ENGINEERING, REIMAGINED

AIRPORT MASTER PLAN NARRATIVE REPORT

Mercer County Regional Airport (HZE)

Hazen, North Dakota

October 2024

This project was funded by Mercer County Regional Airport Authority, the North Dakota Aeronautics Commission and the Federal Aviation Administration through an Airport Improvement Program (AIP) grant 3-38-0075-021-2023.

CHAPTER 1: AIRPORT, COMMUNITY & AVIATION ACTIVITY

Purpose and Scope

The information presented in this report represents the study findings for the 2023 Airport Master Plan study prepared for the Mercer County Regional Airport Authority, the airport owner. Airport Master Plans are prepared in accordance with Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*. This project was funded in part by the FAA under grant number AIP 3-38-0075-021-2023.

This study for the Mercer County Regional Airport (HZE) will serve as an updated guide identifying future development necessary to accommodate existing and future aviation demands. The airport's current and forecasted safety, capacity and compatibility needs are addressed in this study. Many projects have been completed and new planning considerations have surfaced since the last Airport Layout Plan (ALP) was approved in 2008. An Airport Master Plan study was completed in 1992.

The airport sponsor and Kadrmas, Lee & Jackson (KLJ) developed the scope for the project in cooperation with FAA Airports District Office and the North Dakota Aeronautics Commission officials to identify the specific needs and objectives of the airport owner. The scope includes work tasks with the purpose of documenting existing conditions, forecasting future aviation activity levels, identifying future facility requirements, formulating, and evaluating development alternatives, preparing implementation plans and engaging the public and other government agencies. Recommendations will be made for improvements that are triggered by safety requirements or demand thresholds.

The project received notice to proceed in March 2023 from the airport sponsor. The baseline project data is from inventory efforts completed in December 2023. Data from year 2022 was used to establish a baseline of existing airport information.

Planning Objectives

Planning considerations for an airport master plan are features, elements or events that should be evaluated because they have the potential to affect the airport facility over the long term.

As stated previously, the last airport master plan was completed in 1992 which reviewed three sites for the future Mercer County Regional Airport. Each site included a 5,500-foot-long by 75-foot-wide runway, a parallel taxiway, and development of an apron area. The Hazen site was selected and there after alternatives were based on that location. The last ALP was approved in 2008. A parallel taxiway was planned, airport industrial lots, fixed based operator (FBO) lots, and runway extension by 1,000 feet on the Runway 33 End (32 designation in 2008 ALP).

The master plan is more than 30 years old, and the ALP is over 10 years old. New development demands and the need to meet current FAA design standards are the factors that are driving the need for an update. Based on the background and planning considerations, the planning objectives for this study identify the methods used to meet the airport development goals outlined by the airport owner. The key project objectives are identified as follows:

- Examine the need for a crosswind turf runway to achieve 95% crosswind coverage
- Evaluate the approach runway lighting and optimize the instrument approach procedures
- Evaluate the current split terminal areas
- Examine the demand for hangar space and configuration of hangars and terminal area to maximize the use of space while maximizing the functionality for each type of use
- Update ALP to current design standards

FAA Aeronautical Survey

The FAA has implemented Aeronautical Survey requirements per FAA AC 150/5300-18B: *General Guidance and Specifications for Submission of Aeronautical Data to NGS: Field Data Collection and Geographic Information System (GIS) Standards*. FAA airport survey requirements require obstruction data to be collected using assembled aerial imagery for the airport. This data is used in aeronautical publications and to develop instrument approach procedures.

An aeronautical survey is being conducted as a part of this Master Planning study. The imagery was collected in June 2023. A detailed obstruction analysis will be completed using data from the aeronautical survey. This detailed obstruction identification and mitigation disposition is identified in the Airport Layout Plan developed at the end of this planning study.

Master Plan Process

Guidelines for completing a Master Plan are set forth in FAA AC 150/5070-6B. Each master plan study scope and level of effort is customized to fit each individual airport's needs and address critical issues.

The required and recommended contents of Airport Master Plans are detailed per FAA standards. Effective airport master plans are based on the analysis of significant amounts of data, and many airport master plans typically present not only the planning conclusions, but all data and accompanying analysis in considerable detail.

This Master Plan study presents data in a sequential manner following the typical FAA planning process. Appendices are included to provide more detailed information on a subject. In addition, internet hyperlinks are included to reference documents that are current as of the time of this report.

Alternatives Analysis

The alternatives evaluation process is the most collaborative portion of the master plan study. The alternatives are reviewed and refined through meetings with federal/state agency representatives and the study's advisory group. Evaluation criteria is used to compare the alternatives. The alternative evaluation criteria for this study includes the following:

Operational Performance - How does each alternative allow the airport, and specifically the runway/taxiway system, to operate as a functional system, meet design standards, and meet the needs of the community.

Best Planning Tenets – What are the strengths and weaknesses of the alternatives as it relates to 1) flexibility to meet demand and react to unforeseen changes; 2) highest and best on- and off-airport land use; 3) feasibility to implement politically and within practical phases; and 4) ability to satisfy airport user needs.

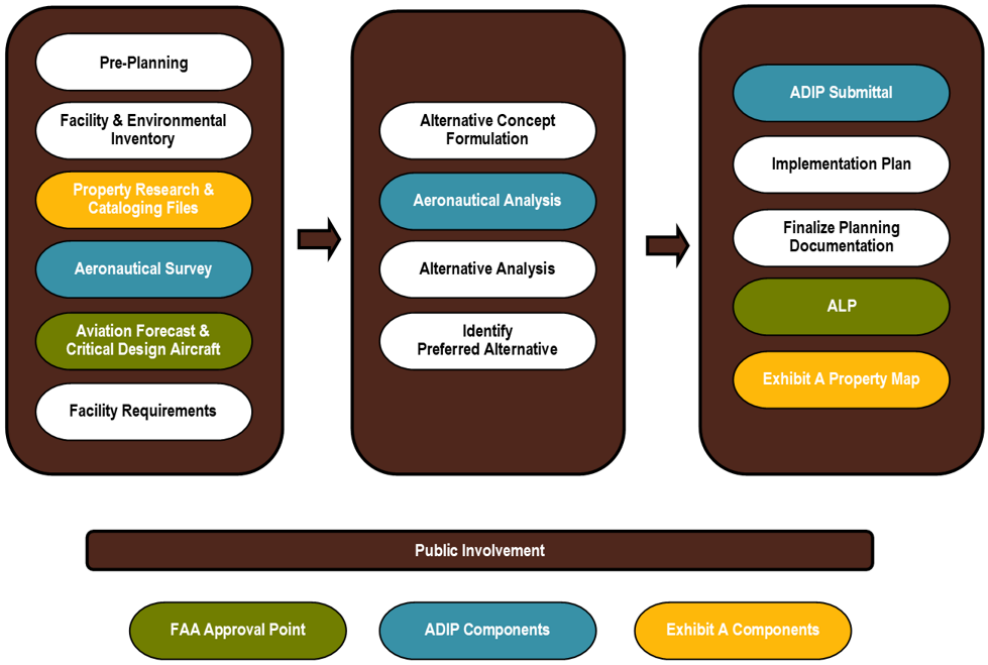
Environmental Factors – What are the potential effects of the alternatives upon the natural and built environment.

Fiscal Factors – How much will the options cost as compared to each other, while making the most use of federal, state, and local resources.

The Airport Master Planning process involves several coordinated steps. The master plan study for HZE consists of the following elements:

- **Pre-Planning** – Airport development concerns are identified and planning objectives prepared to address these issues. An overall vision for the study is formulated that will guide the process.
- **Facility & Environmental Inventory** – Overview of airport setting and environment; infrastructure and assets which includes airside, landside, and support facilities; airspace, navigational aids, and airport access utilizing data from an FAA Aeronautical Survey. Provide an overview of anticipated environmental impacts as part of the development of alternatives.
- **Forecast of Aviation Demand** – Using established forecasting methods, estimate current and project future airport activity for general aviation, air cargo, and passenger enplanements.
- **Demand Analysis and Facility Requirements** – Compare the existing capacity with the future demand and identify the facility requirements to satisfy the aviation safety, capacity, and compatibility needs.
- **Alternatives Development and Evaluation** – Identify and evaluate options considering both on-airport and off-airport impacts consistent with the study goals and objectives. A preferred alternative is selected.
- **Implementation Plan** – Provide a comprehensive plan for implementation of the preferred alternative including project triggers, sequencing, and cost estimates.
- **Land Use Compatibility** – Complete a comprehensive review of land surrounding the airport for potential uses that are incompatible with safe airport operations and provide mitigation recommendations.
- **Airport Layout Plan (ALP)** – Document the existing and planned airport facilities through a set of drawings approved by the airport sponsor, state, and FAA.
- **Stakeholder and Public Involvement** – Prepare and execute a plan to engage important airport stakeholder and the public throughout the study to gather their input and address their concerns.

Figure 1-1 – Airport Master Planning Process



Source: KLJ

Study Documentation & Approvals

The Master Plan Update was divided into chapters of information to document airport planning data, analysis, findings, and recommendation of the study. The following sections included in the narrative report:

- Chapter 1 – Airport, Community & Aviation Activity
- Chapter 2 – Runways & Taxiways
- Chapter 3 – Terminal Area & Support Facilities
- Chapter 4 – Implementation & Compatibility
- Chapter 5 – Airport Layout Plan

- Appendix A – Glossary of Terms
- Appendix B – General Aviation Airports 101
- Appendix C – Meetings and Public Involvement
- Appendix D – Runway Length Analysis
- Appendix E – Recycling and Solid Waste Plan

Each chapter was prepared separately and distributed to the airport owner for review and comment. After the airport owner's review, each draft chapter findings were made available to key airport stakeholders including the State and FAA for input prior to a final review and approval by the airport owner. Each approved final draft chapter was then published on the airport's website for public viewing.

The Master Plan Update was adopted by the Mercer County Regional Airport Authority in October 2024. The ALP was submitted to the State and FAA for review and approval in November 2024.

Public Involvement

Public involvement is a key component to the successful development of an Airport Master Plan study. The purpose is to encourage information sharing and feedback from airport stakeholders including the airport owner, airport users/tenants, local government officials, resource agencies, elected and appointed officials and the public. Public involvement provides valuable input to assist the airport owner in decision making and develop consensus on study conclusions.

The Planning Advisory Committee (PAC) is comprised of several airport authority board members and airport users and was established to provide input throughout the life of the study. The purpose of the PAC was to facilitate group discussion and feedback regarding the draft planning materials. There are also stakeholders that were contacted in the planning process. These included the following stakeholder groups.

- City of Hazen and other cities in the County
- Mercer County
- Airport Users/Tenants
- Community/Area Businesses

A project website, https://inputcentral.com/hze-airportplan was developed as a forum to share information about the project with the public. This website was used to distribute project documentation as well as collect feedback. Draft study documents were posted progressively and made available for review. An online comment form ran throughout the life of the project to provide feedback directly to the project team.

See **Appendix C: Public Involvement** for other information including copies of public involvement meeting agendas, attendees, presentations, and summaries.

Airport & Community Overview

General

The Mercer County Regional Airport is a general aviation airport serving the City of Hazen and surrounding areas of Mercer County in west central North Dakota. The airport is classified as local by the Federal Aviation Administration (FAA) in the FAA's ASSET study. See **Appendix B: General Aviation Airports 101** for additional details about airport classifications.

Mercer County Regional Airport has one lighted, 75-foot-wide by 4,999-foot-long asphalt runway. Airport facilities are split into two different apron areas, one north and one south. The south apron has 8 asphalt tiedowns and 2 concrete tiedowns. Additionally, there are two hangars, a terminal building, and a Snow Removal Equipment (SRE) building. Aircraft fueling is also located on this apron. The south apron is accessed by a paved airport road with designated vehicle parking. The county road from Highway 200 to the airport road is however gravel. The north apron has three asphalt tiedowns, 4-unit T-hangar, four box hangars, and a storage facility. The apron can be accessed from a dirt road and provides no designated vehicle parking spots.

Location and Area Setting

Mercer County is located in west central North Dakota. The largest city within the county is Beulah which is approximately 13 miles west of the Mercer County Regional Airport (HZE). Other nearby cities include Bismarck, 69 miles to the southeast and Dickinson, 90 miles to the southwest. The airport is also 15 miles south of Lake Sakakawea, the third largest man-made lake in the United States. **Figure 1-2: Airport Location Map** provides an overview of the airport's local environment.

The airport is two miles east of the central business district of Hazen which has a population of 2,281. The airport can be accessed by State Highway 200. The airport elevation is 1,814 feet above mean sea level (AMSL). The terrain around the airport is generally flat and primary land use around the airport is agricultural.

Airport Ownership & Management

The airport is owned and operated by the Mercer County Regional Airport Authority. The authority consists of six appointed members who represent the surrounding cities of Hazen, Zap, Golden Valley, Pick City, Stanton, and Mercer County.

Airport History

In 1992, Airport Authority received a grant from the FAA to prepare a study to determine the need of a 5,000 foot by 75-foot runway in the area. The current site of Hazen Municipal Airport was selected for development and in June 1993, construction began. The runway was completed in December 1993.

A complete list of major airport development projects that received funding from FAA and the State can be found in **Table 1-1 - Past Airport Projects.**

Table 1-1 – Past Airport Projects

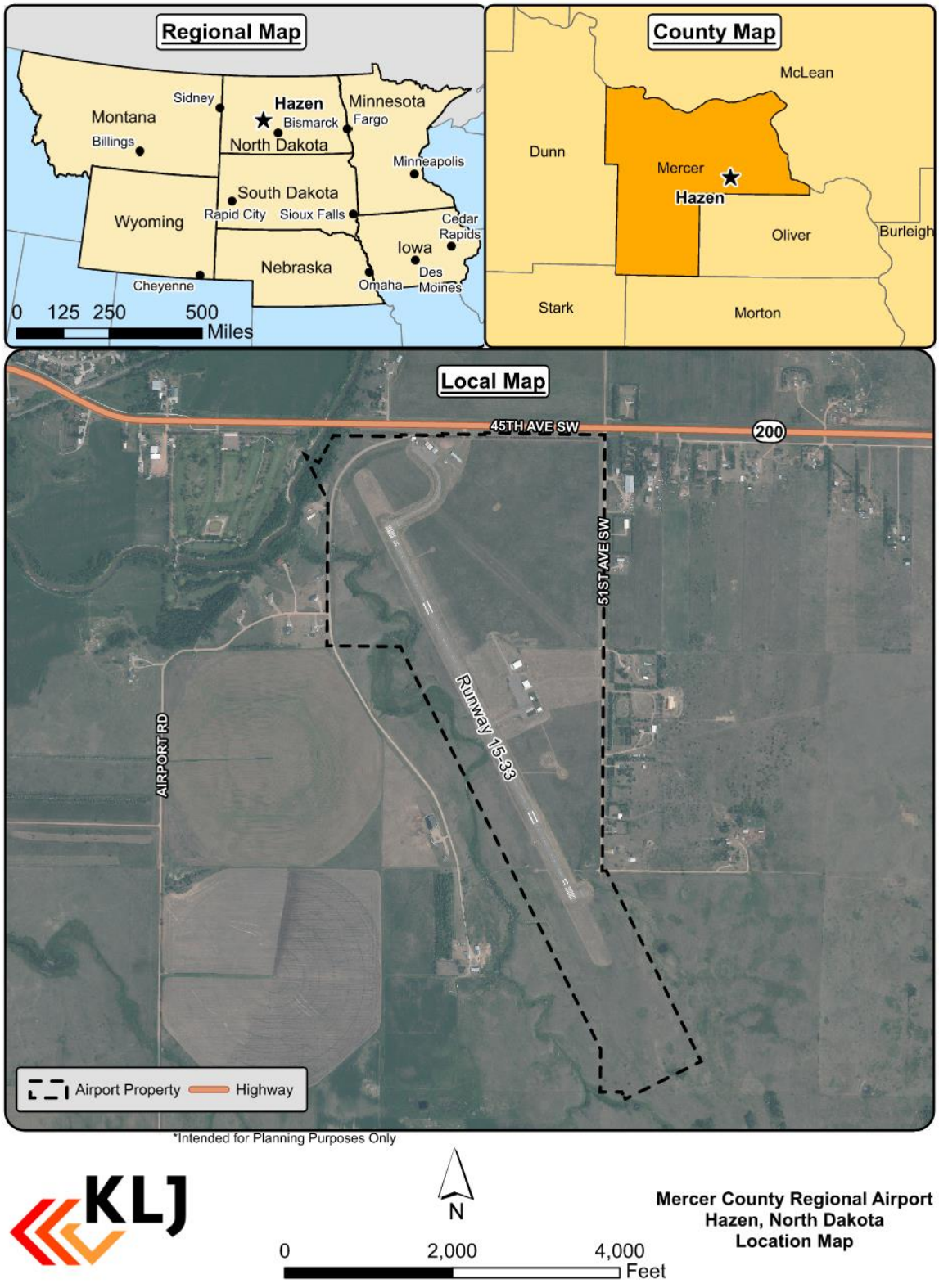
Year	Project	Federal Grant
2006	Rehabilitate Runway	$10,000
2006	Update Airport Master Plan Study	$76,642
2007	Construct Building (Hangar)	$318,280
2007	Rehabilitate Runway	$10,000
2008	Construct Fuel Farm	$34,985
2008	Rehabilitate Runway	$10,164
2009	Acquire Snow Removal Equipment	$34,521
2010	Acquire Snow Removal Equipment	$138,400
2011	Install Airport Beacons	$83,050
2011	Rehabilitate Runway	$26,387
2013	Rehabilitate Runway	$46,278
2015	Construct Apron	$80,000
2015	Improve Building	$169,400
2015	Rehabilitate Apron	$30,000
2015	Rehabilitate Runway	$93,036
2015	Rehabilitate Taxiway	$20,000
2017	Install Miscellaneous NAVAIDS	$7,200
2017	Reconstruct Taxiway	$37,085
2018	Install Miscellaneous NAVAIDS	$45,000
2018	Reconstruct Taxiway	$266,415
2019	Rehabilitate Apron	$40,000
2019	Rehabilitate Runway	$73,457
2019	Rehabilitate Taxiway	$25,000
2021	Reconstruct Runway Lighting	$637,826
2021	Rehabilitate Runway	$2,067,174

Source: FAA Records, KLJ Analysis

Land Area

The airport began acquiring land in 1983 and continued expanding along with airport development projects. According to the 2008 Airport Layout Plan, the Airport has 367 acres owned in fee simple and 21 acres in easement. The airport's Exhibit A Property Map will be updated as a part of this study to the FAA's SOP 3.00 requirements.

Figure 1-2 – Location Map



Airport Role & Design

HZE is a general aviation (GA) airport, meaning it accommodates aeronautical activity other than scheduled commercial air service. GA airports provide vital services for the public including emergency response, community access, personal and business aviation. Additionally, general aviation airports serve a key role in the facilitation of pilot training. HZE does not have an FBO at the airport, but Vanco Aviation operates from the airport and provides aircraft exterior refurbishing and painting. The airport serves Mercer County which includes five cities and customers such as Basin Electric Coop, Sanford Health, U.S. Army Corp of Engineers, Bismarck Air Medical, and agricultural sprayer operations. Public use airports in the United States within 50 nautical miles are listed in **Table 1-2** to provide background into the other area airports.

Table 1-2 – Surrounding Public Airports

Airport Name / City	FAA ID	Location from HZE	Driving Distance	Based Aircraft	Instrument Approach	Longest Runway
Mercer County Regional/ Hazen	HZE	-	-	16	400’ 1m	4,999’
Beulah/Beulah	95D	11 W	15 mi	20	Visual	4,030’
Garrison Municipal/Garrison	D05	23 N	51 mi	17	400’ 1m	3,699’
Glen Ullin Regional/Glen Ullin	D57	31 S	49 mi	12	300’ 1m	3,799’
Mandan Regional/Mandan	Y19	32 SE	66 mi	97	300’ ¾ m	4,399’
Bismarck Municipal/Bismarck	BIS	46 SE	73 mi	105	200’ ½ m	8,794’
Dunn County/Killdeer	9Y1	49 W	61 mi	8	600’ 1m	4,200’

Source: AirNav.com, KLJ Analysis

The airport is part of the National Plan of Integrated Airport Systems (NPIAS) as classified by the Federal Aviation Administration (FAA). NPIAS airports are vital to the national air transportation system. According to FAA standards, the airport is classified as a Local airport. The North Dakota Aeronautics Commission developed a State Aviation System Plan (SASP) in 2014 and airports were placed into four different classifications: Commercial, Local, Basic, Community Pave and Community Turf. HZE is classified as Basic in the SASP.

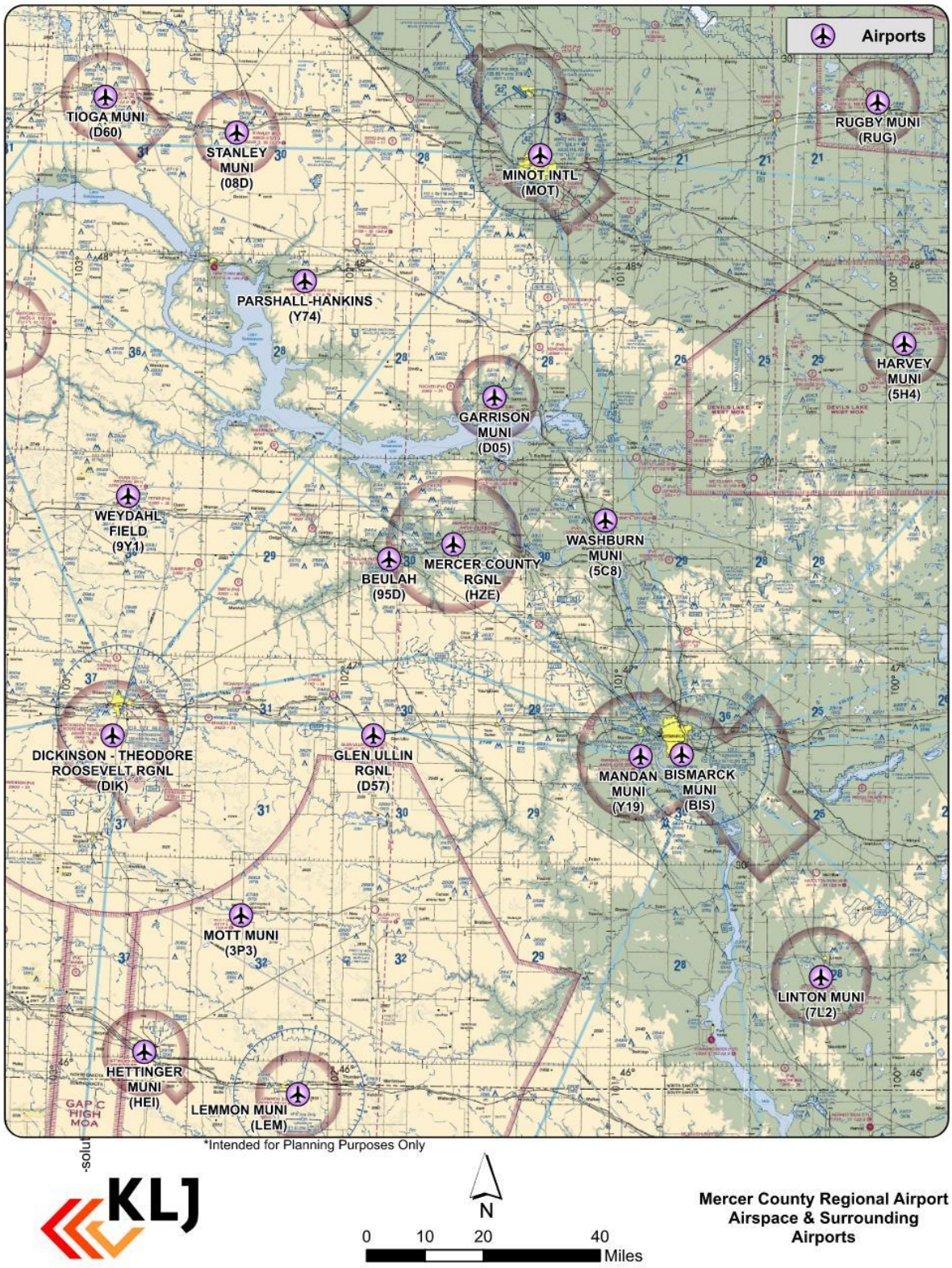
The FAA’s Airport Reference Code (ARC) identifies a design category based on aircraft wingspan, tail height and approach speed for aircraft types that regularly use the airport. For HZE, the existing ARC is B-II. This means the airport is designed for aircraft approach speeds of up to 121 knots and wingspans of up to 79 feet. **Table 1-3** summarizes the airport’s role and design. See **Appendix B: General Aviation Airports 101** for more details on FAA design classifications and State classifications.

Table 1-3 – Airport Role & Design

Airport ID	City	State Classification	FAA Classification	FAA GA Asset Group	ARC
HZE	Hazen	Basic	Non-Primary	Local	B-II
95D	Beulah	Basic	none	none	B-I
D05	Garrison	Local	Non-Primary	Basic	B-I
D57	Glen Ullin	Basic	Non-Primary	Basic	A-I
Y19	Mandan	Local	Non-Primary	Local	B-II
BIS	Bismarck	Commercial Service	Primary Non- Hub	-	D-IV
9Y1	Killdeer	Basic	-	-	B-I

Source: NDSASP, ARC = Airport Reference Code, FAA NPIAS Appendix A

Figure 1-3 – Surrounding Airports



Climate

Mercer County Regional Airport is located in a humid continental climate zone. Winters are cold and relatively dry, while summers are warm and wet. The average annual temperature is 43.2°F from 1991-2020 and an annual precipitation of 16.88 inches. **Table 1-4 – Average Weather** provides the normal conditions that are experienced throughout the year in Mercer County.

The airport has an AWOS-IIIPT located on the airfield, which is an automated weather observation system. Data from the station shows prevailing winds are from the southeast and are generally aligned with the airport's runway orientation. More detailed discussion of meteorological conditions and wind coverage is found in **Chapter 2: Runways and Taxiways**.

Figure 1-4 – Mercer County Regional Airport Wind Chart

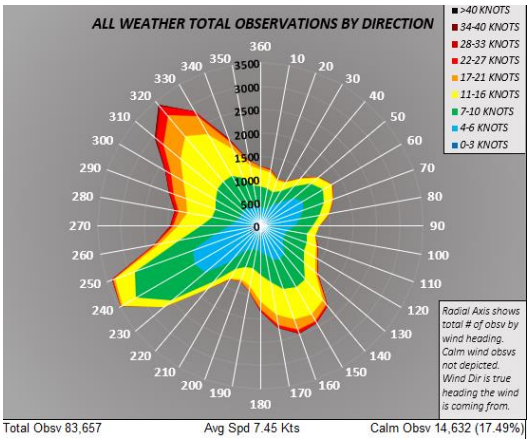


Table 1-4 – Average Weather

Month	Precipitation (in.)	Average Low Temperature (°F)	Average High Temperature (°F)
January	0.26	2.8	23.3
February	0.53	18.0	29.2
March	0.72	30.4	42.5
April	1.61	43.7	58.2
May	2.40	55.1	69.4
June	3.29	64.2	78.0
July	2.50	70.6	85.5
August	1.85	69.8	85.9
September	1.53	60.3	76.8
October	1.33	45.4	58.9
November	0.63	29.4	41.0
December	0.23	17.9	27.8

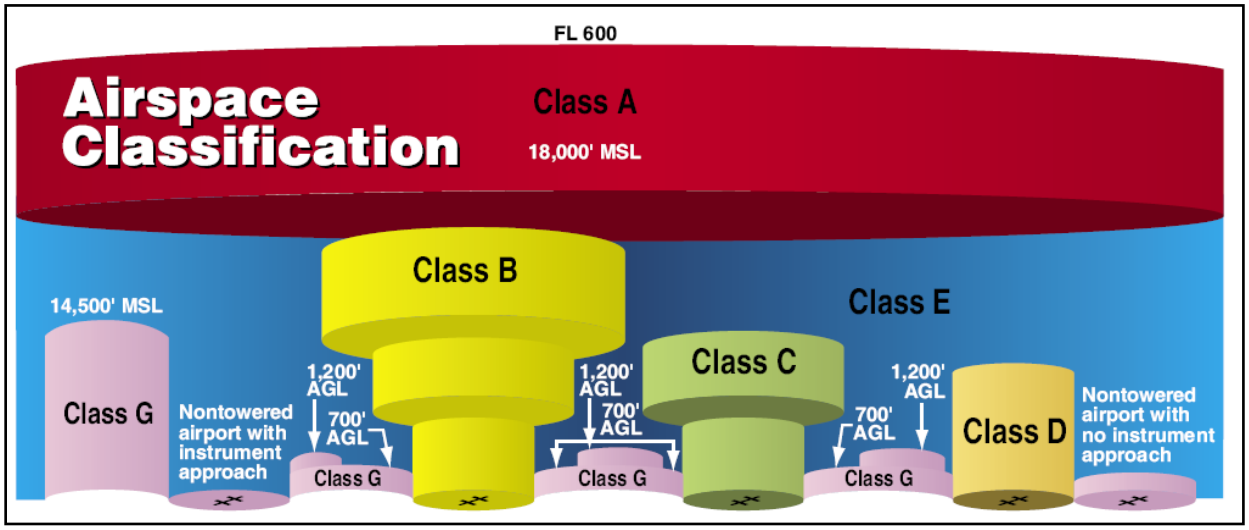
Source: National Weather Service Climate 1991-2020 – Beulah, ND 9 mi W of HZE

Airspace & Area Navigation Systems

The National Airspace System (NAS) consists of various classifications of airspace regulated by the FAA. Airspace classification ensures the safe separation of VFR and IFR aircraft. Airspace is separated into controlled, uncontrolled, special use, or other airspace. Controlled airspace is classified as A, B, C, D, or E. Uncontrolled airspace is classified as G. These classes specify appropriate minimum cloud clearances, visibility requirements, and other operating requirements for aircraft. The major difference between controlled and uncontrolled airspace is that the FAA does not exercise air traffic control over aircraft operating within uncontrolled airspace. Airspace is segregated into controlled, uncontrolled, special use or other airspace. Each airspace class has different operating rules.

HZE is located in uncontrolled Class G Airspace. Controlled Class E Airspace begins at 700 feet above the surface. Flights departing the Airport under instrument flight rules (IFR) must receive an IFR clearance from Minneapolis Center before reaching an altitude of 2,514 feet above mean sea level.

Figure 1-5 – FAA Airspace Classifications



Source: Federal Aviation Administration (FAA) Pilot's Handbook of Aeronautical Knowledge (2007)

Automatic Dependent Surveillance-Broadcast (ADS-B)

ADS-B is a satellite-based surveillance technology in which aircraft transmit GPS position information to other aircraft and to ATC facilities. ADS-B will supplement primary ground-based radar. FAA has required all aircraft operating within airspace requiring a transponder to have ADS-B transmitting equipment installed by the year 2020 as part of the Next Generation Air Transportation System (NextGen) initiative. Various ground stations have been located nationwide to provide ADS-B coverage.

Communications & ATC

The ability for pilots to communicate with other pilots and air traffic control (ATC) is critical for the safety and efficiency of the overall air transportation system. HZE will continue to be an uncontrolled airport however there is a Common Traffic Advisory Frequency (CTAF) that can be used for pilots to communicate with one another while operating on or around the airfield.

Airspace Protection

Airspace is an important resource around airports that is essential for safe flight operations. The airspace is protected through several layers of protection which include property ownership, avigation easements and land use/height restriction zoning.

LAND ACQUISITION

Land acquisition allows the airport to protect airspace and land use areas from possible intrusions. FAA encourages the airport sponsor to own the following land for existing and planned airport facility:

- Airport Infrastructure
- Runway and Taxiway Object Free Areas
- Runway Protection Zones
- Building Restriction Line
- Navigational Aid Critical Areas
- Airspace Protection

AVIGATION EASEMENTS

Avigation easements can control height and/or land use. They have often been used to control the area inside the Runway Protection Zone however the FAA has more recently recommended full acquisition of these properties. The easements can still be a very useful tool to protect the airport depending on the circumstances of particular properties and the type of protection that is needed.

LAND USE AND HEIGHT RESTRICTION ZONING

FAA recommends airport sponsors protect airport land use and airspace through local zoning. Owners of public airports are encouraged to enact airport zoning to protect airspace and surrounding land use for public safety. The intent of zoning is to:

- Protect the airport from incompatible land uses that could interfere with the safety operation of the airport,
- Protect public safety by reducing the potential for fatalities, property damage or noise complaints within the vicinity of the airport, and
- Protect the public investment made by taxpayers in the airport and the economic benefits it provides to the region restrict land uses

Federal - Part 77 Civil Airport Imaginary Surfaces

Title 14 CFR (Code of Federal Regulations) Part 77 *Safe, Efficient Use, and Preservation of the Navigable Airspace* is used to determine whether man-made or natural objects penetrate three-dimensional airspace surfaces and are obstructions. See **Appendix B – General Aviation Airports 101** for a detailed explanation of Part 77 surfaces. **Table 1-5** depicts the existing approach airspace surfaces for HZE. Any existing, future, or ultimate Part 77 obstructions located around HZE will be identified on the ALP and later in this report for further action.

Table 1-5 – Part 77 Approach Airspace Requirements

Runway End	Approach Standards	Part 77 Code	Inner Width*	Outer Width	Length	Slope
Existing						
15-33	Non-Precision Other than Utility As low as 1 mile	C	1,000’	3,500’	10,000’	34:1

*Source: Title 14 CFR Part 77, KLJ Analysis *Inner width is also the Primary Surface width driven by the most demanding approach to a runway.*

Local Airspace Protections

Mercer County Zoning Ordinance follows FAA recommendations regarding airspace protection surrounding HZE. Current zoning ordinances regulate and restrict the height of structures and objects and use of property in the vicinity of the airport in accordance with the FAA. More information regarding how the county protects land surrounding the airport can be found on the county’s website.

Environmental Inventory

Introduction

This section provides an overview of environmental conditions and issues at the airport and the immediate vicinity. This environmental review section is not intended to fulfill the requirement of environmental review required by National Environmental Policy Act (NEPA) or provide a definitive class

of action determination for the proposed improvements. The purpose of this environmental review is to provide community, airport sponsor, and regulatory awareness of the importance of minimizing the environmental impacts this airport improvement area and to provide a general indication of the likely need for further investigation. Appropriate environmental documentation in accordance with FAA Order 5050.4B, *NEPA Instructions for Airport Actions* and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures* is required to be completed prior to commencing with project actions.

Key environmental resources are described for the existing airport area. **Figure 1-6: Environmental Overview Wetland Inventory** provides a graphical depiction of the existing environmental conditions described in this section.

Relevant Environmental Features

BIOLOGICAL RESOURCES



HZN Airport Setting

Biological resources include flora and fauna that are present in an area. HZN is in the Northern Great Plains Ecoregion according to US Geological Survey, a semiarid rolling plain interspersed with intermittent buttes and badlands, which is characterized by vast grasslands and prairies. The area has a continental climate that experiences hot summers and cold winters. The region is primarily used for agricultural purposes, with crops such as wheat, corn, and soybeans grown extensively. The area is home to several grassland and prairie plant species such as big bluestem, switchgrass, and prairie coneflower. Along the nearby Knife River, cottonwood and ash trees can be found. Wildlife in the area includes white-tailed deer, coyotes, prairie dogs, and various bird species such as the western meadowlark and red-tailed hawk. The Knife River and Spring Creek also provides habitat for fish such as suckers, catfish, perch, walleyed pike, and northern pike.

The following is not a complete list of fauna that could be present in the area; it represents the species most likely to be encountered. Bison historically roamed through the area. The wildlife that you are most likely to encounter near the Airport depends on the time of year. In general, the area is known for its population of white-tailed deer, antelope, coyotes, fox, badger, raccoon, jackrabbit, skunk, prairie dogs, and beaver. During the summer months, you may see various bird species such as western meadowlarks, red-tailed hawks, and other migratory birds. The marbled godwit and Prairie Falcon are USFWS Bird of Conservation Concern and may warrant special attention for projects that may occur outside of the existing airport boundary.

According to the U.S. Fish and Wildlife Services website, federally listed endangered, threatened, proposed or candidate species in Mercer County include the Northern long-eared bat, Whooping crane, piping plover, red knot rufa, dakota skipper, and monarch butterfly. In accordance with Section 7 of the Endangered Species Act, consultation with USFWS to determine the potential for occurrences of federally-listed threatened and endangered species in the project area would be necessary. Prior to project implementation, further analysis is required to identify the potential for fish, wildlife and plant impacts as a result of any proposed projects.

DEPARTMENT OF SECTION 4(F) AND SECTION 6 (F)

Section 4(f) is applicable to projects which require the use of publicly-owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance, or land of an historic site of national, state, or local significance. **Figure 1-6: Environmental Overview Wetland Inventory** provides a graphical depiction of the Airport property and surrounding area.

There are no known publicly owned lands from parks, recreation areas, or refuge areas within the immediate vicinity of the Airport. There is a semi-private golf club (privately owned but open for public use) located to the northwest of the Airport. Further review of the potential to impact Section 4(f) resources would be required at the environmental documentation phase of any projects that would require ground disturbance.

Section 6(f) from the Land & Water Conservation Fund Act provides that the Secretary shall not approve any program or project which requires the use of state and local parks, lakes, trails, beaches, and conservation lands, unless: (1) if the request complies with Section 4(f), (2) information is provided that is needed to make findings required under Section 6(f), and (3) coordination is carried out with the NPS and the state agency responsible for the Section 6(f) property. A review of Land Water Conservation Fund grants for Mercer County indicates that 47 grants have been issues for properties within the county. These properties are not located near the Airport. Proposed improvements are not anticipated to impact existing Section 6(f) properties; therefore, no further analysis is required.

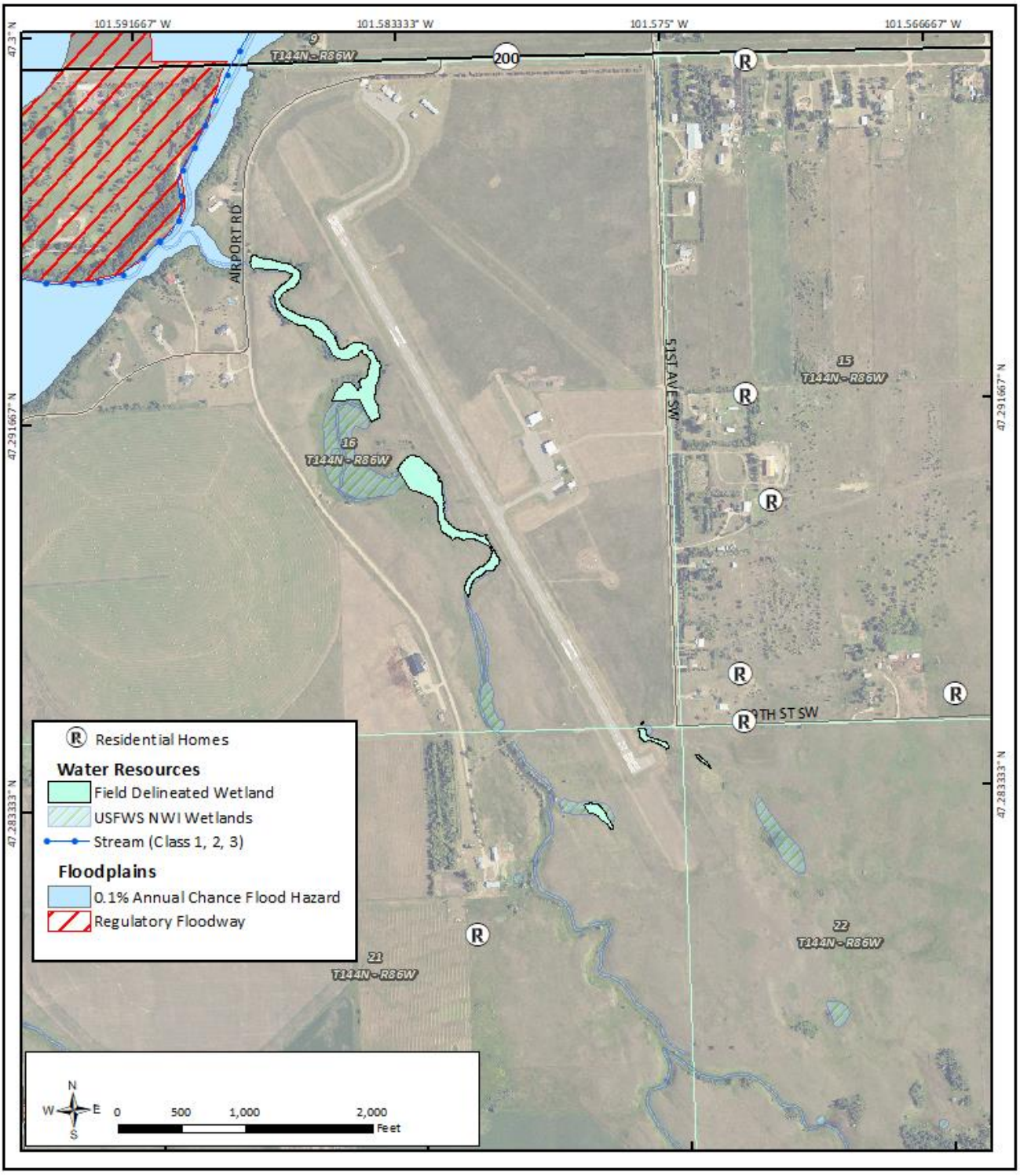
HAZARDOUS MATERIALS

There have been no reported spills or hazardous material leaks in or around HZN. This is based on a review of the ND Department of Environment Quality and Environmental Protection Agency databases regarding underground storage tanks, listings for superfund sites, and sites covered under the Resource Conservation and Recovery Act. Prior to acquisition of new land to be owned in fee title by an airport sponsor, FAA recommends that an Environmental Due Diligence Audit (EDDA) be performed. An EDDA includes a more detailed review of an area, relative to NEPA-level review, for the possible presence of environmental contamination.

SOLID WASTE

The airport has not produced significant amounts of solid waste including garbage, refuse or sludge as compared to the broader community. FAA recommends a Solid Waste Management Plan to be developed as part of this Airport Master Plan study. A Solid Waste study is in **Appendix E: Recycling & Solid Waste Plan**.

Figure 1-6 - Environmental Overview Wetland Inventory



HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Section 106 of the National Historic Preservation Act of 1966, as amended, requires that federally funded projects be evaluated for the effects on historic and cultural properties included in, or eligible for listing in, the National Register of Historic Places (NRHP). The Archaeological and Historic Preservation Act of 1974 provides for the survey, recovery, and preservation of significant scientific, prehistoric, archaeological, or paleontological data when such data may be destroyed or irreparably lost due to a federal, federally licensed, or federally funded project.

Before a project that involves land disturbance is implemented, an analysis to identify the potential for cultural resources would need to be conducted for the project area. Coordination with the State Historic Preservation Office (SHPO) is necessary for projects involving land disturbance. Additionally, any project affecting buildings that have the potential to be listed in the NRHP would require coordination with SHPO.

Prior to this master planning effort a file search was completed at the State Historical Society of North Dakota (SHSND) on July 31, 2019 there are eight previously recorded cultural resources within a one-mile radius of the master plan study area. These consisted of one prehistoric sites, three historical era sites, one architectural sites, one historic lead, one prehistoric isolated find, and one historic isolated find. Of these, the eastern portion of prehistoric site 32ME405 is located within the planning area.

A Class III Inventory was also conducted of the master plan study area during August 2019 by two KLJ archaeologist and two Traditional Cultural Specialists(TCS) from the Standing Rock Sioux Tribe. During the inventory, one previously documented prehistoric site, three newly documented isolated finds and one newly documented historic-era site with modern intrusions were encountered. Isolated finds 32MEX815, 32MEX816, and 32MEX817 each consisted of single artifacts. Site 32ME405 is a previously recorded sparse cultural material scatter. Site 32ME2649 consists of a scatter of historic and modern debris and a push-pile of rocks, bricks, concrete, metal, and glass. The isolated finds and site 32ME2649 were recommended Not Eligible for the NRHP. Site 32ME405 was previously recommended in 2010 as Not Eligible due to the site being destroyed by construction of a water pipeline and gravel road. The KLJ archaeologists agreed with this recommendation.

Provided that no new sites are recorded within the existing airport boundary, no additional inventories would be necessary, and a determination of no historic properties affected could be made during consultation with the ND SHPO. This consultation would need to occur at the environmental documentation phase.

FARMLAND

Under the National Environmental Policy Act (NEPA), it is essential to consider the impacts on farmlands classified as prime, unique, or of statewide or local importance. The Farmland Protection Policy Act (FPPA) of 1981 aims to safeguard prime and unique farmlands. Prime farmland is characterized by the optimal combination of physical and chemical properties for producing food, fiber, forage, feed, and oilseed crops and is available for such purposes. Unique farmland, on the other hand, refers to farmland used to produce specific high-value crops for food, feed, and fiber. Statewide farmland is of critical importance to the production of food, feed, fiber, forage, and oilseed crops, and its designation is determined by state agencies. Local agencies identify locally important farmland where food, feed, fiber, forage, and oilseed crop production are essential at the local level, but not nationally or statewide.

A search of the USDA Natural Resources Conservation Service (NRCS) web soil survey identified land located on and around the Airport is classified as not prime farmland with small pockets of farmland of statewide importance located off the Runway 33 end. Further consultation with NRCS would be required during a project's environmental review stage to calculate the Farmland Conversion Impact Rating if land outside the existing airport property would be acquired and converted to airport property.

LAND USE

Compatible land uses refer to land uses that are not significantly impacted by the normal operations of an airport. These land uses are typically located in the vicinity of the airport and are generally associated with noise impacts and safety concerns. Noise impacts are a major consideration when determining the compatibility of land uses near an airport. Airport operations can generate significant levels of noise, particularly during takeoffs and landings. As a result, areas near the airport that are designated for residential, commercial or other noise-sensitive uses may not be compatible with the noise levels generated by the airport. Safety concerns are also a key factor in determining the compatibility of land uses near an airport. Runways and flight paths require clear zones that must be kept free of obstacles, which can limit the types of land uses that can be in these areas. Additionally, there may be specific restrictions on the height of buildings or other structures in the vicinity of an airport to ensure that they do not interfere with flight operations. Ultimately, the compatibility of land uses near an airport is an important consideration for both airport operators and neighboring communities. Careful planning and zoning can help to ensure that noise and safety concerns are addressed, while still allowing for compatible land uses that can benefit the community and support the airport's operations.

Land uses considered incompatible often include fuel storage facilities, public assembly venues, tree-lined areas, densely populated residential zones, and regions likely to attract hazardous wildlife. Generally, the area surrounding HZN is characterized by open spaces, lightly populated rural residential development, and agricultural land use towards the south.

WILDLIFE HAZARDS

The FAA has developed protocols and guidelines aimed at mitigating wildlife-related damage to aircraft and aviation infrastructure. In the last two decades, there has been an uptick in wildlife collisions, with improved reporting mechanisms bringing greater attention to the associated risks to human health, safety, and economic interests.



Sewage Treatment ponds northwest of the Airport

The area around HZN Airport includes private pasture lands and irrigated croplands to the southwest. Additionally, the town of Hazen's sewage disposal ponds, situated approximately 1.25 miles northwest of the airfield, necessitate regular monitoring to prevent them from attracting wildlife that could endanger aircraft operations at HZN. The Knife River, located less than a quarter mile north of the airport, also requires surveillance for similar reasons.

The airport is encircled by a perimeter fence consisting of three or four wires, which offers limited deterrent against wildlife such as deer, antelope, and coyotes from entering the airport's operational areas, including the runway. It is imperative for the airport to stay vigilant regarding wildlife activity. Should concerns arise, consulting a qualified wildlife biologist for a site assessment could yield strategic recommendations to alleviate wildlife hazards at the airport.

