1.0 INVENTORY OF EXISTING CONDITIONS

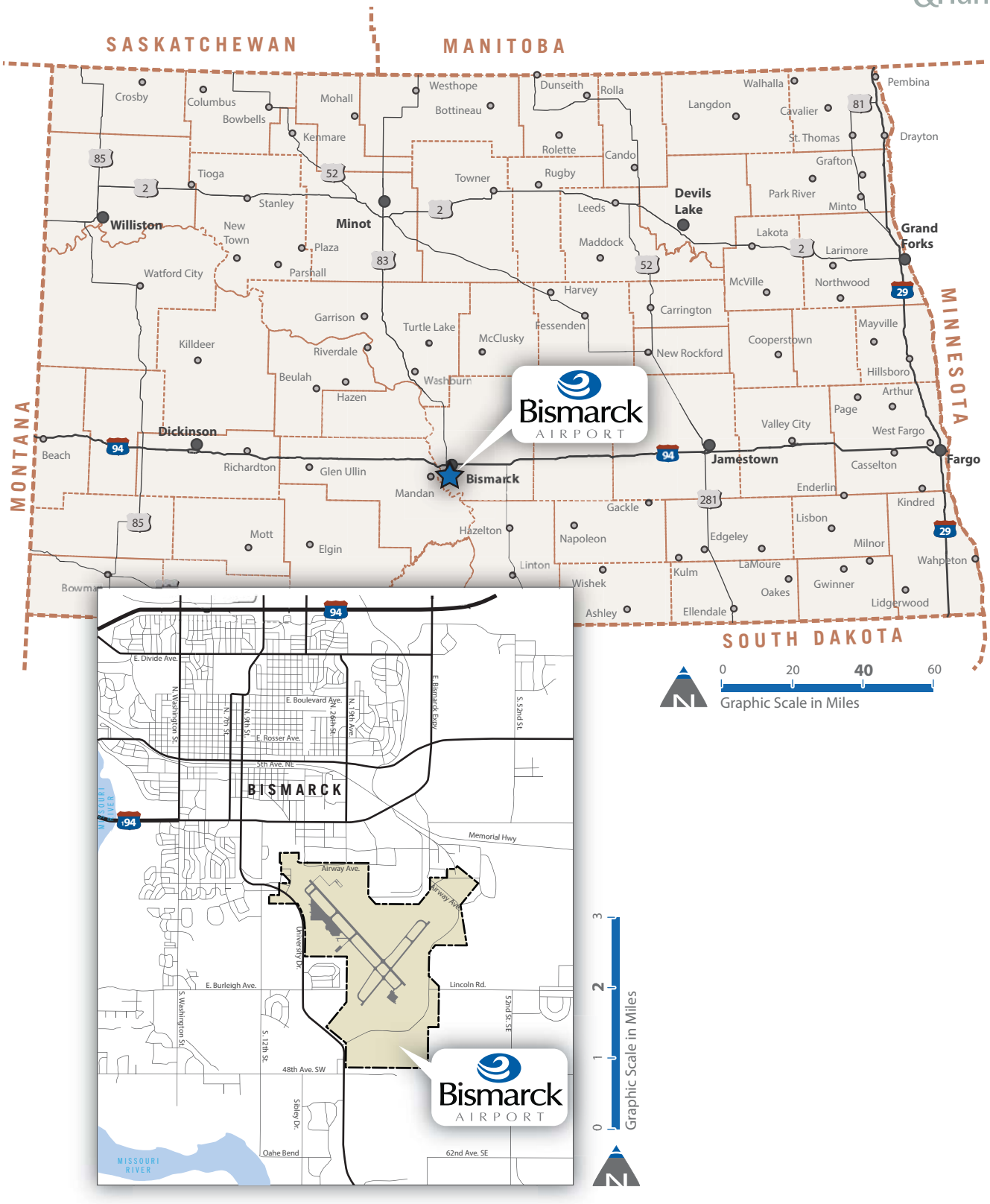
One of the initial tasks in the preparation of an airport master plan is the collection of information on the condition of existing facilities and services. This inventory of data is necessary to not only evaluate the physical attributes of the airside, landside, and support facility infrastructure, but also to complete subsequent study tasks such as demand/capacity analyses and the determination of facility requirements. The information collected focuses on the use, size, quantity, type, area, operational intent, and other characteristics of the airside and landside components of the Bismarck Airport. Typical categories of information that are collected include history, physical infrastructure, regional setting, surrounding land uses, environmental features, historical aviation activity, business affairs, and socioeconomic demographics of the surrounding community.

Several sources of information were reviewed to compile a comprehensive database of the facilities and services at the Bismarck Airport (Airport). These included, but were not limited to, the previous Airport Master Plan, the 2014 North Dakota State Aviation System Plan, 2015 North Dakota Airport Economic Impact Study, Bismarck Airport Pavement Condition Index Report, recent National Environmental Policy Act (NEPA) documents, the Bismarck Airport website, land use documents, and the current Airport Layout Plan (ALP). In addition, historical enplanements, aircraft operations, based aircraft, aircraft fleet mix, enplaned cargo, and automobile parking data were obtained from Federal Aviation Administration (FAA) databases and Airport records. Finally, an on-site visual inspection of the Airport was conducted in November 2015 to complete the inventory effort and verify any data discrepancies.

Organized by the following sections, this Chapter summarizes the data that was collected on the condition of existing Airport facilities and services:

1.1. AIRPORT LOCATION AND ROLE

As shown in **Exhibit 1-1**, Bismarck is located in the southern half of central North Dakota, approximately 190 miles west of Fargo, North Dakota and 175 miles east of the Montana-North Dakota border. The Airport is located in Burleigh County on the southeast side of the City of Bismarck. Interstate 94 passes through Bismarck linking it to Fargo and Interstate 29 (I-29) to the east and Billings (415 miles) and Interstate 90 to the west. Other major highway access to Bismarck is provided by Highway 83 which links to Minot (110 miles) and Highway 2 to the north. In addition to being known as the location of the state capitol, the City of Bismarck is also known for its prominent place on the banks of the Missouri River. Bismarck, and its sister city, Mandan, have evolved over time to serve the needs of the large government workforce, tourism industry and energy industry, as well as those drawn to the area's natural beauty and outdoor opportunities. Many institutions of higher learning are located in the area to support the needs of this growing community, including University of Mary, United Tribes Technical College, and Bismarck State College. The private sector has also seen significant growth with Sanford Health, Basin Electric, CHI St. Alexius Medical Center, Montana-Dakota Utilities (MDU) Company, Walmart, and Aetna becoming some of the largest employers in the region.



Bismarck AIRPORT
Master Plan Update

Exhibit 1-1 **Bismarck Airport Location Map**

1.1.1. Federal and State Role

The identification of an airport's role and classification is one of the FAA's primary responsibilities. The Airport is a vital air transportation center for the capitol city of North Dakota, and the state as a whole. Along with approximately 250 other airports nationwide, it is classified in the federal National Plan of Integrated Airport Systems (NPIAS) as a primary, non-hub commercial service airport which is required to support the demands of the nation's aviation system. A primary, non-hub airport is defined by the FAA as having more than 10,000 passenger boardings (enplanements) that make up less than 0.05% nationwide boardings. In order to receive federal funding, an airport must be included in the NPIAS. The FAA prepares a NPIAS report for Congress every two years. This report identifies those airports considered to be vital to the nation's airspace system and classifies airports according to their relationship within the broader transportation network. In 2014, the North Dakota Aeronautics Commission (NDAC) revised their proprietary airport classification system to align with criteria published by the FAA. As depicted in **Exhibit 1-2**, the Bismarck Airport is one of eight commercial service airports within the State of North Dakota.

1.1.2. Surrounding Airports

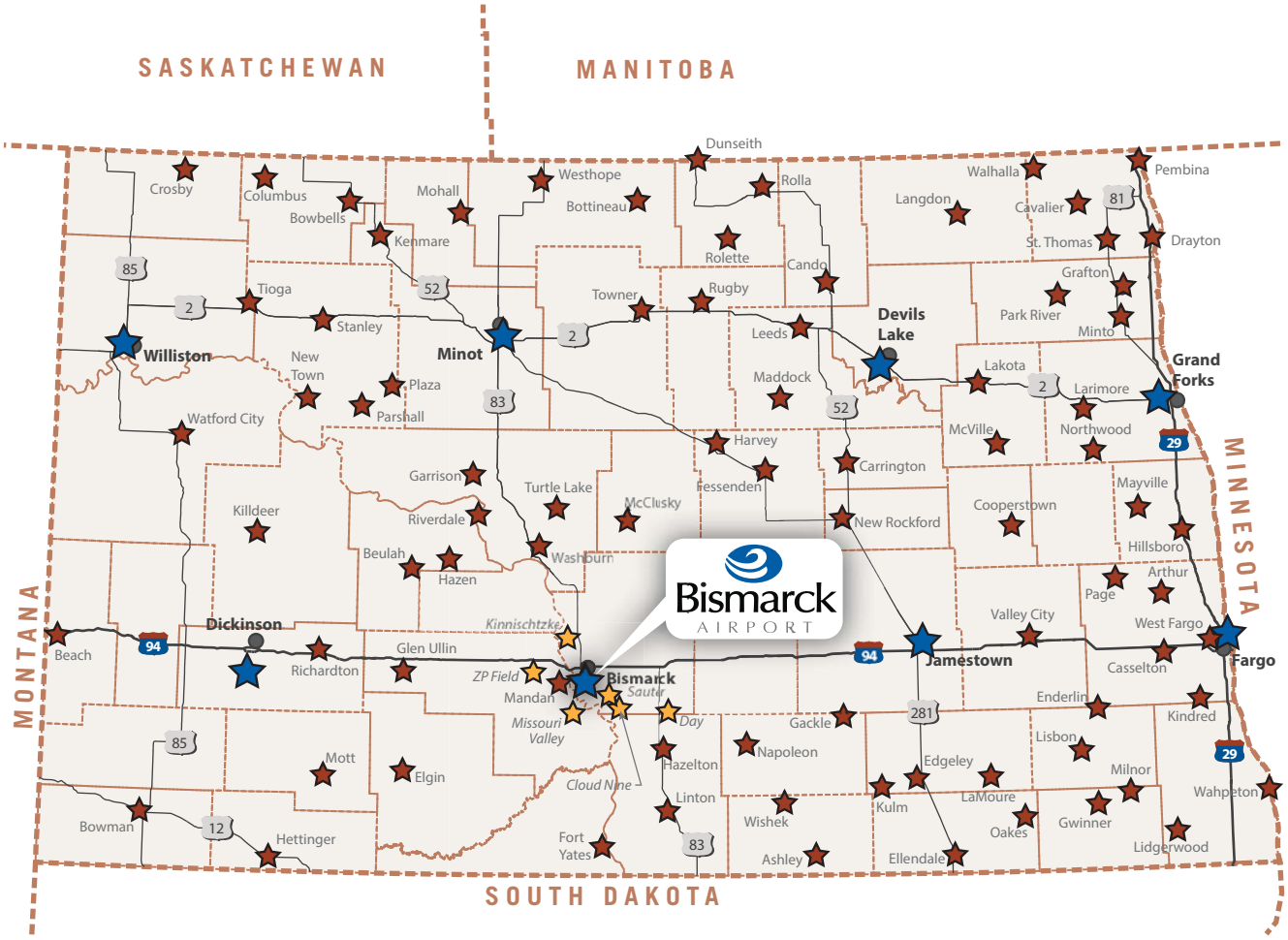
The identification of surrounding airports is important when evaluating an airport's service area as well as the potential impact other airports may have on surrounding airspace. Within 35 miles of the Bismarck Airport, there are only two publicly owned, public-use general aviation airports. These include:

- Mandan Municipal, near Mandan (located approximately 13 miles (nm) to the west, 30 miles by car)
- Hazelton Municipal, near Hazelton (located approximately 30 nm to the southeast, 45 miles by car)

In addition, there are six privately-owned airports in proximity to the Bismarck Airport:

- Sauter Airstrip, near Bismarck (located approximately 3 nm to the northeast)
- Cloud Nine, near Lincoln (located 4 nm to the east)
- Kalberer, near Lincoln (located 7 nm to the southeast)
- Kinnischtzke Airfield, near Harmon (located approximately 12 nm to the north)
- Day Private Airfield, near Moffit (located approximately 16 nm to the southeast)
- Z.P. Field, near Mandan (located approximately 17 nm to the northwest)

Classified as general aviation airports, these eight airports have a limited impact on the overall operation of the Bismarck Airport. Primarily, these eight facilities focus on smaller general aviation operations and cater to aerial applicators, recreational and sport pilots who do not routinely require the extensive amenities offered at the larger airport, such as Bismarck. Airports like these provide an important option for aircraft owners and pilots who utilize aircraft for purposes of recreation rather than for business purposes. Exhibit 1-2 illustrates the locations of the commercial, general aviation, and privately-owned airports relative to the Bismarck Airport.



SOURCE: *2014 North Dakota State System Plan.*

Exhibit 1-2 **North Dakota Airports**

1.1.3. Commercial Airline Service

Commercial airline service at the Airport is provided by Allegiant Air, American Airlines, Delta Air Lines, Frontier Airlines (seasonal), and United Airlines. As of January 2016, these airlines offer round trip flights to and from Chicago (ORD), Dallas/Fort Worth (DFW), Orlando/Sanford (SFB), Denver (DEN), Las Vegas (LAS), Minneapolis/St. Paul (MSP), and Phoenix/Mesa (IWA). Other airports offering commercial airline service in close proximity to the Bismarck region include:

- Dickinson Theodore Roosevelt Regional Airport, near Dickinson (103-mile driving distance to the west)
- Jamestown Regional Airport, in Jamestown (104-mile driving distance to the east)
- Minot International Airport, in Minot (112-mile driving distance to the north)

Two of these nearby airports, Dickinson Theodore Roosevelt Regional Airport and Jamestown Regional Airport, are eligible to participate in the Essential Air Service (EAS) program and receive federal funds from the United States Department of Transportation (USDOT). This money is used to support commercial airline operations within these small communities. Prior to airline deregulation, many of these same airports were served by certified air carriers. Currently, EAS at Dickinson and Jamestown is maintained at a minimal level. EAS subsidies are generally awarded as two-year contracts with renewal dependent upon several factors such as the average number of passengers enplaned daily at an airport. This is important to note since commercial airline service at these airports could be discontinued if EAS subsidies are not renewed in these communities. It is worth noting, however, that, due to favorable economic conditions, the Airport in Dickinson has seen an increase in alternative sources of funding and is not currently accepting these subsidies.

1.2. AIRPORT HISTORY

Pre 1920-1950

As the dawn of powered flight began to shape the use of aircraft throughout the US, the state of North Dakota began writing its own aviation history. The State's aviation history began primarily as a result of World War I which saw the use of aircraft during the years of 1914 through 1918. In July 1916, the City of Bismarck experienced its first-ever aircraft landing. As excitement continued to build for aviation in the State, the City built its first airport located on South Washington Street. Known as Straus Field, Bismarck's first airport consisted of approximately 80 acres which was leased from local resident F.B. Straus and Cora S. McLean. Straus Field grew to approximately 300 acres through purchases from other landowners and the War Assets Administration.

Stinson Detroiter, 1930s Source: Charles Rector (2015)

Several years later, the City relocated the Airport from Washington Street to its present location on University Drive (Highway 1804). The decision to move the Airport stemmed from the passage of the Air Commerce Act of 1926 which empowered the US Government to modernize air travel. A number of important conditions in this act included: a requirement that the government establish a system for air commerce; issue regulations for air traffic rules; procedure requirements for pilot licensing; develop a procedure for certifying the airworthiness of aircraft; and standardize airways to bring order to the open skies. Shortly after Charles Lindberg's 1927 transcontinental flight, North Dakota's own Carl Ben Eielson demonstrated how to fly over the top of the world when he departed Point Barrow, Alaska for Spitzbergen- an island located off the coast of Norway.

Aviation within the state began to connect the City of Bismarck with the rest of the country in the summer of 1931. In the same year, Northwest Airlines landed a Stinson Detroiter at the Bismarck Airport. This was the first commercial passenger aircraft to arrive in the city. In 1936, the Airport constructed its first modern-designed hangar which consisted of an art deco style building still present at the Airport today. For many years this hangar was the epicenter of activity at the Bismarck Airport. By 1939, additional airlines began operating from the Airport. Hanford Airlines and Mid-Continent Airlines provided commercial service flights between Bismarck and Tulsa, Oklahoma. Other airlines including Braniff, North Central, and Frontier began operating from Bismarck; however, the coming years would see many mergers and acquisitions which resulted in fewer airlines serving the Airport. Still, Northwest Airlines dominated commercial activity at Bismarck Airport during the Airport's first six decades.

