.1. Socioeconomics

Principal impacts to be considered include the displacement of families or businesses, effects to neighborhood characteristics, dividing or disrupting established communities, changing ground transportation patterns, disruption of orderly planned community development or creating measurable changes in employment. If land acquisition were necessary for proposed Airport development alternatives, it would be accomplished in accordance with 49 CFR Part 24, *Uniform Relocation Assistance and Real Property Acquisition Policies Act* (Uniform Act), and FAA AC 150/5100-17, *Land Acquisition and Relocation Assistance for Airport Improvement Program Assisted Projects*. The Uniform Act standardizes real property acquisition policies and requires the uniform and equitable treatment of persons relocated due to a federally assisted project.

Proposed projects will be evaluated for the potential effects to the community economy, social structure, and necessary community health and safety services as specific alternatives are developed during the design process.

4.15.2. Environmental Justice

EO 12898 - *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,* directs federal agencies to consider the potential effects of federal actions, including those involving federally obligated airports, to cause a disproportionate and adverse effect upon low-income or minority populations.

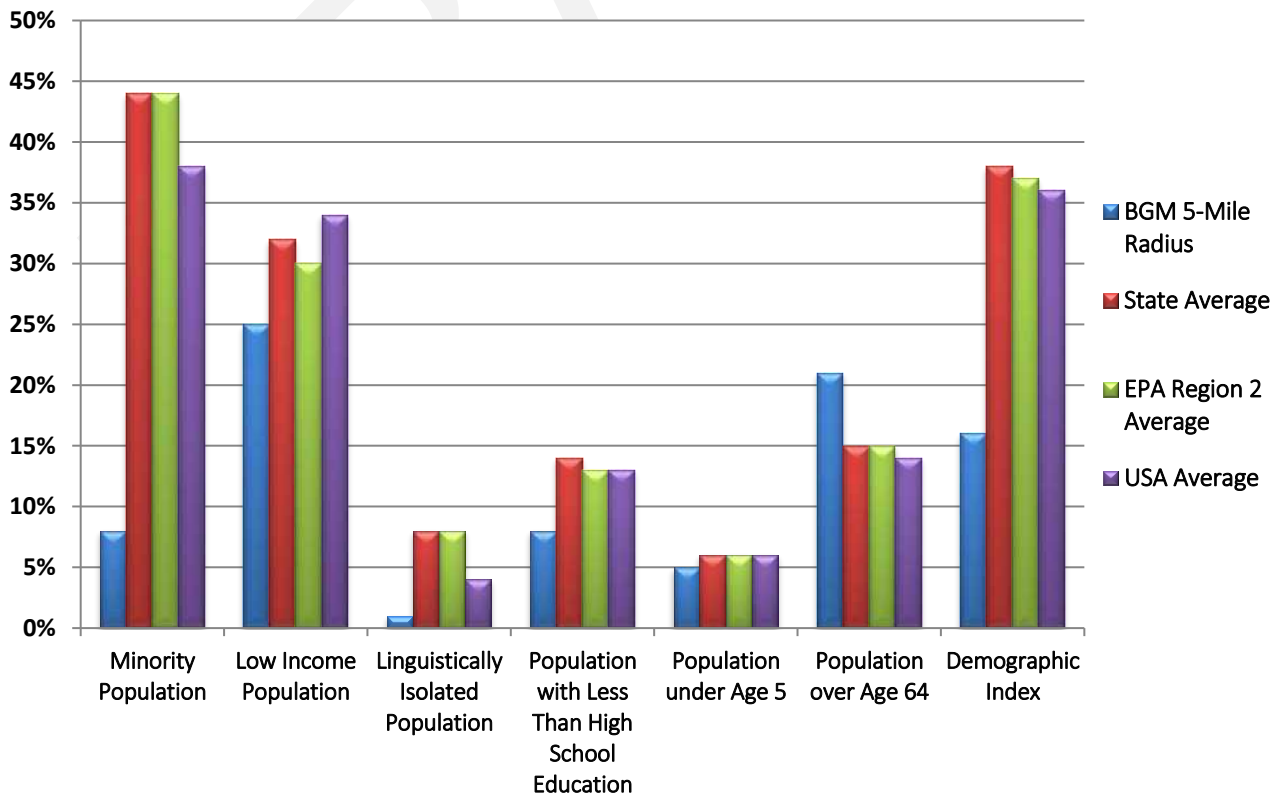
An environmental justice (EJ) screening of the area within a 5-mile radius centered on the Airport was conducted using the EPA's EJ mapping and screening tool EJSCREEN. EJSCREEN evaluates seven select demographic indicators calculated from the Census Bureau's American Community Survey 2008-2012. These demographic indicators include:

- Percent Minority - Percent minority as a fraction of population, where minority is defined as all but Non-Hispanic White Alone.
- Percent Low-income - Percent of individuals whose ratio of household income to poverty level in the past 12 months was less than 2 (as a fraction of individuals for whom ratio was determined).
- Percent Less Than High School Education - Percent of individuals age 25 and over with less than high school degree.

- **Percent in Linguistic Isolation -** Percent of households in which no one age 14 and over speaks English "very well" or speaks English only (as a fraction of households).
- **Percent Over Age 64 -** Percent of individuals over age 64 as a fraction of the population.
- **Percent Under Age 5 -** Percent of individuals under age 5 as a fraction of population.
- **Demographic Index -** The Demographic Index in EJSCREEN is a combination of percent low-income and percent minority, the two demographic factors that were explicitly named in EO 12898 on EJ. For each census block group, these two numbers are simply averaged together. The formula is as follows: Demographic Index = (percent minority + percent low-income) / 2.

Review of the EJSCREEN data indicates the area within a 5-mile radius of the Airport has lower percentages of minority population, low income population, linguistically isolated population, population with less than high school education, and population under age 5 compared to EPA Region 2, State, and United States of America (USA) averages. The exception is that the area within a 5-mile radius of the Airport has a higher population over 64 percentage in comparison to EPA Region 2, State, and USA averages. The lower minority population and low-income population percentages have a positive correlation with the demographic index which is also much lower than EPA Region 2, State, and USA averages. A graphical presentation of the comparison of the data of the area from within a 5-mile radius of the Airport to EPA Region 2, State, and USA data is shown in **Figure 4-4**, Demographic Profile Comparison Graph.

Figure 4-4: Demographic Profile Comparison Graph



Source: EPA EJSCREEN, Accessed January 15, 2019

The NYSDEC has mapped potentially environmental justice areas for Broome County based on the presence of minority or low-income communities per the 2000 U.S. Census data and pursuant to NYSDEC Commissioner Policy 29. Review of the NYSDEC Potential Environmental Justice Areas Mapping for Broome County indicated that nearest potential environmental justice area is located greater than 8 miles from Airport owned property.

Based on the aforementioned information, Airport development is not likely to result in a disproportionately high and adverse human health or environmental effect to children, low income or minority populations. Further analysis will be required during the NEPA evaluation process to ensure that Airport development projects do not significantly adversely affect elderly populations in the vicinity of the Airport.

4.15.3. Children's Environmental Health and Safety Risks

Pursuant to EO 13045 - *Protection of Children from Environmental Health Risks and Safety Risks*, federal agencies are directed to make identification and assessment of environmental health and safety risks that may disproportionately affect children a h[illegible]ri[illegible], Fed[illegible]al [illegible] are encouraged to ensure that their policies, programs, and acti[illegible]ties ac[illegible]s ar[illegible]isp[illegible]rtic[illegible]ate risks children may incur from environmental health and saf[illegible]sk Th[illegible]s risk[illegible]e gene[illegible]ally attributable to products or substances that a child is likely to come in contact with or ingest, such as air, food, drinking water, recreational waters, soil, or products they might use or to which they may be exposed.

The Airport development alternatives under consideration will not disproportionately affect children or products and substances they are likely to come in contact with.

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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:

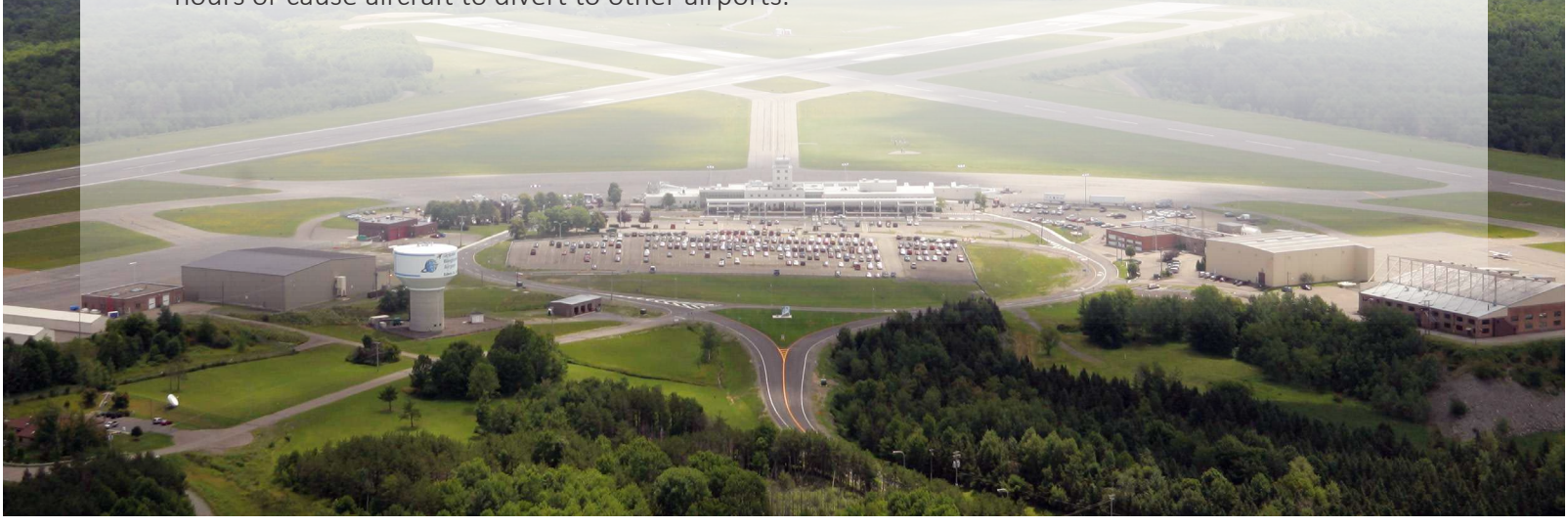
- Airfield Capacity Analysis
- Airside Facility Requirements
- Passenger Terminal Facility Requirements
- Parking and Roadway Access Facility Requirements
- General Aviation and Landside Facility Requirements
- Utilities and Support Facilities
- Facility Requirements Summary

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.

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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 p nt f gle gin n exit in wet conditions, and 100 percent can exit under dry co diti s Th sar e er tage 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%	1%

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.

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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 Cumula ve 'til .au n Pr ent ge

Exit Taxiway	Distance from Displaced Threshold to Exit	Wet Runways			Dry Runways		
		Right and Acute Angle Exits			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			Dry Runways		
		Right and Acute Angle Exits			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	8	100	10	1 0

A – small, single engine (<12,500 pounds); B – small, twin engine (<12,5 0 p un s); C – l 12 00 pour s 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			Dry Runways		
		Right and Acute Angle Exits			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 10 Approach End Exit Taxiway Cumulative Utilization Percentage

Exit Taxiway	Distance from Displaced Threshold to Exit (Feet)	Wet Runways			Dry Runways		
		Right and Acute Angle Exits			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.

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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 airfield system in one hour under VFR or IFR conditions, respectively. The hourly capacity assessment 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: Annual Operations Forecast

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	0

Source: McFarland Johnson analysis, 2018.

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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 (7,304 feet long), 10-28 (5,001 feet long), and Heliport H1 (98’ by 118’). Runway length charts and calculations are included in Appendix F.

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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 7,304-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 r nwa /l ngt ide i fie is incre sed by 15 percent, or up to 5,500 feet at 60 percent useful load, nd ,0 0 fe t 0 p rcent u eful 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 7,304-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 7,304-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

Table 5-8: Runway Wind Coverage Analysis

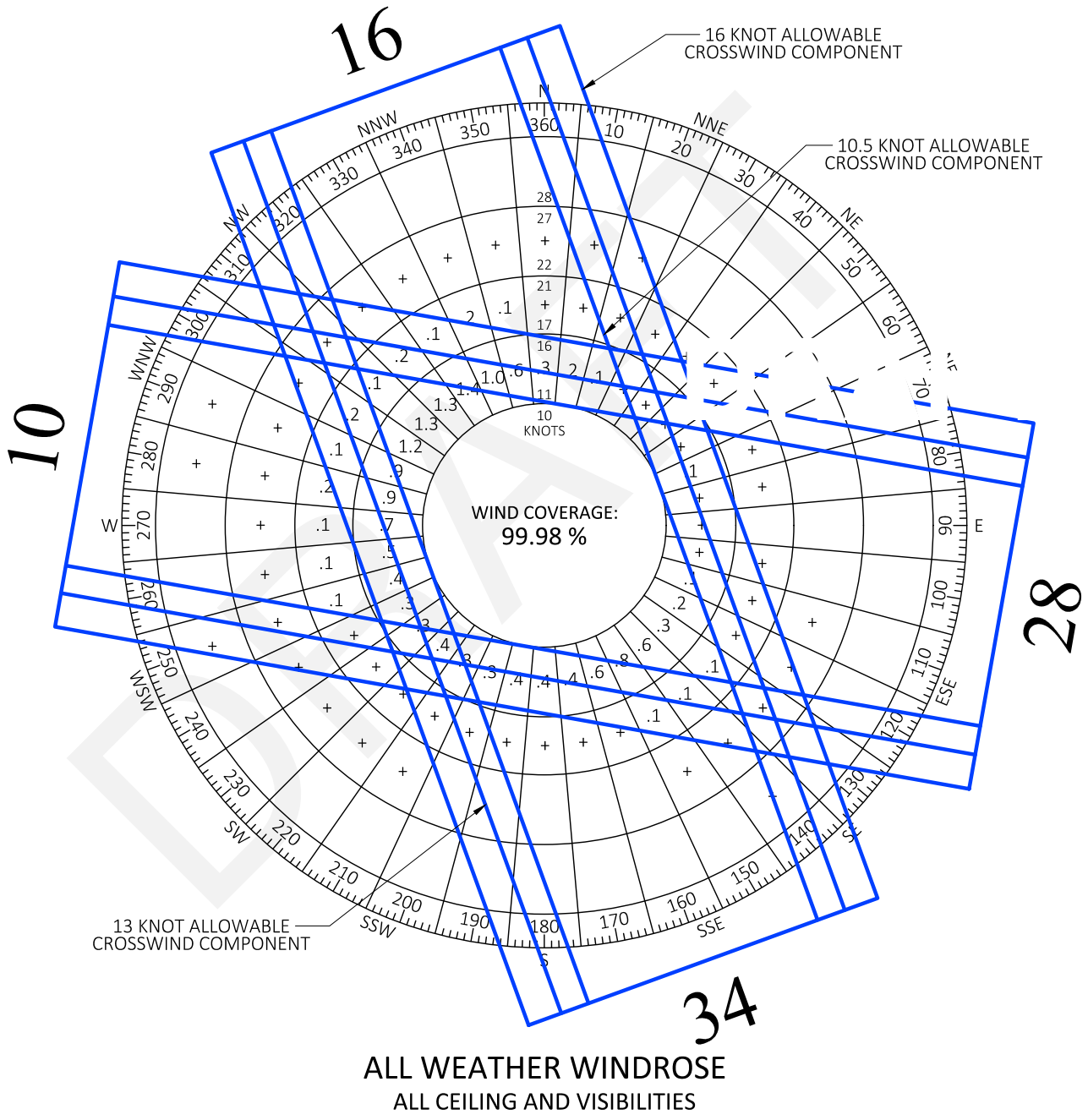
Runway	All Weather Wind Coverage[1]			IFR Wind Coverage[2]		
	10.5 Knot	13 Knot	16 Knot	10.5 Knot	13 Knot	16 Knot
Runway	94.80%	97.43%	99.36%	95.33%	97.78%	99.36%
Runway 16	48.43%	49.29%	49.095%	48.99%	49.57%	49.96%
Runway 34	53.45%	55.23%	56.52%	53.09%	54.96%	56.16%
Runway	92.96%	96.90%	99.47%	92.09%	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.

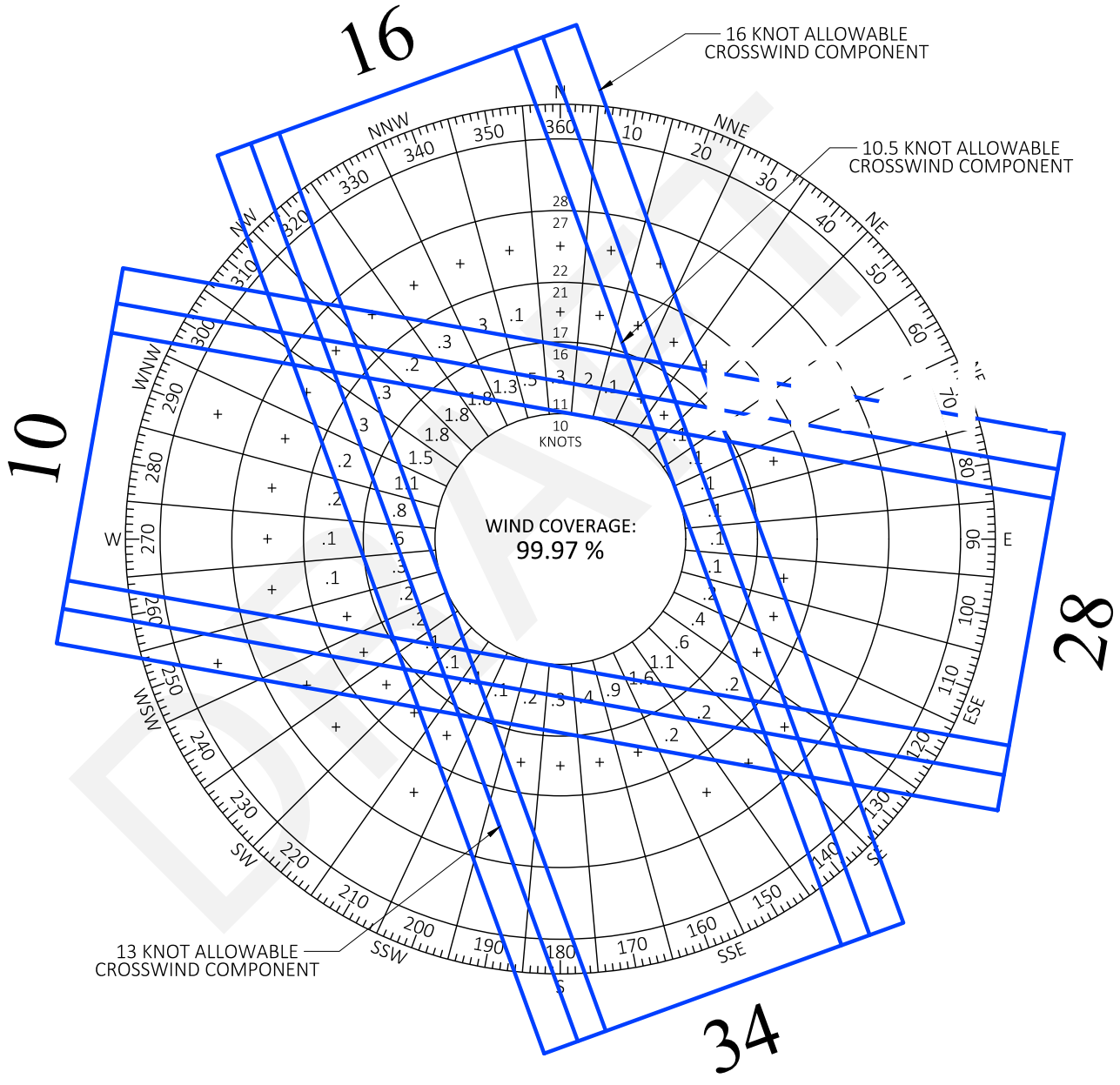
Figure 5-1: All Weather Wind Rose



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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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.

5.2.6. 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 and dry 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 (EMAS) 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.

The Runway 34 Departure End EMAS is approximately 315 feet long and 161 feet wide. It has been designed to stop an Embraer 145 at 70 knots. It is set back approximately 480 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. An October 2020 FAA Airport certification inspection revealed the Runway 34 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.

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 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.

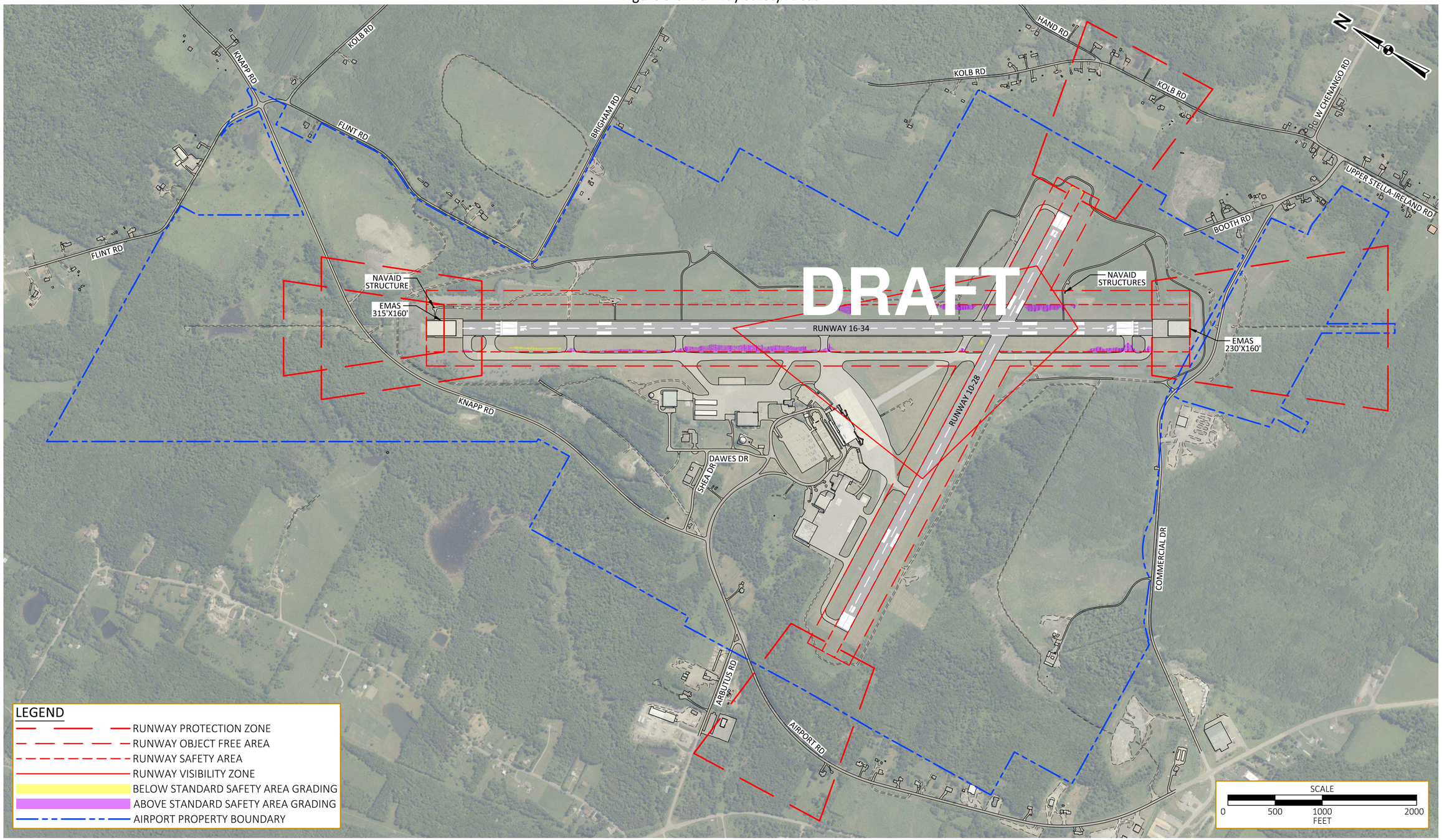
Table 5-9: Declared Distances

Runway	16/34	10/28
Takeoff Run Available (TORA)	7,304 / 7,304	5,001 / 5,001
Takeoff Distance Available (TODA)	7,304 / 7,304	5,001 / 5,001
Accelerate-stop Distance Available (ASDA)	7,304 / 7,304	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

Figure 5-3: Runway Safety Areas

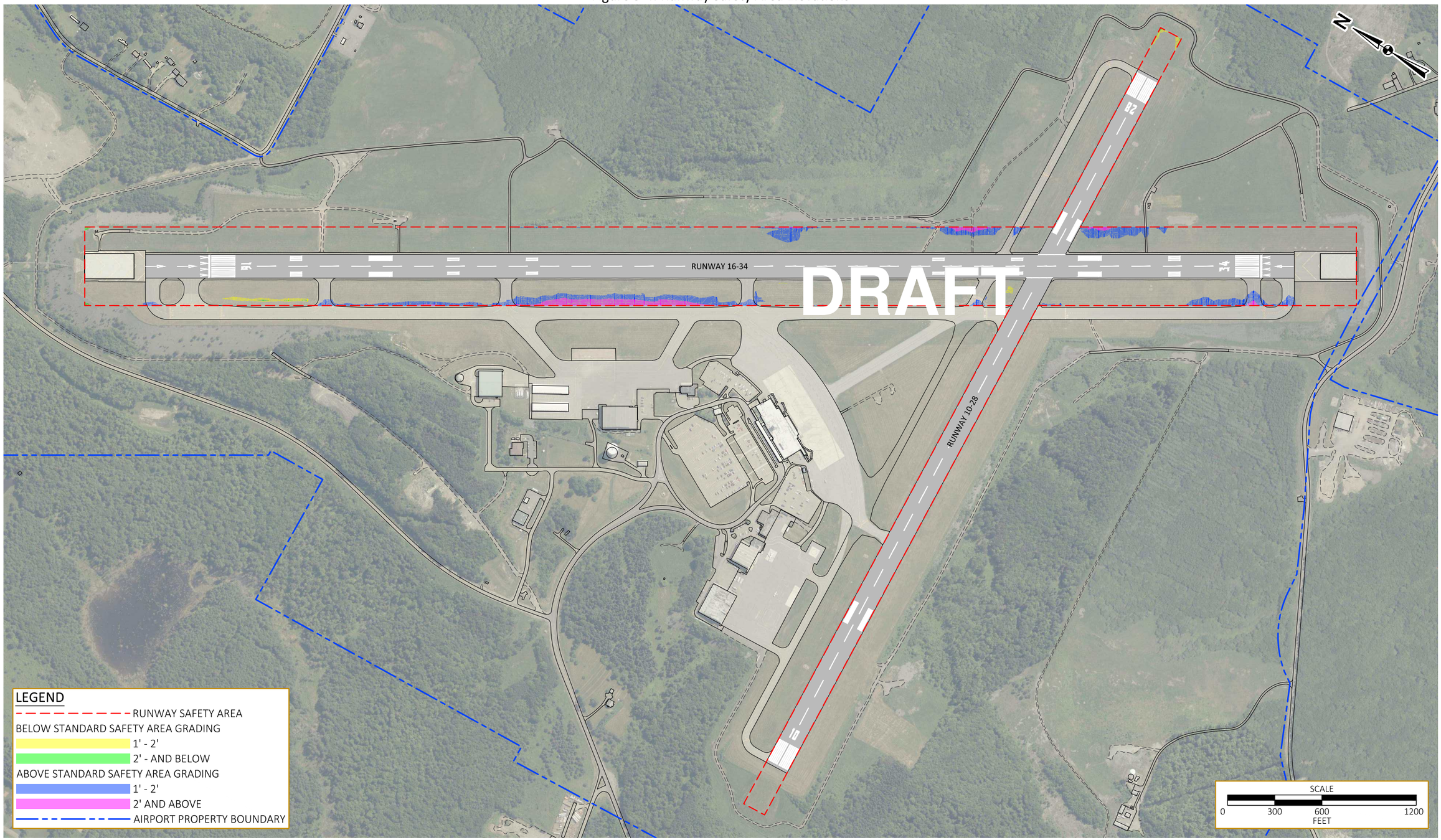


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Figure 5-4: Runway Safety Area Elevations

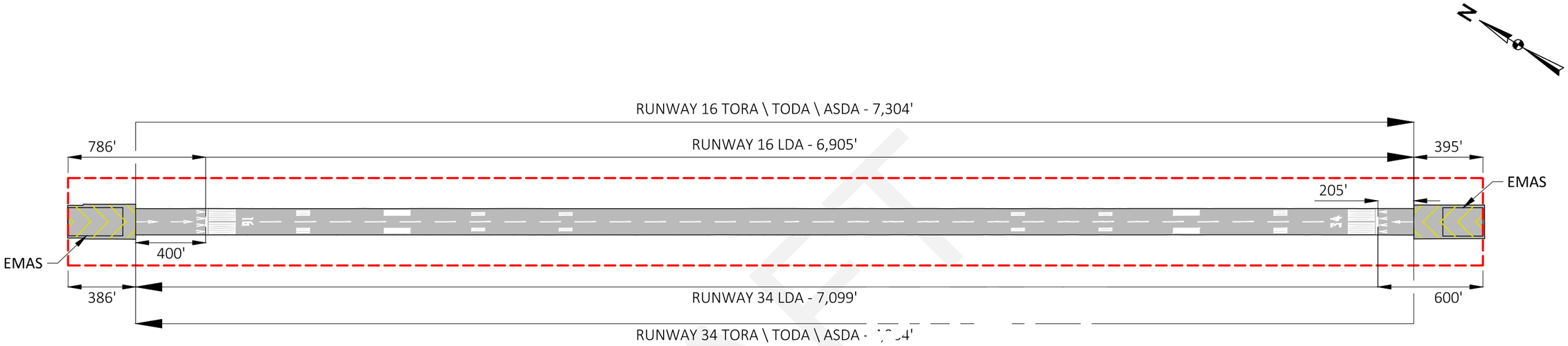


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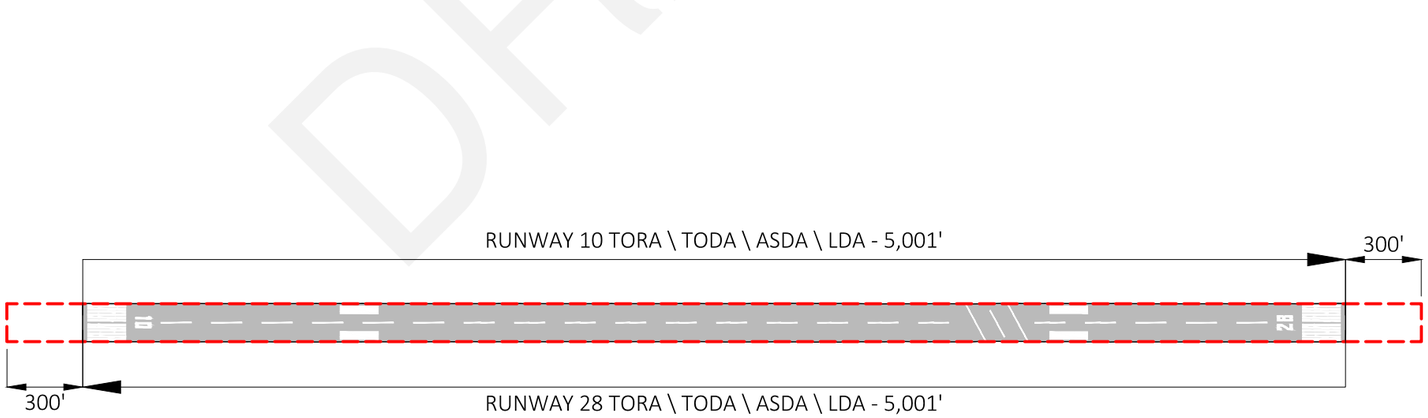
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Figure 5-5: Declared Distances



RUNWAY 16-34



RUNWAY 10-28

SCALE
0 300 600 1200
FEET

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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.

5.2.7. 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 ADG 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.

5.2.8. 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.

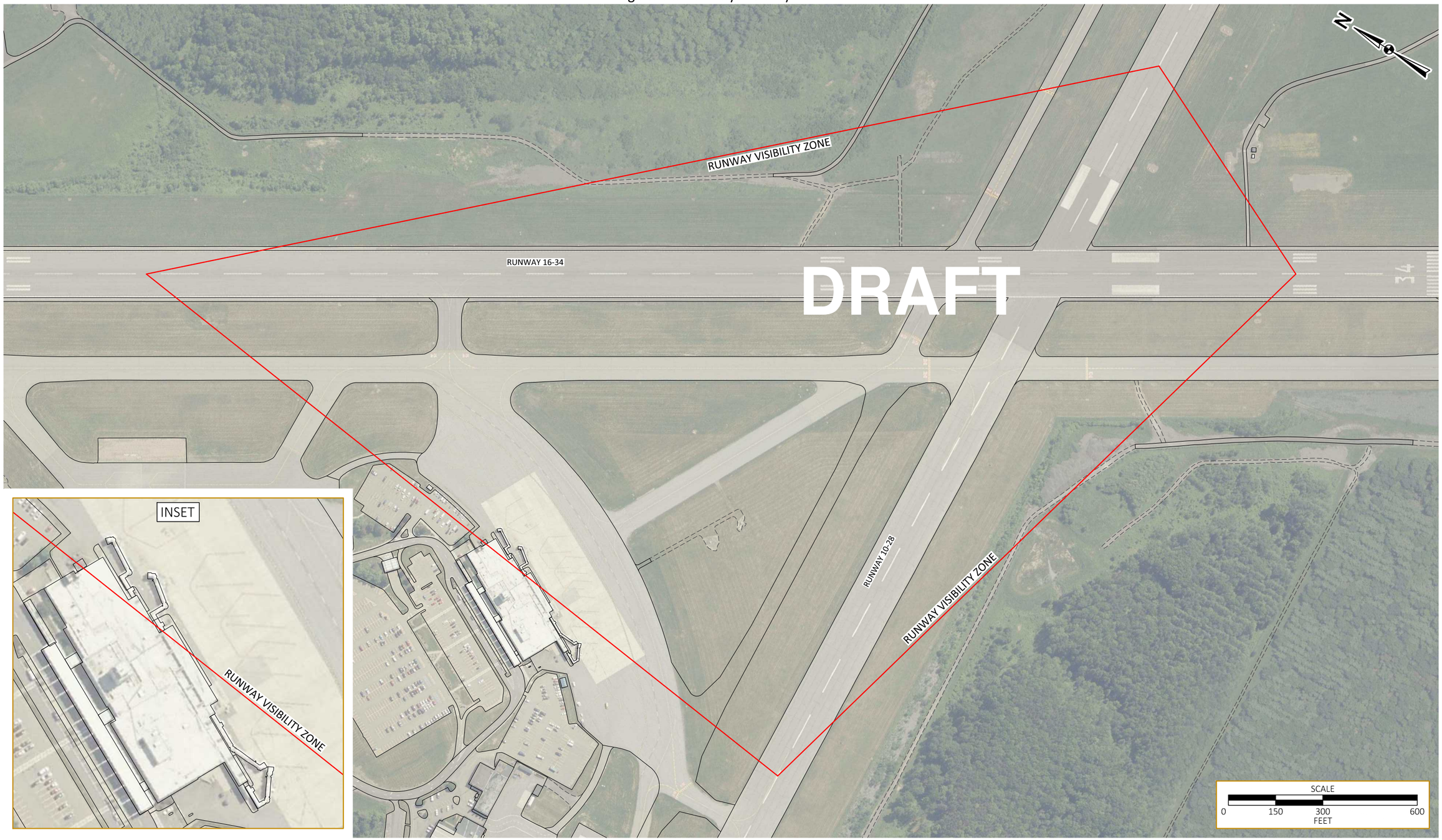
Recommendation: Acquire control of all land uses within existing RPZs (through fee simple acquisition or avigation easements) for those properties not currently under Airport control or owned by a public entity.

5.2.9. 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**.

Figure 5-6: Runway Visibility Zone



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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 remain outside the RVZ.

5.2.10. 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 [illegible] establishment of a precision approach to either end of Runway 10-28, [illegible] There is one known issue with runway painted markings that exist at the Airport. The unway 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.

5.2.11. 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**.

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'*

Source: FAA AC 150/5300-13A.

** Runway/taxiway separation vary based on approach visibility minimums*

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
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.

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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.

5.2.12. 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

[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::>.

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 pla e ien of si s ar iron 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 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

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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 ca[illegible]reat[illegible]nfusi[illegible]an[illegible]e runway incursions or accidents.
- Unexpected Holdlines: Holdlines located on a parallel ta[illegible]y c[illegible]otl[illegible]er[illegible]e[illegible]ted loc[illegible]ion 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.

[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>.

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 F 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
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.

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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 forecasted.

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 full-length runway 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 taxiway hold 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 a ɜ ıı tl ɜ ĸ)FA ⟨ ıd ɜlocati⟨ ı 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 chapter.

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	7,304’ / 5,001’	7,304’ / 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)

Item/Facility	Existing Facility or Capacity	Ultimate Requirement	Deficit
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.

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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.

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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

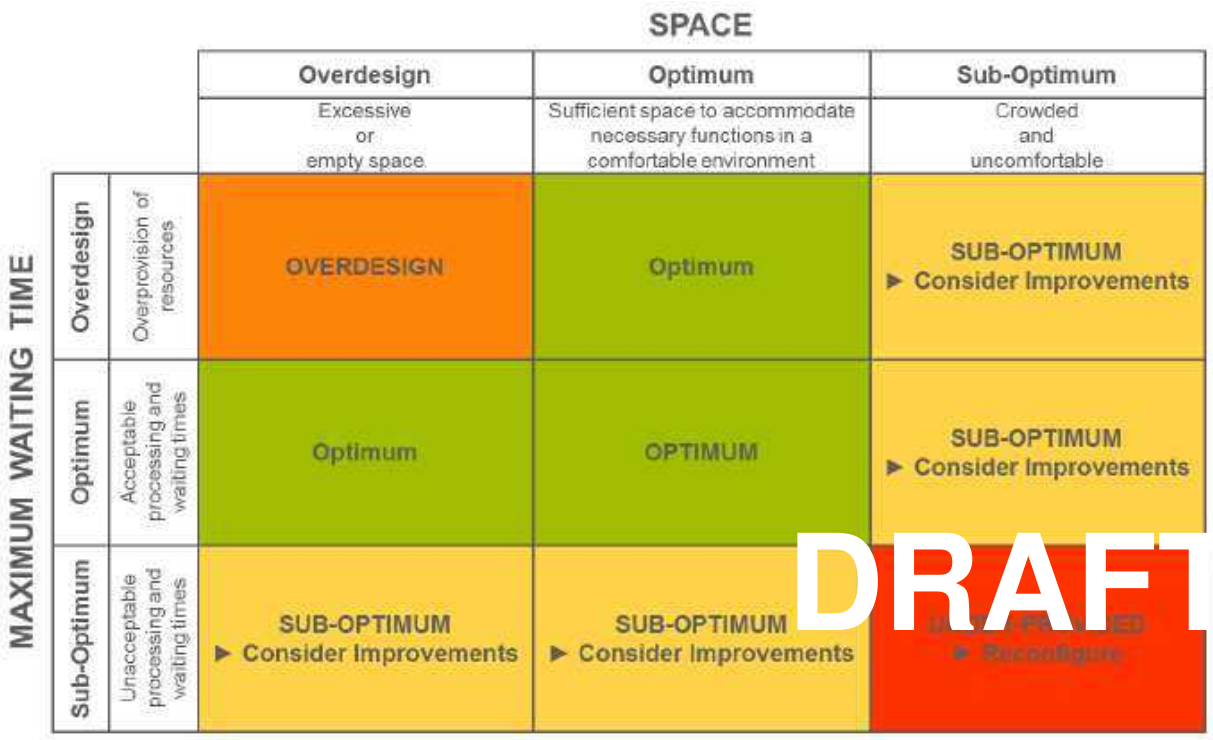
The IATA has published the ADRM, a comprehensive guide with standards for planning various passenger processing functions for airport terminal buildings. These standards reflect the dynamic nature of terminal operations and throughput (passenger processing rate from check-in through enplanement) and 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.

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Figure 5-7: IATA Level of Service Performance Categories



Source: IATA and ACI, 2014.

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.

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 b[illegible] not b[illegible] figu[illegible] 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.

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.

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.

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 typical baggage train will accommodate the number of bags through the peak 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
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

Functional Area	Current Status	Ultimate Requirement	Ultimate Deficit
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**	**1,103**	**140**
Passenger Lounges/Holdroom			
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
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

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Functional Area	Current Status	Ultimate Requirement	Ultimate Deficit
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 unu[illegible] sp[illegible] (i.e. [illegible] eric[illegible] walls), the net total 49,373 SF appears to be adequate for the planning pe[illegible] od i[illegible] t[illegible] [illegible] of [illegible] sq[illegible] foc[illegible] age required. While some specific areas show a deficit, others show [illegible] surpl[illegible] s a[illegible] d[illegible] [illegible] ana[illegible] [illegible] g the sp[illegible] ces 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 l[illegible] th[illegible]ft. Fi[illegible]lly, [illegible] splits with vehicles leaving the Airport heading off to [illegible] for vehicles to continue back around to the entrance o[illegible] Ai[illegible] 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 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

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

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.
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.

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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	6,185
Average Day/Peak Month		10
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. As such, existing passenger parking capacity should be sufficient to accommodate peak parking demand through the 20-year planning period. However, a number of 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 passing distance 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 lanes capacities at the terminal curb be maintained. Additionally, specific operational improvements described in **Table 5-21** should be addressed, including: geometry and sight distance issues; compliance with MUTCD and ADA; signage; drainage; upgrade or replacement of revenue control devices; and the provision of a cell phone lot. In the event that modifications, improvements, 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 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 may not be made available for lease to future tenants. Should demand exceed hangar capacity or how 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			
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 requirement 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
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	
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.

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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 service – 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	-

Item/Facility	Existing	Ultimate Requirement	Deficit
Length	7,304' / 5,001'	7,304' / 5,001'	None
Width	150'	100' / 100'	None
RSA Width	500' / 150'	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'	800'	300' Runway 10-28 (Future)
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	MALSR, PAPI / MALSR, PAPI	VASI, REIL / VASI	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
Lighting	MITL	MITL	None
Terminal Apron	33,000 SY	33,000 SY	None

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Item/Facility	Existing	Ultimate Requirement	Deficit
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.

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6. Alternatives

This Alternatives chapter documents a variety of proposed development scenarios to accomplish the recommended facility improvements identified in Chapter 5, Capacity Analysis and Facility Requirements. It evaluates the scenarios against several evaluation factors to determine if the recommended improvements enhance the safety and efficiency of the Greater Binghamton Airport (BGM or the Airport) and meet future demand while minimizing environmental and community impacts. The evaluation factors used to compare development options were selected based on specific considerations associated with the Airport.

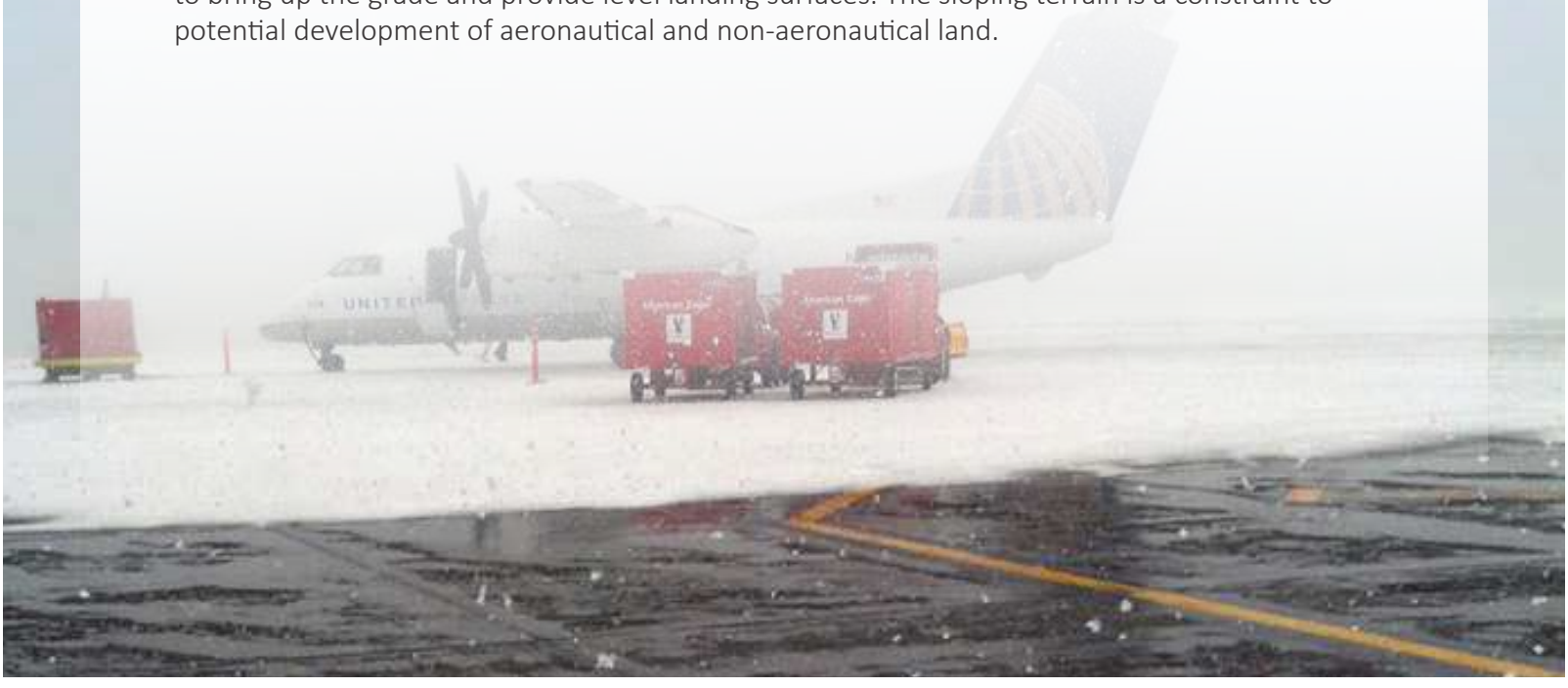
Airside alternatives will be considered first followed by an evaluation of general aviation and landside facilities and completing with an evaluation of terminal alternatives. Each of these areas will include a no-build alternative, as well as other potential alternatives for consideration. The preferred alternatives are selected based on assessed criteria, as well as their compatibility with one another and the overall airport environment. These individual alternatives combine to create an overall Preferred Airport Development Alternative. This chapter also reviews land uses for non-aeronautical areas to maximize revenue generation as part of the landside alternatives.

The identification and evaluation of the Airport development alternatives are outlined as follows:

- Development Constraints
- Airside Alternatives
- General Aviation and Landside Alternatives
- Terminal Area Alternatives
- Preferred Airport Development Alternative

6.1. DEVELOPMENT CONSTRAINTS

Terrain - BGM was built on top of Mt. Ettrick, and as such, there are steep drop offs surrounding the Airport. These drop offs are most pronounced at the runway ends where fill has been used to bring up the grade and provide level landing surfaces. The sloping terrain is a constraint to potential development of aeronautical and non-aeronautical land.



6.2. AIRSIDE ALTERNATIVES

Airside alternatives present potential solutions to geometry or airport design deficiencies as identified in Chapter 5. The alternatives presented are evaluated against each other according to the criteria identified below, and a recommended airside alternative for the Airport is presented.

6.2.1. Evaluation Criteria

A set of evaluation criteria has been developed to provide an equal and consistent assessment of each alternative. These criteria pose questions regarding how each of the alternatives address identified issues, such as: aviation user needs (facility requirements) and operational efficiency, environmental impacts, Federal Aviation Administration (FAA) standards, costs, and long-term flexibility/expansion. These evaluation criteria are as follows:

- **Facility Requirements:** Does the alternative meet the existing and future needs of the Airport and is the alternative feasible for implementation? What affect does this alternative have from an operational standpoint?
- **Environmental Impact:** Qualitative assessment of the potential environmental consequences associated with implementation of the alternatives. Important social, economic, and environmental effects of the alternative will be identified and described. Potential mitigation measures, as appropriate, will be identified. Chapter 4, *Environmental Overview*, provides a detailed review of environmental considerations for the Airport.
- **FAA Standards:** Does the alternative meet the design standards of FAA Advisory Circular (AC) 150/5300-13A, *Airport Design*, and Code of Federal Regulations (CFR) Part 77 *Safe, Efficient Use, and Preservation of the Navigable Airspace* (Part 77) to the maximum extent feasible?
- **Development Costs:** Does the alternative have reasonable development costs in comparison to other alternatives that achieve the same goal? Order of magnitude cost estimating will be used to evaluate and score each alternative.
- **Development Flexibility:** To what extent does this alternative leave flexibility for change and future surrounding development?

These evaluation factors have been given a scoring value, as follows:

Facility Requirements:	None	(0)	Some	(1)	Most	(2)	All	(3)
Environmental Impact:	High	(0)	Moderate	(1)	Minor	(2)	None	(3)
FAA Standards:	None	(0)	Some	(1)	Most	(2)	All	(3)
Development Costs	High	(0)	Medium	(1)	Low	(2)	None	(3)
Development Flexibility:	Poor	(0)	Fair	(1)	Good	(2)	Excellent	(3)

Alternatives were compared using both a qualitative and quantitative comparison and given a value based on the alternative's ability to meet the requirements of the evaluation factor. Selection of a recommended alternative is based on the alternative meeting demand needs, enhancing operations and safety, while minimizing environmental and community effects, and providing future flexibility.

6.2.2. Summary of Airside Facility Requirements

In Chapter 5, *Facility Requirements*, airside improvements were identified that should be addressed within the 20-year planning period. These improvements include:

- Consideration toward increasing the size of the runway safety area (RSA), and runway object free area (ROFA) for Runway 10-28 from an aircraft approach category (AAC) – airplane design group (ADG) B-II to accommodate AAC-ADG C-II aircraft
- Acquiring control of all land uses within existing runway protection zones (RPZs) through fee simple acquisition or avigation easements
- The request of a Modification of Standard (MOS) for penetrations to the runway visibility zone (RVZ) in the terminal area
- Pursuing the installation of runway end identifier lights (REILs) for Runway 10
- Relocating Taxiway A to provide a taxiway separation of 400 feet from Runway 16-34 from the current 300 feet, or request an MOS from the FAA for the deficit in runway/taxiway separation
    - Associated with this non-standard separation, runway hold short signs along Taxiway A are improperly placed at offset angle
- Pursuing a full-length parallel taxiway for Runway 10-28. (Note: at the time of the drafting of this document, the Airport recently completed construction of a full-length parallel taxiway for Runway 10-28, and as such, this recommendation will not be further discussed)

6.2.3. Alternatives Considered and Dismissed

As discussed in Chapter 5, there are engineered materials arrestor systems (EMAS) on both ends of Runway 16-34 in order to mitigate for a lack of full dimensional RSAs. The EMAS bed for the Runway 34 departure end is reaching the end if its useful life. A planning level cost analysis was conducted to determine the cost of removing the EMAS and providing a full dimensional RSA. The Runway 16 departure end EMAS was constructed in 2011 and is nearing the end of it's useful life per FAA standards for equipment.

It is estimated that approximately 2.5 million cubic yards of material would need to be brought in to level the Runway 34 departure end. At an estimated $25 per cubic yard, the cost for fill alone to create a standard RSA would be approximately $63 million. This estimate does not include engineering costs, nor costs associated with modifications to the existing approach light system, the relocation (or potential tunneling) of Knapp Road, or environmental impacts and mitigation. Due to the extremely high cost, this alternative has been considered and dismissed.

6.2.4. Airside Alternative 1 - No Build

The No Build Alternative recommends no changes to the existing runway and taxiway layout at BGM. Alternatives that recommend acquiring land will be compared against the No Build option. The existing airport layout is shown in **Figure 6-1**.

The No Build Alternative was assessed against the five evaluation factors; the results are below:

- **Facility Requirements:** The No Build Alternative does not meet BGM's current or future

facility requirements related to runways, taxiways, instrumentation, or approach lighting. This evaluation factor was given a value of **None (0)** as it does not meet any of the recommended facility requirements.

- **Environmental Impact:** This alternative does not propose any additional construction, and as such, there are no environmental consequences. This evaluation factor was given the highest value of **None (3)** since the alternative has no additional environmental and/or natural resource impacts.
- **FAA Standards:** The No Build Alternative does not address FAA standards as identified in FAA AC 150/5300-13A, or Part 77, including adequate safety areas and geometry criteria. The evaluation factor was assigned a value of **None (0)** as it does not meet, or attempt to meet, FAA standards.
- **Development Costs:** There are no design or construction costs associated with the No Build Alternative and it is therefore scored as **None (3)** for development costs.
- **Development Flexibility:** With no proposed changes to the Airport, this alternative provides flexibility for future development. This evaluation component was awarded a value of **Excellent (3)** for future development flexibility

6.2.5. Airside Alternative 2 – Increased RSA and ROFA for Ru[illegible] 10 28

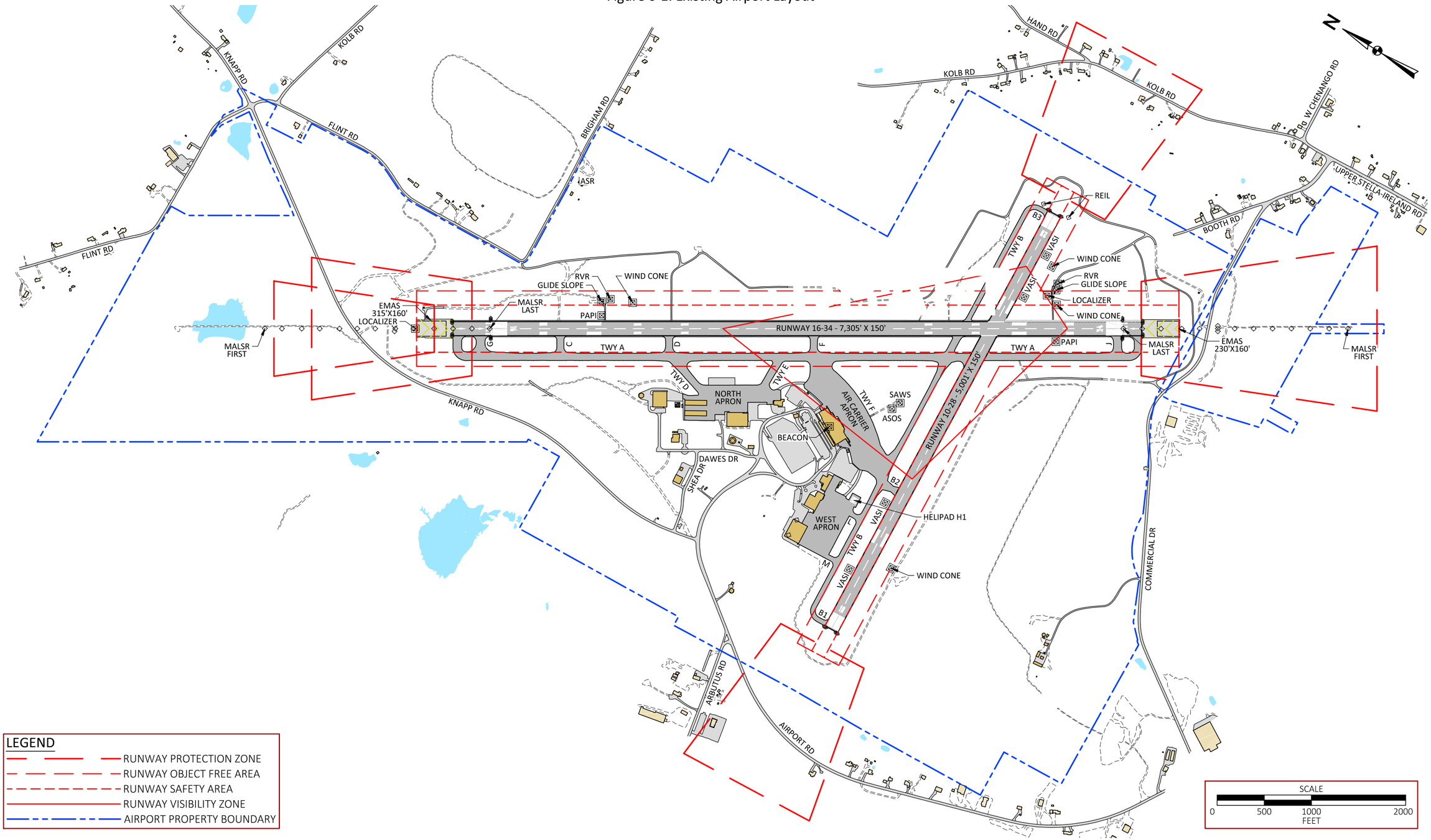
The following airside alternatives include options for increasing the size of the RSA and ROFA for Runway 10-28. As discussed in Chapter 3, *Aviation Forecasts*, Runway 10-28 currently has an AAC-ADG of B-II as represented by the Beechcraft Super King Air 350. Visibility minimums of existing approaches are a factor in the determination of the size of the RSA and ROFA, and with current visibility minimums of ¾ mile, the RSA is 300 feet beyond each departure end and 150 feet wide, while the existing ROFA is also 300 feet beyond each departure end and is 500 feet wide.

If Runway 10-28 were to increase to an AAC-ADG of C-II, as forecast in Chapter 3, the RSA would increase in size to 1,000 feet beyond each runway end, and 500 feet wide, while the ROFA would increase to 1,000 feet beyond each runway end and 800 feet wide. Also, south of Runway 10-28, a portion of the airport perimeter fence, and two small navigational aid (NAVAID) buildings for the offset Runway 16 localizer antenna, and the Runway 34 glideslope antenna would also be within the expanded ROFA. The increased ROFA and RSA can be seen in **Figure 6-2**.

Options for accommodating the increased RSA and ROFA will be presented in the following alternatives and include a No Build Alternative, constructing a full-dimensional RSA and ROFA by infilling steep drop offs at the ends of Runway 10-28, the installation of EMAS on one or both ends of the runway, and providing for an acceptable level of safety through declared distances. Lastly, the expanded RSA and ROFA would extend off Airport property and these parcels should be acquired by the Airport in order to have full control over the use of this land.

The goal of these alternatives is to maximize RSA available to the extent practical and financially feasible even if the RSA does not meet full standards. According to FAA AC 150/5300-13A, the "FAA recognizes that incremental improvements inside full RSA dimensions can enhance the margin of safety for aircraft." FAA Order 5200.8, *Runway Safety Area Program*, states in Appendix 2 that "when it is not practicable to obtain an RSA that meets current standards through the measures identified […], the feasibility of increasing the size of the RSA by including

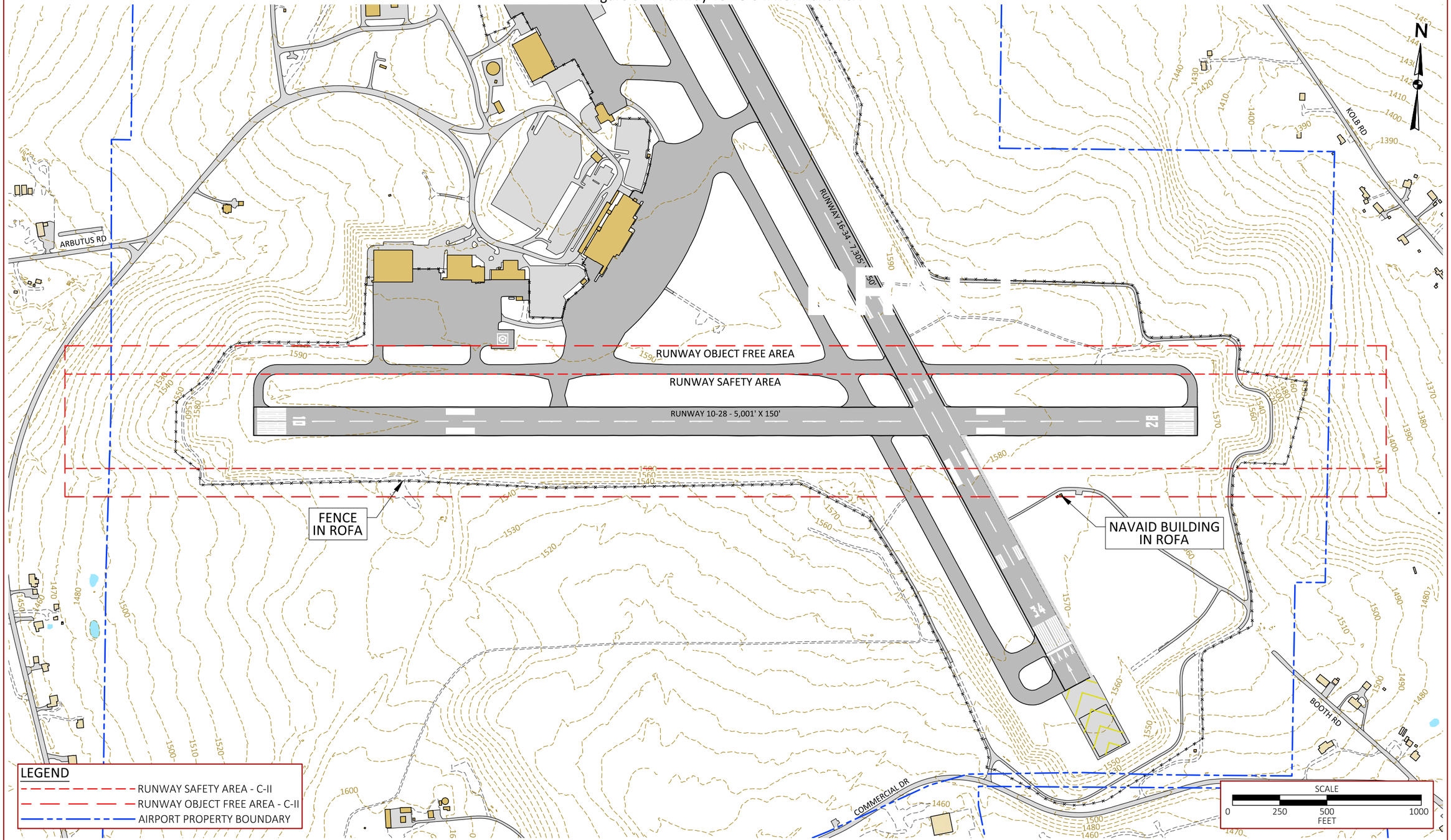
Figure 6-1: Existing Airport Layout



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Figure 6-2: Runway 10-28 C-II ROFA and RSA



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additional land parcels should be considered, even if their inclusion will result in an RSA with an irregular shape."

Airside Alternative 2A – Full Dimensional Expanded RSA and ROFA

Airside Alternative 2A is shown in Figure 6-3. Airside Alternative 2A includes increasing the size of the Runway 10-28 RSA and ROFA to accommodate C-II aircraft. The full dimensional RSA would be accomplished by filling in land on both ends of Runway 10-28. It is estimated this would require approximately 2.75 million cubic yards of fill material which would need to be graded and stabilized. As there is insufficient infill material at the Airport, all of the material would need to be brought in from other sources.

At a planning level estimate of $25.00 per cubic yard of infill material, the cost of constructing a full dimensional RSA on the Runway 10 approach end of the runway would cost approximately $25 million, and the cost to do so on the Runway 28 approach end would cost approximately $44 million. Due to the extremely high cost of this alternative, it has been considered and dismissed.

Airside Alternative 2B – EMAS

Another alternative to meet FAA standards for a C-II RSA is through the use of EMAS. EMAS utilizes low density concrete blocks which crush under the weight of an aircraft, thereby stopping the aircraft in a short distance, usually with minimal or no damage to the aircraft. It has been installed at 68 U.S. airports with plans to install an additional three EMAS systems at two additional U.S. airports.[1] EMAS has safely stopped 15 overrunning aircraft.

FAA Order 5200.9 (the Order), *Financial Feasibility and Equivalency of Runway Safety Area Improvements and Engineered Material Arresting Systems* provides guidance for comparing various RSA alternatives with ones that utilize EMAS. It also assists in determining the maximum financially feasible costs, whether they include EMAS or not.

The Order points out that a standard EMAS installation can provide a level of safety equivalent to a full dimensional RSA for overruns. An EMAS installation must be capable of stopping the overrunning (or in some cases, undershooting) design aircraft travelling at 70 knots. In some cases, such as the case with Runway 10-28 at BGM, space limitations or other circumstances might not permit a standard EMAS installation. In such cases, a non-standard EMAS that can stop the design aircraft at 40 knots or more should be considered. For planning purposes, Runway Safe, the only EMAS manufacturer in the US was contacted and asked for guidance on the appropriate size of EMAS systems that might be able to be accommodated on both ends of Runway 10-28. A company spokesperson indicated the approximate size for the systems would be 150 feet by 300 feet. Further, these would not be standard systems, capable of stopping the design aircraft at 70 knots and would be classified as non-standard systems. The approximate cost of each EMAS system is estimated to be roughly $4,000,000.

Airside Alternative 2B is considered against the evaluation factors below and can be seen in Figure 6-4.

[1] FAA.gov, https://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=13754. Accessed 13 March 2020

- **Facility Requirements:** Airside Alternative 2B meets BGM's future facility requirements related to the use of Runway 10-28 by C-II aircraft. The FAA recognizes EMAS as a viable alternative to a full dimensional RSA and ROFA. EMAS would be relatively easy to implement once production resumes. This evaluation factor was given a value of **Most (2)** as it does somewhat restrict the utility of Runway 10-28 due to setback requirements.
- **Environmental Impact:** This alternative does not propose any improvements that are anticipated to have environmental impacts, and as such, there are no environmental consequences, and as such this evaluation factor was given the highest value of **None (3)**.
- **FAA Standards:** The alternative meets FAA standards as identified in FAA AC 150/5300-13A, including adequate safety areas. The evaluation factor was assigned a value of **All (3)** for its ability to meet FAA standards.
- **Development Costs:** Costs associated with Airside alternative 2B are high, particularly in comparison to other viable alternatives. The alternative scores as **High (0)** for development costs.
- **Development Flexibility:** The addition of EMAS would have little effect on the overall development of the Airport and was given a value of **Excellent (3)** for future landside development.

