CHAPTER 1

Inventory of Facilities

1.1 Introduction

The purpose of the inventory chapter of an airport master plan is to present relevant information about the airport and its function, the surrounding community, and any existing plans that govern or guide the airport's development. This chapter describes the existing condition of facilities at the Albert Lea Municipal Airport (AEL or the Airport) and provides information about historical activity, previous plans and studies, land use and zoning, environmental resources, and local socioeconomic trends. This will be done in the following sections:

- Airport Background
- Federal, State and Local Planning
- Airport Zoning and Land Use
- Airside Facilities
- Landside Facilities
- Airspace
- Local Socioeconomics
- Inventory Summary

1.2 Airport Background

The Albert Lea Municipal Airport is a public-use general aviation airport in south-central Minnesota. Located at the northern edge of the City of Albert Lea, AEL is approximately 2 miles north of the city center, near the geographic center of Freeborn County. The Airport is approximately 85 miles south of the Minneapolis-St. Paul metropolitan area and 13 miles north of the Minnesota/Iowa border, conveniently located near the I-90 and I-35 corridor. **Figures 1-1** and **1-2** depict AEL's location. The City of Albert Lea owns and operates the Airport. AEL is situated among several other airports in the vicinity, listed in **Table 1-1** and shown in **Figure 1-3**. The two closest commercial service airports, both within a one-hour drive time, are the Mason City Municipal Airport (MCW) and the Rochester International Airport (RST).

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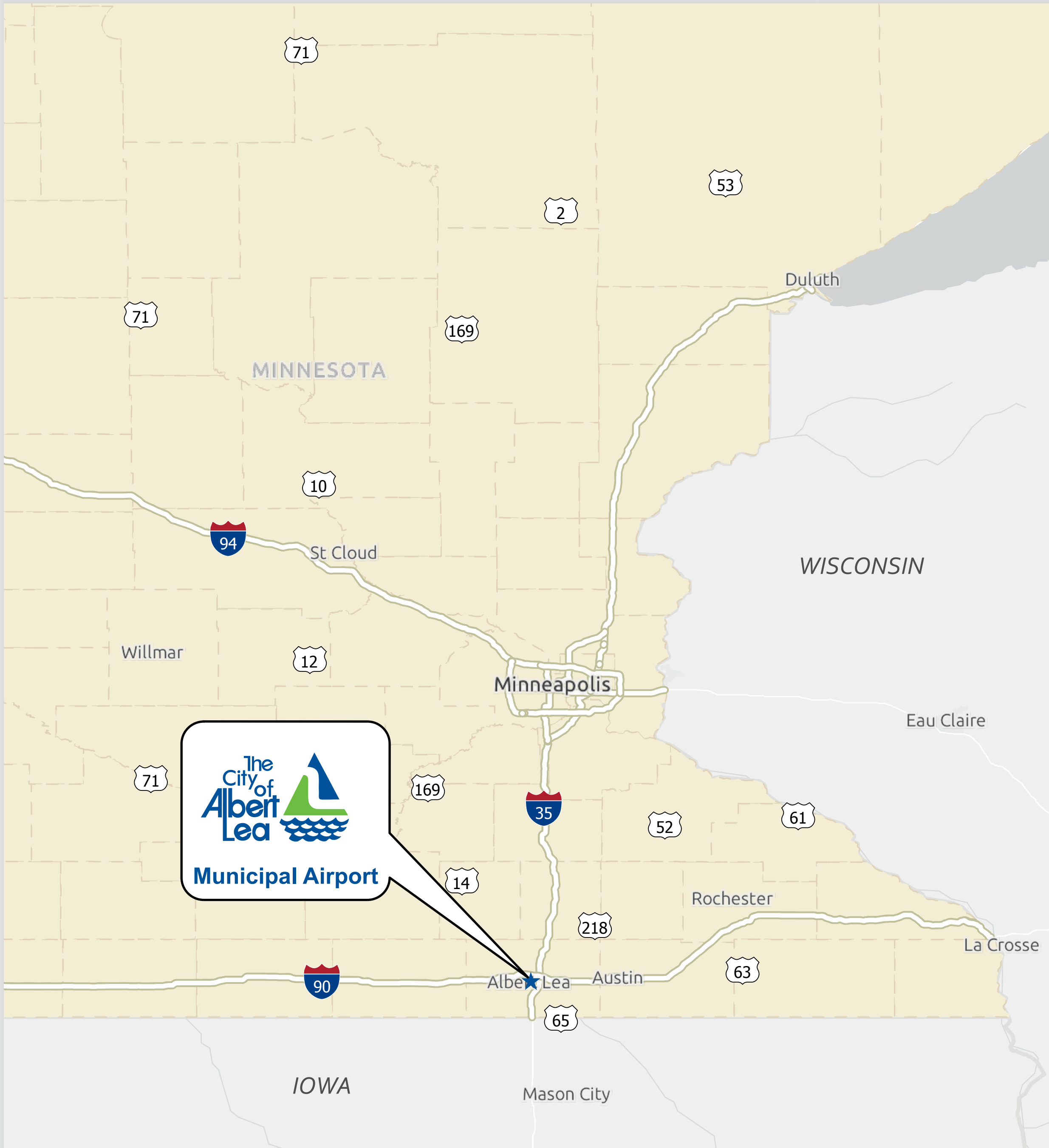

0 25 50 100

Graphic Scale in Miles

Figure 1-1: **Airport Location**

Source: *Esri, HERE, Garmin, FAO, NOAA, USGS, Open Street Map*

The City of Albert Lea

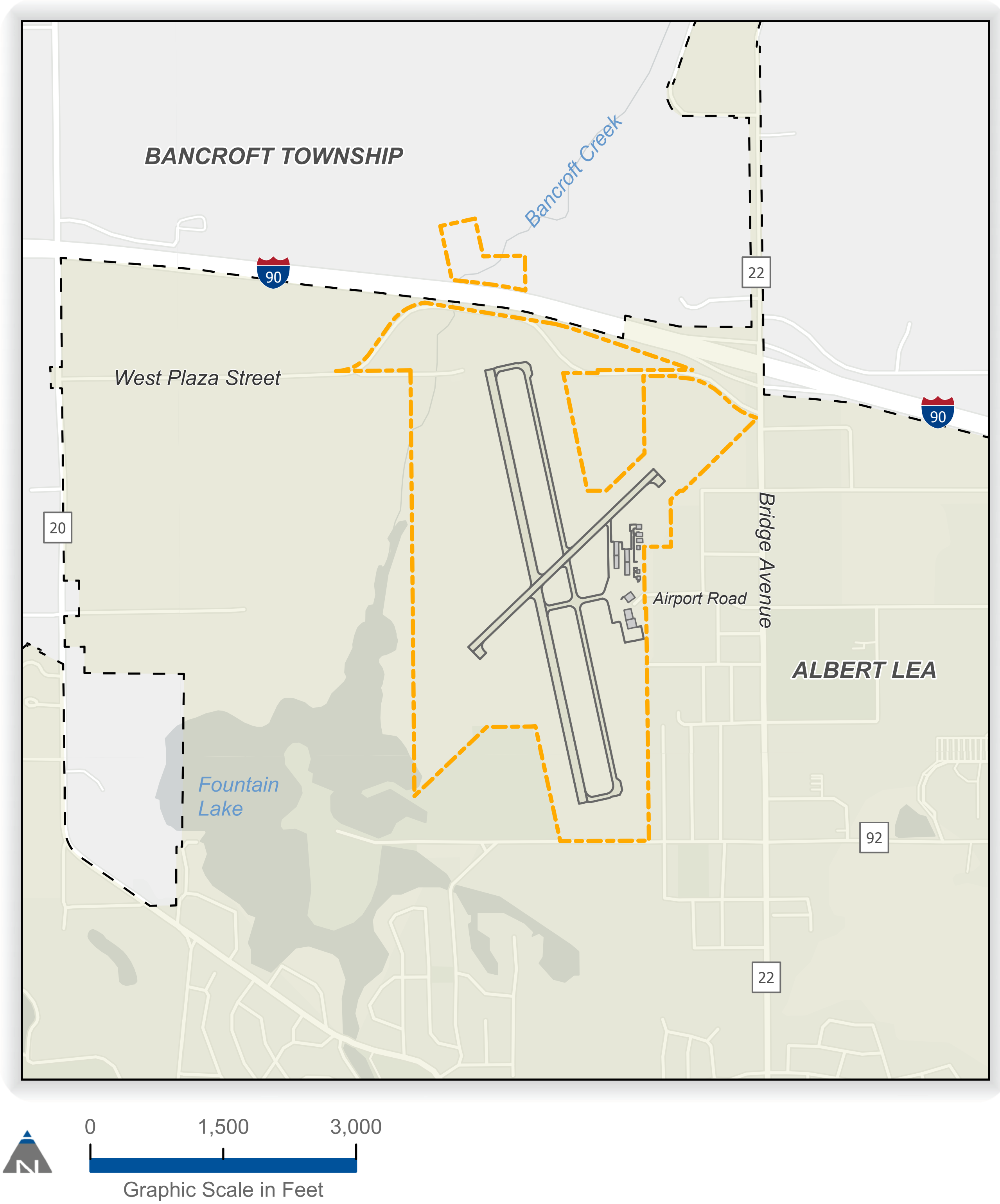

Figure 1-2: **Airport Vicinity**

Source: *Esri, HERE, Garmin, FAO, NOAA, USGS, Open Street Map*

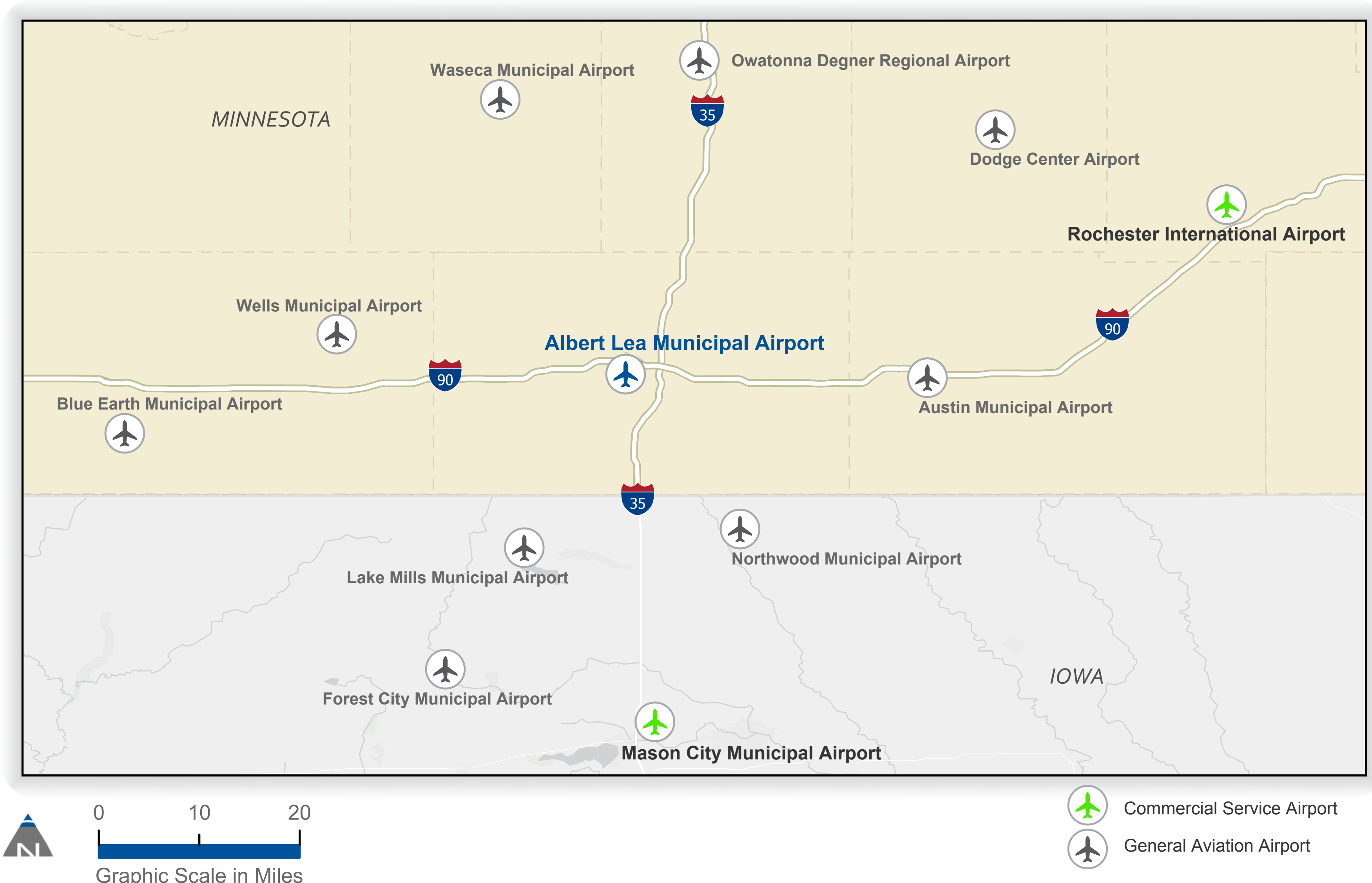

Figure 1-3: **Airports in the Vicinity**

Source: *Esri, HERE, Garmin, FAO, NOAA, USGS, Open Street Map*

Table 1-1: Airports in the Vicinity

Airport	Distance	NPIAS	Runway Type Available	
			Paved	Turf
Northwood Municipal (5D2)	18 miles			X
Lake Mills Municipal (0Y6)	20 miles			X
Wells Municipal (68Y)	21 miles			X
Austin Municipal (AUM)	22 miles	X	X	
Waseca Municipal (ACQ)	29 miles	X	X	
Owatonna Degner Regional (OWA)	31 miles	X	X	
Forest City Municipal (FXY)	33 miles	X	X	
Dodge Center (TOB)	35 miles	X	X	X
Mason City Municipal (MCW)	36 miles	X	X	
Blue Earth Municipal (SBU)	37 miles	X	X	X
Rochester International (RST)	46 miles	X	X	

Sources: SkyVector, AirportIQ 5010

1.3 Federal, State and Local Planning

This section provides a summary of previous planning documents that impact the Airport and provide information for this Master Plan.

1.3.1 NPIAS

The National Plan of Integrated Airport Systems (NPIAS) is a report the Federal Aviation Administration (FAA) submits to Congress every two years. The report lists and categorizes airports that are integral to the national air transportation network. Airports may be included in the NPIAS if they meet certain location and size criteria. Upon inclusion, they are eligible for development grants under the FAA's Airport Improvement Program (AIP). The NPIAS describes the roles of included airports and provides an overview of the types of eligible AIP development projects and budgeted federal funding over the next five years. The 2019 – 2023 NPIAS identifies 3,328 public use airports (3,321 existing and 7 proposed) that contribute to the national air transportation system, which is about 65 percent of the 5,087 total U.S. public use airports and 17 percent of the 19,636 total U.S. airport facilities.

AEL is one of 97 airports in Minnesota included in the NPIAS and is classified as Local. These tend to be general aviation facilities, which the NPIAS indicates have a range of uses including recreation, commerce, and training. The NPIAS estimates five-year costs for airport improvements eligible for Federal development grants under the AIP and lists $1,090,903 for AEL.

1.3.2 State Airport System Plan (SASP)

The Minnesota SASP offers planning and development guidance based on an airport's role in the state system and its categories differ from the categories in the NPIAS. The Minnesota Department of Transportation Office of Aeronautics (MnDOT Aeronautics) is currently developing an update to the Minnesota SASP, which was last updated in 2012. The 2012 SASP categorizes AEL as one of 30 Key

Airports in the state, which can serve most types of aircraft, including business jets, and help connect communities to regional and global markets. The SASP also recommends strategies to fund improvements and generate revenue at small airports, and bases guidance for growth and development on system goals and forecasted needs for the airport service area.

Minnesota GO

The SASP is integrated with Minnesota GO, a broad planning vision for multimodal transportation initiated in 2011 that spans 50 years. The Minnesota GO vision emphasizes interconnected modes of transportation and explains that good connections to airports are important for business and tourism, especially in greater Minnesota. This concept is consistent with the NPIAS and SASP focus on airports as a method for communities to access regional or national markets.

1.3.3 Airport Planning Documents

Several recent studies have been completed for AEL over the past five years. Those studies have been referenced in the undertaking of this Master Plan, and information from those studies will be utilized to the extent possible.

2015 Runway 23 Runway Protection Zone (RPZ) Alternatives Analysis

This technical memorandum details the assessment of RPZ alternatives for the proposed realignment of West Plaza Street near the Airport, as required by the FAA's interim guidance. The document described the technical analysis for the proposed road realignment project and presented associated RPZ alternatives. The preferred alternative resulted in a portion of West Plaza Street moving 150 feet closer to the existing Runway 23 threshold, and further into the Runway 23 RPZ, while keeping the proposed runway extension on the Airport Layout Plan (ALP). This new configuration relocated West Plaza Street to align with East Plaza Street at the intersection of Bridge Avenue. Bridge Avenue is an important local arterial street just east of the Airport property boundary that connects I-90 immediately north of the Airport. This realignment improved the safety and traffic flow of Bridge Avenue by reducing the number of access points in the vicinity of the I-90 on- and off-ramps.

The ALP depicts a future extension of Runway 23, which would increase the runway length from 2,898 feet to 3,500 feet and further reduce the distance between the threshold and the realigned road by 600 feet. The FAA Airports District Office obtained FAA Regional and Headquarters concurrence on the RPZ Alternatives Analysis subject to a future review of the viability of extending Runway 5/23. This would include completing an RPZ alternatives analysis if an extension is included in the Master Plan and ALP. This extension would introduce I-90, exit ramps, and additional intersections in the RPZ and will be reviewed as part of this master plan.

2015 Arrivals and Departures Building Study

This 2015 report followed the 2014 Albert Lea Facilities Master Plan and was intended to determine the best alternative for preserving the Arrivals/Departures (A/D) and flight school public services for the community. During the study, it was determined that demand for these facilities was expected to remain steady or grow incrementally in the future. However, both the A/D and the flight school buildings were outdated and would not be able to meet the future needs of the Airport without major renovation. Since these buildings were no longer fully compliant with code requirements, future renovations would require the affected portions of the buildings to be brought into compliance with current code. While many code issues such as the tactile exit signs could be remedied with little effort, other issues were inherent to the building's layout and construction. Options for providing a new building were developed, exploring layouts that would best meet the facility requirements and assessing both operational performance and construction feasibility. Through this process, a recommended layout emerged that combined several important site opportunities, benefiting from optimal access to the airfield, public roadways, and the parking lot. Finally, the report gave a financial analysis, complete with potential funding sources and likely federal, state, and local cost shares. The improvements needed for the A/D building that were recommended in this plan have since been constructed. Further discussion of the A/D building is found in **Section 1.6.2**.

2016 A/D Building Environmental Assessment

The 2016 environmental assessment (EA) for the A/D building evaluated the existence and extent of any environmental impacts associated with the new facility. The proposed action included construction of a new A/D building, parking lot reconstruction, and other associated site development. The EA required completion of a historic evaluation due to the age and type of construction of an adjacent wooden hangar (built in 1943) and the replacement facility’s proximity to this hangar. Because the Airport planned to ultimately construct a new hangar in the location of the existing wooden hangar, the EA included coordination with the FAA and State Historic Preservation Office (SHPO) to prepare a Finding of Effect for both the A/D building construction and the 1943 hangar removal and to identify acceptable mitigation. The study found there were no significant environmental impacts as a result of the new A/D building, and in April 2016, the FAA issued a Finding of No Significant Impacts (FONSI). Furthermore, the existing adjacent wooden hangar was determined to not be eligible for the National Register of Historic Places as a historically significant structure, meaning that a future project requiring the removal or demolition of that building will be possible without mitigation.

1.4 Airport Zoning and Land Use

Several entities have authority to regulate zoning and land use in and around airport property, including Freeborn County and the City of Albert Lea. Parcels that fall within a particular jurisdiction must comply with use and design standards set by the governing body for the designated district. In addition, the State of Minnesota offers zoning guidance specific to airports that communities are encouraged to adopt to maintain safety and usability for airport users and nearby land. In 2012, the City adopted the State’s zoning guidance with some additional restrictions during its most recent update to the Albert Lea Municipal Airport Zoning Ordinance.

1.4.1 City of Albert Lea Zoning and Land Use Ordinance & Albert Lea Municipal Airport Zoning Ordinance

Airport property and much of the surrounding land is governed by the Albert Lea Zoning and Land Use Ordinance including the Albert Lea Municipal Airport Zoning Ordinance. The Albert Lea Municipal Airport Zoning Ordinance was enacted for, “the protection of the public health, safety, order, convenience, prosperity, and general welfare, and for the promotion of the most appropriate use of land” by preventing, “the creation or establishment of airport hazards.”

AEL property is 332 acres, of which the vast majority is located within the Albert Lea city limits. AEL property includes approximately 10 acres of land north of I-90, which is outside the city limits. This land houses equipment associated with AEL's Omni-directional Approach Lighting System (ODALS).

The majority of the Airport and areas west of the Airport are located in the City's Limited Industrial district (Zone I-1). Land uses in this area include the City's transfer station and demolition landfill a quarter mile west of the runway's intersection. The northwest portion of AEL, used for the landside activities, is in the Industrial district (Zone I-2). This area contains the Ulland Brothers gravel pit adjacent to Airport property, between the Runway 17 and 23 ends. The area east of the Airport is zoned Community Business district (Zone B-2) where several retailers and restaurants are located. The area northwest of the Airport is zoned Interstate Development district (Zone IDD) and contains a lumber yard as well as a landscaping and garden center. The remaining surrounding area, to the southeast and south, is a Single-Family Residential district (Zone R-1). Land uses in this area include a private golf course directly south of the Airport, low-density residential areas, and a public disc golf course. The City's official zoning map is shown in **Figure 1-4**.

The Albert Lea Municipal Airport Zoning Ordinance imposes additional restrictions on the areas defined by the Airspace Zoning exhibit. The most recent Airport Zoning Ordinance was adopted in 2012. The ordinance and zoning map outline the three-dimensional airspace zones near the runways that must be free from obstructions, thus establishing height restrictions for objects beneath these spaces. It also defines Safety Zones A, B, and C and the permitted uses of land therein. These zones are shown in **Figures 1-5** and **1-6**.

> **Safety Zone A:** Land in the approach zones of a runway extending outward from the end of the primary surface a distance of two-thirds of the planned length of the runway. This distance is 3,333 feet for Runway 17/35 and 2,400 feet for Runway 5/23. Safety Zone A is the most restrictive and prohibits buildings, temporary structures, exposed transmission lines, or other similar above-ground land use structural hazards. Safety Zone A allows agriculture, horticulture, animal husbandry, raising of livestock, wildlife habitat, light outdoor recreation (non-spectator), cemeteries, parking, and other uses that will not create, attract, or bring together an assembly of people.

> **Safety Zone B:** Land in the approach zones of a runway extending outward from Safety Zone A, a distance of one-third of the planned length of the runway. This distance is 1,667 feet for Runway 17/35 and 1,200 feet for Runway 5/23. Safety Zone B allows some low-density development; usage sites must be a size of at least 3 acres and may not have a population of more than 15 people per acre. Additionally, each site may have no more than one building plot upon which any number of structures may be erected; building plots need to be single, uniform, and non-contrived areas whose shapes are uncomplicated and whose area shall not exceed the ratios set forth in the ordinance with respect to total site area. Some uses are specifically prohibited in Zone B including churches, hospitals, schools, theaters, stadiums, hotels, motels, trailer courts, campgrounds, and other places of assembly.

> **Safety Zone C:** Land within the perimeter of the horizontal zone that is not included in Zone A or Zone B. Zone C has no land use restrictions but is subject to height restrictions.

Exemptions to these safety zones exist for established residential neighborhoods in built-up urban areas, defined as land uses that existed as of January 1, 1978. These land uses are exempt from the use restrictions of Safety Zones A and B but are subject to the height restrictions. There are several residences within established residential neighborhoods that are located within Runway 35's Safety Zones A and B.

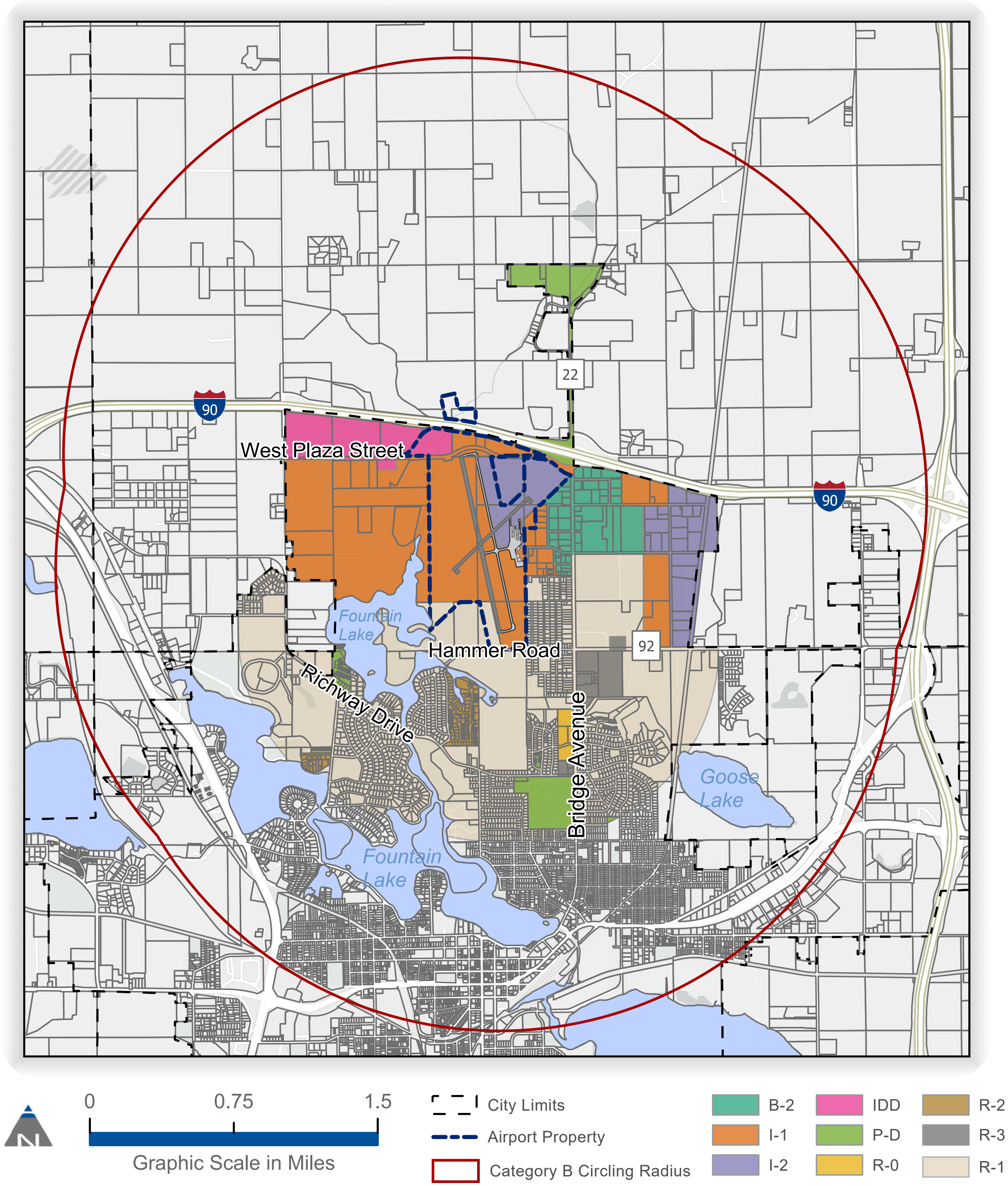

Figure 1-4: **City of Albert Lea Zoning**

Source: *City of Albert Lea Official Zoning Map, January 2014; USFWS National Wetland Inventory, October 2019; Esri, HERE, Garmin, FAO, NOAA, USGS, Open Street Map*

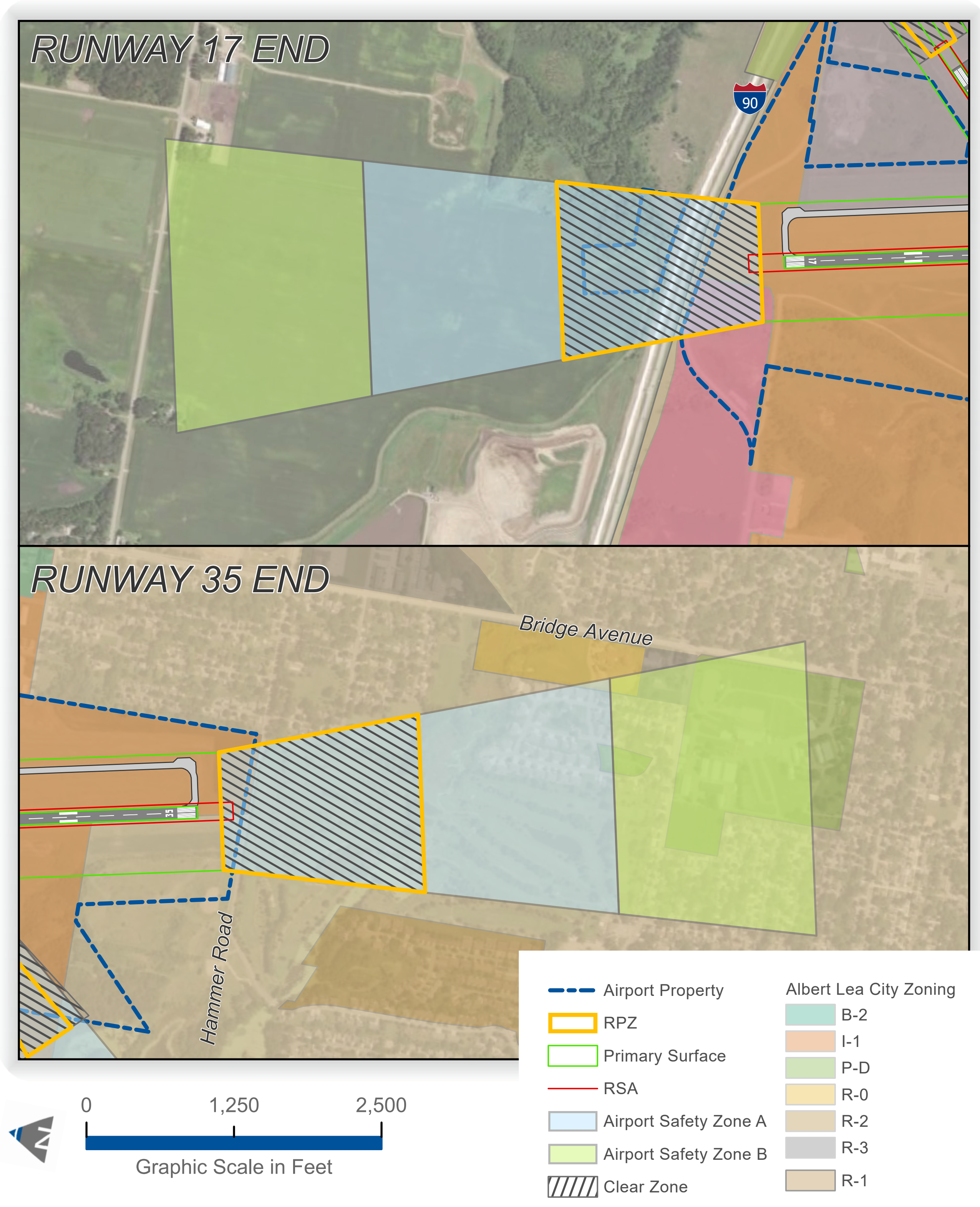

Figure 1-5: **Runway 17/35 Zoning**

Source: *Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN*

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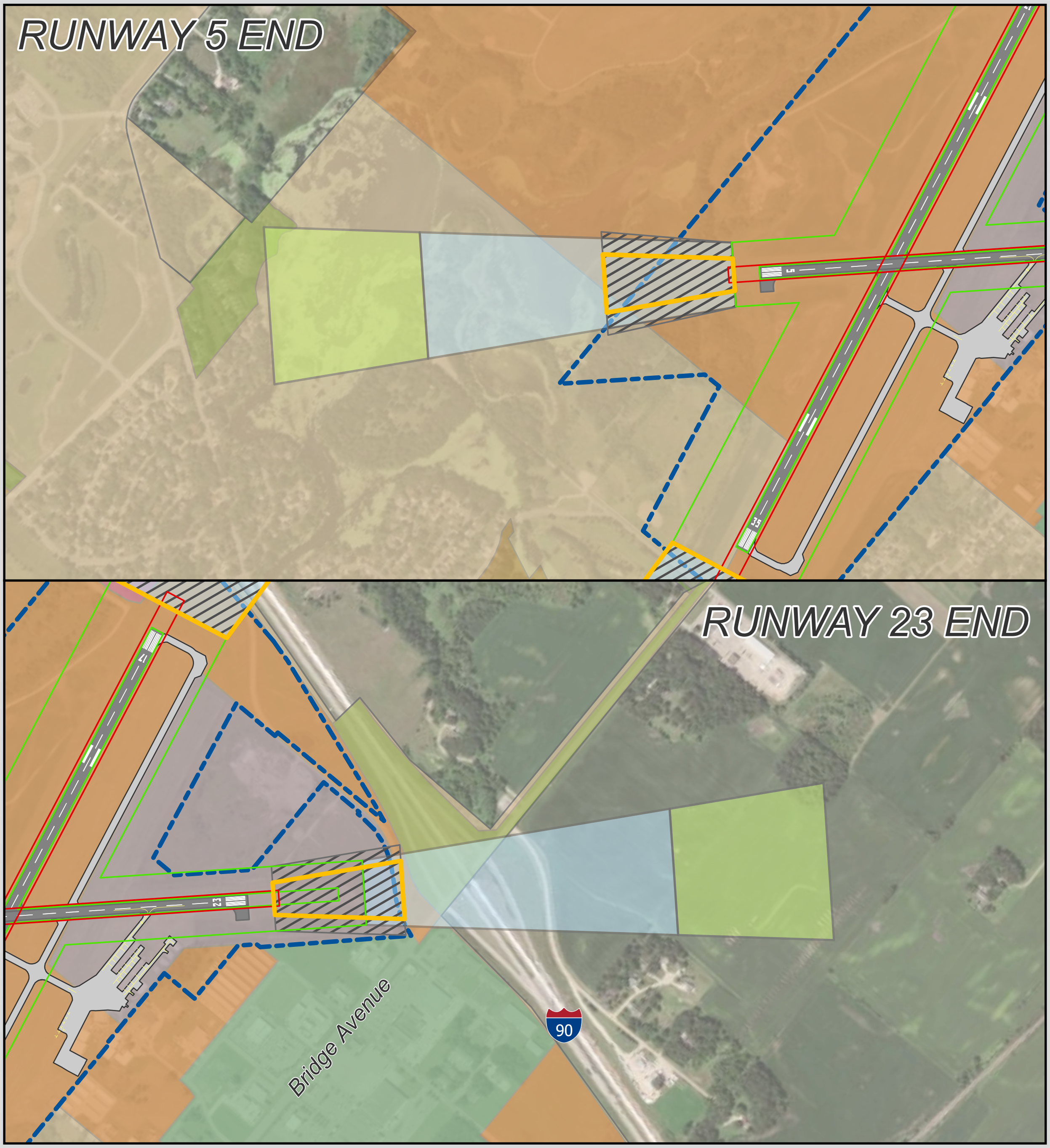


0 1,250 2,500
Graphic Scale in Feet

Airport Property
RPZ
Primary Surface
RSA
Airport Safety Zone A
Airport Safety Zone B
Clear Zone

Albert Lea City Zoning
B-2
I-1
I-2
IDD
P-D
R-1

Figure 1-6: **Runway 5/23 Zoning**

Source: *Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN*

The City of Albert Lea

1.4.2 Freeborn County Zoning Ordinance

The Freeborn County Zoning Ordinance adopts the Albert Lea Municipal Airport Zoning Map by reference. Both the same airspace protections and allowed uses are included in the County zoning ordinance as the Albert Lea Municipal Airport Zoning Ordinance. While the Runway 17 RPZ and safety zones, as well as the northernmost 10 acres of airport property (north of I-90), extend outside of the City boundary, they are protected by the airport zoning ordinance.

1.4.3 Existing Land Uses

Incompatible land uses are those that hinder safe and efficient airport operations, or those that expose people living or working nearby to noise or other aviation hazards. Land uses that are least compatible with airports include densely populated residential or office buildings, streetlamps and structures that emit bright light, dust-producing smokestacks that cause visual and physical obstructions, and ponds and large wetlands that attract wildlife. Other incompatible land uses include farmland, residential developments, and places where people gather in large numbers, such as schools and churches, or recreational uses like parks.

Albert Lea Senior High School, Riverland Community College, and several small parks are located within 1 mile of AEL; however, they are not located in an approach area. Green Lea Golf Course, a privately owned facility, to the south of Runway 17/35, and I-90 to the north provide a buffer from potential encroachment of residential development. Fountain Lake (Bancroft Bay) is to the southwest of the Airport, off the Runway 5 end, thereby limiting any future development in this direction.

On the western portion of the Airport is locally based Very high frequency omni-directional range (VOR), positioned approximately 500 feet to the west of the center of Runway 17/35. Current non-aeronautical use of AEL property includes several pieces of the property that are leased for farming. This includes areas in the west, northwest, northeast, and southern portions of airport property.

1.4.4 MnDOT Aeronautics

MN Administrative Rules 8800.1200, *Criteria for Determining Air Navigation Obstructions*, and 8800.2400, *Airport Zoning Standards*, cover much of the regulation that impacts land use surrounding an airport. Relevant sections of Rule 8800.1200 detail both general obstructions and obstructions to public airports, and generally coincide with local ordinances. As local governing bodies may enact a zoning ordinance that is more restrictive than what is required by MN Administrative Rules, the local ordinances take precedent and are shown in **Table 1-2**. As the table shows, the local ordinance is more restrictive, since AEL has planned for and protected their airspace for better approaches.

Table 1-2: Airport Zoning Surfaces

Surface	State Standard	Local Ordinance
MN Administrative Rule 8800.1200 / Part 77		
Runway 17/35		
Primary Surface	200’ beyond runway end x 1000’ wide	Same
Horizontal Surface	10,000’ radius from each end	Same
Conical Surface	20:1 slope x 4,000’ distance	Same
Approach Surface	1,000’ wide (inner) x 10,000’ long 4,000’ wide (outer), 34:1 slope	1,000’ wide (inner) x 10,000’ long x 4,000’ wide (outer), 50:1 slope continuing to: 40,000’ long x 16,000’ wide (outer), 40:1 slope
Transitional Surface	7:1 slope	Same
Runway 5/23		
Primary Surface	200’ beyond runway end x 250’ wide	200’ beyond runway end x 500’ wide
Horizontal Surface	5,000’ radius from each end	Same
Conical Surface	20:1 slope x 4,000’ distance	Same
Approach Surface	250’ wide (inner) x 5,000’ long x 1,250’ wide (outer), 20:1 slope	500’ wide (inner) x 10,000’ long x 3,600’ wide (outer), 40:1 slope
Transitional Surface	7:1 slope	Same
MN Administrative Rule 8800.2400		
Runway 17/35		
Safety Zone A	3,333’ long	Same
Safety Zone B	1,667’ long	Same
Safety Zone C	10,000’ radius from each end	Same
Runway 5/23		
Safety Zone A	1,932’ long	Same
Safety Zone B	966’ long	Same
Safety Zone C	5,000’ radius from each end	Same

Source: MN Statute 8800.1200, 2400, Albert Lea Municipal Airport Zoning Ordinance adopted Dec. 10, 2012, Retrieved December 2019

1.4.5 Airport Environmental Overview

AEL is located in south-central Minnesota, where the surrounding environs consist primarily of farmlands, lakes, streams, and wetlands. The impacts to wetlands and surface waters; archaeology; fish, wildlife, and plants; and hazardous materials must be considered when developing alternatives and identifying a preferred alternative for the Airport. As such, the following sections discuss those environmental considerations.

Wetlands and Surface Waters

According to the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory Wetlands Mapper, shown in **Figure 1-7**, several wetlands are in the vicinity of AEL. A large complex of wetlands associated with Fountain Lake and Bancroft Creek is located west of the airfield, including at the approach end of Runway 5. The nearby Ulland Brothers gravel pit north of the Airport terminal area has just over 1 acre of wetlands within. Approximately 3 acres of wetlands are less than ¼-mile from the Runway 23 threshold and approximately ¾ of an acre of wetlands are found east of the apron. Additional wetlands are east of the ODALS in the Runway 17 approach, some of which appear to be within airport property north of I-90. Fountain Lake is approximately ¼-mile from the Runway 5 threshold.

Archaeological

As part of the 2016 A/D Building EA, a Phase II (intensive level) evaluation report was conducted for properties within the area of potential effect (APE). In consultation with the FAA, the APE was defined to include buildings within and immediately adjacent to the proposed A/D building. The APE was determined to include two hangars of near-historic or historic age, a 1972 steel hangar and a 1943 glued-laminated hangar. The study revealed that significant historical context for AEL involved the use of the Airport as a training area for the Civilian Pilot Training Program (CPTP). The CPTP was a federally funded program started in 1939 that trained civilian pilots in preparation for the possibility of America entering into World War II, while creating an interest in aviation among younger generations. The 1943 hangar was constructed in the following years to meet growing training needs and to house aircraft. The hangar served as one of seven buildings on the airfield for the program. Neither the 1943 nor the 1972 hangar were recommended as eligible for listing in the National Register of Historic Places. The 1943 hangar was one of several buildings used during the CPTP and alone cannot convey the significance of the program, while nearby airports retain the majority of buildings erected for the CPTP. The SHPO agreed with the findings that the hangars are not eligible for listing and that no historic properties would be affected by the project. Furthermore, based on previous ground disturbance within the area of potential effect, SHPO concurred that an archaeological survey was not necessary.

Fish, Wildlife & Plants

As part of this Master Plan, a Wildlife Hazard Site Visit (WHSV) was conducted for AEL during a four-day period from October 11 to October 14, 2019, and **Appendix A** includes a summary report. Eleven monitoring locations were strategically selected to identify and mitigate potentially hazardous wildlife and wildlife attractants on or near AEL. Seven of these locations were on-site and provided visual coverage of the airfield, while four were off-airport and established in areas that were identified as potential wildlife attractants (e.g., agricultural fields, lakes, golf course, and woodlands) or in aircraft approach/departure zones. The wildlife that are the most potentially hazardous and most frequently observed during this effort included various bird species that forage and loaf within the airport operations area (AOA), such as Canada geese and other waterfowl, along with various types of blackbirds and gulls, and the American crow. Other bird species, such as raptors and ducks, while not observed in great numbers during the WHSV, pose an additional risk to aircraft operations at AEL during spring and fall migrations.

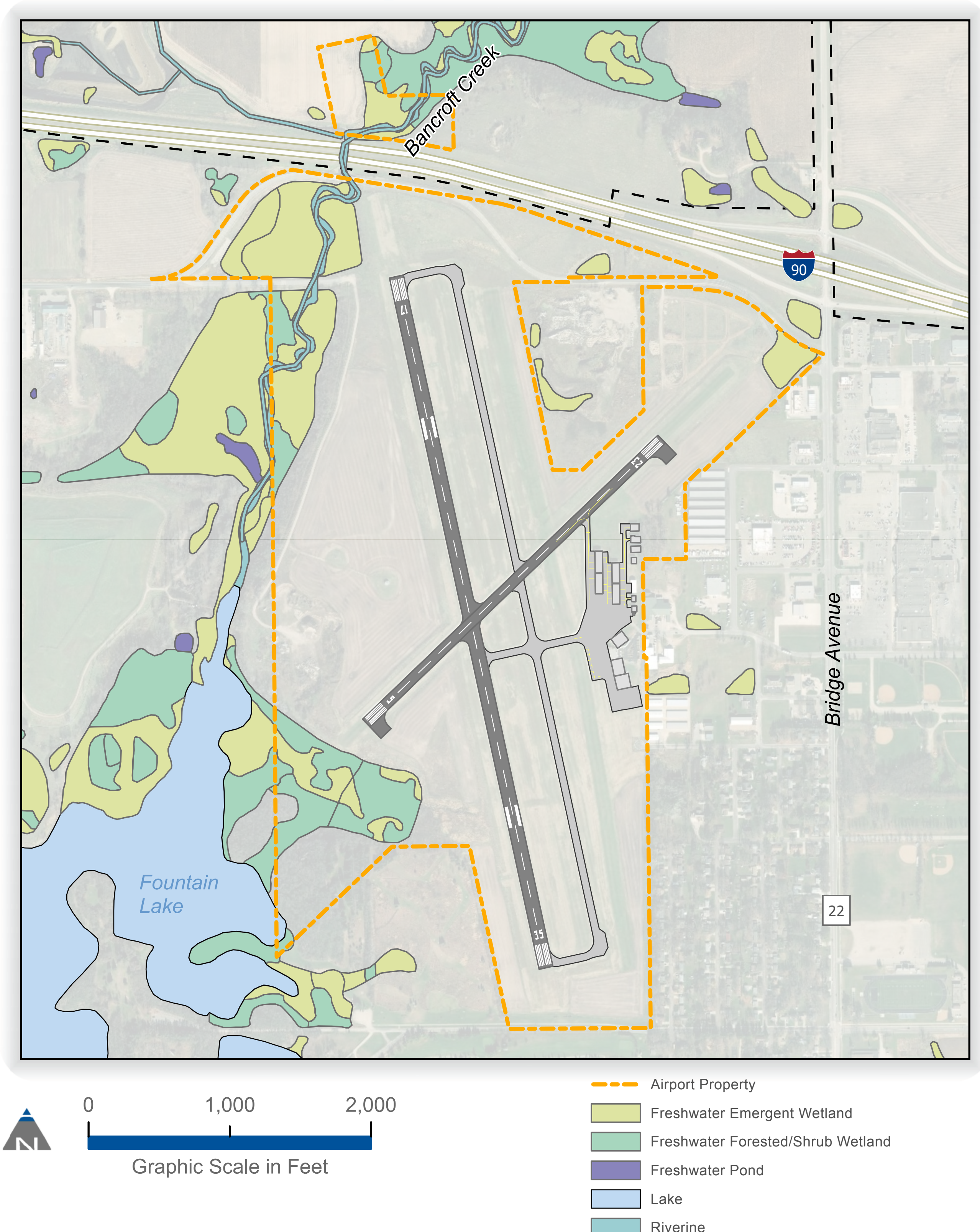


Figure 1-7: **Vicinity Surface Water and Wetlands**

Source: *USFWS National Wetland Inventory, October 9 2019; Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN*

The FAA recommends a separation distance of at least 10,000 feet between attractants and airports that serve turbine-powered aircraft such as AEL. For all airports, the FAA recommends 5 statute miles between the farthest edge of the airport's AOA and the hazardous wildlife attractant if the attractant could cause hazardous wildlife movement into or across the approach or departure airspace. AC 150/5200-33B, *Hazardous Wildlife Attractants On or Near Airports*, identifies the following land uses as potential hazardous wildlife attractants: landfills, water management facilities, wetlands, spoil containment areas, agricultural activities, golf courses, and landscaping. Given AEL's proximity to several of these types of land uses, including Fountain Lake and Green Lea Golf Course, the FAA Dakota-Minnesota Airports District Office and USDA Wildlife Services St. Paul office recommended a WHSV be conducted as part of this Master Plan. The following features or conditions on or surrounding AEL were observed to be potential wildlife attractants:

- Turf grass
- Long grass and brush
- Small mammals
- Agriculture
- Dense woodlands
- Open water sources such as Fountain Lake, Goose Lake, Albert Lea Lake, Bancroft Creek, and surrounding wetlands
- Green Lea Golf Course

The Goose Lake Waterfowl Production Area (WPA), located approximately 1.15 miles to the southeast of AEL, is within the recommended 10,000-foot separation distance and is another such land use that should be considered a possible wildlife attractant. Managed by the USFWS as part of the National Wildlife Refuge System, WPAs were established to protect and restore waterfowl habitat. However, this WPA is not on an extended runway centerline and, therefore, falls outside the typical approach/departure path for aircraft using AEL.

As of October 2019, the USFWS identified one federally endangered species in Freeborn County: the federally threatened northern long-eared bat. During the WHSV conducted in October 2019, the bat was not observed on or in the vicinity of AEL. The Minnesota Department of Natural Resources also identifies state-listed threatened, endangered, or species of special concern although none of these species were observed on or in the vicinity of AEL during the WHSV.

The WHSV summary report recommends several wildlife hazard management actions for AEL. Some of these are actions airport staff are already taking and should continue to do, such as:

- Maintaining the grass within the AOA at the FAA-recommended height of 6 to 12 inches
- Continuing daily wildlife patrols
- Maintaining the appropriate federal and state depredation permits.

Other strategies are ones AEL could start implementing to better mitigate wildlife hazards, such as:

- Employing new pyrotechnic devices to harass wildlife such as 15mm screamers and bangers
- Establishing a protocol for reporting wildlife sightings or strikes directly to the airport manager
- Monitoring the on-site agricultural fields and dispersing birds from them when observed.

Hazardous Materials

Four primary Federal laws govern the handling and disposal of hazardous materials, chemicals, and wastes. The two statutes of most importance related to airport facility planning are the Resource Conservation and Recovery Act (RCRA) (as amended by the Federal Facilities Compliance Act of 1992) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA or Superfund) and the Community Environmental Response Facilitation Act of 1992. The RCRA governs the generation, treatment, storage, and disposal of hazardous wastes. CERCLA provides for consultation with natural resources trustees and cleanup of any release of a hazardous substance (excluding petroleum) into the environment.

Other considerations when determining hazardous materials in the area are sites covered by CERCLA, also known as Superfund sites. These sites are considered hazardous to the public and trigger additional steps when considering construction on one. A query of online data sources indicates there are no Superfund sites located in Freeborn County.

A review of federal and state records and database listings for potential hazardous materials and other regulated elements was completed for the 2016 A/D Building EA. According to the Minnesota Pollution Control Agency, AEL has seven registered underground storage tanks. Three of the seven tanks have been removed, while the remaining four are actively used and contain jet fuel, aviation gas, and E-10 gas.

1.5 Airside Facilities

This section discusses AEL’s existing airside facilities. For orientation, **Figure 1-8** provides a visual reference for major design surfaces and other airside facilities based on the previous ALP.

1.5.1 Aircraft Categories

As many of the restrictions for airport facilities are based on the characteristics of a specific aircraft, it is necessary to establish how aircraft are categorized. These categories will be used throughout this Master Plan when discussing existing restrictions and determining the future critical aircraft. To identify the appropriate design parameters for a runway and associated facilities, aircraft are categorized by dimensions and performance, which form part of the Runway Design Code (RDC). In turn, the RDC determines the design standards to which the runway is to be built.

The RDC is broken into three separate parts. The first component is the Aircraft Approach Category (AAC) and is designated by a letter that corresponds to the approach speed of an aircraft. The second component is the Airplane Design Group (ADG) represented by a roman numeral dependent on the aircraft tail height and wingspan. If there is a conflict between the tail height and the wingspan, the more restrictive, or higher, group identifier is used. Finally, visibility minimums are expressed as the runway visual range (RVR) in feet approximately equal to quarter-mile increments, although this last component of the RDC is not descriptive of aircraft characteristics.