In 1940, the City of Bismarck became the official owners of the Airport. In that same year, the City purchased an additional 60 acres of property from the Watcher family and the Works Progress Administration (WPA) helped to construct the first paved runways at the Airport. The development of these runways would prove useful during World War II as the 7th Ferry Command of the Army Air Corps relied heavily on the Bismarck Airport as a location to provide flight training for its pilots. Two years later under the Federal Airports Act of 1946, the War Assets Administration transferred 160 acres to the city for future airport development. In 1946, Fort Lincoln gifted a parcel of land which would later be used to develop a new terminal building at the Airport.

The 1950s and 1960s

The 1950s saw many improvements to the Airport. In 1950 and continuing through 1951, the Airport made significant improvements to its drainage conditions. Also, in 1950, a total of $31,000 was spent on enhancing Bismarck's Air Traffic Control Tower (ATCT) through a joint funding effort between the City and the US Government. These tower

improvements allowed for flight control and communications systems to be consolidated into one operation, reducing the number of employees from eleven to six. In 1952, a two-phased north-south (Runway 13-31) runway reconstruction project was initiated in order to support larger and heavier aircraft such as the Douglass DC-3 and Convair.

Five years later, in 1957, the second phase of the Runway 13-31 reconstruction project was completed. In 1962, Runway 13-31 was extended to 6,925 feet to accommodate jet aircraft. The years 1964 and 1965 included a major extension of the City's sanitary sewer system and water main connection for the development of a new terminal building. The new terminal's construction was completed the following year. Other projects occurring during the late 1960's included the construction of a crosswind runway (Runway 17-35), new taxiways, aircraft aprons, airfield lighting, vehicular parking lots, terminal access roadway, and additional drainage modifications to channel surface water on the airfield. The number of passengers using the Airport increased significantly from 1960 to 1965. For example, in 1960, the Bismarck Airport serviced 35,280 passengers. Within five years, the number of passengers grew to nearly 67,000. As reported during the 1970 US Census, this level of growth was consistent with the increase in population experienced in both Burleigh and Morton Counties. By 1972, the number of passengers using the Bismarck Airport swelled to 133,000.

The 1970s and 1980s

As the number of passengers increased, so did the size of the aircraft operating at the Airport. This was primarily due to the development of larger jet aircraft such as the Boeing 727 and DC-9. To accommodate the demand, the Airport began a series of airport improvements to the north-south runway and the terminal building. Runway 13-31 was extended a second time from 6,925 feet to its existing length of 8,794 feet. Improvements to the terminal building included the development of a baggage belt and baggage claim area, as well as passenger boarding bridges, used to load passengers onto commercial

aircraft. In 1976, a new ATCT was constructed on the south side of the airport. This ATCT is still used today by the FAA. Additional construction in the early 1980s resulted in a substantial extension to the south end of the terminal building and included a second level with connecting passenger boarding bridges.

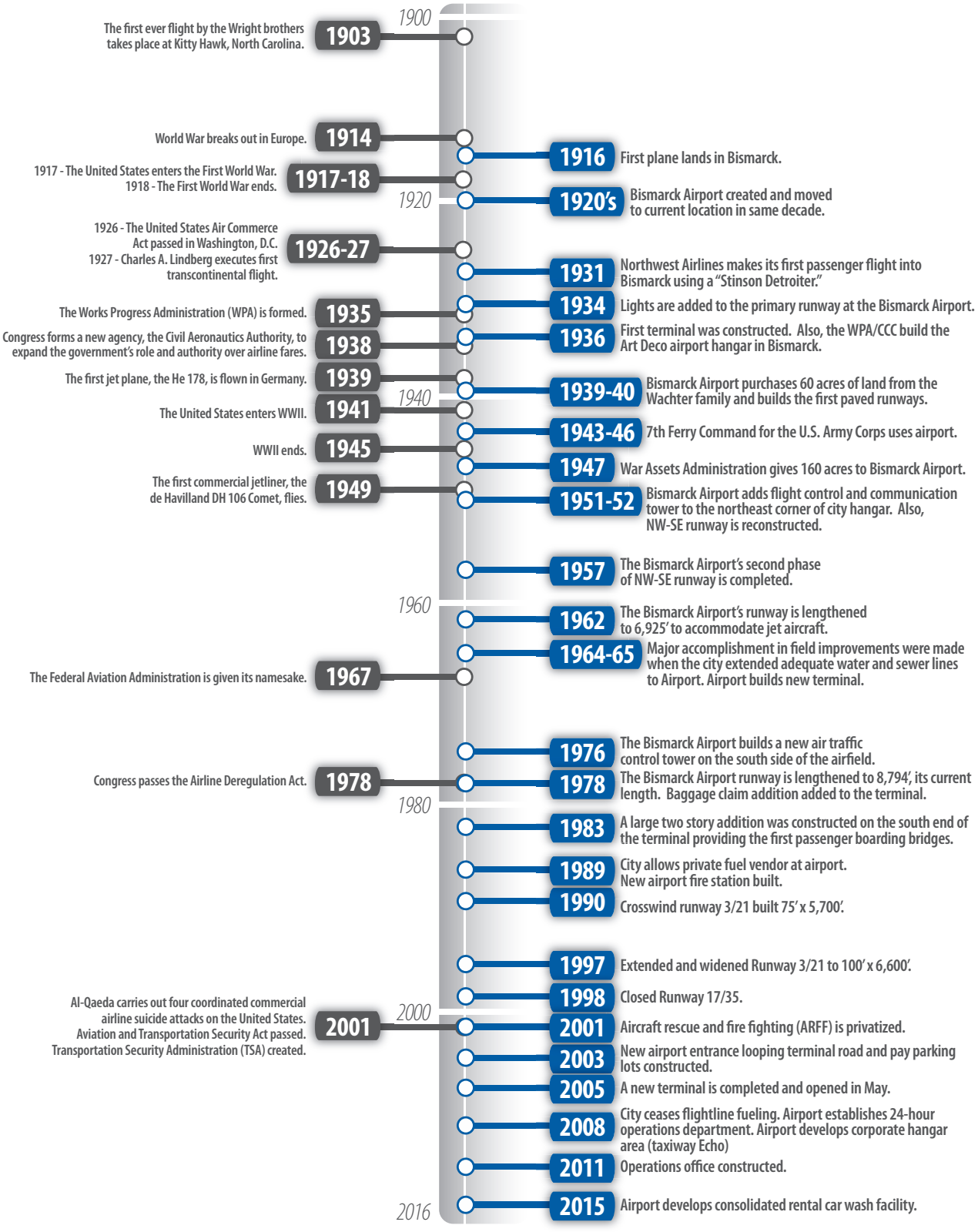
1990 – Present Day

In 1990 Bismarck had three network carriers; Northwest, Continental, and Delta which provided service to three hubs in Minneapolis, Denver, and Salt Lake City. As the decade progressed, several changes took place with carrier mergers and acquisitions as well as an increase in operations by the regional carriers. Bismarck saw the departure of Delta and Continental, the entrance of United, and the return in 1994 of Frontier, and then Frontier's departure in 1996. The one steady force was Northwest Airlines who carried the bulk of the passengers during this time. Then in 2004, newcomer Allegiant Air entered the market; providing low-cost, less-than-daily service to Las Vegas (LAS). The entry of Allegiant marked a turning point in passenger activity at Bismarck. Starting with just two flights per week to Las Vegas in 2004, Allegiant carried 15,000 passengers in their first year of service. With access to the legacy carrier networks of Northwest and United, and the low-cost option provided by Allegiant, passenger numbers continued to grow over the next two decades.

To accommodate demand, the Airport set out to construct a new terminal to meet these needs. In May 2005, Bismarck completed the development of a state-of-the-art terminal with a clean contemporary look and feel. This one of a kind terminal was designed to

complement the natural surroundings of the region and is considered an iconic building within the City.

Over the last decade the Airport has continued to experience growth in its passengers an air carrier service, even amid more acquisitions and mergers in the airline industry. In 2008, Delta Airlines acquired Northwest Airlines, and in 2010 United merged with Continental. Both airlines continue to provide service from Bismarck, with United's service to Denver and Delta's service to Minneapolis. Allegiant has grown their operations to three destinations; Las Vegas, NV, Mesa, AZ, and Sanford/Orlando, FL, with over 60,000 passenger enplanements per year. Frontier Airlines returned to the Bismarck market for a third time in 2012 with a new low fare business model from Denver. In 2014, American joined the successful airlines with service to Bismarck with service to two of their largest hubs; Dallas – Fort Worth and Chicago - O'Hare. With the addition of American Airlines, Bismarck Airport has five airlines providing non-stop service to seven destinations. These air carrier additions made it easier to meet the increasing demand for air travel that resulted from the upswing in activity in the oil and gas industry in western North Dakota. All of these changes have resulted in the Airport setting new boarding records year after year for the last decade. As of 2016, the Airport now encompasses over 2,400 acres of property and has started the process of identifying its facility needs for the next 20 years, through 2035. **Exhibit 1-3** provides a historical timeline of the Bismarck Airport's history.



Bismarck AIRPORT
Master Plan Update

Exhibit 1-3 **Bismarck Airport Historical Timeline**

1.3. SURROUNDING ENVIRONMENT AND LAND USE

In order to plan for future airport development, local environmental conditions and surrounding land uses must be well understood. Topography, soil type, and climate can all factor into determining future infrastructure needs and areas suitable for development while surrounding land uses can influence growth and expansion opportunities. As part of the inventory data collection effort, information was gathered on local environmental conditions and a review was conducted of surrounding land uses. This section summarizes the Airport's environs and adjacent land uses.

1.3.1. Topography

The Bismarck Airport is positioned within a 30- to 70-mile-wide strip of land called the Missouri Coteau. This ribbon of land runs from the northwest corner of the state to the south center. It was the location of the furthermost advance of glacial ice into the region. This advance and retreat of glacial ice cut sharply undulating topography with 300 to 500 feet of relief that is now primarily used as rangeland. Bismarck is also located in the Missouri River watershed, along the Missouri River, located approximately three miles west of the Airport. The Airport is located at elevation of 1,661 feet above mean sea level (MSL) and covers more than 2,400 acres of land bordered by an assortment of farm and ranch land and mixed-use areas.

1.3.2. Soil Composition

The United States Department of Agriculture (USDA) Web Soil Survey lists a majority of the soils on and around the Airport as loamy sand and silt varieties. This type of soil is a medium, well-drained soil that is not predominantly sand, silt, or clay. It contains a large amount of humus and is very suitable to farming and agricultural applications. This soil readily absorbs water, and then drains easily when inundated. The soil has high moisture retention and is considered prime farmland. Loam soils are easily tillable and makes for attractive crop lands when topography allows. Multiple areas of the airfield are leased to

local farmers for low-profile crop production to increase Airport revenue. Other soil types surrounding the immediate proximity of Airport property include Parshall-Lihan fine sandy loams, Mandan silt loams, and Havrelon silty clay. All of these categories are able to support construction and agriculture uses on the airfield.

1.3.3. Meteorological Conditions

Bismarck has a humid continental climate that is characterized by seasonal temperature differences and year-round precipitation. Winters are typically cold, with average temperatures in January reaching as low as 2 degrees Fahrenheit, and highs around 23 degrees Fahrenheit. Summers offer fairer temperatures with the average temperatures in July reaching a high of 85 degrees Fahrenheit and a low of 57 degrees Fahrenheit. Winds from the north and west are responsible for most of the weather patterns that affect the state, although summer storms from the southwest regularly affect weather patterns. On average, the area receives 17.82 inches of annual precipitation, with 3.19 inches on average in the wettest month of June. In a typical year, approximately 50 inches of snow fall on the area, with diminutive totals of accumulation between winter months.

1.3.4. Generalized Land Use

When studying and creating a plan for future development, the use of land that borders an airport should be reviewed to identify any possible issues if an expansion of facilities outside an airport's existing property line is needed. To the north of the airport, a majority of the property is mixed commercial and industrial land uses, with residential land use increasing when moving to the west. The west side of the Airport is bordered by park and agricultural land, as well as ND Soil Conservation Forestry Property, with considerable residential land use extending from the north to the south. United Tribes Technical College is also located on this side of the airfield, just to the south of the airline terminal. The south side of the Airport consists primarily of farm and ranch land with pockets of residential developments towards the Missouri River. The east side of the Airport consists

of nearly all uninhabited land until reaching the town of Lincoln, approximately two miles from the Airport fence. **Exhibit 1-4** defines these areas in relation to Airport property.

1.4. AREA DEMOGRAPHICS

Demographic data is used to assess the economic climate in an area by identifying and comparing statistics and trends in population, sales, employment, and other relevant factors that help gauge the health of an economy. The strength of these factors may be directly supported by airport activity and can promote a substantial impact to a region.

1.4.1. Socioeconomic Data

The socioeconomic conditions within an Airport's primary service area must be acknowledged before future aviation activity projections can be developed to determine what development needs will be required over the next 20 years. Though a majority of the regular users reside in and around the City of Bismarck, the Airport's service area includes at least five Central North Dakota counties as illustrated in **Exhibit 1-5**. Socioeconomic data obtained by Woods & Poole Economics indicate the total population of the five counties that comprise the Airport's service area in 2015 was 125,622. Populations of the individual counties within the service area are summarized in **Table 1-1**, which indicates that overall population grew by 16.12 percent, from 108,179 in 2005 to 125,622 by 2015.

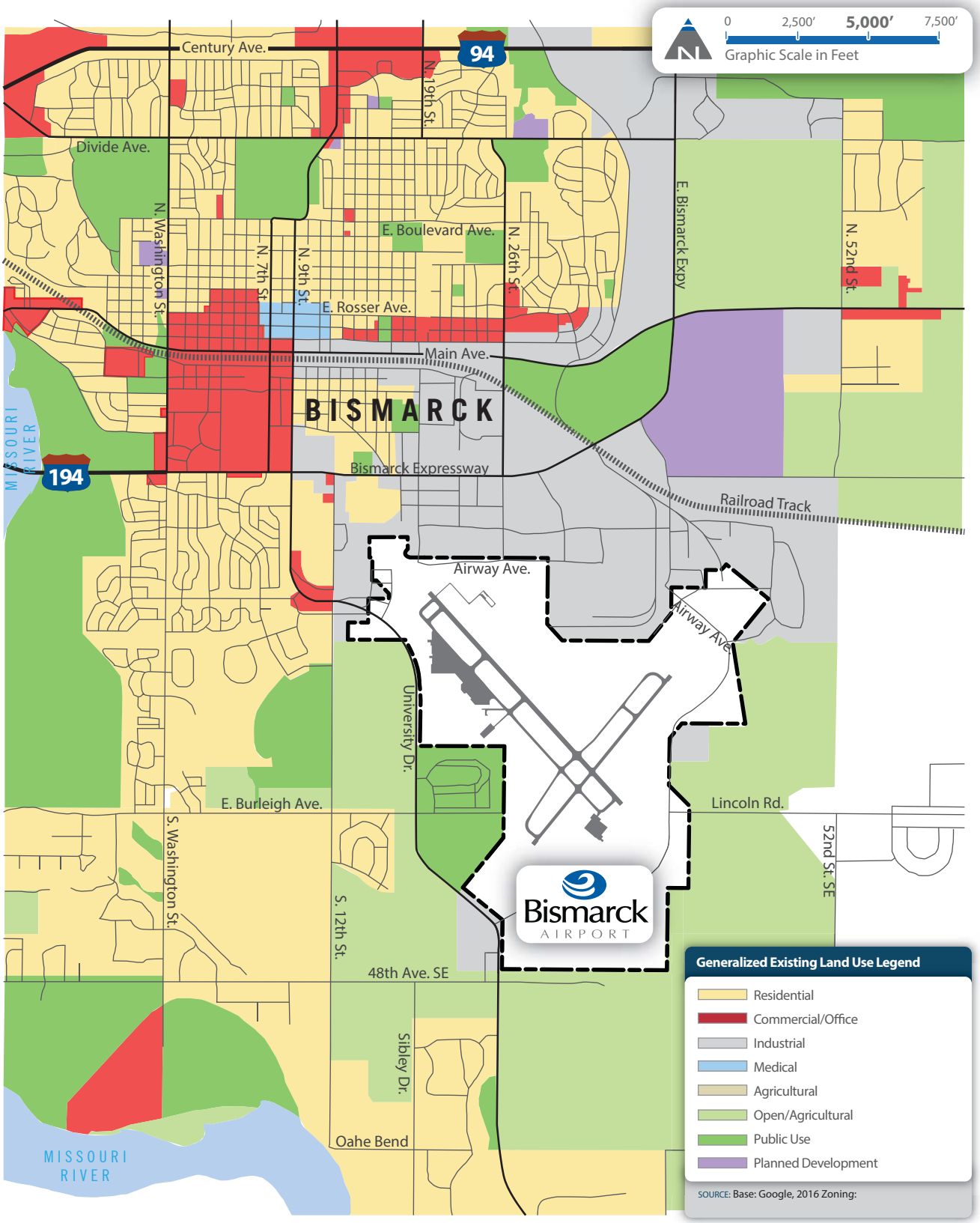


Exhibit 1-4 **Surrounding Land Use Map**

Table 1-1 Socioeconomic Statistics									
	Population			Retail Sales			Employment		
County	2005	2015	% Change	2005	2015	% Change	2005	2015	% Change
Burleigh	74,375	89,306	20.08%	1,443,733,000	1,708,409,000	18.33%	61,929	76,450	23.45%
Emmons	3,825	3,502	-8.44%	34,957,000	26,985,000	-22.81%	2,348	2,386	1.62%
Kidder	2,496	2,416	-3.21%	26,755,000	30,426,000	13.72%	1,760	1,927	9.49%
Morton	25,576	28,518	11.50%	364,034,000	396,552,000	8.93%	11,276	12,933	14.69%
Oliver	1,907	1,880	-1.42%	10,485,000	11,205,000	6.87%	1,105	1,506	36.29%
Totals	*108,179*	*125,622*	*16.12%*	*1,879,964,000*	*2,173,577,000*	*15.62%*	*78,418*	*95,202*	*21.40%*