Airside Alternative 2C – Declared Distances

A third alternative to meet FAA RSA and ROFA standards is to effectively shorten the runway through the use of declared distances. Per FAA AC 150/5200-13A, declared distances utilize specific portions of runway pavement as a substitute for a full dimensional RSA and/or ROFA. Declared distances typically limit a runway's use and are typically associated with one or more displaced thresholds.

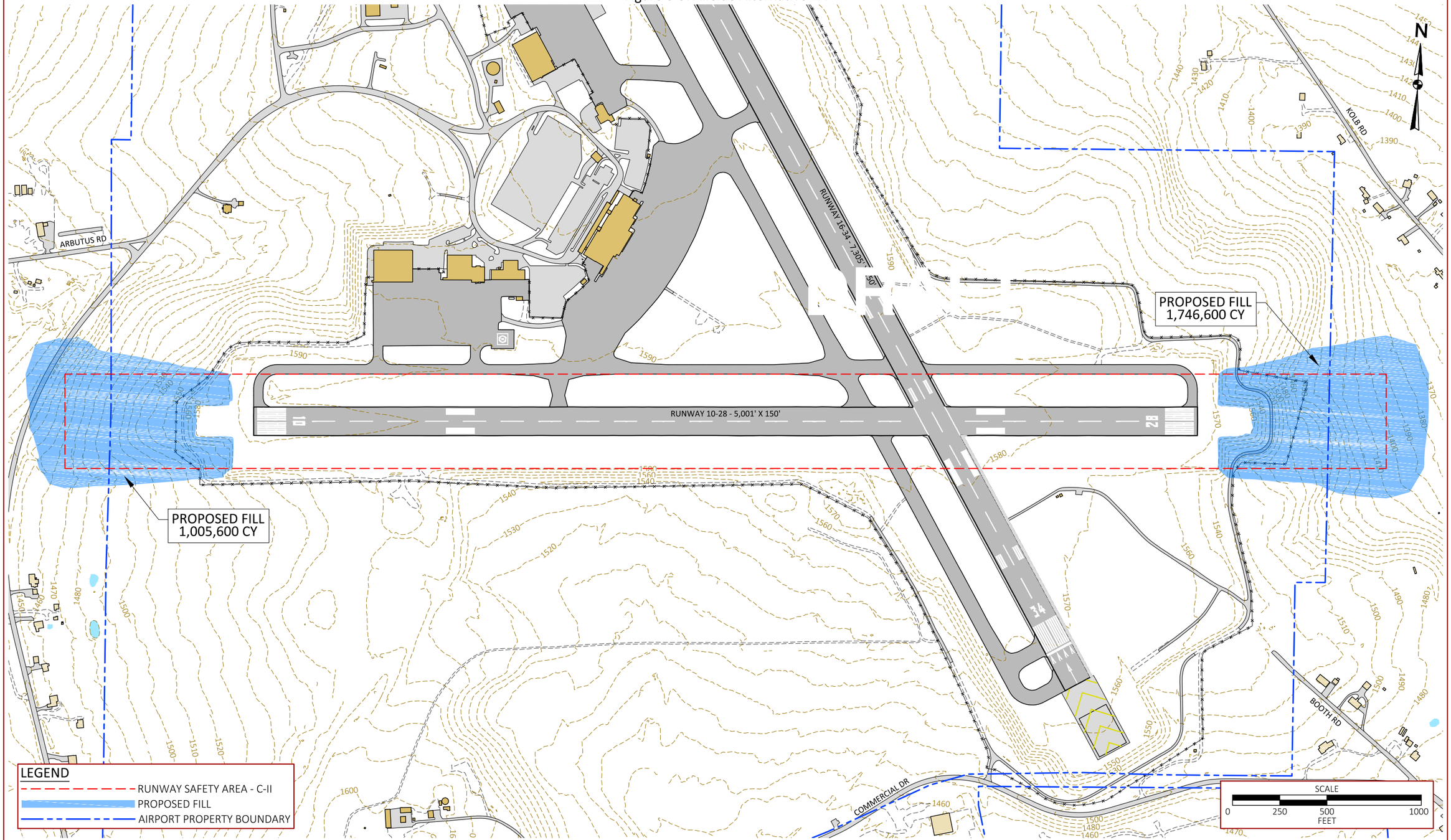
The FAA defines four declared distances:

- **Takeoff Run Available (TORA)** – the runway length declared available and suitable for satisfying takeoff run requirements. The TORA is measured from the start of takeoff to a point 200 feet from the beginning of the departure runway protection zone.
- **Takeoff Distance Available (TODA)** – this distance comprises the TORA plus the length of any remaining runway or clearway beyond the far end of the TORA.
- **Accelerate-Stop Distance Available (ASDA)** – the runway plus stopway length declared available and suitable for the acceleration and deceleration of an aircraft that must abort its takeoff. A stopway is an area beyond the takeoff runway able to support the airplane during an aborted takeoff, without causing structural damage to the airplane.
- **Landing Distance Available (LDA)** – the runway length that is declared available and suitable for satisfying aircraft landing distance requirements.

The proposed declared distances for Airside Alternative 2C can be seen in **Figure 6-5**. The alternative is evaluated against the factors described in **Section 6.2.1** with the following results:

- **Facility Requirements:** Airside Alternative 2C does meet BGM's future facility requirements by providing adequate safety areas, however the shortened runway lengths from implementing declared distances do not meet the runway length requirements for AAC-ADG C-II aircraft. This evaluation factor was given a value of **Some**:

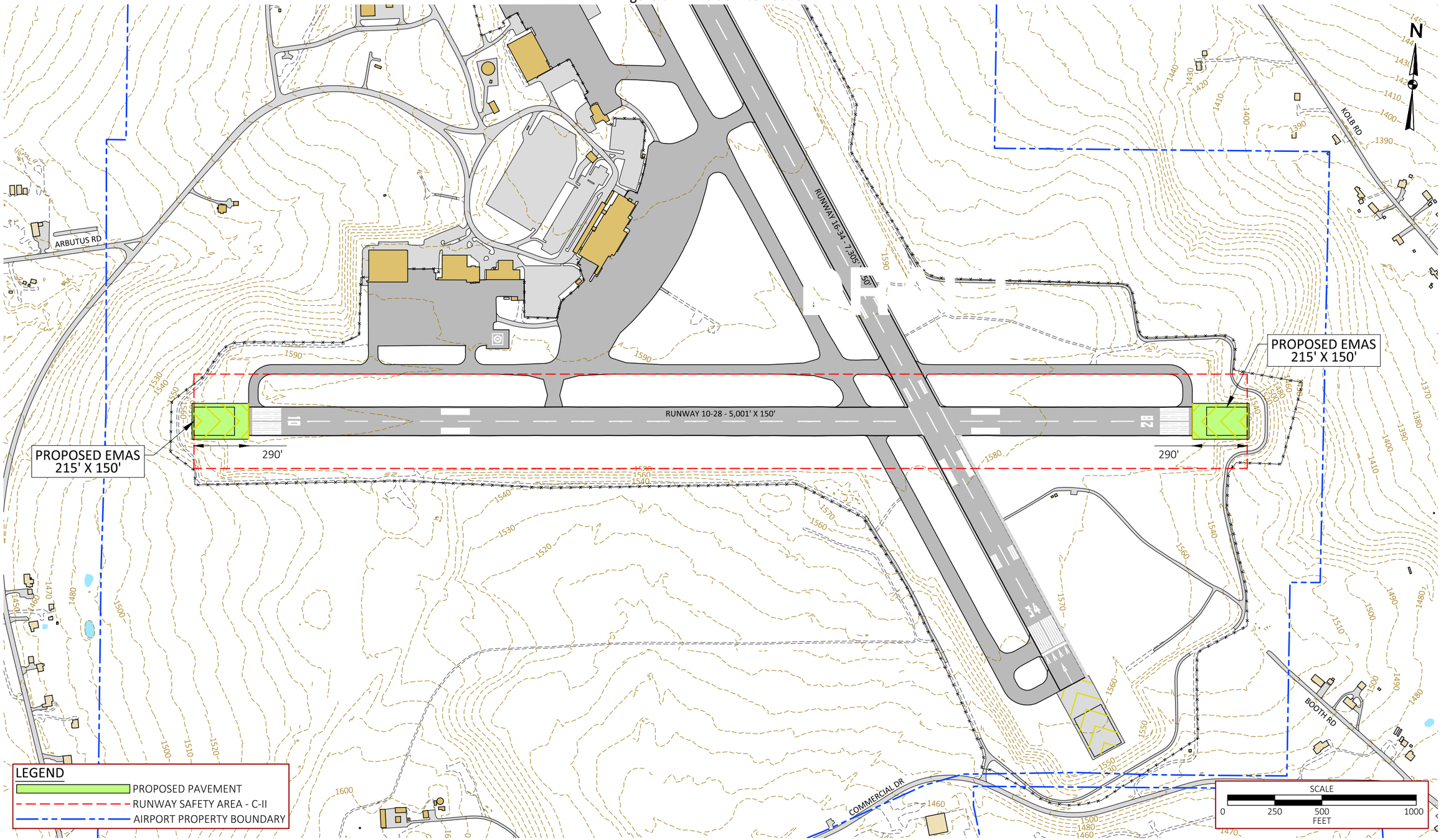
Figure 6-3: Airside Alternative 2A



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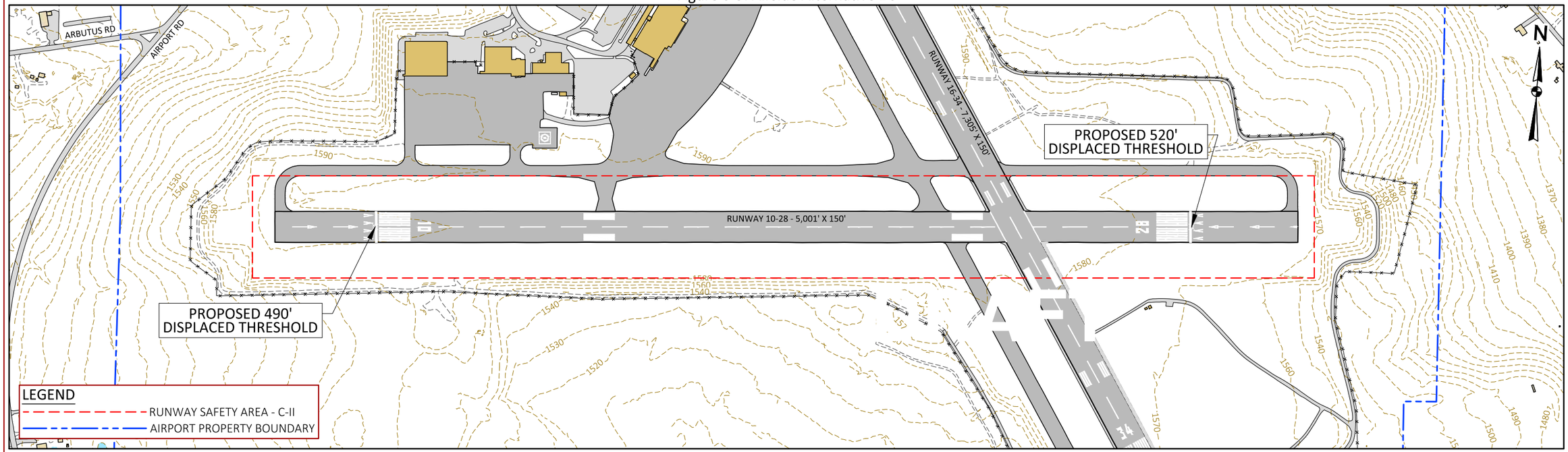
Figure 6-4: Airside Alternative 2B

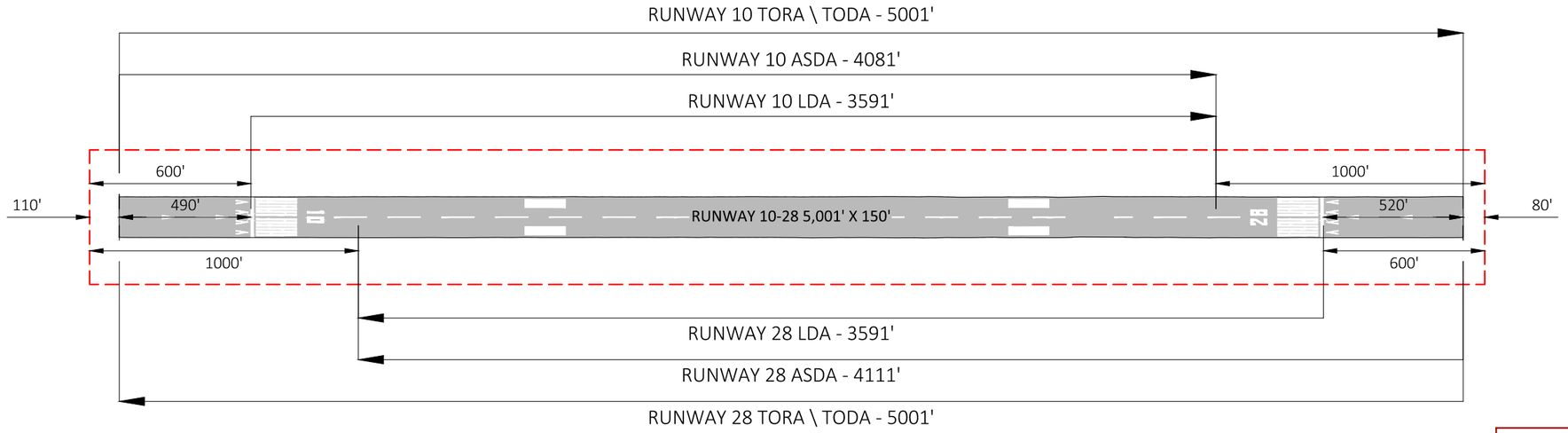


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Figure 6-5: Airside Alternative 2C





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(1) as it does somewhat restrict the utility of Runway 10-28.

- **Environmental Impact:** This alternative does not propose any additional construction, and as such, there are no environmental consequences, and as such this evaluation factor was given the highest value of **None (3)**.
- **FAA Standards:** The alternative meets FAA standards as identified in FAA AC 150/5300-13A, including adequate safety areas. The evaluation factor was assigned a value of **All (3)** as it does meet FAA standards.
- **Development Costs:** Costs associated with Airside Alternative 2C are minimal, and the alternative is scored as **None (3)** for development costs.
- **Development Flexibility:** With no proposed physical changes to the Airport, this alternative provides flexibility for future development, however the reduced runway lengths implemented through declared distances limit the utility of the runway. This evaluation component was awarded a value of **Good (2)**.

6.2.6. Preferred RSA and ROFA Alternative for Runway 10-28

As can be seen in **Table 6-1**, Alternative 2C – Declared Distances [illegible] and is selected as the preferred airside alternative to meet FAA standards as related to [illegible] RSA and ROFA for Runway 10-28.

Table 6-1: Runway 10-28 RSA and ROFA Alternatives

	Facility Requirements	Environmental Impact	FAA Standards	Development Costs	Development Flexibility	Total
No Build	None (0)	None (3)	None (0)	None (3)	Excellent (3)	9
Alt. 2A	N/A	N/A	N/A	N/A	N/A	0
Alt. 2B	Most (2)	None (3)	All (3)	High (0)	Excellent (3)	11
Alt. 2C	Some (1)	None (3)	All (3)	None (3)	Good (2)	12

Source: McFarland Johnson analysis.

6.2.7. Airside Alternative 3 – RPZs

As discussed in Chapter 5, *Facility Requirements*, the Airport should control all land uses within the RPZs. Currently, the RPZs at the ends of Runway 10-28 and Runway 34 extend off Airport property. A total of 19 parcels comprising 151 acres of land fall underneath the three RPZs. At a planning level estimate of $20,000 per acre, the total estimated cost to acquire these parcels is approximately $3.0 million. The RPZs with proposed airport property acquisitions can be seen in **Figure 6-6** and **Figure 6-7**. While the acquisition of the land within the RPZs in fee simple is recommended, avigation easements with sufficient land use controls to protect people and property within the RPZ would be sufficient. Airside Alternative 3 is discussed against the evaluation factors below:

- **Facility Requirements:** Airside Alternative 3 meets BGM's future facility requirements related to the control of RPZs and is feasible to implement. This evaluation factor was given a value of **All (3)**.
- **Environmental Impact:** This alternative does not propose any additional construction, and as such, there are no environmental consequences. This evaluation factor was given a value of **None (3)** for impacts to the environment.

- **FAA Standards:** The alternative meets FAA standards as identified in FAA AC 150/5300-13A, including airport control over RPZs. The evaluation factor was assigned a value of **All (3)** for meeting FAA standards.
- **Development Costs:** While the property acquisitions would be costly, they are considered an Airport Improvement Program (AIP) eligible expense. The alternative is given a score of **Medium (1)** for development costs.
- **Development Flexibility:** With no proposed physical changes to the Airport, this alternative provides flexibility for future development. This evaluation component was awarded a value of **Excellent (3)** for future flexibility.

6.2.8. Preferred RPZ Alternative

As can be seen below in **Table 6-2**, Airside Alternative 3 which recommends acquiring land within the three RPZs that fall off Airport property scores highest against the No Build Alternative and is selected as the preferred RPZ alternative.

Table 6-2: RPZ Alternatives Evaluation S[illegible]ar

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	Facility Requirements	Environmental Impact	FAA Standards	Development Costs	Development Flexibility	Total
No Build	None (0)	None (3)	None (0)	None (3)	Excellent (3)	9
Alt. 3	All (3)	None (3)	All (3)	Medium (1)	Excellent (3)	13

Source: McFarland Johnson analysis.

6.2.9. Airside Alternative 4 – Miscellaneous Airside Items

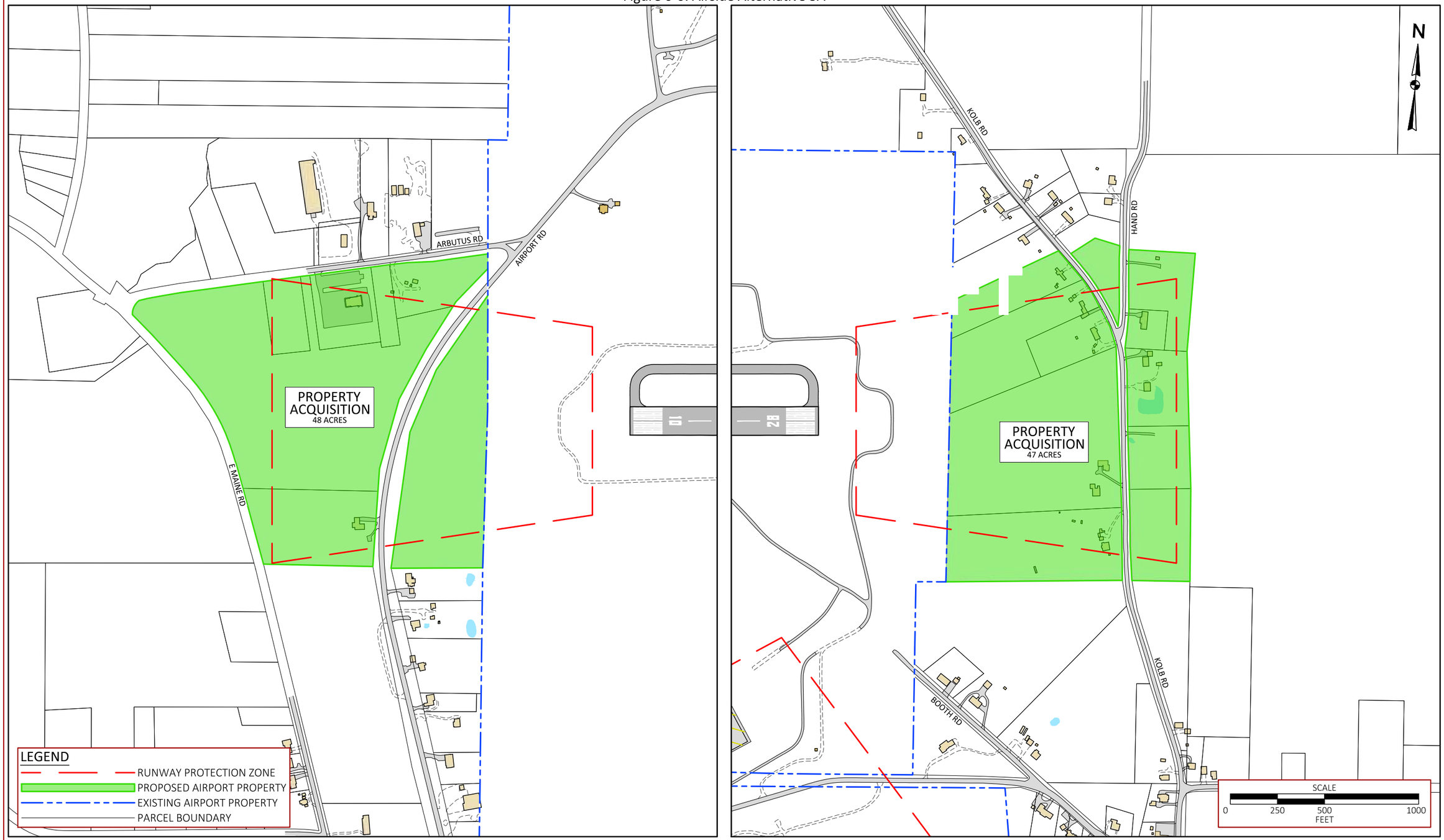
Airside Alternative 4 includes various miscellaneous items referenced in Chapter 5, *Facility Requirements,* which include:

- The installation of runway end identifier lights (REILs) for Runway 10
- The relocation of the localizer control building at the approach end of Runway 16 outside of the RSA for Runway 16-34

Airside Alternative 4 can be seen in **Figure 6-8**. These improvements will be assessed against the evaluation factors below.

- **Facility Requirements:** Airside Alternative 4 meets BGM's future facility requirements related to safety and is feasible to implement. This evaluation factor was given a value of **All (3)**.
- **Environmental Impact:** The changes proposed would have little, if any, environmental consequences. This evaluation factor was given a value of **None (3)**.
- **FAA Standards:** The alternative meets FAA standards as identified in FAA AC 150/5300-13A, including ensuring objects remain outside of RSAs. The evaluation factor was assigned a value of **All (3)** for meeting FAA standards.
- **Development Costs:** The REILs and remarking of the taxiway would have minimal costs, but the relocation of the localizer control building would be challenging and somewhat costly given the terrain. The alternative is given a score of **Medium (1)** for development costs.

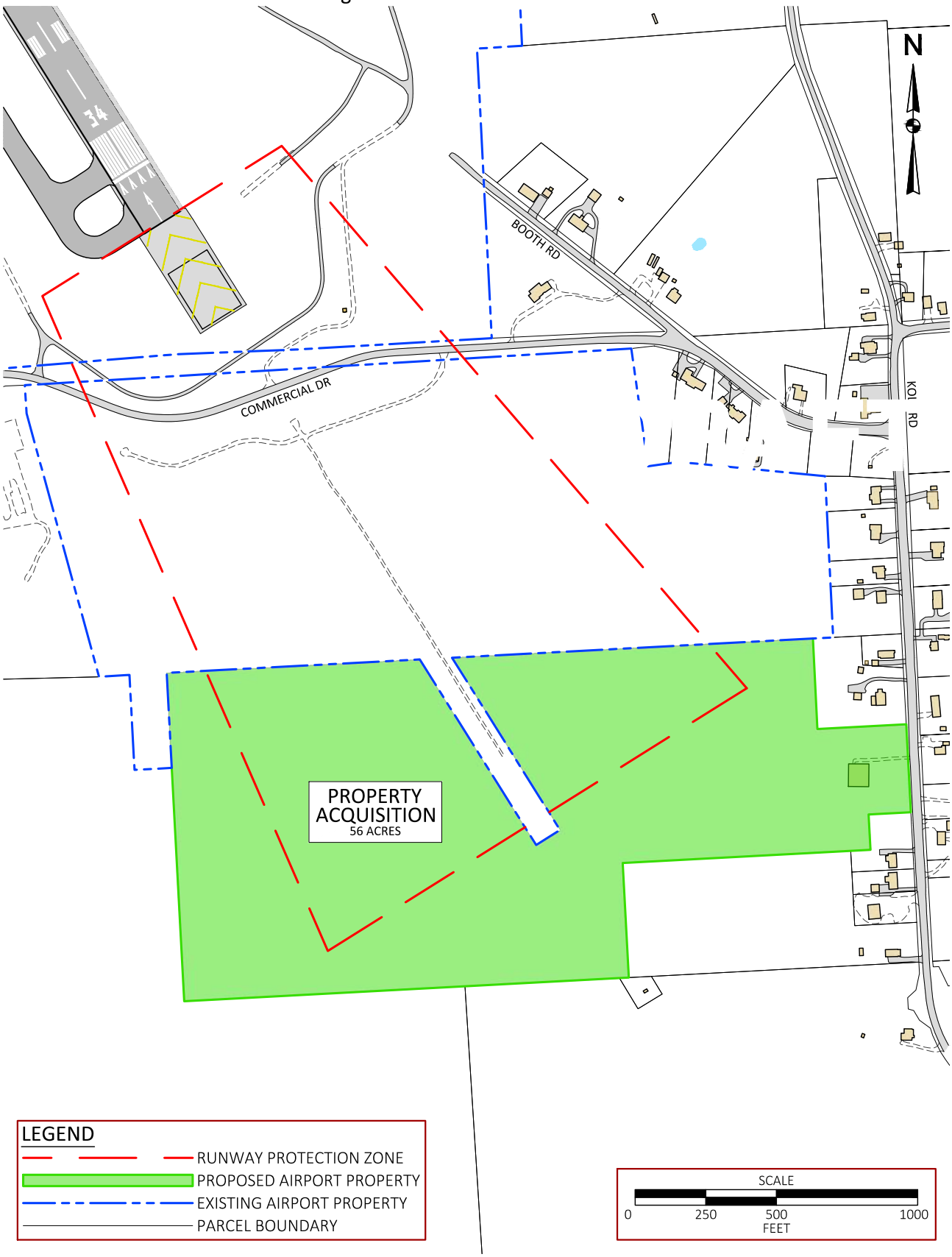
Figure 6-6: Airside Alternative 3A



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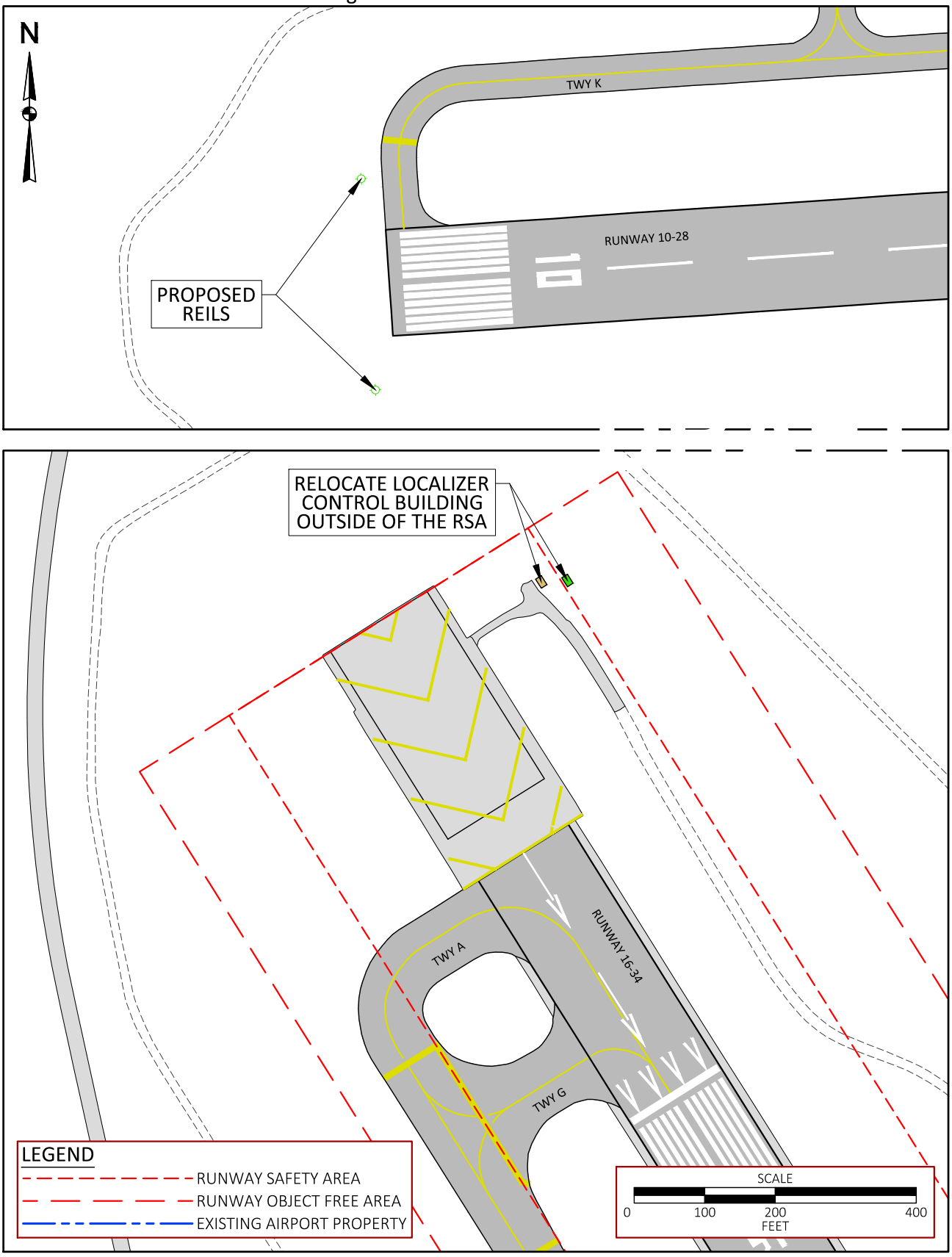
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Figure 6-7: Airside Alternative 3B



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Figure 6-8: Airside Alternative 4



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- **Development Flexibility:** With minimal physical changes to the Airport, this alternative provides flexibility for future development. This evaluation component was awarded a value of **Excellent (3)** for future flexibility.

Table 6-3 shows the results of the comparison to the No Build Alternative.

Table 6-3: Miscellaneous Airside Improvements Evaluation

	Facility Requirements	Environmental Impact	FAA Standards	Development Costs	Development Flexibility	Total
No Build	None (0)	None (3)	None (0)	None (3)	Excellent (3)	9
Alt. 4	All (3)	None (3)	All (3)	Medium (1)	Excellent (3)	13

Source: McFarland Johnson analysis.

As can be seen in **Table 6-3**, Airside Alternative 4 scores higher than the No Build Alternative and it is recommended these improvements be implemented.

6.2.10. Airside Alternative 5

Airside Alternative 5 is the final airside alternative and relate[illegible] prc idi[illegible] run[illegible], cente[illegible] ine-to-taxiway centerline separation of 400 feet from the existing 300 feet between Taxiway A and Runway 16-34 in order to meet FAA standards for AAC-ADG D-II and C-III aircraft. Also, runway hold-short signs along Taxiway A are not aligned with hold-short markings per FAA standards. There are three potential alternatives to meet FAA standards with respect to this separation. They include the No Build Alternative, physically relocating the taxiway, and requesting an MOS from the FAA.

Alternatives are assessed against the evaluation factors below.

Airside Alternative 5A – Relocate Taxiway

It is anticipated that the cost of relocating Taxiway A would be approximately $31 million. A significant portion of this cost is attributable to infill areas as the terrain drops off steeply as the taxiway approaches the Runway 16 and Runway 34 ends. Further, the alternative will also require the relocation of a portion of Knapp Road on the Runway 16 approach end. Airside Alternative 5A can be seen in **Figure 6-9**, and is assessed against the evaluation factors below.

- **Facility Requirements:** Airside Alternative 5A would meet the Airport's future facility requirements in relation to the design aircraft using Runway 16-34 and Taxiway A. It would allow for standard sign placement along Taxiway A and the stub taxiways from Runway 16-34 to Taxiway A. This evaluation factor was given a value of **All (3)** for meeting facility requirements.
- **Environmental Impact:** With significant construction and infill required, there would be some environmental impacts, although it is anticipated there would be no wetland impacts. This alternative is given a score of **Minor (2)** for impacts to the environment.
- **FAA Standards:** The alternative meets FAA standards as identified in FAA AC 150/5300-13A, including separation standards as they relate to runways and parallel taxiways. The evaluation factor was assigned a value of **All (3)** as it does meet FAA standards.

- **Development Costs:** Costs associated with Airside Alternative 5A are significant, and the alternative is scored as **High (0)** for development costs.
- **Development Flexibility:** The relocation of the taxiway crowds existing airport infrastructure, including the necessity to potentially eliminate the deicing pad adjacent to the T-hangars. Also, it is anticipated there will be some loss of some aircraft parking at the terminal building. This alternative scores **Poor (0)** For future development flexibility.

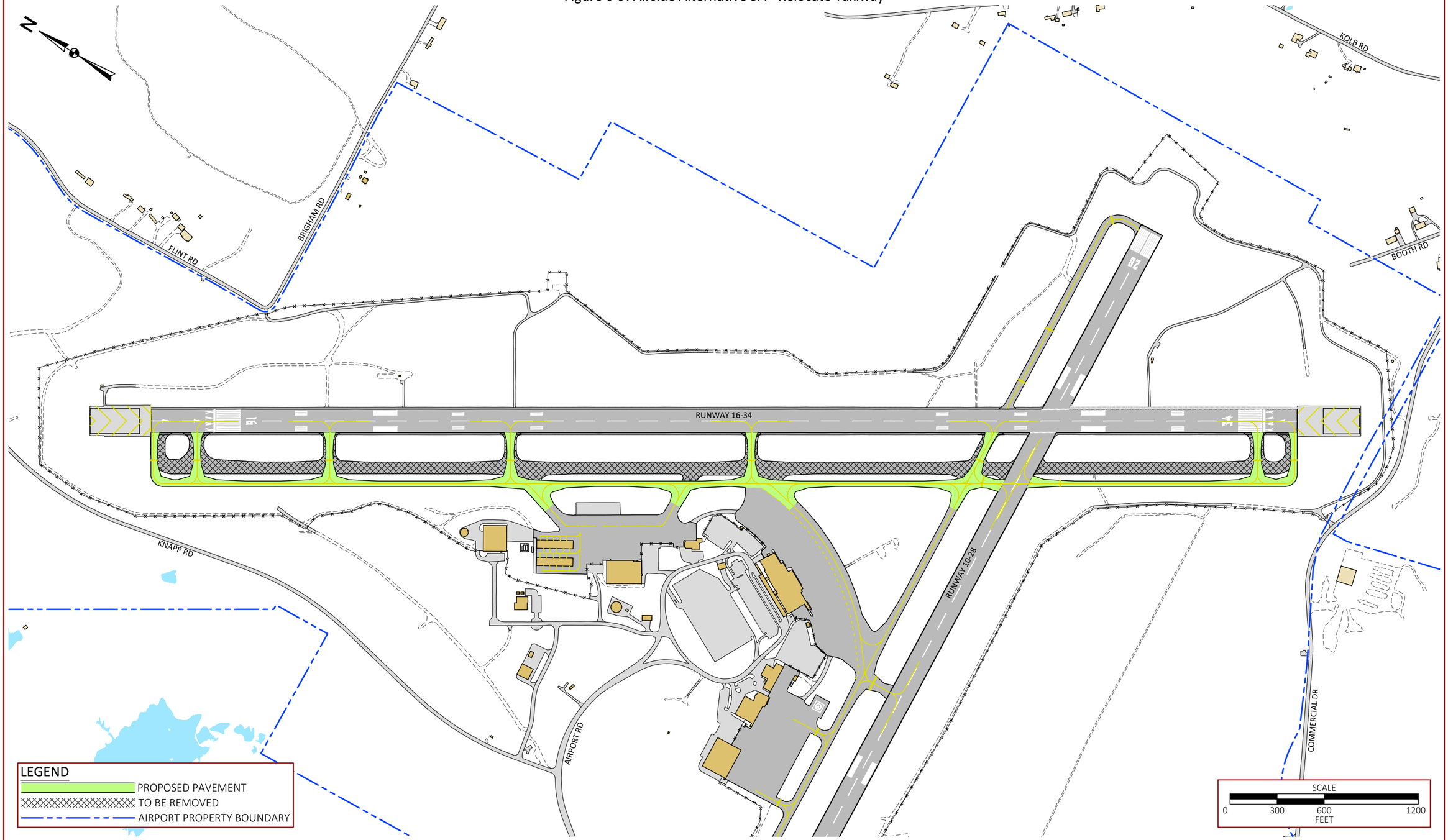
Airside Alternative 5B – Modification of Standards (MOS)

Another alternative that would not involve relocating the taxiway would be to request an MOS from the FAA for the non-standard condition of the runway/taxiway separation. It is recommended at least one hold-short sign on each of the stub taxiways be relocated to the FAA standard position in alignment with the runway hold-short markings. Further, due to the non-standard hold lines, this alternative would also consider the installation of runway guard lights at each of the hold lines along Taxiway A. This alternative is assessed below.

- **Facility Requirements:** Airside Alternative 5B is a viable alternative and generally reflects the existing condition, however it would not provide FAA standard separation between Taxiway A and Runway 16-34 and would require signs on the stub taxiways to be relocated from existing positions to those along the hold line at each of the stub taxiways, just off the pavement for Taxiway A. The alternative would also include the recommendation to include runway guard lights at each of the hold lines. This evaluation factor was given a value of **Some (1)** for meeting existing and future needs and minimizing impacts on operations.
- **Environmental Impact:** With limited construction associated with the relocation of the signs and installation of the runway guard lights, there would be no environmental impacts. This alternative is given a score of **None (3)** for impacts to the environment.
- **FAA Standards:** The alternative does not meet FAA standards as identified in FAA AC 150/5300-13A, including separation standards as they relate to runways and parallel taxiways. However, the alternative does propose the relocation of the taxiway hold signs to the standard position. The evaluation factor was assigned a value of **Some (1)** as it does not meet all FAA standards.
- **Development Costs:** The costs associated with Airside Alternative 5B include the installation of new runway guard lights and the relocation of existing hold signs. As a result, the alternative is scored as **Low (2)** for development costs.
- **Development Flexibility:** With no construction, there remains potential for future development. This alternative scores **Excellent (3)** for maintaining future development potential.

The alternatives relative to the runway/taxiway separation between Runway 16-34 and Taxiway are compared below in **Table 6-4**.

Figure 6-9: Airside Alternative 5A - Relocate Taxiway



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Table 6-4: Airside Alternative 5 Evaluation Summary

	Facility Requirements	Environmental Impact	FAA Standards	Development Costs	Development Flexibility	Total
No Build	None (0)	None (3)	None (0)	None (3)	Excellent (3)	9
Alt. 5A	All (3)	Minor (2)	All (3)	High (0)	Poor (0)	8
Alt. 5B	Some (1)	None (3)	Some (1)	Low (2)	Excellent (3)	10

Source: McFarland Johnson analysis.

Alternative 5B scores highest and requesting an MOS from FAA is the recommended alternative.

6.2.11. Preferred Airside Alternative

The evaluation and selection of a Preferred Airside Alternative must satisfy the long-term aeronautical needs of the Airport, including such factors as satisfying future aeronautical needs, minimizing environmental impacts, meeting FAA standards, cost, and flexibility. The summary of the evaluation can be seen in Table 6-5.

Table 6-5: Airside Alternatives Evaluation Summary

	Facility Requirements	Environmental Impact	FAA Standards	Development Costs	Development Flexibility	Total
No Build	None (0)	None (3)	None (0)	None (3)	Excellent (3)	9
Alt. 2C	Some (1)	None (3)	All (3)	None (3)	Good (2)	12
Alt. 3	All (3)	None (3)	All (3)	Medium (1)	Excellent (3)	13
Alt. 4	All (3)	None (3)	All (3)	Medium (1)	Excellent (3)	13
Alt. 5B	Some (1)	None (3)	Some (1)	Low (2)	Excellent (3)	10

Source: McFarland Johnson analysis.

In consideration of the analysis above, it is recommended the Airport:

- Implement declared distances for Runway 10-28 at such time the critical aircraft for the runway has an AAC-ADC of C-II (Airside Alternative 2C – Declared Distances)
- Acquire RPZs off Airport property, either in fee simple, or through avigation easements (Airside Alternative 3 – RPZs)
- Install REILs at the end of Runway 10 (Airside Alternative 4 – Miscellaneous Airside Items)
- Relocate the localizer control building at the approach end of Runway 16 so it is outside the RSA (Airside Alternative 4 – Miscellaneous Airside Items)
- Request an MOS from the FAA for the separation distance between Runway 16-34 and Taxiway A, as well as relocate the existing stub taxiway hold signs and install runway guard lights (Airside Alternative 5B – Modification of Standards (MOS))

6.3. GENERAL AVIATION AND LANDSIDE ALTERNATIVES

Outside of the runways and taxiways at BGM, several items were noted in Chapter 5 that should be addressed within the planning period, including:

- Planning to replace the airfield lighting vault and should consider locations for future siting to ensure the facility does not impede future development Installing a primary

wind cone
- Ensuring that all supplemental wind cones are located outside of an expanded future ROFA
- Updating the Airport traffic control tower (ATCT) within the planning period to meet current equipment needs and meet height standards
- Plan for the construction of additional conventional hangar units to accommodate new based tenants, as well as transient aircraft
- Assessing available land for compatible non-aeronautical use

6.3.1. Evaluation Criteria

A set of evaluation criteria was developed to provide an equal and consistent assessment of each alternative. These criteria pose questions regarding how each alternative addresses land use compatibility, environmental and cultural effects, potential for expansion, operational efficiency, and revenue generating capability. Each alternative was evaluated against the No Build Alternative.

- **Land Use Compatibility:** Is the alternative compatible with on- and off-airport factors of land use? The criterion will evaluate such things as access to the airside movement areas, access to the local road network, and the degree to which the alternative is compatible with activities occurring in surrounding areas.
- **Environmental Effects:** Important social, economic, and environmental effects of the alternative will be identified and described. Potential mitigation measures, as appropriate, will be identified. Federal and State regulatory requirements (e.g., permits, Pennsylvania Department of Environmental Protection, National Environmental Policy Act) will be described.
- **Potential for Expansion:** Is the alternative flexible and dynamic in the sense that it has the ability to accommodate both planned and unanticipated future changes in demand? This criterion recognizes the fact that location decisions made today will influence future airport development for many years to come. Planning shall consider future development needs beyond the facility requirements of the current period.
- **Operational Efficiency:** Will this alternative contribute to the development of a smoothly functioning airport with efficient movement of aircraft? This criterion will consider whether the alternative makes the best and most efficient use of airport facilities and infrastructure.
- **Revenue Generation Capability:** Does the alternative take a strategic business and capital-based approach that allows or creates opportunities for airport management to increase revenue generation and/or diversify revenue sources thereby improving the overall competitiveness and cost effectiveness of the Airport?

These evaluation factors have been given a scoring value, as follows:

Land Use Compatibility:	Poor	(0)	Fair	(1)	Good	(2)	Excellent	(3)
Environmental Impact:	High	(0)	Moderate	(1)	Minor	(2)	None	(3)
Expansion Potential:	Poor	(0)	Fair	(1)	Good	(2)	Excellent	(3)
Operational Efficiency:	None	(0)	Low	(1)	Moderate	(2)	High	(3)
Revenue Generation:	Poor	(0)	Fair	(1)	Good	(2)	Excellent	(3)

6.3.2. General Aviation and Landside Alternative 1 – No Build

The No Build Alternative can be seen in **Figure 6-1**, and proposes no changes to the landside and GA areas of the Airport. The No Build Alternative is evaluated as follows:

- **Land Use Compatibility:** As the Airport property and surrounding land use are currently compatible, and the No-Build alternative proposes no changes, the alternative scores **Excellent (3)** with respect to land use compatibility.
- **Environmental Effects:** This alternative proposes no changes and no environmental impacts. It is given a score of **None (3)** for impacts to the environment.
- **Potential for Expansion:** With nothing being built, the potential for expansion at the Airport remains high and this alternative scores **Excellent (3)** for future expansion potential.
- **Operational Efficiency:** This alternative does nothing to enhance operational efficiency and scores **None (0)** for operational efficiency.
- **Revenue Generation Capability:** With no changes to the Airport, there are no opportunities for increased revenue generation and this alternative scores **Poor (1)** for revenue generation.

6.3.3. General Aviation and Landside Alternative 2

General Aviation and Landside Alternative 2 can be seen in **Figure 6-10**, and includes multiple recommendations from Chapter 5, *Facility Requirements*, including:

- The Airport should plan to replace the airfield lighting vault and should consider locations for future siting to ensure the facility does not impede future development
- With the lighting vault relocated, the Airport should expand the West Apron to the east
- The Airport should install a primary wind cone in the vicinity of former Taxiway G.
- The supplemental wind cones should be relocated outside of the Runway 16-34 ROFA
- The Airport should plan for the addition of a new corporate hangar on the North Apron
- The Airport should plan for the addition of a new corporate hangar on the West Apron
- The ATCT should be updated within the planning period to meet current equipment needs and meet height standards
- The Airport should preserve space on the West Apron for a US Customs and Border Protection (USCBP) Federal Inspection Station (FIS)

As discussed in Chapter 5, *Facility Requirements*, the existing airfield lighting 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. Relocating the lighting vault provides an opportunity to expand the West Apron toward the east.

As a Code of Federal Regulations (CFR) Part 139 airport that serves commercial air traffic, a primary wind cone is required, and it is recommended one be installed within the planning period. A site within the vicinity of former Taxiway G was identified as meeting the siting criteria for a primary wind cone. Also, the supplemental wind cones should be sited outside of RSAs and ROFAs.

It is recommended the Airport plan for additional corporate hangars to meet future demand. Locations could include the West and North Aprons. Lastly, the ATCT was constructed in 1950 and is outdated. Consideration should be made to improving the ATCT, however, maintaining its current location on the Airport.

These improvements will be considered against the evaluation criteria below.

- **Land Use Compatibility:** The recommendations in this alternative are compatible with on- and off-airport patterns of land use, and as such scores **Excellent (3)** with respect to land use compatibility.
- **Environmental Effects:** These recommendations in the GA and Landside Alternative 2 would have minimal environmental impacts as the proposed improvements are on previously developed land. It is given a score of **Minor (2)** for impacts to the environment.
- **Potential for Expansion:** These recommendations have some impact on future expansion potential, and this alternative scores **Good (2)** for future expansion potential.
- **Operational Efficiency:** A new, relocated lighting vault, a primary wind cone, and a new ATCT would enhance operational efficiency. This alternative scores **High (3)** for enhancing operational efficiency.
- **Revenue Generation Capability:** This alternative provides multiple opportunities to increase revenue generation at the Airport, including the leasing of hangar space or land for hangar development, and potentially lease space inside of the terminal building from a relocated ATCT. This set of recommendations scores **Excellent (3)** for revenue generation.

The comparison between GA and landside Alternatives 2 and the No Build Alternative can be seen below in **Table 6-6**.

Table 6-6: GA and Landside Alternative 2 Comparison

	Land Use	Environmental Effects	Expansion Potential	Operational Efficiency	Revenue Generation	Total
No Build	Excellent (3)	None (3)	Excellent (3)	None (0)	None (0)	9
GA Alt. 2	Excellent (3)	Minor (2)	Good (2)	High (3)	Excellent (3)	13

Source: McFarland Johnson analysis.

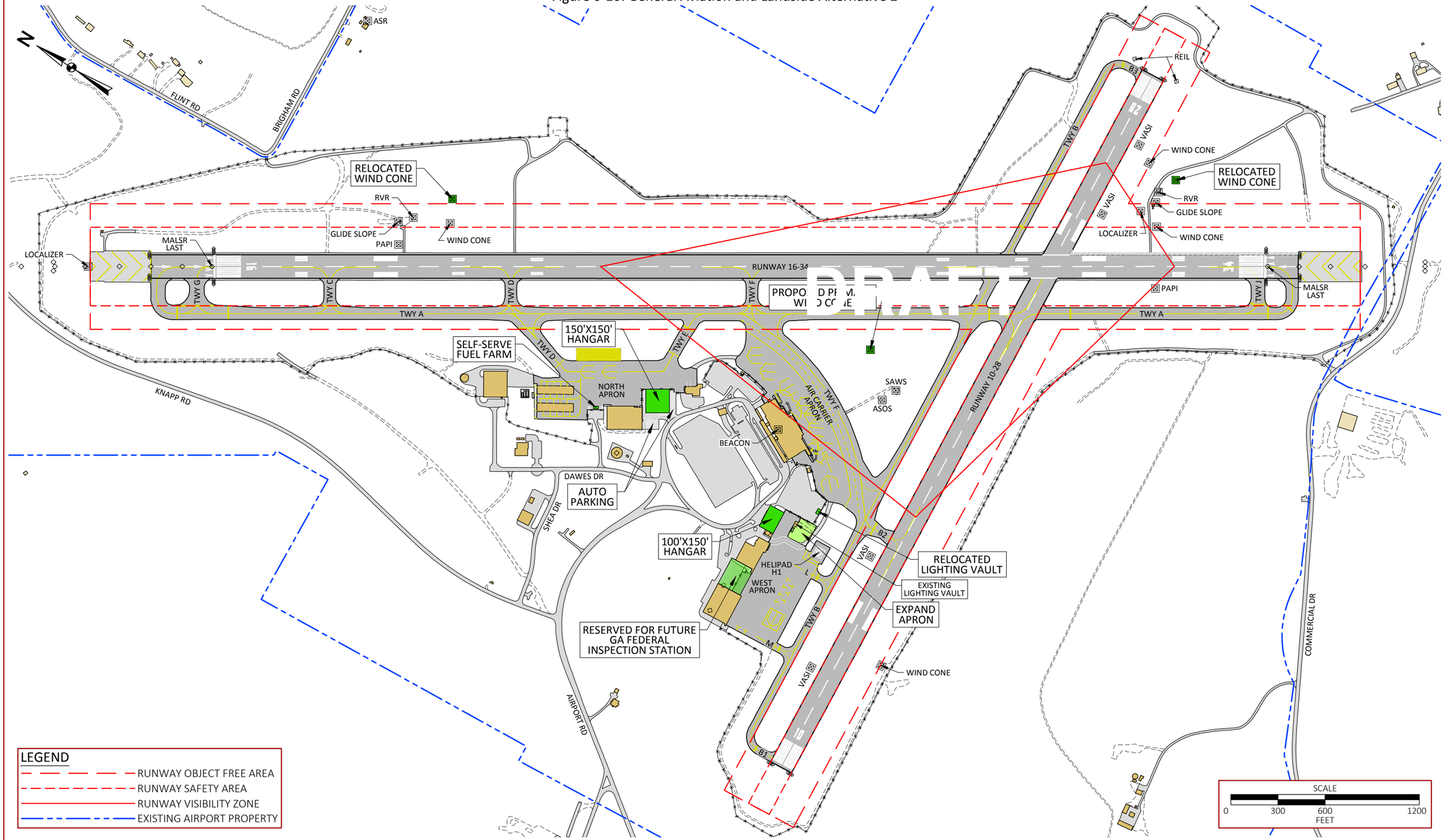
As can be seen in **Table 6-6**, GA and Landside Alternative 2 scores higher and it is recommended those projects be carried forward.

6.3.4. General Aviation and Landside Alternative 3 – Corporate Hangars

Chapter 5 identified the potential need for additional hangar space at BGM, particularly for larger, corporate jet aircraft. The Airport should plan for the construction of additional conventional hangar units to accommodate new based tenants, as well as transient aircraft, at BGM.

GA and Landside Alternative 3 proposes up to three box hangars on the southwest quadrant of the Airport, with access to the approach end of Runway 10. This alternative can be seen in **Figure 6-11**, and is evaluated below using the criteria from **Section 6.3.1**.

Figure 6-10: General Aviation and Landside Alternative 2



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Figure 6-11: General Aviation and Landside Alternative 3 - Corporate Hangars



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- **Land Use Compatibility:** This alternative works very well with the surrounding land use and makes excellent use of the land the hangars are situated on. It is perhaps the only viable use of the land, and it scores **Excellent (3)** with respect to land use compatibility.
- **Environmental Effects:** There would be some minor environmental impacts with the addition of new facilities, but those effects could be mitigated with proper grading and drainage. This alternative is given a score of **Minor (2)** for impacts to the environment.
- **Potential for Expansion:** This alternative makes the best use of the available land, while leaving other areas of the Airport available for future expansion. It scores **Excellent (3)** for future expansion potential.
- **Operational Efficiency:** The location of the hangars is not the most optimal for airport operational efficiency as some arriving and departing aircraft, particularly those utilizing Runway 16-34 will have long taxi times and will inevitably have to cross Runway 10-28. This alternative scores **Low (1)** for enhancing operational efficiency.
- **Revenue Generation Capability:** This alternative maximizes revenue generation for this parcel of land as one of the only potential uses of this space. This alternative scores **High (3)** for revenue generation capability.

Table 6-7 below compares GA and Landside Alternative 3 against the no build alternative.

Table 6-7: GA and Landside Alternative 3 Evaluation

	Land Use	Environmental Effects	Expansion Potential	Operational Efficiency	Revenue Generation	Total
No Build	Excellent (3)	None (3)	Excellent (3)	None (0)	None (0)	9
GA Alt. 3	Excellent (3)	Minor (2)	Excellent (3)	Low (1)	High (3)	12

Source: McFarland Johnson analysis.

As can be seen, GA and Landside Alternative 3 scores higher. It is recommended the Airport move forward with hangar construction or find a developer willing to build on the site.

6.3.5. Preferred General Aviation and Landside Alternative

Table 6-8 details the preferred GA and Landside Alternatives. It is recommended the Airport move forward with these improvements.

Table 6-8: GA and Landside Alternatives Evaluation Summary

	Land Use	Environmental Effects	Expansion Potential	Operational Efficiency	Revenue Generation	Total
GA Alt. 2	(N/A)	None (3)	Excellent (3)	High (3)	Fair (1)	10
GA Alt. 3	Excellent (3)	Minor (2)	Excellent (3)	Low (1)	High (3)	12

Source: McFarland Johnson analysis.

6.3.6. Non-Aeronautical Land Use Alternative

A goal of the Airport, and the FAA is financial self-sufficiency. As part of this Master Plan Update, areas for non-aeronautical development have been explored and included in this analysis in an effort to generate revenue. Five sites totaling approximately 270 acres have been identified that would be suitable for concurrent non-aeronautical development.

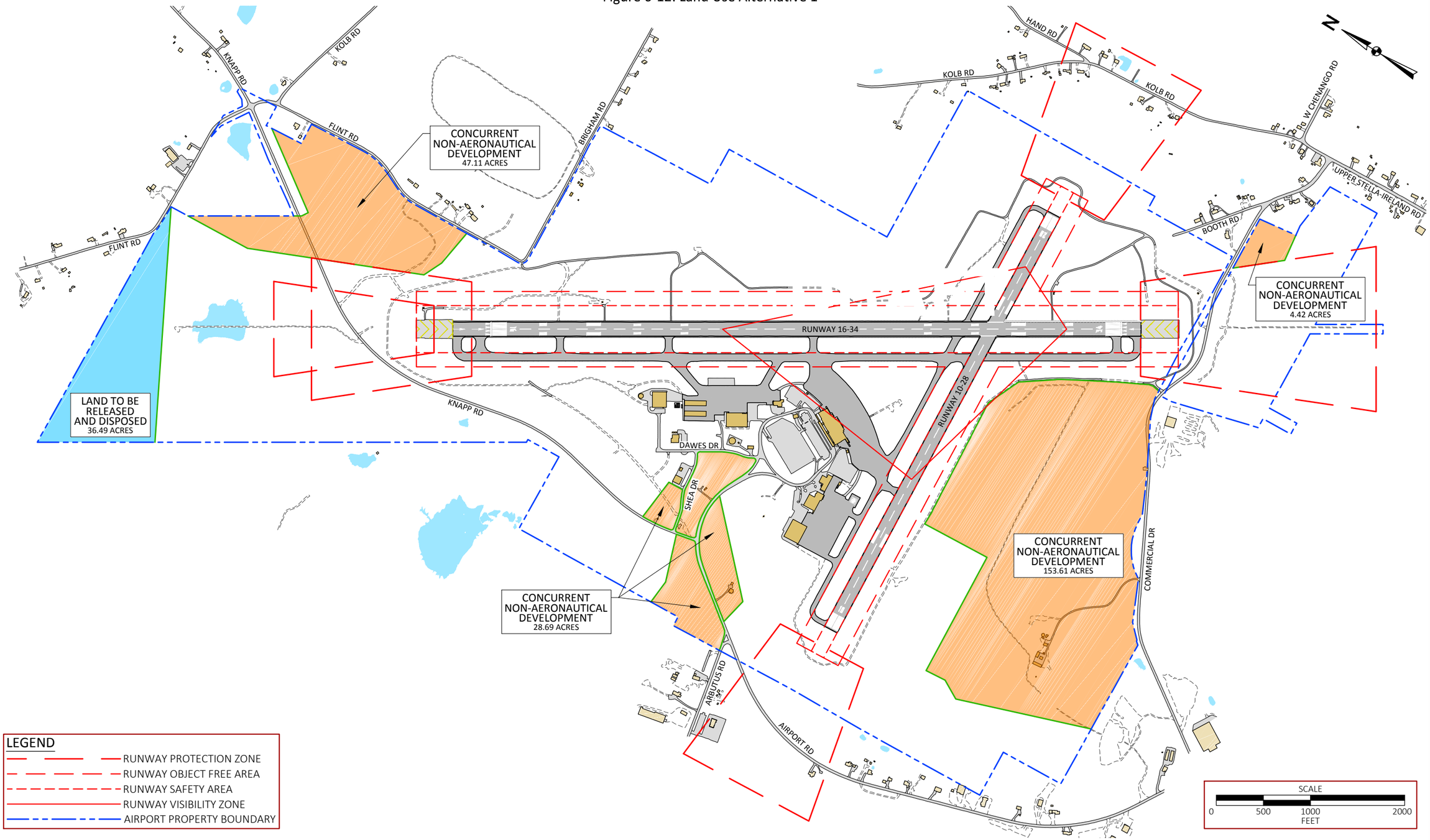
One of the sites is an approximately 154-acre site along Commercial Drive. A second site to the west of the existing terminal building and parking lots of approximately 29 acres could be suitable for concurrent non-aeronautical development. A third site is located northeast of the approach end of Runway 16 and is approximately 47 acres which could also be utilized for concurrent non-aeronautical development. A fourth site of approximately 4.5 acres is located along Commercial Drive.

A fifth site of approximately 37 acres has been identified off of the approach end of Runway 16. Given its distance from the Airport, it is unlikely it could ever be developed for aeronautical use. Also, with very little road frontage, it is not an ideal site for commercial development. It is recommended this parcel be released and disposed of. An adjacent land user has proposed to acquire the site for agricultural uses All five sites for non-aeronautical development can be seen in Figure 6-12.

6.4. PREFERRED AIRPORT DEVELOPMENT ALTERNATIVE

The preferred airport development alternative combines the recommended airside, general aviation and landside alternatives and is shown in Figure 6-13. The figure also shows the construction of buildings due to requests from interested potential tenants.

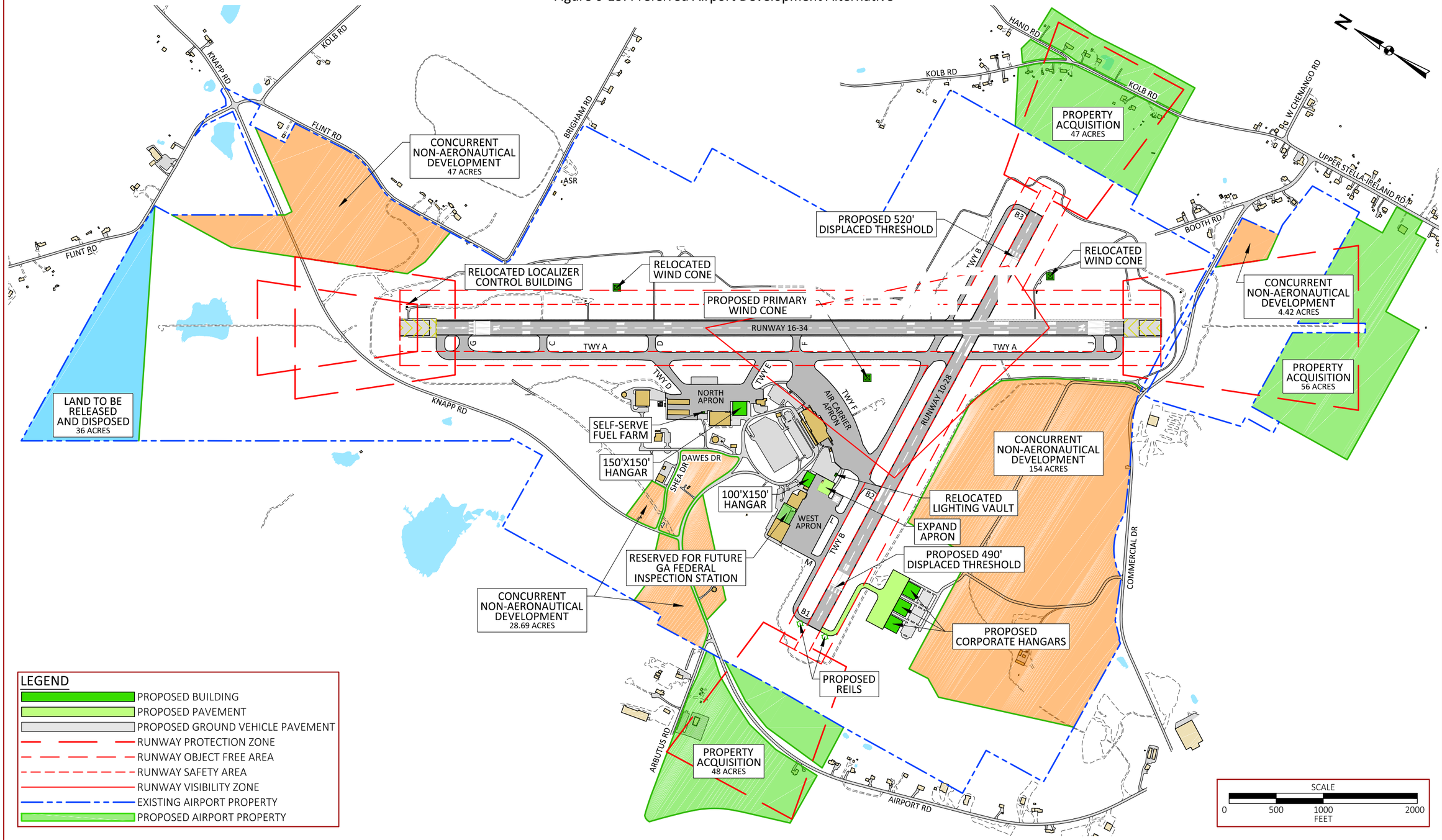
Figure 6-12: Land Use Alternative 1



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Figure 6-13: Preferred Airport Development Alternative



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A. Utility Survey

A.1. INTRODUCTION

The purpose of this utility survey is to support the ongoing Airport Master Plan Update (MPU) by locating utilities on the 1,166 acres of land currently known as the Greater Binghamton Airport (BGM). The utility survey provides a compilation of current active utilities on the site along with the known utilities which have been abandoned and remain in place should the owners decide to further develop the airport. The survey was conducted from September 2017 through January 2018 in the field and office. The report and separate drawing set has been developed for use as a supporting tool when performing the MPU or considering future infrastructure changes. A 58-page drawing set was developed as a part of this index.

A.2. PROCESS OF MAP COMPILATION

The utility survey prepared for BGM was compiled from a number of sources. Record drawings, which are commonly known as-built maps, formed the basis for the survey. Using record mapping from the McFarland Johnson archives, the Federal Aviation Administration (FAA), and BGM Operations, a base map of utilities which included storm and sanitary sewers, water, natural gas, electric, communications and lighting was created. Record mapping dated as far back as 1951 and as recently as 2016. Once the mapping was compiled, field location and verification took place on the above ground utilities.

A surveying subcontractor was utilized to locate and elevate all storm and sanitary sewers while locating evidence of other underground utilities by acquiring locations of valves, paint marks, duct bank markers, lights, posts and other available information. Inverts for the sanitary and storm sewers were obtained and pipe runs were established to connect the underground gravity sewers. Location of surface features such as hydrants, valves, and paint marks gave visual evidence of subsurface utilities which were then located as accurately as possible by using subsurface utility engineering (SUE).

SUE utilizes electromagnetic, magnetic, sonic, and other energy fields to determine the approximate horizontal location of underground utilities.

A.3. RUNWAY ELECTRICAL CIRCUITS

16-34

The airport is served by two runways, a north-south runway designated 16-34 and an east-west runway designated 10-28. Runway 16-34 is served by runway circuit R-3 which originates in the existing electrical vault. It is a No. 8 5KV cable which passes through a series of duct banks, in front of the existing terminal before turning along Taxiway F and out to the Runway. Circuit R-3 encircles Runway 16-34 before returning to the electrical vault via Taxiway F. The runway lights

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are a part of this circuit as are a number of directional and distance marking signs. The windsock and its light, get its power from this circuit.

10-28

Runway 10-28 is served by runway circuit R-8 which originates in the existing electrical vault. It passes through a series of duct banks to the edge of the runway. Circuit R-8 encircles Runway 10-28 before returning to the electrical vault. The runway lights are a part of this circuit as are a number of directional and distance marking signs. The Threshold lights and the windsock and its light, get their power from this circuit.

A.4. TAXIWAY ELECTRICAL CIRCUITS

The airport has thirteen taxiways designated A through P (the letter "I" is not used to designate taxiways to avoid confusion with the number "1" and the letter "N" is not utilized). All of the taxiways are constructed using asphalt and are equipped with blue, omnidirectional medium intensity taxiway lights (MITL).