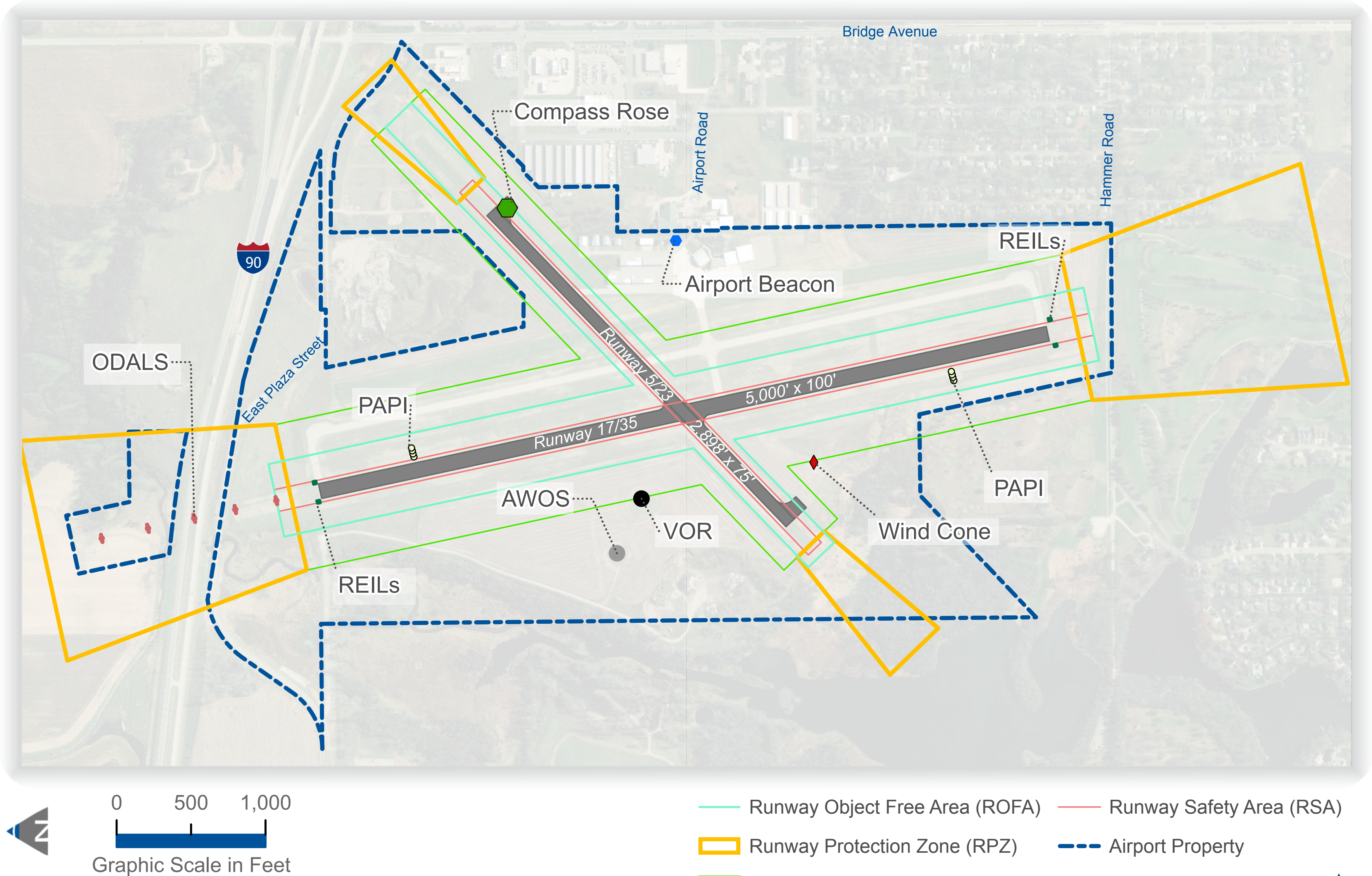


Figure 1-8: **Airside Facilities**

Source: *Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN*

The AAC and ADG criteria can be seen in **Table 1-3**. In addition to these categories, aircraft can further be separated by weight. The moniker "small" can be added to the A-II, B-II and lesser categories to designate aircraft that have a maximum takeoff weight of 12,500 pounds or less. Runways intended to serve "small" aircraft have specific design standards associated with them and are known as a utility runway, such as Runway 5/23. Chapter 3 will determine the appropriate RDC for each runway and their associated surfaces based on existing conditions and forecasted activity.

Table 1-3: Runway Design Code Components

Aircraft Approach Category (AAC)		Airplane Design Groups (ADG)			Runway Visual Range (RVR)	
AAC	**Approach Speed**	**ADG**	**Tail Height**	**Wingspan**	**RVR**	**Visibility**
A	< 91 knots	I	< 20 feet	< 49 feet	1600	1/4
B	≥ 91 knots, < 121 knots	II	20 – 29 feet	49 – 78 feet	2400	1/2
C	≥ 121 knots, < 141 knots	III	30 – 44 feet	79 – 117 feet	3200	5/8
D	≥ 141 knots, < 166 knots	IV	45 – 59 feet	118 – 170 feet	4000	3/4
E	≥ 166 knots	V	60 – 65 feet	171 – 213 feet	4500	7/8
		VI	66 – 79 feet	214 – 261 feet	5000	1

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

1.5.2 Runways and Taxiways

The primary runway at AEL is Runway 17/35. Constructed in its current location in 2011, this asphalt runway is oriented in a northwest/southeast direction and is 5,000 feet long by 100 feet wide. Runway 17/35 is supported by a 35-foot-wide, full-length parallel taxiway with paved shoulders that provides access to the runway at three points: the Runway 35 threshold, near the midpoint via a connector taxiway, and the Runway 17 threshold.

Runway 5/23 is the crosswind runway, made of asphalt, 2,898 feet long by 75 feet wide, and oriented in a northeast/southwest direction. Runway 5/23 has a single taxiway connector originating from the north end of the terminal area but does not have a parallel taxiway. For this reason, Runway 5/23 has aircraft turnarounds on both ends and aircraft are often required to back taxi on the runway for full-length takeoffs or to reach a taxiway exit after landing.

FAA Advisory Circular (AC) 150/5300-13A, *Airport Design*, states that direct access from an apron to a runway is discouraged, as pilots may inadvertently taxi onto the runway while expecting a taxiway. This is particularly a concern for pilots not familiar with the airport or during poor visibility conditions. AEL has two such direct connections. The first connects from the west of the apron to Runway 17/35 but is mitigated by the parallel taxiway, which intersects this connection and can signal to pilots that they are approaching a runway. However, later chapters will consider methods to further severe the direct connection between the apron and the runway while also moving the connection away from the middle third of the runway. Intersections in the middle third of the runway are known as high-energy intersections and discouraged as aircraft tend to carry a greater amount of speed in this section of the runway. The second is a direct connection from the north portion of the apron to Runway 5/23. **Table 1-4** contains a summary of runway data for both runways.

Table 1-4: Runway Information

Runway	Length x Width	Surface	Strength	Lighting
17	5,000 feet x 100 feet	Asphalt	S-30* D-55*	ODALS, REIL, PAPI
35				REIL, PAPI
5	2,898 feet x 75 feet	Asphalt	S-12.5	None
23				

Sources: AirportIQ 5010, 2012 ALP, AirNav, Procedure effective date: 0901Z Oct 10 - 0901Z Dec 05, 2019
*Note: *Differs from Airport Facility Directory*

Pavement Condition

In 2019, AEL's pavements were inspected and rated using the Pavement Condition Index (PCI) procedure, which provides a numerical value indicating overall pavement condition. An index of 100 indicates perfect condition, while an index of 0 indicates pavement that has totally failed. The 2019 inspection showed that Runway 17/35 had a PCI rating of 82, indicating the pavement was in "Very Good" condition. The majority of Runway 5/23 was also in "Very Good" condition, with a PCI rating of 83. The portion of Runway 5/23 that intersects with Runway 17/35's parallel taxiway had a rating of 94, which indicates an "Excellent" condition. The parallel taxiway and all but one connector taxiways were in "Excellent" condition, with PCI ratings ranging from 92 to 99. The connector taxiway between Runway 17/35 and its parallel taxiway was in "Very Good" condition with a PCI of 84. The taxilanes in the hangar area have PCIs of 85 and 86, with the eastern taxilane at the highest end of "Very Good" condition and the western taxilane at the lowest end of "Excellent" condition. The PCIs are likely to have declined somewhat since the 2019 inspection due to use and weathering. Chapter 3 will analyze the projected PCI values and address potential replacement and maintenance needs. **Figure 1-9** shows the PCI rating categories and depicts AEL's PCI ratings for the various pavement sections**.**

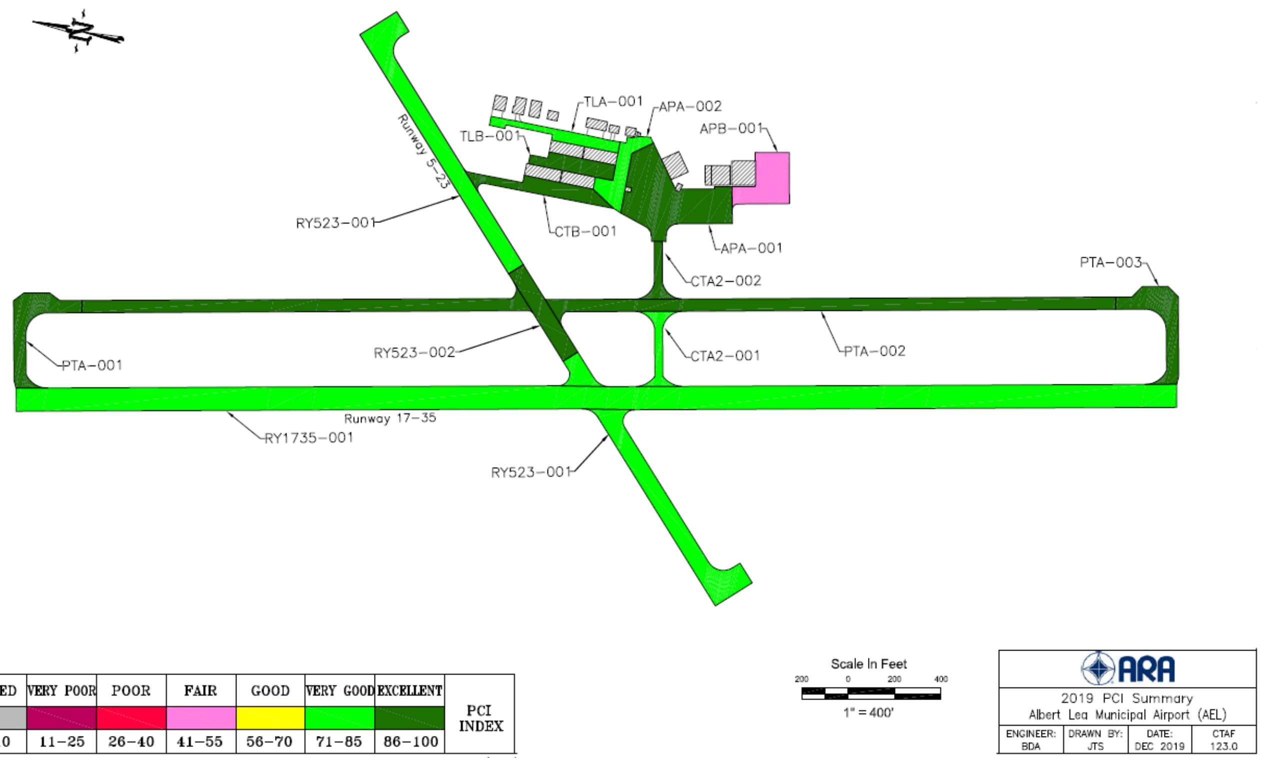
Crosswind Coverage

Crosswinds are winds that do not align with the orientation of the runway. Strong crosswinds can endanger aircraft by requiring the pilot to adjust the aircraft position while landing to compensate for the force of the wind. Crosswinds are particularly hazardous to small aircraft because these aircraft operate with lower approach speeds, which results in a higher relative crosswind. Small aircraft often lack the capability to produce sustained excess lift and power. To prevent a potentially dangerous situation, the FAA provides limitations on crosswind components for aircraft. The allowable crosswind component used to compute the wind coverage for a runway or combination of runways is based on the RDC, as shown in **Table 1-5**.

Table 1-5: Allowable Crosswind Component by Runway Design Code (RDC)

RDC	Allowable Crosswind Component
A-I and B-I	10.5 knots
A-II and B-II	13 knots
A-III and B-III	16 knots
C-I through D-III	
D-I through D-III	
A-IV and B-IV	20 knots
C-IV through C-VI	
D-IV through D-VI	
E-I through E-VI	

Source: FAA Advisory Circular 150/5300-13A



	FAILED	VERY POOR	POOR	FAIR	GOOD	VERY GOOD	EXCELLENT	PCI INDEX
NS	0–10	11–25	26–40	41–55	56–70	71–85	86–100	

Figure 1-9: **Airfield Pavement Condition**

Source: *2019 AEL Pavement Condition Report, Applied Research Associates, Inc.*

Wind coverage is the average percentage of time that a runway or grouping of runways do not experience crosswinds greater than the allowable crosswind component for each runway. To determine crosswind coverage at a specific airport, it is preferable to use 10 years of historical wind data. AEL uses its Automated Weather Observing System (AWOS) to collect wind information. The data in **Table 1-6** shows the crosswind coverage available at the Airport using historical data collected by the AWOS for the period 2009-2018. According to AC 150/5300-13A, the desirable wind coverage is 95 percent. If a single runway cannot provide 95 percent wind coverage, a crosswind runway may be required. On the primary runway, 10.5-knot crosswind coverage is less than 95 percent in Instrument Flight Rules (IFR) and all weather conditions. The 10.5-knot crosswind is the appropriate component for small piston-powered aircraft. As several of these types of aircraft are based at AEL, a crosswind runway is required.

This table also shows the crosswind coverage in differing weather conditions. FAA regulations define weather flight conditions in terms of specific values for ceiling and visibility. Visual flight rules (VFR) are defined as a ceiling greater than 3,000 feet above ground level (AGL) and visibility greater than 5 miles. IFR, defined as a ceiling less than 1,000 feet AGL and/or visibility less than 3 miles, apply to operations that occur when a pilot is unable to see well enough to navigate visually, and instead navigates by referring to instruments and navigational aids. Any weather parameters between these two conditions is referred to as marginal visual flight rules (MVFR).

Table 1-6: Runway Crosswind Coverages

Crosswind Component	Rwy 17	*Rwy 17/35*	Rwy 35	Rwy 5	*Rwy 5/23*	Rwy 23	All Runways
All Weather Conditions							
10.5 knots	58.62%	***94.83%***	52.91%	43.38%	***87.59%***	60.92%	97.40%
13 knots	59.74%	***97.56%***	54.52%	45.23%	***92.94%***	64.42%	99.22%
16 knots	60.53%	***99.40%***	55.57%	47.10%	***98.13%***	67.74%	99.84%
20 knots	60.77%	***99.89%***	55.83%	47.64%	***99.66%***	68.72%	99.99%
Visual Flight Rules (VFR)							
10.5 knots	59.52%	***95.23%***	52.67%	42.08%	***87.98%***	62.87%	97.59%
13 knots	60.60%	***97.77%***	54.13%	43.78%	***93.23%***	66.41%	99.30%
16 knots	61.37%	***99.47%***	55.06%	45.52%	***98.26%***	69.70%	99.86%
20 knots	61.59%	***99.90%***	55.28%	46.03%	***99.69%***	70.63%	99.99%
Instrument Flight Rules (IFR)							
10.5 knots	50.67%	***92.02%***	54.32%	52.04%	***84.73%***	45.67%	96.37%
13 knots	52.20%	***96.02%***	56.80%	55.20%	***91.06%***	48.84%	98.80%
16 knots	53.32%	***98.94%***	58.60%	58.10%	***97.44%***	52.32%	99.73%
20 knots	53.67%	***99.81%***	59.12%	58.94%	***99.48%***	53.51%	99.98%

Station: Albert Lea AWOS, Period of Record: 2009 – 2018
Source: National Climatic Data Center, FAA Standard Wind Analysis Tool

1.5.3 Electronic and Visual Navigational Aids

This section summarizes both electronic and visual navigational aids (NAVAIDs) and the roles they serve at AEL. The Airport's electronic NAVAIDs include a very high frequency omni-directional range (VOR) and an AWOS. AEL's visual NAVAIDs include an ODALS, precision approach path indicators (PAPIs), runway end identifier lights (REILs), and a rotating beacon. The NAVAIDs on the Airport are state owned, including the PAPIs, MIRLs, ODALS and REIL. Also, while not technically defined as NAVAIDs, runway pavement markings and signage are also discussed in this section as they aid in a pilot's navigation of the airfield.

Very High Frequency Omni-directional Range (VOR)

VOR is a type of short-range radio navigation system used by civil aircraft within the National Airspace System (NAS). VOR enables aircraft with a receiving unit to determine its position and stay on course by receiving radio signals transmitted by a network of ground-based radio beacons. AEL has a VOR on the west side of the airfield, just northwest of the Runway 17/35 and Runway 5/23 intersection, which is used for navigation and also supports instrument approaches at AEL and surrounding airports. AEL's VOR is discussed in more detail in **Section 1.5.4**, ***Instrument Approaches***.

Automated Weather Observation System (AWOS)

Weather data is collected at AEL by an AWOS, which is a suite of weather sensors of various configurations. AEL has an AWOS-3P/T located on the west side of the airfield, just northwest of the Runway 17/35 and Runway 5/23 intersection. The system transmits a short weather message updated each minute. The AWOS-3P/T reports altimeter, wind data (referenced to magnetic north), temperature, dew point, density altitude, visibility, cloud/ceiling data, precipitation type, and thunderstorm/lightning. The upper limit of cloud height and visibility reported by AWOS is 12,000 feet and 10 miles. AWOS information can be obtained on the proper radio frequency in flight and by telephone on the ground.

Omnidirectional Approach Lighting System (ODALS)

ODALS is a configuration of seven omnidirectional sequenced flashing lights located in the runway approach area to aid pilots in lining up with the runway. The ODALS provides circling, offset, and straight-in visual guidance for non-precision approach runways. There is an ODALS for Runway 17 at AEL. The City has an easement for the I-90 right-of-way and property north of I-90 that allows access to the ODALS light stations that are not located on airport property. The advantage of an ODALS as compared to a medium-intensity approach lighting system (MALS) is that the omnidirectional nature of the lights provides additional aid to pilots conducting a circling approach to the runway.

Precision Approach Path Indicator (PAPI)

PAPIs provide a visual indication to pilots of their position relative to the approach glide path. This allows pilots to make appropriate height corrections when approaching a runway to land. The PAPIs at AEL are four-light systems located near the approach ends of Runway 17 and 35. A PAPI is intended to be visible for 3 to 5 miles during the day and 20 miles at night while within 10 degrees of the extended centerline.

Runway End Identifier Lights (REILs)

REILs consist of a synchronized pair of flashing lights at the end of the runway. REILs are particularly helpful when artificial light in the vicinity may confuse the pilot and during poor visibility conditions. Both Runways 17 and 35 have REILs.

Rotating Beacon

AEL has a standard rotating beacon that allows pilots to visually identify the Airport from sunset to sunrise or when visibility is less than 3 miles and ceilings are less than 1,000 feet. This equipment is required for any airport with runway edge lights, according to FAA AC 150/5340-30H, *Design and Installation Details for Airport Visual Aids* (AC 150/5340-30H). The beacon has one green lens and one clear lens and flashes beams of light in two directions, 180 degrees apart, for 360-degree visibility. The rotating beacon is located on the easternmost taxilane near the Airport's entrance drive, approximately 1,200 feet from the primary runway in accordance with FAA guidance.

Runway Pavement Markings

Runway pavement markings provide visual indications to pilots for distances on the runway and aid in pilot orientation. As Runway 17/35 does not have any precision instrument approaches, the markings are non-precision markings and consist of threshold, aiming point, and centerline markings, as well as numeric runway designation markings. Although both non-precision and precision approaches can offer vertical guidance, a runway requires precision markings when visibility limitations are lower than 3/4 of a mile. The Runway 23 turnaround has a compass rose painted on a compass calibration pad. This is used to mark a location on the airport surface suitable for calibrating the compass of an aircraft.

Airfield Signage

Airfield signage identifies the locations of runways, taxiways, and aprons, and may provide noise abatement instructions and other airfield information to pilots. Airfield signage at AEL includes directional signs and runway hold signs.

1.5.4 Instrument Approaches

This section will provide a summary of the instrument approach procedures available at AEL. Currently AEL offers four instrument approaches: two GPS-based, Area Navigation (RNAV) approaches, and two VOR approaches. Runways 17 and 35 both offer the lowest minimums available at AEL, with a decision altitude of 250 feet and a visibility minimum of 3/4 statute mile. However, there are some obstructions in the surfaces associated with the instrument approaches and Chapter 3 will evaluate these obstacles for proposed changes in Chapter 4. **Table 1-7** shows information about each approach, and the instrument approach procedures are shown in **Figures 1-10** through **1-13**. There are no instrument approaches to Runway 5/23.

Global Positioning System (GPS)

GPS is a system that provides location information using a satellite system. Properly equipped aircraft can determine their location, altitude, direction of travel, and speed. Using this system, aircraft can conduct various types of RNAV GPS approaches at AEL, including Lateral Navigation/Vertical Navigation (LNAV/VNAV) and Localizer Performance with Vertical Guidance (LPV) approaches. LNAV approaches are non-precision approaches that provide lateral guidance but do not offer vertical navigation. Each of these approaches have either a decision altitude or minimum descent altitude where aircraft may descend to a specified altitude and then establish visual contact with the Airport environment.

Very High Frequency Omni-directional Range (VOR)

VOR is a source of navigation used by civil aviation within the NAS. AEL has a VOR on the west side of the airfield, just northwest of the Runway 17/35 and Runway 5/23 intersection, which is used for navigation and instrument approaches at AEL and surrounding airports. As part of the FAA's ongoing effort to transition to performance-based navigation under the NextGen program (which was initially proposed in 2011 under 76 Code of Federal Regulations 77939), selected VORs are being decommissioned nationwide. Although the AEL VOR is not scheduled for decommissioning, several surrounding VORs will either be decommissioned or are undergoing evaluation at the time of writing. These changes are not expected to have a direct adverse effect on operations at AEL.

Table 1-7: Instrument Approach Procedures

Approach Type	Minimum Altitude (Feet, AGL)	Visibility Minimum (Statute Miles)	TCH (Feet)*	Descent Angle
Runway 17				
LPV	250	¾	50	3.00°
LNAV/VNAV	250	¾		3.00°
LNAV	440	1		3.00°
Runway 35				
LPV	250	¾	50	3.00°
LNAV/VNAV	315	1		3.00°
LNAV	459	1		3.00°
VOR Runway 17				
S-17	540	1	50	3.23°
CIRCLING	539	1		3.23°
VOR Runway 35				
S-35	479	1	50	3.31°
CIRCLING	519	1		3.31°

Source: FAA Terminal Procedures January 30 – February 26, 2020
Notes: Alternative minimums may apply under instrument meteorological conditions (IMC).
Minimums listed are for Category A and B aircraft. Minimums and procedures may differ for larger aircraft.
Descent Angle and TCH may differ from visual glideslope indicator.
**Airport Facility Directory and Terminal Procedures approach plates vary on some published TCHs.*
No instrument approaches are available for Runway 5/23.
LP: Localizer Performance with Vertical Guidance
LNAV/VNAV: Lateral Navigation/Vertical Navigation
DA: Decision Altitude
MDA: Minimum Descent Altitude
AGL: Above Ground Level
TCH: Threshold Crossing Height

1.5.5 Runway Lighting

Runway lighting at the Airport provides increased safety and situational awareness for pilots during low light or poor visibility conditions. AEL offers medium intensity runway lights alongside the runway edges at approximately 200-foot intervals. Although normally white, these lights are yellow when either less than 2,000 feet or less than half of the runway length remains. Two sets of four threshold indicator lights mark each end of the runway with split red and green lights. Runway lighting is only available on Runway 17/35 while Runway 5/23 is unlit.

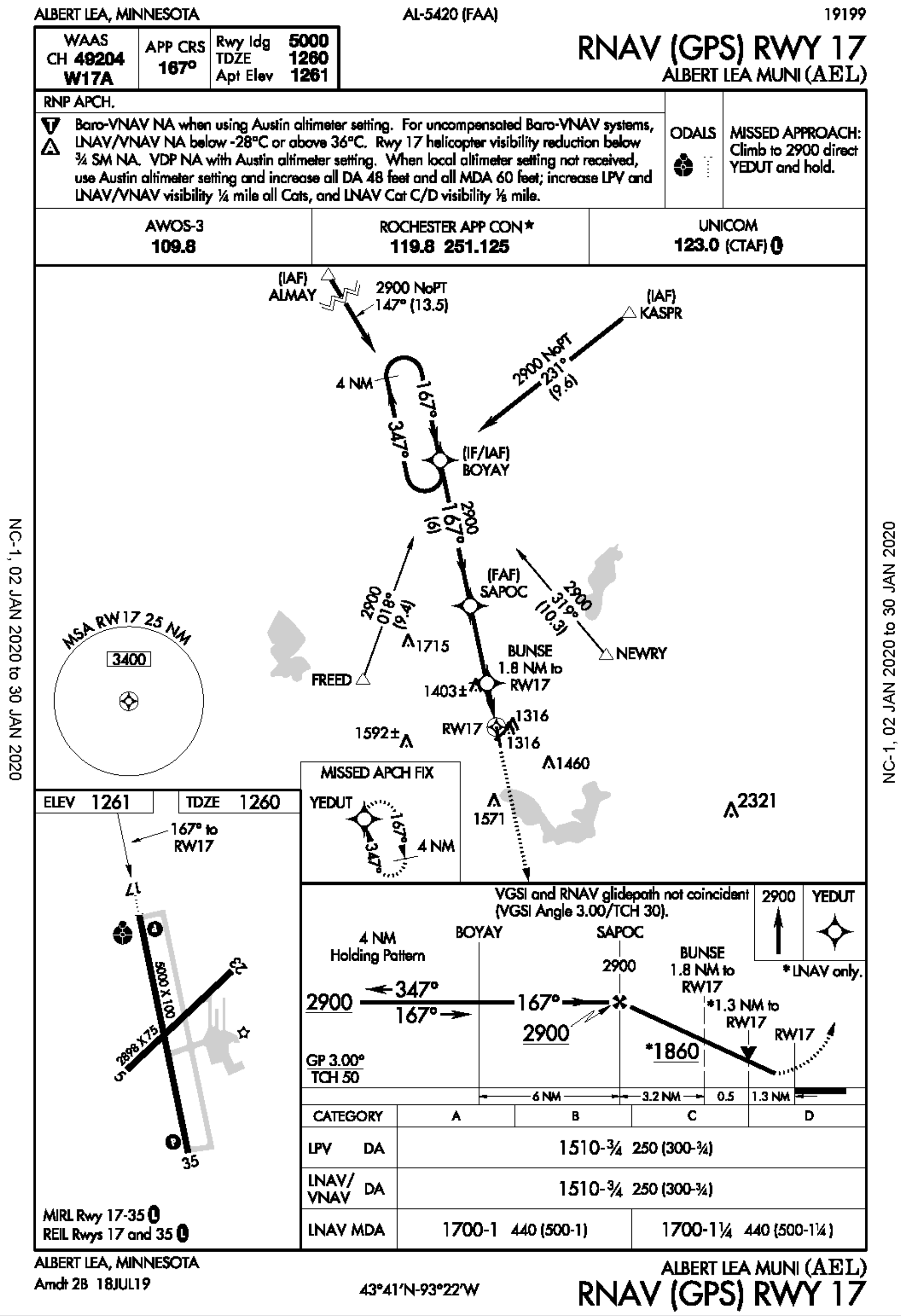


Figure 1-10: **RNAV Approach Runway 17**

Source: *FAA Digital Terminal Procedures January 2020*

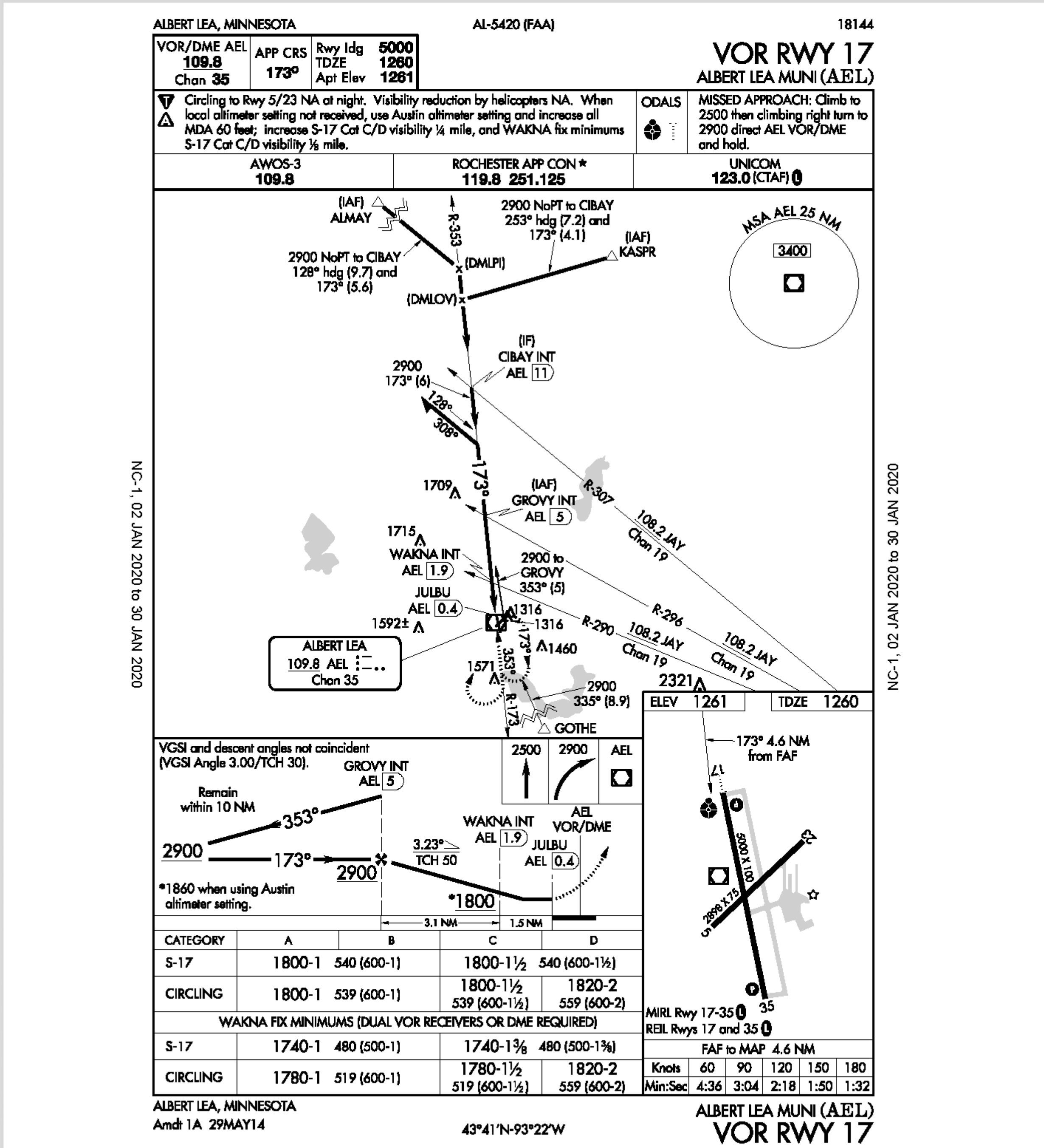
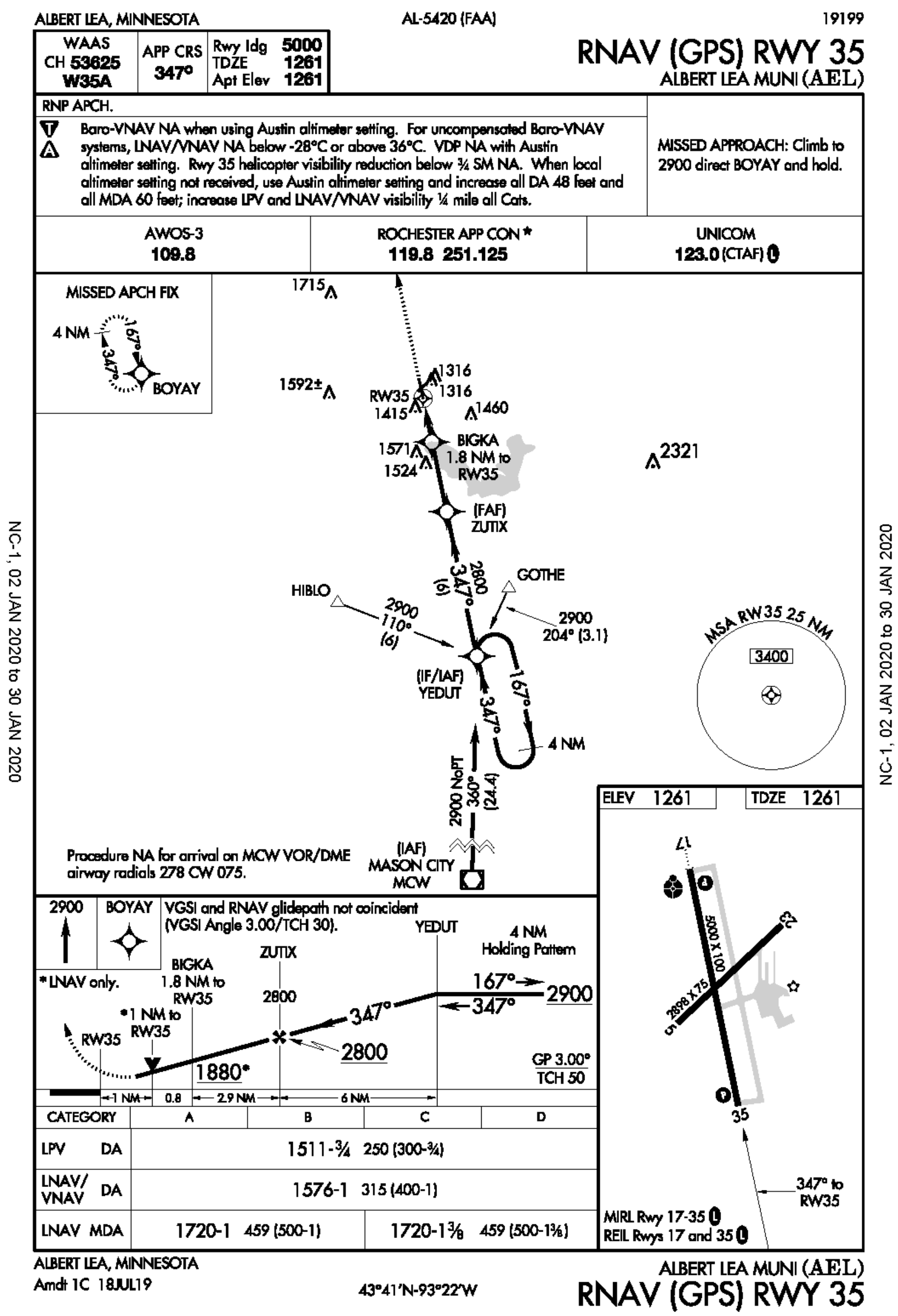


Figure 1-11: **VOR Approach Runway 17**

Source: *FAA Digital Terminal Procedures January 2020*



CATEGORY	A	B	C	D
LPV DA	1511-¾ 250 (300-¾)			
LNAV/VNAV DA	1576-1 315 (400-1)			
LNAV MDA	1720-1 459 (500-1)		1720-1⅜ 459 (500-1⅜)	

Figure 1-12: **RNAV Approach Runway 35**

Source: *FAA Digital Terminal Procedures January 2020*

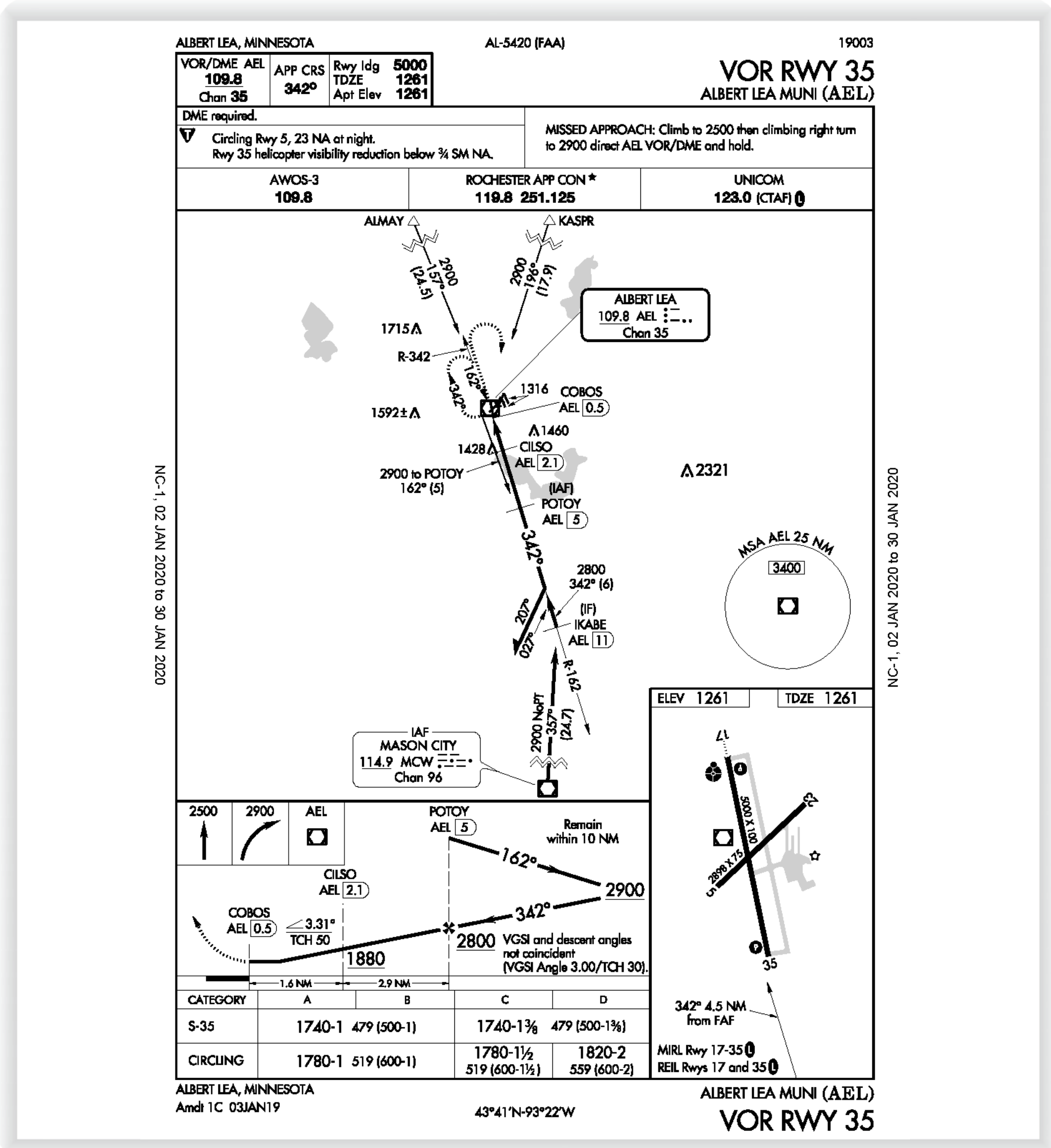


Figure 1-13: **VOR Approach Runway 35**

Source: *FAA Digital Terminal Procedures January 2020*

1.6 Landside Facilities

This section provides a summary of the landside facilities at AEL. These structures provide support for maintenance, fueling, passenger and pilot transit, and other support activities. Landside facilities are shown in **Figure 1-14** for orientation.

1.6.1 Apron

The apron at AEL is located on the east side of the airfield and supports a variety of uses, including the arrival/departure building, fixed-base operator (FBO), flight school, and the based aircraft located in the hangars. Seven itinerant aircraft tie-down spaces are on the western portion of the apron. These designated tie-downs are sized for ADG I aircraft although there is open space available in this area for ADG II parking. This section and the surrounding area were reconstructed in 2013. According to the 2019 PCI study, the two pavement sections making up the northern portion of the apron total 131,030 square feet and had PCI ratings of 97 (Portland Cement Concrete portion) and 81 (asphalt cement portion), equating to “Excellent” and “Very Good” pavement conditions. The 2019 PCI study listed the 37,600-square-foot southern portion of the apron as having a last construction date of 1993. This asphalt section of the apron had a 2019 PCI rating of 52, indicating the pavement was in “Fair” condition. During an October 2019 site visit, this pavement was noted to be some of the poorest on the Airport. **Figure 1-9**, presented in Section 1.5.2, shows the PCI rating categories and depicts AEL’s PCI ratings for the various pavement sections**.** Pavement conditions, including projected PCI values and potential replacements and maintenance needs, will be discussed in Chapter 3.

1.6.2 Arrival/Departure Building

In 2018, construction was substantially completed on a new 4,500-square-foot arrival/departure (A/D) building that is connected to an existing steel hangar measuring 80 feet by 80 feet. The facility features a flexible-use space with a passenger waiting area, vending room, pilots’ lounge, shower, restrooms, and conference room. AEL has a single FBO that provides a variety of services to the traveling public including aviation fuel, aircraft rental, maintenance, restoration, and sales. In addition, the A/D building houses a local flight school.

1.6.3 Snow Removal Equipment (SRE)/Maintenance Building

AEL’s SRE/maintenance building is approximately 40 feet by 90 feet and is located north of the A/D building on the easternmost taxilane near the T-hangars and several conventional hangars. This facility is used to store the Airport’s maintenance equipment used for mowing and snow removal.

1.6.4 Hangars

General aviation aircraft storage facilities include 24 T-hangar units and nine conventional hangars. The majority of these hangars are City-owned, with one privately owned. While the T-hangars and several of the conventional hangars are located on a taxilane north of the A/D building, three conventional hangars are located near the A/D building. The Airport provides apron parking for seven ADG I sized tie-downs for transient aircraft while open apron space can accommodate larger aircraft.

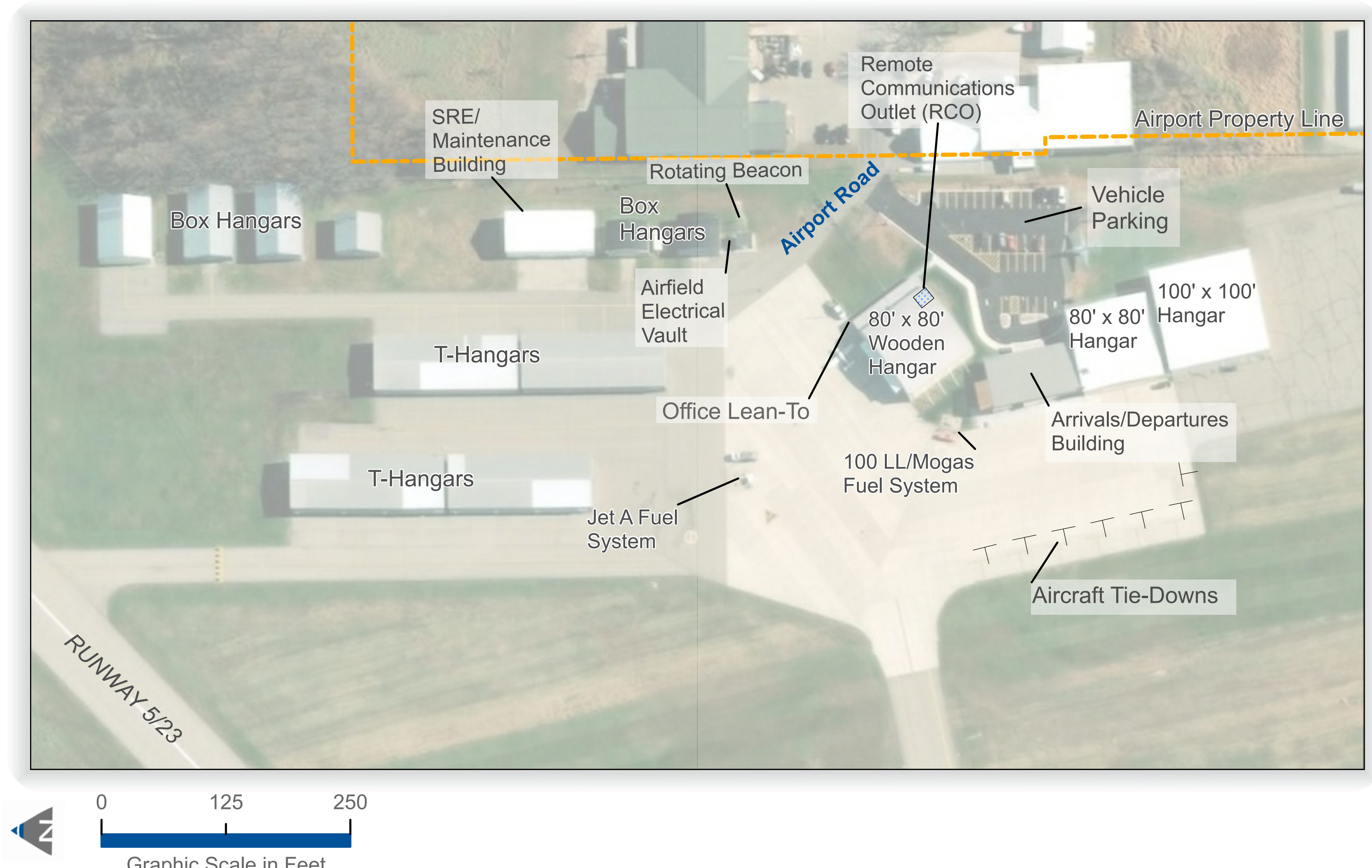


Figure 1-14: **Landside Facilities**

Source: *Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus,DS, USDA, USGS, AeroGRID, IGN*

One of the conventional hangars is a 80 feet by 80 feet wooden hangar constructed in 1943. This hangar is primarily used for storing flight school aircraft. In addition, this building houses an FAA Remote Communications Outlet (RCO)—a space within the hangar approximately 10’x10’ plus an RCO antenna attached to the southeast side of the building’s exterior. The RCO is used to relay flight communications and extend the communications capabilities of flight centers and service stations. There is also a lean-to attached to this hangar with office space that was previously used by the flight school and FBO but is currently unoccupied. A second 80’x80’ conventional storage hangar with steel structure was constructed in 1972. This hangar provides storage for FBO aircraft. The third conventional hangar located in the terminal area, built in the late 1980s, is located on the south side of the second hangar. This 100’x100’ hangar is also used for FBO aircraft storage.

1.6.5 Airfield Electrical Vault

An airfield electrical vault houses all the controls for the airfield lighting system. AEL’s electrical vault, which is adjacent to the rotating beacon, is northeast of the A/D building on the easternmost taxilane near the Airport’s entrance drive.

1.6.6 Ground Access and Auto Parking

Automobile access to the Airport is provided via County Road 22 (Bridge Avenue) and Airport Road. As part of the new A/D building project, the parking lot was reconstructed with a new layout during its a project in 2017-2018 to improve circulation and capacity. Currently, the new configuration offers 33 public parking spaces near the A/D building.

1.6.7 Fuel Facilities

AEL offers fuel for sale in the grades of Mogas (automotive), 100 Low Lead (LL) and Jet A. The Jet A system on the north side of the apron consists of two 6,000-gallon underground storage tanks. The 100 LL and Mogas fuel system located near the A/D building consists of two 10,000-gallon underground storage tanks and was constructed in 1999.

1.6.8 FAA Runway Protection Zones

A runway protection zone (RPZ) is a trapezoidal area centered on the extended runway centerline starting 200 feet from each runway end. The RPZ serves to protect people and property on the ground, and to this end, Airport ownership of this area is encouraged by the FAA. Ownership enables the sponsor to control land uses within the RPZ, including clearing them of incompatible land uses, and then maintaining the clearances. RPZ dimensions are functions of the type of aircraft and the approach visibility minimums associated with each runway end. RPZ dimensions for AEL are shown in **Table 1-8**.

FAA AC 150/5300-13A states that, “It is desirable to clear the entire RPZ of all above-ground objects. Where this is impractical, airport owners, at a minimum, should maintain the RPZ clear of all facilities supporting incompatible activities.” On September 27, 2012, the FAA Office of the Associate Administrator of Airports (ARP) issued the memorandum, *Interim Guidance on Land Uses Within a Runway Protection Zone*, which further clarifies incompatible land uses. Consultation with the FAA is required when there are new or changed uses planned within an RPZ, or a planned change to an RPZ size or location. Examples of these types of land uses include:

- Buildings and structures (for example, residences, schools, churches, hospitals or other medical care facilities, commercial/industrial buildings)
- Recreational land use (for example, golf courses, sports fields, amusement parks, other places of public assembly)
- Transportation facilities (for example, rail facilities, public roads/highways, vehicular parking facilities)
- Fuel storage facilities (above and below ground)
- Hazardous material storage (above and below ground)
- Wastewater treatment facilities
- Above ground utility infrastructure (for example, electrical substations or solar panel installations)

Table 1-8: Existing RPZ Dimensions

Runway	Length	Inner Width	Outer Width
Runway 17	1,700’	1,000’	1,510’
Runway 35	1,700’	1,000’	1,510’
Runway 5	1,000’	250’	450’
Runway 23*	1,000’	250’	450’

Sources: 2012 ALP, AEL Runway 23 Runway Protection Zone (RPZ) Alternatives Analysis Technical Memorandum to FAA dated July 8, 2015
*Notes: *Existing RPZ dimensions according to 2012 ALP. Note that these differ from those shown in the 2015 RPZ Alternatives Analysis Technical Memorandum to FAA.*

As discussed in **Section 1.3.3**, when the City desired to relocate West Plaza Street, an RPZ alternatives analysis was completed in 2015 for Runway 23. Note that the analysis was completed using larger dimensional standards than currently exist on Runway 5/23 to better prepare for changes in the fleet mix or other future changes. The preferred alternative for the realignment, which was subsequently constructed, resulted in a portion of the street moving 150 feet closer to the existing Runway 23 threshold, and further into the Runway 23 RPZ. Future chapters of this Master Plan will evaluate the existing and future RPZs, as well as the viability of and desire to extend Runway 5/23.

Currently, RPZs for AEL are not fully on airport property. To the north, the Runway 17 RPZ overlaps I-90 and West Plaza Street. To the south, the Runway 35 RPZ overlaps Hammer Road, the privately-owned Green Lea Golf Course, and four residences located on Highland Avenue between Hammer Road and Troy Road. To the northeast, the Runway 23 RPZ overlaps East Plaza Street.

1.6.9 Design Surfaces

Several design standards are relevant when considering surrounding land use and expansion of facilities on the Airport. Some of the most critical design standards are shown below in **Table 1-9**.

Table 1-9: Existing Runway Design Surfaces

Surface	Dimensions
Runway 17/35 (B-II)	
Runway Safety Area	150’ wide x 300’ beyond runway end
Runway Object Free Area	500’ wide x 300’ beyond runway end
Threshold Siting Surface	Type 4 TSS starts 200’ beyond runway end, 400’ (inner width) x 10,000’ (length) x 3,400’ (outer width), 20:1 slope
Runway 5/23 (B-I Small)	
Runway Safety Area	120’ wide x 240’ beyond runway end
Runway Object Free Area	250’ wide x 240’ beyond runway end
Threshold Siting Surface	Type 2 TSS 250' (inner width) x 5,000' (length) x 700’ (outer width), 20:1 slope

Sources: 2012 ALP; Advisory Circular 150/5300-13A, Airport Design; FAA Engineering Brief No. 99, Changes to Tables 3-2 and 3-4 of Advisory Circular 150/5300-13A, Airport Design

1.6.10 MnDOT Clear Zones

MnDOT clear zones are areas beyond each runway end in which state guidelines restrict or prohibit structures and natural objects to prevent obstacles to aircraft operations. Similar to RPZs, MnDOT clear zones are trapezoidal areas centered on the extended runway centerline beginning 200 feet beyond each runway end. MnDOT clear zone dimensions are categorized according to aircraft served, available NAVAIDs, and the approach visibility minimums associated with each runway. At AEL, Runway 17/35 is categorized as a non-precision instrument other than utility runway with ¾-mile visibility, while Runway 5/23 is considered a visual utility runway. The MnDOT clear zone existing dimensions for AEL’s runways are shown in **Table 1-10**. Based on the MnDOT Office of Aeronautics Policy Statement No. 1, *Clear Zone Requirements,* dated 10/4/2005, AEL’s clear zones conform to the policy and are the appropriate dimensions.

Table 1-10: MnDOT Clear Zone Existing Dimensions

Runway	Area Begins	Slope	Length	Inner Width	Outer Width
Runway 17/35	200’ beyond runway end	34:1	1,700’	1,000’	1,510’
Runway 5/23	200’ beyond runway end	20:1	1,000’	500’	700’

Sources: 2012 ALP; Minnesota Department of Transportation Office of Aeronautics Policy Statement No. 1, Clear Zone Requirements, dated 10/4/2005

1.7 Airspace

The NAS is a complex system of navigable airspace and supporting facilities that enables safe and efficient air transportation within the United States. As surrounding structures or land uses may affect airspace, it is important to consider how AEL operations may be impacted. **Figure 1-15** shows the surrounding airspace while the rest of the section discusses each relevant type.

1.7.1 Controlled Airspace

Controlled airspace is a term applied to all airspace in which FAA Air Traffic Control (ATC) service is provided in accordance with the airspace classification. This does not mean that controlled airspace must have a control tower in the immediate vicinity but rather that some type of ATC authority is extended to the airspace.

Class A Airspace

Class A airspace generally begins at 18,000 feet above mean sea level (MSL) up to 60,000 feet MSL throughout the United States and 12 nautical miles off of each coast. This airspace requires an IFR flight plan to enter and ATC approval must be received before entering. Class A airspace does not have a direct effect on AEL.

Class B Airspace

Class B airspace often surrounds the nation’s busiest airports and extends from the surface to 10,000 feet MSL in multiple tiers of various dimensions. This design is intended to incorporate all instrument approaches into the airport once an aircraft enters the airspace. Class B is one of the most restrictive airspaces requiring additional equipment on the aircraft and express permission from ATC to enter. MSP is the closest Class B airport to AEL at approximately 85 miles away, although its Class B airspace begins approximately 45 miles to the north of AEL at 7,000 feet MSL.

Class C Airspace

Class C airspace is utilized for airports that have a control tower and radar approach control but do not require the greater restrictions of Class B. This airspace generally extends from the surface to 4,000 feet above the airport elevation. The dimensions of Class C airspace are tailored for the specific airport but usually consist of an inner 5-nautical-mile radius surrounding the airport with an outer circle that begins at 1,200 feet above the airport and has a total diameter of 20 nautical miles. There are no Class C airports within the state of Minnesota.

Class D Airspace

Class D airspace generally extends to 2,500 feet above the airport elevation and is used for airports that have a control tower but not necessarily radar capacity. Similar to other airspace classes, when an approach is published for an airport surrounded by Class D, the airspace is usually tailored to accommodate the approach. The closest surrounding airport with Class D airspace is Rochester International Airport.