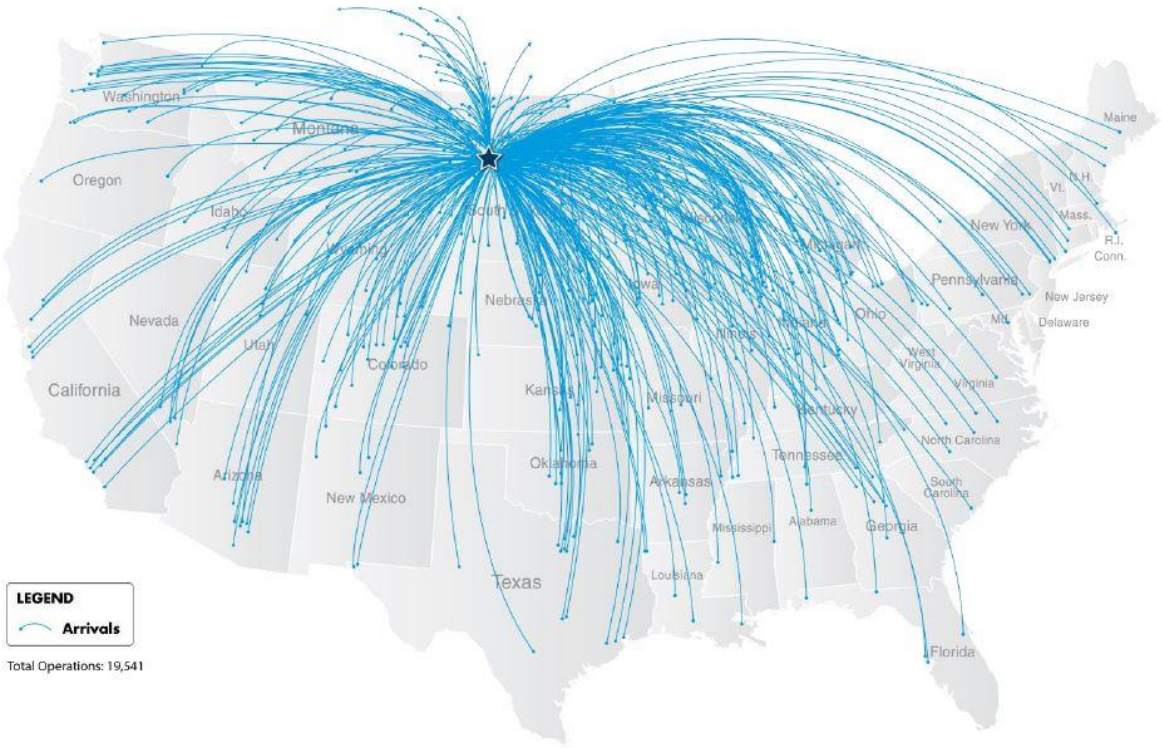
In addition to population, employment throughout a region offers another variable that can be used to understand the socioeconomic demographics of an airport's service area. Table 1-1 also summarizes the change in employment from 2005 to 2015 for the five Central North Dakota counties that surround the Airport. As illustrated in the table, overall employment rose 21.40 percent over the ten-year period with all counties experiencing an increase in job growth.

In an effort to gain a more detailed understanding of socioeconomic conditions throughout the service area, data was also obtained on the total retail sales for the five counties. As illustrated in Table 1-1, overall retail sales grew 15.62 percent from $1.87 billion in 2005 to 2.17 billion in 2015. Substantial growth was experienced in all counties except Emmons County (-22.81 percent), which experienced a reduction in retail sales.

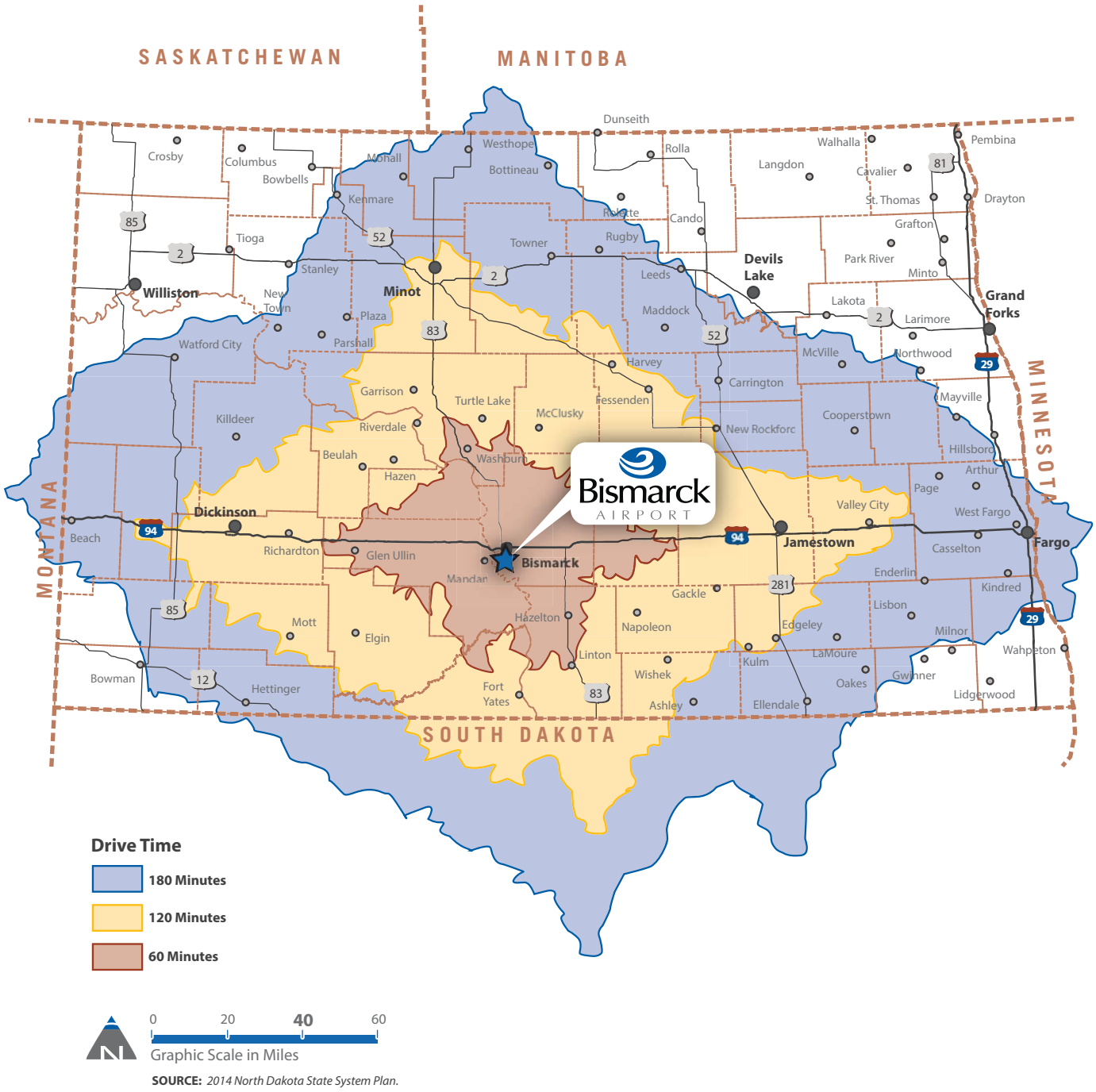
1.4.2. Airport Economic Impact

As identified in the *2015 North Dakota Statewide Aviation Economic Impact Study*, the Bismarck Airport generates approximately $279.7M in total economic impact into the local economy and contributes to the nationwide growth of airport economic impact. The benefits of the Airport truly go beyond the realm of city, state, or region. These benefits include, amongst other things, employment, sales, and revenue. **Table 1-2** and the accompanying graphic depict the financial impact that the Airport has on the community as well as the arrivals to Bismarck in 2014.

Table 1-2 Airport Economic Impacts (2015)									
	Employment			Payroll			Output		
	Direct	Indirect	Total	Direct	Indirect	Total	Direct	Indirect	Total
Airport Management	24	16	40	$ 1,923,650	$ 774,790	$ 2,698,440	$ 6,966,207	$ 6,269,586	$ 13,235,793
Airport Tenants	403	379	782	$ 22,968,345	$ 18,587,940	$ 41,556,285	$ 76,502,687	$ 49,726,747	$ 126,229,434
Capital Investment	62	73	135	$ 4,102,808	$ 2,789,909	$ 6,892,717	$ 11,094,850	$ 9,097,777	$ 20,192,627
GA Visitor Spending	48	21	69	$ 1,186,848	$ 926,070	$ 2,112,918	$ 4,385,640	$ 2,806,810	$ 7,192,450
Commercial Visitor Spending	764	336	1100	$ 18,643,128	$ 14,606,824	$ 33,249,952	$ 68,838,160	$ 44,056,423	$ 112,894,583
Total Impacts	*1,301*	*825*	2126	*$ 48,824,779*	*$ 37,685,533*	*$ 86,510,312*	*$ 167,787,544*	*$ 111,957,343*	*$ 279,744,887*



Source: *2015 North Dakota Statewide Aviation Economic Impact Study*



SOURCE: *2014 North Dakota State System Plan.*

Exhibit 1-5 **Airport Service Area Map**

1.5. ORGANIZATION STRUCTURE

Since 1940, the City of Bismarck has served as the official sponsor of the Bismarck Airport. The City of Bismarck itself is organized into a five-member city commission which is elected at large. The commission is led by the Mayor of Bismarck. The Airport Director reports directly to the City Commission. The commission meets on the second and fourth Tuesday of each month. The management structure at Bismarck Airport consists of a traditional flat organizational model. As shown in **Exhibit 1-6**, the Airport Director is responsible for the day-to-day operations at the Airport. The director is supported by an Assistant Airport Director who has direct responsibility for three lines of business: operations, administration, and maintenance.

All lines of business contain subordinate responsibilities associated within the function of each service line. The airport management team is responsible for managing all airside facilities (runways, taxiways, and aprons) and landside facilities including the commercial airline terminal building and vehicle parking lots. The short and long-term parking areas are owned by the Airport, and daily maintenance is conducted by Airport staff. Capital planning and development as well as administration duties associated with the Airport's Passenger Facility Charge (PFC) program and federal grant assurances are also the responsibility of the management team. It should be noted that according to CFR Part 1542 the Airport Director is responsible for, along with the Transportation Security Administration (TSA), security of the entire Airport including the commercial airline terminal building. Other airport management team responsibilities include maintenance of all airfield surface pavements, snow removal, as well as hangar and tenant leasing and rental negotiations. Aircraft Rescue and Fire Fighting (ARFF) is the responsibility of the City of Bismarck and is staffed by the Rural Metro Fire Department who serve as contract employees. As of December 2015, the City of Bismarck employs approximately 22 employees at the Airport.

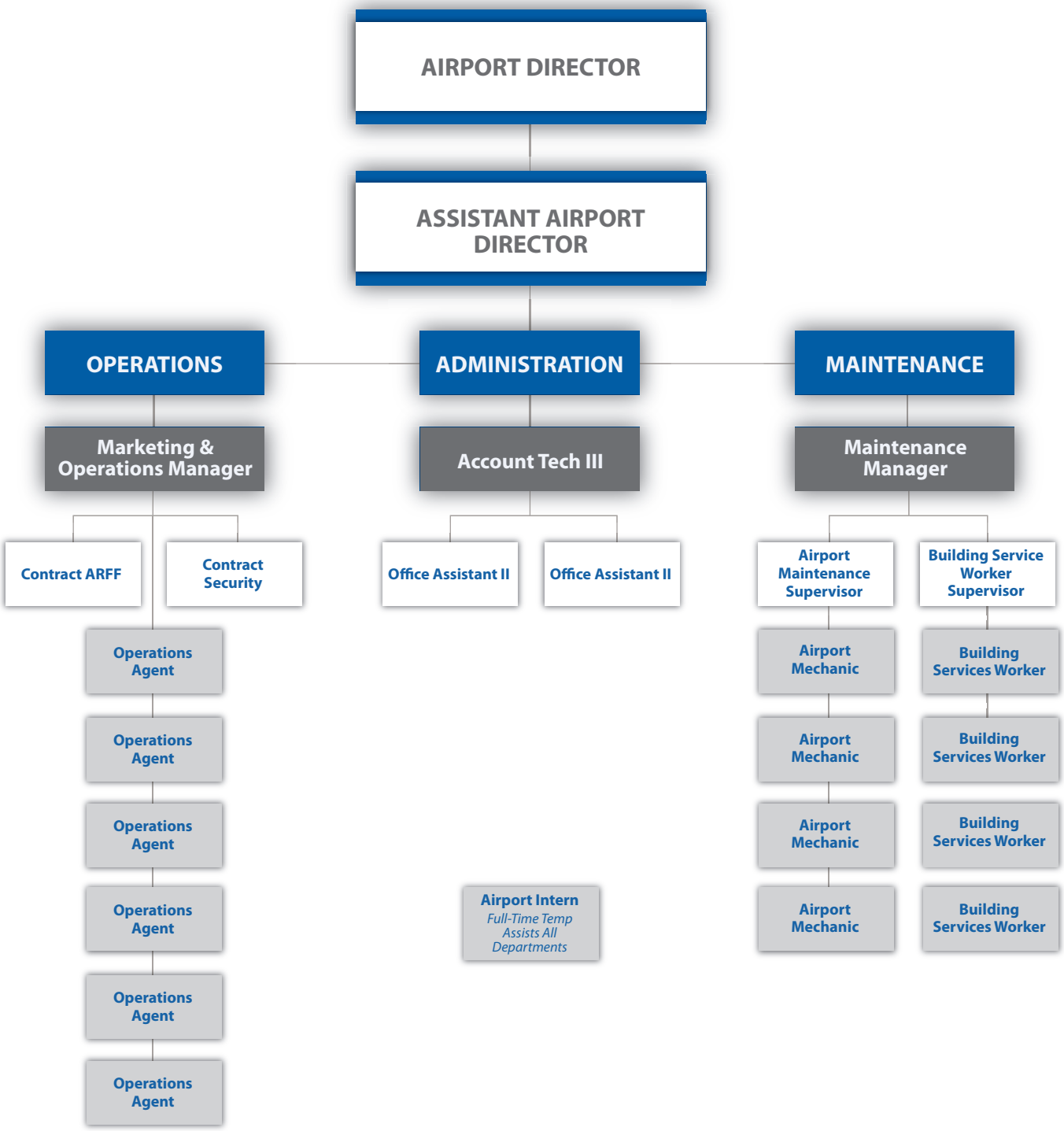


Exhibit 1-6 **Bismarck Airport Organizational Chart**

1.6. EXISTING FACILITIES

A detailed assessment of Bismarck Airport's existing facilities was conducted in November of 2015. This effort focused on the collection of information and photography associated with the current conditions of the Airport's airside, landside, and support facilities. This information is used during the development of facility requirements in order to help identify future improvements needed to meet anticipated future aviation demand. A summary of the Airport's existing airside, landside, and support facilities are presented in sections 1.6.1 through 1.6.3.

1.6.1. Airside Facilities

An assessment of Bismarck's airside facilities was conducted to determine their condition and individual specifications for future planning purposes. The airside facilities evaluated as part of this section include the runways, taxiways, and aircraft aprons.