SOCIOECONOMIC IMPACTS, ENVIRONMENTAL JUSTICE AND CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISKS

The social repercussions of a project are determined by its influence on the lifestyle, behavior, and economic status of the individuals residing in the project's vicinity. This includes the project's impact on local businesses, job opportunities, transportation, utilities, and other factors crucial to the community's social fabric. Actions that either negatively or positively alter these aspects can be seen as having a social impact on the inhabitants of a certain area. Projects confined to the premises of an existing airport are generally not expected to negatively affect minority and low-income groups. Given that the airport is situated within a community identified by the EPA as disadvantaged, any expansion beyond the current airport boundaries could potentially result in disproportionate impacts. Therefore, to prevent any unequal and adverse effects on minority and/or low-income populations, conducting further analyses in the early phases of project development would be necessary.

WATER RESOURCES

Wetlands

Wetlands are defined in Executive Order 11990, Protection of Wetlands, as those areas that are inundated by surface or groundwater with a frequency to support, and under normal circumstances does or would support, a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Three parameters that define a wetland as outlined in the US Army Corps of Engineers Wetland Delineation Manual are hydric soils, hydrophytic vegetation, and hydrology.

There are wetlands shown in the National Wetland Inventory (NWI) located on the Airport property. A wetland field delineation was completed on the Airport in 2019 prior to a pavement rehabilitation project on the runway, taxiways, and apron. Three wetlands, comprised of six segments, were delineated. The delineated wetlands totaled approximately 8.31 acres. The wetland located on the westside of Runway 15-33 was determined to be a jurisdiction water of the U.S the USACE on January 7, 2020. Coordination with USACE would need to be completed at the environmental documentation phase for any project that impacts this resource, and the field delineation may require an update if more than five years have passed since the determination was issued. In addition to maintaining water quality in rivers and recharging groundwater among other positive benefits, wetlands may have the potential to attract wildlife that can be hazardous to aircraft using the Airport. Please refer to **Figure 1-6**.

Surface and Ground Waters

The Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977, provides the authority to establish water quality standards, control discharges into surface and subsurface waters, develop waste treatment management plans and practices, issue permits for discharges (Section 402) and for dredged or fill material (Section 404).

Activities at the airport can impact water quality, primarily through stormwater runoff from paved surfaces. Implementing best management practices and incorporating vegetated swales for treating stormwater runoff from runways, taxiways, and apron areas can significantly reduce potential water quality degradation. At HZN Airport, drainage typically flows directly from paved surfaces across grass covered scopes and into an unnamed tributary of the Knife River, located along the airport's western boundary. This tributary joins the Knife River about a quarter mile north of the airport, which then flows into the Missouri River, situated approximately 10 miles eastward.



Drainage on west side of Runway 15- 33

Environmental Features Not Relevant

AIR QUALITY CLASSIFICATION

The FAA Orders 1050.1F and 5050.4B outline procedures for determining when airport-related projects require an air quality analysis, and if so, what level of analysis may be necessary. The Airport is located within an area of attainment for all National Ambient Air Quality Standards (NAAQS); due to the small size of the airport and limited number of operations that would occur at the airport detailed analysis is very unlikely to be required.

CLIMATE

Although there are no federal standards for aviation-related Green House Gas (GHG) emissions, it is well-established that GHG emissions can affect climate. The Council on Environmental Quality (CEQ) has indicated that climate should be considered in NEPA analyses. As noted by CEQ, however, “it is not currently useful for the NEPA analysis to attempt to link specific climatological changes, or the environmental impacts thereof, to the particular project or emissions; as such direct linkage is difficult to isolate and to understand.”

With respect to GHG emissions, aviation activity at Mercer County Regional Airport represents a small percentage of U.S. and global emissions; therefore, no further review is required.

COASTAL RESOURCES

Coastal Resources include Coastal Barriers and Coastal Zone Management. Coastal Barriers include islands that protect the mainland from storm or hurricane-driven winds or waves by providing a buffer to the shoreline. Coastal Barriers protect fish, wildlife, human life, and property along coasts and shorelines. Facilities are not recommended to be built within the Coastal Barrier Resource System (CBRS). Coastal Zone Management includes development provisions actions to protect major shorelines and associated recreational, historical, cultural, and aesthetic values. The area is not located near a coastal zone as defined in the Coastal Zone Management Act of 1972. No further analysis is required.

NATURAL RESOURCES AND ENERGY

Impacts on energy supplies and natural resources are related to changes of stationary facilities, such as airfield lighting or terminal building heating and expansion, as well as any increase of fuel consumption by aircraft or ground vehicles. Proposed improvements at HZN would require additional energy but is not anticipated to cause significant impacts to energy supplies or natural resources. No further analysis is required.

NOISE AND NOISE COMPATIBLE LAND USE

Noise emitted from aircraft can significantly affect the well-being of people living or working near an airport. The FAA requires noise studies for certain projects. If a project involves Airplane Design Groups I and II and has forecasted operations of less than 90,000 annual propeller operations or 700 annual adjusted jet operations such as the case at HZN then no further noise analysis is required.

VISUAL IMPACTS

The aesthetic value of an area is influenced by its landscape and the viewer's response to the view, scenic resource, or man-made features. The extent of potential visual contrast/compatibility effects with adjacent landforms and land uses are addressed from the vantage point of those looking to an airport from outside the system.

WATER RESOURCES

Floodplains

Floodplains constitute lands situated along rivers and their tributaries that are subject to periodic flooding on the average interval of 100 years or less. While the floodplain is located just northwest of the Airport, HZN is not located within a 100-year floodplain. No further analysis is required.

Wild and Scenic Rivers

No designated Wild and Scenic Rivers are located near HZN. The segment of the Knife River located north of the airport is not listed in National Rivers Inventory. No direct or indirect impacts to wild scenic rivers would occur due improvement. No further analysis is required.

Aviation Activity

The Aviation Activity Forecasts chapter of the Airport Master Plan analyzes current and future airport activity at the Mercer County Regional Airport (HZE). Forecasting provides an airport with a general idea of the magnitude of growth, as well as fluctuations in activity anticipated over the forecast period. They assist the Airport in determining existing and planned future facility needs based on airport activity level estimates and projections. Forecasts attempt to develop a realistic estimate of future changes.

Forecasting efforts are based on a "snapshot" of existing aviation trends and socioeconomic climate. As such, forecasting tends to be a dynamic element of airport master planning. When conditions change dramatically, forecasts should be reviewed and updated accordingly to reflect the changed environment.

The forecasts developed for HZE will be important to adequately plan, size, and sequence development of future facilities to meet future projected growth. Development at airports, however, is demand-based from actual numbers rather than forecasts.

To thoroughly analyze and develop a probable aviation forecast, a technical review has been completed using several methods to help quantify the potential aviation activity over the next 20 years.

Forecast Rationale

Forecasting the demand for airport use is a critical step in airport development. It allows an airport to examine its ability to satisfy the needs of the aircraft and people it serves, and to determine the approximate timing of necessary improvements by projecting airport user activity levels.

Forecasts developed for airport master plans and/or federal grants must be approved by the Federal Aviation Administration (FAA). It is the FAA's policy, listed in FAA AC 150/5070-6B, Airport Master Plans, that FAA approval of forecasts should be consistent with the Terminal Area Forecasts (TAF). Master plan forecasts for operations and based aircraft are consistent with the TAF if they meet the following criteria:

1. Forecasts differ by less than 10 percent in the five-year forecast and 15 percent in the 10-year period, or
2. Forecasts do not affect the timing or scale of an airport project, or
3. Forecasts do not affect the role of the airport as defined in the current version of FAA Order 5090.5, Formulation of the National Plan of Integrated Airport Systems (NPIAS) and the Airports Capital Improvement Plan (ACIP).

Forecasts that are inconsistent with the TAF require additional FAA review to confirm the planning assumptions and appropriate methodologies are used.
Furthermore, FAA Order 5090.5 states forecasts should be:

1. *Realistic*
2. *Based on the latest available data*
3. *Reflect the current conditions at the airport*
4. *Supported by information in the study*
5. *Provide an adequate justification for the airport planning and development*

The TAF model used for this report is from the 2022 FAA TAF published in January 2023. This is latest data available when the forecasting effort began for this study.

Factors Affecting Forecasts

FAA provides general guidance in evaluating factors that affect aviation activity. FAA AC 150-5070-6B states:

> *"Planners preparing forecasts of demand or updating existing forecasts should consider socioeconomic data, demographics, disposable income, geographic attributes, and external factors such as fuel costs and local attitudes towards aviation."*

For purposes of this forecast, the following defining factors have been used to develop the forecast:

1. Based on availability of data when the project began (August 2023), Federal fiscal year 2022 (October 1, 2021 through September 30, 2022) has been used as the baseline year.
2. FAA data from 2022 (where available) and State data from 2014 has been used to validate forecast assumptions and update the forecast baseline.

3. The forecast period is 20 years encompassing years 2022 through 2042.
4. The most recent 2022 estimates and future projections of socioeconomic and demographic trends have been utilized for the airport service area.
5. The core airport service area is considered Mercer County, ND for this forecasting effort.

The forecasts prepared for the airport assume an unconstrained scenario where facilities are available for use to meet demand. Any constrained forecasts prepared will be noted throughout the document. Time periods include short-term (5-year), mid-term (10-year) and long-term (20-year) resulting in forecasts for year 2027, 2032, 2037, and 2042. Forecasts may be developed using a composite of methodologies over the planning period.

Forecasting Methods

Various methodologies are used to develop aviation forecasts. Forecasts should not be considered predictions of the future but rather an educated projection of future activity. Some of the following forecasting methods were applied for this analysis, including trend extensions, market share analysis, regression analysis, socioeconomic methodologies, and professional judgment.

TREND EXTENSIONS

A trend extension forecast identifies historical growth patterns and projects those patterns into the future. Often, a trend line can be drawn through a graph of the historical data to reveal an overall trend, which can then be extended into the immediate future to develop a forecast.

MARKET SHARE ANALYSIS

Market share analysis assumes a relationship between local and national/regional forecasts. The market share approach to forecasting is a top-down method where activity at an airport is assumed to be tied to growth in some external measure (typically a regional, state, or national forecast).

REGRESSION ANALYSIS

Regression analysis is a statistical technique for estimating the relationships between one or more variables and a specific dependent variable. Regression analysis identifies the correlation between a known independent variable(s) (e.g., estimates and projections of population, income, etc.) and the dependent variable(s) (e.g., based aircraft or aircraft operations). The correlation between the dependent and independent variable is represented by the correlation coefficient defined as the R^2 (R-squared) value. The range of values for the correlation coefficient is quantified as either a positive or negative value between +1.00 and -1.00 indicating a positive or negative relationship between the dependent and independent variable(s). Generally, a correlation coefficient greater than 0.8 is described as strong, whereas a correlation coefficient less than 0.5 is generally described as weak.

PROFESSIONAL JUDGMENT

Judgmental methods are educated estimations of future events based on the industry knowledge, experience, and intuition of the forecaster. This method permits the inclusion of a broad range of relevant information into the forecasting process, and is usually used to refine the results of the other methods.

Socioeconomic Data

Socioeconomic information within the airport service area can provide insight into factors that affect aviation activity at an airport. Commonly evaluated metrics include population, employment, income, gross regional product, and retail sales. Historic trends, current data and forecast estimates are evaluated in this section to identify socioeconomic trends that may affect aviation activity forecasts at HZE. Growth rates are used as a method to compare the airport service area to other regional, statewide, and national trends.

For purposes of this study analysis Mercer County data[1] has been determined to represent the core local airport service area.

Population

Population is a basic indicator of the number of people who may utilize the airport. From **Table 1-6** you can see a very small decline for Mercer County while the state and county are increasing in population.

Table 1-6 – Population

Year	Mercer County	North Dakota	United States
2000	8,597	642,023	282,162,375
2010	8,418	674,752	309,327,089
2020	8,330	778,962	331,501,080
Historical Annual Growth Rate	*-0.158%*	*0.971%*	*0.809%*
2022 (base)	8,322	780,262	334,193,837
2027	*8,321*	*806,206*	*345,453,926*
2032	*8,320*	*831,260*	*356,413,897*
2037	*8,319*	*854,976*	*366,893,550*
2042	*8,318*	*881,844*	*376,916,244*
Forecast Annual Growth Rate	*-0.002%*	*0.58%*	*0.60%*

Source: Woods & Poole Economics, U.S. Census Bureau

Income

Per Capital Personal Income (PCPI) was also considered as a factor affecting aviation activity. Those who have more disposable income may have a higher propensity to utilize the time savings of aviation, or simply more disposable income for leisure.

Table 1-7 – Per Capita Personal Income

Year	Mercer County	North Dakota	United States
2000	$26,783	$25,892	$30,672
2005	$32,423	$31,967	$35,868
2010	$43,547	$44,284	$40,690
2015	$56,189	$54,014	$48,738
2020	$59,364	$60,451	$59,147
Historical Annual Growth Rate	*4.06%*	*4.33%*	*3.34%*
2022 (Base)	$64,833	$68,502	$65,831
2027	$80,893	$86,526	$83,842

[1] Woods and Poole Economics 2022 Data Set

2032	$100,332	$108,351	$105,939
2037	*$124,430*	*$135,956*	*$133,943*
2042	*$153,898*	*$170,492*	*$169,054*
Forecast Annual Growth Rate	*4.37%*	*4.61%*	*4.78%*

Source: Woods & Poole Economics, U.S. Census Bureau

Employment

Total employment is the measure of the active workforce. For Mercer County, the largest five industries are Utilities, Mining, Health Care, State/Local Government and Retail. These five groups make up 56% of the total employment.

Table 1-8 – Airport Service Area Employment (2022)

Industry	Employment	Earnings (in millions)
Utilities	983	$127.42
Mining	621	$86.48
Health Care and Social Assistance	571	$22.57
State and Local Government	531	$23.98
Retail Trade	506	$11.16
Construction	444	$38.26
Farming	350	$3.11
Lodging and Food	269	$3.76
Other	243	$8.04
Finance and Insurance	216	$7.31
Real Estate and Rental Leasing	162	$2.12
Professional and Technical Services	134	$4.85
Administrative and Waste Services	126	$2.62
Information	112	$7.37
Wholesale Trade	107	$6.56
Forestry, Fishing and Related Activities	100	$4.54
Transportation and Warehousing	67	$2.14
Arts, Entertainment and Recreation	55	$0.46
Federal Military	49	$1.66
Manufacturing	47	$1.12
Federal Civilian Government	38	$2.83
Educational Services	35	$0.75
Management of Companies	0	0
All Industries	**100%** **5,766**	**100%** **$369.00**

Source: Woods & Poole Economics (2009 dollars)

Table 1-9 – Total Employment (in thousands)

Year	Mercer County	North Dakota	United States
2000	6,088	440,655	165,370,755
2010	6,363	503,810	172,901,669
2020	5,496	550,691	190,776,766
Historical Annual Growth Rate	*-0.51%*	*1.12%*	*0.72%*

2022 (base)	*5,766*	*595,581*	*207,048,429*
2027	*5,956*	*641,054*	*223,733,232*
2032	*6,060*	*678,509*	*237,417,579*
2037	*6,146*	*715,905*	*250,859,680*
2042	*6,217*	*753,458*	*264,7133,081*
Forecast Annual Growth Rate	*0.31%*	*1.12%*	*1.15%*

Source: Woods & Poole Economics, U.S. Census Bureau

Based Aircraft

A based aircraft is an operational and airworthy aircraft claiming an airport as its home for most the year. The inventory of based aircraft is maintained using the National Based Aircraft Inventory Program (NBAIP) which is controlled by the FAA. Each airport is able to enter their aircraft into the NBAIP by N-Number. If for any reason that an aircraft is recorded at more than one airport, the aircraft is not counted in any airport's inventory. It is then up to the respective airport managers to communicate with each other and resolve where the aircraft is located.

Historical Data

According to the FAA's Master Record (Form 5010), the based aircraft count is 16 single engine aircraft. The National Based Aircraft Inventory Program (NBAIP) states there are 17 in the FAA Aircraft Registration data inventory but only 16 were validated. The Terminal Area Forecast (TAF) issued in February 2023 reported 16 based aircraft. The 2014 North Dakota State Aviation System Plan stated that there were ten based single engine aircraft with a forecast of only 13 aircraft by the year 2035. Based on this information, 16 based aircraft were decided to be used throughout the study.

Forecast

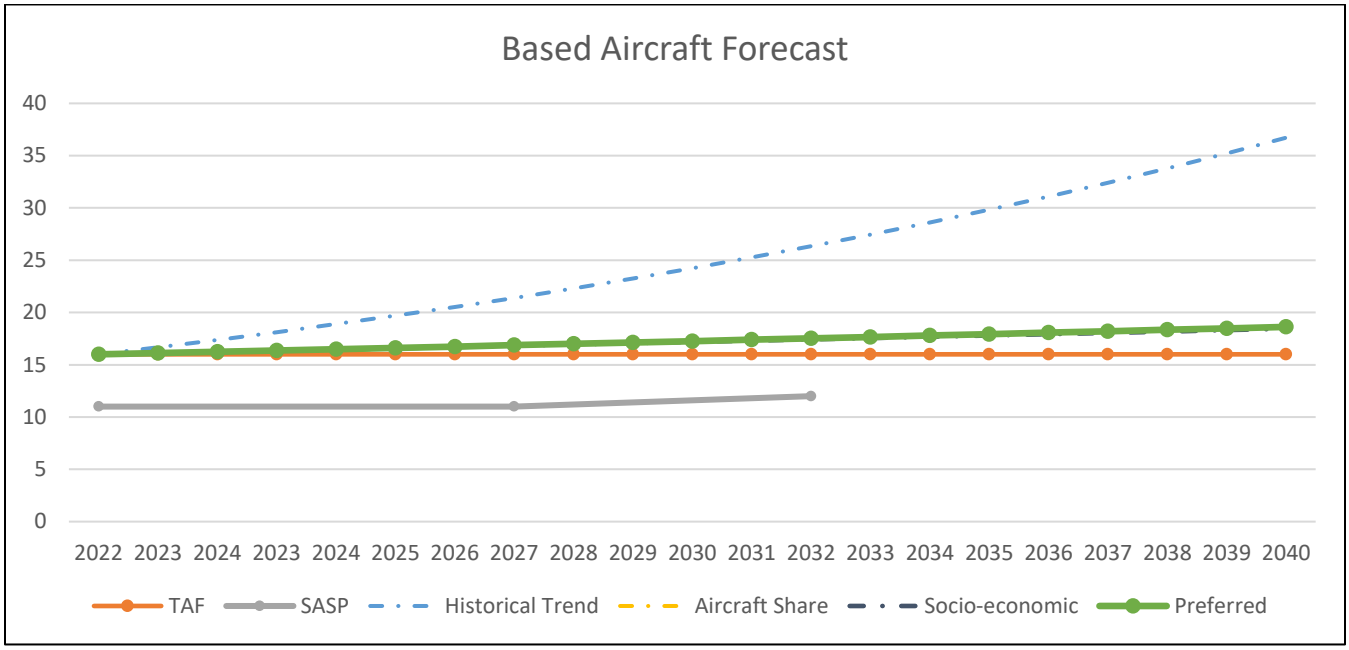
Local industry trends were evaluated when preparing this forecast of based aircraft at HZE. It is estimated that based aircraft will grow at HZE for several reasons:

- From a socio-economic perspective, Mercer County's per capita personal income will increase by 4.37% and total employment will grow by 0.31%. These numbers track with the national per capita personal income of a 4.78% growth rate and national total employment growth of 1.15%. An area with more disposable income will have more of a propensity to use aviation services.
- There is a strong demand for individual aircraft storage space. Many users currently share a large hangar and moving aircraft takes time. Lack of hangar space is a local and regional trend. Over the last three to five years local hangar availability has been no more than one vacant space per year. There is no current waiting list for the airport, but several users have ceased basing aircraft at HZE due to the lack of individual hangars.
- A turf crosswind runway would benefit many current tenants for most do not fly on windy days and utilize the existing non-published turf runway (13-31 alignment used before construction of 15-33) though it is not FAA approved nor maintained. Users stated they are discouraged from flying between 20% to 40% of the time due to the lack of a crosswind runway. Current planning of a turf crosswind runway is believed to increase based users from flying up to 50% more.

- Request for a flight school has been brought up but due to the lack of storage and apron space it has yet to be pursued. Increased infrastructure could attract a flight school and there for increase based operations.

The preferred HZE based aircraft forecast method for HZE will be the aircraft share. The reason for this is because data is coming from the Terminal Area Forecast (TAF) utilizing the state information which follows the socio-economic growth rate end the North Dakota State Aviation System Plan growth rate. With 16 based in 2022, by 2042 the number of based aircraft at HZE should increase by 0.76% which will make the new number of based aircraft 19 single-engine aircraft and one multi-engine aircraft.

Figure 1-7 – Based Aircraft Forecast



Source: KLJ Analysis. TAF=Terminal Area Forecast, SASP=State Aviation System Plan.

General Aviation

General Aviation (GA) is non-commercial aviation activity not classified in another category. At non-towered airports like HZE, FAA estimates operations and classifies them as civil local or GA itinerant. Combined these include all types of general aviation operations.

Local operations are performed by aircraft that remain in the local traffic pattern and stay within a 20–mile radius. These operations typically include practice landings, touch-and-go operations, practice approaches and maneuvering within the local area in non-military aircraft. Local operations are usually performed by recreational and flight training aircraft.

Itinerant operations are performed by a landing aircraft arriving from outside the airport area (20 miles) or a departing aircraft that leaves the airport area. Itinerant operations are conducted in all types of aircraft.

Historical Data

The TAF for the national, state, and airport historical GA itinerant operations shows multiple shifts from decreasing to increasing with the 1990-2020 CAGR for national at -0.01%, state at 0.002% and the airport at -0.02%. From the population, the TAF CAGR for the airport is decreasing at a very slow pace but the state and nation are planning on increasing up to 0.60% through 2043.

This is a non-towered airport so keeping track of the exact number of aircraft operations is not probable. An estimate is used from IFR operations. In 2022 a total of 222 IFR operations were reported from the FAA's Traffic Flow Management System (TFMS). This number does not include VFR operations which account for a lot of the smaller aircraft utilizing the airport for flight training and recreational use. Based aircraft contribute to the local operations and are made up of single engine aircraft used for personal use.

Fuel gallons sold at the airport can be a contributing factor to forecasting apron space and facility needs. The type of fuel sold can also provide insight into the types of aircraft utilizing fueling services. **Table 1-10 identifies annual fuel sales at HZE in the last six years.**

Table 1-10 – Historic Annual Fuel Sales

Year	100LL (Gallons Sold)	Jet A (Gallons Sold)	Total Gallons (Annual)
2016	11,712	13,535	25,247
2017	7,241	12,874	20,115
2018	8,667	10,291	18,958
2019	6,776	10,775	17,551
2020	11,476	1,967	13,443
2021	8,875	3,203	12,078
2022	9,660	8,008	17,668

Source: Mercer County Regional Airport Authority, KLJ Analysis

Forecast

Without an air traffic control tower, there is no accurate method to determine itinerant or local operations at the airport. Several options were evaluated to determine the most realistic aircraft operations. The national and state TAF, 2014 SASP, master record, and inventory collected from outreach to airport users were all considered and evaluated to pull data from.

It was decided 5,000 operations would be the starting point for the GA operations forecast numbers. This was determined by using 300 annual operations per based aircraft which is a typical ratio noted in FAA Order 5090.3C Field Formulation of the NPIAS. **Table 1-11** breaks down the forecasted local and itinerant operations for the planning period.

Table 1-11 – General Aviation Operations Forecast

Metric	2022	2027	2032	2037	2042	*CAGR*
Local Operations	2,600	2,689	2,782	2,878	2,977	0.68%
Itinerant Operations	2,400	2,483	2,568	2,656	2,748	0.68%
Total Operations	**5,000**	**5,172**	**5,350**	**5,534**	**5,724**	**0.68%**

Source: KLJ Analysis. CAGR=Compounded Annual Growth Rate

Fleet Mix

When determining a fleet mix of aircraft at a general aviation airport, information is typically limited to what the sponsor sees or who is based on the airfield. However, most operations conducted under IFR are tracked by FAA at airports that have Instrument procedures. The drawback of this data is it does *not* cover those aircraft operating under VFR or outside of a radar environment. For VFR flights, interpolation and estimating is required. Most corporate general aviation aircraft operate under IFR. FAA's Traffic Flow Management System (TFMS) data was used to determine an overall estimated fleet mix. Specifically, this data was used to determine proration percentages of aircraft types using the airport under IFR. This proration was then applied to existing and future airport operations at HZE.

TFMS data was gathered from years 2018 through 2022. The fleet mix of aircraft identified in the following table is used for itinerant flights conducted under IFR. An aggregate of aircraft types were ranked and the top 20 moved forward to help establish an overall IFR fleet mix. It is estimated about 15 percent of all operations at HZE are operated under IFR.

Table 1-12 – TFMS Data Fleet Mix (2018-2022)

Aircraft ID	Make/Model	Type	Operations
BE20	Beechcraft King Air 200	Turboprop	122
C208	Cessna 208 Caravan	Turboprop	84
E55P	Embraer Phenom300	Turbojet	74
C560	Cessna Citation Ultra	Turbojet	61
SW4	Fairchild Merlin 4/ Metro 2	Turboprop	47
PC12	Pilatus PC-12	Turboprop	41
PA46	Piper Malibu Matrix/Mirage	Single Engine Piston	24
M20P	Mooney M-20C Ranger	Single Engine Piston	22
SR22	Cirrus SR-22	Single Engine Piston	19
EC45	Eurocopter EC145	Helicopter	17
C182	Cessna 182	Single Engine Piston	15
C310	Cessna 310	Multi Engine Piston	15
BE9L	Beechcraft King Air C90	Turboprop	14
C172	Cessna 172	Single Engine Piston	12
P46T	Piper Pa-46 500Tp Malibu Meridian	Single Engine Piston	12
C441	Cessna Conquest II	Turboprop	11
PA34	Piper Pa-34 Seneca	Multi Engine Piston	9
BE35	Beechcraft Bonanza 35	Single Engine Piston	8
P28A	Piper Cherokee	Single Engine Piston	8
C25C	Cessna Citation CJ4	Turbojet	7
		Total Top 20 Sample	**622**
		Turboprop (51%)	319
		Turbojet (26%)	159
		Piston (23%)	144
		Total 2011-2022 IFR Operations	**769**

Source: FAA Traffic Flow Management System (TFMS), KLJ Analysis

The data table above is only a sample of IFR operations as the clear majority of VFR operations are conducted in single-engine piston aircraft. Estimated fleet mix percentages are then identified for all commercial, local and itinerant airport operations conducted under IFR and VFR. Modifications have

been made based on available local data, local user projections, broader industry trends and professional judgement to account for anticipated future user fleet mix changes. The overall estimated fleet mix share breakdown is identified in the table below.

Table 1-13 – Fleet Mix Share Breakdown

Metric	2022	2027	2032	2037	2042	CAGR
Single-Engine Piston	65.00%	65.13%	65.25%	65.38%	65.50%	0.04%
Multi-Engine Piston	15.00%	15.00%	15.00%	15.00%	15.00%	0.00%
Turboprop	7.50%	7.50%	7.50%	7.50%	7.50%	0.00%
Turbojet	7.00%	7.06%	7.13%	7.19%	7.25%	0.18%
Helicopter	5.00%	4.94%	4.88%	4.81%	4.75%	-0.26%
Ultralight/Other	0.50%	0.38%	0.25%	0.13%	0.00%	-100.00%

Source: KLJ Analysis, CAGR = Compounded Annual Growth Rate

The total annual operations are prorated by the estimated fleet mix share percentage to yield a fleet mix operational forecast.

Table 1-14 – Total Operations Fleet Mix Forecast

Metric	2022	2027	2032	2037	2042	CAGR
Single-Engine Piston	3,250	3,368	3,491	3,618	3,749	0.72%
Multi-Engine Piston	750	776	802	830	859	0.68%
Turboprop	375	388	401	415	429	0.68%
Turbojet	350	365	381	398	415	0.86%
Helicopter	250	255	261	266	272	0.42%
Ultralight/Other	25	19	13	7	0	-100.00%
Total Operations	**5,000**	**5,172**	**5,350**	**5,534**	**5,724**	0.68%

Source: KLJ Analysis, CAGR = Compounded Annual Growth Rate

Critical Design Aircraft

The critical design aircraft is identified as the most demanding aircraft or family of aircraft to regularly use the airport. A critical design aircraft type or family must operate at least 500 annual operations at the airport to be considered "regular" use by FAA for improvements to be justified for FAA funding. The methodology identified in FAA AC 150/5000-17, Critical Aircraft and Regular Use Determination was used for this analysis.

A review of the TFMS data and feedback from airport users was used to determine the design aircraft. At HZE, a fleet mix including turboprop and small jet aircraft were the largest aircraft types to operate.

Existing

The FAA TFMS is one source of information, but outreach was also conducted by the planning team to learn the variety of aircraft operating at HZE. Through this, the range of aircraft that is most demanding was identified. These aircraft are listed in **Table 1-15 - Existing Critical Design Aircraft**. None of these individual aircraft types has 500 annual operations, but from this range it was determined to make the B-II (TDG-2) aircraft to be the existing critical design aircraft. Examples of the aircraft sizes are portrayed in **Figure 1-8**.

Table 1-15 – Existing Critical Design Aircraft

Aircraft Type	FAA AAC	FAA ADG	FAA TDG	MTOW (lbs.)
Air Tractor 402	A	II	1-A	7,860
Air Tractor 502	A	II	1-B	9,400
Air Tractor 802	B	II	1-B	16,000
Beechcraft King Air 200	B	II	2	12,500
Beechcraft King Air 90	B	II	1A	9,650
Cessna Citation Ultra	D	II	2	16,630
Cessna 208 Caravan	A	II	1-A	8,750
Embraer Phenom 300	B	II	1A	17,527
Pilatus PC-12	A	II	2	10,450

Source: KLJ Analysis, AAC = Aircraft Approach Category, ADG = Airplane Design Group, TDG = Taxiway Design Group, MTOW = Maximum Takeoff Weight

Future

While it is not expected that the fleet mix at Hazen will change in the future, Basin Electric has expressed interest in operating their Embraer Phenom 300 at the Airport. For planning purposes, the Critical Design Aircraft will continue to be B-II (TDG-2) until the airport's needs dictate otherwise.

Figure 1-8 – Airport Reference Code Aircraft

ARC A-I Aircraft		ARC A-II/Small Aircraft	
Piper PA-28		Pilatus PC-12	
ARC B-I/Small Aircraft		**ARC B-II/Small Aircraft**	
Cessna 421		Beech King Air 90	
ARC B-I Aircraft		**ARC B-II Aircraft**	
Citation CJ1		Beech King Air 200	
Helicopter (more than 7,000 lbs)		**ARC B-II**	
Airbus H145		Phenom 300	

Photography Source: Airliners.net

Peak Activity

Peak demand periods help quantify aviation activity during busy periods. Time periods evaluated include the peak month, design day and design hour characteristics for airport operations. Peak periods are defined in FAA AC 150/5060-5, *Airport Capacity and Delay*. Peak activity is important when planning the size of facilities with fixed capacities.

- **Peak Month:** The calendar month when peak operations occur
- **Design Day**: The average day in a peak month (peak month / 30)
- **Busy Day**: The busy day of a typical week in a peak month (Design Day + 10 percent)
- **Design Hour**: The peak hour within the design day (10 percent of Busy Day)

Peak periods evaluated include the peak month, design day and design hour characteristics for passenger enplanements and airport operations. The results of the peak activity forecasts will be used to determine the airport facility requirements. The methodology developed is derived from Airports Cooperative Research Program (ACRP) Report 25: *Airport Passenger Terminal Planning and Design*,

which emphasizes the use of design periods to forecast use patterns rather than individual absolute peak periods.

Airport Operations

Peaking tendencies for total airport operations were reviewed for preferred airport activity forecasts.

PEAK MONTH, DESIGN DAY & HOUR

Table 1-16 – Peak & Design Operations Forecast

Metric	2022	2027	2032	2037	2042	CAGR
Annual Operations	5,000	5,172	5,350	5,534	5,724	*0.68%*
Peak Month	750	776	802	830	859	*0.68%*
Design Day	25.0	25.9	26.7	27.7	28.6	*0.68%*
Busy Day (Design Day + 15%)	28.8	29.7	30.8	31.8	32.9	*0.68%*
Design Hour	1.8	1.9	1.9	2.0	2.1	*0.68%*

Source: KLJ Analysis, CAGR = Compounded Annual Growth Rate

Forecast Summary

	Activity Levels					Average Annual Compound Growth Rates			
A. Forecast Levels	**2022**	**2027**	**2032**	**2037**	**2042**	**0-5 Years**	**0-10 Years**	**0-15 Years**	**0-20 Years**
Operations									
Itinerant									
Commuter/Air Taxi	-	-	-	-	-	-	-	-	-
General Aviation	2,400	2,483	2,568	2,656	2,748	0.68%	0.68%	0.68%	0.68%
Military	-	-	-	-	-	-	-	-	-
Total Itinerant Operations	2,400	2,483	2,568	2,656	2,748	0.68%	0.68%	0.68%	0.68%
Local									
Civil	2,600	2,689	2,782	2,878	2,977	0.68%	0.68%	0.68%	0.68%
Military	-	-	-	-	-	-	-	-	-
Total Local Operations	2,600	2,689	2,782	2,878	2,977	0.68%	0.68%	0.68%	0.68%
TOTAL OPERATIONS	5,000	5,172	5,350	5,534	5,724	0.68%	0.68%	0.68%	0.68%
Annual Instrument Approaches	-	-	-	-	-	-	-	-	-
Peak Hour Operations	1.8	1.9	1.9	2.0	2.1	0.68%	0.68%	0.68%	0.68%
Based Aircraft									
Single Engine	16	16	17	17	18	0.51%	0.51%	0.51%	0.50%
Multi Engine	-	-	-	1	1	0.00%	0.00%	0.51%	0.51%
Turbojet	-	-	-	-	-	-	-	-	-
Helicopter	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
TOTAL BASED AIRCRAFT AIRCRAIRCRAFT	16	17	17	18	19	0.76%	0.76%	0.76%	0.76%
B. Operational Factors	16	17	17	18	19	0.76%	0.76%	0.76%	0.76%
GA Operations per Based Aircraft	300	304	315	309	307	0.27%	0.49%	0.19%	0.12%

Source: KLJ Analysis. Note: Some figures are rounded

Forecast Comparison with FAA TAF

Proposed aviation activity forecasts must be reviewed and approved by FAA. A forecast is consistent with the FAA TAF if the proposed activity is within a certain tolerance of the official TAF forecast. If the proposed forecast is inconsistent with the TAF, then differences must be resolved for the forecast to be adopted by the FAA. Key activity measures that are reviewed include based aircraft and total operations. The 2022 FAA TAF issued January 2023 is used for comparison.

BASED AIRCRAFT

The airport's proposed forecast of constrained based aircraft is **consistent** with the FAA TAF for the 10-year forecast horizon. The unconstrained forecast for facility planning purposes yields 19 based aircraft, 16.39 percent greater than the FAA TAF at the end of the planning period.

Table 1-17 – Based Aircraft vs. FAA TAF

Metric	2022	2027	2032	2037	2042	CAGR
HZE Based Aircraft Forecast	16	17	17	18	19	*0.76%*
2022 FAA TAF	16	16	16	16	16	*0.00%*
Difference	0	3.87%	7.88%	12.05%	16.39%	-
Allowable Difference	-	10.0%	15.0%	-	-	-
Consistent with FAA TAF?	-	**YES**	**YES**	-	-	-

Source: KLJ Analysis, FAA Terminal Area Forecast (January 2016), CAGR = Compounded Annual Growth Rate

OPERATIONS

The airport's proposed forecast of constrained total operations is **inconsistent** with the FAA TAF for the 10-year forecast horizon. The unconstrained forecast for facility planning purposes yields 5,724 operations, 274.14 percent greater than the FAA TAF at the end of the planning period.

Table 1-18 – Total Operations vs. FAA TAF

Metric	2022	2027	2032	2037	2042	CAGR
HZE Operations Forecast	5,000	5,172	5,350	5,534	5,724	*0.68%*
2022 FAA TAF	1,530	1,530	1,530	1,530	1,530	*0.00%*
Difference	226.8%	238.04%	249.67%	261.69%	274.14%	-
Allowable Difference	-	10.0%	15.0%	-	-	-
Consistent with FAA TAF?	-	**NO**	**NO**	-	-	-

Source: KLJ Analysis, FAA Terminal Area Forecast (January 2016), CAGR = Compounded Annual Growth Rate

Forecast Approval

The FAA approved the aviation forecasts prepared in this chapter on _____ for use in this master planning effort.

CHAPTER 2: RUNWAYS & TAXIWAYS

Introduction

This Chapter of the Airport Master Plan is focused on the Runway and Taxiway system at the airport which is commonly referred to as the airfield where aircraft takeoff, land, and maneuver on the ground. Please note that **Chapter 3: Terminal Area and Support Facilities** will look at the apron, hangars and other facilities supporting the airport. These two chapters will address existing and future facility needs at Mercer County Regional Airport (HZE).

As the chapter analyzes various components of the runway and taxiways at HZE, it will review current conditions and any deficiencies that do not meet FAA design standards. It will consider the future critical design aircraft and provide facility requirements to accommodate these aircraft through the planning period. The chapter will further present the alternatives that were considered to meet future needs and the preferred airfield alternative that was chosen. Included in this chapter will be the following elements:

- Critical Design Aircraft
- Meteorological Data
- Runways
- Taxiways
- Alternatives
- Preferred Alternative

Critical Design Aircraft

As discussed in the previous chapter, the current and future critical design aircraft is a B-II aircraft which has an aircraft approach category (AAC) B, airplane design group (ADG) II, and a taxiway design group (TDG) 2A.

The critical design aircraft types must be identified to determine the appropriate airport design standards to incorporate into airport planning. The existing and future critical design aircraft characteristics at HZE are summarized in the following sections.

Table 2-1 –Airfield Design Aircraft Summary

Design Characteristics	Existing	Future
Aircraft Make/Model	Various	Various
Airplane Approach Category	B	B
Airplane Design Group	II	II
Taxiway Design Group	2	2
Wingspan	Up to 79’	Up to 79’
Length	Up to 65’	Up to 65’
Height	Up to 25’	Up to 25’
Main Gear Width	Up to 20’	Up to 20’
Approach Speed	Up to 121 knots	Up to 121 knots
Maximum Takeoff Weight	12,500 pounds	12,500 pounds

Source: KLJ Analysis

Meteorological Data

The runway discussion must start with meteorological information. For safety and to maximize performance capabilities, aircraft need to takeoff and land into the wind. In addition, aircraft must often operate in poor weather conditions to deliver passengers and cargo. For these reasons, weather needs to be addressed early in the discussions.

Weather Reporting

There are two types of weather reporting systems that are certificated for use on an airport which are the ASOS and AWOS. The Automated Surface Observing System (ASOS) program was a joint effort between the Federal Aviation Administration and the National Weather Service (NWS) to deploy a network of high-grade weather monitoring stations across the United States. ASOS serves as a primary climatological observing network in the United States and have equipment that provides weather observations every minute. The AWOS is a second-tier system which is maintained locally or by states and contains varying sets of instrumentation packages to provide local weather observations. Hazen has an AWOS-IIIPT weather observation system located on the airfield. For wind analysis at HZE, the AWOS on the field was used to provide wind coverage and meteorological analysis.

Wind coverage and weather conditions are evaluated based on the two different flight rules, VFR and IFR. Visual Meteorological Conditions (VMC) are encountered when the visibility is 3 nautical miles or greater, and the cloud ceiling height is 1,000 feet or greater. Conditions less than these weather minimums are considered Instrument Meteorological Conditions (IMC) requiring all flights to be operated under IFR.

Meteorological conditions that affect the facility requirements of an airport include but are not limited to wind direction, wind speed, cloud ceiling, visibility, and temperature. Hourly metrological data was reviewed from HZE AWOS available from the National Climatic Data Center (NCDC). Periodic “special” weather observations within each hour were removed. This method provides and considers the true average weather trends at an airport without skewing conditions toward IFR where multiple observations may be taken each hour due to changing conditions.

In addition to wind, temperature affects runway length required. From weather reports over the last years (1991-2020) the average maximum temperature at HZE in the hottest month has been 84 degrees Fahrenheit (July).

WIND COVERAGE

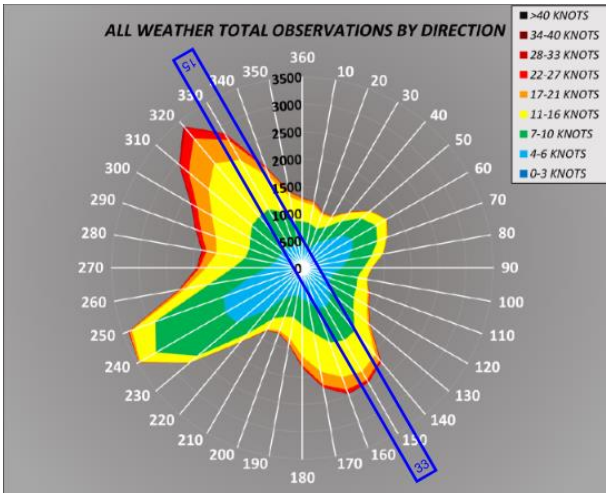
Wind coverage is important to airfield configuration and utilization. Aircraft ideally takeoff and land into a headwind aligned with the runway orientation. Aircraft are designed and pilots are trained to land aircraft in limited crosswind conditions. Small, light aircraft are most affected by crosswinds. To mitigate the effect of crosswinds, FAA recommends runways be aligned so that excessive crosswind conditions are encountered at most 5 percent of the time. This is known as a “95 percent wind coverage”



Small Aircraft Crosswind Landing Diagram (faasafety.gov)

standard. When this level of coverage is not provided, the FAA recommends development of a secondary (crosswind) runway.

A runway's wind coverage is determined by an aircraft's ability to operate with a "direct" crosswind, which is defined as 90 degrees to the direction of travel. For planning purposes, FAA has defined the maximum direct crosswind for small aircraft as 12 miles per hour (10.5 knots). For increasingly larger aircraft, a 15-mile per hour (13 knot) direct crosswind is used up through 23-mile per hour (20 knots) for the largest aircraft. Aircraft can operate safely in progressively higher wind speeds as the crosswind angle decreases and the wind direction aligns more closely with the direction of flight.



Source: KHZE AWOS (2012 -2021, hourly) National Climatic Data Center, 83,657 total observations

Even when the 95 percent wind coverage standard is achieved for the design airplane or airplane design group, cases arise where certain airplanes with lower crosswind capabilities are unable to utilize the primary runway. The maximum crosswind component for different aircraft sizes and speeds are shown in **Table 2-2 - FAA Wind Coverage Standards**.

Table 2-1 – FAA Wind Coverage Standards

AAC-ADG	Maximum Crosswind Component
A-I & B-I	10.5 knots
A-II & B-II	13.0 knots
A-III, B-III & C/D I-III	16.0 knots

Source: FAA AC 150/5300-13B – Airport Design

Prevailing winds, as reported by the HZE AWOS are from the southwest and is generally aligned with the current runway configuration. The HZE data is shown in **Table 2-3** for Runway 15-33.

Table 2-2 – AWOS All-Weather Wind Analysis

Runway	AAC-ADG	Crosswind Component (Wind Speed)		
		10.5 knots	13.0 knots	16.0 knots
15-33	A/B-II	93.50%	97.60%	99.17%

Source: KHZE AWOS (2012 -2021, hourly), National Climatic Data Center, 83,657 total observations

For all-weather conditions, the A/B-II design aircraft crosswind component (13 knots) is accommodated with Runway 15-33 according to the HZE AWOS. However, A/B-I design aircraft crosswind component (10.5 knots) is not accommodated.

Wind coverage during IMC is evaluated to determine the ideal alignment for instrument approach to an airport's runway. As shown in **Table 2-4**, the wind data was applied to the runway alignment at HZE to evaluate the IMC wind coverage. The 95 percent wind coverage requirement is met for the design aircraft (B-II) with a maximum crosswind component of 13.0 knots. The 95 percent wind coverage requirement is not met for A/B-I aircraft.

Table 2-4 – IMC Wind Analysis

Runway	AAC-ADG	Crosswind Component (Wind Speed)		
		10.5 knots	13.0 knots	16.0 knots
15-33	A/B-II	91.19%	96.67%	98.97%

Source: HZE AWOS (2012-2021; hourly), National Climatic Data Center, 5,233 total observations

Based on the wind analysis, the current runway configuration meets 95 percent wind coverage for the critical design aircraft family of B-II (or 13 knot crosswind component) at HZE in both all weather conditions and IMC. Runway 15-33 does not meet the required 95 percent crosswind coverage for A/B-I aircraft (10.5 knot crosswind component). **It is recommended that a crosswind runway be evaluated to increase airport usability for A/B-I design aircraft.** The crosswind runway alternatives should include considerations of surrounding obstructions such as residences and terrain, as well as optimal orientation to provide increased wind coverage for smaller aircraft to increase the overall usability of the airport.

Based on true hourly weather data summarized in **Table 2-5**, the airport has visual meteorological conditions 93.24 percent of the time. With an instrument approach of 400 feet ceiling and 1-mile visibility, the airport is used an additional 4.78% (17.4 days) leaving only 7.2 days unusable.

Table 2-5 – Meteorological Analysis

Weather Condition	Percentage			Days Per Year	Hours Per Year
VMC	93.24%			340.3	8,168
Usable IMC 400 foot Ceiling - 1 mile visibility	4.78%			17.4	419
Existing Usability	**98.02%**			**357.8**	**8,587**
Additional Capture with IMC Improvements	**Rwy 15**	**Wind Calm**	**Rwy 33**		
300 foot Ceiling - ¾ mile Visibility No Approach Lighting Required	0.41%	0.11%	0.49%	3.7	88.3
250 foot Ceiling - ½ mile Visibility MALSR Lighting Required[1]	0.02%	0.02%	0.04%	0.2	5.2
Below Weather Minimums	0.91%			3.3	79.5
Total	**100.00%**			**365.0**	**8,760**

*Source: HZE AWOS (2012-2021; hourly), National Climatic Data Center, 77,043 total observations. Note: *Based on Runway 15 & 33 current IFR minimums are 400-foot cloud ceiling and 1-mile visibility for RNAV GPS approach.*

If the instrument approach was changed to a ceiling as low as 300 feet and a ¾ mile visibility for both runway ends, this would increase the usable IMC by 1.01% for an additional 3.7 days or 21.1 days total per year. If the instrument approach were improved further to 250 feet and a ½ mile visibility with the addition of Medium Intensity Approach Lighting with Runway Alignment Indicator (MALSR) approach lighting on the Runway 33 end it would increase the usable IMC by an additional 0.06% for an additional 0.2 days or a total of 21.3 days per year. As a result, the recommendation is to improve the instrument approach capabilities to 300 feet and ¾ mile visibility but to not pursue approach lighting.

[1] MALSR on Runway 33 end – Days and Hours based on Calm and Runway 33 wind conditions. Runway 15 wind conditions are below weather minimums and are included in the remaining calculations.

Figure 2-1 – Airfield Facilities Map



Runways

There is currently one paved runway at HZE, Runway 15-33. The details of the runway are as follows.

RUNWAY 15-33

Runway 15-33 runs Southeast to Northwest and is the primary asphalt runway that is 4,999 feet long by 75 feet wide with a weight bearing capacity to accommodate up to single wheel 17,000 pounds. There is a non-precision approach with one mile visibility and two-light Precision Approach Path Indicator (PAPI) for both runway ends. The runway has medium intensity runway lights (MIRL) and on the Runway 33 End there are Runway End Identifier Lights (REILs).

Table 2-6 – Runway Facility Summary

Component	Runway 15-33
Runway Length (feet)	4,999
Runway Width (feet)	75
Runway Surface Material	Asphalt
Runway Surface Treatment	None
Single Wheel Pavement Strength	17.0
Runway Design Code	A/B-II

Source: KLJ Analysis

RUNWAY DESIGN CODES

The Runway Design Code (RDC) provides the design standards for a specific runway based on design aircraft and instrument approach minimums. Further information about Runway Design Codes can be found in **Appendix B: General Aviation Airports 101**.

Runway 15-33: The existing RDC is B-II-5000 for both runway ends. No recommended change is needed to accommodate larger aircraft during this planning study.