Circuit T-1

Taxiway circuit T-1 is responsible for lighting Taxiway F, along the Air Carrier Apron, Taxiway G, and the southerly portion of Taxiway A between Taxiway G and Runway 10-28. The circuit originates in the existing electrical vault and runs through the duct banks under Taxiway K and Taxiway P before turning north to power the edge lighting for the southerly portion of the Air Carrier Apron. The circuit turns southeasterly and powers the northerly side Taxiway G and the southerly end of Taxiway A before returning back along the southerly side of Taxiway G and through existing duct banks under Taxiways P and K to its point of beginning. T-1 is shown on the attached Existing Utility plans on sheets UT-13, UT 19, UT 28 through UT-30.

Circuit T-2

Taxiway circuit T-2 originates in the existing electrical vault at the West Apron and passes through a series of duct banks, crossing Taxiways K and P to a point opposite the Air Carrier Apron just east of Taxiway F. The circuit runs roughly parallel to the Taxiway F before passing through a duct bank across the Air Carrier Apron to a point along the westerly edge of Taxiway A. the circuit passes under Taxiway E and follows the west edge of Taxiway A, crossing Taxiway D before continuing along to a point near the westerly edge of Runway 16-34. T-2 turns south and crosses Taxiway A. It runs a route that serves Taxiways B, C, D, and F before crossing under Taxiway H. The circuit then cuts perpendicular across Taxiway A and then perpendicular across Runway 10-28. T-2 then runs easterly back to Taxiway A where it follows the Taxiway until it reaches a point where it cuts across Taxiway A to service Taxiway J before heading back to the north along Taxiway A. It crosses back over Runway 10-28 and then runs along the westerly side of Taxiway A before turning parallel along the southerly side of Taxiway G. It crosses through a duct perpendicular to Taxiway G and back to a point west of Taxiway A. T-2 then runs parallel with Taxiway A to a point near Taxiway F where it turns southwesterly along the Air Carrier apron and toward its point of origination. Along this path, T-2 powers taxiway lights and

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directional marking signs. T-2 is shown on the attached Existing Utility plans on sheets UT-13, UT 14 and UT 28 through UT-33.

Circuit T-4

Taxiway circuit T-4 is responsible for the lighting and signage along Taxiway H. The circuit originates in the existing electrical vault and follows along the same route as Circuit T-1 until it reaches a point along the northerly edge of Taxiway G at its intersection with Runway 16-34. The circuit then crosses runway 16-34 and runs along the northerly side of Taxiway H to a point at the easterly end of Runway 10-28. The circuit then passes through an existing duct bank before running back along the southerly edge of Taxiway H to a point in the easterly edge of Runway 16-34. The circuit then runs parallel to the Runway before turning through a duct bank, further to the north than its original crossing, and crossing Runway 16-34. It then follows along on its original path back to the existing electrical vault. T-4 is shown on the attached Existing Utility plans on sheets UT-13, UT 19, UT 28 and UT-29.

Circuit T-6

Taxiway circuit T-6 is responsible for lighting along Taxiways K and L and the Western apron. The circuit gains its power from the existing electrical vault and runs to a point in the northerly edge of Taxiway K before turning easterly along the taxiway before going through an existing duct bank to a point east of Taxiway F. The circuit runs southerly along Taxiways F and P before crossing under Taxiway P. T-6 then moves northerly along Taxiway P and then westerly and southerly along the southern edge of Taxiway K before passing through a duct bank to the northerly edge of Taxiway K at the southwesterly end of Runway 10-28. The circuit then runs northerly and easterly along Taxiway K where it feeds a light pole on the west side of the West Apron and crosses under Taxiway M. The circuit feeds signage and lights to the east before returning and moving north along Taxiway M to a point along the southerly edge of the West Apron. The circuit heads east and south before crossing Taxiway L. It feeds more lighting on the east edge of the West Apron before returning to the electrical vault. T-6 is shown on the attached Existing Utility plans on sheets UT-05, UT 08, UT 13 and UT-14.

Circuit T-7

Taxiway circuit T-7 originates in the existing electrical vault and is primarily used to light the easterly edge of the North Apron and all of Taxiways D and E. The circuit follows the same path as T-2 to a point at the northerly edge of the Air Carrier Apron where it serves Taxiway E. The circuit then crosses Taxiway E and runs parallel to Taxiway A before crossing and serving Taxiway D. It then turns back along the easterly edge of the North Apron and follows its original path back across Taxiway E and back to the electrical vault. T-7 is shown on the attached Existing Utility plans on sheets UT-13, UT-19, UT-29 and UT 30.

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A.5. BUILDING UTILITIES

ASR 11 Digital Airport Surveillance Radar

ASR 11 is located on the hill overlooking the airport on Brigham Road. The facility is served by electric and communications lines. The electric comes directly from pole NYSEG 28 to an existing electric panel then underground to the Engine/Generator (EG) Shelter via (4) 3/0-Thermoplastic Water-Resistant nylon coated wire (THWN) cables in 3" conduit. The power passes through switchgear and runs to the existing CMU Equipment building. The EG shelter on the site also contains a backup 100kw diesel generator. The electric for the Waveguide tower is provided from the existing CMU building. The site has a fiber-optic line that runs underground and is connected to the terminal building on the airport. The fiber optic line leaves the terminal on the northern side and works its way through a series of manholes to the westerly edge of Runway 16-34. The fiber optic line and power line to the old ASR 7 site crosses the runway at a point north of Taxiway F before continuing northeasterly toward ASR 7. The line heads generally north along the existing chain link fence line where it makes an abrupt southeasterly turn, generally parallel with Brigham Road. The line continue int[illegible] which is in front o the old RTR site before crossing the fence and entering on the [illegible]ast [illegible]d of he [illegible]uilding The ASR site is found on sheet UT-50 while the fiber optic path is found on sheets UT 19, 30, 31, 40, 41 and 50.

Sand Dome

The Sand Dome is located at the north end of the airport support area. It is serviced by electric and liquid propane. The 240 Volt electrical service originates in the SRE building and leaves the building at the northwest corner and runs diagonally to the electric panel located on the southwesterly side of the Sand Dome via ½" conduit. The liquid propane is supplied via the existing propane tanks located just outside the fence and is delivered via 1" line to the southeasterly side of the building. The Sand Dome is shown on the attached Existing Utility plans on sheets UT-20 and 21.

Snow Removal Equipment Building

The Snow Removal Equipment Building (SRE) is located just south of the Sand Dome on the western side of Runway 16-34. The SRE is serviced by water, electric, sanitary, telephone/communications and natural gas. The building is fed by a 6" water service that enters the building on the west face. The electric is underground via pole NYSEG 2075 19-6 and is metered prior to entering the south side of the building. The sanitary sewer is a 4" PVC gravity sewer which leaves the building on the western face and connects to a sanitary sewer manhole in the parking area. The fiber optic line is in a 2" SCH40 PVC conduit that enters the building on the south side just east of the electric. The gas line is a 1 1/2" steel gas line that runs from the south to a meter along the western building face.

Fuel Farm

The fuel farm is a 50,140-gallon Jet-A fuel and 10,140-gallon AVGAS storage facility, located just south of the SRE building. There are two 25,000-gallon Jet A fuel tanks and one 140-gallon Jet-A

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fuel tank on the site. The fuel farm also has one 10,000 gallon and one 140-gallon AVGAS tanks. Electric for the pumps is provided via underground electric which comes from pole NYSEG 2075 19-5 to the meters and pumps located in the southeastern portion of the Fuel Farm facility. There is also a stop oil sump and 1,000-gallon oil/water separator just north of the tanks provided for the water collected from the concrete containment areas.

North Glycol Tank

Sitting just to the south of the fuel farm fencing is the 10,000 Gallon Propylene Glycol tank used for Aircraft Deicing. Its only utility is electric for the pump which is underground from pole NYSEG 2075 19-5 to the meter and pump located on the west side of the tank.

T-Hangars

The T-Hangars are only equipped with electric. The electric is underground from pole NYSEG 2075 19-5 and runs to each of the Hangars. The buildings are metered on the north side of the hangars.

Hangar 1

Hangar 1 is the largest hangar on the north side and is serviced by water, electric, sanitary, telephone/communications and natural gas. The water connection is made via a 2" water line which enters the building on the southern face, near to the southwesterly corner. The hangar is served by a natural gas line that is located and metered on the westerly face of the building. The electric is overhead and connects to the west face of the hangar above the gas meter. Sanitary sewer effluent leaves the building by a 4" PVC line on the southern wall near to the middle of the hangar. It flows westerly from its wye connection into a sewer manhole near the southwesterly building corner.

Crash and Fire Rescue Facility

The Crash and Fire Rescue Facility (CRF) is the operational hub of the airport. It houses the emergency response and operations teams. The building is serviced by water, electric, sanitary, telephone/communications and natural gas. The water is a 6" water service that connects to the existing 12" watermain and passes to the north of the building before turning and entering the building from the east wall. The electric originates at NYSEG 2075 21 and travels underground to a metering point on the north wall near the garage doors. The underground cable follows the same path. The Sanitary effluent flows out of the building via a 4" PVC to an existing lift station where it changes to a 1 ¼" PE- DR11 forcemain. The forcemain is then pumped to the existing 6" sanitary sewer near Circle Drive. The facility is equipped with an oil/water separator that sits just west of the main garage doors on the buildings west side. It has a 4" PVC outlet which connects to the building's 4" sanitary line. An underground fiber optic line runs north of the existing propane tanks and before turning south to enter the building along the north face. Natural gas is fed to the building from the existing gas main on Circle Drive to the northwest corner of the facility.

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Terminal

The terminal building is serviced by water, electric, sanitary, telephone/communications and natural gas. The building receives its water from a 10" water service that enters the building approximately 31 feet southerly from the northeasterly corner. Electric power for the terminal originates at a pole at the entrance to the car rental parking lot and is 3 Phase primary wiring. The electrical cables run southeasterly and then southerly across the car rental parking lot before reaching the electrical cabinets and entering the building. The Automated Surface Observing System (ASOS) Station located on the airport derives its power from the southerly side of the terminal via duct bank. The sanitary leaves the terminal building in two places. The northerly sanitary pipe leaves the building approximately 72 feet south from the northwesterly building corner. The southerly sanitary pipe leaves the building approximately 158 feet northerly from the building's southwesterly corner. Each of the runs are 8" Vitrified Clay Pipe and flow into existing manholes along the access road. Communications for the terminal are fed from the front of the terminal building via underground cable. The cable enters the building approximately 138 feet southerly from the northwesterly building corner. Underground fiber optic and FAA power cables run from the north face of the terminal northerly toward the current RTR site ASR-11.

Electrical Vault

The electrical is located adjacent to the West Apron and provides all the electricity for Runway and Taxiway circuits. The vault receives its power from a pole NYSEG 675 6-1 with 3 transformers just east of the southeasterly corner of the old maintenance building. The power is supplied by underground secondary cable in conduit. The circuit is metered at the old maintenance building and then cuts diagonally across the pavement to the vault. The vault contains regulators for all circuits and a backup diesel generator along with two 330-gallon fuel tanks.

Hangar 2

Hangar 2 is leased by FirstAir and is located adjacent to the West Apron. The hangar is serviced by water, electric, sanitary, telephone/communications and natural gas. The water service is a 6" to the hangar and ties back to the existing 8" that runs toward Hangar 3. The electric, telephone and cable all enter the building on the north face approximately 40 feet from the northwest building corner. The electric and cable are overhead and come from pole NYSEG 4146-4 while the telephone is underground and can be located by the existing telephone pedestals. The sanitary sewer line is a 4" PVC lateral that ties to an existing manhole just northeast of the hangar. The natural gas line enters the building on the eastern face and splits into two. These two lines serve the office area and the hangar sections of the building.

Hangar 3

Hangar 3 is leased by First Air and others and is located adjacent to the West Apron. The hangar is serviced by water, electric, sanitary, telephone/communications and natural gas. A 2" copper water service enters the building at the north face approximately 28 feet from the northeasterly corner. The electric service comes directly from a transformer, obscured by trees,

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into the northeasterly corner of the building. Sanitary effluent flow comes from the building and connects to the existing 8" sanitary main under the parking area. The communications line ties into the northwesterly building corner and comes from a telephone manhole located in the grass island north of the hangar. Gas service runs parallel to the west side of the building to a meter midway along buildings west face.

Rental Car Service Facility

The Rental Car Service Facility is located on Shea Drive and is serviced by water, electric, and sanitary. The water is a 2" service that crosses Shea Drive and connects to an existing 6" DIP watermain. The water service enters the building near the midpoint of the east face of the building. The sanitary is a 4" PVC gravity line that runs along the south side of Shea Drive. The oil/water separator collects the car wash water and flows into the same gravity system as the effluent. Overhead electric service is the main power for the building and comes from two 75 KVA transformers mounted on pole NYSEG 2075 17-3C on the west side of the building. The building electric feeds the pump islands and supplies power to the 10,000-gallon gasoline tank located on the east edge of parking area.

National Weather Service

The National Weather Service (NWS) building on Dawes Drive is serviced by water, electric, sanitary, telephone/communications and natural gas. A 2" water service running from the main at Dawes Drive runs easterly to the south of the existing parking lot before turning north and entering the building at the southeast corner. The building electric and cable are underground and come from an unnamed pole in front of the NWS and run toward the northwesterly building corner and then parallel to the building before entering into the building near the northerly corner. Building power provides for the antenna farm power. The sanitary effluent leaves the building under the south face and runs through a grinder pump south of the parking lot before entering a 1 ½" forcemain. The forcemain connects to an existing 4" forcemain on Dawes Drive. Four 4" PVC conduits provide telephone service to the NWS. It runs along the north edge of the parking lot before turning into the building.

Doppler Weather Station

The Doppler weather station is served only by electric. The station is located on the hill above Commercial Drive and obtains its power from overhead electric to pole NYSEG 2229 17-4 where it splits and serves a number of buildings. The power for the main power building is overhead from NYSEG 2229 17-4 to an unnamed power pole just south of the Doppler Radar site via a 120/240V 100-amp service. From here it goes underground and is metered near the southwest corner of the site before entering the facility and powering the Radar site's buildings. A 100-kw backup generator located in the power building provides alternate power for the radar. The rest of the site uses a combination of underground and overhead electric for its buildings.

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B. Forecast Coordination Letters

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EVOLUTION JETS

Innovative Flight Solutions

Mr. David Hickling
Commissioner of Aviation
Greater Binghamton Airport
2534 Airport Road, Box 16
Johnson City, NY 13790

January 28, 2019

Dear Mr. Hickling:

In follow-up to my conversation earlier this year with Zach Staff and Jeff Wood of McFarland Johnson regarding the Greater Binghamton Airport Master Plan Update, I am writing to review our planned u[illegible] the [illegible]t.

Evolution Jets specializes in the charter, sales, and acquisitions of aircraft acro[illegible]th co[illegible]ntry W pre[illegible]nt [illegible]operat[illegible] a fleet of Embraer Legacy business jets utilized for charter flights on a daily basis in major metropolitan areas, particularly Los Angeles, Miami, and New York. Evolution Jets signed a lease with Broome County for the 28,000 square foot Hangar 1 at the Airport, effective January 1, 2018 to utilize as our northeast maintenance base. As aircraft are regularly utilized for charter and are operated on a daily basis, it is imperative that we identify a base convenient to the location of our customers. With the close proximity of the Greater Binghamton Airport to the New York City metropolitan area, the location was ideal for this purpose. Our plan is to ferry aircraft to Binghamton for maintenance and cleaning, before dispatching the aircraft for operations the next morning.

We commenced operations out of Hangar 1 at Greater Binghamton Airport in the summer of 2018. As discussed with Mr. Staff and Mr. Wood, we anticipated completing an average of three operations per week at BGM in 2019, increasing to six operations in 2019, with steady growth in our operations over the next 10 years, increasing to 16 weekly operations in 2029. While future operations are still planned at this point, we believe these estimates are prudent for consideration as part of the Master Plan Update.

We would recommend, as part of the Master Plan Update, that the County identify and plan for the development of additional general aviation development sites on the Airport. As our business continues to grow over the next decade, it is important that the Airport have development sites for additional hangar and apron space planned for development should we identify a need for additional hangar space to accommodate our operations.

If we can provide any other information to assist with the development of the Master Plan Update, please do not hesitate to contact us.

Sincerely,

Jamie Thomas
President – Evolution Jets

SkyWest AIRLINES®

David Hickling
Commissioner of Aviation
Greater Binghamton Airport
2534 Airport Road Box 16
Johnson City, NY 13790

DATE: 1/9/2019

Mr. Hickling,

SkyWest Airlines is pleased to learn of the ongoing master plan study for the Greater Binghamton Airport (BGM), we understand the importance of having an informed plan in place for your airport. As your partner in aviation, we would like to provide some planning-level considerations for you to consider in the forecast and future facility needs elements of the master plan:

Like many regional carriers, SkyWest is slowly upgauging our fleet to larger dual-class regional jets. While we do not yet know what aircraft BGM will be served with 10-20 years from now, we feel this plan should consider dual-class aircraft such as the CRJ-900 or Embraer 175 for planning purposes for the 20-year horizon. Long- term planning considerations should also include the possibility of an additional daily round trip flight, for a total of four daily departures from BGM. Any additional service would be subject to market conditions, and as a long-term consideration, details of any potential additional flying remain to be seen. However, we feel this would be a valid planning consideration as you undertake the master plan effort.

Regarding the airside facilities, SkyWest is satisfied with the existing airside facilities at BGM, including the existing 7,304'x150' Runway 16-34 with medium intensity approach lighting systems and instrument landing systems, as well as the full parallel taxiway. However, improvements such as touchdown zone lighting or centerline lighting would be viewed favorably to improve visibility minimums for landings on Runway 34. In addition, the planned construction of a full parallel taxiway to Runway 10-28 will remove general aviation traffic from Taxiway F and the terminal apron, which will also improve operating conditions. We do not foresee any issues with the potential larger aircraft operating from the existing airside infrastructure at BGM.

We trust this study will produce financially prudent investments that will keep the airport operating in the safe and efficient manner we have come to enjoy. We encourage you to engage our local staff as part of our stakeholder engagement process, and please do not hesitate the contact us if we can be of any assistance.

Daniel Belmont
Manager Network Planning | Market Development
SkyWest Airlines

C. FAA Terminal Area Forecast Comparison

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Appendix C
Greater Binghamton Airport (BGM) Airport Planning Forecasts
A. Forecast Levels and Growth Rates

Specify base year: 2017

	Base Yr. Level 2017	Base Yr.+1yr. 2018	Base Yr.+5yrs. 2022	Base Yr.+10yrs. 2027	Base Yr.+15yrs. 2032	Average Annual Compound Growth Rates: Base Yr.+1yr. 2018	Base Yr.+5yrs. 2022	Base Yr.+10yrs. 2027	Base Yr.+15yrs. 2032
Passenger Enplanements									
Air Carrier	0	0	18,980	37,960	58,912	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Commuter	33,666	36,400	24,296	9,171	0	8.12%	-6.32%	-12.19%	-100.00%
TOTAL	**33,666**	**36,400**	**43,276**	**47,131**	**58,912**	**8.12%**	**5.15%**	**3.42%**	**3.80%**
Operations									
Itinerant									
Air Carrier	19	19	710	1,415	2,150	0.00%	106.30%	53.89%	37.06%
Commuter / Air Taxi	3,331	3,282	2,421	1,586	790	-1.47%	-6.18%	-7.15%	-9.15%
Total Commercial Operations	3,350	3,301	3,131	3,001	2,940	-1.46%	-1.34%	-1.09%	-0.87%
General Aviation	5,886	6,999	9,260	11,175	11,997	18.91%	9.49%	6.62%	4.86%
Military	218	218	218	218	218	0.00%	0.00%	0.00%	0.00%
Local									
General Aviation	2,995	3,004	3,040	3,086	3,133	0.30%	0.30%	0.30%	0.30%
Military	98	98	98	98	98	0.00%	0.00%	0.00%	0.00%
TOTAL OPERATIONS	**12,547**	**13,620**	**15,747**	**17,578**	**18,386**	**8.55%**	**4.65%**	**3.43%**	**2.58%**
Instrument Operations	3,639	3,950	4,567	5,098	5,332	8.55%	4.65%	3.43%	2.58%
Peak Hour Operations	8	8	9	10	11	0.00%	2.38%	2.26%	2.15%
Based Aircraft									
Single Engine (Nonjet)	26	26	25	24	23	0.00%	-0.78%	-0.80%	-0.81%
Multi Engine (Nonjet)	6	6	6	6	7	0.00%	0.00%	0.00%	1.03%
Jet Engine	3	3	3	4	4	0.00%	0.00%	2.92%	1.94%
Helicopter	2	2	2	2	3	0.00%	0.00%	0.00%	2.74%
Other	0	0	0	0	0	N/A	N/A	N/A	N/A
TOTAL	**37**	**37**	**36**	**36**	**37**	**0.00%**	**-0.55%**	**-0.27%**	**0.00%**

B. Operational Factors

	Base Yr. Level 2017	Base Yr.+1yr. 2018	Base Yr.+5yrs. 2022	Base Yr.+10yrs. 2027	Base Yr.+15yrs. 2032
Average Aircraft Size (seats)					
Air Carrier	0	0	65	65	65
Commuter	50	50	50	50	50
Average Enplaning Load Factor					
Air Carrier	0.00%	0.00%	82.25%	82.54%	84.31%
Commuter	40.43%	44.36%	40.14%	23.13%	0.00%
GA Operations Per Based Aircraft	240	270	342	396	409

Note: Show base plus one year if forecast was done. If planning effort did not include all forecast years show interpolated years as needed.

Average Enplaning Load Factor is based on Commuter / Air Taxi Operations, which incorporates unscheduled Part 135 operations outside of the Commuter schedule utilizing aircraft with fewer than 50 seats.

The base year for passenger enplanements and operations is represented as 2017.

N/A - No prior activity to show growth rates.

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Appendix C
Comparison of Airport Planning & TAF Forecasts - BGM

	Year	Airport Forecast	TAF	AF/TAF (% Difference)
Passenger Enplanements				
Base yr.	2017	33,666	41,454	-18.79%
Base yr. + 1yr.	2018	36,400	41,454	-12.19%
Base yr. + 5yrs.	2022	43,276	41,454	4.40%
Base yr. + 10yrs.	2027	47,131	41,454	13.69%
Base yr. + 15yrs.	2032	58,912	41,454	42.11%
Commercial Operations				
Base yr.	2017	3,350	3,350	0.00%
Base yr. + 1yr.	2018	3,301	3,350	-1.46%
Base yr. + 5yrs.	2022	3,131	3,350	-6.54%
Base yr. + 10yrs.	2027	3,001	3,350	-10.42%
Base yr. + 15yrs.	2032	2,940	3,350	-12.24%
Total Operations				
Base yr.	2017	12,547	12,547	0.00%
Base yr. + 1yr.	2018	13,620	12,062	12.92%
Base yr. + 5yrs.	2022	15,747	12,130	29.82%
Base yr. + 10yrs.	2027	17,578	12,215	43.91%
Base yr. + 15yrs.	2032	18,386	12,300	49.48%

Note: TAF data is on a U.S. government fiscal year basis (October through September)

D. Environmental Coordination

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New York Ecological Services Field Office
3817 Luker Road
Cortland, NY 13045-9385
Phone: (607) 753-9334 Fax: (607) 753-9699
http://www.fws.gov/northeast/nyfo/es/section7.htm

In Reply Refer To: November 01, 2019
Consultation Code: 05E1NY00-2020-SLI-0384
Event Code: 05E1NY00-2020-E-01283
Project Name: Master Plan Update

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*). This list can also be used to determine whether listed species may be present for projects without federal agency involvement. New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list.

Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the ESA, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC site at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list. If listed, proposed, or candidate species were identified as potentially occurring in the project area, coordination with our office is encouraged. Information on the steps involved with assessing potential impacts from projects can be found at: http://www.fws.gov/northeast/nyfo/es/section7.htm

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/

eagle_guidance.html). Additionally, wind energy projects should follow the Services wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the ESA. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New York Ecological Services Field Office
3817 Luker Road
Cortland, NY 13045-9385
(607) 753-9334

Project Summary

Consultation Code: 05E1NY00-2020-SLI-0384

Event Code: 05E1NY00-2020-E-01283

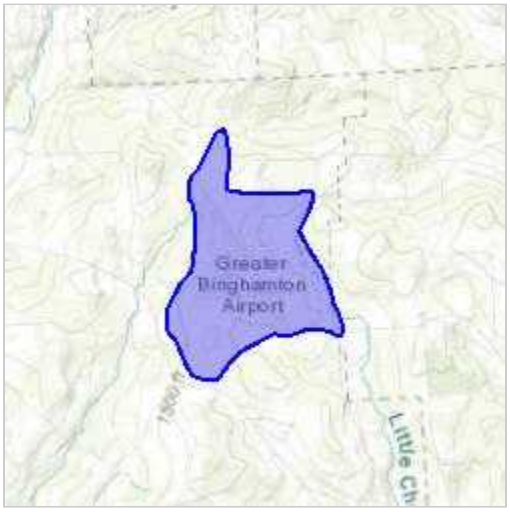
Project Name: Master Plan Update

Project Type: Guidance

Project Description: The Greater Binghamton Airport is currently undergoing a Master Plan Update. The Official Species List will be referenced in the Master Plan for consideration when proposing projects for future development at the Airport.

Project Location:

Approximate location of the project can be viewed in Goo le M ap : h ps: www.google.com/maps/place/42.21065369410256N75.97 21 46 38(1 v



Counties: Broome, NY

Endangered Species Act Species

There is a total of 0 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

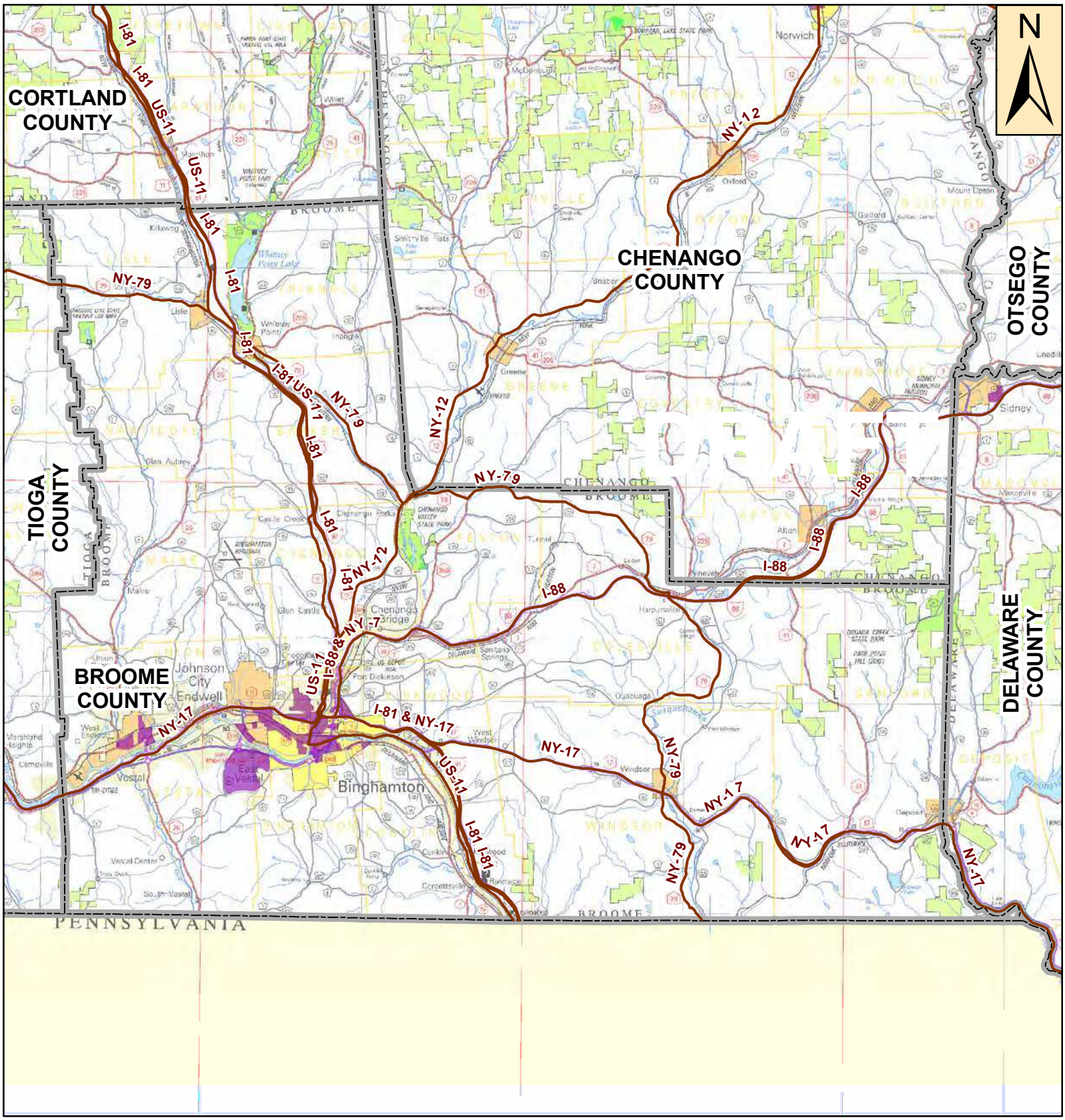
1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

Potential Environmental Justice Areas in Broome County, New York

Click on any Potential EJ Area outlined in blue for a detailed map



This computer representation has been compiled from supplied data or information that has not been verified by NYSDEC. The data is offered here as a general representation only and is not to be used for commercial purposes without verification by an independent professional qualified to verify such data or information.

NYSDEC does not guarantee the accuracy, completeness, or timeliness of the information shown and shall not be liable for any loss or injury resulting from reliance.

Data Source for Potential Environmental Justice Areas:
U.S. Census Bureau, 2000 U.S. Census

Legend

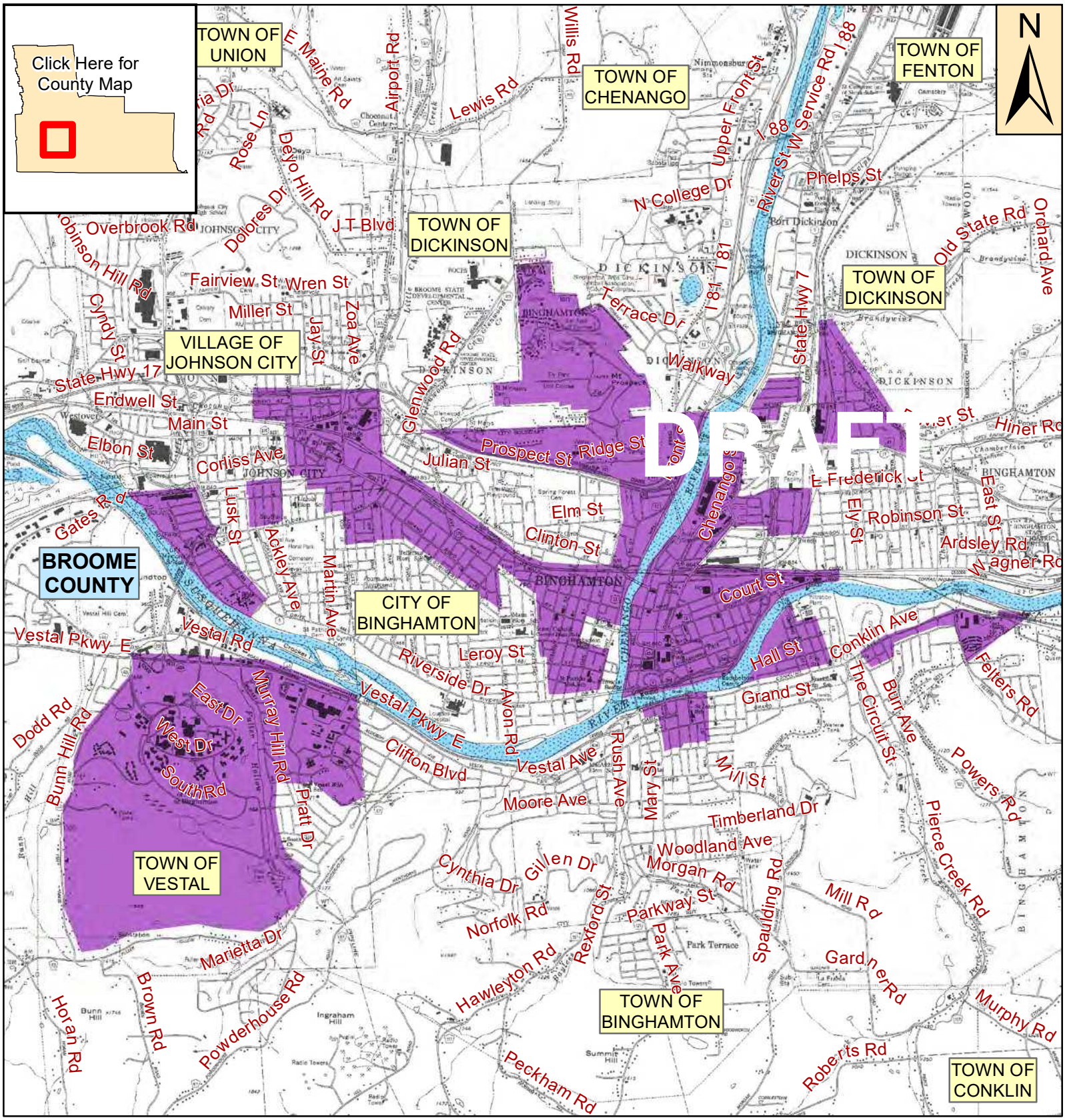
- Potential EJ Area
- County Boundary

Miles
0 2 4 6 8 10

SCALE: 1:325,000

For questions about this map contact:
New York State Department of Environmental Conservation
Office of Environmental Justice
625 Broadway, 14th Floor
Albany, New York 12233-1500
(518) 402-8556
ej@gw.dec.state.ny.us

Potential Environmental Justice Areas in the Binghamton Area
Broome County, New York



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Data Source for Potential Environmental Justice Areas:
U.S. Census Bureau, 2000 U.S. Census

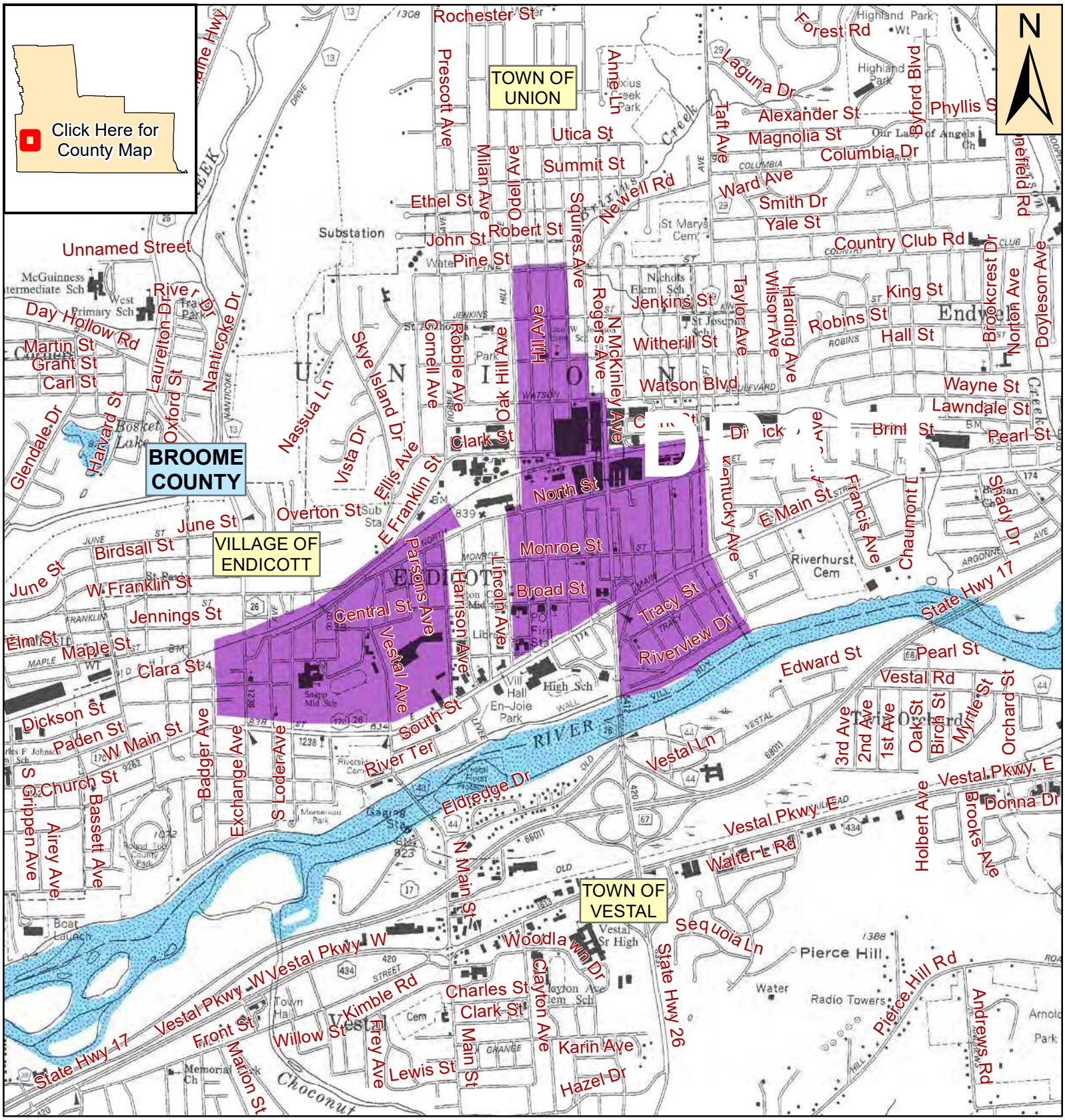
Legend

- Potential EJ Area
- County Boundary
- Waterbodies

Miles
0 0.5 1 1.5 2
SCALE: 1:50,000

For questions about this map contact:
New York State Department of Environmental Conservation
Office of Environmental Justice
625 Broadway, 14th Floor
Albany, New York 12233-1500
(518) 402-8556
ej@gw.dec.state.ny.us

Potential Environmental Justice Areas in the Village of Endicott
Broome County, New York



Legend

- Potential EJ Area
- County Boundary
- Waterbodies

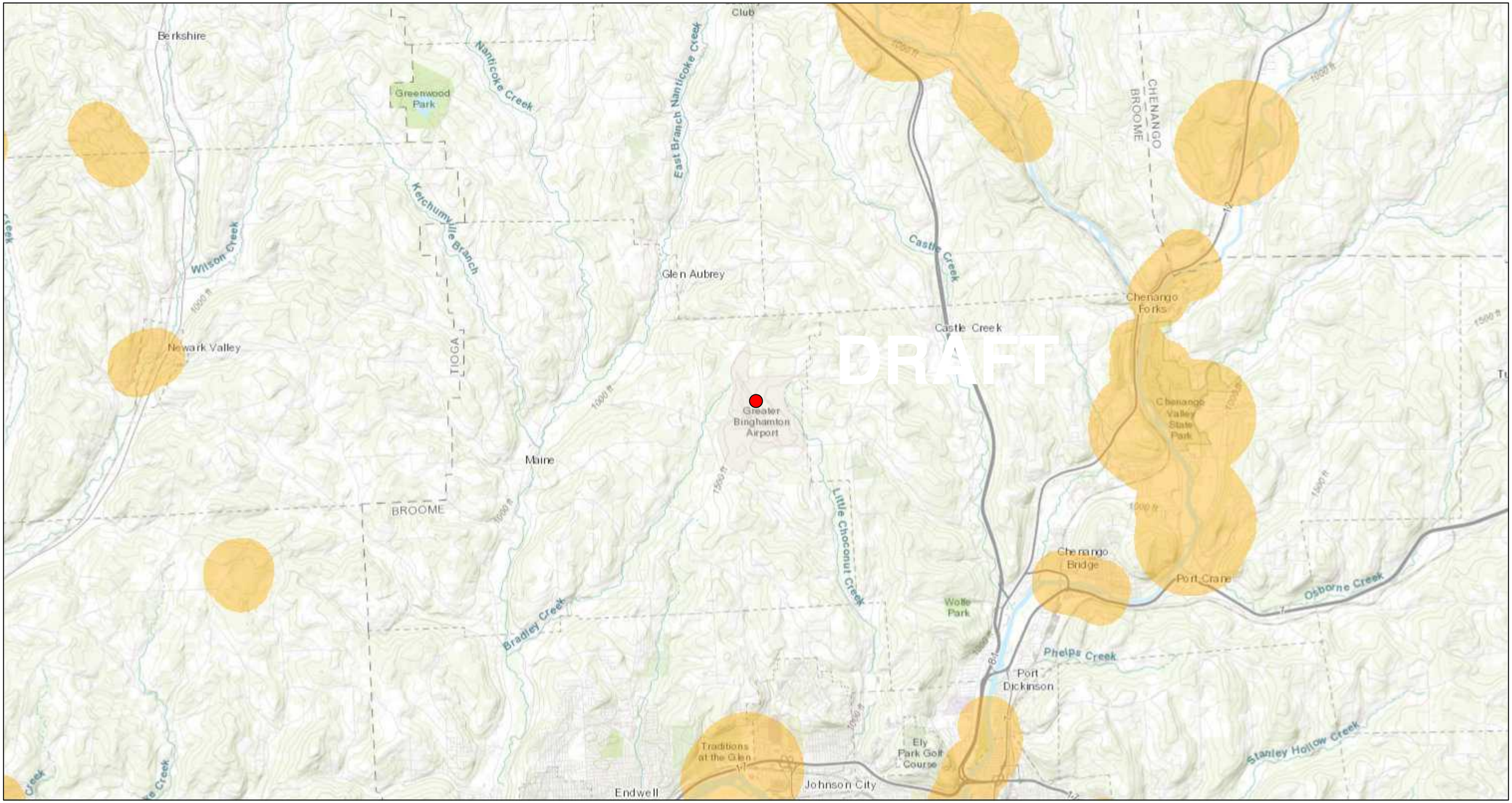
This computer representation has been compiled from supplied data or information that has not been verified by NYSDEC. The data is offered here as a general representation only and is not to be used for commercial purposes without verification by an independent professional qualified to verify such data or information.

NYSDEC does not guarantee the accuracy, completeness, or timeliness of the information shown and shall not be liable for any loss or injury resulting from reliance.

Data Source for Potential Environmental Justice Areas:
U.S. Census Bureau, 2000 U.S. Census

For questions about this map contact:
New York State Department of Environmental Conservation
Office of Environmental Justice
625 Broadway, 14th Floor
Albany, New York 12233-1500
(518) 402-8556
ej@gw.dec.state.ny.us

BGM Master Plan Update



December 18, 2017

1:144,448

0 1.75 3.5 7 mi

0 2.75 5.5 11 km

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Author: Thomas Wirickx
Not a legal document

Introduction

From 1990 to 2004, 59,196 wildlife-aircraft strikes in the U.S. were reported to the Federal Aviation Administration (FAA) (Cleary et al. 2005) with an estimated cost of more than $495 million to civil aviation annually. Of these strikes, 3,295 (6.4%) occurred in New York State (Cleary et al. 2005). Further, Barras and Dolbeer (2000) estimate that as few as 13% of all bird strikes are reported. Worldwide, over 300 people have been killed from wildlife strikes (Dolbeer et al. 2000). Due to an increasing presence of wildlife at airports and to an increased awareness of the potential damage caused by wildlife, the FAA has implemented procedures to mitigate damage to aircraft by wildlife.

Federal Aviation Regulations Part 139.337(b) requires that a Wildlife Hazard Assessment be conducted when an air carrier aircraft experiences a multiple wildlife strike; an engine ingestion of wildlife; substantial damage from striking wildlife; or wildlife of a size, or in numbers, capable of causing an event described above is observed to have access to any airport flight pattern or aircraft movement area. If the airport notes wildlife hazards on or near the airport in the Airport Facility Directory (AFD), on [illegible] (NOTAM) or on the Automated Terminal Information Service (ATIS), the airport may be required to conduct a Wildlife Hazard Assessment. FAR Part 139 requires that Wildlife Hazard Assessments be conducted over a 1-year period to capture seasonal and daily patterns of wildlife (Cleary and Dolbeer 1999). FAA Advisory Circulars entitled, "Hazardous Wildlife Attractants On or Near Airports" (AC 150/5200-33) and "Airport Landscaping for Noise Control Purposes" (AC 150/5320-14) and the FAA manual entitled, "Wildlife Hazard Management at Airports," (Cleary and Dolbeer 1999) pertain to wildlife hazards and should be consulted.

According to our records, correspondence between Wildlife Services (WS) (formerly "Animal Damage Control") and Binghamton Region Airport (BGM) occurred in 1979 in the form of a letter and permit application to kill gulls and other birds to reduce hazards to aircraft (Appendix A). The initial consultation pertaining to this Wildlife Hazard Assessment (WHA) between WS and the management of BGM occurred in June 2003. A meeting and site visit were conducted on June 23, 2003.

Based on the site visit, discussions with airport personnel, proximity of the Broome County Landfill, and in consideration of FAA requirements, WS recommended that a 1-year WHA be conducted at BGM. The Cooperative Service Agreement to perform Wildlife Hazard Assessments at Binghamton Regional Airport and Broome County Landfill was finalized on August 30, 2004. The field portion of the WHA started in September 2004 and was completed in September 2005.

Legal Authority of Wildlife Service

The United States Department of Agriculture (USDA) is directed by law to protect American agriculture and other resources from damage associated with wildlife. Animal Plant and Health Inspection Services (APHIS) WS has statutory authority under the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C.426-426b) as amended, and the Act of December 22, 1987 (101Stat. 1329-331, 7 U.S.C. 426c), to cooperate with States, local jurisdictions, individuals, public and private agencies, organizations, and institutions while conducting a

program of wildlife services involving mammal and bird species that are reservoirs for zoonotic diseases, or animal species that are injurious and/or a nuisance to, among other things, agriculture, horticulture, forestry, animal husbandry, wildlife, and human health and safety.

WS Directive 2.305, *Wildlife Hazards to Aviation*, provides guidance for WS wildlife biologists in providing technical assistance or direct control to airport managers, State aviation agencies, the aviation industry, the FAA, and the Department of Defense regarding hazards caused by wildlife to airport safety. Wildlife Services activities are conducted in cooperation with other federal, state and local agencies, and with private organizations and individuals.

The WS program is a non-regulatory, federal cooperative wildlife management program whose mission is to provide leadership in reducing conflicts between people and wildlife. Wildlife Services has the primary responsibility for responding to threats caused by migratory birds. A growing focus of WS is to help promote the safe operation of aircraft by working with airport management to document, assess and reduce wildlife hazards at airports throughout the country.

FAA Cert. Alert No. 97-02, "Relationship between FAA and WS" (Appendix B), defines the respective roles of the agencies in resolving wildlife hazards on airports. It references a Memorandum of Understanding between FAA and USDA, Wildlife Services (formally Animal Damage Control) that establishes a cooperative relationship between these two agencies to resolve hazards to aviation by wildlife (Appendix C). This MOU recognizes that WS has the professional and technical knowledge to reduce wildlife hazards on or near airports, and it acknowledges that most airports do not possess this expertise. FAR Part 139.337 requires each airport operator to develop a wildlife hazard management plan. Even though the operator may work with WS to develop this plan or use a wildlife hazard assessment to support the plan, it is the responsibility of the airport operator (not WS) for the development, approval and implementation of the plan. FAA Cert Alert No. 97-09, "Wildlife Hazard Management Plan Outline" (Appendix D), provides guidance on the formulation and content of a FAA-approved wildlife hazard management plan for an airport.



Ring-billed gull (*Larus delawarensis*)

Objectives

The objectives of this wildlife hazard assessment were to:

1. identify the species, numbers, locations, local movements, and daily and seasonal occurrences of wildlife observed,
2. identify and locate features on and near the airport that attract wildlife,
3. describe existing wildlife hazards to air carrier operations,
4. review available wildlife strike records, and
5. provide recommendations for reducing wildlife hazards at BGM.



Strike Reporting

Wildlife Strikes

Bird Strike Committee Canada (Transport Canada 1992) developed a bird strike definition that has since been revised by the FAA effective 10 February 2004 and adopted by the International Civil Aviation Organization (ICAO), Bird Strike Committee USA, International Bird Strike Committee, and the U.S. Air Force. Under this definition, a wildlife strike is considered to have occurred if:

1. an air carrier aircraft experiences multiple wildlife strikes,
2. an air carrier aircraft experiences substantial damage from striking wildlife. As used in this paragraph, substantial damage means damage or structural failure incurred by an aircraft that adversely affects the structural strength, performance, or flight characteristics of the aircraft and that would normally require major repair or replacement of the affected component,
3. an air carrier aircraft experiences an engine ingestion of wildlife; or
4. wildlife of a size, or in numbers, capable of causing the effects described in (1), (2), or (3) of this section is observed to have access to an airport flight pattern or aircraft movement area.

The number of civilian wildlife-aircraft strikes reported annually in the United States has increased from 1,743 in 1990 to 6,511 strikes reported in 2004 (Cleary et al. 2005). This increase could be the result of several factors: an increase in wildlife-aircraft strike issue awareness, an increase in air traffic, or an increase in some populations of hazardous wildlife species.

From 1980 to 2004 commercial aircraft movements in the U.S. increased from 17.8 million to 29 million (Cleary et al. 2005). This rise in air traffic coincides with increasing wildlife populations. In New York, the resident (non-migratory) Canada goose population increased from about 19,000 in 1981 to an estimated 220,000 today (Swift 2006). Nationally, the resident Canada goose population increased at a mean annual rate of 9.6% from 1980-2001; the ring-billed gull population increased at a mean annual rate of 2.2%, the red-tailed hawk population by 2.4%, and the turkey vulture population by a mean annual rate of 2.2% (Sauer et al. 2003). The white-tailed deer population in the United States increased from 350,000 in 1900 to about 24 million in 1994 (Jacobson and Kroll 1994). Increasing plane movements and increasing urban wildlife populations creates risks that are greater than ever before for wildlife-aircraft strikes (Dolbeer & P. Eschenfelder 2002).

Collecting and Reporting Wildlife Strike Data

Diligent collection of bird strike data should be a priority for airport operations personnel. The number of strikes per 10,000 aircraft movements is used to assess the severity of wildlife hazards at an airport and to evaluate current wildlife management plans. Bird strike statistics based solely on pilot reports are unreliable and unrepresentative because most strikes go unreported. Through regular carcass searches on the runways at a major international airport, Barras and Dolbeer (2000) estimated that as few as 13% of all bird strikes were reported.

The FAA and the National Wildlife Research Center (NWRC—the research division of USDA, Wildlife Services) manage a national wildlife strike database (NWSD) with records dating from January 1990. Pilots, tower personnel, and airport staff should be encouraged to be aware of bird strikes and the importance of reporting them to the FAA. It is critical for the integrity of a strike record database, both locally and nationally, to receive as much information as possible through the FAA Strike Report Form 5200-7 (Appendix E); the strike report can also be submitted online. Advisory Circular 150/5200-32A explains the importance of diligently reporting strikes to the database (Appendix E).

If any of the four criteria listed on page 4 is met, a Strike Report Form should be completed with as much information as possible and submitted to the FAA. If a carcass is found that cannot be identified, specified feathers or parts of these carcasses should be submitted to the Smithsonian Institute Feather Lab (Appendix F). Or if a strike is reported but no carcass recovered, any feathers or parts remaining on the plane should also be removed and submitted to the Feather Lab. *Bird identification is provided at no expense to airport*s.

The FAA and the NWRC provide a comprehensive analysis of the national wildlife strike database each year in the annual report "Wildlife Strikes to Civil Aircraft in the United States." This document and the FAA Strike Report Form 5200-7 can be downloaded at http://wildlife-mitigation.tc.faa.gov/.

BGM and Adjacent Property

BGM is located in the Town of Maine approximately 5.2 miles north of the Village of Johnson City in Broome County, N.Y. The airport is situated east of NY State Route 69 (Airport Road). The airport is surrounded by woodlands with scattered residential homes. Broome County Landfill is located approximately 1.3 miles northeast from the end of runway 16.

During the WHA we considered wildlife activity on BGM property and within a 5-mile radius of the airport. BGM has two intersecting runways: runway 10/28 (5,002 x 150 ft.) and runway 16/34 (7,100 x 150 ft.). Aircraft movements average 91 per day: 47% commercial; 33% transient general aviation; 17% local general aviation; and 3% military (Source: www.airnav.com/airport/KBGM).

Wildlife

Deer are the greatest threat to aviation (Dolbeer et al. 2000), while large flocking birds such as gulls and waterfowl are usually considered the greatest avian threat to aviation. However, smaller starlings and blackbirds can also present significant hazards because of their propensity to form tight flocks comprised of thousands of individuals. Turkeys also present significant hazards due to their size and some solitary birds such as raptors present a concern because of their size and aerial hunting behavior.

Appendix G lists all the species of wildlife observed at BGM during the WHA. Mammals observed include the Eastern cottontail rabbit (*Sylvilagus floridanus*), striped skunk (*Mephitis mephitis*), red fox (*Vulpes fulva*) and woodchuck (*Marmota monax*). Mammals indigenous to this area that were not observed inside the security fence during the WHA

include the white-tailed deer (*Odocoileus virginianus*), beaver (*Castor canadensis*), opossum (*Didelphis marsupialis*), raccoon (*Procyon lotor*), bobcat (*Lynx rufus*), black bear (*Ursus americanus*) and many species of rodents. This list is an excellent representation of the larger bird species common to southern New York; however, there are many species of passerines (smaller birds) that were not observed. Although several species of amphibians and reptiles are common to the area, none were recorded during the WHA.

Habitat Description

The BGM property is 1,199 acres in size comprised of paved or concrete surfaces, permanent buildings, woods and grassy areas. Because the airport was built on Mt. Ettrick, the elevation of the airport is higher then the immediate surrounding terrain. The airfield is enclosed in an eight foot chain link security fence with three strands of barbed wire. Woodlands, wetlands and residential areas surround airport property.

Current Wildlife Hazard Management Plan

BGM presently views wildlife hazard management as a priority with approximately four operations staff (including one operations supervisor) trained to assist in managing problem wildlife at the airport. Current wildlife management practices include:

- short-grass management immediately adjacent to the runways and taxiways, and areas situated within the taxiways,
- contract with NY State licensed NWCO (nuisance wildlife control operator) to remove fox and beaver when necessary,
- current state and federal permits for killing migratory birds (Canada geese & gulls, plus non Threatened and Endangered species during emergency takes),
- non-lethal control: the use of hand-launched pyrotechnic devices,
- wildlife-aircraft strike reporting

Legal Status of Wildlife Species

Federal, state, or municipal laws protect most forms of wildlife and their habitats. Before administering any control action at BGM, whether lethal or non lethal, the identification and legal status of the target species should be determined. Regulatory agencies governing wildlife issue permits to trap or kill wild animals depending on the species and method of control involved. A permit is also usually required to harass species of special concern (i.e., threatened and endangered species). BGM is responsible for adhering to the current regulations regarding wildlife control and for obtaining the appropriate permits to take or harass specific types of wildlife. Potential non-target animals should be identified, as well, to aid in determining the appropriate control methods that would avoid killing or harassing these species.

Federal Regulations

The U.S. Government has passed several acts for the protection of wildlife including the Migratory Bird Treaty Act (MBTA), the Lacey Act, the Endangered Species Act, Eagle Protection Act, the National Environmental Policy Act, and the Federal Insecticide,

Fungicide, and Rodenticide Act (FIFRA). These are the basis of most wildlife regulations that have been issued in the Codes of Federal Regulations (CFR). Several agencies are responsible for implementing these regulations and many of these regulations affect wildlife management at airports. Federal wildlife laws are administered by the U.S. Fish and Wildlife Service (USFWS) and primarily involve migratory birds protected under the MBTA and all species protected under the Threatened and Endangered (T&E) Species Act (Appendix H). Permits from the USFWS must be updated annually unless otherwise stated on the permit.

BGM is currently managing wildlife under Federal Fish and Wildlife Service Depredation Permit Number MB672121-0 (Appendix I). This permit authorizes BGM to kill "non-endangered and non-threatened species of migratory birds when they are creating or about to create a hazard to aircraft, only after non-lethal techniques have been tried." This permit expires on 09/30/2006. To avoid lapses in permits, BGM should "submit a written application at least 30 days prior to the expiration date of the permit." Depredation permits are also subject to the conditions put stated in 50 CFR § 21.27: Special Purpose Permits (Appendix J). Under these guidelines BGM is required to d[illegible] en the perm[illegible]ted activity including type of action, species and numbers involved, and disp[illegible]sition of c[illegible]rc[illegible]sse[illegible]. These records should be available for inspection if necessary.

State and Local Regulations

New York State law follows the Federal regulations for migratory bird species and further regulates actions concerning mammals and game birds (Environmental Conservation Law of New York, Article 11) (Appendix K). The New York State Department of Environmental Conservation (NYSDEC) is responsible for issuing state depredation permits (permits that allow birds and mammals to be taken to protect property, agriculture, and human health and safety) (see page 8). The DEC publishes these regulations annually as the Environmental Conservation Law of New York. A copy of these regulations is available through DEC upon request. The airport is currently operating under a NYSDEC Depredation License Number 23 (Appendix I) that supports their Federal Fish and Wildlife Permit discussed above.

A reference list of birds and mammals commonly found in New York and the permits required for depredation control.

Category	**Species**	**State Permit**	**Federal Permit**
Resident game birds	Turkey, ruffed grouse, bobwhite quail, pheasants	YES	NO
Resident nongame birds	Starlings, house sparrows, pigeons	NO	NO
Migratory game birds[1]	Geese, ducks, snipe, woodcocks, rails, gallinules	YES	YES
Migratory nongame birds[1]	Raptors, doves, gulls, jays, songbirds, swifts, swallows, shorebirds, and wading birds	YES	YES
Depredation order birds[2]	Crows, red-winged blackbirds, brown-hea ed cowbirds, and grackle	JO	NO
Mammals	Deer, bear, red fox, gray fox, Eastern cottontail rabbits, squirrels, coyotes, bobcats, raccoons, skunks, possums, muskrats, beavers	YES	NO
Unprotected species	Woodchucks, porcupines, red squirrels, snapping turtles	NO[3]	NO
Threatened & Endangered Species (lethal & nonlethal control)	See Appendix I	YES	YES
Feral domestic mammals	Dogs, cats, livestock	NO— call local animal control	NO

[1] For a complete list of migratory birds see 50 CFR § 10.13 (Appendix J).

[2] A federal permit is not required "when concentrated in such numbers and manner as to constitute a health hazard or other nuisance," see 50 CFR § 21.43 (Appendix J).

[3] Unprotected species may be taken at any time without limit.

Methods

Bird Survey

From September 2004 to September 2005 bird surveys were conducted at BGM four times each month. The surveys used a time-area sampling design based on a modified version of the U.S. Fish and Wildlife Service's Breeding Bird Survey. This survey is designed to capture temporal (seasonal and diurnal) and spatial use of the airport property by birds as well as behavior, abundance, and diversity of species (Appendix L). In addition to providing a report on the current use of the airport by birds, this assessment provides a baseline of information by which airport operations can evaluate the effectiveness of their program in the future.

An assumption of this survey method is that all birds present are seen and identified. This assumption was undoubtedly violated due to the presence of small, solitary species that occasionally went unnoticed or birds that were unidentified. However, this violation is acceptable because the intent of this survey is to capture an index of the presence and behavior of larger-bodied or flocking birds as these birds pose a greater risk to aircraft (Dolbeer et al. 2000).

Seven permanent observation stations were selected to monitor all areas of the airfield (especially runways and approach and departure lanes) or a potential attractant (e.g., pond or stream area). During each survey, an observer monitored these permanent observation stations on the property (Appendix M). Data were collected at each station for three minutes and in 360 degrees. Binoculars were used to identify species and obtain counts, but not to search for birds. Start times for the surveys were randomly selected to begin between dawn and dusk; each survey required about 1.5 hours.

At each station WS recorded each species observed, and for each species we recorded the number of individuals and the type of behavior in which that group was engaged. To determine a species' hazard level to aircraft, we assigned each behavior a level of risk. These behaviors are listed and defined in the table on page 11. Occasionally, important wildlife sightings were made which fell outside the timed structure of the bird survey. These incidental sightings and events were documented in addition to the survey.

Mammal Surveys

Large mammal survey

Most large mammals are nocturnal and are generally most active just after sunset or just before sunrise. Once per month WS conducted a survey after sunset using a spotlight and FLIR (forward looking infra-red) to search for large mammals. The survey driving route covered both the airfield and lower road. The species, number, and location of each observation were recorded (Appendix L).

Small mammal survey

A survey of small mammal abundance was conducted during the WHA. These surveys allowed us to monitor the presence and relative abundance of small mammals (i.e., mice, voles, shrews) that serve as a prey base and attractant for raptors and large mammals such as coyotes and foxes (Appendix L). Surveys were conducted in the spring and the fall, when small mammals are most active. The plots were selected in three locations based on the location of runways and types of habitat.

One hundred forty-four (144) traps were set for 3 evenings in May and September for a possible total of 864 trap-nights. Three types of traps were set: mouse snap traps, rat snap traps, and Sherman live traps. The traps were checked daily, and all mammals caught were positively identified. The number of actual trap-nights was adjusted during each survey to account for sprung traps and non-target catches.

Analysis of Survey Data

WS used descriptive statistics to analyze the data from the three small mammal surveys as they represent the situation at BGM relevant to the time the surveys were made. Because there was no hypothesis being tested, other statistical analysis was not necessary.

To analyze the bird survey data, bird species were organized into guilds. Guilds are groupings of birds based on similar behavior, especially foraging behavior, and not necessarily on species relatedness. For example, red-winged blackbirds, common grackle, eastern meadowlark and European starlings, are combined into the guild "starlings and blackbirds." Tracking birds of similar behavioral characteristics is important in determining which species of birds are most likely to be involved in bird-aircraft strikes. Also, birds of similar behavior tend to respond to the same control methods such as habitat modification, hazing, or types of exclusion.

WS analyzed the temporal, spatial, and behavioral use of the airport by bird guild. Data obtained from the WHA is presented in various tables and graphs. Tables show the number of observations (*an "observation" means that a species was observed and does not imply group size, whereas "individuals counted" is the actual number of individual animals recorded*) and total number of birds documented during each month, survey station, and behavior category. Graphs include the number of observations and number of birds counted per month, observations and number of birds counted per survey station, and the percentage of birds documented in each behavior category. The behavior categories in the graphs appear as a percentage of total observations with the most observed behavior (top of graph) to the least observed (bottom of graph) with the most hazardous behavior (crossing over runway) highlighted in red.

Hazard Level	Behavior	Description
Least hazardous ↓ *Most hazardous*	Sitting	loafing on ground outside of runway
	Swimming	loafing on water
	Feeding	feeding on the ground outside of the runway
	Perching	perched on manmade structure
	Perching	perched on vegetation
	Flyover	flying over the observation area
	Hunting	aerial hunting
	In runway	on ground in or adjacent to runway
	Incursion	Crossing over a runway

Wildlife Attractants

Wildlife has four basic needs: food, water, cover, and loafing areas. Removing these elements on an airport is the first defense against wildlife strikes. Even when these elements of wildlife management are carefully considered, events can occur which cause the attractiveness of the airport to certain species to increase. Seldom used areas may revert to brush and tall grass, soil may settle creating collection points for water, and piled materials such as construction remnants or soil can serve as shelter for wildlife. Land adjacent to airports may become developed, causing wildlife to seek habitats at an airport that meets their needs. For example, raised landing lights, trees, and snags (standing, dead trees) may be used as a perch by raptors to search for small mammals.

Food sources for wildlife may include overflowing dumpsters, handouts from people, vegetation, mast, seeds (including grass seeds), berries, insects, rabbits, rodents, and earthworms. Water sources can include streams, impoundments, puddles, sprinklers, dripping faucets, lakes, ponds, and rivers. Cover and nesting habitat may include hangars for doves and pigeons; brushy or grassy areas in ditches, fields, and along fences; towers and signs; urban structures; trees; or abandoned machinery and materials. Fields at airports may also provide shelter for burrowing animals.

Modifying or managing airport habitat is an effective and economical deterrent to wildlife because these methods tend to be longer lasting than short term methods that remove individual animals. The goal is to render BGM property as unattractive to hazardous wildlife species as possible. The best way to accomplish this goal is to limit food, water, and cover for wildlife by creating a monotypic (uniform) environment throughout the airport. During the WHA, WS documented several of the above attractants and potential attractants to wildlife which will be addressed in this document.

Wildlife-aircraft Strike Analysis

WS analyzed BGM's 16-year history of wildlife-aircraft strikes (from January 1990 to March 2006) by year, guild, and month. A species hazard ranking for BGM is also presented, based on the strike record. In addition, WS performed a runway and phase of flight analysis that shows which runways and which phases of flight (approach, landing roll, take-off roll, or climb) are most susceptible to wildlife strikes.



Wildlife Attractants at BGM

The following attractants were identified during the WHA at BGM from September 2004 through September 2005. Both airports and wildlife are dynamic entities, and attractants may change over time. Therefore, this section should be viewed as a report of the situation at BGM during the time of the WHA and not as a permanent identification of the wildlife situation at BGM. Future modifications to airport property or property surrounding the airport should take into consideration ramifications they may have on wildlife.

On site Attractants

Grass. Grassy areas throughout airport property can be a major attractant to several species, and grass height will determine which species will use a given area. Grass height at BGM should be homogeneous, which will help in controlling wildlife use.

Wooded Areas. The wooded areas on BGM property provide good habitat for many wildlife species. The woody, scrubby, dense vegetation found on the slopes leading down from the airfield to the lower road provide food and cover for several species of wildlife.

Wildlife prey. Eastern cottontail rabbits, woodchucks, and skunks are common at BGM and can be found throughout airport property. These species serve as prey for hawks, owls, other raptors, foxes and coyotes.