1.6.1.1. Runways

The primary runway at the Airport, Runway 13-31, is oriented in a northwest/southeast direction and is 8,794 feet in length by 150 feet in width. Runway 13-31 is paved in asphalt, grooved, and the majority is considered to be in fair condition, with many large areas in poor condition. Reconstruction of Runway 13-31 is scheduled to be completed in calendar year 2017. Runway 13-31 is designed to meet Runway Design Code (RDC) category D-IV standards, meaning it is capable of accommodating aircraft with approach speeds less than 166 knots and wingspans between 118 and 171 feet. A wide variety of aircraft types are able of operate on the runway based on the weight bearing capacity of their main landing gear wheel configurations. The runway's pavement is rated to 130,000 pounds for aircraft with single wheel main landing gear configurations and up to 340,000 pounds for aircraft with dual wheel tandem main landing gear configurations. The main runway has an elevation variation of approximately 10 feet; the approach end of Runway

13 lies at an elevation of 1,654.4 feet MSL, while the approach end of Runway 31 lies at an elevation of 1,645.0 feet MSL.

The condition of pavement is evaluated using a system called the Pavement Condition Index (PCI), which categorizes pavement surface conditions using a variety of factors. Some of these factors can include skid resistance/hydroplaning potential, rate of deterioration, capacity, roughness, and structural integrity. On a scale of 0 to 100, pavements are rated using this PCI, with a score of 100 being in “excellent” condition, and a score under 10 considered to be “failed”.

Another method to measure the condition of pavement is by assigning a Pavement Classification Number (PCN), which is a similar analysis to the PCI which determines pavement strength and condition. PCN is determined based on two methods: The “using” procedure in which the largest Aircraft Classification Number of aircraft permitted to operate on the pavement surface is used to calculate the PCN and the “technical” evaluation in which the PCN is determined based on the allowable load rating of aircraft operating on the surface which takes into account such factors as frequency of operation and permissible pavement stress levels. The standard PCN scale ranges from 5 (assigned to the weakest pavements) to 110 (assigned to the strongest pavements).

In 2015, Applied Pavement Technologies (APTech) was contracted as a part of the North Dakota PCI Study project team to prepare a PCI and PCN analysis of Runways 13-31, 3-21, and all other airfield pavement surfaces. This analysis involved visual inspections of pavement surfaces, Falling Weight Deflectometer (FWD) testing, and an allowable load analysis of all airfield pavements. The analysis found Runway 13-31 has a PCI of 32-94. Appendix A of this document contains the full PCI report for the Bismarck Airport.

A summary of the data collected for Runway 13-31 is presented in **Table 1-3**.

Table 1-3 Runway 13/31 Data Summary	
Length	8,794 feet
Width	150 feet
Surface	Asphalt
Runway Design Code (RDC)	D-IV
Weight Bearing Capacity	Single Wheel: 130,000 pounds Dual Wheel: 180,000 pounds
Pavement Condition Index (PCI) Rating	32-94
PCN Value	42

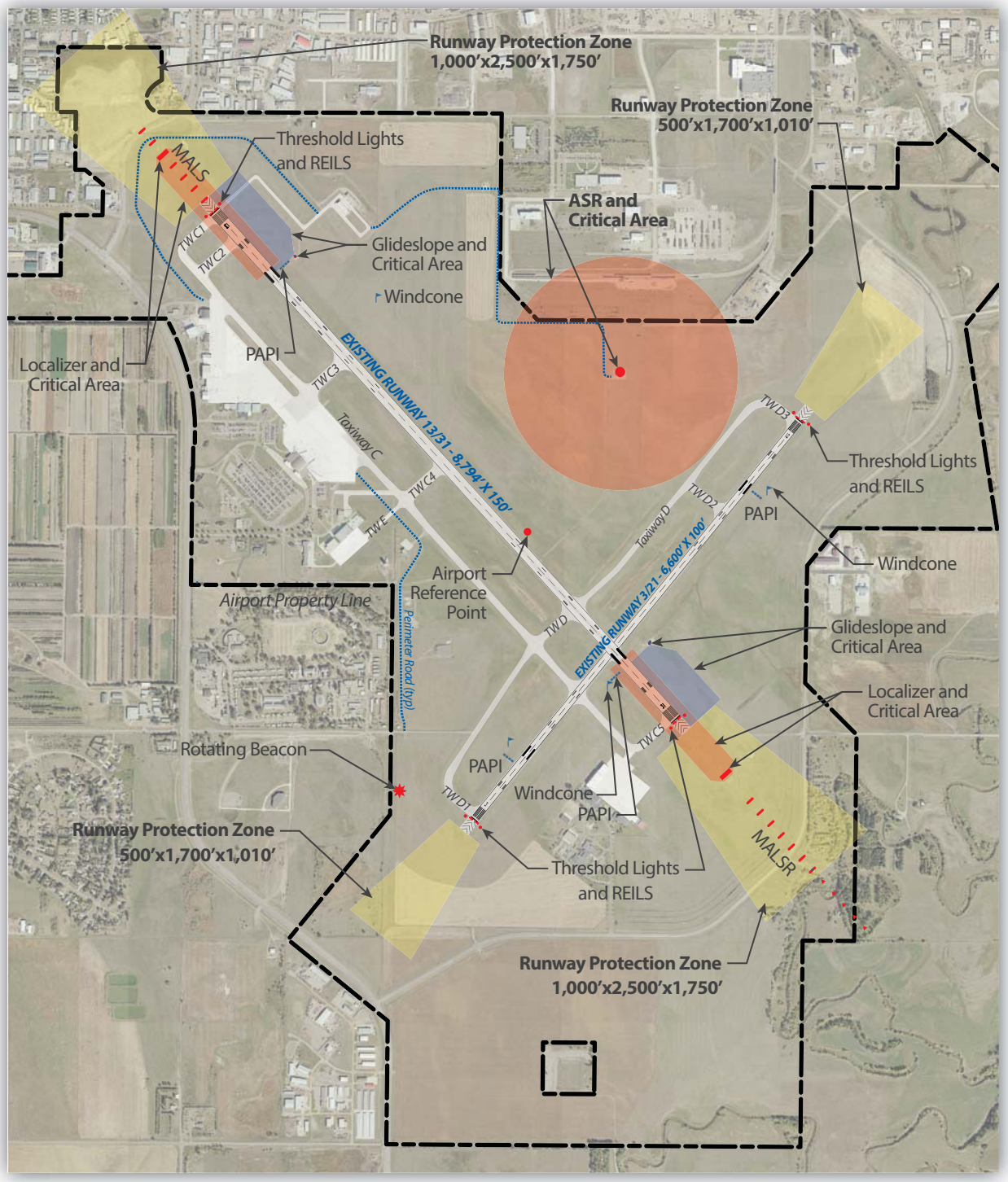
The crosswind runway at the Airport, Runway 3-21, is oriented in a northeast/southwest direction and is 6,600 feet in length and 100 feet in width. It is paved in asphalt, grooved, and is considered to be in fair condition. The runway's design meets RDC category C-II standards, meaning it is primarily designed for aircraft with approach speeds between 121 and 141 knots and wingspans between 49 and 79 feet. A wide variety of aircraft types are capable of operating on the runway based on the weight bearing capacity of their main landing gear wheel configurations. The runway's pavement is rated to 100,000 pounds for aircraft with single wheel main landing gear configurations and 140,000 pounds for aircraft with dual wheel main landing gear configurations. The approach end of Runway 3 lies at an elevation of 1,660.7 feet MSL, while the approach end of Runway 21 lies at an elevation of 1,661.3 feet MSL. APTech analysis found Runway 3-21 has a PCI of 54-90.

A summary of the data collected for Runway 3/21 is presented in **Table 1-4**.

Table 1-4 Runway 3/21 Data Summary	
Length	6,600 feet
Width	100 feet
Surface	Asphalt
Runway Design Code (RDC)	C-II
Weight Bearing Capacity	Single Wheel: 100,000 pounds Dual Wheel: 140,000 pounds
Pavement Condition Index (PCI) Rating	54-90
PCN Value	26

1.6.1.2. Taxiways

Taxiways are defined pavement surfaces that are used for aircraft to travel safely between the runway and other airfield destinations like hangars, terminals, and aprons. The taxiway system at the Airport is comprised of parallel taxiways that are located on the south side of Runway 13-31 and north side of 3-21. Several connector taxiways between the parallel taxiway and runways allow for movement to exterior areas of the airfield. Taxiway PCI numbers vary greatly from as low as 37 and 38 in some areas, to a high of 94, with most falling in the mid-seventies. **Exhibit 1-7** illustrates the taxiway system at the Airport.



0 1,000' 2,000' 3,000'

Graphic Scale in Feet

Bismarck AIRPORT Master Plan Update

Exhibit 1-7 **Airfield Layout**

1.6.1.3. Aircraft Aprons

Aprons, also known as ramps, are large paved surfaces that are specifically designed for the parking and servicing of aircraft. In addition, aprons provide aircraft access to hangars, Fixed Base Operators (FBOs), terminals, and locations to transfer passengers and cargo as well as fueling and maintenance. There are three primary aprons areas at the Airport, also identified in Exhibit 1-7.

The terminal apron, located adjacent to the commercial airline terminal building, is approximately 610,000 square feet and is used exclusively by commercial airline and large charter aircraft for the transfer of passengers to and from the commercial airline terminal building. The second primary apron, the general aviation apron, is approximately 750,000 square feet and offers access to both of the FBO buildings. This general aviation (GA) apron is used for a variety of purposes including the transfer of passengers and cargo between aircraft and the general aviation terminal building, parking for itinerant aircraft, and general aviation aircraft fueling. The third primary apron, the corporate aviation apron, is located south of the Airport terminal and is accessed from Taxiway E. At approximately 100,000 square feet in area, this apron is primarily used for loading and unloading of passengers using the corporate facilities. Another small apron is located near the Bravo hangars that is used for temporary parking when aircraft are not inside. Apron PCI values, during the 2015 study, reached from 29 in one small part to 97 and 98 over large areas of multiple aprons.

1.6.2. Landside Facilities

Landside facilities were evaluated for condition, utilization, and passenger convenience. The assessment of the terminal building included an in-depth focus on the primary functions within the building which helped identify those facilities requiring improvements

over the near-term planning period. Additionally, a review of the Airport's existing air cargo facilities is included in this section.

1.6.2.1. Terminal Building

As shown in **Exhibit 1-8**, the City of Bismarck's terminal, which opened in 2005, is a state-of-the-art passenger traffic facility that presents a simple, linear configuration. The terminal building consists of two levels. Level one is comprised of two halves, a secure and non-secure area. The non-secure area is located immediately to the west and includes the two primary entrance ways; public greeting space; rental car counters; baggage claim; ticketing; lobby seating; a small food and beverage concessionaire; vending; public restrooms; and the North Dakota Hall of Fame Museum. The secure area is located to the east and makes up the second half of level one. This area includes the baggage screening area; airline office space; airline storage; and tug lanes used for accessing aircraft located on the commercial apron. Consistent with level one, level two consists of a non-secure and secure area and is accessed by an elevator, escalator, and a two-sided staircase located in the midpoint of the terminal building. The non-secure area includes the airport administration offices; Transportation Security Administration (TSA) office; airport security office; TSA document check-in area; conference room; public restrooms; and airport storage room. Each of these facilities are connected by a linear hallway spanning the entire length of the terminal building. The level two secure area is accessed through the TSA checkpoint and includes a large non-partitioned holdroom which spans the entire length of the building. The holdroom is made up of public seating including traditional passenger seating clusters, business cubicles, as well as a passenger circulation area spanning the entire length of the second level. The level two secure area also includes a café/gift shop concessionaire; public restrooms; vending machines; game room; cell phone booster; flight information monitors; televisions; and free public Wi-Fi. Passengers access commercial aircraft using four passenger boarding bridges connected to the holdroom. Gates 1 and 2 are located along the north side of

level two while Gates 3 and 4 are located along the south side of the building. **Exhibit 1-9** depicts the terminal building floor plan.

The terminal building's exterior is a mixture of limestone, precast concrete, pre-finished metal panel and insulated glass. A large barrel vault with a standing seam metal roof is located at the center of the building with appendages that are largely symmetrical flanking each side. Roof mounted antennae are located to the east along the airside of the building. Passenger ingress/egress is achieved through a series of bi-parting automatic doors through vestibules with walk-off mats. The building's interior has a combination of porcelain tile and carpeted floors. Building walls are a combination of painted gypsum board, stone, glass, precast concrete panel, wood panels, glass railings, sprayed on acoustic wall treatment and porcelain tile. Ceiling treatment is mixture of acoustic lay in tiles, painted gypsum board and suspended wood panels. Four passenger boarding bridges are located on the airside connecting the passenger holdrooms and associated aircraft. It was observed that sunshine during afternoon hours penetrates the existing window glazing along the landside causing substantial glare for passengers and tenants alike, including the airlines and TSA. The installation of automated interior shade devices would easily remedy this issue and are addressed further during the facility requirements chapter. Consideration for location, height, opacity of shade material, color capability and seasonal adjustments are also addressed in Chapter Three.

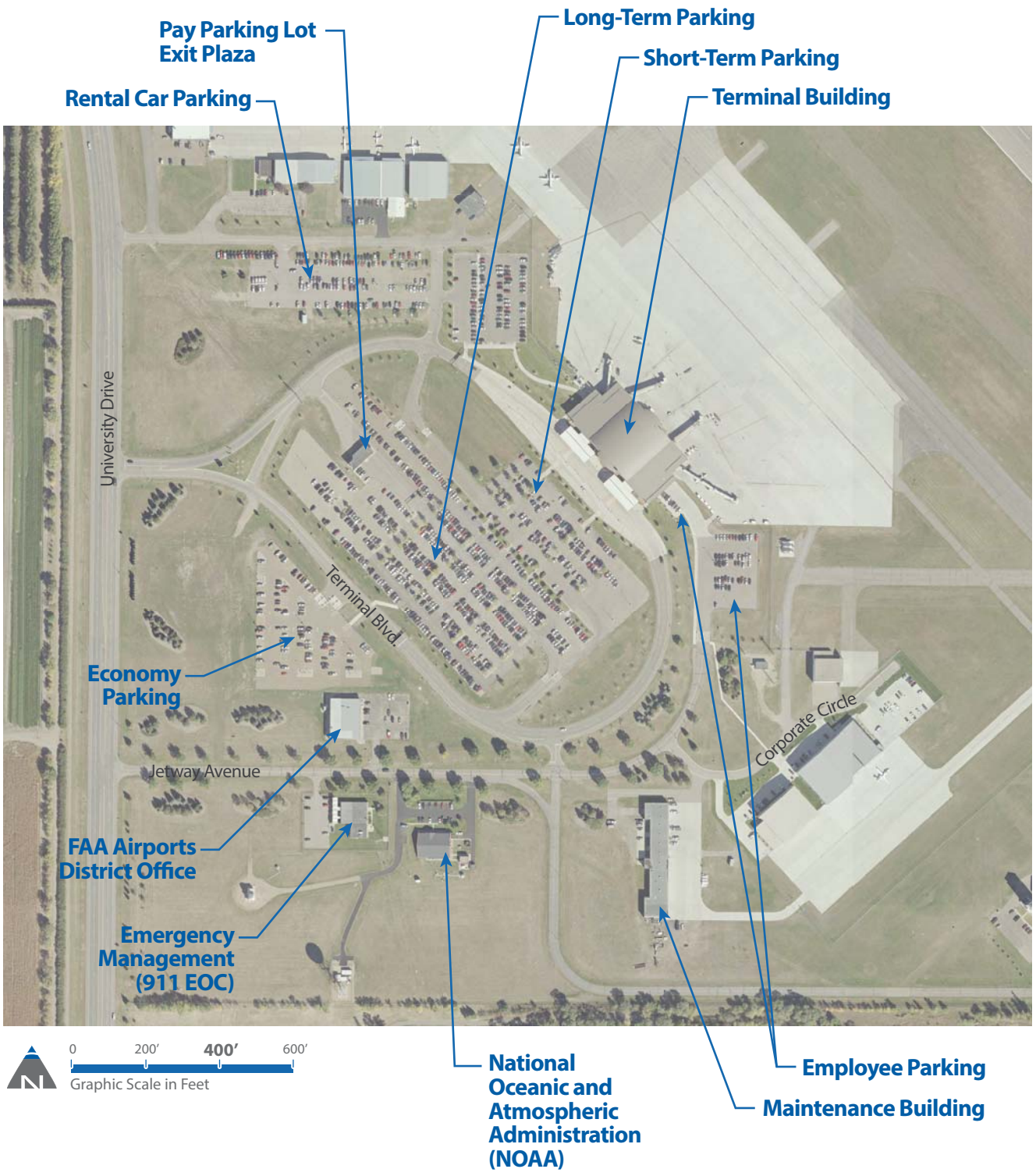
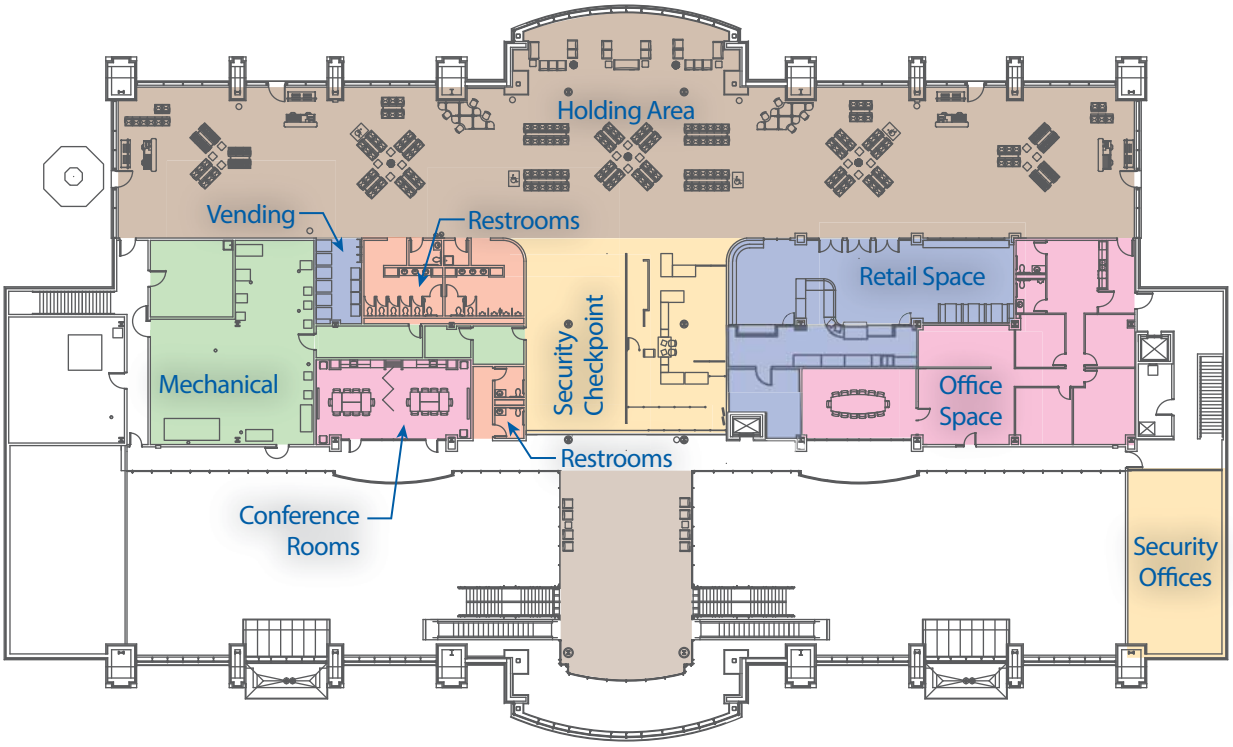