RUNWAY REFERENCE CODES

Runway Reference Codes (RRCs) indicate current operational capabilities where no special operations procedures are necessary, and without consideration of the actual runway length. The existing operational capabilities of the runway are derived based on a taxiway separation distance.

Runway 15-33: The runway does not have a parallel taxiway and therefore does not have either approach reference codes or departure reference codes.

RUNWAY DESIGNATION

Runway designation is determined by the magnetic bearing (azimuth) of the runway centerline which is relative to the location of the magnetic north pole. The runway designator number is the whole number nearest the one-tenth of the magnetic azimuth along the runway centerline.

The 2024 magnetic declination at HZE is 6° 10’ east, changing 0° 5’ west per year as the location of the magnetic north pole moves over time. Any change to runway designation will be made at the discretion of the FAA as it requires the update of aeronautical publications, procedures, and signage.

DESIGN STANDARDS

Basic Safety Standards

One primary purpose of this master plan is to review and achieve compliance with all FAA safety and design standards. The design standards vary based on the RDC and RRC as established by the design aircraft. Some of the safety standards include:

- Runway Safety Area (RSA)
- Runway Object Free Area (ROFA)
- Runway Obstacle Free Zone (ROFZ)

Other basic design standards include runway width, runway surface gradient, runway shoulder width, blast pad, and required separation distances to markings, objects, and other infrastructure for safety. Critical areas associated with navigational aids as well as airspace requirements are described further in this chapter.

The existing RSA, ROFA and ROFZ standards for Runway 15-33 meet existing airport design standards. Improvements will need to be made to meet future standards. The basic safety standards dimensional requirements for the runway are summarized in **Table 2-7**.

Table 2-7 – Runway Safety Design Standards

Standard	Runway 15-33
Runway Safety Area (RSA)	5,599 x 150’
Runway Object Free Area (ROFA)	5,599 x 500’
Runway Obstacle Free Zone (ROFZ)	5,399’ x 400’

Source: KLJ Analysis

Runway Protection Zone

The Runway Protection Zone (RPZ) is a trapezoidal land use area at ground level prior to the landing threshold or beyond the runway end. The RPZ’s function is to enhance the protection of people and property on the ground. The RPZ size varies based on the runway’s RDC. The RPZ is further broken down to Approach RPZ and Departure RPZ.

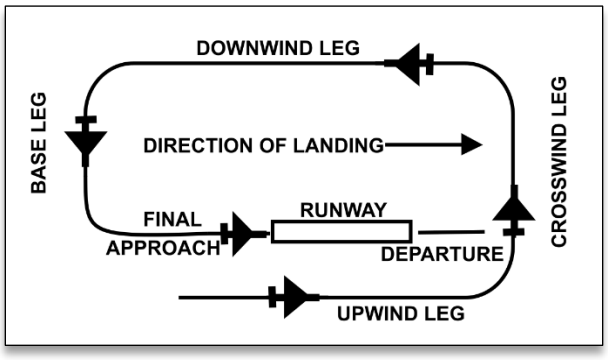
Airport owners should, at a minimum, maintain the RPZ clear of all facilities supporting incompatible activities, such as residential structures. It is desirable to clear all above-ground objects from the RPZ. Protection of the RPZ is achieved through airport control over RPZs including fee title ownership or clear zone easement.

The land uses in the existing RPZs appear to be acceptable now. Further review is required if new land uses, runway end locations or a change in the size of the RPZ is proposed and a land use requiring FAA coordination is in the RPZ.

Runway 15-33 has RPZs sitting 200 feet from the runway threshold, 500 feet-wide for the inner width, 700 feet-wide for the outer width, and are 1,000 feet long. Currently, HZE controls the land needed in fee or easement for the RPZs. The airport should continue acquiring land to control all future and ultimate RPZs in fee simple or land use easement.

APPROACH/DEPARTURE PROCEDURES

Aircraft operate under either Visual Flight Rules (VFR) or Instrument Flight Rules (IFR) depending on weather conditions and/or operational standards.



Standard VFR Airport Traffic Pattern (Source: FAA)

Visual Approach/Departure Procedures

Under VFR, pilots are advised to utilize a standard rectangular traffic pattern around the runway to approach or depart an airport. Standard traffic pattern legs include upwind, crosswind, downwind, base, and final. Departures are typically straight-out from a departing runway, a 90-degree crosswind, or 180 degrees downwind. Arrivals typically enter a traffic pattern 45 degrees to a downwind leg for landing. All traffic at HZE follow a standard left traffic pattern.

IFR/Obstacle Departure Procedures

Special procedures are published at airports to provide aircraft with adequate obstacle clearance. Examples include increased aircraft climb rates or recommended turns. Both runway ends are available for instrument departures. There are penetrations to the existing Runway 15 and 33 instrument departure surfaces that are noted in FAA publications (see below figure).

HAZEN, ND
MERCER COUNTY RGNL (HZE)
TAKEOFF MINIMUMS AND (OBSTACLE) DEPARTURE PROCEDURES
AMDT 1 20APR23 (23110) (FAA)
TAKEOFF MINIMUMS:
Rwy 15, 300-1⅛ or std. w/min. climb of 296' per NM to 2100 or 1000-3 for climb in visual conditions.
Rwy 33, std. w/min. climb of 215' per NM to 2700 or 1000-3 for climb in visual conditions.
VCOA:

Runway Approach/Departure Surfaces

FAA identifies sloping approach surfaces that must be cleared at an absolute minimum for safety for landing aircraft. These surfaces are identified in paragraph 3.6 of FAA AC 150/5300-13B Change 1.

The departure surface applies to runways with instrument departures available. It begins at the end of the takeoff distance available and extends upward and outward at a 40:1 slope. No new penetrations are allowed unless an FAA study has been completed and a determination of no hazard has been issued.

The applicable approach/departure surface standards are identified in **Table 2-8**:

Table 2-8 – Approach/Departure Surface Requirements

Runway End(s)	Par. 3.6 Surface	Description	Slope
Existing/Future/Ultimate			
15, 33	5	Approach end of runways providing ILS or localizer type directional aid with glidepath (LPV, LNAV/VNAV) ≥ ¾ mile visibility	20:1
Future/Ultimate			
Crosswind Runway	2	Approach end of runways serving small airplanes with approach speeds of 50 knots or more	20:1

Source: FAA AC 150/5300-13B, KLJ Analysis. Note: Most critical row(s) shown. Only changes from existing shown in future.

RUNWAY LENGTH

Runway 15-33 at HZE has a length of 4,999 feet. As of the date this Master Plan study was initiated, FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design* was the current guidance for determining runway lengths at airports. A detailed analysis using this method including FAA runway length charts and aircraft performance data is in **Appendix D: Runway Length Evaluation**.

Small Airplanes Up to 12,500 Pounds

The FAA design approach to determine recommended runway length in small aircraft is identified in Chapter 2 of FAA AC 150/5325-4B. The method requires several steps to be performed including identifying percentage of fleet and using airport data to calculate runway length based on curves. Calculations for HZE are identified in **Table 2-9**.

Table 2-9 – FAA AC 150/5345-4B Runway Length Requirements (≤ 12,500 lbs.)

Airport and Runway Data	
Airport Elevation	1814 feet
Mean Daily Maximum Temperature of Hottest Month	84.0°F
Aircraft Classification	**Recommended Runway Length**
Small Airplanes 12,500 Pounds or less	
10 or more passenger seats	4,410 feet
Less than 10 passenger seats at 100 percent of fleet	4,280 feet
Less than 10 passenger seats at 95 percent of fleet	3,700 feet
Other Notable Aircraft	
Air Tractor 502	3,330 feet
Air Tractor 802	**5,300** feet
Beech King Air 200	3,905 dry/4,491 wet
Pilatus PC-12	3,619 dry/4,162 wet
Cessna 560 XL	4,838 dry/**5,564** wet
Phenom 300	4,427 dry/**5,091** wet

Source: FAA AC 150/5325-4B, KLJ Analysis
Note: Runway length requirements estimated based on charts for airport planning purposes only.

For general aviation aircraft that operate at HZE, the FAA runway length requirements of 95 percent of fleet would apply at HZE due to it being located in a lower population community which is a length of 3,700 feet. Specific aircraft were also analyzed which operate at HZE. Most notable are the requirements of the Air Tractor 802 and the Cessna 560 XL and Phenom 300 in wet conditions. The

length requirements are respectively 5,300, 5,564 and 5,019 feet. The existing runway length of Runway 15-33 is determined to be sufficient through the planning period and no extension is needed.

Crosswind Runway

As discussed above, Runway 15-33 does not provide the necessary crosswind coverage to accommodate smaller A/B-I aircraft. **To increase crosswind coverage for smaller aircraft, the addition of a crosswind runway is recommended.**

FAA recommends secondary "crosswind" runways have a length capable of accommodating the lower crosswind capable aircraft expected to use this runway. The length of a runway must now be justified to accommodate the aircraft that requires its use.

Because of the restricted land to the west of the current runway, the length for the turf crosswind was determined based on available land of the evaluated alignment. The final runway length will be determined as the airport layout plan is put together in more detail. Details on specific needed runway lengths can be found in **Appendix D – Runway Length Analysis**.

Taxiways

SYSTEM DESIGN

FAA has placed a renewed emphasis on taxiway design in their updated airport design standards. Fundamental elements help develop and efficient system to meet demands, reduce pilot confusion and enhance safety. Considerations include:

- Design taxiways to meet FAA design standards for existing and future users considering expandability of airport facilities.
- Design taxiway intersections so the cockpit is over the centerline with a sufficient taxiway edge safety margin.
- Simplify taxiway intersections to reduce pilot confusion using the three-node concept, where a pilot has no more than three choices at an intersection.
- Minimize the number of runway crossings and avoid direct access from the apron to the runway.
- Eliminate aligned taxiways whose centerline coincides with a runway centerline.

TAXIWAYS

Taxiways provide for the safe and efficient movement of aircraft between the runway and other operational areas of the airport. The taxiway system should provide critical links to airside infrastructure, increase capacity, and reduce the risk of an incursion with traffic on the runway. The taxiway system should meet the standards design requirements identified in FAA AC 150/5300-13B. The design standards vary based on individual aircraft geometric and landing gear characteristics. The Taxiway Design Group (TDG) and Airplane Design Group (ADG) identified for the design aircraft using a particular taxiway. Some of the safety standards include:

- Taxiway Width
- Taxiway/Taxilane Safety Area (TSA)
- Taxiway/Taxilane Object Free Area (TOFA)

Other design standards include taxiway shoulder width to prevent jet blast soil erosion or debris ingestion for jet engines and required separation distances to other taxiways/taxilanes. More information can be found in **Appendix B: General Aviation Airports 101**.

The taxiway system at Hazen is made up of two taxiways.

- **North Taxiway:** This taxiway is paved, 35 feet wide and connects the north terminal apron to Runway 15.
- **Central Taxiway:** This taxiway is paved, 35 feet wide and connects the south terminal apron to the midpoint of Runway 15-33.

As part of the feedback received from various airport users, there were safety concerns regarding the lack of radio communications by pilots back taxiing on the runway during busy times. **As defined in the 2008 Airport Layout Plan, the airport should continue to plan for the addition of a parallel taxiway meeting design requirements of a TDG-2A to increase safety at HZE.**

Runway and Taxiway Conditions

PAVEMENT CONDITION/STRENGTH

Airfield pavements should be adequately maintained, rehabilitated, and reconstructed to meet the operational needs of the airport. The published pavement strength is based on the construction materials, thickness, aircraft weight, gear configuration and operational frequency for the pavement to perform over its useful life.

At HZE the current surface treatment is asphalt with a single wheel weight bearing capacity of 17.0 according to the airport master record (5010). In 2020, all airside pavements underwent a full mill and overlay as part of the 2020 Capital Improvement plan.

According to the North Dakota Aeronautics Commission Pavement Management System, all airside pavements at HZE are listed at 100 PCI. As such, no recommendations for pavement maintenance are recommended during this planning study.

VISUAL NAVIGATION AIDS

Visual aids are installed to provide airport usability during periods of darkness and/or low visibility. Pavement markings and lighting systems available at the airport are summarized in the following sections.

Identification Lighting

HZE has a clear and green rotating beacon, which is a two-sided light that assists pilots in the visual identification of a civilian airport. The clear and green beacon indicates a lighted land airport. The airport beacon is located on the northeast edge of the north apron and operates sunset to sunrise.

Pavement Edge Lighting

Pavement edge lighting fixtures are installed off the edges of runway and taxiway pavements to help pilots identify the edges and ends of pavement and facilitate safe operations in darkness and/or low visibility environments. Runway edge lights are white (bi-directional), except for the final 3,000 feet of the runway where the lights change color to yellow to warn pilots approaching the end of the runway for instrument runways. The runway end threshold lights (bi-directional) are green when viewing down the runway at the start of takeoff roll and red when approaching the end of the runway. Taxiway edge lights are blue and omni-directional.

The airport has Medium Intensity Runway Lighting (MIRL) for Runway 15-33. The taxilanes connecting to the north and south apron areas are marked with reflectors. It is recommended to maintain good

condition of the MIRL on all paved runways. **If when a parallel taxiway is constructed, it is recommended the airport install a Medium Intensity Taxiway Lighting (MITL) system.**

Airfield lighting systems allow for pilots to control the complexity and intensity of lights. The lights for the Runways including the PAPIs are all controlled with the pilot-controlled lighting system activated through the Common Traffic Advisory Frequency (CTAF).

Visual Approach Lighting

Visual approach lighting (or visual approach aids) provide vertical descent guidance to pilots for a specific runway end. These approach aids enable the pilot to acquire and maintain the correct glide path for landing. Precision Approach Path Indicator Lights (PAPI) are the current FAA standard equipment installed for this purpose.

The PAPI has red and white lights that are used by the pilot to indicate whether they are too high, too low, or on the appropriate glidepath. PAPIs project light along a standard glide path to a runway end, with red and white colored lights indicating the aircraft's vertical position (above, below, or on glide path) relative to the defined glide path.

Hazen has two box PAPIs on both ends of Runway 15-33. The PAPIs are set at a 3.00-degree angle for each runway end. The airport should continue to maintain the PAPI lighting in good condition.

Runway End Identifier Lights (REIL)

REILs consist of high-intensity flashing white strobe lights located on the approach ends of runways to assist the pilot in early identification of the runway threshold. HZE currently has the runway 33 end with REILs installed. These REILs should be maintained through the long-term.

Approach Lighting System



Typical Approach Lighting System (FAA)

An approach lighting system provides extended runway centerline alignment information near the runway's end for pilots to transition from instrument flight to visual flight for landing in low visibility conditions. There are several types of systems with varying configurations. The type of ALS to consider at HZE is the **Medium-intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR):** This is the system that would be needed to reduce visibility down to ½ mile by providing an extended centerline 2,400 feet from the Runway 33 threshold. This full ALS consists of seven rows of lights, five flashing lights and a row of steady burning green lights prior to runway threshold. Consideration of the MALSR is related to instrument meteorological conditions noted previously in this chapter.

Pavement Markings

Pavement markings provide visual guidance to aircraft to critical areas on the runway and taxiway surface. FAA has defined numerous different pavement markings to promote safety and situational awareness as defined by FAA AC 150/5340-1, *Standards for Airport Markings*. Runway markings vary in complexity depending on the type of approach served. Runway markings vary in complexity depending on the type of approach. Runway 15-33 is marked with non-precision runway markings which include a landing designator, centerline, threshold markings, and aiming point.

Airfield Guidance Signs

Guidance signs provide location, direction, and guidance information to pilots on the ground to enhance awareness. Signs are placed around the airfield to identify runway and taxiway intersections, runway hold positions, and other guidance. Mandatory signs are red and identify an intersection with a runway or critical safety zone. Other types of signs include location, direction, destination, and distance remaining signs.

Hazen has all the required lighted mandatory signs for the runways and directional signs for all the taxiways.

Airfield Summary

This section identifies safety, capacity and development needs for the Mercer County Regional Airport based on forecasted activity levels. These recommendations provide the basis for formulating development alternatives to adequate address recommended improvements. The following summarizes the facility recommendations:

Airside Facilities

- Continue to maintain runway and taxiway design standards in accordance with FAA AC 150/5300-13B Change 1
- Plan for the addition of a taxiway parallel to Runway 15-33
- Plan for the addition of a turf crosswind runway to increase wind coverage for A/B-I aircraft

Alternatives

A wide range of alternatives are evaluated to determine the best solution for the airport to meet facility needs. In many cases the process is iterative to react to new information and input. Please refer to the alternative analysis process in **Chapter 1** for details on the factors considered.

The planning study identified the need for an additional runway to satisfy crosswind coverage for A/B-I aircraft. After gathering feedback from various airport users and members of the Planning Advisory Committee, many of them expressed a preference for a turf runway option at HZE. It was determined that the addition of a turf runway would provide the best solution to satisfy the crosswind requirements.

The alternatives listed below consider current property, wind coverage, geographical features, Runway Protection Zones (RPZs), Part 77 surfaces, runway length, and effect on future development.

INITIAL TURF RUNWAY ALTERNATIVES

Parallel Runway within Runway 15-33 RSA: Proposed addition of a 2,800-foot turf runway parallel to runway 15-33 located inside the existing Runway Safety Area (RSA). See **Figure 2-2 Parallel Runway Alternatives.**

Advantages:

- No issues with RPZs or Part 77 surfaces
- No additional property needed
- No need to relocate any runway lighting or change any runway markings
- No impact to future terminal area development

Disadvantages:

- Considered the same surface as Runway 15-33, therefore no simultaneous use
- Does not increase crosswind coverage

Parallel Runway with 300-foot Centerline Separation from Runway 15-33: 1,800-foot turf runway parallel to Runway 15-33.

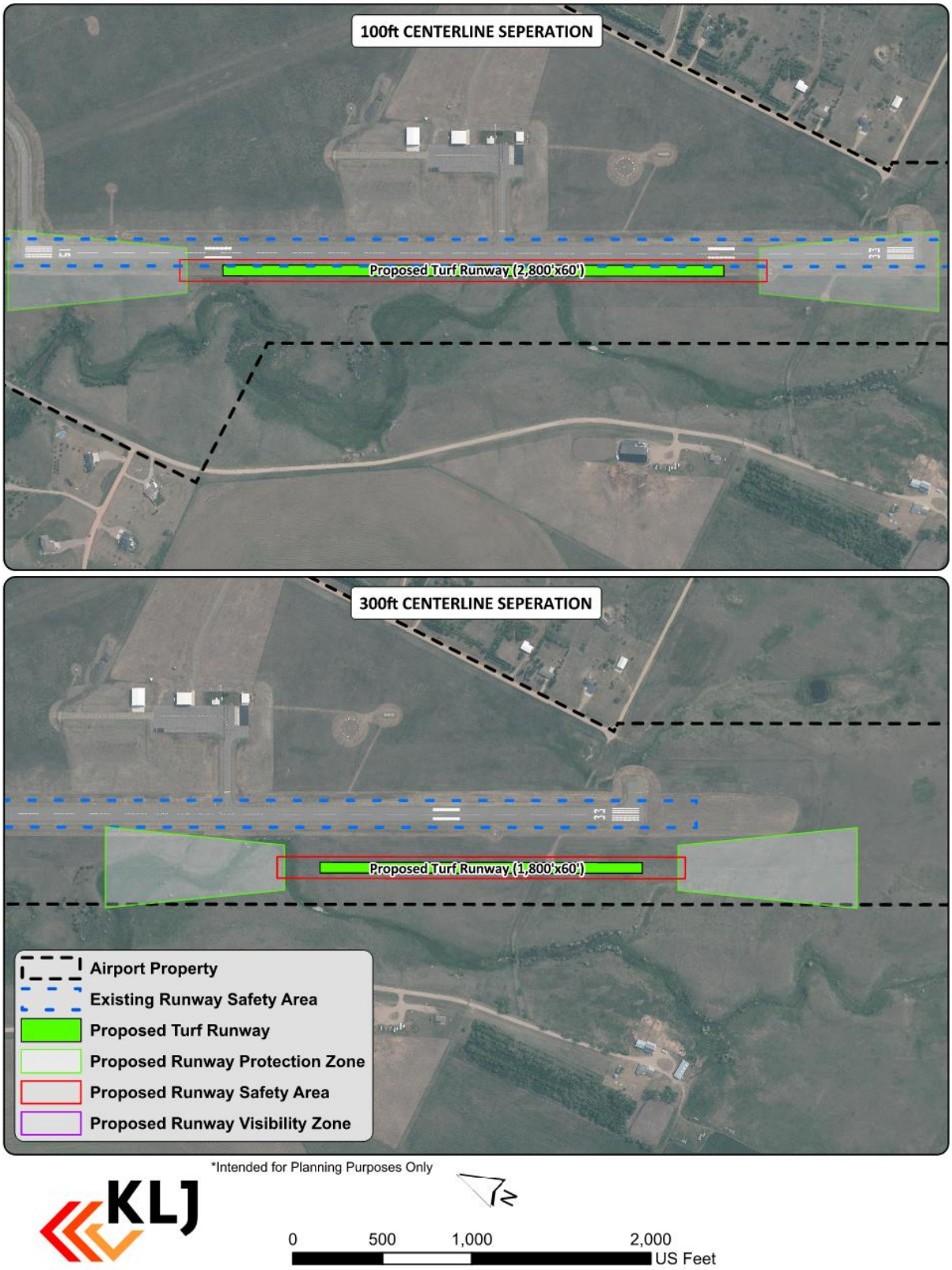
Advantages:

- Provides turf runway option to users
- No impact to future terminal area development
- Minimal land acquisition required for RPZs

Disadvantages:

- Does not increase crosswind coverage
- Current airport fencing would need to be moved at least 135 feet to the west

Figure 2-2 - Parallel Turf Runway Alternatives



Initial Runway 3-21 Option

A new 2,000-foot turf runway northwest of central terminal area. See **Figure 2-3 Initial Runway 3-21.**

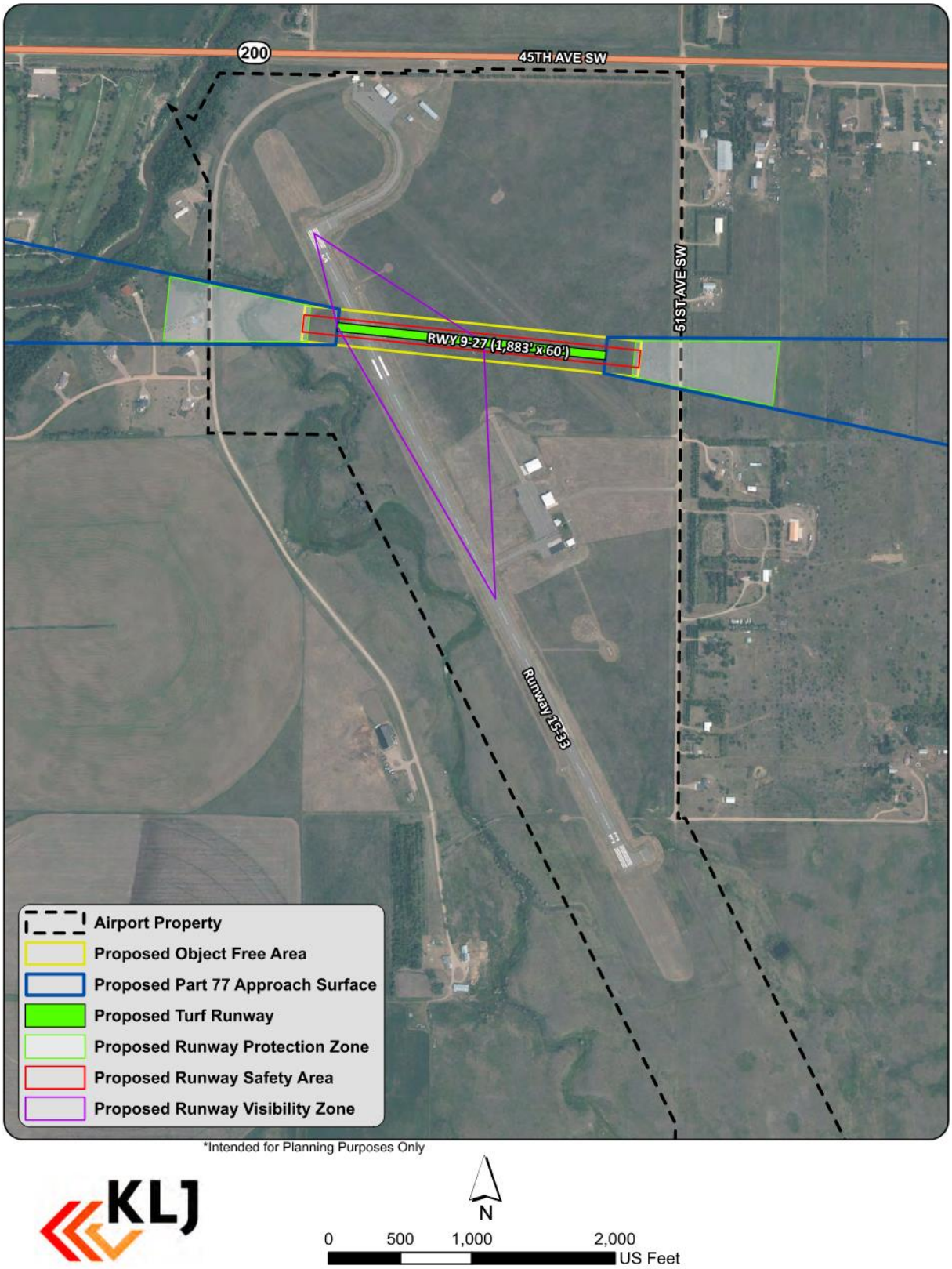
Advantages:

- 97.22% crosswind coverage

Disadvantages:

- Runway Visibility Zone (RVZ) requirements impact possible future terminal area development
- Incompatible uses within RPZs on both ends (land control and relocate part of property fence)

Figure 2-3 - Initial Runway 3-21



Initial Runway 9-27 Option

A new 2,000-foot turf runway located between the terminal areas. See **Figure 2-4 Initial Runway 9-27.**

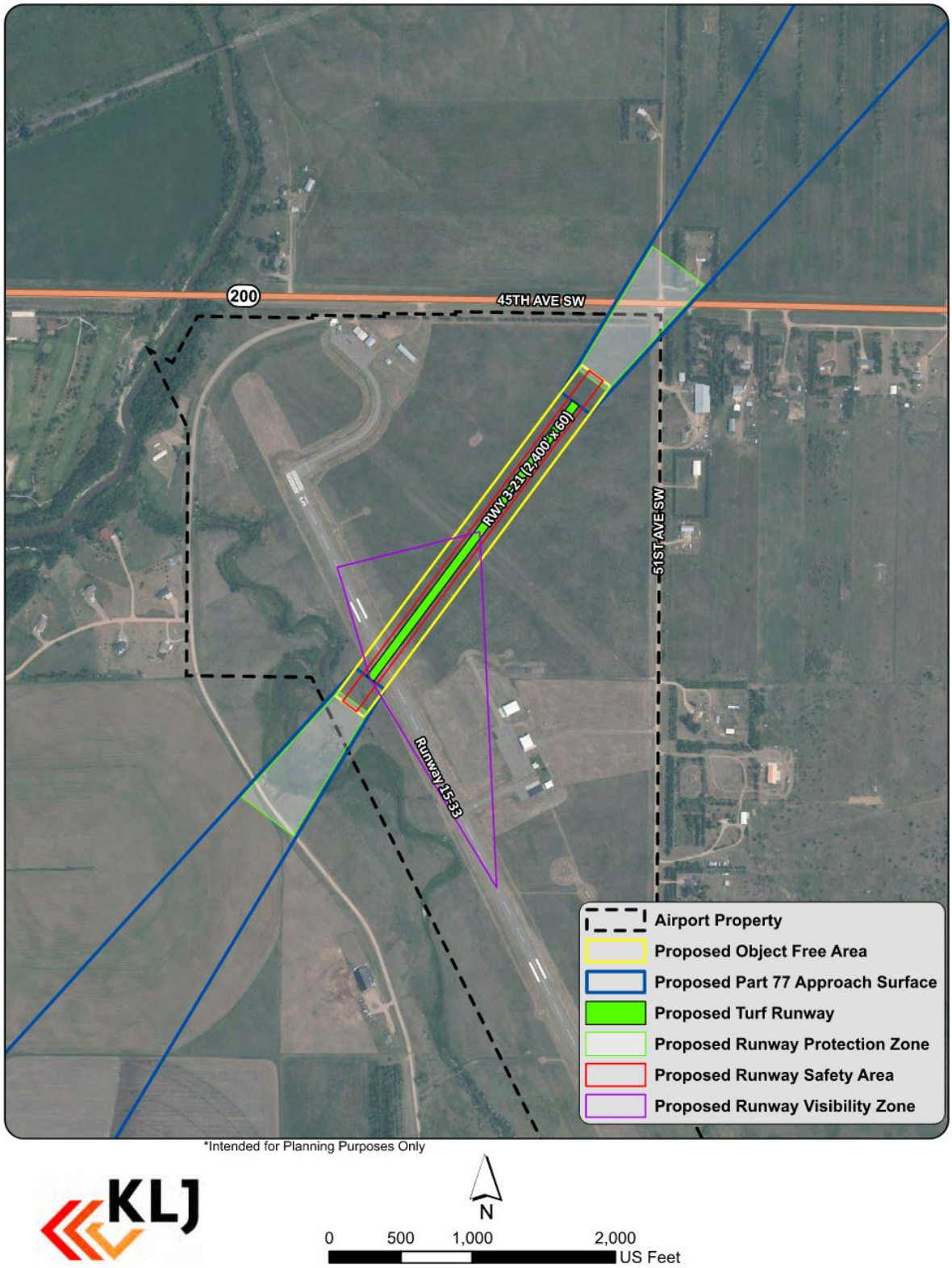
Advantages:

- 98.85% crosswind coverage
- RVZ does not interfere with future terminal area development

Disadvantages:

- Incompatible uses within RPZs on both ends (land control and relocate part of property fence)

Figure 2-4 - Initial Runway 9-27



Initial Runway 13-31 Option

A new 2,300-foot turf runway between terminal areas. See **Figure 2-5 Initial Runway 13-31.**

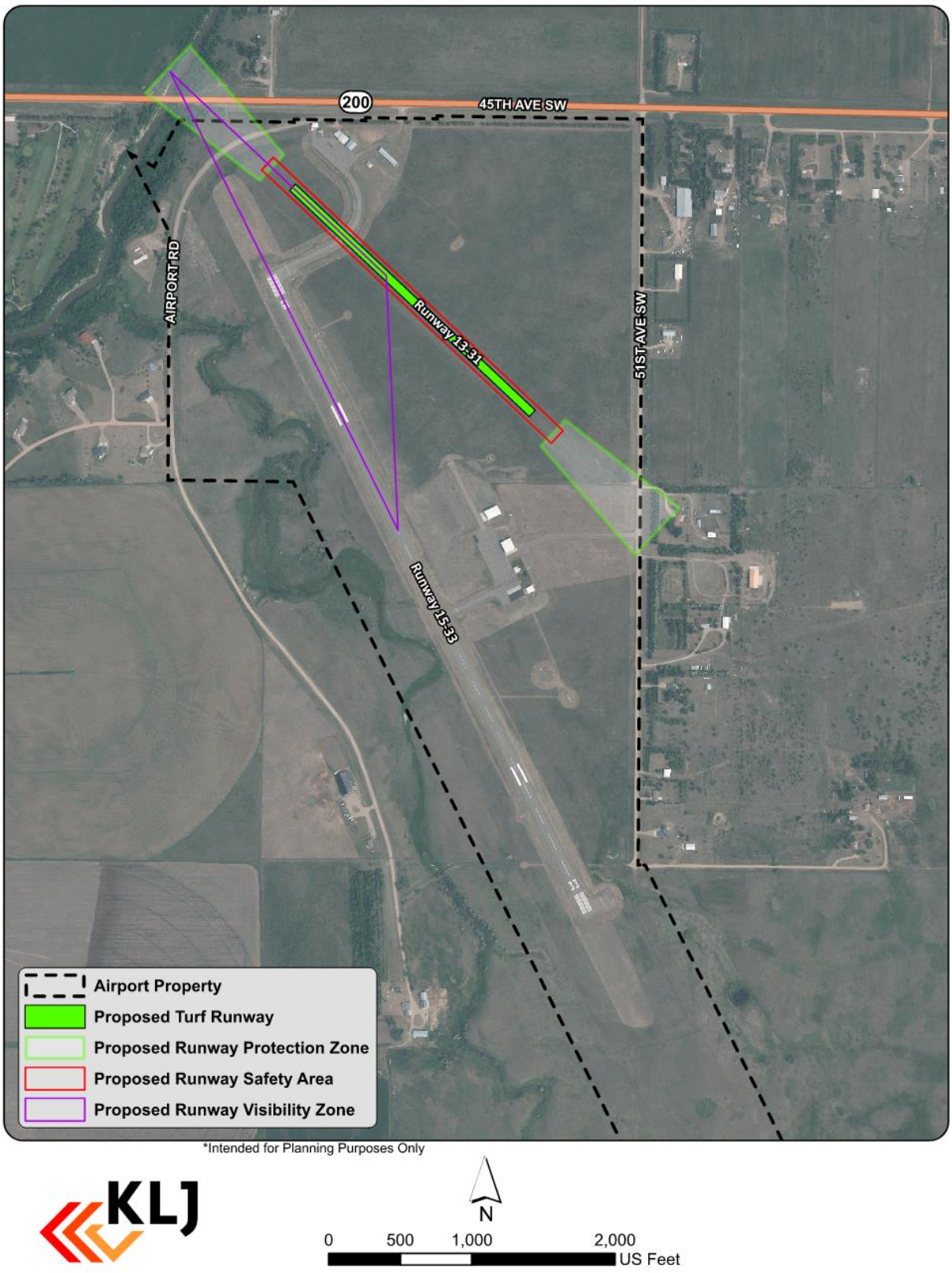
Advantages:

- 96.79% crosswind coverage
- No impact to future terminal area development

Disadvantages:

- Crosses airport access road and north taxiway
- Incompatible uses within RPZs (land control)

Figure 2-5 - Initial Runway 13-31



REVISED TURF RUNWAY ALTERNATIVES

Each alternative was presented to the Planning Advisory Committee (PAC) and other airport users. Feedback was gathered and the PAC and airport users determined to further explore the Runway 3-21 option and Runway 9-27 option. These two alternatives were revised with consideration to the following items;

- Current runway lights and PAPI location
- Fill material needed on the west side of the current runway
- RPZ placement and Part 77 surfaces
- Ensuring aircraft on the west end of the turf runway will be positioned outside the Runway 15-33 RSA before taking off.
- Possible runway length

Revised Runway 3-21 Option

Please reference **Figure 2-6**.

This option would extend the previous 2,000-foot option by 400 feet to offer a new 2,400-foot turf runway that would sit northeast of the central terminal area. The RVZ could limit future central terminal area development for this area which must remain free of structures and aircraft parking.

Revised Runway 9-27 Option

Please reference **Figure 2-7**.

This option was shortened to 1,883 feet from the previous 2,000-foot runway option. The length was adjusted for the west end to minimize the amount of fill material. This option could limit development within the east RPZ and would also require easement control be established very soon.

Table 2-10 – Turf Runway Options Summary Table

	3-21	9-27
Length	2,400’	1,833’
Wind Coverage	97.22%	98.85%
Terminal Area Impact	Minimal	Minimal
RPZ Items	Mosset Way, 45th Ave & 51st Ave	Mosset Way & 51st Ave Must limit development within RPZ
Easement Required	11.0 acres	9.0 acres (portion currently developable)
Unclassified Excavation	20,600 cubic yards	12,200 cubic yards
Topsoil (obtained on-site)	5,500 cubic yards	4,400 cubic yards
Estimated Cost	$940,000	$620,000

Source: KLJ Analysis

Figure 2-6 – Revised Runway 3-21 Option

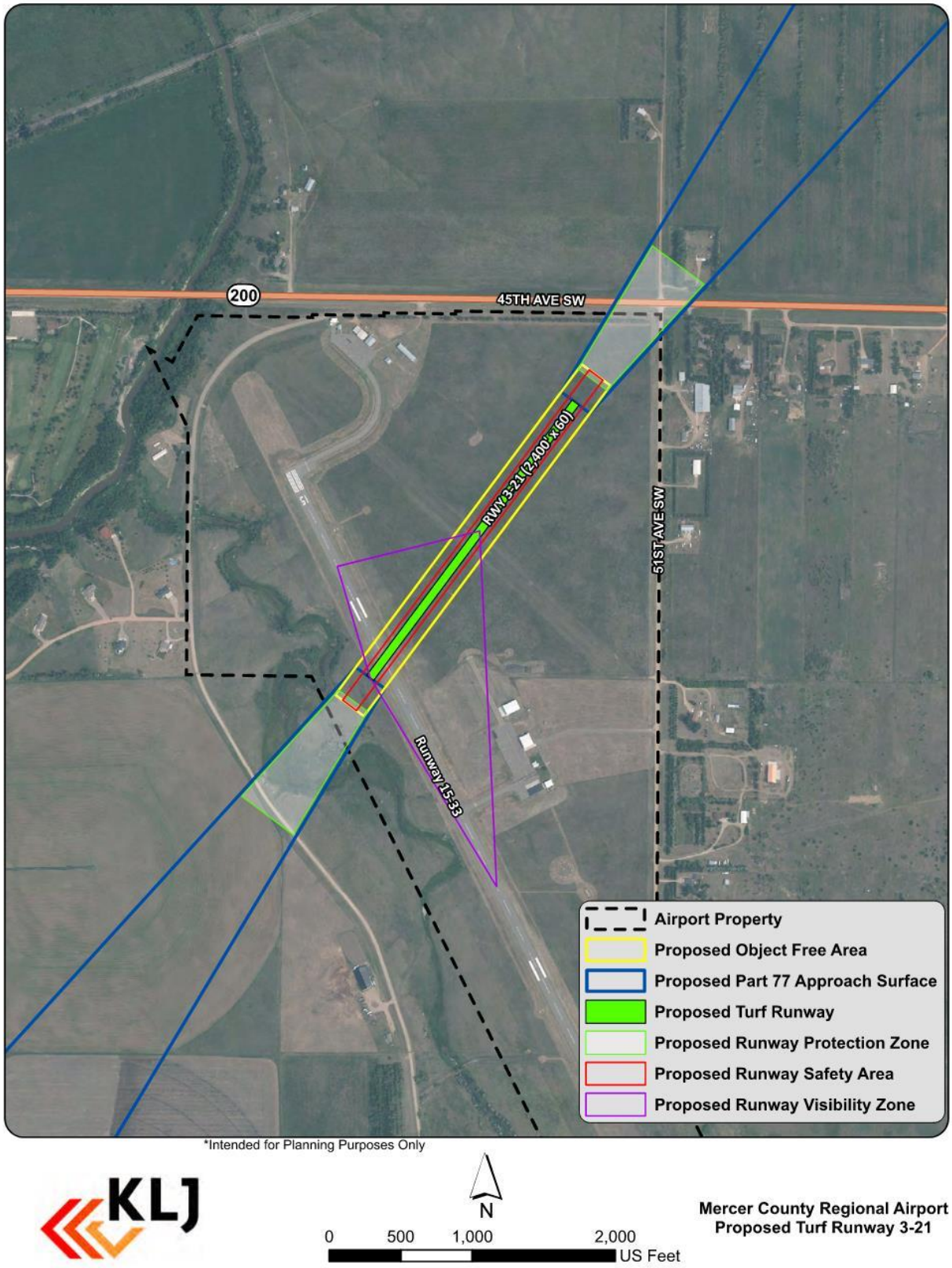
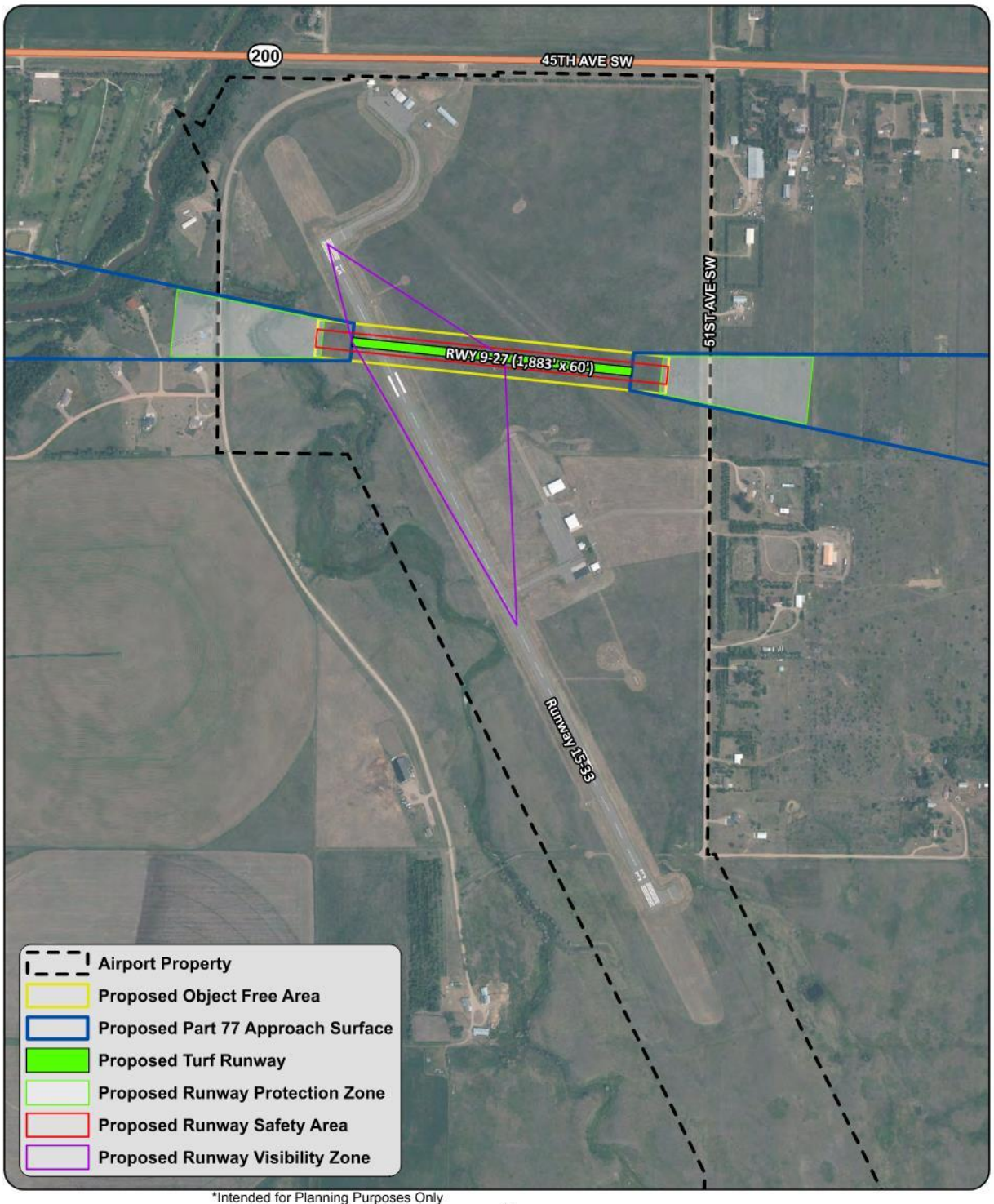


Figure 2-7 – Revised Runway 9-27 Option



FAA EVALUATION OF RUNWAY 4-22

While developing the Airport Layout Plan (ALP), the actual alignment of the proposed turf crosswind runway was determined to be 4-22 rather than 3-21. After the Runway 4-22 alternative was reviewed by the FAA, they had concerns of the 22 End RPZ being close to a residence. They also asked about the possibility of moving the Runway 4 End to the east of the current paved runway. KLJ evaluated three alternatives and those were presented to the Mercer County Airport Board.

Option 1: 22 RPZ at Road Intersection and 4 End West of Paved Runway

This option allows for 2,500 feet of runway length with the 4 End to the west of the current paved runway and the outer edge of the 22 End RPZ at the roadway intersection. A displaced threshold will be placed on the 22 End at 285 feet. Please reference **Figure 2-8**. This may require an RPZ Analysis when the runway is designed.

Option 2: 22 RPZ at Road Intersection and 4 End East of Paved Runway

This option presented leaves the 22 End RPZ outer edge at the intersection while bringing the Runway 4 End to the east of the paved runway. This brings the total runway length to 1,900 feet with a displaced threshold of 285 feet on the 22 End.

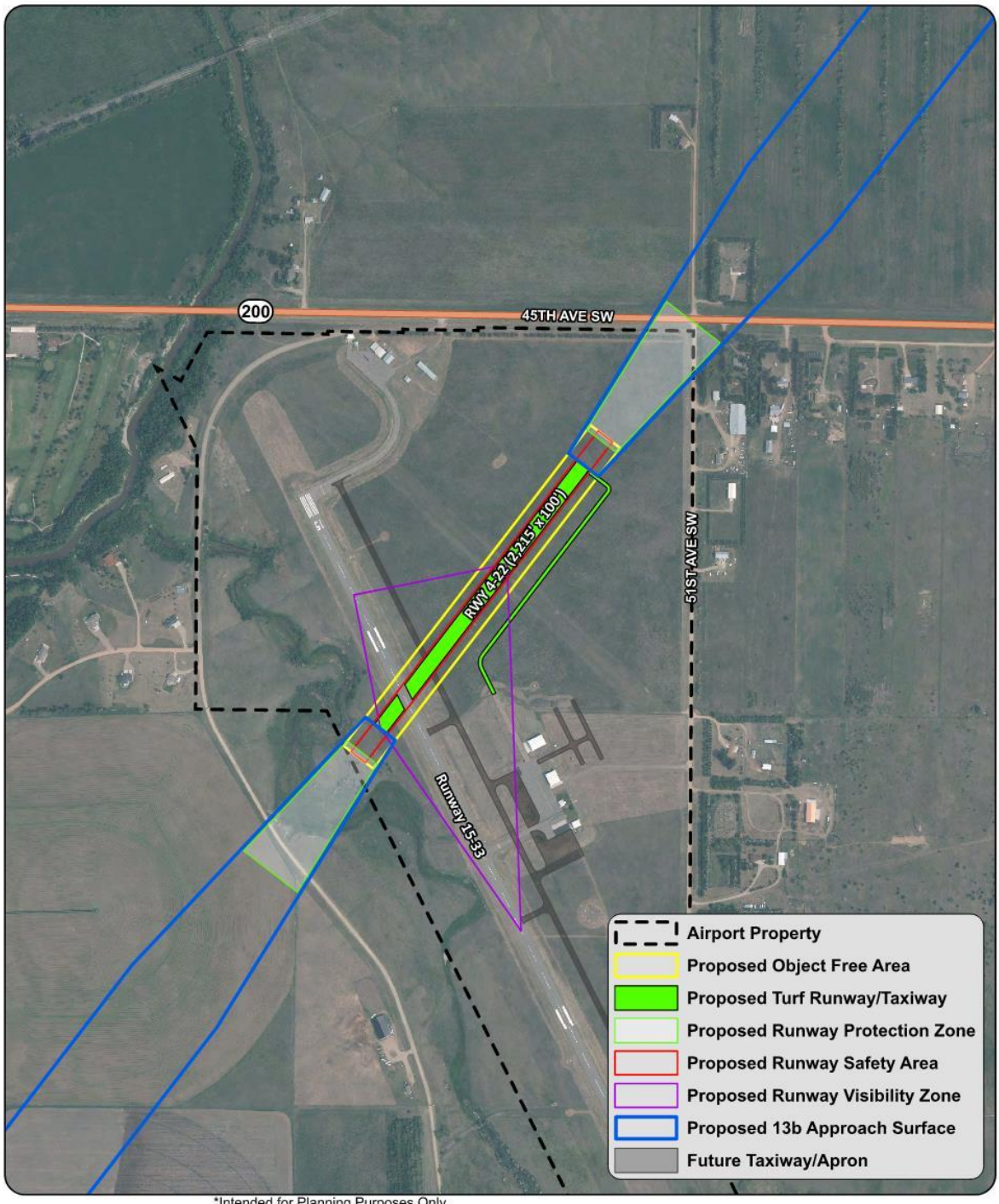
Option 3: 22 RPZ within Current Property and 4 End East of Paved Runway

This option offers the least runway length amount of 1,900 feet with a displaced threshold of 600 feet on the 22 End. This is with the Runway 4 End to the east of the current paved runway and the Runway 22 End RPZ is within current airport property.