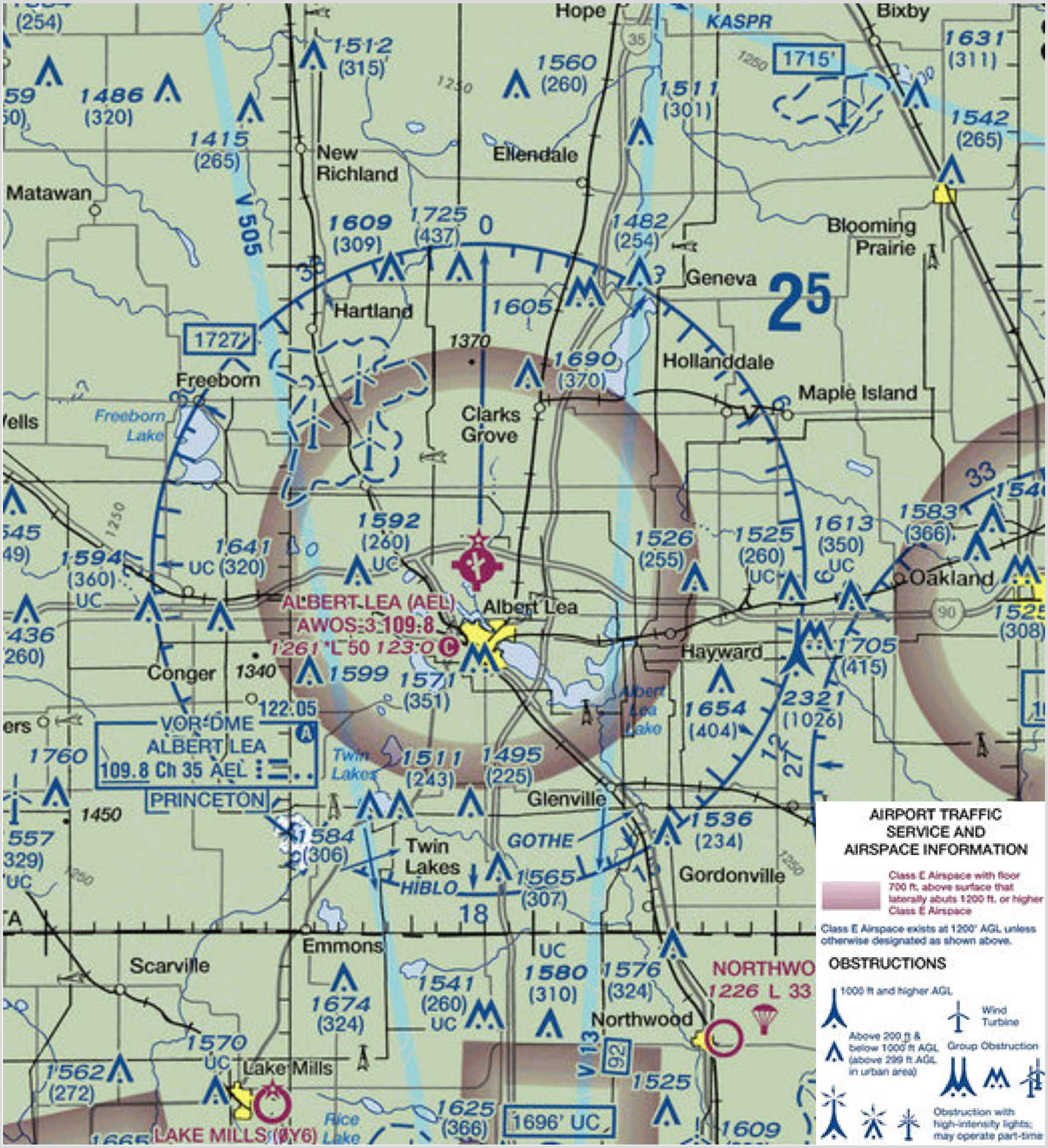


Figure 1-15: **Surrounding Airspace**

Source: *SkyVector Aeronautical Charts*

Class E Airspace

By default, if airspace is controlled but not Class A, B, C, or D, then it is classified as Class E airspace. Class E is unique in that it is a multifaceted airspace that is used in a variety of situations to protect approaches to airports. The area surrounding AEL is classified as Class E airspace. Class E airspace begins at 700 feet above the Airport's surface before rising to 1,200 feet to provide separation for pilots operating under IFR.

1.7.2 Uncontrolled Airspace

Uncontrolled airspace is any airspace that is not Class A, B, C, D, or E, and is known as Class G airspace. Class G airspace is the only uncontrolled airspace in the NAS. ATC does not possess responsibility or authority to control air traffic, but there are VFR minimums that apply to pilots operating in this area. Class G is common in relatively unpopulated areas where air traffic is sparse and sits directly over the Airport before terminating at Class E airspace.

1.7.3 Special Use Airspace

Special use airspace designates areas in which certain activities are confined and additional limitations may be imposed on aircraft entering the airspace. While these areas vary according to their use, some areas present hazards, and pilots are advised to maintain situational awareness. While there are several types of special use airspace (prohibited, restricted, warning, military operation areas, alert area, and controlled firing areas), none of these are known to exist within a 30-mile radius of AEL and are subsequently excluded from this discussion.

1.7.4 Other Airspace

Other airspace is simply a generic term to describe the majority of remaining airspace not covered by the above sections, such as military training routes (MTR) or parachute jump aircraft operations. However, no airspace under this classification exists within 30 miles of AEL. Temporary Flight Restrictions are an exception, because they may be temporarily enacted to keep traffic out of the area in the event of emergency. However, due to their transient and infrequent nature, a detailed discussion is not necessary here.

1.8 Local Socioeconomics

Understanding socioeconomic conditions within the service area of an airport assists in planning for appropriate infrastructure improvements. The influence of the surrounding area is important at all airports, but it is especially critical at smaller airports. Significant local factors such as population, income, and employment are discussed in this section.

The city of Albert Lea and the Airport are centrally located within Freeborn County. Since 2009, Freeborn County has experienced a steady decline in the number of residents, and population estimates show this trend continuing. However, total income per capita for the county has increased in the past 10 years, from $34,137 in 2009 to $38,654 in 2018, despite declines in 2013 and 2014. Historical population, employment, total income, and income per capita statistics are shown in **Table 1-11** and **Figures 1-16** and **1-17**.

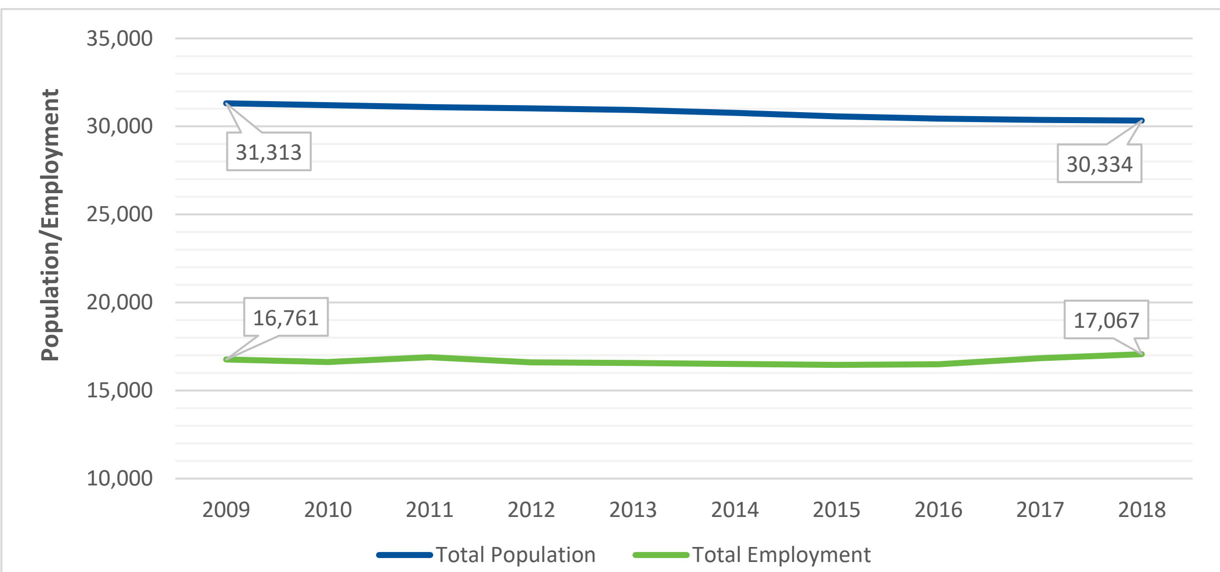
Table 1-11: Freeborn County Historical Socioeconomics

Year	Population	Employment	Total Income (in 2009 dollars)	Income Per Capita (in 2009 dollars)
2009	31,313	16,761	$1,068,920,000	$34,137
2010	31,210	16,622	$1,067,349,000	$34,199
2011	31,093	16,891	$1,120,902,000	$36,050
2012	31,035	16,607	$1,150,539,000	$37,072
2013	30,936	16,570	$1,115,753,000	$36,066
2014	30,768	16,508	$1,077,518,000	$35,021
2015	30,570	16,458	$1,100,348,000	$35,994
2016	30,446	16,494	$1,100,482,000	$36,145
2017	30,380	16,837	$1,151,564,000	$37,905
2018	30,334	17,067	$1,172,529,000	$38,654

Source: Woods & Poole Economics, Inc. 2018 Complete Economic and Demographic Data Source

The State Demographer recently analyzed population trends in greater Minnesota, and concluded that counties with rural/town mixes, such as Albert Lea, have experienced population loss throughout the state since 2010, largely because of net losses due to migration.

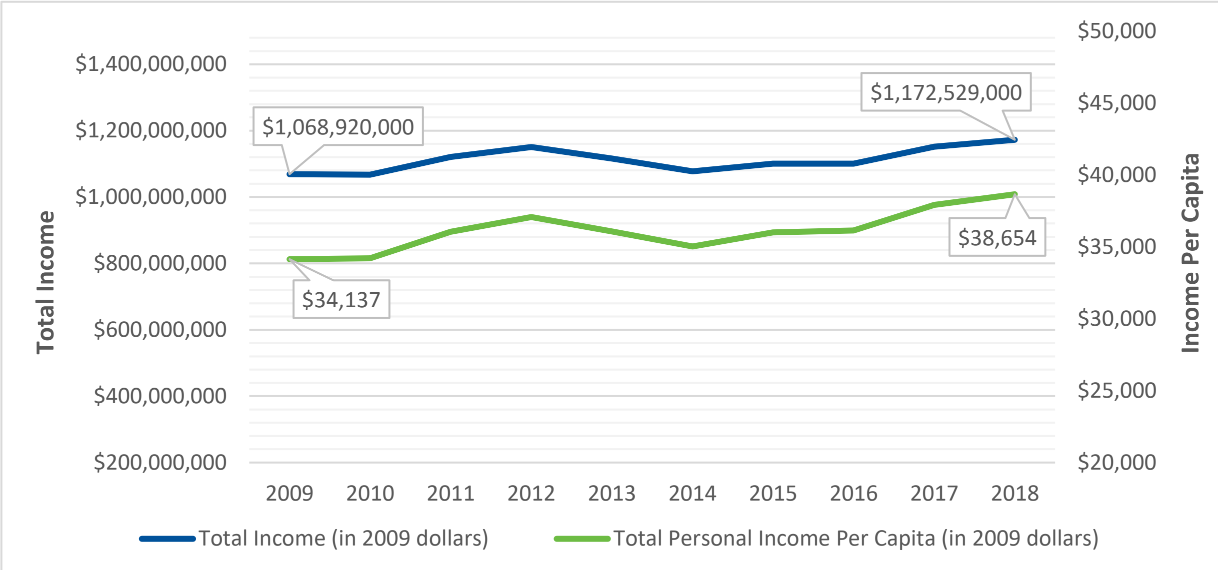
Figure 1-16: Freeborn County Historical Socioeconomics



Source: Woods & Poole Economics, Inc. 2018 Complete Economic and Demographic Data Source

While the population in Freeborn County has declined over the past decade, total employment, measured in number of jobs, has remained relatively steady, with less than a 2 percent growth rate between 2009 and 2018. As **Figure 1-17** shows, total income and income per capita have followed roughly the same trend, with a peak in 2012 lagging about a year behind a peak in employment in 2011, then declining until 2014 and on the rise since then. This may imply that even though there is population loss, improving economic activity provides a basis to support GA activity.

Figure 1-17: Freeborn County Historical Income Trends



Source: Woods & Poole Economics, Inc. 2018 Complete Economic and Demographic Data Source
Note: Dollars are shown in 2009 dollars to account for inflation.

1.9 Inventory Summary

The goal of this chapter is to develop an understanding of existing facilities at the Airport and the local context within which it operates. Information presented in this chapter provides a baseline to evaluate the ability of current airport facilities to meet future demand over the next 20 years. Completion of other tasks such as the demand/capacity analysis, evaluation of alternatives, and the development of planning initiatives are also dependent upon information obtained through the inventory effort. This Master Plan will serve as a guide to help the City of Albert Lea make the most of the Airport's economic benefit and further the ability of AEL to adapt to future change.

2.1 Introduction

Aviation activity forecasts serve as the basis for determining future airport capacity needs and facility development plans. Aviation activity at Albert Lea Municipal Airport (AEL or the Airport) includes general aviation (GA), air taxi, and military operations. The chapter is organized into the following sections:

- Forecasting Approach
- General Aviation Trends
- Based Aircraft and Fleet Mix
- General Aviation Operations
- Other Operations
- Peak Aircraft Operations
- Critical Aircraft
- Forecast Summary

Although forecasting often projects activity based on five-year increments, actual activity growth rates may vary due to unpredictable or unforeseen events such as national economic shifts or regulation changes. Therefore, to extend the useful life of this Master Plan, each five-year increment of the forecasts is assigned a Planning Activity Level (PAL). Assigning a PAL to each of the activity levels establishes a clear planning threshold for facilities to meet the future needs of the Airport (**Table 2-1**), regardless of the year in which activity occurs. This chapter establishes the activity level associated with each PAL that is also used in later chapters to determine facility requirements and project phasing.

Table 2-1: Planning Activity Levels

Year	PAL
2019	N/A
2024	I
2029	II
2034	III
2039	IV

2.2 Forecasting Approach

Several forecasting techniques that range from subjective judgment to sophisticated mathematical modeling may be used to project aviation activity. These techniques incorporate local and national industry trends in assessing current and future demand. Socioeconomic factors such as local population, income, and employment have also been analyzed for how they will influence aviation activity.

Therefore, as ongoing current trends influence the approach to forecasting, it should be noted that this forecast was prepared at the same time as the evolving impacts of the COVID-19 public health emergency. Forecast approval is based on the methodology, data, and conclusions at the time the document was prepared. However, consideration of the impacts of the COVID-19 public health emergency on aviation activity is warranted to acknowledge the reduced confidence in growth projections using currently-available data. Accordingly, FAA approval of this forecast does not constitute justification for future projects. Justification for future projects will be made based on activity levels at the time the project is requested for development. Documentation of actual activity levels meeting planning activity levels will be necessary to justify AIP funding for eligible projects. However, industry standard approaches can still be employed to produce forecasts useful for planning purposes. FAA forecasts, market share methodologies, and socioeconomic methodologies are some of the primary approaches used to develop forecasts for AEL and are described in the following sections.

2.2.1 FAA Forecast Analysis

The FAA reports historical and projected aviation activity in the Federal Aviation Administration (FAA) Terminal Area Forecast (TAF), which is released annually. The TAF contains aviation activity forecasts for all active airports in the National Plan of Integrated Airport Systems (NPIAS). These forecasts include several measures of aviation activity, including based aircraft and operations. When the TAF forecasts no change in activity it may be deemed less valid due to recent fluctuations in aviation activity at both a local and national level. In some instances, the TAF is reviewed and may be used for long-range planning.

2.2.2 Growth Rate Methodology

This methodology uses the growth rates projected by relevant planning documents and applies these growth rates to activity at the Airport. These growth rates are often gleaned from state or federal planning documents such as the FAA TAF, FAA Aerospace Forecast, or the State Aviation System Plan (SASP). Once determined, relevant growth rates are applied to the appropriate types of activity at the Airport.

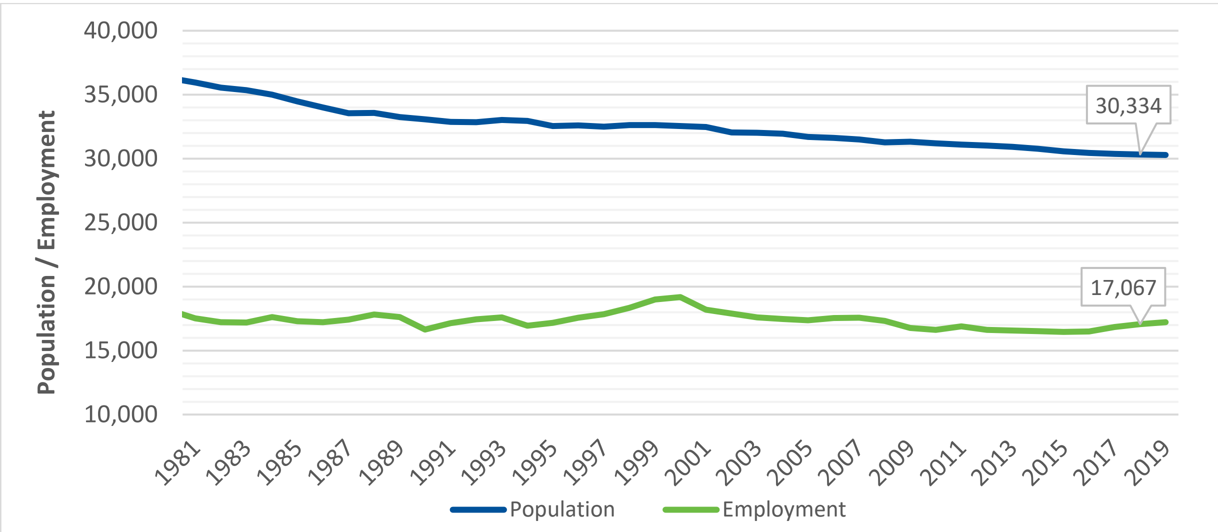
2.2.3 Market Share Methodology

Market share, ratio, and top-down methodologies compare local levels of activity with a larger entity. Such methodologies imply that the proportion of activity that can be assigned to the local level is a regular and predictable quantity compared to the larger environment. This method can be used in the aviation industry to develop forecasts at the local level based on broader trends. Historical data is most commonly used to determine the share of total national traffic activity that will be captured by a region or airport.

2.2.4 Regression Analysis Methodology

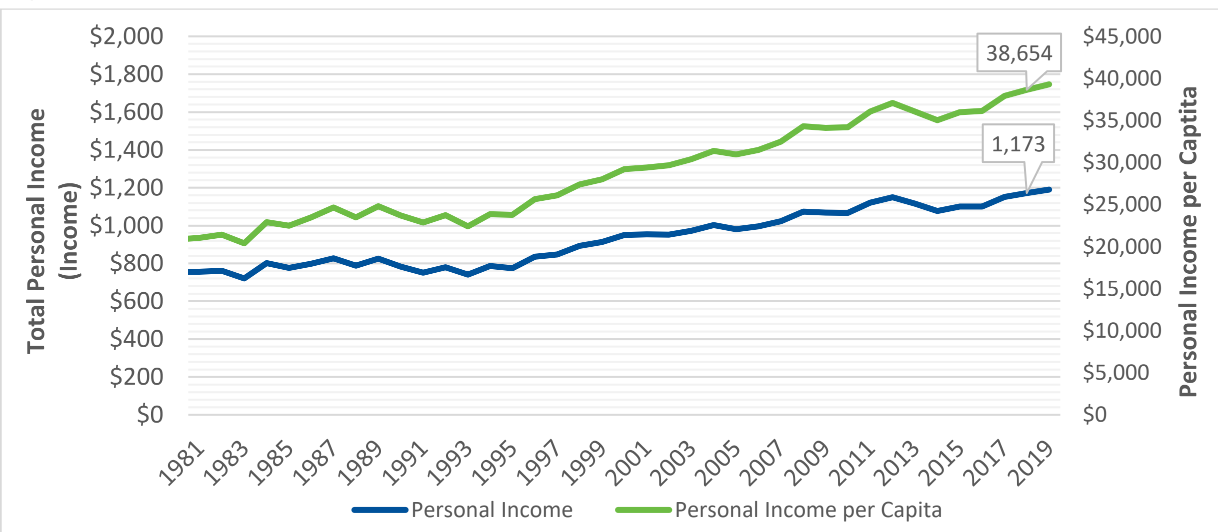
A regression analysis examines the direct relationship between two or more sets of historical data, often socioeconomic. Local socioeconomic conditions examined in this chapter include population, total employment, and income for Freeborn County. Historical and forecasted socioeconomic statistics for Freeborn County were obtained from the economic forecasting firm Woods & Poole Economics, Inc. Population and employment are shown in **Figure 2-1**, while **Figure 2-2** shows information on personal income. The population within Freeborn County has decreased slowly over the past decades, but employment has remained steady for this same duration, even increasing since 2015. This trend aligns with the significant growth of personal income, both for total and per capita.

Figure 2-1: Freeborn County Population and Employment Trends



Source: Woods & Poole, Inc.

Figure 2-2: Freeborn County Personal Income Trends



Source: Woods & Poole, Inc.
Notes: Dollars are shown in 2009 dollars to account for inflation.

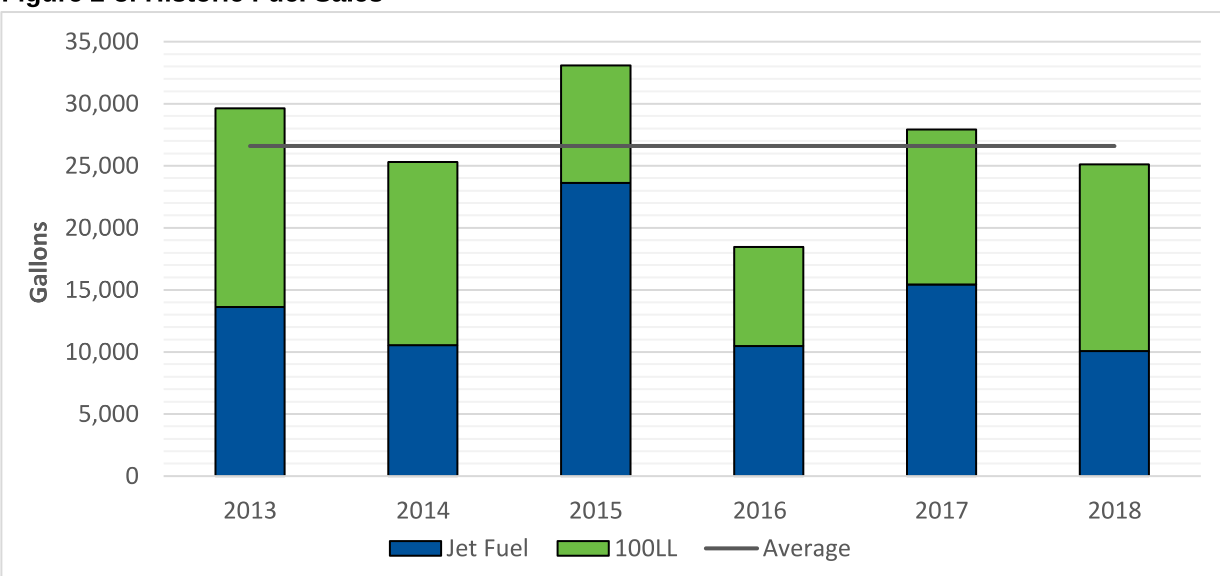
The relationship between aviation activity at the Airport and socioeconomic data is measured by determining how changes to one variable impact the other. This is measured with the R^2 value where a result of 1 implies a perfect relationship, with each variable perfectly influencing and driving the other, and where 0 means no relationship. Regression analysis can be a useful tool to establish relationships between various types of activity, but it does have limitations. As a result, it is best to use local expertise and industry knowledge in conjunction with this method, rather than relying exclusively on regression analysis results. Future aviation activity projections are based on the relationship between historical aviation activity and the socioeconomic data sets.

2.3 General Aviation Trends

Historic information on GA trends at AEL is difficult to synthesize due to the lack of information. Many of the aircraft operations are conducted under visual flight rules (VFR); therefore, records of these operations may not be accessible. However, some information on local activity is available, can be supplemented by examining regional and national GA trends to better understand and anticipate the GA industry in general, and how these trends may impact activity at AEL.

Available fuel sales information at AEL is shown in **Figure 2-3**. Except for 2016, over 25,000 gallons of combined jet and 100 low lead (LL) fuel have been sold every year. Although the years 2016 and 2015, respectively, experienced higher and lower fuel sales than average, sales have remained relatively stable with only minor changes from year to year. Although the 2019 FAA TAF is only able to offer a general estimate of activity, with a total of 26,175 annual operations, historic fuel sales also indicate that activity at the Airport is relatively stable.

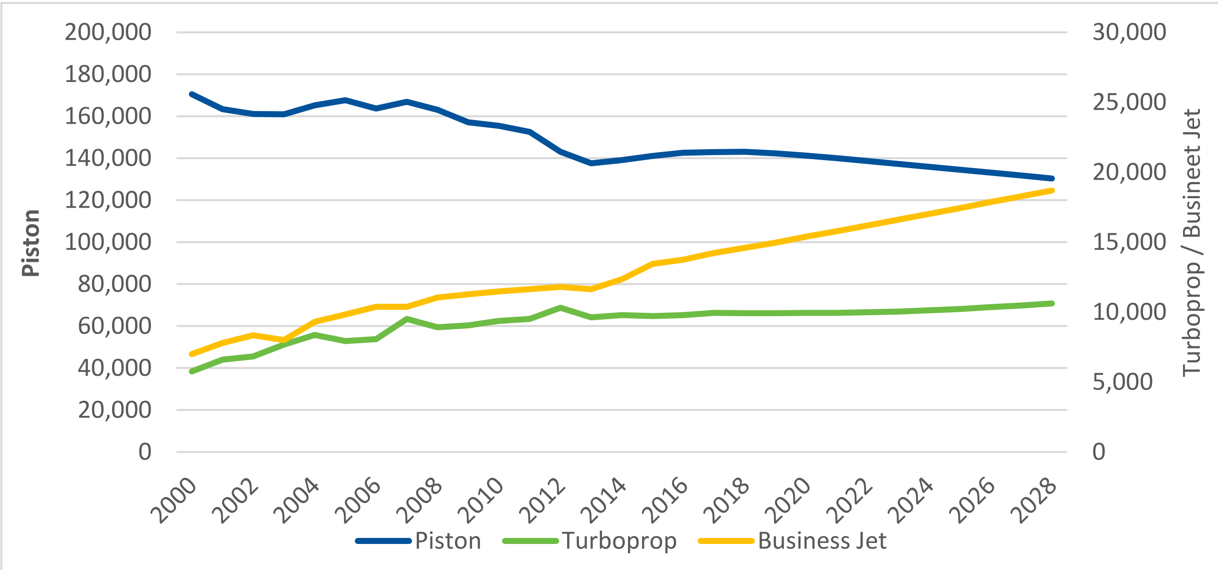
Figure 2-3: Historic Fuel Sales



Notes: The Jet A fuel pump was inoperative for several months during 2018 and led to lower sales.
Source: Airport Records

Nationally, active GA aircraft have declined since the turn of the millennium (**Figure 2-4**). Total GA activity increased modestly from 2002 until the 2008 recession but has since decreased. Piston aircraft still represent most of the national GA fleet, but even before the 2008 recession, the makeup of the GA fleet began to shift. Piston aircraft are often owned and operated by single pilots with an emphasis on recreation and training. Due to the rising cost of aviation fuel, these pilots have begun to conduct fewer operations, and operations by business jets are becoming more common, as businesses are more insulated from these expenses. The decrease in GA fleet activity and a decrease in private and commercial pilot categories parallel each other. However, rather than being simply a decrease in all GA activity, the trend instead indicates a shift in the GA industry, as other aspects increase.

Figure 2-4: Active Aircraft by Type



Source: GAMA 2019 Annual Report

Commercial pilots also decreased nationally, influenced by the 2010 decision that all scheduled airline flight crew members must hold an Airline Transport Pilot (ATP) certificate by August 2013. The decision contributed to a drop in commercial pilots. However, student pilot counts, increasing since 2011, reached 128,501 in 2016, 149,121 by the end of 2017 and 197,665 at the end of 2019. This will contribute to the replacement of traditional piston aircraft and their associated private and commercial pilots. The *2020 – 2040 FAA Aerospace Forecast* reports that all pilot certificates, with the exception of certificates limited to rotorcraft or to recreational activity, have continued to increase in recent years. This is particularly applicable to AEL due to the presence of a busy flight school.

The total GA fleet is projected to remain stable over the forecast period. However, the number of hours flown by total GA aircraft is expected to increase significantly even as the total number of more traditional single-engine aircraft become less common. Light sport aircraft are a small portion of the fleet but are expected to increase their hours flown at 4.2 percent annually and mitigate the overall decline in single-engine aircraft. The national turbine fleet is expected to grow at a rate of 2.2 percent from 2020 to 2040.

Over the years, AEL has aimed to be amenable to any users who wish to utilize the Airport. As a result, AEL has avoided development decisions that create the feeling that the Airport is only for a certain category or type of user. The activity and aircraft types at AEL are diverse and include flight training operations, jet and helicopter activity, and an active glider community. This diversity also directly supports the local community, as itinerant users will stay and be customers of the surrounding community's shops, hotels, and restaurants. This is particularly evident during the annual glider competition, formally known as the

Soaring Competition, held at AEL in late May. This event includes pilots from not only Minnesota but the neighboring states and even as far away as Arizona or Colorado. The regional event includes up to 20 competitors, their crew, and many volunteers and spectators, although during national competitions this number can more than double to over 50 competitors. The competition takes place over six days with one practice day before the event. As tow planes must be used to bring the gliders (or sailplanes) aloft, these aircraft also add to the total operations and use of Airport facilities.

Albert Lea is well suited to support these events and has received praise from event users even as the events continue to bolster the reputation of the Airport and economy of the local community. Several other reoccurring types of activity at the Airport include itinerant jet operations from business, local charter operations, recreational flights, flight training from an Airport based flight school, and seasonal activity by agricultural aviation. These agricultural-oriented operations include 10 turbine aircraft from multiple operators. While temporarily based at the Airport, they conduct numerous trips to and from the Airport for treating nearby areas several times a day for approximately 30 days a year. Other types of common activity at AEL include turboprop operations and smaller homebuilt aircraft. AEL only has 1 jet currently, but growth is anticipated, as the local fleet mix is expected to follow national trends during this transition. While the Airport is home to a diverse mix of events and users, national trends suggest that there may not be rapid growth in overall aircraft numbers but modest growth with some change in the fleet mix.

2.4 Based Aircraft and Fleet Mix

Based aircraft influence the need for and design characteristics of many types of airport facilities. Due to weather hazards, such as the harsh winters, hot summer days and wind and hail damage, based aircraft will often be housed in hangars. The type of these aircraft will determine the size of hangars and the dimensions of supporting taxiways and taxilanes. This section uses the previously described methodologies to forecast the number of based aircraft over the 20-year planning period.

The first step in developing a reliable based aircraft forecast is to first determine the number of historical and existing based aircraft at the Airport. The number of based aircraft is recorded in several locations, but these records may conflict with each other. The FAA TAF is often the best source for historical data on based aircraft although it is not always updated with the most recent based aircraft counts. The most up to date information is usually baseaircraft.com and is reflected in the 5010 master record. Currently these sources conflict and a comparison is shown in **Table 2-2**.

Table 2-2: TAF Comparison of Total Based Aircraft

Year	5010 Validated Aircraft	2019 TAF
Single-engine	33	45
Multi-engine	3	4
Jet	1	1
Helicopters	1	2
Other	0	8
Total	**38**	**60**

Sources: 2019 FAA TAF, 5010 master record

While there are several ultralights, gliders and other aircraft types that will use the Airport commonly they are not based there year round. Aircraft like this, while not contributing to the validated aircraft count, still place a demand on facilities and should be considered in the forecast chapter. Therefore, the conclusion of this section will include both the selection of the preferred based aircraft forecast, which will be submitted for FAA approval, and a forecast based on potential future demand.

2.4.1 Terminal Area Forecast (TAF)

The 2019 TAF recorded the past 10 years of based aircraft counts at AEL. Aircraft have increased steadily since 2010 and have remained nearly steady for the past two years at 60 based aircraft. The TAF also projects that based aircraft will remain at 60 for the duration of the 20-year planning period, contrary to previous trends. As this does not match the existing number of aircraft at AEL this forecast is dismissed and the preferred based aircraft forecast is presented at the end of this section.

2.4.2 FAA TAF Summary

The 2019 TAF Summary also offers trend data relevant for this analysis. The 2019 TAF Summary is different from the 2019 TAF—while the 2019 TAF is developed specifically for a given airport, the 2019 TAF Summary is more focused on trends applicable to a region or type of aircraft and projects activity for each region of the United States. In **Table 2-3** the based aircraft growth rate for the Great Lakes region according to the 2019 TAF Summary has been applied to AEL.

Table 2-3: Based Aircraft Forecast – Regional Growth

PAL / Year	Great Lakes Based Aircraft	AEL Based Aircraft
Base Year (2019)	27,465	38
I (2024)	28,368	39
II (2029)	29,235	40
III (2034)	30,122	42
IV (2039)	31,018	43
CAGR	0.61%	0.61%

Source: 2019-2045 Terminal Area Forecast Summary
Note: CAGR = Compound Annual Growth Rate

2.4.3 Minnesota State Aviation System Plan (SASP)

The Minnesota SASP describes the current airport system within the state and guidance for future development. Forecasts developed for the various types of aircraft within the state play a significant role in planning for future development. Although the SASP only projects activity through the year 2030, this master plan uses the CAGR from the SASP to extrapolate projections to 2039. This growth rate is applied to the existing aircraft at AEL in **Table 2-4**.

Table 2-4: Based Aircraft Forecast – SASP Based Growth

PAL / Year	SASP Based Aircraft	AEL Based Aircraft
Base Year (2019)	5,654	38
I (2024)	5,860	39
II (2029)	6,065	41
III (2034)	6,271	42
IV (2039)	6,491	44
CAGR	*0.69%*	*0.69%*

Source: 2012 MN SASP
Notes: Years after 2030 were projected based on SASP growth trends.

2.4.4 Regression Analysis Forecast

As previously described, this methodology compares socioeconomic data to historic based aircraft to determine their relationship. For AEL, the population, employment, total personal income, and total personal income per capita in Freeborn County were compared to historical based aircraft counts reflected in the 2019 TAF since 1980. As **Table 2-5** shows, none of these variables approach the 0.9 R^2 value usually desired before using a regression analysis as the basis for future activity. Therefore, this methodology was not used.

Table 2-5: Based Aircraft Forecast – Regression Analysis R^2 Values

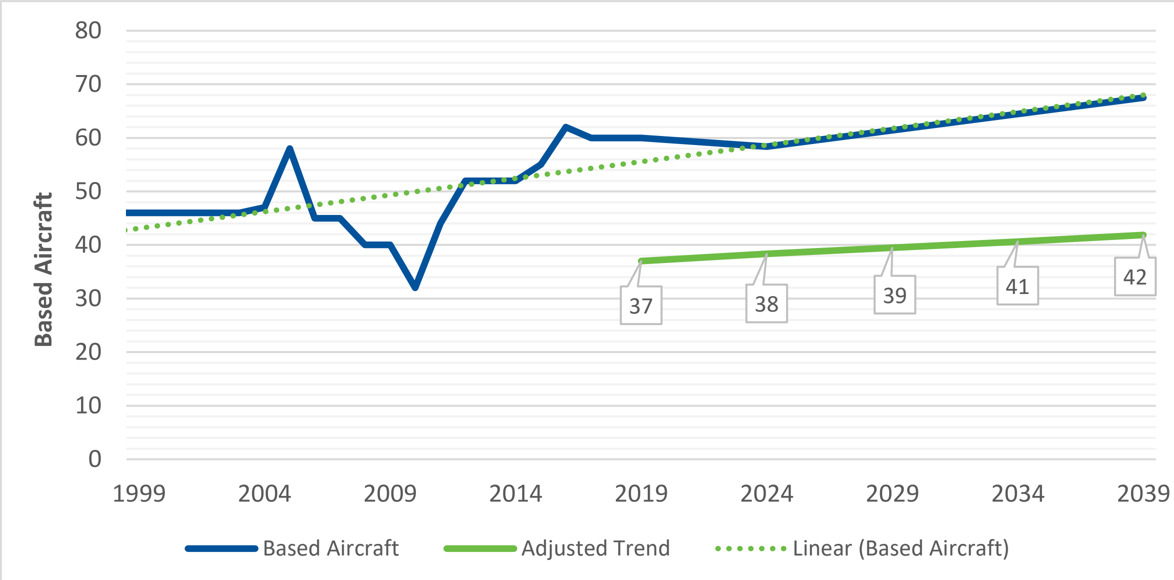
Socioeconomic Value	R^2 Value
Population	0.44
Employment	0.02
Personal Income	0.52
Personal Income per Capita	0.53

Source: Woods & Poole Inc.
Notes: Income statistics are based on 2009 dollars

2.4.5 Trend Line Forecast

This method is similar to regression analysis except it uses growth over time to predict future activity. This methodology establishes a trendline for the past activity at the Airport and then extends that trendline over the planning period (**Figure 2-5**). As this methodology benefits from a long duration of historical data, enplanements from 1998 were used. Although the number of based aircraft decreased around the 2008 era recession, aircraft numbers have generally increased steadily and recovery from the 2008 recession occurred quickly. Although the trend line shows an initial drop compared to the number of current based aircraft, it is not realistic to expect that the number of based aircraft would "snap back" to the indicated trend line. Therefore, the growth rate projected by the trendline shown has instead been applied to the 2019 based aircraft to allow for steady growth that will eventually match historical trends.

Figure 2-5: Based Aircraft Forecast – Trend Line



Source: 2019 Terminal Area Forecast

2.4.6 Preferred Forecast

A comparison of based aircraft forecasts from this section is shown in **Table 2-6** and a preferred forecast will be selected. The 2019 TAF projects that based aircraft numbers will plateau for the duration of the 20-year planning period.

Table 2-6: Based Aircraft Forecast Summary

PAL / Year	Regional	SASP	Trend
Base Year (2019)	**38**	38	37
I (2024)	**39**	39	38
II (2029)	**40**	41	39
III (2034)	**42**	42	41
IV (2039)	**43**	44	42
CAGR	0.61%	0.69%	0.62%

Source: 2019 TAF, 2012 MN SASP, 2019-2045 Terminal Area Forecast Summary, Mead & Hunt

Given historical based aircraft activity at AEL and growing economic trends, based aircraft are unlikely to remain stagnant for the next 20 years, so this forecast was no longer considered. The trend line forecast is limited as previous historical based aircraft records may not always be kept up to date. This would indicate more pronounced shifts in based aircraft than may have actually occurred as records were updated periodically. The Minnesota SASP was used to determine the SASP based aircraft growth. This forecast is appealing because it uses state-specific phenomenon to forecast activity at AEL, but it is currently undergoing an update. The most recent version from 2012 is now eight years old, so this forecast also was no longer considered. The regional growth forecast is based on the TAF Summary document and uses the total based aircraft growth anticipated for the Great Lakes region. This is more specific to AEL than a national trend and uses the most recent available information to project future activity at AEL. This growth is modest but in line with previous trends at AEL and the anticipated industry trends as GA experiences modest growth during fleet mix transitions. For these reasons, the regional forecast based on the 2019 TAF Summary is selected as the preferred forecast.

However, as previously stated, there are additional local aircraft that are not counted by the Airport but may still utilize its facilities. This includes several aircraft that are either not currently airworthy or are temporarily located elsewhere. These aircraft do not have an immediate impact on the Airport, but their future needs should still be considered. As these aircraft are restored or moved back to AEL it will impact facility requirements, such as hangar and fueling needs. The majority of these aircraft are small experimental aircraft based at pilot's homes.

Table 2-7: Based Aircraft Forecast – Potential Demand

PAL / Year	Based Aircraft
Base Year (2019)	50
I (2024)	52
II (2029)	53
III (2034)	55
IV (2039)	56
CAGR	0.61%

Notes: This count includes aircraft based in the local area and not currently at the Airport.

Based on discussions with Airport staff there are 12 aircraft that fit this description and **Table 2-7** shows the preferred growth rate applied to these aircraft in addition to the aircraft that are currently based at the Airport. It is unlikely that all of these aircraft would desire to come to the Airport in a similar time and the existing hangar vacancies would be able to accommodate many of these aircraft if they desired to be based at the Airport. Long-term alternatives will consider potential impacts due to the influx of these additional aircraft. Therefore, while there are as many as 50 aircraft in the vicinity of the Airport, this chapter will consider the 38 validated aircraft.

2.4.7 Aircraft Fleet Mix

The mix of aircraft at AEL is already diverse, and the local fleet mix is expected to continue to diversify in minor ways as it follows national trends. Additional jets are expected at the Airport as local business grows. The advantageous location of the Airport and City near the juncture of Interstates 35 and 90 provides good opportunities for business in the region, and recent trends indicate positive growth for local incomes. Single-engine aircraft are expected to experience minor growth, partially due to the addition of light sport aircraft, and other aircraft fleet changes will also be minor. While there are several ultralights and gliders that utilize the Airport, they are not based at the Airport and several hangars are currently available if their preference changes. The future fleet mix is shown in **Table 2-8**.

Table 2-8: Based Aircraft Forecast Summary

PAL / Year	Single Engine	Multiengine	Jet	Helicopters	Other
Base Year (2019)	33	3	1	1	0
I (2024)	34	3	1	1	0
II (2029)	34	3	2	1	0
III (2034)	35	3	2	2	0
IV (2039)	35	3	3	2	0
CAGR	0.33%	0.69%	5.66%	2.75%	-

Source: 2019 TAF, 2012 MN SASP, 2019-2045 Terminal Area Forecast Summary, Mead & Hunt

2.5 General Aviation Operations

The 2019 TAF estimates a plateau of activity for the past several decades. Based on the 2019 TAF, an estimated 23,875 GA operations have occurred annually since 1990 and are projected to continue until 2045. It is unlikely that operations will remain stagnant for fifty-five consecutive years and the lack of historical information makes it difficult to employ several industry standard forecasting methods, such as regression analysis, operations per based aircraft, and trend line analysis. As AEL is not a towered airport these operations likely underrepresent activity. As stated in Section 2.3, activity at the Airport is varied and includes local flight school operations, seasonal activity by agricultural aircraft and soaring competitions, and normal use by local and itinerant aircraft.

Airport records do not track all operations by the flight school, but some estimates may be conducted from available records. One hour of local flight time is enough to support up to a dozen operations, as one touch and go could be conducted by an aircraft in the pattern every six minutes. As one landing and one takeoff each count as an operation, this would mean one aircraft flying in this manner would conduct 12 operations per hour. As 500 hours of aircraft activity are recorded for touch and go training operations, these can be estimated to support 6,000 operations for the two Piper Warriors used by the flight school alone. Additional operations by the Piper Warriors include approximately 500 hours of instrument activity. Other operations are conducted by a Piper Arrow and Piper Seminole twin. These aircraft do not conduct operations at the same rate as the smaller Piper Warriors, which are most commonly used for touch and go operations, but each record approximately 500 hours of activity, largely for local operations.

However, the lack of a tower means that that while it can be understood not all of these operations are captured by the TAF, the TAF’s estimate of activity is the only available FAA information on Airport activity. Therefore, this section will focus on using the TAF’s conservative estimate of existing activity and determine relevant growth rates to project future activity.

Three applicable growth rates are used to determine future levels of activity at AEL, shown in **Table 2-9** and **Figure 2-6**. The SASP uses the total number of GA operations in the state and projects the total growth. This growth rate was then applied to the number of operations at the Airport from the TAF. However, the SASP was released in 2010 and projects activity until 2030, so it is moderately outdated. While this document is useful in that is focused on the state of Minnesota, the changing nature of the GA industry means that it may be less applicable today and is therefore dismissed from consideration. The FAA Aerospace rate shows the strongest growth of the various methodologies used, which reflects national trends for GA growth. This growth rate may be less applicable to AEL because a single airport will not necessarily parallel national trends. Therefore, this forecast was dismissed from consideration.

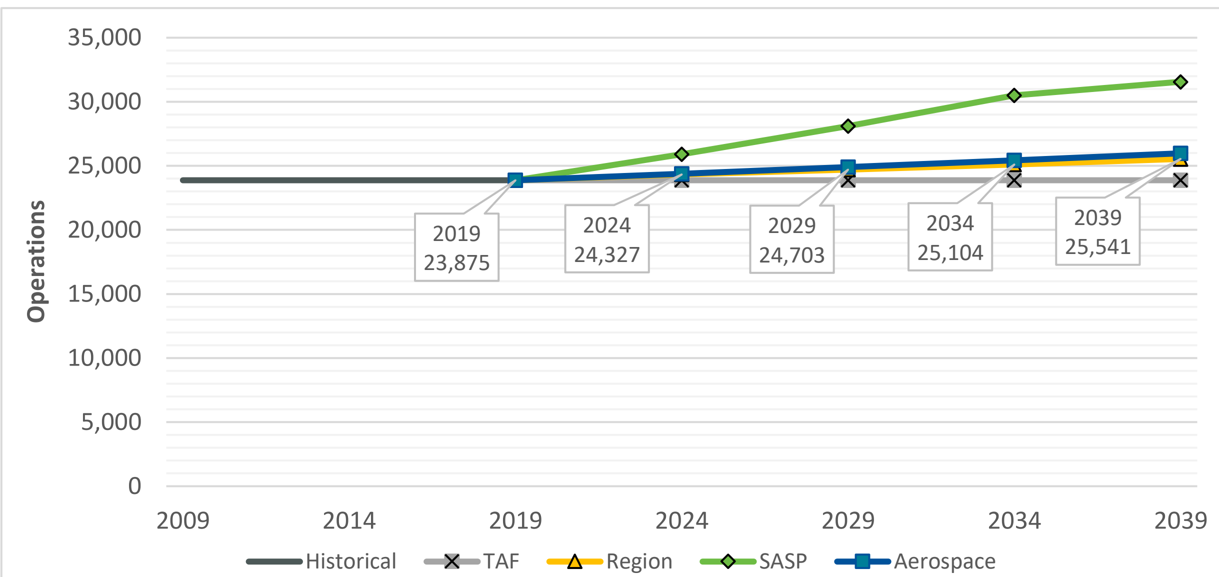
The last is the growth projected by the 2019-2045 Terminal Area Forecast Summary. It should again be clarified that the 2019 TAF Summary is different from the 2019 TAF. While the 2019 TAF is developed specifically for a given airport, the 2019 TAF Summary is more focused on trends applicable to a region or type of aircraft and projects total operations within the Great Lakes region. AEL is a GA airport without air carrier service and a strong GA presence. Although the 2019-2045 TAF Summary does not project GA operations in the region, it does project both total operations and commercial operations. While there are some commercial operations at AEL, an approximation of the applicable trends can be derived by subtracting the region’s commercial trends from the total trends. The resulting growth in operations other than commercial is then applied to AEL to result in the final forecast. As this forecast is the most applicable to the Airport, it is selected as the preferred forecast.

Table 2-9: GA Operations Forecasts Summary

PAL / Year	TAF	SASP	FAA Aerospace	Regional Growth*
Base Year (2019)	23,875	23,875	23,875	**23,875**
I (2024)	23,875	25,902	24,384	**24,327**
II (2029)	23,875	28,102	24,904	**24,703**
III (2034)	23,875	30,489	25,435	**25,104**
IV (2039)	23,875	31,559	25,977	**25,541**
CAGR	*0.00%*	*1.40%*	*0.42%*	***0.34%***

Source: 2019-2045 Terminal Area Forecast Summary, 2019 TAF, 2012 MN SASP, Mead & Hunt 2020-2040 FAA Aerospace Forecast, Mead & Hunt
*Notes: *The Regional Growth forecast uses the 2019-2045 Terminal Area Forecast Summary*
CAGR = Compound Annual Growth Rate

Figure 2-6: GA Operations Forecasts



Source: 2019-2045 Terminal Area Forecast Summary, 2019 TAF, 2012 MN SASP, Mead & Hunt

2.6 Other Operations

Although GA operations make up most operations at AEL, a limited number of air taxi and military operations also occur there. This section projects activity for each of these types of operations.

2.6.1 Air Taxi

Air taxi operations are defined as unscheduled takeoffs and landings by commercial aircraft with 60 or fewer seats. These operations are usually on-demand flights typically conducted by charter companies such as local Fixed-Based Operators (FBO) and fractional ownership aircraft operators. Based on 2019 TAF data, air taxi operations have made up 7.6 percent of total operations, or 2,000 annual operations. If the growth rate for commercial operations, the same that were subtracted from the GA forecast in **Section 2.5**, is applied to existing air taxi operations, the result is a modest growth in air taxi operations (**Table 2-10**).

Table 2-10: Air Taxi Operations

Year	Operations
Base Year (2019)	2,000
I (2024)	2,098
II (2029)	2,201
III (2034)	2,309
IV (2039)	2,422
CAGR	*0.96%*

Source:

2.6.2 Military

A limited number of military operations take place at AEL. According to the estimates in the 2019 TAF, military operations represent approximately 1 percent of total operations at AEL. The 2019 TAF anticipates that military operations will remain steady at 300 annual itinerant operations and zero local operations throughout the planning period. As military operations are driven by federal policy decisions, the preferred forecast methodology for military operations is the FAA TAF.

2.7 Peak Aircraft Operations

Forecasting peak activity is important for any airport. Annual measurements are only useful when activity tends to be evenly distributed over the entire year. However, seasons and events often create periods of fluctuating demand. As a result, it is important to identify and forecast peak period activity levels.

As AEL is a non-towered airport, information on the peak periods of operations are limited. Based on a survey of the TFMSC database from 2010 through 2019, June appears to be the peak month at approximately 9.6 percent of annual operations according to instrument operations. Although glider activity usually takes place in May and may be similar to June peak activity, information is more readily available for the instrument operations conducted in June. The results align with expectations for a GA airport, as the months surrounding summer are often busier. Estimates for peak month operations are the result of applying this percentage to the preferred forecast (**Table 2-11**).

Table 2-11: Peak Month Operations

Year	Annual Operations	Peak Month Operations
Base Year (2019)	26,175	2,513
I (2024)	26,725	2,566
II (2029)	27,204	2,612
III (2034)	27,713	2,660
IV (2039)	28,263	2,713

Peak month operations can further be refined into peak hour operations. Dividing the June operations by 30, for the number of days in June, equates to the number of average daily operations. The average daily operations are then multiplied by 25 percent to determine peak hour operations. This percentage is used as the Airport hosts many events throughout the year and it is not uncommon for a rapid series of operations to happen during a short window of time, such as during the beginning of the glider competition. The results of these calculations are shown in **Table 2-12.** Note that the peak hour forecast is intended to evaluate the peak hour of the average day of the busiest month, and not just the busiest hour out of the entire year. Therefore, this peak hour forecast will likely be periodically exceeded during larger events, such as the Region 7 Glider Competition, but should serve in planning to accommodate most periods of temporarily increased demand and to prevent overdevelopment that only accommodates infrequent but high activity.

Table 2-12: Peak Hour Operations

Year	Peak Month Operations	Average Day Operations	Peak Hour Operations
Base Year (2019)	2,513	84	21
I (2024)	2,566	86	21
II (2029)	2,612	87	22
III (2034)	2,660	89	22
IV (2039)	2,713	90	23

2.8 Critical Aircraft

The most effectively designed airport facilities accommodate the most demanding aircraft expected to use the airport regularly. According to AC 150/5000-17, *Critical Aircraft and Regular Use Determination,* this aircraft is referred to as the design aircraft, and it is crucial to identify during the planning process. If no one aircraft is the most demanding aircraft, a grouping of aircraft with similar characteristics that make regular use of the airport can be used. Design aircraft within a specific grouping include those with comparable operational performance characteristics and/or physical dimensions. Regular use is defined by AC 150/5000-17 as 500 annual operations, including both itinerant and local operations, but not touch-and-go operations. An operation is defined as either a takeoff or landing.

Design aircraft influence the runway design by their Aircraft Approach Category (AAC), Airplane Design Group (ADG), and approach visibility minimums of the runway in question. The AAC relates to aircraft approach speed while ADG is based on aircraft wingspan and height. The moniker “small” may also be added to the ADG to denote that the critical aircraft is 12,500 pounds or less. The AAC and ADG are based on the fastest and largest aircraft, respectively, expected to regularly operate on the runway and its adjacent taxiways (500 operations per year). These three characteristics combine to form a Runway Design Code (RDC) that signifies the design standards to which a runway is to be built. **Table 2-13** shows the characteristics that define the designation for each component of the RDC.