Exhibit 1-8 **Bismarck Airport Terminal Facilities Map**



▲ Level Two

▼ Level One

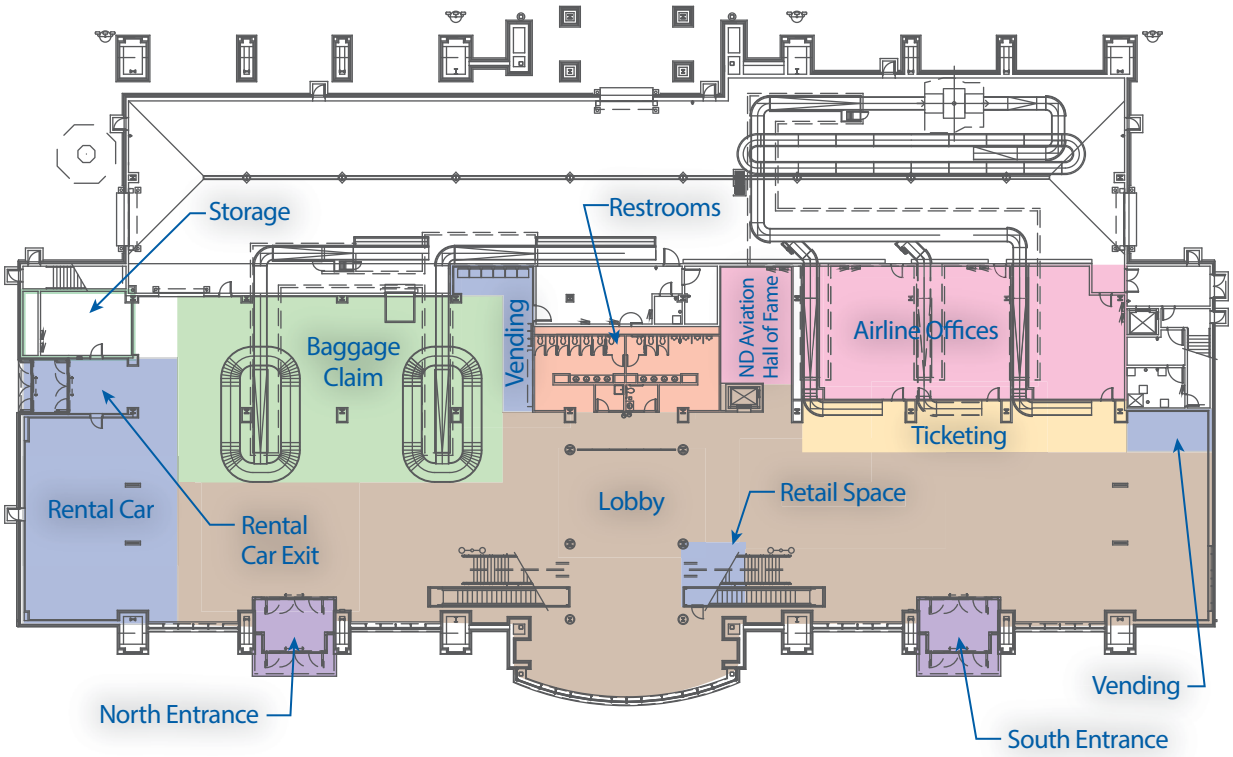


Exhibit 1-9 **Airport Terminal Building Levels One and Two**

Security Checkpoint

Located on level-two, the TSA security checkpoint is accessed by two sets of stairs, an elevator, and an escalator. A carpeted queuing area with stanchions is directly in front of the TSA document checker position. Sharing space in this area is a display for historical artifacts. It was observed during a busy period that the queuing depth is inappropriately sized. During that period, lines backed up towards the administration area circulation lanes. In addition, lines backed up towards the up escalator discharging passengers into congestion. This is a significant concern from an operational and emergency response perspective. In addition, the divestment area does not have enough roller area to avoid impacting screener throughput. TSA guidelines identify an 80-foot depth for the preferred checkpoint. This is measured from end of divestment roller to end of composure roller. The AIT and/or magnetometer screening device is roughly centered in this length. While this is the desired depth, it is not required. However, a straight in-line orientation of the rollers and machines directly determines passenger through-put. The Airport plans to expand the TSA security checkpoint to the north by reducing the width of the current passenger exit point from two lanes down to one lane. This will provide approximately 10 feet of additional space for the TSA to expand within. Longer-term, the Airport plans to further expand this area to accommodate additional passenger demand. Chapter Three will address the spacing requirements necessary to accommodate future passenger flow and be represented as an alternative developed as part of Chapter Four, Alternatives Analysis.

Holdroom

The passenger holdroom is located within the secure side of level-two. The holdroom is accessed directly from the TSA security checkpoint area. The holdroom area is a continuous space which serves four aircraft gates, each equipped with a passenger boarding bridge. The holdroom includes ample ceiling height and has glazed window openings on three sides. The shared common wall facing the checkpoint contains

vending, concessions, checkpoint exit, mechanical access, game room, restrooms and access-controlled building circulation. The center area is a continuation of the barrel vault ceiling running from front to rear of the terminal. The structural steel framing for a portion of the exterior wall is exposed. Waste receptacles are located throughout. Beam seating is clustered throughout the entire area as well as airline gate podiums equipped with monitors. Each passenger boarding bridge is accessed through a controlled access door; passengers can also be brought down through the north or south stairwell in case of mechanical failure. In addition to beam seating, floor displays and business cubicles are located in the center of the holdroom. Wall mounted advertising is located in various areas of the holdroom. Ceiling hung and wall mounted wayfinding is located at appropriate areas and is legible throughout. Observations made over multiple days indicate that the available holdroom seating is inadequate for aircraft presently being served. As a result, passengers are encroaching on required circulation and other adjacent areas. Chapter Three will address the current passenger seating limitations and identify the recommended space needed to facilitate adequate egress from this secure area.

Ticketing

Five airline ticket counters are located in the level-one non-secure area known as the ticket lobby. These counters are operated by Delta, American, Frontier, Allegiant, and United Airlines. Customer queue depth appears to be sufficient for current ticketing demands. Self-service kiosks are located at the United and Delta ticket counters for passengers' convenience. While this proximity can cause congestion at the counter, it does allow for the counters to operate with minimal staffing. Any future relocation of remote ticket kiosks would require data and power to be routed though the existing floor, walls or ceiling drops to operate. It should be noted that an additional area located directly adjacent to ticketing is available for future ticket counters. This area is presently being used as a display area. Within the secure area located behind the current ticketing area, minimal room exists to expand the TSA baggage screening area without significant

structural changes to the terminal building. Chapter Three addresses the need for additional expansion of the TSA screening area and the associated facilities impacted by a potential relocation.

Outbound Baggage

Outbound baggage is located immediately behind the airline ticket counters. Existing baggage conveying devices and screening operations were observed in addition to ground handling operations. Outbound baggage travels along a baggage belt directly to the TSA baggage screening area located in the level-one secure area. The baggage travels in a path below grade and up into the shared outbound baggage tunnel. The recent addition of the new TSA screening machines constrains the area currently used for TSA baggage screening. While the screening equipment appears to have an excellent throughput rate, the current system does not allow for any redundancy in the event that the device is offline. It was observed that multiple tug machines were operating in this space or were parked overnight thereby contributing to the congestion occurring in this area.

Baggage Claim

Two stainless steel inclined plane baggage claim devices are located on the north end of the terminal building within the level-one non-secure area. Both devices are fed from a baggage return belt located below the level-one floor. The devices were observed during a busy period and operated well. The operational age of a typical baggage devices can reach 25-30 years before maintenance costs become prohibitive. Thus, they should be operational for years to come if routinely maintained. The surrounding floor is porcelain tile, with wall mounted advertising displayed in certain areas. The floor area between the devices and the surrounding circulation/queue is appropriately sized for two larger aircraft arriving at the same time. The device length appears similarly right sized. Chapter Three will address the need for future expansion of the current baggage claim devices.

Rental Car

Three rental car companies currently operate at the Airport. These tenants include Avis, Hertz and Enterprise. All rental car counters and associated office spaces are provided directly adjacent to the baggage claim area. These counters are conveniently located for departing passengers. Each tenant space has back wall internally illuminated corporate signage. The office area is appropriately sized for current traffic levels. The three tenant spaces are connected with a tenant wall dividing them. A fourth potential tenant space is available across the vestibule circulation area. As of December 2015, the Airport has contracted with the current rental car companies to construct a consolidated rental car Quick Turn Around Facility (QTA) which is used to wash cars, support general maintenance, and prepare cars for rental. This area is located immediately west of the existing rental car ready return parking lot near University Drive (Highway 1804).

Concessions

A pre-security concession space is located within the level-one non-secure area directly underneath the staircase located at the midpoint of the terminal building. A variety of retail and food/beverage offerings are available. This concession area is somewhat limited in visibility throughout level-one but is sized sufficiently for the need. The largest concessionaire, the Fly and Buy Bar/Café, is located within the level-two secure area immediately south of the TSA security checkpoint. The Fly and Buy has a wide variety of offerings include food/beverage, souvenirs and retail. Both booth and counter seating are provided within this enclosed space. In addition, a single row of high-top seating is available just outside the tenant wall.

Restrooms

Public restrooms are located on both levels of the terminal building. These restrooms include men's, women's and family facilities. Each restroom is equipped with porcelain tile floors and wainscoting which provides long lasting durability and ease of maintenance.

All restrooms are ADA compliant for size, and wall mounted wayfinding is appropriately located for ease of use. During peak deplaning periods, those restrooms located within the level-two secure area were observed to be insufficient to meet current demand. Based on International Air Transport Association (IATA) recommendations, approximately three times as many plumbing fixtures are needed to accommodate passenger demand. Moreover, as the national trend for use of larger aircraft continues, the need for larger restrooms equipped with additional stalls will be required to meet the desired level of service. Chapter Three will address the number, size and location of future restroom needs over the 20-year planning period.

Administration/Conference

Airport administration, TSA, and law enforcement offices are located on the non-secure side of level-two. These offices are accessed by stairs, escalators and elevators which meet accessibility requirements. The administrative office area includes private offices, open reception area, administrative conference room, break room, and private restrooms. A second conference room is located north of the TSA checkpoint and is frequently used by TSA and other public meetings. This public conference room is adequately sized for a variety of public meetings. All areas appear to appropriately sized for present and future uses. Wayfinding is located on both levels. With the exception of the restrooms, all areas have carpeted floors, painted gypsum walls and acoustic ceilings with lay-in lighting.

Meet and Greet Area

A meeter/greeter area is located on both level-one and two within the non-secure area of the terminal building. On level-one, this area is located at the base of the staircase and includes multiple soft-seated chairs within a well-decorated environment. This carpeted area also includes multiple glazed windows which provide ample lighting to the area. An additional meeter/greeter area is provided at the top of the staircase adjacent to the TSA security checkpoint. This area consists of a few soft-seated chairs with small tables

between seating. It was observed that the connectivity between both meeter/greeter areas functions well and appears to be sufficiently sized for present and future needs.

Terminal Curbfront

The primary access to the commercial terminal is located off University Drive (Highway 1804) by way of a curving road approaching the southwest corner of the terminal. Sightlines to the terminal and general wayfinding are adequate for arriving vehicles. The approach road splits into four lanes for traffic; two drop off lanes, two for through traffic and separate lane for taxis, vans and shuttles. General observations of traffic and queuing found the configuration to be very effective. The drop off lanes had an appropriate amount of curb frontage to provide direct access for passengers. In addition, a masonry and steel canopy with a curved polycarbonate covering provides weather protection and general wayfinding. The canopy is in 2 parts and is interrupted by a curved (in plan) central portion of the terminal. The interruption was to maintain views of adjacent property from the security checkpoint second level. Canopy lighting provides adequate evening lighting levels. Roof mounted snow guards retain accumulated snow for pedestrian safety. Benches, waste receptacles, and general landscaping are also provided.

1.6.2.2. Vehicular Parking and Pedestrian Access

Vehicular parking at the Airport consists of nearly 1,900 total surface parking spaces. Of these, 1,119 spaces are for public parking while the remaining 580 spaces support employee, FBO and rental car parking needs. Surface fee-based parking is provided for short and long-term parking as well as economy parking. The short-term parking lot is located immediately west of the terminal building and consists of 282 parking spaces. The short-term parking area is used primarily for hourly passenger services. Long-term parking is located further west of short-term parking and is separated by a grass median and three control-arm gates located along the grass median. The long-term parking lot contains 660 parking spaces. This lot is intended for overnight and extended stays when

flying out of the Airport. The economy lot is located furthest from the terminal building and includes 177 parking spaces. This lot was constructed for weekly and monthly use and provides a less expensive alternative for long term parking. Information provided by the airport indicates that the far western end of the surface parking lot is approximately 1,000 feet from the terminal building entrance. IOTA standards for Level of Service (LOS) have indicated that 1,000 feet is the maximum walking distance for a LOS "C" grade. In short, a C grade balances passenger expectations and airport cost/maintenance which typically is an acceptable threshold.

An additional parking lot located to the north provides parking for the rental car companies operating at the Airport. This lot includes the recently developed QTA facility which is used to provide light maintenance, car washing, storage and preparation for new rentals. The total rental car parking consists of 435 parking spaces. Of these 435 spaces, 76 are designated as ready spaces, 39 as return spaces, and 320 as storage spaces.

An airport employee parking lot containing seven parking positions is located along the south side of the terminal building. This lot is used by Airport Administration staff. A second lot is located further to the south and contains 80 parking stalls that are used by the employees who work inside the terminal.