Preferred Alternative

After reviewing the options for turf runway alternatives at HZE, the Mercer County Airport Authority chose to select the revised runway 4-22 option with the 22 RPZ at the road intersection and the 4 End west of the paved runway as the preferred alternative. The reason for this selection was for the length of 2,215 feet without displaced thresholds. The Runway 4-22 alignment provides a combined 97.22% wind coverage including Runway 15-33 to meet the FAA minimum requirement of 95%. Please reference **Figure 2-8**.

Figure 2-8 – 22 RPZ at Road Intersection and 4 End West of Paved Runway



CHAPTER 3: TERMINAL AREA & SUPPORT FACILITIES

Introduction

This Chapter of the Airport Plan is focused on the Terminal Area and Support Facilities which includes the aprons, taxilanes, hangars, and access roads. The chapter follows the Runway and Taxiway chapter where the primary aircraft movement takes place. This chapter addresses the existing and future facility needs at HZE. The chapter analyzes the landside requirements necessary to support airport, aircraft, and passenger operations. It will consider forecasted planning activity levels for based aircraft and operations. Alternatives will be analyzed along with the decision on a preferred alternative. The following elements are provided for examining terminal area/support facilities:

- Planning Activity Levels
- Aircraft Storage
- Aircraft Parking Apron
- Support Facilities
- Requirements Summary
- Alternatives
- Preferred Alternative

Planning Activity Levels (PALs)

These PALs are carried forward from **Chapter 1** and are used later in this chapter to determine the requirements for facilities through the planning period. There are various airport activity measures used to determine airport facility requirements including annual operations, peak hour activity, and based aircraft. Airport activity can be sensitive to industry changes, national and local economic conditions. This results in difficulty in identifying a specific calendar year for associated demand-driven improvements.

For this study, PALs are used to identify demand thresholds for many recommended facility improvements. If an activity level is approaching a PAL, then the airport should prepare to implement the improvements. Alternatively, activity levels that are not approaching a PAL can allow improvements to be deferred. The demand forecasts developed in this study correspond to an anticipated planning level calendar year to each PAL (2027, 2032, 2037, 2042) from the preferred aviation forecasts as seen in **Table 3-1** and **Table 3-2**.

Table 3-1 – Planning Activity Levels (PALs)

Key Activity Metrics	Base	PAL 1	PAL 2	PAL 3	PAL 4
Forecast Year	**2022**	**2027**	**2032**	**2037**	**2042**
Operations	5,000	5,172	5,350	5,534	5,724
Based Aircraft	16	17	17	18	19

Source: KLJ Analysis

Table 3-2 – Peak Airport Operations Forecast

Metric	2022	2027	2032	2037	2042	CAGR
Annual Operations	5,000	5,172	5,350	5,534	5,724	*0.68%*
Peak Month	750	776	802	830	859	*0.68%*
Design Day	25.0	25.9	26.7	27.7	28.6	*0.68%*
Busy Day (Design Day + 15%)	28.8	29.7	30.8	31.8	32.9	*0.68%*
Design Hour	1.8	1.9	1.9	2.0	2.1	*0.68%*

Source: KLJ Analysis, CAGR = Compounded Annual Growth Rate

General Aviation

General Aviation (GA) includes all civil aviation activities except for commercial service. Providing necessary facilities and access for general aviation users at HZE will continue to be important for the vitality of the Hazen and Mercer County community. Current GA activity includes aerial spray applicator operations, business travel, and air ambulance service.

Fixed Base Operators (FBOs) are commercial businesses providing multiple aviation services to the public, primarily for general aviation. Specialized Aviation Service Providers (SASOs) are commercial aviation businesses providing one or a few services. There is no FBO at the airport but there is an arrival/departure terminal building that the airport manager maintains. Vanco Aviation is an aircraft exterior refurbishing and painting operations based at HZE.

HZE currently houses 16 single-engine based aircraft. Based aircraft are planned to grow by 0.76% percent through PAL 4.

Facilities should be planned to provide flexibility for growth including a Fixed-Base Operator (FBO) business providing aeronautical services from HZE. Space should be considered for an onsite flight training and a maintenance facility. General aviation facilities evaluated in this section include aircraft storage hangars, aircraft parking apron and arrival/departure terminal building.

Aircraft Storage

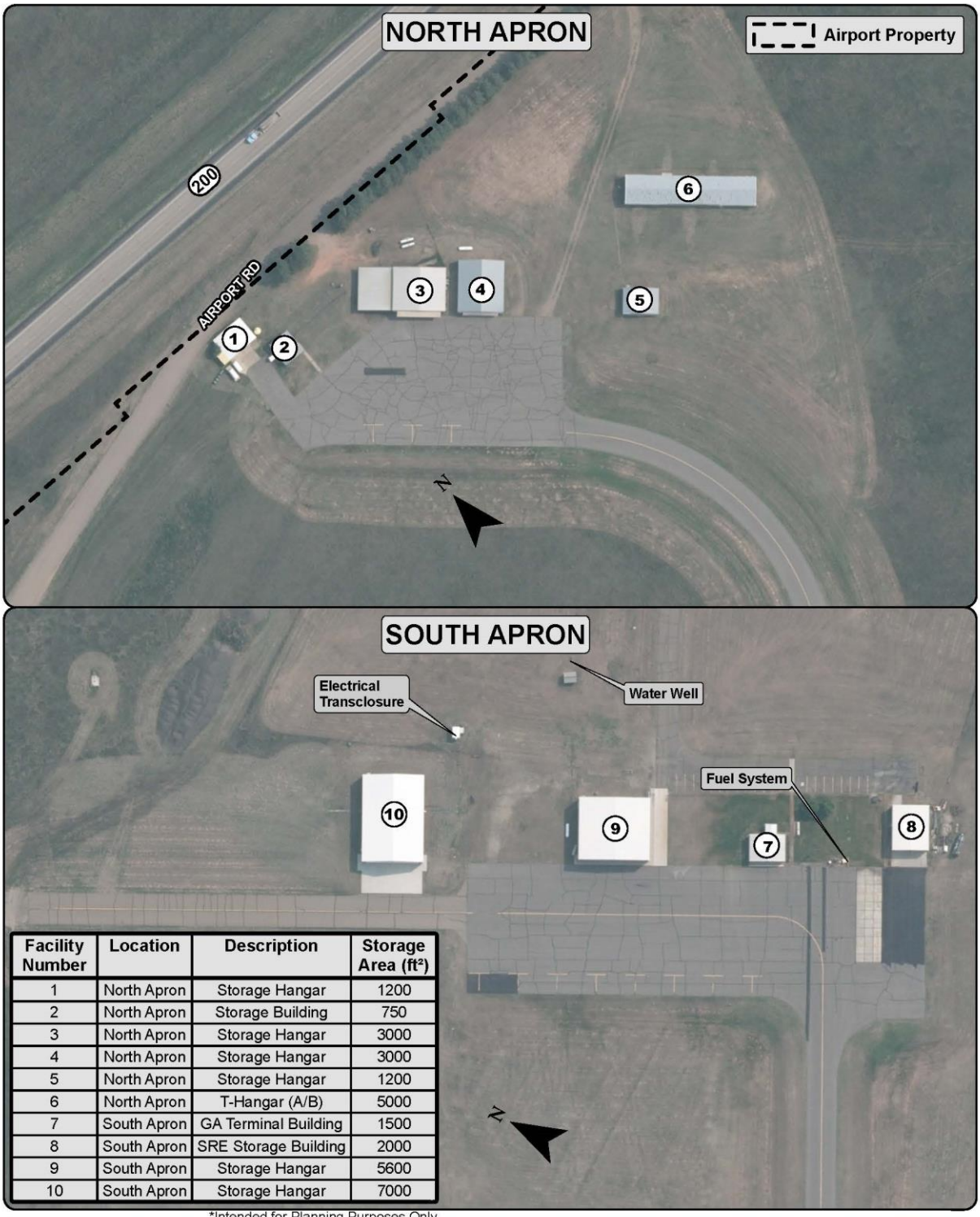
Aircraft storage requirements are driven by operational requirements, aircraft size, local climate, and owner preferences. For based aircraft, the harsh winters in the upper Midwest drive all owners to seek aircraft storage facilities rather than outdoor parking on an aircraft parking apron. Owners prefer to have covered, secure storage for their aircraft with space for other aeronautical facilities including an office or maintenance/storage areas. All based aircraft at HZE are stored in aircraft storage hangars. Transient aircraft travel to airports for up to a few days at a time. These aircraft typically park on the aircraft apron or seek temporary indoor aircraft storage, especially during adverse weather conditions. Aircraft storage facilities are listed in **Table 3-3**.

Table 3-3 – Aircraft Storage Facilities

Facility Number	Location	Description	Storage Area (SF)
1	North Apron	Storage Hangar	1,200
3	North Apron	Storage Hangar	3,000
4	North Apron	Storage Hangar	3,000
5	North Area	Storage Hangar	1,200
6	North Area	T-Hangar (A/B)	5,000
9	South Apron	Storage Hangar	5,600
10	South Area	Storage Hangar	7,000
TOTAL		***Shared Storage Hangars***	*21,000*
		T-Hangars (4 units)	*5,000*
		Grand Total	**26,000**

Source: KLJ Analysis

Figure 3-1 – Terminal Area Facilities Map



Facility Number	Location	Description	Storage Area (ft²)
1	North Apron	Storage Hangar	1200
2	North Apron	Storage Building	750
3	North Apron	Storage Hangar	3000
4	North Apron	Storage Hangar	3000
5	North Apron	Storage Hangar	1200
6	North Apron	T-Hangar (A/B)	5000
7	South Apron	GA Terminal Building	1500
8	South Apron	SRE Storage Building	2000
9	South Apron	Storage Hangar	5600
10	South Apron	Storage Hangar	7000

*Intended for Planning Purposes Only

KLJ

Mercer County Regional Airport Terminal Facility Map

BASED AIRCRAFT STORAGE

All 16 based aircraft are currently stored in approximately 26,000 square feet of available aircraft storage space. The following factors are used for aircraft storage space requirements:

- Single-Engine Piston/Other/Ultralight: 45' x 35' storage area (1,600 SF)
- Multi-Engine/Turboprop: 50' x 50' storage area (2,500 SF)
- Other: 40' x 30' storage area (1,200 SF)
- Additional 20 percent for general aeronautical storage and supplies

Using these factors, a facility space model was developed to estimate aircraft storage hangar size needs. The model uses the based aircraft fleet mix forecast and estimates a size per aircraft type to determine recommended facility space. It is important to understand that this projection provides a broad estimate of needed space into the future for facility planning. Actual space needs are demand-driven.

Table 3-4 – Based Aircraft Storage Requirements

Category	*Existing*	Base	PAL 1	PAL 2	PAL 3	PAL 4
Based Aircraft Forecast						
Single Engine	*16*	16	17	17	17	18
Multi Engine	*0*	0	0	0	1	1
Total	*16*	16	17	17	18	19
Based Aircraft Storage Space (SF)						
Aircraft Storage Space (SF)	*26,000*	25,600	27,200	27,200	29,500	31,300
Capacity/Deficiency (SF)	-	**400**	**1,200**	**1,200**	**3,500**	**5,300**
Based Aircraft Storage Units						
Shared Storage Units	*6*	6	5	2	2	2
T-Hangar (Individual) Units	*4*	4	8	14	17	20
Total Units	*10*	10	13	16	19	22
Capacity/Deficiency	-	-	**3**	**6**	**9**	**12**

Source: KLJ Analysis. Note: RED indicates a deficiency to existing capacity.

The above analysis suggests sufficient aircraft storage space exists to accommodate based aircraft needs only until PAL 1, though is important to note the current issues with the storage hangars.

- Current tenants share hangar space except for the few that are in the north area hangars. There is a liability concern because of having to move other aircraft.
- The north hangars are reaching the end of their useful life and will need to be replaced.
- The north apron area hangars are significantly disconnected from the remainder of the airfield and are required to taxi on active runways for long stretches. This hangar space should be moved to the south apron area.
- It has been stated if the airport had more individual storage hangar space, then the number of based aircraft tenants would increase.

The recommended hangar types to accommodate aircraft storage depend on airport and aircraft owner preferences and financial position. There are two main hangar types:

- T-Hangar: Nested small aircraft storage units within a rectangular building.
- Conventional Hangar: Commonly known as "box" hangars are square/rectangular.

It is recommended T-Hangars be added in the south apron area so current north apron area hangar tenants can relocate. Other hangars should be constructed as soon as demand warrants.

FBO/SASO STOARGE

HZE currently does not have an FBO, but the airport has expressed interest in trying to get an FBO or SASO operator housed at the airport. The airport has potential for an operator through the planning period. FBO/SASO storage is utilized on an as-needed basis as aircraft require temporary storage as well as to support service companies. Aircraft types that require this type of storage are typically larger and more expensive airplanes such as turboprop and turbojet aircraft. Storage timeframes vary but can be for a few hours to several days.

Transient aircraft storage should plan to accommodate one single-engine and one multi-engine/turboprop airplane through the planning period. **It is recommended at least 5,000 SF be made available to accommodate transient aircraft utilizing an FBO or SASO.**

As stated above that the north hangars are aging out, and an option will be examined in the alternatives to determine how to transition to all facilities being located on the south area. One alternative will be if the based aircraft in storage hangars #3 and #4 were to relocate, those hangars could be used for an interested operator for a SASO. Once the hangars have reached the end of their useful life then it is recommended the operator be relocated to a facility on the south apron area. **Table 3-5** represents the total aircraft storage space required through the planning period.

Table 3-5 – Total Aircraft Storage Requirements

Category	*Existing*	Base	PAL 1	PAL 2	PAL 3	PAL 4
Total Aircraft Storage Space (SF)						
Based Aircraft	*26,000*	26,500	27,200	27,200	29,500	31,300
FBO/SASO Hangar	-	4,100	4,100	4,100	4,100	4,100
Total	*26,000*	30,600	31,300	31,300	33,600	35,400
Capacity/Deficiency	**-**	**4,600**	**5,300**	**5,300**	**7,600**	**9,400**

Source: KLJ Analysis. Note: RED indicates a deficiency to existing capacity.

Aircraft Parking Aprons

GA aircraft parking is utilized by transient or based aircraft. With all the based aircraft at HZE stored in hangars, the aircraft parking necessary for transient aircraft requiring parking for a few minutes to a few days. Itinerant aircraft will require either covered aircraft storage (based or transient) or apron parking space.

The apron areas serve the loading, unloading, parking and maneuvering needs for general aviation operations and air medical operations. Locations are identified in **Figure 2-3**.

- **North Apron** is roughly 4,600 square yards (SY) of asphalt with three tiedown parking spots. This apron serves based aircraft tenants only with three storage hangars on the apron and two storage hangars (including T-Hangars) east of the apron.
- **South Apron** is roughly 8,800 SY which is mostly asphalt except for the 340 SY of concrete for larger aircraft parking. This apron houses the SRE building, terminal building, fuel farm, and another storage hangar. It has eight tiedown spots along the west edge and serves both based and transient customers.

AIRCRAFT DEMAND

The apron size is driven by the number and size of maneuvering and parked aircraft.

Only the south apron is considered in the needs analysis because it is necessary to consolidate storage into this one area. Currently, the south apron area has eight tiedown spots for ADG-I aircraft. The number of total and equivalent aircraft parking positions required at HZE is calculated below and identified in **Table 3-6**.

Table 3-6 – Aircraft Parking Requirements

Category	*Existing*	Base	PAL 1	PAL 2	PAL 3	PAL 4
Transient Aircraft Parking						
Total Operations	-	5,000	5,172	5,350	5,534	5,724
Busy Day (Design Day plus 15%)	-	28.8	29.7	30.8	31.8	32.9
Busy Day Parking (25%)	-	7.2	7.4	7.7	8.0	8.2
Total ADG-I Aircraft	-	*4.7*	*4.8*	*5.0*	*5.2*	*5.4*
Total ADG-II Aircraft	-	*2.1*	*2.2*	*2.3*	*2.4*	*2.4*
Equivalent Tie-Downs	-	7.9	8.1	8.4	8.7	9.1
Equivalent Tie-Downs (Rounded)	***8***	**8**	**8**	**8**	**9**	**9**
Capacity/(Deficiency)	**-**	0	0	0	1	1

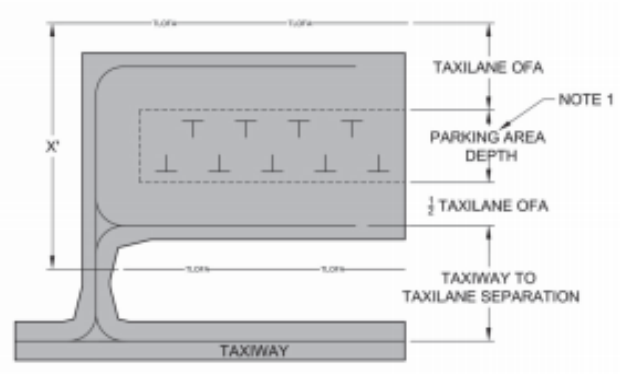
Source: KLJ Analysis. Note: RED indicates a deficiency to existing capacity.

The current amount of tiedowns is adequate through PAL 2. Forecast aircraft tie-down needs through PAL 4 (9) is less than the existing total number of tie-downs (8).

SIZE & CONFIGURATION

The Single Engine aircraft position requires 230 SY of area while larger multi-engine, turboprop and turbojet aircraft require approximately 345 SY. The apron area also includes at least one taxilane and therefore the total apron area can be calculated by multiplying the aircraft parking by 2.42 for ADG-I Taxilanes and by 3.00 for parking with ADG-II Taxilanes.

Apron size must accommodate both the required aircraft parking positions and maneuvering standards. Aircraft maneuvering at HZE is required to accommodate safety setbacks for FAA Airplane Design Group (ADG) II wingspans. The current apron configuration meets maneuvering and parking standards for the design aircraft.



Dual-Taxilane Apron Configuration (ACRP Report 96)

While HZE currently has a single row of ADG-I tiedowns on the west side of the apron, the preferred apron design for Design Group II aircraft is a nested ADG-I configuration which also has sufficient depth for ADG-II aircraft like the figure shows. Parking areas shall be lighted with stand-alone flood lighting to enhance night operations and to improve security. Currently, ADG-II aircraft are being accommodated with parking positions served from a single taxilane.

The apron size is based on the size and number of aircraft, as well as the design standards for the maneuvering taxilanes. Using ADG-I equivalent aircraft and ADG-II taxilanes at HZE, a rate of 900 SY per aircraft was used. This calculation includes dual apron taxilanes for maneuvering.

Table 3-7 – Transient Apron Size Requirements

Category	*Existing*	Base	PAL 1	PAL 2	PAL 3	PAL 4
Apron Area (SY)						
Equivalent Tie-Downs	*8*	8	8	8	9	9
Size Per Aircraft	*750*	900	900	900	900	900
South Apron Area*	*6,000*	7,200	7,200	7,200	8,100	8,100
Capacity/Deficiency	**-**	**1,200**	**1,200**	**1,200**	**2,100**	**2,100**

*Source: KLJ Analysis. Note: RED indicates a deficiency to existing capacity. * Includes only apron north of the taxiway connector to the runway which is used for parking.*

Based on this assessment, the existing apron could be reconfigured in deeper configuration to accommodate the ADG-I and ADG-II projected needs. With the 80' x 70' hangar directly on the apron, if an aircraft is sitting in front of it that does block the taxilane especially if aircraft are parked on the tiedown spots. Layout of the apron configuration will be evaluated later in this chapter. It is recommended all apron space continue to be lighted at all times with stand-alone flood lights around the terminal building area.

PAVEMENT CONDITION

According to the 2021 North Dakota Pavement Condition Index (PCI) Study; the north and south asphalt aprons had a PCI rating of 100. The concrete pad on the south apron had a PCI of 98. These all qualify as good conditions. It is expected by 2031 the north and south apron asphalt will decrease to a 73 PCI and the concrete pad will decrease to 87. It is recommended the airport continue to maintain the pavement in a good condition.

Support Facilities

Support facilities are necessary to support a safe and efficiently run airport supporting airport operations and the travelling public.

GA Terminal Building

The size of the GA terminal building is based on the number of passengers and types of services. Although additional facilities can be provided, at a minimum the terminal building serving general aviation needs should include the following services:

- Passenger Waiting Area
- Restrooms
- Vending
- Pilots Lounge/Flight Planning
- Mechanical Room
- Storage Room
- Circulation

The terminal building should be located adjacent to the transient aircraft parking apron with good visibility to the airfield, and be in close approximately to the automobile parking and waiting area. In most cases the terminal building is located within or near the Fixed Base Operator (FBO) providing

aeronautical services. The terminal building at HZE is provided by the airport sponsor and is located on the south apron towards the center on the east side of the pavement. It is estimated there is 700 SF of terminal space usable for airport users. This excludes the 200 SF meeting area.

The presence of an operator may require additional space such as aircraft maintenance, office space, and road side parking access.

The estimated planning-level size of the terminal building is based on peak hour total airport operations, 2.5 passengers per peak hour operation and 100 square feet of space per passenger as identified in ACRP Report 113. These figures provide an estimate of the number of passengers to arrive, depart and generally flow through the GA terminal. Calculations are summarized in **Table 3-8**.

Table 3-8 – GA Terminal Building Size Requirements

Category	*Existing*	Base	PAL 1	PAL 2	PAL 3	PAL 4
GA Terminal Building Size (SF)						
Peak Hour GA Operations	-	2.1	2.1	2.2	2.3	2.4
Number of Passengers	-	5.25	5.25	5.50	5.75	6.00
Total Building Size	*700*	**525**	**525**	**550**	**575**	**600**
Capacity/Deficiency	**-**	***175***	***175***	***150***	***125***	***100***

Source: KLJ Analysis

The existing GA terminal located inside the FBO sufficiently meets the existing and projected future GA itinerant passenger needs.

PASSENGER CONVENIENCE

Passenger convenience elements for the general aviation pilots and passengers were reviewed. The proximity of the aircraft apron to the terminal building is ideal to minimize outdoor exposure time. The terminal building itself does adequately meet the space and comfort needs for both HZE pilots and passengers. The fuel facility has a 24-hour card reader for ease and is next to the terminal building. The automobile parking is adjacent to the terminal building which minimizes outdoor exposure time. A courtesy car is available on site and is stored in the SRE building which helps regarding winter weather exposure but limits the availability to use the car. To use the courtesy car, flight crews must notify the airport in advance. Information about the courtesy car can be added to airportcourtesycars.com to provide more information to the flying community.

Communication Facilities

Communication facilities allow aircraft to transmit and receive clearances to air traffic control to navigate the national airspace system safely and effectively. HZE does not have an air traffic control tower so communication is up to the pilots to follow standard airspace procedures and practices on the Common Traffic Advisory Frequency (CTAF) and Universal Communications (UNICOM). The Air Route Traffic Control Center (ARTCC) is Minneapolis Center and Flight Service Station (FSS) is Grand Forks. Minneapolis ARTCC is contacted through the RCAG at Dickinson on 124.25 which is 57 nautical miles to the southwest and Grand Forks FSS is contacted with the Hazen RCO on 122.6 which is 6 nautical miles east of the airport. The airport is covered by ADS-B within 500 feet above ground level.

Airport Maintenance & Snow Removal

The airport has a dedicated facility to store airport maintenance equipment. The building is located south of the GA terminal building on the far southeast corner of the south apron. See **Figure 3-1**

Terminal Area Map labeled as SRE. Typical equipment is used to cut grass or control snow and ice. All equipment is stored inside the dedicated building, along with the courtesy car.

Snow and ice control equipment typically required includes a carrier vehicle (i.e. dump truck or tractor), snow plows, spreaders, sweepers, and blowers. For non-winter operations, grass cutting is accomplished with a carrier vehicle (i.e. tractor) and mower attachment. Smaller equipment is also used to facilitate snow removal or grass cutting. Equipment should be stored in a dedicated heated building for timely access and protection from the weather. North facing building doors should be avoided if possible to minimize prolonged snow and ice accumulation.

The airport should continue to maintain the current 2,000 SF equipment storage building while monitoring the amount of equipment and need to keep the equipment protected. It should be noted that not all space areas described in this section are eligible for FAA funding.

Fueling Facilities

Mercer County owns the airport fuel facility storing and dispensing 100 octane low led (Avgas) and jet fuel (Jet-A). Each fuel tank is underground with a 5,000-gallon capacity. Self-service fuel dispensing units are available 24-hours a day with a credit card. There are not fuel trucks at HZE for fueling. Aircraft access the fuel facility in a designated apron space.

The fuel farm was constructed in 2008 and the airport has expressed the current tanks cannot take a full delivery. An ideal fuel farm should provide a tank capacity of 12,000 gallons to accommodate a full tanker truck (10,000 gallons) to minimize the cost of deliveries. **It is recommended both the Jet-A and Avgas tanks be upgraded to 12,000 gallon tanks to accommodate a full fuel load from deliveries.** The airport should continue to upkeep the 24-hour credit card reader though this planning period.

It is important to point out that the movement to achieve unleaded aviation fuel is a developing and changing trend. The FAA's goal is to convert the aviation fleet to unleaded by 2030 through the Eliminate Aviation Gasoline Lead Emissions (EAGLE) program. HZE has expressed the interest of implementing this type of fuel when it becomes available. The airport needs to continue to monitor the needed process of changing current fuel tanks and how 100LL and unleaded users needs will be met through the planning period.

Fencing, Security & Wildlife

SECURITY & FENCING

The first line of security protection infrastructure is a perimeter fence. Perimeter fencing is not a requirement for non-certificated airports such as HZE. Its installation would help prevent unauthorized persons from entering the airfield. A minimum 6-foot high fence with added barbed wire is generally recommended at a minimum for security. Airfield access points should be minimized, however those that are needed should be controlled. Ideally, automated controlled access gates would be installed at the apron and hangar area. Locked field gates would be installed at other airfield access points.

Currently the airport has a 4-foot chain fence surrounding the north and apron area buildings but then turns into a barbed wire fence the further you get from any building. The remainder of the property is outlined by a 4-foot barbed wire fence. Therea is currently one latch gate for vehicle access on the south apron area. It is recommended the airport continue to maintain the current fencing they have through the planning period.

WILDLIFE CONTROL & MITIGATION

Controlling wildlife on or near the airport helps mitigate existing and prevent the creation of potential new hazards to aircraft. The airport can take steps to help increase safety of the airfield by completing a Wildlife Hazard Management Plan (WHMP). The WHMP will recommend any steps to take regarding wildlife including, birds, mammals, or any others that pose hazards to aviation.

Utilities

The airports water is from Southwest Water Authority. There are onsite septic tanks and a 1,000-gallon propane tank next to the GA terminal building. There are efforts in the community to bring natural gas to the area. When that is done, natural gas could be an option for the airport.

There is also a 50' Montana Dakota Utility (MDU) waterline easement roughly 650 feet south of the south terminal area and running between the windcone and AWOS and across the runway. If a parallel taxiway is to be constructed this easement needs to be considered in the evaluation of building area alternatives.

Other Facilities

GROUND ACCESS & CIRCULATION

The overall design objective is to provide ground vehicles with access to and from the terminal building and hangar facilities using a primary access road. To achieve this, access points should be secured to the apron, hangar area and any field access points to reduce undesired automobile access. The number of hangar access points should be limited to reduce the possibility of vehicle/aircraft incidents which improves safety. Fuel delivery trucks should have access to tanks without entering airside operations areas. Access roads should be paved to reduce the likelihood of foreign object debris (FOD) on the airside areas where it may become a hazard to aircraft.

The north apron area can be accessed from Mosset Way then has two access paths, both which lead to the southeast corner of the apron. All the roads on the north apron area are gravel. Car access to the south apron area is provided by 51st Avenue which is a gravel road and then west along a paved airport access road. Vehicles can access the apron just south of the large hangar straight off the access road. The parking lot has two walking access points, one leading to the GA terminal and one directly south of the SRE building.

It is recommended to pave 51st Avenue, and all access points should be secured, with the higher activity access points secured with a controlled access gate. Ideally access points should require a turn from the end of a roadway to discourage inadvertent airfield access. Fuel tanks are currently accessed from the parking lot so the delivery truck does not have to access the apron.

AUTOMOBILE PARKING

Automobile parking at general aviation airports should accommodate landside access needed to serve aeronautical facilities. Facilities requiring automobile parking include the arrival/departure terminal building, aircraft storage hangars, administration, maintenance equipment storage buildings and FBOs. Vehicles should be discouraged from parking in airside areas. Automobile parking lots should be sized for the demand and have appropriate number of handicapped accessible spaces. Lighting is recommended for night-time use and security.

Currently there are no designated parking spaces for the north apron area, so tenants park their personal vehicles next to the hangars. The south apron area has 20 parking spaces (including one

handicapped accessible space) within the paved parking lot that runs along the east side of the hangars. The parking lot is lit by flood lights placed on the SRE building, GA terminal building, and large hangar. The future vehicle parking lots will be evaluated in further detail in the alternatives section later in the chapter.

Requirements Summary

This chapter identifies safety, capacity and development needs for the Mercer County Regional Airport based on forecasted activity levels. These recommendations provide the basis for formulating development alternatives later in this chapter to adequate address recommended improvements. The following summarizes the facility recommendations:

Hangars

- Make space available for additional private use hangars.
- Add group hangars (T-Hangars, Executive Box Hangars) to get current based aircraft out of shared spaces and increase based aircraft tenants.
- Plan space for large hangars for a maintenance facility.

Apron Areas & Taxilanes

- Plan for the north apron facilities to be relocated/moved to the south apron area.
- Provide adequate ADG-II apron and taxilane space for 10 aircraft tiedown spots.
- Proactively add taxilanes and appropriate utilities to allow for hangar development.
- Consider a connector taxiway from the planned crosswind turf runway to the apron area.

Support Facilities

- Once replacement is necessary, upgrade the fuel facility to 6,000-gallon AVGAS storage tank and a 10,000-gallon JET-A storage tank.
- Provide space for the storage and distribution of future alternative aircraft fuels.
- Maintain the existing fencing, plan for a chain and link fence around any hangar areas along with adding automated gate access to any access points.

Landside Facilities

- Pave 51st Avenue to the airport access road.
- Plan vehicle access roads and parking areas for hangar area development.

Alternatives

A wide range of alternatives were evaluated to determine the best solution for the airport to meet facility needs. In many cases the process is iterative to react to new information and input. Please refer to the alternative analysis process in **Chapter 1** for details on the factors considered.

Terminal Area Alternatives

A range of initial alternatives were presented to the Planning Advisory Committee (PAC) for consideration and to create a narrower slate of alternatives for further evaluation. This was followed by a review of refined alternatives with more in-depth analysis. In the end a preferred alternative was selected and is portrayed at the end of this chapter.

All the alternatives focused on different arrangements of the aircraft parking apron, connector taxiways, ADG-I and ADG-II hangar development, corresponding taxilanes, self-fueling location and vehicle access. Below are specific components considered in each of the alternatives presented.

- ADG-II and TDG-2A aircraft maneuvering space on the apron
- Removal of direct access from apron to runway to meet design standards
- Apron configuration and aircraft parking locations
- Fuel system locations
- ADG-I and ADG-II hangar development areas
- FBO/SASO Facility
- Existing structures such as Drainage swale and electrical vault
- Runway Visibility Zone

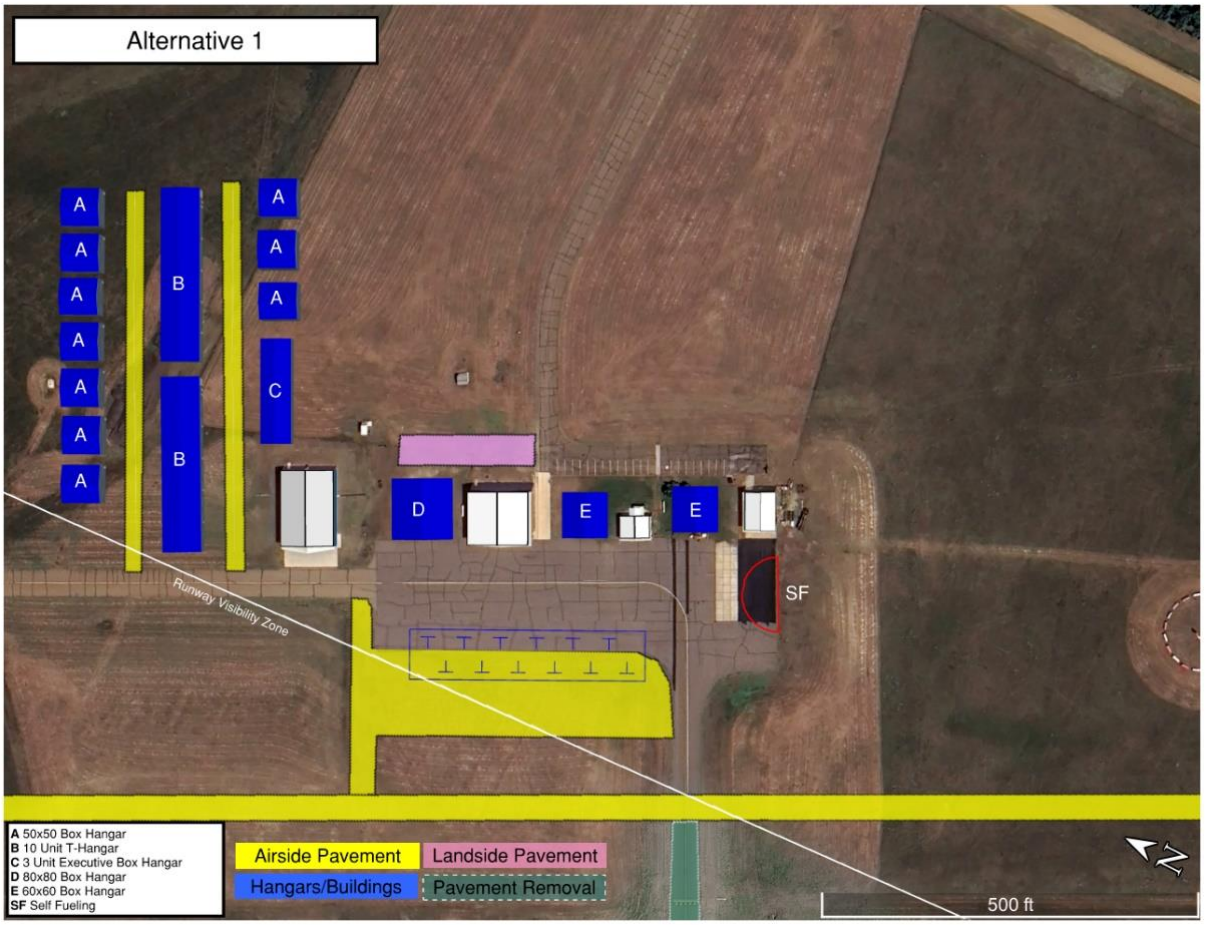
INITIAL ALTERNATIVES:

Six initial alternatives were drafted for the terminal area and presented to the Planning Advisory Committee. The alternatives are described and depicted as follows.

Alternative 1

Apron depth is expanded with nested tie-downs and dual taxilanes in a “racetrack” style. Dual access to the taxiway is provided by a new connector at the northwest end of the apron while also utilizing the existing connector at the southwest corner of the apron. Self-fueling is located at the south end of the apron. Larger ADG-II hangars that could be utilized by an FBO or maintenance facility are located along the apron. Two TDG-1 taxilanes leading to a mix of box hangars, T-hangars and an executive box hangar to the south side of the area.

Figure 3-3 Alternative 1



Alternative 2

Apron depth is expanded to accommodate two rows of nested tie downs spots oriented wings east to west. Box hangars are placed to the west of the taxilane extension[1], as well as a TDG-1 taxilane leading to the east with more box hangars. Self-fueling is moved to the northwest corner of the existing apron. An 80'x80' box hangar that could be utilized by an FBO/SASO is show between the existing terminal building and SRE building.

Figure 3-4 Alternative 2

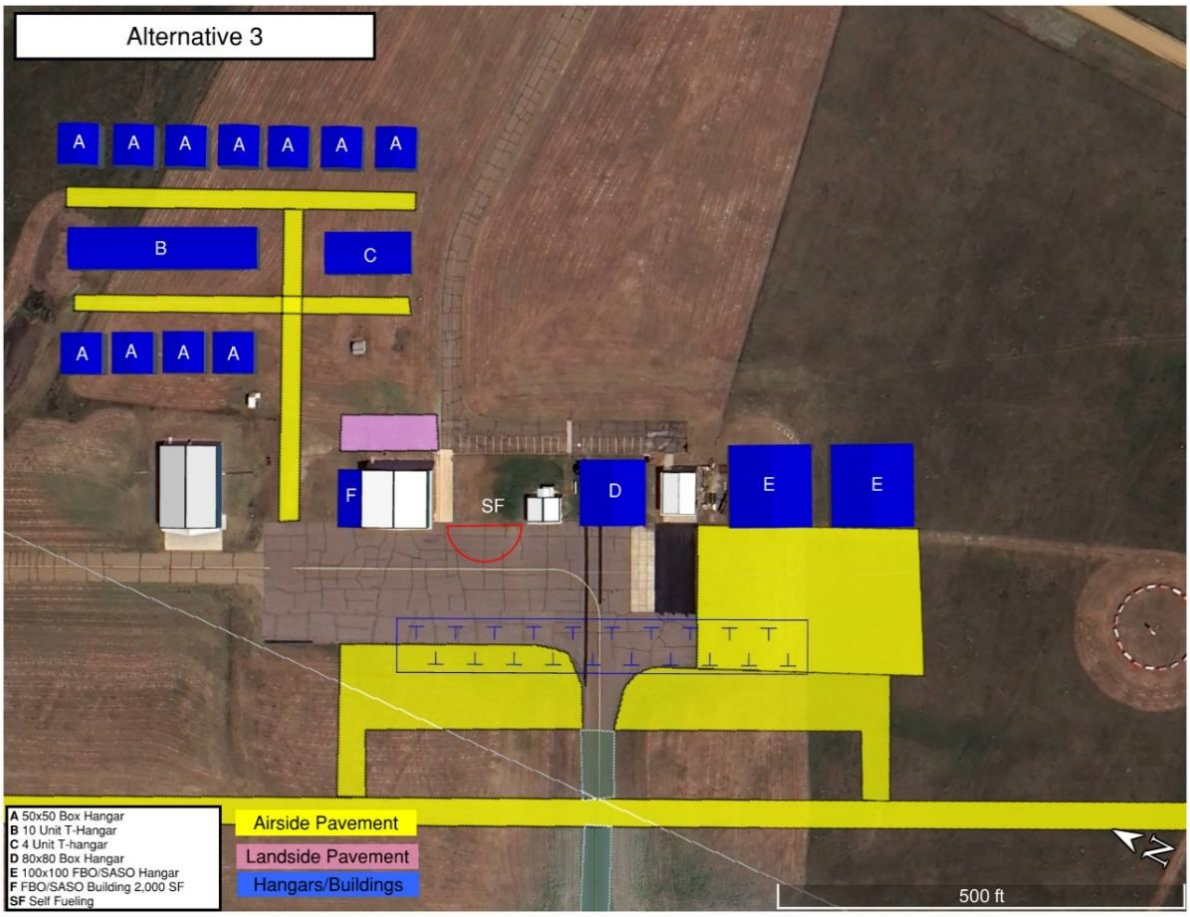


[1] The Box Hangars are placed on the west side of the taxilane as was originally planned when the last Airport Layout Plan was completed. As portrayed, the hangars would be within the Runway Visibility Zone and therefore could not be constructed without impacting the planned crosswind runway.

Alternative 3

Apron depth is expanded to accommodate 20 nested tie down spots. The existing connector will be removed and new taxiway connectors are show on either side of the apron. perpendicular to the runway/taxiway to expand ADG-II hangar development on the south end. ADG-I hangar development is positioned on the northeast side. Larger hangars are shown adjacent to the apron south of the terminal building. Self-fueling is centrally located on the apron.

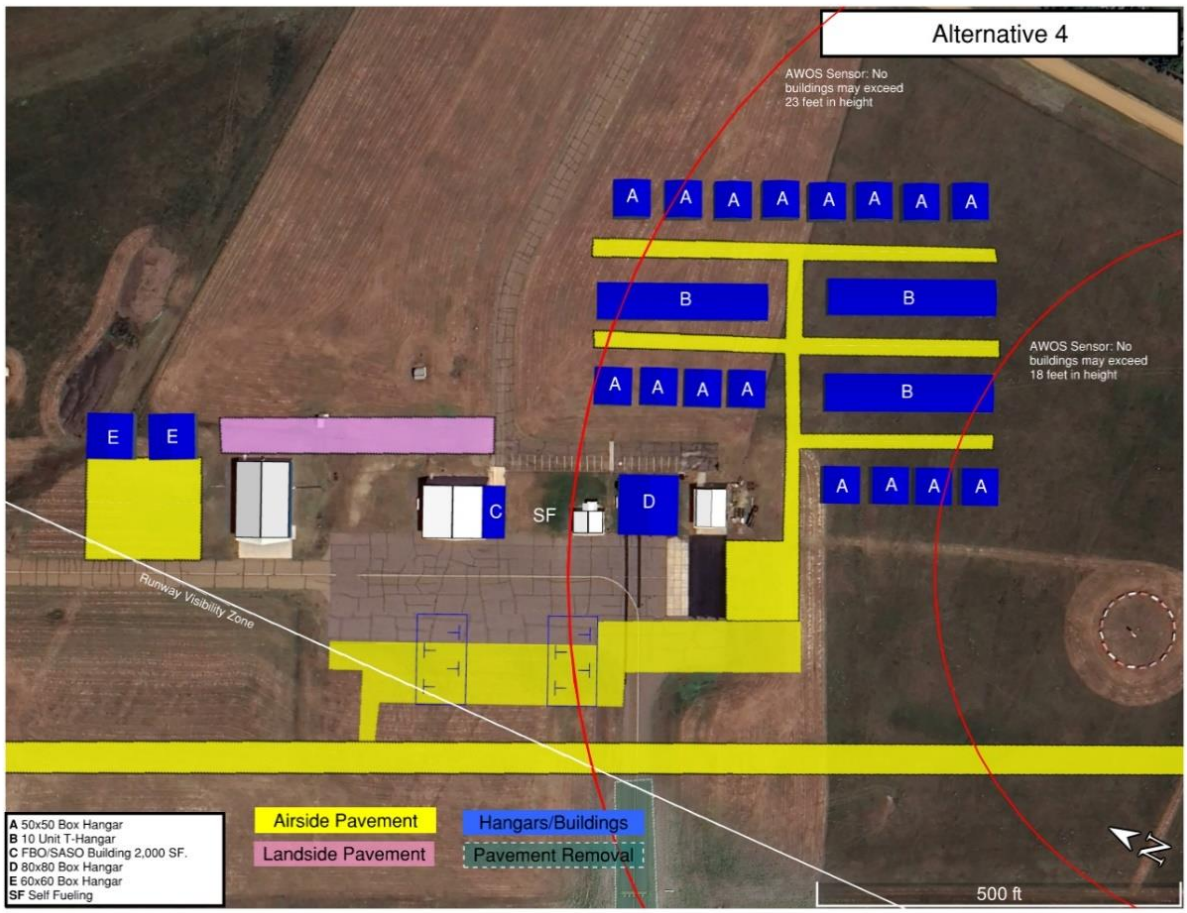
Figure 3-5 Alternative 3



Alternative 4

This alternative explores hangar development to the south using a combination of box and T-hangars. Apron depth is expanded to allow two groups of nested tie-down spots oriented wings east to west. Dual access to the parallel taxiway is provided utilizing the existing connector, as well as one on the north side of the apron. Hangars with dedicated apron space are shown east of the existing taxilane. As seen with the red rings, the hangar development to the south, could have an impact on the existing AWOS and therefore height might be limited or the AWOS would need to be relocated.

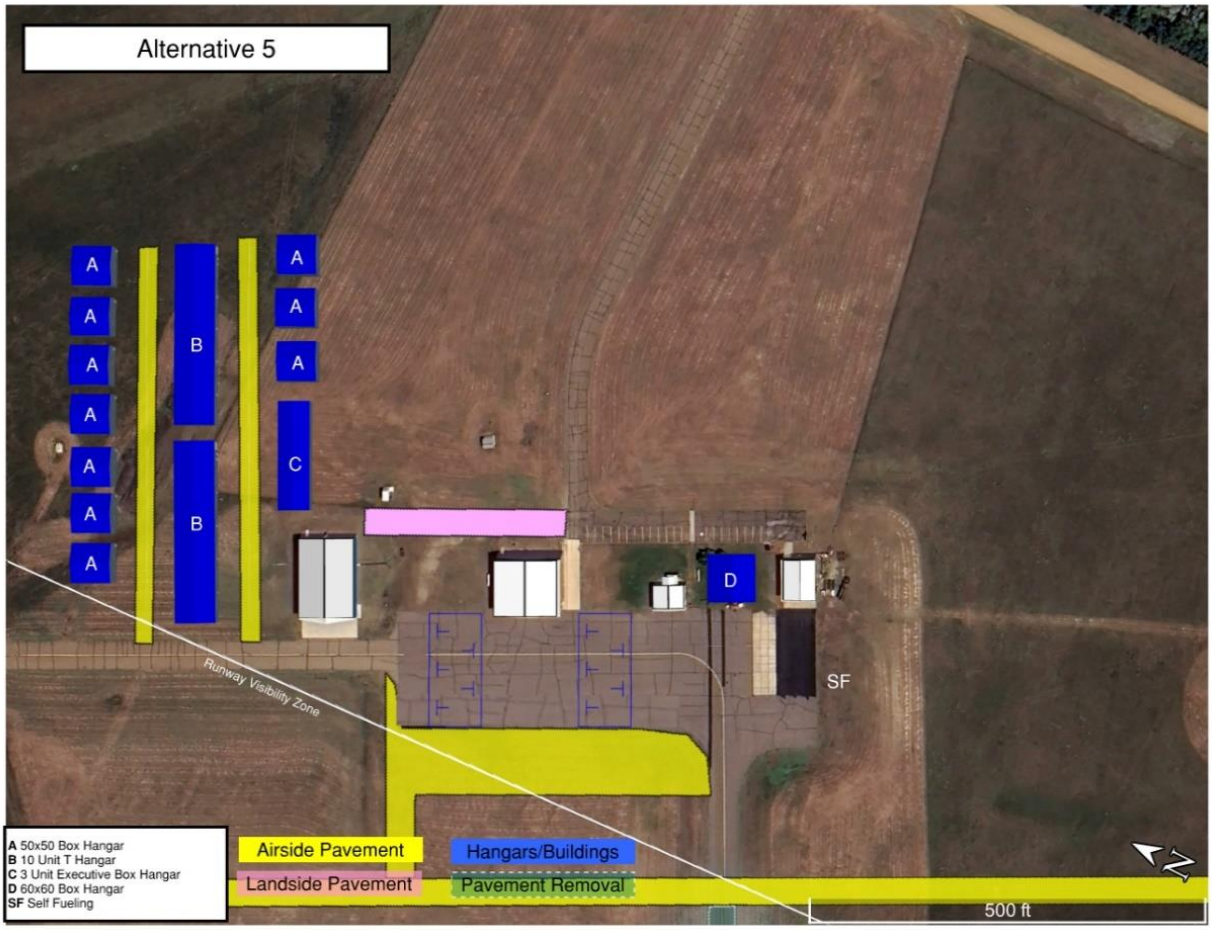
Figure 3-6 Alternative 4



Alternative 5

In this alternative, apron depth is expanded to allow room for aircraft maneuvering. Two rows of nested tiedowns are shifted to the eastern edge of the existing apron. Hangar development is to the northeast with a mix of box and T-hangars.). Self-fueling is located on the southern end of the apron.