Table 2-13: Runway Design Code Components

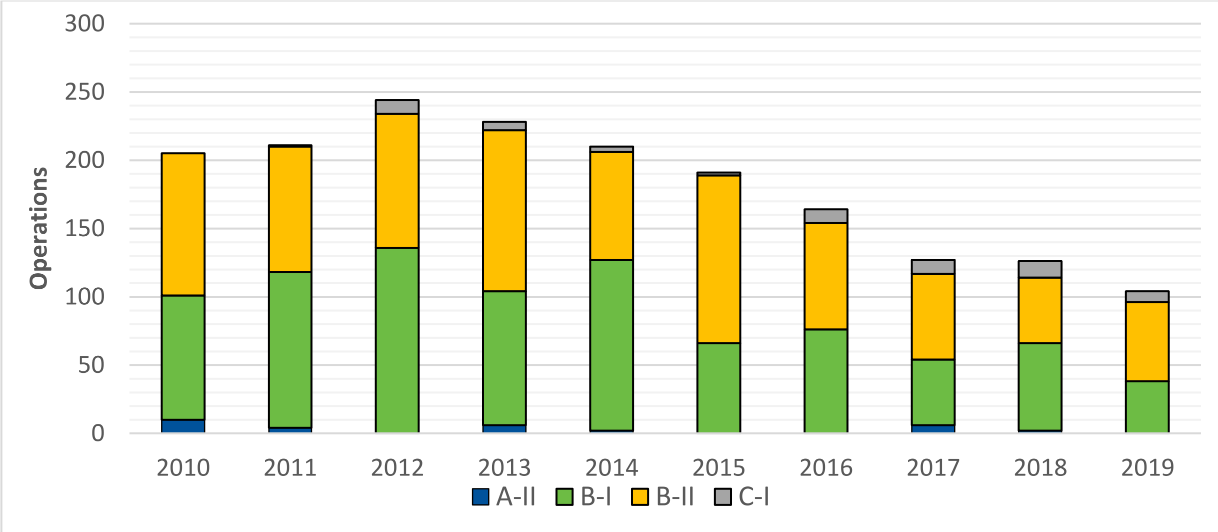
Aircraft Approach Category (AAC)		Airplane Design Groups (ADG)			Runway Visual Range (RVR)	
AAC	Approach Speed	ADG	Tail Height	Wingspan	RVR	Visibility
A	< 91 knots	I	< 20 feet	< 49 feet	1600	1/4
B	≥ 91 knots, < 121 knots	II	20 – 29 feet	49 – 78 feet	2400	1/2
C	≥ 121 knots, < 141 knots	III	30 – 44 feet	79 – 117 feet	3200	5/8
D	≥ 141 knots, < 166 knots	IV	45 – 59 feet	118 – 170 feet	4000	3/4
E	≥ 166 knots	V	60 – 65 feet	171 – 213 feet	4500	7/8
		VI	66 – 79 feet	214 – 261 feet	5000	1

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

Based on the operations captured by the TFMSC, more demanding aircraft that regularly use AEL include A-II, B-I, B-II and C-I aircraft. Operations by these aircraft over the past 10 years (**Figure 2-7**) show that A-II aircraft, such as the Pilatus PC-12, are uncommon. Aircraft in the B-I and B-II categories are the most demanding aircraft that commonly operate at the Airport. This includes aircraft like the Cessna Citation (B-I) or the King Air 200 (B-II), Super King Air 350 (B-II) and some larger gliders. While C-I aircraft, such as the Learjet 45, do operate at the Airport, they are infrequent and do not reach the threshold of 500 annual operations. B-II operations also do not reach 500 operations alone in this figure, as this only accounts for instrument operations.

However, whether inbound aircraft cancel their instrument clearance based on weather before they arrive into the Airport, or conduct their flight under VFR, the TFMSC database only captures a small percentage of total activity at the Airport because it only tracks IFR activity. Regardless, an average of 305 annual instrument operations have been conducted over the past five years. This constitutes 1.2 percent of the 26,175 operations estimated by the 2019 TAF yet captures activity by various B-II jets, such as the Cessna Citation CJ4 and Cessna Excel. Instrument operations only reflect a small proportion of the total number of operations and an active King Air 200 is based at the airport which conducted 196 trips, or 392 operations, at AEL in 2019. Itinerant jet traffic commonly visits the Airport and it is reasonable to expect that there are currently more than 500 annual B-II operations at AEL. Therefore, B-II is selected as the existing and future critical aircraft category for Runway 17/35 and the King Air 200 is selected as the representative aircraft.

Figure 2-7: Operations by Runway Design Code



Source: Traffic Flow Management System Counts (TFMSC)
Notes: The TFMSC only accounts for instrument operations.

A current and future critical aircraft should also be selected for the crosswind runway, Runway 5/23. Larger turbine aircraft are unlikely to use a runway that is 2,898 feet long and has no instrument approaches. Therefore, the primary users of this runway would be piston driven aircraft less than 12,500 pounds, or aircraft in the A/B-I (small) category. As the pavement strength for this runway is also 12,500 pounds, the critical aircraft category is A/B-I (small). This includes many single engine piston aircraft, such as the Beech Bonanza 36 and Cessna Skyhawk 172 but can include small turbine aircraft in the B-I(small) category such as the Cessna Citation Mustang.

2.9 Forecast Summary

This section summarizes all the forecasts presented in this chapter and compares them to the FAA TAF. The FAA templates for summarizing and documenting airport planning forecasts and for comparing forecasts with the FAA TAF are presented in **Table 2-14** and **Table 2-15**.

Table 2-14: Comparison of Airport Planning and TAF Forecast

Year	Master Plan	TAF	% Difference
Commercial Operations			
Base Year (2019)	2,000	2,000	0.0%
I (2024)	2,098	2,000	4.9%
II (2029)	2,201	2,000	10.1%
III (2034)	2,309	2,000	15.5%
Total Operations			
Base Year (2019)	26,175	26,175	0.0%
I (2024)	26,725	26,175	2.1%
II (2029)	27,204	26,175	3.9%
III (2034)	27,713	26,175	5.9%

Table 2-15: FAA Template for Summarizing and Documenting Airport Planning Forecasts

Criteria	Year						Average Annual Compound Growth Rates			
	2019	2024	2029	2034	2039		Base Yr. to +5	Base Yr. to +10	Base Yr. to +15	Base Yr. to +20
Operations										
Itinerant										
Air Carrier	0	0	0	0	0		-	-	-	-
Commuter/air taxi	2,000	2,098	2,201	2,309	2,422		0.96%	0.96%	0.96%	0.96%
Total Commercial Operations	2,000	2,098	2,201	2,309	2,422		0.96%	0.96%	0.96%	0.96%
General aviation	6,781	6,909	7,016	7,130	7,254		0.38%	0.34%	0.34%	0.34%
Military	300	300	300	300	300		0.00%	0.00%	0.00%	0.00%
Local										
General aviation	17,095	17,418	17,687	17,974	18,287		0.38%	0.34%	0.34%	0.34%
Military	0	0	0	0	0		-	-	-	-
TOTAL OPERATIONS	26,175	26,725	27,204	27,713	28,263		0.42%	0.39%	0.38%	0.38%
Peak Hour										
Operations*	21	21	22	22	23		0.00%	0.47%	0.31%	0.46%
Based Aircraft										
Single Engine (Nonjet)	33	34	34	35	35		0.60%	0.30%	0.39%	0.29%
Multi Engine (Nonjet)	3	3	3	3	3		0.00%	0.00%	0.00%	0.00%
Jet Engine	1	1	2	2	3		0.66%	7.18%	4.73%	5.65%
Helicopter	1	1	1	2	2		0.00%	0.00%	4.73%	3.53%
Other	0	0	0	0	0		-	-	-	-
TOTAL	38	39	40	42	43		0.54%	0.51%	0.67%	0.62%
Operations Factors										
GA operations per based aircraft	628.3	623.2	617.6	597.7	594.0					

CHAPTER 3

Facility Requirements

3.1 Introduction

This chapter examines how well existing facilities can meet current and projected aviation demand at Albert Lea Municipal Airport (AEL). This analysis evaluates the existing facilities, identified in Chapter 1, to determine their ability to accommodate forecasted aviation activity and demand, as discussed in Chapter 2. Facilities are evaluated in this chapter while alternatives for addressing needs will be evaluated in the following chapter. This chapter is split into specific facilities as shown:

- Future Critical Aircraft
- Airfield Design Standards
- Runways
- Instrument Approaches
- Taxiways and Taxilanes
- Aprons
- Pavement Conditions
- Hangars
- Supporting Facilities
- Airport Zoning
- Airport Assessment – Summary and Recommendations

3.2 Future Critical Aircraft

The existing critical aircraft, as determined in the previous chapter, is the B-II family of aircraft for the Airport and Runway 17/35, and B-I (small) for Runway 5/23. If a more demanding aircraft family were to be selected for the future critical aircraft, then C-I aircraft would be the most probable choice, as these aircraft have had a persistent but modest presence at AEL. In order for the C-I aircraft family to be selected, these aircraft must conduct 500 annual operations. Operations by C-I aircraft are underreported by the Traffic Flow Management System Counts (TFMSC) database, as it only records flights with an instrument flight plan and has averaged less than 10 annual operations in the past five years. However, this database does not capture all annual operations and C-I aircraft operations likely occur more frequently. Although it is unlikely for C-I aircraft to exceed 500 annual operations in the near future, jet activity is expected to continue to grow rapidly. Aircraft like the Learjet 45 already visit AEL several times a year.

The King Air 200, a B-II aircraft

The Learjet 35, a C-I aircraft

With C-I aircraft, many of the impacts off Airport property and to local zoning would remain similar to those for B-II. For instance, the Runway Protection Zones (RPZs), which extend beyond Airport property and should be considered in local zoning, would not change. However, many of the safety areas associated with C-I aircraft are more demanding than for the B-II and would increase significantly. This increase in the runway safety area (RSA) and runway object free area (ROFA) in particular would require the introduction of declared distances for C-I aircraft to operate effectively on the runway. These areas extend 1,000 feet beyond the runway end and would be limited by the presence of the AEL perimeter fence and surrounding roadways. For these reasons B-II is recommended to remain as the future critical aircraft.

3.3 Airfield Design Standards

Runways, taxiways and other airport areas have designated safety surfaces to allow for safe and efficient operations. These surfaces are often based on the critical aircraft for the relevant area. **Table 3-1** and **Table 3-2** compare the existing dimensions of these surfaces to the relevant prescribed standards for each runway and this section discusses the purposes of select surfaces.

3.3.1 Approach and Departure Codes

The approach reference code (APRC) and departure reference code (DPRC) determine aircraft takeoff and landing restrictions for a specific runway. Like the runway design code, the APRC is composed of three components: aircraft approach category, airplane design group, and visibility minimums. The APRC determines the size of aircraft able to land on a runway while the DPRC determines what aircraft can take off when multiple aircraft are present. Due to the low visibility restrictions and large distances between the primary runway and parallel taxiways at AEL, the only aircraft that would be restricted by these codes on the primary runway would likely already exceed the required needs for pavement strength and runway lengths.

Table 3-1: Runway 17/35 Design Standards

Criteria	Runway 17		Runway 35	
	Existing	Standard	Existing	Standard
Runway Design Code	B-II-4000	N/A	B-II-4000	N/A
Runway Length	5,000 feet	N/A	5,000 feet	N/A
Runway Width	100 feet	75 feet	100 feet	75 feet
Runway CL to Holding Position	200 feet	200 feet	200 feet	200 feet
Runway CL to Parallel Taxiway	400 feet	240 feet	400 feet	240 feet
Reference Codes				
Approach Reference Code	D/IV/4000 D/V/4000	Same	D/IV/4000 D/V/4000	Same
Departure Reference Code	D/IV D/V	Same	D/IV D/V	Same
Runway Protection Zone (RPZ)[1]				
Inner Width	1,000 feet	Same	1,000 feet	Same
Length	1,700 feet	Same	1,700 feet	Same
Outer Width	1,510 feet	Same	1,510 feet	Same
Runway Safety Area (RSA)				
Length Beyond Runway End	300 feet	Same	300 feet	Same
Length Prior to Threshold	300 feet	Same	300 feet	Same
Width	150 feet	Same	150 feet	Same
Runway Object Free Area (ROFA)				
Length Beyond Runway End	300 feet	Same	300 feet	Same
Length Prior to Threshold	300 feet	Same	300 feet	Same
Width	500 feet	Same	500 feet	Same
Primary Surface				
Length Beyond Runway End	200 feet	Same	200 feet	Same
Width	1,000 feet	Same	1,000 feet	Same
MnDOT Clear Zone				
Inner Width	1,000 feet	Same	1,000 feet	Same
Length	1,700 feet	Same	1,700 feet	Same
Outer Width	1,510 feet	Same	1,510 feet	Same
Slope	34:1	Same	34:1	Same

Table 3-1: Runway 17/35 Design Standards (continued)

Criteria	Runway 17		Runway 35	
	Existing	Standard	Existing	Standard
Threshold Siting Surface (TSS) [2]				
Inner Width	400	Same	400	Same
Length	10,000	Same	10,000	Same
Outer Width	3,400	Same	3,400	Same
Slope	20:1[3]	Same	20:1[3]	Same
Critical Aircraft				
Existing	King Air 200	N/A	King Air 200	N/A
Future	King Air 200	N/A	King Air 200	N/A
Visibility Minimums				
Lowest in Statute Miles	3/4	N/A	3/4	N/A
Vertically Guided Surface	Yes	N/A	Yes	N/A

Notes: 1: RPZ is the same for both ends of Runway 17/35
2: TSS is the same for both ends of Runway 17/35 and standards and based on Engineering Brief 99A
3: More information on the runway sloping surfaces is discussed in Section 3.3.6.

Table 3-2: Runway 5/23 Design Standards

Criteria	Runway 5		Runway 23	
	Existing	Standard	Existing	Standard
Runway Design Code	A/B-I (small)-Visual	N/A	A/B-I (small)-Visual	N/A
Runway Length	2,898 feet	N/A	2,898 feet	N/A
Runway Width	75 feet	60 feet	75 feet	60 feet
Runway CL to Holding Position	200 feet[1]	125 feet	200 feet[1]	125 feet
Runway CL to Parallel Taxiway	150 feet	N/A	150 feet	N/A
Reference Codes				
Approach Reference Code	B/I (small)/VIS	Same	B/I (small)/VIS	Same
Departure Reference Code	B/I (small)	Same	B/I (small)	Same
Runway Protection Zone (RPZ)[1]				
Inner Width	250 feet	Same	250 feet	Same
Length	1,000 feet	Same	1,000 feet	Same
Outer Width	450 feet	Same	450 feet	Same
Runway Safety Area (RSA)				
Length Beyond Runway End	240 feet	Same	240 feet	Same
Length Prior to Threshold	240 feet	Same	240 feet	Same
Width	250 feet	Same	250 feet	Same
Runway Object Free Area (ROFA)				
Length Beyond Runway End	240 feet	Same	240 feet	Same
Length Prior to Threshold	240 feet	Same	240 feet	Same
Width	210 feet	Same	210 feet	Same
Primary Surface				
Length Beyond Runway End	200 feet	Same	200 feet	Same
Width	250 feet	Same	250 feet	Same
MnDOT Clear Zone				
Inner Width	500 feet	Same	500 feet	Same
Length	1,000 feet	Same	1,000 feet	Same
Outer Width	700 feet	Same	700 feet	Same
Slope	20:1	Same	20:1	Same

Table 3-2: Runway 5/23 Design Standards

Criteria	Runway 5		Runway 23	
	Existing	Standard	Existing	Standard
Threshold Siting Surface (TSS)[2]				
Inner Width	400 feet	Same	400 feet	Same
Length	10,000 feet	Same	10,000 feet	Same
Outer Width	3,400 feet	Same	3,400 feet	Same
Slope	20:1[3]	Same	20:1[3]	Same
Critical Aircraft[4]				
Existing	Cessna Mustang	N/A	Cessna Mustang	N/A
Future	Cessna Mustang	N/A	Cessna Mustang	N/A
Visibility Minimums				
Lowest in Statute Miles	N/A	N/A	N/A	N/A
Vertically Guided Surface	No	N/A	No	N/A

Notes: 1: RPZ is the same for both ends of Runway 5/23
2: TSS is the same for both ends of Runway 5/23 and standards and based on Engineering Brief 99A
3: More information on the runway sloping surfaces is discussed in Section 3.3.5.
4: The critical aircraft family for Runway 5/23 is B-I(small) aircraft

3.3.2 Primary Surface

The primary surface is an area around a runway that protects from obstructions and its dimensions are based on attached instrument approaches and the size of aircraft using the runway. For all runways with a hard surface, the primary surface extends two hundred feet beyond the runway end while the width is tailored per runway. For Runway 17/35, the 3/4 mile approaches and ability to serve aircraft greater than 12,500 pounds mean that the width of primary surface is 1,000 feet, extending 500 feet from each side of the runway centerline. This width means that some of the surrounding facilities conflict with this surface. This includes a section of the perimeter fence that runs parallel to the Runway 35 threshold and a line of trees growing adjacent to the fence. As the primary surface would remain its current dimensions even if only one of the runway ends maintains a 3/4 mile approach, the relocation of these obstructions and other mitigation strategies will be considered in the following chapter.

3.3.3 Runway Safety Area (RSA)

The RSA is intended to protect the safety of aircraft in the event of a runway excursion. The dimensions of the RSA are designed to incorporate 90 percent of runway overruns based on the size of the aircraft using the runway. This must be kept clear of all objects, except those fixed by function, and capable of supporting aircraft, maintenance, and rescue vehicles.

3.3.4 Runway Object Free Areas (ROFA)

Similar to the RSA, the ROFA provides an additional clearance around runways free of objects that are not fixed by function. Although larger than the RSA it is not intended to support aircraft or vehicles. Airport personnel have noted that there are ditches of significant depth on the Airport. These are located to the east of Runway 17/35, both sides of the southwestern portion of Runway 5/23 and to the north of the Runway 23 threshold. While these ditches are inside the ROFA, they are not inside the RSA and the ROFA is not intended to support aircraft or vehicles. Therefore, the existing design meets federal guidance, and it is unlikely that federal funds would be available to infill these areas. However, it is possible that this work may be paired with an eligible project or locally funded.

3.3.5 Runway Protection Zones (RPZ)

As stated in Chapter 1, the RPZs are intended to protect people and property on the ground near the runway ends. The RPZ is a trapezoidal shape that is fixed to the ground. Its dimensions are determined by the critical aircraft for the runway and the visibility minimums for any approach associated with the runway. Any improvements to the approaches would impact the size of these surfaces. As determined in the beginning of this chapter, the critical aircraft family is not expected to change, as an increase in jets will likely occur but remain within the critical aircraft family, for the duration of the planning period, so the primary driver of RPZ size would likely be any changes to the instrument approaches.

The existing approach to the Runway 35 end has visibility miles of 3/4 miles which requires an RPZ that is 1,000 feet wide at the beginning, 1,700 feet long and terminates with a width of 1,510 feet wide. Due to its size, its overlaps some residential properties to the approximately a quarter of a mile to the southeast of the Runway 35 threshold. Also, in the RPZ is Hammer Road and a portion of the adjacent golf course. These are not compatible land uses and the following chapter will consider mitigations to the RPZ.

3.3.6 Threshold Siting Surface (TSS)

The TSS is a trapezoidal shape that rises at a determined slope and is designed to provide a safe path of travel for aircraft conducting an approach to the runway. This surface influences the placement of the runway threshold, as it is positioned to avoid penetration from surrounding obstacles. The 20:1 slope for Runway 17/35 is dependent on the approaches to the runway having no less than ¾-mile visibility minimums. However, the TSS is not the most restrictive slope on Runway 17/35, as the runway has an LPV (GPS) RNAV approach to each end of the runway that offers vertical guidance additional protection is needed. FAA Order 8260.58A, *United States Standards for Performance Based Navigation Instrument Procedure Design*, states that for LPV approaches, the protected slope is based on the glideslope angle. Both Runway 17 and Runway 35 have a 3 degree glideslope for the instrument approach and requires a 30:1 surface for the TSS approach surface. Therefore, the most restrictive surface is due to the protections needed for the LPV approach to each of these runways.

3.4 Runways

This section examines the length of both runways in accordance with FAA guidance based on the current and expected fleet mix. First the necessary runway length for AEL as a whole is determined based on the AEL fleet mix and FAA guidance, and then this section concludes with an analysis on the ability of both runways to meet Airport needs.

3.4.1 Runway Configuration

As AEL has two intersecting runways, FAA Advisory Circular (AC) 1500-13A, *Airport Design,* states that a runway visibility zone should exist to allow coordination between any aircraft and/or vehicles that are operating on the runways. This area, which originates at the midpoint from the intersection of the two runways to the thresholds of Runway 17, 35, and 23, and extends 750 feet towards the Runway 5 threshold, should allow visibility five feet above the runway surface. This area is clear, and visibility is maintained in accordance with the guidance.

However, although the runways meet this guidance, there is a large gravel pit with trees located off of, but immediately adjacent to, Airport property and north of the Runway 23 threshold and hangars and other buildings to the south. These obstructions prevent an aircraft on the Runway 17 or 35 thresholds from seeing any activity on the Runway 23 threshold and vice versa. As AEL is not a towered airport, and pilots rely on self-coordination and radio communication to coordinate landing, it would be preferable to have these two runway thresholds mutually visible.

3.4.2 FAA Runway Length Calculation

FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides guidelines and a six-step procedure to determine recommended runway lengths for a selected list of critical design aircraft. One of the specific elements of this Master Plan Update is to conduct a runway length analysis for AEL runways. The six-step procedure is applied and described in the following paragraphs.

Step 1 – Critical Aircraft Design

The first step to determine required runway length is to identify a list of aircraft that demand the greatest runway length. The critical aircraft family for the AEL is B-II, and **Table 3-3** shows B-II aircraft that frequently operate at AEL. Although smaller aircraft types conduct a substantial share of aircraft operations at AEL, they are not listed in this table because they generally require less runway length, and this table has been restricted to aircraft in the B-II aircraft family or greater.

Table 3-3: B-II and Greater Common Aircraft

Aircraft	Critical Aircraft Family	MTOW (pounds)
Learjet 45	C-I	21,500
Cessna Excel	B-II	20,200
Cessna Citation CJ4	B-II	17,110
Beech 200 King Air 200	B-II	12,500
Beech Super King Air 350	B-II	15,000
Cessna Conquest	B-II	9,850

Note: MTOW = Maximum Takeoff Weight

Step 2 – Aircraft Runway Length Requirement based on Maximum Takeoff Weight (MTOW)

The second step is to identify what aircraft will require the longest operational runway length based on its MTOW and will use the runway regularly (a minimum of 500 operations annually). The FAA groups aircraft into three weight categories: 12,500 pounds or less, over 12,500 pounds but less than 60,000 pounds, and 60,000 pounds or greater. The aircraft weight category determines what method to use to establish the recommended runway length.

Except for regional jets, when the MTOW of listed aircraft is 60,000 pounds or less, the recommended runway length is determined according to a grouping of aircraft having similar performance characteristics and operating weights. All aircraft that currently operate or may operate at AEL are less than 60,000 pounds. Aircraft greater than 60,000 pounds do not generally operate at AEL based on the typical facility requirements of these aircraft.

Step 3 – Determine Method to Establish Recommended Runway Length

The third step is to reference the aircraft identified in Table 1-1 in FAA AC 150/5325-4B (shown below in **Table 3-4**) to identify the method to be used to establish the recommended runway length. As the critical aircraft family can be greater than 12,500 pounds but less than 60,000 pounds, the required runway length should be determined by a family grouping of large airplanes as determined by charts within this guidance.

Step 4 – Select Fleet Mix

The method for determining the proper runway length is dependent on the type of aircraft using the runway. For aircraft that have a greater MTOW than 12,500 pounds but less than 60,000 pounds and are not regional jets, the recommended runway length is determined through a critical family of aircraft with similar performance characteristics and operating weights. For this size of aircraft, the FAA groups them into the 75 percent and 100 percent fleet mix.

The vast majority of operations at AEL are conducted by aircraft within the 75 percent fleet mix. The 100 percent fleet mix is reserved for some of the largest or most demanding business aircraft that either are near the 60,000-pound limit or require significantly longer runway lengths, such as Dassault Falcon 2000 or Learjet 60. However, these larger aircraft are infrequent at AEL. As the 75 percent fleet mix represents aircraft that create the greatest demand at AEL, this is the applicable category for determining runway length.

Table 3-4: Airplane Weight Categorization for Runway Length Requirements

<table>
<tr><th>Runway Category</th><th colspan="3">Airplane Maximum Takeoff Weight</th><th>Design Approach</th></tr>
<tr><td>1</td><td rowspan="4">12,500 pounds or less</td><td colspan="2">Approach Speeds less than 30 knots</td><td>Family grouping of small airplanes</td></tr>
<tr><td>2</td><td colspan="2">Approach Speeds of at least 30 knots but less than 50 knots</td><td>Family grouping of small airplanes</td></tr>
<tr><td>3</td><td rowspan="2">Approach Speeds of 50 knots or more</td><td>With less than 10 passengers</td><td>Family grouping of small airplanes</td></tr>
<tr><td>4</td><td>With more than 10 passengers</td><td>Family grouping of small airplanes</td></tr>
<tr><td>5</td><td colspan="3">Over 12,500 pounds but less than 60,000 pounds</td><td>Family grouping of large airplanes</td></tr>
<tr><td>6</td><td colspan="3">60,000 pounds or more or Regional Jets</td><td>Individual large airplane</td></tr>
</table>

Note: Runway Categories are used purely for ease of reference in this document and are not part of FAA guidance.
Source: Table 1-1, FAA AC 150/5325-4B, Runway Length Requirements for Airport Design

Step 5 - Determine Fleet Mix and Useful Load

The 75 percent fleet mix includes aircraft such as the Cessna Citation II, Learjet 45 and other medium sized business jets and is the applicable choice for AEL. The 75 percent fleet mix is further divided by a 60 or 90 percent useful load. The FAA guidance defines the useful load of an airplane as the difference between an empty aircraft and a fully loaded aircraft. Useful load indicates the combined amount of fuel, passengers, and cargo the aircraft can carry. An aircraft operating with a lower useful load will mean that it must either operate at a lighter takeoff weight, which would limit cargo and passengers, or it must operate at shorter distances. This would inherently limit the potential markets that aircraft are able to reach before stopping to refuel.

Step 6 – Apply Necessary Adjustments

The charts in FAA guidance for runway length include temperature and airport elevation as determining variables for runway length. Both parameters influence air density. Air density directly impacts aircraft performance in two ways. First, the thrust generated by propeller or jet engines will be less effective at higher temperatures and elevations, as the thinner air will not produce as much forward momentum in the aircraft. Second, the air moving over the wing will not generate as much lift, and greater speeds are required to generate the same amount of lift as lower temperatures and elevations. These two factors combine to exponentially increase an aircraft's takeoff distance as temperature and elevation increase. Based on historical data from 2015 through 2019, the applicable temperature, which is the maximum average monthly temperature, is 81.5 °F and usually occurs in July. The Airport's elevation is 1,261 feet above mean sea level and occurs at the Runway 35 threshold.

3.4.3 Runway 17/35

The critical aircraft at AEL fall into runway category 5 in **Table 3-4**. Based on category 5 parameters for the 60 percent useful load, the recommended runway length is shown in **Figure 3-1**. The 90 percent useful load is shown in **Figure 3-2**. Based on this analysis, the recommended runway length for the 75 percent fleet mix at 60 percent useful load is 4,800 feet and at 90 percent useful load is 6,200 feet.

The 2003 Master Plan also examined runway length needs and determined very similar recommendations for the 75 percent fleet mix for these useful load categories. For the 60 percent useful load, a length of 4,840 feet was recommended and for the 90 percent useful load a length of 6,440 feet was recommended. As stated in that master plan, the 60 percent useful load would have the impact of limiting trip length of some jets to 400 to 500 nautical miles, which would make them less cost efficient than turboprops for the same trip length.

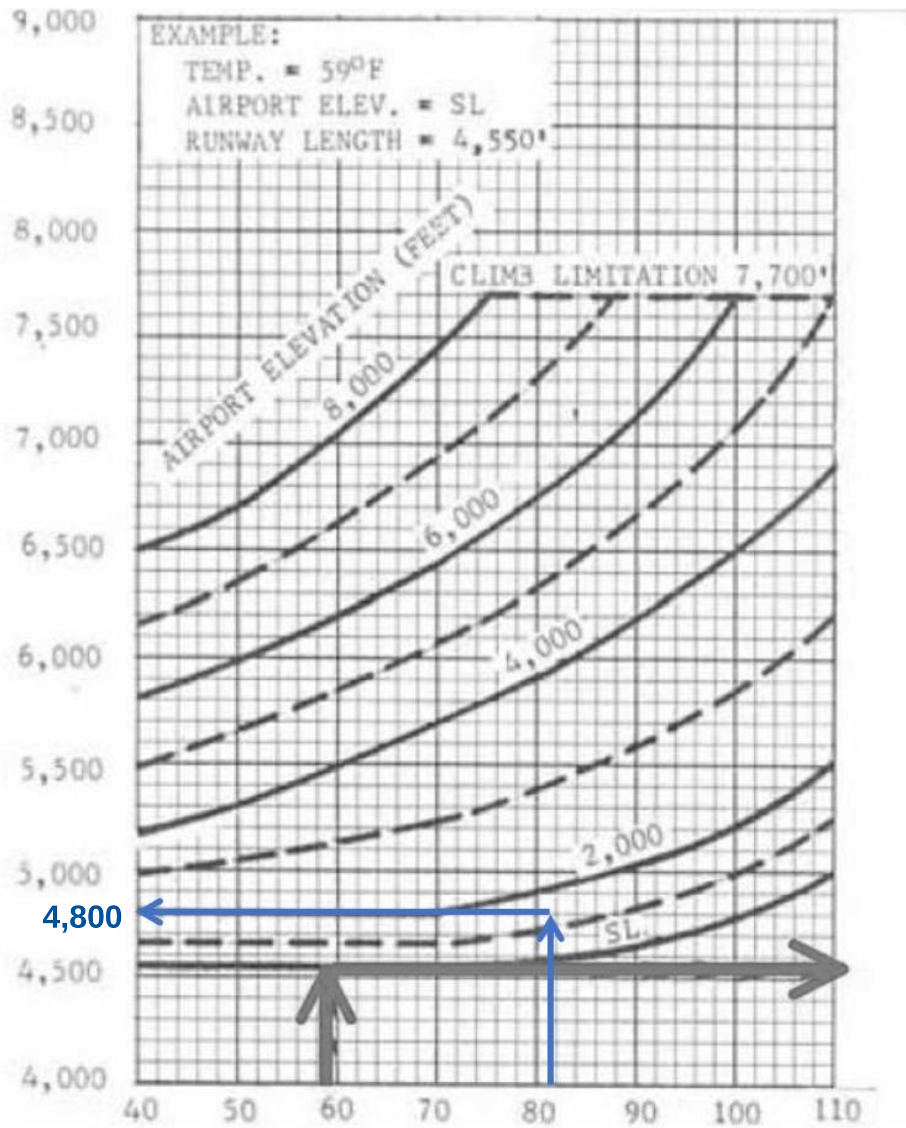
To determine effective use of AEL by local businesses, outreach was performed as part of the prior master planning effort to determine active jet aircraft. As a result, it was determined that a runway length of at least 5,000 feet would benefit AEL and provide the minimum runway length needed for corporate flight departments and aircraft insurance companies. Since that time, Runway 17/35 has been relocated and extended from 4,000 feet to 5,000 feet, and the repositioned runway allows for a parallel taxiway and additional room for development in the terminal area.

The primary runway at AEL, Runway 17/35 is 5,000 feet long based on the previous master planning effort determination and site constraints. While this length meets AEL's existing and forecasted needs based on the critical aircraft family and anticipated fleet mix, any extension to the runway's usable length would allow for greater useful loads and operating distances. However, surrounding constraints present considerable challenges to any extension of Runway 17/35.

Runways are often constrained by surrounding infrastructure, and expansion opportunities, even when justified, may be limited or infeasible. However, even when additional pavement cannot be added to a runway, dedicating a clearway or stopway for a runway can still provide greater usable length. A clearway is an area off the departure end of the runway that is 500 feet wide and free from obstacle penetrations. As the area to the north of AEL is predominantly agriculture fields, and the roads near the threshold of Runway 17 are at a lower elevation, the establishment of a clearway may be feasible and the following chapter will consider its implementation. A clearway will add to the usable length for larger jets when determining the field length they require. Part 135, or other jet operators, require additional runway length in addition to what is strictly required for the aircraft to get off the ground. A balanced field length provides enough space for an aircraft to either get to its rotation speed, experience a single engine failure and either come to a full stop or continue its takeoff with only the remaining engine. During this single engine climb out a clearway can provide adequate clearance from obstacles. There are many large aircraft that use Runway 35 for departure at AEL and the TFMSC database records consistent operations by the Beech 200 King Air and Beech 350 Super King Air, Cessna Citation Mustang, CJ2, CJ3 and other variants. The following chapter will consider the specific needs and operations of these aircraft as they pertain to the clearway length.

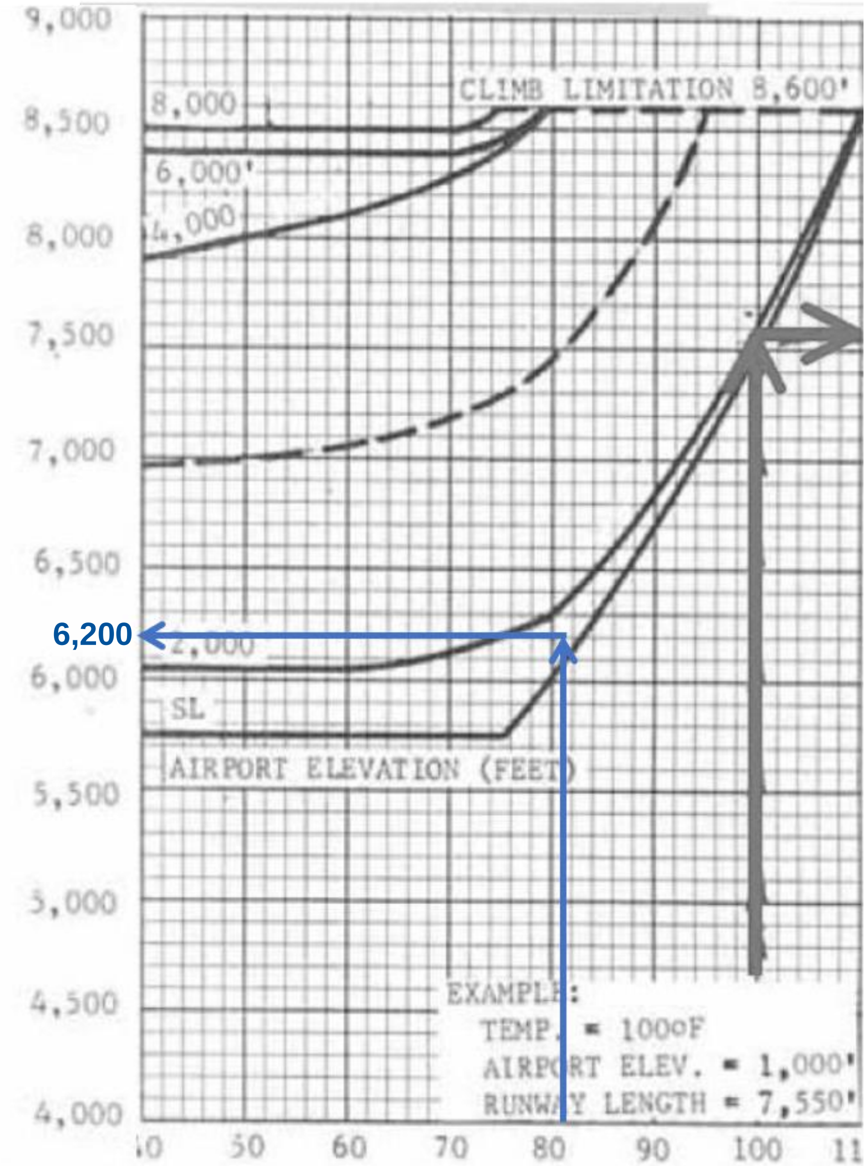
A stopway is an area attached to a runway that must be capable of supporting an aircraft during an aborted takeoff without inflicting structural damage. The roadways on both the north and south sides of the runway make it unlikely that a stopway could be incorporated into use for Runway 17/35, but the following chapter will consider alternatives to this end.

Figure 3-1: 75 Percent fleet Mix at 60 Percent Useful Load



Source: FAA Advisory Circular (AC) 150/5325-4B, Runway Length Requirements for Airport Design, Figure 3-1

Figure 3-2: 75 Percent fleet Mix at 90 Percent Useful Load



Source: FAA Advisory Circular (AC) 150/5325-4B, Runway Length Requirements for Airport Design, Figure 3-1

Another consideration for this runway is the width of the pavement. While the standard width for a B-II runway is 75 feet, Runway 17/35 is 100 feet wide. This aligns with MnDOT standards for a Key GA Airport and federal standards for an improved instrument approach to this runway with visibility minimums of lower than 3/4 of a mile. Maintaining this width may not be justifiable if an improved instrument approach is not deemed viable. However, the pavement for Runway 17/35 is in very good shape and a full reconstruction is not anticipated in the next ten-years. The following chapter will consider instrument approaches to this runway which will influence pavement width.

3.4.4 Runway 5/23

A crosswind runway serves an important role at an airport as it allows aircraft to still use an airport when the primary runway does not offer adequate wind coverage. The wind coverage provided by Runway 17/35, discussed in detail in Chapter 1, is less than 95 percent for aircraft with a 10.5 knot crosswind threshold when considered in isolation. It must be paired with Runway 5/23 to meet the 95 percent threshold, as shown in **Table 3-5**. As this crosswind threshold applies to aircraft in the A/B-I category, Runway 5/23 length is largely determined by the needs of aircraft in this category.

Table 3-5: Runway Crosswind Coverages during All Weather Conditions

Crosswind Component	Runway 17/35	Runway 5/23	All Runways
10.5 knots	94.83%	87.59%	97.40%
13 knots	97.56%	92.94%	99.22%
16 knots	99.40%	98.13%	99.84%
20 knots	99.89%	99.66%	99.99%

Station: Albert Lea AWOS, Period of Record: 2009 – 2018
Source: National Climatic Data Center, FAA Standard Wind Analysis Tool

While A-I aircraft are usually small piston aircraft, the B-I aircraft family does include some turbine aircraft that require a longer runway length. **Table 3-6** shows several aircraft in the B-I category that operate at AEL based on a survey of the TFMSC database. While these aircraft are a mix of engine types, they are all considered “small” as they have a MTOW of less than 12,500 pounds. These aircraft also have less than 10 passenger seats and fall in runway category 3 in Table 3-4. As the crosswind coverage for Runway 17/35 is less than 95 percent, this means that the Airport is eligible for a crosswind runway but not automatically justified. For planning purposes, the runway length for Runway 5/23 should then be determined based on the B-I family of aircraft.

Table 3-6: B-I Aircraft at AEL

Aircraft	Engine Type	MTOW
Cessna Citation CJ2/M2	Jet	10,700
King Air 90	Turboprop	9,300
Cessna Citation Mustang	Jet	8,645
Cessna Golden Eagle 421	Piston	7,450
Cessna Chancellor 414	Piston	6,750
Beech 58	Piston	5,500

Source: FAA Aircraft Characteristics Database, (Appendix 1 of AC 150/5300-13A, Airport Design). Page last modified: October 05, 2018 9:07:23 AM EDT. Accessed May 2020.

The B-I fleet mix can also be divided based on the aircraft that typically operate at AEL. These aircraft often have an approach speed of more than 50 knots but do not approach the 12,500-pound benchmark that defines large aircraft. The AC 150/5325-4B has a chart developed for this aircraft family divided into the 95 percent fleet mix and 100 percent fleet mix. The runway curves that are designed for 95 percent of this fleet:

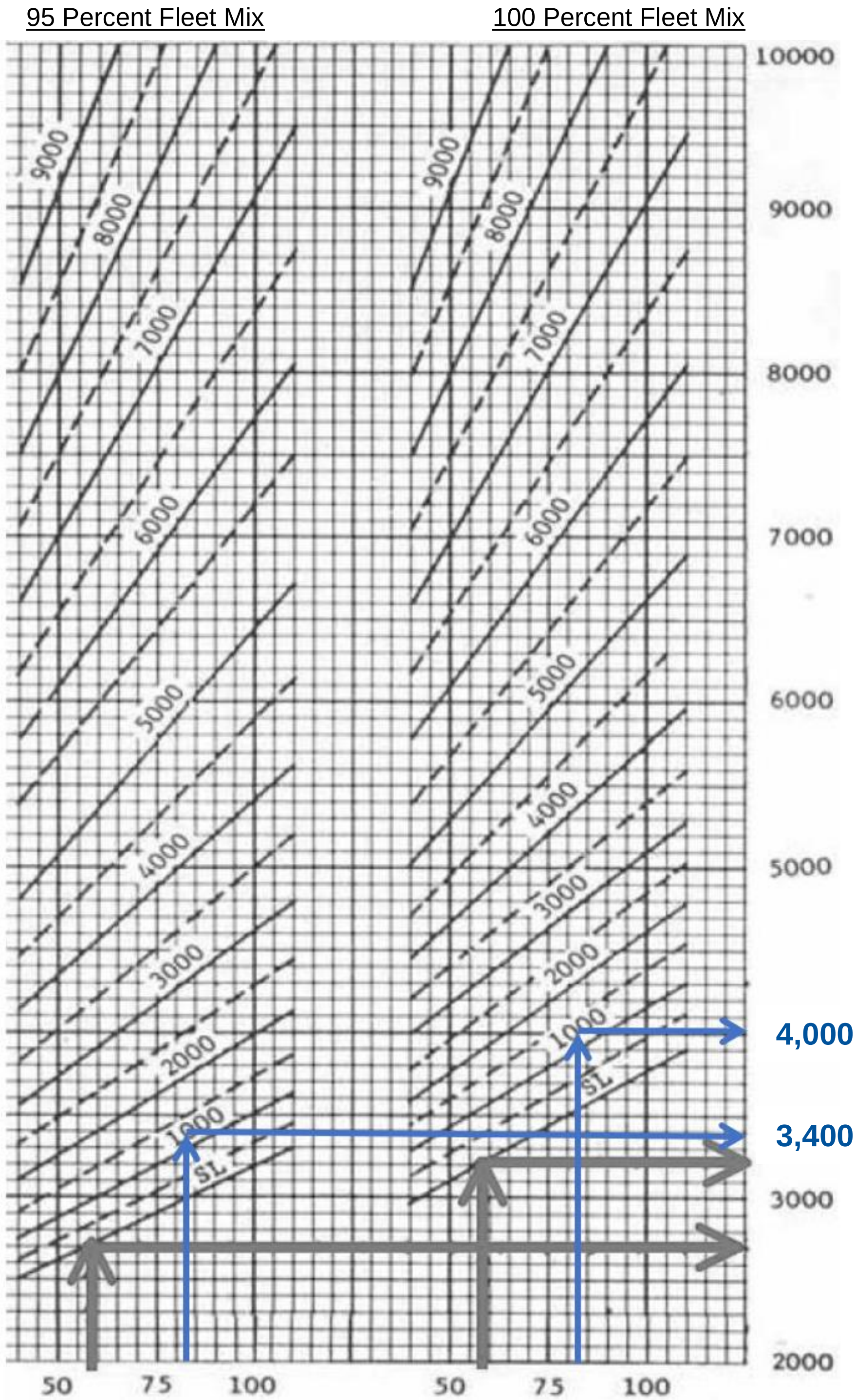
> *applies to airports that are primarily intended to serve medium size population communities with a diversity of usage and a greater potential for increased aviation activities. Also included in this category are those airports that are primarily intended to serve low-activity locations, small population communities, and remote recreational areas. Their inclusion recognizes that these airports in many cases develop into airports with higher levels of aviation activities.*

The 100 percent of fleet is intended to serve communities located on the fringe of a metropolitan area. As AEL is not on the edge of a major metropolitan area and fits the description for the 95 percent fleet mix, this is the applicable fleet mix for AEL. As shown in **Figure 3-3**, the recommended runway length for 95 percent of the fleet on Runway 5/23 is 3,400 feet.

This runway, while contributing to the crosswind coverage for smaller aircraft, is also partially hidden from Runway 17/35 due to surrounding infrastructure and places safety areas over Interstate 90 and potentially developable land off of Airport property. To this end, there has been discussion of converting the runway to turf to mitigate local maintenance costs and off Airport impacts. The following chapter will consider future changes to this runway.

Like Runway 17/35, Runway 5/23 has a pavement width that aligns with the requirements for an instrument approach of less than 3/4 of a mile. However, the runway is currently a visual only runway and the location of surrounding facilities, such as hangars and the fence, would make it very difficult to establish an instrument approach with these minimums to this runway. The following chapter will consider instrument approaches to this runway, which will influence the pavement width.

Figure 3-3: 75 Percent fleet Mix at 60 Percent Useful Load for Runway 5/23



Source: FAA Advisory Circular (AC) 150/5325-4B, Runway Length Requirements for Airport Design, Figure 3-1

3.4.5 Alternate Operations Area

Prepared turf near the runway can also be a preferential landing area for some aircraft, such as tailwheel aircraft and gliders. There is a strong glider presence at the Airport. As discussed in Chapter 2, the Airport hosts an annual soaring competition and regional events may include up to 20 competitors while previous national competitions have had over 50 competitors. These aircraft will utilize the turf surfaces east of Runway 17/35 to land at the Airport. The Draft Advisory Circular 150/5300-13B, *Airport Design*, provides guidance on landing in the turf area of the RSA near the runway. The RSA for Runway 17/35 is 150 feet wide and only exceeds the pavement width by 25 feet on each side. This is not enough space for aircraft to land solely in the RSA due to the presence of runway lights and signage. In addition, the ROFA, as previously mentioned, is not subject to the same grading requirements as the RSA. Therefore, the grading and maintenance of the turf operations area is not likely to be eligible for federal funding and would instead be locally or state funded.

3.5 Instrument Approaches

The instrument approaches at AEL appear to be serving Airport needs. Currently, there is not a need to improve the instrument approaches although previous planning efforts have considered providing lower minimums for Runway 17. However, the current 3/4 mile approaches and resulting primary and approach surface obstructions mean that some changes to the approaches should be considered. Therefore, this section assesses the feasibility of improved approaches, summarizing the main challenges to this effort and highlighting existing obstacles. Instrument approaches allow aircraft to continue to utilize an airport during inclement weather. There are three types of GPS Area Navigation (RNAV) approaches at AEL with visibility minimums as low of 3/4 of a mile. Approaches with minimums lower than this usually employ an Instrument Landing System (ILS) and/or an intermediate approach lighting system. ILS approaches require considerable on-site equipment, including localizer and glideslope antenna systems. Although still used regularly at airports nationwide, very few ILS systems are being installed due to the advent of GPS systems with comparable performance and lower establishment and maintenance costs. There are also Very High Frequency (VHF) Omni-directional Range (VOR) approaches at AEL. These stations also use radio beacons strategically located nationwide to provide approach navigation. While RNAV (GPS) refers to the type of approach, there are several methods of establishing minimums for these approaches. Relevant RNAV approach minimum types with required equipment and available guidance are shown in **Table 3-7**.

Table 3-7: RNAV Instrument Approach Minimum Types

Short Name	Full Name	Vertically Guided	Additional Aircraft Equipment
LPV	Localizer Performance with Vertical Guidance	Yes	WAAS*
LNAV/VNAV	Lateral Navigation / Vertical Navigation	Yes	WAAS*
LNAV	Lateral Navigation	No	None

*Note: *WAAS = Wide Area Augmentation System*

For these reasons, any changes to AEL approaches in the near term would likely be through modifying the RNAV (GPS) approaches. Improving approaches to the end of either of these runways would require changes to meet the criteria shown in **Table 3-8** as well as expanded RPZs. While the majority of these criteria are met, the approach lighting system (ALS) and expanded RPZ would provide some challenges. The current omni-directional approach lighting system (ODALS) on the Runway 17 end does not meet the required ALS for an approach of less than 3/4 of a mile. Therefore, any significant improvement to the visibility minimums for Runway 17 would require the installation of a new ALS, as seen in note one of **Table 3-8**. This new system would replace the ODALS installed less than a decade ago, and would require considerable expense, since all of the full ALSs listed in the table extend 2,400 feet.

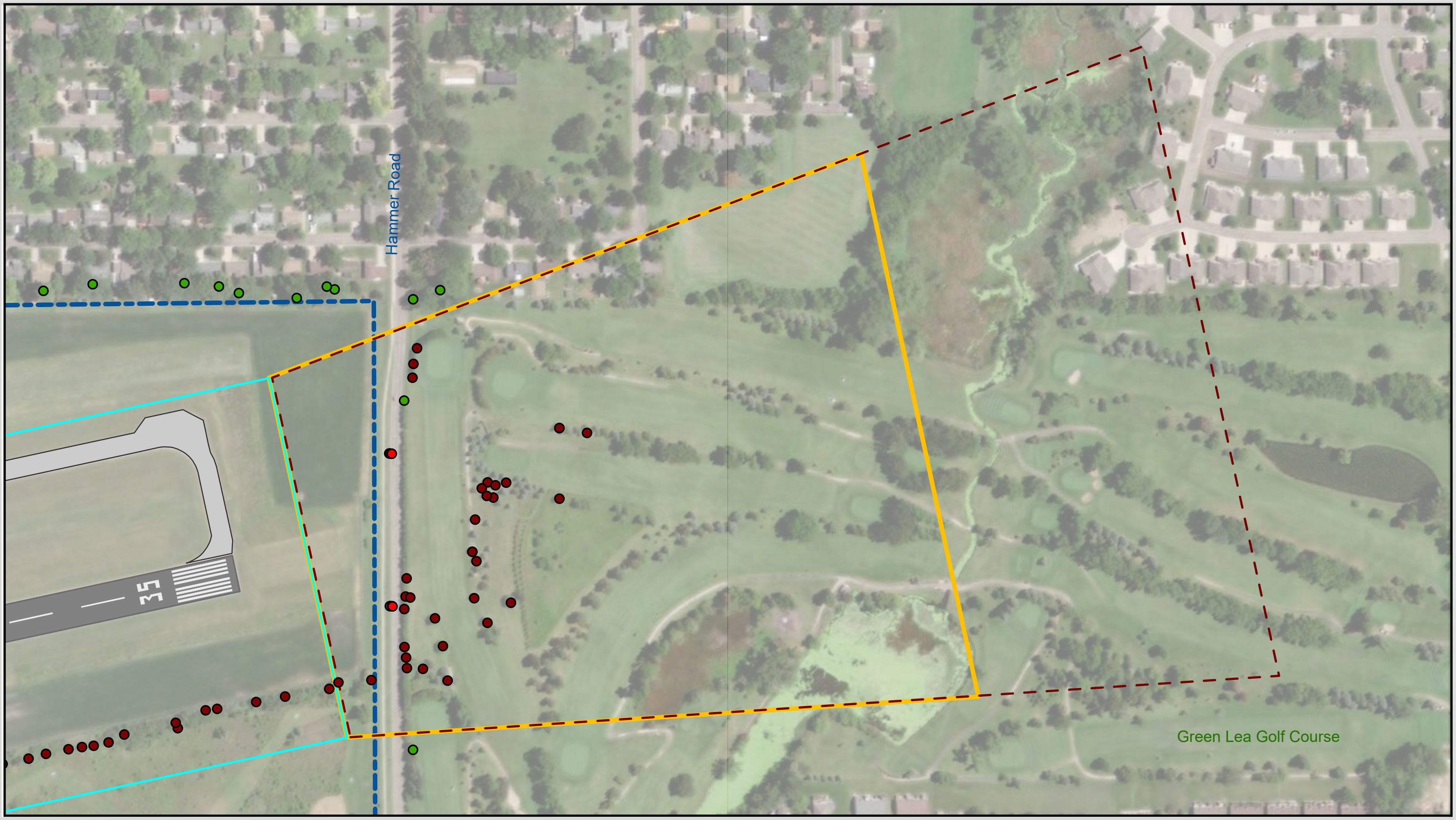
As stated, any improvement to the visibility minimums would also require a larger RPZ, with the affected RPZs increasing in length by 800 feet. To the north, the extension of the existing Runway 17 RPZ (shown in **Figure 3-4**) would only extend further into the underdeveloped agricultural fields in the area, and East Plaza Street and Interstate 90 would remain in the RPZ. To the south, the extension of the existing Runway 35 RPZ (shown in **Figure 3-5**) would cause a minor overlap with the residential area southeast of the Green Lea Golf Course, an undesirable condition. In addition, multiple obstructions already exist in this approach surface.