The FBOs and other major airport tenants located at the Airport require large parking areas to meet customer demand. These parking areas are located adjacent to each facility and combine for 208 parking spaces. It should be noted that there are other smaller paved areas around the airport which are used for parking; however, these areas are not designated nor labeled as public parking. **Table 1-5** summarizes the vehicle parking spaces at the Airport.

Table 1-5 Vehicle Parking Capacities	
Parking Lot	**Spaces**
Short Term	282
Long Term	660
Economy	177
Rental Car	435
Employee	87
FBOs	208
Other	48
Total	***1,897 Parking Stalls***

Based on information provided by the Airport, surface parking is limited during peak travel periods. Currently, the Airport utilizes a grassy area located immediately behind the economy parking lot to accommodate additional vehicles during peak travel periods. This area is delineated by roping and signage. Pedestrian access is provided via painted walkways from each lot to the terminal building. Pavement markings are slightly raised to connect pedestrians from the parking area and the terminal sidewalk. In addition, stop signs are provided at the cross walks providing traffic calming and pedestrian safety. Handicapped parking spaces are located within each paved parking lot along the side closest to the terminal building. With exception of the grassy overflow parking area, all surface parking lots consist of bituminous materials and are in fair condition. During the inventory collection process, all paved lots were observed to be largely full. In addition, one unpaved grassy area located along the north end of the short-term parking lot closest to the terminal has an underground geothermal well field. Previous engineering reports prepared for the Airport indicate that vehicle parking in this area is permitted, provided no excavation is completed as a result of the project. The well heads for the geothermal system are housed slightly below the surface. Without a significant reconfiguration of

existing infrastructure, the surface parking area is largely at maximum capacity. The aforementioned grass area and geothermal field appear to be remaining areas for customer parking; however, initial observations of this approach indicate that the costs would be considerable. The identification of additional parking areas and their associated costs will be addressed in the Facility Requirements Chapter of this master plan.

1.6.2.3. Air Cargo

Air Cargo operations at Bismarck are important addition to the daily activities of the Airport. Fed Ex operates Cessna Caravans filled with packages and flats on feeder routes to larger hubs. These aircraft and pilots operate from the apron area between the main general aviation ramp and the terminal apron. In addition, UPS and United States Postal Service (USPS) also have a significant presence. As of 2016, these operations are served by Alpine Air's Beechcraft 1900s, but this can change as contracts evolve. Occasionally, there are also other smaller cargo operators that move goods in and out of Bismarck using Metro III and Beechcraft 1900 aircraft. This area is accessed by Maverick Avenue from University Drive. Bismarck Airport's average monthly cargo weight totals are approximately 660,000 pounds, and this figure increases significantly during the peak seasons. Cargo demand is anticipated to continue increasing, and thus, fleet changes, in the form of number or aircraft size, are expected to follow.

The Northern Plains Commerce Center (NPCC), located immediately north of the Airport, is an industrial park with access to the Interstate system and multiple rail lines. This area has been identified as a possible cargo expansion location in the future.

1.6.3. Support Facilities

A number of airport support facilities were reviewed to determine their condition and function at the Airport. These include aircraft fueling, navigational aids, weather observation systems, Airport Rescue and Fire Fighting (ARFF) equipment, Snow

Removal Equipment (SRE), electrical systems, and airport access roadway. The following section provides an overview of each support facility.

1.6.3.1. Aircraft Fueling and Storage

The fuel farms at the Bismarck Airport are located southeast of the airline terminal, adjacent to Taxiway C. The northernmost fuel farm is owned by Executive Air Taxi Corporation (EATC) and has a total of 4 tanks. They have one (1) 500-gallon diesel tank for use in fuel trucks and other vehicles. For aircraft fuel storage, EATC has two (2) 15,000-gallon Jet-A tanks and one (1) 15,000-gallon 100LL tank. The fuel farm to the south is owned by Bismarck Aero Center (BAC) and contains a total of five tanks. Three (3) of the tanks store Jet-A, with a combined total of 52,000 gallons. The other two (2) store 17,000 gallons of 100LL and 500 gallons of diesel. In addition to this fuel farm capacity, the BAC FBO also employs fuel trucks that give them another 13,000 gallons of Jet-A capacity and 1,750 gallons of 100LL. All of these products are primarily used for commercial and general aviation operations on the terminal and GA ramps, and are owned by the respective FBOs. The two fuel sites have EPA-approved secondary containment measures to help contain fuel in the event of an accidental leakage. Jet-A and 100LL fuel at the Airport is available 24 hours per day, seven days a week, 365 days a year through the Airport's FBOs.

1.6.3.2. Navigational Aids

Navigational aids (NAVAIDs) are forms of visual devices and electronic equipment that assist pilots when navigating to and around an airport. NAVAIDs can be lights, signs, pavement markings, and antennas and are most beneficial when an aircraft is on approach to land and/or in conditions when visibility is limited such as at night and in inclement weather. While most NAVAIDs are ground-based equipment installed on an airfield, some are satellite-based that provide navigational signals through the Global Positioning System (GPS) to properly equipped aircraft. This section reviews both the

ground-based and satellite-based visual and electronic NAVAID equipment that is used for aircraft operations at the Airport.

Visual NAVAIDs – Visual NAVAIDs are considered to be lights, signs, and pavement markings that provide visual navigational information to pilots when on approach to land and when taxiing after landing or prior to takeoff. The following section summarizes the visual NAVAIDs that are located at the Airport:

- **Rotating Beacon –** A rotating beacon is a high intensity light that rotates 360 degrees and is operated during low visibility situations such as at night and in inclement weather to assist pilots in identifying the location of an airport from the air. Rotating beacons are equipped with a green and white lens separated 180 degrees from each other so that alternating green and white flashes can be viewed from the air signaling to pilots that an airport is available for public use. The rotating beacon at the Airport is located on a freestanding tower just west of the Runway 3 end.
- **Wind Indicators –** Wind Indicators (also known as wind socks or wind cones) are orange cone-shaped fabric devices that visually indicate wind strength and direction. Wind indicators are most beneficial to pilots prior to landing and during takeoff when aircraft are most impacted by surface winds; as such, wind indicators are typically located approximately 1,000 feet from the end of a runway if it serves air carrier aircraft and lighted if an airport is open to commercial air carrier operations at night. Four wind indicators are located at the Airport, all of them being lighted: one north of Runway 13-31 near the aprons, which serves the 13 end, one near the 31 end, one serving the Runway 21 end, and another one located near the Runway 3 end.
- **MALSR –** Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) assists in visually confirming the centerline of a runway prior to its threshold. MALSRs are typically equipped of with a series of light bars, each equipped with five lights that are preceded by

a series of sequenced flashing lights. MALSRs are most beneficial at night, in inclement weather, when visibility is limited, and/or when lights from the surrounding environment have the potential to make visual identification of the runway threshold challenging, such as when an airport is located in a metropolitan area. At Bismarck, a MALSR is located at the approach end of Runway 31, while the 13 end has only a MALS. On Runway 31, the approach lighting segment intensity can be controlled by the pilot.

- **Precision Approach Path Indicator (PAPI) –** Precision Approach Path Indicators (PAPIs) are approach lighting systems that indicate the correct glide slope angle to a runway through a series of angled white and red lights located adjacent to the touchdown zone aiming point marking on a runway. PAPIs are typically comprised of a two- or four-light unit in which combinations of the lights indicate if an aircraft is above, below, or on path with the correct glide slope. A four-light PAPI unit is located at each end of Runways 13-31 and 3-21. The PAPIs serving the Runway 13 end are FAA-owned, while those on 31, 3, and 21 are owned by the Airport.
- **Runway Edge Lighting –** Runway edge lighting is an important visual navigational tool as it designates the edge of a runway pavement surface when conditions limit visibility such as at night and in inclement weather. Runway edge lights are white except for the final 2,000 feet of an instrument runway when lighting is amber in color to help pilots identify the end of the pavement surface. Runway edge lights are classified into three types of lighting systems based on the number of illumination intensity settings. High Intensity Runway Light (HIRL) systems have the greatest illumination intensity with five light settings while Medium Intensity Runway Light (MIRL) systems have three light intensity settings. Low Intensity Runway Light (LIRL) systems offer only a single light intensity setting. Runways 13-31 and 3-21 are each equipped with a HIRL system.
- **Runway Pavement Markings –** While runway pavement markings are not typically considered as a NAVAID, they offer pilots with another visual confirmation of the touchdown zone, centerline, and boundaries of a runway

surface. Runways with visual approaches many only require a few essential markings while runways with precision approaches may require additional markings to help pilots designate the touchdown zone and runway threshold. Each end of Runway 13-31 is equipped with precision pavement markings that include those identifying the threshold, runway designation, aiming point, touchdown zone, centerline, and the sides of the runway. Runway 3-21 is equipped with similar precision markings on each end as well.

- **Airfield Signage –** Airfield signage is an important visual navigational aid that helps identify the locations of runways, taxiways, and aprons as well as provide noise abatement instructions and other airfield information to pilots. Airfield signage at the Airport includes runway distance remaining signs, directional signs, runway holding signs, and surface-painted hold signs.
- **Taxiway Edge Lighting –** Taxiway edge lighting is similar to runway edge lighting in that it helps identify the edge of taxiway surfaces when visibility is limited such as at night and in inclement weather conditions. Taxiway edge lights are blue and are typically installed with three illumination intensity settings at airports that support commercial airline service. The taxiway edge lights installed at the Airport are a Medium Intensity Taxiway Light (MITL) system that is equipped with three illumination intensity settings.
- **Electronic NAVAIDs –** Electronic NAVAIDs are important navigational tools in that they allow properly equipped aircraft to conduct landings when conditions impact the ability of a pilot to visually navigate a landing into an airport such when low cloud ceiling and/or inclement weather is presented. Electronic NAVAIDs are also used to complement visual NAVAIDs so that the capability for aircraft to arrive and depart from an airport can be maintained in both visual flight rules (VFR) and instrument flight rules (IFR) weather conditions. Electronic NAVAIDs operate by transmitting electronic signals that are received by avionics equipment installed in an aircraft. The signals transmitted by the electronic NAVAID may provide position, altitude, and speed information which allows a properly trained and certified pilot to navigate an aircraft to the Airport using only the instrumentation in the cockpit

if needed. Electronic NAVAIDs range from ground-based antennas installed at an airport to satellites transmitting GPS signals. The following section summarizes the electronic NAVAIDs that are utilized for aircraft landings at the Airport.

- **Runway Visual Range (RVR) –** The RVR is an estimation of how far down a runway a pilot can expect to see. It is calculated using ambient light levels and the intensity of the runway lights. The RVR distance values are reported in feet. RVR is used as one of the main criteria for minima on instrument approaches; in most cases a pilot must attain visual location of the runway before the aircraft. The maximum RVR range that is reported is 6,000 feet. RVR readings are reported by ATC and weather reports such as ATIS and METARs. The RVR equipment at Bismarck Airport is located adjacent to Runway 13-31.
- **Automatic Dependent Surveillance - Broadcast (ADS-B) –** The ADS-B is an integral part of the US Next Generation Air Transportation System (NextGen) program. It essentially replaces secondary radar facilities and allows broadcasting of aircraft ground and air position reporting. Although it is a ground-based antenna system, the system can be used to provide automated traffic separation around uncontrolled airport environments. The on-board equipment also has the capability to give weather reports and weather radar information to pilots in the air. The ADS-B that serves the Airport is located at the Mandan Airport, 6 nm to the west.
- **Instrument Landing System (ILS) –** An Instrument Landing System (ILS) is comprised of two antennas that provide horizontal and vertical positioning guidance information to properly equipped aircraft on approach to land on a runway. The first antenna, a localizer, is positioned beyond the far end of a runway and transmits a signal down the length of the runway and beyond to help aircraft on approach to align horizontally with the runway centerline. The second antenna, a glide slope, transmits a signal that guides aircraft vertically with the proper approach angle towards the landing threshold. An ILS is the most precise electronic navigational guidance system of all electronic

NAVAIDs.

There are different categories of ILSs based upon the navigational accuracy of the transmitted signals, the allowable decision height at which visual confirmation of the runway is needed in order to land, and the minimum visibility needed to conduct an approach. The standard ILS, Category I, allows a properly equipped aircraft to conduct a landing when the cloud ceiling height is not lower than 200 feet and the visibility is not lower than 1/2 mile. At Bismarck, Category I ILS systems are installed at the approach end of Runways 13 and 31.

- **Global Positioning System (GPS) –** The Global Positioning System (GPS) is a satellite based navigational system that transmits location signals to properly equipped aircraft so that location, altitude, direction of travel, and speed can be determined. GPS offers the ability for aircraft to conduct non-precision approaches to runways that are not equipped with ground based navigational equipment. At Bismarck, Area Navigation (RNAV) GPS approaches can be conducted to Runways 13, 31, 3, and 21.
- **Very High Frequency Omni-directional Radio Range (VOR)** – A VOR beacon is a ground based navigational system that emits radio signals to help an aircraft calculate its bearing. VORs are utilized for non-precision approaches and operate by directing an aircraft to the general vicinity of an airport upon which the pilot must be able to visually identify the airfield prior to maneuvering for a landing. The VOR used for navigational and approach purposes is located 2.9 nm from Runway 31 and has a published circling approach to all runways.

1.6.3.3. Weather Observation Systems

Weather observation equipment is often installed at an airport to record and disseminate accurate and timely weather conditions since aircraft operations can be directly impacted by local weather conditions. Two types of weather observation equipment are often

installed at airports: Automated Surface Observing Systems (ASOSs) and Automated Weather Observing Systems (AWOSs) with the components of each system relatively similar. At the Airport, an AWOS III unit is located adjacent to the Runway 13 PAPI, approximately 1,100' from the approach end of the runway. The AWOS unit is equipped to measure temperature, dew point, barometric pressure, density altitude, visibility, precipitation accumulation, cloud ceilings, sky cover, present weather conditions, and wind data such as speed, direction, and gusts. This system also allows augmentation by observers for conditions such as unusual precipitation (snow pellets, hail, etc.), smoke and volcanic ash.

1.6.3.4. Snow Removal Equipment (SRE) Facility

The SRE facility is situated directly south of the terminal building and auto parking area, with access to Taxiway C. It is used for the storage, servicing, and repair of vehicles and equipment utilized for maintaining the airfield. The SRE facility, at approximately 16,000 square feet, currently is undersized based upon existing eligible Airport equipment. Given the limited space for snow removal equipment, the Airport uses two other buildings to store out-of-season equipment. The primary storage building is able to house most of the Airport's plows, blowers, brooms, sand trucks, pickups, tractors, and spare attachments miscellaneous equipment, and sand storage. It also houses a large garage space for repair and routine maintenance of SRE equipment. Within the existing building are many snow removal crew conveniences. Some of these amenities include restrooms, office space, a crew rest area, and internet service. Outside the building there are storage tanks for products used by the Airport to sustain the operations on the airfield. Some of the products stored here are liquid runway deicer, glycol, used waste oil, diesel fuels, and unleaded auto gas. These are all used exclusively by airport staff and are not for sale to airfield tenants.

1.6.3.5. Aircraft Rescue and Fire Fighting (ARFF) Facility

The Airport holds a Federal Aviation Regulation (FAR) Part 139 operating certificate, meeting the requirements of a Class I airport capable of serving scheduled and unscheduled operations of small and large air carrier aircraft. The Airport meets ARFF Index B requirements for firefighting equipment and fire extinguishing agents and is capable of Index C requirements if necessary.

The ARFF facility is a 6,500-square-foot building located adjacent to Taxiway C, just northeast of the ATCT. It is equipped with three vehicle bays and is used for the storage of trucks and emergency vehicles. These bays currently house two Oshkosh vehicles, one command vehicle, and one ARFF foam trailer. Additional storage areas are used for surplus equipment, supplies, and fire-fighting gear. The ARFF building also houses emergency communications equipment as well as a backup generator, and personnel areas such as a restroom with shower facilities, a training room, fitness area, break area with a microwave and refrigerator, and office space.

1.6.3.6. Airfield Electrical Vault and Generator

A constant supply of power to airfield lighting and navigational equipment is essential for an airport to support continual aircraft operations. Two elements that are necessary to supply a continual source of power to airfield electrical components are an airfield electrical vault and a power generator. Airfield electrical vaults are structures designed to house transformers, lighting panels, constant current regulators (CCRs), relays, and other electrical components necessary to keep an airfield's electrical infrastructure operational. Airfield power generators are natural gas powered and provide a source of backup electricity in the event of an off-Airport public utility power failure.