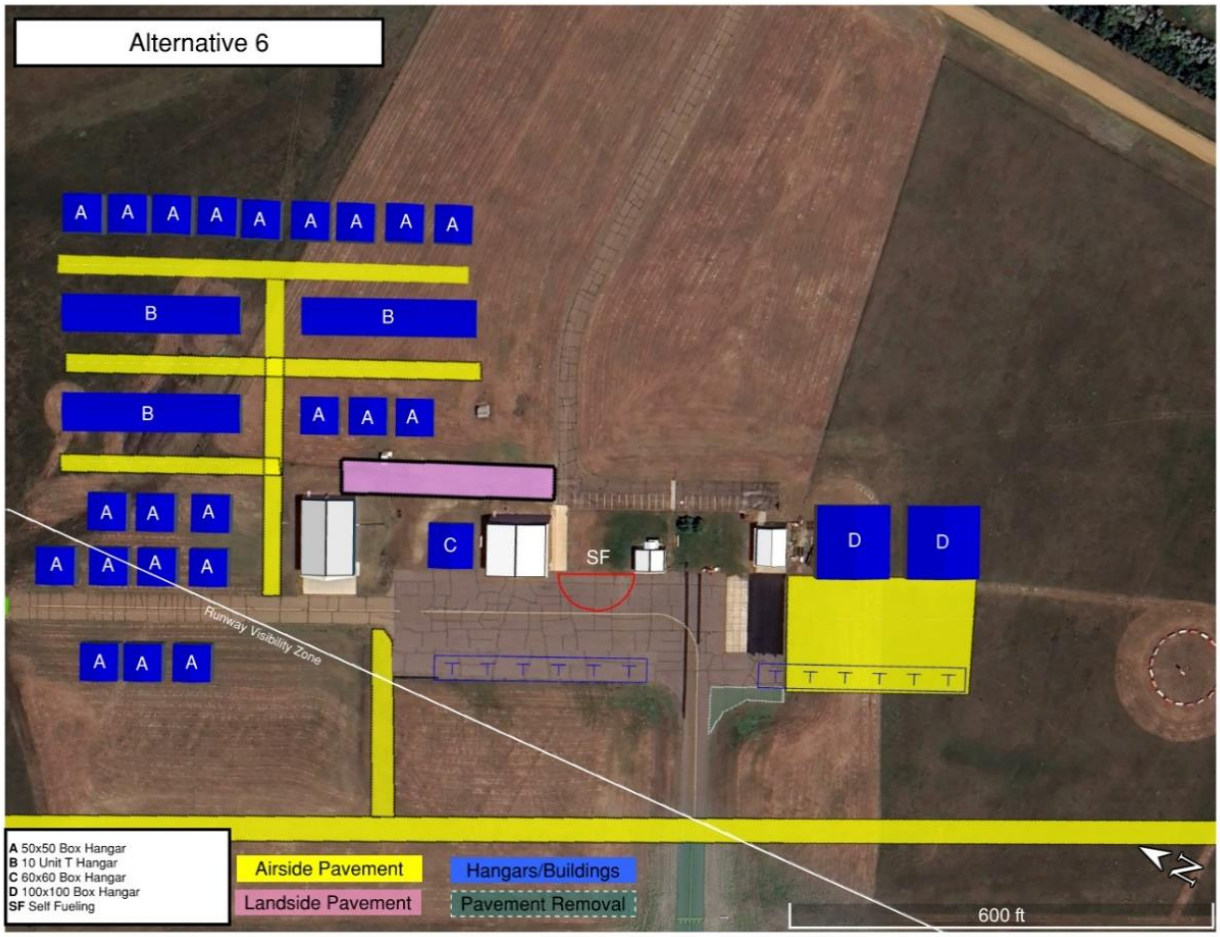
Figure 3-7 Alternative 5



Alternative 6

In this alternative the apron is expanded south, with single row tiedown spots continuing along the edge. Larger hangars are placed at the southeastern edge of the expanded apron. Additional hangars are placed along the existing taxilane within the RVZ (see footnote to Alternative 2). A TDG-1 taxilane leads to a mix of box and T-hangars to the northeast. Self-fueling is located centrally on the apron.

Figure 3-8 Alternative 6



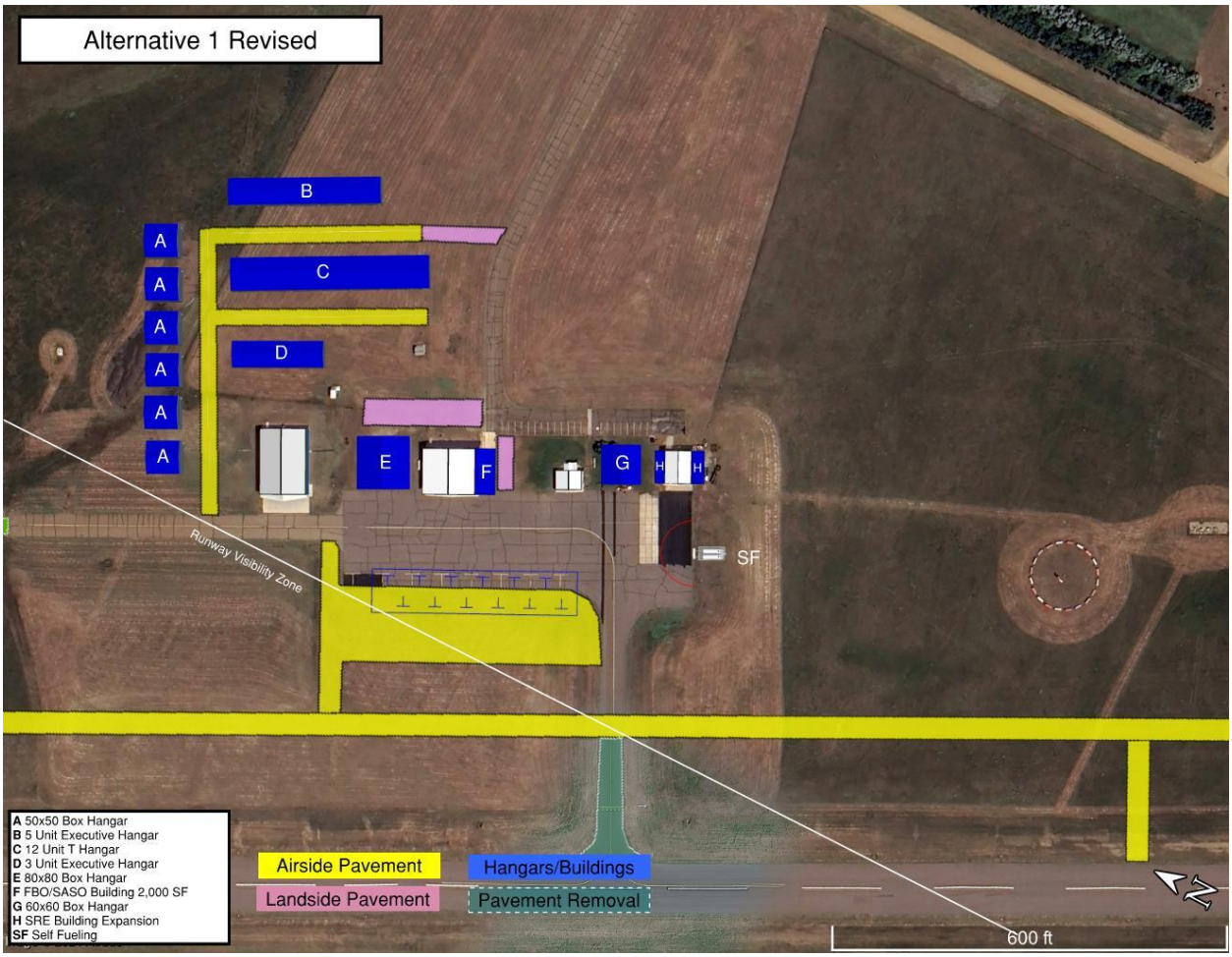
REVISED ALTERNATIVES

After the initial alternatives were reviewed by the PAC, changes were made to Alternative 1 and Alternative 3. The other alternatives for hangar/terminal area development were dismissed.

Revised Alternative 1

In this revision, the individual hangar taxilane was changed to an alignment similar to Alternative 2. The hangars opening east and west were changes to T-hangars and Executive Box Hangars. A lean-to was added to the current large hangar on the apron to allow for establishing an FBO/SASO for aircraft maintenance. The access road would be shifted further south. Additions were made to the current SRE storage building to expand the storage space.

Figure 3-9 Revised Alternative 1



Revised Alternative 3

This alternative was revised by reducing the size of the box hangars on the south area and reducing the apron space. Parking was added for these hangars which would extend the current parking area. The proposed hangars on the current apron from the initial alternative 3 was also reduced in size. The SRE storage building was updated to have lean-to additions for extra space.

Figure 3-10 Revised Alternative 3

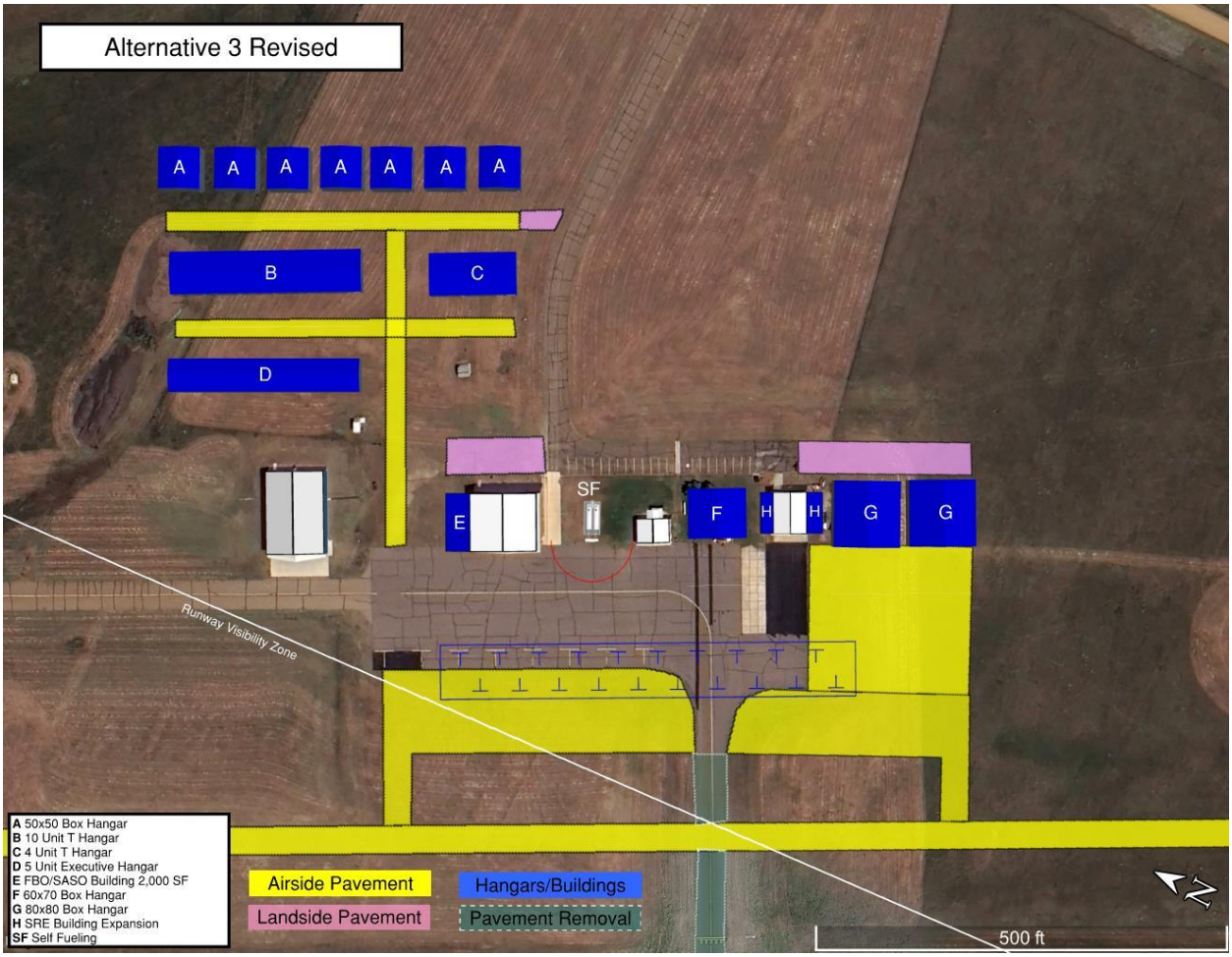


Preferred Alternative

After final review by the PAC, it was determined that Revised Alternative 3 will offer the best approach for development for the future of the airport. The recommend development includes the following:

- FBO/SASO Storage: A lean-to is planned to be added to the north of the current hangar on the apron. One large hangar will be planned to the south of the current terminal building where the fuel farm is currently. Two large hangars will be planned to the south of the SRE building on the apron extension to the south.
- Fuel Farm Facility: When the fuel tanks reach the end of their useful life, a 12,000-gallon Jet-A and Avgas tank, both self-serves to meet minimum gallon amount of the deliveries. They will be placed to the south of the current apron access road for easier access of the delivery trucks.
- Apron and Tiedowns: 4,500 SY of pavement will be added to the east of the current tiedowns and 6,600 SY of surface will extend the apron to the south and east where the planned two 80' x 80' hangars will be housed. This will allow a total of 20 ADG-I nested tiedown spots. The nested spots will also be able to accommodate ADG-II aircraft parking.
- SRE Storage: The current building will be expanded in its current location to meet current and future equipment needs.
- Aircraft Storage: A mixture of T-Hangars, Executive Box hangars and small Box Hangars will be added to the east of the north apron area on new taxilanes. All hangar development will be based on demand.
- Apron Taxiways: The current taxiway connecting the apron to the runway will be removed while two connecting taxiways will be placed on the new northern and southern apron.
- Hangar Taxilanes: A 25' wide taxilane will run east and west between the two current large hangars for the aircraft storage hangar area. Two more 25' wide taxilanes will branch off running north and south for east and west facing hangars.
- Access Roads and Parking: An access point will be added to the new furthest east taxilane in the new storage hangar area. All access points should be secured, with the higher activity access points secured with a controlled access gate. The parking lot will extend north to the east of the current large hangar on the apron and extend to the south, east of the proposed two large hangars on the new apron area.
- Other Road Access: It is recommended that the existing graveled road, 51st Avenue, be paved from the airport road north to Highway 200.

Figure 3-11 Preferred Alternative



CHAPTER 4: IMPLEMENTATION & COMPATIBILITY

Introduction

The implementation and compatibility plan provides guidance on how to carry out the preferred development recommendations identified in **Chapter 2: Runways and Taxiways** and **Chapter 3: Terminal Area and Support Facilities**. Based on the preferred development plan, the improvement projects needed at the Mercer County Regional Airport (HZE) over the planning period can be formulated. This chapter includes the following sections:

- Project Sequence
- Financial
- Environmental Review
- Compatibility

Background

Each project is sequenced to balance demand, schedule, other projects, environmental/agency approval, funding, and financial constraints. The project plan may change over time to react to changing conditions but is flexible so that the airport can react to change and re-prioritize projects based on actual demand.

A more detailed facility implementation and financial feasibility plan is identified for the near-term (i.e. 1-10 years), because needs are more realistically anticipated based on available funding and actual demand. There is more uncertainty in project funding, demand, and local project importance in the long-term. When reaching that point, airport planning documents should be updated.

Implementing a Project

The airport must go through an established process to receive the federal funds to complete an airport development project. FAA requires long lead times to complete all project steps and incorporate projects into federal funding plans. Additional coordination is required to prepare National Environmental Policy Act (NEPA) environmental documentation. Common steps in the project implementation process for a complex project include (steps may be shorter or longer based on complexity):

Professional Services: Select a qualified consultant for the project planning, environmental reviews, survey, engineering design, and construction administration for the project. The FAA recommends a distinct selection process for both planning and engineering services.

Five (5) Years Prior to Construction: Identify the project on the Airport Layout Plan, complete necessary airport planning studies and collect supporting documentation to demonstrate the project is justified for AIP funding, and is compatible with the Airport Layout Plan.

Four (4) Years Prior to Construction: Update the Capital Improvement Plan (CIP) to identify the project scope, eligibility, justification, and funding. Close coordination with FAA is required.

Three (3) Years Prior to Construction: Initiate any aeronautical surveys, navigational aid agreements (reimbursable agreements) or special FAA coordination for flight procedures which may be necessary prior to construction. Solidify project funding plan and final justification with FAA.

Two (2) Years Prior to Construction: Complete required NEPA environmental documentation and analysis for the proposed action. Prepare 30 percent project design, refine cost estimates, and prepare benefit/cost analysis as necessary. Acquire land for project and initiate airspace studies.

One (1) Year Prior to Construction: Obtain environmental clearance and permits for the proposed action. Prepare funding pre-application, detailed project plans and specifications including design report, airspace studies, Safety Management Systems (SMS) and construction safety/phasing plan. Finalize project schedule.

Year of Construction: Complete final design. Solicit bid proposals from companies engaged in the project construction. Prepare grant application and accept Federal grant. Issue notice to proceed and monitor construction. Maintain FAA grant compliance and payments.

After Construction: Submit final report and close out the AIP grant.

For complex projects requiring federal discretionary funding such as runway extensions, these steps may take up to five years prior to the issuance of an AIP grant for construction. Less complex projects using entitlements such as pavement rehabilitation will require less lead times, typically no less than three years prior to grant issuance.

All planning-level project costs developed are in 2024 dollars. Final project costs are subject to change based on actual construction and project formulation needs.

Many of the projects identified are demand-driven based on the Planning Activity Levels (PALs) established in the approved aviation forecasts. The timing of implementation is estimated from the FAA-

approved activity forecasts. Any change from the forecasted airport activity may affect the timing of capacity-driven improvements.

Based on the PALs and other regular pavement and safety needs, some airport development capacity projects may not able to be sequenced to meet PALs within a realistic funding plan. These projects are initiated within a few years of their PAL demand trigger to account for anticipated available funding.

Project Sequence

Significant individual projects are described in this section along with information about the project purpose, scope, and triggering events. The recommended project phasing at HZE is based on anticipated needs and available funding. This information provides guidance to the airport sponsor and funding agencies on future implementation steps.

Near-Term Projects (0-10 Years)

Near-term projects cover the planning period for the next ten years through 2034, generally corresponding to the forecast Planning Activity Levels (PAL) 1 and 2. Projects in this phase address the highest priority needs justified for funding. Significant near-term projects are further described in **Table 4-1 Near-Term Projects.**

Table 4-1 - Near-Term Projects

Project	Scope	Estimated Cost	Trigger	Justification
Turf Crosswind Runway 3-21	Design and construction of a 2,500' x 100' turf crosswind runway	$900,000	The current alignment of Runway 15-33 only meets the 95% wind coverage for the critical design aircraft of B-II.	To meet the 95% wind coverage for all weather conditions and IMC.
FBO/SASO Expansion	Design and construction a 2,000 SF lean-to north of current apron hangar	$600,000	Airport sponsor has expressed interest to get an on field FBO and/or SASO operator.	Construct the lean-to addition on the hangar for adequate operating space for a business and airport users to operate.
Relocation of the Fueling Facility	Update the fuel tanks to a 10,000-gallon JET-A tank and a 6,000-gallon AVGAS tank and move the facility west of the terminal building	$1.2 m	Current fuel storage tanks cannot hold a full delivery and were constructed in 2008.	Replace the outdated tanks and upgrade the gallon amount. The fuel facility will also be relocated to a spot easily accessible for deliveries.

Source: KLJ Analysis

Capital Improvement Plan (CIP)

The CIP is a key element in the implementation plan. The CIP identifies the project title, year, estimated costs, and anticipated funding for airport improvements. Larger projects are often divided into smaller elements that reflect how projects are approved, designed, and constructed. Each project is requested through the CIP project programming and grant application process. The CIP is updated and submitted to the FAA annually to program Federal and State grant funding. The proposed HZE CIP identifies over $6 million in airport improvements over the next 10 years see **Table 4-2 Capital Improvement Plan**. For years 2025 and 2026, CIP projects will be granted a 95% FAA funding rate while state and local funding rate will be 2.5%. For the following years a 90% FAA funding rate will be used with a 5% funding rate for state and local funds. These percentages were determined based on the 2024 FAA Reauthorization Bill. More details about the bill can be found in following text.

Table 4-2 – Capital Improvement Plan

Year	Project	Scope	Estimated Cost	FAA Funds	State Funds	Local Funds
Short Term Projects (2025 – 2034)						
2025	Pavement Rehabilitation	Crack Seal, Seal Coat, New Pavement Markings	$553,000	$525,350	$13,825	$13,825
2026	Design Fuel Facility	Design 12,000-gallon JET-A & AVGAS above ground tanks with 24-hour card reader in new location	$100,000	$95,000	$2,500	$2,500
2027	Design Crosswind Runway	Design for 2,500'x100' turf runway	$130,000	$-	$117,000	$13,000
2027	Construct Fuel Facility	Construct 12,000-gallon JET-A & AVGAS above ground tanks with 24-hour card reader in new location	$1,000,000	$900,000	$50,000	$50,000
2027	Remove Current Fuel Facility	Remove the two current 5,000-gallon underground tanks	$100,000	$90,000	$5,000	$5,000
2028	Construct Crosswind Runway	Construct 2,500'x100' turf runway	$800,000	$-	$720,000	$80,000
2029	Design an FBO/SASO hangar Lean-to	Design a 2,000 SF lean-to addition	$100,000	$90,000	$5,000	$5,000
2030	Construct the FBO/SASO Lean-To	Construct the 2,000 SF lean-to addition to the apron hangar	$500,000	$450,000	$25,000	$25,000
2031	Design Taxilane West & North of Apron	Design taxilane west (275'x25') & taxilane north (255'x25')	$100,000	$90,000	$5,000	$5,000
2031	Design NW T-Hangar	Design for 5-Unit T-Hangar	$100,000	$90,000	$5,000	$5,000
2032	Construct Taxilane East & North of Apron	Construct taxilane east (275'x25') & taxilane north (255'x25')	$700,000	$630,000	$35,000	$35,000
2033	Expand Parking to FBO/SASO Lean-To	Extend parking area north (575 SY)	$500,000	$450,000	$25,000	$25,000
2034	Construct NW T-Hangar	Construct 5-Unit T-Hangar	$1,500,000	$1,350,000	$75,000	$75,000
2034	Design Parallel Taxiway with MITL	Design a 5,000'x35' parallel taxiway, connectors, and lighting and remove current taxiway to runway connector	$150,000	$135,000	$7,500	$7,500
Sub-Total			$6,300,000	$4,900,300	$1,100,800	$300,800

Long Term Projects (2035 – 2044)						
2035	Construct Parallel Taxiway with MITL	Construct a 5,000'x35' parallel taxiway, connectors, and MITL and remove current taxiway to runway	$1,200,000	$1,080,000	$60,000	$60,000
2036	Design Taxilane Continuing East & North	Design taxilane east (130'x25') and taxilane north (255'x25')	$100,000	$90,000	$5,000	$5,000
2036	Design NE T-Hangar	Design 10-unit T-hangar	$100,000	$90,000	$5,000	$5,000
2037	Construct Taxilane Continuing East & North	Continue constructing taxilane east (130'x25') & taxilane north (255'x25')	$700,000	$630,000	$35,000	$35,000
2037	Construct NE T-Hangar	Construct 10-unit T-Hangar	$2,500,000	$2,250,000	$125,000	$125,000
2038	Storage Hangars (4)	50'x50' hangar, privately built	$3,000,000	$2,700,000	$150,000	$150,000
2038	Apron Hangar	Construct 60'x70' box hangar	$1,000,000	$900,000	$50,000	$50,000
2038	Design North Apron Expansion	Design expansion of the north part of the apron & taxiway connector	$100,000	$90,000	$5,000	$5,000
2039	Construct North Apron Expansion	Expand apron and taxiway connector, 4,540 SY with 10 tiedowns	$700,000	$630,000	$35,000	$35,000
2039	Design South Taxilanes	Design taxilanes continuing south (130'x25')	$100,000	$90,000	$5,000	$5,000
2040	Construct South Taxilanes	Construct southeast & southwest taxilanes (130'x25')	$700,000	$630,000	$35,000	$35,000
2040	Design South T-Hangar	Design 4-unit T-Hangar	$100,000	$90,000	$5,000	$5,000
2041	Construct South T-Hangar	Construct 4-unit T-Hangar	$1,000,000	$900,000	$50,000	$50,000
2041	Storage Hangars (3)	50'x50' hangar, privately built	$2,250,000	$2,025,000	$112,500	$112,500
2042	Design South Apron Expansion	Design expansion of the south part of the apron & taxiway connector	$100,000	$90,000	$5,000	$5,000
2043	Construct South Apron Expansion	Expand apron and taxiway connector, 3,910 SY with 10 tiedowns & remove current connector taxiway	$1,000,000	$900,000	$50,000	$50,000
2044	Large Apron Hangars	Construct 2 80'x80' hangars	$2,400,000	$2,160,000	$120,000	$120,000
2044	Expand Parking to Large Hangars	Expand parking area south (920 SY)	$500,000	$450,000	$25,000	$25,000
2045	Implement a ¾ Mile Visibility	Aeronautical survey for obstruction analysis & runway lighting	$500,000	$450,000	$25,000	$25,000
Sub-Total			$ 18,100,000	$16,200,000	$900,500	$900,500
TOTAL			$24,400,000	$21,100,400	$2,000,300	$1,200,300

Source: KLJ Analysis; Total values rounded to nearest 100.

Financial

The implementation plan considers the airport's ability to fund the projects identified in this planning study. Projects in the short-term and mid-term are discussed in more detail for realistic project sequencing based on identified needs, airport priorities and available funding. Financial feasibility is a major consideration in developing the implementation plan and Capital Improvement Plan (CIP).

Airport funding for projects is derived from many sources. Funding sources can be categorized into three main categories:

- Federal funding
- State funding
- Local or Private funding

Detailed information about these funding programs can be found in **Appendix B – General Aviation Airports 101 (Airport Funding)**. A realistic project implementation plan must consider financial resources. The financing strategy for the Mercer County Regional Airport provides sufficient federal, state, and local funding for future airport improvements. Projected funding sources are based on existing legislation.

Federal Funding

Federal Airport Improvement Program (AIP) funding provides financing for most of the improvements proposed at HZE. While maximizing the projected entitlement funding available to Mercer County ($150,000/year), these entitlements will only finance a portion of the proposed improvements through the 20-year period. Entitlements will be used to fund AIP-eligible projects, particularly critical maintenance, safety, and capacity enhancements. Discretionary funding unfortunately is not anticipated due to low priority ratings. A summary of Federal funding needs is outlined in **Table 4-3**.

Table 4-3 – Total Funding

Phase	Cost	FAA Entitlement	FAA Discretionary	State	Local
Near-Term (2025-2034)	$6,333,000	$1,440,300	$0	$1,090,825	$346,825
Long-Term (2035+)	$18,050,000	$1,650,000	$0	$902,500	$902,500
TOTAL	**$24,383,000**	**$3,090,300**	**$0**	**$1,993,325**	**$1,249,325**

Source: KLJ Analysis

COVID-19 Relief

During the Coronavirus Disease 2019 Pandemic (COVID-19), the United States government signed three laws for economic assistance to eligible U.S. airports through 2020 and 2021. These funds were to be used to prevent, prepare for, and respond to COVID-19.

The first law, the Coronavirus Aid, Relief, and Economic Security (CARES) Act was signed on March 27, 2020, for $2.3 trillion dedicated towards combatting the effects of COVID-19. Of this, $10 billion were to keep airports in operation to serve the industry, traveling public and to support the economy, along with keeping airports credited ratings stable, and to keep airport and aviation workers employed. These funds could be used for any purpose for which airport revenues may be lawfully used.

Then on December 27, 2020, the Coronavirus Response and Relief Supplemental Appropriation Act (CRRSAA) was the second law signed including $900 billion in supplemental appropriation for COVID-19 relief. The FAA established the Airport Coronavirus Response Grant Program (ACRGP) which included $2 billion of the act.

Finally, the American Rescue Plan Act of 2021 was signed into law on March 11, 2021, which included $1.9 trillion to address the ongoing health crisis and spur a strong economic recovery. The FAA established the Airport Rescue Grants which is how $8 billion of those funds.

Mercer County Regional Airport was granted $20,000 under the CARES Act as a general aviation airport. $13,000 was granted from the ACRGP as a non-primary allocation for a basic general aviation airport. Then, $32,000 was granted from the Airport Rescue Grants as a non-primary allocation. In total $65,000 has been awarded to combat the effects of COVID-19.

Bipartisan Infrastructure Law

On November 6, 2021, the Bipartisan Infrastructure Law (Infrastructure Investment and Jobs Act) was passed. This included $ 1 trillion for improvements to highways, bridges, roads, passenger and freight rail, airports, water and wastewater treatment, internet access and modernizing the electric grid. The FAA awarded the $25 billion received from the law to 3,075 airports and divided it into three grant groups:

1. $5 billion for airport terminals to replace aging terminals, increase energy efficiency and accessibility.
2. $5 billion for air traffic facilities to update and upgrade equipment to improve safety, security and environmental standards and replace necessary facilities.
3. $15 billion for airport infrastructure for projects as defined under the existing Airport Improvement Grant and Passenger Facility Charge criteria including runways, taxiways, safety and sustainability projects, terminal, airport-transit, and roadway.

In the past three years 2.89 billion has been made available to U.S. Airports and nearly $9 billion in Airport Infrastructure Grants (AIG). For HZE the following amounts were allocated; 2022 - $159,000, 2023 - $145,000, 2024 - $144,000.

2024 FAA Reauthorization Bill

On October 1, 2024, House Resolution 3935 went into effect for Fiscal Years 2025 through 2028. This increases AIP funds from $3.35 billion to $4.0 billion effective fiscal year 2025. This also temporarily provides an increase of funding allocations for fiscal years 2025 and 2026 to 95% for all non-hub primary and non-hub non-primary airports such as HZE. For fiscal years 2027 and 2028 federal shares reverts back to the standard 90%.

State Funding

The North Dakota Aeronautics Commission disburses funding annually to public airports across the state for airport improvement projects. These grant funds are derived primarily through aviation fuel taxes, aircraft excise taxes, and aircraft registrations. Airport sponsors may apply for state grant funding at fifty percent (50%) of the non-federal share of project costs. If a higher state funding level is needed for the project, the airport sponsor indicates the level that is required and provide justification within the grant application. Federal Aviation Administration (Airport Improvement Program) projects will be given priority in determining state funding. For the projects contained in the Airport CIP, the funding level is projected 95% Federal / 2.5% State / 2.5% Airport Sponsor for 2025 and 2026 then 90% Federal / 5% State / 5% Airport Sponsor starting in 2027.

Similar to the FAA, the North Dakota Aeronautics Commission has a priority rating system for airport projects. The current policy is maintained on the commission's website at aero.nd.gov. In general, the policy provides ratings for different types of projects within certain broad categories of work. The state priority rating is not intended to mirror the FAA system but instead is complimentary to the FAA priorities and emphasizes funding to projects that are needed, but not necessarily a national priority. See **Figure 4-1** for details on the state's priority rating.

Figure 4-1 North Dakota Aeronautics Commission Project Priority Rating

NORTH DAKOTA AERONAUTICS COMMISSION

POLICY #: GR-3
POLICY: Priority Rating of Airport Projects
PURPOSE: To establish a priority number for airport projects to assist the Commission in awarding state grants.

Adopted: May 1st, 1984
Reviewed and Approved: June 1st, 2023
Next Review Date: 2026

Priority Rating of Airport Projects

High ← → Low

Categories	50	40	30	20	10
OBSTRUCTIONS, NAVIGATION, AND LIGHTING	Approach Obstruction Removal Marking/Lighting Obstructions Displaced Threshold Improvements Airfield Light Replacement/Repair Runway Cones	Airport Beacons Airside Security Improvements Windsock/Segmented Circle Painting of Airside Markings	Wildlife/Security Fencing Weather Reporting System - AWOS Navigation Aids - PAPI/VASI/REILS New Lighting/Marker Installation Instrument Approach Development Airfield Safety Signage		
PRESERVATION AND DEVELOPMENT OF EXISTING SYSTEM	Pavement Rehabilitation Drainage & Culvert Installation/Repair Earthwork & Grading Improvements Pavement Maintenance Turf Runway Maintenance	Pavement Reconstruction New Pavement Construction	Public Access Roads Terminals - Air Service SRE Building Crosswind Runway Development	Runway Grooving Public Auto Parking Terminals - General Aviation Fuel Facilities* Landside Airport Signage	Equipment Storage Buildings Community Hangars*
PLANNING	All Projects Receiving Federal Aid	Project Engineering/Design	Master Plan Studies Airport Layout Plan Studies	Air Service/ Air Cargo, and Other Special Plans	
LAND EASEMENTS AND ACQUISITION	Zoning Implementation Land Acq. for Obstruction Removal	Land Acq. for RPZ Land Acq. for New Airport	Land Acq. for Operational Capacity	Land Acq. for Future Expansion	
ENVIRONMENTAL		Environmental Assessments Environmental Impact Statements	Wetlands Delineation/Mitigation SWPPP, SPCC, SWM, Other Special Studies, ect.		
AIRFIELD EQUIPMENT	ARFF Equipment		Mower Unit Snow Removal Equipment Turf Rollers	Aircraft Tug Equipment Operations Vehicles	

NOTE: The higher the number, the higher the Priority
(Add second digit below to each ten digit above for project priority rating)

7. Approaches 5. Taxiways 3. Access 1. Other (service roads, fencing, etc.)
6. Runways 4. Aprons 2. Equipment/storage

Any minor work associated with an improvement item receives the same ranking as the major item. Examples are: Work for a runway extension ranks a "46", lighting the apron ranks a "54", reconstruct taxiway ranks a "55", Runway overlay ranks a "46, tree removal on an approach ranks a "57", etc.
NOTE: The above priority system is used for projects needing attention during the current fiscal year. Any project that is considered being needed in a future year will be given a priority rating of 10. Projects already completed will use the above rating; however, only projects completed within the last 3 years of the date of the grant meeting will be considered without special justification.

SPECIAL NOTES:
* Sponsor's that apply for a state grant for a community hangar or a fuel facility need to attach a business plan to the grant application for the project to be considered.

1. Aeronautics Commission staff will help establish the priority rating for projects not listed.
2. Ineligible projects include: aerial spray pads, airport liability insurance premiums, interest payments, private aprons, and privately owned hangars.

Source: North Dakota Aeronautics Commission

The highest priority projects for HZE are as follows:

1. Implement at ¾ Mile Visibility – 57
2. Pavement Rehabilitation – 56
3. South Apron Expansion – 54
4. North Apron Expansion – 54
5. New Turf Crosswind Runway – 52
6. Taxilane West & North of Apron – 45
7. Parallel Taxiway – 45
8. South Taxilanes – 45
9. Taxilane Continuing West & North – 45

Local Funding

A local match will be needed for the AIP funded projects. This requirement will be as much as 10% of the project cost but could vary depending on project eligibility and the structure of the State and Federal funding programs. The Mercer County Regional Airport has a slate of projects planned and should assure

that it has adequate funding sources for operating expenses as well as project funding. See **Appendix B – General Aviation Airports 101 (Airport Funding)** for further details on airport funding options.

Environmental Review

Introduction

FAA AC 150/5070-6B, *Airport Master Plans* identifies a planning-level environmental review as one of the elements of effective planning. The purpose behind this element of the airport master planning process is to help the airport sponsor thoroughly evaluate environmental impacts of airport development alternatives, and to provide information for subsequent environmental processing. Key environmental considerations for future development at HZE were based on the existing conditions described in **Chapter 1: Airport, Community & Aviation Activity.**

This environmental review section is not intended to fulfill the requirement of environmental review required by National Environmental Policy Act (NEPA) or provide a definitive class of action determination for the proposed improvements. The purpose of this environmental review is to provide community, airport sponsor, and regulatory awareness of the importance of minimizing the environmental impacts to this airport improvement area and to provide a general indication of the likely need for further investigation. Appropriate environmental documentation in accordance with FAA Order 5050.4B, *NEPA Instructions for Airport Actions* and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures* is required to be completed prior to commencing with project actions.

NEPA Environmental Review Process

Every Federal action requires an environmental review per NEPA. Actions shall be thoroughly evaluated and coordinated with resource agencies during the environmental review phase. Impacts should be avoided whenever possible, minimized, or mitigated as a final option. Federal actions fall into one of three types of class of actions:

- **Categorical Exclusion (CATEX):** This environmental documentation is used for actions that do not normally require an Environmental Assessment (EA) or Environmental Impact Statement (EIS), because they do not individually or cumulatively have a significant effect on the human and/or natural environment. Documentation required includes either simple documentation or the completion of a checklist with supporting documentation certifying that the action will not exceed any environmental impact thresholds.
- **Environmental Assessment (EA):** Typical actions that require an EA are those that are not categorically excluded or actions that may result in extraordinary circumstances such as impacts to wetlands, historical properties, or floodplains. EA documentation required here includes a condensed or comprehensive environmental analysis of the proposed action and alternatives, and the anticipated impacts from the proposed action. Agency review and coordination of the proposed action and impacts is required. The decision document proceeded after this analysis if no significant impacts are determined is a Finding of No Significant Impact (FONSI) issued by FAA, which is typically valid for three years.
- **Environmental Impact Statement (EIS):** Actions that require an EIS include those that will have a significant impact to the quality of the human and/or natural environment. An EIS may also be triggered if an EA concludes that the project will have a significant impact. This document provides in-depth impact and cumulative analyses of all proposed alternatives. The document published once a decision has been made on the alternative (typically the alternative that

achieves the actions goals but has the least impacts) to move forward with is a Record of Decision (ROD). The EIS is valid for a period of three years.

Environmental Categories

Descriptions of potential impacts associated with the proposed Master Plan improvements are discussed by the impact categories identified in FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*. Additional consultation regarding the improvement area would be warranted in the future during the environmental review phase of the project action.

Impact categories that will remain potentially unaffected by the proposed airport improvements identified in this study include:

- **Air Quality** – The improvements identified are not anticipated to effect air quality.
- **Climate** - The improvements identified are not anticipated to affect the climate.
- **Coastal Resources –** The airport is not located in a coastal environment.
- **Natural Resources and Energy Supply** – The proposed airport improvements would not affect any natural resources and energy supply.
- **Visual Impacts** – Visual impacts to adjacent properties from proposed airport activities are not expected.
- **Wild and Scenic Rivers** – There are no wild and scenic river designations near the Airport.

The categories identified below have the potential to be affected by the airport improvements identified in this study.

BIOTIC RESOURCES

As identified in **Chapter 1: Airport, Community & Aviation Activity**, six threatened, endangered, and candidate species and no critical habitat have been identified for HZE Airport. Due to the potential for some of these threatened or endangered species to be located on or near the Airport, biological resources will be reviewed for each proposed activity. An example of an activity that biological resources could be affected by is the proposed construction of new crosswind runway. It's anticipated that impacts to biological resources will not be significant.

FARMLANDS

The Farmland Protection Policy Ace (FPPA) defines prime farmland as land that has the best combination of physical and chemical characteristic for producing food, feed, forage, fiber and oilseed crops, and is also available for these uses. Unique farmland is farmland that is used for production of specific high value food, feed, and fiber crops. A search of the USDA Natural Resources Conservation Service (NRCS) web soil survey shows that land surrounding the airport is classified as not prime farmland with small pockets of statewide importance off the Runway 33 End. Further consultation with NRCS would be required during a project's environmental review stage to calculate the Farmland Conversion Impact Rating if land outside the existing airport property would be acquired and converted to airport property.

FLOODPLAINS

Floodplains constitute lands situated along rivers and their tributaries that are subject to periodic flooding on the average interval of 100 years or less. HZE is not located within a 100-year floodplain; therefore, no further analysis is required.

HAZARDOUS MATERIALS, SOLID WASTE, AND POLLUTION PREVENTION

There are proposed activities that would require hazardous materials, solid waste, and pollution prevention to be addressed, such as the construction of the fuel facility. All construction activities would be required to meet stormwater pollution prevention plan requirement, spill prevention best practices, and the state's fire codes. Although there are no known contaminated sites within one mile of the airport, prior to acquisition of new land to be owned in fee title by an airport sponsor, FAA recommends that an Environmental Due Diligence Audit (EDDA) be performed. An EDDA includes a more detailed review of an area, relative to NEPA-level review, for the possible presence of environmental contamination.

HISTORIC AND CULTURAL FEATURES

Before a project that involves land disturbance is implemented, an analysis to identify the potential for cultural resources would need to be conducted for the project area. Coordination with the State Historical Preservation Offices (SHPO) and tribal members is necessary for projects involving land disturbance. A Level III Cultural Resources Inventory with Tribal Review was performed Fall 2019.

Any buildings affected that have potential to be listed in the National Register of Historic Places (NRHP) would require coordination with SHPO. Projects involving ground surface disturbance would require a determination of affect to historic property to be obtained from the SHPO. Structures more than 50 years old are eligible for inclusion on the NRHP and further review is required to determine if these structures have significant historical, cultural, or architectural characteristics.

LAND USE

Mercer County Regional Airport is surrounded by open spaces and lightly populated rural residential development. Compatible land use is typically not influenced by normal airport operations. The compatibility of existing land uses in the vicinity of an airport is usually associated with the extent of noise impacts occurring from airport property and safety concerns. Incompatible land uses are typically items such as fuel storage facilities, areas of public assembly, tree rows, high density residential areas, and areas that have the potential to attract hazardous wildlife. See **Chapter 1: Airport, Community & Aviation Activity** on wildlife hazards.

NOISE

Effects from noise during construction and use of the airport is another resource that may need to be addressed as needed depending on the proposed action. FAA does not require a noise analysis at airports whose forecasted operations do not exceed 90,000 annual propeller operations or 700 annual jet operations. These operations normally result in a cumulative noise exposure to be less than a 65 decibel Day-Night Level (DNL) identified as a critical threshold by FAA to take actions to mitigate sound exposure. Current airport operations at HZE are below this threshold.

DEPARTMENT OF TRANSPORTATION-SECTION 4(F) & SECTION 6(F) PROPERTIES

Section 4(f) applies only to those portions of a multiple-use public property that is designated by statute or identified in an official management plan as being primarily for public park, recreation. Or wildlife and waterfowl refuge purposes and are determined to be significant for such use. There are no known publicly owned lands from parks, recreation areas, or refuge areas within the immediate vicinity of the Airport. Further review of the potential to impact Section 4(f) resources would be required at the environmental documentation phase of any projects that would require ground disturbance.

47 grants have been issued for properties within the county though these properties are not located near the airport. No further analysis of Section 6(f) is required. See **Chapter 1: Airport, Community & Aviation Activity** for more details.

SOCIOECONOMIC IMPACTS, ENVIRONMENTAL JUSTICE & CHILDREN'S ENVIRONMENTAL HEALTH & SAFETY RISKS

Social impacts from a project depend on how that project affects the character, habits, and economic conditions of the people living within the affected area of the project. The effect on business, employment, transportation, utilities, etc., are factors that affect the social climate of a community. Any action that would either adversely or beneficially affect the factors stated above would be considered as having some type of social impact on the residents of a particular community. Off-airport actions including acquisition of land use and airspace avigation easements and potential future obstruction mitigation. Further analysis is required.

WATER RESPORCES – SURFACE AND GROUND WATERS

Airport activities can affect water quality mainly due to stormwater runoff from paved areas. Providing treatment for stormwater runoff from runway, taxiway and apron areas using best management practices and grassed swale areas would minimize potential impacts to water quality. At HZN Airport, drainage typically flows directly from paved surfaces across grass covered scopes and into an unnamed tributary of the Knife River, located along the airport's western boundary. This tributary joins the Knife River about a quarter mile north of the airport, which then flows into the Missouri River, situated approximately 10 miles eastward.

A General Permit for Storm Water Discharges Associated with Construction Activities may be required from the ND Department of Environmental Quality (NDDEQ) for the proposed improvements if the area of disturbance exceeds one acre. Permit requirements would need to be reviewed during the environmental documentation phase. Further coordination with the NDDEQ may be needed for airport development projects.

WATER RESOURCES - WETLANDS

There are wetlands in the National Wetland Inventory (NWI) located on the Airport property. In addition to maintaining water quality in rivers and recharging groundwater among other positive benefits, wetlands may have the potential to attract wildlife that can be hazardous to aircraft using the Airport.

All wetlands would require delineation to clearly identify their boundaries. Projects with wetland impacts greater than one half acre of wetlands requires a U.S. Army Corps of Engineers (USACE) general permit. A wetland delineation and coordination with applicable resource agencies would be necessary

prior to project implementation to further analyze the impacts the proposed improvements would have on wetlands. Further analysis is required for future projects.

NEPA Documentation

Based on the preliminary environmental evaluation completed in this section and the anticipated 10-year projects in the implementation plan, **Table 4-8** has been prepared to document the potential anticipated environmental documentation necessary to proceed with the proposed actions. The ultimate decision on what documentation may be required for each proposed action will be determined by the FAA. All environmental reviews must be completed prior to initiating project design beyond 25 percent.

Table 4-4 – Environmental Documentation

Proposed Action(s)	Anticipated Environmental Documentation
Turf Crosswind Runway	Likely to be a CATEX but possibly an Environmental Assessment
FBO/SASO Expansion	CATEX
Relocation of the Fueling Facility	CATEX
Taxilane north and west of apron	CATEX
Partial parallel taxiway	CATEX

Source: KLJ Analysis

Environmental Impact Summary

The Environmental Review Summary identified in **Table 4-9** summarizes the potential environmental impacts identified in the prior sections of this Chapter. This table is intended to give a general indication of the likely need for further environmental analysis. Additional environmental investigation is necessary to determine possible impacts associated with the improvement area.

At the appropriate time, the FAA would decide whether, and to what extent, any additional investigation would be performed. Based on findings of this environmental review, it is estimated that further environmental analysis is required for the proposed improvements.

Table 4-5 – Environmental Review Summary

NEPA Impact Category	Further Analysis Required
Air Quality	No
Biological Resources	Yes
Climate	No
Coastal Resources	No
Department of Transportation Act Section 4(f)	No
Farmlands	No
Floodplains	No
Hazardous Materials, Pollution Prevention, and Solid Waste	No
Historical and Cultural Resources	Yes
Land Use	No
Natural Resources and Energy Supply	No
Noise	No
Socioeconomic Impacts and Environmental Justice	No
Surface and Ground Water	No
Visual Impacts	No
Wetlands	Yes
Wild and Scenic Rivers	No

Source: KLJ Analysis, FAA Order 1050.1F, Environmental Impacts: Policies and Procedures

Compatibility

Overview

Airports are community assets providing significant benefits. They facilitate the movement of people, goods, and services, promote tourism and trade, stimulate business development, and support a variety of jobs.

The objective of land use planning is to guide on-airport and off-airport land use development to be compatible with airport operations. The airport directly controls on-airport compatible land uses to primarily serve aeronautical activities. The airport does not directly control off-airport land uses. Surrounding land uses compatible with airports typically include those uses that can co-exist with a nearby airport without either constraining the safe and efficient operation of the airport or exposing people working or living nearby to unacceptable levels of noise or safety hazards. Compatible land use

also considers minimizing potential hazards to aircraft and the flying public. The impact of airport planning decisions extending well beyond the airport property line must be considered.

Land use planning around airports is important to airports and communities for several reasons:

- **Safety** - Compatibility is needed to maintain safety of the general and flying public. Risk should be reduced to an acceptable level. The airport must also maintain operational utility within identified safety and risk criteria.
- **Airport Utility** - Land uses around airport should provide the airport so that there are not undue restrictions placed on the airport's existing or planned future arrival and departure procedures. Opportunities for future development identified in the Airport Master Plan and shown on the Federally (FAA) approved Airport Layout Plan should be considered.
- **Human Environment** - Balancing the human environment with airport operations is important to maintain an acceptable level of airport impacts (i.e. noise and visual exposure) with the surrounding community.
- **Economic Development** – Operational restrictions placed on the airport because of land use compatibilities have the potential to have a trickle-down effect on the community. This reduces the community's ability to accommodate the aviation needs of the public and local businesses, thus limiting economic development opportunities.

Incompatible land uses are one of the largest issues facing airports today, often resulting in conflicts between airports and their communities. They also may result in airport operational and grant project funding implications in certain situations. Building consistency between the recommendations in this study with airport land use compatibility standards and area-wide planning is vital for maintaining compatible land use.