Table 3-8: Standards for Instrument Approach Procedures

Criteria	< 3/4 Statute Miles	3/4 to < 1 Statute Mile (Runway 17/35)	≥ 1 Statute Mile (Runway 5/23)
Obstacle Clearance Surface	34:1	20:1	20:1
Minimum Runway Length	4,200 feet	3,200 feet	3,200 feet
Runway Edge Lights	HIRL or MIRL	HIRL or MIRL	MIRL or LIRL
Parallel Taxiway	Required	Required	Recommended
Approach Lighting System (ALS)	Required[1]	Recommended[2]	Recommended

Notes: [1]Acceptable ALSs for < ¾-mile visibility include an ALSF-1, ALSF-2, SSALR, or a MALSR
[2]Acceptable ALSs for ¾ to <1-mile visibility include an ODALS, MALS, SSALS, or a SALS
HIRL: High Intensity Runway Lights. MIRL: Medium Intensity Runway Lights
Source: Engineering Brief 99A

Mead & Hunt



N

0 300 600

Graphic Scale in Feet

Existing RPZ

Airport Property

Primary Surface

Obstruction: Light Pole

Obstruction: Tree Top

Future RPZ

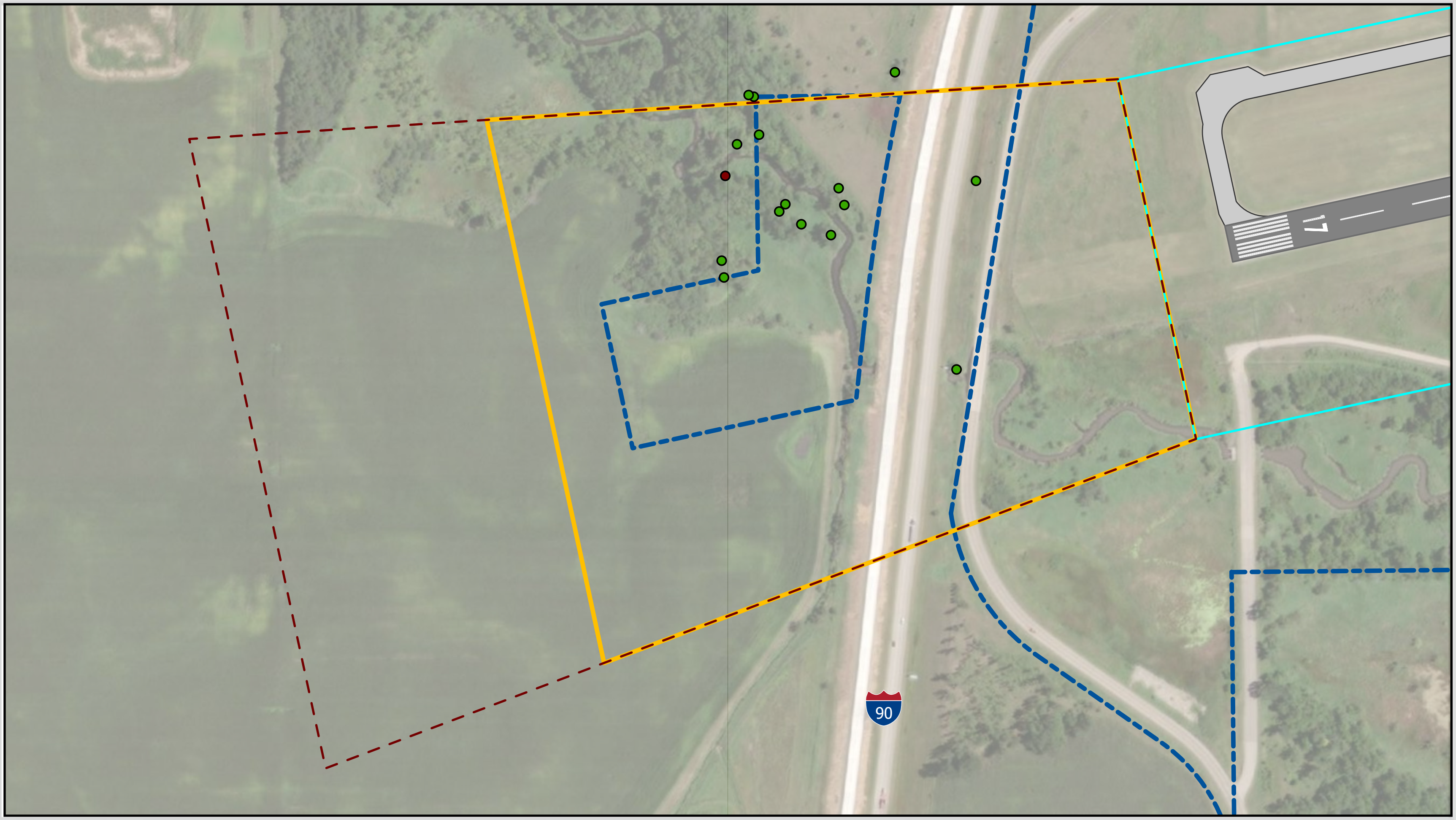
Tree Top

Light Pole

Figure 3-4: **Runway 35 Future and Existing Runway Protection Zones**

The City of Albert Lea

Source: *Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN*



0 300 600

Graphic Scale in Feet

Future RPZ

Existing RPZ

Airport Property

Primary Surface

Obstruction: Tree Top

Tree Top

Figure 3-5: **Runway 17 Future and Existing Runway Protection Zones**

Source: *Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN*

While the crosswind coverage provided by Runway 35 is superior to Runway 17, as shown in **Table 3-9**, there are a greater number of obstacles are to the south of AEL. The obstacles to the south of AEL make it unlikely that any significant instrument approach improvements would occur there and instead mitigation of these obstacles will be further explored in Chapter 4, *Alternatives*. Due to these obstacles, the need to upgrade to a full ALS and the extended RPZs it would be a considerable effort to improve the instrument approaches to Runway 17 while the existing approaches appear to be serving the Airport well. For these reasons, the following chapter will not consider changes to the instrument approaches for Runway 17 while offering mitigation strategies for the Runway 35 approach.

Table 3-9: IFR Crosswind Coverage

Criteria	Runway 17	Runway 35	Runway 5	Runway 23
10.5 knots	50.67%	54.32%	52.04%	45.67%
13 knots	52.20%	56.80%	55.20%	48.84%
16 knots	53.32%	58.60%	58.10%	52.32%
20 knots	53.67%	59.12%	58.94%	53.51%

Runway 5/23 currently does not have any straight in instrument approaches available, but, has a circling approach available as well as instrument departures. This means that the instrument departure surface is also attached to this runway. As shown in **Table 3-9**, Runway 5 has the second best crosswind coverage during IFR conditions for most aircraft categories. The only way to currently utilize this runway during Instrument Flight Rules (IFR) conditions is to conduct a VOR approach to Runway 17/35, and then a circling approach to Runway 5/23. Circling approaches allow aircraft to conduct an approach to one runway, and then enter a visual traffic pattern to land at another runway. As these circling approaches do not consist of a predetermined path for aircraft to follow to a runway end, a given area around the runway ends must be protected from obstacles. Beginning November 15, 2012, the FAA expanded circling approach area dimensions to provide better obstacle protection. These areas, as well as their dimensions, are shown in **Figure 3-6**. However, due to the wind coverage provided and lack of local development near the Runway 5 threshold, it would be beneficial to consider adding a straight-in approach for this runway end. The following chapter will consider alternatives to implement an instrument approach to this runway.

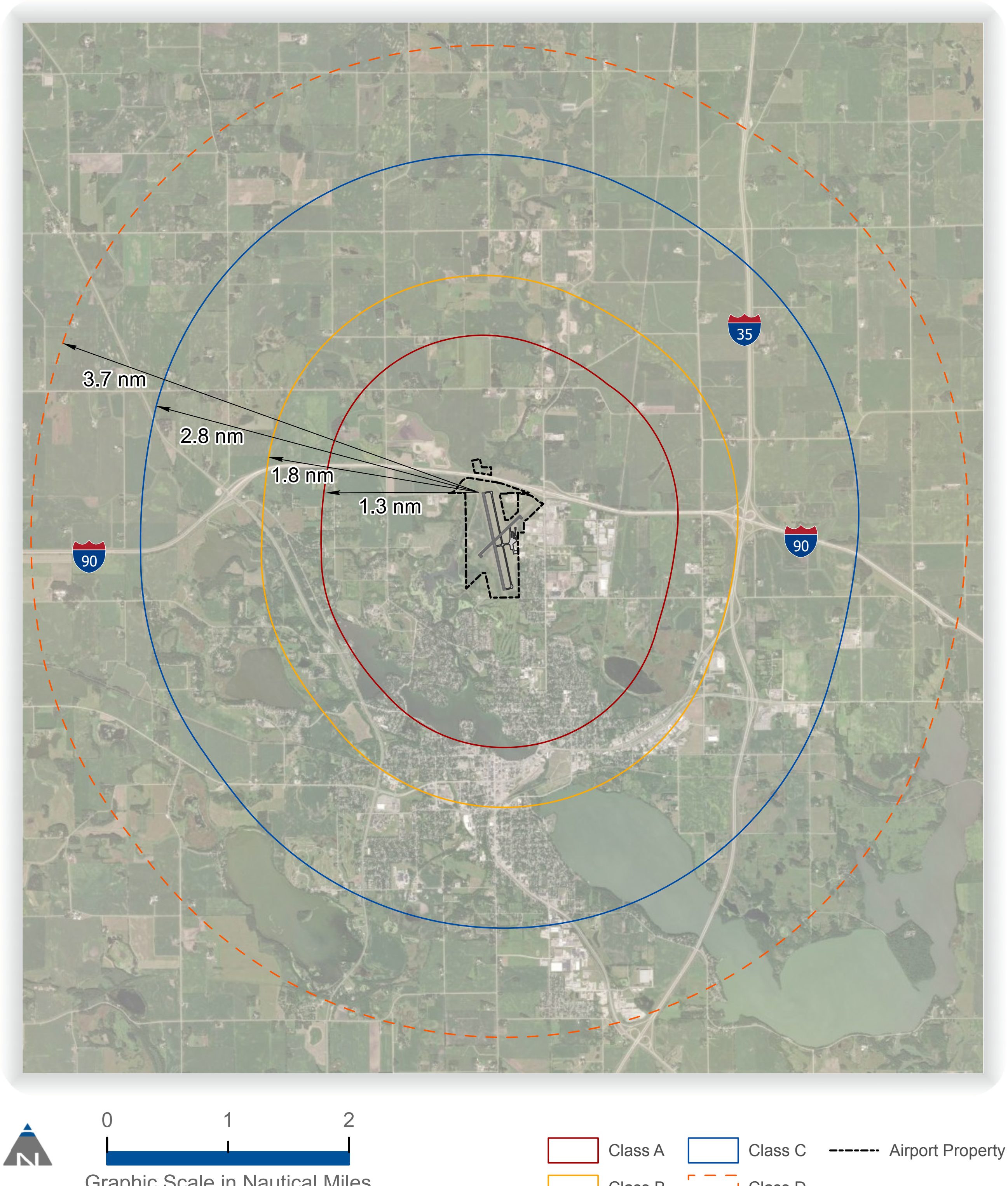


Figure 3-6: **Circling Radii**

Source: *Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN*

3.6 Taxiways and Taxilanes

Taxiways and taxilanes provide access between runways and aircraft parking or storage areas. In general, taxiways support runways, whereas taxilanes provide access from taxiways to hangars, aircraft parking, and other terminal areas. At AEL, the taxiway system consists of a single 35-foot-wide, full-length parallel taxiway with paved shoulders that supports Runway 17/35, with three taxiway connectors to Runway 17/35, and additional taxilanes that provide access to the hangars, aircraft parking areas, and Runway 5/23. FAA AC 150/5300-13A, *Airport Design*, provides parallel taxiway guidance for runways based on their instrument approach procedures. A runway with a non-precision instrument approach and visibility minimums less than 1 mile, such as AEL's Runway 17/35, requires a full-length parallel taxiway. Therefore, the parallel taxiway conforms to this FAA standard.

The crosswind runway, Runway 5/23, does not have a parallel taxiway. While FAA guidance recommends a parallel taxiway, one is not required because there is not an instrument approach to this runway. However, a parallel taxiway is recommended for circling approaches, as available on Runway 5/23, and for instrument approach with visibility minimums equal to 1 mile. In addition, the absence of a parallel taxiway requires aircraft to back-taxi on the runway. This reduces Airport utility and poses some risk as aircraft must be on the runway for a prolonged period as they taxi.

Taxiway design is based on the combination of the Taxiway Design Group (TDG), determined by landing gear configuration, and Airplane Design Group (ADG) classification of the critical design aircraft intended to operate on the surface. The TDG classification determines the physical pavement dimensions of a taxiway, while the ADG classification determines required taxiway separations and the width of the taxiway safety area (TSA) and taxiway object free area (TOFA). As stated in Chapter 2, B-II is the existing and future critical aircraft category for Runway 17/35. Common aircraft in the B-II family, such as the King Air 200 and several of the Cessna Citation variants, are categorized as TDG 2. As the based King Air 200 conducted 392 operations in 2019, the additional itinerant aircraft in the B-II family provide the additional operations to meet the TDG 2 500 operations threshold. A/B-I (small) is the critical aircraft category for crosswind Runway 5/23. If a future parallel taxiway were to be built for the crosswind runway, it should be designed to TDG 1B standards. Examples of aircraft in this category include many of the Learjet models, the Air Tractor series often used in agricultural aerial application, and the Cessna Citation XLS. Taxiway and taxilane design standards are shown in **Table 3-10**.

Table 3-10: Taxiway Design Dimensions

Taxiway Design Group Criteria	TDG 1B	TDG 2
Taxiway Width	25 feet	35 feet
Taxiway Edge Safety Margin	5 feet	7.5 feet
Taxiway Shoulder Width	10 feet	15 feet
Airplane Design Group Criteria	**ADG-I**	**ADG-II**
Taxiway Safety Area Width	49 feet	79 feet
Taxiway Object Free Area Width	89 feet	131 feet
Taxilane Object Free Area Width	79 feet	115 feet

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

The parallel taxiway's 15-foot shoulders are partially paved. Paved shoulders are only required for taxiways serving ADG-IV aircraft and recommended for ADG-III aircraft but a portion of the pavement width was retained during the conversion from the previous runway to the existing taxiway. This preserved width provides pavement up to the taxiway lights and allows for ease of snow removal operations.

FAA AC 150/5300-13A states that direct access from an apron to a runway is discouraged, as pilots may inadvertently taxi onto the runway expecting that it is a taxiway. This is particularly a concern for pilots not familiar with the airport or during poor visibility conditions. AEL has two such direct connections. The first connects from the western edge of the apron to Runway 17/5. The second is a direct connection from the north portion of the apron to Runway 5/23.

3.7 Aprons

Aircraft aprons provide an area for aircraft to maneuver, park and have limited service such as fueling. The total size of the apron at AEL is approximately 169,000 square feet, with the northern portion totaling approximately 131,000 square feet, and the southern portion, 38,000 square feet. Seven itinerant aircraft tie-down spaces are located along the southwestern edge of the northern portion of the apron, which is south of the primary taxiway connector. FAA AC 150/5300-13A states that the total amount of GA apron area required is based on local conditions and will vary from airport to airport. Apron size should not be examined in isolation but in conjunction with the facilities it supports. The size and tie-down configuration of AEL's apron poses some constraints when larger aircraft are present, especially when they traverse to and from the 100-foot-by-100-foot hangar, which is accessed via the southern portion of the apron, while another aircraft is parked at the southernmost tie-down position. These larger, parked aircraft can block the flow of traffic, and it can be difficult for them to turn around. Therefore, an apron expansion and possible reconfiguration of the tie-down positions are recommended. Apron alternatives will be vetted in the next chapter along with specific taxilane and tie-down layouts.

3.7.1 Aircraft Parking

As locally based aircraft will often be hangared, itinerant aircraft primarily drive tie-down demand. Itinerant aircraft may originate from anywhere, which makes it difficult to predict the type of aircraft that will use an airport, but historical information can provide some insight. AEL has a total of seven tie downs sized for ADG-I aircraft. Due to their location on the edge of the apron, they are away from existing buildings and meet parking standards. As stated in Chapter 2, while single-engine piston aircraft are the most common aircraft at AEL, a survey of the 2018 TFMSC reveals turbine aircraft activity. This includes aircraft such as the Beech 200 Super King and the Pilatus PC-12 as well as jet aircraft like the Cessna Citation CJ2 and Bombardier Learjet 45.

Parking demand at AEL is determined by dividing the projected peak hourly itinerant operations in **Table 3-11** into ADG categories. While military aircraft are omitted, these operations included commercial and other GA operations. Peak monthly operations were determined to be 10.9 percent of annual operations, as stated in Chapter 2; therefore, it is assumed peak monthly itinerant operations would be 10.9 percent of annual itinerant GA and commuter/air taxi operations. This number is then divided by 30, for the number of days in the peak month of June. The average daily operations are then multiplied by 25 percent to determine peak hour operations.

Finally, of the 26,175 operations projected in the base year, 2,000 of them are in the commuter/air taxi category. This is 7.6 percent of all operations and are assumed to be larger, ADG II aircraft. However, general aviation operations, which comprise 91.2 percent of all operations at AEL, also include some larger aircraft operations. As smaller aircraft can use larger aircraft parking spaces but the reverse is not true, it is sensible to slightly overestimate the number of large aircraft parking at AEL at any given time. Therefore, 20% of the peak hour itinerant operations are considered to be ADG II aircraft. This separation can also be seen in Table 3-11.

Table 3-11: Itinerant Aircraft Parking Demand

Criteria	2018	2023	2028	2033	2038
Operations					
Annual Itinerant Operations	8,781	8,986	9,186	9,399	9,625
Peak Month Itinerant Operations	957	979	1,001	1,024	1,049
Peak Month Average Day Itinerant Operations	32	33	33	34	35
Peak Hour Itinerant Operations	8	8	8	9	9
Parking Demand					
ADG I Aircraft	6	6	6	7	7
ADG II Aircraft	2	2	2	2	2

Source: Mead & Hunt
Note: Any minor discrepancies in calculations are due to rounding.

3.8 Pavement Conditions

Grant assurances require airports using federal funds for construction, reconstruction, or repair of airfield pavement to create a pavement maintenance management program. This approach at AEL will aid in providing a safe and operable pavement system. MnDOT assists Minnesota airports in this effort by contracting with a specialist to provide pavement evaluation and management inspections for airports every three years. In June of 2019, Applied Research Associates (ARA) conducted a pavement condition evaluation using the Pavement Condition Index (PCI) methodology in accordance with AC 150/5380-6C, *Guidelines and Procedures for Maintenance of Airport Pavements*, and ASTM D5340, *Standard Test Method for Airport Pavement Condition Index Surveys*.

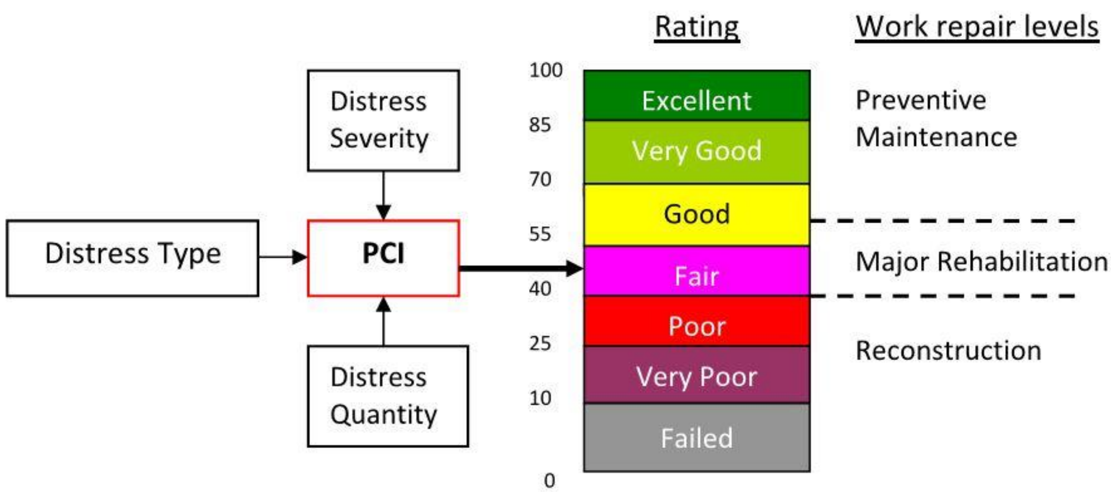
To assess the pavement at AEL, pavement was divided into three management units: branches, sections, and sampling units. Branches were determined by the distinct function they support, such as runways, taxiways, or aprons. Branches were further divided into sections, or portions of pavement that have uniform construction history, pavement structure, traffic patterns, and conditions throughout its entire length or area. Sections represent segments of a branch pavement that were constructed or rehabilitated at different times or deteriorated at different rates. Sections of a branch are further divided into several sampling units that span throughout a section and are used to determine the overall PCI of a section. PCI is a value ranging from 0 to 100 that represents the pavement condition. **Table 3-12** shows how PCI values correspond to qualitative conditions. **Figure 3-6** illustrates how PCI values and ratings correlate to repair levels needed. Each segment is described in **Table 3-13** and shown in **Figure 3-7**.

Table 3-12: Pavement Condition Index

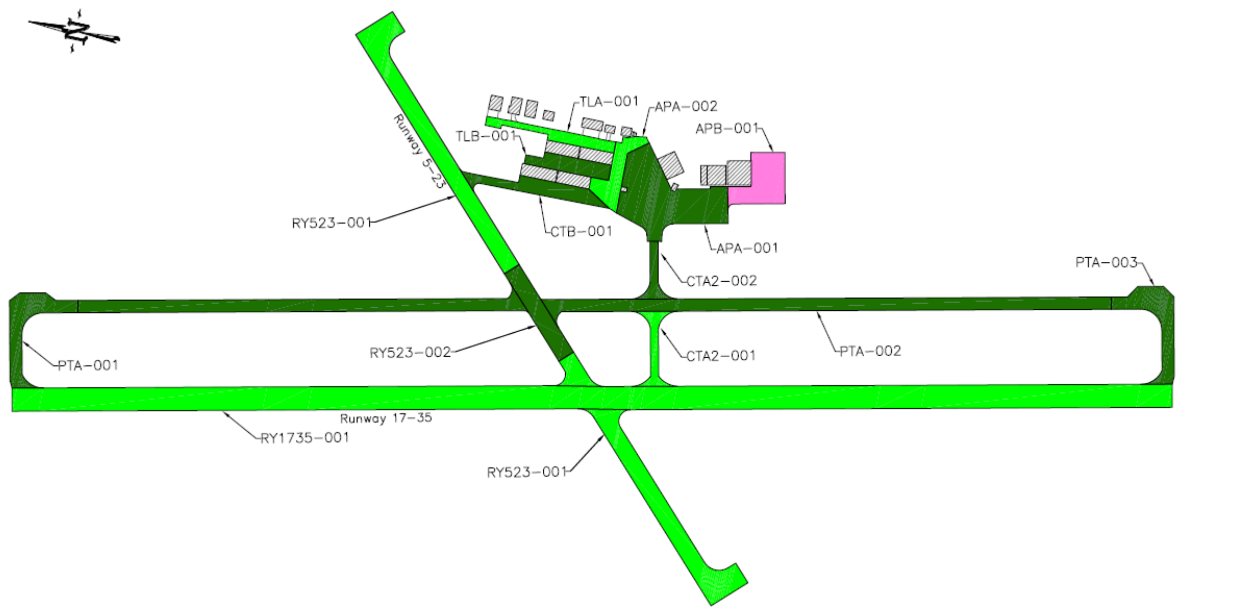
PCI Value	PCI Rating
86-100	Excellent
71-85	Very Good
56-70	Good
41-55	Fair
26-40	Poor
11-25	Very Poor
0-10	Failed

Source: 2019 AEL Pavement Condition Report, Applied Research Associates, Inc.

Figure 3-6: PCI Rating Scale and Repair Levels



Source: 2019 AEL Pavement Condition Report, Applied Research Associates, Inc.



	FAILED	VERY POOR	POOR	FAIR	GOOD	VERY GOOD	EXCELLENT	PCI INDEX
NS	0-10	11-25	26-40	41-55	56-70	71-85	86-100	

Figure 3-7: **Airfield Pavement Condition**

Source: *2019 AEL Pavement Condition Report, Applied Research Associates, Inc.*

Table 3-13: PCI Section Summary Table

Name	Branch ID	Section ID	Surface Type	2016 PCI	2019 PCI	Drop in PCI/Year	2020 PCI (Projected)	2020 Rating (Projected)
Apron A	APA	001	PCC	98	97	0.5	97	Excellent
	APA	002	AC	91	81	3.2	78	Very Good
Apron B	APB	001	AAC	68	52	1.8	50	Fair
Connecting Taxiway A2	CTA2	001	AC	91	84	1.8	82	Very Good
	CTA2	002	AC	100	93	0.9	92	Excellent
Connecting Taxiway B	CTB	001	AC	99	95	0.6	94	Excellent
Parallel Taxiway A	PTA	001	AC	94	92	0.9	91	Excellent
	PTA	002	AC	100	99	0.1	99	Excellent
	PTA	003	AC	100	98	0.2	98	Excellent
Runway 17/35	RY1735	001	AC	90	82	2.0	80	Very Good
Runway 5/23	RY523	001	AC	83	81	1.9	81	Very Good
	RY523	002	AC	100	94	0.8	93	Excellent
Taxilane A	TLA	001	AAC	95	85	2.5	83	Very Good
Taxilane B	TLB	001	AC	97	86	2.3	84	Very Good

Sources: 2019 AEL Pavement Condition Report, Applied Research Associates, Inc.; Mead & Hunt
Notes: Any minor discrepancies in calculations are due to rounding.

AEL's pavements are generally in great shape, ranging from "Excellent" to "Fair" condition. However, it is to be expected that a pavement's PCI value will decline over time from normal use. With preventive pavement maintenance, such as crack sealing and patching, throughout the planning period, AEL can extend the useful life of its pavements. As the pavement continues to deteriorate, though, more complex and expensive repair levels will be needed. Once a pavement section has a PCI of 40 to 60, equating to "Fair" or the lower end of "Good" condition, major rehabilitation is typically required. As pavement deterioration can be exponential or vary with use, and alternatively can be slowed with preventive maintenance, it is difficult to project the PCI values throughout the 20-year planning period. However, with MnDOT conducting the state's PCI inspections every three years, AEL has access to timely PCI data. It is recommended AEL continually monitor pavement conditions and perform preventive maintenance, as necessary. An overview of AEL's current runway, taxiway, taxilane, and apron pavement conditions is provided below. Specific recommendations and alternatives will be explored in Chapter 4.

3.8.1 Runways

Runway 17/35 was in "Very Good" condition with a PCI of 82 at the time of the 2019 PCI Study, showing common distresses such as weathering and longitudinal and transverse (L&T) cracking. Its 2020 PCI value is projected to be 80, remaining in "Very Good" condition. The majority of Runway 5/23 was also in "Very Good" condition with a PCI of 83 at the time of the 2019 PCI Study, showing some L&T cracking. It remains in "Very Good" condition when the PCI values are extrapolated for current 2020 conditions, with a PCI value of 81. The Runway 5/23 pavement section that intersects with Runway 17/35's parallel taxiway had a PCI of 94 in 2019. With a 0.8 drop in PCI per year in the 2019 PCI report, it remains in “Excellent” condition in 2020 with a projected PCI of 93.

3.8.2 Taxiways and Taxilanes

The pavement of all segments of the taxiway, connector taxiways, and taxilanes was in either “Excellent” or “Very Good” condition at the time of the 2019 PCI Study with PCIs ranging from 84 to 99. The report indicated last construction dates of 2010 to 2011 for the taxiway pavements and 2013 for the taxilanes. With only minor drops in PCI per year projected, conditions are similar when the PCI values are extrapolated for current 2020 conditions. The connector taxiway between the primary runway and its parallel taxiway and the two taxilanes are expected to remain in “Very Good” condition, and all other taxiway and connector taxiway pavements, in “Excellent” condition.

3.8.3 Apron

The pavement evaluation divides the northern portion of the apron into two sections: a 103,000-square-foot section adjacent to the arrival/departure (A/D) building with a PCI value of 97. The northernmost 28,000-square-foot asphalt cement section adjacent to the hangar area has a PCI of 81 in 2019, equating to “Excellent” and “Very Good” pavement condition, respectively. Together these two sections total approximately 131,000 square feet of pavement and were last reconstructed in 2013. With time and normal wear and tear, the AC section is anticipated to deteriorate quickly with a drop in PCI per year of 3.2, equating to a 2020 anticipated PCI of 78 and remaining in “Very Good” condition. The PCC portion, with an anticipated drop in PCI per year of 0.5, remains in “Excellent” condition.

The 2019 PCI study listed the southern portion of the apron as having a last construction date of 1993 and a PCI rating of 52, indicating the pavement was in “Fair” condition. With the anticipated drop in PCI per year of 1.8, this portion remains in “Fair” condition with a 2020 projected PCI of 50. According to the 2019 PCI report, the pavement is showing distresses such as alligator cracking, L&T cracking, patching, and weathering. It is some of the poorest pavement on the airfield and will likely require rehabilitation during the 20-year planning period.

3.9 Hangars

Hangars provide a space for aircraft to shelter from the elements and for maintenance to be performed. Hangar demand can be projected based on the number of aircraft expected to be at AEL over the 20-year planning period. The preferred based aircraft forecast presented in Chapter 2 projects the number of based aircraft by fleet mix. However, since the time that chapter was written seven additional aircraft have been based at the Airport, filling all vacancies as the airport and bringing the based aircraft total count to 45 in the base year. The updated number of based aircraft after these additions are shown in **Table 3-14**. T-hangars are used primarily for single-engine aircraft, while box hangars are used for remaining single-engine, multiengine, and turbine aircraft. There are currently 24 T-hangar units, configured in four six-unit structures, and nine box hangars, ranging in size from 1,200 to 10,000 square feet. Many of the larger box hangars house multiple aircraft. As the airport is already at capacity, it is apparent additional hangar space is needed and this exercise is intended to show how the forecasted based aircraft will increase these needs.

Table 3-14: AEL Based Aircraft Fleet Mix Forecast

Aircraft Type	2019*	2024	2029	2034	2039
Single Engine	40	41	41	42	42
Multiengine	3	3	3	3	3
Jet	1	1	2	2	3
Helicopters	1	1	1	2	2
Other	0	0	0	0	0
Total	45	46	47	49	50

Sources: Airport 5010 Master Record, Mead & Hunt
Notes: Although 2019 is the base year for the this forecast, this updated count is current as of January 2022. The remainder of the fleet mix forecast is unchanged after the addition of the previously mentioned seven based aircraft.

Aircraft type can be reasonably tied to hangar type although this is not a perfect correlation. Small single-engine aircraft will often be housed in T-hangars when operated by a recreational pilot who owns the aircraft. However, a flight school may often house multiple single-engine aircraft together in the same box hangar for ease of access and maintenance. As the airport is already at capacity, multiple needs are present. A T-hangar would be the most efficient way to quickly increase the number of small aircraft the Airport is able to house while larger box hangars will be needed for the anticipated increase in business aircraft. These larger box hangars may be either jet aircraft or multiple piston aircraft housed in the same structure. While the following chapter will consider specific hangar types and location it is anticipated that a T-hangar should be built within the next three years and box hangar will further development.

3.10 Supporting Facilities

3.10.1 Navigational Aids (NAVAIDs)

AEL's existing electronic and visual NAVAIDs, including the Runway 17 omnidirectional approach lighting system (ODALS), VOR, Automated Weather Observing System (AWOS), Precision Approach Path Indicators (PAPIs), Runway End Identifier Lights (REILs), wind cone, and rotating beacon, are all in working order and installed according to FAA standards. These NAVAIDs meet the current and future needs of AEL, but some type of visual approach indicator, such as a visual approach slope indicator (VASI) or PAPI, for each end of Runway 5/23 could be beneficial as there are currently no NAVAIDs on the crosswind runway.

FAA Order 6560.20C, *Siting Criteria for Automated Weather Observing Systems*, provides guidance on the location of automated weather stations. For airports with only visual and/or non-precision runways, such as AEL, the preferred location of the station is adjacent to the primary runway 1,000 to 3,000 feet down from the runway threshold and between 500 and 1,000 feet perpendicular from the runway centerline, assuming there is flat terrain in this specified area. In addition, the station should not be located within any ROFAs or TOFAs, safety areas, obstacle free zones, or terminal instrument procedures surfaces. AEL's AWOS is situated northwest of the Runway 17/35 and Runway 5/23 intersection, approximately 1,875 feet down from the Runway 17 threshold and 830 feet perpendicular from Runway 17/35's centerline. Located outside the RSA, object free area, and primary surface, the AWOS is properly sited and conforms to the above-mentioned standards.

A wind cone visually indicates the prevailing wind direction at a specific location on the airfield. Small aircraft are particularly prone to crosswind hazards, and wind cones provide real-time wind information on location, which is valuable as wind may change even over short distances due to local features. FAA AC 150/5340-30J, *Design and Installation Details for Airport Visual Aids*, recommends that a supplemental wind cone be available when the primary wind cone is not visible from a runway end. It is generally preferred to install wind cones on the left side of the runway as it increases the visibility to pilots, although it must be outside of the RSA and is preferred to be outside of the ROFA unless there is an operational need. AEL has a single illuminated wind cone located southwest of the Runway 17/35 and Runway 5/23 intersection. While this cone is located over 1/2 mile from the Runway 23 and 17 thresholds, AEL is not a towered airport, and aircraft are able to overfly the field to view the wind cone when needed.

3.10.2 Airport Access

While Airport Road provides the main access to AEL and connects to Bridge Avenue, another largely unpaved road provides access from East Plaza Street to the AWOS and VOR located west of Runway 17/35. This road allows access to these facilities without crossing Runway 17/35, which occurs when the main Airport road is used. However, this unpaved road includes a small bridge over Bancroft Creek that is in poor condition and near the end of its useful life. Repairs for this bridge are currently scheduled to provide continued access for the Airport’s AWOS and VOR.

3.10.3 Equipment

Some of the snow removal equipment (SRE) for AEL is aging and needs to be replaced. The most recent acquisition was a blower purchased in 2016. The current Capital Improvement Program shows a new SRE vehicle in 2020, a bidirectional tractor as a blower and mower replacement in 2022, and a sweeper attachment in 2023. The existing SRE and maintenance facility is adequate to hold existing equipment although future equipment may require an expansion of these facilities. Space should be reserved surrounding this facility if equipment is replaced and expansion is required.

3.10.4 Fueling Facilities

Fueling facilities at AEL are located near the A/D building and adjacent apron. The Jet A fuel is located approximately 200 feet north of the A/D building in the center of the apron. The central location for Jet A provides uninhibited access for aircraft fueling although large aircraft parked in this position may obstruct other aircraft or vehicles. 100 Low-Lead (LL) aviation fuel is located directly adjacent to the A/D building. As both of these fueling areas are located where ADG II aircraft may pass, they each adhere to the 57.5 feet minimum from a taxilane to a fixed or movable object. Agricultural aircraft will seasonally use AEL as a base for nearby operations and will fuel on the ramp. The existing location and quantity appear to be meeting Airport needs and no changes are recommended.

3.11 Airport Zoning

Chapter 1 discussed the existing local Airport zoning compared to the state ordinance. While most of the standards are the same, some of the local ordinance is more restrictive to protect for future approach improvements, as shown in **Table 3-15**. As stated in Section 3.5, since the existing instrument approaches for Runway 17/35 appear to be serving AEL well, but mitigation for the primary surface and Runway 35 approach obstructions and are needed. Protecting for future approach improvement is a prudent approach by the City to prevent future conflicts with AEL.

Runway 5/23 lacks a straight in instrument approach and can only be used during IFR conditions by circling to land from Runway 17/35. However, the local ordinance is sized to protect for a nonprecision instrument approach. An RNAV (GPS) approach can be established with limited facility requirements. Adding an instrument approach to the crosswind runway would provide additional options for aircraft operating during inclement weather but increase the safety areas attached to the runway. The following chapter will consider establishing straight-in instrument approaches for Runway 5/23 that align with the protections provided by local ordinance.

Table 3-15: Airport Zoning Surfaces

Surface	State Model Ordinance	Local Ordinance
MN Administrative Rule 8800.1200 / Part 77		
Runway 17/35		
Primary Surface	200’ beyond runway end x 1,000’ wide	Same
Approach Surface	1,000’ wide (inner) x 10,000’ long 4,000’ wide (outer), 34:1 slope	1,000’ wide (inner) x 10,000’ long x 4,000’ wide (outer), 50:1 slope continuing to: 40,000’ long x 16,000’ wide (outer), 40:1 slope
Horizontal Surface	10,000 radii from each runway end	Same
Conical Surface	4,000 feet originating on the Horizontal Surface, 20:1 surface	Same
Transitional Surface	5,000 feet originating from the Primary Surface, 7:1 surface	Same
Runway 5/23		
Primary Surface	200’ beyond runway end x 250’ wide	200’ beyond runway end x 500’ wide
Approach Surface	250’ wide (inner) x 5,000’ long x 1,250’ wide (outer), 20:1 slope	500’ wide (inner) x 10,000’ long x 3,600’ wide (outer), 40:1 slope
Horizontal Surface	5,000 radii from each runway end	Same
Conical Surface	4,000 feet originating on the Horizontal Surface, 20:1 surface	Same
Transitional Surface	5,000 feet originating from the Primary Surface, 7:1 surface	Same

Source: MN Statute 8800.1200, 2400, Albert Lea Municipal Airport Zoning Ordinance adopted Dec. 10, 2012, Retrieved December 2019

3.12 Airport Assessment – Summary and Recommendations

- The future critical aircraft is the B-II for Runway 17/35 and B-I(small) for Runway 5/23.
- Airfield design standards and local zoning should continue to protect for improved instrument approach improvements.
- Runway 17/35 runway length is adequate, but a clearway and stopway will be examined in the following chapter. Runway 5/23 is below the recommended runway length, so a runway extension will be considered in the following chapter although this is not considered to be an immediate need.
- Visibility between the Runway 17 and Runway 23 thresholds should be increased as feasible.
- Consider additional wind cones in closer proximity to runway ends in the event that Runway 5/23 is extended.
- Instrument approaches are adequately serving Runway 17/35 but mitigation strategies for the primary surface and Runway 35 approach surface will be considered.
- The potential for instrument approaches on Runway 05/23 will be considered, as only circling approaches currently exist.
- Space surrounding the SRE building should be preserved for future expansion. The following chapter will consider specific improvements.
- Taxiways connecting aprons directly to a runway should be reconfigured to comply with FAA guidance.
- Aircraft circulation and parking on the apron could be improved. Changes to the primary apron will be considered in the following chapter.
- Evaluate a parallel taxiway for Runway 5/23 to allow for greater runway utility and an instrument approach.
- The Airport's hangars are currently at capacity and a near-term expansion is needed to accommodate additional aircraft. The following chapter will consider the specific hangars that best meet these needs.

CHAPTER 4

Alternatives

4.1 Introduction

This chapter presents and analyzes alternatives developed to meet the needs identified in Chapter 3. The alternatives take into consideration over the twenty year planning period, from 2019 through 2039, at Albert Lea Municipal Airport (Airport or AEL) while addressing near-term needs, with various scenarios for each need identified. This chapter documents both the preferred alternatives as well as showing what options were considered but dismissed from consideration. For ease of reference, all significant alternatives considered in this chapter are shown below in **Table 4-1**.

Table 4-1: Alternatives Matrix

Category	Alternative	Advantages	Challenges	Recommendation
Runway 17/35 (Section 4.2.1)	Physical Extension	• Runway pavement could be used in both directions • Additional length could serve all aircraft	• Several existing roads border the current runway, such as Plaza Street, Interstate 90 and Hammer Road that would require closure or relocation • Topography to the north would require significant grading • Current length helps protect for extended safety areas if the event of future approach improvements	Not anticipated within this planning period
	Clearway off of Runway 17 End	• Allows additional TODA for aircraft departing to the north without impacting RPZ location • Currently limited aircraft can operate with greater takeoff weight without increasing runway length • The required 80:1 surface has few obstacles to address	• Can only be used in one direction • Does not impact actual runway length	Preferred Alternative
	Addition of a Stopway	• Provides additional pavement length for aircraft during an aborted takeoff • Does not impact RPZ locations	• For a Runway 35 stopway, safety areas would be extended over Hammer Road and require road closure or relocation • For a stopway on the Runway 17 end, topography and existing infrastructure would add to cost • Extends runway safety areas without extending LDA, TORA or TODA	Not anticipated within this planning period

Table 4-1: Alternatives Matrix (Continued)

Category	Alternative	Advantages	Challenges	Recommendation
Runway 5/23 (Section 4.2.3)	Maintenance of Existing Conditions	• Runway provides a crosswind option for smaller aircraft • Existing infrastructure has remaining life and allows for continued use	• Limited use of runway still requires upkeep of the surface regardless of total operations • Limited visibility from crosswind runway ends to primary runway • Dependent on continued FAA support and eligibility based on AIP eligibility	Initial Preferred
	Physical Extension	• Would allow larger aircraft to use the crosswind runway when needed • Lack of lighting would allow extension without relocating infrastructure	• Extending this runway would relocate RPZ more centrally over Plaza Street and Interstate 90 • Safety areas and other surfaces associated with the runway would limit development to the northeast	Not anticipated within this planning period (2019 – 2039)
	Conversion to Turf	• Better support for tailwheel aircraft • Lower annual maintenance costs	• Conversion is unlikely to be federally funded • Turf surface is less suitable or may be unusable for larger aircraft	Not anticipated within this planning period (2019 – 2039)

Table 4-1: Alternatives Matrix (Continued)

Category	Alternative	Advantages	Challenges	Recommendation
Instrument Approaches (Section 4.2.2 and throughout Section 4.2)	Existing Conditions	• Provides incoming aircraft visibility minimums of 3/4 mile for both ends of Runway 17/35	• A RPZ study for Runway 35 was not completed and FAA is unlikely to approve existing conditions • The Runway 35 RPZ currently overlaps Hammer Road, a portion of a residential area, and a significant portion of the adjacent golf course	Dismissed from Consideration
	Runway 35 Instrument Approach to 1-mile	• Would bring RPZ into FAA compliance • The Runway 17 3/4-mile visibility approach meets MnDOT's Key Airport Requirements • Primary impacts limited to Part 135 operations and Part 91 operations could attempt the approach	• Would only leave one 3/4-mile approach on the Runway 17 end	Preferred Alternative

Table 4-1: Alternatives Matrix (Continued)

Category	Alternative	Advantages	Challenges	Recommendation
Taxiways and Taxilanes (Section 4.3)	Alternative 1: North Parallel to Runway 5/23	• Would provide a full parallel taxiway to Runway 5/23 • Would avoid infrastructure conflicts on the south side of the runway	• Its location would require aircraft to cross Runway 5/23 to access, which is not desirable • Tied to future of Runway 5/23	Not anticipated within this planning period (2019 – 2039)
	Alternative 2: South Parallel to Runway 5/23	• Would provide a full parallel taxiway to Runway 5/23 • Would not require crossing Runway 5/23 to access taxiway	• Could create a complex intersection with existing taxiway connections and would require their relocation • Tied to future of Runway 5/23	Not anticipated within this planning period (2019 – 2039)
	Direct Access: West Apron	• Markings would better delineate the edge of the apron for pilots transiting the area • Any pavement changes could accompany a larger apron project	• Configuration would need to be reassessed once pavement reconstruction is required	Preferred Alternative

Table 4-1: Alternatives Matrix (Continued)

Category	Alternative	Advantages	Challenges	Recommendation
Aeronautical Development Areas (Section 4.4)	Terminal Area	• Existing access and infrastructure are in place to support a natural expansion of hangars to the south • An existing taxiway system	• Area to the north is nearly completely built out and long-term development opportunities are limited	Preferred Alternative
	Southwest Development Area	• Area is partially undeveloped • Access is readily available to this area from Hammer Road	• Due to the safety area of Runway 17/35, any significant development would require a closure of the Tall Grass Disc Golf Course	Dismissed from Consideration
	West Development Area	• Area currently only has sparse development and open green space for development	• Safety areas of the nearby VOR, AWOS, and runways severely limit the available space for any reasonable development	Dismissed from Consideration
	North Development Area	• Access to this area is readily available from East Plaza Street • Area is located near Runway 17 threshold and would allow prime hangar development • Sufficient space for non-aeronautical development in the east of this area	• Area is not currently airport owned and acquisition of this property would be necessary • Topography would require significant grading efforts	Ultimate Preferred, but not anticipated within this planning period

Table 4-1: Alternatives Matrix (Continued)

Category	Alternative	Advantages	Challenges	Recommendation
Terminal Area (Section 4.4)	Alternative 1	• Vehicle access road for hangars to the north would provide separate circulation for vehicles and aircraft • Sufficient room for larger private or corporate hangars • South hangars would have immediate access from Pilot Street	• Hangars to the south are not spatially efficient and additional development would be possible • Vehicle access road development would be limited due to surrounding hangars	Dismissed from Consideration
	Alternative 2	• Hangars to the south would utilize an efficient layout with flexible development options and additional capacity • South hangars would have immediate access from Pilot Street • Relocated existing wooden hangar could be positioned to be aligned with south hangars	• Vehicle access road for hangars to the north would share a small portion of the taxilane with aircraft	Preferred Alternative

4.2 Runways

The runways at AEL are generally serving the needs of the Airport after the 2011 Runway 17/35 (previously Runway 16/34) project. Additional major changes to this runway are not expected based on the current planning period. However, while major immediate changes are not anticipated, necessary improvements to the existing conditions and protecting for future growth should be considered. As discussed in Chapter 3, the primary concerns for the runways include surface penetrations, instrument approaches, protecting for future growth and increasing the utility of Runway 17/35 for users without off-airport impacts. Each of these topics will be covered in this section.

4.2.1 Runway 17/35

Dimensions

The length of the runway has been shown to be adequately serving the majority of aircraft that use the Airport. The current width of the runway is 100 feet, which helps support aircraft during inclement weather and contaminated runway conditions. However, based on the current critical aircraft and instrument approaches attached to this runway, the recommended width is 75 feet. For a runway with an approach of lower than 3/4 of a mile, a width of 100 feet is required. Maintaining a runway width of 100 feet is recommended to continue to support these existing operations and to protect for an improved approach. However, coordination with the FAA will likely be necessary when the time comes to reconstruct this runway to determine funding eligibility for 100-foot or a 75-foot runway. Any pavement reconstruction would likely be accompanied by improvements or replacement of runway lighting.

Both Chapter 3 and the 2003 Master Plan had a similar length recommendation for 75 percent of the relevant fleet mix at 65 percent useful load, with a recommendation of 4,800 feet and 4,840 feet, respectively. The current 5,000-foot length of Runway 17/35 closely aligns with these lengths determined using FAA guidance and no physical changes to the length of Runway 17/35 are anticipated during the planning period.

4.2.2 Usable Length

At 5,000 feet long, Runway 17/35 currently serves the Airport's needs, and any physical extension to the runway is unlikely given the physical constraints around it. Therefore, efforts should be made to maximize the current available runway. As discussed in Chapter 3, either a stopway or clearway may be a feasible way of providing additional usable length for some aircraft.

A stopway is a paved area extending from the runway and capable of supporting an aircraft without causing structural damage to the aircraft. While a stopway does not necessarily have to be paved, it must be able to support aircraft intended to use it without causing structural damage to the aircraft. The aircraft that could benefit from a stopway at AEL include the most demanding aircraft that currently operate at the Airport, such as the Challenger 300, Hawker 800, Learjet 45, Learjet 75, Super King Air 350 and Citation V. Many of these aircraft have a maximum takeoff weight exceeding 20,000 pounds and would be unable to use a stopway that is unpaved and of sufficient design standards.

Both a stopway and runway safety area (RSA), are intended to support aircraft but for different purposes and effect. This difference is best shown by comparing the two definitions as shown in paragraph 102 f AC 5300-13A, *Airport Design*:

> *Runway Safety Area (RSA) – A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to aircraft in the event of an undershoot, overshoot, or excursion from the runway.*
>
> *Stopway (SWY) – An area beyond the takeoff runway, no less wide than the runway and centered upon the extended centerline of the runway, able to support the airplane during an aborted takeoff, without causing structural damage to the airplane, and designated by the airport authorities for use in decelerating the airplane during an aborted takeoff. A blast pad is not a stopway.*

Paragraph 312 in 5300-13A directs to AC 150/5320-6, *Airport Pavement Design and Evaluation*, to determine the required pavement strength of a stopway. This guidance states that the pavement would need to be designed with equivalent strength and thickness as a paved shoulder. If a stopway was implemented on Runway 17 or 35, then the runway safety area (RSA) and runway object free area (ROFA) would originate at the end of the stopway and continue for 300 feet. The RSA has to meet grading standards in addition to being clear of unnecessary obstacles. On the Runway 35 end, the existing ROFA terminates immediately before meeting the perimeter fence, which is situated in front of Hammer Road. Any additional pavement for a stopway would extend these safety areas beyond Airport property and conflict with the fence. Therefore, the addition of a stopway on the Runway 35 is not possible without the realignment of Hammer Road and relocation of the perimeter fence and is not considered a valid alternative at this time due to the high cost and negative impact to the community.

There is more space available on the north end of the runway to institute a stopway, but challenges do exist. The perimeter fence is located near the runway but the steep topography in the area would allow the ROFA to extended from a 200-foot stopway without penetration to the ROFA or RSA. The RSA would also extend from the stopway, with a width of 150 feet (centered on the runway centerline) and extend beyond the stopway pavement for 300 feet, as shown in **Figure 4-1**.

However, as AC 150/5300-13A, *Airport Design*, states, “Their limited use and high construction cost, when compared to a full-strength runway that is usable in both directions, makes their construction less cost effective.” Given the minor extension opportunities compared to the cost required for such a project, a clearway is a much more feasible option as it does not require extending the pavement of the runway. The high elevation of the Runway 17 threshold in comparison to the surrounding facilities, such as the perimeter fence, Plaza Street, and I-90, would allow the 80:1 surface required for a clearway to exist without penetrations, as shown in **Figure 4-2**. This area is primarily used for agricultural purposes and is otherwise generally unoccupied except for some utility poles.

The addition of a clearway would allow an increase in the Takeoff Distance Available (TODA) beginning at the end of the Takeoff Runway Available (TORA). This could be done in two stages. The initial stage would require the reconfiguration of the threshold and taxiway lights, to eliminate potential obstacles. A 1,079-foot clearway could then be positioned so that the attached departure surface would clear the controlling obstacle, the center utility pole. If these poles are later buried and the remainder of the land in the RPZ is acquired then the clearway could be extended to 2,200 feet in length, terminating at the end of the easement area north of the Airport. There would be no impacts to the land in this area as the clearway does not require any additional infrastructure. As determined in Chapter 3, many aircraft within the 75 percent fleet mix would benefit from additional runway length. However, there is not room at the Airport for any significant length improvements on Runway 17/35. **Table 4-1** compares the recommended runway lengths established in Chapter 3 to the proposed TODA length after the addition of a clearway.