Since airfield electrical vaults and generators are often connected to the same circuit, they are generally located in close proximity to one another to provide a centralized

location for maintenance and accessibility. At the Airport, the generator that serves limited functions in the terminal building is located to the north, next to the cooling tower for the heating/cooling system. The south airfield electrical vault is on the west side of the airfield on the extension of Burleigh Avenue, just past Gate 100. This vault powers the crosswind runway and parallel taxiway, as well as a portion of Taxiway C. The north vault and the airfield generator are located in the operations building located north of Gate 55. This vault powers the main runway and a portion of Taxiways C and B.

1.6.3.7. Airport Access Road

Bismarck Airport is located immediately off University Drive (Highway 1804) approximately four miles from Interstate 94. The primary entrance into the Airport is provided by circular terminal roadway known as Terminal Boulevard. University Drive is located on the western side of the airport and the entrance to the Terminal environment is marked by a large Bismarck Airport sign. To the east, the Airport is accessed via Airway Avenue. Yeagan Road dead-ends at University Drive to the south side and continues past Morrison Avenue, located on the north side of the Airport. Access to the north end of the airfield is provided by Airport Road, which connects to the eastern side of the Bismarck Expressway (Highway 810) and Airway Avenue. This northern portion of Airway Avenue does not connect directly to the portion on the east side of the airfield but terminates in the west at Airport Road. Approximately 25 various locations around the Airport have gate access to the airfield.

1.7. GENERAL AVIATION BUSINESSES AND TENANTS

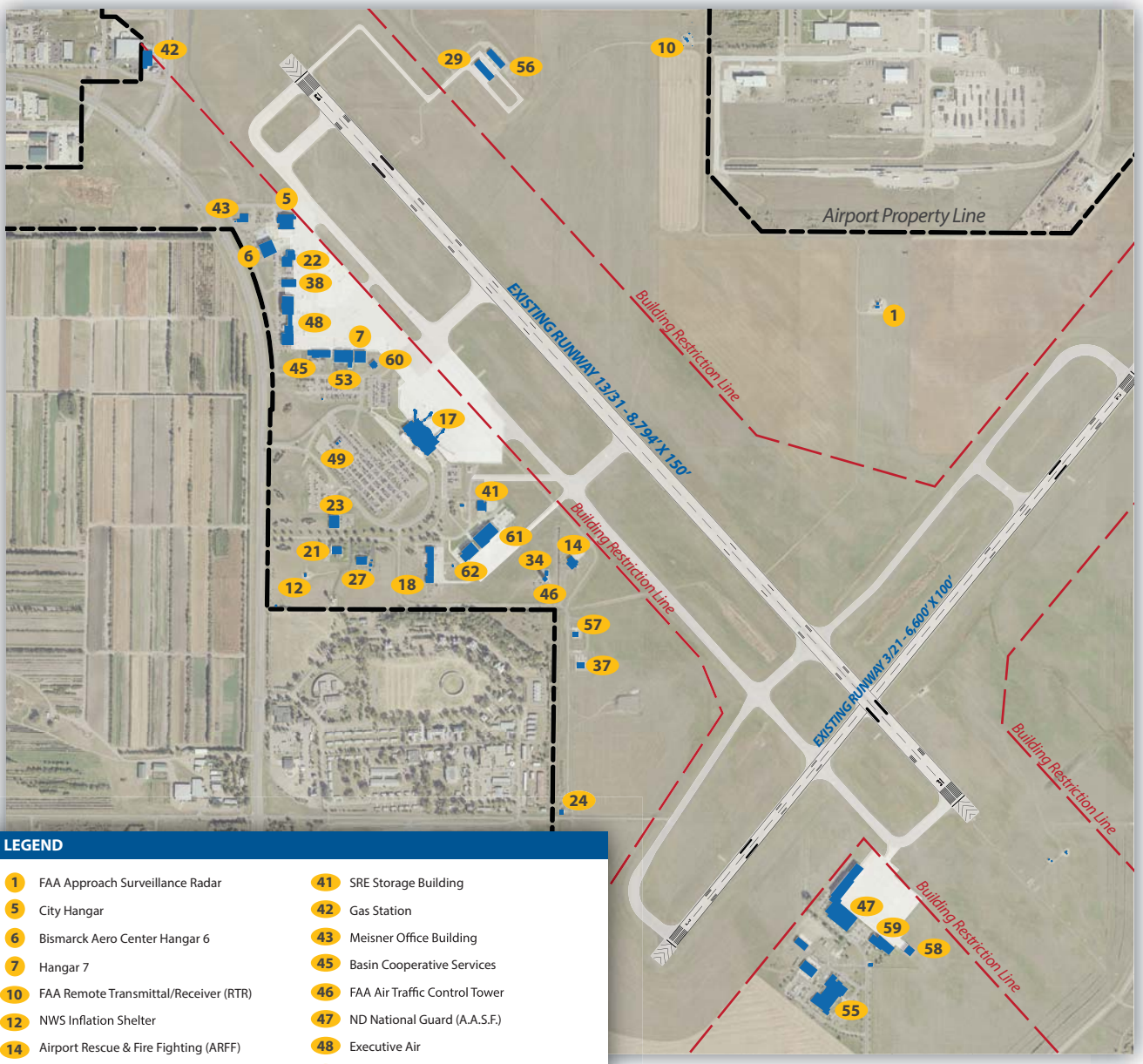
Bismarck is home to two Fixed Based Operators (FBOs); the North Dakota Aeronautics Commission; North Dakota Fish and Game; North Dakota State Highway Patrol; FedEx; Basin Electric Corporation; MDU; the US Army National Guard; FAA and Motix. The FBOs, Bismarck Aero Center and Executive Air, are located on the general aviation ramp area north of the terminal. Both FBOs provide a wide variety of services including general aircraft maintenance, avionics, charter brokerage, aircraft rental, flight instruction, fueling,

aircraft sales, ground school, hangar storage and pilot services. The Bismarck Aero Center complex also houses the North Dakota Aeronautics Commission staff offices.

Both Basin Electric and MDU are located south of the terminal building, each utilizing its own large corporate hangar adjacent to Taxiway E. Further south, the North Dakota Army National Guard facility is located on the south end of the airfield and is the base of several military aircraft including the UH-60 Blackhawk, UH-72 Lakota, and one C-12 fixed wing aircraft. The Civil Air Patrol (CAP) relocated to Mandan Airport in 2015.

1.7.1. General Aircraft Storage

The many hangars located around the general aviation area at the Airport are used by based and itinerant aircraft for recreational and business flying purposes. Many of the hangars are either owned by the FBOs for their use or are leased to tenants for their flight operations. One hangar that doesn't fit this narrative is the City of Bismarck-owned hangar on the extreme north end. This hangar has surpassed it useful life and although it is currently being used for aircraft storage, it is slated for removal in the near future. South of the terminal, adjacent to the SRE building, are two private corporate hangars. These buildings house some of the larger corporate operations on the field including MDU and Basin Electric. Another area of hangar development on the airfield is due east of the Runway 13 end. Referred to as the Bravo Hangers, there are two completed buildings in this area which include a three-unit row hangar and an 8-unit T-hangar, with room for many more hangars in the area. Locations on the airfield are shown in **Exhibit 1-10**.



LEGEND

1 FAA Approach Surveillance Radar
5 City Hangar
6 Bismarck Aero Center Hangar 6
7 Hangar 7
10 FAA Remote Transmittal/Receiver (RTR)
12 NWS Inflation Shelter
14 Airport Rescue & Fire Fighting (ARFF)
17 Airline Terminal Building
18 Airport Maintenance SRE Building
21 Emergency Management (911 EOC)
22 Bismarck Aero Center/ND Aeronautics
23 FAA Bismarck ADO
24 Electrical Vault
27 NOAA
29 Aero Stor Condo Hangar
34 FAA ATCT Garage & Emergency Generator
37 EAT Fuel Farm
38 Executive Air Taxi
41 SRE Storage Building
42 Gas Station
43 Meisner Office Building
45 Basin Cooperative Services
46 FAA Air Traffic Control Tower
47 ND National Guard (A.A.S.F.)
48 Executive Air
49 Pay Parking Lot Exit Plaza
53 Simmers Hangar
55 ND National Guard (A.A.S.F.) Readiness Center
56 Jay Byer Partnership Hangar
57 BAC Fuel Farm
58 ND National Guard (A.A.S.F.) Wash Rack
59 ND National Guard (A.A.S.F.)
60 Airport Operations
61 Basin Electric
62 MDU Hangar

Exhibit 1-10 **Hangar & Support Facilities Map**

1.8. AIRSPACE, AIR TRAFFIC CONTROL AND APPROACH PROCEDURES

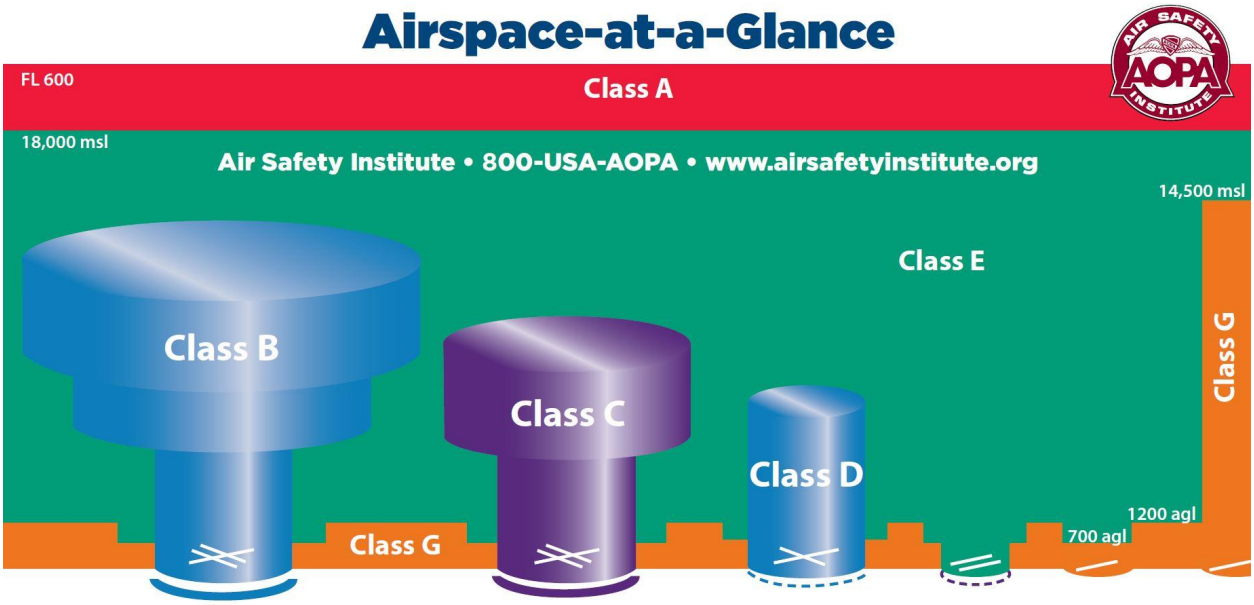
The inventory effort also reviewed how airspace is controlled around the Airport to gain a better understanding about how aircraft safely and efficiently maneuver for landing, takeoff, and taxi. This information will be beneficial for subsequent study tasks such as the demand/capacity analysis and evaluation of instrument approach procedures to help determine the air traffic control/approach procedure improvements that may be needed throughout the 20-year planning period. Information obtained as a part this task included a review of the airport traffic control tower and the existing instrument approach procedures that have been developed for the Airport. A summary of these elements for which information was obtained is presented in the following sections.

1.8.1. Airspace

In addition to facility and infrastructure information that was collected throughout the airfield, an inventory was taken of the airspace surrounding the Airport which included information on the classification of airspace as designated by the FAA. The following section provides a summary of these airspace components and lists the dimensions, where appropriate, for airspace surfaces that are associated with Runways 13-31 and 3-21.

Airspace over the United States can be classified into one of six separate categories by the FAA. The classification is based on different criteria, such as type of air traffic control (ATC) within the airspace, IFR and VFR flight requirements, and level of activity. It should be noted that there are certain operating rules, conditions, and restrictive circumstances that apply to each category of airspace. **Exhibit 1-11** illustrates the six classifications of airspace in the National Airspace System (NAS). The following text summarizes the six classifications of airspace and describes the operational criteria associated with each of them.

Exhibit 1-11: Classes of Airspace



Source: Aircraft Owners and Pilots Association (AOPA) 2016

Class A – Class A airspace is located between the altitudes of 18,000 feet and 60,000 feet MSL and lies overtop of the entire United States. Aircraft operating in Class A airspace are required to file a flight plan with an FAA Flight Service Station (FSS) do so under IFR. All aircraft operating in this airspace must receive approval from ATC before entering and must maintain constant radio communication with ATC.

Class B – Class B airspace is located between ground level and rises to 10,000 feet MSL; generally, Class B airspace is designated around airports with high levels of air traffic. The horizontal dimensions of Class B airspace can vary based on the specific needs of an airport that include orientation of the runways, surrounding land uses, and arrival and departure procedures. Aircraft operating in this class of airspace are required to receive clearance from ATC prior to entering and are required to remain in constant radio communication.

Class C – Class C airspace is from ground level to an altitude of 4,000 feet MSL and is only associated with airports that have a control tower, radar approach control, and have a large number of IFR operations. The horizontal dimensions of Class C airspace will vary depending on the specific needs of an airport but generally is designed in a two-tier shape with an inner radius of five miles around an airport from ground level to an altitude around 1,200 feet MSL while the outer radius is ten miles and ranges from an altitude of 1,200 feet MSL to 4,000 feet MSL. Permission is required from ATC for an aircraft to enter Class C airspace; constant radio communication with ATC is also required as well.

Class D – Class D airspace is located between ground level to an altitude of 2,500 feet MSL and is assigned around airports that have an air traffic control tower but may not have radar approach control. The horizontal dimensions of Class D airspace vary based upon the specific needs of an airport such as types of arriving and departing aircraft, level of IFR/VFR activity, and aircraft approach and departure routes. Aircraft operating in Class D airspace must request permission to do so from ATC and must remain in constant radio communication.

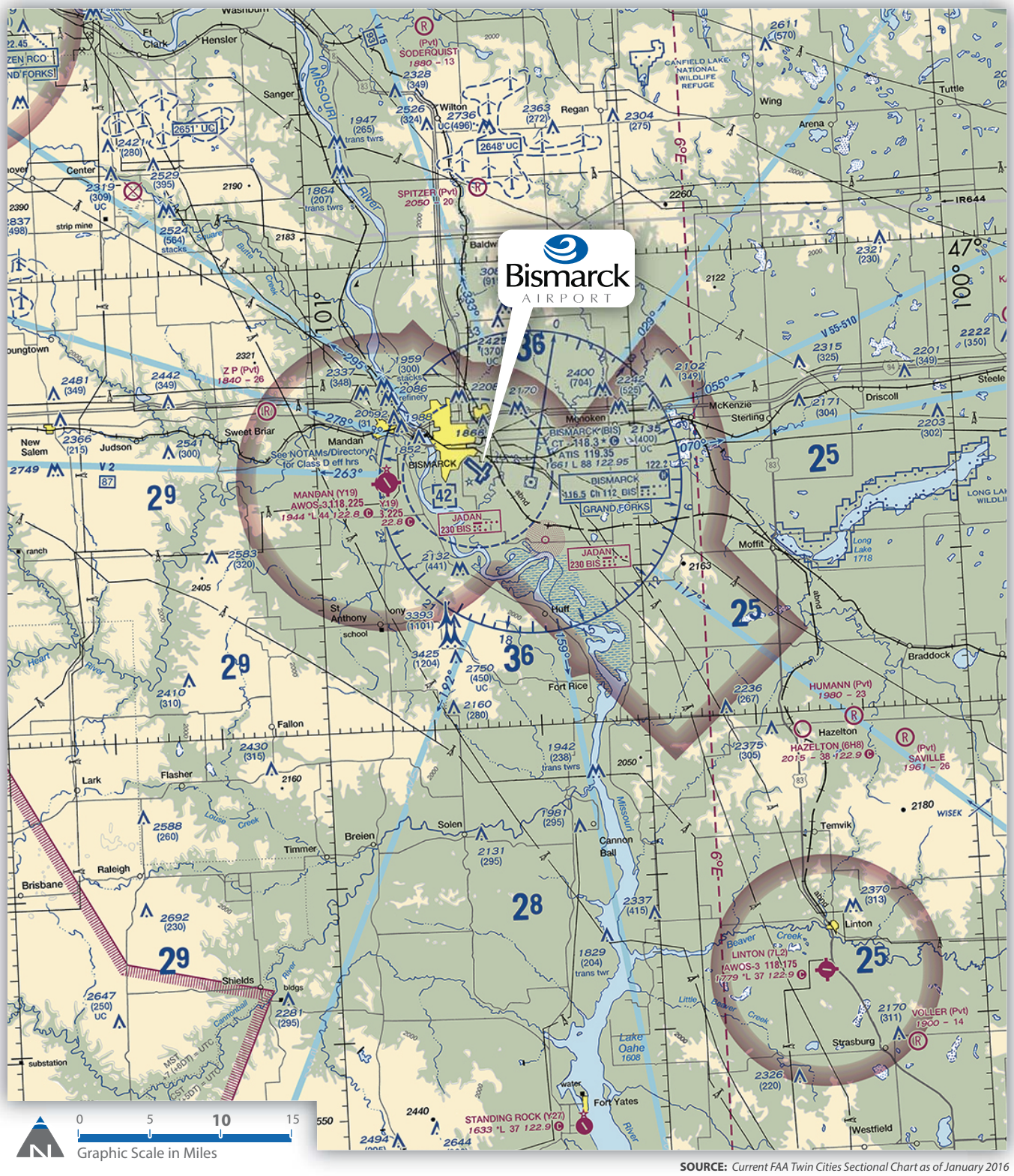
Class E – Class E Airspace is located between ground level to 18,000 feet MSL and from 60,000 feet MSL to the upper operational ceiling of aircraft that is not classified as A, B, C, D, or G. Aircraft operating under IFR are required to maintain constant communication with ATC while within Class E airspace; aircraft operating under VFR are not required to contact ATC while in Class E airspace.