Perching areas. The woods surrounding the runways and taxiways provide a multitude of perching locations. Abandoned structures, isolated trees on the airfield, security fence, hangars, buildings, and FAA equipment also provide perching structures throughout airport property. The lighting structure extending from runway 16 is both a perching and nesting attractant to several species of birds. The dense pine tree area found south of runway 10 provides an ideal roosting location for crows and starlings.

Off site Attractants

Great blue heron rookery. This well established rookery is found on private property approximately 0.5 miles west of runway 16. WS biologists have observed > 30 active nests during the spring. Because the airfield plateau is higher than the rookery, herons leaving the nest to forage east of the airfield fly at a dangerous altitude over the airport, increasing the risk of bird strikes.

Broome County landfill. The landfill is located approximately 1.3 miles northeast of runway 16 and is a major attractant to hazardous bird species. This landfill provides food, cover and water to species such as gulls, Canada geese, turkey vultures, crows, starlings, and great blue herons.

Results of Surveys

BGM and surrounding area contain a large diversity of wildlife. Only a few species are primarily responsible for creating wildlife hazards at BGM. During the WHA, we identified 36 species of birds, and 4 species of mammals that use BGM (Appendix G).

All Bird Species Combined

Thirty-six bird species were documented during 360 observations (48 visits) on the airfield at BGM during the WHA, September 2004 through September 2005 (Appendix G). WS documented the greatest diversity of bird species during the month of July and the least diversity in November (Figure 1).

Figure 1. Monthly bird species diversity documented at BGM during the WHA.

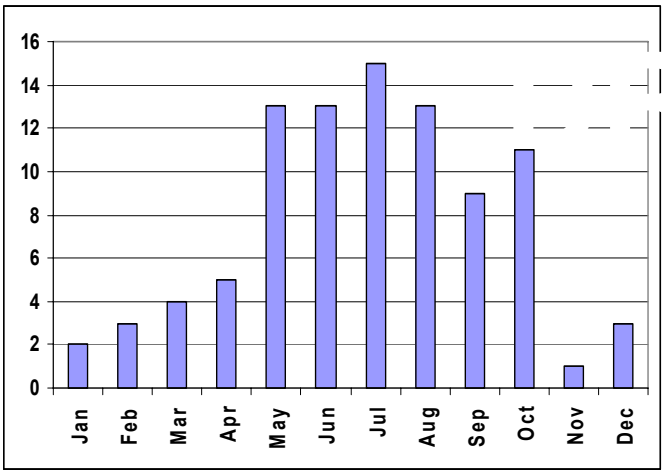
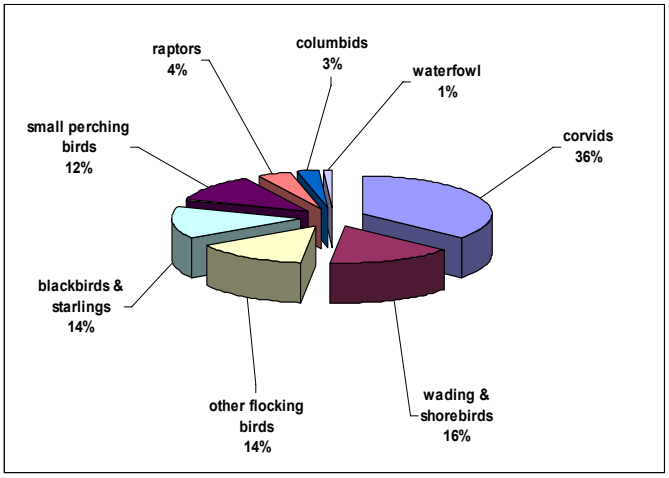


Figure 2 indicates how often we observed each guild as a proportion of total observations made on-site during the WHA. "Corvids" accounted for the largest percentage of observations followed by "wading and shorebirds," "other flocking birds," and "blackbirds & starlings." Of the "corvids," 98% of all observations and 98% of all individual birds counted were crows. "Wading and shorebirds" observations were represented most often by killdeers at 82% followed by great blue herons at 16% and upland sandpipers at 2%. The two most prevalent species observed in the guild "other flocking birds" were barn swallows at 54% and tree swallows at 27%; other species observed from this guild include snow buntings, horned larks, and cedar waxwings. Starlings accounted for 94% of all observations from the guild "blackbirds & starlings." Birds such as starlings and blackbirds feed and move in large flocks so they generally pose a greater threat to aircrafts than do solitary birds such as songbirds.

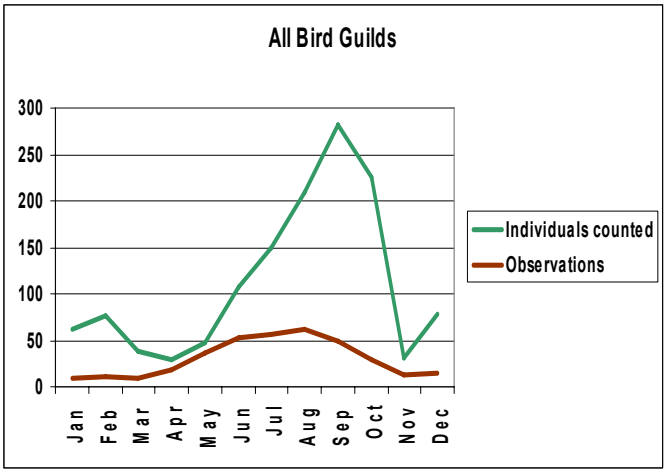
Figure 2. Bird guilds as a proportion of total observations documented during WHA.



"Small perching birds" observations were represented by several species (Appendix C); however, the species most often observed include savannah sparrows at 37%, song sparrows at 17%, and American robins at 10%. "Raptors" observations were represented most often by American kestrels at 47%; other species observed from this guild include red-tailed hawks, turkey vultures, northern goshawks, peregrine falcons and sharp-shinned hawks. "Columbids" observations were represented by two species, mourning doves at 80% and pigeons at 20%. Canada geese were the only species from the guild "waterfowl" documented on the airfield. WS biologists did not document any "gulls" on the airfield during the WHA.

The month of August had the highest number of observations, while the highest number of individual birds counted occurred during the month of September (Table 1, Figure 3). Both of the guilds "other flocking birds" and "wading & shorebirds" each accounted for 32% of all observations during the month of August; of these observations, 48% were killdeers and 40% were barn swallows. Observations in June were represented most often by the guilds "blackbirds and starlings," at 34% and "small perching birds" at 21%. "Blackbirds and starlings" accounted for 65% of all individual birds counted in June; of these birds, 99% were starlings. Savannah sparrows represented 55% of the observations and 58% of individual birds counted in the guild "small perching birds" during the month of June.

Figure 3. All bird species observations and number individual birds counted each month during the WHA.



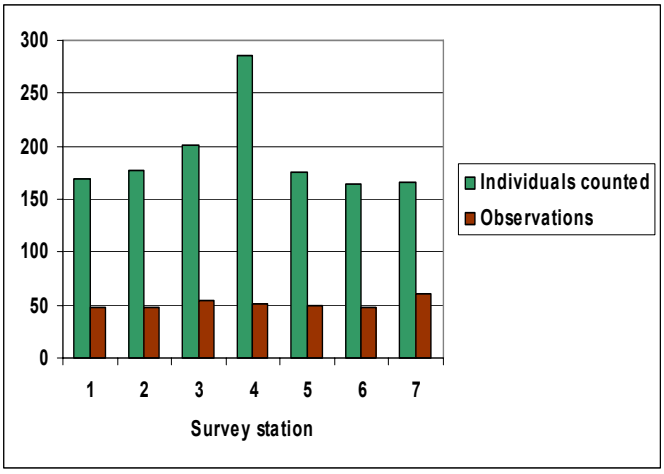
The peak in the number of individual birds counted in Septe[illegible] w[illegible]prese[illegible]ted [illegible] guilds "blackbirds and starlings" at 46%, "corvids" at 17%, [illegible]nd l[illegible]ot[illegible] "w[illegible]dir[illegible] shorebirds" and "waterfowl" at 15%. Of these, starlings acc[illegible]d[illegible]or a[illegible]l[illegible]ds[illegible]n[illegible]e "blackbirds & starlings" guild and crows accounted for 98% of the "corvid" guild, while Canada geese accounted for all birds in the "waterfowl" guild and killdeers represented all birds in the "wading & shorebirds" guild.

Starlings represent a significant threat to aircraft due to their flocking behavior and Canada geese represent a major threat due to both their size and flocking behavior. Starling average flock size during the month of September was 14 birds, while the average flock size for Canada geese was 43 birds. The average flock size for starlings and Canada geese throughout the year was 10 birds and 26 birds, respectively.

Survey station

During the WHA, the number of bird observations at each survey station ranged from 48 to 61 (Table 2, Figure 4). Most observations occurred at survey station 7 (east end of t/w Long H at the approach end of r/w 28), while the fewest occurred at survey stations 1 (intersection of t/w's A & D), 2 (north end of t/w A at the approach of r/w 16) and 6 (south end of t/w G at the approach of r/w 34). The guilds most often observed at survey station 7 were "corvids" at 43% and "small perching birds" at 18%.

Figure 4. All bird species observations and individuals counted at each survey station during the WHA.

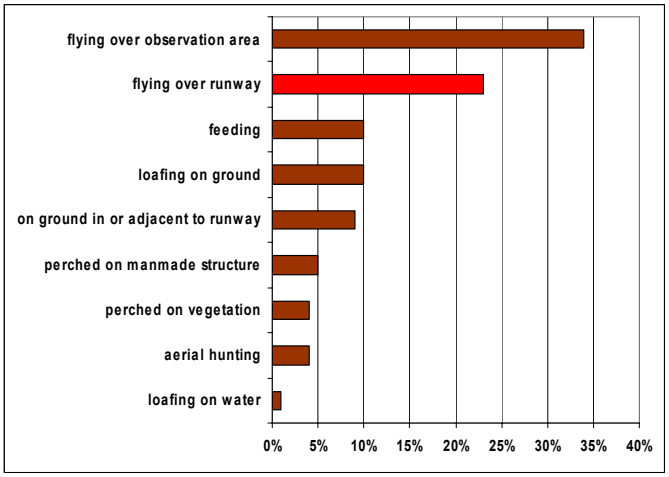


The number of individual birds counted ranged from 164 at survey station 6 to 285 at survey station 4 (intersection of t/w's F & K). Of the individual birds counted at survey station 4, 55% were starlings and 19% were killdeers.

Behavior

Behavior is an important consideration because flocking birds such as starlings, geese, horned larks, and swallows pose a greater threat to aircraft than solitary birds as stated above. In addition to behavior, these observational data should also be reviewed in conjunction with a species' (or guild's) strike history to determine a species' importance in terms of risk level to aircraft (Dolbeer and P. Eschenfelder 2002). All nine behavior categories were documented during the survey (Figure 5). The behavior "flying over the observation area" was observed 122 times, which accounted for 34% of all observed behaviors (Table 3, Figure 5)

Figure 5. All bird species behaviors as a percentage of total observations.



The most dangerous behavior, "flying over runway" was observed 84 times, which accounted for 23% of all observed behaviors. The 3 behaviors with the least observations included "loafing on water," "aerial hunting," and "perched on vegetation" with 2, 14, and 15 observations, respectively.

Bird Guilds

Corvids (Crows and Jays)



Description. Crows and jays are generally known for their raucousness, intelligence (relative to other birds), and highly social behavior. Most corvids are black but jays, which are included in this group, are usually blue. Both sexes in corvids look alike. Crows are omnivorous, feeding on a wide range of food items including crops, insects, and refuse at landfills. They tend to be less wary and are more likely to be found at airfields than other corvids. Crows are often described as "too smart to be struck by aircraft." This belief is not true. Any [illegible] cross a runway and is therefore a threat to aircraft safety. Crows [illegible] congregate in large roosts, traveling from daily feeding areas to nighttime roosts in long flight lines across airports.

Attractants. Crows commonly feed in open areas, especially when there is dense cover nearby such as trees or brush. Corvids are opportunistic feeders and will feed on a wide variety of food including fruits, nuts, small animals, insects, refuse, and carrion. Activities such as mowing or soil excavation (as during construction) expose insects which attract crows.

Risks. Three hundred and sixty-nine crows have been reported to the FAA database between 1990 and 2005 as struck by aircraft in the U.S. (Cleary et al. 2005). Nationally, crows represent 1.5% and jays represent < 0.1% of all bird-aircraft strikes (Cleary et al. 2005). Corvids rank 18th out of the 21 most hazardous wildlife species to aircraft (Dolbeer et al. 2000).

Legal status. Corvids are protected by the Migratory Bird Treaty Act, but certain species under this act may be taken under the Federal blackbird depredation order. American crows are included in the blackbird depredation order and "may be taken when causing or about to commit damage to …or when concentrated in numbers or in a manner as to constitute a health hazard or nuisance" (Appendix J, 50 CFR 21.43). There is no reporting requirement under the blackbird depredation order. If birds, including blue jays, must be shot on an airport, a USFWS depredation permit must be obtained. American crows may be hunted with a valid NYS hunting license from September 1 – March 31 (Fridays, Saturdays, Sundays, and Mondays only) throughout the state with the exception of New York City.

Control measures. The most effective method to prevent crows from using an airport is habitat modification. This method includes allowing the grass to grow taller than 7 inches, removing trees used for roosting and structures used for perching. If crows continue to use the airport, they should be dispersed with pyrotechnics and reinforced with live

ammunition. Australian crow traps may be used in some cases, but care must be taken to prevent attracting additional crows to the bait in the trap.

Risk Analysis

Prevalence. Corvids were observed 130 times during the WHA with crows accounting for 98% of both observations and individual birds counted. Peak observations for this guild occurred in September, while January, March, and August had the lowest (Table 1, Figure 6). September also had the highest count of individual birds and August had the lowest. Crows were observed on the airfield throughout the year.

Figure 6. Number of corvid observations and individuals counted each month.

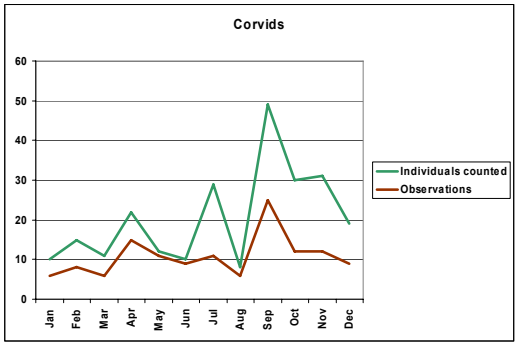
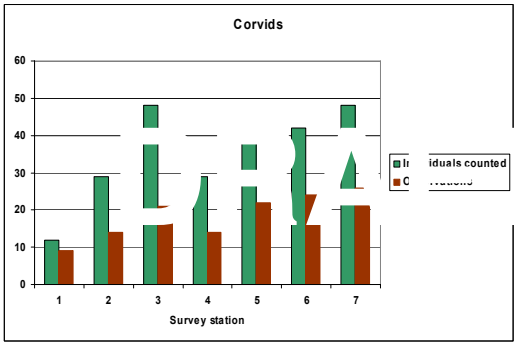


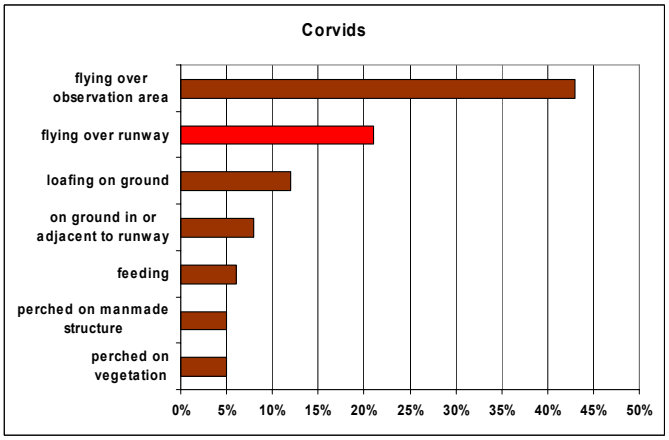
Figure 7. Number of corvid observations and individuals counted at each survey station.



Corvid observations were well distributed throughout all the survey stations with the highest number occurring at survey station 7 (Table 2, Figure 7), while the lowest number of observations occurred at survey station 1. The highest number of individual birds counted occurred at survey stations 3 (intersection of t/w's H & G) and 7, while survey station 1 had the lowest.

Behavior. The behavior most often observed was "flying over the observation area" at 43% followed by "flying over runway" at 21% (Table 3, Figure 8). Crows were responsible for 32% of all runway flyovers observed for all species during the WHA.

Figure 8. Percentage of behavioral observations in which corvids were documented.



Strikes. According to the NWSD, four strikes involving crows have been reported at BGM. Two strikes occurred on runway 34, one strike occurred on runway 16, and one strike report provided no runway information.

Wading Birds and Shorebirds



Description. The wading birds guild is usually divided into "long-legged" and "smaller" wading birds. Long-legged wading birds are comprised of egrets and herons while smaller wading birds include plovers, sandpipers, killdeer, etc. Smaller wading birds are often referred to as shorebirds. Some of the birds observed in this group at BGM include killdeers and great blue herons.

Attractants. These birds are attracted to shallow water or shorelines where they can hunt for small to medium-sized fish, amphibians, small marine life, and insects. Upland shorebirds such as killdeers and upland sandpipers a[illegible] op[illegible] gr[illegible] habitat found on most airports.

Risks. Nationally, wading birds and shorebirds represent 7.4% of all known bird-aircraft strikes (Cleary et al. 2005). Herons are ranked 12th and smaller shorebirds such as killdeer and common snipes are ranked 17th out of the 21 most hazardous wildlife species to aircraft (egrets were not ranked) (Dolbeer et al. 2000). Egrets and herons pose a more serious threat to aircraft than their smaller kin. These long-legged wading birds are larger and can, therefore, cause greater impact damage to aircraft. They are also slower and more lumbering in flight than the smaller birds. The smaller birds tend to nest close to where they feed, and they forage and travel along shorelines. The larger birds may travel farther, in comparison, between foraging areas and their roost, crossing various types of terrain.

Legal status. Wading birds are classified as migratory nongame birds and are protected under the Migratory Bird Treaty Act. They may be killed with a USFWS depredation permit and a concurrent state depredation permit.

Control measures. The areas that attract wading birds are generally areas adjacent to airports, and they are often regulated as wetlands; therefore, management for these birds can be difficult. If drainage ditches are on the airport, they should be kept free of aquatic vegetation and tall grass. Standing water should be drained from ditches to reduce attractiveness to wading birds. Egrets and herons should be deterred from crossing the airport by hazing them with pyrotechnics. Hazing with pyrotechnics should also occur if these birds are observed foraging, roosting, or loafing on the airport. It may be necessary to kill one or two individuals that persist on the airfield.

Risk Analysis

Prevalence. Wildlife Services made 56 observations of wading and shorebirds consisting of 182 individual birds (Table 1). All observations consisted of three species, killdeers at 82%, great blue herons at 16% and upland sandpipers at 2%. Wading birds were not present at BGM during the months of January, February, March, November and December

(Table 1, Figure 9). The highest number of observations and individuals counted occurred during the month of August. Of the individual birds documented in August, 97% were killdeers.

Figure 9. Number of wading and shorebird observations and individual birds counted each month.

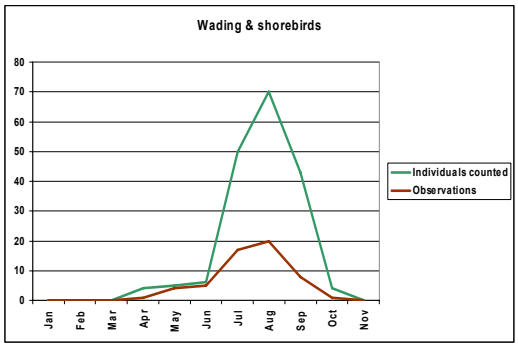
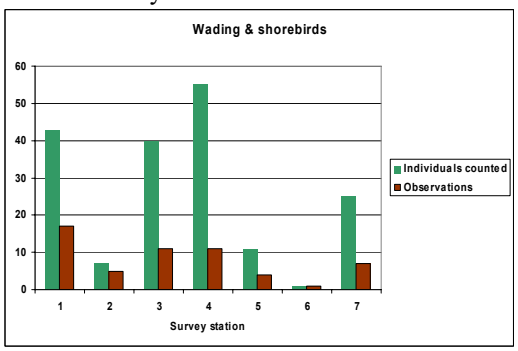


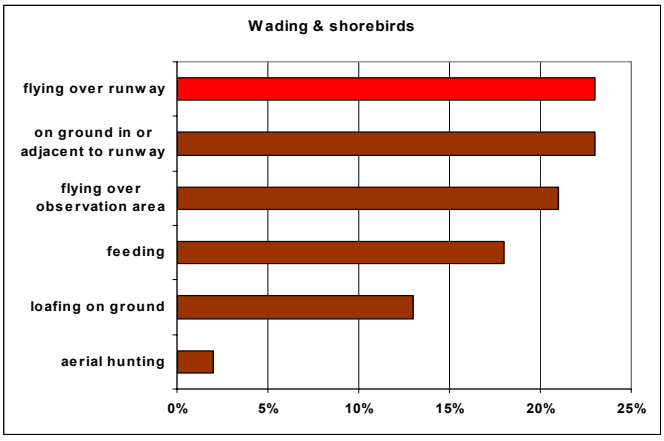
Figure 10. Number of wading and shorebird observations and individual birds counted at each survey station.



Survey station 1 had the highest number of observations with killdeers accounting for 76% and great blue herons accounting for 24% (Table 2, Figure 10). Due to the location of the rookery just west of runway 16, survey station 1 incurred both the highest number of observations and individual great blue herons counted.

Behavior. The two behaviors most often observed for the guild wading and shorebirds were "flying over runway" and "on ground in or adjacent to runway" both accounting for 23% of all observations for this guild (Table 3, Figure 11). Killdeers accounted for 76%, while great blue herons accounted for 24% of the behavior "flying over runway." Fifty-four percent of all runway flyovers for this guild occurred at survey station 1 (intersection of t/w's A & D).

Figure 11. Percentage of behavioral observations in which wading and shorebirds were documented.



Strikes. According to the NWSD, 19 birds from this guild have been reported struck at BGM. The species reported struck included 17 killdeers (seven strikes on runway 16, nine

strikes on runway 34 and one strike on runway 28) , one plover (runway 10), and one upland sandpiper (runway 16).

Other Flocking Birds



Description. This group includes birds that move in flocks other than the blackbirds and starlings. Examples of these birds that were observed at BGM during the WHA are barn swallows, horned larks, tree swallows, cedar waxwings and snow buntings. Swallows are migratory species and are not present at BGM in the winter. Horned larks and cedar waxwings also migrate, but can be found in New York State year-round. Snow buntings spend the summer in the Arctic Region then migrate to the United States during the winter. Both swallows and horned larks travel in flocks and fly erratically across an airport in search of food. This behavior makes them a commonly struck bird at certain times of the year.

Attractants. Swallows and cedar waxwings feed upon flying insects and are often seen in flocks over fields. Because the number of insects is greater [illegible] will be observed when the grass is allowed to grow taller than [illegible] Swallows also feed on bayberries while migrating. Horned [illegible] prefer dirt fields and gravel ridges for loafing or feeding, and their diet consists of insects, snails, and seeds.

Risks. Nationally, swallows, larks, and swifts represent 5.2% of known birds struck by aircraft between 1990 and 2004 in the U.S. (Cleary et al. 2005). Swallows are the 11th ranked species most often struck by aircraft but because of their small size, they are not in the top 20 bird species reported struck and causing damage to civil aircraft (Dolbeer et al. 2000).

Control measures. Swallows and horned larks may be best managed through an integrated program that includes habitat management, insect control, harassment and shooting. The habitat should be managed so that the grass is a uniform composition and density with a height between 7 and 10 inches. This uniformity limits the availability of insects, which will attract fewer birds. If insect populations spike, insecticides are a possible management option. A U.S. Fish and Wildlife Service depredation permit is required to shoot swallows, horned larks, or swifts.

Risk Analysis

Prevalence. Other flocking birds were observed 51 times by WS biologists with the highest number of observations and individuals counted occurring during the summer and winter months (Table 1, Figure 12). Barn swallows accounted for 67% and tree swallows accounted for 33% of observations during the summer months, while snow buntings and horned larks accounted for all observations during the winter months.

Figure 12. Number of other flocking bird observations and individual birds counted each month.

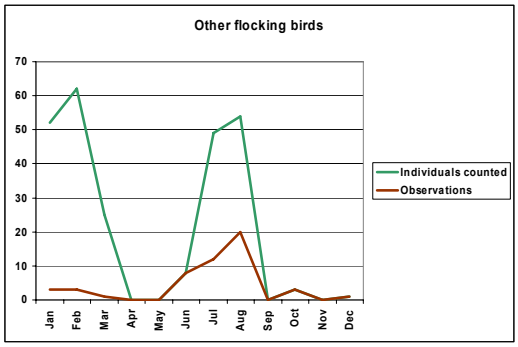
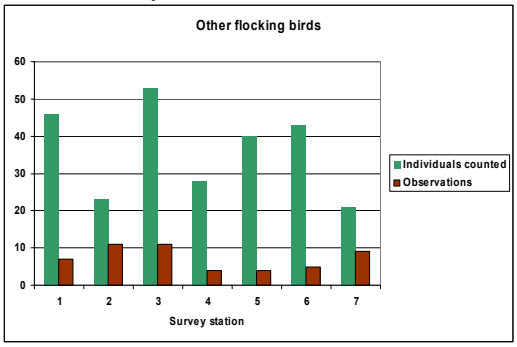


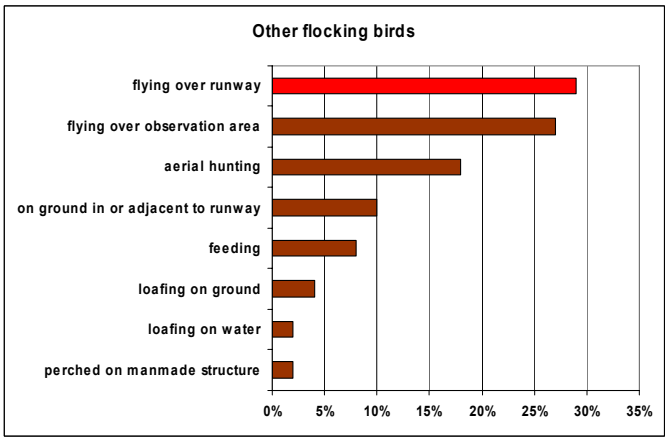
Figure 13. Number of other flocking bird observations and individual birds counted at each survey station.



Survey stations 2 and 3 had the highest number of observations (Table 2, Figure 13). Survey station 3 also had the highest number of individual birds counted followed by survey station 1. Of the individual birds counted at survey s[illegible] 3 [illegible] t co[illegible]iste[illegible] swallows at 57% followed by snow buntings at 32%.

Behavior. The behavior most often observed was "flying over runway" at 29%, followed by "flying over the observation area" at 27% (Table 3, Figure 14). Of the behavior "flying over runway," 41% occurred at survey station 7 and 31% occurred at survey station 2. All nine behaviors were documented with the exception of "perched on vegetation."

Figure 14. Percentage of behavioral observations in which other flocking birds were documented.



Strikes. According to the NWSD, three birds from this guild have been reported struck at BGM since 1990. Of these strikes, two were barn swallows and one an unidentified species of swallow.

European Starlings and Blackbirds



Description. The term *blackbird* loosely refers to about 10 different species of North American birds. The species most common to New York include the brown-headed cowbird, red-winged blackbird, and common grackle. Meadowlarks, bobolinks, and blackbirds are a varied group possessing conical, sharp-pointed bills and rather flat profiles. Some are black with iridescence, others are highly colored. Starlings are similar in size, but appear stockier with a shorter tail and are heavily speckled in winter. Although starlings are not technically blackbirds, the two groups are often considered together due to behavioral and morphological similarities and because they are often found in mixed flocks.

All blackbirds and starlings are gregarious, especially in winter when thousands may roost together, often of mixed species, sometimes including American robins. In BGM's geographic area, large flocks of blackbirds and starlings begin to form roosts for winter as early as August and begin disbanding in February. Starlings [illegible] red-winged blackbirds, cowbirds, bobolinks, and Eastern me[illegible] the winter. Starlings and blackbirds are active during daylig[illegible]

Attractants. Starlings and blackbirds are omnivorous, feeding on grains, weed seeds, fruits, and insects. Both starlings and blackbirds are found in urban areas, airports, grassy or weedy fields, and fallow croplands. Trees planted on or adjacent to airports serve as potential roosting sites for starlings. Starlings are cavity nesters and will nest in woodpecker holes, buildings, airport structures and even out of service airplanes. Red-winged blackbirds prefer croplands and weedy fields, and they roost and nest in marshy areas with tall vegetation such as cattails or phragmites.

Risks. Starlings and blackbirds are considered a serious threat to aviation because of the large flocks they form. Nationally, starlings account for 5.4% and blackbirds account for 4.5% of all bird-aircraft strikes of known species (Cleary et al. 2005). Starlings and blackbirds rank 2nd out of the 21 wildlife species most often reported struck by aircraft, but because of their small size are rated 19th as the most hazardous species (Dolbeer et al. 2000). There have been two significant incidents involving human fatalities in aviation history involving starlings and brown-headed cowbirds. The first incident was in 1960 when a Lockheed Electra turbo-prop ingested starlings into all engines during takeoff and crashed into Boston Harbor, resulting in 62 human fatalities. The second documented incident occurred in 1973 when a Lear jet struck a flock of cowbirds on departure from Peachtree Airport in Dekalb, Georgia. Engine failure resulted in a crash and eight human fatalities. Other incidents involving starlings damaging aircraft have been documented (Cleary et al. 2005).

In addition, winter roosts present a nuisance because of the noise and associated droppings that corrode and damage buildings and property. If allowed to accumulate, droppings can become a source of diseases that can infect humans and domestic animals. Also, nesting starlings can create a fire hazard in combustible structures because they continually deposit nesting materials (primarily dried grasses and twigs) in the same nesting place year after year.

Legal status. Starlings are an introduced species and are not protected by federal or state laws. They may be killed at any time without permit. However, the use of certain methods such as toxicants or traps may be regulated by New York State. Blackbirds are classified as migratory non-game birds, but can be killed when concentrated in a manner that constitutes a threat to human health and safety under both federal and New York State depredation orders (Appendix K). The presence of a flock of starlings or blackbirds in or adjacent to an AOA should be interpreted as a direct threat to human health and safety.

Control measures. Habitat management (i.e., grass management, roost removal, etc.) is usually the most cost effective management because it serves as a long term deterrent. Grass height management has proven helpful in keeping starlings and blackbirds from feeding on airfields. The best grass height for an airport depends largely on local conditions such as grass stem density, grass variety, alternative food sources, weed species and density, etc. However, it is absolutely necessary to minimize seed head production in grass and weeds. This practice is wise management for all mower-accessible areas of the airport. The management of roosting sites on or adjacent to [illegible] starling and blackbird presence.

Habitat management alone may not be enough to discourage bird presence. When starlings and blackbirds are present, pyrotechnics should be used to haze them and move them from the airport. Flocks of birds can be dispersed with pyrotechnics and visual repellants. Often birds simply move to another location on the airfield so it is important to be persistent in hazing any bird species. Shooting or trapping may be necessary if the birds become habituated to pyrotechnics or other non-lethal methods.

Risk Analysis

Prevalence. Starlings and blackbirds were observed 49 times consisting of 452 individual birds during the WHA (Table 1). Ninety-four percent of all observations and 99% of all individual birds counted in this guild consisted of starlings. This guild had the highest number of observations during the month of June, while September incurred the highest number of individuals counted (Table 1, Figure 15). The peak observed in September is likely due to fledglings leaving the nest and joining local flocks.

Figure 15. Number of blackbird & starling observations and individuals counted per month.

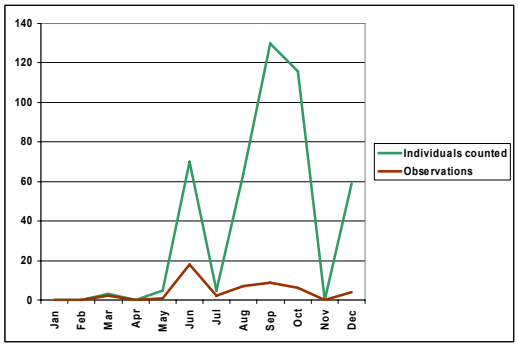
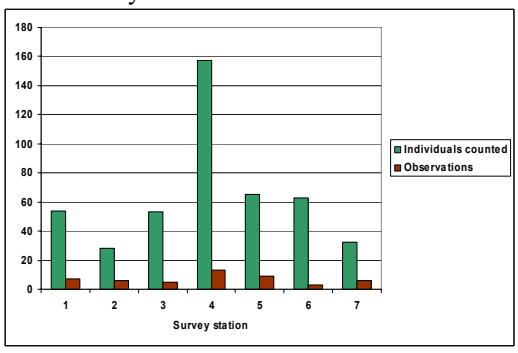


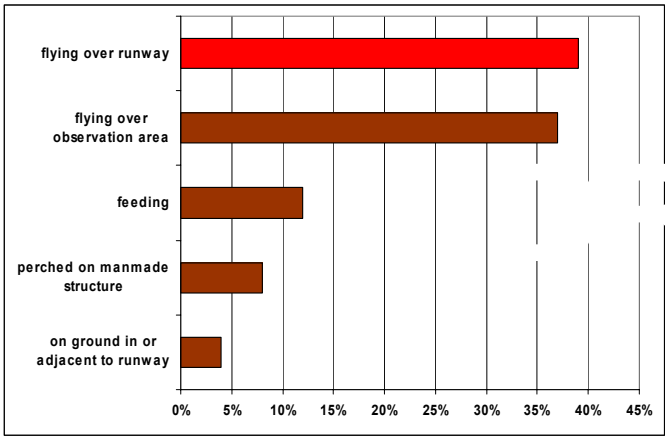
Figure 16. Number of blackbird & starling observations and individuals counted at each survey station.



This guild had the highest number of observations and individual birds counted at survey station 4 followed by survey stations 5 and 6 (Table 2, Figure 16). These three survey stations are found on the south side of the airfield and accounted for 63% of all individual starlings documented.

Behavior. The most common behaviors observed was "flying over runway" followed by "flying over observation area" (Table 3, Figure 17). Of the runway flyovers, 56% occurred at survey stations 3 and 4.

Figure 17. Percentage of behavioral observations in which blackbirds and starlings were documented.



Strikes. According to the NWSD, four birds from the blackbirds and starlings guild have been reported struck at BGM between January 1990 and March 2006. Three birds were identified as starlings and one as an unidentified blackbird.

Small perching birds



Description. Small perching birds are a diverse guild of small to medium sized passerines, which eat a variety of foods and inhabit a variety of habitats. In this analysis, perching birds include American robins, northern mockingbirds, house sparrows, eastern kingbirds, song sparrows, northern flickers, chipping sparrows, and several other small passerines.

Attractants. Members of this guild are diverse in the types of habitat they occupy, but they are often attracted to buildings, brush piles, trees, shrubs, weedy fields, grasslands, and cultivated fields. Many species are common in urban areas, especially during the breeding season. Although these species primarily eat seeds, they may also feed on fruits, grains, earthworms, and insects.

Risks. Nationally, small perching birds represent about 9% of all bird-aircraft strikes in the U.S. (Cleary et al. 2005). Most species in this guild stay close to shrubs, trees, and structures where they are afforded protection from predators; therefore they are infrequently struck by aircraft. Because members of this guild are small in size, they rarely result in damage to an aircraft when they are struck. Due to their small size and strike

history, they are not considered a significant hazard at BGM. This finding does not, however, mean their hazard potential can be dismissed altogether. In addition to bird strike hazards, these species can cause structural damage and create a nuisance with their droppings.

Legal status. House sparrows are an introduced species and do not receive any legal protection. However, all other species characterized as "small perching birds" are protected under the MBTA and New York State Law.

Control Measures. Management of tall, non-seeding grass and the removal of brush piles, unwanted structures, and weeds will reduce the presence of these species. Pyrotechnics combined with visual repellents and periodic shooting can be used to disperse flocks from runways. However, these species tend to adapt to these methods quickly, especially around structures. Exclusion netting can be used to prevent these birds from nesting in specific areas such as in idle aircraft engines and in building structures.

Risk Analysis

Prevalence. Small perching birds were observed 45 times during the WHA with a total of 50 individual birds documented. Fifty-four percent of all individual birds counted consisted of sparrows, savannah sparrows at 36% and song sparrows at 18%. The month of May had both the highest number of observations and individual birds counted (Table 1, Figure 18). Of the individual birds counted for the months of May and June, 46% consisted of savannah sparrows.

Figure 18. Number of small perching bird observations and individuals counted per month.

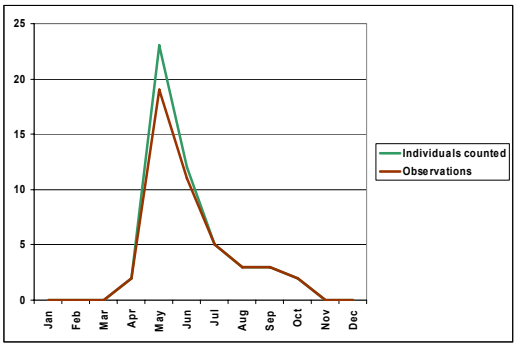
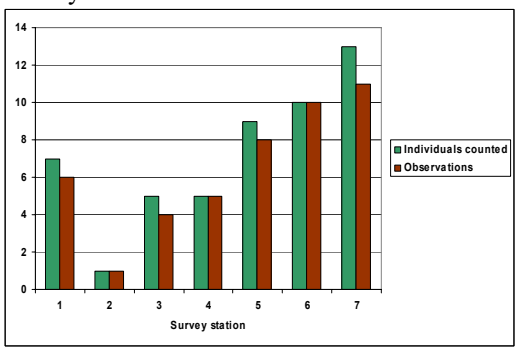


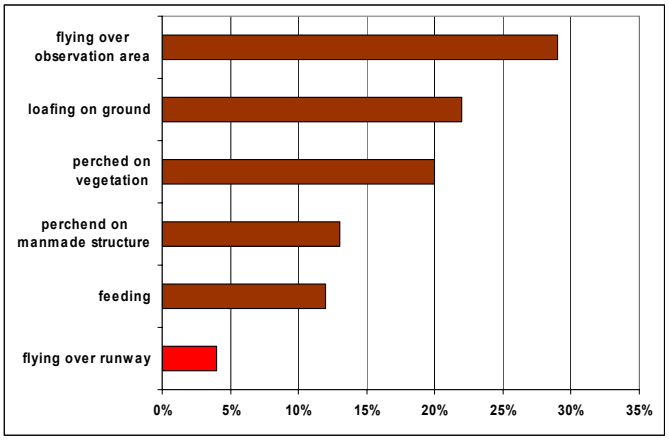
Figure 19. Number of small perching bird observations and individuals counted at each survey station.



The majority of observations (63%) and individual birds counted (64%) occurred at survey stations 5, 6, and 7 (Table 2, Figure 19). All species documented from this guild were represented at these three survey stations.

Behavior. When observed, small perching birds were most commonly seen "flying over the observation area" followed by "loafing on ground" (Table 3 & Figure 20). The behavior "flying over runway" was the least of the observed behaviors at 4%.

Figure 20. Percentage of behavioral observations in which small perching birds were documented.



Strikes. According to the NWSD, four unidentified species of sparrow have been reported struck at BGM since 1990.

Raptors



Description. Raptors are predatory birds and scavengers that feed upon prey animal species. Raptors include vultures, eagles, hawks (kites, harriers, accipiters, and buteos), falcons (including kestrels), ospreys, and owls. They range in size from the 7-inch screech owl to the 43-inch bald eagle. Most species have characteristic hunting styles such as soaring (vultures, eagles, red-tailed hawks), flying low (harriers), dense forest ambush (accipiters), hovering (kites and kestrels), and watching from perches (buteos and owls). Raptors observed at BGM during the WHA include American kestrels, peregrine falcons, red-tailed hawks, turkey vultures, sharp-shinned hawks and northern goshawks.

Attractants. Raptors are attracted to habitats that have an abundant supply of prey species. For raptors such as rough legged hawks, red-tailed hawks, northern harriers, sharp-shinned hawks and American kestrels, prey species include rabbits, small rodents, birds, reptiles and insects, while larger owls are attracted to rabbits and hares. In order to hunt effectively, many raptors need large trees or snags at the edge of fields in which to perch as they watch for prey. Large trees are also used for nesting. Turkey vultures are attracted to carrion. They are often attracted to airports because of the strong thermals needed to soar that are created as the ground is warmed. Because of their propensity of soaring over open spaces, turkey vultures are especially hazardous on airports.

Risks. Raptors represent a significant hazard to aircraft since they are typically large in size, and their hunting behavior predisposes them to collisions with aircraft. Nationally, raptors account for 13% of known species bird-aircraft strikes in the U.S. (Cleary et al. 2005). Hawks and owls are more commonly struck on airports while hunting, whereas vultures tend to be struck while soaring at higher altitudes. Two species in this guild have had a marked population increases in the past few decades. The red-tailed hawk population has increased annually at a 3% rate, and the turkey vulture population has increased annually at a rate of 1% (Sauer et al. 2004).

Legal status. All raptors are protected by the MBTA and may only be killed, trapped or relocated with a U.S. Fish and Wildlife Service depredation permit and a NYSDEC permit. Further, bald and golden eagles are afforded additional protection under both federal and state regulations, wherein it is illegal to possess either of these birds, alive or dead, in whole or in part (including eggs and nests). The golden eagle and peregrine falcon are also listed as endangered species in New York State.

Control measures. Raptors may be best managed through an integrated program that includes habitat management, rodent and insect control, relocation and shooting. The habitat should be managed so that the grass is a uniform composition, density and height of between 7 and 10 inches. This limits the available prey-base of rodents and insects, and, consequently, reduces the number of raptors. Any dead snags or tall trees at the edge of the AOA, which raptors are observed using, should be removed. If rodent and insect populations increase, rodenticides and insecticides may be applied. If specific raptors habitually frequent an area, they should be routinely dispersed with pyrotechnics. If the bird continues to remain in the area, it should be trapped and relocated or killed. A U.S. Fish and Wildlife Service depredation permit is required to l[illegible] a n[illegible] -en[illegible] or threatened raptor.

Risk Analysis

Prevalence. Raptors were observed 15 times by WS during the WHA. American kestrels accounted for 47% of all raptor observations. Eighty percent of raptor observations occurred during the months of July and August (Table 1, Figure 21). No raptors were recorded from November through March on BGM during the WHA.

Figure 21. Number of raptor observations and individuals counted per month.

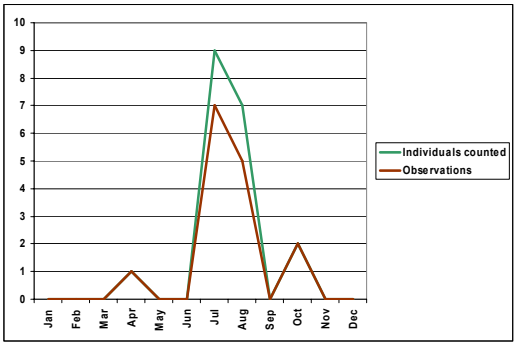
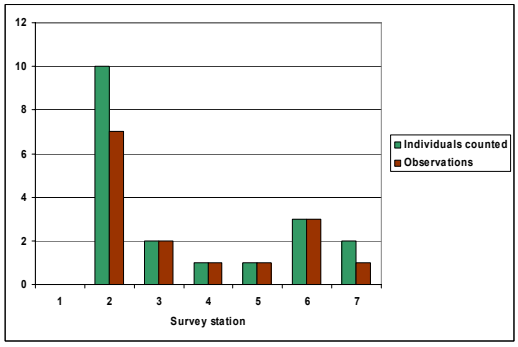


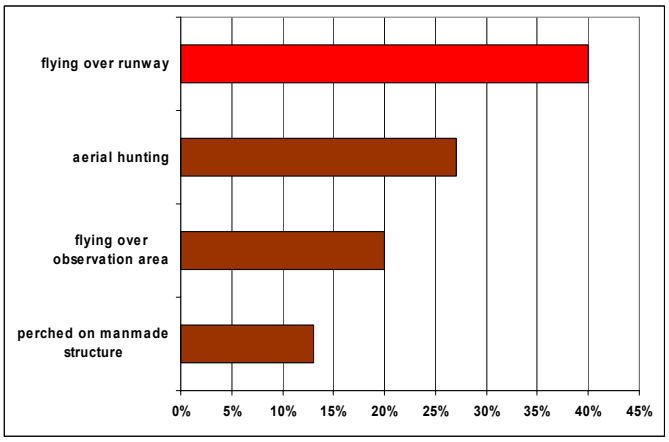
Figure 22. Number of raptor observations and individuals counted at each survey station.



Raptor observations were most often observed at survey station 2 followed by survey station 6 (Table 2, Figure 22). Observations at survey station 2 consisted of six American kestrels and one turkey vulture.

Behavior. "Flying over runway" was the behavior most often observed from this guild at 40% (Table 3, Figure 23). Other behaviors documented included "aerial hunting," "flying over observation area," and "perched on manmade structure."

Figure 23. Percentage of behavioral observations in which raptors were documented.



Strikes. According to the NWSD, six raptors have been reported struck at BGM. Strikes reported involved three hawks (2 red-tailed hawks and 1 unidentified hawk species) and three falcons (1 American kestrel, 1 gyrfalcon, and 1 peregrine falcon).

Columbids (Pigeons and Doves)



Description. Feral pigeons, commonly referred to as pigeons or rock doves, are familiar birds that are abundant in cities and farms throughout New York State. Mourning doves are also widespread throughout New York, and are especially abundant in the more open rural settings. Doves are powerful fliers with robust bodies, small heads, and short beaks. Mourning doves flock most of the year and typically fly close to the ground near cover as they travel between feeding and roosting areas, whereas feral pigeons tend to fly at higher altitudes, descending to their destinations in a rapid circling pattern with wings spread back. Although both species are primarily granivorous, they will occasionally consume protein-rich animal material such as insect larvae. Pigeons are known for readily accepting handouts from humans.

Attractants. Mourning doves are common near wooded streams, in agricultural and weedy fields, and in urban areas. Freshly seeded bare ground and grassy areas that are allowed to go to seed are strong attractants for doves. Feral pigeons, on the other hand, are found in urban and agricultural areas, generally in close association with people. Large, open buildings, such as hangars, often provide desirable nesting areas (e.g., flat surfaces and ledges, metal I-beams, etc.).

Risks. Although pigeons are not as large-bodied as many species considered dangerous to air safety (i.e., waterfowl, gulls, and raptors), they are still a concern because of their loose flocking behavior, which increases their risk of collision with aircraft. Nationally, columbids represent 13.6% of known species bird-aircraft strikes in the U.S. (Cleary et al. 2005). Pigeons rank 10th and mourning doves rank 13th out of the top 21 species of wildlife hazardous to aviation (Dolbeer et al. 2000). Because pigeons nest in structures at airports and use airport property to search for food and nesting materials, they tend to spend more

of their time on airports, relative to other species. This amount of time spent at airports exposes pigeons to a greater risk of being struck by aircraft.

Legal status. Outside of New York City, feral pigeons are not regulated by federal or state laws and can be killed at any time. Mourning doves, however, are migratory game birds and are regulated by federal and state regulations; permits are required for lethal control measures. No hunting seasons have been established for managing doves in New York.

Control measures. Habitat modification helps reduce the numbers of doves directly using the airfield. Weedy fields should be cut and/or replaced with grass. Paved surfaces and drainages should be kept free of standing water.

In structures where pigeons are already nesting, nest removal and/or shooting are both effective means for removing offending animals. If nest removal is employed, the nest may need to be removed several times before a pigeon abandons a nesting area. Once the birds are removed, exclusion netting or other barriers should be installed.

New structures should be constructed to deter pigeons from esti g ·sta in e: ·lusion netting or reducing exposed ledges. Nixalite or other mecha··· re, ell··t· can ·e ttache· to flat areas to deter perching.

Risk Analysis

Prevalence. Mourning doves represented most of the observations (80%) and individual birds counted (96%) for this guild during the WHA. The month of October had the highest number of observations and individuals counted from this guild (Table 1, Figure 24) consisting of all mourning doves.

Figure 24. Number of columbid observations and individuals counted per month.

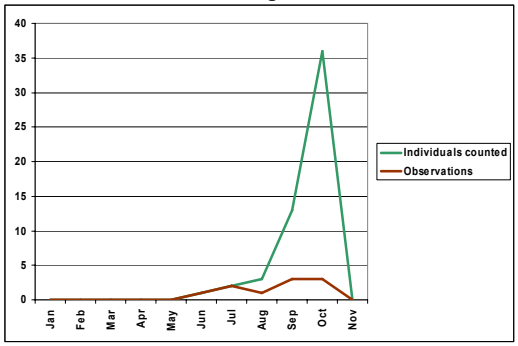
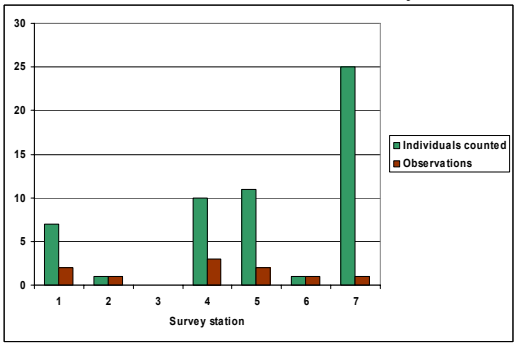


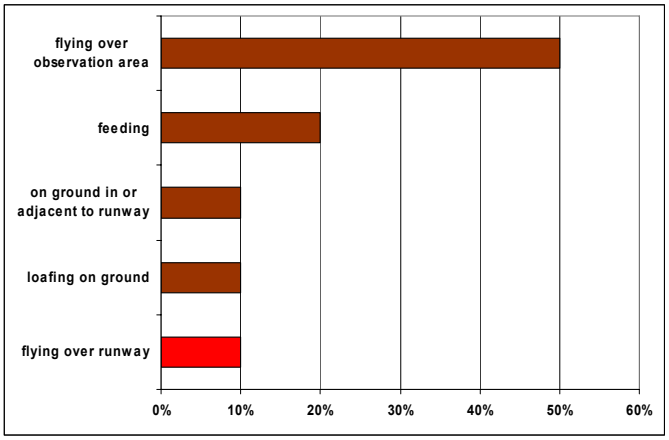
Figure 25. Number of columbid observations and individuals counted at each survey station.



Survey station 4 had the highest number of observations, while survey station 7 had the highest number of individual birds counted (Table 2, Figure 25). Birds from this guild were recorded at all survey stations with the exception of station 3.

Behavior. The most observed columbid behavior observed was "flying over the observation area" at 50% followed by feeding at 20% (Table 3, Figure 26). Each of the three remaining behaviors accounted for 10% of all observations for this guild.

Figure 26. Percentage of behavioral observations in which columbids were documented.



Strikes. According to the NWSD, nine mourning doves have been reported struck by aircraft at BGM, two occurred on runway 16 and five on runway 34

Waterfowl (Ducks, Geese, Brant, and Swans)



Description. Due to their larger body sizes, waterfowl (particularly geese) pose serious risks to aircraft. Ducks are rarely seen feeding, loafing, or roosting away from water, even if it is only a puddle. Geese, however, will land on nearly any sizeable field or lawn where they can watch for predators while feeding. Geese pose a greater risk to aircraft not only because of their larger size, but also because they tend to travel in flocks. Both like to roost on larger bodies of water to escape predation or other risks. Geese and ducks tend to leave their roosts near sunrise to locate a feeding area. They return to their roosts during or just after sunset. However, Canada geese will sometimes be seen foraging at night.

Resident Canada geese are those that nest and reside predominately in the U.S. and do not migrate like the rest of the populations of Canada geese. They are able to tolerate human and other disturbances, while proliferating in an urban/suburban environment. Many Canada geese populations are at or just below desired levels; however, the resident population in New York is well above desired levels. Resident Canada geese are essentially a non-native bird species in New York.

Attractants. During the day, Canada geese search for areas where they can feed and loaf. These areas include expanses of lawn where they can easily see approaching predators or areas with a pond where they can quickly escape in the event of danger. The grassy fields at BGM make attractive places for geese to feed and loaf, while the nearby ponds provide protection. An important aspect of managing geese is to not let them feel safe. As soon as they arrive, it is imperative that they are harassed until it is certain that they have left the airport, and not merely moved to another area on the airport.

Risks. Waterfowl can be particularly hazardous to aircraft because of their large size, weight, flocking behavior, and relative abundance. Nationally, waterfowl represent 9.9% of known species bird-aircraft strikes in the U.S. (Cleary et al. 2005). Canada geese and mallards rank 4th and 10th, respectively, out of the top 20 bird species reported as struck by civil aircraft in the U.S. between 1990 and 1998 (Dolbeer et al. 2000). Geese are ranked 1st among all species groups as being the most costly species for an aircraft to strike (Dolbeer et al. 2000). The potential for damage by Canada geese was tragically illustrated in September 1995 when an Air Force AWACS plane crashed in Alaska after striking a flock of Canada geese on takeoff, killing all 24 crew members. In 1995, a Concorde landing at JFK International Airport ingested a Canada goose into an engine causing two engines to fail. The damage cost was over $9 million. On September 9, 2003, 5 geese were struck at LaGuardia Airport causing an uncontained engine failure. The FK-100 made an emergency landing at JFK Airport. Fortunately there were no injuries or fatalities in either of these latter incidents.

The USFWS defines a resident Canada goose as one that nests or resides on a year-round basis within the conterminous United States (Ankey 1996). [illegible] there were about 19,000 resident Canada geese in New York. During [illegible] geese populations in New York averaged 137,000 statewide, [illegible] in the Lower Hudson Valley and Long Island (Atlantic Flyway Council 1999). Today, there are estimated to be 195,000 resident geese in New York (Swift 2004). According to the NWSD, there have been 85 goose-aircraft strikes reported in New York State, 41of which were damaging. Of these damaging strikes, 19% reported substantial damage and 29% reported minor damage.

Legal status. Waterfowl are protected as migratory game birds by federal and state laws, but most may be hunted during the fall and winter. However, there are constraints that limit the feasibility of hunting as a viable control technique for urban Canada geese, such as seasonal restrictions, bag limits, and municipal ordinances. Federal and state depredation permits are required to remove waterfowl out of season or in excess of the legal bag limit during hunting season. Currently, BGM has both of these permits.

Control measures. The best method of control for waterfowl is the removal and exclusion of attractive wetland habitat and agricultural crops. Wire grids are effective at 10-20 foot intervals over ponds and other wetlands. Mylar tape stretched between two stakes, 50-100 feet apart at 25-foot intervals may be temporarily effective for feeding areas. Using long grass management (8-12 inches) or an unpalatable ground cover can effectively preclude a wide variety of birds (Linnell et al. 1997), including geese, from feeding on airfields. Pyrotechnics work well for most waterfowl. If they habituate to hazing efforts, it may become necessary to shoot a few individuals to reinforce these methods. Habituation to hazing techniques is most often noticeable with resident birds, but may also occur in migrants a few weeks after the regular hunting season closes. Waterfowl are also affected by the use of visual repellents in conjunction with pyrotechnics.

In addition to implementing direct control actions, ground personnel responsible for reducing wildlife hazards and pilots should be made aware of potential hazards at BGM, especially during the fall and spring migration periods when waterfowl are plentiful.

Risk Analysis

Prevalence. Waterfowl were observed 3 times during the WHA consisting of 78 individual birds (Table 1). Of these, Canada geese accounted for all individual birds from this guild during the year-long assessment at BGM. Canada geese were observed on or over airport property during the months of May, September, and October. However, Canada geese were always in close proximity to the airport at the Broome County Landfill. Each of the three months had only one observation, but the number of individuals counted ranged from 2 – 43 birds (Table 1, Figure 27). These three months coincide with the spring and fall migration periods. All goose observations occurred at survey station 2 (Table 2 & Figure 28).

Figure 27. Number of waterfowl observations and individual counted per month.

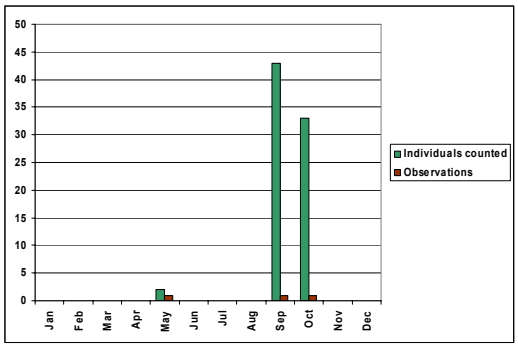
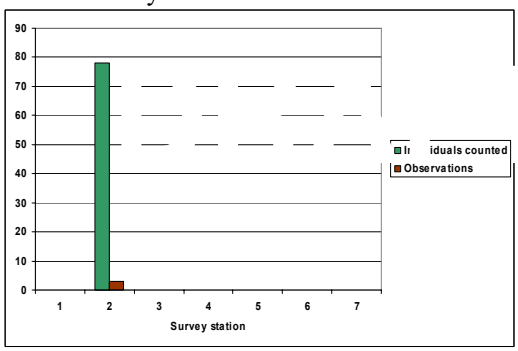
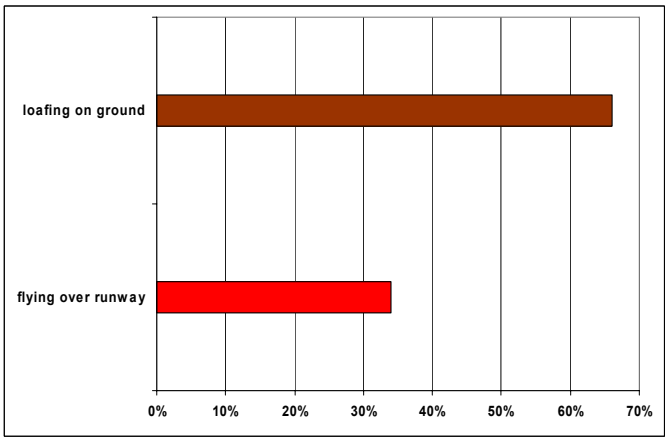


Figure 28. Number of waterfowl observations and individual birds counted at each survey station



Behavior. The most observed goose behavior on BGM was "loafing on ground," followed by "flying over the runway" (Table 3, Figure 29).

Figure 29. Percentage of behavioral observations in which waterfowl were documented.



Strikes. According to the NWSD, no birds from this guild have been reported struck at BGM since 1990.

Large Mammal Survey

The large mammals of most concern at BGM are fox, coyotes, and cottontail rabbits. Other species observed included striped skunks and woodchucks.

Red Fox (*Vulpes vulpes*)



Description. The red fox is the most common fox native to North America. It is dog-like in appearance, with a light orange-red coat, black legs, lighter-colored underfur, and a white-tipped tail. The red fox is found throughout New York State. It is a crepuscular animal, moving primarily during the early morning hours. Red foxes are solitary except from the winter breeding season through midsummer when mates and their young associate closely.

Attractants. This fox is an adaptable animal, occurring often in urban habitats. It usually prefers open areas with moderate cover. Red foxes are opportunistic feeders, hunting mostly rabbits, mice, bird eggs, insects, and native fruits, mo[illegible] adjacent to BGM. They are adept at using ditches and swale[illegible] Foxes may dig their own den or they may use an abandoned [illegible]

Risks. Nationally, red foxes account for 2% of all reported mammal strikes in the U.S. (Cleary et al. 2005). Red foxes are predators and are seldom hunted as prey by other animals, with the exception of coyotes occasionally. The primary risk they present to airports is as a strike hazard or FOD. It would be easy for a fox to cross a runway in front of a plane during take-off or landing roll and for the pilot to suddenly brake or swerve to avoid hitting an unidentifiable target.

Legal status. Red fox are furbearing animals and are, thus, regulated by the state. However, they may be killed out of season under a depredation permit (New York Environmental Conservation Law, Section 11-0521). Also, under Section 11-0523, BGM may kill a red fox without a permit if that fox " is injuring their property or has become a nuisance thereon."

Control measures. Foxes adapt quickly to frightening devices such as propane cannons, tape recordings, or pyrotechnics. However, these methods may be used to temporarily reduce fox activity in an area. Trapping can be an effective and selective control method, and should be conducted by an experienced trapper. Unsuccessful attempts at trapping may serve to "educate" the fox, thus making them more difficult to trap. Shooting is also an effective and selective method to remove fox. When shooting fox on an airport, safety is of paramount importance. Care should be taken that there is always an adequate backstop for the bullet.

Risk Analysis

Prevalence. WS personnel observed fox on the airfield twice and several times just outside the security fence. One fox was observed on the lower perimeter road between runways 28 and 34 in June of 2005, and two fox were observed in July of 2005, one at the approach of runway 34 and one on the lower perimeter road at the approach end of runway 34.

Strikes. According to the NWSD, one red fox has been reported struck at BGM. The strike occurred during the evening of July 4, 1997 when a DASH-8 struck a fox during a landing roll on runway 28. No damage from the strike was reported.

Striped Skunk (*Mephitis mephitis*)



Description. The striped skunk is probably one of the best known mammals in North America. It is about the size of a house cat and is known for its strong scent glands and black body with a white stripe starting on the forehead and dividing into two stripes down its back. Skunks are chiefly nocturnal and can be identified by a deep amber eye shine. They do not hibernate and may appear on warm nights in the middle of winter. Skunks mate between February and March and 5 to 6 young are born in early May.

Attractants. Skunks prefer semi-open country, mixed woods, brush land and open prairie, normally within 2 miles of water. Skunks are omnivorous a[illegible] insects, grubs, berries, and carrion. They den in ground burrows [illegible] buildings, boulders, or wood or rock piles.

Risks. Skunks commonly roam airports at night and often cross runways. Nationally, striped skunks account for 3.1% of all known terrestrial mammal strikes and they seldom cause serious damage because of their small size (Cleary et al. 2005). Skunks can also be carriers of rabies.

Legal status. Skunks are a valuable fur resource and are regulated by the NYSDEC as a furbearer. The 2005/06 legal trapping season for skunk occurs from October 25 until February 15. Skunks may also be taken when causing damage to property according to NY DEC Regulation 11-0523.

Control measures. Skunks are easily trapped in a box trap with cat food, chicken bones or other meat products. The trap should be covered with canvas to reduce the chances of the trapped skunk to discharge its scent. The canvas creates a dark, secure environment for the animal. They must be approached carefully and disposed of by a method in which the scent gland will not discharge. If the skunk is to be killed, the US Department of Agriculture recommends shooting or euthanization with CO_2. Eliminating food sources such as rodents and grubs will force skunks to relocate elsewhere.

Risk Analysis

Prevalence. Six skunks were observed during spotlight surveys at BGM. One skunk was observed in the safety area of runway 10-28, one at the approach of runway 28, three north of runway 28 and one on the lower perimeter road at the approach end of runway 28.

Strikes. According to the NWSD, no skunks have been reported struck by aircraft at BGM.

Eastern Cottontails (*Sylvilagus floridanus*)



Description. Rabbits tend to live in brushy areas or brush piles, using burrows to escape predators. They feed on a variety of vegetation including grass, flowers, young trees, shrub stems, and many garden crops.

Attractants. Cottontail rabbits nest and hide in thick, brushy areas that provide shelter from inclement weather, protection from predators, and food.

Risks. Nationally cottontail rabbits account for 2.5% of all known mammal aircraft strikes (Cleary et al. 2005). Rabbits themselves do not generally represent a direct threat to aircraft because of their small size and tendency to avoid open areas such as runways. However, they serve as an attractant to raptors and coyotes which do pose a threat to aircraft.

Legal status. Rabbits are considered a game animal and are made protected under New York state law. A state permit is required before any lethal management is undertaken at BGM. Cottontail rabbits may also be taken without a permit when causing damage to property or occupied farm lands.

Control measures. Habitat modification is an effective deterrent to rabbits. By removing brushy areas and brush piles, especially along fences and stream banks, the rabbits will seek new places for cover. It is prudent to keep the number of rabbits to a minimum to reduce attraction of larger mammals and raptors to the airport.

Risk Analysis

Prevalence. Three rabbits were seen during the spotlight surveys. All three rabbits were observed in November on taxiway K.

Strikes. According to the NWSD, no cottontail rabbits have been reported struck at BGM.

Small Mammal Survey

A small mammal survey was conducted with trapping periods occurring in the spring of 2005 (May 10-12) and fall of 2005 (September 7 – 9). During the survey, no small mammals were captured on the airfield. However, many small mammal populations cycle from high to low over a period of several years, which in turn can dictate the number of predators using BGM property.



A mouse trap (left) and a Sherman live trap (right), used in the small mammal survey.

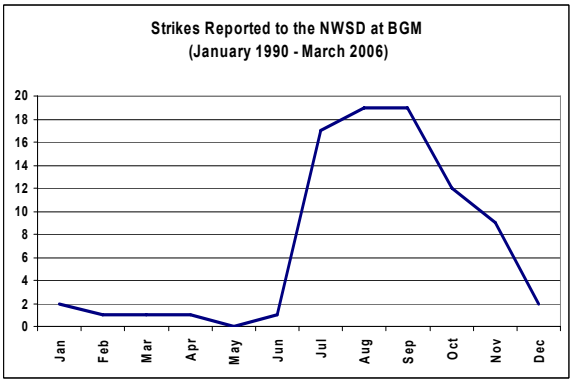
BGM Airport's Strike Record, 1990-2006

From January 1990 through March 2006, 84 wildlife strikes (5.16 strikes per year) were reported to the FAA National Wildlife Strike Database. Assuming similar reporting rates, this number of strikes equals 1.55 strikes/10,000 movements, below the national average, which is estimated at 2.20 strikes/10,000 movements. However, as mentioned earlier, research has shown that as few as 13% of all bird strikes are reported (Barras and Dolbeer 2000), which implies that as many as 39 strikes per year could be occurring at BGM.

It is difficult to explain differences in the number of strikes among years, since many human, meteorological, and biological factors exist. Some factors include an increased awareness of the wildlife strike issue, weather conditions such as fog and wind, and an increase in populations of several species of birds and mammals.