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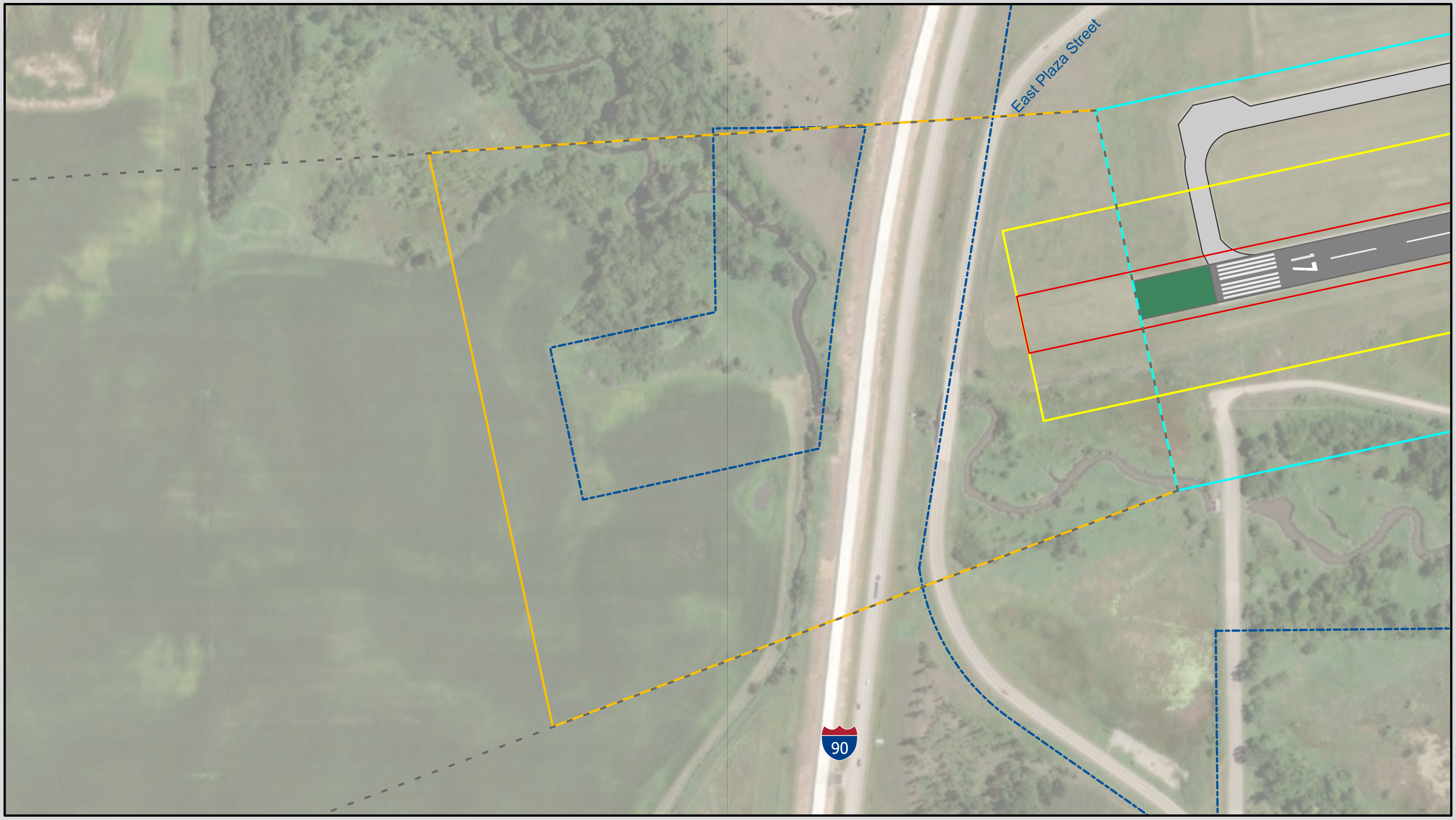


0 300 600

Graphic Scale in Feet

Figure 4-1: **Runway 17 Stopway**

Stopway

Existing Runway Protection Zone

Runway Object Free Area

Runway Safety Area

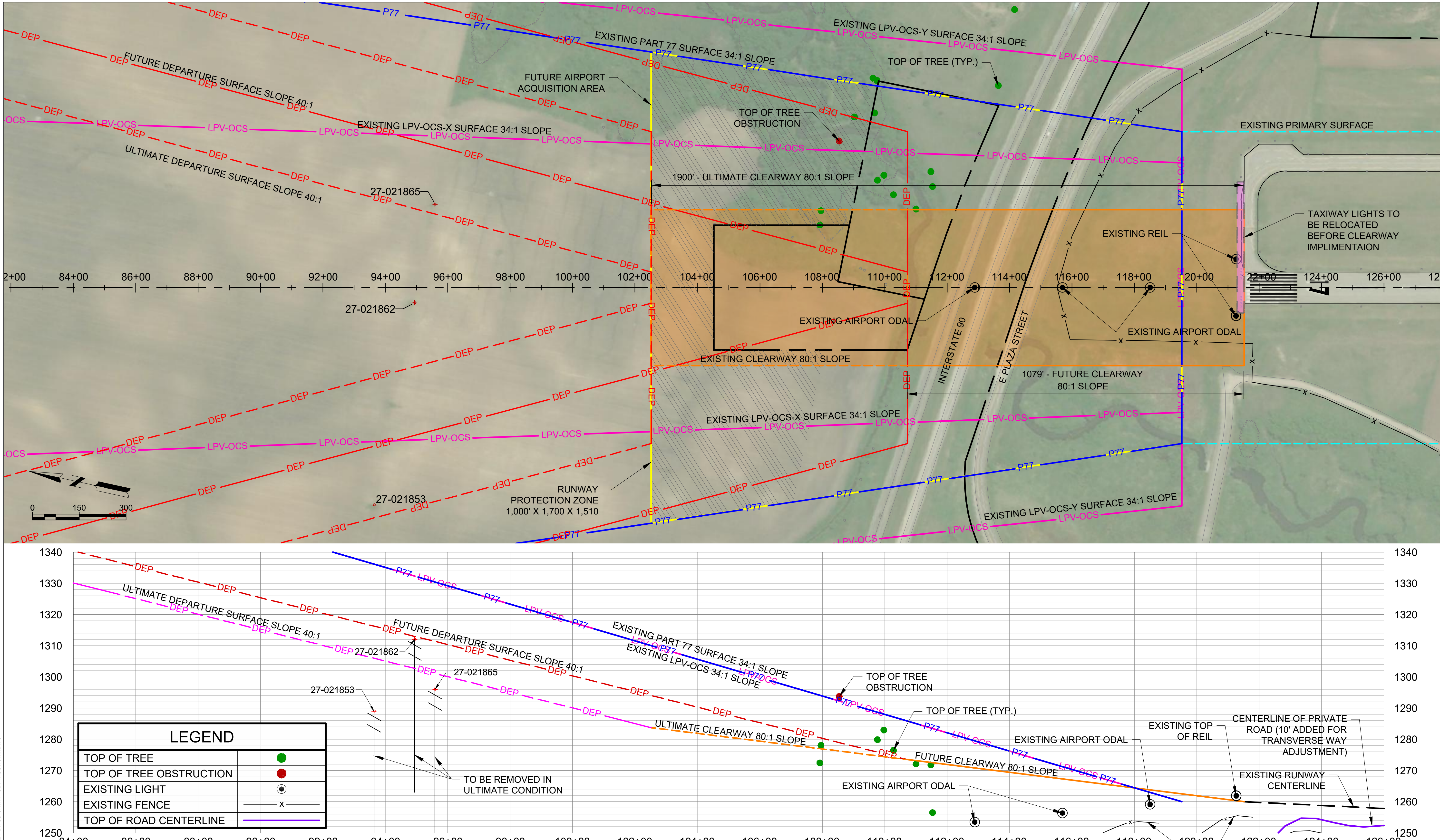
Part 77 Approach Surface

Primary Surface

Airport Property

The City of Albert Lea

Source: *Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN*



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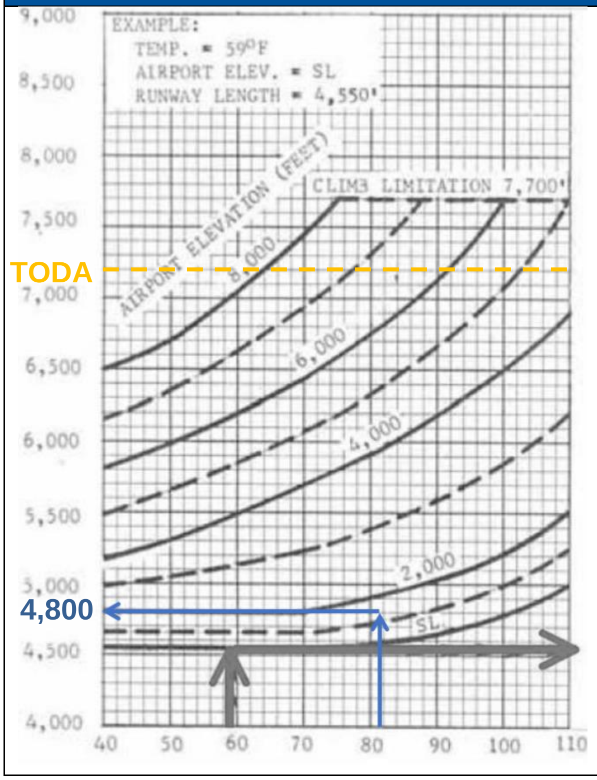
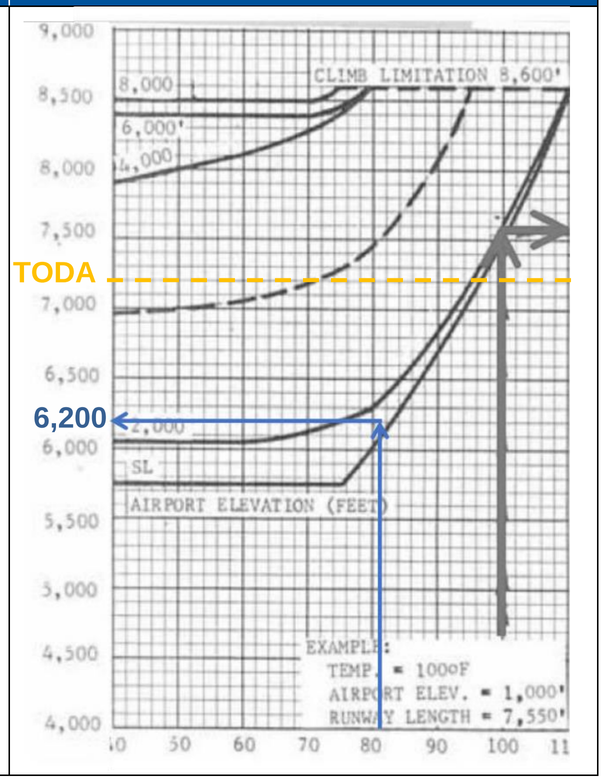
RUNWAY 17 OBSTRUCTIONS - 3/4 MILE MINIMUM

FIGURE 4-2

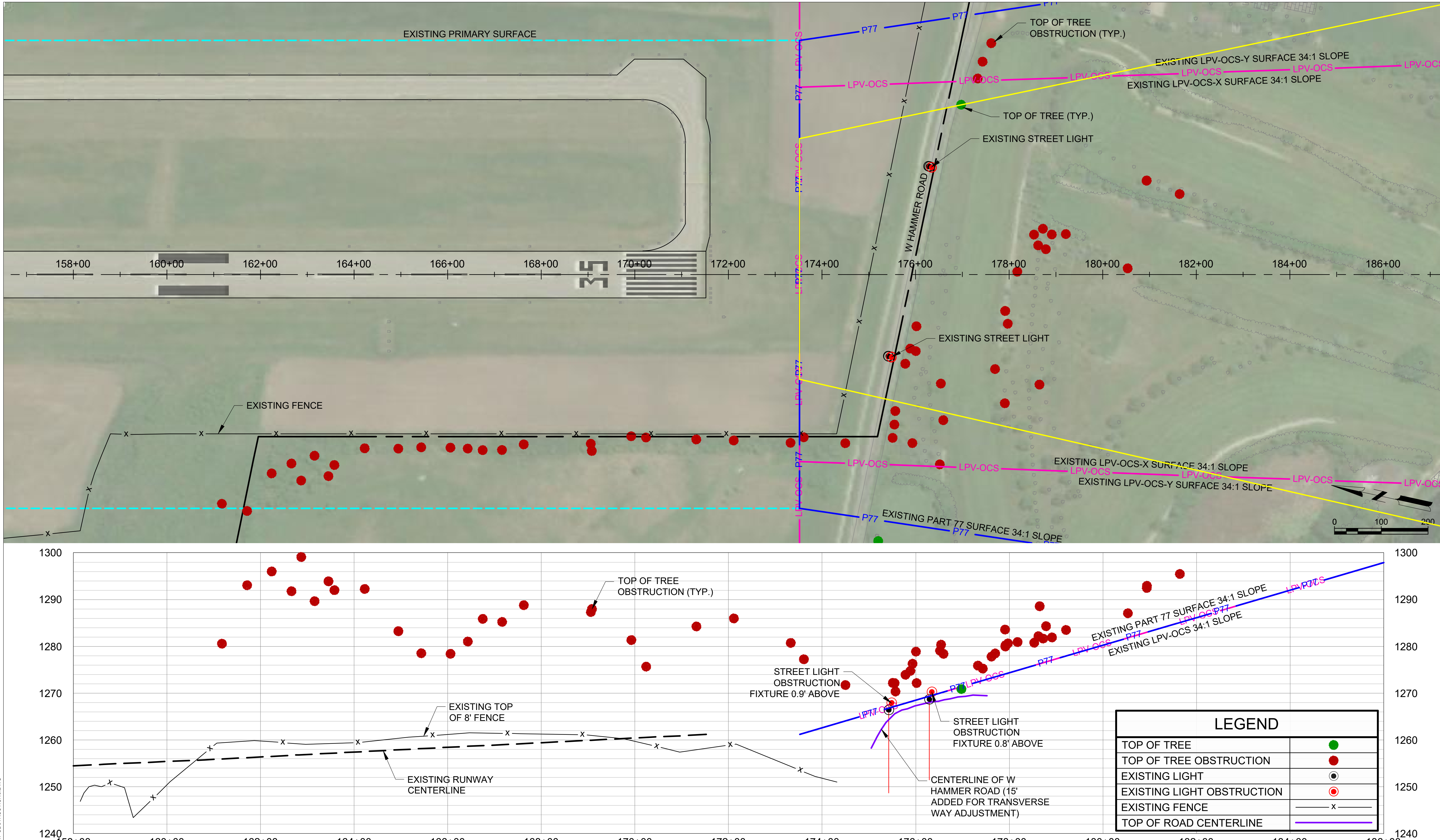
Table 4-1: Clearway Impact Compared to Runway Length Needs

75 Percent fleet Mix at 60 Percent Useful Load	75 Percent fleet Mix at 90 Percent Useful Load
	

The addition of a clearway would exceed the needs of the 75 percent fleet mix both at 60 percent useful load and 90 percent useful load. The majority of the business jet operations at AEL fall into the 75 percent fleet mix as the 100 percent fleet mix includes aircraft near 60,000 maximum takeoff weight and require significantly longer runways. These aircraft include the Cessna Citation CJ2, CJ3 and Excel, the Learjet 45, and Hawker 800. Therefore, a clearway is recommended based on the existing and projected future operations in addition to its low cost and impacts.

Instrument Approaches

Also visible on Figure 4-2 are the few obstructions in this area, although only one is a penetration. The interstate and Plaza Street are within the RPZ but no changes to this runway end are expected. The existing 3/4-mile visibility approach to Runway 17 allows the Airport to remain accessible even during poor weather conditions. While Runway 35 also has a 3/4-mile approach, there are several obstacles on that end of the runway that impact the approach surface. The primary surface, which is centered on the runway and 1,000 feet wide based on these approaches, has interference from the perimeter fence and trees located less than 400 feet west of the Runway 35 threshold, as shown on **Figure 4-3**. This section will discuss how to mitigate these obstacles while maintaining Airport accessibility.



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RUNWAY 35 OBSTRUCTIONS - 3/4 MILE MINIMUM

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FIGURE 4-3

Coordination with the Minnesota Department of Transportation (MnDOT) and the FAA occurred throughout the fall and winter of 2020 to evaluate priorities for the Airport while considering mitigation options. The Airport serves a role in the overall system of airports throughout the state of Minnesota as a Key Airport. Key Airports serve the region by providing accessibility to business jets and other aircraft that may not be able to utilize other, smaller general aviation airports. Any changes to the Airport should be weighed against how it would impact the state system as a whole, and Key Airports are expected to have an approach with visibility minimums no greater than 3/4 of a mile.

Even if the Runway 17 approach was maintained, the primary surface would stay at its current dimensions of 200 feet beyond the runway end and 1,000 feet wide. On the north end of the runway, there is not any interference with the primary surface, as the steep topography allows the fence to be positioned near the Runway 17 end but significantly under the primary surface. However, the perimeter fence on the south end of the runway penetrates the primary surface to the west of the Runway 35 threshold as it runs parallel to the runway and needs to be relocated.

Finally, two surfaces influenced by the instrument approach to Runway 35 should be considered. Originating from the primary surface, the 34:1 Part 77 approach surface extends to the south of Runway 35 and conflicts with several obstacles, primarily trees on the golf course. Similarly, the GPS (RNAV) LPV offers vertical guidance and requires a 34:1 Obstacle Clearance Surface (OCS). This LPV OCS shares many penetrations with the Part 77 approach surface. The Runway Protection Zone (RPZ) size is largely determined by the instrument approach, and the 3/4-mile approach requires a larger RPZ. Since the RPZ is larger, it overlaps a larger section of Hammer Road and the golf course beyond Airport property.

In summary, four key issues are associated with the Runway 35 end:

- A 3/4-mile approach should be maintained by a Key Airport defined by the State Aviation System Plan (SASP).
- The 1,000-foot primary surface is penetrated by the perimeter fence and adjacent trees and overlaps the adjacent Tall Grass Disc Gold Course which is owned by the City.
- Several penetrations exist in the 34:1 surfaces for the Part 77 approach surface and LPV OCS.
- The existing Runway 35 RPZ, if unchanged, to undergo an RPZ study.

Each of these items connect to and are influenced by the Runway 35 3/4-mile approach. Joint efforts with the Airport and coordination with MnDOT and the FAA indicate that reverting the Runway 35 approach to 1-mile visibility minimums and relocating a portion of the perimeter fence would be the most effective way to resolve these four issues. The remainder of this section proposes changing the Runway 35 approach and discusses the impact this would have to each specific existing challenge.

While the Airport's MnDOT status as a Key Airport requires a 3/4-mile approach, each of the primary runway ends does not need to maintain an approach of this specification to meet this requirement. MnDOT has confirmed that the single 3/4-mile approach on the Runway 17 end would meet this requirement. However, the Runway 17 approach would still necessitate a 1,000-foot primary surface, which would overlap the perimeter fence and adjacent trees. This fence would need to be relocated 160 feet to be out of the primary surface plus an additional 55 feet to clear the transitional surface that originates from the primary surface. This means the fence would need to be relocated a total of 215 feet to the west and into the Tall Grass Disc Golf Course.

Section 4(f) of the U.S. Department of Transportation Act of 1966 protects significant publicly owned parks, recreation areas, wildlife refuges, and historic sites. A Section 4(f) use includes alteration of structures or facilities on the subject property, or constructive uses that do not physically affect the property, but indirectly impairs the resource in some way. The Section 4(f) regulation requires proposed transportation use be avoided, if avoidance is feasible and prudent, before U.S. DOT grants any funding or approvals for the transportation use. The Tall Grass Disc Golf Course qualifies as a Section 4(f) property.

The land on which the disc gold course is situated was acquired by the City of Albert Lea in 1984. City Resolution 84-14 states that the purchase of this land was initially done for the projection and promotion of safety in aeronautics, to provide public park and recreational areas, and to "enable the City to prevent the development of airport hazards in the area and to expand Bancroft Bay Park." The land initial purchase was made with a combination of local and state funds. The Tall Grass Disc Golf Course would undergo moderate changes as the fence would be relocated 215 to the west, but would remain functional, as three baskets would be relocated elsewhere on the course. On December 1st 2021, a Final Finding was issued that found the described project would not significantly alter the Tall Grass Disc Golf Course and a de minimis finding was issued. The finding and full report is available in **Appendix B**.

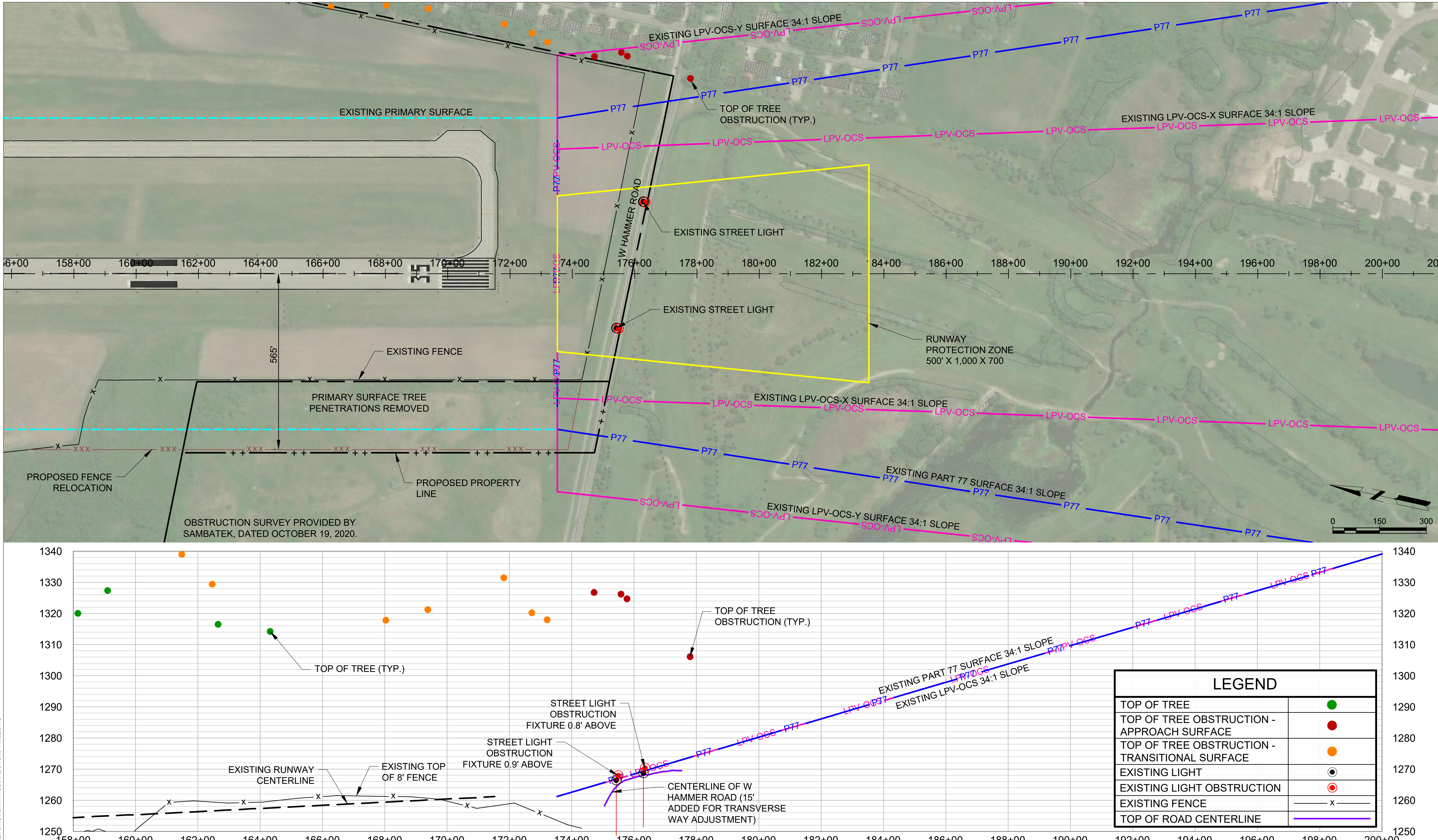
The return to a 1-mile instrument approach on Runway 35 would not have any impacts to the size of the 34:1 LPV OCS surface, but both the 34:1 Part 77 approach surface and the RPZ would be reduced in size as seen in **Table 4-2** and shown in **Figure 4-4**. Also shown in this graphic is the reduction of obstacles surrounding Runway 35 that occurred in Spring of 2022. These size reductions would only have a minor impact on the Part 77 approach but would significantly reduce the size of the RPZ so that there would be less overlap with Hammer Road and would shorten its incursion into the golf course by 700 feet. Based on FAA coordination, this change in the size of the RPZ would not require a separate study given the reduction of the RPZ to its previous size and subsequent improvement in surrounding land use. Based on the 14 CFR § 135.225 - *IFR: Takeoff, approach and landing minimums*, applicable to Part 135 aviation, which includes on-demand and commuter aircraft that operate at AEL, these operations are not permitted to begin an instrument approach unless the weather is reported as at or above the authorized IFR landing minimums for that procedure. No such limitation exists for Part 91, which covers general operations. This means that Part 91 pilots may still begin an instrument approach and have the option of conducting a missed approach if they are not able to see the runway environment. For this reason, reverting the Runway 35 approach to 1-mile visibility minimums would primarily impact Part 135 operations while Part 91 operations would experience few impacts.

Based on these benefits, this is the preferred alternative for the Runway 35 approach and perimeter fence and a letter dated October 26, 2021 was sent to the FAA ADO requesting the new Runway 35 approach.

Table 4-2: Runway 35 Instrument Approach Modification Impacts

Surface	Dimensions	
	Existing 3/4-mile Approach	Proposed 1-mile Approach
Part 77 Approach Surface	1,000' inner width x 10,000' length x 4,000' outer width	1,000' inner width x 10,000' length x 3,500' outer width
Runway Protection Zone	1,000' inner width x 1,700' length x 1,510' outer width	500' inner width x 1,000' length x 700' outer width

Sources: Code of Federal Regulations Part 77, Section 77.19 - Civil airport imaginary surfaces, and *FAA AC 5300-13A, Airport Design*



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RUNWAY 35 OBSTRUCTIONS - 1 MILE MINIMUM

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FIGURE 4-4

Runway 17 was also considered for improvements. The existing 3/4-miles approach dates to the previous runway project. The runway relocation project, which converted the previous runway to a taxiway and relocated the extended Runway 17/35 400 feet to the west, added the ODALS, and reduced the Runway 17 visibility minimums to 3/4-miles was later completed in 2011. Today, the approach remains at 3/4-miles and satisfies MnDOT's Key Airport requirement. The intent of these visibility minimums for Runway 17 (originally Runway 16 before the relocation project) follows a consistent through line from the 2003 Master Plan, 2005 ALP, and 2005 Environmental Assessment. As the planning for and implementation of visibility minimums to ¾-miles for Runway 17 predate the 2012 interim RPZ guidance a RPZ study is not required.

Improvement to a precision approach was also considered. Although Runway 17/35 meets many of the requirements for a precision approach as stated in AC 5300-13A, *Airport Design*, two primary obstacles exist: runway length and approach lighting. The minimum runway length for an approach with visibility minimums less than 3/4-miles is 4,200 feet. Due to site constraints this length would be extremely difficult to meet in the runway's existing location. The Airport is bound by major roadways on either end of the runway and a golf course is also present south of the Runway 35 threshold. The existing approach lighting system (ALS) are ODALs off the north end of Runway 17. This meets existing approach needs but a MASLR, or similar ALS, would be required to meet precision approach requirements. As the land north of the Airport is primarily agricultural, this is not unattainable but would require additional easements in the area. However, the existing approaches are currently meeting needs and a runway extension to meet the minimum requirements for a precision approach is not feasible. Therefore, it is recommended that the existing Runway 17 approach be preserved for the planning period.

4.2.3 Runway 5/23

Runway 5/23, currently 2,898 feet long, serves as the crosswind runway for A/B-I aircraft and is expected to meet the needs of the Airport for the duration of the planning period. While the B-I category includes some turbine aircraft, these aircraft nearly exclusively use the primary runway and the crosswind runway primarily supports light aircraft that need to use it during strong crosswinds. Any proposed changes in this section are not intended to indicate immediate need but instead to preserve the Airport's existing facilities while protecting for future growth.

The purpose of a master plan is to consider the needs of the Airport beyond existing conditions. To this end, Runway 5/23 should be included in this master plan and efforts made to protect for the ultimate condition of the Airport, even if improvements are not anticipated within the planning period.

Alternative 1

This alternative considers a 502-foot expansion to Runway 23. The 2013 Airport Layout Plan (ALP) shows an extension of this runway to 3,500 feet, but Chapter 3 determined a length of 3,400 feet would meet the runway length assessment for the critical aircraft specific to Runway 5/23. While the majority of aircraft that use this runway are small piston powered aircraft that primarily use the runway during crosswind conditions, the A/B-I aircraft family does include some turbine aircraft.

These turbine aircraft, while included in the critical aircraft family for the runway, currently use Runway 17/35 for its greater length, width, and presence of instrument approaches. Turbine aircraft typically fly under an Instrument Rules Flight (IFR) flight plan regardless of weather and tend to use available instrument approaches more frequently than piston aircraft when arriving at an Airport. Therefore, while turbine aircraft are included in the aircraft family and influence the recommended runway length, it is unlikely this runway would need to be extended to accommodate these aircraft in the near future. However, the purpose of a master plan is to consider not only the immediate needs of an airport but anticipate what the future of the

Airport may require. This means that it is often necessary to evaluate alternatives that may not be needed presently in order to protect for later demand. To the northeast of the Runway 23 threshold, East Plaza Street and I-90 are each located approximately a quarter of a mile away north of I-90 lies largely unoccupied farmland. A 502-foot extension to this runway, as determined in Chapter 3, is shown in **Figure 4-5**.

This proposed length of 3,400 feet creates less overlap with the nearby roadways compared to the total length of 3,500 proposed by the previous ALP while still reserving the space for future use if and when it is required. The increased size of the approach surface accounts for the addition of a 1-mile instrument approach, although this would not have any impacts to the size of the RPZ. However, it would push it further away from Airport property onto Plaza Street and I-90. This means that although the size of the RPZ would not increase, it would have an impact on incompatible land uses.

This would also relocate Safety Zone A and Safety Zone B further away from the Airport. These zones are in accordance with Minnesota Administrative Rules 8800.2400 and place restrictions on the types of land use that may reside near runway's extended centerlines. Safety Zone A is two thirds the length of the runway from which it originates while Safety Zone B is one third the runway's length. The land that these safety zones currently occupy, and would occupy if the runway is extended, is primarily agricultural although Plaza Street and Interstate 90 do intersect the area. It is important to consider how these zones may restrict future development and the zoning ordinance identifies the following associated land use restrictions:

- **Safety Zone A** shall contain no buildings and shall be restricted to those uses which will not create, attract, or bring together an assembly of persons thereon. Permitted uses may include agriculture, light outdoor recreation (nonspectator), and auto parking.
- **Safety Zone B** shall be used for the following purposes only:
    - For agricultural and residential purposes, provided there shall not be more than one single family dwelling per three acre tract of land.
    - Any commercial or industrial use which meets the following minimum standards:
        - Each single commercial or industrial use shall not create, attract, or bring together a site population that would exceed 15 times that of the site acreage.
        - Each single commercial or industrial site shall be of a size not less than three acres.
        - Each single commercial or industrial site shall contain no dwellings and shall contain no more than one building per three acre tract of land.
        - The maximum ground area to be covered by a single commercial or industrial building is subject to minimum ratios with respect to the building area.

The extension of the runway, and subsequent relocation of these safety zones, does not result in any immediate land use conflicts. It is recommended that the City continue to monitor the state of development in this area to prevent any future conflicts if the runway is extended. The runway is currently unlit, but runway edge lights are only required for either circling approaches conducted at night or any straight in approach. Currently, this runway does not have a straight in instrument approach, and the addition of an instrument approach is unlikely due to the proximity of facilities near the runway, as further discussed in Section 4.4. However, as one of the purposes of the master plan is to protect for future uses, even if they are not suitable for current Airport circumstances, the recommendation is to continue to protect for an instrument approach.

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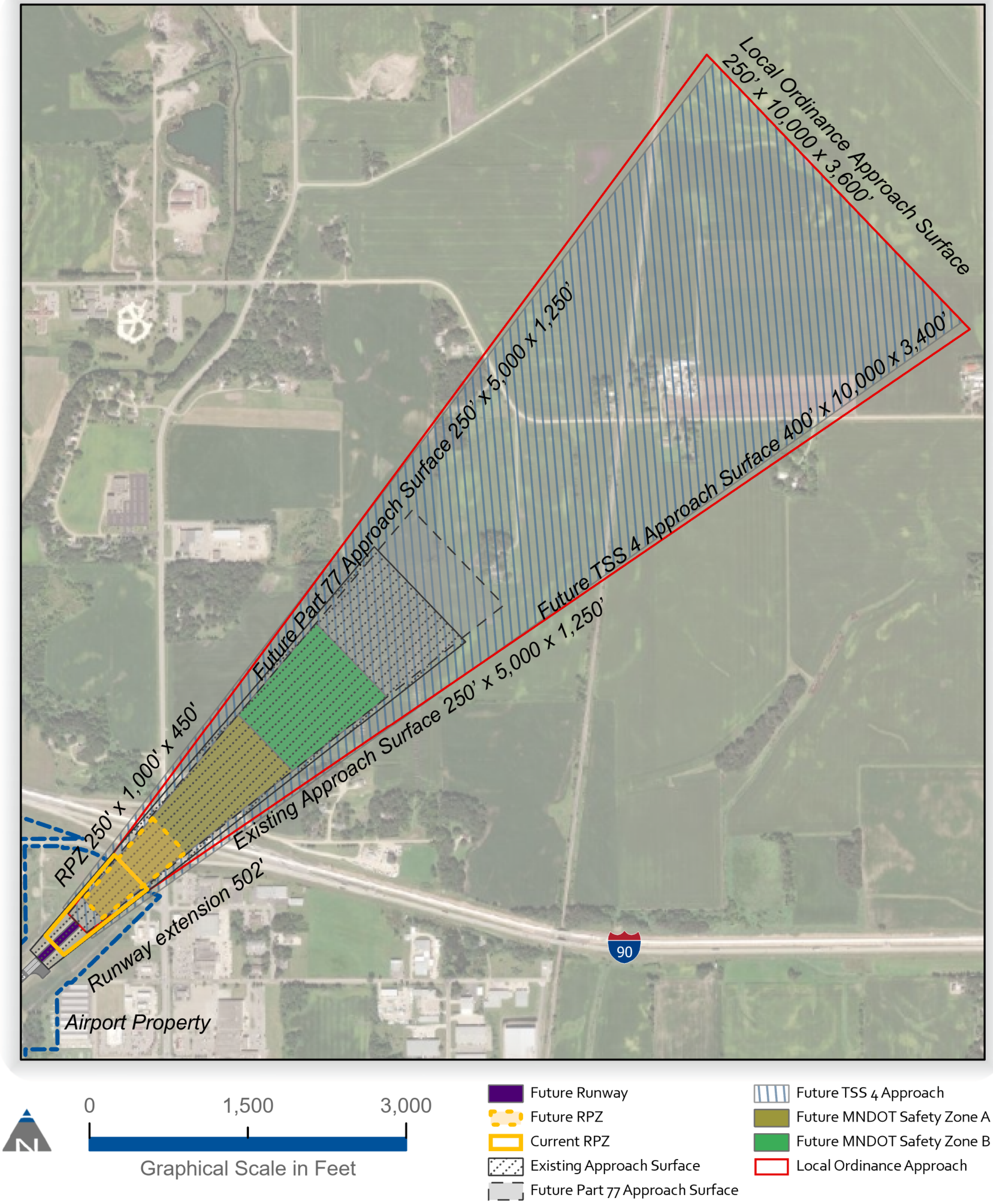

Figure 4-5: **Runway 5/23 Extension and Approach Protection**

Sources: *Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN*

The City of Albert Lea

Alternative 2

Protecting for a runway extension and for a future instrument approach attempts to preserve the existing infrastructure while allowing future growth at the Airport. However, demand may not evolve in the future to necessitate these improvements and other considerations for this runway should be included in this master plan. In the event that this runway continues to serve a minor role for the duration of its useful life interest has been expressed to convert this runway to turf. AEL has a strong glider and tailwheel aircraft presence and both of these aircraft benefit from a turf surface.

Tailwheel aircraft often have additional crosswind limitations that go beyond what would be assumed simply based on their size. This is due to the location of their center of gravity and pivot point in turns when taxiing on the ground. For a tailwheel aircraft, this point is often behind the main landing gear, or the point at which they pivot during taxiing. Aircraft with tricycle landing gear have their center of gravity and pivot point in front of the main landing gear. FAA publication FAA-H-8083-3B, *Airplane Flying Handbook*, explains why this phenomenon can lead to a greater susceptibility to crosswinds for tailwheel aircraft:

> *Characteristically, an airplane has a greater profile or side area behind the main landing gear than forward of it. With the main wheels acting as a pivot point and the greater surface area exposed to the crosswind behind that pivot point, the airplane tends to turn or weathervane into the wind. This weathervaning tendency is more prevalent in the tailwheel-type because the airplane's surface area behind the main landing gear is greater than in nosewheel-type airplanes.*

This challenge can be particularly noticeable on paved runways when the interior wheel during an impending weathervaning event will grip onto the pavement and encourage rotation. This can be compared to a turf surface on which, if the same situation occurs, this wheel is more likely to slide on the turf and help the pilot to avoid the incident. Therefore, while the crosswind runway is currently serving the crosswind runway role at AEL, in the event that demand for this runway declines or funding is limited the conversion of this runway to turf could be an option that continues to serve the Airport.

4.3 Taxiways

As Chapter 3 states, FAA Advisory Circular (AC) 150/5300-13A, *Airport Design*, provides parallel taxiway guidance for runways based on their instrument approach procedures. The guidance indicates the crosswind runway does not require a parallel taxiway but one is recommended based on the circling approaches available for Runway 5/23. A parallel taxiway offers benefits such as improving aircraft circulation and minimizing risks associated with aircraft back-taxiing on a runway by reducing the amount of time aircraft must be on the runway. This section analyzes both a north and a south parallel taxiway option for Runway 5/23.

As documented in Chapter 3, A/B-I (small) is the critical aircraft category for crosswind Runway 5/23, and if a parallel taxiway were to be added for that runway, it should be designed to TDG 1B standards. Based on FAA guidance, this results in a 25-foot-wide taxiway with a runway centerline to taxiway centerline separation of 150 feet. With these dimensions and separation standards, either parallel taxiway alternative fits within the existing airfield configuration without encroaching upon the hangar area, acquiring any land, or relocating the property fence. Likewise, both alternatives (**Figure 4-6**) would eliminate the need for aircraft to back-taxi on the runway.

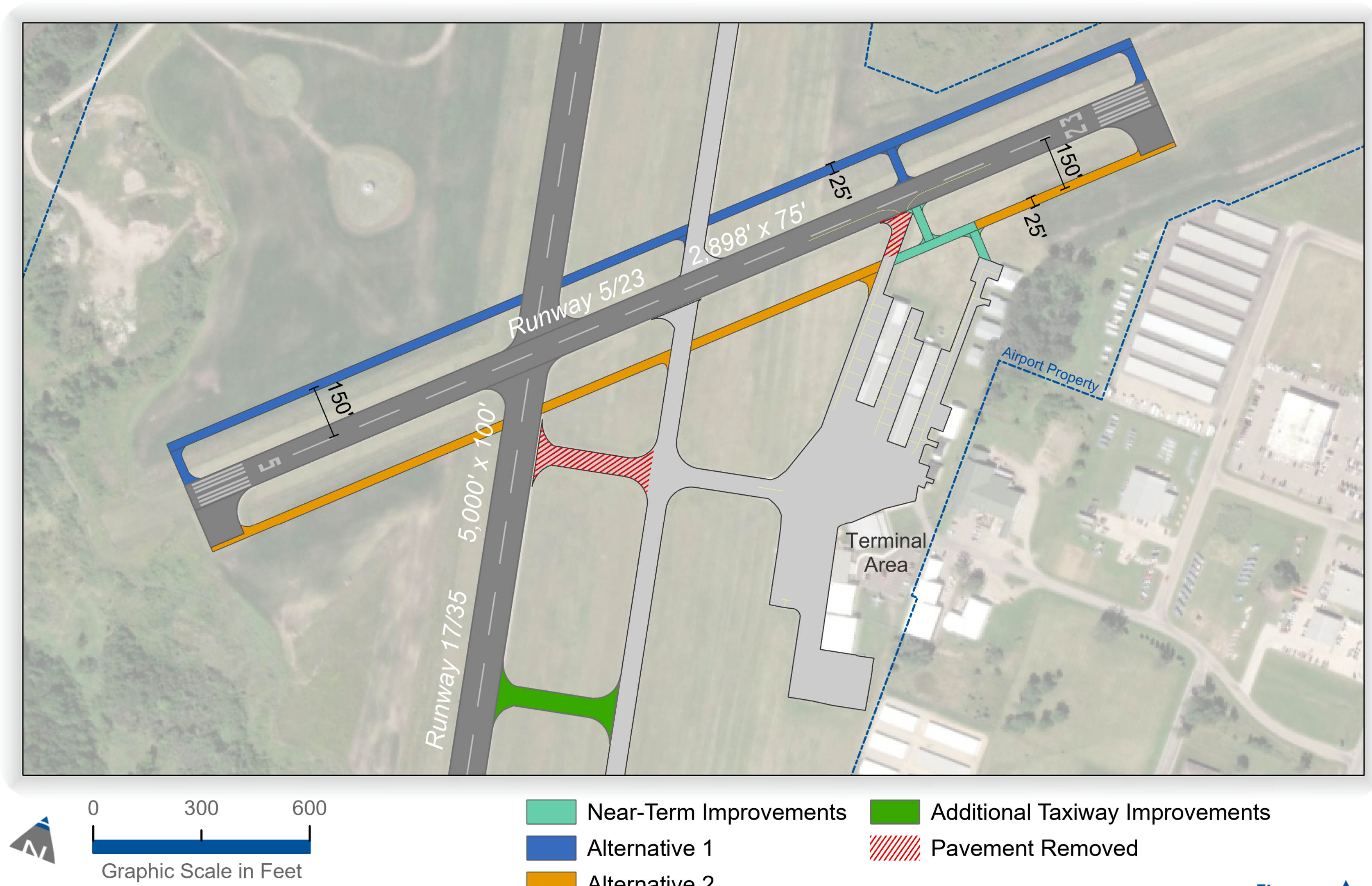

Figure 4-6: **Taxiway Alternatives**

Sources: *Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN*

The parallel taxiway to Runway 17/35 currently crosses in the middle of Runway 5/23, which is generally undesirable as this is considered a high energy intersection by the FAA due to the speed aircraft tend to carry through this region of the runway. However, while a parallel taxiway for Runway 5/23 would make this intersection more accessible, it would not otherwise impact this standard, and any parallel taxiway for the crosswind runway would result in a similar layout.

4.3.1 Direct Access

Regardless of the parallel taxiway alternative selected, the taxiway/taxilane recommendations include some additional improvements to resolve the direct access taxiway connections documented in Chapter 3 from the apron to both runways. Near-term improvements include eliminating direct access from the north side of the apron to Runway 5/23 by removing the pavement segment that connects to Runway 5/23 and instead connecting to a new partial parallel taxiway south of the runway. This parallel taxiway segment would then connect to the runway via a new 90-degree-angled taxiway connector northeast of the existing connector. This new route from the apron to Runway 5/23 would require two turns, indicating to pilots that they are approaching a runway. These improvements would also extend the easternmost taxilane north to connect to the partial parallel taxiway to improve circulation in the hangar area. The parallel taxiway segment would have a 150-foot runway to taxiway centerline separation so it could be expanded into the south full-length parallel taxiway option, described below, if future demand dictates.

Taxiway recommendations also include resolving the direct access connection from the west side of the apron to Runway 17/35. The pavement in this area is in excellent condition and major rehabilitation or reconstruction is not likely within this planning period. Once this pavement requires reconstruction this connection could be staggered from by relocating the taxiway connector segment between Runway 17/35 and its parallel taxiway approximately 250 feet south of its current location. In the interim, the pavement markings that connect this taxiway connector could be extended to better demonstrate the turn required before entering this taxiway connector. Currently, the taxiway centerline pavement marking terminates right as it reaches the west portion of the apron. Extending this taxiway line onto the apron and splitting it to show two clear turning options would better delineate the end of the apron and demonstrate to pilots that they are entering the taxiway/runway system. These two turns would include a 45 degree turn to the north near the fueling area and a 90 degree turn south towards the aircraft tie-downs. This configuration could then be reassessed when it is time for the current taxiway connector to be reconstructed.

4.3.2 Runway 5/23 Parallel Taxiway

A parallel runway is recommended, but not required, for runways with a circling approach. In its current condition, a parallel taxiway for Runway 5/23 is not required either for approach needs or to alleviate traffic congestion. In the event that traffic to this runway increases or a more restrictive instrument approach is attached to this runway in the future a parallel runway would be beneficial. However, in its existing configuration this is not deemed immediately necessary and so neither of these alternatives are unlikely to come to fruition in the short-term. Naturally, a parallel taxiway for Runway 5/23 is directly tied to the future of the runway itself and in the event this runway is abandoned, or its activity levels do not increase, a parallel taxiway would not be necessary.

Taxiway Alternative 1: Runway 5/23 North Parallel Taxiway

Alternative 1 proposes a 25-foot-wide full-length parallel taxiway located 150 feet (centerline to centerline) to the north of Runway 5/23 with a right-angled taxiway connector between the runway and proposed taxiway, approximately 550 feet from the Runway 23 threshold, and taxiway connectors at each runway end. This alternative allows aircraft to taxi north from the hangar area taxiway to the new partial parallel taxiway south of Runway 5/23, described above, to a taxiway connector that crosses the runway to the proposed north parallel taxiway. Aircraft could also taxi west from the apron taxiway connector to Runway 17/35's parallel taxiway, then travel north to reach this taxiway, crossing Runway 5/23 at its midpoint.

While this alternative is feasible, it has some drawbacks. Using the proposed north parallel taxiway in any Runway 5/23 takeoff or landing scenario would require crossing Runway 5/23 at either its midpoint or near the 23 end. In addition, departures from Runway 5 and arrivals on Runway 23 would require an additional runway crossing as aircraft would have to cross both Runway 5/23 and Runway 17/35. FAA guidance recommends limiting runway crossings to reduce the opportunity for human error. Generally, the north parallel taxiway proposed in this alternative is not as accessible as a south parallel taxiway.

Taxiway Alternative 2: Runway 5/23 South Parallel Taxiway

Alternative 2 proposes a 25-foot-wide full-length parallel taxiway located 150 feet (centerline to centerline) to the south of Runway 5/23. With the right-angled taxiway connector between the runway and south taxiway alternative proposed as part of the near-term taxiway improvements discussed earlier there would be no need for additional taxiway connectors associated with this alternative. This alternative is generally more accessible than the north alternative, as it is located closer to the hangar and terminal areas. In Alternative 2, aircraft could taxi north from the hangar area to the new full-length parallel taxiway south of Runway 5/23, then to either runway end.

Aircraft could also taxi west from the apron taxiway connector to Runway 17/35's parallel taxiway, then turn and travel north to reach this proposed taxiway. This alternative does not require any Runway 5/23 crossings, although Runway 5 departures and Runway 23 arrivals would require a Runway 17/35 crossing. Overall, these alternative limits runway crossings, in accordance with FAA guidance. Another benefit of the south alternative is that the full-length parallel taxiway infrastructure would build upon the near-term partial parallel taxiway improvements that are recommended regardless of the parallel taxiway alternative selected, and therefore it ultimately requires less pavement.

Conclusion

In the event that a parallel taxiway is deemed necessary in the existing configuration, where Runway 5/23 remains at its existing length and without an instrument approach, then Alternative 2 would best meet need while not interfering with surrounding infrastructure. However, as stated in the introduction to this section, it is not likely that a parallel taxiway would be needed for Runway 5/23 unless further improvements to the runway are made. In the event the runway is extended, and a non-precision instrument approach attached to the runway then larger safety areas would mean that the undeveloped areas to the north of Runway 5/23 would be more suitable for a parallel taxiway. In summary, this parallel taxiway is directly tied the demand of Runway 5/23. Demand increasing sufficiently in the existing configuration to merit a parallel taxiway is considered unlikely and improvements to Runway 5/23 are not anticipated within this planning period. Therefore, a parallel taxiway is not expected to be needed in the foreseeable future but should be revisited if there is a significant increase in local demand.

4.4 Aeronautical Development Areas

Nearly all of the facilities at AEL are in the existing terminal area. This includes the Arrival/ Departure (A/D) Building, facilities used by the local flight school, the fixed base operator and supporting hangars, maintenance buildings, tenant hangars, and vehicle parking. As the Airport continues to grow it will eventually fill out this area to expand into a new development area. As there are currently some hangar vacancies and additional space in the terminal area, a new development area is unlikely to be required within the near future and the build-out of the existing terminal area should first be completed. Existing and potential development areas are shown in **Figure 4-7** and the existing terminal area is discussed first.

Terminal Area

The terminal area is largely developed, and various constraints limit its further expansion. The primary constraints consist of the Airport property line to the east and south and the building restriction line (BRL) from Runway 17/35 to the west (35-foot BRL) and Runway 5/23 to the north (20-foot BRL). The BRL to Runway 17/35 is unlikely to increase in size, but the restrictions surrounding Runway 5/23 could if a non-precision instrument approach is ever attached to the runway, although this is unlikely to occur during the planning period. Modifying the runway from the visual and circling approaches it currently has to a 1-mile instrument approach would increase the primary surface of the runway from the 250 feet it is now to 500 feet wide. This would result in the primary surface and BRL being repositioned over some of the hangars in the terminal area unless the hangars were repositioned. Due to these limitations, an instrument approach is not anticipated for the duration of the planning period on this runway, and the northern limitation of the terminal area is expected to remain unchanged for the planning period.

The existing terminal area has some open spaces near the existing hangars and additional development opportunities exist in this area. The first area is located northeast of the existing terminal area along Runway 5/23, approximately 4 acres, and occupied by trees. The second is south of the A/D Building. This area is a prime area for additional development as it is a greenfield site and has available access from Pilot Street, which could provide a separate vehicle entrance for this area. In the north part of the terminal area there is 4.5 acres of land that is undeveloped and forested. This area is surrounded by private businesses, which makes providing a separate entrance to this area difficult and would require vehicles to access through existing Airport property.

Aside from these two areas, the majority of the area is built out. While hangar conditions vary, the footprint of the building is heavily influenced by the surrounding buildings. Generally, the T-hangars are in moderate condition and may have over a decade of useful life remaining. This means that removal of these hangars, either to allow for a non-precision instrument approach to Runway 5/23 or to reconfigure the hangar area, would not be ideal in the near future. Hangars along the easternmost taxiway are not in good condition. To further facilitate the orderly removal and replacement of existing hangars, the two following alternatives include three priorities of hangars.

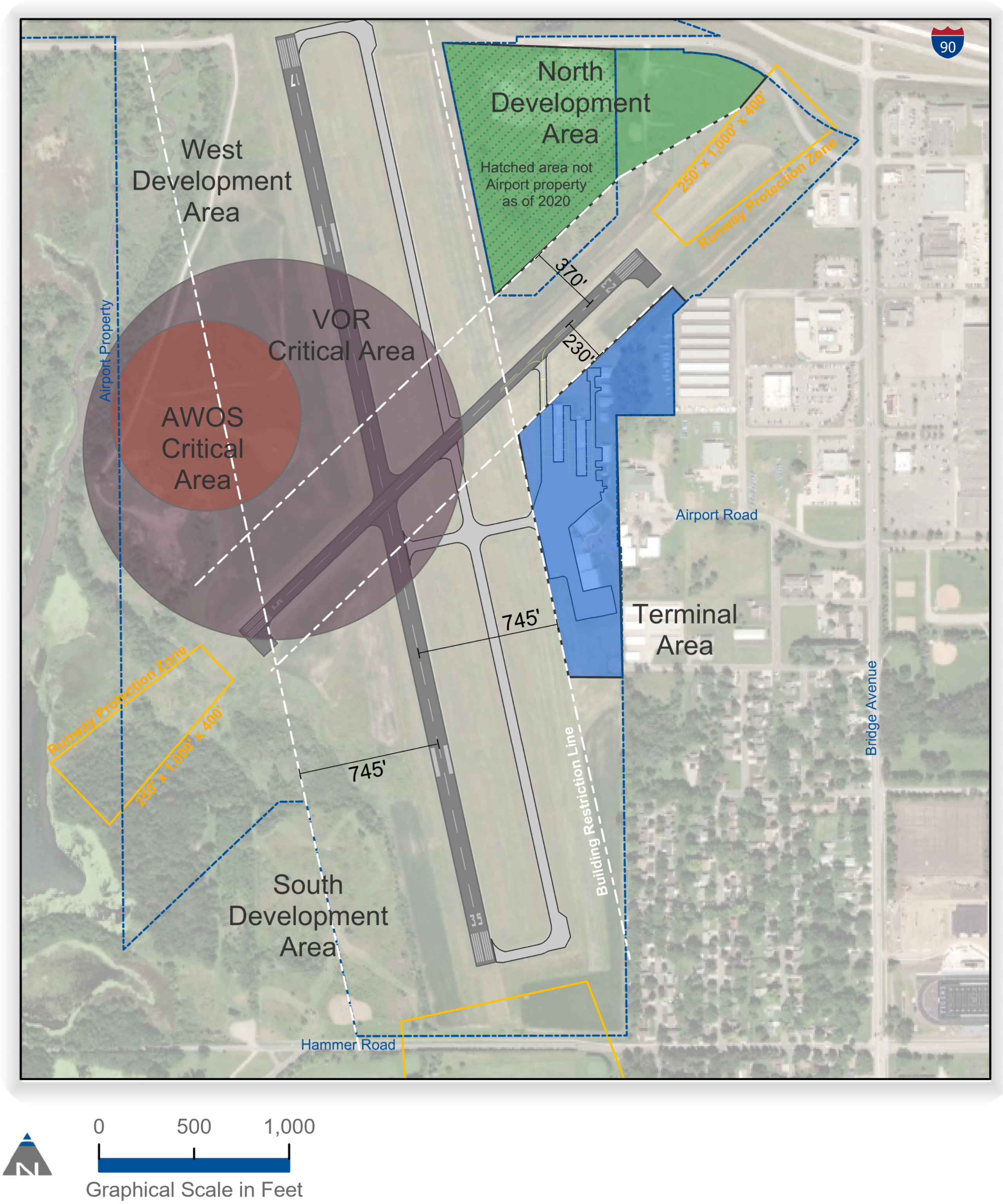

Figure 4-7: **Development Areas**

Sources: *Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN*

The first are those that are expected to remain in a similar footprint for the duration of the planning period as they currently meet Airport needs and few improvements, if any, are needed. Tier two hangars are those that are expected to generally continue to meet Airport needs but may require replacement due to their age. These hangars include hangars in moderate or newer conditions, such as the T-hangars and some box hangars to the north of the developed area. While these structures may need improvement or some minor improvements, the basic footprint is expected to stay the same, although maintenance or expansion is anticipated. Finally tier three structures are generally in poor condition. Due to site constraints, significant changes to the footprints of these development sites are not expected, but improvements or reconstruction would be more immediately beneficial for the Airport.

However, all of these listed potential changes would have a minimal, if any, impact to the total capacity of the existing terminal area. In other words, when a given existing hangar has reached the end of its useful life, any replacement is likely to occupy a similar footprint due to building limitations. Once these older hangars are removed, as demand grows and new hangars in these spaces are needed, it will likely be the most feasible option to allow tenants to construct their own private or corporate hangars and lease land from the Airport. This will minimize the cost to the Airport during development while also allowing tenants additional flexibility in meeting their needs and preferences. This not only incurs less capital expense for the Airport but is likely more prudent given that there are existing vacancies. The larger available spaces in the terminal area, the greenfield southern portion and wooded northern portion, need to be considered. The following two alternatives will access various methods to develop these areas while meeting near-term needs and setting up for a long-term efficient layout. Included in these alternatives are proposed improvements to the aprons to improve aircraft circulation and maneuverability.