Class G – While Class G airspace is classified as being located between ground level up to an altitude of 14,500 feet MSL, it is generally assigned from ground level to an altitude of 1,200 feet MSL. This class of airspace is typically found around large, remote areas and does not require aircraft operating within it to contact ATC.

As shown on the following page, **Exhibit 1-12**, Bismarck's Class D airspace is centered over the Airport and extends 4.0 nautical miles (nm) around the facility from ground level to an altitude of 18,000 feet MSL. Beyond the 4nm ring, Class E airspace, down to 700 feet AGL, extends outward from the center of the Class D; from an additional 4nm in the north to as far as 45nm to the southeast. Below this Class E layer, rests Class G airspace from the surface to 700 feet AGL.

1.8.2. Air Traffic Control

The Class D airspace around the Bismarck airport is controlled by an FAA ATCT from 1200Z – 0600Z (6:00am to 12:00am), located on the west side of the field. Aircraft separation, during those times, is the responsibility of ATC. After the tower is closed, the airfield switches to Class E, and aircraft separation is accomplished through radio contact on the CTAF frequency (118.30) and visual avoidance. Arrival and Departure radar control is provided by Minneapolis Center on 135.25 for instrument flight rules and visual flight rules as requested during the same hours. Outside of those hours, it is the responsibility of air traffic controllers from Minneapolis Center at KMSP. All aircraft, vehicles, and personnel moving on the ground are required to be in constant radio contact with BIS Ground Control while operating within the movement area on frequency 121.90 megahertz (MHz) when the ATCT is open. Ground service and fuel requests are via the UNICOM frequency at 122.95.



SOURCE: *Current FAA Twin Cities Sectional Chart as of January 2016*

Exhibit 1-12 **Sectional Aeronautical Chart**

1.8.3. FAR Part 77

The FAA established FAR Part 77 to protect aircraft operating in proximity to an airport from obstructions such as towers, buildings, and other tall objects through a set of defined surfaces centered on a runway's centerline. Through FAR Part 77, five surfaces are defined to protect aircraft arriving to, departing from, and maneuvering in the vicinity of an airport from obstructions and vary in dimension based on criteria such as type of runway, type of approach to the runway, and visibility minimums. The following section describes these surfaces and lists the dimensions for each as they are associated to the Airport's runways.

Primary Surface – The primary surface is centered longitudinally on the runway centerline at the same elevation as the runway and extends 200 feet beyond each end of a paved runway while the length is the same length as the runway for those that have turf surfaces.

The width of a primary surface runway is:

- 250 feet for utility runways (designed for propeller driven aircraft of 12,500 pounds maximum gross weight or less) having only visual approaches
- 500 feet for utility runways having non-precision instrument approaches
- 500 feet for runways other than utility having only visual approaches
- 500 feet for non-precision instrument runways other than utility having visibility minimums greater than 3/4 statue mile
- 1,000 feet for non-precision instrument runways other than utility having a non-precision instrument approach with visibility minimums as low as 3/4 statue mile
- 1,000 feet for precision instrument approach runways other than utility

The primary surface for Runway 13-31 is 1,000 feet in width since the breadth of a primary surface, as per Part 77, is to be that of the most precise approach found on either end of a runway. The total length of the Runway 13-31's primary surface is 9,194 feet since the

surface extends 200 feet beyond each end of the runway; the primary surface for 3-21 is 7,000 feet long and 500 feet wide.

Approach Surface – The approach surface is centered on the runway centerline and extends longitudinally upward and outward away from the primary surface at each end of a runway. The inner width of the approach surface is the same width as the primary surface and expands uniformly to a width of:

- 1,250 feet for the end of a utility runway with only visual approaches
- 1,500 feet for the end of a runway other than utility with only visual approaches
- 2,000 feet for the end of a utility runway with a non-precision instrument approach
- 3,500 feet for the end of a non-precision instrument runway other than utility having visibility minimums greater than 3/4 statue mile
- 4,000 feet for the end of a non-precision instrument runway other than utility having a non-precision instrument approach with visibility minimums as low as 3/4 statue mile
- 16,000 feet for precision instrument runways

The horizontal distance and slope of the approach surface is:

- 5,000 feet at a slope of 20:1 for all utility and visual runways
- 10,000 feet at a slope of 34:1 for all non-precision instrument runways other than utility
- 10,000 feet at a slope of 50:1 with an additional 40,000 feet at a slope of 40:1 for all precision instrument runways

The dimensions of the approach surfaces for Bismarck's runways are presented below in **Table 1-6**.

Table 1-6 Runway Approach Surface Dimensions		
Dimension	**Runway 13/31**	**Runway 3/21**
Inner Width	1,000 feet	1,000 feet
Outer Width	16,000 feet	4,000 feet
Slope/Horizontal Distance	50:1 for 10,000 feet; then 40:1 for an additional 40,000 feet	34:1 for 10,000 feet

Transitional Surface – The transitional surface is centered on the runway centerline and extends outward and upward perpendicularly from the width of the primary surface at a slope of 7:1 until a height of 150 feet above an airport where it intersects with the horizontal surface. The dimensions of this surface are the same for all runways, regardless of type of runway, approach, or visibility minimums.

Horizontal Surface – The horizontal surface is a horizontal plane located 150 feet above an airport and intersects with the transitional and conical surfaces. The perimeter of the horizontal surface is formed by lines of tangent from arcs generated from each runway end. The radii of the arcs are:

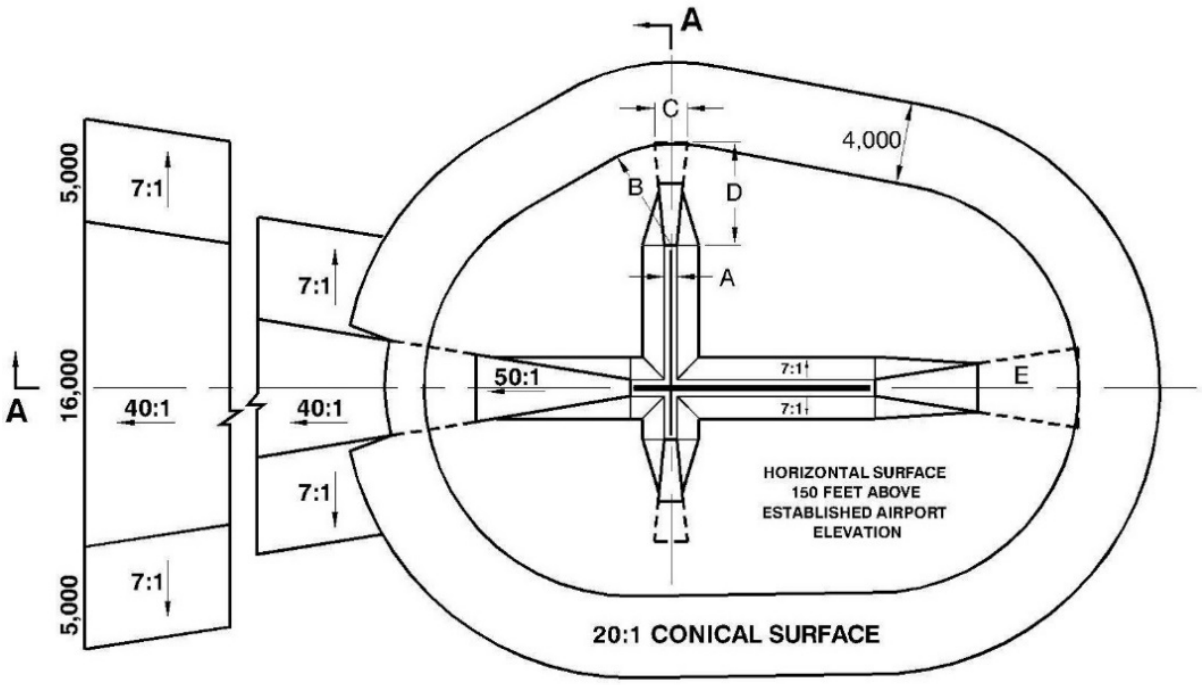
- 5,000 feet for all runways designated as utility and visual
- 10,000 feet for all other runways

The radii of the arcs used in the establishing the perimeter of the horizontal surface is 10,000 feet for Runway 13-31 and 10,000 feet for Runway 3-21.

Conical Surface – The conical surface extends outward and upward from the perimeter of the horizontal surface at a slope of 20:1 for a horizontal distance of 4,000 feet. The dimensions of this surface are also the same for all runways, regardless of type of runway, approach, or visibility minimums.

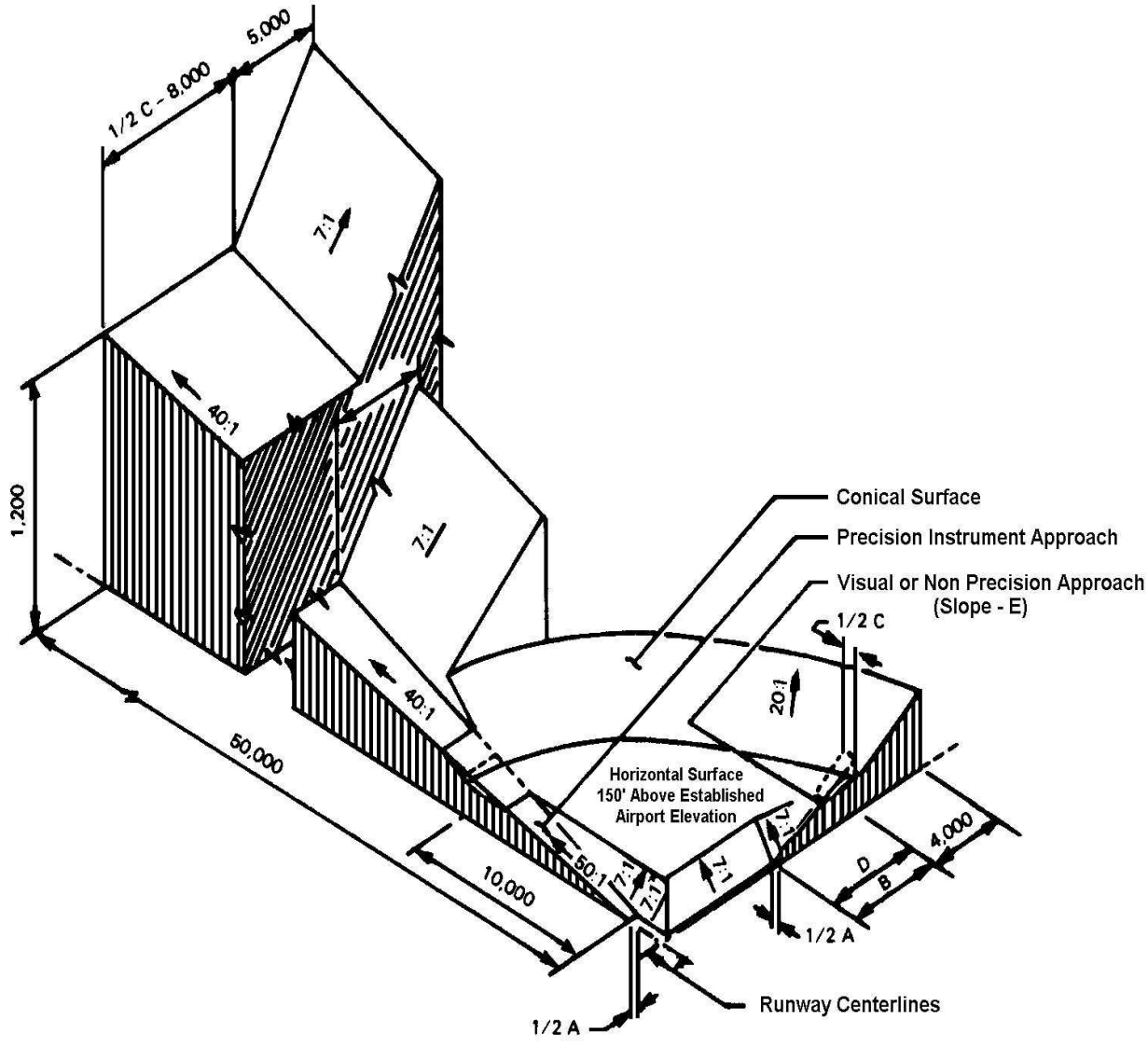
Exhibit 1-13 illustrates a plan view of the five FAR Part 77 surfaces while an isometric view is presented in **Exhibit 1-14**.

Exhibit 1-13: FAR Part 77 Surfaces – Plan View



Source: FAR Part 77

Exhibit 1-14: FAR Part 77 Surfaces – Isometric View



Source: FAR Part 77

1.8.4. Approach Procedures

Approach procedures provide pilots with a set of predetermined maneuvering instructions to successfully navigate a landing which are beneficial during conditions when visibility is limited such when low cloud ceilings are present or when inclement weather is present.

Approach procedures are also developed to help manage the flow of traffic in high volume areas as well as in situations when the flow of traffic needs to be controlled away from populated areas or for noise abatement purposes. Developed and published by the FAA, approach procedures are based on the type of navigational equipment installed on a runway. Precision instrument approaches offering the ability for pilots in properly equipped aircraft to conduct landings when low cloud ceiling heights and/or reduced visibility minimums are present are established for runways that are equipped with an ILS. Runways equipped with other NAVAID systems or with the capability to utilize GPS are assigned non-precision instrument approaches while runways that require a pilot be in constant visual contact of the airfield while on approach are assigned visual approaches. At the Bismarck Airport, seven approach procedures have been developed for arriving aircraft which are summarized below in **Table 1-7**. Full FAA approach plates, as of January 2016, can be found in Appendix B of this document.

Table 1-7 Airport Approach Minimums

Approach	Runway	Visibility	Min Altitude
ILS	13	3/4 mile	200' AGL
ILS	31	1/2 mile/2400RVR	200' AGL
RNAV/GPS	3	3/4 mile	200' AGL
RNAV/GPS	13	3/4 mile	200' AGL
RNAV/GPS	21	3/4 mile	250' AGL
RNAV/GPS	31	1/2 mile/2400RVR	200' AGL
VOR Circling	All	1 mile	579' AGL

1.8.5 Terminal Procedures (TERPS) Surfaces

TERPS surfaces exist to protect users of the airport's terminal procedures. These surfaces of varying slopes and sizes include, amongst others, the departure surface,

glideslope qualification surface, and the one engine inoperative surface. The most critical of these surfaces to be clear of instructions is the 20:1 surface that insures a minimal amount of object clearance when on final approach to the runway. The departure surface is a large 40:1 surface that allows compliance with standard departure procedures when clear. This surface is applied to all runways at airports with an instrument approach procedure and consequently, applies to all runways at the Bismarck Airport.

1.9 SUMMARY

Information obtained during the inventory effort provides a baseline to evaluate how well existing facilities are capable of accommodating future demand. Through this evaluation, an understanding can be gained of the infrastructure improvements that will be needed for the Airport to meet the air transportation requirements of central North Dakota for the next 20 years. Completion of other study tasks such as the demand/capacity analysis, evaluation of alternatives, and the development of sustainability planning initiatives are also dependent upon information obtained through the inventory effort. With a history that spans nearly 90 years, the Airport has continually evolved to meet the demands of its users. This master plan will serve as a guide to help the Airport plan for future infrastructure development as well as strengthen its commitment to be a community-friendly business and vital transportation hub for the region.