Species Composition. Of the known species struck, killdeers and gulls accounted for most of the strikes at 20% and 13%, respectively. However, the highest percentage of all strikes went unidentified at 26%. During the WHA (September 2004 – September 2005), 5 strikes were reported to the strike database consisting of one swallow, two American crows and two unidentified species.

Seasonal Strike Distribution. Knowing which season incurs the most wildlife strikes helps airport operations managers know when they need to adjust or increase their wildlife vigilance and management efforts. The graph below shows that the majority of reported strikes occur during the summer and early fall months. Eighty percent of all reported strikes occurred during months of July through October. Of the known species reported, strikes consisted of killdeers at 25%, gulls at 13%, and mourning doves at 6%.



Runway and Phase of Flight Analysis. Analyzing which runway and phase of flight incurs the most wildlife strikes helps airport wildlife managers prioritize areas to manage. This type of analysis helps pinpoint where most strikes occur, thus assisting in the development of wildlife hazard management plans. Nationally, most bird strikes reported to the FAA (42%) occurred on either descent or approach of an airport, whereas over half of the mammal strikes (53%) occurred on a landing roll (Cleary et al. 2005). As seen below, the highest percentage of bird strikes at BGM occurred during the landing roll, followed by the approach, take-off run, and climb. However, as valuable as this data may be, not all strike reports contain the phase of flight. The one mammal strike reported to the NWSD (red fox) occurred during a landing roll on runway 28.

Phase of Flight	Number of Bird Strikes
Landing roll	25 (36%)
Approach	22 (31%)
Take-off run	20 (26%)
Climb	3 (4%)

Of the known strike locations, runway 34 accounted for 49%, runway 16 accounted for 45%, runway 28 accounted for 4% and runway 10 accounted for 1%. This data should be considered in terms of how often each runway is used.

	Strikes During Arriving Flights			Strikes During Departing Flights		
Runway	**Desc/appr.**	**Landing roll**	**Total**	**Take-off run**	**Climb**	**Total**
16	9	9	18	10	0	10
34	9	11	20	6	1	7
10	0	1	0	0	0	1
28	1	2	3	1	0	1

The species of birds most often reported struck on runway 34 were killdeers (35%) and mourning doves (19%), while gulls and killdeers represented the species most often struck on runway 16, both at 24%.

Analyzing runway and phase of flight information for bird strikes aids airport operations managers by indicating which areas to concentrate wildlife control measures, what type of control methods to use, how and when to best disseminate wildlife hazard information to pilots, where to expect to locate bird carcasses, etc. These data also assist managers and researchers in understanding conditions unique to each runway and additional factors contributing to wildlife-aircraft collisions.

Recommendations for Managing Wildlife Hazards at BGM

USDA, Wildlife Services Program promotes an Integrated Wildlife Damage Management (IWDM) approach (sometimes referred to as "Integrated Pest Management" or IPM) in which a series of methods may be used or recommended to reduce wildlife damage. IWDM is described in Chapter 1, 1-7 of the ADC Program Final Environmental Impact Statement. These methods include altering cultural practices as well as habitat and behavioral modification to prevent damage. However, controlling wildlife damage may require that the offending animal(s) be killed or that populations of the species be reduced.

The following recommendations are presented as a means to begin the process of reducing or eliminating wildlife hazards observed at BGM during the WHA. They provide some initial context based on the WHA that should be detailed and adapted into the Wildlife Management Plan. If followed, these recommendations should result in a significant reduction of current wildlife hazards at BGM, *but they do not replace the need to continue to monitor for new hazards*. Specific action recommendations are presented from most important concerns to least important concerns in terms of the potential hazard to aircraft. Following these recommendations are administrative recommendations that complement the specific-action recommendations by offering organizational advice for a well-rounded wildlife management program.

Specific Action Recommendations

1. Remove great blue heron rookery

Remove the great blue heron rookery located approximately ¼ mile east of runway 16. Biologists observed in excess of 30 active nests during the spring of 2005. Adult birds leave the nests several times a day traveling across runways in search of food for nestlings. The altitude of these runway crossings, along with the slow flight speed of the herons, increases the potential of a strike. Since 1990, reported economic loss due to damaging strikes caused by great blue herons in the U.S. is in excess of $2,500,000. The rookery should be altered during a period when the nests are inactive (Appendix N).

2. Maintain Communications with Broome County Landfill

Due to the close proximity of the landfill and its attractiveness to a variety of hazardous wildlife species towards aircraft (vultures, geese, and gulls) (Appendix O), BGM

operations personnel must maintain a working relationship and communications with the landfill supervisor. The landfill supervisor will inform airport operations personnel before any bird hazing or removal efforts are undertaken. This communication will decrease the likelihood of scaring birds toward the airfield while aircraft are departing or landing at BGM.

3. Be More Aggressive in Dispersing Birds, Particularly Canada Geese, Crows, and Gulls.

Geese are a concern to aviation because of their large size, flocking behavior which increases the likelihood of multiple bird strikes, attraction to airports for grazing, and year-round presence in urban environments surrounding airports (Dolbeer and Seubert 2004). Canada geese should be considered a species of zero-tolerance at any airport. Nationally, gulls are the most frequently struck bird group and are responsible for the greatest number of bird strikes having a negative effect on flight (Dolbeer et al. 2000). Crows were responsible for 32% of all runway crossings observed during the field portion of the assessment. The hazards that geese, crows, and gulls presen at BG Pa sig fica due to the flocking behavior and body size of the birds.

Patrols should be conducted several times each day during periods when geese, crows, and gulls are likely to be present. Instruct tower personnel to inform operations personnel when bird activity is observed on the airfield. BGM personnel should aggressively use pyrotechnics so the birds will feel uncomfortable at BGM. All patrols should be documented in a log, along with any actions taken.

All wildlife eventually becomes habituated to the noise of pyrotechnics and propane cannons. To maintain the discomfort level of birds, it is recommended that pyrotechnics be supported by occasionally shooting an individual bird of the target species.

4. Maintain and Modify a Deer and Coyote Proof Security Fence

Because deer and coyotes are the primary large mammal wildlife concerns for airports in the State of New York, the perimeter fence must be maintained or modified to exclude these species. Deer can be excluded from the airport by installing an 8 foot chain link fence with 3 strands of barbed wire angled outward at 45 degrees. Fences need to follow the topography of the landscape to prevent gaps along the ground. A 4-foot skirt of chain-link fence material, attached to the bottom of the fence and buried at a 45 degree angle on the outside of the fence will prevent animals from digging under the fence and reduce the chance of washouts. Drainage pipes, ditches, creeks and other openings under the fence must have the proper barriers installed to prevent access. In places where fencing is difficult to install because of streams or terrain or it will interfere with navigational equipment, contact WS personnel for specific recommendations. Additionally, fences need to be routinely inspected and repaired as necessary.

5. Remove Red Foxes on the airfield

Remove all red foxes observed on the airfield. Although red foxes are relatively small (10-15 lbs), they do represent a strike hazard and may cause damage to some of the smaller

aircraft using BGM. The most effective and efficient way to remove foxes is by shooting at night. If the use of firearms by BGM personnel is restricted, then contract an outside agency or Nuisance Control Officer to remove red fox from the airfield. Trapping fox is also an effective way to remove fox from the airfield.

6. Grass Management

Grass management is the primary wildlife hazard management tool for airports. FAA Cert Alert No. 98-05, "Grasses Attractive to Hazardous Wildlife" (Appendix P), discusses hazards associated with certain airport reseeding projects. Various heights and types of grass attract different types of wildlife. Shorter grasses attract American crows, starlings, Canada geese, and gulls. Taller grasses harbor small mammals and insects and produce seeds that in turn attract birds such as raptors, swallows, wild turkeys and many other species. Taller grasses also attract mammals such as rabbits, deer, and foxes. The recommended grass height will change depending on the time of year and species using the airport. As a general rule, airport managers are encouraged to maintain grass height at a uniform 6 to 10 inches. In addition to providing cover for w ldl fe, tas will natu and develop seed heads providing a food source for wildlife. To prev n g s f on go g o seed, the grass should be mowed regularly.

In areas away from runways and taxiways where the grass is not regularly maintained, it needs to be mowed as often as possible, at least often enough to keep the grass from developing seed heads.

Different varieties of grass have been studied in hopes of finding one that is aversive to Canada geese. There is recent evidence that some species of fescue grass are aversive to geese. However, it must form a complete ground cover to be effective as a goose deterrent.

7. Remove or Modify Perching Structures

Birds use many structures on an airport for perching. While it is not feasible or advisable to treat every structure, there are some structures that are strong attractants and should be treated. To deter birds such as raptors, crows, doves, pigeons, and starlings from the airfield, WS recommends that BGM remove all unnecessary structures that birds may use as perches.

We recommend that operational structures, such as landing lights, be modified to deter birds from perching. BGM can easily make these modifications by attaching perching deterrent devices such as Nixalite ® or Cat Claw ®, or single strand wire along perch edges. Dead trees (snags) found on airport property should be removed due to the tendency of raptors to use these trees as perching locations. In open areas of the airport, solitary trees make ideal staging and loafing for birds as well as hunting perches for hawks and owls.

8. Remove or Thin the Stand of Pine Trees South of Runway 10.

Due to its attractiveness to crows and other species of birds for loafing and roosting, remove or thin the stand of pine trees located on the south side of runway 10. This dense

stand of pine trees also provides cover and protection for birds from predators (raptors) and weather.

9. Remove Wildlife Prey

Cottontail Rabbits
We recommend that BGM remove eastern cottontail rabbits on its property. Rabbits serve as an attractant to raptors, fox, and coyotes that prey on them. The most effective and efficient way to remove rabbits is by shooting at night. If the use of firearms by BGM personnel is restricted, then an outside agency or Nuisance Wildlife Control Operator should be contracted to remove rabbits.

Administrative Recommendations

1. Zero-tolerance Policy Toward Hazardous Wildlife

Adopt a "zero-tolerance" on the airfield toward deer, coyote, Canada geese and gulls. A strict approach establishes an attitude for all operations personnel and helps prioritize events as they occur.

2. Better Bird Identification

Of paramount importance to furthering our knowledge and understanding of bird strikes is correct species identification. Twenty-six percent of all strikes reported to the FAA from BGM was listed as an unidentified species. Whenever possible (carcass reporting, strike reporting, etc.) it is important to determine and report the correct species of bird. Operations personnel should undergo Airport Wildlife Hazards and Bird Identification training provided by WS. This will help ensure that all carcasses are correctly identified using a field identification manual. If a collected specimen is unidentifiable, appropriate parts should be sent to the Smithsonian Institution Feather Lab for proper identification (Appendix F).

Proper identification helps airports tailor their Wildlife Management Plans to more effectively reduce wildlife hazards and to keep costs low. Knowledge of the problem species also helps researchers focus on the species of concern to develop and improve hazard management techniques.

3. Designate a Wildlife Coordinator and Delineate Responsibilities of all Personnel Involved.

Appoint a wildlife coordinator to respond to and monitor all wildlife-related activities. It would be the responsibility of the coordinator to see that recommendations from the WHA are implemented and the appropriate wildlife control permits and supplies are maintained. The coordinator would keep a database of wildlife strike information, and be responsible for ensuring that BGM personnel, pilots, and ground crews are familiar with the proper procedures for collecting and reporting wildlife strike information (either on the web or using the FAA Form 5200-7). The coordinator would also oversee wildlife management activities with maintenance and air traffic control personnel.

The wildlife coordinator, with the assistance of a contract biologist, would actively participate in construction and land-use projects or changes, on or off airport property that could increase wildlife hazards at BGM. For example, new buildings should be designed in a manner that discourages use by wildlife, and mitigation projects to restore habitat potentially attractive to hazardous species should be sited as far as possible from the airfield's critical zone.

4. Obtain and Maintain the Necessary Permits

Obtain an Airport Air Strike Hazard Permit from the DEC and a depredation permit from the USFWS to ensure that BGM has the ability to respond with lethal control when wildlife poses a risk to aircraft at BGM. Obtain and maintain permits for at least the following species.

NYSDEC only*

Deer	Skunk	Beaver
Red Fox	Eastern Cottontail	
Coyote	Wild Turkey	

NYSDEC and USFWS
Ring-billed, Herring, and Greater Black-backed gulls
Waterfowl (Canada geese and ducks)

On the permits, list the name (s) of the appropriate operations and/or maintenance personnel who will be involved in removal efforts, along with other agency personnel (if desired) as designated agents.

* Permits for mammals should allow shooting and the use of artificial lights.

5. Diligently Document Wildlife Strikes and Wildlife Management Actions

WS recommends that BGM begin to record data in a computer database that will allow them or other individuals the ability to analyze data quickly and conveniently, along with maintaining a strike log. Direct strikes reported by pilots or the tower, wildlife remains on planes, and carcasses found should all be considered strikes and recorded in the database. A FAA Strike Report Form 5200-7 should be completed for each of these types of strikes. The Operations Manager should ensure that 5200-7's have been filed for all strikes listed on the Bird Activity Reports.

Direct strikes. Airport operations personnel should work with tower personnel to ensure that both parties are aware of all wildlife-aircraft strikes and that all strikes are submitted to the FAA in a timely and thorough manner. If there is a question as to whether or not a particular report has been filed, *it is better to mistakenly submit a report twice rather than not at all*. Reports are filtered for duplicate submissions before they are entered into the database.

Wildlife remains on planes. Another source of wildlife strike data is the planes themselves. We recommend that ground crews be required to report remains on an aircraft to airport operations personnel. Unidentifiable bird remains (feathers, feet, wings, beaks, etc.) should be collected, a strike report filed, and the remains sent to Carla Dove at the Smithsonian Institute in Washington, D.C. for identification (Appendix F). *Bird identification is provided at no expense to airports*. To ensure that remains are collected properly and efficiently it is advisable to prepare a kit with items such as scrapers, forceps (tweezers), a misting bottle to moisten dried blood and feathers, paper towels, plastic collection bags, data labels, and markers.

Carcasses found. Records from bird carcasses found during regular runway sweeps assist airport managers in developing more accurate pictures of the wildlife-aircraft strike situation at their airports. Instruct operations personnel to search in the grassy areas (up to 200 feet from the centerline) during runway sweeps, because many birds fall away from the runways after being struck. All birds found within 200 feet of the centerline and in the safety zones should be reported as a strike unless the cause of death is absolutely known not to be caused by an aircraft. These carcasses should be reported as wildlife strikes, also using FAA Strike Report Form (FAA 5200-7).

Positively identify carcasses using a bird field guide or by someone experienced in bird identification. If the carcass cannot be identified, store it in a freezer and contact WS or send the specified parts to the Smithsonian for identification. Label the carcasses with **name of person finding the carcass, date and time found, location found, and tentative species identification,** and enter all carcasses found in a wildlife log.

6. Maintain Appropriate Supplies

WS recommends that operations/maintenance vehicles regularly operating on the airfield be equipped with a pyrotechnic launcher and a supply of pyrotechnics. In addition to hazing equipment, operations/maintenance vehicles should have carcass bags, data sheets, a bird identification book, and binoculars.

7. Continue Monitoring Wildlife Abundance and Behavior

The intent of the WHA has been to document general presence and behavior of wildlife at BGM. It is important to recognize that the presence and behavior of wildlife on airports is very dynamic and is influenced by many variables that may change from year to year or season to season. Conclusions based on wildlife populations during this study are meant to be a guide and may or may not be consistent with subsequent years. Data from this study will provide a baseline for comparison in following years.

The survey route and method followed required about 1.5 hours to complete. BGM operations personnel should continue to perform these surveys along the same route, although, perhaps, with less frequency. BGM can use this information to monitor the current wildlife situation.

8. Airport Wildlife Hazard Training and Review

Attend the Airport Bird Identification class as required by the FAA and the NYSDEC every year. This training will help airport operations personnel develop and retain familiarity with bird identification and wildlife control methods.

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TABLES

BGM North
42.21891416163813, -75.98673629760705
Prepared for: McFarland Johnson

Tuesday, January 15, 2019

Environmental Radius Report

2055 E. Rio Salado Pkwy
Tempe, AZ 85381
480-967-6752

Summary

	< 1/4	1/4 - 1/2	1/2 - 1
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National Priorities List (NPL)

This database returned no results for your area.

The Superfund Program, administered under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is an EPA Program to locate, investigate, and clean up the worst hazardous waste sites throughout the United States. The NPL (National Priorities List) is the list of national priorities among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its territories. The NPL is intended primarily to guide the EPA in determining which sites warrant further investigation. The boundaries of an NPL site are not tied to the boundaries of the property on which a facility is located. The release may be contained with a single property's boundaries or may extend across property boundaries onto other properties. The boundaries can, and often do change as further information on the extent and degree of contamination is obtained.

CERCLIS List

This database returned no results for your area.

The United States Environmental Protection Agency (EPA) investigates known or suspected uncontrolled or abandoned hazardous substance facilities under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). EPA maintains a comprehensive list of these facilities in a database known as the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS). These sites have either been investigated or are currently under investigation by the EPA for release or threatened release of hazardous substances. Once a site is placed in CERCLIS, it may be subjected to several levels of review and evaluation and ultimately placed on the National Priority List (NPL).

CERCLIS sites designated as "No Further Remedial Action Planned" (NFRAP) have been removed from CERCLIS. NFRAP sites may be sites where, following an intitial investigation, no contamination was found, contamination was removed quickly without the need for the site to be placed on the NPL, or the contamination was not serious enough to require Federal Superfund Action or NPL consideration.

CERCLIS NFRAP

This database returned no results for your area.

As of February 1995, CERCLIS sites designated "No Further Remedial Action Planned" NFRAP have been removed from CERCLIS. NFRAP sites may be sites where, following an initial investigation, no contamination was found, contamination was removed quickly without the site being placed on the NPL, or the contamination was not serious enough to require Federal Superfund action or NPL consideration.
EPA has removed these NFRAP sites from CERCLIS to lift unintended barriers to the redevelopment of these properties. This policy change is part of EPA"s Brownfields Redevelopment Program to help cities, states, private investors and affected citizens promote economic redevelopment of unproductive urban sites.

RCRA CORRACTS Facilities

This database returned no results for your area.

The United States Environmental Protection Agency (EPA) regulates hazardous waste under the Resource Conservation and Recovery Act (RCRA). The EPA maintains the Corrective Action Report (CORRACTS) database of Resource Conservation and Recovery Act (RCRA) facilities that are undergoing "corrective action." A "corrective action order" is issued pursuant to RCRA Section 3008(h) when there has been a release of hazardous waste or constituents into the environment from a RCRA facility. Corrective actions may be required beyond the facility"s boundary and can be required regardless of when the release occurred, even if it predated RCRA.

RCRA non-CORRACTS TSD Facilities

This database returned no results for your area.

The United States Environmental Protection Agency (EPA) regulates hazardous waste under the Resource Conservation and Recovery Act (RCRA). The EPA"s RCRA Program identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRA Facilites database is a compilation by the EPA of facilities that report generation, storage, transportation, treatment, or disposal of hazardous waste. RCRA Permitted Treatment, Storage, Disposal Facilities (RCRA-TSD) are facilities which treat, store and/or dispose of hazardous waste.

Federal Institutional Control / Engineering Control Registry

This database returned no results for your area.

Federal Institutional Control / Engineering Control Registry

Emergency Response Notification System (ERNS)

This database returned no results for your area.

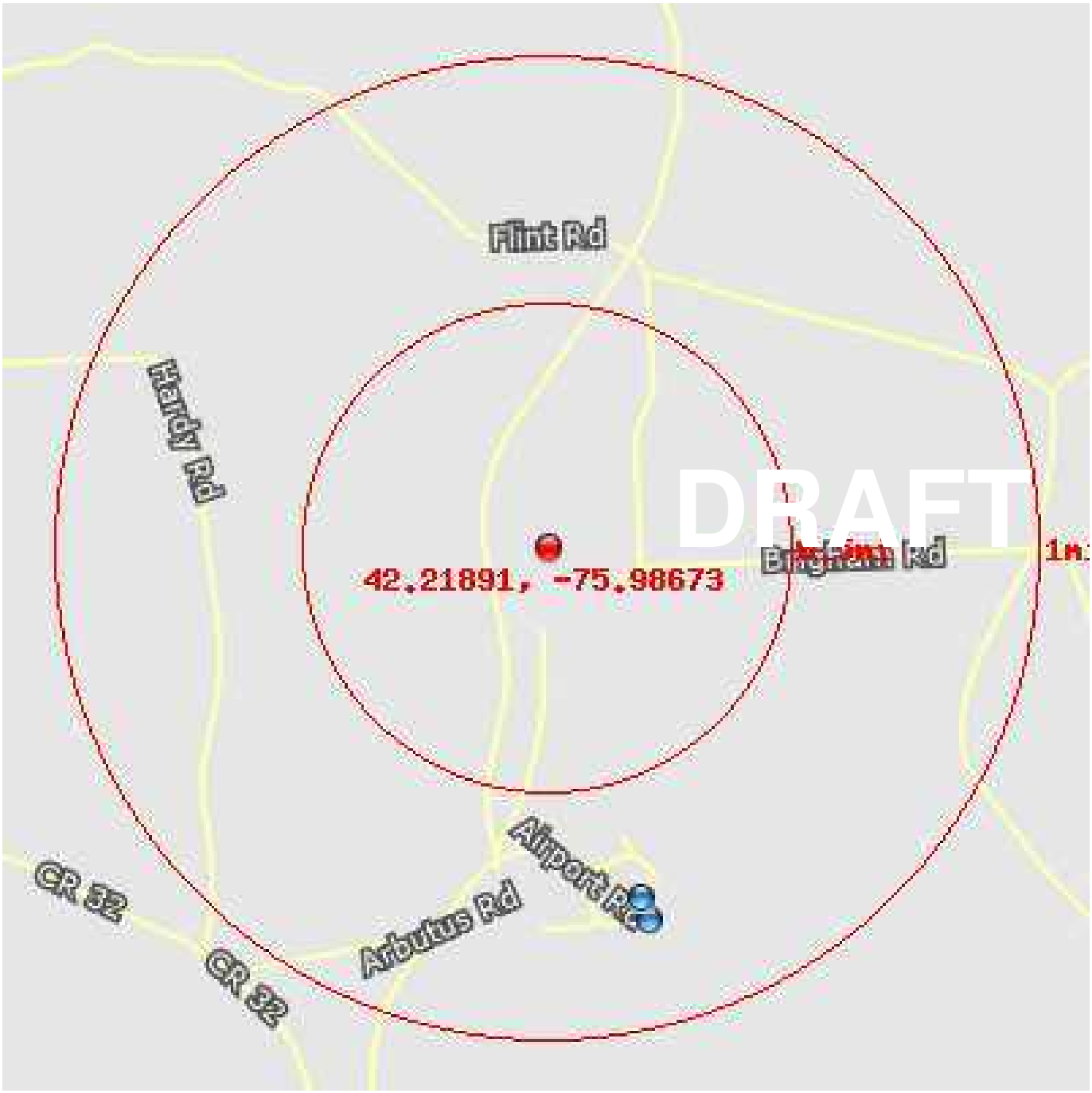
The Emergency Response Notification System (ERNS) is a national computer database used to store information on unauthorized releases of oil and hazardous substances. The program is a cooperative effort of the Environmental Protection Agency, the Department of Transportation Research and Special Program Administration"s John Volpe National Transportation System Center and the National Response Center. There are primarily five Federal statutes that require release reporting: the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) section 103; the Superfund Amendments and Reauthorization Act(SARA) Title III Section 304; the Clean Water Act of 1972(CWA) section 311(b)(3); and the Hazardous Material Transportation Act of 1974(HMTA section 1808(b).

US Toxic Release Inventory

This database returned no results for your area.

The Toxics Release Inventory (TRI) is a publicly available EPA database that contains information on toxic chemical releases and other waste management activities reported annually by certain covered industry groups as well as federal facilities. TRI reporters for all reporting years are provided in the file.

US RCRA Generators (CESQG, SQG, LQG)



This database returned 2 results for your area.

The United States Environmental Protection Agency (EPA) regulates hazardous waste under the Resource Conservation and Recovery Act (RCRA). EPA maintains a database of facilities, which generate hazardous waste or treat, store, and/or dispose of hazardous wastes.

Conditionally Exempt Small Quantity Generators (CESQG) generate 100 kilograms or less per month of hazardous waste, or 1 kilogram or less per month of acutely hazardous waste.

Small Quantity Generators (SQG) generate more than 100 kilograms, but less than 1,000 kilograms, of hazardous waste per month.

Large Quantity Generators (LQG) generate 1,000 kilograms per month or more of hazardous waste, or more than 1 kilogram per month of acutely hazardous waste.

US RCRA Generators (CESQG, SQG, LQG)

Location	42.20853, -75.98299
Distance to site	3924 ft / 0.74 mi S
Info URL	*http://ofmpub.epa.gov/enviro/fii_query_detail.disp_program_facility?p_registry_id=110004367159*
EPA Identifier	110004367159
Primary Name	FLIGHT OPTIONS
Address	BINGHAMTON REG AIRPORT BLDG 2
City	JOHNSON CITY
County	BROOME
State	NY
Zipcode	13790
Programs	RCRAINFO
Program Interests	SQG
Updated On	09-AUG-2010 10:07:44
Recorded On	01-MAR-2000 00:00:00

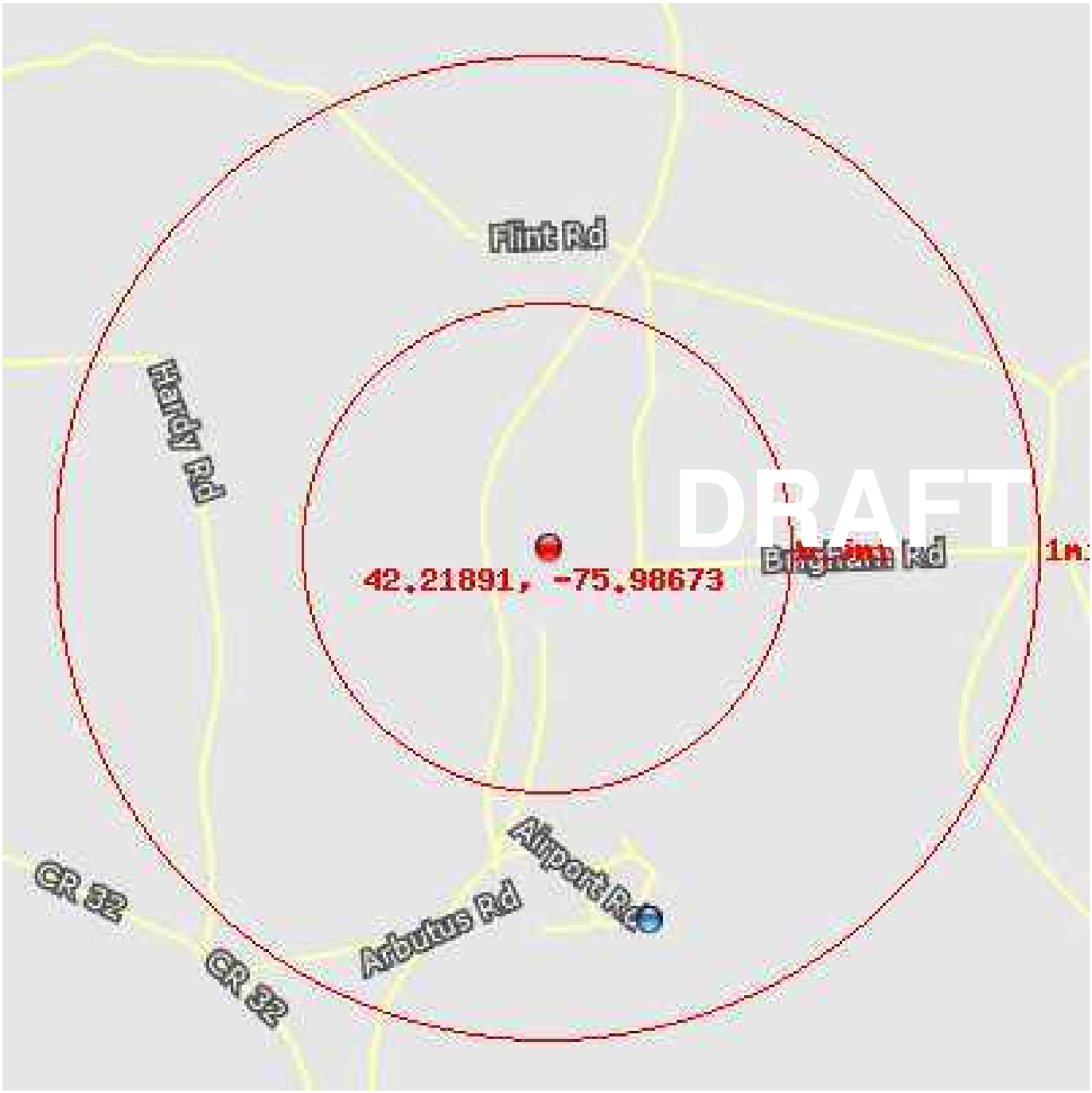
Location	42.20795, -75.98268
Distance to site	4148 ft / 0.79 mi S
Info URL	*http://ofmpub.epa.gov/enviro/fii_query_detail.disp_program_facility?p_registry_id=110004317588*
EPA Identifier	110004317588
Primary Name	TSA AT GREATER BINGHAMTON EDWIN LINK FLD
Address	2534 AIRPORT BLVD BOX 16
City	JOHNSON CITY
County	BROOME
State	NY
Zipcode	13790-4100
NAICS Codes	488119
Programs	NPDES, RCRAINFO
Program Interests	CESQG, ICIS-NPDES UNPERMITTED
Updated On	11-JAN-2016 10:09:34
Recorded On	01-MAR-2000 00:00:00
NAICS Descriptions	OTHER AIRPORT OPERATIONS.

US ACRES (Brownfields)

This database returned no results for your area.

Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties protects the environment, reduces blight, and takes development pressures off greenspaces and working lands. The Assessment, Cleanup and Redevelopment Exchange System (ACRES) is an online database for Brownfields Grantees to electronically submit data directly to The United States Environmental Protection Agency (EPA)

US NPDES



This database returned 2 results for your area.

The NPDES module of the Compliance Information System (ICIS) tracks surface water permits issued under the Clean Water Act. Under NPDES, all facilities that discharge pollutants from any point source into waters of the United States are required to obtain a permit. The permit will likely contain limits on what can be discharged, impose monitoring and reporting requirements, and include other provisions to ensure that the discharge does not adversely affect water quality.

US NPDES

Location	42.20795, -75.98268
Distance to site	4148 ft / 0.79 mi S
Info URL	*http://ofmpub.epa.gov/enviro/fii_query_detail.disp_program_facility?p_registry_id=110019512222*
EPA Identifier	110019512222
Primary Name	GREATER BINGHAMTON AIRPORT
Address	2534 AIRPORT RD
City	JOHNSON CITY
County	BROOME
State	NY
Zipcode	13790
SIC Codes	4581, 8999
SIC Descriptions	AIRPORTS, FLYING FIELDS, AND AIRPORT TERMINAL SERVICES, SERVICES, NOT ELSEWHERE CLASSIFIED
Programs	FIS, NPDES
Program Interests	ICIS-NPDES NON-MAJOR, STATE MASTER
Updated On	11-JAN-2016 14:44:11
Recorded On	20-NOV-2004 02:58:23

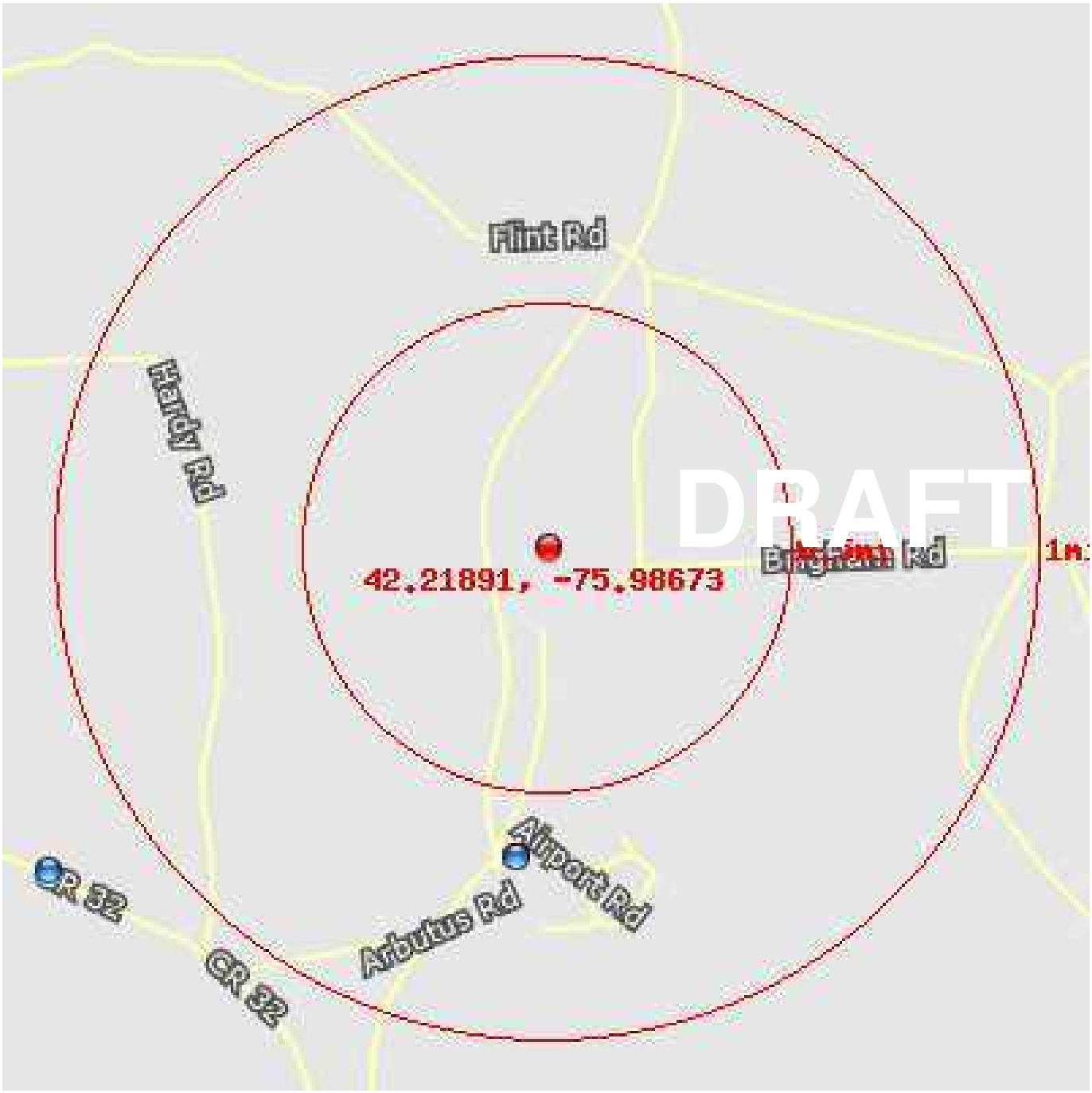
Location	42.20795, -75.98268
Distance to site	4148 ft / 0.79 mi S
Info URL	*http://ofmpub.epa.gov/enviro/fii_query_detail.disp_program_facility?p_registry_id=110004317588*
EPA Identifier	110004317588
Primary Name	TSA AT GREATER BINGHAMTON EDWIN LINK FLD
Address	2534 AIRPORT BLVD BOX 16
City	JOHNSON CITY
County	BROOME
State	NY
Zipcode	13790-4100
NAICS Codes	488119
Programs	NPDES, RCRAINFO
Program Interests	CESQG, ICIS-NPDES UNPERMITTED
Updated On	11-JAN-2016 10:09:34
Recorded On	01-MAR-2000 00:00:00
NAICS Descriptions	OTHER AIRPORT OPERATIONS.

US Air Facility System (AIRS / AFS)

This database returned no results for your area.

The Air Facility System (AIRS / AFS) contains compliance and permit data for stationary sources of air pollution (such as electric power plants, steel mills, factories, and universities) regulated by EPA, state and local air pollution agencies. The information in AFS is used by the states to prepare State Implementation Plans (SIPs) and to track the compliance status of point sources with various regulatory programs under Clean Air Act.

NY Underground Storage Tanks



This database returned 2 results for your area.

Underground Storage Tanks (UST) containing hazardous or petroleum substances are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA). The New York Department of Environmental Conservation Quality (DEC) maintains a list of registered USTs.

NY Underground Storage Tanks

Location	42.20979, -75.98793
Distance to site	3346 ft / 0.63 mi S
Facility Status	ACTIVE
Address	2534 AIRPORT RD
Zip Code	13790
Expiration Date	9/19/2012 12:00:00 AM
City	JOHNSON CITY
County	BROOME
Facility Name	GREATER BINGHAMTON AIRPORT
Site Type	PBS
Site Number	7-140368

Location	42.20979, -75.98793
Distance to site	3346 ft / 0.63 mi S
Facility Status	ACTIVE
Address	BOX 17 2534 AIRPORT RD.
Zip Code	13790
Expiration Date	6/5/2012 12:00:00 AM
City	JOHNSON CITY
County	BROOME
Facility Name	USDOT-FAA 83GJ
Site Type	PBS
Site Number	7-128864

NY Brownfields

This database returned no results for your area.

New York State Department of Environmental Conservation (DEC) maintains a database of contaminated and abandoned properties known as brownfield sites. Left untouched, brownfields pose environmental, legal and financial burdens on a community and its taxpayers. However, after cleanup, these sites can again become the powerful engines for economic vitality, jobs and community pride that they once were. Promoting site cleanups: New York offers incentives in the form of technical and financial assistance, as well as liability relief, to encourage the cleanup and reuse of contaminated sites. Incentive programs target both the public and private sector. DEC also oversees cleanups of inactive hazardous waste disposal sites and petroleum/chemical spills

NY State Superfund Program

This database returned no results for your area.

The State Supefund Program (also known as The Inactive Hazardous Waste Disposal Site Remedial Program) is an enforcement program whose mission is to identify and characterize suspected inactive hazardous waste disposal sites and to investigate and remediate those sites found to pose a significant threat to public health and environment.

NY Voluntary Cleanup Program

This database returned no results for your area.

New York established its Voluntary Cleanup Program (VCP) to address the environmental, legal and financial barriers that often hinder the redevelopment and reuse of contaminated properties. The Voluntary Cleanup Program was developed to enhance private sector cleanup of brownfields by enabling parties to remediate sites using private rather than public funds and to reduce the development pressures on "greenfield" sites.

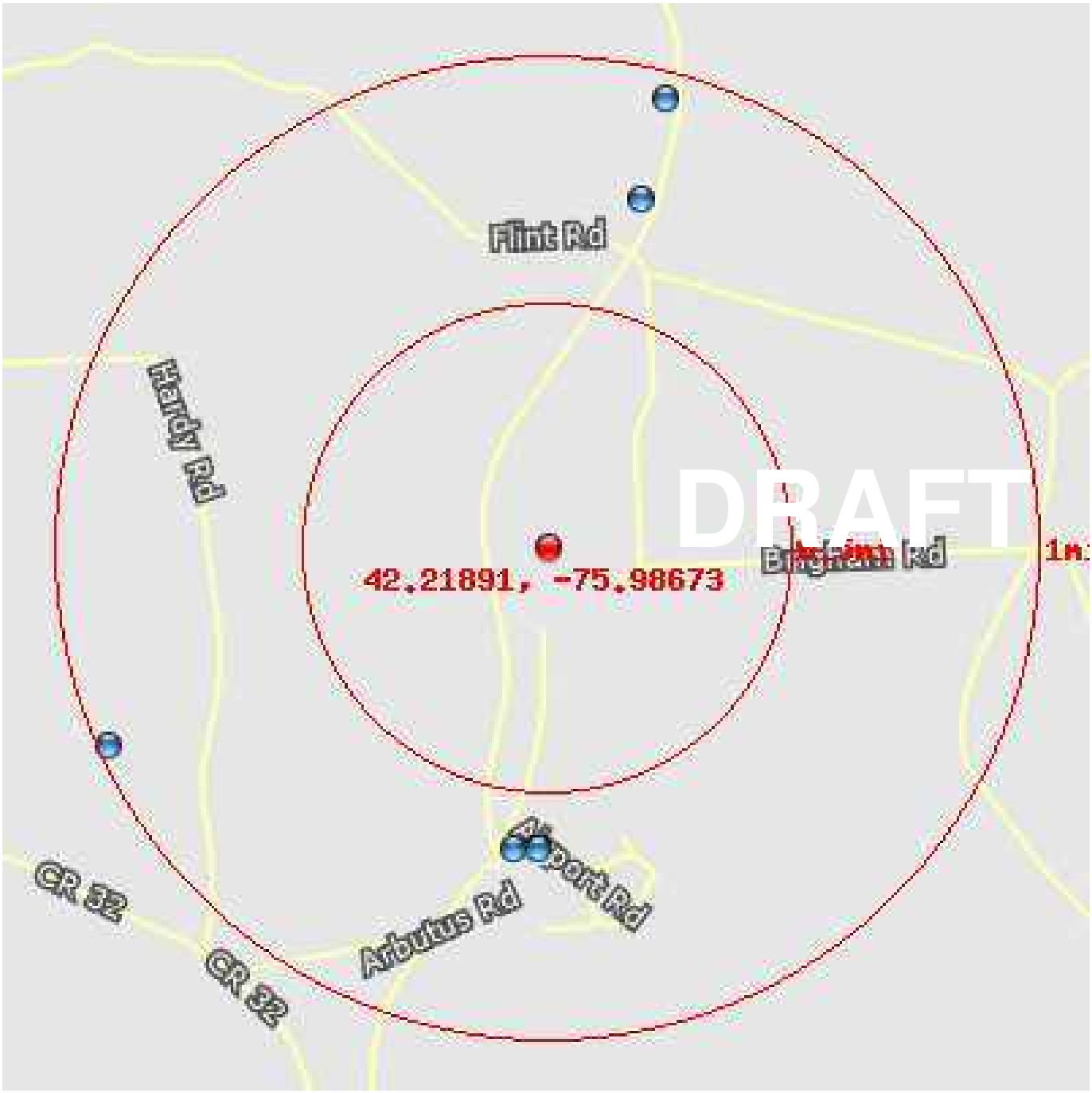
New York's Voluntary Cleanup Program is a cooperative approach among the New York State Department of Environmental Conservation (Department), lenders, developers and prospective purchasers to investigate and/or remediate contaminated sites and return these sites to productive use. Under the Voluntary Cleanup Program, a volunteer performs remedial activities pursuant to one or more Department approved work plans. The volunteer agrees to remediate the site to a level which is protective of public health and the environment for the present or intended use of the property. Investigation and remediation is carried out under the oversight of the Department and the New York State Department of Health (DOH) and the volunteer pays the State's oversight costs. When the volunteer completes work, a release from liability from the Department is provided with standard reservations.

NY Environmental Restoration Program

This database returned no results for your area.

The Environmental Restoration Program (ERP) provides grants to municipalities to reimburse up to 90 percent of on-site eligible costs and 100 percent of off-site eligible costs for site investigation and remediation activities. Once remediated, the property may then be reused for commercial, industrial, residential or public use.

NY Leaking USTs and Spills



This database returned 11 results for your area.

The New York Department of Environmental Conservation maintains a database of leaking underground storage tanks (LUST) and spills.

NY Leaking USTs and Spills

Location	42.20967, -75.98766
Distance to site	3381 ft / 0.64 mi S
Spill Number	750391
Date Reported	1/22/2007
Spill Name	GREATER BINGHAMTON AIRPORT
County	Broome
City	JOHNSON CITY
Address	2524 AIRPORT ROAD

Location	42.20966, -75.9874
Distance to site	3382 ft / 0.64 mi S
Spill Number	9712269
Date Reported	02/03/98
Spill Name	HERTZ RENT A CAR
County	Broome
City	JOHNSON CITY
Address	2534 AIRPORT RD

Location	42.20966, -75.9874
Distance to site	3382 ft / 0.64 mi S
Spill Number	302247
Date Reported	06/03/03
Spill Name	BINGHAMTON AIRPORT
County	Broome
City	JOHNSON CITY
Address	2534 AIRPORT ROAD BOX 16

Location	42.20966, -75.9874
Distance to site	3382 ft / 0.64 mi S
Spill Number	612347
Date Reported	2/10/2007
Spill Name	GREATER BINGHAMTON AIRPOR
County	Broome
City	JOHNSON CITY
Address	2534 AIRPORT ROAD

Location	42.20966, -75.9874
Distance to site	3382 ft / 0.64 mi S
Spill Number	9515089
Date Reported	02/23/96
Spill Name	BINGHAMPTON REGIONAL AIRP
County	Broome
City	JOHNSON CITY
Address	2534 AIRPORT ROAD BOX 16

NY Leaking USTs and Spills

Location	42.20966, -75.9874
Distance to site	3382 ft / 0.64 mi S
Spill Number	9602125
Date Reported	05/13/96
Spill Name	BROOME CO AIRPORT
County	Broome
City	MAINE
Address	2534 AIRPORT RD

Location	42.20966, -75.9874
Distance to site	3382 ft / 0.64 mi S
Spill Number	9604585
Date Reported	07/08/96
Spill Name	E.A. LINK FIELD
County	Broome
City	JOHNSON CITY
Address	2535 AIRPORT RD

Location	42.20966, -75.9874
Distance to site	3382 ft / 0.64 mi S
Spill Number	9604547
Date Reported	07/07/96
Spill Name	BINGHAMTON AIRPORT
County	Broome
City	JOHNSON CITY
Address	2534 AIRPORT RD

Location	42.22947, -75.98278
Distance to site	3996 ft / 0.76 mi N
Spill Number	751144
Date Reported	11/21/2007
Spill Name	PLANE CRASH
County	Broome
City	BINGHAMTON
Address	156 KNAPP ROAD

Location	42.23209, -75.98199
Distance to site	4977 ft / 0.94 mi N
Spill Number	411966
Date Reported	2/9/2005
Spill Name	PRIVATE RESIDENCE
County	Broome
City	BINGHAMTON
Address	200 KNAPP ROAD

NY Leaking USTs and Spills

Location	42.21302, -76.00411
Distance to site	5166 ft / 0.98 mi W
Spill Number	313295
Date Reported	3/3/2004
Spill Name	SIMMONS RESIDENCE
County	Broome
City	JOHNSON CITY
Address	130 HARDY RD

BGM South
42.20200470767747, -75.97695541381847
Prepared for: McFarland Johnson

Tuesday, January 15, 2019

Environmental Radius Report

2055 E. Rio Salado Pkwy
Tempe, AZ 85381
480-967-6752

Summary

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National Priorities List (NPL)			
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National Priorities List (NPL)

This database returned no results for your area.

The Superfund Program, administered under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is an EPA Program to locate, investigate, and clean up the worst hazardous waste sites throughout the United States. The NPL (National Priorities List) is the list of national priorities among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its territories. The NPL is intended primarily to guide the EPA in determining which sites warrant further investigation. The boundaries of an NPL site are not tied to the boundaries of the property on which a facility is located. The release may be contained with a single property's boundaries or may extend across property boundaries onto other properties. The boundaries can, and often do change as further information on the extent and degree of contamination is obtained.

CERCLIS List

This database returned no results for your area.

The United States Environmental Protection Agency (EPA) investigates known or suspected uncontrolled or abandoned hazardous substance facilities under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). EPA maintains a comprehensive list of these facilities in a database known as the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS). These sites have either been investigated or are currently under investigation by the EPA for release or threatened release of hazardous substances. Once a site is placed in CERCLIS, it may be subjected to several levels of review and evaluation and ultimately placed on the National Priority List (NPL).

CERCLIS sites designated as "No Further Remedial Action Planned" (NFRAP) have been removed from CERCLIS. NFRAP sites may be sites where, following an intitial investigation, no contamination was found, contamination was removed quickly without the need for the site to be placed on the NPL, or the contamination was not serious enough to require Federal Superfund Action or NPL consideration.

CERCLIS NFRAP

This database returned no results for your area.

As of February 1995, CERCLIS sites designated "No Further Remedial Action Planned" NFRAP have been removed from CERCLIS. NFRAP sites may be sites where, following an initial investigation, no contamination was found, contamination was removed quickly without the site being placed on the NPL, or the contamination was not serious enough to require Federal Superfund action or NPL consideration.
EPA has removed these NFRAP sites from CERCLIS to lift unintended barriers to the redevelopment of these properties. This policy change is part of EPA"s Brownfields Redevelopment Program to help cities, states, private investors and affected citizens promote economic redevelopment of unproductive urban sites.

RCRA CORRACTS Facilities

This database returned no results for your area.

The United States Environmental Protection Agency (EPA) regulates hazardous waste under the Resource Conservation and Recovery Act (RCRA). The EPA maintains the Corrective Action Report (CORRACTS) database of Resource Conservation and Recovery Act (RCRA) facilities that are undergoing "corrective action." A "corrective action order" is issued pursuant to RCRA Section 3008(h) when there has been a release of hazardous waste or constituents into the environment from a RCRA facility. Corrective actions may be required beyond the facility"s boundary and can be required regardless of when the release occurred, even if it predated RCRA.

RCRA non-CORRACTS TSD Facilities

This database returned no results for your area.

The United States Environmental Protection Agency (EPA) regulates hazardous waste under the Resource Conservation and Recovery Act (RCRA). The EPA"s RCRA Program identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRA Facilites database is a compilation by the EPA of facilities that report generation, storage, transportation, treatment, or disposal of hazardous waste. RCRA Permitted Treatment, Storage, Disposal Facilities (RCRA-TSD) are facilities which treat, store and/or dispose of hazardous waste.

Federal Institutional Control / Engineering Control Registry

This database returned no results for your area.

Federal Institutional Control / Engineering Control Registry

Emergency Response Notification System (ERNS)

This database returned no results for your area.

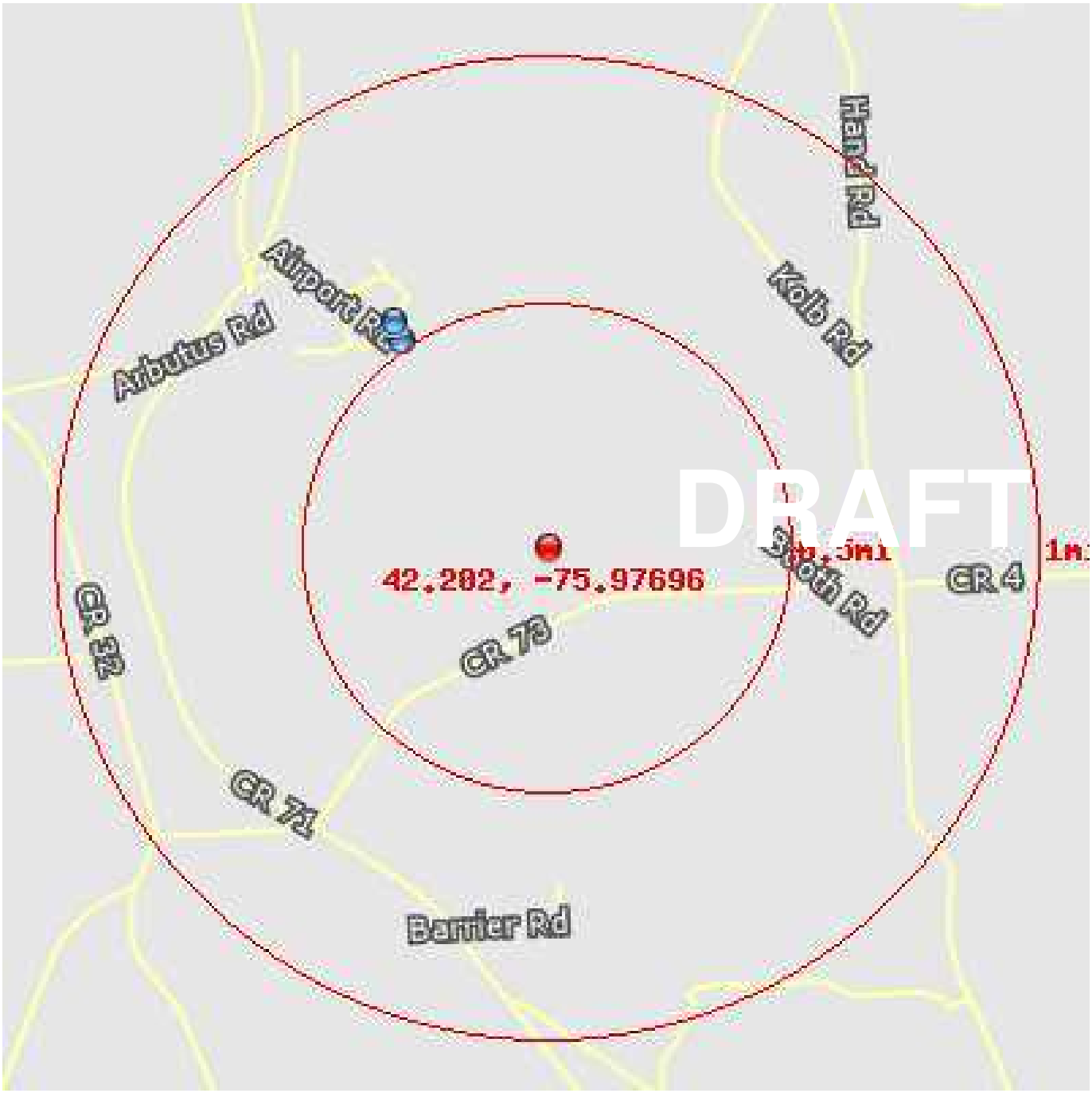
The Emergency Response Notification System (ERNS) is a national computer database used to store information on unauthorized releases of oil and hazardous substances. The program is a cooperative effort of the Environmental Protection Agency, the Department of Transportation Research and Special Program Administration"s John Volpe National Transportation System Center and the National Response Center. There are primarily five Federal statutes that require release reporting: the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) section 103; the Superfund Amendments and Reauthorization Act(SARA) Title III Section 304; the Clean Water Act of 1972(CWA) section 311(b)(3); and the Hazardous Material Transportation Act of 1974(HMTA section 1808(b).

US Toxic Release Inventory

This database returned no results for your area.

The Toxics Release Inventory (TRI) is a publicly available EPA database that contains information on toxic chemical releases and other waste management activities reported annually by certain covered industry groups as well as federal facilities. TRI reporters for all reporting years are provided in the file.

US RCRA Generators (CESQG, SQG, LQG)



This database returned 2 results for your area.

The United States Environmental Protection Agency (EPA) regulates hazardous waste under the Resource Conservation and Recovery Act (RCRA). EPA maintains a database of facilities, which generate hazardous waste or treat, store, and/or dispose of hazardous wastes.

Conditionally Exempt Small Quantity Generators (CESQG) generate 100 kilograms or less per month of hazardous waste, or 1 kilogram or less per month of acutely hazardous waste.

Small Quantity Generators (SQG) generate more than 100 kilograms, but less than 1,000 kilograms, of hazardous waste per month.

Large Quantity Generators (LQG) generate 1,000 kilograms per month or more of hazardous waste, or more than 1 kilogram per month of acutely hazardous waste.

US RCRA Generators (CESQG, SQG, LQG)

Location	42.20795, -75.98268
Distance to site	2665 ft / 0.5 mi NW
Info URL	*http://ofmpub.epa.gov/enviro/fii_query_detail.disp_program_facility?p_registry_id=110004317588*
EPA Identifier	110004317588
Primary Name	TSA AT GREATER BINGHAMTON EDWIN LINK FLD
Address	2534 AIRPORT BLVD BOX 16
City	JOHNSON CITY
County	BROOME
State	NY
Zipcode	13790-4100
NAICS Codes	488119
Programs	NPDES, RCRAINFO
Program Interests	CESQG, ICIS-NPDES UNPERMITTED
Updated On	11-JAN-2016 10:09:34
Recorded On	01-MAR-2000 00:00:00
NAICS Descriptions	OTHER AIRPORT OPERATIONS

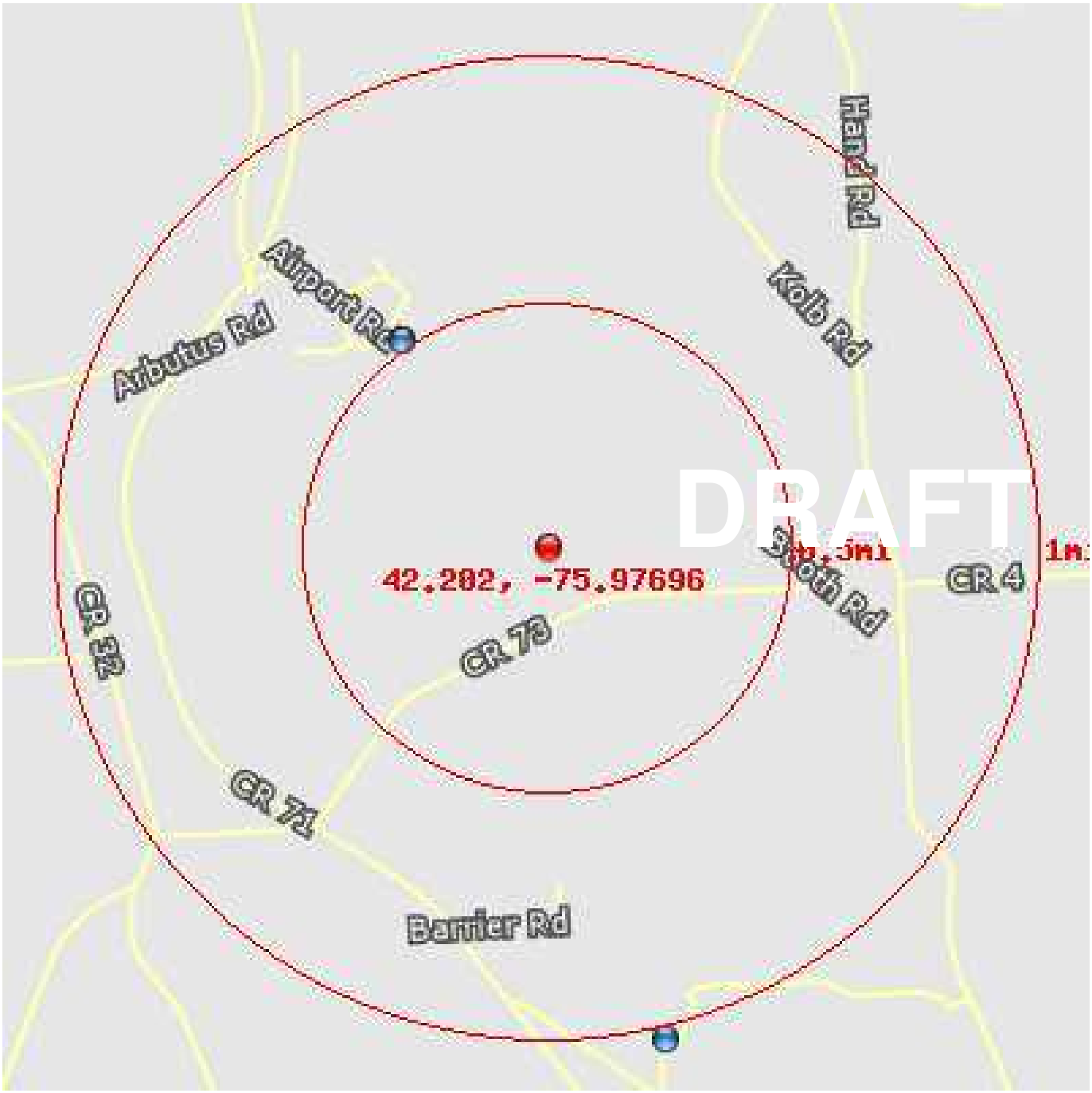
Location	42.20853, -75.98299
Distance to site	2885 ft / 0.55 mi NW
Info URL	*http://ofmpub.epa.gov/enviro/fii_query_detail.disp_program_facility?p_registry_id=110004367159*
EPA Identifier	110004367159
Primary Name	FLIGHT OPTIONS
Address	BINGHAMTON REG AIRPORT BLDG 2
City	JOHNSON CITY
County	BROOME
State	NY
Zipcode	13790
Programs	RCRAINFO
Program Interests	SQG
Updated On	09-AUG-2010 10:07:44
Recorded On	01-MAR-2000 00:00:00

US ACRES (Brownfields)

This database returned no results for your area.

Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties protects the environment, reduces blight, and takes development pressures off greenspaces and working lands. The Assessment, Cleanup and Redevelopment Exchange System (ACRES) is an online database for Brownfields Grantees to electronically submit data directly to The United States Environmental Protection Agency (EPA)

US NPDES



This database returned 2 results for your area.

The NPDES module of the Compliance Information System (ICIS) tracks surface water permits issued under the Clean Water Act. Under NPDES, all facilities that discharge pollutants from any point source into waters of the United States are required to obtain a permit. The permit will likely contain limits on what can be discharged, impose monitoring and reporting requirements, and include other provisions to ensure that the discharge does not adversely affect water quality.

US NPDES

Location	42.20795, -75.98268
Distance to site	2665 ft / 0.5 mi NW
Info URL	*http://ofmpub.epa.gov/enviro/fii_query_detail.disp_program_facility?p_registry_id=110019512222*
EPA Identifier	110019512222
Primary Name	GREATER BINGHAMTON AIRPORT
Address	2534 AIRPORT RD
City	JOHNSON CITY
County	BROOME
State	NY
Zipcode	13790
SIC Codes	4581, 8999
SIC Descriptions	AIRPORTS, FLYING FIELDS, AND AIRPORT TERMINAL SERVICES, SERVICES, NOT ELSEWHERE CLASSIFIED
Programs	FIS, NPDES
Program Interests	ICIS-NPDES NON-MAJOR, STATE MASTER
Updated On	11-JAN-2016 14:44:11
Recorded On	20-NOV-2004 02:58:23

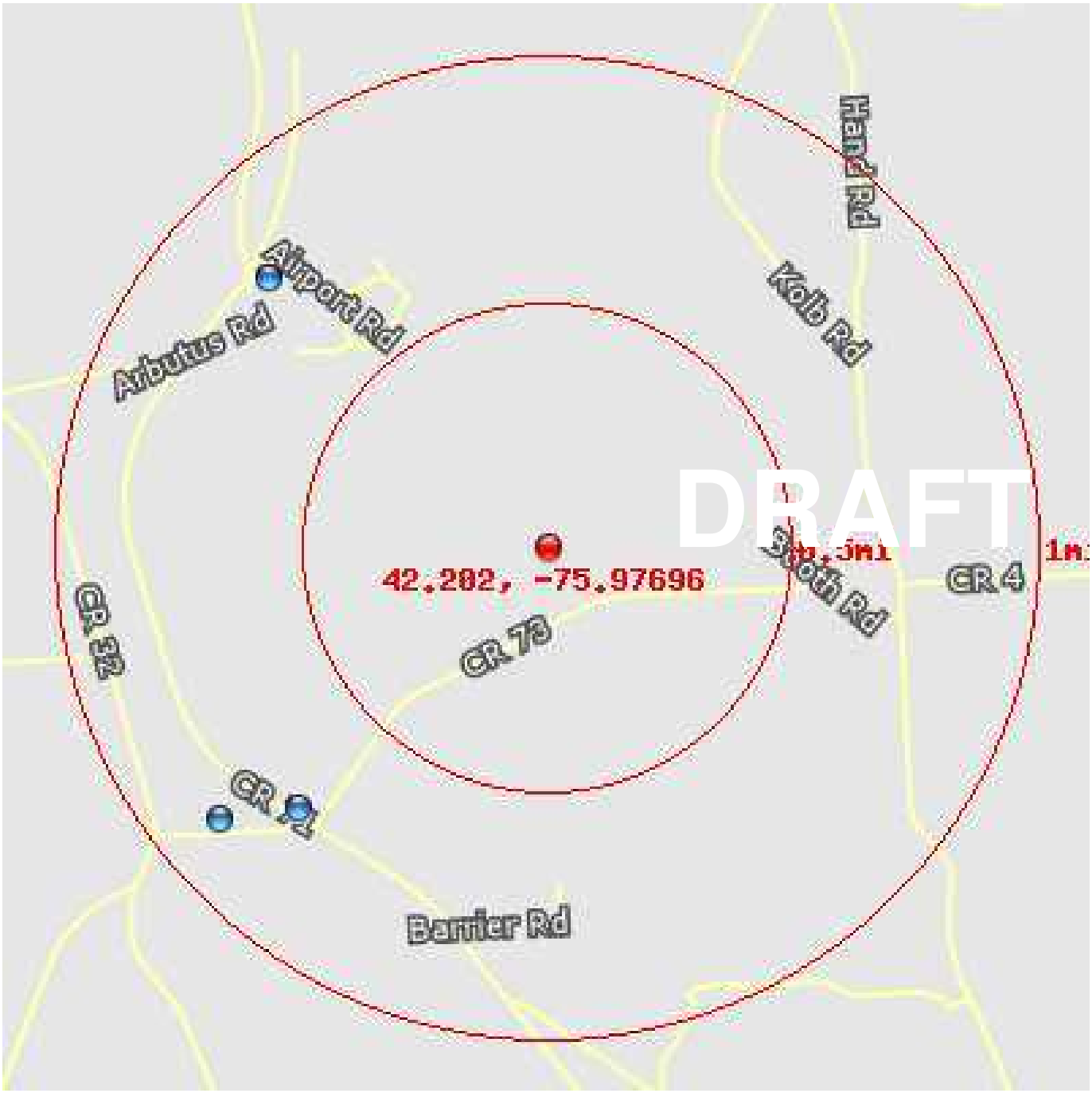
Location	42.20795, -75.98268
Distance to site	2665 ft / 0.5 mi NW
Info URL	*http://ofmpub.epa.gov/enviro/fii_query_detail.disp_program_facility?p_registry_id=110004317588*
EPA Identifier	110004317588
Primary Name	TSA AT GREATER BINGHAMTON EDWIN LINK FLD
Address	2534 AIRPORT BLVD BOX 16
City	JOHNSON CITY
County	BROOME
State	NY
Zipcode	13790-4100
NAICS Codes	488119
Programs	NPDES, RCRAINFO
Program Interests	CESQG, ICIS-NPDES UNPERMITTED
Updated On	11-JAN-2016 10:09:34
Recorded On	01-MAR-2000 00:00:00
NAICS Descriptions	OTHER AIRPORT OPERATIONS.