In preparing to allow private or corporate hangar development, it is also recommended to establish minimum standards for commercial aeronautical activities and rules and regulations. This helps to ensure that private or corporate development is more homogonous and that the character of the Airport is upheld as it continues to grow. Items covered in typical minimum standards documents are as follows:

- Define types of commercial aeronautical activities the airport will require to be a Fixed Base Operator (FBO).
- Define facility requirements, if any, for commercial aeronautical activities. These often vary depending on size of airport, types of activities, and between FBO and single service providers.
- Establish requirements that ensure safe and efficient operations.
- Establish rates and charges that allow the Airport to be as self-sufficient as possible. These should consider periodic adjustments to maintain a fair and reasonable rate structure.
- Establish rules or policies for actions at the end of a lease term. These could include items such as updates to facilities for lease extensions, reversionary conditions, site restoration, or other actions.
- Established rules that are reasonable, not unjustly discriminatory, and uniformly applied. The rules can discriminate but must be just and fair. An example is rates and charges may be higher for prime airfield locations as compared to less favorable locations.
- Define reasonable hours of operation.
- Define insurance requirements.
- Construction standards may also be defined. Examples: Limit exterior colors, fire suppression, building codes above local standards, etc.

- Subordinate to the FAA Grant Assurances to minimize risk of losing federal funding.

Typical Items covered in Rules and Regulations are as follows:

- Establish requirements for safe and efficient operations. Examples:
    - Restricting use of hangars to help maintain safe and efficient operations. Examples may include storage of flammable chemical (i.e., Fuel, paint, etc.), limit non-aeronautical uses,
    - Limit aircraft to appropriate areas predicated on weight, wingspan, etc. to maintain safe operations.
    - Restrict or limit vehicle traffic and equipment to protect pavement and to minimize access to area that would create a risk to aircraft operations.
- Set limits on open storage of non-airworthy aircraft, wreckage, or unsightly equipment.
- Define any requirements for self service activities such as fueling or maintenance.
- Subordinate to the FAA Grant Assurances to minimize risk of losing federal funding.

Establishing these standards before the presence of private hangars is firmly established will aid the Airport in protecting its development investments and provide expectations both to tenants and visitors.

One of the first Airport owned hangar projects likely to occur in the existing terminal area is the relocation of the 80-foot wooden hangar currently located next to the A/D building. This hangar still has useful life but occupies a central area of the terminal area that could serve a larger hangar. Therefore, the existing wooden hangar should be relocated elsewhere in the terminal area to free up this area while still serving the Airport. There are three locations that stand out as potential relocation sites and each are shown in **Figure 4-8**. The first location appears to be a natural continuation of the existing hangar and would be situated at the northernmost end of the row of central hangars. However, while this seems a natural area for this hangar the size of the structure would mean that it would interfere with the TOFA of both adjacent taxilanes. This would interfere with aircraft circulation as well as severely limit the aircraft the hangar is able to house. For these reasons this first option is not considered suitable.

Both the second and third option could accommodate the building without interfering with surrounding infrastructure, although each has particular advantages. The second location is currently occupied by an aging hangar and could serve as an access point to future hangar development (see the following terminal alternatives). However, this would allow the wooden hangar to mesh into the existing hangar layout and place it in a semi-prominent location next to the SRE, which would aid accessibility while leaving room for future development of the SRE and an access point for further development as shown in Alternative 1 below. The third location is to the south of the terminal area. This site would construct the hangar near the existing apron although a separate taxilane/apron section would need to be constructed to serve the relocated hangar which would open to the west. This location would also benefit from access from Pilot Street and could be the beginning of the hangar row proposed in Alternative 2 below.

Figure 4-8: **Hangar Relocation**

Sources: *Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN*

Each of these locations could serve Airport needs but the primary determining factor will likely be future demand. This wooden hangar is expected to be relocated once a larger hangar is slated to replace it. At that time, if demand also shows that private parties are interested in developing new box hangars to the south and creating access from Pilot Street is feasible then then option three would be the natural expansion point. However, if this hangar needs to be relocated before demand is adequate to begin developing to the south of the existing terminal area, then option two would allow relocation of the hangar with minimal changes to existing development.

In a similar fashion, additional hangar space could be established with another T-hangar in several locations. Although more holistic alternatives are considered later in this section, the addition of a single hangar in the near-term should be considered if demand is present. Shown in **Figure 4-9**, three areas were considered. The third is positioned to the south of the existing structures. While this does not interfere with any existing terminal functions, it occupies a prime area with a potential entrance from Pilot Street that could better serve as a separate entrance to larger hangars. To add a T-hangar here would also require substantial supporting infrastructure, such as taxiways, that are available elsewhere in the terminal area. The second option places the T-hangar along the existing terminal area on the outermost taxilane. This option requires less supporting infrastructure as it could be placed on an existing taxilane, but the orientation would mean that it could only be entered from one side, which limits capacity. Due to the proximity to the BRL, building size would be limited and not sufficient for larger aircraft.

The final option makes use of the existing opening in the terminal area between two of the terminal area taxilanes. This option would require minimal additional pavement to provide entrance to both sides of a six-unit T-hangar. The bays on the west side of this would have some limitation as the taxilane does not meet standards for ADG I aircraft. However, following guidance found in FAA Engineering Brief 78, aircraft with a wingspan of no more than 38 feet 4 inches could pass freely through this area. As many of the popular single engine aircraft, such as the Cessna 172 and Piper Arrow, do not exceed these dimensions, this would be sufficient for potential future based aircraft at the Airport. Therefore, this option is selected as the preferred T-hangar location. The rest of this section will focus on the remainder of the terminal area.

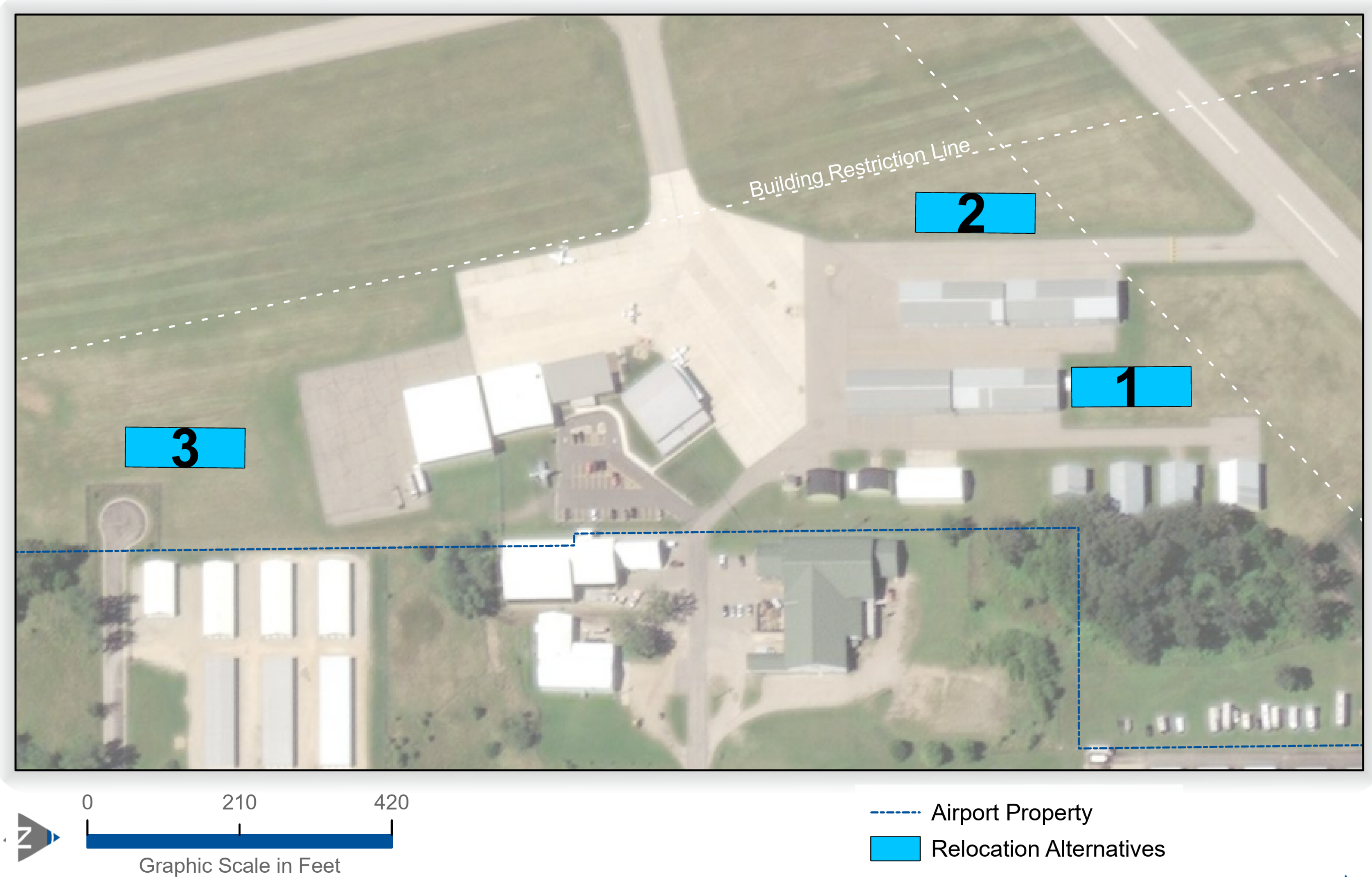

Figure 4-9: **Proposed T-Hangar Locations**

Sources: *Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN*

Alternative 1

Shown in **Figure 4-10**, this first alternative proposes two rows of individual box hangars configured around a central taxilane in the north area currently partially occupied by woodlands near the Runway 23 threshold. Vehicle access would have a separate, vehicle-only entrance to the area. This road would turn north from the main entrance to the Airport and provide access behind the existing first row of hangars to this development area. Providing a separate vehicle access would keep vehicles off the taxiways and reduce traffic in front of the southernmost buildings on this taxiway. Also, this separate entrance would mean that the removal of an existing hangar would not be required to provide access from a taxilane, as proposed in Alternative 2.

Other changes to the terminal area include the addition of hangars and the replacement of the 80-foot- by-80-foot hangar with a 100-foot by 120-foot hangar in a similar footprint to the existing hangar, which could coincide with improving lighting on the apron. However, these options present some challenges. Maintaining the existing hangar footprint would direct aircraft using this hangar into the center of the apron where other aircraft may be using the apron or in the path of fuel trucks transiting the area. The other four hangars shown would be positioned over an existing abandoned gas pipeline, now owned by the City of Albert Lea, that would need to be removed.

One of the open areas is located near the snow removal equipment (SRE) building. The existing SRE building has three bays, is approximately 3,500 square feet, and is located nearly 300 feet north of the Airport entrance. This building houses lawn mowing in addition to the snow removal equipment and is currently meeting the Airport's needs. However, as the Airport continues to grow, and equipment is either upgraded or added, a larger facility will be needed. Fortunately, the space directly north of the SRE building is unoccupied and a natural expansion or replacement opportunity exists. This space could be reserved for an SRE expansion. To the south, the apron could be expanded along with a taxilane to accommodate the 80-foot-by-80-foot hangars, similar to those shown on the previous ALP. However, the taxilane curve and termination between these hangars could make maneuvering an aircraft difficult.

In addition, the layout of these proposed hangars may increase capacity but not as spatially efficient as this area would allow. One of the benefits to this configuration, however, is the allowance of a taxiway connection to the full parallel taxiway. While the connection may be some distance from the existing apron near the A/D Building, it would nevertheless help aircraft circulation in the area, as aircraft would not be forced to turn around but could continue south to reconnect to the airfield via the next taxiway.

Alternative 2

These two hangar rows, located near Runway 23, would have parking behind the hangars, and vehicle access would be provided from the existing eastern most taxilane. While this access point is feasible, it has some drawbacks. The connection between the taxiway and the proposed vehicle access point would require vehicles to drive on the taxilane to reach this point. This would require additional vehicle traffic on what is otherwise primarily used as a taxilane but reduce total pavement compared to Alternative 1 access. The north area would still have two rows of hangars with a central taxiway and vehicle parking, as shown in **Figure 4-11**.

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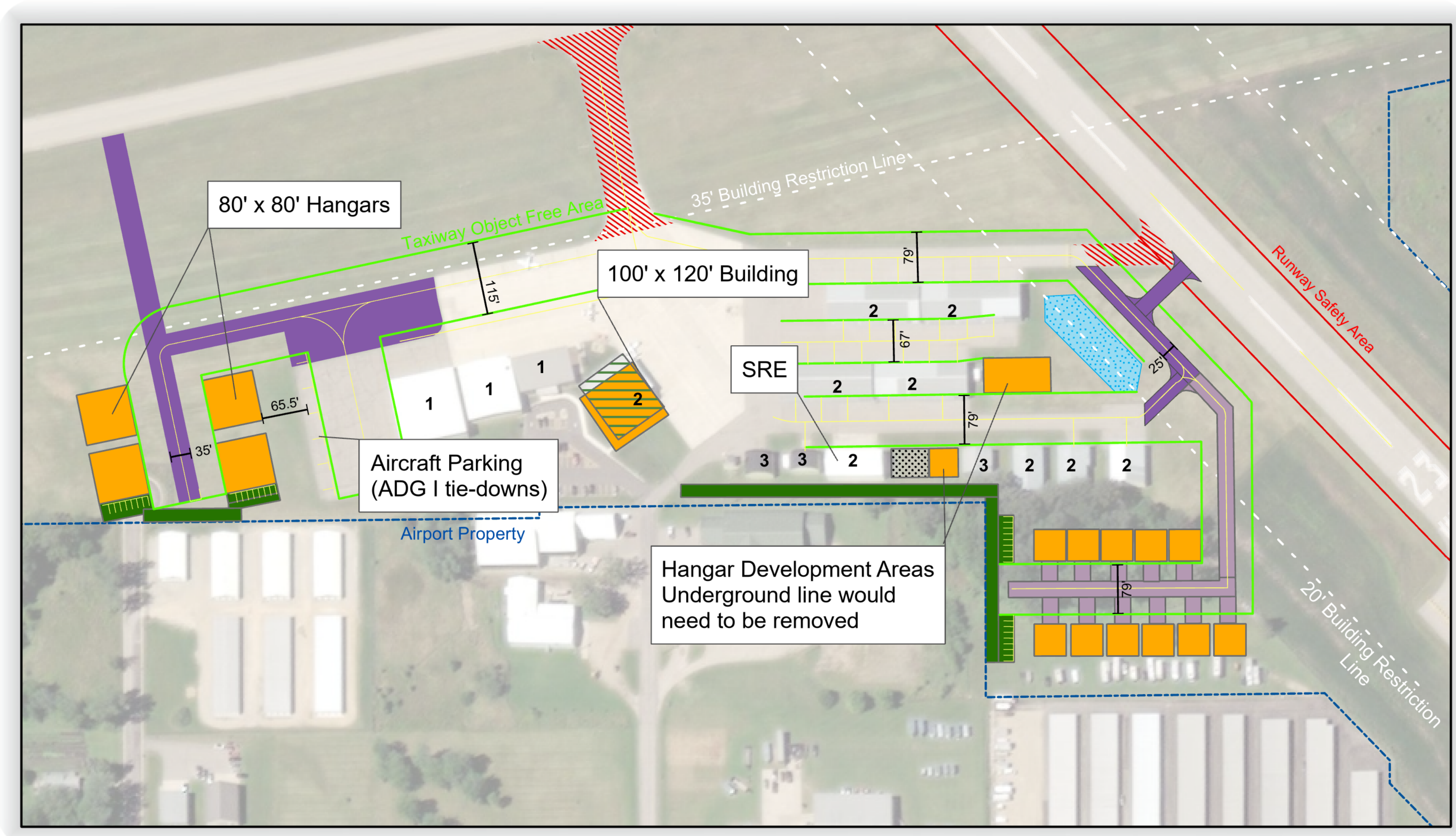


N

0 250 500

Graphic Scale in Feet

Pavement Removed

Roadway/Parking

Reserved for SRE Expansion

New Building

New Pavement

New Pavement Phase 2

Dry Retention Pond

Existing Buildings
1 - First priority
2 - Second priority
3 - Third priority

Figure 4-10: **Terminal Area Alternative 1**

The City of Albert Lea

Sources: *Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN*

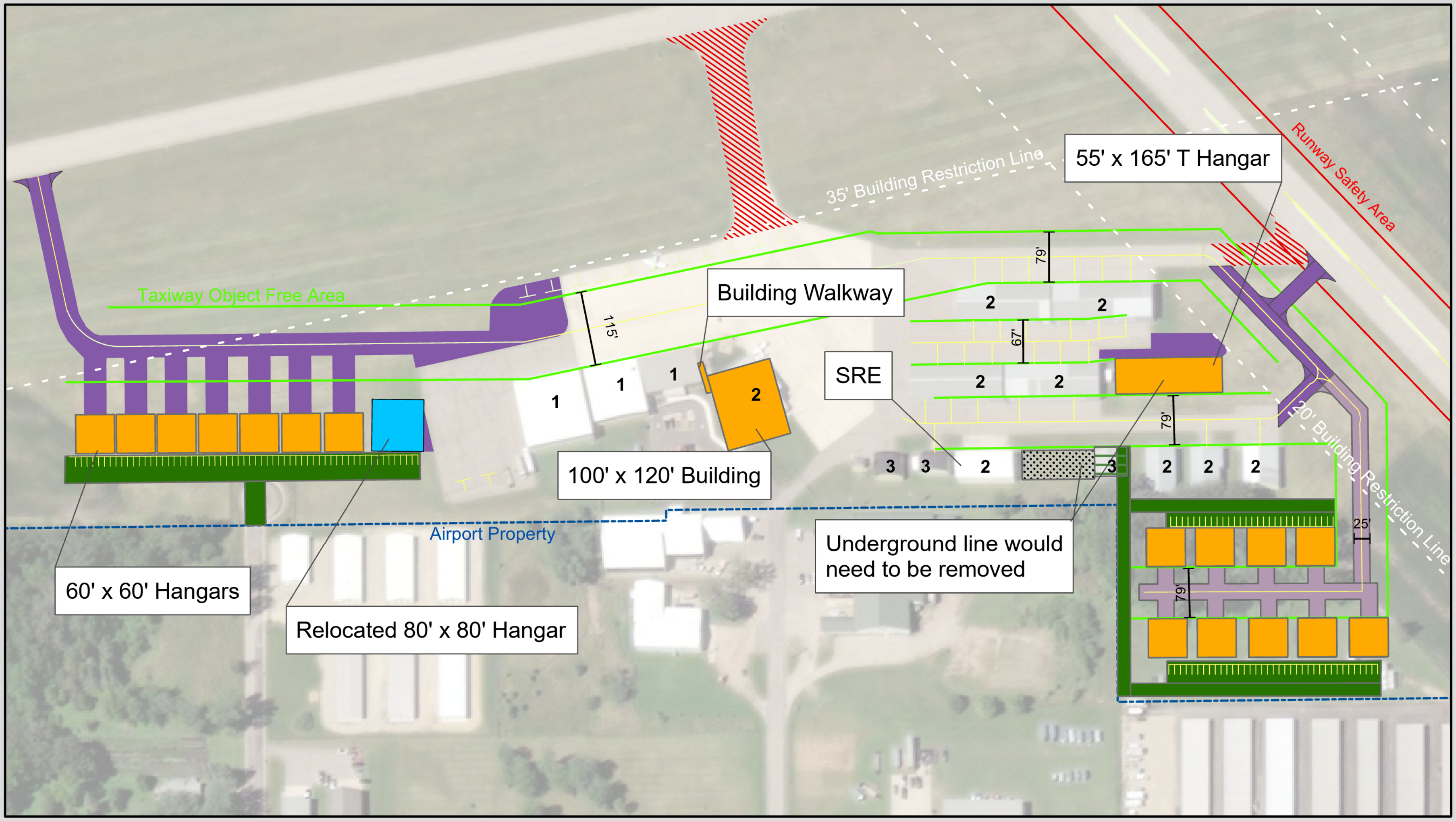


Figure 4-11: **Terminal Area Alternative 2**

Sources: *Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN*

Some aspects of this alternative would be similar to Alternate 1, with the taxiway reconfiguration, space reserved for the SRE, and additional hangars, but has a minor change to the large hangar that will replace the current 80-foot wooden hangar. The proposed 100-foot-by-120-foot hangar would be reoriented to face north and surrounding lighting could be added to improve apron visibility. This is an essential improvement as the Jet A fueling area is dimly lit and visibility at night is limited. Lighting would also be added to the newly developed south hangars and the hangars to the north in the existing woodlands.

The south portion of the terminal area would gain 60-foot-by-60-foot individual hangars for larger aircraft. This location would be ideal as the access from Pilot Street would offer a separate entrance to the area, which is often desirable for both business aviation and private owners. The ramp would be extended through this area to accommodate staging while, similar to the first alternative, a relocated taxiway connection would allow for smooth circulation of aircraft through the area. Hangar setbacks would allow aircraft a place to stage without blocking the taxiway although this area could also be occupied by an apron to allow easier snow removal. The removal of the taxiway connection from the apron would allow for additional tie-down spaces along the edge of the apron. This alternative offers clear advantages over the first alternative via offers superior vehicle access, more spatially efficient box hangars, and a better utilization of the southern portion of the terminal area. Therefore, it is selected as the preferred alternative.

4.4.1 South Development Area

The South Development Area is positioned to the west of Runway 35 and over a portion of the Tall Grass Disc Golf Course. This area was a consideration due to its proximity to Runway 35, its location on City-owned land, and easy access from Hammer Road. However, the proposed relocation of the fence to resolve the primary surface issues discussed in Section 4.2.1 and the location of the resulting BRL significantly reduce the amount of developable space in this area. The 35-foot BRL is located 745 feet to the west of Runway 35. Significant building past this point would require the complete closure of the disc golf course, which is undesirable as it popular in the community and serves a role as a low-population density buffer between the nearby parks and the Airport. A potential layout demonstrating this challenge is shown in **Figure 4-12**. A partial parallel taxiway would need to be constructed to provide aircraft circulation by means of two connections to the runway. An access road from Hammer Road would parallel the line of trees that runs north-south in the Tall Grass Disc Golf Course and lead to parking for each separate hangar cluster. For these reasons, this site is not considered an attractive area for development.

4.4.2 West Development Area

An existing entrance to the western portion of the Airport, west of Runway 17/35, from West Plaza Street provides access to the very high frequency omni-directional range (VOR) and automated weather observing station (AWOS). The state-owned VOR is used for local navigation and supports a VOR approach for both ends of Runway 17/35. The AWOS reports weather on the airfield in real time to pilots or other interested parties. Due to the nature of these two facilities, a dedicated amount of open space is required around each one to prevent interference in the VOR's signal and the AWOS's weather reading. The VOR's larger critical area, at 1,000 feet, eclipses many of the AWOS's sitting criteria, which are typically 500 feet based on the specific weather sensor. In addition to the critical area, the VOR limits the proximity of metal buildings via a safety area that originates at the center of its base and rises at a rate of 1.2 degrees. This would allow a building approximately 20 feet tall at the edge of this critical area. Even if a less restrictive BRL of 20 feet is established on the west side of Runway 35, this would only allow for an area of approximately 0.3 acres or 13,000 square feet for development.

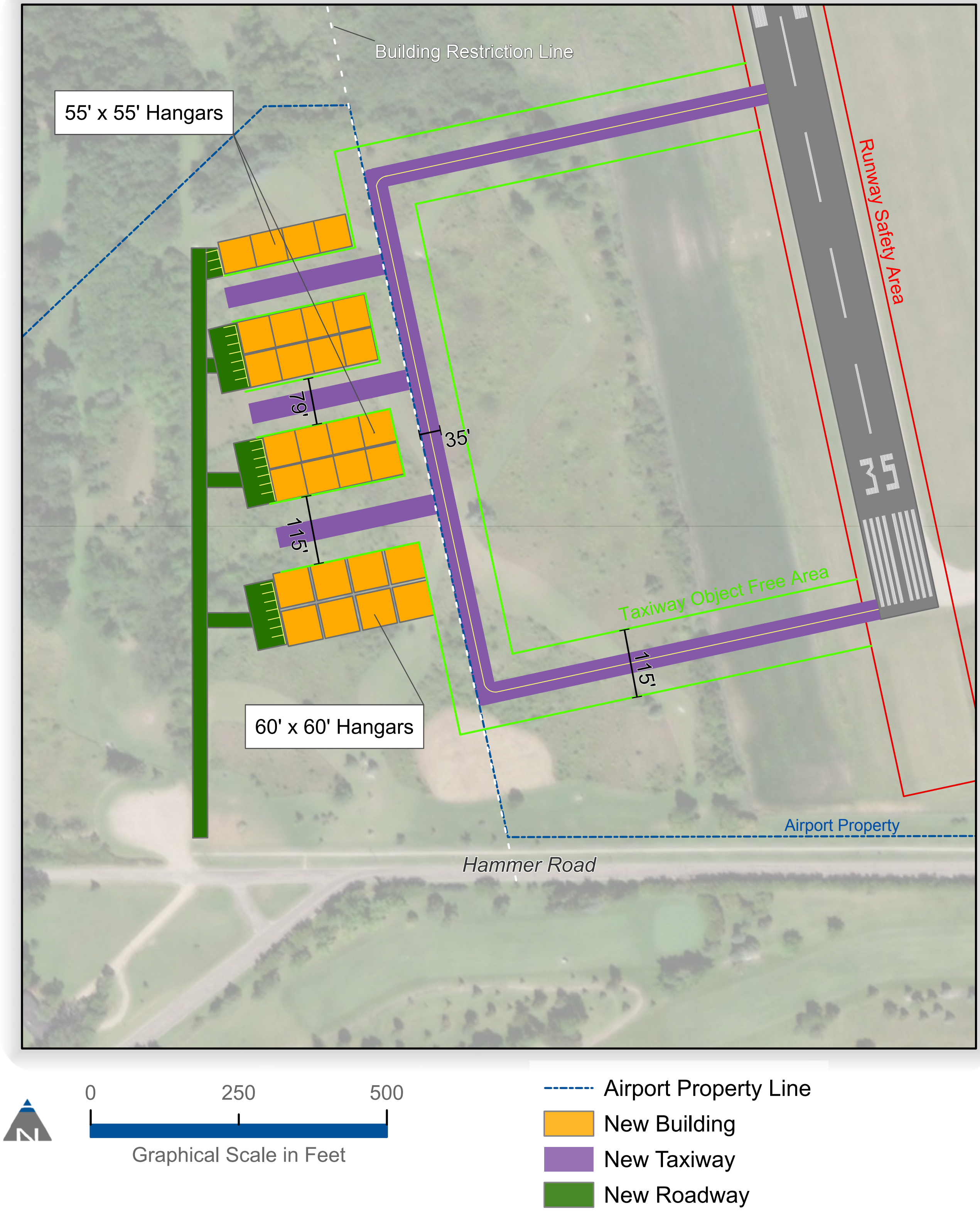


Figure 4-12 **South Development Area**

Sources: *Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN*

Due to this small footprint of available developable space and the additional pavement needed, such as the partial parallel taxiway required to support this space, there would only be room for a very limited number of small hangars and nothing available for non-aeronautical development in this area. Access could be provided through the existing gate from West Plaza Street but, like the South Development Area, aircraft would need to cross Runway 17/35 to reach services such as fuel and the A/D Building. The smaller access point and limited visibility would also make this a less appealing location for any non-aeronautical development. In summary, while this area would not require any land acquisition, the small buildable area may support future specific function facilities but is not an ideal area for a larger future development area.

4.4.3 North Development Area

The north development area (**Figure 4-13)** consists of the space north of the Runway 23 threshold, east of the Runway 17 threshold and bounded by East Plaza Street to the north. Part of this land is already owned by the Airport, and the remaining land would require approximately 20 acres of land acquisition. This remaining section of land is currently privately owned and used as excavation storage. This would introduce some grading challenges but is free of structures. While this acquisition would likely make this the most expensive development option of those presented here, it is the only option with enough space for a significant non-aeronautical development area.

Aeronautical development could extend south parallel to the Runway 17 threshold at the 495-foot BRL with access to the runway provided by taxilane connections to the existing parallel taxiway. This is an advantage compared to development area on the west side of Runway 17/35 that would require a partial parallel taxiway constructed to support aircraft circulation. Continuous box hangars would be constructed alongside these supporting taxilanes, and parking could be positioned in between alternative rows of hangars to maximize spatial efficiency. The lack of other facilities in the area, such as the VOR or AWOS, limits other safety areas or surfaces that would impose limitations on development. Access to these parking areas and associated hangars would be provided by the access road connecting to East Plaza Street. While this is the only alternative that would require land acquisition, it would offer the most benefits for future development based on ease of access, few building limitations, and sufficient land to also support non-aeronautical development. As the current terminal area is expected to be able to support the projected growth for the duration of the planning period, this proposed acquisition is not an immediate need, but it is recommended that the City pursue a right of first refusal agreement in the instance that this property is sold in the future and should be depicted on the current ALP.

4.5 Supporting Facilities

Supporting facilities can include a wide variety of other structures supporting dedicated services. This may include navigational aids such as wind cones and signage or major structures intended to house large SRE. This section will discuss the remaining aspects of the Airport to be considered during this planning period.

The remote communications outlet (RCO) currently positioned in the 80-foot-by-80-foot wooden hangar has been disabled by the FAA. This followed a national effort to reduce the number of RCOs. In 2017, the FAA was maintaining a network of over 2,100 RCO locations, which are used by contractors to communicate with pilots in flight. These can be used to receive or open flight plans, including IFR, as well as obtain weather briefings and other services. In April 2018, the FAA made known the intent to significantly reduce the number of RCOs around the country. While this reduces the FAA infrastructure at AEL, local personnel seek a dedicated land line to the RST approach. Given the recency of these events, coordination with the FAA is ongoing to determine feasible solutions for this capability.

Figure 4-13: **North Development Area**

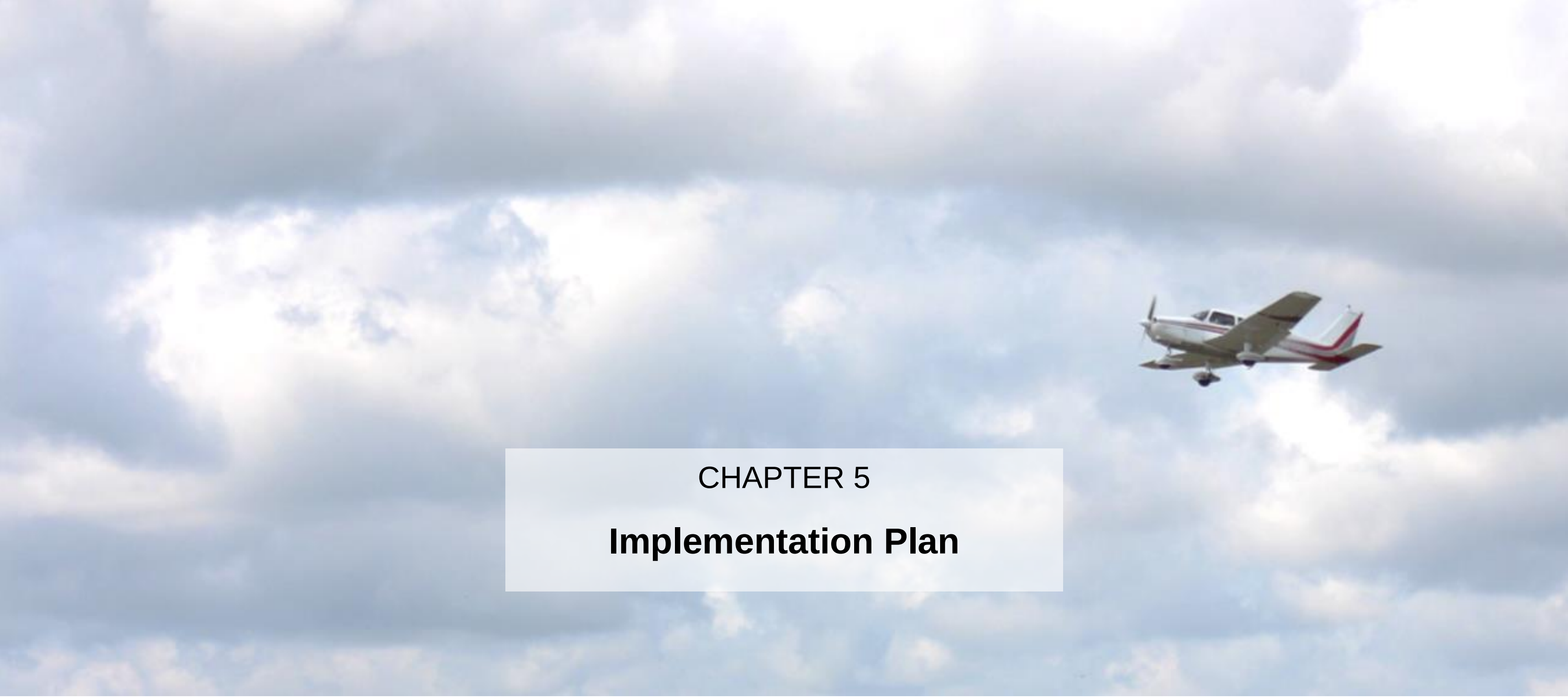
Sources: *Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN*

In the event that Runway 5/23 is expanded, likely beyond this planning period, an additional wind cone should be considered due to the greater distance between runway thresholds. FAA guidance states that a location to the left of the runway threshold is ideal for typical traffic patterns. This could easily be accomplished by placing the wind cone outside of the 250-foot ROFA to the left of the existing Runway 23 threshold.

4.6 Summary of Alternatives

The section summarizes the primary preferred alternatives for ease of reference. Overall, Albert Lea is a unique airport that serves a wide spectrum of aircraft. Preparing for the future will aid its ability to continue to serve general aviation and the City of Albert Lea. Selected alternatives can be seen below:

- Runway length for Runway 17/35 is considered adequate for the planning period but a clearway is recommended to aid turbine operations. An extension to Runway 5/23 is considered unlikely during this planning period. However, the extension to the paved runway will be shown on the Airport Layout Plan for continued runway protections.
- Instrument approaches are meeting the needs of the Airport. However, it is recommended the Runway 35 RNAV (GPS) approach return to 1-mile visibility limits, which will reduce incompatible land uses in the RPZ. The 3/4-mile approach on Runway 17 will be maintained. This will also include shifting the perimeter fence to the west and relocating three disc golf baskets.
- The existing taxiway connections from the apron to the runways are recommended to be reconfigured to align with current FAA guidance. A parallel taxiway should be protected for Runway 5/23 but is not expected within this planning period.
- Future aeronautical and non-aeronautical development is expected to occur to the east of Runway 17. This is not expected to be needed within the current planning period as the current terminal area is capable of supporting additional hangars.
- Alternative 2 is the preferred alternative for the future build-out of the terminal area as it offers better access and circulation and greater capacity.



CHAPTER 5

Implementation Plan

5.1 Introduction

Keeping a current Capital Improvement Plan (CIP) that accurately reflects the anticipated expense and timing of upcoming projects is crucial for any publicly funded airport. Projects must be listed on the CIP in order to be eligible for funding. In Minnesota there are 136 publicly funded airports in the state and 97 federally funded airports. The CIP allows projects to be reviewed and funding distributed to airports based on priority.

5.2 CIP General Outline

This table shows the order of many of the focal projects discussed in the previous chapter in addition to their potential funding sources. This serves to demonstrate not only the priority of these projects but how they can fit together over the long-term vison of the Airport. While correcting issues or building hangars as the need arises can be a tempting avenue, it can lead to long-term congestion or an inefficient use of space. The order of projects below is intended to meet immediate needs while also adhering to the Airport's long-term vision. The CIP for the planning period at the Albert Lea Municipal Airport is shown in **Table 5-1**.

Table 5-1: Airport Capital Improvement Plan

Description	FAA	MnDOT	Local	Total
2022 (SFY 2023)				
Airfield Crack Routing, Cleaning & Sealing, Seal Coat and Pavement Marking[1]	$360,000	$90,000	$50,000	**$500,000**
Bi-Fold Door & Heat for Maintenance Building	$0	$47,600	$20,400	**$68,000**
Glider Area Turf Rehab[2]	$0	$7,000	$3,000	**$10,000**
Fuel System EMV Upgrade	$0	$21,000	$9,000	**$30,000**
Replacement Runway Guidance Signs and Updates to LED	$0	$28,000	$12,000	**$40,000**
2023 (SFY 2024)				
Loader, Blower and Mower Replacement, Sweeper Attachment	$0	$140,000	$60,000	**$200,000**
Existing Hangar Repair & Updates	$0	$70,000	$30,000	**$100,000**
Improve Ramp Lighting	$0	$17,500	$7,500	**$25,000**
Design for T-Hangar (6-unit)	$0	$50,000	$50,000	**$100,000**
2024 (SFY 2025)				
Construct T-Hangar (6-unit)	$0	$500,000	$500,000	**$1,000,000**
Snow Removal Equipment Building Design	$135,000	$7,500	$7,500	**$150,000**
Airport Welcome Sign Update	$0	$52,500	$22,500	**$75,000**
2025 (SFY 2026)				
Snow Removal Equipment Building Construction[3]	$1,350,000	$75,000	$75,000	**$1,500,000**
Site Design for Central Wooden Hangar Relocation	$0	$35,000	$15,000	**$50,000**
Design Fixed Based Operator[4]	$0	$101,500	$43,500	**$145,000**
Snow Removal Equipment Vehicle	$144,000	$8,000	$8,000	**$160,000**
2026 (SFY 2027)				
Central Wooden Hangar Site Preparation and Relocation	$0	$210,000	$90,000	**$300,000**
Construct Fixed Base Operator Hangar	$0	$1,050,000	$450,000	**$1,500,000**
Fee Simple Land Purchase of Ulland Pit - Approx. 21 acres	$225,000	$12,500	$12,500	**$250,000**
South Building Area Site Design	$180,000	$10,000	$10,000	**$200,000**
Existing Hangar Repair & Updates	$0	$35,000	$15,000	**$50,000**

Table 5-1: Airport Capital Improvement Plan (continued)

Description	FAA	MnDOT	Local	Total
2027 (SFY 2028)				
South Building Area Site Preparation and Construction	$1,620,000	$90,000	$90,000	**$1,800,000**
2028 (SFY 2029)				
Precision Approach Preparation (Environmental & Land Acquisition)	$238,000	$13,250	$13,250	**$264,500**
2031 (SFY 2030)				
Airfield Crack Routing, Cleaning & Sealing, Seal Coat and Pavement Marking[1]	$360,000	$90,000	$50,000	**$500,000**
Hangar Repair & Updates	$0	$35,000	$15,000	**$50,000**
2035 (SFY 2036)				
Airfield Crack Routing, Cleaning & Sealing	$40,500	$2,250	$2,250	**$45,000**
2036 (SFY 2037)				
Hangar Repair & Updates	$0	$35,000	$15,000	**$50,000**
2041 (SFY 2042)				
Runway 17/35 Pavement Overlay & Pavement Marking	$810,000	$45,000	$45,000	**$900,000**

Notes: FFY: Federal Fiscal Year
1: Crosswind Runway 5/23 pavement maintenance is not AIP eligible
2: Approximately 800-foot section of turf
3: Assumes a new 7,000 square foot building
4: Assumed to be a 100-foot by 120-foot hangar with a concrete floor and average finishes

5.3 Annual Project Descriptions

Part of any planning effort should include a more detailed description of the scope of anticipated projects. This assists in ensuring that needs are met, and projects are completed in a complementary fashion. Previous chapters describe the development of these in greater detail overall while the remainder of this section provides additional details on each project per year.

5.3.1 2022 (FFY 2023)

The routing maintenance for crack sealing and pavement markings will include the airport surfaces, but Runway 5/23 may not be eligible for federal funding based on its current status. This routine maintenance for the Airport is expected to cover the airfield surfaces, such as the runways, taxiways, and aprons. The improvements for the maintenance building include a bi-fold door as current equipment does not fit through the current opening. Other immediate projects include rehabilitating the turf surface east of Runway 17/35, which is used during glider operations, improving payment options for the existing fueling system, and improving Airport signage.

5.3.2 2023 (FFY 2024)

Projects slated for this year focus on providing the Airport with adequate equipment and improving the existing hangar areas. Attachments for the maintenance and snow removal equipment will be added to the Airport vehicle fleet. Hangar improvements include repairs to the existing T-hangars in the terminal area as many are in disrepair even as several new based aircraft have relocated to the Airport. Another of the hangar improvements slated for this year is the relocation of the large 80-foot-by-80-foot wooden hangar currently located adjacent to the Arrival/Departure Building. As the currently unoccupied area to the south of the existing terminal area is intended to build a row of larger box hangars, this hangar will be relocated to that area to initiate this hangar row.

5.3.3 2024 (FFY 2025)

The space that the wooden hangar will vacate, described above in 2023, would be an excellent location for a Fixed Base Operator (FBO). Projects in 2024 would include the design and construction of the hangar for the proposed FBO. Another hangar that would be designed and constructed in this year is a T-hangar that would align with existing T-hangars on the north side of the terminal area to meet based aircraft demand.

5.3.4 2025 (FFY 2026)

In addition to acquiring a snow removal equipment vehicle, the major effort slated for this year is the design of the south building area. This space is intended to be developed into larger box hangars with an entrance from Pilot Street with connected taxiways and parking. Design will include detailed layouts for this area.

5.3.5 2026 (FFY 2027)

The construction of the south building development area will include enacting the design of the previous year. This construction will include site preparation for privately developed hangars, such as preparing parking areas and bringing utilities to the area. Existing hangars will be repaired and updated for routine upkeep and the purchase of the Ulland Pit immediately north of existing Airport property is also scheduled for this year. The fee simple purchase of this land is dependent on availability and Airport demand.

5.3.6 2031 (FFY 2032)

This year includes regular maintenance and upkeep for the Airport through crack sealing and seal coating for the airfield as well as normal hangar upkeep and repair.

5.3.7 2035 (FFY 2036)

Normal maintenance upkeep of the airfield is scheduled for this year.

5.3.8 2036 (FFY 2037)

Additional hangar repairs for the existing terminal area are planned for this year.

5.3.9 2041 (FFY 2042)

Runway maintenance and updated pavement markings are planned for this year.

Appendix A

Wildlife Hazard Site Visit Summary Report

Wildlife Hazard Site Visit Summary Report for Albert Lea Municipal Airport

Prepared for:

City of Albert Lea
Albert Lea Municipal Airport
400 Airport Road
Albert Lea, MN 56007

Prepared by:

Mead & Hunt
www.meadhunt.com

February 2021

Table of Contents

Appendices

Project Team

The Wildlife Hazard Site Visit (WHSV) and summary report for the Albert Lea Municipal Airport were conducted by Mead & Hunt, Inc. in October 2019. The site visit and report were conducted in cooperation with City of Albert Lea and Airport staff.

The Mead & Hunt team included the following individuals:

- Rick Jones, a Qualified Airport Wildlife Biologist in accordance with Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5200-36B, "Qualifications for Wildlife Biologist Conducting Wildlife Hazard Assessments and Training Curriculums for Airport Personnel Involved in Controlling Wildlife Hazards on Airports." Mr. Jones conducted all wildlife surveys and prepared the WHSV report.
- Matt Wagner, an aviation engineer and planner with extensive knowledge of and experience working on the Albert Lea Municipal Airport. Mr. Wagner provided review of the WHSV report.
- Lisa Harmon, a senior environmental planner with expertise in wildlife hazard management. Ms. Harmon reviewed and provided input to the WHSV report.

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Conflicts between aircraft and wildlife have occurred since the dawn of aviation. Orville Wright was the pilot associated with the first documented bird strike in 1905 during a flight over Dayton, Ohio. The first fatality associated with a wildlife strike occurred on April 3, 1912, when Calbraith Rodgers died after his aircraft struck a gull and crashed in Long Beach, California.

The Federal Aviation Administration (FAA) and the United States Department of Agriculture-Wildlife Services (USDA-WS) publish an annual report that summarizes wildlife strikes to civilian aircraft in the United States since the FAA began to record strike data in 1990. According to the 2019 report, which addresses wildlife strikes during the period from 1990 to 2018 (FAA 2019), the following statistics are representative of wildlife strikes with civilian aircraft in the United States:

- The number of wildlife strikes reported to the FAA has increased by more than 8 times since 1990, from a total of 1,356 strikes in 1990 to a total of 15,799 strikes in 2018.
- During the period from 1990 to 2018, a total of 214,048 strikes were reported. In 2018, birds were involved in 94.7 percent of the reported strikes, terrestrial mammals in 1.8 percent, bats in 3.2 percent and reptiles in 0.3 percent.
- Although the number of reported strikes in the USA has dramatically increased since 2000 (from 5,871 in 2000 to 15,799 in 2018), the number of damaging strikes has declined 8 percent during the same timeframe (from 741 in 2000 to 684 in 2018).
- The decline in damaging strikes has been most pronounced for commercial aircraft in the airport environment (at 1,500 feet above ground level). Damaging strikes have not declined for general aviation (GA) aircraft.

1.1 Regulatory Background

The FAA is the agency responsible for establishing and enforcing Federal Aviation Regulations (FARs), which are codified in Title 14 of the Code of Federal Regulations (CFR). FAA regulations and policies seek to enhance safety both at airports holding certificates under Title 14, CFR Part 139 (also referred to as FAR Part 139) and at non-certificated federally obligated airports.

Although the Albert Lea Municipal Airport (AEL or “the Airport”) does not hold a certificate pursuant to FAR Part 139, this WHSV analysis and report were developed in accordance with FAR Part 139 guidelines. AEL is a federally obligated airport, and the City of Albert Lea (City) receives funds from the FAA to undertake capital improvements. When an airport owner, such as the City, accepts funds from FAA-administered airport financial assistance programs, it must agree to certain obligations and the terms of its federal grant assurances. These obligations require the grant recipient to maintain and operate its airport facilities safely and efficiently in accordance with specified conditions.

The FAA has established 37 specific grant assurances that airport operators must adhere to if they are to receive federal funds. Wildlife hazard management is associated with FAA Airport Improvement Program

(AIP) Grant Assurance No. 19, “Operations and Maintenance.” FAA may recommend that a federally obligated airport conduct a wildlife study, such as a Wildlife Hazard Site Visit (WHSV) or Wildlife Hazard Assessment (WHA) in accordance with Grant Assurance No. 19. Pending the results of the WHSV or WHA, the FAA may also recommend that an airport develop a Wildlife Hazard Management Plan (WHMP). The City received funding from FAA to conduct the WHSV at AEL.

Mead & Hunt, Inc. (Mead & Hunt) conducted a WHSV for AEL during a four-day period from October 11 to October 14, 2019 to identify the presence of potentially hazardous wildlife on and near AEL that could pose risks to aircraft operations. The WHSV was conducted in accordance with FAA guidance and FAA Advisory Circular (AC) 150/5200-38, “Protocol for the Conduct and Review of Wildlife Hazard Site Visits, Wildlife Hazard Assessments, and Wildlife Hazard Management Plans.” According to the AC, a WHSV must include three components:

- Gathering airport information;
- Conducting field observations; and
- Preparing a final report with recommendations.

Airports can use a WHSV to quickly evaluate and mitigate potential hazards and to determine whether a WHA and WHMP are necessary.

1.2 Project Objectives

In accordance with the FAA guidance, the objectives of the WHSV are to:

- Identify the wildlife species observed, their numbers, locations, and local movements.
- Identify and locate features on and near the airport that attract wildlife.
- Provide a description of the wildlife hazards to aircraft operations.
- Recommend actions for reducing identified wildlife hazards to aircraft operations.

2.1 Site Background

The Albert Lea Airport was developed as a private airfield in the 1920s and located on the City's west side. The Airport was relocated to its current location near the Interstate 90 (I-90) & Interstate 35 (I-35) corridor in 1943 as part of the Civilian Pilot Training Program during WWII (see **Figures 1** and **2**). AEL is a public-use General Aviation (GA) airport that is owned and operated by the City with the help of an Airport Advisory Board.

AEL is approximately 3 miles north of the City's downtown business district in Freeborn County, Minnesota. The airport is bound by residential development to the south and east, I-90 to the north, and wetlands, lakes, and agricultural areas to the west. Agriculture is the predominant use north and west of the airport and in the area surrounding the City. Cultivation includes the production of corn and small grains.

The Fountain Lake complex is adjacent to the southwest side of the airport, and Goose Lake is approximately 1.15 miles southeast of the airport. The Green Lea public golf course is directly south of the airport. The large Albert Lea Lake is approximately 2.0 miles south of the airport. Bancroft Creek traverses the northwestern portion of the airport property and flows south to Fountain Lake, adjacent to the Airport's western boundary. **Figure 3** identifies surface water features, the City of Albert Lea, adjacent agricultural areas, and other features that were considered during the planning and conduct of the WHSV.

The Airport is located within the Western Corn Belt Plains-Des Moines Lobe Level III and IV Ecoregions established by the United States Environmental Protection Agency (EPA 2019). This ecoregion is characterized by vast fertile plains of deep soils dominated by row crops. The climate of Albert Lea and Freeborn County is characterized by distinct seasonal patterns: Summers are hot and humid with average temperatures in the mid to high 80s in degrees Farenheight (°F) and most precipitation received from thunderstorms. Winters are cold and snowy with average temperatures in the high 20s °F with precipitation resulting from snowstorms.