The objective of this section is to assist the Mercer County Regional Airport in identifying land use standards compatible with the development plan and provide recommendations so that the airport can continue to meet safety and compatibility criteria. This chapter should become the framework to future land use planning efforts between Airport and Mercer County.

Roles and Responsibilities

AIRPORT SPONSOR

As the airport sponsor, the County of Mercer, applies and receives federal grants. These federal grants require the city to develop and maintain the airport compatible with FAA rules and regulations through FAA Grant Assurances (obligations). There are currently 39 grant assurances which an airport sponsor assumes as a contractual obligation with the Federal Government when the sponsor accepts federal funds for airport development. FAA has published Order 5190.6B *Airport Compliance Manual* to assist FAA personnel and airport sponsors to maintain compliance with grant and land obligations. These grant assurances describe how the sponsor must operate the airport and serve the needs of the flying public. Grant assurances 20 and 21 pertain to compatible land use around airports.

> **20. Hazard Removal and Mitigation.** It will take appropriate action to assure that such terminal airspace as is required to protect instrument and visual operations to the airport (including established minimum flight altitudes) will be adequately cleared and protected by removing, lowering, relocating, marking, or lighting or otherwise mitigating existing airport hazards and by preventing the establishment or creation of future airport hazards.
>
> **21. Compatible Land Use.** It will take appropriate action, to the extent reasonable, including the adoption of zoning laws, to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations, including landing and takeoff of aircraft. In addition, if the project is for noise compatibility program implementation, it will not cause or permit any change in land use, within its jurisdiction, that will reduce its compatibility, with respect to the airport, of the noise compatibility program measures upon which Federal funds have been expended.

FAA grant assurances require airports take appropriate action to protect airspace and restrict land uses in the immediate vicinity to those compatible with airport operations. Compatible land use control for the Mercer County Regional Airport is the responsibility of the airport sponsor.

FEDERAL AVIATION ADMINISTRATION

The FAA can provide guidance and funding to promote compatible land development around airports; however, it has no regulatory authority for controlling land uses. State and local governments are responsible for land use planning, zoning, and regulations. The FAA develops grant assurances to protect federal investments in airports but are the responsibility of the airport sponsor to maintain.

The FAA monitors all obligated airports to ensure they comply with the requirements of the grant assurances through its Compliance Program. If the sponsor fails to take the necessary corrective action, the FAA can legally impose penalties on the sponsor, including the loss of federal funding.

As defined by law, the FAA's authority to enforce most regulations and grant assurances is limited to within the airport boundaries. The FAA's only authority on compatible land use planning is through the grant assurances airport sponsors must adhere to in order to obtain federal funding for airport improvements. In most cases, the most practical and cost-effective method for a sponsor to affect compatible land use outside of the airport's property is through zoning or easements rather than through land acquisition.

STATE OF NORTH DAKOTA

The process and procedures for adopting zoning in North Dakota is spelled out in Chapter 2-04 of the North Dakota Century Code. Excerpts from procedures detailed in the chapter are provided below.

2-04-03. Power to adopt airport zoning regulations.

1. In order to prevent the creation or establishment of airport hazards, every political subdivision having an airport hazard area within its territorial limits may adopt, administer, and enforce, under the police power and in the manner and upon the conditions hereinafter prescribed, airport zoning regulations for such airport hazard area, which regulations may divide such area into zones, and, within such zones, specify the land uses permitted and regulate and restrict the height to which structures and trees may be erected or allowed to grow.
2. Where an airport is owned or controlled by a political subdivision and any airport hazard area appertaining to such airport is located outside the territorial limits of said political subdivision, the political subdivision owning or controlling the airport and the political subdivision within which the airport hazard area is located may, by ordinance or resolution duly adopted, create a joint airport zoning board, which board has the same power to adopt, administer, and enforce airport zoning regulations applicable to the airport hazard area in question as that vested by subsection 1 in the political subdivision within which such area is located. Each such joint board shall have as members two representatives appointed by each political subdivision participating in its creation and in addition a chairman elected by a majority of the members so appointed.
3. If in the judgment of a political subdivision owning or controlling an airport, the political subdivision within which is located an airport hazard area appertaining to that airport, has failed to adopt or enforce reasonably adequate airport zoning regulations for such area under subsection 1 and if that political subdivision has refused to join in creating a joint airport zoning board as authorized in subsection 2, the political subdivision owning or controlling the airport may itself adopt, administer, and enforce airport zoning regulations for the airport hazard area in question. In the event of conflict between such regulations and any airport zoning regulations adopted by the political subdivision within which the airport hazard area is located, the regulations of the political subdivision owning or controlling the airport govern and prevail.

2-04-05. Procedure for adoption of zoning regulations.

1. No airport zoning regulations shall be adopted, amended, or changed under this chapter except by action of the legislative body of the political subdivision in question, or the joint board provided for in subsection 2 of section 2-04-03 after a public hearing in relation thereto, at which parties in interest and citizens shall have an opportunity to be heard. At least fifteen days' notice of the hearing shall be published in an official newspaper, or a newspaper of general circulation, in the political subdivision or subdivisions in which is located the airport hazard area to be zoned.
2. Prior to the initial zoning of any airport hazard area under this chapter, the political subdivision or joint airport zoning board which is to adopt the regulations shall appoint a commission, to be known as the airport zoning commission, to recommend the boundaries of the various zones to be established and the regulations to be adopted therefor. The commission shall make a preliminary report and hold public hearings thereon before submitting its final report, and the legislative body of the political subdivision or the joint airport zoning board shall not hold its public hearings or take other action until it has received the final report of such commission. If a city planning commission or zoning commission already exists, it may be appointed as the airport zoning commission.

SURROUNDING JURISDICTIONS

Local jurisdictions are responsible for developing and enforcing land use planning, zoning, and regulations. Development proposals are reviewed and approved at this local level through an established process. The local authority enforces multi-jurisdictional airport zoning regulations for proposed development. For the Mercer County Regional Airport, surrounding jurisdictions affected by the airport includes the Town of Hazen and Mercer County.

Land Use Compatibility Elements

Four key elements should be considered to achieve land use compatibility at any airport.

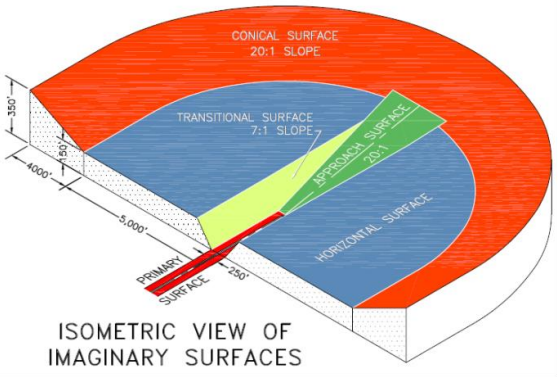
- Airspace
- Safety
- Noise
- Compliance

A general description of each element is provided based on criteria developed by the FAA and the State of North Dakota, if applicable.

AIRSPACE

Guidelines & Evaluation

Airspace compatibility includes avoiding vertical development that reduces the level of safety, increases risks of aircraft accidents, or measurably reduces the operational utility of airports. 14 CFR Part 77, *Objects Affecting Navigable Airspace* defines obstructions to air navigation. Other airspace requirements are defined in FAA Advisory Circulars and Orders. All Part 77 obstructions are a hazard to air navigation unless an aeronautical study concludes otherwise.



ISOMETRIC VIEW OF IMAGINARY SURFACES

It is important to acknowledge that the FAA's role is limited to evaluating the aeronautical effects of proposed structures; the FAA has no legal authority to stop the construction of any proposed structure. However, FAA grant assurance obligations require sponsors to take reasonable action to prevent and remove hazards to air navigation. North Dakota state law requiring airport zoning and other regulations be consistent with the Airport Layout Plan.



Recommendations

Recommendations to maintain airspace compatibility at HZE include:

- Consider provisions in building codes to require FAA Form 7460-1 *Notice of Proposed Construction or Alterations* to be submitted and reviewed by the Airport as part of the local building permit approval process.
- Schedule an aeronautical study to implement plans for the obstructions identified in the Airport Layout Plan.

SAFETY

FAA design standards and regulations prescribe several zones and imaginary surfaces intended to protect aircraft and their occupants while landing or taking off. However, the safety element primarily associated with compatible land use is focused on minimizing risks to persons and property on the ground.

FAA Runway Protection Zones



To reduce the public safety risk associated with aircraft operations, communities typically use FAA airport design standards and safety compatibility guidelines developed by state aeronautical agencies to formulate safety policies. The safety element primarily associated with compatible land use is focused on minimizing risks to the flying public, as well as persons and property on the ground. FAA has defined minimum land use standards in the form of a Runway Protection Zone (RPZ) in FAA AC 150/5300-13A *Airport Design*. See **Chapter 2: Runways & Taxiways** for definitions. Existing RPZs are either owned in fee or by avigation easement. There are no incompatible land uses inside the existing RPZs at HZE. For future RPZs it is recommended that the City acquire necessary property interest to insure no incompatible land uses.

Wildlife Hazards



FAA is also focused on minimizing safety risks associated with wildlife near an airport. Hazardous wildlife use natural or artificial habitats on or near an airport for food, water, or cover. Wildlife near airport operations may result in an aircraft-wildlife strike. The FAA recommends that airport sponsors implement the standards and practices contained in FAA AC 150/5200-33*, Hazardous Wildlife Attractants On or Near Airports* to mitigate wildlife risks. The airport has an existing deer-proof perimeter fence and it is recommended to maintain that fence and extend it to encompass any new airfield improvements.

Recommendations

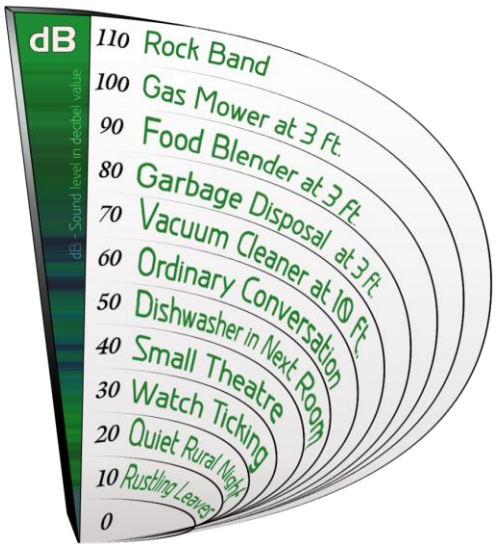
Recommendations to maintain safety compatibility at HZE include:

- Regularly monitor the sewage disposal ponds the City of Hazen has 1.25 miles northwest of the airport and the Knife River less than a mile north of the airport for prevention of attracting wildlife.
- If wildlife activity becomes a noticeable concern, it is recommended a wildlife biologist be consulted for a site assessment.

NOISE

The noise element is focused on minimizing the number of people exposed to high frequency and event levels of aircraft noise. Noise emitted from aircraft can affect the well-being of persons living or working near an airport. While there are several effects of aircraft noise upon people, the most common is annoyance. Annoyance can be defined as the overall adverse reaction of people to noise. Other effects of aircraft noise include sleep disturbance and speech interference. Noise affects everyone differently.

Noise analysis for airports is conducted using FAA's Aviation Environmental Design Tool (AEDT). FAA has determined that a cumulative noise exposure of individuals to noise resulting from aviation activities must be established in terms of Yearly Day Night Average Sound Level (DNL).



COMMON SOUNDS AND THEIR ASSOCIATED DECIBEL LEVELS

No noise analysis is needed for Airplane Design Group I or II airplanes if operations do not exceed 90,000 annual propeller-driven or 700 annual jet aircraft. The FAA has established significant noise impact thresholds for DNL 60 or 65 dB over a noise sensitive area (e.g. residences, schools, hospitals, parks, recreation areas) for airport projects.

No significant noise impacts are anticipated at HZE because the operations do no exceed FAA thresholds, and there are no close-in sensitive properties near the existing, future, or ultimate primary runway ends. If proposed annual jet aircraft operations exceed 700 operations annually in Design Group II aircraft, then noise impacts should be evaluated in future environmental review documents.

COMPLIANCE

As noted before, airports that do not abide by grant assurances are subject to withholding of FAA grant funding. Common airport compliance issues include non-aeronautical use of airport property, land releases, and through-the-fence operations.

Non-Aeronautical Use of Airport Property

Airport property is to be used for aeronautical purposes. For an airport to develop land for non-aeronautical use, the FAA must first approve of the change in airport property use from aeronautical to non-aeronautical. All airport property is identified in the Exhibit "A"/Airport Property Map.

Land Releases

When requested, the FAA will consider a release, modification, reform, or amendment of any airport agreement to the extent that such action has the potential to protect, advance, or benefit the public interest in civil aviation. Such action may involve only relief from specific limitations or covenants of an agreement, or it may involve a complete and total release that authorizes subsequent disposal of federally obligated airport property. Common types of release requests include concurrent use, request

for change in use or the sale/disposal of airport property. No land has been released from federal obligations or sold at HZE.

Through-the-fence Operations

Agreements that permit access to the airfield by aircraft based on land adjacent to, but not a part of, the airport property are commonly referred to as a "through-the-fence'' operation (even though a perimeter fence may not be visible). "Through-the-fence" arrangements can encumber the airport property and reduce an airport's ability to meet its federal obligations. There are no documented through-the-fence operations at HZE.

Action Plan & Recommendations

Recommendations to address airport compliance at HZE include:

- Identify encumbrances and non-aeronautical land uses in the Airport Layout Plan and Exhibit "A"/Airport Property Map to ensure sufficient control by the airport.
- Continue to control development that occurs on airport and consult with FAA as needed to verify compliance with FAA rules and regulations.

CHAPTER 5: AIRPORT LAYOUT PLAN

Background and Purpose

This Chapter presents the Airport Layout Plan (ALP) and associated drawings for the Mercer County Regional Airport (HZE). The ALP drawing set graphically depicts the development of the airport proposed over the 20-year planning period and beyond. The ALP drawings reflect the culmination of the master planning process evaluating aviation demand, airside and landside facility needs, and options for development of airside and landside facilities. The preferred development plan is shown on the ALP drawings located at the end of this chapter. The rationale for preferred development and the public involvement process is documented in **Chapters 2 and 3**.

The ALP is intended to serve as the framework for future development and growth. All airport development must be done in accordance with an FAA-approved ALP. Proposed development must be shown on an approved ALP to be eligible for FAA Airport Improvement Program (AIP) grant funding. Projects must be justified based on safety, security, capacity, planning, environmental and infrastructure needs meeting FAA standards within the next five years to be eligible for AIP funding. Proper environmental approval must also be completed before proceeding to project implementation. More information is available in FAA Order 5100.38, AIP Handbook.

The ALP drawing set reflects airport design standards in accordance with the following documents:

- FAA AC 150/5070-6B, *Airport Master Plans* (Change 2)
- FAA AC 150/5300-13B, *Airport Design*
- FAA ARP SOP No. 2.00, Airport Layout Plan Review Checklist (October 2013)
- FAA ARP SOP No. 3.00, Exhibit 'A' Airport Property Map Review Checklist (October 2013)

These drawings will be submitted to the FAA North Dakota DOT Aeronautics Division for their review and comment. FAA approval of the ALP indicates that the existing facilities and proposed development depicted on the ALP conforms to the FAA airport design standards in effect at the time of the approval. Approval indicates the FAA finds the proposed development to be safe and efficient.

The airport has an FAA grant assurance obligation to keep the ALP document current. Periodic "as-built" updates should be completed during the closeout of projects to update existing conditions. The Master Plan and accompanying ALP drawing set should be updated every 10 years at a general aviation airport to evaluate aviation needs and the development plans.

ALP Drawing Set

The ALP drawing set contains several sheets depicting the existing facilities, planned development, and other pertinent information concerning the airport. The following sections describe the specific elements found on each sheet with the ALP drawing set, along with significant changes from the previously approved Mercer County Regional Airport ALP (2008). The HZE ALP drawings in this planning study include:

- Sheet 1: Title Sheet
- Sheet 2: Airport Data Sheet

- Sheet 3: Airport Layout Plan
- Sheet 4: Terminal Area North
- Sheet 5: Terminal Area South
- Sheet 6: Inner Portion of the Approach Surface – Runway 15 End
- Sheet 7: Inner Portion of the Approach Surface – Runway 15-33
- Sheet 8: Inner Portion of the Approach Surface – Runway 33 End
- Sheet 9: Inner Portion of the Approach Surface – Runway 15 End (Ultimate)
- Sheet 10: Inner Portion of the Approach Surface – Runway 15-33 (Ultimate)
- Sheet 11: Inner Portion of the Approach Surface – Runway 33 End (Ultimate)
- Sheet 12: Inner Portion of the Approach Surface – Runway 4 End (Ultimate)
- Sheet 13: Inner Portion of the Approach Surface – Runway 22 End (Ultimate)
- Sheet 14: Part 77 Airspace Plan (Ultimate)
- Sheet 15: Runway Departure Surface
- Sheet 16: Land Use Drawing
- Sheet EX-A1: Exhibit 'A' Parcel Inventory Map
- Sheet EX-A2: Exhibit 'A' Encumbrance Inventory Map

Sheet 1: Title Sheet

The title sheet is an index to the ALP drawing set. It also provides pertinent information such as the airport sponsor, airport name, grant number the project is funded through, location and vicinity maps, revision numbers and the date the plan was completed. The title sheet also includes the airport wind coverage tables and wind roses for space purposes.

Sheet 2: Airport Data Sheet

The data sheet provides technical information on airport facilities and design standards for the existing and future airport configurations. Elements include an airport data table and runway data table.

The data tables for this ALP depict several development phases. These include existing (E) and ultimate (U). These have been identified to better match with the development sequence identified in the Master Plan. A description of the features is included in the Airport Layout Drawing discussion.

There are no FAA Modifications to Airport Design Standards for the airport.

Sheets 3: Airport Layout Plan

The Airport Layout Drawing is a graphical depiction of the airport facilities and design standards. Existing conditions and future development phases are distinguished.

The sheet provides a depiction of the existing Runway 15-33.

The sheet has the addition of an ultimate turf crosswind Runway 4-22 which is a turf crosswind at 2,500 feet long and 100 feet wide. It also provides an ultimate depiction of a no less than ¾ mile approach for Runway 15-33 Ends. They also show a parallel taxiway for the current Runway 15-33

All the terminal development is also included as an ultimate layout even though the development of hangars is always based on demand.

Sheets 4 & 5: Terminal Area Plans

The Terminal Area Plan drawings provides a large-scale view of areas with significant terminal facility development, so that features such as aprons, buildings, hangars, and parking lots are easily discernable. Dimensions are included to clearly depict clearance from objects. All hangar development is based on demand and is expected to occur in different areas at different times depending on the needs of particular tenants.

There are infrastructure projects that will be proactive efforts by the airport such as the relocation and updated fuel facility, the extension of the apron, and the construction of the taxilanes. When these are completed they will allow for other development to occur.

Sheets 6 through 13: Inner Portion of the Approach Surface

This drawing provides plan and profile views of the portions of approach surfaces that are typically to a point on the approach slope 100 feet above the runway threshold elevation. Several approach surfaces are shown including FAR Part 77, FAA threshold siting, and glidepath qualification surface approach surfaces.

Roadways and railroads assume a standard mobile vehicle per Part 77 criteria. Standards include 10 feet for private roads, 15 feet for public roads, 17 feet for interstate highways and 25 feet for railroads. These heights are added to the ground elevation.

There are sheets developed for each runway threshold because any obstruction issues must be examined specifically for each approach surface. Triggering events are noted for when objects that may be obstructions are dealt with.

Sheet 14: Part 77 Airport Airspace

This drawing shows the FAR Part 77 Imaginary Surfaces for the ultimate layout of the Airport. The Part 77 surfaces are the basis for identifying obstructions to the airspace around an airport. The FAA determines if any of the obstructions to Part 77 surfaces are hazards to air navigation.

Part 77 defines five distinct surfaces, each with a different size and shape. The dimensions of these surfaces are based on the type of runway and the type of approach ultimately planned for the Airport. The imaginary surfaces are defined below.

Primary Surface - The primary surface is rectangular, is centered on the runway, extends 200 feet beyond a paved runway, and has a width that varies based on airport-specific criteria. The elevation of the primary surface corresponds to the elevation of the nearest point of the runway centerline.

The width of the existing primary surface of Runway 15-33 is 500 feet, this will change to 1,000 feet when a ¾ mile visibility is implemented. The width of the ultimate planned turf crosswind Runway 4-22 primary surface will be 250 feet for a visual utility runway.

Approach Surface - Each runway end has an approach surface. The approach surface is centered on the extended runway centerline, starts at the end of the primary surface, and has a width equal to that of the primary surface. Approach surfaces slope upward and outward from the runway ends.

The ultimate planned approach surfaces at the Airport reflect a non-precision approaches (3/4 mile) for Runway 15-33. It will have an inner width of 1,000 feet, extends outward 10,000 feet to an outer width

of 4,000 feet, and rises at a slope of 34:1. The approach surface for the ultimate turf crosswind runway will be visual utility, with an inner approach surface width of 250 feet, extending outward 5,000 feet to an outer width of 1,250 feet, and rises at a slope of 20:1.

Transitional Surface - The transitional surface is a sloping 7:1 surface that extends outward and upward at right angles to the runway centerline from the sides of the primary surface and from the sides of the approach surfaces.

Horizontal Surface - The horizontal surface is a flat, elliptical surface at an elevation 150 feet above the established airport elevation (1,964.7' MSL). The extent of the horizontal surface is determined by swinging arcs of a 10,000-foot radius from the center of each end of the primary surface for other-than-utility runways.

Conical Surface - The conical surface extends outward and upward from the horizontal surface at a slope of 20:1 for a horizontal distance of 4,000 feet. The conical surface rises to a maximum elevation of 2,164.7' MSL. The obstacle data is based on an aeronautical survey performed in June 2023.

Sheet 15: Runway Departure Surface

The Runway Departure Surface Drawing depicts the plan and profile views of runways with instrument departure procedures. Each departure surface at the Airport begins at the departure end of the runway at a width of 1,000 feet, extends outward 12,152 feet to an outer width of 7,512 feet, and slopes up at 40:1. The departure surface applies to the existing and ultimate runway end locations for Runway 15-33. Runway 4-22 are exempt as they are not designated for instrument departures.

Sheet 16: Airport Land Use

The Airport Land Use Drawing depicts both on- and off-airport land uses and zoning in the area around the airport. Land uses around airports should be compatible with airport operations. The airport should enact zoning to control land uses from incompatibility activities. Examples of land use compatibility issues at airports include:

- Aircraft Noise
- Nearby Lighting
- Glare, Smoke, and Dust Emissions
- Wildlife Attractions and Landfills
- Airspace Obstructions
- Electromagnetic Interference
- Concentrations of People
- Structures Near Runway Ends

Sheets EX-A1 & EX-A2: Exhibit 'A' - Airport Property Map'

This sheet serves as an Airport Property Map and Exhibit 'A'. The Exhibit 'A' is a snapshot of the inventory of parcels that make up dedicated airport property. The Exhibit 'A' provides boundary information on airport property interests and encumbrances upon airport property. Detailed information is provided on airport property interests, released, or sold property, recorded or unrecorded encumbrances. All land shown on an Exhibit 'A' constitutes the airport property federally obligated for compliance. The airport property map builds upon the Exhibit 'A' information by depicting property to be acquired to support the future and ultimate development of the airport. The property

map and tables are depicted on separate sheets for clarity. A separate booklet has been prepared containing property documentation.

The existing Airport encompasses 366.74 acres owned in fee, 16.75 acres of property controlled through avigation and clear zone easements, and 8.13 of land is controlled through right-of-way easements. It is currently proposed that an additional 30.3 acres are needed in easements to control the ultimate FAA Runway Protection Zones for the ¾ approach for Runway 15-33 and RPZ's for the future turf crosswind runway.

This Exhibit A meets FAA SOP 3.00 standards. The previous ALP included an airport property map but did not include an official Exhibit 'A' drawing.

APPENDIX A: GLOSSARY OF TERMS

Introduction

Combining the extremely technical language of airports and aviation with the bureaucratic language of government organizations can create a myriad of unusual words and term. The combination of technical language and "governmentese" often results in many short-hand phrases or acronyms. This appendix presents many of the terms and acronyms used throughout the master plan.

Glossary of Terms

ABOVE GROUND LEVEL (AGL): The elevation of a point or surface above the ground.
ACCELERATE-STOP DISTANCE AVAILABLE (ASDA): See declared distances.
ADVISORY CIRCULAR: Publications issued by the FAA providing recommendations relative to policy, guidance, and information on specific aviation subject. The recommendations in these publications are considered mandatory requirements for airports that have received federal grants.
AIR CARRIER: An operator that: (1) performs at least five round trips per week between two or more points and publishes flight schedules specifying the times, days of the week, and places between which such flights are performed; or (2) transports mail by air under a current contract with the U.S. Postal Service. Certified in accordance with Federal Aviation Regulation (FAR) Parts 121 and 127.
AIRCRAFT OPERATION: The landing, takeoff, or touch-and-go procedure by an aircraft on a runway at an airport.
AIRCRAFT OPERATIONS AREA (AOA): A restricted and secure area on airport property designed to protect all aspects of aircraft operations.
AIRCRAFT OWNERS AND PILOTS ASSOCIATION (AOPA): A private organization serving the interests and needs of general aviation pilots and aircraft owners.
AIRCRAFT APPROACH CATEGORY (AAC): A grouping of aircraft based on 1.3 times their stall speed in landing configuration at their maximum certificated landing weight. The AAC categories are as follows:

- Category A: Speed less than 91 knots.
- Category B: Speed 91 knots or more, but less than 121 knots.
- Category C: Speed 121 knots or more, but less than 141 knots.
- Category D: Speed 141 knots or more, but less than 166 knots.
- Category E: Speed greater than 166 knots.

AIRCRAFT RESCUE AND FIRE FIGHTING (ARFF): An airport service and facility that provides emergency vehicles, extinguishing agents, and personnel responsible for minimizing the impacts of an aircraft accident or incident.
AIRFIELD: The portion of an airport that contains facilities necessary for aircraft operations.
AIRLINE HUB: A category of commercial service airports or group of commercial service airports in a metropolitan or urban area based on the percentage of annual national enplanements at the airport or airports. The categories are large hub, medium hub, small hub, or non-hub. The categories form the basis for the apportionment of entitlement funds.
AIRPLANE CLASSIFICATION NUMBER (ACN): An international method that expresses the effect of an individual aircraft on different pavements with a unique number that varies according aircraft weight and configuration, pavement type, and subgrade strength.

AIRPLANE DESIGN GROUP (ADG): A grouping of aircraft based on wingspan. The groups are:

- Group I: Up to but not including 49 feet.
- Group II: 49 feet up to but not including 79 feet.
- Group III: 79 feet up to but not including 118 feet.
- Group IV: 118 feet up to but not including 171 feet.
- Group V: 171 feet up to but not including 214 feet.
- Group VI: 214 feet or greater.

AIRPORT AUTHORITY: A quasi-governmental organization responsible for setting the policies governing the management and operation of an airport or system of airports under its jurisdiction.
AIRPORT BEACON: A navigational aid located at an airport that displays a rotating light beam to identify the type of airport.
AIRPORT CAPITAL IMPROVEMENT PLAN (ACIP): The Federal Aviation Administration planning program that identifies, prioritizes, and distributes airport development funds required to meet the needs of the National Airspace System as specified by national goals and objectives.
AIRPORT ELEVATION: The highest point on the runway system at an airport expressed in feet above mean sea level (MSL).
AIRPORT IMPROVEMENT PROGRAM (AIP): A program created under the Airport and Airway Improvement Act of 1982 to provide funding for airport planning and development.
AIRPORT LAYOUT PLAN (ALP): The airport drawing showing boundaries and proposed additions to all areas owned or controlled by the sponsor for airport purposes, including the location and nature of existing and proposed airport facilities and structures, and the location on the airport of existing and proposed non-aviation areas and improvements.
AIRPORT MASTER PLAN: A long-range plan for airport development, including descriptions of the data and analyses on which the plan is based.
AIRPOR T OBSTRUCTION CHAR T: A scaled drawing depicting the Federal Aviation Regulation (FAR) Part 77 surfaces, with representation of objects that penetrate these surfaces, runway, taxiway, and ramp areas, navigational aids, buildings, roads, and other airport vicinity details.
AIRPORT REFERENCE CODE (ARC): A coding system used to relate airport design criteria to the operational (Aircraft Approach Category) and physical characteristics (Airplane Design Group) of the most demanding airplanes projected to operate at an airport.
AIRPORT REFERENCE POINT (ARP): The latitude and longitude of the approximate center of the airport.
AIRPORT REFERENCE TEMPERATURE: The mean maximum temperature of the hottest month.
AIRPORT SPONSOR: The entity legally responsible for the management and operation of an airport, including the fulfillment of the requirements of applicable laws and regulations.
AIRPORT SURFACE DETECTION EQUIPMENT (ASDE): A radar system providing air traffic controllers with a visual representation of aircraft and other vehicles ground movements on the airfield.
AIRPORT SURVEILLANCE RADAR (ASR): The primary radar located at an airport or in an air traffic control terminal area that depicts the location of aircraft in the air. The signal only provides the azimuth and range of aircraft from the location of the antenna.
AIRPORT TRAFFIC CONTROL TOWER (ATCT): A central operations facility in the terminal air traffic control system, consisting of a tower, including an associated instrument flight rule (IFR) room if radar equipped, using air to ground communications and/or radar, visual signaling and other methods to provide safe and expeditious movement of terminal air traffic.

AIRPORTS GEOGRAPHIC INFORMATION SYSTEM (AIRPORTS GIS or AGIS): Used by the FAA to collect airport and aeronautical data to support the FAA's next generation (NextGen) aviation system. AGIS provides standards for surveying and data collection to assist the FAA in the development of instrument approaches and provides the basis for electronic ALPs (eALP).

AIR ROUTE TRAFFIC CONTROL CENTER (ARTCC): A facility established to provide air traffic control service to aircraft operating on an IFR flight plan within controlled airspace and principally during the enroute phase of flight.

AIRSIDE: The portion of an airport containing the facilities necessary for the operation of aircraft. This normally includes, runways, taxiways, aprons, and hangar areas.

AIRSPACE: The volume of space above the surface of the ground provided for the safe operation of aircraft.

AIR TAXI: An air carrier certificated in accordance with FAR Part 121 and FAR Part 135 and authorized to provide on demand, public transportation of persons and property by aircraft. Generally, operates small aircraft "for hire" for specific trips.

AIR TRAFFIC CONTROL (ATC): A service operated by an appropriate FAA designated organization for the purpose of providing for the safe, orderly, and expeditious flow of air traffic.

AIR TRANSPORT ASSOCIATION OF AMERICA (ATA): An organization that represents the interests of the airline industry on major aviation issues before federal, state, and local government bodies. The ATA promotes air transportation safety by coordinating industry and governmental safety programs and serves as a focal point for industry efforts to standardize practices and enhance the efficiency of the air transportation system.

ALERT AREA: See special-use airspace.

ALTITUDE: The vertical distance measured in feet above mean sea level or above ground level.

APPROACH LIGHTING SYSTEM (ALS): An airport lighting facility that provides visual guidance to landing aircraft by radiating light beams by which the pilot aligns the aircraft with the extended centerline of the runway on his final approach and landing.

APPROACH MINIMUMS: The altitude below which an aircraft may not descend while on an IFR approach unless the pilot has the runway in sight.

APPROACH SURFACE: See Part 77.

APRON: A specified portion of the air field used for passenger, cargo, or freight loading and unloading, aircraft parking, and the refueling, maintenance, and servicing of aircraft.

AREA NAVIGATION (RNAV): The air navigation procedure that provides the capability to establish and maintain a flight path on an arbitrary course.

AUTOMATED TERMINAL INFORMATION SERVICE (ATIS): The continuous broadcast of recorded non-control information at towered airports. Information typically includes wind speed, direction, and runway in use.

AUTOMATED SURFACE OBSERVATION SYSTEM (ASOS): A reporting system that provides frequent airport ground surface weather observation data through digitized voice broadcasts and printed reports.

AUTOMATED WEATHER OBSERVATION STATION (AWOS): Equipment used to automatically record and relay weather conditions (i.e. cloud height, visibility, wind speed and direction, temperature, dew point, etc.)

AUTOMATIC DEPENDENT SURVEILLANCE – BROADCAST (ADS-B): A major component of the FAA's NextGen system, where aircraft equipped with GPS receivers can transmit their location and altitude to other nearby aircraft and to air traffic control.

AUTOMATIC DIRECTION FINDER (ADF): An aircraft radio navigation system that senses and indicates the direction to a non-directional radio beacon (NDB) ground transmitter.
AVIGATION EASEMENT: A contractual right or property interest in land over which the unobstructed right of flight in the airspace is established.
AZIMUTH: Horizontal direction expressed as the angular distance between true north and the direction of a fixed point (as the observer's heading).
BASE LEG: See "traffic pattern."
BASED AIRCRAFT: The total number of active general aviation aircraft that use or may be expected to use a specific airport as a home base.
BEARING: The horizontal direction to or from any point, usually measured clockwise from true north or magnetic north.
BLAST FENCE: A barrier used to divert or dissipate jet blast or propeller wash.
BLAST PAD: A prepared surface beyond the end of a runway for the purpose of eliminating ground surface erosion caused by the wind generated by aircraft engines at the initiation of a takeoff.
BUILDING RESTRICTION LINE (BRL): A theoretical line on an airport layout plan beyond which airport buildings must not be located in order to maintain safe aircraft operations.
CAPITAL IMPROVEMENT PLAN (CIP): A program for the design and construction of airport improvements needed to accommodate the operational and passenger activity at an airport.
CEILING: The cloud height above the ground surface, which is reported as either broken or overcast.
CIRCLING APPROACH: A pilot maneuver to align the aircraft with the runway for landing when flying a predetermined circling instrument approach procedure under IFR.
CLASS A, B, C, D, E, G AIRSPACE: See Controlled Airspace
CLEAR ZONE: See Runway Protection Zone.
COMMERCIAL SERVICE AIRPORT: A public airport providing scheduled passenger service that enplanes at least 2,500 annual passengers.
COMMON TRAFFIC ADVISORY FREQUENCY (CTAF): A radio frequency designated for the purpose of transmitting airport advisory information and procedures while operating to or from an uncontrolled airport.
COMPASS LOCATOR (LOM): A low power, low/medium frequency radio-beacon installed in conjunction with the instrument landing system at one or two of the marker sites.
CONICAL SURFACE: See Part 77.
CONTROLLED AIRPORT: An airport that has an operating airport traffic control tower.
CONTROLLED AIRSPACE: Airspace of defined dimensions within which air traffic control services are provided to instrument flight rules (IFR) and visual flight rules (VFR) flights. Controlled airspace in the United States is designated as follows:

- **CLASS A**: Generally, the airspace from 18,000 feet mean sea level (MSL) up to but not including flight level FL600 (60,000 feet). All pilots must operate their aircraft under IFR.
- **CLASS B**: Generally, the airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports. The configuration of Class B airspace is unique to each airport, but typically consists of two or more layers of airspace and is designed to contain all published instrument approach procedures to the airport. An air traffic control clearance is required for all aircraft operating in the area.
- **CLASS C**: Generally, the airspace from the surface to 4,000 feet above the airport elevation (reported as MSL) surrounding those airports that have an operational control tower and radar approach control and are served by a qualifying number of IFR operations or passenger

enplanements. Although individually tailored for each airport, Class C airspace typically consists of a surface area with a five nautical mile (nm) radius and an outer area with a 10 nautical mile radius that extends from 1,200 feet to 4,000 feet above the airport elevation. Two-way radio communication is required for all aircraft.

- **CLASS D**: Generally, that airspace from the surface to 2,500 feet above the airport elevation (reported as MSL) surrounding airports that have an operational control tower. Class D airspace is individually tailored and configured to encompass published instrument approach procedures. Unless otherwise authorized, all pilots must establish two-way radio communication.
- **CLASS E**: Generally, controlled airspace that is not classified as Class A, B, C, or D. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. When designated as a surface area, the airspace will be configured to contain all instrument procedures. Class E airspace encompasses all Victor Airways. Only aircraft following instrument flight rules are required to establish two-way radio communication with air traffic control.
- **CLASS G**: Generally, that airspace not classified as Class A, B, C, D, or E. Class G airspace is uncontrolled for all aircraft. Class G airspace extends from the surface to the overlying Class E airspace.

CONTROLLED FIRING AREA: See special-use airspace
CROSSWIND: A wind that is not parallel to a runway centerline or to the intended flight path of an aircraft.
CROSSWIND COMPONENT: The component of wind that is at a right angle to the runway centerline or the intended flight path of an aircraft.
CROSSWIND LEG: See "traffic pattern."
DECIBEL: A unit of noise representing a level relative to logarithmic scale.
DECISION HEIGHT: The height above the runway surface at which a decision must be made to either continue the approach or execute a missed approach.
DECLARED DISTANCES: The distances declared available for an airplane's: takeoff runway; takeoff distance; accelerate-stop distance; and landing distance requirements as defined below:

- **TAKEOFF RUNWAY AVAILABLE (TORA)**: The runway length declared available and suitable for the ground run of an airplane taking off;
- **TAKEOFF DISTANCE AVAILABLE (TODA)**: The TORA plus the length of any remaining runway and/or clearway beyond the far end of the TORA;
- **ACCELERATE-STOP DISTANCE AVAILABLE (ASDA)**: The runway plus stopway length declared available for the deceleration of an aircraft aborting a takeoff; and
- **LANDING DISTANCE AVAILABLE (LDA)**: The runway length declared available and suitable for landing.

DEPARTMENT OF TRANSPORTATION (DOT): The federal government organization including the Federal Aviation Administration, which was established to promote the coordination of federal transportation programs and to act as a focal point for research and development efforts in transportation.
DISCRETIONARY FUNDS: Federal grant funds that may be appropriated to an airport as designation by the Secretary of Transportation or Congress to meet a specified national priority such as enhancing capacity, safety, and security, or mitigating noise.
DISPLACED THRESHOLD: A threshold that is located at a point on the runway other than the physical beginning of the runway.

DISTANCE MEASURING EQUIPMENT (DME): Equipment (airborne and ground-based) used to measure in nautical miles, the slant range distance of an aircraft from the DME navigational aid.
DNL: (Day/Night Level) The 24-hour A-weighted average aircraft sound level between 10 PM and 7 AM as averaged over a span of one year. It is the FAA standard metric for deter mining the cumulative exposure of individuals to noise.
DOWNWIND LEG: see "traffic pattern."
EASEMENT: The agreed upon legal right of one party to use a portion of the real estate rights of another party as specified in the easement document.
ELEVATION: The vertical distance measured in feet above mean sea level.
ENROUTE: The portion of a flight between departure and arrival terminal areas.
ENPLANED PASSENGERS: The total number of revenue passengers boarding air craft, including originating, stop-over, and transfer passengers, in scheduled and non-scheduled services.
ENPLANEMENT: The loading of passengers, cargo, freight, or mail on an aircraft.
ENTITLEMENT: Federal funds for which a commercial service airport may be eligible based on its annual passenger enplanements.
ENVIRONMENTAL ASSESSMENT (EA): An environmental analysis performed in accordance with the National Environmental Policy Act (NEPA) to determine whether an action would significantly affect the environment and thus require a more detailed environmental impact statement.
ENVIRONMENTAL AUDIT: An assessment of a party's compliance with the applicable environmental requirements of an authority's environmental compliance policies, practices, and controls.
ENVIRONMENTAL IMPACT STATEMENT (EIS): A NEPA document required of federal agencies for major projects or legislative proposals affecting the environment. The EIS is a decision-making tool describing the positive and negative effects of a proposed action.
ESSENTIAL AIR SERVICE (EAS): A federal program that guarantees air carrier service to selected small communities by providing subsidies as needed to prevent these cities from losing such service.
FEDERAL AVIATION REGULATIONS (FAR): The rules established by the executive departments and agencies of the Federal Government for aviation. FAR's are the aviation subset of the Code of Federal Regulations.
FINAL APPROACH: See "traffic pattern."
FINDING OF NO SIGNIFICANT IMPACT (FONSI): A public document prepared by a Federal agency that presents the rationale why a proposed action will not have a significant effect on the environment and for which an environmental impact statement will not be prepared.
FIXED BASE OPERATOR (FBO): A provider of services to airport users. Such services include, but are not limited to: aircraft storage; fueling; flight training; repair; and maintenance.
FLIGHT LEVEL: An altitude designation within controlled airspace.
FLIGHT SERVICE STATION (FSS): An operations facility in the national flight advisory system that uses data interchange facilities for the collection and dissemination of Notices to Airmen, weather, and administrative data. An FSS provides pre-flight and in-flight advisory services to pilots through air and ground based communication facilities.
FRANGIBLE NAVAID: A navigational aid that retains its structural integrity and stiffness up to a designated maximum load, but on impact from a greater load, breaks, distorts, or yields in such a manner as to present the minimum hazard to aircraft.
GENERAL AVIATION: That portion of civil aviation that encompasses all facets of aviation except commercial or military aircraft.

GLIDESLOPE (GS): The electronic component of an ILS system that emits signals providing vertical guidance using airborne instruments during instrument approaches during approach and landing.
GLOBAL POSITIONING SYSTEM (GPS): A system of satellites that enables navigators equipped with GPS receivers to determine their latitude, longitude, and altitude.
GROUND ACCESS: The transportation system on and around the airport that provides access to and from the airport by ground transportation vehicles for passengers, employees, cargo freight, and airport services.
HELIPAD: A designated area for the takeoff, landing, and parking of helicopters.
HIGH INTENSITY RUNWAY LIGHTS (HIRL): The highest intensity or brightness of lights that delineate the lateral boundaries of a runway.
HIGH-SPEED EXIT TAXIWAY: A long radius taxiway designed to expedite aircraft movement off runways after landing (at speeds up to 60 knots), thus reducing runway occupancy time.
HORIZONTAL SURFACE: See 'Part 77'
INSTRUMENT APPROACH: An approach to an airport with the intent to land by an aircraft in accordance with an IFR flight plan when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude.
INSTRUMENT APPROACH PROCEDURE (IAP): A series of predetermined maneuvers under instrument flight conditions for a landing, or to a point from which a landing may be made visually.
INSTRUMENT FLIGHT RULES (IFR): Procedures for the conduct of flight in weather conditions below Visual Flight Rules weather minimums. The term IFR is often also used to define weather conditions and the type of flight plan under which an air craft operates.
INSTRUMENT LANDING SYSTEM (ILS): A precision instrument approach system that normally consists of the following electronic components and visual aids:

1. Localizer;
2. Glide Slope;
3. Outer Marker;
4. Middle Marker;
5. Approach lights.

INSTRUMENT METEOROLOGICAL CONDITIONS (IMC): Specific visibility and ceiling conditions that are less than the minimums specified for visual meteorological conditions.
ITINERANT OPERATIONS: Arrivals and departures by aircraft to or from a location greater than 20 miles from the airport.
KNOTS: A unit of speed used in navigation that is equivalent to the number of nautical miles traveled in one hour.
LAND AND HOLD SHORT OPERATIONS (LAHSO): An air traffic control procedure intended to increase airport capacity without compromising safety that allows pilots to land and hold short of an intersecting runway, an intersecting taxiway, or some other designated point on a runway.
LANDSIDE: The portion of an airport that provides the facilities necessary for the processing of passengers, cargo, freight, and ground transportation vehicles.
LANDING DISTANCE AVAILABLE (LDA): See declared distances.
LARGE AIRPLANE: An airplane that has a maximum certified takeoff weight in excess of 12,500 pounds.
LOCAL AREA AUGMENTATION SYSTEM (LAAS): A differential GPS system that provides localized measurement correction signals to the basic GPS signals to improve navigational accuracy, integrity, continuity, and availability.

LOCAL OPERATIONS: Aircraft operations performed by aircraft based at the airport and operating in the local traffic pattern or within sight of the airport, including aircraft known to be departing for or arriving from flights in local practice areas within a prescribed distance from the airport, or that execute simulated instrument approaches at the airport.
LOCAL TRAFFIC: Aircraft operating in the traffic pattern or within sight of the tower, or aircraft known to be departing or arriving from the local practice areas, or aircraft executing practice instrument approach procedures. Typically, this includes touch-and-go training operations.
LOCALIZER (LOC): The component of an ILS that provides course guidance to the runway.
LOCALIZER TYPE DIRECTIONAL AID (LDA): A facility of comparable utility and accuracy to a localizer, but not part of a complete ILS and not aligned with the runway.
LOCALIZER PERFORMANCE WITH VERTICAL GUIDANCE (LPV): A Global Positioning System (GPS) runway instrument approach procedure providing horizontal and vertical guidance. Accuracy levels are 16 meters horizontally and 20 meters vertically.
LOW INTENSITY RUNWAY LIGHTS (LIRL): The lowest intensity or brightness of lights designated for use in delineating the sides of a runway.
MEDIUM INTENSITY RUNWAY LIGHTS MIRL: The middle intensity or brightness of lights designated for use in delineating the sides of a runway.
MILITARY OPERATIONS: Aircraft operations performed by military aircraft.
MILITARY OPERATIONS AREA (MOA): See special-use airspace.
MILITARY TRAINING ROUTE: An air route depicted on aeronautical charts for the conduct of military flight training at speeds above 250 knots.
MISSED APPROACH COURSE (MAC): The flight route to be followed if, after an instrument approach, a landing is not completed. Missed approaches normally occur:
1. When an aircraft has descended to the decision height but has not established visual confirmation of the runway; or
2. When directed by air traffic control to pull up or to go around.
MOVEMENT AREA: The runways, taxiways, and other areas of an airport used for taxiing/hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. At airports with an airport traffic control tower, air traffic control clearance is required for entry onto the movement area.
NATIONAL AIRSPACE SYSTEM (NAS): The network of air traffic control facilities, air traffic control areas, and navigational facilities through the U.S.
NATIONAL PLAN OF INTEGRATED AIRPORT SYSTEMS (NPIAS): The national airport system plan developed by the Secretary of Transportation on a biannual basis for the development of public use airports to meet national air transportation needs.
NATIONAL TRANSPORTATION SAFETY BOARD (NTSB): A federal government organization established to investigate and determine the probable cause of transportation accidents, to recommend equipment and procedures to enhance transportation safety, and to review on appeal the suspension or revocation of any certificates or licenses issued by the Secretary of Transportation.
NAUTICAL MILE: A unit of distance used in navigation that is equivalent to the distance spanned by one minute of arc in latitude, that is, 1,852 meters or 6,076 feet. It is equal to approximately 1.15 statute mile.
NAVIGATIONAL AID (NAVAID): A term used to describe lights, signs, and associated supporting electronic equipment (e.g., PAPI, VASI, ILS, etc.) to aid in aircraft navigation.