US Air Facility System (AIRS / AFS)

This database returned no results for your area.

The Air Facility System (AIRS / AFS) contains compliance and permit data for stationary sources of air pollution (such as electric power plants, steel mills, factories, and universities) regulated by EPA, state and local air pollution agencies. The information in AFS is used by the states to prepare State Implementation Plans (SIPs) and to track the compliance status of point sources with various regulatory programs under Clean Air Act.

NY Underground Storage Tanks



This database returned 4 results for your area.

Underground Storage Tanks (UST) containing hazardous or petroleum substances are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA). The New York Department of Environmental Conservation Quality (DEC) maintains a list of registered USTs.

NY Underground Storage Tanks

Location	42.19424, -75.98677
Distance to site	3881 ft / 0.74 mi SW
Facility Status	ACTIVE
Address	BROOME COUNTY AIRPORT
Zip Code	13790
Expiration Date	8/23/2013 12:00:00 AM
City	JOHNSON CITY
County	BROOME
Facility Name	HERTZ RENT-A-CAR (1750.21)
Site Type	PBS
Site Number	7-459380

Location	42.20979, -75.98793
Distance to site	4107 ft / 0.78 mi NW
Facility Status	ACTIVE
Address	2534 AIRPORT RD
Zip Code	13790
Expiration Date	9/19/2012 12:00:00 AM
City	JOHNSON CITY
County	BROOME
Facility Name	GREATER BINGHAMTON AIRPORT
Site Type	PBS
Site Number	7-140368

Location	42.20979, -75.98793
Distance to site	4107 ft / 0.78 mi NW
Facility Status	ACTIVE
Address	BOX 17 2534 AIRPORT RD.
Zip Code	13790
Expiration Date	6/5/2012 12:00:00 AM
City	JOHNSON CITY
County	BROOME
Facility Name	USDOT-FAA 83GJ
Site Type	PBS
Site Number	7-128864

NY Underground Storage Tanks

Location	42.19399, -75.98988
Distance to site	4557 ft / 0.86 mi SW
Facility Status	ACTIVE
Address	3020 CROSS RD.
Zip Code	13790
Expiration Date	8/29/2012 12:00:00 AM
City	JOHNSON CITY
County	BROOME
Facility Name	DANDY MINI MART #42
Site Type	PBS
Site Number	7-460540

NY Brownfields

This database returned no results for your area.

New York State Department of Environmental Conservation (DEC) maintains a database of contaminated and abandoned properties known as brownfield sites. Left untouched, brownfields pose environmental, legal and financial burdens on a community and its taxpayers. However, after cleanup, these sites can again become the powerful engines for economic vitality, jobs and community pride that they once were. Promoting site cleanups: New York offers incentives in the form of technical and financial assistance, as well as liability relief, to encourage the cleanup and reuse of contaminated sites. Incentive programs target both the public and private sector. DEC also oversees cleanups of inactive hazardous waste disposal sites and petroleum/chemical spills

NY State Superfund Program

This database returned no results for your area.

The State Supefund Program (also known as The Inactive Hazardous Waste Disposal Site Remedial Program) is an enforcement program whose mission is to identify and characterize suspected inactive hazardous waste disposal sites and to investigate and remediate those sites found to pose a significant threat to public health and environment.

NY Voluntary Cleanup Program

This database returned no results for your area.

New York established its Voluntary Cleanup Program (VCP) to address the environmental, legal and financial barriers that often hinder the redevelopment and reuse of contaminated properties. The Voluntary Cleanup Program was developed to enhance private sector cleanup of brownfields by enabling parties to remediate sites using private rather than public funds and to reduce the development pressures on "greenfield" sites.

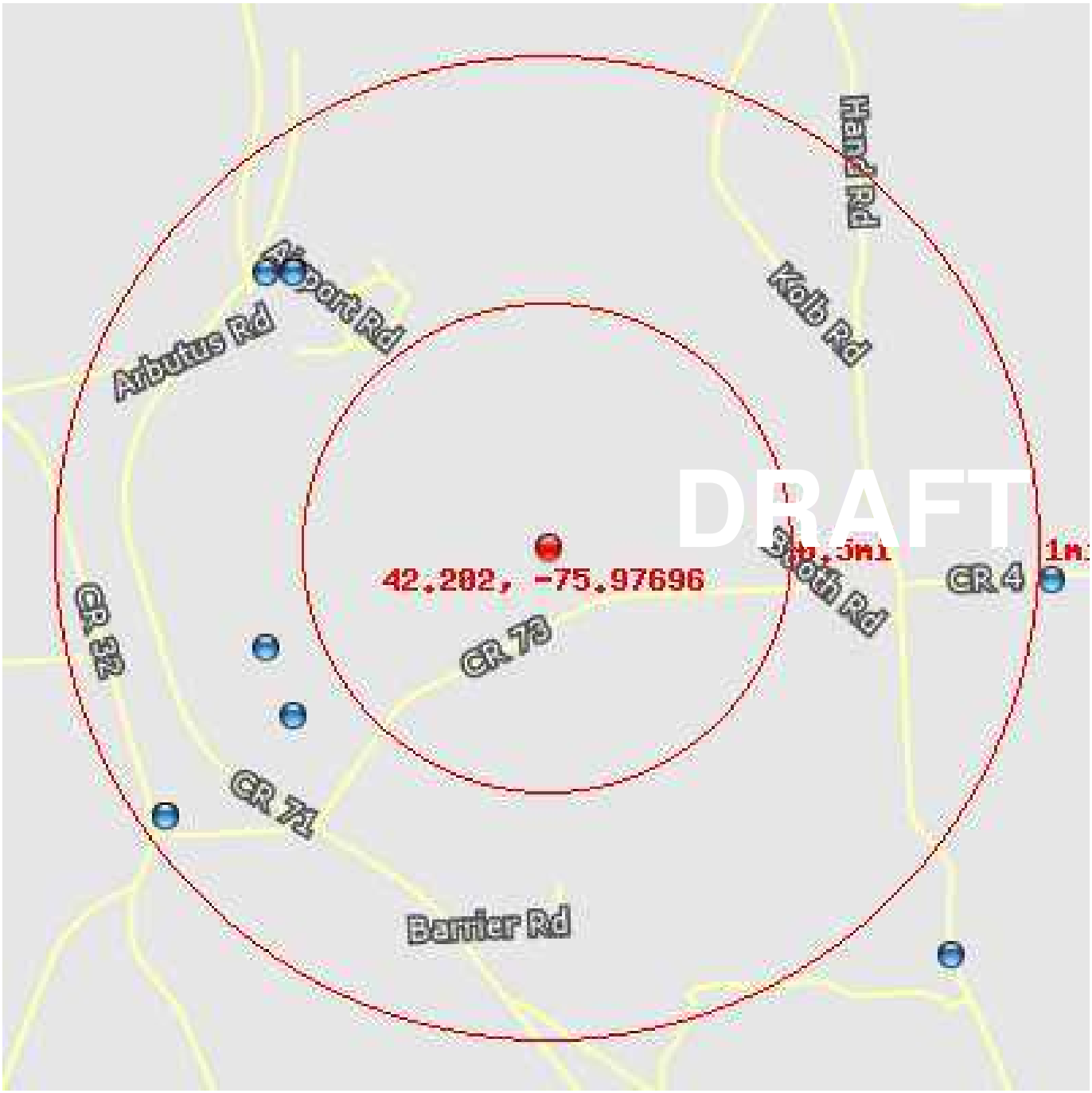
New York's Voluntary Cleanup Program is a cooperative approach among the New York State Department of Environmental Conservation (Department), lenders, developers and prospective purchasers to investigate and/or remediate contaminated sites and return these sites to productive use. Under the Voluntary Cleanup Program, a volunteer performs remedial activities pursuant to one or more Department approved work plans. The volunteer agrees to remediate the site to a level which is protective of public health and the environment for the present or intended use of the property. Investigation and remediation is carried out under the oversight of the Department and the New York State Department of Health (DOH) and the volunteer pays the State's oversight costs. When the volunteer completes work, a release from liability from the Department is provided with standard reservations.

NY Environmental Restoration Program

This database returned no results for your area.

The Environmental Restoration Program (ERP) provides grants to municipalities to reimburse up to 90 percent of on-site eligible costs and 100 percent of off-site eligible costs for site investigation and remediation activities. Once remediated, the property may then be reused for commercial, industrial, residential or public use.

NY Leaking USTs and Spills



This database returned 12 results for your area.

The New York Department of Environmental Conservation maintains a database of leaking underground storage tanks (LUST) and spills.

NY Leaking USTs and Spills

Location	42.1994, -75.98827
Distance to site	3203 ft / 0.61 mi W
Spill Number	0905863
Date Reported	08/19/2009
Spill Name	DITCH ON EAST SIDE OF THE HIGHWAY
County	Broome
City	JOHNSON CITY
Address	2330 AIRPORT RD

Location	42.19714, -75.9874
Distance to site	3334 ft / 0.63 mi SW
Spill Number	65142
Date Reported	02/22/01
Spill Name	FOX RESIDENCE
County	Broome
City	JOHNSON CITY
Address	2295 AIRPORT RD.

Location	42.20966, -75.9874
Distance to site	3972 ft / 0.75 mi NW
Spill Number	612347
Date Reported	2/10/2007
Spill Name	GREATER BINGHAMTON AIRPOR
County	Broome
City	JOHNSON CITY
Address	2534 AIRPORT ROAD

Location	42.20966, -75.9874
Distance to site	3972 ft / 0.75 mi NW
Spill Number	302247
Date Reported	06/03/03
Spill Name	BINGHAMTON AIRPORT
County	Broome
City	JOHNSON CITY
Address	2534 AIRPORT ROAD BOX 16

Location	42.20966, -75.9874
Distance to site	3972 ft / 0.75 mi NW
Spill Number	9515089
Date Reported	02/23/96
Spill Name	BINGHAMPTON REGIONAL AIRP
County	Broome
City	JOHNSON CITY
Address	2534 AIRPORT ROAD BOX 16

NY Leaking USTs and Spills

Location	42.20966, -75.9874
Distance to site	3972 ft / 0.75 mi NW
Spill Number	9602125
Date Reported	05/13/96
Spill Name	BROOME CO AIRPORT
County	Broome
City	MAINE
Address	2534 AIRPORT RD

Location	42.20966, -75.9874
Distance to site	3972 ft / 0.75 mi NW
Spill Number	9604547
Date Reported	07/07/96
Spill Name	BINGHAMTON AIRPORT
County	Broome
City	JOHNSON CITY
Address	2534 AIRPORT RD

Location	42.20966, -75.9874
Distance to site	3972 ft / 0.75 mi NW
Spill Number	9712269
Date Reported	02/03/98
Spill Name	HERTZ RENT A CAR
County	Broome
City	JOHNSON CITY
Address	2534 AIRPORT RD

Location	42.20966, -75.9874
Distance to site	3972 ft / 0.75 mi NW
Spill Number	9604585
Date Reported	07/08/96
Spill Name	E.A. LINK FIELD
County	Broome
City	JOHNSON CITY
Address	2535 AIRPORT RD

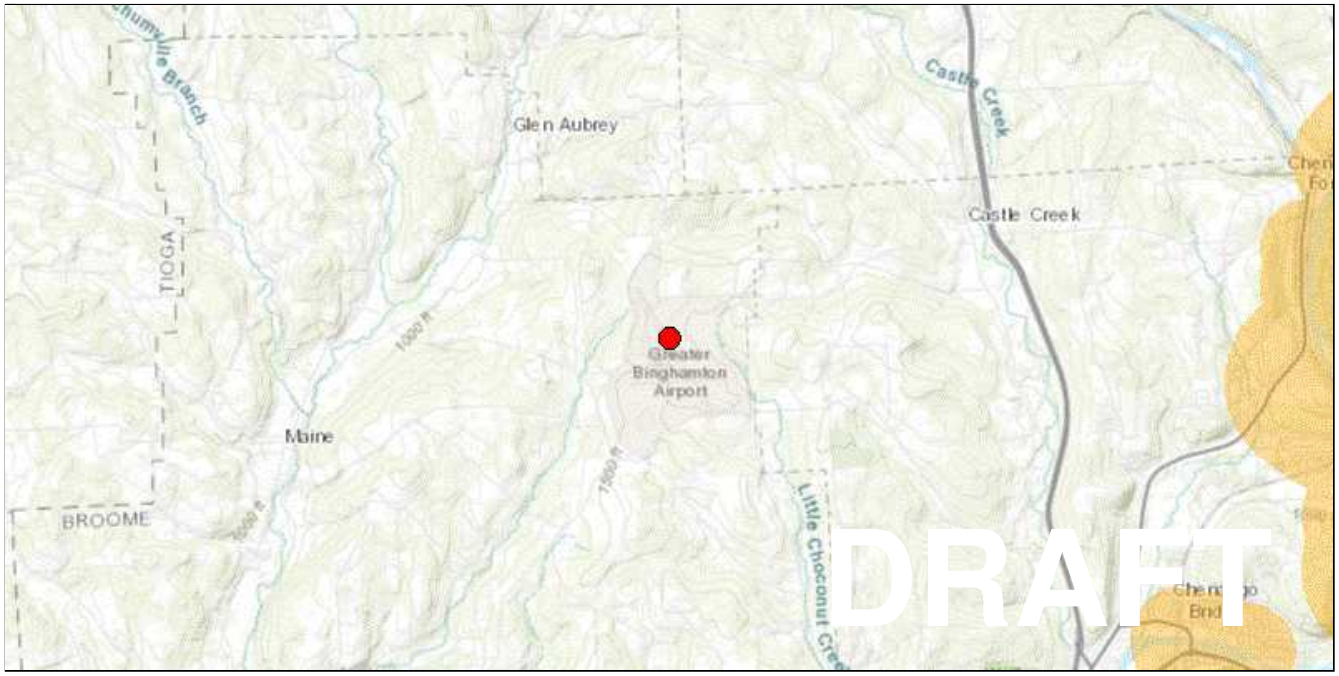
Location	42.20967, -75.98766
Distance to site	4026 ft / 0.76 mi NW
Spill Number	750391
Date Reported	1/22/2007
Spill Name	GREATER BINGHAMTON AIRPORT
County	Broome
City	JOHNSON CITY
Address	2524 AIRPORT ROAD

NY Leaking USTs and Spills

Location	42.19354, -75.99246
Distance to site	5207 ft / 0.99 mi SW
Spill Number	751232
Date Reported	12/14/2007
Spill Name	DANDY MINI MART
County	Broome
City	JOHNSON CITY
Address	51 COMMERCIAL DRIVE

Location	42.19354, -75.99246
Distance to site	5207 ft / 0.99 mi SW
Spill Number	605043
Date Reported	8/2/2006
Spill Name	DANDY MINI MART
County	Broome
City	JOHNSON CITY
Address	51 COMMERCIAL DRIVE

Environmental Resource Mapper



The coordinates of the point you clicked on are:

UTM 18	**Easting:**	419067.188	**Northing:**	4673779.134
Longitude/Latitude	**Longitude:**	-75.981	**Latitude:**	42.212

The approximate address of the point you clicked on is:
Greater Binghamton Airport

County: Broome
Town: Maine
USGS Quad: CASTLE CREEK

DEC Region

Region 7:
(Central New York) Broome, Cayuga, Chenango, Cortland, Madison, Onondaga, Oswego, Tioga and Tompkins counties. For more information visit **http://www.dec.ny.gov/about/615.html**.

If your project or action is within or near an area with a rare animal, a permit may be required if the species is listed as endangered or threatened and the department determines the action may be harmful to the species or its habitat.

If your project or action is within or near an area with rare plants and/or significant natural communities, the environmental impacts may need to be addressed.

The presence of a unique geological feature or landform near a project, unto itself, does not trigger a requirement for a NYS DEC permit. Readers are advised, however, that there is the chance that a unique feature may also show in another data layer (ie. a wetland) and thus be subject to permit jurisdiction.

Please refer to the "Need a Permit?" tab for permit information or other authorizations regarding these natural resources.

Disclaimer: If you are considering a project or action in, or near, a wetland or a stream, a NYS DEC permit may be required. The Environmental Resources Mapper does not show all natural resources which are regulated by NYS DEC, and for which permits from NYS DEC are required. For example, Regulated Tidal Wetlands, and Wild, Scenic, and Recreational Rivers, are currently not included on the maps.

E. Airfield Pavement Management Study

E.1. INTRODUCTION

E.1.1. Project Description and Scope of Work

McFarland-Johnson, Inc. (Engineer/Consultant) was retained by the County of Broome, New York, Owner/Sponsor of the Greater Binghamton Airport (BGM or the Airport) to provide planning and engineering services, to complete the pavement inspection and Airfield Pavement Management Study (APMS).

The APMS will aid the Sponsor in project planning and securing grants and funding for the overall Maintenance and Rehabilitation (M&R) of their airfield pavements.

All work performed as part of this APMS has been performed in accordance with:

- Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5380-7B *Airport Pavement Management Program*
- FAA AC 150/5380-6C *Guidelines and Procedures for Maintenance of Airport Pavements*
- American Society for Testing and Materials (ASTM) D5340-12 *Standard Test Method for Airport Pavement Condition Index Surveys*
- ASTM D6690-15 *Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements*

To complete the APMS, the following services were performed by the Engineer/Consultant:

- Reviewed existing record plans to develop pavement histories
- Defined the pavement network and calculated sample units based on project history and record documents
- Conducted an airfield pavement condition survey to visually assess the condition of all airfield pavement and document pavement distress types, severities and quantities
- Evaluated the results of the visual assessment and documented distresses to assign a Pavement Condition Index (PCI) value for each section and branch of pavement using PAVER software
- Performed analyses of distress data and deterioration rates to develop a maintenance plan, 5-year near-term Capital Improvement Program (CIP), and a 20-year long-term CIP including estimated project costs
- Identified basic short and long-term M&R techniques

E.1.2. Deliverables

The following deliverables are included in the project scope:

- Color-coded PCI map of all inspected airfield pavements
- Basic network plan of airfield pavement showing branch, section, and sample unit boundaries including inspected sample units

DRAFT

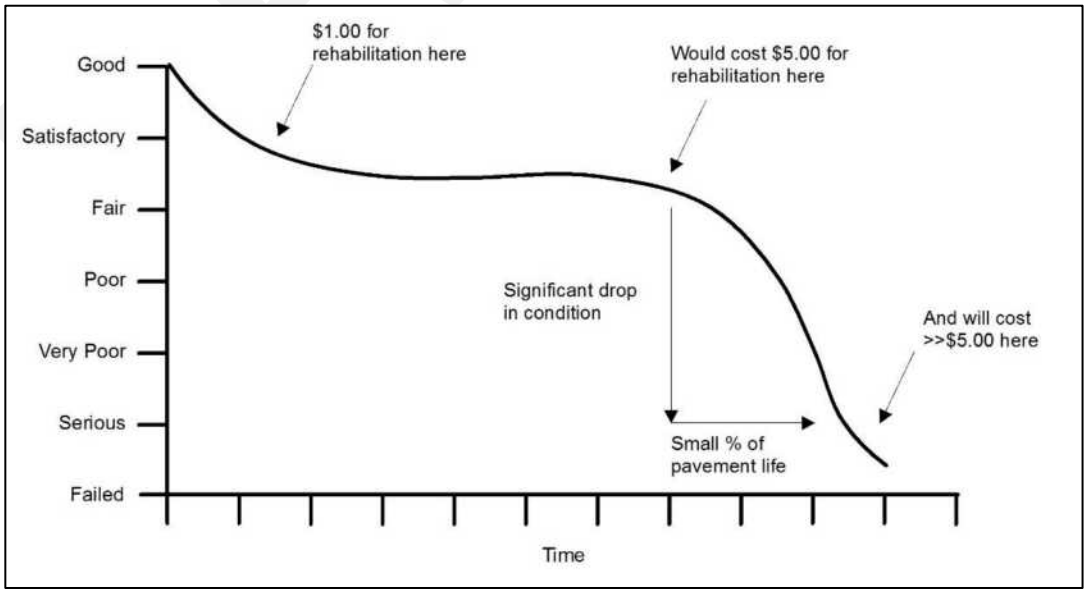
- Electronic base mapping for BGM showing pavement locations and boundaries used in the APMS, which includes the PCI calculations and analysis, types of distresses noted for each pavement branch, deterioration rate and its effect on the PCI, and basic M&R techniques
- 5-year near-term CIP
- 20-year long-term CIP
- Technical report which summarizes the above data and includes PCI maps along with inspection photographs, descriptions of pavement distresses and definitions of repair methods and strategies
- PAVER Version 7.0.5 Software

E.1.3. Purpose

The FAA requires federally obligated airports funding projects through the Airport Improvement Program (AIP) or with revenue from the Passenger Facility Charges (PFC) Program to implement an APMS. A detailed inspection of airfield pavements at least once a year is also required. The exception to the annual detailed inspection is when a PCI survey is performed and in this case, the frequency of detailed inspections may be extended to three years.

By implementing an APMS, an airport owner is able to evaluate the condition of its pavements, prioritize preventative M&R, quickly identify the most economical time to perform M&R, and implement the best M&R practice for a given section of pavement. The importance of this is identified in Figure E-1. Preserving pavements by performing M&R within the first 75 percent of the pavement life can eliminate or delay rehabilitation or reconstruction expenses that may be six to ten times the cost of preventative maintenance measures.

Figure E-1: Typical Pavement Condition Life Cycle



Source: FAA AC 150/5380-7B Airport Pavement Management Program

E.1.4. Software

PAVER Version 7.0.5 and PAVER FieldInspector, developed by Colorado State University were used to develop the APMS.

PAVER Version 7.0.5 software was developed for the sole purpose of managing pavements, and allows the user to inventory pavements, calculate PCI values from field inspections, predict pavement deterioration and prepare pavement M&R programs.

PAVER FieldInspector is a tablet-based software application that allows pavement inspectors to record pavement distress data in the field and calculate the PCI in real time. Additionally, the Global Positioning System (GPS) capability in both the tablet and the software allow inspectors to rapidly identify their position on a pavement network map.

E.2. PAVEMENT INVENTORY

E.2.1. Overview

This section of the APMS describes the steps taken to define the pavement network and establish the various pavement branch and section boundaries at the Airport. An accurate pavement network allows for a comprehensive PCI survey to be conducted.

E.2.2. Definitions

To provide an accurate assessment of the PCI, each APMS is divided into a pavement network with branches, sections and sample units within those sections. These terms, common to all APMSs, are used as a baseline for the organization of pavements to be inspected. Found in FAA AC 150/5380-7B, and ASTM D5340-12, they are defined as follows:

- Pavement Network: The highest level of an APMS. For example, a network can include all the airfield pavements at a single airport or all the airfield pavements in a state airport system. For this project, the BGM airfield pavements are defined as the pavement network.
- Pavement Branch: A readily identifiable part of the pavement network with a distinct function. For example, pavement branches in an airport setting consist of each individual runway, taxiway, or apron and together make up the pavement network.
- Pavement Section: Individual components of a pavement branch. Each branch consists of at least one section but may consist of more if pavement characteristics vary throughout the branch. Factors that affect the division of branches into sections include, but are not limited to: pavement structure, type, age and condition; traffic composition and frequency (current and future); construction history; pavement function; and drainage facilities and shoulders.
- Pavement Sample Unit: The final level of an APMS. Sample units are 20 contiguous slabs (±8 slabs if the total number of slabs in the section is not evenly divided by 20, or to accommodate specific field condition) for Portland Cement Concrete (PCC) airfield pavement and 5,000 contiguous square feet (SF) (± 2,000 SF if the pavement is not evenly divided by 5,000, or to accommodate specific field conditions) for Asphalt Concrete (asphalt) airfield pavement and porous friction surfaces. A statistically significant number of sample units are inspected within a pavement section to determine the PCI.

In addition to the above, other terms related to M&R efforts are commonly used throughout APMSs. Some of these include:

- Preventative Maintenance: Cost-effective efforts applied to an existing pavement network that slows future deterioration, preserves the network, and maintains or improves the condition of the system. Preventative maintenance does not significantly increase the structural capacity of the pavement section. Examples include slurry seals, crack sealing/filling, or patching for asphalt pavements and joint or slab repair for PCC pavements.
- Pavement Rehabilitation: Structural improvements to an existing pavement section that increase its load carrying capacity and extends its service life. Examples of pavement rehabilitation includes mill and overlay of existing asphalt pavements, as well as reclamation through pulverization and asphalt or PCC overlay for PCC pavements.
- Pavement Reconstruction: Replacement of the entire pavement section with an equivalent or increased section dependent upon the aircraft fleet mix.

E.2.3. Records Review and Pavement History

The Engineer/Consultant performed a thorough review of past project records at BGM to determine construction history and the pavement structures for the existing airfield pavements. Record plans from projects designed by McFarland-Johnson, Inc. were reviewed. Pavement section data and construction history at BGM is included in **Attachment E-1**. Recent grant information is included in **Attachment E-9**.

E.2.4. Pavement Ownership

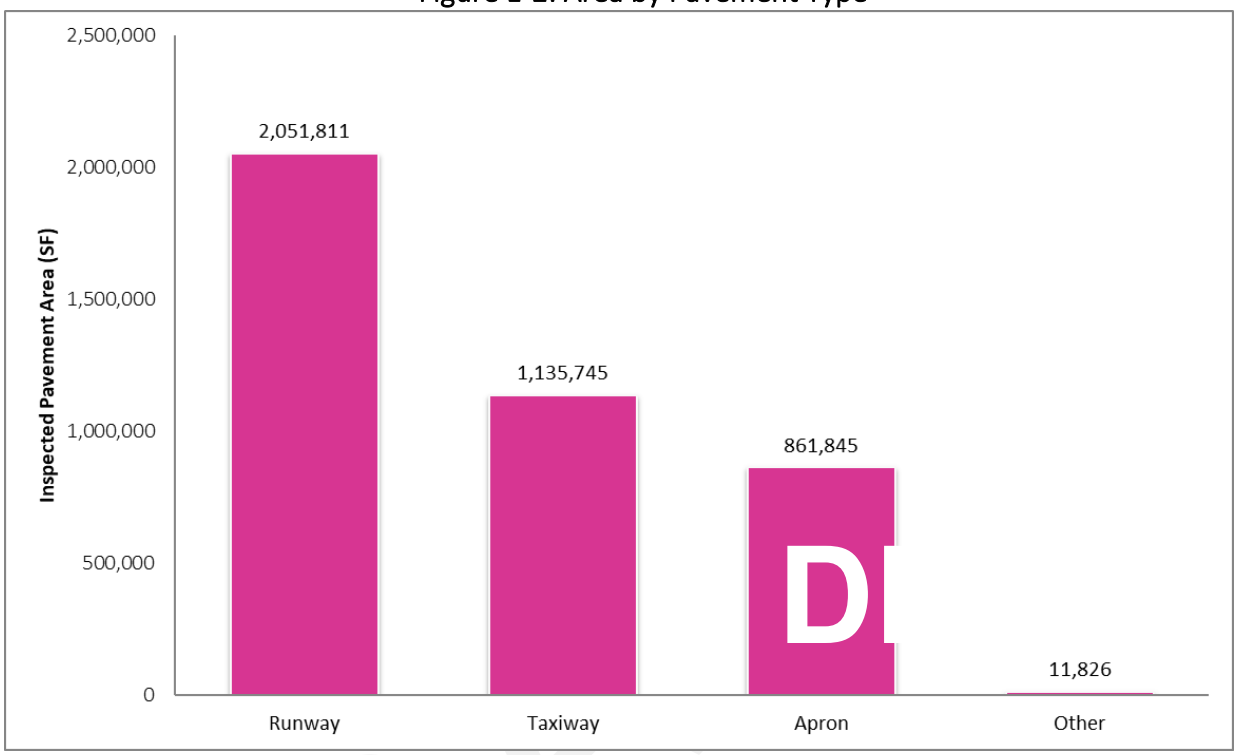
The Airport owns and is responsible for the maintenance of all the airfield pavement. All pavement sections are identified and described in the attachments of this appendix. Additionally, Attachment E-3 identifies and describes all of the pavement distresses that were identified as part of this study.

E.2.5. Pavement Inventory Results

The total existing airfield pavement area at BGM is 4,061,277 SF. A total of 907,447 SF of the airfield pavement area of BGM was inspected. A detailed breakdown of the total pavement areas categorized by type (branch use) is shown in **Figure E-2**. The final pavement inventory is displayed in **Attachment E-2** showing the established branches, sections and sample units.

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Figure E-2: Area by Pavement Type



Source: PAVER, McFarland-Johnson Analysis

E.3. PAVEMENT CONDITION EVALUATION

E.3.1. Field Inspection and Procedure

Pavement conditions for BGM were evaluated using the PCI procedure, as documented in the FAA AC 150/5380-6C, and ASTM D5340-12. The PCI procedure is the aviation industry standard for visually assessing pavement condition. It involves inspecting sample units within a particular section, identifying the type and severity of pavement distresses within that sample unit and measuring the quantity of distress.

The PCI represents the overall condition of the pavement ranging from 0 to 100. A pavement section in excellent condition receives a PCI score of 100, with a failed pavement section receiving a PCI score of 0. Figure E-3 shows visual representations of several PCI values at BGM.

Figure E-3: Visual Representation of PCI Values at BGM

Pavement Surface	PCI
	84
	6[illegible]
	38

Source: McFarland Johnson, 2018

The PCI field inspections took place over the course of three different inspections. The first inspection was conducted on March 21, 2017 as part of the 10-28 Runway Rehabilitation project. The second PCI field inspection of BGM pavements took place over the course of four days, occurring July 10-13, 2018. The last inspection was of newly rehabilitated pavements (i.e. Runway 16-34, Taxiway C, etc.), which took place on March 28th, 2019. The inspections were performed by a two-person crew, and measurements and photographs were taken of the various distresses found in the pavement sample units identified in **Attachment E-2** with the resulting distress data for each sample unit shown in **Attachment E-3**.

E.3.2. Distress Types

To better understand the cause of pavement deterioration, it is necessary to look at the distress types associated with each PCI score. Each distress type has been classified into three groups based on cause including load, climate/durability, or other. Load-related distresses such as alligator cracking in asphalt pavements, or corner breaks in PCC pavements, indicate that the

structural integrity of the pavement has been compromised. Climate-related distresses indicate that the pavement has aged due to seasonal environmental effects. Distresses that cannot be attributed solely to either load or climate, are classified as other. **Table E-1** presents the asphalt and PCC distress types in the PCI procedure, including their cause classification, and also identifies the most common distresses found at BGM during the pavement inspection. A full inventory of distress types at BGM for each sample unit are shown in **Attachment E-3**.

Table E-1: PCI Distress Types

Asphalt Distresses	Cause Classification	PCC Distresses	Cause Classification
Alligator Cracking	Load	Blowup	Climate
Bleeding	Other	Corner Break	Load
Block Cracking	Climate	Linear Cracking	Load
Corrugation	Other	Durability Cracking	Climate
Depression	Other	Joint Seal Damage	Climate
Jet Blast	Other	Small Patch	Other
Joint Reflection Cracking	Climate	Large Patch	Other
Long. & Transv. Cracking	Climate	Popouts	Other
Oil Spillage	Other	Pumping	Other
Patching	Other	Scaling/crazing	Other
Polished Aggregate	Other	Faulting	Other
Raveling	Climate	Shattered Slab	Load
Rutting	Load	Shrinkage Cracking	Other
Shoving	Other	Joint Spalling	Other
Slippage Cracking	Other	Corner Spalling	Other
Swelling	Other	Alkali Silica Reaction	Climate
Weathering	Climate		

Indicates most common distresses found at BGM

Source: ASTM D5340-1: Standard Test Method for Airport Pavement Condition Index Surveys

For the asphalt pavements at BGM, the most common distress types found were the following:

- Alligator cracking – a series of interconnecting cracks caused by fatigue failure of the asphalt surface under repeated traffic loading. The cracking initiates at the bottom of the asphalt surface where tensile stress and strain is highest under a wheel load. Alligator cracking is considered a major structural distress.
- Longitudinal and transverse cracking – resulting from shrinkage or contraction of the asphalt pavement. Shrinkage of the surface material is caused by oxidation and age hardening of the asphalt material. Contractions are caused by thermal fluctuations induced by temperature changes and freeze-thaw cycles. This type of cracking is not load associated.
- Weathering – the wearing away of the asphalt binder and fine aggregate matrix from the pavement surface. The asphalt surface begins to show signs of aging which may be accelerated by climatic conditions.

For the PCC pavements at BGM, the most common distress types found were the following:

- Joint Seal Damage – any condition that enables incompressible foreign material such as soil or rocks to accumulate in the joints or that allows infiltration of water. Accumulation of foreign materials prevents the slabs from expanding and may result in buckling, shattering, or spalling. Joint seal damage is caused by improper joint width, use of the wrong type of sealant, incorrect application, not properly cleaning the joint before sealing and/or climate (aging).
- Linear Cracks – a combination of repeated loads and shrinkage stresses usually causes this type of distress. It is characterized by cracks that divide the slab into two or three pieces that may indicate poor construction techniques, underlying pavement layers that are structurally inadequate for the applied load, or pavement overloads.

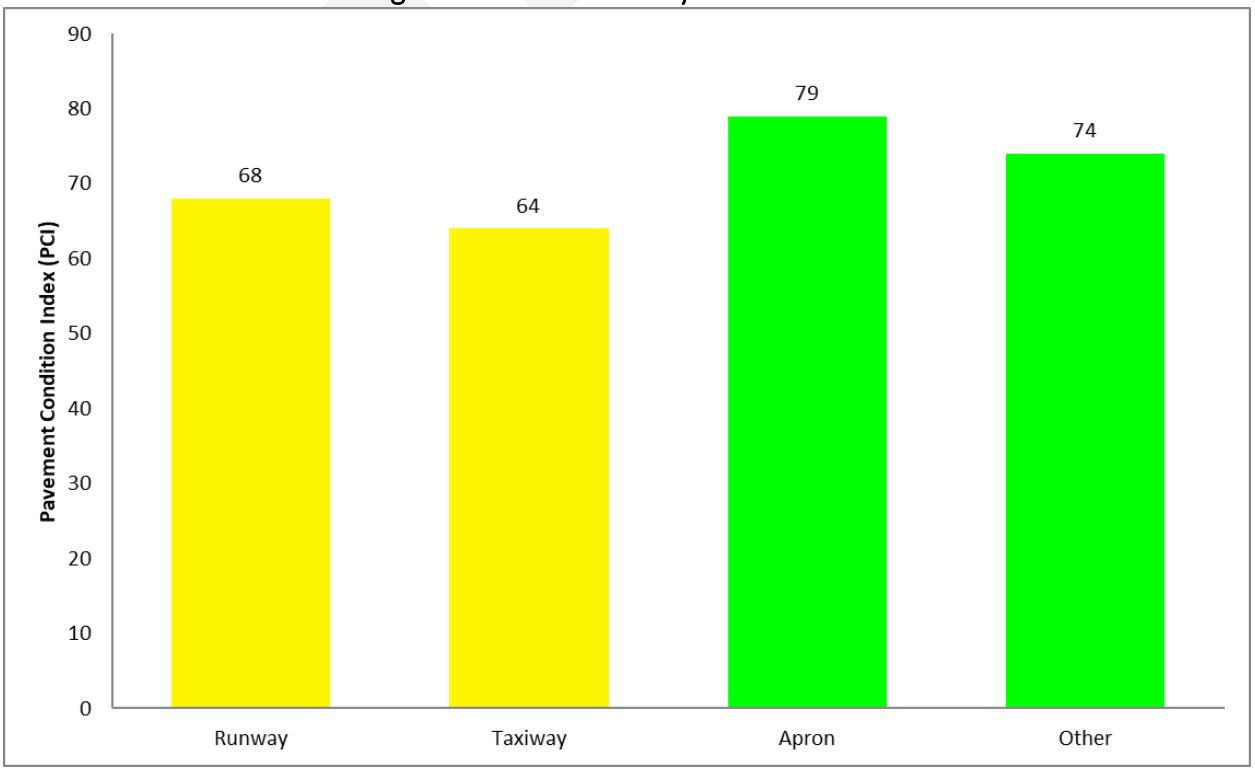
BGM inspection photographs of these distresses can be found in **Attachment E-4**.

E.3.3. Pavement Condition Index (PCI) Results Summary

Approximately 22% of all airfield pavements were inspected. he ɔt ' -a c a fie ; pave ent included in this study is 4,212,077 SF. Of this total, the inspect ɔur ːye 9 7,4 7 F.

Figure E-4 below depicts the results of the PCI survey graphically for each branch type.

Figure E-4: PCI Results by Pavement Use



Source: PAVER, McFarland Johnson, 2019

Table E-2 provides a general description of the PCI rating categories and the corresponding pavement areas at BGM which fall under these categories.

Using the distress measurements taken by the inspectors, a PCI was determined for each pavement sample unit within a given pavement section. PCI calculations were completed using the PAVER software to determine a PCI value for each section, with a weighted PCI then calculated for each branch. These results may be found in **Table E-3,** and a visual representation of these results may be found on the PCI Map in **Attachment E-5**.

Table E-2: Distribution of PCI Ratings for BGM

Simplified PCI Rating	PCI Range	Definition	Pavement Area (SF)	Pavement Area (%)
Good	86-100	GOOD: Pavement has minor or no distresses and requires only routine maintenance	1,331,401	33%
	71-85	SATISFACTORY: Pavement has scattered low-severity distresses that need only routine maintenance	825,782	20%
Fair	56-70	FAIR: Pavement has a combination of generally low and medium-severity distresses. M&R needs are routine to major in the near future	1,060,424	26%
Poor	41-55	POOR: Pavement has low, medium, and high-severity distresses that probably cause some operational problems. Near-term maintenance and repair needs may range from routine up to a requirement for reconstruction	816,649	20%
	26-40	VERY POOR: Pavement has predominantly medium and high-severity distresses that cause considerable maintenance and operational problems. Near-term maintenance and repair needs will be intensive in nature	20,970	1%
Poor	11-25	SERIOUS: Pavement has mainly high-severity distresses that cause operational restrictions; immediate repairs are needed	-	-
	0-10	FAILED: Pavement deterioration has progressed to the point that safe operations are no longer possible; complete reconstruction is required	-	-

Source: PAVER, McFarland-Johnson Analysis

Table E-3: PCI Results for BGM

Branch Description	Branch ID	Branch PCI	Surface	Section	PCI
Runway 16 (End)	RW 16	42	Asphalt	RW 16	42
Runway 34 (End)	RW 34	76	Asphalt	RW 34-1	74
			Asphalt	RW 34-2	78
Runway 16-34	RW 16-34	86	Asphalt	RW 16-34	86
Runway 10-28	RW 10-28	53	Asphalt	RW 10-28-1	50
			Asphalt	RW 10-28-2	86
			Asphalt	RW 10-28-3	78
			Asphalt	RW 10-28-4	51
T-Hangar Apron	TH APRN	73	Asphalt	TH APRN-1	84
			Asphalt	TH APRN-2	63
North Apron	N APRN	85	Asphalt	N APRN	85
Deicing Area	DEICE	52	Asphalt	DEICE	52
Terminal Apron	T APRN	78	Asphalt	T APRN-1	70
			PCC	T APRN-2	85
			Asphalt	T APRN-3	42
West Apron	W APRN	79	Asphalt	W APRN-1	80
			PCC	W APRN-2	76
Helipad	HELI	75	Asphalt	HELI-1	74
			PCC	HELI-2	76
Taxiway A	TWY A	62	Asphalt	TWY A-1	77
			Asphalt	TWY A-2	70
			Asphalt	TWY A-3	58
			Asphalt	TWY A-4	83
Taxiway B	TWY B	59	Asphalt	TWY B-1	43
			Asphalt	TWY B-2	77
Taxiway C	TWY C	85	Asphalt	TWY C	85
Taxiway D	TWY D	62	Asphalt	TWY D-1	65
			Asphalt	TWY D-2	47
			Asphalt	TWY D-3	92
Taxiway E	TWY E	69	Asphalt	TWY E	69
Taxiway F	TWY F	65	Asphalt	TWY F-1	68
			Asphalt	TWY F-2	35
			Asphalt	TWY F-3	89
Taxiway G	TWY G	61	Asphalt	TWY G-1	62
			Asphalt	TWY G-2	59
Taxiway H	TWY H	64	Asphalt	TWY H-1	63
			Asphalt	TWY H-2	59

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Branch Description	Branch ID	Branch PCI	Surface	Section	PCI
			Asphalt	TWY H-3	89
			Asphalt	TWY H-4	95
			Asphalt	TWY H-5	41
Taxiway J	TWY J	93	Asphalt	TWY J	93
Taxiway K	TWY K	58	Asphalt	TWY K-1	58
			Asphalt	TWY K-2	67
			Asphalt	TWY K-3	54
Taxiway L	TWY L	56	Asphalt	TWY L	56
Taxiway M	TWY M	53	Asphalt	TWY M	53
Taxiway P	TWY P	49	Asphalt	TWY P	49

Source: PAVER, McFarland-Johnson Analysis

E.3.4. Projected PCI

Included in the APMS is an analysis of the projected airfield pavement deterioration rates at BGM. **Table E-4** shows the results of PAVER's Condition Performance Analysis. The analysis shows projected deterioration of the various pavement branches at the Airport over a 5-year period. Colors shown equate to the previously described PCI rating scale. It should be noted that this deterioration rate table does not account for any preventative maintenance implemented at the Airport, nor any rehabilitation or reconstruction projects that may take place over this 5-year period.

E.4. MAINTENANCE AND REHABILITATION (M&R) PROGRAM

E.4.1. Introduction

The results of the PCI survey can be correlated with an appropriate M&R work type. This is illustrated in **Table E-5**. Pavements with a PCI of 71 and above will benefit from preventative maintenance such as crack sealing and surface treatments. Pavements with a PCI between 41 and 70 likely will require major or minor rehabilitation. Pavement with a PCI of 40 or below typically has deteriorated beyond repair and only full reconstruction will correct the problems exhibited. The M&R program for this APMS was developed using the criteria shown in **Table E-5.**

Table E-4: Projected Pavement Deterioration at BGM

Branch ID	2019	2020	2021	2022	2023	2024
(All)	73	70	67	64	60	56
RW 16	42	39	36	33	30	28
RW 34	76	75	74	72	71	70
RW 16-34	86	82	79	76	73	70
RW 10-28	53	49	46	40	37	34
TH APRN	77	74	71	68	65	63

Branch ID	2019	2020	2021	2022	2023	2024
N APRN	85	80	76	72	68	63
DEICE	52	49	47	44	41	39
T APRN	78	76	73	70	67	64
W APRN	79	74	68	62	57	51
HELI	74	71	68	65	62	59
TWY A	65	62	58	55	52	48
TWY B	63	58	55	52	49	46
TWY C	85	81	78	75	72	69
TWY D	65	61	57	53	49	45
TWY E	69	65	62	59	56	52
TWY F	64	61	58	54	51	48
TWY G	61	56	51	46	41	37
TWY H	67	64	61	57	54	51
TWY J	93	90	87	83	79	76
TWY K	62	59	56	53	49	46
TWY L	56	51	47	43	39	35
TWY M	53	48	44	39	35	30
TWY P	49	42	35	28	21	15

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Source: PAVER Condition Performance Analysis (Area Weighted Average), McFarland-Johnson Analysis

Table E-5: PCI Compared to Repair Type

PCI		Rating	Repair
86-100		Good	Preventative Maintenance
71-85		Satisfactory	
56-70		Fair	Minor Rehabilitation
41-55		Poor	Major Rehabilitation
26-40		Very Poor	Reconstruction
11-25		Serious	
0-10		Failed	

Source: McFarland Johnson, 2018

E.4.2. Inspection Schedule

Airport Sponsors are required by the FAA to meet certain requirements for their APMS. One of these requirements is the frequency of inspections. Airports must perform a detailed inspection

of airfield pavements at least once a year. The only exception is if a PCI survey, such as that included in this project, is performed, whereupon the frequency of the detailed inspections may be extended to three years. Airports should also incorporate less detailed daily, weekly and monthly inspections of their pavements.

E.4.3. Best Practices for Rehabilitation and Repair

Different types and severity levels of distresses require varying degrees and frequency of maintenance in order to be effective. Table E-6 and Table E-7 contain recommended localized pavement maintenance based on distress type and severity level for asphalt and PCC pavement types. Attachment E-6 provides further detail of M&R Work Descriptions.

E.4.1. Pavement Repair Materials

Pavement repair materials are frequently improved and new products are being introduced to the market on a regular basis. The following materials listed in this section are the recommended materials available to Airport maintenance staff.

Joint and Crack Sealer

Hot-poured, pressure-injected, polymeric rubberized asphalt sealant meeting the requirements of ASTM D6690 is the FAA required standard for joint and crack sealant material. The advantage to this material is its low cost, durability, and the fact that it is suitable for both flexible (asphalt) and rigid (PCC) pavements.

Flexible Pavement Patch

Long-term patches should be made with high-quality plant mixed hot-mix asphalt having a ¾-inch maximum aggregate size and meeting FAA P-401 specifications. P-401 is a specialty asphalt mix and as such is not always available from local suppliers, especially in the small quantities required for asphalt patching. Should this be the case, high quality state highway asphalt mixes may be used in lieu of P-401. For short-term repairs, high performance plant mixed cold patching products may be used. Low-quality asphalt patch materials available at local hardware stores should be avoided.

Rigid Pavement Patch

Permanent patches in rigid pavement should be made with air-entrained concrete that has a 1-inch maximum coarse aggregate size. Consideration should be given to whether the area being repaired needs to be opened to traffic immediately after repair. If so, consideration should be given to adding an accelerator admixture to the concrete, or using type III cement. The concrete patch material should either have low slump or zero slump. As with flexible pavement patches, low-quality packaged materials should be avoided.

E.4.2. Pavement Repair Equipment

As with pavement repair materials, the equipment used in pavement repairs is regularly being upgraded and refined. Specialty equipment is available to speed up the process of, and produce

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long lasting, pavement repairs. The following are the most commonly used and effective pieces of equipment in pavement repair operations:

Air Compressor

Air compressors are used to remove non-compressible sand, debris, and other detritus from cracks and joints. A sustained capacity of 120 cubic feet per minute with a nozzle velocity of 100 pounds per square inch is the most effective unit. An air compressor meeting these requirements is typically a towed unit or trailer-mounted.

Concrete Saw

Concrete saws must have the ability to make a minimum 3-inch deep cut in both asphalt and concrete pavements. To perform this type of work, gasoline-powered, 5- to 20-horsepower walk-behind saws are typically used.

Router

Routing pavement cracks before sealant is installed will e[illegible] ave[illegible] ignifica[illegible]tly. Adequate depth is provided after routing to allow the sealant to handle the seasonal expansion and contraction. Typical crack routers have a 25-horsepower motor and are available from a variety of manufacturers.

Heating Kettle

The heating kettle is a critical item in a successful and productive crack sealing program. A heating kettle with minimum material capacity of 100 gallons and a melt rate of at least 1,000 pounds per hour is recommended for large sealing operations. These variables dictate the rate at which a crew progresses. Heating kettles should also contain a double boiler tank with continuous recirculation. Sealant material has the potential to be overheated by the heating kettle and temperatures should be monitored as sealing operations are ongoing. “Burning” the sealant will age harden the material and reduce its effectiveness.

Vibratory Roller or Plate Compactor

Both pieces of equipment are required to compact plant mixed hot-mix asphalt material. Vibratory rollers are typically used for larger patches and plate compactors are used for smaller patches.

Milling Machine or Cold Planer

These machines use a large rotating drum to remove and grind the pavement surface. They should be used to ensure an adequate area and depth of pavement is removed prior to patching and/or repairing joints.

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Table E-6: Recommended Maintenance Method – Asphalt Concrete

Distress Type	Probable Cause of Distress	Recommended Maintenance Method
Alligator Cracking	Fatigue failure of the asphalt surface under repeated traffic loading.	If localized, partial- or full-depth asphalt patch. If extensive, major rehabilitation needed.
Block Cracking	Shrinkage of the asphalt and daily temperature cycling; it is not load associated.	At low severity levels, crack seal and/or surface treatment. At higher severities, consider overlay.
Bleeding	Excessive amounts of asphalt cement or tars in the mix and/or low air void content.	Spread heated sand, roll, and sweep. Another option is to plane excess asphalt, or, remove and replace.
Corrugation	Traffic action combines with and unstable pavement layer.	If localized, mill. If extensive, remove and replace.
Depression	Settlement of the foundation soil.	Patch.
Jet Blast	Bituminous binder has been burned or carbonized.	Patch.
Joint Reflection Cracking	Movement of the concrete slab beneath the asphalt the asphalt surface due to thermal and moisture changes.	At low- and medium-severities, crack seal. At higher severities, especially if extensive, consider overlay.
Longitudinal and Transverse Cracking	Cracks may be caused by 1) poorly constructed paving joint, 2) shrinkage of the asphalt surface due to low temperatures or hardening, or 3) reflective crack caused by cracks in an underlying asphalt layer.	At low- and medium-severity levels, crack seal. At higher severities, especially if extensive, consider overlay options.
Oil Spillage	Deterioration or softening of the pavement surface caused by the spilling of oil, fuel, or other solvents.	Replace patch if deteriorated.
Patching	N/A	
Polished Aggregate	Repeated traffic applications.	A gre at ... cc t is one ption. Could also groove or mill. Overlay is another option.
Rutting	Usually caused by consolidation or lateral movement of the materials due to traffic loads.	Patch medium- and high-severity levels if localized. If extensive, consider major rehabilitation.
Shoving	Where PCC pavements adjoin flexible pavements, PCC "growth" may shove the asphalt pavement.	Mill and patch as needed.
Slippage Cracking	Low strength surface mix or poor bond between the surface and next layer of pavement structure.	Partial- or full-depth patch.
Swelling	Usually caused by frost action or by swelling soil.	Patch if localized. Major rehabilitation if extensive.
Raveling	Asphalt binder may have hardened significantly, causing coarse aggregate pieces to dislodge.	Patch if isolated. At higher severity levels, consider major rehabilitation if extensive.
Weathering	Asphalt binder and/or fine aggregate may wear away as the pavement ages and hardens.	Patch if isolated. Consider a surface treatment if extensive.

Table E-7: Recommended Maintenance Method – PCC

Distress Type	Probable Cause of Distress	Recommended Maintenance Method
Alkali Silica Reaction (ASR)	Chemical reaction of alkalis in the Portland cement with certain reactive silica minerals. ASR may be accelerated by the use of chemical pavement deicers.	At medium- and high-severity levels, slab replacement is recommended.
Blow-Up	Incompressible material in joints.	Partial- or full-depth patch. Slab replacement.
Corner Break	Load repetition combined with loss of support and curling stresses.	Seal cracks at low-severity. Full-depth patch.
Cracks	Combination of load repetition, curling stresses, and shrinkage stresses.	Seal cracks. At high-severity, may need full-depth patch or slab replacement.
Durability Cracking	Concrete's inability to withstand environmental factors such as freeze-thaw cycles.	Full-depth patch if present on small amount of slab. At higher severity levels, once it has appeared on most of slab, slab replacement.
Joint Seal Damage Cracking	Stripping of joint sealant, extrusion of joint sealant, weed growth, hardening of the filler (oxidation), loss of bond to the slab edges, or absence of sealant in joint.	Replace joint seal.
Patching (Small and Large)	N/A	Replace patches if deteriorated.
Popouts	Freeze-thaw action in combination with expansive aggregates.	Monitor.
Pumping	Poor drainage, poor joint sealant.	Seal cracks and joints. Under seal is an option if voids have developed. Establish good drainage.
Scaling	Overfinishing of concrete, deicing salts, improper construction, freeze-thaw cycles, and poor aggregate.	At low-severity levels, do nothing. At medium- and high-severity levels, partial-depth patches or slab replacement.
Settlement	Upheaval or consolidation.	At higher severity levels, leveling patch or grind to restore smooth ride.
Shattered Slab	Load repetition.	Replace slab.
Shrinkage	Setting and curing of the concrete.	Monitor.
Spalling (Joint and Corner)	Excessive stresses at the joint caused by infiltration of incompressible materials or traffic loads; weak concrete at joint combined with traffic.	Partial-depth patch.

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Other Equipment

General use equipment such as dump trucks, water trucks, power sweeping units, and front-end loaders are commonly used in pavement repair operations and can be helpful in a maintenance program.

E.4.3. Recommended Maintenance Actions

The airfield pavements at BGM that need the most repair are the taxiways (as shown in **Figure E-2**). Overall, the taxiways have the lowest overall PCI of 64, which is categorized as requiring minor rehabilitation. Taxiways M and P, the Deicing Area in the North Apron, Runway 10-28, and the end of Runway 16 fall within the PCI range of 41 and 55, which calls for major rehabilitation. A portion of Taxiway F, with a PCI of 36, has the lowest PCI and falls in the reconstruction category.

Using the results of the PCI survey, the most common distress types encountered, and the projected deterioration shown in **Table E-4**, it is recommended that the Airport implement a comprehensive crack sealing program on asphalt surfaces and joint sealer replacement on PCC surfaces. All of the pavements at the Airport would benefit and see increased life with these maintenance actions. Localized asphalt pavement patching is recommended in areas where longitudinal and transverse cracking widths have increased to the point where sealant is no longer effective. It should be noted that PCI surveys are conservative estimates as to the current condition of the pavements. Detailed engineering analysis conducted during the design phase of a project may result in a different conclusion as to the extent of repair required. Technically, AIP funding can be used for routine maintenance which includes, cleaning, filling and/or sealing of longitudinal and transverse cracks, grading pavement edges, and pavement patching, however, due to funding constraints the FAA has been reluctant to fund these types of projects, therefore, PFC and/or funding sources outside of AIP would be needed to implement preventive maintenance activities at the airport.

E.5. CAPITAL IMPROVEMENT PROGRAM (CIP)

E.5.1. Objective

One of the primary objectives of the BGM APMS is to identify and determine the airfield pavement M&R needs of the Airport by comparing the PCI values to a standardized benchmark called the Minimum Service Level (MSL). The MSL is defined as the minimum pavement condition acceptable for airside operations at the Airport. MSL values are shown in **Table E-8** below. Once the MSLs are established, the MSLs are the basis of the Capital Improvement Program (CIP).

Table E-8: Minimum Service Levels

Branch Use	MSL Value
Runway	65
Taxiway	60
Apron	60

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E.5.2. Analysis Approach

By establishing benchmark MSLs, a CIP can be developed using project data inputs into PAVER software to develop projects and costs. It should be noted that the CIP is based on 1) visual evaluation of pavements to establish a condition baseline, 2) applying recommended deterioration rates for pavements to predict when a particular pavement section attains the MSL, and 3) utilizing historic unit cost data based on type of pavement and PCI to estimate project costs of maintaining, rehabilitating or replacing pavements. Since more rigorous engineering analysis would be necessary to establish overall project costs, the CIP should only be used as a guide in developing the costs associated with only pavement work in any project funding requests. It is advisable to employ a more detailed analysis to identify and estimate overall project scopes and costs that are intended to be used in any grant funding requests.

This section of the report identifies and defines future CIP projects, along with their respective estimated costs based on acceptable PCI service levels, project type, and year of proposed construction. The M&R plan and CIP development utilized analysis of existing record plan information, the visual inspection of the pavement surfaces, a d ii ac oro nc ith ne met ods described in FAA AC 150/5380-7B and ASTM D5340-12. Bas d o c go g ct plans, and conversations with BGM; the following funding scenario was utilized in development of the CIP's:

- Stopgap/Preventive Maintenance – Set Budget of $10,000: A specific budget amount of approximately $10,000/year was used.
- Major Rehabilitation – Unlimited Budget.

Before presenting the analysis results, it is important to explain how the PAVER software develops such a program. Within the PAVER software, pavement repair is categorized as follows:

- Major Rehabilitation such as an overlay, mill and pave, or reconstruction.
- Localized Stopgap/Preventive Maintenance is a maintenance action that is applied only to a distressed area, such as crack sealing or patching. It is called Stopgap Maintenance when the PCI is less than the MSL and Preventive Maintenance when the PCI is greater than the MSL.

For each year of the analysis, the PAVER software applies the performance models and estimates the future condition of the pavement sections. If a section falls below the MSL's shown in Table E-8, major rehabilitation is recommended during that year. Stopgap maintenance is used if a major rehabilitation project cannot be completed in the year the PCI falls below the MSL. If the section is above the critical PCI, localized preventive maintenance may be recommended for that year. After the treatment is selected for the pavement section based on its predicted PCI value and the criteria listed above, its cost is calculated using the unit cost figures store in PAVER.

E.5.3. 5-Year Near-Term CIP

A 5-Year Near-Term CIP was developed to provide BGM with a list of short-term pavement capital projects for the 2019 through 2024 timeframe, the full 5-year plan is shown in Attachment E-7.

Table E-9: 5-Year Capital Improvement Plan Costs

Year	Stopgap/Preventive	Major Rehabilitation
2019	$10,000	$7,109,974.08
2020	$10,000	$0.00
2021	$10,000	$6,000,000.00
2022	$10,000	$5,890,314.19
2023	$10,000	$0.00

The full 5-Year Capital Improvement Plan showing treatment and PCI for each Branch/Section of airport pavement is shown in **Attachment E-7**.

E.5.4. 20-Year Long-Term CIP

A 20-Year Long-Term CIP was developed to provide BGM with a list of long-term pavement capital projects for 2020 through 2039. The 20-Year Long-Term CIP is an extension of the 5-Year Plan and was developed in the same manner.

Table E-10: 20-Year Capital Improvement Plan Costs

Year	Stopgap/Preventive	Major Rehabilitation
2019	$10,000	$7,109,974.08
2020	$10,000	$0.00
2021	$10,000	$6,000,000.00
2022	$10,000	$5,890,314.19
2023	$10,000	$0.00
2024	$10,000	$14,409.48
2025	$10,000	$30,417.46
2026	$10,000	$310,669.58
2027	$10,000	$766,096.88
2028	$10,000	$4,789,978.90
2029	$10,000	$409,619.48
2030	$10,000	$214,370.64
2031	$10,000	$716,357.61
2032	$10,000	$0.00
2033	$10,000	$2,398,810.69
2034	$10,000	$720,847.03
2035	$10,000	$689,199.52
2036	$10,000	$6,469,667.77
2037	$10,000	$165,794.12
2038	$10,000	$93,346.30

Source: PAVER, McFarland-Johnson Analysis

The full 20-Year Long-Term Capital Improvement Plan showing treatment and PCI for each Branch/Section of airport pavement is shown in **Attachment E-8**.

It should also be noted that in using the developed CIP to plan future funding requirements, BGM may find it necessary to adjust the timing of CIP projects due to fiscal and operational constraints. For example, a taxiway pavement may be divided into multiple sections that reach the MSL during different years. However, in an operational sense, it may be deemed not to be feasible to stage the rehabilitation of the taxiway over the course of multiple years. Instead, the rehabilitation may actually be programmed to minimize the taxiway closure time, while simultaneously maximizing the remaining service life. Conversely, it also may become necessary to break a large CIP project into multiple phases due to constraints based on available grant funding.