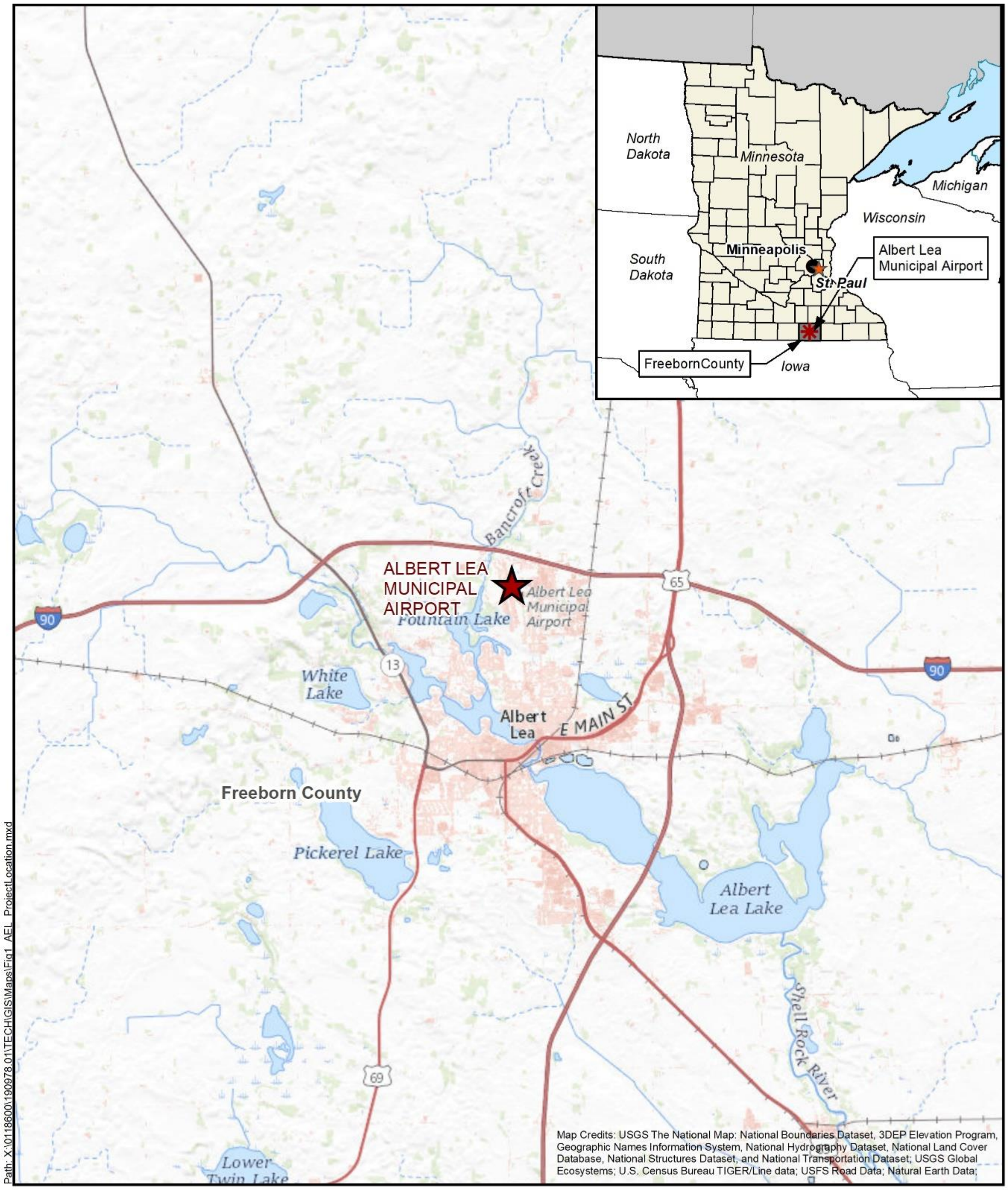

Figure 1
Site Location
Albert Lea Municipal Airport, Freeborn County, Minnesota

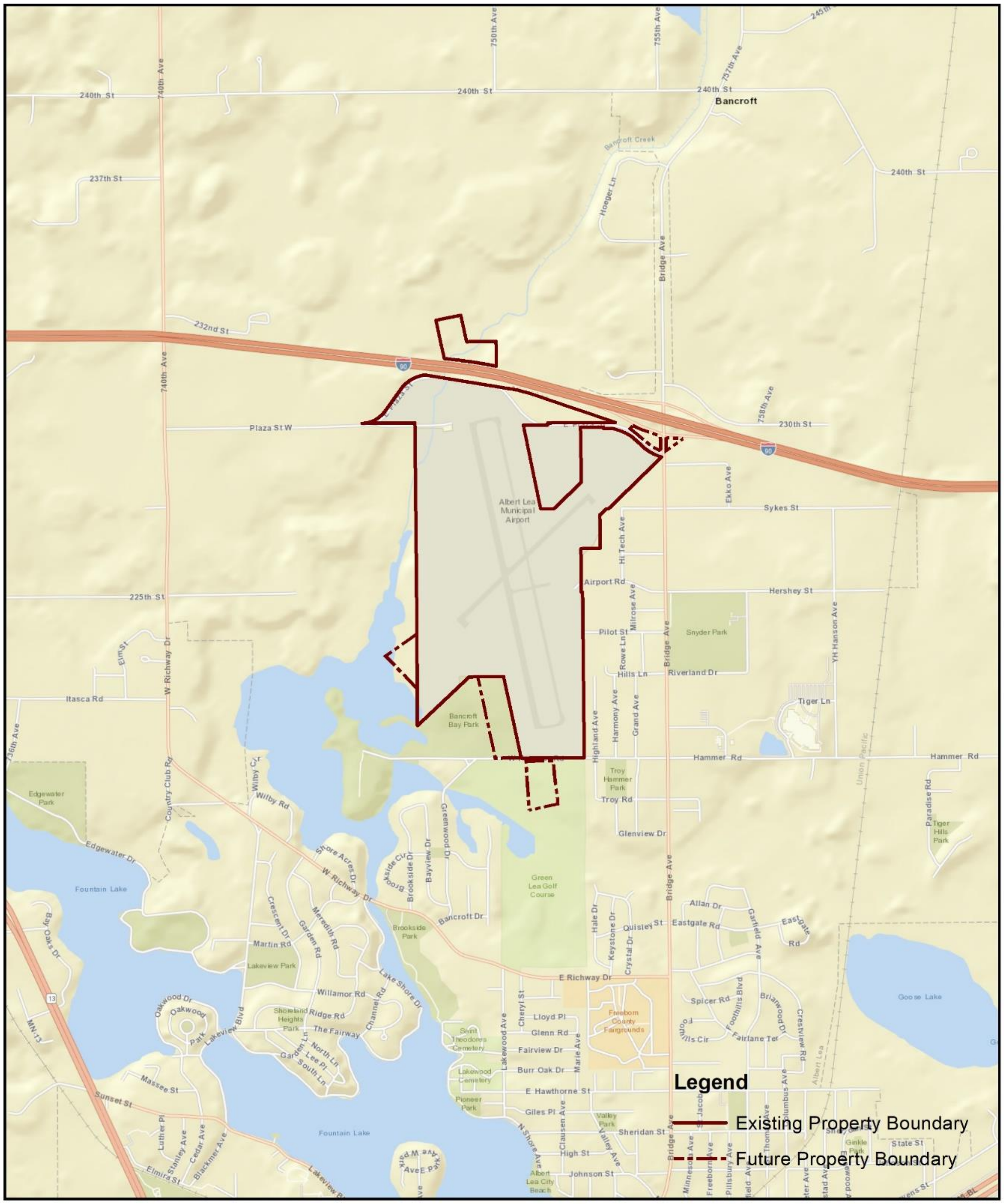

Figure 2
Site Vicinity
Albert Lea Municipal Airport,
Freeborn County, Minnesota

Map Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community

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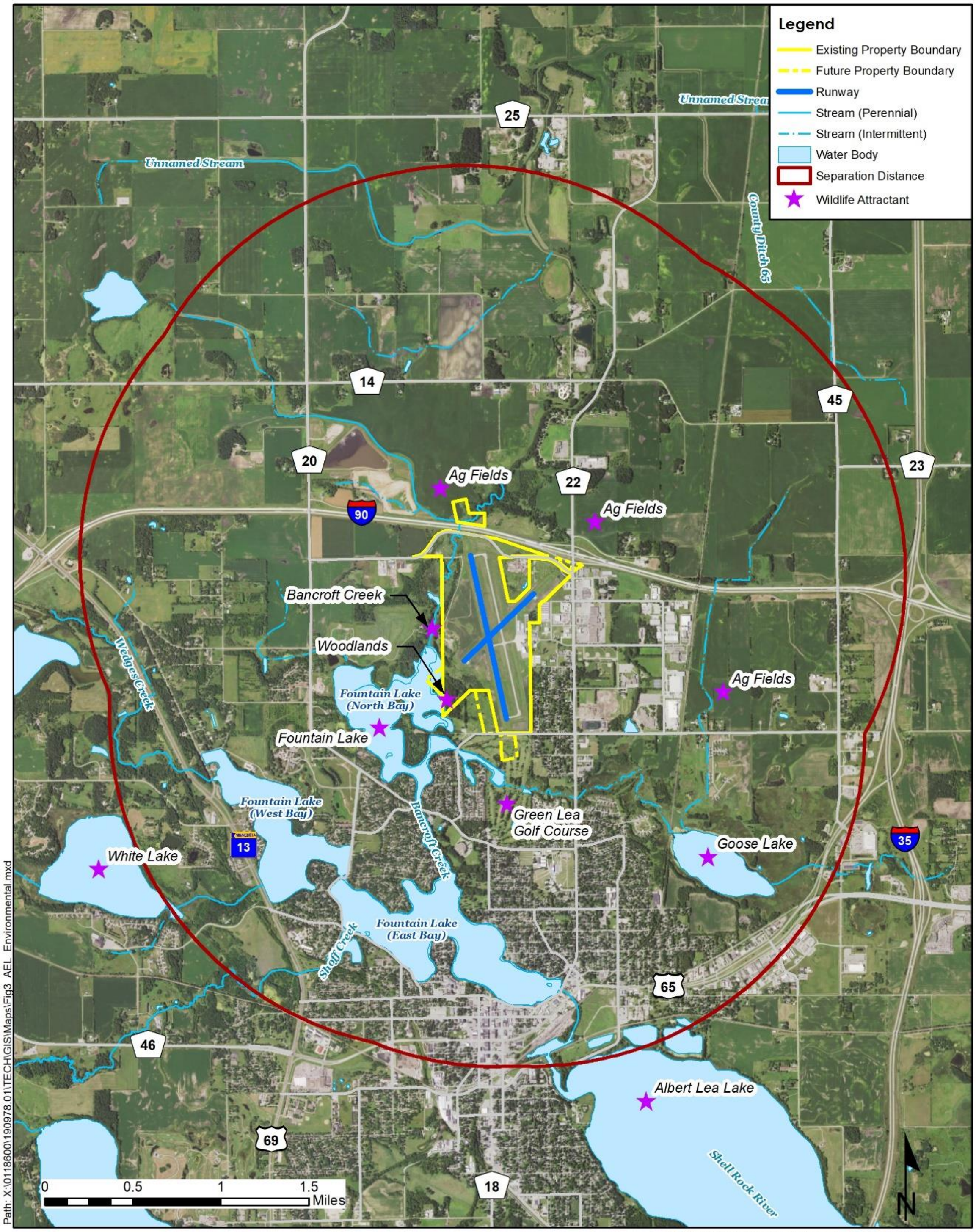

Image Source: FSA NAIP, Freeborn County, Minnesota 2019, 1m

Figure 3
Land Uses and Wildlife Attractants
Albert Lea Municipal Airport, Freeborn County, Minnesota

Photo 1: *View east across the infield at the AEL arrivals/departures building.*

2.2 Airport Description

AEL is a non-towered GA airport. The airfield consists of two bituminous surfaced runways:

- Runway 17/35 is 5,000 feet long, 100 feet wide, and oriented northwest-southeast; and
- Runway 5/23 is 2,898 feet long, 75 feet wide, and oriented northeast-southwest.

Runway 17/35 serves as the primary runway and is equipped with a parallel taxiway. The runway includes GPS/LPV approach and can support operations to weather minimums of 250 feet and ¾-mile visibility. The runway is also equipped with a Very High Frequency Omni-directional Range (VOR) approach procedure, Medium Intensity Runway Lights (MIRLs), Runway End Identifier Lights (REILs), and a Precision Approach Path Indicator (PAPI). Runway 17 has an Omni-directional Approach Lighting System (ODALS). Runway 5/23 has no instrument approach, runway lighting or visual navigational aids.

According to the Airport's most recent 5010 record, 60 aircraft are based at AEL including 45 single-engine piston, four multi-engine piston, six ultralights, two helicopters, two glider airplanes, and one jet. For the 12-month period ending on October 31, 2017, approximately 15,510 annual operations occurred at AEL, of which 65 percent were local general aviation, 26 percent transient general aviation, 8 percent air taxi, and 1 percent military. The City owns four six-unit T-hangars and several box hangars that are available for lease. Albert Lea Airport, Inc., is the fixed-base operator (FBO) responsible for the day-to-day management of the airport on behalf of the City. Accelerated Aviation Instruction is a flight training school located at AEL. The City owns approximately 332 acres at the airport with approximately 250 acres inside the airport perimeter/boundary fence.

Photo 2: *View northeast at Runway 5.*

Photo 3: View southwest across the infield and toward the Runway 35 approach end.

Photo 4: *View of hangars that are available for public lease (looking south).*

2.3 Existing Wildlife Hazard Management at AEL

The staff of Albert Lea Airport, Inc., which manages the airport, disperses hazardous wildlife when it is observed at the airport. Mr. Jim Hanson, Airport Manager, stated that he patrols the Air Operations Area (AOA) regularly to disperse wildlife from the airfield. The birds that are most frequently dispersed include Canada geese and gulls.

The airport is equipped with a perimeter security fence that excludes mammals from entering the AOA, and Mr. Hanson says that he frequently dispersed deer and coyotes from the AOA before fence construction. He also manages the airfield turf for the presence of gophers, thirteen-lined ground squirrels and badgers that dig holes in the grass. The City holds a Federal depredation permit to perform lethal control of migratory birds.

The FBO operator maintains turf grass well throughout the airfield. The grass was observed to be 6 inches high at the time of the site visit, and Mr. Hanson stated that he typically maintains turf grass at a height of 6 inches depending on weather-related field conditions. Portions of the airfield perimeter are leased to a local farmer for small grain production. These fields are typically planted in May and harvested in late September and into October. The edge areas in between the crop fields and the airfield turf are non-accessible to airport mowing operations, because of ridges or drainage that prevent mowers from accessing these areas.

Photo 5: *View of the airport perimeter fence along West Hammer Road. Note that the bottom of the fence is not flush with the ground, which enables small- and medium-sized mammals to enter the AOA.*

Photo 6: *View of the airfield grass, which is typically maintained at a height of 6 to 12 inches.*

Photo 7: *View of the edge areas between the crop fields and the airfield turf grass. The City is unable to maintain this area because ridges and drainage prevent mowing operations.*

2.4 Personnel Responsible for Airport Operations

Mr. Jim Hanson serves as the Airport Manager and is paid by the City of Albert Lea. The day-to-day operations of the airport are managed by Jim Hanson.

2.5 Recent Airport Improvements

The City undertook a series of major airport improvements from 2008 to 2013, which included the construction of Runway 17/35 and its full-length, parallel taxiway, as well as the installation of its associated navigation and approach aids including REILs, a PAPI, and an ODALS. Also included in the comprehensive airfield improvements was the installation of an eight-foot high chain-link fence stretching over 3.7 miles around the Airport's perimeter, a new airfield electrical vault and reconstruction of the main apron.

The most recent airport improvement project at AEL included the construction of a 4,500-square-foot arrival/departure building and parking lot. The new facility has a passenger waiting area, FBO office space, conference room, vending area, flight planning room, pilot's lounge, flight school and restrooms.

Major airport improvement projects listed on MnDOT's Capital Improvement Program (CIP) for AEL for the next three years include the following:

- *2020* – Construct NAVAID Access Road
  Design Fixed Base Operator Hangar
- *2021* – Airfield Crack Sealing & Seal Coat
  FAA RCO Relocation RA
  Demolish/Relocate Large Wood Hangar
  Property Purchase
  Design T-Hangar

- *2022* – Construct Fixed Base Operator Hangar
  T-Hangar Site Preparation & Construction

2.6 FAA Wildlife Strike Database Records

According to the FAA National Wildlife Strike Database, three wildlife strikes have been reported at AEL:

- One strike with a Canada goose occurred in September 2007 and caused minor damage to the aircraft.
- One strike with a rock pigeon occurred in August 2010, and no damage to the aircraft was reported.
- Another Canada goose strike occurred in October 2013 and caused substantial damage to the aircraft.

FAA strike records must be used with caution; reports can be entered by airport staff or pilots, and the data may be inconsistent among records. In addition, the number of reported strikes may present only a partial amount of the number of strikes that actually occur at an airport. FAA estimates that only 20 percent of all strikes that occurred nationwide from 1990 to 2008 were recorded in the database, and only 40 percent of all strikes that occurred since 2009 were recorded (FAA 2018). Wildlife strikes have the potential to go unreported at AEL in the absence of a dedicated Air Traffic Control Tower (ATCT) and communications between pilots and the airport manager.

Airport manager, Jim Hanson, disagrees with the FAA strike records. Mr. Hanson stated that he has been flying out of AEL since 1962, has served as the airport manager since 1982, and was unaware of the strikes identified in the FAA database.

2.7 Current Wildlife Hazard Threats and Concerns

Many species have the potential to pose a threat to aircraft operations; however, some species pose a greater threat than others. FAA AC 150/5200-33B, "Hazardous Wildlife Attractants On or Near Airports," identifies and ranks the 25 species or groups of species that are known to pose the greatest risk to aircraft operations based on data from the FAA's National Wildlife Strike Database (FAA 2012). As shown in **Table 1**, the 25 species or groups of species involved in documented wildlife strikes were ranked according to three criteria: likelihood of damage, major damage to aircraft, and effect on flight.

Table 1 **Ranking of the Relative Hazards to Aviation of 25 Species of Wildlife**			
Species	**Hazard Value**	**Species**	**Hazard Value**
1. Deer	100	14. Owls	23
2. Vultures	63	15. Horned lark/buntings	17
3. Geese	55	16. Crows/ravens	16
4. Cormorant/pelican	54	17. Coyotes	14
5. Cranes	47	18. Mourning Dove	14
6. Eagles	41	19. Shorebirds	10
7. Ducks	39	20. Blackbirds-starlings	10
8. Osprey	39	21. American kestrels	9
9. Turkey/pheasant	33	22. Meadowlarks	7
10. Herons	27	23. Swallows	4
11. Hawks	25	24. Sparrows	4
12. Gulls	24	25. Nighthawks	1
13. Pigeons	23		
Source: Ranking the Hazard Level of Wildlife Species to Civil Aviation in the USA, R.A. Dolbeer, et al., 2000.			

The wildlife species that pose the greatest risk to aircraft operations at AEL include various bird species that forage and loaf within the AOA, such as Canada geese, various species of gulls (e.g., ring-billed gulls), waterfowl (e.g., mallards and other species), and blackbirds (e.g., red-winged blackbirds and European starlings). Other bird species pose an additional risk to aircraft operations at AEL during spring and fall migrations. These include other species of gulls (e.g., Franklin's gulls), raptors, ducks, and various passerine species.

The following features or conditions were observed to attract potentially hazardous wildlife to AEL.

- **Turf grass.** The extensive turf grass within the AOA provides attractive habitat for various bird species, which were observed to forage, loaf, and nest within the grass. FAA recognizes that turf/grass areas can be attractive to a variety of hazardous wildlife species, and it generally recommends that airport operators maintain intermediate grass heights of 6 to 12 inches. Turf at AEL is typically maintained at a height of 6 inches during the growing season and when infield conditions permit mowing. Even with proper turf management, turf grass remains an attractant for various species of bird (e.g., geese, blackbirds, grassland birds). Research conducted by USDA Wildlife Services indicate that no single grass management regime will deter all species of hazardous wildlife in all situations, and airport operators should develop airport turf grass management plans on a prescription basis, depending on the airport's geographic locations and the type of hazardous wildlife likely to frequent the airport (FAA 2007).

- **Long grass and brush.** The edge areas between infield turf grass and the crop fields provides attractive habitat for various species of birds and small mammals. The long dense grass provides cover for nesting birds and cover for rodents from predators.
- **Small mammals.** The presence of small mammals (i.e., gophers, ground squirrels and other burrowing rodents) on the airfield provides a food source for raptors and coyotes.
- **Open water sources.** Several large lakes are located west, southwest, south, and southeast of the airport (see **Figure 3**). These open water sources attract Canada geese, ducks, pelicans, and other water and shorebirds, which pose hazards to aircraft as they fly between these lakes and enter AEL airspace or even fly across or loaf within the AOA.
- **Dense woodlands.** Dense woodlands that are attractive to raptors, crows, doves, and other passerines that fly back and forth across the AOA and runways are located on either side of the airport. These woodlands also provide cover for coyotes that can move across the AOA from woodland to woodland. If airfield perimeter gates are left open, deer have the potential to enter the AOA from these woodlands.
- **Agriculture.** Agricultural row crop fields (i.e., corn and/or small grains) occur both within and near the airport property. These agricultural fields can attract hazardous wildlife, including Canada geese, blackbirds, and other birds that feed on the seed after fall harvest. The off-airport fields also provide cover for deer, which are attracted to harvested areas. Deer can move around the landscape and can enter the AOA through an open gate or jump over the 4-foot section of perimeter fence at the airport's main entrance. Agricultural crops (i.e., corn and/or small grain) can attract hazardous wildlife, including large waterfowl, many flocking bird species and mammals. The FAA recommends against the use of airport property for agricultural production unless the revenue gained from agriculture is necessary to maintain the viability of the Airport. However, if an airport operator has no alternative for revenue generation, the FAA provides guidance in AC 150/5200-13, Change 1, "Airport Design." In addition, FAA AC 150/5200-33B, "Hazardous Wildlife Attractants On or Near Airports," recommends that airport operators consider the cost of wildlife control and risk potential mishaps when determining whether to allow crop production on airport property (FAA, 2007).
- **Golf course.** The Green Lea public golf course is directly south of the airport. The golf course includes large trees where birds can roost (e.g., blackbirds) and large expansive turf grass and open water that attract Canada geese, gulls, and other species.

FAA AC 150/5200-33B, "Hazardous Wildlife Attractants On or Near Airports" identifies land use practices that attract or sustain hazardous wildlife and recommends minimum separation criteria between those land uses and nearby airports. The FAA recommends a separation distance of at least 5,000 feet between hazardous wildlife attractants and airports that serve piston-powered aircraft, and at least 10,000 feet between attractants and airports that serve turbine-powered aircraft, such as AEL. For all airports, the FAA recommends 5 statute miles between the farthest edge of the airport's AOA and the hazardous wildlife attractant if the attractant could cause hazardous wildlife movement into or across the approach or departure airspace. AC 150/5200-33B identifies the following land uses as potential hazardous wildlife attractants: landfills, water management facilities, wetlands, spoil containment areas, agricultural activities, golf courses, and landscaping.

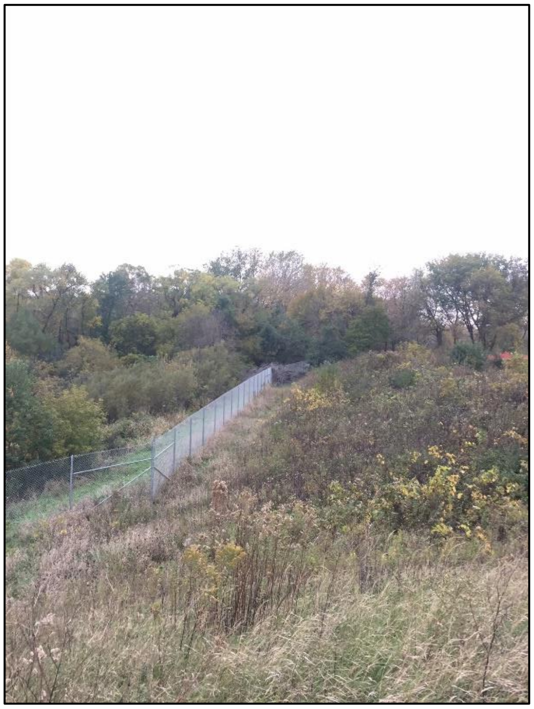

Photo 8: *Long grass and brush in the AOA provides attractive habitat for various birds and mammals.*

Photo 9: *The Fountain Lake complex is located immediately west of the airport. These open water sources attract Canada geese, ducks, pelicans, and other water and shorebirds that can pose hazards to aircraft as they fly among the lakes, in AEL airspace, or fly and loaf within the AOA.*

Photo 10: *A woodland area west of the airport and Bancroft Creek provide nesting opportunities for numerous bird species and cover for various mammals.*

2.8 Current Federal and State Wildlife Control Permits

As previously stated, the City does hold a Federal depredation permit to perform lethal control of migratory birds, particularly for Canada geese, and ring-billed gull.

Prior to conducting the WHSV, the Mead & Hunt team reviewed pertinent background information to gain familiarity with the environmental features and the types of wildlife expected to occur in the airport vicinity. Aerial photographs were reviewed to consider the airport property in relation to its surroundings and the nearby features or facilities that could attract potentially hazardous wildlife. This information was summarized and used as reference material during the airport personnel interviews and fieldwork.

3.1 Wildlife Surveys

Mead & Hunt conducted a site visit that included field days during four consecutive days from October 11 to 14, 2019. Rick Jones, an FAA-Qualified Airport Wildlife Biologist (QAWB), toured AEL property to evaluate property boundaries, identify monitoring locations, and document existing conditions. Weather conditions during the four-day site visit included cloudy skies with moderate to high winds and high daily temperatures in the high 20^{o} F to low 30^{o} F. The second day of the visit included high winds, poor visibility and light snow.

Eleven monitoring locations were identified and used throughout the survey period (see **Figure 4**). Seven on-site monitoring locations were established to provide visual coverage of the AOA including runways, taxiways, ramps, infield turf areas, buildings, and structures. Four off-airport monitoring locations were established in areas that were identified as potential wildlife attractants (e.g., agricultural fields, lakes, golf course, and woodlands) or located in aircraft approach/departure zones. These off-site locations included the areas within a 10,000-foot radius of the AOA (per FAA AC 150/5200-33B, “Hazardous Wildlife Attractants On or Near Airports”).

The methodologies identified in Sections 3.1.1 through 3.1.4 were implemented throughout the site visit.

3.1.1 Fixed-point Wildlife Surveys

The QAWB conducted the fixed-point wildlife surveys to observe wildlife presence and behavior. Six surveys were conducted over the four-day period: two morning surveys, two mid-day surveys, and two evening surveys. The morning survey began at dawn and the evening survey began approximately two hours before sunset. The mid-day survey took place between 11:00 a.m. and 2:00 p.m. During each survey, the QAWB recorded all species observed during a five-minute interval at each monitoring location. All data were recorded on an airport WHSV data observation sheet.

3.1.2 Spotlight Surveys

Two spotlight surveys were conducted to determine the presence of nocturnal wildlife during nighttime hours. The spotlight surveys were conducted on-site approximately one hour after sunset on October 11 and 12. The QAWB drove along runways, taxiways, ramp areas, and the infield turf areas. Wildlife observations and locations were recorded.

3.1.3 Game Camera Surveys

A game camera was installed on site to monitor mammal activity during daytime and nighttime hours. The camera location was moved each day to monitor wildlife presence and movement throughout the airport both day and night.

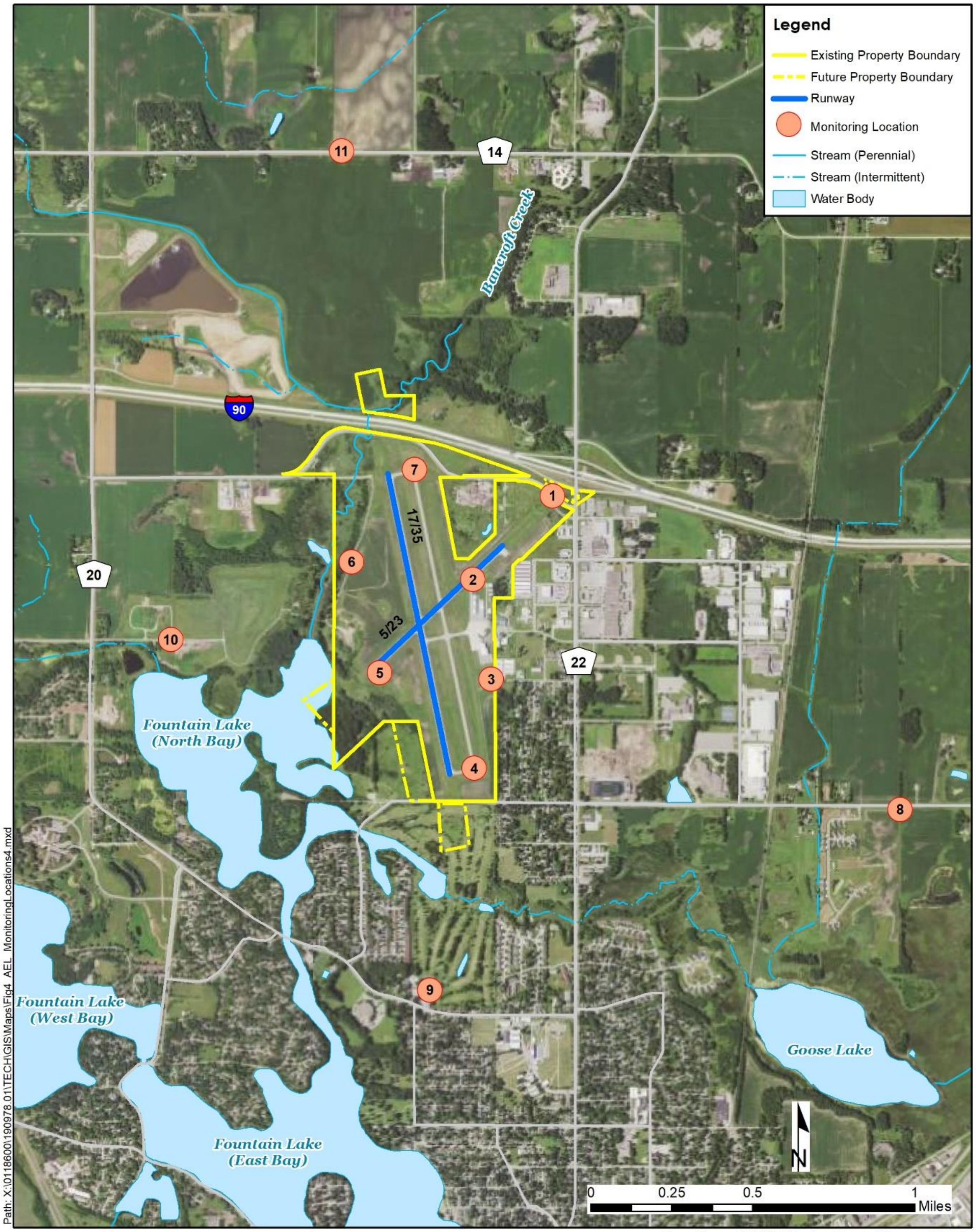

Image Source: FSA NAIP, Freeborn County, Minnesota 2019, 1m

Figure 4
WHA Observation Points
Albert Lea Municipal Airport, Freeborn County, Minnesota

3.1.4 General Observations

In addition to data obtained during formal survey events, data was obtained from general observations pertaining to the presence or evidence of wildlife (e.g., scat, tracks) that was not associated with a fixed-point monitoring location. General observations included wildlife observed while traveling between monitoring locations, in hangars, adjacent to the airport, or while conducting other activities on airport property.

3.2 Additional Data Collection

3.2.1 Habitat Observation

The QAWB also identified habitats and biological communities present on and near the airport property that could attract or support wildlife (e.g., vegetation, turf grass, agricultural row crop fields, lakes, shrubs, trees, structures, buildings, hangars, etc.).

3.2.2 Interviews with Airport Personnel

Mead & Hunt conducted interviews with Mr. Jim Hanson, Airport Manager, to discuss his observations of wildlife, known wildlife strike, and to gain an understanding of known wildlife hazard issues and wildlife management techniques used at the airport.

3.2.3 General Inspections of On-site and Off-site Areas

General inspections were conducted to identify features that were observed or had the potential to attract hazardous wildlife. Such features included open turf grass, agricultural fields, lakes, woodlands, buildings, hangars, and airfield structures.

Both airports and wildlife are dynamic, and the use of the airport property and facilities by wildlife may change over time as a result of seasonal and daily variations in site conditions and weather patterns. WHSV data can provide only a snapshot of the wildlife presence and behavior on and near the airport; therefore, the data presented in this report should not be viewed as a definitive representation of wildlife populations and behavior at AEL but should serve as a baseline for future studies. Any proposed modifications or improvements to AEL property or facilities should be evaluated by a QAWB to identify their potential effect on wildlife presence, location, behavior, and abundance in the AOA and surrounding areas. Such modifications include changes to structures, landscaping, stormwater management/drainage facilities, and agricultural use or practices.

4.1 Wildlife Observations

4.1.1 Standardized Wildlife Surveys

Table 2 presents the number of birds and mammals observed during standardized surveys both on and near airport property.

Table 2
Birds Observed during Standardized Wildlife Surveys
October 11 – 14, 2019

Guilds and Species Observed	*Scientific Name*	Abundance	Percent of Abundance
Raptors		**3**	**≤0.1%**
Bald Eagle	*Haliaeetus leucocephalus*	2	66.7%
Cooper's Hawk	*Accipiter cooperii*	1	33.3%
Sparrows/Larks		**74**	**2.9%**
Song Sparrow	*Melospiza melodia*	66	89.2%
Western Meadowlark	*Haemorhous mexicanus*	8	10.8%
Shorebirds		**4**	**≤0.1%**
Killdeer	*Charadrius vociferous*	4	100.0%
Swallows		**2**	**≤0.1%**
Barn Swallow	*Hirundo rustica*	2	100.0%
Doves/Pigeons		**4**	**≤0.1%**
Mourning Dove	*Zenaida macroura*	2	50.0%
Rock Pigeon	*Columba livia*	2	50.0%
Waterfowl		**619**	**24.5%**
Canada Goose	*Branta canadensis*	573	92.6%
Mallard	*Anas platyrhynchos*	46	7.4%

Table 2
Birds Observed during Standardized Wildlife Surveys
October 11 – 14, 2019

Guilds and Species Observed	*Scientific Name*	Abundance	Percent of Abundance
Blackbirds		**1,360**	**53.8%**
Brewer's Blackbird	*Euphagus cyanocephalus*	429	31.5%
European Starling	*Sturnus vulgaris*	429	31.5%
Red-winged Blackbird	*Agelaius phoeniceus*	502	37.0%
Gulls		**288**	**11.4%**
Franklin's Gull	*Leucophaeus pipixcan*	161	55.9%
Ring-billed Gull	*Larus delawarensis*	127	44.1%
Corvids		**166**	**6.6%**
American Crow	*Corvus brachyrhynchos*	166	100.0%
Other		**10**	**0.4%**
Eastern Bluebird	*Sialia sialis*	4	40.0%
Northern Flicker	*Colaptes auratus*	6	60.0%
Total Number of Species: 18 species		**Total Individuals: 2,530**	

To analyze the wildlife data, the species observed were organized or grouped into guilds based on similar behavior and/or habitat preferences. While some guild members may be taxonomically different and have different diets, they typically exhibit similar behavior and are found in similar vegetative habitats or pose similar risks to aircraft operations. Birds that exhibit similar behavior tend to respond in a similar way to wildlife control methods, such as habitat modification, exclusion, or hazing with pyrotechnics.

The species richness observed at AEL was typical for the region and during the time of year that the WHSV was conducted (late fall migration). Most of the species observed are common residents of, or fall migrants through, southern Minnesota. The most frequently observed bird species at AEL were blackbirds (Brewer's blackbirds, European starlings, and red-winged blackbirds) and waterfowl (Canada geese and mallards). The most frequently observed species were attracted to off-site agricultural fields for foraging opportunities (seed left in the fields). Gulls and waterfowl were attracted to all the surrounding large water bodies. Gulls and corvids were frequently observed flying through the AOA. Wildlife was most abundant during the morning and least abundant during the mid-day hours.

4.1.2 Nighttime Spotlight Surveys

Two nighttime spotlight surveys were conducted during the WHSV. Wildlife was not observed within the AOA during spotlight surveys.

4.1.3 Game Camera Surveys

A game camera was installed on the airfield to monitor mammal activity during the two-night site visit. The camera location was moved each day to monitor wildlife presence and movement throughout the airport both day and night. No wildlife was documented using the game camera.

4.1.4 Threatened and/or Endangered Species at AEL

U.S. Fish and Wildlife Service (USFWS) identifies one federally endangered species in Freeborn County: the federally threatened northern long-eared bat. The bat was not observed during the WHSV. The Minnesota Department of Natural Resources identifies state listed threatened, endangered, or species of special concern. None of the species listed by the State were observed during the WHSV.

4.2 Wildlife Attractants

4.2.1 On-site Wildlife Attractants

Airfield Turf Grass

As previously identified, most of the airfield is composed of open grass fields, which provide foraging habitat for many resident bird and mammal species and migratory bird species during the spring and fall. These could include European starlings, red-winged blackbirds, Canada geese, and various raptor and passerine species. Based on research performed by USDA, the FAA recommends that grass within the AOA be managed at an intermediate height of between 6 and 12 inches. At the time of the WHSV, the turf grass was approximately 6 inches in height. Airport staff reported that the turf grass is maintained at 6 inches during the growing season.

Airfield Crop Production

A limited amount of crop production (i.e., small grains) occurs along the airport’s western boundary. In general, FAA discourages agricultural production on airport property because most crops can attract hazardous wildlife during some phase of production. These agricultural fields can attract hazardous wildlife, including Canada geese, blackbirds, and other birds that feed on the spent seed after harvest in the fall. FAA acknowledges that agricultural leases can provide necessary income to maintain the viability of the airport. Nevertheless, the responsibility to manage potentially hazardous wildlife remains with the City. It is recommended that both the City and its tenant discuss potential concern with wildlife hazard management and how to address them should a hazard be presented.

Long Grass and Brush

Edge habitats are attractive to wildlife, and the edge areas between infield turf grass and the cultivated area on the airport’s west side provides attractive habitat for various birds and small mammals. The long, dense grass provides cover for nesting birds and cover for rodents from predators. It is recommended that the ridges within the airfield be leveled and the low spots/non-wetland drainages be filled to allow airport staff to mow and maintain these areas.

4.2.2 Off-site Wildlife Attractants

Off-site wildlife attractants, such as lakes, creeks, wetlands, agricultural crops, the golf course, and nearby woodlands can attract potentially hazardous wildlife to the airport. For example, birds and other hazardous wildlife can visit AEL or pass through its associated airspace while traveling to or among off-site attractants and pose hazards to aircraft operations.

The airport is located north of the City, and the predominant off-site wildlife attractants in the vicinity are agricultural fields and numerous open water features. Although the City cannot manage off-site land uses directly, it must manage on-site uses to reduce or prevent the risk posed by hazardous wildlife. As previously mentioned, FAA acknowledges that agriculture can attract hazardous wildlife, but recognizes that agricultural leases can provide much-needed revenue and contribute to an airport's economic viability. In such cases, airport operators must weigh the benefits and risks associated with agricultural production and actively reduce wildlife attractants and their subsequent risks.

Table 3 summarizes the recommended passive and active wildlife hazard management actions as well as administrative actions that could be introduced at AEL. Each measure is prioritized to assist management with implementation.

Table 3
Recommended Wildlife Hazard Management Actions at AEL

Action Type	Action	Priority
Passive Management Actions	• Monitor and maintain/improve the perimeter fence for vegetation growth into the fence and for holes along the bottom. If warranted, retrofit the perimeter gates to reduce spaces between gate arms or at the bottom of the gate to prevent entry by coyotes and other mammals.	Medium
Active Management Actions	• Continue daily wildlife patrols at the airport to identify hazardous wildlife in the AOA and to maintain the perimeter “wildlife” fence. • Obtain field training and use pyrotechnics to harass wildlife from airport property. • Maintain permits and incorporate lethal control in coordination with federal depredation permits as necessary to manage both mammal (e.g., gophers) and bird species that are hazardous to aircraft. • Continue to monitor on-site turf grass areas for the presence of hazardous wildlife. • Continue to monitor wildlife presence at off-site agricultural fields within the critical area. • Manage long grass and brush within the AOA. • Monitor the on-site agricultural fields and disperse birds from these locations when they are observed. • Continue to monitor wildlife presence, abundance, and behavior in and around the airport. • Obtain additional wildlife hazard management training for airport staff from a Qualified Airport Wildlife Biologist.	High

Table 3 Recommended Wildlife Hazard Management Actions at AEL		
Action Type	**Action**	**Priority**
Administrative Actions	• Instruct staff, pilots, and tenants to report all wildlife strikes to the FAA Wildlife Strike Database: http://wildlife.faa.gov. • Establish a protocol for airport users and/or pilots to report wildlife sightings or strikes directly to the Airport Manager. • Document all wildlife management actions. • Maintain necessary federal and state depredation permits to perform lethal control of hazardous wildlife. • Train and equip airport personnel to identify and manage hazardous wildlife. • Advise pilots to issue pilot reports (PIREPs) relating to wildlife hazards on or near the airport. • Issue a notice to airmen (NOTAM) if consistent and persistent wildlife hazards are identified on or near the airport at specific times. • Post signs and information on airport property (e.g., pilot's lounge, tenant hangars, A/D building) to increase awareness and promote the reporting of wildlife hazards.	High

5.1 Passive Management Actions

Monitor and Maintain/Improve the Perimeter Fence

The airport perimeter fence is not flush to the ground, which enables wildlife to access the AOA. In addition, portions of the fence are obscured by the presence of dense vegetation. The City should continue to monitor the perimeter fence for vegetation growth into the fence and for the presence of gaps/holes along the fence base. The perimeter gates also include gaps or spaces. If warranted, the fence should be retrofitted to reduce gaps or spaces between gate arms or spaces at the bottom of the gate to prevent entry by deer and other mammals.

5.2 Active Management Actions

Continue Regular Wildlife Patrols at the Airport and Within the AOA

The City should continue to conduct wildlife patrols year round to identify hazardous wildlife on and near the AOA, and record observations on daily inspection forms, such as runway inspection form or other site inspection forms that are currently used. The wildlife patrols during the spring and fall migration periods are important to address the presence of migrating populations of birds. Documenting wildlife observations and management actions is considered a risk management measure, as it demonstrates the City's ongoing due diligence to identify and manage wildlife hazards to enhance safety.

Obtain Field Training to Use Pyrotechnics to Disperse/Harass Wildlife

The City should actively harass wildlife observed within the AOA using pyrotechnic devices, such as 15mm screamers and bangers. Both types of pyrotechnic devices should be used by appropriately trained airport staff to disperse wildlife when necessary. The type of device used (screamers or bangers) should vary to prevent habituation. The use of propane cannons is not recommended as wildlife become habituated to these devices.

Airport Cooperative Research Program (ACRP) Synthesis Report 52, *Habitat Management to Deter Wildlife at Airports,* provides detailed information on the use of pyrotechnics to disperse/harass hazardous wildlife. The report is available free of charge at: https://www.nap.edu/catalog/22375/habitat-management-to-deter-wildlife-at-airports.

Maintain Permits and Incorporate Lethal Control as Necessary

Most wildlife will habituate to non-lethal harassment measures over time. Lethal control can help to reinforce the use of non-lethal methods. ACRP Synthesis Report 39, *Airport Wildlife Population Management,* provides detailed information on incorporating lethal control to deter or remove hazardous wildlife. The report is available free of charge at: https://www.nap.edu/catalog/22599/airport-wildlife-population-management.

Wildlife will often respond more favorably to pyrotechnic harassment following the use of lethal control. Although lethal control may not be desirable to the public, the benefits achieved from lethal control outweigh the negative impacts. Lethal control should be used only as a last resort when other methods fail or require reinforcement. The City may need to modify its depredation permit to include the hazardous wildlife species identified during the WHSV. Following the renewal of appropriate state and federal depredation permits, USDA Wildlife Services and private wildlife control contractors may be available to implement lethal control measures through a contract with the City, specifically for gopher control. (Refer to the discussion of Administrative Management Actions below regarding permit procurement and renewals.)

Continue to Monitor On-site Turf Grass

On-site turf grass was observed to attract potentially hazardous wildlife to the airport, because the grass provides food, cover, and nesting cover to various species of birds and mammals. It is imperative that the City continue to monitor wildlife use in these areas and incorporate necessary wildlife management measures. An intermediate grass height is recommended because it can disrupt inter-flock communication, obscure insect food sources, limit predator detection, impede ease of movement, and out-compete weedy vegetation; it also has a slower growth rate to require less frequent mowing. It is recommended that the airport maintain grass heights in accordance with the FAA-recommended guideline of 6 to 12 inches to discourage smaller flocking birds (i.e., European starlings) from foraging in the turf grass. This longer grass will also help discourage Canada geese from loafing and foraging in the infield turf grass, and it will discourage raptors by obscuring small rodents from view.

Continue to Monitor and Disperse Wildlife from Airfield Agricultural Fields

A limited number of agricultural fields (i.e., small grains) occurs along the boundaries of the airfield. In general, FAA discourages agricultural production on airport property because most crops can attract hazardous wildlife during some phase of production. These agricultural fields can attract hazardous wildlife, including Canada geese, blackbirds, and other birds that feed on the spent seed after harvest in the fall. FAA acknowledges that agricultural leases can provide necessary income to maintain the viability of an airport. Nevertheless, the responsibility to manage potentially hazardous wildlife remains with the City. It is recommended that both the City and its tenant discuss potential concerns with wildlife hazard management and how to address them should a hazard be presented.

Manage Long Grass and Brush

Edge habitats are attractive to wildlife, and the edge areas between infield turf grass and the cultivated area on the airport's west side provides attractive habitat for various birds and small mammals. The long, dense grass provides cover for nesting birds and cover for rodents from predators. It is recommended that the ridges within the airfield be leveled and the low spots/non-wetland drainages be filled to allow airport staff to mow and maintain these areas.

Monitor On-site and Adjacent Off-site Woodlands and Agricultural Crops for the Presence of Hazardous Bird Abundance

The adjacent woodlands and agricultural crops can attract birds by providing shelter, perching, and roosting opportunities and they provide cover for deer. Birds that fly to or disperse from these locations could fly across the runway or enter AEL airspace, potentially creating adverse effects on departing or landing aircraft.

Airport staff should monitor the adjacent woodlands and agricultural crops to determine whether birds that are going to/from this location are crossing into the AOA or flying through protected airspace. If birds at this location are entering the AOA, the City should seek permission from the property owner to disperse the birds and work with USDA Wildlife Services to identify potential bird control measures that could be implemented in cooperation with the property owner.

Continue to Monitor Wildlife Presence, Behavior, and Abundance

The data obtained during the four-day WHSV presents a snapshot of wildlife presence and abundance at AEL. Conditions and wildlife populations change daily, seasonally, and annually. Therefore, it is important that the City continues to monitor wildlife presence, behavior, and abundance on and adjacent to the airport, especially in nearby agricultural fields and prairie potholes.

Obtain Wildlife Hazard Management Training

The Airport should obtain additional wildlife hazard management training for airport staff from a Qualified Airport Wildlife Biologist. This training is recommended by the FAA for airport personnel responsible for managing wildlife on their airports.

5.3 Administrative Actions

Instruct Staff, Pilots, and Tenants to Report Wildlife Strikes

The City should initiate practices to report all wildlife strikes to the FAA Wildlife Strike Database. Strikes may be reported quickly using an online form that is available at: http://wildlife.faa.gov.

Establish a Protocol to Report Wildlife Sightings or Strikes

Although the FAA maintains a voluntary reporting system for wildlife strikes, it is recommended that all wildlife strikes and observations be reported to better identify wildlife trends and monitor the effect of wildlife control measures at AEL. To do so, airport management should establish a protocol for airport users, FBOs, pilots, and airport staff to report wildlife sightings, strikes, and management actions to the Airport Manager, who should maintain a log of those events. Wildlife records and management logs are routinely incorporated into Wildlife Hazard Management Plans.

Document Wildlife Management Actions

City staff should document all wildlife management actions performed at the airport using a wildlife management log. The log can be used to demonstrate the City's diligence in addressing wildlife hazards. The data in the log can also be used to identify trends in wildlife presence and the most effective management techniques.

Maintain Necessary Permits to Control Hazardous Wildlife

The current federal depredation permit must be maintained to perform the lethal control of migratory bird species, and a state depredation permit is required from the Minnesota Department of Natural Resources to perform the lethal control of state-managed mammals. The City will be required to renew the permits annually with the proper federal and state agencies. As mentioned previously, lethal management can be performed by USDA Wildlife Services through a contract with the City.

Train and Equip Airport Personnel to Identify and Manage Hazardous Wildlife

If warranted, airport personnel should receive training in wildlife identification and management procedures, so they can respond to wildlife hazards appropriately and legally. Personnel should be equipped with the proper equipment needed to manage hazardous wildlife, including but not limited to binoculars, bird and mammal identification manuals, wildlife management logbook, pyrotechnics, shotguns/rifles/pellet guns, and personal protective equipment. The training could be extended to airport tenants as well. If lethal control is required for wildlife management, the City can contract with USDA-WS to perform these management actions.

Advise Pilots to Issue Pilot Reports

Pilots using AEL should issue Pilot Reports (PIREPs) via UNICOM or CTAF that pertain to wildlife hazards on or near the airport, but only when hazardous wildlife are present within the AOA or in AEL airspace. Pilots should be encouraged to issue a PIREP only when they observe wildlife that could pose a hazard to other aircraft in the airport vicinity.

Issue a Notice to Airmen

AEL should issue a Notice to Airmen (NOTAM) if consistent, persistent, or immediate wildlife hazards are identified on or around the airport at specific times. NOTAMs can be beneficial during periods of peak wildlife activity but should be specific and not include generic phrases such as “wildlife on and in the vicinity of the airport.”

Post Signs and Information to Increase Awareness of Hazardous Wildlife

AEL staff should place posters and signs pertaining to hazardous wildlife and strike reporting throughout the airport property (e.g., pilot’s lounge, tenant hangars, A/D building) to increase the awareness of wildlife hazards. Newsletters or simple email notifications can be sent to all airport tenants and stakeholders to alert them to the presence of potentially hazardous wildlife, the potential effects of wildlife strikes, and strike reporting procedures.

Section 6
Conclusion

The data obtained by a Qualified Airport Wildlife Biologist during recent field surveys and discussions with Airport staff and other airport users was sufficient to identify the presence of hazardous wildlife on and near the airport. Species-specific wildlife hazards were evident, especially those posed by Canada geese, waterfowl, raptors, coyotes, and blackbirds.

Several tools are available to manage the wildlife hazards observed. For example, the use of visual and auditory devices, such as pyrotechnic screamers and bangers, and the consistent hazing/dispersal of wildlife would help to discourage wildlife from the AOA (see ACRP Synthesis Reports 39 and 52). Further, monitoring and maintaining/improving the airport perimeter wildlife fence as described in Section 5.1 will help to exclude mammals from the AOA.

This WHSV report should serve as the final documentation for the assessment of wildlife hazards at the Albert Lea Municipal Airport. Unless otherwise directed by the FAA, a WHA is not recommended because the WHSV was conducted and reviewed by a Qualified Airport Wildlife Biologist, and the documentation is sufficient to identify the types of wildlife present and wildlife management measures necessary. Based on the findings presented in this WHSV summary report and recommendations from a Qualified Airport Wildlife Biologist, a Wildlife Hazard Management Plan appears to be warranted for the Albert Lea Municipal Airport.

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Author Accreditation

RICK JONES, CWB
FAA-QUALIFIED AIRPORT WILDLIFE BIOLOGIST

Rick Jones is an FAA-qualified airport wildlife biologist and a certified wildlife biologist with 17 years of professional consulting experience, extensive wildlife hazard management expertise, and a strong working knowledge of the aviation industry. Rick has been responsible for developing and implementing wildlife hazard management programs across the western US. He has completed or is currently working on projects at more than 60 airports across the country. At these airports, he has been responsible for conducting wildlife hazard assessments (WHA), writing the wildlife hazard management plans (WHMP), and training airport personnel on wildlife management and hazards. He provides direction to airport personnel and tenants to support day-to-day compliance with regulations, protocols and procedures related to the implementation of 14 CFR Part 139.337 and other pertinent regulations. He has provided wildlife damage/hazard assistance to airport managers; consultants; federal, state, and local governments; trade groups; and individuals. He is skilled at interagency coordination associated with wildlife management and has budgeted, planned, and initiated a variety of wildlife management programs and helped resolve wildlife conflicts at airports and for municipalities. Rick understands the methods and tools used to avoid and minimize wildlife conflicts on and near airports.

Rick also works with airport personnel, US Fish and Wildlife Service, US Department of Agriculture, and state wildlife agencies to support airport wildlife management activities and permit renewal applications. As project manager, Rick coordinates with airlines, fixed-base operators (FBOs), city/county officials and other stakeholders to convey the importance of wildlife hazard management. Rick's ability to effectively and efficiently work with airports, project teams, regulatory agencies and various stakeholders, along with his strong problem solving and communication skills, have resulted in a proven record of successful projects.

To date, Rick has been involved in Wildlife Hazard Assessments (WHAs), Wildlife Hazard Management Plans (WHMPs), or Wildlife Hazard Site Visits, or wildlife hazard management training projects at the following airports (not a full list):

- Yampa Valley Regional Airport, Hayden, CO
- Cortez Municipal Airport, Cortez, CO
- Pueblo Memorial Airport, Pueblo, CO
- Four Corners Regional Airport, Farmington, NM
- Denton Municipal Airport, Denton, TX
- Lone Star Executive Airport, Conroe, TX
- Athens Municipal Airport, Athens, TX
- Jackson Hole Airport, Jackson, WY
- Sherwood Airport, Plentywood, MT
- Sandpoint Airport, Sandpoint, ID
- Klamath Regional Airport, Klamath Falls, OR
- Fresno Yosemite International Airport, Fresno, CA
- Livermore Municipal Airport, Livermore, CA
- Fullerton Municipal Airport, Fullerton, CA
- San Carlos Airport, San Carlos, CA

Areas of Expertise

- Wildlife damage management
- Wildlife hazard assessments
- Wildlife hazard management plans
- NEPA regulations
- Environmental planning
- Project management
- Regulatory compliance
- Financial management

Education

- MS, Wildlife Ecology, Texas State University, 2008
- BS, Field Biology, University of Northern Colorado, 2003

Registration/Certification

- Certified Wildlife Biologist (CWB)
- FAA Qualified Airport Wildlife Biologist

Memberships

- The Wildlife Society (National Chapter)
- Colorado Chapter of the Wildlife Society
- Association of Field Ornithologist
- Pheasants/Quail Forever
- Rocky Mountain Elk Foundation
- Wildlife Damage Management Working Group (The Wildlife Society)

Training and Seminars

- The Wildlife Society's Leadership Institute, 2010
- Airport Wildlife Hazard Management Training, ERAU, 2010
- Airport Wildlife Trainer's Course, ERAU, 2010
- Bird Strike Committee USA Annual Conference, 2009-2019
- Embry-Riddle Aeronautical University: Wildlife Hazard Training Session
- AAAE, Airport Wildlife Trainer's Course
- Basic/Advanced NEPA Training, NWETC, 2018

- Hayward Executive Airport, Hayward, CA
- Palo Alto Airport, Palo Alto, CA
- Salinas Municipal Airport, Salinas, CA
- Watsonville Airport, Watsonville, CA
- Chino Municipal Airport, Chino, CA
- Whiteman Municipal Airport, Pacoima, CA
- Hawthorne Municipal Airport, Hawthorne, CA
- Riverside Municipal Airport, Riverside, CA
- Cable Airport, Upland, CA
- Brackett Field, La Verne, CA
- William J. Fox Field, Lancaster, CA
- El Monte Airport, El Monte, CA
- Camarillo Airport, Camarillo, CA
- Boulder City Municipal Airport, Boulder City, NV
- Auburn Municipal Airport, Auburn, WA
- Dallas Executive Airport, Dallas, TX
- Inyokern Airport, Inyokern, CA
- San Bernardino International Airport, San Bernardino, CA
- Stockton Metropolitan Airport, Stockton, CA
- Grand Canyon National Park Airport, Tusayan, AZ
- Goodyear Airport, Goodyear, AZ
- Falcon Field, Falcon, AZ
- Deer Valley Airport, Phoenix, AZ
- Scottsdale Airport, Scottsdale, AZ
- Glendale Airport, Glendale, AZ
- Chandler Airport, Phoenix, AZ
- Casa Grande Airport, Casa Grande, AZ
- Marana Regional Airport, Marana, AZ
- Coeur D' Alene Airport, Coeur D' Alene, ID
- Nampa Municipal Airport, Nampa, ID
- Sand Point Airport, Sand Point, ID
- Bremerton National Airport, Bremerton, WA
- Napa County Airport, Napa, CA
- French Valley Airport, Murrieta, CA
- Hemet-Ryan Airport, Hemet, CA
- Oakdale Municipal Airport, Oakdale, CA
- Jacqueline Cochran Airport, Thermal, CA
- Corvallis Municipal Airport, Corvallis, OR
- Eastern Oregon Regional Airport, Pendleton, OR
- Scappoose Industrial Airpark, Scappoose, OR
- New Ulm Municipal Airport, New Ulm, MN
- Provo Municipal Airport, Provo, UT
- Ogden Municipal Airport, Ogden, UT
- Cache County-Logan Airport, Logan, UT

Past Employment

- Kleinfelder, Inc.
  10 years, Wildlife Biologist
- Mead & Hunt, Inc.
  6 years, Senior Wildlife Biologist