NEXT GENERATION AIR TRANSPORTATION SYSTEM (NextGen): An umbrella term for the FAA's ongoing upgrade to the National Airspace System from a ground-based system of air traffic control to a satellite-based system of air traffic management.
NOISE CONTOUR: A continuous line on a map of the airport vicinity connecting all points of the same noise exposure level.
NON-DIRECTIONAL BEACON (NDB): A radio beacon transmitting electronic signals in a 360-degree pattern. Pilot of an aircraft equipped with direction finding equipment can determine their bearing to/from the radio beacon and home on, or track to, the station. When the radio beacon is installed in conjunction with the ILS marker, it is normally called a Compass Locator.
NON-PRECISION APPROACH PROCEDURE: A standard instrument approach procedure using horizontal but no vertical course guidance, such as VOR, TACAN, NDB, or LOC.
NOTICE TO AIRMEN (NOTAM): A time sensitive notice to pilots containing information concerning the establishment, condition, or change in any component of or hazard in the National Airspace System that is considered essential to flight operations personnel.
OBJECT FREE AREA (OFA): An area on the ground free of objects, except those required for air navigation or aircraft ground maneuvering purposes, centered on a runway, taxiway, or taxilane to enhance the safety of aircraft operations.
OBSTACLE FREE ZONE (OFZ): The airspace below 150 feet above the established airport elevation and along the runway and extended runway centerline that provides clearance for aircraft landing or taking off from the runway, and for missed approaches. The OFZ is required to be kept clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function.
OPERATION: A take-off or a landing.
OUTER MARKER (OM): An ILS navigation facility located four to seven miles from the runway threshold on the extended centerline, indicating the pilot is passing over the facility and can begin final approach.
PART 77: Federal laws under Title 14 of the Code of Federal Regulations identifying standards for the Safe, Efficient Use and Preservation of the Navigable Airspace. Several different imaginary airspace surfaces are defined for airports purposes of identifying an obstruction to air navigation:

- **PRIMARY SURFACE:** An imaginary surface defined in FAR Part 77 that is specified as a rectangular surface longitudinally centered about a runway. The specific dimensions of this surface are a function of the type of approaches existing or planned for the runway.
- **APPROACH SURFACE:** An imaginary surface defined in FAR Part 77 that is longitudinally centered on an extended runway centerline and extends outward and upward from the primary surface at each runway end at a designated slope and distance based on the type of available or planned approach by aircraft to a runway.
- **TRANSITIONAL SURFACE:** An imaginary surface extending outward and upward at right angles to the runway centerline and the runway centerline extended at a slope of 7 to 1 from the sides of the primary surface and from the sides of the approach surfaces.
- **HORIZONTAL SURFACE:** An imaginary airspace surface with the horizontal plane 150 feet above the established airport elevation, the perimeter of which is constructed by swinging arcs from the center of each end of the primary surface of each runway of each airport and connecting the adjacent arcs by lines tangent to those arcs.
- **CONICAL SURFACE:** An imaginary surface defined in FAR Part 77 that extends from the edge of the horizontal surface outward and upward at a slope of 20 to 1 for a horizontal distance of 4,000 feet.

PAVEMENT CONDITION INDEX (PCI): A numerical index between 0 and 100 which is used to indicate the general condition of a pavement. Surveying processes and calculation methods are standardized for airport pavements.
PAVEMENT CLASSIFICATION NUMBER (PCN): An international method of expressing the load-carrying capacity of a pavement as a single unique number, without specifying a particular aircraft or detailed information about the pavement structure.
PILOT CONTROLLED LIGHTING: Airport runway lighting systems controlled by pilots activating their microphone on a specified radio frequency.
PRECISION APPROACH: A standard instrument approach procedure that provides runway alignment and descent (glide slope) information. Precision approaches are categorized as:

- **CATEGORY I (CAT I):** A precision approach providing a decision height of not less than 200 feet and visibility of not less than 1/2 mile or Runway Visual Range (RVR) 2400 (RVR 1800) with operative touchdown zone and runway centerline lights.
- **CATEGORY II (CAT II):** A precision approach that provides a decision height of not less than 100 feet and visibility not less than 1200 feet RVR.
- **CATEGORY III (CAT III):** A precision approach that provides approaches with a decision height and visibility lower than Category II.

PRECISION APPROACH PATH INDICATOR (PAPI): A lighting system providing visual approach slope guidance to aircraft during a landing approach. It is similar to a VASI but provides a sharper transition between the colored indicator lights.
PRECISION APPROACH RADAR (PAR): A radar facility in the terminal air traffic control system used to detect and display with a high degree of accuracy the direction, range, and elevation of an aircraft on the final approach to a runway.
PRECISION OBJECT FREE AREA (POFA): An area centered on the extended runway centerline, beginning at the runway threshold and extending beyond the runway threshold that is 200 feet long by 800 feet wide. The POFA is a clearing standard that requires the POFA to be kept clear of above ground objects protruding above the runway safety area edge elevation (except for frangible N AVAIDS). The POFA applies to all new authorized instrument approach procedures with less than 3/4 mile visibility.
PRIMARY AIRPORT: A commercial service airport that enplanes at least 10,000 annual passengers.
PRIMARY SURFACE: See Part 77.
PROHIBITED AREA: See special-use airspace.
PVC: Poor visibility and ceiling. Used in determining Annual Service Volume. PVC conditions exist when the cloud ceiling is less than 500 feet and visibility is less than one mile.
RADIAL: A radio signal generated by a Very High Frequency Omni-directional Range (VOR) station that is defined as an azimuth from the station.
REGRESSION ANALYSIS: A statistical technique used to identify and quantify the relationships between forecast factors.
REMOTE COMMUNICATIONS OUTLET (RCO): An unstaffed transmitter receiver/facility remotely controlled by air traffic personnel. RCOs serve flight service stations (FSSs)and are established to provide ground-to-ground communications between air traffic control specialists and pilots at satellite airports for delivering enroute clearances, issuing departure authorizations, and acknowledging instrument flight rules cancellations or departure/landing times.
REMOTE TRANSMITTER/RECEIVER (RTR): See remote communications outlet. RTRs serve ATCTs.

RELIEVER AIRPORT: An airport serving general aviation aircraft that might otherwise use a congested air-carrier airport.
REQUIRED NAVIGATION PERFORMANCE (RNP): A type of performance-based navigation that enables aircraft with required on-board navigation performance monitoring and alerting equipment to fly a specific path between defined points, fundamentally similar to RNAV.
RESTRICTED AREA: See special-use airspace.
RNAV: Area navigation: airborne equipment that permits flights over determined tracks within prescribed accuracy tolerances without the need to over-fly ground-based navigation facilities. Used enroute and for approaches to an airport.
RUNWAY: A defined rectangular area on an airport prepared for aircraft landing and takeoff. Runways are normally numbered in relation to their magnetic direction, rounded off to the nearest 10 degrees. For example, a runway with a magnetic heading of 180 degrees would be designated Runway 18. The heading on the opposite end of the runway is 180 degrees from that runway end. For example, the opposite runway heading for Runway 18 would be Runway 36 (magnetic heading of 360 degrees). Aircraft can takeoff or land from either end of a runway, depending on wind direction.
RUNWAY ALIGNMENT INDICATOR LIGHT (RAIL): A series of high intensity, sequentially flashing lights installed on the extended runway centerline, usually in conjunction with an approach lighting system.
RUNWAY END IDENTIFIER LIGHTS (REIL): Two synchronized flashing lights, one on each side of the runway threshold, that provide rapid and positive identification of the approach end of a particular runway.
RUNWAY GRADIENT: The average slope, measured in percent, between the two ends of a runway.
RUNWAY PROTECTION ZONE (RPZ): An area off the runway end to enhance the protection of people and property on the ground. The RPZ is trapezoidal in shape with dimensions determined by the aircraft approach speed and runway approach type and minima.
RUNWAY SAFETY AREA (RSA): A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.
RUNWAY VISIBILITY ZONE (RVZ): A specified area on the airport to be kept clear of permanent objects that provides an unobstructed line-of-site from any point five feet above the runway centerline to any point five feet above an intersecting runway centerline within the specified area.
RUNWAY VISUAL RANGE (RVR): An electronically-derived value in feet, representing the horizontal distance a pilot can see down the runway.
SPECIALIZED AVIATION SERVICE OPERATOR (SASO): Sometime known as single-service providers or special FBOs, a SASO is a commercial service provider on an airport typically providing a single specialized aeronautical service that does not meet the minimum standards of a full service fixed based operator (FBO).
SCOPE: The document that identifies and defines the tasks, emphasis, and level of effort associated with a project or study.
SEGMENTED CIRCLE: Visual indicators designed to provide traffic patter n Information at airports without operating control towers.
SHOULDER: An area adjacent to the edge of paved runways, taxiways, or aprons providing a transition between the pavement and the adjacent surface that supports aircraft running off the pavement; provides enhanced drainage; and blast protection.
SLANT-RANGE DISTANCE: The straight line distance between an aircraft and a point on the ground.
SMALL AIRPLANE: An airplane that has a maximum certified takeoff weight of up to 12,500 pounds.

SPECIAL-USE AIRSPACE: Airspace of defined dimensions identified by a surface area where activities must be confined because of their nature and/or where limitations may be imposed on aircraft operations that are not a part of those activities. Special-use airspace classifications include:

- **ALERT AREA**: Airspace that may contain a high volume of pilot training activities or an unusual type of aerial activity, neither of which is hazardous to aircraft.
- **CONTROLLED FIRING AREA**: Airspace where activities are conducted under conditions so controlled as to eliminate hazards to nonparticipating aircraft and to ensure the safety of persons or property on the ground.
- **MILITARY OPERATIONS AREA (MOA)**: Designated airspace with defined vertical and lateral dimensions established outside Class A airspace to separate/segregate certain military activities from instrument flight rule (IFR) traffic and to identify for visual flight rule (VFR) traffic where these activities are conducted.
- **PROHIBITED AREA**: Designated airspace within which aircraft flight is prohibited.
- **RESTRICTED AREA**: Airspace designated under Federal Aviation Regulation (FAR) 73, where the flight of aircraft, while not wholly prohibited, is subject to restrictions. Most restricted areas are designated joint use. When not in use by the using agency, IFR/VFR operations can be authorized by the controlling air traffic control facility.
- **WARNING AREA**: Airspace that may contain hazards to nonparticipating aircraft.

STANDARD INSTRUMENT DEPARTURE (SID): A preplanned IFR departure routing, preprinted for pilot use in graphic and textual form.
STANDARD TERMINAL ARRIVAL (STAR): A pre-planned IFR arrival routing, preprinted for pilot use in graphic and textual or textual form only.
STOP-AND-GO: Procedures wherein an aircraft will land, make a complete stop on the runway, and then takeoff. A stop-and-go is recorded as two operations: one operation for the landing and one operation for the takeoff.
STOPWAY: An area beyond the end of a takeoff runway designed to support aircraft during an aborted takeoff without causing structural damage to the aircraft. It is not to be used for takeoff, landing, or taxiing of aircraft.
STRAIGHT-IN LANDING/APPROACH: A landing aligned within 30 degrees of the final approach course following completion of an instrument approach.
TACTICAL AIR NAVIGATION (TACAN): An ultra-high frequency electronic air navigation aid providing suitably equipped aircraft with a continuous indication of bearing and distance to the TACAN station.
TAKEOFF RUNWAY AVAILABLE (TORA): See declared distances.
TAKEOFF DISTANCE AVAILABLE (TODA): See declared distances.
TAXILANE: The portion of the aircraft parking area used for access between taxiways and aircraft parking positions.
TAXIWAY: A defined path established for the taxiing of aircraft from one part of an airport to another.
TAXIWAY SAFETY AREA (TSA): A defined surface on each side of the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway.
TERMINAL INSTRUMENT PROCEDURES: Published flight procedures for conducting instrument approaches to runways under instrument meteorological conditions
TERMINAL RADAR APPROACH CONTROL (TRACON): An element of the air traffic control system responsible for monitoring the enroute and terminal segment of air traffic in the airspace surrounding airports with moderate to high levels of air traffic.

TETRAHEDRON: A device used as a landing direction indicator. The small end of the tetrahedron points in the direction of landing.
THRESHOLD: The beginning of that portion of the runway available for landing. In some instances, the landing threshold may be displaced.
TOUCH-AND-GO: An operation by an aircraft that lands and departs on a runway without stopping or exiting the runway. A touch-and-go is recorded as two operations: one operation for the landing and one operation for the takeoff.
TOUCHDOWN: The point at which a landing aircraft makes contact with the runway surface.
TOUCHDOWN ZONE (TDZ): The first 3,000 feet of the runway beginning at the threshold.
TOUCHDOWN ZONE ELEVATION (TDZE): The highest elevation in the touchdown zone.
TOUCHDOWN ZONE (TDZ) LIGHTING: Two rows of transverse light bars located symmetrically about the runway centerline normally at 100-foot intervals. The basic system extends 3,000 feet along the runway.
TRAFFIC PATTERN: The traffic flow prescribed for aircraft landing at or taking off from an airport. The components of a typical traffic pattern are the upwind leg, crosswind leg, downwind leg, base leg, and final approach, described as follows:

- **UPWIND LEG**: A flight path parallel to the landing runway in the direction of landing.
- **CROSSWIND LEG**: A flight path at right angles to the landing runway off its upwind end.
- **DOWNWIND LEG**: A flight path parallel to the landing runway in the direction opposite to landing. The downwind leg normally extends between the crosswind leg and the base leg.
- **BASE LEG**: The flight path at right angles to the landing runway off its approach end. The base leg normally extends from the down-wind leg to the intersection of the extended runway centerline.
- **FINAL APPROACH**: A flight path in the direction of landing along the extended runway centerline. The final approach normally extends from the base leg to the runway.

UNCONTROLLED AIRPORT: An airport without an airport traffic control tower where Visual Flight Rules traffic is performed.
UNCONTROLLED AIRSPACE: Airspace within which aircraft are not subject to air traffic control.
UNIVERSAL COMMUNICATION (UNICOM): A non-government airport communications facility that may provide airport information. Locations and frequencies of UNICOM's are shown on aeronautical charts and publications.
UPWIND LEG: See "traffic pattern."
VECTOR: A heading issued to an aircraft to provide radar navigational guidance.
VERY HIGH FREQUENCY OMNIDIRECTIONAL RANGE STATION (VOR): A ground-based electronic navigation aid transmitting very high frequency radio signals, 360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the national airspace system. The VOR periodically identifies itself by Morse Code and may have an additional voice identification feature.
VERY HIGH FREQUENCY OMNIDIRECTIONAL RANGE STATION/ TACTICAL AIR NAVIGATION (VORTAC): A navigation aid providing co-located VOR azimuth, TACAN azimuth, and TACAN distance-measuring equipment (DME).
VICTOR AIRWAY: A control area or portion thereof established in the form of a corridor, whose centerline is defined by radio navigation aids.
VISUAL APPROACH: An aircraft approach conducted in VFR conditions.
VISUAL APPROACH SLOPE INDICATOR (VASI): An airport approach aid providing visual approach slope guidance to aircraft during a landing approach. The VASI emits a directional pattern of high intensity red

and white focused light beams that indicate to the pilot they are on path when seeing red/white, above path if white/white, and below path if red/red. Some airports serving large aircraft have three-bar VASI's that provide two visual glide paths to the same runway.

VISUAL FLIGHT RULES (VFR): Rules that govern the procedures for conducting flight under visual conditions. The term VFR is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, pilots and controllers use VFR to indicate the type of flight plan.

VISUAL METEOROLOGICAL CONDITIONS: Meteorological conditions expressed in terms of specific visibility and ceiling conditions equal to or greater than the threshold values for instrument meteorological conditions.

VOR: See "Very High Frequency Omnidirectional Range Station."

VORTAC: See "Very High Frequency Omnidirectional Range Station/Tactical Air Navigation."

WARNING AREA: See special-use airspace.

WIDE AREA AUGMENTATION SYSTEM (WAAS): An enhancement of the Global Positioning System that includes integrity broadcasts, differential corrections, and additional ranging signals for the purpose of providing the accuracy, integrity, availability, and continuity required to support all phases of flight.

Acronyms and Abbreviations

AC: advisory circular
ACN: aircraft classification number
ADF: automatic direction finder
ADG: airplane design group
ADS-B: automatic dependent surveillance - broadcast
AFSS: automated flight service station
AGL: above ground level
AGIS: Airports Geographic Information System
AIP: Airport Improvement Program
AIR-21: Wendell H. Ford Aviation Investment and Reform Act for the 21st Century
ALS: approach lighting system
ALSF-1: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT I configuration)
ALSF-2: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT II configuration)
APV: instrument approach procedure with vertical guidance
ARC: airport reference code
ARFF: aircraft rescue and firefighting
ARP: airport reference point
ARTCC: air route traffic control center
ASDA: accelerate-stop distance available
ASR: airport surveillance radar
ASOS: automated surface observation station
ATCT: airport traffic control tower
ATIS: automated terminal information service
AVGAS: aviation gasoline - typically 100 low lead (100LL)
AWOS: automated weather observation station
BRL: building restriction line
CFR: Code of Federal Regulations
CIP: capital improvement program
DME: distance measuring equipment
DNL: day-night noise level
DWL: runway weight bearing capacity for aircraft with dual-wheel type landing gear
DTWL: runway weight bearing capacity of aircraft with dual-tandem type landing gear
FAA: Federal Aviation Administration
FAR: Federal Aviation Regulation
FBO: fixed base operator
FY: fiscal year
GPS: global positioning system
GS: glide slope
HIRL: high intensity runway edge lighting
IFR: instrument flight rules (FAR Part 91)
ILS: instrument landing system

IM: inner marker
LAAS: local area augmentation system
LAHSO: land and hold short operations
LDA: localizer type directional aid
LDA: landing distance available
LIRL: low intensity runway edge lighting
LMM: compass locator at middle marker
LOC: ILS localizer
LOM: compass locator at ILS outer marker
LPV: localizer performance with vertical guidance
MALS: medium intensity approach lighting system
MALSR: medium intensity approach lighting system with runway alignment indicator lights
MIRL: medium intensity runway edge lighting
MITL: medium intensity taxiway edge lighting
MLS: microwave landing system
MM: middle marker
MOA: military operations area
MSL: mean sea level
NAVAID: navigational aid
NDB: nondirectional radio beacon
NextGen: next generation air transportation system
NM: nautical mile (6,076 .1 feet)
NPES: National Pollutant Discharge Elimination System
NPIAS: National Plan of Integrated Airport Systems
NPRM: notice of proposed rulemaking
ODALS: omnidirectional approach lighting system
OFA: object free area
OFZ: obstacle free zone
OM: outer marker
PAC: planning advisory committee
PAPI: precision approach path indicator
PCN: pavement classification number
PFC: porous friction course
PFC: passenger facility charge
PCL: pilot-controlled lighting
PIW: public information workshop
PLASI: pulsating visual approach slope indicator
POFA: precision object free area
PVASI: pulsating/steady visual approach slope indicator
PVC: Poor visibility and ceiling.
RCO: remote communications outlet
REIL: runway end identifier lighting
RNAV: area navigation
RNP: required navigation performance
RPZ: runway protection zone

RSA: runway safety area
RTR: remote transmitter/receiver
RVR: runway visibility range
RVZ: runway visibility zone
SALS: short approach lighting system
SASO: specialized aviation service operator
SASP: state aviation system plan
SEL: sound exposure level
SID: standard instrument departure
SM: statute mile (5,280 feet)
SRE: snow removal equipment
SSALF: simplified short approach lighting system with sequenced flashers
SSALR: simplified short approach lighting system with runway alignment indicator lights
STAR: standard terminal arrival route
SWL: runway weight bearing capacity for aircraft with single-wheel type landing gear
STWL: runway weight bearing capacity for aircraft with single-wheel tandem type landing gear
TACAN: tactical air navigational aid
TDZ: touchdown zone
TDZE: touchdown zone elevation
TAF: Federal Aviation Administration (FAA) Terminal Area Forecast
TODA: takeoff distance available
TORA: takeoff runway available
TRACON: terminal radar approach control
VASI: visual approach slope indicator
VFR: visual flight rules (FAR Part 91)
VHF: very high frequency
VOR: very high frequency omni-directional range
VORTAC: VOR and TACAN collocated
WAAS: wide area augmentation system

APPENDIX B: GENERAL AVIATION AIRPORTS 101

Introduction

This appendix provides background information for various issues that are pertinent to airports. The issues covered in this appendix include the following:

- Airport Governance and Management
- Airport Classification
- Airport Funding
- Airport Design Standards

Airport Management/Governing Structure

Airports function as public entities and are managed or governed in a variety of forms. Before outlining the current governing and management structure for (airport name), this section will provide an overview of the variety of options that airports use to govern and manage their affairs.

Governing Structures

There are four predominant types of airport governing structures used to provide public oversight for airports:

City/County Department – the City/County governing board serves as the airport's governing board for all matters such as contracting, capital improvements, finance' and similar matters. The City/County may use its taxing authority to help support the airport or there may be provisions in state statutes that allow additional limited taxing authority to support the airport.

City/County Department with Advisory Board – the City/County governing board serves as the airport's governing board for all matters but looks to the Airport Advisory board for recommendations on actions. The City/County may use its taxing authority to help support the airport or there may be provisions in state statutes that allow additional some limited taxing authority to support the airport.

Airport Board – there are provisions in state statutes that allow for a first or second class city to create an Airport Board with limited and specific governing authority. The type of authority that exists with the board varies but in general this structure allows the airport to operate semi-autonomously from the City while final responsibility for the airport still rests with the City which owns the airport. The City may use its taxing authority to help support the airport or there may be provisions in state statutes that allow some limited taxing authority to support the airport.

Airport Authority – there are provisions in state statues that allow for the creation of an independent airport authority. These may be created by a City/County or created through a separate process. Once created, these entities have complete authority to govern the activities at the airport. Depending on state statutes, these governing bodies may also have independent, but limited, taxing authority to aid in funding the airport.

Management Structures

There are three general types of management structures for an airport. These different management structures are necessary to ensure that the policies established by the governing body can be carried out on a day by day basis in the operation and delivery of services at the airport. These are as follows:

Appointed Airport Manager – an appointed airport manager is one whose sole responsibility is the operation of the airport. The airport manager is selected by the governing body, the city/county manager or through the city/county's established human resources structure through a qualifications-based selection process. The airport manager then serves at the will of the city/county.

City/County Department Head also assigned as Airport Manager – this person is assigned as airport manager in title but often has larger responsibility such as public works director, city engineer, or transportation director. Like the appointed manager, this person is selected by the governing body, the city/county manager, or through the city/county's human resources system through a qualifications based selection process.

FBO Appointed as Airport Manager – this person is assigned as airport manager mostly in order to provide a physical presence at the airport and assure the day to day operation of the airport. This person also serves as the FBO at the airport and therefore has a concerted interest in the operation of their FBO business. When an FBO is appointed as airport manager, the governing body often retains more responsibility as to formulating capital improvement plans, financial planning, leasing, and similar matters.

FBO/Aircraft Services

The final element of the airport's management and governing structure has to do with the provision of Fixed Base Operator (FBO) type aircraft servicing. At many small airports, it is not financially feasible for an FBO to operate. At some larger airports, the airport has chosen to provide FBO-type aircraft servicing in order to retain the profits from such an activity to fund the airport. In accordance with FAA policy, airports have the 'Proprietary Exclusive Right' to provide any and all types of aeronautical services if they wish. Information regarding the 'Proprietary Exclusive Right' may be found in AC 150/5190-6 "Exclusive Rights at Federally-Obligated Airports" and FAA Order 5190-6b Airport Compliance Manual (Chapter 8). The decision to operate one way or another is an economic and policy choice made by the governing body.

Private FBO – this arrangement has a private company operating under an agreement with the governing body to use space at the airport. The FBO provides services for aircraft and pilots which may include fueling, maintenance, hangaring, aircraft handling, instruction etc.

Airport providing Aircraft Servicing (similar to an FBO) – this structure carries out all the traditional responsibilities of an airport to maintain the airfield and additionally provides FBO-type aircraft services. This direct customer service role adds another dimension to the variety of duties that an airport manager will encounter on a daily basis.

Mercer County Regional Airport

The Mercer County Regional Airport Authority is the governing body which owns and is responsible for the operations and capital development of the airport and is considered the 'Airport Sponsor'. The airport is managed by part time staff that work for the airport authority. There are full FBO services provided by the airport that includes fuel, pilot space, a courtesy car, and hangar space.

Airport Classification

Airports are given different classifications or designations, depending on the source. This section discusses the various sources or systems used nationally, regionally, or locally to classify an airport. The primary systems used to classify an airport include:

a. FAA National Plan of Integrated Airport Systems (NPIAS)
b. Regional or State Aviation System Plans (SASP)
c. FAA General Aviation Airport Report (ASSET)

National Plan of Integrated Airport Systems

The Airport and Airway Improvement Act of 1982 directed the Secretary of Transportation to prepare, publish, and biannually revise a national system plan – the National Plan of Integrated Airport Systems (NPIAS) – for the development of public-use airports in the United States. This requirement can be found in Public Law 49 United States Code § 47103. The NPIAS is a system that emphasizes system planning and development to meet current and future aviation needs. It includes the development considered necessary to provide a safe, efficient, and integrated airport system to meet the needs of civil aviation, national defense, and the United States Postal Service. It takes into account the relationship of each airport to the rest of the transportation system in a particular area, the forecast of technological developments in aeronautics, and the development forecast in other modes of transportation.

To be eligible for funding under the Airport Improvement Program (AIP), an airport must be included in the NPIAS. The FAA determines whether an airport can be included in the NPIAS and the requirements for inclusion in the NPIAS are defined by law and FAA policy. As general criteria, the airport must be a publicly-owned, public-use airport serving civil aviation (privately-owned, public use airports may be included under certain circumstances) with an eligible sponsor, must have at least 10 based aircraft, and must be located at least 20 miles from another NPIAS airport.

Although it is not a factor in determining an airport's classification in the NPIAS, it is important to note that, after an airport is included in the NPIAS and accepts a federal grant for AIP funds, the airport sponsor is contractually obligated to meet the terms and conditions of the AIP grant. These terms and conditions, typically called grant assurances, are established by federal law and define the requirements a sponsor must comply with in the safe and efficient operation and maintenance of the airport.

NPIAS Airport Classification

The public law that created the NPIAS plan defines airports by categories of airport activities. Those categories are defined as follows:

Commercial Service

Commercial service airports are defined as publicly owned airports that have at least 2500 passenger boardings each calendar year and receive scheduled passenger service. Commercial service airports are further categorized based on the number of annual passenger boardings.

Primary commercial service: a commercial service airport with more than 10,000 passenger boardings each year.

Nonprimary commercial service: a commercial service airport with at least 2,500 but no more than 10,000 passenger boardings each year. These airports are commonly referred to as **Commercial Service** airports.

Because of the wide range in levels of passenger boardings throughout the United States, primary commercial service airports are further categorized by the percentage of total passenger boardings in the United States.

Large Hub: a primary commercial service airport with 1 percent or more of the annual national passenger boardings. Commonly referred to as **Large Hub** airports, annual passenger boardings typically range above 8 million.

Medium Hub: a primary commercial service airport with at least 0.25 percent but not more than 1 percent of the annual national passenger boardings. Commonly referred to as **Medium Hub** airports, passenger boardings typically range from 2 million to 8 million.

Small Hub: a primary commercial service airport with at least 0.05% but not more than 0.25 percent of the annual national passenger boardings. Commonly referred to as **Small Hub** airports, passenger boardings typically range from 350,000 to 2 million.

Nonhub: a primary commercial service airport with more than 10,000 but less than 0.05 percent of the annual national passenger boardings. Commonly referred to as **Nonhub Primary** airports, passenger boardings typically range from 10,000 to 350,000.

General Aviation

Most airports that are not considered commercial service airports fall into this category. Although some general aviation airports do have scheduled passenger service, they have fewer than 2500 annual boardings and therefore are not classified as commercial service airports. See the section **General Aviation Airport: A National Asset** for more detail on general aviation airports.

Reliever

Reliever airports are general aviation airports designated by the FAA to relieve congestion at a commercial service airport and to provide more general aviation access to the overall community.

Mercer County Regional Airport Classification

The Mercer County Regional Airport is classified as a general aviation airport in the current NPIAS.

State Aviation System Plan

An integrated State airport system plan is the representation of facilities required to meet immediate and future needs as well as achieve overall goals of the State. It recommends the general role, location, and characteristics of new airports or the nature of expansion for existing ones. In order for an airport to be considered for inclusion in the NPIAS, it must first be included in the State's Aviation System Plan

(SASP). Each SASP may use different terms or definitions for the role of an airport within the state, and those roles are defined below.

North Dakota State Aviation System Plan

Airports in the North Dakota State Aviation System Plan are classified by the North Dakota Aeronautics Commission (NDAC) according to the level of service they offer and the communities they serve. This categorization stems from the NDAC's most recent North Dakota State Aviation System Plan. For the 2014 update of the SASP, the North Dakota Aeronautics Commission elected to use the same classifications and criteria used by FAA. There are 89 public airports North Dakota's aviation system. Classification of airports in North Dakota is described in the following section:

PRIMARY COMMERCIAL SERVICE

- Meets the NPIAS criteria as a Primary Commercial Service airport with more than 10,000 passenger boardings each year;
- There are 6 airports in this category as of the 2014 NDSASP Study.

NON-PRIMARY COMMERCIAL SERVICE

- A non-primary commercial service airport has at least 2,500 but no more than 10,000 passenger boardings each year;
- There are 2 airports in this category as of the 2014 NDSASP Study.

LOCAL

- An airport meeting the FAA Asset criteria of 10+ instrument operations and 15+ based aircraft;
- There are 19 airports in this category as of the 2014 NDSASP Study.

BASIC (NPIAS & NON-NPIAS)

- A NPIAS airport meeting the FAA Asset criteria of
    - 10+ based aircraft; or 4+ based helicopters; or the airport is located 30+ miles from the nearest NPIAS airport; or the airport is a new or replacement facility activated after January 1, 2001; or
    - The airport is identified and used by the U.S. Forest Service, or U.S. Marshals, or U.S. Customs and Border Protection (designated, international, or landing rights), or U.S. Postal Service (air stops).
- A Non-NPIAS airport which meets FAA Asset criteria for a 'Basic' airport but is otherwise not classified as 'Basic'.
- There are 35 airports in this category as of the 2014 NDSASP Study.

COMMUNITY PAVED (NPIAS & NON-NPIAS)

- A NPIAS airport which is unclassified but paved.
- A Non-NPIAS airport which does not meet the FAA Asset criteria as a 'Basic' airport but is paved.
- There are 10 airports in this category as of the 2014 NDSASP Study.

COMMUNITY TURF (NON-NPIAS)

- A Non-NPIAS airport which does not meet the FAA Asset criteria as a 'Basic' airport but is un-paved.
- There are 17 airports in this category as of the 2014 NDSASP Study.

Mercer County Regional Airport is classified as a Basic airport in the current North Dakota State Aviation System Plan.

General Aviation Airports: A National Asset

This report, commonly known as the ASSET 1 Study, documented an 18-month study of the nearly 3000 general aviation (GA) airports, heliports, and seaplane bases identified in the FAA's National Plan of Integrated Airport Systems (NPIAS). The in-depth analysis highlighted the pivotal role GA airports play in our society, economy, and the aviation system. The study also aligned the GA airports into four categories – national, regional, local, and basic – based on their existing activity levels. The categories are a tool to help the FAA and state aeronautical agencies make more consistent planning decisions for the nation's GA airports. They reflect the current aviation activity at GA airports, such as the number and type of based aircraft, the number of passenger boardings, and the number of flights.

During the initial study, the FAA found that almost 500 GA airports did not clearly fit into the four defined categories. As a result, the FAA initiated a second phase of the study in 2013 to define a category for those airports, as well as reassign airports to different categories, based on updated information. That study, known as the ASSET 2 study, assigned 212 previously unclassified airports to one of the four categories.

ASSET Study Airport Categories

The current version of the ASSET study includes four categories. These categories are National, Regional, Local, and Basic. As the second phase of the study was completed, the number of airports considered unclassified was reduced from 497 to 281.

National Airports

These 84 GA airports are located in metropolitan areas near major business centers and support flying throughout the nation and the world. Currently located within 31 states, they account for 13 percent of total flying at the studied airports and 35 percent of all filed flight plans at the airports in the four categories. These 84 airports support operations by the most sophisticated aircraft in the GA fleet. Many flights are by jet aircraft, including corporate and fractional ownership operations and air taxi services. These airports also provide pilots with an alternative to busy primary commercial service airports. There are no heliports or seaplane bases in this category. The criteria used to define the National category include:

- 5,000 + instrument operations, 11+ based jets, 20+ international flights, or 500+ interstate departures: or
- 10,000+ enplanements and at least 1+ charter enplanement by a large certificated air carrier: or
- 500+ million pounds of landed cargo weight.

Regional Airports

The 468 airports in the Regional Airport category are located in metropolitan areas and serve relatively large populations. These airports support interstate and some long distance (cross country) flying with more sophisticated aircraft. 49 states, with the exception of Hawaii, currently have Regional airports. These airports account for 37 percent of total flying at the studied GA airports and 42 percent of filed flight plans. There is a substantial amount of charter (air taxi), jet flying, and rotorcraft at regional airports. There are no heliports or seaplane bases in this category. The criteria used to define the Regional category include:

- Metropolitan Statistical Area (Metro or Micro) and 10+ domestic flights over 500 miles, 1,000+ instrument operations, 1+ based jet, or 100+ based aircraft; or
- The airport is located in a metropolitan or micropolitan statistical area, and the airport meets the definition of commercial service.

Local Airports

The 1,263 airports in the Local category are the backbone of the general aviation system, with at least one Local airport in every state. They are typically located near larger population centers but are not necessarily in metropolitan or micropolitan areas. Local airports account for 42 percent of the general aviation airports eligible for Federal funding. They also account for approximately 38 percent of the total flying at the studied GA airports and 17 percent of filed flight plans. Most of the flying is by piston aircraft in support of business and personal needs. In addition, these airports also typically accommodate flight training, emergency services, and charter passenger service, and the flying tends to be within a state or immediate region. There are no heliports, but there are four seaplane bases in this category. The criteria used to define the Local category include:

- 10+ instrument operations and 15+ based aircraft; or
- 2,500+ passenger enplanements.

Basic airports

The 852 airports in the Basic category are often able to fulfill their role with a single runway, helipads, seaplane area, and limited infrastructure. 43 states have Basic airports and these airports fulfill the role of a community airport providing a means for private GA flying and linking the community to the national airport system. Basic airports account for approximately 7 percent of the total flying at GA airports and 2 percent of filed flight plans. Most of the flying is self-piloted for business and personal reasons using propeller-driven aircraft. A fair amount of air charter (taxi) services is provided at these airports. There are also 3 heliports and 20 seaplane bases in this category. The criteria used to define the Basic category include:

- 10+ based aircraft; or
- 4+based helicopters; or
- The airport is located 30+ miles from the nearest NPIAS airport; or
- The airport is identified and used by the US Forest Service, US Marshals, US Customs and Border Protection (designated, international, or landing rights), or US Postal Service (air stops), or has Essential Air Service; or

- The airport is a new or replacement facility activated after January 1, 2001; and
- Publicly owned or privately owned and designated as a reliever with a minimum of 90 based aircraft.

General Aviation airports not classified

There are 281 airports that did not fit into one of the four categories. Most of these airport have been in the NPIAS for decades and may have seen an erosion of based aircraft and activity (because of population or economic shifts or recession) or may have no based aircraft. 54 of these airports are privately owned and were originally included in the national system as relievers for commercial service airports, but no longer met the entry criteria. Others may be seasonal airports, military airfields recently converted to general aviation use, or airports used to access important state airports with related national interests. These airports account for approximately 6 percent of total flying at the studied GA airports and 2 percent of filed flight plans. However, none are commercial service airports and none received scheduled air service through the Essential Air Service program.

Mercer County Regional Airport ASSET Classification

Mercer County Regional Airport is classified as a Basic airport in the current ASSET report.

Airport Funding

This section provides background information on available Federal, State, and local funding, and lists the various projects that have been undertaken at the Mercer County Regional Airport (HZE).

Federal Funding

Most funding for airport development comes from federal government programs. The predominant federal funding program is the Airport Improvement Program (AIP), managed by the Federal Aviation Administration.

Federal Funding Legislation

The Federal Aviation Administration (FAA) issues grants for airport planning and development in the United States under Public Law 49 United States Code (USC) § 47104(a). Two separate legislative actions - an authorization and an appropriation are needed in order to issue grants and operate the Airport Improvement Program (AIP) grant program.

- **Authorization.** The FAA authorization legislation has numerous titles but is often referred to as the FAA Reauthorization and is passed by Congress for varying lengths of time. The authorization sets yearly limits on AIP funding levels and gives the FAA contract authority to issue grants. The AIP is currently operating under an extension (H.R. 636) of the FAA Modernization and Reform Act of 2012 (Public Law 112-95). The Act extends the agency's authority and provides funding at current levels through September 2017.
- **Appropriation.** Congress establishes an annual appropriation that allows the FAA to incur obligations and make payments for specific purposes. Although the FAA reauthorization typically establishes an annual authorized funding level for the AIP program, Congress may also use the appropriation law to adjust the authorized AIP funding level for the current year.

Airport and Airway Trust Fund (Source of AIP)

AIP funds are drawn from the Airport and Airway Trust Fund, referred to as the Trust Fund. The Trust Fund receives revenues solely from a variety of sources in the aviation industry, including the domestic ticket tax, a domestic passenger flight segment fee, a departure tax for flights to Hawaii and Alaska, a passenger ticket tax at rural airports, international departure and arrival taxes, frequent flyer taxes, domestic freight and mail taxes, a commercial aviation fuel tax, and a general aviation fuel tax.

AIP Funding Categories

The AIP legislation determines the amount of funding available in each period. Once that amount is established, a complex set of formulas defined by the FAA authorization law, determines how much funding is available within each airport category. In general, AIP funding is distributed in the following categories:

Entitlements

Entitlement funds are AIP funds available to individual airports and fall into various categories based on the number of enplaned passengers.

Cargo Entitlements

Airports receiving cargo shipments may be eligible for cargo entitlements. Cargo entitlements are based on the distribution of 3.5 percent of the total available AIP funds, divided on a pro-rata basis according to an airport's share of total US landed cargo weight.

Primary Entitlements

These funds are available to airports with scheduled passenger service and enplaning more than 10,000 passengers per year. Passenger entitlements are calculated based on the following formula:

- $7.80 for each of the first 50,000 passenger enplanements
- $5.20 for each of the next 50,000 passenger enplanements
- $2.60 for each of the next 400,000 passenger enplanements
- $0.65 for each of the next 500,000 passenger enplanements
- $0.50 for each passenger enplanement greater than 1 million

The annual minimum is $650,000 and the annual maximum is $22 million per airport. By a special provision in the authorization, when $3,200,000,000 or more AIP is appropriated in the fiscal year, each level doubles (i.e., instead of $7.80 for each of the first 50,000, the rate becomes $15.60, etc.), the annual minimum becomes $1 million, and the maximum becomes $26 million per airport.

Nonprimary Entitlements

The special provision in the authorization (as noted above) stipulates that airports not receiving passenger entitlements will receive nonprimary entitlements when AIP appropriations are $3,200,000,000 or more in the fiscal year. These entitlements are the lesser of $150,000 or 20 percent of an airport's 5-year development costs listed in the biennial National Plan of Integrated Airport Systems (NPIAS) report to Congress.

State Apportionment

These funds are available for eligible airport development projects within a state. Normally, 18.5 percent of total available AIP grant funds are apportioned for airports based on an area/population formula. These funds are generally limited to commercial service, nonprimary, and general aviation airports.

Discretionary

The appropriated funds remaining after the other types of funds have been allocated are referred to as "discretionary" funds. A portion of the discretionary funds are directed toward specific, or "set-aside," programs, such as noise-related projects or the Military Airport Program. Of the discretionary funds remaining after set-asides, 75 percent are to be used for enhancing capacity, safety, security, and noise compatibility planning and programs. The remaining 25 percent, known as pure discretionary funds, may be used for any eligible project at any airport, as determined by the FAA.

As a general rule pure discretionary funds typically account for less than four percent of the available AIP funds. However, during the fiscal year some airport sponsors may decide not to proceed with an AIP project or may have funds remaining after the completion of a project. Those funds are returned to FAA and converted to discretionary funds, creating additional discretionary funds to be used for eligible projects.

Federal Share of Project Funding

AIP funds typically do not cover the entire cost of an airport development project. Although there are some exceptions, the current legislation limits the federal share of allowable AIP costs to 90 percent for most non-hub primary or smaller airports. The remaining 10 percent is considered the local share and is the sponsor's responsibility.

Types of Potential AIP Funding Available for HZE

By law, only public-use airports in the NPIAS are eligible for AIP funding. These airports are classified into various categories based on their usage and level of passenger enplanements, and those categories determine the type of airport funding eligibility. **Mercer County Regional Airport meets the definition for non-primary airport and receives non-primary entitlement funding for eligible projects.**

Most AIP-eligible projects would also be eligible for discretionary funding. However, as stated earlier, the assignment of discretionary funds is determined by the FAA, and extensive coordination with the FAA is required to determine the potential availability of discretionary funding for specific projects.

The Federal AIP Grant Process

Once AIP funding has been identified, the airport sponsor must go through an established process to receive the federal funds and apply them towards an airport development project. The current version of FAA Order 5100.38 contains a detailed explanation of all requirements and processes. In addition, coordination with the Airports District Office (ADO) is strongly encouraged to ensure there is no confusion.

Basic Grant Steps

While there are numerous steps in the FAA AIP grant process, all AIP grants proceed through the same basic steps.



Pre-Grant Actions

Pre-grant actions must be taken before an AIP-eligible project is ready to be considered for inclusion in a grant. The most critical action is the need for early and extensive coordination between the sponsor and the FAA. The majority of the sponsor's interface with the FAA is at the local level with the appropriate ADO.

Sponsors must develop a Capital Improvement Plan (CIP), typically based on the airport's 20-year development plan. This CIP is submitted to the ADO, where it is reviewed to identify the projects that meet all of the applicable requirements. The ADO enters those projects into an automated AIP system, which is then used to create a five-year NPIAS report, outlining projects eligible for AIP funding. The FAA creates an Airports Capital Improvement Plan (ACIP) to identify the projects that may be funded with AIP over the next three years. Inclusion of a project in the ACIP represents the initial FAA concurrence with the project. However, inclusion of a project in the NPIAS or the ACIP is not a guarantee of funding, nor does the FAA consider the value of the project a final determination.

The ADO will typically notify the sponsor of the favorable potential for receiving federal funding in the upcoming fiscal years. However, it is not a commitment nor a guarantee of funds; rather, it is simply a notice that funding for the project appears favorable and the sponsor should consider initiating those actions that require long lead times in order to avoid delays in the grant process. In addition, the sponsor must develop a realistic project schedule, setting realistic sponsor deadlines for key steps in the grant process and coordinate this schedule with the ADO.

Grant Programming

A grant is "programmed" when the ADO creates a proposed grant in the automated AIP system. These proposed grants are typically based on estimated costs. The grant is then reviewed within the FAA Office of Airports. If the grant is approved, it then enters into the congressional notification process.

The FAA posts the grant on the official FAA Office of Airports website after the congressional notification process is complete. This is considered formal notification that the ADO has authority to issue the grant. The sponsor is typically notified in writing through a Tentative Allocation letter.

Grant Application, Offer and Acceptance

The following steps must be completed after the sponsor has been notified that they will receive a grant:

- Submittal of Grant Application Package

- Grant Application Review
- Fund Reservation
- Grant Offer
- Grant Acceptance

Grant Acceptance

If the sponsor agrees with the grant offer an authorized representative of the sponsor must sign the grant agreement. The sponsor's attorney must also sign the grant agreement, confirming the sponsor is legally able to enter into the contract with the US government. No funds can be drawn from the grant allocation until the ADO receives an original signed agreement and enters it into the FAA's system.

Grant Payments

The sponsor may begin requesting payments from the FAA once the grant agreement has been fully executed and returned to the ADO. It is important to note a number of requirements in the payment process.

- All grant payment requests must be processed through the currently approved DOT grant payment system.
- Payment requests must be submitted at least annually, unless the ADO requests more frequent submissions. The sponsor may submit payment requests more frequently as costs are incurred.
- Payment requests must be based on costs already paid by the sponsor. Advance payments must be approved by the ADO.
- The last 10 percent of the federal share of the grant must be withheld until the ADO receives the final grant closeout report.
- The sponsor must retain all the documentation supporting the grant payment for the required time period and must make this information available on request.

Grant Amendments

A grant agreement can be amended under certain circumstances. Only the ADO can change a grant agreement and amendments are the process used to implement such changes. In general, a grant agreement can be amended with certain limitations for the following reasons:

- To increase or decrease the grant amount. Grants for planning projects cannot be increased. In addition, amendments to increase the grant amount are limited to a maximum of 15 percent.
- To clarify the project description.
- To add, delete or modify a project.

The Sponsor must coordinate with the ADO to determine requirements for grant amendments.

Grant Closeouts

The final step in the process after the project has been completed is to complete all the administrative actions to close out the grant. This step is particularly important to the sponsor, since the FAA is required to withhold the last 10 percent of the federal share of the grant amount until the closeout report has been submitted to the ADO. The basic steps of the process are:

- Physically complete all projects in the grant.
- Complete all grant administrative and financial requirements
- Complete the closeout process

A project is physically complete when all work funded by the grant has been satisfactorily completed in accordance with all specifications or requirements. Before the ADO can process the closeout, they must receive the appropriate documentation demonstrating that the grant project requirements have met, the sponsor has met all of the grant requirements and all project costs are properly documented.

After the ADO has received all required documentation and verified that all requirements have been met, they will prepare a FAA Final Project Report. The ADO will then send written notification to the sponsor of the final payment amount. After the final payment has been made, the ADO will coordinate with other FAA offices to close the grant. When all these actions have been completed, the ADO will notify the sponsor in writing that the grant is physically and financially complete and the grant is officially closed.

Post-Grant Actions

Once the FAA has officially closed the grant, the sponsor:

- Is required by law to retain all grant-related documentation for three years. If there is litigation, the sponsor must retain the documentation until the issue is resolved or three years, whichever is later;
- Must meet grant assurances and special conditions. Most grant assurances and special conditions remain in effect for 20 years after the grant was signed. Some assurances or special conditions are in effect for the life of the equipment or facility, while other obligations remain in effect for in perpetuity.
- Must comply with the Office of Management and Budget (OMB) single audit requirements If a sponsor expends more than $500,000 in federal funds (all federal funds, not just AIP) in a fiscal year. Unless the sponsor is an independent airport authority, this requirement applies to the airport's governing organization, i.e., city, county, state, etc.
- Must receive FAA approval to dispose of equipment or land acquired with AIP funds.

NOTE: The above narrative on the AIP grant process is a summary of current program guidance and does not include all the available details and program requirements. A more detailed description of all of the elements of the AIP grant process can be found in the current version of *FAA Order 5100.38, Airport Improvement Program Handbook*. In addition, sponsors are strongly encouraged to consult their local ADO for the latest policy and guidance.

State Funding

State governments typically have a variety of airport development funding programs available. These funding programs typically use funds from a variety of sources, such as aviation fuel taxes or aircraft registration fees, and are often used to fund a portion of an airport sponsor's local share of federally-funded airport development projects.

North Dakota State Aviation Funding

State funding for airport development is managed by the North Dakota Aeronautics Commission (NDAC). For more information on available funding and procedures, contact the North Dakota Aeronautics Commission staff at 701-328-9650.

The NDAC normally receives biennial appropriations from the state legislature, using funds collected from aviation fuel taxes, aircraft excise taxes, and aircraft registrations. Airports may apply for state grants to cover up to 50 percent of the local share for federal AIP-funded projects. Airports may also apply for state grants to cover up to 50 percent of the cost of airport development projects that are not funded through the federal AIP program. Contact the NDAC for grant application procedures and schedules.

Local Funding

While funding for airport development is typically derived from federal or state sources, portions of most capital projects and the majority of airport operating expenses must be funded through local sources. Ideally, the airport generates sufficient revenue to meet those costs. For this reason, the FAA has included in Grant Assurance Number 24 which states:

> "It [the airport sponsor] will maintain a fee and rental structure for the facilities and services at the airport which will make the airport as self-sustaining as possible under the circumstances existing at the particular airport, taking into account such factors as the volume of traffic and economy of collection."

For most small airports airport expenses and funding requirements typically exceed available airport revenue and the airport must rely on other funding sources. This section reviews local revenue and identifies possible revenue or funding sources for airport capital development projects, growth, and operation and maintenance expenses. For comparison, Montana DOT Aeronautics Division annually conducts a survey of rates and charges and posts those results on their website.

Rates and Charges Revenue

The primary category of income for airports comes from rates and charges that are established by the airport sponsor for the use of the airport. These include fees for services as well as rental income from the use of airport property.

Fuel Flowage Fees – The airport sponsor can charge a fee per gallon for fuel pumped at the airport. This should be for all fuel pumped at the airport whether it is from an FBO or a private company/individual with their own tanks. The fuel flowage provides an easy to calculate and collect user fee based on the aircraft use of the airport. Larger aircraft use more fuel and pay more. Higher frequency activity uses more fuel and pays more. Each of these correspond with higher use of the airport's facilities. It is important to note that this fuel flowage fee is to cover some of the expenses of operating the airport. The airport sponsor may also be leasing the fuel facility to an FBO or trying to cover maintenance of the fuel facility. Charges for leasing the fuel facility may be based on fuel flowage but should be over and above the standard fuel flowage fee for using the airport.