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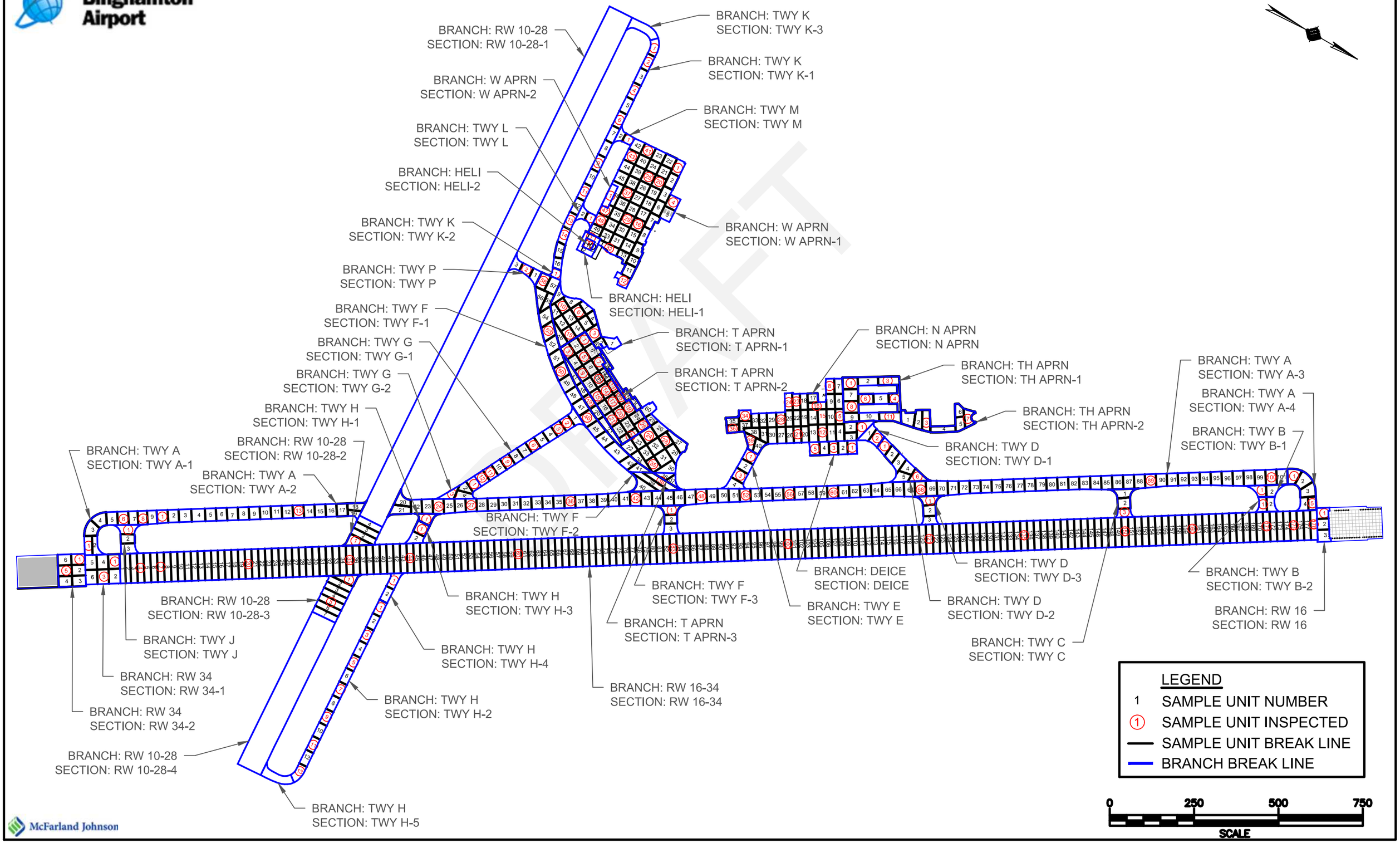
ATTACHMENT E-1: BGM PAVEMENT CONSTRUCTION HISTORY

Network	Name	Branch	Section	Section Area (ft²)	Last Construction Date	Surface Type[1]	Surface Course[1]	Base Course	Subbase Course[1]	Notes
Greater Binghamton Airport	Runway 16	RW 16	RW 16	14,319	9/1/2001	AC	-	-	-	
	Runway 34	RW 34	RW 34-1	35,670	-	AC	-	-	-	
		RW 34	RW 34-2	31,104	-	AC	-	-	-	
	Runway 16-34	RW 16-34	RW 16-34	1,242,797	7/1/2017	AC	4" AC	VARIES AC	VARIES CABC	
	Runway 10-28	RW 10-28	RW 10-28-1	509,585	9/1/1999	AC	4" AC	-	-	
	Runway 10-28	RW 10-28	RW 10-28-2	24,281	7/1/2017	AC	4" AC	4" AC	VARIES CABC	
	Runway 10-28	RW 10-28	RW 10-28-3	42,043	7/1/2017	AC	4" AC	VARIES AC	VARIES CABC	
	Runway 10-28	RW 10-28	RW 10-28-4	152,012	9/1/1999	AC	4" AC	-	-	
	Taxiway A	TWY A	TWY A-1	45,189	9/1/2009	AC	2.25" AC	3" AC	18.5" CABC	
		TWY A	TWY A-2	92,024	9/1/2009	AC	2.25" AC	3" AC	18.5" CABC	
		TWY A	TWY A-3	426,227	9/1/2009	AC	2.25" AC	3" AC	18.5" CABC	
		TWY A	TWY A-4	26,159	7/1/2017	AC	[illegible]" AC	[illegible]" AC	24" CABC	
	Taxiway B	TWY B	TWY B-1	10,244	9/1/2009	AC	2.25" AC	3" AC	18.5" CABC	
		TWY B	TWY B-2	8,762	7/1/2017	AC	4" AC	-	-	
	Taxiway C	TWY C	TWY C	14,289	7/1/2017	AC	4" AC	-	-	
	Taxiway D	TWY D	TWY D-1	10,269	9/1/2016	AC	2.25" AC	3.75" AC	17" CABC	
		TWY D	TWY D-2	29,661	9/1/2009	AC	2.25" AC	3" AC	18.5" CABC	
		TWY D	TWY D-3	14,263	7/1/2017	AC	4" AC	-	-	
	Taxiway E	TWY E	TWY E	20,001	9/1/2009	AC	2.25" AC	3" AC	18.5" CABC	
	Taxiway F	TWY F	TWY F-1	110,935	9/1/2011	AC	3" AAC	+/- 10" AC	-	
		TWY F	TWY F-2	20,971	9/1/2009	AC	2.25" AC	3" AC	18.5" CABC	
		TWY F	TWY F-3	14,397	7/1/2017	AC	4" AC	4" AC	-	
	Taxiway G	TWY G	TWY G-1	54,201	9/1/2016	AC	3" AAC	+/- 10" AC	-	
		TWY G	TWY G-2	16,404	9/1/2009	AC	2.25" AC	3" AC	18.5" CABC	
	Taxiway H	TWY H	TWY H-1	5,209	9/1/2009	AC	2.25" AC	3" AC	18.5" CABC	
		TWY H	TWY H-2	59,124	9/1/2008	AC	2" AC	-	-	
		TWY H	TWY H-3	10,343	7/1/2017	AC	4" AC	-	-	
		TWY H	TWY H-4	9,502	7/1/2017	AC	4" AC	-	-	
		TWY H	TWY H-5	9,783	9/1/2008	AC	2" AC	-	-	
	Taxiway J	TWY J	TWY J	15,818	7/1/2017	AC	4" AC	-	-	
	Taxiway K	TWY K	TWY K-1	74,536	9/1/2008	AC	2" AC	-	-	
		TWY K	TWY K-2	3,147	9/1/2011	AC	2.25" AC	3" AC	18.5" CABC	
		TWY K	TWY K-3	9,619	9/1/2008	AC	2" AC	-	-	
	Taxiway L	TWY L	TWY L	6,854	9/1/2008	AC	2" AC	-	-	
	Taxiway M	TWY M	TWY M	6,285	9/1/2008	AC	2" AC	-	-	
	Taxiway P	TWY P	TWY P	11,829	-	AC	-	-	-	
	T-Hangar Apron	TH APRN	TH APRN-1	65,639	9/1/2013	AC	-	-	12" CABC	
		TH APRN	TH APRN-2	35,928	-	AC	-	-	-	
	North Apron	N APRN	N APRN	180,235	9/1/2016	AC	2.25" AC	3.75" AC	17" CABC	
	Deicing	DEICE	DEICE	22,100	-	AC	-	-	-	
	Terminal Apron	T APRN	T APRN-1	187,495	9/1/2011	AC	3" AAC	+/- 10" AC	-	
		T APRN	T APRN-2	120,254	9/1/2011	PCC	13" PCC	4" AC, 6" CABC	10" P-154-6.1	
		T APRN	T APRN-3	5,916	9/1/2009	AC	2.25" AC	3" AC	18.5" CABC	
	West Apron	W APRN	W APRN-1	238,975	9/1/2015	AC	2.5" AC	3.5" AC	24" CABC	
		W APRN	W APRN-2	5,636	9/1/2015	PCC	12" PCC	4" AC	14" CABC	
	Helipad	HELI	HELI-1	8,690	9/1/2016	AC	2.5" AC	3.5" AC	24" CABC	
		HELI	HELI-2	3,139	9/1/2016	PCC	12" PCC	4" AC	14" CABC	

[1] *AC = Asphalt Concrete, AAC = Asphalt Overlay on AC, CABC = Crushed Aggregate Base Course, PCC=Portland Cement Concrete*

Greater Binghamton Airport

Attachment E-2: Network Map



McFarland Johnson

ATTACHMENT E-3 - PAVEMENT DISTRESSES BY BRANCH, SECTION AND SAMPLE UNIT ID

BranchID	SectionID	Surface Type - Current	Sample Unit Id	Distress Description	Severity
RW 16	RW 16	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 16	RW 16	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 16	RW 16	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
RW 16	RW 16	AC	01	SHOVING	MEDIUM
RW 16	RW 16	AC	01	PATCHING	LOW
RW 16	RW 16	AC	01	WEATHERING	MEDIUM
RW 16	RW 16	AC	01	BLOCK CRACKING	LOW
RW 34	RW 34-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 34	RW 34-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 34	RW 34-1	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 34	RW 34-2	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 34	RW 34-2	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 34	RW 34-2	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 34	RW 34-2	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 16-34	RW 16-34	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 16-34	RW 16-34	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 16-34	RW 16-34	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 16-34	RW 16-34	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 16-34	RW 16-34	AC	03	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 16-34	RW 16-34	AC	04	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 16-34	RW 16-34	AC	04	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 16-34	RW 16-34	AC	05	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 16-34	RW 16-34	AC	06	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 16-34	RW 16-34	AC	06	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 16-34	RW 16-34	AC	07	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 16-34	RW 16-34	AC	08	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 16-34	RW 16-34	AC	09	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 16-34	RW 16-34	AC	09	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 16-34	RW 16-34	AC	10	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 16-34	RW 16-34	AC	11	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 16-34	RW 16-34	AC	12	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 16-34	RW 16-34	AC	13	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 16-34	RW 16-34	AC	14	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 16-34	RW 16-34	AC	15	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 10-28	RW 10-28-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 10-28	RW 10-28-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 10-28	RW 10-28-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
RW 10-28	RW 10-28-1	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 10-28	RW 10-28-1	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
RW 10-28	RW 10-28-1	AC	03	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 10-28	RW 10-28-1	AC	03	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
RW 10-28	RW 10-28-1	AC	04	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 10-28	RW 10-28-1	AC	04	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
RW 10-28	RW 10-28-1	AC	05	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM

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ATTACHMENT E-3 - PAVEMENT DISTRESSES BY BRANCH, SECTION AND SAMPLE UNIT ID

BranchID	SectionID	Surface Type - Current	Sample Unit Id	Distress Description	Severity
RW 10-28	RW 10-28-1	AC	05	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
RW 10-28	RW 10-28-1	AC	06	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 10-28	RW 10-28-1	AC	06	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 10-28	RW 10-28-1	AC	06	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
RW 10-28	RW 10-28-1	AC	07	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 10-28	RW 10-28-1	AC	07	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 10-28	RW 10-28-1	AC	07	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
RW 10-28	RW 10-28-1	AC	08	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 10-28	RW 10-28-1	AC	08	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 10-28	RW 10-28-1	AC	08	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
RW 10-28	RW 10-28-1	AC	09	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 10-28	RW 10-28-1	AC	09	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 10-28	RW 10-28-1	AC	09	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
RW 10-28	RW 10-28-1	AC	10	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 10-28	RW 10-28-1	AC	10	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
RW 10-28	RW 10-28-1	AC	11	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 10-28	RW 10-28-1	AC	11	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 10-28	RW 10-28-1	AC	11	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
RW 10-28	RW 10-28-1	AC	12	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 10-28	RW 10-28-1	AC	12	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 10-28	RW 10-28-1	AC	12	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
RW 10-28	RW 10-28-1	AC	13	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 10-28	RW 10-28-1	AC	13	ALLIGATOR CRACKING	MEDIUM
RW 10-28	RW 10-28-1	AC	13	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
RW 10-28	RW 10-28-2	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 10-28	RW 10-28-2	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 10-28	RW 10-28-3	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 10-28	RW 10-28-3	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 10-28	RW 10-28-3	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 10-28	RW 10-28-3	AC	02	ALLIGATOR CRACKING	LOW
RW 10-28	RW 10-28-4	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 10-28	RW 10-28-4	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
RW 10-28	RW 10-28-4	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 10-28	RW 10-28-4	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
RW 10-28	RW 10-28-4	AC	03	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 10-28	RW 10-28-4	AC	03	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 10-28	RW 10-28-4	AC	03	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
RW 10-28	RW 10-28-4	AC	04	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 10-28	RW 10-28-4	AC	04	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
RW 10-28	RW 10-28-4	AC	05	LONGITUDINAL & TRANSVERSE CRACKING	LOW
RW 10-28	RW 10-28-4	AC	05	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 10-28	RW 10-28-4	AC	05	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
RW 10-28	RW 10-28-4	AC	06	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
RW 10-28	RW 10-28-4	AC	06	LONGITUDINAL & TRANSVERSE CRACKING	HIGH

ATTACHMENT E-3 - PAVEMENT DISTRESSES BY BRANCH, SECTION AND SAMPLE UNIT ID

BranchID	SectionID	Surface Type - Current	Sample Unit Id	Distress Description	Severity
TXW A	TWY A-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TXW A	TWY A-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TXW A	TWY A-1	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TXW A	TWY A-1	AC	03	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TXW A	TWY A-1	AC	03	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TXW A	TWY A-2	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TXW A	TWY A-2	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TXW A	TWY A-2	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TXW A	TWY A-2	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TXW A	TWY A-2	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
TXW A	TWY A-2	AC	02	BLOCK CRACKING	LOW
TXW A	TWY A-3	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TXW A	TWY A-3	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
TXW A	TWY A-3	AC	01	ALLIGATOR CRACKING	LOW
TXW A	TWY A-3	AC	01	BLOCK CRACKING	LOW
TXW A	TWY A-3	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TXW A	TWY A-3	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
TXW A	TWY A-3	AC	02	ALLIGATOR CRACKING	LOW
TXW A	TWY A-3	AC	03	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TXW A	TWY A-3	AC	03	ALLIGATOR CRACKING	LOW
TXW A	TWY A-3	AC	04	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TXW A	TWY A-3	AC	04	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
TXW A	TWY A-3	AC	04	ALLIGATOR CRACKING	LOW
TXW A	TWY A-3	AC	04	BLOCK CRACKING	LOW
TXW A	TWY A-3	AC	05	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TXW A	TWY A-3	AC	05	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
TXW A	TWY A-3	AC	05	BLOCK CRACKING	LOW
TXW A	TWY A-3	AC	06	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TXW A	TWY A-3	AC	06	BLOCK CRACKING	LOW
TXW A	TWY A-3	AC	07	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TXW A	TWY A-3	AC	07	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TXW A	TWY A-3	AC	07	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
TXW A	TWY A-3	AC	08	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TXW A	TWY A-3	AC	08	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
TXW A	TWY A-3	AC	08	ALLIGATOR CRACKING	LOW
TXW A	TWY A-3	AC	09	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TXW A	TWY A-3	AC	09	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TXW A	TWY A-3	AC	09	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
TXW A	TWY A-3	AC	09	ALLIGATOR CRACKING	LOW
TXW A	TWY A-3	AC	10	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TXW A	TWY A-3	AC	10	ALLIGATOR CRACKING	LOW
TXW A	TWY A-3	AC	11	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TXW A	TWY A-3	AC	11	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
TXW A	TWY A-3	AC	11	ALLIGATOR CRACKING	LOW

ATTACHMENT E-3 - PAVEMENT DISTRESSES BY BRANCH, SECTION AND SAMPLE UNIT ID

BranchID	SectionID	Surface Type - Current	Sample Unit Id	Distress Description	Severity
TXW A	TWY A-4	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TXW A	TWY A-4	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TXW A	TWY A-4	AC	01	PATCHING	LOW
TXW A	TWY A-4	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY B	TWY B-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY B	TWY B-1	AC	01	WEATHERING	LOW
TWY B	TWY B-1	AC	01	ALLIGATOR CRACKING	LOW
TWY B	TWY B-1	AC	01	BLOCK CRACKING	LOW
TWY B	TWY B-2	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY B	TWY B-2	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY C	TWY C	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY C	TWY C	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY D	TWY D-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY D	TWY D-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY D	TWY D-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
TWY D	TWY D-1	AC	01	ALLIGATOR CRACKING	LOW
TWY D	TWY D-2	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY D	TWY D-2	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY D	TWY D-2	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
TWY D	TWY D-2	AC	01	ALLIGATOR CRACKING	LOW
TWY D	TWY D-2	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY D	TWY D-2	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
TWY D	TWY D-2	AC	02	ALLIGATOR CRACKING	LOW
TWY D	TWY D-3	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY E	TWY E	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY E	TWY E	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY E	TWY E	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY E	TWY E	AC	02	ALLIGATOR CRACKING	LOW
TWY F	TWY F-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY F	TWY F-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY F	TWY F-1	AC	01	ALLIGATOR CRACKING	LOW
TWY F	TWY F-1	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY F	TWY F-1	AC	02	ALLIGATOR CRACKING	LOW
TWY F	TWY F-1	AC	03	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY F	TWY F-1	AC	03	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY F	TWY F-1	AC	03	ALLIGATOR CRACKING	LOW
TWY F	TWY F-1	AC	04	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY F	TWY F-1	AC	04	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY F	TWY F-1	AC	04	DEPRESSION	LOW
TWY F	TWY F-2	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY F	TWY F-2	AC	01	ALLIGATOR CRACKING	LOW
TWY F	TWY F-2	AC	01	ALLIGATOR CRACKING	MEDIUM
TWY F	TWY F-3	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY F	TWY F-3	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM

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ATTACHMENT E-3 - PAVEMENT DISTRESSES BY BRANCH, SECTION AND SAMPLE UNIT ID

BranchID	SectionID	Surface Type - Current	Sample Unit Id	Distress Description	Severity
TWY G	TWY G-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY G	TWY G-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY G	TWY G-1	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY G	TWY G-1	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY G	TWY G-1	AC	02	ALLIGATOR CRACKING	LOW
TWY G	TWY G-1	AC	03	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY G	TWY G-1	AC	03	ALLIGATOR CRACKING	LOW
TWY G	TWY G-1	AC	04	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY G	TWY G-1	AC	04	ALLIGATOR CRACKING	LOW
TWY G	TWY G-1	AC	05	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY G	TWY G-1	AC	05	ALLIGATOR CRACKING	LOW
TWY G	TWY G-1	AC	06	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY G	TWY G-1	AC	06	ALLIGATOR CRACKING	LOW
TWY G	TWY G-2	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY G	TWY G-2	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY G	TWY G-2	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
TWY G	TWY G-2	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY G	TWY G-2	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
TWY G	TWY G-2	AC	02	ALLIGATOR CRACKING	LOW
TWY H	TWY H-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY H	TWY H-1	AC	01	ALLIGATOR CRACKING	LOW
TWY H	TWY H-2	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY H	TWY H-2	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY H	TWY H-2	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY H	TWY H-2	AC	02	ALLIGATOR CRACKING	LOW
TWY H	TWY H-2	AC	03	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY H	TWY H-2	AC	03	ALLIGATOR CRACKING	LOW
TWY H	TWY H-2	AC	04	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY H	TWY H-2	AC	04	ALLIGATOR CRACKING	LOW
TWY H	TWY H-2	AC	05	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY H	TWY H-2	AC	05	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY H	TWY H-2	AC	05	ALLIGATOR CRACKING	LOW
TWY H	TWY H-2	AC	06	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY H	TWY H-2	AC	06	ALLIGATOR CRACKING	LOW
TWY H	TWY H-2	AC	07	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY H	TWY H-2	AC	07	ALLIGATOR CRACKING	LOW
TWY H	TWY H-2	AC	07	BLOCK CRACKING	LOW
TWY H	TWY H-3	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY H	TWY H-4	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY H	TWY H-5	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY H	TWY H-5	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
TWY H	TWY H-5	AC	01	WEATHERING	MEDIUM
TWY J	TWY J	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY K	TWY K-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM

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ATTACHMENT E-3 - PAVEMENT DISTRESSES BY BRANCH, SECTION AND SAMPLE UNIT ID

BranchID	SectionID	Surface Type - Current	Sample Unit Id	Distress Description	Severity
TWY K	TWY K-1	AC	01	ALLIGATOR CRACKING	LOW
TWY K	TWY K-1	AC	01	BLOCK CRACKING	LOW
TWY K	TWY K-1	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY K	TWY K-1	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY K	TWY K-1	AC	02	ALLIGATOR CRACKING	LOW
TWY K	TWY K-1	AC	03	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY K	TWY K-1	AC	03	ALLIGATOR CRACKING	LOW
TWY K	TWY K-1	AC	03	BLOCK CRACKING	LOW
TWY K	TWY K-1	AC	04	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY K	TWY K-1	AC	04	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY K	TWY K-1	AC	04	ALLIGATOR CRACKING	LOW
TWY K	TWY K-1	AC	05	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY K	TWY K-1	AC	05	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY K	TWY K-1	AC	05	ALLIGATOR CRACKING	LOW
TWY K	TWY K-1	AC	06	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY K	TWY K-1	AC	06	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY K	TWY K-1	AC	06	ALLIGATOR CRACKING	LOW
TWY K	TWY K-1	AC	06	BLOCK CRACKING	LOW
TWY K	TWY K-1	AC	07	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY K	TWY K-1	AC	07	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY K	TWY K-1	AC	07	ALLIGATOR CRACKING	LOW
TWY K	TWY K-1	AC	08	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY K	TWY K-1	AC	08	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY K	TWY K-1	AC	08	ALLIGATOR CRACKING	LOW
TWY K	TWY K-2	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY K	TWY K-2	AC	01	ALLIGATOR CRACKING	LOW
TWY K	TWY K-3	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY K	TWY K-3	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
TWY K	TWY K-3	AC	01	POLISHED AGGREGATE	MEDIUM
TWY L	TWY L	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY L	TWY L	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
TWY L	TWY L	AC	01	ALLIGATOR CRACKING	LOW
TWY M	TWY M	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TWY M	TWY M	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY M	TWY M	AC	01	ALLIGATOR CRACKING	LOW
TWY M	TWY M	AC	01	BLOCK CRACKING	LOW
TWY P	TWY P	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TWY P	TWY P	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
TWY P	TWY P	AC	01	ALLIGATOR CRACKING	LOW
TH APRN	TH APRN-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TH APRN	TH APRN-1	AC	01	DEPRESSION	LOW
TH APRN	TH APRN-1	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TH APRN	TH APRN-1	AC	03	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TH APRN	TH APRN-1	AC	03	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM

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ATTACHMENT E-3 - PAVEMENT DISTRESSES BY BRANCH, SECTION AND SAMPLE UNIT ID

BranchID	SectionID	Surface Type - Current	Sample Unit Id	Distress Description	Severity
TH APRN	TH APRN-1	AC	04	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TH APRN	TH APRN-1	AC	05	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TH APRN	TH APRN-1	AC	05	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TH APRN	TH APRN-1	AC	06	LONGITUDINAL & TRANSVERSE CRACKING	LOW
TH APRN	TH APRN-1	AC	06	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TH APRN	TH APRN-2	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TH APRN	TH APRN-2	AC	01	PATCHING	HIGH
TH APRN	TH APRN-2	AC	01	ALLIGATOR CRACKING	HIGH
TH APRN	TH APRN-2	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
TH APRN	TH APRN-2	AC	02	WEATHERING	LOW
N APRN	N APRN	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
N APRN	N APRN	AC	01	DEPRESSION	LOW
N APRN	N APRN	AC	01	PATCHING	LOW
N APRN	N APRN	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	LOW
N APRN	N APRN	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
N APRN	N APRN	AC	03	LONGITUDINAL & TRANSVERSE CRACKING	LOW
N APRN	N APRN	AC	03	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
N APRN	N APRN	AC	04	LONGITUDINAL & TRANSVERSE CRACKING	LOW
N APRN	N APRN	AC	04	DEPRESSION	LOW
N APRN	N APRN	AC	04	PATCHING	LOW
N APRN	N APRN	AC	05	LONGITUDINAL & TRANSVERSE CRACKING	LOW
N APRN	N APRN	AC	06	LONGITUDINAL & TRANSVERSE CRACKING	LOW
N APRN	N APRN	AC	07	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
N APRN	N APRN	AC	07	DEPRESSION	MEDIUM
N APRN	N APRN	AC	08	DEPRESSION	LOW
N APRN	N APRN	AC	09	LONGITUDINAL & TRANSVERSE CRACKING	LOW
N APRN	N APRN	AC	09	WEATHERING	LOW
N APRN	N APRN	AC	10	LONGITUDINAL & TRANSVERSE CRACKING	LOW
N APRN	N APRN	AC	11	LONGITUDINAL & TRANSVERSE CRACKING	LOW
N APRN	N APRN	AC	12	LONGITUDINAL & TRANSVERSE CRACKING	LOW
DEICE	DEICE	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
DEICE	DEICE	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
DEICE	DEICE	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
DEICE	DEICE	AC	01	PATCHING	LOW
DEICE	DEICE	AC	01	PATCHING	HIGH
DEICE	DEICE	AC	01	WEATHERING	MEDIUM
DEICE	DEICE	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	LOW
DEICE	DEICE	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
DEICE	DEICE	AC	02	BLOCK CRACKING	LOW
DEICE	DEICE	AC	02	PATCHING	LOW
DEICE	DEICE	AC	02	WEATHERING	MEDIUM
DEICE	DEICE	AC	03	LONGITUDINAL & TRANSVERSE CRACKING	LOW
DEICE	DEICE	AC	03	PATCHING	LOW
DEICE	DEICE	AC	03	WEATHERING	MEDIUM

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ATTACHMENT E-3 - PAVEMENT DISTRESSES BY BRANCH, SECTION AND SAMPLE UNIT ID

BranchID	SectionID	Surface Type - Current	Sample Unit Id	Distress Description	Severity
DEICE	DEICE	AC	03	DEPRESSION	LOW
DEICE	DEICE	AC	03	BLOCK CRACKING	LOW
T APRN	T APRN-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
T APRN	T APRN-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
T APRN	T APRN-1	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
T APRN	T APRN-1	AC	03	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
T APRN	T APRN-1	AC	03	ALLIGATOR CRACKING	LOW
T APRN	T APRN-1	AC	04	LONGITUDINAL & TRANSVERSE CRACKING	LOW
T APRN	T APRN-1	AC	04	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
T APRN	T APRN-1	AC	04	ALLIGATOR CRACKING	LOW
T APRN	T APRN-1	AC	05	LONGITUDINAL & TRANSVERSE CRACKING	LOW
T APRN	T APRN-1	AC	05	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
T APRN	T APRN-1	AC	05	ALLIGATOR CRACKING	LOW
T APRN	T APRN-1	AC	06	LONGITUDINAL & TRANSVERSE CRACKING	LOW
T APRN	T APRN-1	AC	06	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
T APRN	T APRN-1	AC	07	LONGITUDINAL & TRANSVERSE CRACKING	LOW
T APRN	T APRN-1	AC	07	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
T APRN	T APRN-1	AC	08	LONGITUDINAL & TRANSVERSE CRACKING	LOW
T APRN	T APRN-1	AC	08	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
T APRN	T APRN-2	PCC	01	LINEAR CRACKING	LOW
T APRN	T APRN-2	PCC	01	JOINT SEAL DAMAGE	LOW
T APRN	T APRN-2	PCC	02	LINEAR CRACKING	LOW
T APRN	T APRN-2	PCC	02	JOINT SEAL DAMAGE	LOW
T APRN	T APRN-2	PCC	03	JOINT SEAL DAMAGE	LOW
T APRN	T APRN-2	PCC	04	LINEAR CRACKING	LOW
T APRN	T APRN-2	PCC	04	JOINT SEAL DAMAGE	LOW
T APRN	T APRN-2	PCC	05	LINEAR CRACKING	LOW
T APRN	T APRN-2	PCC	05	JOINT SEAL DAMAGE	LOW
T APRN	T APRN-2	PCC	06	LINEAR CRACKING	LOW
T APRN	T APRN-2	PCC	06	CORNER CRACKING	LOW
T APRN	T APRN-2	PCC	06	JOINT SEAL DAMAGE	LOW
T APRN	T APRN-2	PCC	07	LINEAR CRACKING	LOW
T APRN	T APRN-2	PCC	07	JOINT SEAL DAMAGE	LOW
T APRN	T APRN-2	PCC	08	LINEAR CRACKING	LOW
T APRN	T APRN-2	PCC	09	LINEAR CRACKING	LOW
T APRN	T APRN-2	PCC	09	JOINT SEAL DAMAGE	LOW
T APRN	T APRN-2	PCC	10	LINEAR CRACKING	LOW
T APRN	T APRN-2	PCC	10	JOINT SEAL DAMAGE	LOW
T APRN	T APRN-2	PCC	11	LINEAR CRACKING	LOW
T APRN	T APRN-2	PCC	11	JOINT SEAL DAMAGE	LOW
T APRN	T APRN-2	PCC	12	LINEAR CRACKING	LOW
T APRN	T APRN-2	PCC	12	JOINT SEAL DAMAGE	LOW
T APRN	T APRN-2	PCC	13	JOINT SEAL DAMAGE	LOW
T APRN	T APRN-2	PCC	14	LINEAR CRACKING	LOW

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ATTACHMENT E-3 - PAVEMENT DISTRESSES BY BRANCH, SECTION AND SAMPLE UNIT ID

BranchID	SectionID	Surface Type - Current	Sample Unit Id	Distress Description	Severity
T APRN	T APRN-2	PCC	14	JOINT SEAL DAMAGE	LOW
T APRN	T APRN-2	PCC	15	LINEAR CRACKING	LOW
T APRN	T APRN-2	PCC	15	JOINT SEAL DAMAGE	LOW
T APRN	T APRN-2	PCC	16	LINEAR CRACKING	LOW
T APRN	T APRN-2	PCC	16	JOINT SEAL DAMAGE	LOW
T APRN	T APRN-3	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
T APRN	T APRN-3	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	HIGH
T APRN	T APRN-3	AC	01	ALLIGATOR CRACKING	LOW
W APRN	W APRN-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW
W APRN	W APRN-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
W APRN	W APRN-1	AC	01	DEPRESSION	LOW
W APRN	W APRN-1	AC	02	LONGITUDINAL & TRANSVERSE CRACKING	LOW
W APRN	W APRN-1	AC	02	DEPRESSION	LOW
W APRN	W APRN-1	AC	03	LONGITUDINAL & TRANSVERSE CRACKING	LOW
W APRN	W APRN-1	AC	03	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
W APRN	W APRN-1	AC	04	LONGITUDINAL & TRANSVERSE CRACKING	LOW
W APRN	W APRN-1	AC	04	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
W APRN	W APRN-1	AC	05	LONGITUDINAL & TRANSVERSE CRACKING	LOW
W APRN	W APRN-1	AC	05	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
W APRN	W APRN-1	AC	05	PATCHING	LOW
W APRN	W APRN-1	AC	06	LONGITUDINAL & TRANSVERSE CRACKING	LOW
W APRN	W APRN-1	AC	06	DEPRESSION	LOW
W APRN	W APRN-1	AC	07	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
W APRN	W APRN-1	AC	08	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
W APRN	W APRN-1	AC	09	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
W APRN	W APRN-1	AC	10	LONGITUDINAL & TRANSVERSE CRACKING	LOW
W APRN	W APRN-1	AC	10	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
W APRN	W APRN-1	AC	11	LONGITUDINAL & TRANSVERSE CRACKING	LOW
W APRN	W APRN-1	AC	11	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
W APRN	W APRN-1	AC	12	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
W APRN	W APRN-1	AC	13	LONGITUDINAL & TRANSVERSE CRACKING	LOW
W APRN	W APRN-2	PCC	01	JOINT SEAL DAMAGE	LOW
W APRN	W APRN-2	PCC	01	LINEAR CRACKING	LOW
HELI	HELI-1	AC	01	LONGITUDINAL & TRANSVERSE CRACKING	MEDIUM
HELI	HELI-2	PCC	01	LINEAR CRACKING	LOW
HELI	HELI-2	PCC	01	LONGITUDINAL & TRANSVERSE CRACKING	LOW

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Attachment E-4 – Inspection Photographs

Taxiway A-1: Medium Longitudinal/Transverse Cracking



Taxiway A-1: Medium Longitudinal/Transverse Cracking



Taxiway A-2: Medium Longitudinal/Transverse Cracking



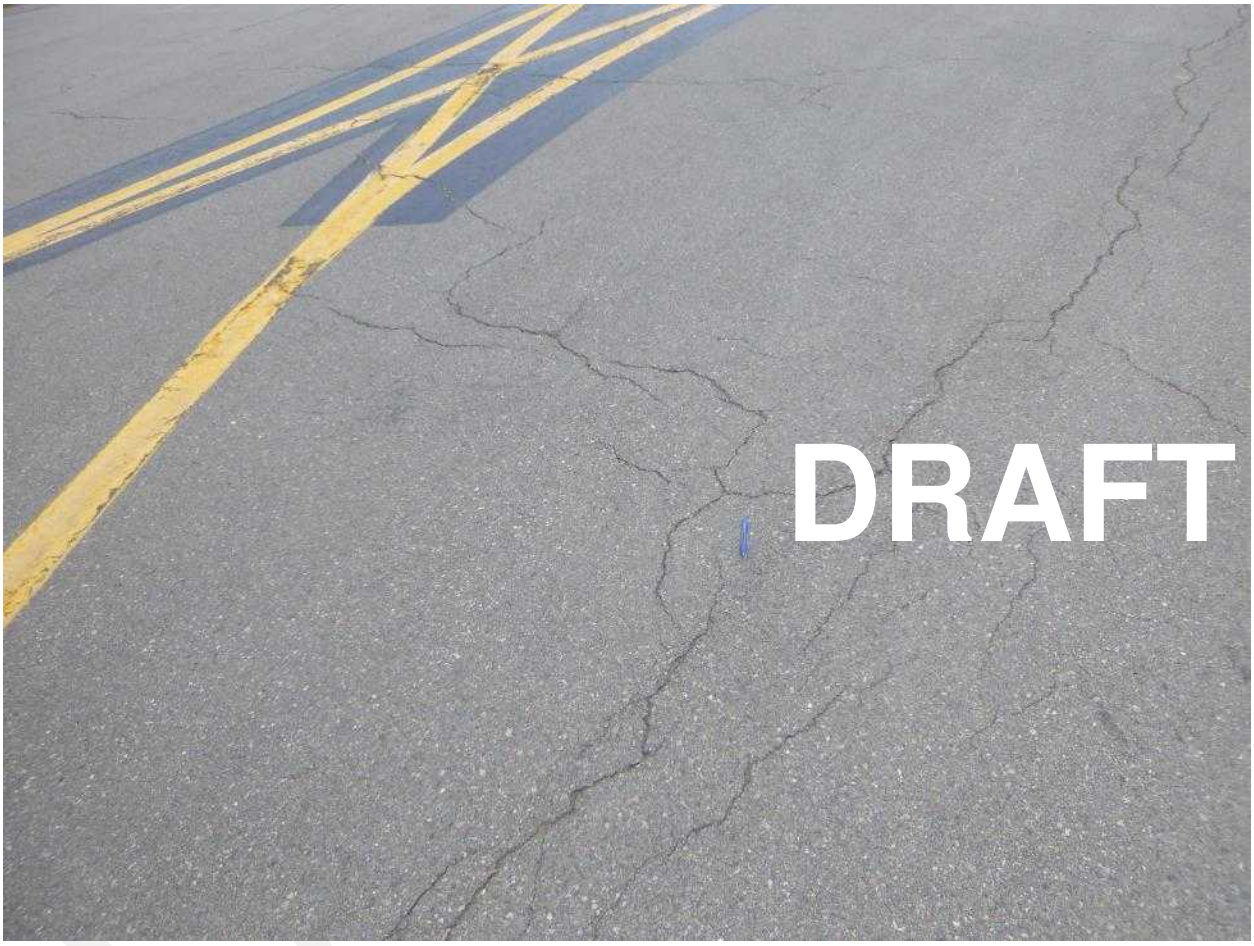
Taxiway A-2: Low Alligator Cracking



Taxiway A-3: High Longitudinal/Transverse Cracking



Taxiway A-3: Low Alligator Cracking



Taxiway A-3: Medium Longitudinal/Transverse Cracking



Taxiway A-4: Low Patching



Taxiway A-4: Medium Longitudinal/Transverse Cracking



Taxiway B-1: Low Block Cracking



Taxiway B-1: Low Weathering



Taxiway B-2: Medium Longitudinal/Transverse Cracking



Taxiway C: Medium Longitudinal/Transverse Cracking



Taxiway C: Low Longitudinal/Transverse Cracking



Taxiway D-1: High Longitudinal/Transverse Cracking



Taxiway D-1: Low Weathering



Taxiway D-2: Low Alligator Cracking



Taxiway D-2: Medium Longitudinal/Transverse Cracking



Taxiway D-3: Low Longitudinal/Transverse Cracking



Taxiway E: Medium Longitudinal/Transverse Cracking



Taxiway E: Low Alligator Cracking



Taxiway F-1: Medium Longitudinal/Transverse Cracking



Taxiway F-1: Low Alligator Cracking



Taxiway F-2: High Longitudinal/Transverse Cracking



Taxiway F-2: Low Alligator Cracking



Taxiway F-3: Low Longitudinal/Transverse Cracking



Taxiway G-1: Medium Longitudinal/Transverse Cracking



Taxiway G-1: Low Alligator Cracking



Taxiway G-1: Medium Longitudinal/Transverse Cracking



Taxiway G-2: Medium Longitudinal/Transverse Cracking



Taxiway G-2: High Longitudinal/Transverse Cracking



Taxiway G-2: Low Alligator Cracking



Taxiway H-1: Low Alligator Cracking



Taxiway H-1: Medium Longitudinal/Transverse Cracking



Taxiway H-2: Low Alligator Cracking



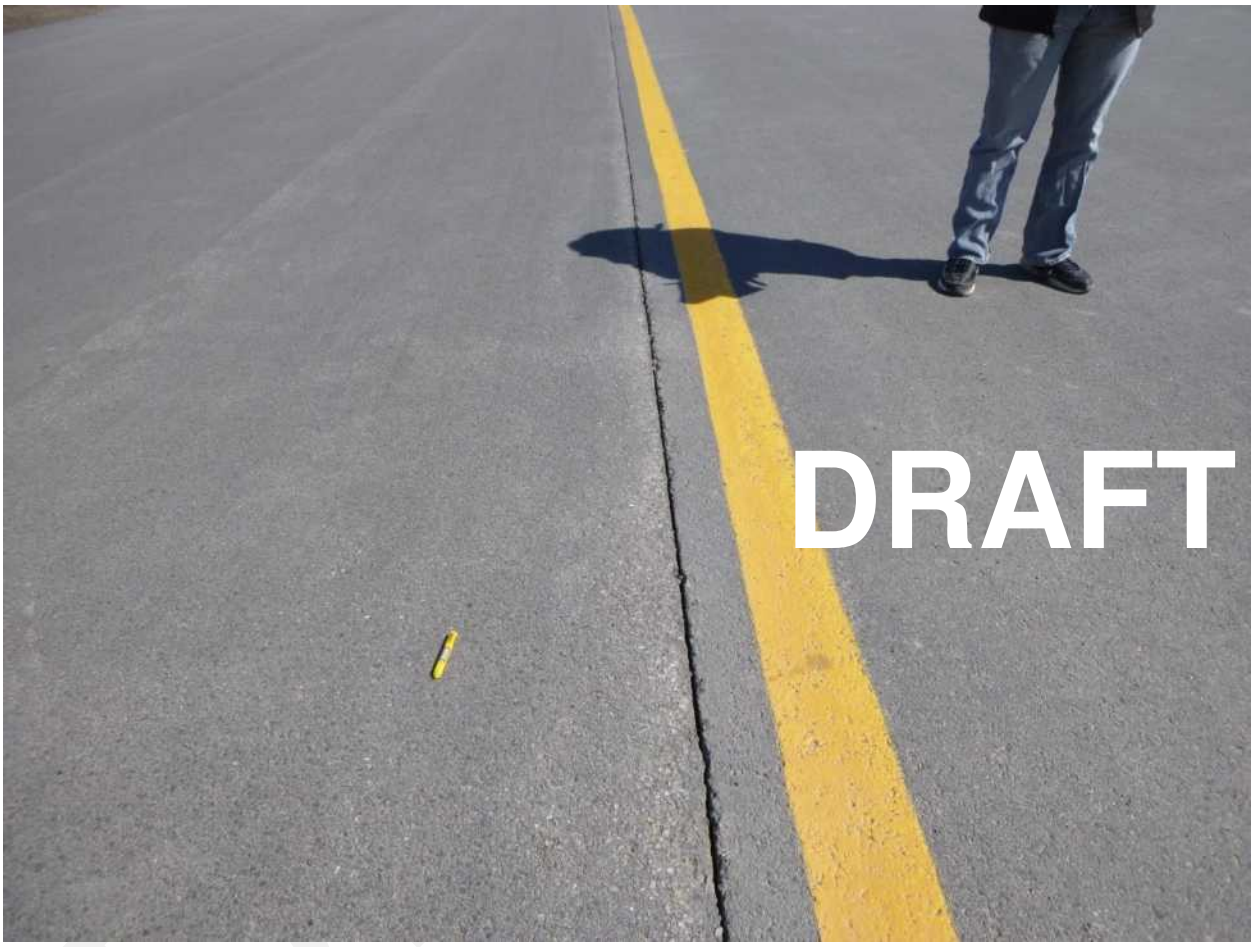
Taxiway H-2: Medium Longitudinal/Transverse Cracking



Taxiway H-2: Medium Longitudinal/Transverse Cracking



Taxiway H-3: Low Longitudinal/Transverse Cracking



Taxiway H-4: Low Longitudinal/Transverse Cracking



Taxiway J: Low Longitudinal/Transverse Cracking



Taxiway K-1: Medium Longitudinal/Transverse Cracking



Taxiway K-1: Low Alligator Cracking



Taxiway K-2: Medium Longitudinal/Transverse Cracking



Taxiway K-2: Low Alligator Cracking



Taxiway L: Medium Longitudinal/Transverse Cracking



Taxiway L: Low Alligator Cracking



Taxiway M: Medium Longitudinal/Transverse Cracking



Taxiway M: Low Alligator Cracking



Taxiway P: Medium Longitudinal/Transverse Cracking



Taxiway P: Low Alligator Cracking



T-Hangar Apron-1: Low Longitudinal/Transverse Cracking



T-Hangar Apron-1: Oil Spots



T-Hangar Apron-1: Low Depression



T-Hangar Apron-2: Medium Longitudinal/Transverse Cracking



T-Hangar Apron-2: High Alligator Cracking



T-Hangar Apron-2: High Patching Damage



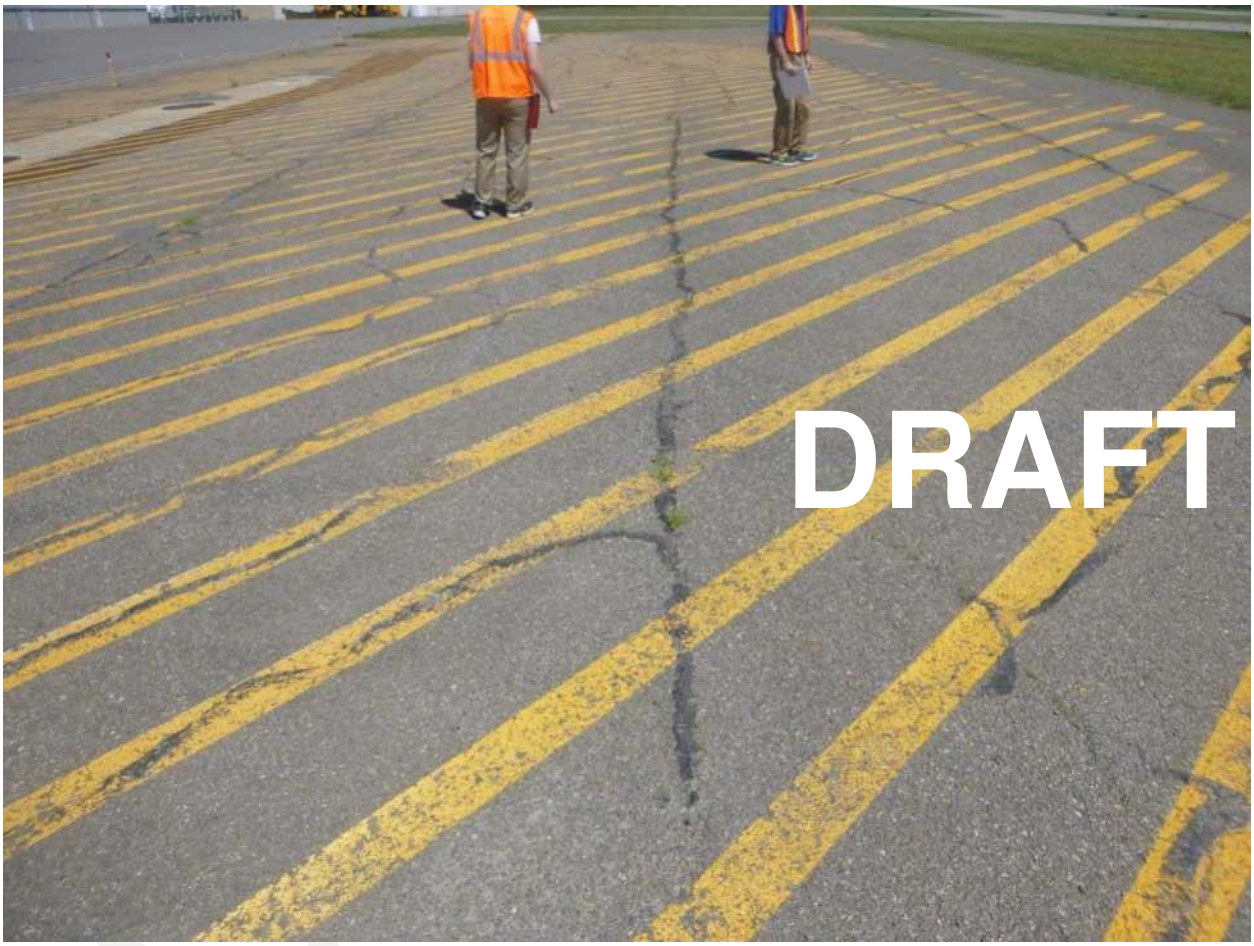
North Apron: Medium Longitudinal/Transverse Cracking



North Apron: Low Depression



Deicing Area: High Longitudinal/Transverse Cracking



Deicing Area: Medium Weathering



Deicing Area: High Patching Damage



Terminal Apron-1: Medium Longitudinal/Transverse Cracking



Terminal Apron-1: Low Alligator Cracking



Terminal Apron-2: Medium Linear Cracking



Terminal Apron-2: Low Joint Seal Damage



Terminal Apron-2: Low Corner Cracking



West Apron-1: Medium Longitudinal/Transverse Cracking



West Apron-1: Low Patching Damage



West Apron-1: Medium Longitudinal/Transverse Cracking



Helipad: Medium Longitudinal/Transverse Cracking



Runway 16-34: Medium Longitudinal/Transverse Cracking



Runway 16-34: Low Longitudinal/Transverse Cracking



Runway 16-34: Medium Longitudinal/Transverse Cracking



Runway 16: Medium Longitudinal/Transverse Cracking



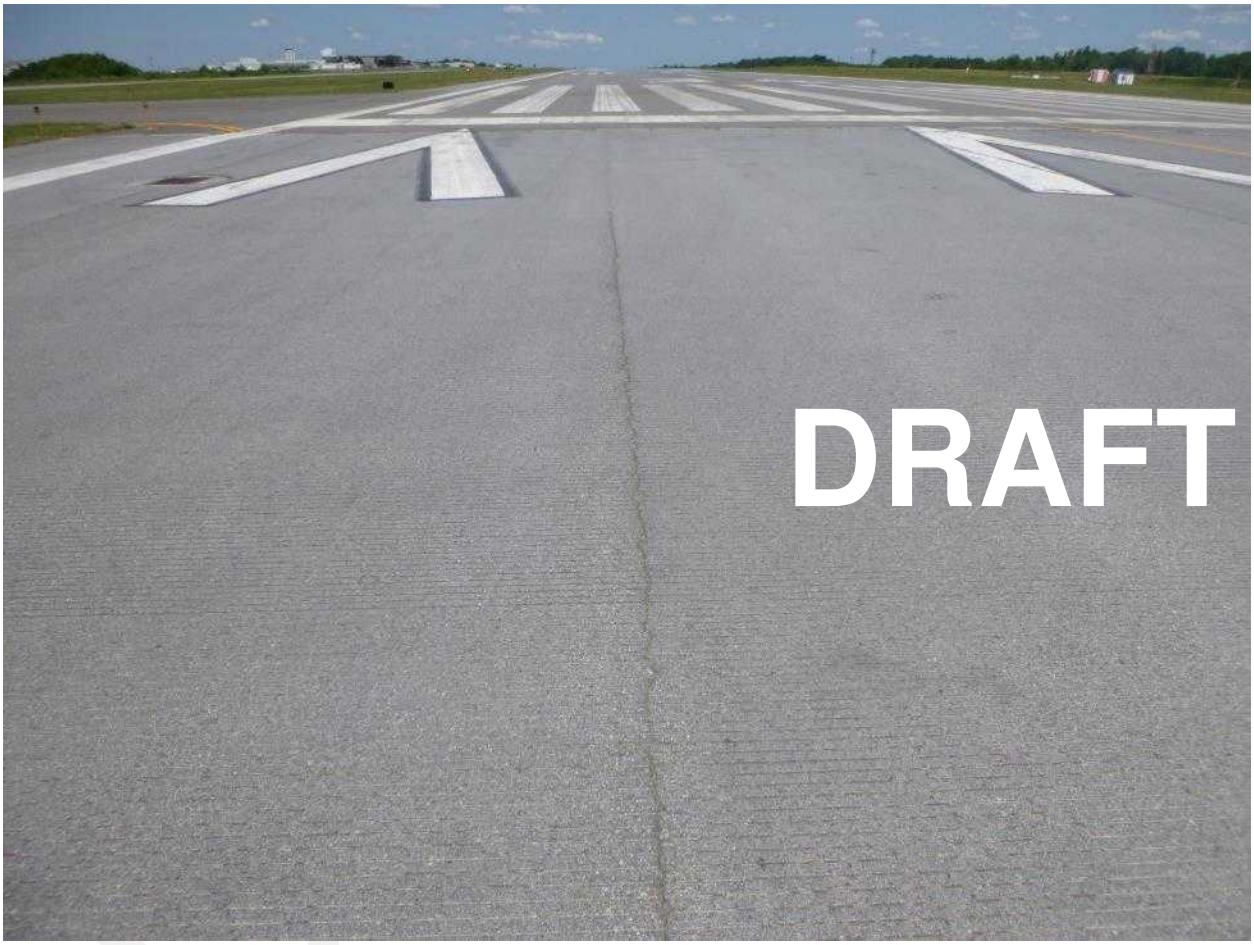
Runway 16: Low Patching Damage



Runway 16: Low Block Cracking



Runway 34-1: Low Longitudinal/Transverse Cracking



Runway 34-1: Medium Longitudinal/Transverse Cracking



Runway 34-2: Medium Longitudinal/Transverse Cracking



Runway 34-2: Medium Longitudinal/Transverse Cracking



Runway 10-28-2: Medium Longitudinal/Transverse Cracking



Runway 10-28-3: Low Alligator Cracking



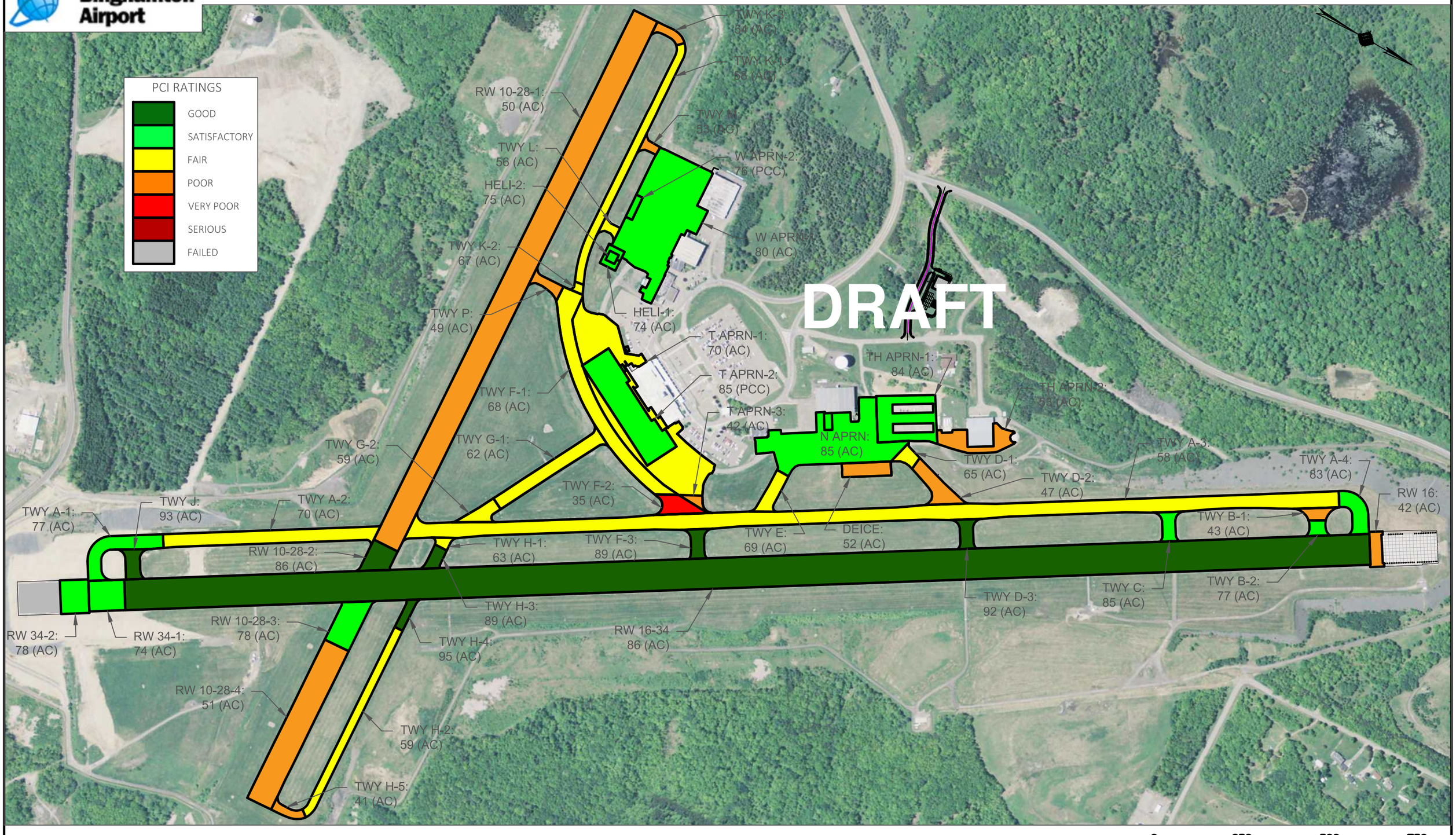
Runway 10-28-3: Low Longitudinal/Transverse Cracking



Greater Binghamton Airport

Airfield Pavement Management Study

Attachment E-5: Pavement Condition Index



McFarland Johnson

0 250 500 750

SCALE

E-6. M&R Work Descriptions

E-6.1. FLEXIBLE PAVEMENT (AC) WORK DESCRIPTIONS

E-6.1.1. Reconstruction

Reconstruction is recommended when pavements have deteriorated to the point where preventative maintenance techniques and pavement rehabilitation are no longer viable. The unit price assumes excavation of the existing pavement section down to subgrade, installation of a geotextile fabric membrane, 18-inches of P-209 base course material, and 11-inches of P-401 AC material.



E-6.1.2. Resurfacing

A form of pavement rehabilitation that eliminates minor distresses in asphalt pavement and extends pavement life. The unit price in this PMP assumes a nominal 2-inch mill, pavement repairs, and 2-inch inlay.



E-6.1.3. Overlay

Overlays are used to address load related distresses and increase pavement load bearing/structural capacity. The overlay unit prices in this PMP include a nominal 2-inch mill of existing pavement, pavement repairs, and overlays at various depths depending on the needs of the pavement section.



E-6.1.4. Patching



Patches may be either partial depth or full depth. They are used to eliminate distresses that have FOD potential. Temporary cold patching material may be used for short term repairs but should be replaced with FAA P-401 hot mix asphalt or an equivalent DOT product.

E-6.1.5. Crack Repair/Sealing

The most common type of preventative maintenance, crack repair/sealing, is highly effective at extending pavement life by preventing moisture from seeping into the pavement section. Cracks of a more severe nature should be routed before sealing operations take place.

E-6.1.6. Surface Treatment/Rejuvenation



Application of a high quality, penetrating sealer to the surface of asphalt pavement. Patching and/or crack sealing may take place before the placement of sealer.

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E-6.2 RIGID PAVEMENT (PCC) WORK DESCRIPTIONS

E-6.2.1. Reconstruction



Reconstruction is recommended when pavements have deteriorated to the point where preventative maintenance techniques and pavement rehabilitation are no longer viable. The unit price assumes excavation of the existing pavement section down to subgrade, installation of a geotextile fabric membrane, 18-inches of P-209 base course material, and 17-inches of P-501 PCC material.

E-6.2.2. Surface Reconstruction



Surface reconstruction consists of the demolition of the top layer of concrete through rubbilization or a crack and seat process. Through this process, reflective crack is minimized and the pavement section retains its compacted state. A new surface layer of PCC is placed.

E-6.2.3. Slab Replacement/Full Depth Patching



Shattered slabs, scaling, and high-severity blowups usually necessitate this repair method. The unit price in this PMP includes sawcutting of the existing concrete, removal of the slab and subbase to subgrade, installation of 18-inches of new P-209 base material, and placement of new concrete at a depth of 17-inches.

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E-6.2.4. Partial Depth Patching

Partial depth patching of existing PCC is an effective method to treat a variety of distresses most notably joint spalling and corner spalling. Unit price assumes removal and replacement of concrete to a depth of 2-inches.



E-6.2.5. Joint Seal Repair/Replacement

The most common type of preventative maintenance, crack repair/sealing, is highly effective at extending pavement life by preventing moisture from seeping into the pavement section. Cracks of a more severe nature should be routed before sealing operations take place.



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ATTACHMENT E-7: 5 YEAR CIP

PCI Ratings Legend						
86-100	71-85	56-70	41-55	26-40	11-25	0-10

Legend

Construction Type $###.## Before: PCI #After: PCI#

Construction Type: StopGap, Preventative, or Major Below Critical
$###.##: Projected cost of project (via PAVER). All
Before: PCI# PCI number before (if any) rehabilitation
After: PCI# PCI number after (if any) rehabilitation
Color of square: Refer to PCI Ratings Legend (based off After: PCI#)

Branch/Section	2019	2020	2021	2022	2023
BGM DEICE DEICE	Do Nothing Before:50.01 After:50.01	Do Nothing Before:48.41 After:48.41	Do Nothing Before:44.82 After:44.82	Major Below Critical $114180.72 Before:42.23 After:100	Do Nothing Before:97 After:97
BGM HELI HELI1	Do Nothing Before:71.71 After:71.71	Do Nothing Before:68.7 After:68.7	Do Nothing Before:65.7 After:65.7	Preventive $410.23 Before:62.7 After:64.03	Preventive $463.33 Before:61.03 After:62.37
BGM HELI HELI2	Do Nothing Before:69.56 After:69.56	Do Nothing Before:62.45 After:62.45	StopGap $125.89 Before:55.36 After:55.36	Major Below Critical $13733.23 Before:48.27 After:100	Do Nothing Before:97 After:97
BGM N-APR N-APR	Do Nothing Before:82.69 After:82.69	Do Nothing Before:79.68 After:79.68	Do Nothing Before:76.68 After:76.68	Do Nothing Before:73.68 After:73.68	Do Nothing Before:70.68 After:70.68
BGM RWY 10-28 RW10-28-1	Major Below Critical $5297339.14 Before:49.9 After:100	Do Nothing Before:96.99 After:96.99	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Preventive $1145.52 Before:88 After:88.85
BGM RWY 10-28 RW10-28-2	Do Nothing Before:85.83 After:85.83	Do Nothing Before:82.82 After:82.82	Do Nothing Before:79.82 After:79.82	Preventiv[illegible]15 Before:76[illegible]2 After:77.9	Prever[illegible]$83[illegible].36 Befor[illegible]74[illegible]1 A[illegible]r:73.99
BGM RWY 10-28 RW10-28-3	Do Nothing Before:75.83 After:75.83	Do Nothing Before:72.82 After:72.82	Do Nothing Before:69.82 After:69.82	Preventive $3024.7 Before:66.82 After:68.15	Preventive $3509.81 Before:65.15 After:66.49
BGM RWY 10-28 RW10-28-4	Major Below Critical $1576570.46 Before:50.9 After:100	Do Nothing Before:96.99 After:96.99	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Preventive $340.93 Before:88 After:88.85
BGM RWY 16-34 RWY 16-34	Do Nothing Before:85.83 After:85.83	Do Nothing Before:82.82 After:82.82	Do Nothing Before:79.82 After:79.82	Do Nothing Before:76.82 After:76.82	Do Nothing Before:73.82 After:73.82
BGM RWY16 RWY16-1	StopGap $291.3 Before:39.85 After:39.85	StopGap $383.8 Before:37.02 After:37.02	StopGap $481.44 Before:34.19 After:34.19	Major Below Critical $98701.69 Before:31.37 After:100	Do Nothing Before:97 After:97
BGM RWY34 RWY34-1	Do Nothing Before:73.03 After:73.03	Do Nothing Before:71.76 After:71.76	Do Nothing Before:70.49 After:70.49	Preventive $2102.75 Before:69.22 After:69.41	Preventive $2380.47 Before:68.15 After:68.33
BGM RWY34 RWY34-2	Do Nothing Before:77.18 After:77.18	Do Nothing Before:76.11 After:76.11	Do Nothing Before:75.04 After:75.04	Preventive $1159.79 Before:73.97 After:74.11	Preventive $1324.68 Before:73.04 After:73.17
BGM TERM-APR TERM-APR1	Do Nothing Before:66.94 After:66.94	Do Nothing Before:62.94 After:62.94	StopGap $2003.26 Before:58.96 After:58.96	Major Below Critical $681774.51 Before:54.97 After:100	Do Nothing Before:97 After:97
BGM TERM-APR TERM-APR2	Do Nothing Before:83.47 After:83.47	Do Nothing Before:81.47 After:81.47	Do Nothing Before:79.48 After:79.48	Do Nothing Before:77.49 After:77.49	Do Nothing Before:75.5 After:75.5
BGM TERM-APR TERM-APR3	StopGap $108.05 Before:41.77 After:41.77	StopGap $186.36 Before:34.73 After:34.73	Do Nothing Before:27.71 After:27.71	Major Below Critical $42083.64 Before:20.69 After:100	Do Nothing Before:97 After:97
BGM TH-APR TH-APR1	Do Nothing Before:83.91 After:83.91	Do Nothing Before:81.35 After:81.35	Do Nothing Before:78.79 After:78.79	Do Nothing Before:76.23 After:76.23	Do Nothing Before:73.67 After:73.67
BGM TH-APR TH-APR2	Do Nothing Before:51.06 After:51.06	Do Nothing Before:48.52 After:48.52	Do Nothing Before:45.98 After:45.98	Major Below Critical $180404.88 Before:43.45 After:100	Do Nothing Before:97 After:97
BGM TWYA TWYA1	Do Nothing Before:75.16 After:75.16	Do Nothing Before:72.74 After:72.74	Do Nothing Before:70.33 After:70.33	Do Nothing Before:67.92 After:67.92	Do Nothing Before:65.51 After:65.51
BGM TWYA TWYA2	Do Nothing Before:67.59 After:67.59	Do Nothing Before:64.43 After:64.43	Do Nothing Before:61.28 After:61.28	Major Below Critical $300266.45 Before:58.14 After:100	Do Nothing Before:97 After:97
BGM TWYA TWYA3	StopGap $4260.7 Before:54.63 After:54.63	StopGap $4388.52 Before:50.21 After:50.21	Do Nothing Before:45.8 After:45.8	Major Below Critical $2250495.91 Before:41.4 After:100	Do Nothing Before:97 After:97

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BGM TWYA TWYA4	Do Nothing Before:82.83 After:82.83	Do Nothing Before:79.82 After:79.82	Do Nothing Before:76.82 After:76.82	Do Nothing Before:73.82 After:73.82	Do Nothing Before:70.82 After:70.82
BGM TWYB TWYB1	StopGap $196.36 Before:40.89 After:40.89	Do Nothing Before:38.11 After:38.11	Do Nothing Before:35.34 After:35.34	Major Below Critical $68669.07 Before:32.56 After:100	Do Nothing Before:97 After:97
BGM TWYB TWYB2	Do Nothing Before:76.83 After:76.83	Do Nothing Before:73.82 After:73.82	Do Nothing Before:70.82 After:70.82	Do Nothing Before:67.82 After:67.82	Do Nothing Before:64.82 After:64.82
BGM TWYC TWYC1	Do Nothing Before:84.83 After:84.83	Do Nothing Before:81.82 After:81.82	Do Nothing Before:78.82 After:78.82	Do Nothing Before:75.82 After:75.82	Do Nothing Before:72.82 After:72.82
BGM TWYD TWYD1	Do Nothing Before:62.72 After:62.72	StopGap $105.43 Before:59.71 After:59.71	StopGap $108.6 Before:56.71 After:56.71	Major Below Critical $38368.93 Before:53.71 After:100	Do Nothing Before:97 After:97
BGM TWYD TWYD2	Do Nothing Before:42.77 After:42.77	Do Nothing Before:37.2 After:37.2	Do Nothing Before:31.64 After:31.64	Major Below Critical $210808.84 Before:26.08 After:100	Do Nothing Before:97 After:97
BGM TWYD TWYD3	Do Nothing Before:91.83 After:91.83	Do Nothing Before:88.82 After:88.82	Do Nothing Before:85.82 After:85.82	Do Nothing Before:82.82 After:82.82	Do Nothing Before:79.82 After:79.82
BGM TWYE TWYE1	Do Nothing Before:66.51 After:66.51	Do Nothing Before:63.25 After:63.25	StopGap $212.1 Before:60 After:60	Major Below Critical $68317.32 Before:56.74 After:100	Do Nothing Before:97 After:97
BGM TWYF TWYF1	Do Nothing Before:64.74 After:64.74	Do Nothing Before:60.48 After:60.48	StopGap $1175.9 Before:56.23 After:56.23	Major Below Critical $436423.91 Before:51.98 After:100	Do Nothing Before:97 After:97
BGM TWYF TWYF2	StopGap $923.07 Before:29.77 After:29.77	Do Nothing Before:22.93 After:22.93	Do Nothing Before:16.11 After:16.11	Major Below Critical $150087.65 Before:9.29 After:100	Do Nothing Before:97 After:97
BGM TWYF TWYF3	Preventive $16.86 Before:88.83 After:89.68	Do Nothing Before:86.68 After:86.68	Do Nothing Before:83.68 After:83.68	Do Nothing Before:80.68 After:80.6	Do Nothing Before:77.68
BGM TWYG TWYG1	Do Nothing Before:57.04 After:57.04	Do Nothing Before:51.85 After:51.85	Do Nothing Before:46.67 After:46.67	Major Below Critical $285671.34 Before:41.49 After:100	Do Nothing Before:97 After:97
BGM TWYG TWYG2	StopGap $163.94 Before:55.71 After:55.71	StopGap $168.86 Before:51.4 After:51.4	StopGap $224.36 Before:47.1 After:47.1	Major Below Critical $83582.29 Before:42.8 After:100	Do Nothing Before:97 After:97
BGM TWYH TWYH1	Do Nothing Before:60.32 After:60.32	StopGap $53.54 Before:56.79 After:56.79	Major Below Critical $91749.14 Before:53.28 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94
BGM TWYH TWYH2	StopGap $591.29 Before:56.02 After:56.02	StopGap $609.02 Before:52.12 After:52.12	Major Below Critical $3078675.91 Before:48.23 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94
BGM TWYH TWYH3	Preventive $12.17 Before:88.83 After:89.68	Preventive $35.51 Before:86.68 After:87.53	Do Nothing Before:84.53 After:84.53	Preventive $96.14 Before:81.53 After:82.53	Do Nothing Before:79.53 After:79.53
BGM TWYH TWYH4	Do Nothing Before:94.83 After:94.83	Do Nothing Before:91.82 After:91.82	Do Nothing Before:88.82 After:88.82	Do Nothing Before:85.82 After:85.82	Do Nothing Before:82.82 After:82.82
BGM TWYH TWYH5	Major Below Critical $66554.72 Before:40.9 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88
BGM TWYJ TWYJ1	Do Nothing Before:92.83 After:92.83	Do Nothing Before:89.82 After:89.82	Do Nothing Before:86.82 After:86.82	Do Nothing Before:83.82 After:83.82	Do Nothing Before:80.82 After:80.82
BGM TWYK TWYK1	StopGap $745.23 Before:54.94 After:54.94	StopGap $767.59 Before:50.94 After:50.94	Major Below Critical $2778281.45 Before:46.95 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94
BGM TWYK TWYK2	Do Nothing Before:64.6 After:64.6	Do Nothing Before:61.46 After:61.46	Major Below Critical $51293.5 Before:58.32 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94
BGM TWYK TWYK3	Major Below Critical $46523.75 Before:52.9 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88
BGM TWYL TWYL1	StopGap $68.48 Before:52.8 After:52.8	StopGap $80.36 Before:48.61 After:48.61	Do Nothing Before:44.43 After:44.43	Major Below Critical $37201.39 Before:40.25 After:100	Do Nothing Before:97 After:97
BGM TWYM TWYM1	StopGap $65.3 Before:49.58 After:49.58	Do Nothing Before:45.1 After:45.1	Do Nothing Before:40.64 After:40.64	Major Below Critical $38193.11 Before:36.17 After:100	Do Nothing Before:97 After:97
BGM TWYP TWYP1	Major Below Critical $122986.01 Before:43.8 After:100	Do Nothing Before:96.99 After:96.99	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88

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BGM W-APR W-APR1	Do Nothing Before:75.63 After:75.63	Do Nothing Before:69.94 After:69.94	Do Nothing Before:64.26 After:64.26	Major Below Critical $768139.52 Before:58.59 After:100	Do Nothing Before:97 After:97
BGM W-APR W-APR2	Do Nothing Before:70.78 After:70.78	Do Nothing Before:63.95 After:63.95	Do Nothing Before:57.14 After:57.14	Major Below Critical $23209.79 Before:50.34 After:100	Do Nothing Before:97 After:97
Major Rehabilitation Cost:	$7,109,974.08	$0.00	$6,000,000.00	$5,890,314.19	$0.00
Major Rehabilitation Projects:	RW 10-28-1, RW 10-28-4, TWY P, TWY K-3, and TWY H-5	-	TWY H-1, TWY H-2, TWY K-1, and TWY K-2 (Includes expansion of TWY K)	RW 16 (End), W APR-1, W APR-2, HELI-2, TH APR-2, DEICE, TERM APR-1, TERM APR-3, TWY A-2, TWY A-3, TWY B-1, TWY D-1, TWY D-2, TWY E, TWY F-1, TWY F-2, TWY G-1, TWY G-2, TWY L, TWY M	-

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ATTACHMENT E-7: 5 YEAR CIP

PCI Ratings Legend						
86-100	71-85	56-70	41-55	26-40	11-25	0-10

Legend

Construction Type $###.## Before: PCI #After: PCI#

Construction Type: StopGap, Preventative, or Major Below Critical
$###.##: Projected cost of project (via PAVER). All
Before: PCI# PCI number before (if any) rehabilitation
After: PCI# PCI number after (if any) rehabilitation
Color of square: Refer to PCI Ratings Legend (based off After: PCI#)

Branch/Section	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
BGM DEICE DEICE	Do Nothing Before:50.01 After:50.01	Do Nothing Before:48.41 After:48.41	Do Nothing Before:44.82 After:44.82	Major Below Critical $114180.72 Before:42.23 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99	Do Nothing Before:75.99 After:75.99	Do Nothing Before:72.99 After:72.99	Do Nothing Before:69.98 After:69.98	Do Nothing Before:66.98 After:66.98	Do Nothing Before:63.98 After:63.98	Do Nothing Before:60.98 After:60.98	Major Below Critical $109557.42 Before:57.98 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94
BGM HELI HELI1	Do Nothing Before:71.71 After:71.71	Do Nothing Before:68.7 After:68.7	Do Nothing Before:65.7 After:65.7	Preventive $410.23 Before:62.7 After:64.03	Preventive $463.33 Before:61.03 After:62.37	Major Below Critical $14409.48 Before:59.36 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91.01 After:91.01	Preventive $11.31 Before:88 After:89.33	Do Nothing Before:86.33 After:86.33	Do Nothing Before:83.33 After:83.33	Do Nothing Before:80.33 After:80.33	Do Nothing Before:77.32 After:77.32	Do Nothing Before:74.32 After:74.32	Do Nothing Before:71.32 After:71.32	Do Nothing Before:68.32 After:68.32	Do Nothing Before:65.31 After:65.31	Do Nothing Before:62.31 After:62.31	Major Below Critical $21833.67 Before:59.31 After:100
BGM HELI HELI2	Do Nothing Before:69.56 After:69.56	Do Nothing Before:62.45 After:62.45	StopGap $125.89 Before:55.36 After:55.36	Major Below Critical $13733.23 Before:48.27 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99	Do Nothing Before:75.99 After:75.99	Preventive $170.06 Before:72.99 After:73.85	Preventive $214.78 Before:70.84 After:71.7	Do Nothing Before:68.7 After:68.7	Do Nothing Before:65.7 After:65.7	Preventive $435.31 Before:62.7 After:63.56	Do Nothing Before:60.55 After:60.55	Major Below Critical $16256.73 Before:57.55 After:100	Do Nothing Before:97 After:97
BGM N-APR N-APR	Do Nothing Before:82.69 After:82.69	Do Nothing Before:79.68 After:79.68	Do Nothing Before:76.68 After:76.68	Do Nothing Before:73.68 After:73.68	Do Nothing Before:70.68 After:70.68	Do Nothing Before:67.67 After:67.67	Do Nothing Before:64.67 After:64.67	Do Nothing Before:61.67 After:61.67	Major Below Critical $669483.49 Before:58.67 After:100	Do Nothing Before:96.99 After:96.99	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:84.99 After:84.99	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99	Do Nothing Before:75.99 After:75.99	Do Nothing Before:72.98 After:72.98	Do Nothing Before:69.98 After:69.98	Do Nothing Before:66.98 After:66.98
BGM RWY 10-28 RW10-28-1	Major Below Critical $5297339.14 Before:49.9 After:100	Do Nothing Before:96.99 After:96.99	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Preventive $1145.52 Before:88 After:88.85	Do Nothing Before:85.85 After:85.85	Do Nothing Before:82.85 After:82.85	Do Nothing Before:79.85 After:79.85	Do Nothing Before:76.85 After:76.85	Do Nothing Before:73.84 After:73.84	Do Nothing Before:70.84 After:70.84	Do Nothing Before:67.84 After:67.84	Do Nothing Before:64.84 After:64.84	Do Nothing Before:61.83 After:61.83	Major Below Critical $2247473.62 Before:58.84 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85
BGM RWY 10-28 RW10-28-2	Do Nothing Before:85.83 After:85.83	Do Nothing Before:82.82 After:82.82	Do Nothing Before:79.82 After:79.82	Preventive $603.15 Before:76.82 After:77.91	Preventive $830.36 Before:74.91 After:75.99	Preventive $1071.45 Before:72.99 After:73.98	Do Nothing Before:70.98 After:70.98	Preventive $1796.11 Before:67.98 After:68.98	Preventive $2158 Before:65.98 After:66.9	Preventive $2553.82 Before:63.89 After:64.81	Preventive $2970.24 Before:61.81 After:62.73	Major Below Critical $95057.8 Before:59.74 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Preventive $75.62 Before:88 After:88.92	Preventive $159.04 Before:85.92 After:86.84	Preventive $247.39 Before:83.84 After:84.76	Preventive $340.9 Before:81.76 After:82.68	Preventive $480.58 Before:79.68 After:80.6
BGM RWY 10-28 RW10-28-3	Do Nothing Before:75.83 After:75.83	Do Nothing Before:72.82 After:72.82	Do Nothing Before:69.82 After:69.82	Preventive $3024.7 Before:66.82 After:68.15	Preventive $3509.81 Before:65.15 After:66.49	Preventive $4021.76 Before:63.48 After:64.68	Preventive $4593.88 Before:61.68 After:62.88	Major Below Critical $145252.95 Before:59.88 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Preventive $116.13 Before:88 After:89.2	Preventive $227.54 Before:86.2 After:87.4	Preventive $346.1 Before:84.39 After:85.59	Preventive $469.8 Before:82.6 After:83.79	Preventive $601.83 Before:80.8 After:82	Preventive $943.6 Before:79 After:80.2	Do Nothing Before:77.19 After:77.19	Do Nothing Before:74.19 After:74.19	Preventive $3331.4 Before:71.19 After:71.94
BGM RWY 10-28 RW10-28-4	Major Below Critical $1576570.46 Before:50.9 After:100	Do Nothing Before:96.99 After:96.99	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Preventive $340.93 Before:88 After:88.85	Preventive $728.44 Before:85.85 After:86.7	Do Nothing Before:83.7 After:83.7	Preventive $1731.01 Before:80.71 After:81.5	Do Nothing Before:78.51 After:78.51	Do Nothing Before:75.5 After:75.5	Do Nothing Before:72.5 After:72.5	Do Nothing Before:69.5 After:69.5	Do Nothing Before:66.5 After:66.5	Do Nothing Before:63.49 After:63.49	Do Nothing Before:60.49 After:60.49	Major Below Critical $720847.03 Before:57.49 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88
BGM RWY 16-34 RWY 16-34	Do Nothing Before:85.83 After:85.83	Do Nothing Before:82.82 After:82.82	Do Nothing Before:79.82 After:79.82	Do Nothing Before:76.82 After:76.82	Do Nothing Before:73.82 After:73.82	Do Nothing Before:70.81 After:70.81	Do Nothing Before:67.81 After:67.81	Do Nothing Before:64.81 After:64.81	Do Nothing Before:61.81 After:61.81	Major Below Critical $4733551.22 Before:58.81 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91.01 After:91.01	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Do Nothing Before:82 After:82	Do Nothing Before:79 After:79	Do Nothing Before:75.99 After:75.99	Do Nothing Before:72.99 After:72.99	Do Nothing Before:69.99 After:69.99
BGM RWY16 RWY16-1	StopGap $291.3 Before:39.85 After:39.85	StopGap $383.8 Before:37.02 After:37.02	StopGap $481.44 Before:34.19 After:34.19	Major Below Critical $98701.69 Before:31.37 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Preventive $35.25 Before:88 After:88.85	Preventive $75.15 Before:85.86 After:86.71	Preventive $117.94 Before:83.7 After:84.56	Preventive $162.68 Before:81.56 After:82.41	Preventive $244.7 Before:79.42 After:80.27	Preventive $428.05 Before:77.27 After:78.13	Preventive $621.99 Before:75.12 After:75.98	Preventive $826.57 Before:72.98 After:73.83	Do Nothing Before:70.83 After:70.83	Preventive $1399.98 Before:67.84 After:68.58	Do Nothing Before:65.58 After:65.58	Do Nothing Before:62.58 After:62.58	Major Below Critical $71512.63 Before:59.58 After:100
BGM RWY34 RWY34-1	Do Nothing Before:73.03 After:73.03	Do Nothing Before:71.76 After:71.76	Do Nothing Before:70.49 After:70.49	Preventive $2102.75 Before:69.22 After:69.41	Preventive $2380.47 Before:68.15 After:68.33	Preventive $2677.97 Before:67.06 After:67.25	Preventive $2986.02 Before:65.98 After:66.17	Preventive $3312.59 Before:64.91 After:65.09	Preventive $3656.07 Before:63.83 After:64.02	Preventive $4017.61 Before:62.75 After:62.93	Preventive $4399.79 Before:61.66 After:61.84	Preventive $4800.81 Before:60.57 After:60.76	Major Below Critical $145114.9 Before:59.49 After:100	Do Nothing Before:96.99 After:96.99	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Preventive $114.43 Before:88 After:88.43	Preventive $270.26 Before:85.42 After:85.85	Do Nothing Before:82.85 After:82.85	Preventive $663.58 Before:79.85 After:80.71
BGM RWY34 RWY34-2	Do Nothing Before:77.18 After:77.18	Do Nothing Before:76.11 After:76.11	Do Nothing Before:75.04 After:75.04	Preventive $1159.79 Before:73.97 After:74.11	Preventive $1324.68 Before:73.04 After:73.17	Preventive $1500.09 Before:72.1 After:72.24	Preventive $1683.11 Before:71.17 After:71.3	Preventive $1877.53 Before:70.23 After:70.37	Preventive $2109.93 Before:69.29 After:69.43	Preventive $2364.01 Before:68.35 After:68.48	Do Nothing Before:67.41 After:67.41	Preventive $2940.77 Before:66.34 After:66.47	Preventive $3237.46 Before:65.4 After:65.53	Preventive $3549.31 Before:64.46 After:64.59	Preventive $3876.52 Before:63.52 After:63.65	Preventive $4220.62 Before:62.58 After:62.71	Preventive $4582.33 Before:61.64 After:61.77	Preventive $4961 Before:60.7 After:60.83	Major Below Critical $149537.39 Before:59.76 After:100	Do Nothing Before:97 After:97
BGM TERM-APR TERM-APR1	Do Nothing Before:66.94 After:66.94	Do Nothing Before:62.94 After:62.94	StopGap $2003.26 Before:58.96 After:58.96	Major Below Critical $681774.51 Before:54.97 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99	Do Nothing Before:75.99 After:75.99	Do Nothing Before:72.99 After:72.99	Do Nothing Before:69.98 After:69.98	Do Nothing Before:66.98 After:66.98	Do Nothing Before:63.98 After:63.98	Do Nothing Before:60.98 After:60.98	Major Below Critical $937266.68 Before:57.98 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94
BGM TERM-APR TERM-APR2	Do Nothing Before:83.47 After:83.47	Do Nothing Before:81.47 After:81.47	Do Nothing Before:79.48 After:79.48	Do Nothing Before:77.49 After:77.49	Do Nothing Before:75.5 After:75.5	Do Nothing Before:73.5 After:73.5	Do Nothing Before:71.51 After:71.51	Do Nothing Before:69.52 After:69.52	Do Nothing Before:67.53 After:67.53	Do Nothing Before:65.53 After:65.53	Do Nothing Before:63.54 After:63.54	Do Nothing Before:61.55 After:61.55	Major Below Critical $487555.87 Before:59.56 After:100	Do Nothing Before:96.99 After:96.99	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:84.99 After:84.99	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99
BGM TERM-APR TERM-APR3	StopGap $108.05 Before:41.77 After:41.77	StopGap $186.36 Before:34.73 After:34.73	Do Nothing Before:27.71 After:27.71	Major Below Critical $42083.64 Before:20.69 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99	Do Nothing Before:75.99 After:75.99	Do Nothing Before:72.99 After:72.99	Do Nothing Before:69.98 After:69.98	Do Nothing Before:66.98 After:66.98	Do Nothing Before:63.98 After:63.98	Do Nothing Before:60.98 After:60.98	Major Below Critical $29398.9 Before:57.98 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94
BGM TH-APR TH-APR1	Do Nothing Before:83.91 After:83.91	Do Nothing Before:81.35 After:81.35	Do Nothing Before:78.79 After:78.79	Do Nothing Before:76.23 After:76.23	Do Nothing Before:73.67 After:73.67	Do Nothing Before:71.11 After:71.11	Do Nothing Before:68.55 After:68.55	Do Nothing Before:65.99 After:65.99	Do Nothing Before:63.43 After:63.43	Do Nothing Before:60.87 After:60.87	Major Below Critical $354798.05 Before:58.31 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Do Nothing Before:82 After:82	Do Nothing Before:78.99 After:78.99	Do Nothing Before:75.99 After:75.99	Do Nothing Before:72.99 After:72.99
BGM TH-APR TH-APR2	Do Nothing Before:51.06 After:51.06	Do Nothing Before:48.52 After:48.52	Do Nothing Before:45.98 After:45.98	Major Below Critical $180404.88 Before:43.45 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99	Do Nothing Before:75.99 After:75.99	Do Nothing Before:72.99 After:72.99	Do Nothing Before:69.98 After:69.98	Do Nothing Before:66.98 After:66.98	Do Nothing Before:63.98 After:63.98	Do Nothing Before:60.98 After:60.98	Major Below Critical $178626.22 Before:57.98 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94
BGM TWYA TWYA1	Do Nothing Before:75.16 After:75.16	Do Nothing Before:72.74 After:72.74	Do Nothing Before:70.33 After:70.33	Do Nothing Before:67.92 After:67.92	Do Nothing Before:65.51 After:65.51	Do Nothing Before:63.09 After:63.09	Do Nothing Before:60.68 After:60.68	Major Below Critical $165416.63 Before:58.26 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99	Do Nothing Before:75.99 After:75.99	Do Nothing Before:72.99 After:72.99	Do Nothing Before:69.98 After:69.98	Do Nothing Before:66.98 After:66.98	Do Nothing Before:63.98 After:63.98
BGM TWYA TWYA2	Do Nothing Before:67.59 After:67.59	Do Nothing Before:64.43 After:64.43	Do Nothing Before:61.28 After:61.28	Major Below Critical $300266.45 Before:58.14 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99	Do Nothing Before:75.99 After:75.99	Do Nothing Before:72.99 After:72.99	Do Nothing Before:69.98 After:69.98	Do Nothing Before:66.98 After:66.98	Do Nothing Before:63.98 After:63.98	Do Nothing Before:60.98 After:60.98	Major Below Critical $456613.28 Before:57.98 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94
BGM TWYA TWYA3	StopGap $4260.7 Before:54.63 After:54.63	StopGap $4388.52 Before:50.21 After:50.21	Do Nothing Before:45.8 After:45.8	Major Below Critical $2250495.91 Before:41.4 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99	Do Nothing Before:75.99 After:75.99	Do Nothing Before:72.99 After:72.99	Do Nothing Before:69.98 After:69.98	Do Nothing Before:66.98 After:66.98	Do Nothing Before:63.98 After:63.98	Do Nothing Before:60.98 After:60.98	Major Below Critical $2114860.05 Before:57.98 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94
BGM TWYA TWYA4	Do Nothing Before:82.83 After:82.83	Do Nothing Before:79.82 After:79.82	Do Nothing Before:76.82 After:76.82	Do Nothing Before:73.82 After:73.82	Do Nothing Before:70.82 After:70.82	Do Nothing Before:67.81 After:67.81	Do Nothing Before:64.81 After:64.81	Do Nothing Before:61.81 After:61.81	Major Below Critical $96613.39 Before:58.81 After:100	Do Nothing Before:96.99 After:96.99	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:84.99 After:84.99	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99	Do Nothing Before:75.99 After:75.99	Do Nothing Before:72.98 After:72.98	Do Nothing Before:69.98 After:69.98	Do Nothing Before:66.98 After:66.98
BGM TWYB TWYB1	StopGap $196.36 Before:40.89 After:40.89	Do Nothing Before:38.11 After:38.11	Do Nothing Before:35.34 After:35.34	Major Below Critical $68669.07 Before:32.56 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99	Do Nothing Before:75.99 After:75.99	Do Nothing Before:72.99 After:72.99	Do Nothing Before:69.98 After:69.98	Do Nothing Before:66.98 After:66.98	Do Nothing Before:63.98 After:63.98	Do Nothing Before:60.98 After:60.98	Major Below Critical $50982.9 Before:57.98 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94
BGM TWYB TWYB2	Do Nothing Before:76.83 After:76.83	Do Nothing Before:73.82 After:73.82	Do Nothing Before:70.82 After:70.82	Do Nothing Before:67.82 After:67.82	Do Nothing Before:64.82 After:64.82	Do Nothing Before:61.81 After:61.81	Major Below Critical $30417.46 Before:58.82 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Do Nothing Before:82 After:82	Do Nothing Before:78.99 After:78.99	Do Nothing Before:75.99 After:75.99	Do Nothing Before:72.99 After:72.99	Do Nothing Before:69.99 After:69.99	Do Nothing Before:66.98 After:66.98	Do Nothing Before:63.98 After:63.98	Do Nothing Before:60.98 After:60.98
BGM TWYC TWYC1	Do Nothing Before:84.83 After:84.83	Do Nothing Before:81.82 After:81.82	Do Nothing Before:78.82 After:78.82	Do Nothing Before:75.82 After:75.82	Do Nothing Before:72.82 After:72.82	Do Nothing Before:69.81 After:69.81	Do Nothing Before:66.81 After:66.81	Do Nothing Before:63.81 After:63.81	Do Nothing Before:60.81 After:60.81	Major Below Critical $56427.68 Before:57.81 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91.01 After:91.01	Preventive $42.02 Before:88 After:88.85	Preventive $89.58 Before:85.86 After:86.71	Preventive $140.37 Before:83.71 After:84.57	Do Nothing Before:81.57 After:81.57	Do Nothing Before:78.56 After:78.56	Do Nothing Before:75.56 After:75.56	Do Nothing Before:72.56 After:72.56
BGM TWYD TWYD1	Do Nothing Before:62.72 After:62.72	StopGap $105.43 Before:59.71 After:59.71	StopGap $108.6 Before:56.71 After:56.71	Major Below Critical $38368.93 Before:53.71 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99	Do Nothing Before:75.99 After:75.99	Do Nothing Before:72.99 After:72.99	Do Nothing Before:69.98 After:69.98	Do Nothing Before:66.98 After:66.98	Do Nothing Before:63.98 After:63.98	Do Nothing Before:60.98 After:60.98	Major Below Critical $50809.24 Before:57.98 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94
BGM TWYD TWYD2	Do Nothing Before:42.77 After:42.77	Do Nothing Before:37.2 After:37.2	Do Nothing Before:31.64 After:31.64	Major Below Critical $210808.84 Before:26.08 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99	Do Nothing Before:75.99 After:75.99	Do Nothing Before:72.99 After:72.99	Do Nothing Before:69.98 After:69.98	Do Nothing Before:66.98 After:66.98	Do Nothing Before:63.98 After:63.98	Do Nothing Before:60.98 After:60.98	Major Below Critical $147267.4 Before:57.98 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94
BGM TWYD TWYD3	Do Nothing Before:91.83 After:91.83	Do Nothing Before:88.82 After:88.82	Do Nothing Before:85.82 After:85.82	Do Nothing Before:82.82 After:82.82	Do Nothing Before:79.82 After:79.82	Do Nothing Before:76.81 After:76.81	Do Nothing Before:73.81 After:73.81	Do Nothing Before:70.81 After:70.81	Do Nothing Before:67.81 After:67.81	Do Nothing Before:64.8 After:64.8	Do Nothing Before:61.8 After:61.8	Major Below Critical $57597.94 Before:58.8 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99	Do Nothing Before:75.99 After:75.99
BGM TWYE TWYE1	Do Nothing Before:66.51 After:66.51	Do Nothing Before:63.25 After:63.25	StopGap $212.1 Before:60 After:60	Major Below Critical $68317.32 Before:56.74 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99	Do Nothing Before:75.99 After:75.99	Do Nothing Before:72.99 After:72.99	Do Nothing Before:69.98 After:69.98	Do Nothing Before:66.98 After:66.98	Do Nothing Before:63.98 After:63.98	Do Nothing Before:60.98 After:60.98	Major Below Critical $99236.79 Before:57.98 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94
BGM TWYF TWYF1	Do Nothing Before:64.74 After:64.74	Do Nothing Before:60.48 After:60.48	StopGap $1175.9 Before:56.23 After:56.23	Major Below Critical $436423.91 Before:51.98 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99	Do Nothing Before:75.99 After:75.99	Do Nothing Before:72.99 After:72.99	Do Nothing Before:69.98 After:69.98	Do Nothing Before:66.98 After:66.98	Do Nothing Before:63.98 After:63.98	Do Nothing Before:60.98 After:60.98	Major Below Critical $550168.77 Before:57.98 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94
BGM TWYF TWYF2	StopGap $923.07 Before:29.77 After:29.77	Do Nothing Before:22.93 After:22.93	Do Nothing Before:16.11 After:16.11	Major Below Critical $150087.65 Before:9.29 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Preventive $220.54 Before:82 After:82.85	Do Nothing Before:79.85 After:79.85	Do Nothing Before:76.85 After:76.85	Do Nothing Before:73.85 After:73.85	Do Nothing Before:70.84 After:70.84	Do Nothing Before:67.84 After:67.84	Do Nothing Before:64.84 After:64.84	Do Nothing Before:61.84 After:61.84	Major Below Critical $101844.96 Before:58.84 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94
BGM TWYF TWYF3	Preventive $16.86 Before:88.83 After:89.68	Do Nothing Before:86.68 After:86.68	Do Nothing Before:83.68 After:83.68	Do Nothing Before:80.68 After:80.68	Do Nothing Before:77.68 After:77.68	Do Nothing Before:74.67 After:74.67	Do Nothing Before:71.67 After:71.67	Do Nothing Before:68.67 After:68.67	Do Nothing Before:65.67 After:65.67	Do Nothing Before:62.66 After:62.66	Major Below Critical $54821.43 Before:59.67 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Preventive $43.5 Before:88 After:88.85	Do Nothing Before:85.86 After:85.86	Do Nothing Before:82.86 After:82.86	Do Nothing Before:79.85 After:79.85	Do Nothing Before:76.85 After:76.85	Do Nothing Before:73.85 After:73.85
BGM TWYG TWYG1	Do Nothing Before:57.04 After:57.04	Do Nothing Before:51.85 After:51.85	Do Nothing Before:46.67 After:46.67	Major Below Critical $285671.34 Before:41.49 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99	Do Nothing Before:75.99 After:75.99	Do Nothing Before:72.99 After:72.99	Do Nothing Before:69.98 After:69.98	Do Nothing Before:66.98 After:66.98	Do Nothing Before:63.98 After:63.98	Do Nothing Before:60.98 After:60.98	Major Below Critical $269055.75 Before:57.98 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94
BGM TWYG TWYG2	StopGap $163.94 Before:55.71 After:55.71	StopGap $168.86 Before:51.4 After:51.4	StopGap $224.36 Before:47.1 After:47.1	Major Below Critical $83582.29 Before:42.8 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99	Do Nothing Before:75.99 After:75.99	Preventive $889.34 Before:72.99 After:73.85	Do Nothing Before:70.84 After:70.84	Do Nothing Before:67.84 After:67.84	Do Nothing Before:64.84 After:64.84	Do Nothing Before:61.84 After:61.84	Major Below Critical $79042.98 Before:58.84 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94
BGM TWYH TWYH1	Do Nothing Before:60.32 After:60.32	StopGap $53.54 Before:56.79 After:56.79	Major Below Critical $91749.14 Before:53.28 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99	Do Nothing Before:75.99 After:75.99	Do Nothing Before:72.99 After:72.99	Do Nothing Before:69.98 After:69.98	Do Nothing Before:66.98 After:66.98	Do Nothing Before:63.98 After:63.98	Do Nothing Before:60.98 After:60.98	Major Below Critical $25801.57 Before:57.98 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91.01 After:91.01
BGM TWYH TWYH2	StopGap $591.29 Before:56.02 After:56.02	StopGap $609.02 Before:52.12 After:52.12	Major Below Critical $3078675.91 Before:48.23 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99	Do Nothing Before:75.99 After:75.99	Do Nothing Before:72.99 After:72.99	Do Nothing Before:69.98 After:69.98	Do Nothing Before:66.98 After:66.98	Do Nothing Before:63.98 After:63.98	Do Nothing Before:60.98 After:60.98	Major Below Critical $293492.81 Before:57.98 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91.01 After:91.01
BGM TWYH TWYH3	Preventive $12.17 Before:88.83 After:89.68	Preventive $35.51 Before:86.68 After:87.53	Do Nothing Before:84.53 After:84.53	Preventive $96.14 Before:81.53 After:82.53	Do Nothing Before:79.53 After:79.53	Do Nothing Before:76.52 After:76.52	Preventive $445.8 Before:73.52 After:74.44	Preventive $565.59 Before:71.44 After:72.36	Do Nothing Before:69.37 After:69.37	Do Nothing Before:66.36 After:66.36	Preventive $1162.23 Before:63.36 After:64.22	Do Nothing Before:61.22 After:61.22	Major Below Critical $44136.26 Before:58.22 After:100	Do Nothing Before:96.99 After:96.99	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Preventive $85.88 Before:85 After:85.85	Do Nothing Before:82.85 After:82.85	Do Nothing Before:79.85 After:79.85
BGM TWYH TWYH4	Do Nothing Before:94.83 After:94.83	Do Nothing Before:91.82 After:91.82	Do Nothing Before:88.82 After:88.82	Do Nothing Before:85.82 After:85.82	Do Nothing Before:82.82 After:82.82	Do Nothing Before:79.81 After:79.81	Do Nothing Before:76.81 After:76.81	Do Nothing Before:73.81 After:73.81	Do Nothing Before:70.81 After:70.81	Do Nothing Before:67.8 After:67.8	Do Nothing Before:64.8 After:64.8	Do Nothing Before:61.8 After:61.8	Major Below Critical $39550.58 Before:58.8 After:100	Do Nothing Before:96.99 After:96.99	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:84.99 After:84.99	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99
BGM TWYH TWYH5	Major Below Critical $66554.72 Before:40.9 After:100	Do Nothing Before:97 After:97	Do Nothing Before:94 After:94	Do Nothing Before:91 After:91	Do Nothing Before:88 After:88	Do Nothing Before:85 After:85	Do Nothing Before:81.99 After:81.99	Do Nothing Before:78.99 After:78.99	Preventive $353.13 Before:75.99 After:76.85	Do Nothing Before:73.85 After:73.85	Do Nothing Before:70.84 After:70.84	Do Nothing Before:67.84 After:67.84	Do Nothing Before:64.84 After:64.84	Do Nothing Before:61.84 After:61.84	Major Below Critical $47233 Before:58.84 After:100	Do Nothing Before:97

ATTACHMENT E-9: Recent Grant History

Fiscal Year	Service Level (or State Project)	State	Location Identifier	Airport Name	Grant Sequence Number	AIP Federal Funds	Work Description	Pavement Included	Hub Type
2007	P	NY	BGM	Greater Binghamton/Edwin A Link Field	47	$272,080	Rehabilitate Taxiway	Design Only	N
2008	P	NY	BGM	Greater Binghamton/Edwin A Link Field	54	$585,993	Rehabilitate Taxiway		N
2008	P	NY	BGM	Greater Binghamton/Edwin A Link Field	52	$7,901,674	Rehabilitate Taxiway	Taxiway A (Reconstruct and Shift from TW B to TW F, Construct new From TW F to TW H, and Reconstruct and Shift from TW H to TW RW 34 end)	N
2009	P	NY	BGM	Greater Binghamton/Edwin A Link Field	56	$310,790	Improve Runway Safety Area - 16/34	Environmental Only	N
2009	P	NY	BGM	Greater Binghamton/Edwin A Link Field	58	$635,585	Improve Runway Safety Area - 16/34		N
2010	P	NY	BGM	Greater Binghamton/Edwin A Link Field	60	$760,000	Improve Runway Safety Area - 16/34	Design Only	N
2010	P	NY	BGM	Greater Binghamton/Edwin A Link Field	59	$3,816,350	Rehabilitate Apron	Terminal Apron Construction	N
2011	P	NY	BGM	Greater Binghamton/Edwin A Link Field	61	$12,312,938	Improve Runway Safety Area - 16/34	RW 34 RSA Improvements (and extension)	N
2012	P	NY	BGM	Greater Binghamton/Edwin A Link Field	62	$855,310	Rehabilitate Apron	North Apron Ph 1	N
2013	P	NY	BGM	Greater Binghamton/Edwin A Link Field	64	$2,606,573	Rehabilitate Apron	West Apron Construction	N
2014	P	NY	BGM	Greater Binghamton/Edwin A Link Field	67	$213,750	Rehabilitate Apron	Design Only	N
2015	P	NY	BGM	Greater Binghamton/Edwin A Link Field	68	$1,354,208	Rehabilitate Apron	North Apron Ph 2	N
2016	P	NY	BGM	Greater Binghamton/Edwin A Link Field	69	$10,705,035	Rehabilitate Runway [RW 16 Touchdown Zone] - 16/34, Rehabilitate Runway - 16/34, Rehabilitate Runway Lighting - 16/34	Runway 16/34 and Taxiway Tie-In's	N
2017	P	NY	BGM	Greater Binghamton/Edwin A Link Field	71	$375,305	Rehabilitate Runway - 10/28	Design Only	N

Notes about the Data

The grant data are generated at the end of each fiscal year and will not reflect subsequent grant amendments. This data will not reflect any funding or project amendments. Airport locations that received funds as part of a State Block Grant Program (SBGP) may have also received grants directly from the FAA prior to inclusion into the SBGP---specifically during periods when the airport was designated as a primary airport and/or opted out of the SBGP. Because of this the data available from this tool may not necessarily be complete for States participating in the SBGP.

F. Runway Length Analysis Charts

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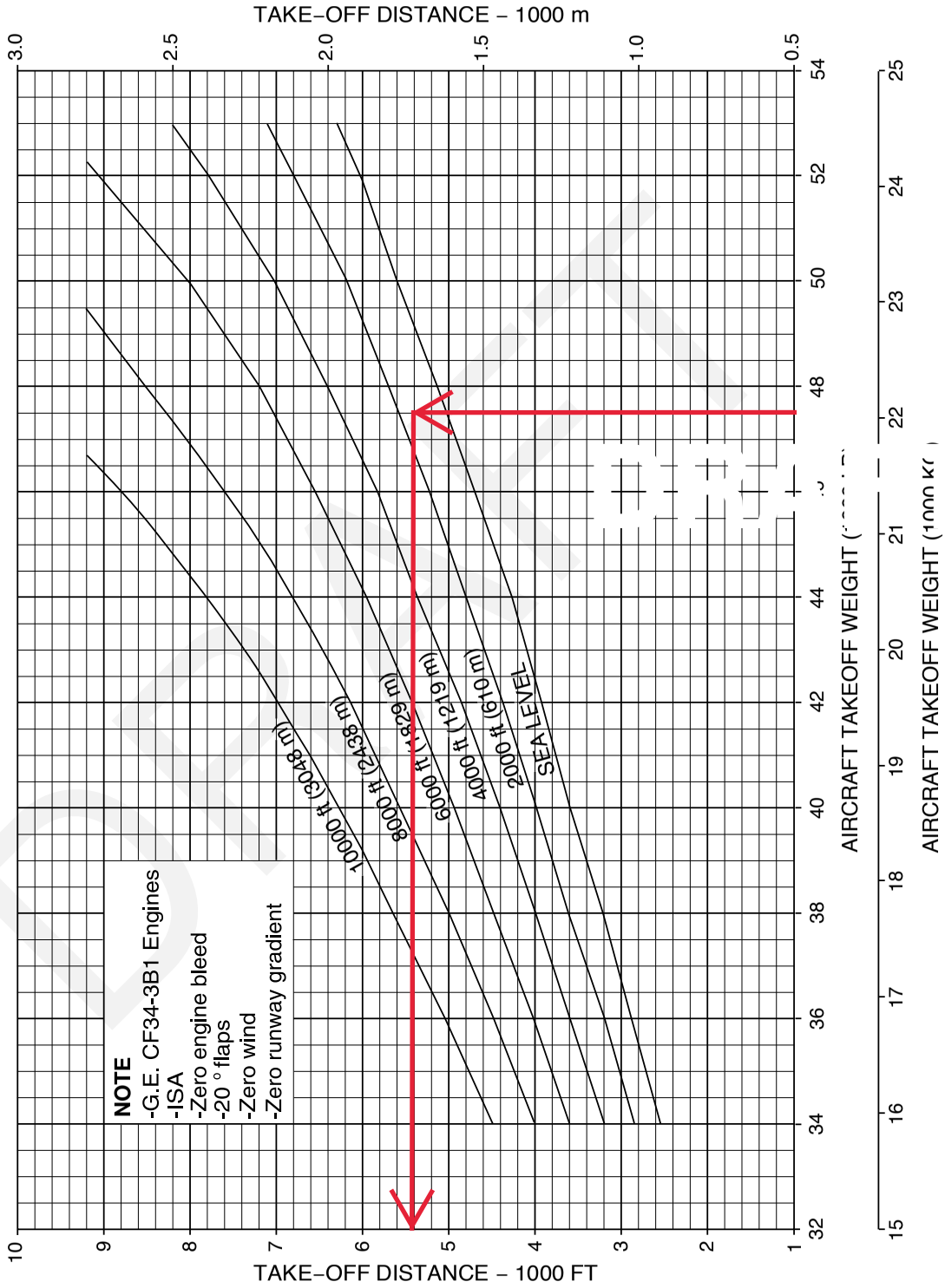
Usable Fuel.	The usable fuel available for the aircraft engines.

C. General Airplane Characteristics

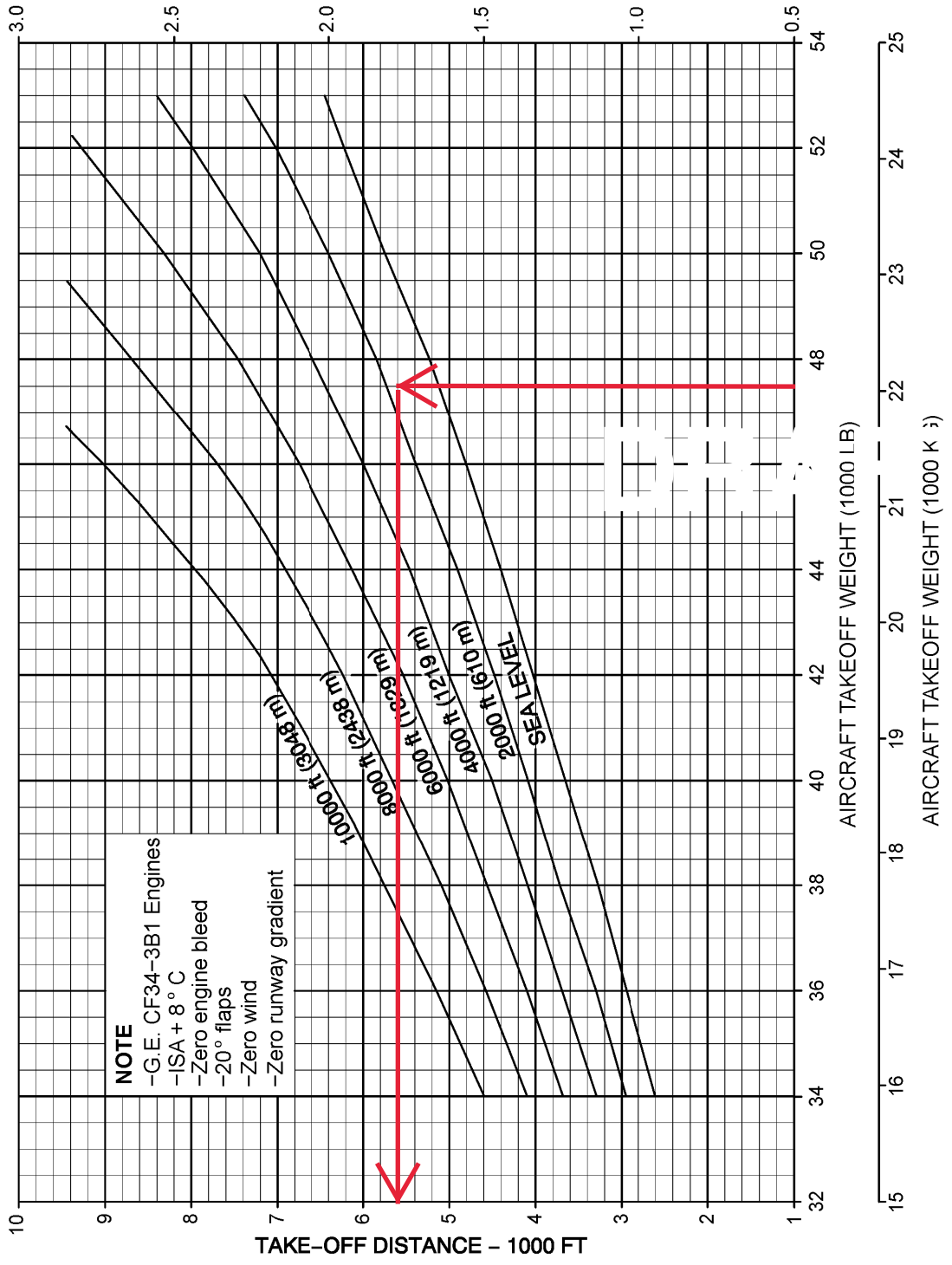
Table 1 – Aircraft Characteristics

Model CL–600–2B19		CRJ100/200	CRJ100 ER	CRJ100 LR	CRJ200 ER	CRJ200 LR
Engines		2 GE CF34 –3A1/–3B1	2 GE CF34 –3A1	2 GE CF34 –3A1	2 GE CF34 –3B1	2 GE CF34 –3B1
Mode		Passenger	Passenger	Passenger	Passenger	Passenger
Maximum Seating Capacity		50	50	50	50	50
Maximum Design Taxi Weight (MTW)	Pounds Kilograms	47700 21636	51250 23247	53250 24154	51 50 23247	53 0 24154
Maximum Design Landing Weight (MLW)	Pounds Kilograms	44700 20276	47000 21319	47000 21319	47000 21319	47000 21319
Maximum Design Take–Off Weight (MTOW)	Pounds Kilograms	47450 21523	51000 23133	53000 24041	51000 23133	53000 24041
Operating Empty Weight (OWE)	Pounds Kilograms	30500 13835	30500 13835	30500 13835	30500 13835	30500 13835
Maximum Design Zero Fuel Weight (MZFW)	Pounds Kilograms	42200 19142	44000 19958	44000 19958	44000 19958	44000 19958
Usable Fuel	US Gallons Liters	1400 5300	2135 8081	2135 8081	2135 8081	2135 8081
Maximum Payload [1]	Pounds Kilograms	11700 5307	13500 6124	13500 6124	13500 6124	13500 6124

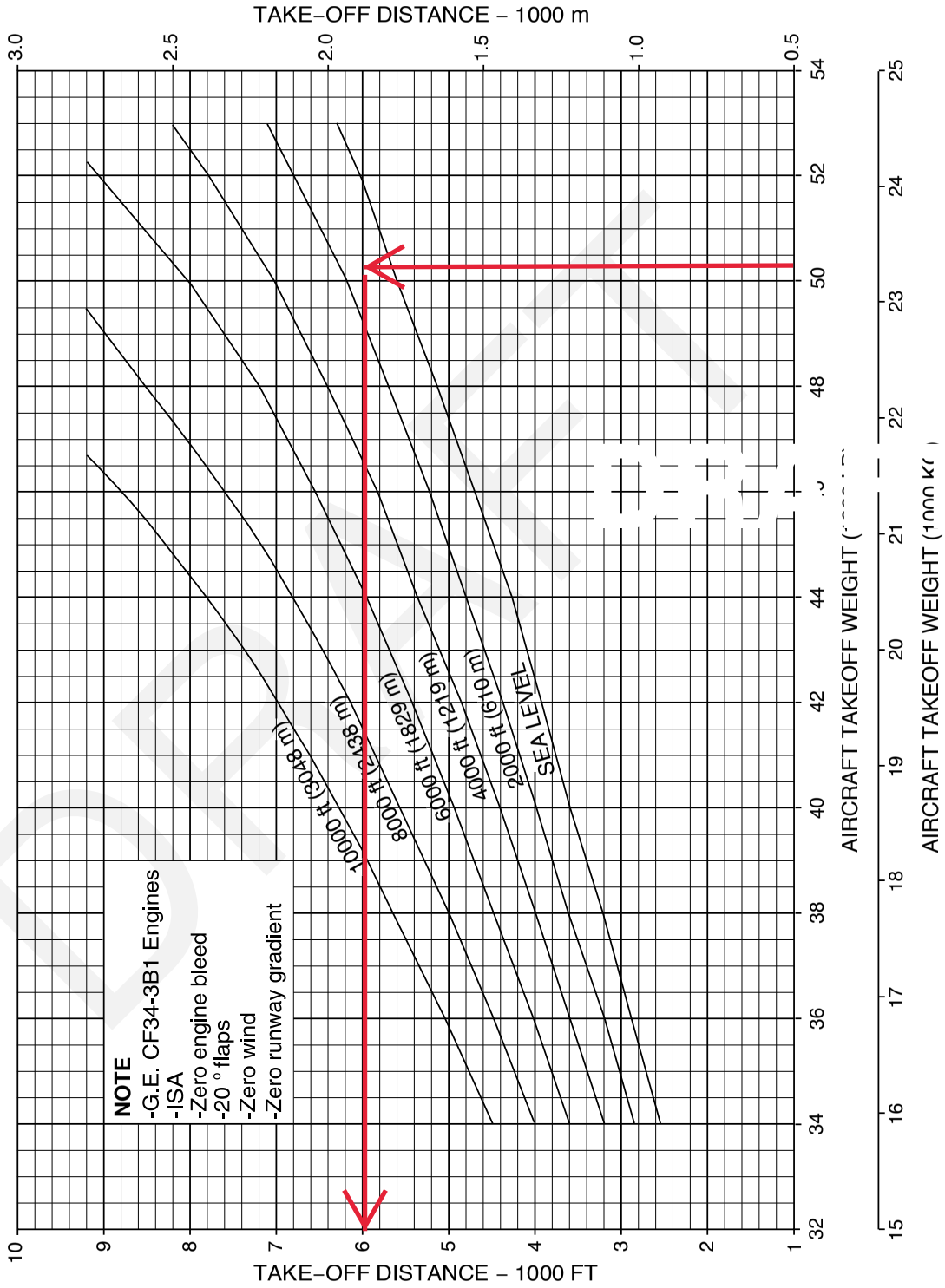
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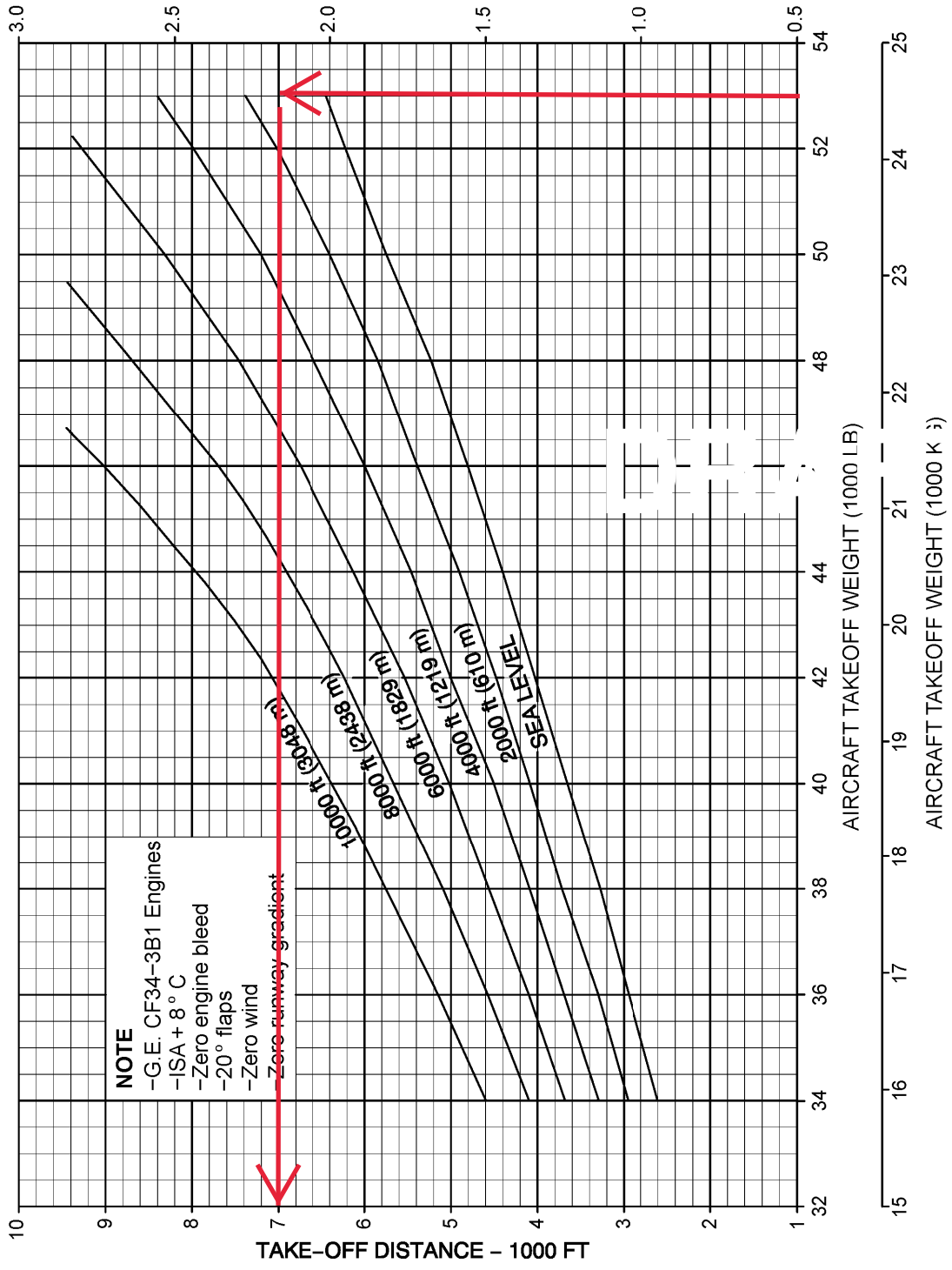
FAR Takeoff Runway Length Requirements – ISA Conditions – CRJ200
Figure 10



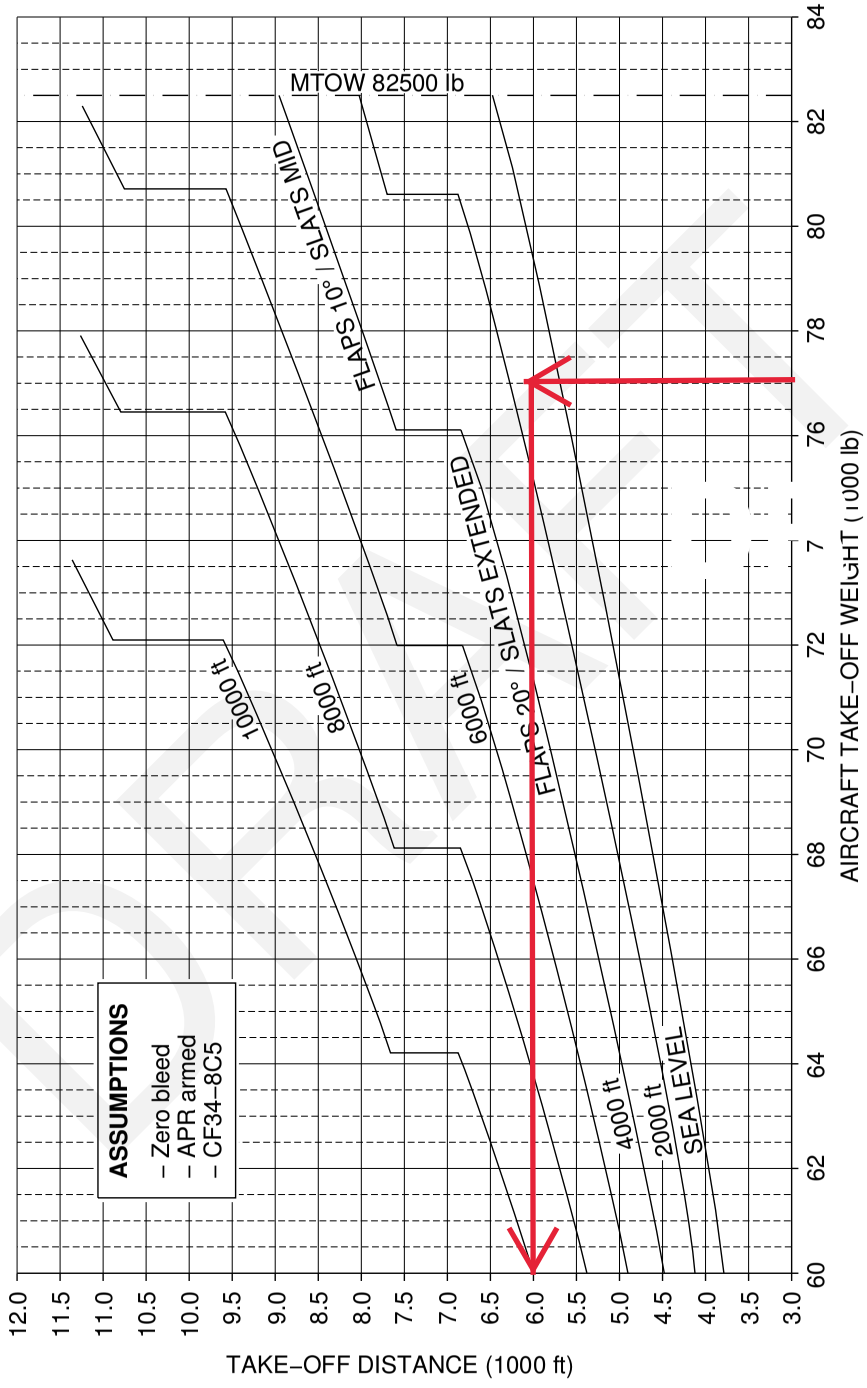
FAR Takeoff Runway Length Requirements – ISA + 15 C – CRJ200
Figure 14



FAR Takeoff Runway Length Requirements – ISA Conditions – CRJ200
Figure 10

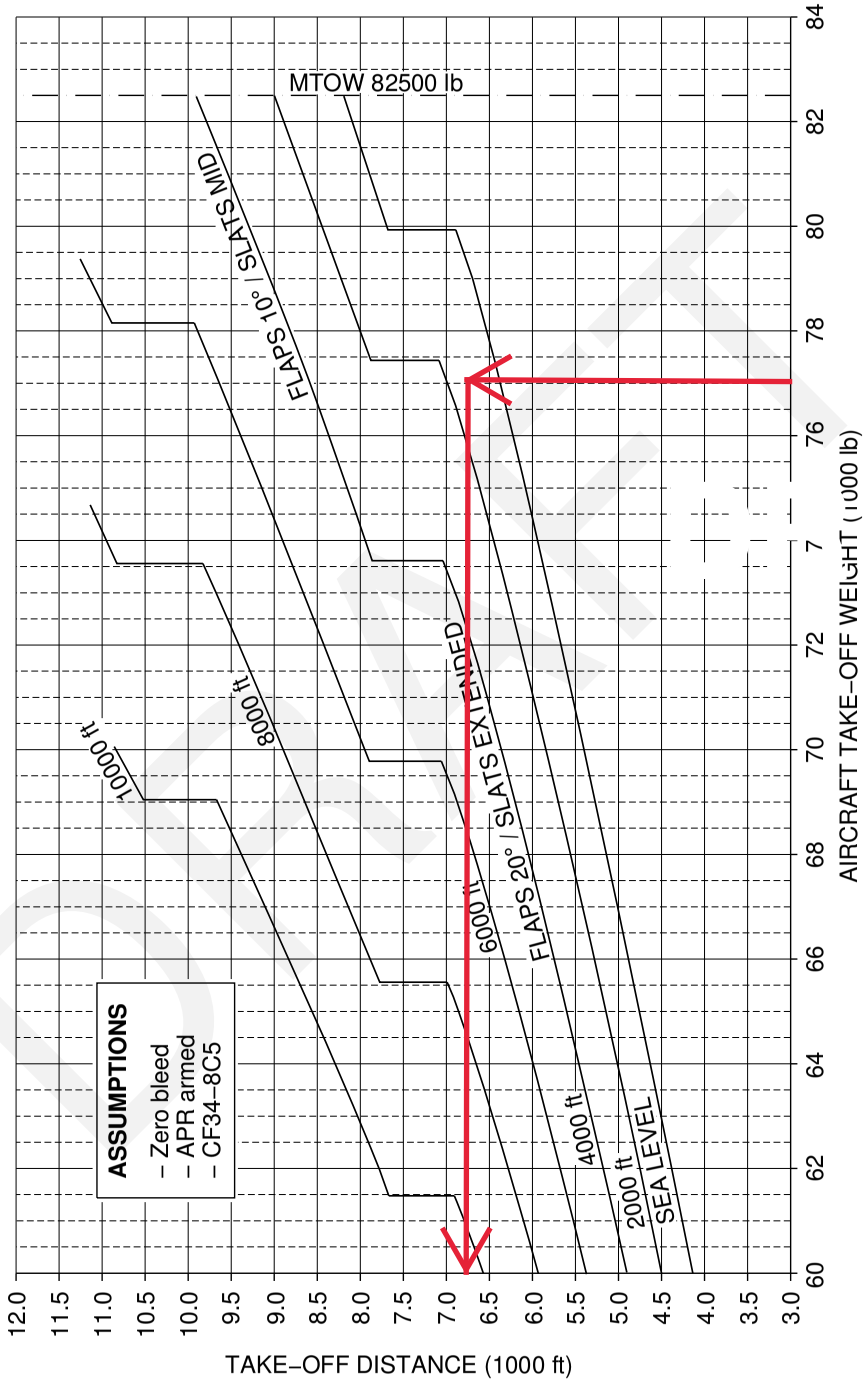


FAR Takeoff Runway Length Requirements – ISA + 15 C – CRJ200
Figure 14



CRJ–900

Take–Off Field Length – ISA
Figure 1



CRJ–900

Take–Off Field Length – ISA + 20 Degrees C
Figure 3

Figure 2-2. Small Airplanes Having 10 or More Passenger Seats
(Excludes Pilot and Co-pilot)

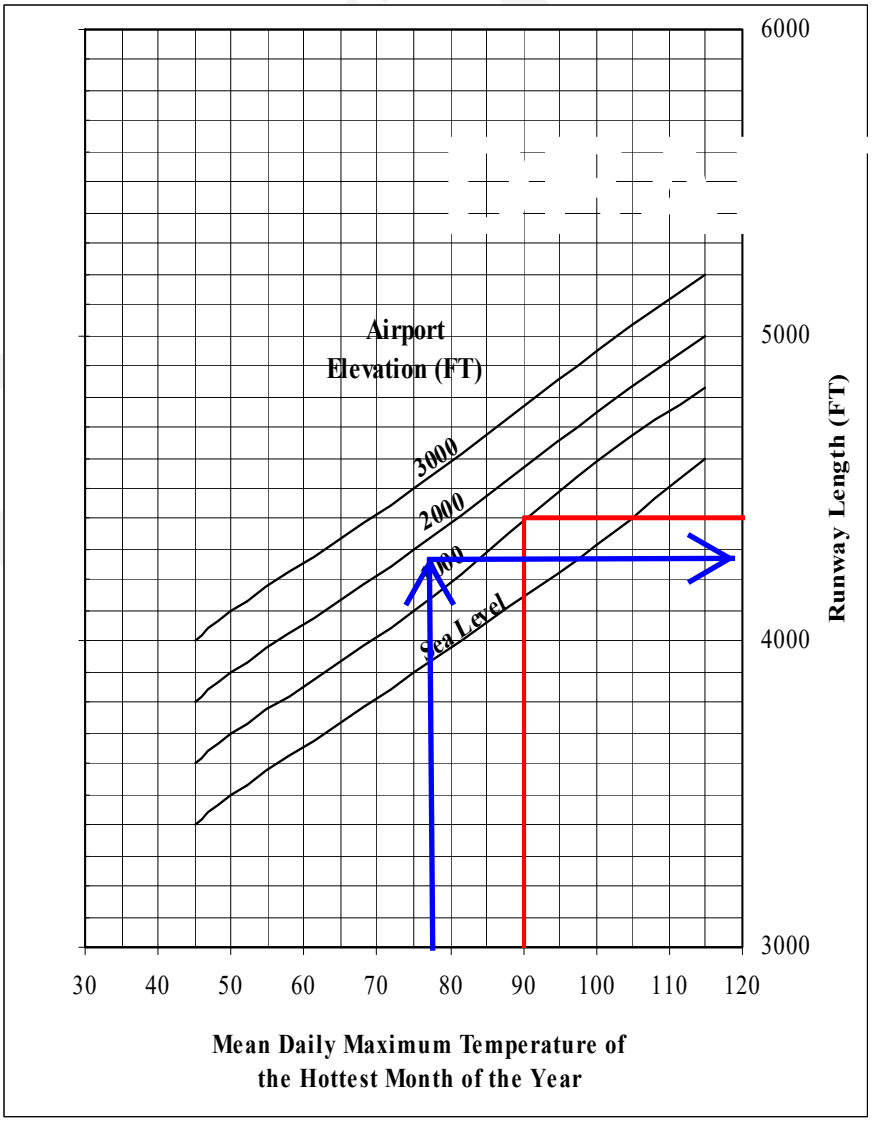
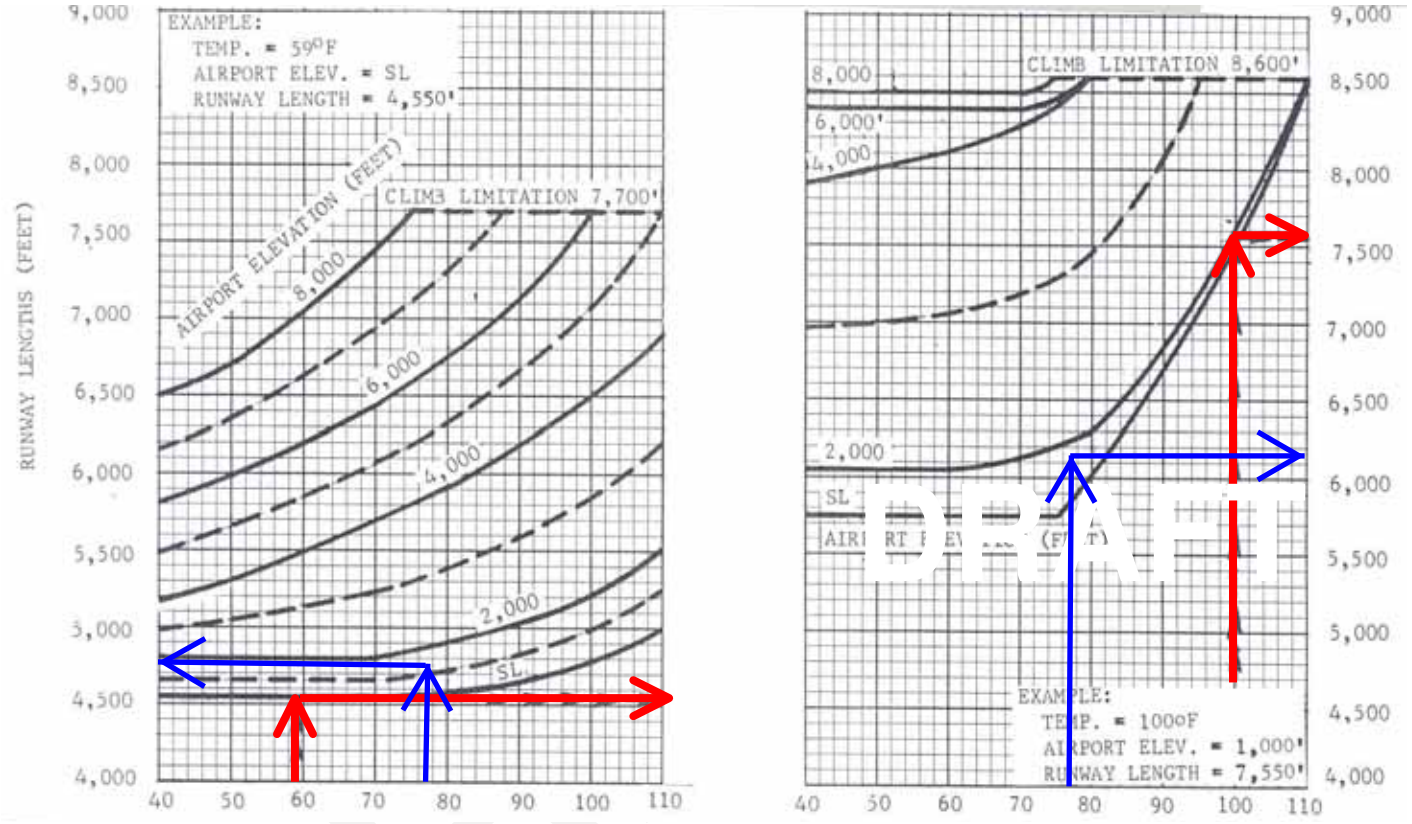
Representative Airplanes	Runway Length Curves
Raytheon B80 Queen Air **Raytheon** E90 King Air **Raytheon** B99 Airliner **Raytheon** A100 King Air (Raytheon formerly Beech Aircraft) **Britten-Norman** Mark III-I Trilander **Mitsubishi** MU-2L **Swearigen** Merlin III-A **Swearigen** Merlin IV-A **Swearigen** Metro II	**Example:** Temperature (mean day max hot month) 90° F (32° C) Airport Elevation (msl) 1,000 feet (328 m) Recommended Runway Length 4,400 feet (1,341 m) **Note:** For airport elevations above 3,000 feet (915 m), use the 100 percent of fleet grouping in figure 2-1. 

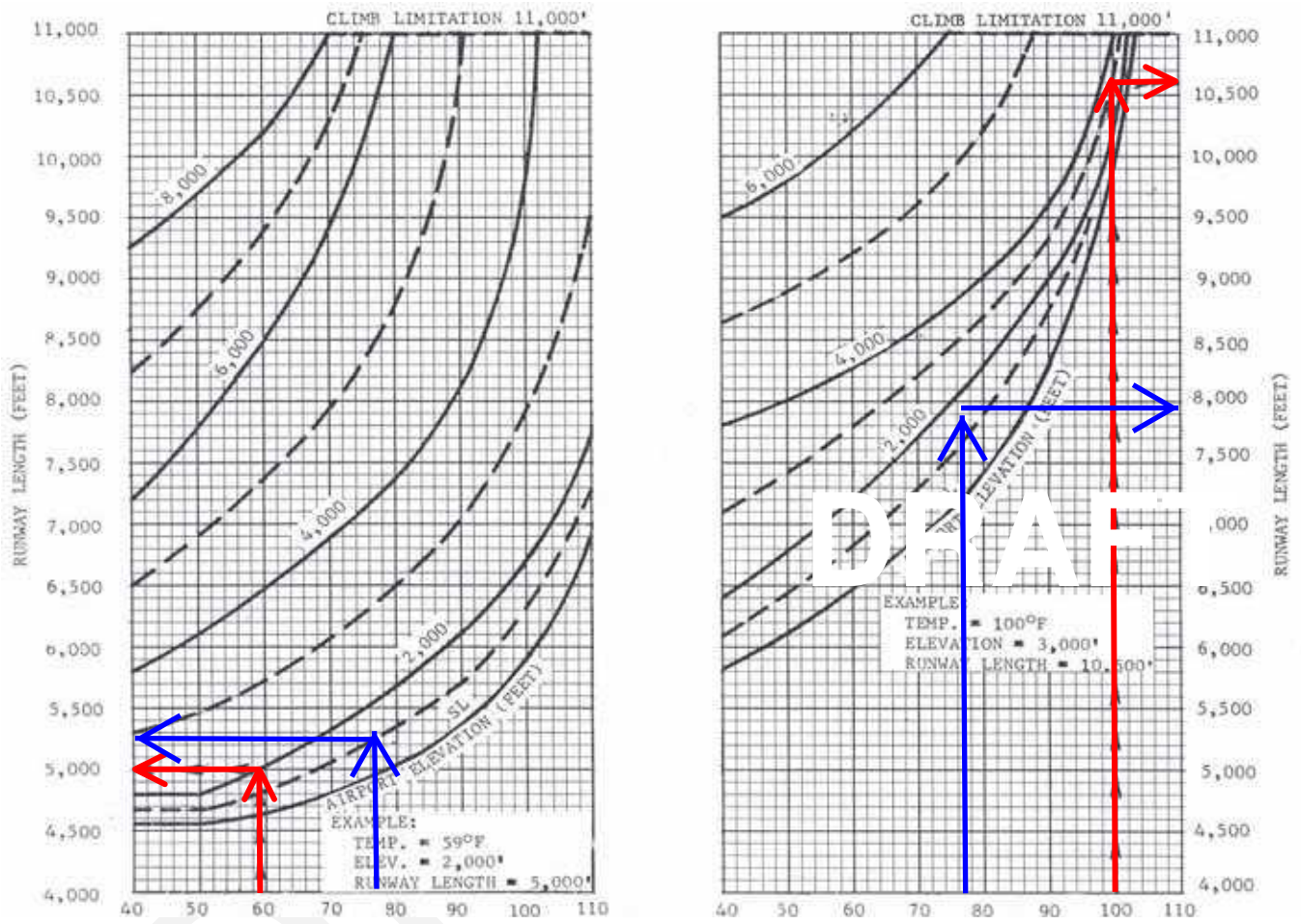
Figure 3-1. 75 Percent of Fleet at 60 or 90 Percent Useful Load



Mean Daily Maximum Temperature of Hottest Month of the Year in Degrees Fahrenheit

75 percent of feet at 60 percent useful load **75 percent of feet at 90 percent useful load**

Figure 3-2. 100 Percent of Fleet at 60 or 90 Percent Useful Load



Mean Daily Maximum Temperature of Hottest Month of the Year in Degrees Fahrenheit

100 percent of feet at 60 percent useful load **100 percent of feet at 90 percent useful load**

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