Landing Fees – The airport sponsor can charge a landing fee for the use of the airport. This is charged as most large airports and is calculated based on maximum gross weight. For most general aviation

airports, the landing fee is not used because of the challenges in collecting the fee. Some airports however may have a landing fee for aircraft over a certain weight such as above 12,500 pounds. The landing fee for larger aircraft then becomes a means to cover the cost to the airport from higher usage from these larger aircraft.

Leases for Aeronautical Uses -- The primary means that a general aviation airport has to produce income is through property leases. Two common options for aeronautical leases are land leases for private hangar development or airport funded hangars leased for aircraft storage. For Mercer County Regional Airport, the county currently leases T-Hangar space for $169 per month.

Land Lease is a common method for allowing hangar construction. This is where a tenant will lease a tract of airport land that is connected to the airfield and public access. The tenant will construct a facility at their own expense and pay a land lease rate to the airport through a term of the lease sufficient for the tenant to amortize their investment. An important element to consider is reversion of the improved property to the airport following the initial 'amortization' term of the lease. The reason to consider reversion is addressed in more detail in this section and would be instituted equally for any person and varies only based on the level of investment made into the facility.

A guideline for setting the initial 'amortization' lease term with reversion is to expect a level of investment of a certain dollar amount per square foot for every 10-years of lease. The lower rates would be given to those who are providing services at the airport and higher rates to those just storing personal/company aircraft but not providing aviation services. An amortization schedule for a facility can also be used to determine the proper term. These are not

What Is Reversion?

Reversion occurs after a private improvement has been constructed on public property and that improvement has been fully amortized. Any improvement to real property becomes an integral part of the underlying land, and in this case, the improvement is to public property. The question is posed quite often about why reversion. Why should an airport expect a tenant to build a facility on the airport then revert ownership of that facility after the term of a lease expires? The underlying question is, **Does the airport owner have a compelling need to control the airport? .. Yes**

The primary issue that drives this discussion is that an airport and its associated facilities (runways, taxiways, aprons, etc.) are constructed on a finite piece of public property. With limited access and ability to expand, **Is it in the public's interest to allow tenants to control the use of that finite property into perpetuity? .. No**

Reversion solves this potential issue and maintains the public's ability to control the airport by allowing the airport to redevelop portions of the airport after a notable period of time (usually 20 – 40 years). An airport may choose to redevelop for a variety of reasons, including conformity with current design standards, repurposing areas for changing demands, or renovation or upgrading existing structures. Airports are quite unique in that even though there are large amounts of acreage for an airport, there are only certain areas that have the proper access to both the airside and landside to make a facility functional. Airports generally have broad impacts on communities including improved medical services and stimulation of economic development, and as a result millions of public dollars are invested to make these hangar areas as functional as possible for all airport users.

The general argument against reversion is that it stifles tenant's ability to maximize the value of their investment, and as such, may prevent the airport from getting development that will allow it to be as self-sustaining as possible. With a reasonable amortization time period and a fair ability to negotiate an improved property lease, these concerns are addressed.

These arguments have been greatly simplified for this discussion, but this decision is one that each airport sponsor should consider carefully to determine what is best for them to meet demand and comply with grant conditions and local, state, and federal laws.

absolute rules but are tools to use to determine the lease term. Here is an example of the calculation of lease term using $35 per square foot investment being worth a 10-year lease.

$$\frac{\$400{,}000\ investment}{5{,}000\ sf\ hangar} = \$80\ per\ SF \qquad \frac{\$80\ per\ SF}{\$35\ per\ 10\ Years} = 22\ years$$

Please note that a person constructing a facility will often be interested in leasing the improved property after the original lease term expires. This is done by negotiating a new rental rate commensurate with the improved value of the property. Assuring that individuals are paying the improved value of the property, puts the proper economic incentive in place so the airports finite property is used to the best of its ability.

Airport Funded Hangars is the other option for the airport to maintain control and provide facilities for aircraft storage. Providing airport funding depends first on whether the airport has the funds to construct a hangar and second on the confidence the airport has in being able to lease the facility at a sufficient rental rate. The FAA allows airports to use non-primary entitlements for revenue producing facilities, such as hangars, but only if all other airport needs for federal funding have been met and no other projects are foreseen in the next three years.

Table 4-7 – Hangar Funding Options

	Land Lease
Pros	Only private funds at risk, No public funds at risk
Cons	Individual hangars use more space than group hangars
Typical Uses	Individual Hangars, Specialized Facilities, Large Investments, Businesses
	Airport Funding
Pros	Can use Non-Primary Entitlement funds Airport maintains control immediately
Cons	Requires up front public funds Public money is at risk if there are no tenants
Typical Uses	Small Hangars, Group Hangars such as T-Hangars

Source: KLJ Analysis

Ownership of Hangars - Whether the city chooses Land Lease or Airport funding to construct hangars, the hangars will still at some point become property of the airport as a result of reversion. When the hangar is not owned by the airport, the hangar is subject to property taxes as an improvement to the property. Since airports are public entities, the property and improvements owned by airports are not subject to property taxes. An advantage to the tenant of reversion is not paying property taxes on the building. An option is to revert the property immediately after construction, but the tenant continues to pay the land lease rate through the initial term. The tenant would still be responsible for minor/major maintenance for the facility.

Leasing for Non-Aeronautical Uses – The only other significant asset that the airport has is land that can be used for agricultural purposes. The primary purpose of the land that the airport has is to provide sufficient safety surfaces for aircraft landing and taking off from 97M. Secondarily to that is to recover a reasonable amount of income while maintaining safety standards. The land is suitable for hay

production and airports have received income by leasing the property for hay. Some airports do an annual cash lease for the property but others have found that a multi-year agreement based on shares of the crop mitigates the risk of changing market conditions and allows the airport to earn income reasonable to the market conditions at the time of the cutting rather than be based on a speculative bid very early in the production season.

Project Funding

An airport does not typically satisfy its capital development needs with internal funding sources alone. Federal, state, and private funding, together with airport funds and bond proceeds, are usually combined to produce the total funds required for capital projects. Federal sources, including Airport Improvement Program (AIP) funds, are subject to modification by Congress or other entities having authority over a funding source.

The specific project eligibility criteria may vary depending on the funding source. In identifying potential sources of funds, it is necessary to examine each project element to determine its eligibility for funding. It's also important to consider the availability of funds for each funding source. AIP funding, as the primary source of federal funding, is described in the previous **Federal Funding** section, and potential state funding is described in the previous **State Funding** section. The following paragraphs briefly describe other funding sources available to the airport.

General Obligation (GO) Bonds

GO bonds are backed by the creditworthiness and taxing power of the municipality operating the airport. They usually bear low interest rates because of their high degree of security. However, state laws may limit a municipality's overall debt, and competition from other community financing requirements may preclude their use for an airport project. Some states have an exemption from the debt limitation rule for general obligation bonds because they are used for a revenue producing enterprise.

Third Party Development

Third party financing may be appropriate in a case where an airport sponsor uses a third-party developer or a tenant to finance a construction project. Only projects with a strong positive cash flow can support this type of financing. Generally, the third party would lease the structure for a period of years to the tenant paying the airport ground rents. According to the terms of the agreement, the airport sponsor receives ownership of the asset upon expiration of the lease.

Airport Design Guidelines

Guidance on minimum FAA airport design standards is found in FAA AC 150/5300-13B, *Airport Design*. Airport design standards provide basic guidelines for a safe, efficient, and economic airport system. Careful selection of basic aircraft characteristics for which the airport will be designed is important. Airport designs based only on existing aircraft can severely limit the ability to expand the airport to meet future requirements for larger, more demanding aircraft. Airport designs that are based on large aircraft unlikely to operate at the airport are not economical.

Critical Design Aircraft

Planning a new airport or improvements to an existing airport requires the selection of one or more "critical aircraft." FAA design standards for an airport are determined by a coding system that relates the physical and operational characteristics of an aircraft to the design and safety separation distances of the airfield facility. The design aircraft is the most demanding aircraft operating or forecast to operate at the airport on a regular basis, which is typically considered 500 annual takeoff and landing operations. The design aircraft may be a single aircraft, or a grouping of aircraft.

The first consideration should be the safe operation of aircraft that regularly use the airport. According to FAA AC 150/5300-13B, any operation of an aircraft that exceeds design criteria of the airport may result in either an unsafe operation or a lesser safety margin unless air traffic control (ATC) Standard Operating Procedures (SOPs) are in place for those operations. However, the AC also states that it is not the usual practice to base the airport design on an aircraft that uses the airport infrequently, and it is appropriate and necessary to develop ATC SOPs to accommodate faster and/or larger aircraft that use the airport occasionally.[1]

The FAA typically only provides funding for design standards required by the existing and approved forecasted critical aircraft that are expected to exceed 500 annual operations.

Airport & Runway Classifications

The FAA has established aircraft classification systems that group aircraft types based on their performance and geometric characteristics. These classification systems (see **Figure B-1**) are used to determine the appropriate airport design standards for specific runway, taxiway, apron, or other facilities, as described in FAA AC 150/5300-13B.

- **Aircraft Approach Category (AAC):** a grouping of aircraft based on approach reference speed, typically 1.3 times the stall speed. Approach speed affects the dimensions and size of runway safety and object free areas.
- **Airplane Design Group (ADG)**: a classification of aircraft based on wingspan and tail height. When the aircraft wingspan and tail height fall in different groups, the higher group is used. Wingspan affects the dimensions of taxiway and apron object free areas, as well as apron and parking configurations.
- **Approach Visibility Minimums:** relates to the visibility minimums expressed by Runway Visual Range (RVR) values in feet. This is the minimum distance pilots must be able to see the runway to execute an approach to land. Visibility categories include visual (V), non-precision (NPA), approach procedure with vertical guidance (APV) and precision (PA). Lower visibility minimums require more complex airfield infrastructure and enhanced protection areas.
- **Taxiway Design Group (TDG):** a classification of airplanes based on outer to outer Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance. TDG affects taxiway/taxilane pavement width and fillet design at intersections. See **Figure B-2** for the TDG chart.

[1] FAA Advisory Circular 150/5300-13B, *Airport Design*

Figure B-1 – Airfield Classification Systems

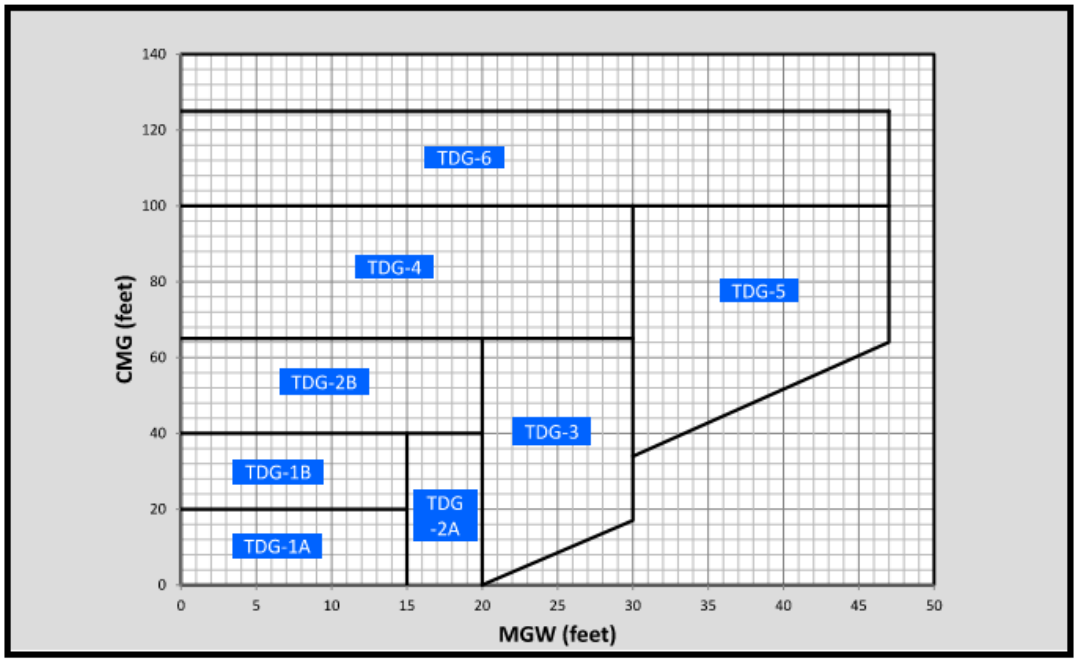
Aircraft Approach Category (AAC)		
AAC	**Approach Speed**	
A	Approach speed less than 91 knots	
B	Approach speed 91 knots or more but less than 121 knots	
C	Approach speed 121 knots or more but less than 141 knots	
D	Approach speed 141 knots or more but less than 166 knots	
E	Approach speed 166 knots or more	
Airplane Design Group (ADG)		
ADG	**Tail Height (ft.)**	**Wingspan (ft.)**
I	< 20’	< 49’
II	20’ - < 30’	49’ - < 79’
III	30’ - < 45’	79’ - < 118’
IV	45’ - < 60’	118’ - < 171’
V	60’ - < 66’	171’ - < 214’
IV	66’ - < 80’	214’ - < 262’
Approach Visibility Minimums		
RVR (ft.)*	**Instrument Flight Visibility Category (statue mile)**	
N/A (VIS)	Visual (V)	
5000	Not lower than 1 mile (NPA)	
4000	Lower than 1 mile but not lower than ¾ mile (APV)	
2400	Lower than ¾ mile but not lower than ½ mile (CAT-I PA)	
1600	Lower than ½ mile but not lower than ¼ mile (CAT-II PA)	
1200	Lower than ¼ mile (CAT-III PA)	

*Source: FAA AC 150/5300-13B; *Runway Visibility Range (RVR) values are not exact equivalents*
APV = Approach with Vertical Guidance, PA = Precision Approach

Figure B-2 – Taxiway Design Group

Source: FAA AC 150/5300-13B Figure 1-1

Figure 1-1. Taxiway Design Groups (TDGs)



Note: Values in the graph are rounded to the nearest foot. 1 foot = 0.305 meters.

Airport Design Principles

Other airport design principles are important to consider for a safe and efficient airport design:

- **Runway/Taxiway Configuration:** The configuration of runways and taxiways affects the airport's capacity/delay, risk of incursions with other aircraft on the runway and overall operational safety. Location of and type of taxiways connecting with runways correlates to runway occupancy time. The design of taxiway infrastructure should promote safety by minimizing confusing or complex geometry to reduce risk of an aircraft inadvertently entering the runway environment.
- **Approach and Departure Airspace & Land Use**: Runways each have imaginary surfaces that extend upward and outward from the runway end to protect normal flight operations. Runways also have land use standards beyond the runway end to protect the flying public as well as persons and property on the ground from potential operational hazards. Runways must meet grading and clearance standards considering natural and man-made obstacles that may obstruct these airspace surfaces. Surrounding land use should be compatible with airport operations. Airports should develop comprehensive land use controls to prevent new hazards outside the airport property line. Obstructions can limit the utility of a runway.
- **Meteorological Conditions**: An airport's runways should be designed so that aircraft land and takeoff into the prevailing wind. As wind conditions change, the addition of an additional runway may be needed to mitigate the effects of significant crosswind conditions that occur more than five percent of the year. Airports that experience lower cloud ceiling and/or visibility should also

consider implementing an instrument procedures and related navigational aids to runways to maximize airport utility.

- **Controller Line of Sight**: The local Airport Traffic Control Tower (ATCT) relies on a clear line of sight from the controller cab to the airport's movement areas which includes the runways, taxiways, aprons, and arrival/departure corridors. Structures on an airport need to consider this design standard, and in some cases, require the completion of a shadow study to demonstrate no adverse impact. This standard only applies to airports with a local ATCT.
- **Navigation Aids & Critical Areas:** Visual navigational aids (NAVAIDs) to a runway or the airfield require necessary clear areas for these NAVAIDs to be effective for pilots. Instrument NAVAIDs on an airport require sufficient clear areas for the NAVAID to properly function without interference to provide guidance to pilots. These NAVAID protection areas restrict development.
- **Airfield Line of Sight:** Runways need to meet grading standards so that objects and aircraft can be seen along the entire runway. A clear line of sight is also required for intersecting runways within the Runway Visibility Zone to allow pilots to maintain visual contact with other objects and/or aircraft that may pose a hazard.
- **Interface with Landside:** The airfield configuration should be designed to provide for the safe and efficient operation of aircraft as they transition from the airfield to landside facilities such as hangars and terminals.
- **Environmental Factors:** Airport development must consider potential impacts in and around the airport environs through the National Environmental Policy Act (NEPA). Additionally, development should also reduce the risk of potential wildlife hazards such as deer and birds that may cause hazards to flight operations.

Design Codes

Runway designs are based on specific FAA runway design standards. These standards, found in FAA AC 150/5300-13B, provide basic guidelines for a safe and efficient airport system, and are based on the most demanding or "design" aircraft expected to use the runway. Runway lengths are related to the design aircraft but are determined in accordance with procedures detailed in the current version of FAA AC 150/5325-4, *Runway Length Requirements for Airport Design*. All other critical dimensions related to the design aircraft are found in FAA AC 150/5300-13B, including dimensions for runway widths, safety areas and separations from other infrastructure.

There are several ways in which the codes from **Figure B-1** are used. These include codes that recognize existing conditions, codes that identify planned capabilities, codes that are for specific runways and codes for the airport. These codes are as follows.

Airport Reference Code (ARC)

The Airport Reference Code (ARC) is an airport designation that represents the AAC and ADG of the aircraft that the entire airfield is intended to accommodate on a regular basis. The ARC is used for planning and design only and does not limit the aircraft that may be able to operate safely on the airport.

Runway Design Code (RDC)

RDC is a code signifying the design standards to which the overall runway is to be planned and built, typically based on the AAC, ADG and approach visibility minimums for a runway. RDC provides the information needed to determine the design standards that apply.

Approach Reference Code (APRC)

The APRC is composed of the AAC, the ADG, and the visibility minimums. See **Figure B-3**. APRC signifies the current operational capabilities of a runway and associated parallel taxiway for landing operations. The visibility minimums are linked to critical standards that determine which aircraft can operate on taxiways adjacent to a runway under meteorological conditions with no special operational procedures necessary.

Figure B-3 – Approach Reference Code

Visibility Minimums	Runway to Taxiway Separation (ft)										
	≥ 150	≥ 200	≥ 225	≥ 240	≥ 250	≥ 300	≥ 350	≥ 400	≥ 450	≥500	≥550
Not lower than 3/4 mile (1.2 km) [4000 RVR]	B/I(S)/ 4000	B/I(S)/ 4000	B/I/ 4000	B/II/ 4000	B/II/ 4000	B/III/ 4000 D/II/ 4000	B/III/ 4000 D/II/ 4000	D/IV/ 4000 D/V/ 4000 [1]	D/IV/ 4000 D/V/ 4000 [2]	D/V/ 4000 [3] D/VI/ 4000	D/IV/ 4000
Lower than 3/4 mile (1.2 km) but not lower than 1/2 mile (0.8 km) [2400 RVR]	N/A	B/I(S)/ 2400	B/I(S)/ 2400	B/I(S)/ 2400	B/I/ 2400	B/II/ 2400	B/III/ 2400	D/IV/ 2400 D/V/ 2400 [1]	D/IV/ 2400 D/V/ 2400 [2]	D/V/ 2400 [3] D/VI/ 2400	D/IV/ 2400
Lower than 1/2 mile (0.8 km) but not lower than 1/4 mile (0.4 km) [1600 RVR]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	D/IV/ 1600	D/IV/ 1600	D/V/ 1600	D/VI/ 1600
Lower than 1/4 mile (0.4 km) [1200 RVR]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	D/IV/ 1200	D/IV/ 1200	D/V/ 1200	D/VI/ 1200

Note 1: Airport elevation at or below 1,345 ft (410 m).
Note 2: Airport elevation between 1,345 ft (410 m) and 6,560 ft (2,000 m).
Note 3: Airport elevation above 6,560 ft (2,000 m).

General Notes:

- (S) denotes small aircraft
- Entries for Approach Category D also apply to Approach Category E. However, there are no Approach Category E aircraft currently in the civil fleet.
- For ADG-VI aircraft with tail heights of less than 66 feet (20.1 m), ADG-V separation standards apply.
- 1 ft = 0.305 m

Source: FAA AC 150/5300-13B Figure L-1

Departure Reference Code (DPRC)

DPRC signifies the runway's operational capabilities for takeoff operations. See **Figure B-4**. The DPRC code is the like the APRC code, but is comprised of two components, AAC and ADG. It represents those aircraft that can takeoff from a runway while any aircraft are present on adjacent taxiways, under meteorological condition with no special procedures necessary.

Figure B-4 – Departure Reference Code

Runway to Taxiway Separation (ft)					
≥ 150	≥ 225	≥ 240	≥ 300	≥ 400	≥ 500
B/I(S)	B/I	B/II	B/III D/II	D/IV D/V	D/VI [1]

Note 1: Refer to Figure L-1. ADG-VI airplanes may depart with aircraft on the parallel taxiway where the runway to taxiway separation is as little as 400-feet (122 m) under these two scenarios:

a. No ADG-VI aircraft is occupying the parallel taxiway beyond 1,500 feet (457 m) of the point of the start of takeoff roll.
b. No aircraft, regardless of size, is occupying the parallel taxiway beyond 1,500 feet (457 m) of the point of the start of takeoff roll when there is snow, ice, or slush contamination on the runway.

General Notes:

- (S) denotes small aircraft
- Entries for Approach Category D also apply to Approach Category E. However, there are no Approach Category E aircraft currently in the civil fleet.
- 1 ft = 0.305 m

Source: FAA AC 150/5300-13B Figure L-2

Small Category

One additional unique coding is the use of the term 'small'. Small aircraft are those that have a maximum certificated takeoff weight of 12,500 pounds or less. Aircraft in categories A and B may be further designated as 'small' which has different standards than larger aircraft. The 'small' term is used with the ARC or RDC but not with APRC or DPRC. The term small is not used for C, D, or E aircraft. As an example, the term will be used as 'B-II (Small)' with a small aircraft as compared to 'B-II' only when referring to larger aircraft.

Code Context

It is critical to understand the context in which the specific code is being used. For example, depending where the code is being used, a C-II-2400 code would have the following meanings:

- **Critical Design Aircraft:** A C-II aircraft is what the runway was either built for what the runway is being designed for. Referencing **Figure B-1**, a C-II aircraft is an aircraft with an approach speed between 121 and 140 knots, and a wingspan between 49 and 78 feet or a tail height between 20 and 29 feet.
- **Runway Design Code (RDC):** The planned runway will be designed to meet the FAA runway design standards for a C-II aircraft with a visibility minimum as low as ½ mile.
- **Approach Reference Code (APRC)**: The runway currently meets the FAA runway design standards for a C-II aircraft with a visibility minimum as low as ½ mile and with a C-II aircraft on the adjacent parallel taxiway.

- **Departure Reference Code (DPRC):** The runway currently meets the FAA runway design standards for a C-II aircraft departing the runway with a C-II aircraft on the adjacent parallel taxiway.
- **Airport Reference Code (ARC):** The ARC can be used to discuss the operational capability of an existing airport, i.e., if the highest RDC of existing runways at an airport is C-II, the airport would have an ARC of C-II. The ARC can also be used to discuss the planned capability of an airport, i.e., an airport will be designated as an ARC C-II airport when the highest RDC of the planned runways is C-II.

Runway Design Standards

Basic runway design standards vary based on the RDC and RRC as established by the design aircraft. Some of the safety standards include:

- **Runway Width:** The physical width of the runway pavement.
- **Runway Safety Area (RSA):** A defined graded 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. The RSA must be free of objects, except those required to be in the RSA to serve their function. The RSA should also be capable to supporting airport equipment and the occasional passage of aircraft.
- **Runway Object Free Area (ROFA):** An area centered on the ground on a runway provided to enhance the safety of aircraft operations by remaining clear of objects, except for objects that need to be in the OFA for air navigation or aircraft ground maneuvering purposes.
- **Runway Obstacle Free Zone (ROFZ):** The OFZ is the three-dimensional volume of airspace along the runway and extended runway centerline that is required to be clear of taxiing or parked aircraft as well as other obstacles that do not need to be within the OFZ to function. The purpose of the OFZ is for protection of aircraft landing or taking off from the runway and for missed approaches.
- **Runway Protection Zone (RPZ):** The RPZ is a trapezoidal area located 200 feet beyond the runway end and centered on the extended runway centerline. The RPZ is primarily a land use control that is meant to enhance the protection of people and property near the airport through airport control. Such control includes clearing of RPZ areas of incompatible objects and activities. If a special application of declared distances is used, separate approach and departure RPZs are required.
- **Runway Line of Sight**: Along individual runways, a point 5 feet above the runway must be mutually visible with any other point 5 feet above the runway centerline. For intersecting runways, Runway Visibility Zone (RVZ) standards require a clear visible 5-foot high line-of-sight to enhance safety amongst airport users when runways intersect.

Other basic runway design standards include:

- Runway surface gradient
- Runway shoulder width to prevent soil erosion or debris ingestion for jet engines,
- Blast pad to prevent soil erosion from jet blast
- Required separation distances to markings, objects, and other infrastructure for safety
- Parallel runway separation distances

There are also critical areas associated with navigational aids as well as airspace clearance requirements for runways.

Runway Protection Zones

The Runway Protection Zone (RPZ) is a trapezoidal land use area at ground level prior to the landing threshold or beyond the departure runway end. The RPZ's function is to enhance the protection of people and property on the ground. The RPZ size varies based on the runway's RDC. The RPZ is further broken down into two types and two areas:

- **Approach RPZ:** Approach RPZ starts 200 feet from the runway threshold.
- **Departure RPZ:** Departure RPZ extends 200 feet from the runway end or claimed Takeoff Runway Available (TORA).
- **Central Portion:** Land within the RPZ centered on runway centerline with a width matching the width of the ROFA.
- **Controlled Activity Area:** Land with the RPZ on the sides of the central portion.

FAA permissible land uses without further evaluation include farming that meets airport design standards, irrigation channels that do not attract wildlife, controlled airport service roads, underground facilities and unstaffed NAVAIDs that are required to be within the RPZ. Airport owners should, at a minimum, maintain the RPZ clear of all facilities supporting incompatible activities. It is desirable to clear all above-ground objects from the RPZ. **Figure B-5** graphically depicts the characteristics of an RPZ and **Figure B-6** provides the dimensions.

Figure B-5 – FAA Runway Protection Zone

Figure 3-26. Runway Protection Zone (RPZ), Runway Object Free Area (ROFA), and Runway Safety Area (RSA)

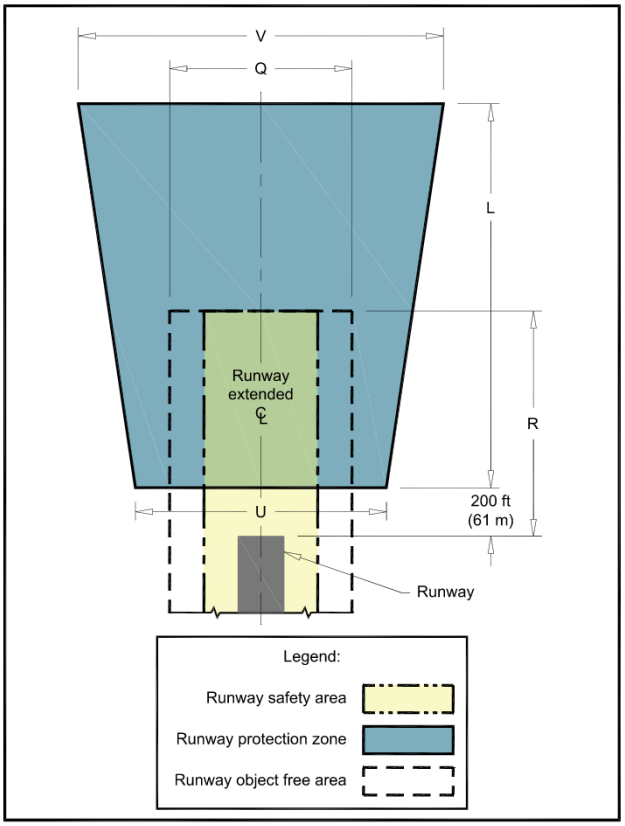
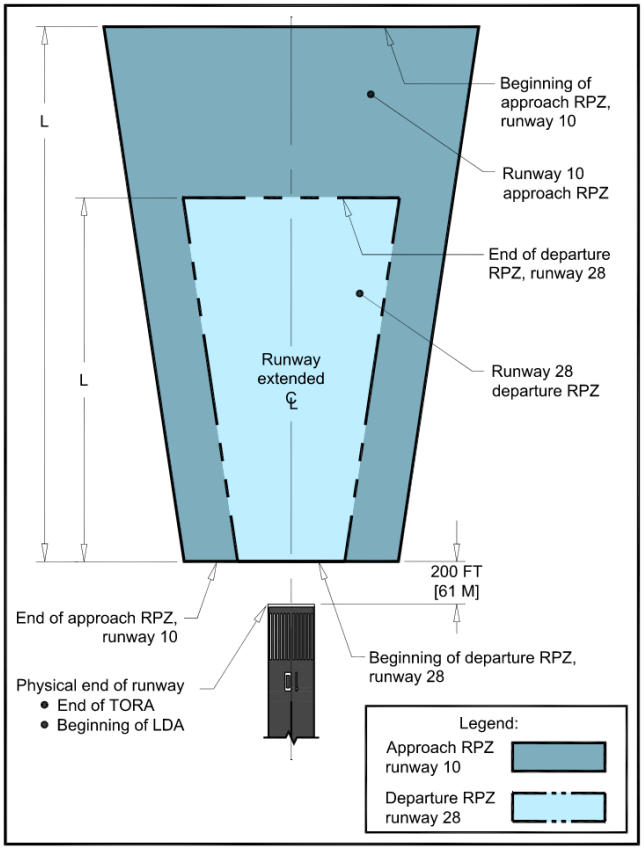


Figure 3-27. Runway with all Declared Distances Equal to the Runway Length



Source: FAA AC 150/5300-13B Figures 3-26 and 3-27

Figure B-6 – Runway Protection Zone Sizes

Runway Protection Zone Dimensions					
AAC	**ADG**	**Visibility Minimums**	**Length (L)**	**Inner Width (U)**	**Outer Width (V)**
A/B*	I, II	Visual, Not Lower than 1 mile	1,000	250	450
A/B	I, II, III, IV	Visual, Not Lower than 1 mile	1,000	500	700
A/B	I, II, III, IV	Not Lower than ¾ mile	1,700	1,000	1,510
C/D/E	I, II, III, IV, V, VI	Visual, Not Lower than 1 mile, Not Lower than ¾ mile	1,700	1,000	1,510
A/B, C/D/E	I, II, III, IV, V, VI	Lower than ¾ mile	2,500	1,000	1,750

*Source: FAA AC 150/5300-13B Appendix G; * Small (up to 12,500 lbs MTOW)*

Protection of the RPZ is achieved through airport control over RPZs including fee title ownership or clear zone easement. The increased emphasis has resulted in additional requirements to monitor and analyze RPZs for conformance to established policies and standards.

In September 2012, FAA issued an interim policy on activities within an RPZ providing airports with guidance on land use compatibility standards. The standards from the interim guidance are summarized below:

- **New or Modified Land Uses:** FAA coordination is required for new or modified land uses within the RPZ because of an airfield project, change in RPZ dimensions or local development proposal.
- **Land Uses Requiring FAA Coordination:** Building and structures, recreational land uses, transportation facilities (i.e. roads, parking, rail), fuel storage, hazardous material storage, wastewater treatment, above-ground utility infrastructure
- **Alternatives Analysis:** A full range of alternatives must be evaluated prior to FAA coordination that avoid introducing the land use into the RPZ, minimize the impact of the land use in the RPZ and mitigate risk to people and property on the ground.
- **Existing Land Uses in the RPZ:** No change in policy, airports should work with FAA to remove or mitigate the risk of any existing incompatible land uses in the RPZ. Incompatible land uses in the RPZ from previous FAA guidance include but are not limited to residences, places of public assembly (i.e. uses with high concentration of persons), fuel storage facilities and wildlife attractants.

FAA has acknowledged the ongoing update to the land use compatibility advisory circular where an RPZ land use consideration section will be added.

FAA Runway Approach/Departure Surfaces

FAA identifies sloping approach surfaces that must be cleared at an absolute minimum for safety for landing and departing aircraft. These approach surfaces are outlined in paragraph 3.6 of FAA AC 150/5300-13B and portrayed in Tables 3-2, 3-3 and 3-4 of the AC. The approach surface tables and respective figures are shown in **Figure B-7, B-8** and **B-9** as follows. All objects must clear the surface for the applicable runway operational design standard to meet minimum aviation safety standards for a given runway landing threshold location. Approach airspace penetrations typically require the removal of the object, operational restrictions, or the runway landing threshold to be shifted or displaced down the runway.

The departure surface applies to runways where instrument departures are allowable. These departure surface is outlined in paragraph 3.6 of FAA AC 150/5300-13B and portrayed in Tables 3-5 of the AC. The departure surface table and respective figure is shown in **Figure B-10**. The surface begins at the end of the takeoff distance available and extends upward and outward at a 40:1 slope. No new penetrations are allowed unless an FAA study has been completed and a determination of no hazard has been issued. Penetrations to the departure surface may require the obstacle to be published, or require mitigation including increasing the minimum aircraft climb rate or runway length operational restrictions.

Mitigation options generally include obstruction removal, lighting/marking, declared distances and/or adjustment of the visual guidance slope indicator angle. Other long-term options include reconfiguring the runway or modifying design standards. New development should be clear of airspace surfaces.

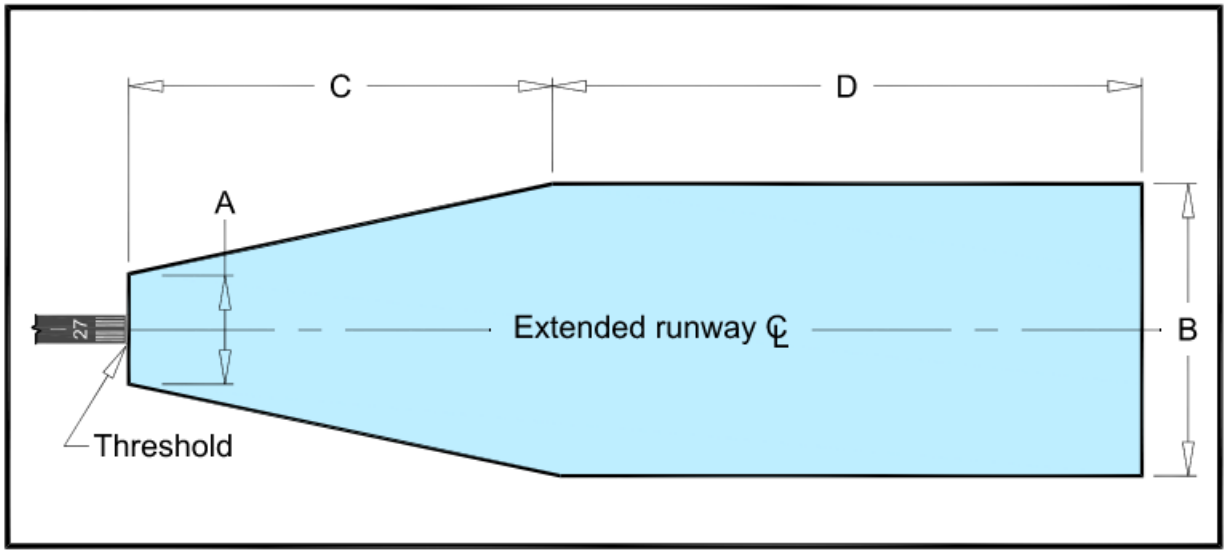
Figure B-7 – FAA Visual Approach Table 3-2

Table 3-2. Visual Approach Surfaces

Surface	Runway Type	A ft (m)	B ft (m)	C ft (m)	D ft (m)	Slope
Surface 1	Approach end of runways serving small airplanes with approach speeds less than 50 knots.	120 (37)	300 (91)	500 (152)	2,500 (762)	15:1
Surface 2	Approach end of runways serving small airplanes with approach speeds of 50 knots or more.	250 (76)	700 (213)	2,250 (686)	2,750 (838)	20:1
Surface 3	Approach end of runway serving large airplanes (>12,500 lbs (5,669 kg))	400 (122)	1,000 (305)	1,500 (457)	8,500 (2,591)	20:1

Note: Approach surface begins at the runway threshold.

Figure 3-5. Visual Approach Surfaces



Note 1: Refer to Table 3-2 for dimensional values.
Note 2: Surface slopes upward and away from starting point.

Source: FAA AC 150/5300-13B Table 3-2

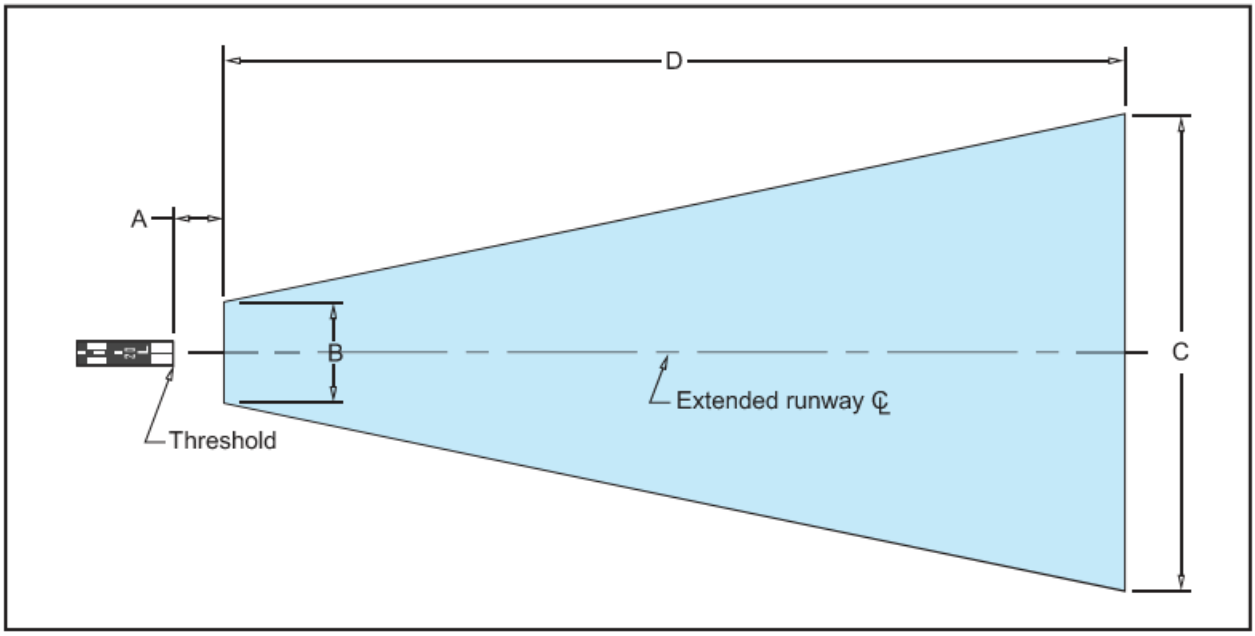
Figure B-8 – FAA NPI Approach Table 3-3

Table 3-3. Non-Precision and IFR Circling Approach Surfaces

Surface	Runway Type	Visibility minimums	A ft (m)	B ft (m)	C ft (m)	D ft (m)	Slope
Surface 4	Approach end of runways that supports IFR circling procedures and procedures only providing lateral guidance (VOR, NDB, LNAV, LP, and LOC).	≥ ¾ statute mile (1.2 km)	200 (61)	400 (122)	3,400 (1,036)	10,000 (3,048)	20:1
		< ¾ statute mile (1.2 km)	200 (61)	400 (122)	3,400 (1,036)	10,000 (3,048)	34:1

Note 1: Dimension A is relative to the runway threshold.
Note 2: Refer to the U.S Terminal Procedures Publication (TPP) to determine if circling minimums are available.
Note 3: Marking and lighting of obstacle penetrations to this surface or the use of a Visual Guidance Lighting System (VGLS) may mitigate displacement of the threshold. Contact the Flight Procedures Team if existing obstacles penetrate this surface.
Note 4: 10,000 feet (3,048 m) represents a nominal value for planning purposes. The length is dependent on the Visual Descent Point (VDP) location.

Figure 3-6. Non-Precision and IFR Circling Approach Surfaces



Note: Refer to Table 3-3 for dimensional values.

Source: FAA AC 150/5300-13B Table 3-3

Figure B-9 – FAA APV and PA Approach Table 3-4

Table 3-4. APV and PA Instrument Runway Approach Surfaces

Surface	Runway Type	Visibility minimums	A ft (m)	B ft (m)	C ft (m)	D [4] ft (m)	Slope
Surface 5	Approach end of runways providing ILS, MMLS, PAR, and landing distance available (LDA) with glidepath, LPV, LNAV/VNAV, RNP, or GLS.	≥ ¾ statute mile (1.2 km)	200 (61)	400 (122)	3,400 (1,036)	10,000 (3,048)	20:1
		< ¾ statute mile (1.2 km)	200 (61)	400 (122)	3,400 (1,036)	10,000 (3,048)	34:1
Surface 6	Approach end of runways providing ILS, MMLS, PAR, and LDA with glidepath, LPV, LNAV/VNAV, RNP, or GLS.	All	0	Runway Width + 200 (61)	1,520 (463)	10,200 (3,109)	30:1

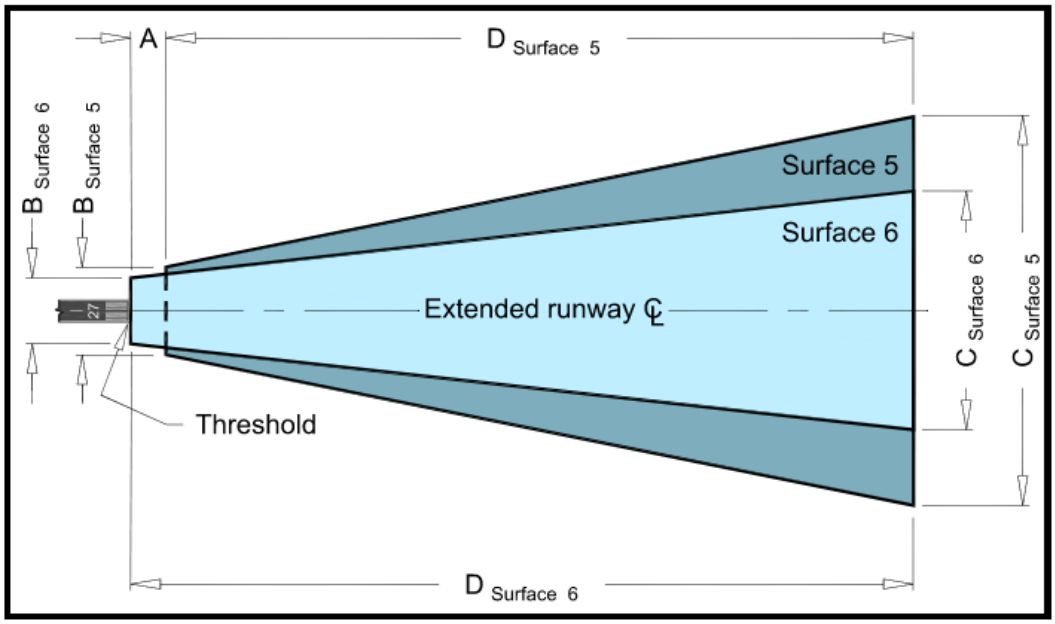
Note 1: Dimension A is relative to the runway threshold.

Note 2: Surface 5 represents the TERPS visual portion of the final approach segment. Surface 6 represents the TERPS Vertical Guidance Surface (VGS). Both surfaces apply for APV and PA procedures. Contact the Flight Procedures Team if existing obstacles penetrate this surface.

Note 3: The FAA assesses TERPS final approach segment criteria (e.g., W, X, Y surfaces) for all runway ends authorized for ILS, mobile microwave landing system (MMLS), precision approach radar (PAR), and LDA with glide slope, LPV, and GLS procedures. Refer to FAA Order 8260.3 for additional information on TERPS surfaces.

Note 4: Represents a nominal value for planning purposes. The actual length depends on the precision final approach fix.

Figure 3-7. Approach Procedure with Vertical Guidance (APV) and Precision Approach (PA) Instrument Runway Approach Surfaces



Note: Refer to Table 3-4 for dimensional values.

Source: FAA AC 150/5300-13B Table 3-4

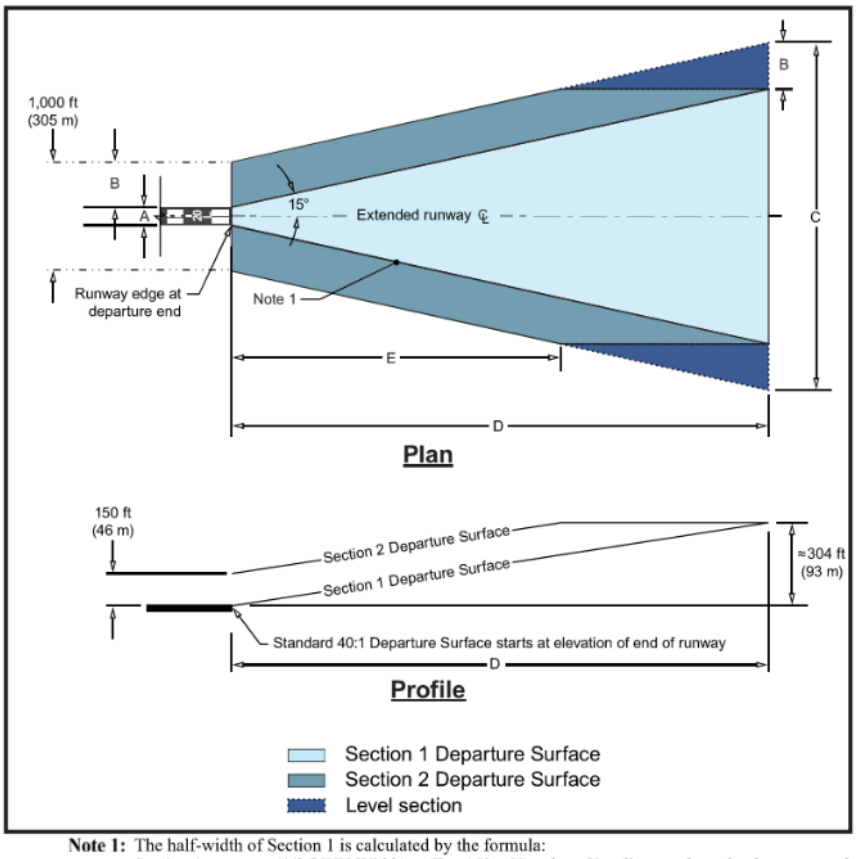
Figure B-10 – FAA Departure Table 3-5

Table 3-5. Instrument Departure Surface

Surface	Runway Type	A ft (m)	B ft (m)	C ft (m)	D [4] ft (m)	E ft (m)	Section 2 Angle θ [2]	Section 2 Transverse Slope m [2]
Surface 7	Runways providing instrument departure operations	60 (18.3)	470 (143)	7,512 (2,290)	12,152 (3,704)	6,152 (1,875)	17:7	3.13:1
		75 (22.9)	462.5 (141)				18.0	3.08:1
		100 (30.5)	450 (137)				18.4	3.00:1
		150 (46)	425 (130)				19.4	2.83:1
		200 (61)	400 (122)				20.6	2.67:1

Note 1: Section 1 of the departure surface starts at the DER elevation for the width of the runway and rises along the extended runway centerline at 40:1. Section 2 starts at an equal elevation to the adjoining Section 1. Section 2 continues until reaching 304 ft (93 m) and then levels off until reaching the line where Section 1 and Section 2 reach 304 ft (93 m) above DER elevation, then that part of Section 2 that leveled off continues at a 40:1 slope.
Note 2: See Figure 3-11 for a graphical depiction of these values.
Note 3: The start of the surface is relative to the departure end of the runway. For runways with published declared distances, the TODA indicates the beginning of the departure surface. See Figure 3-10.
Note 4: 12,152 feet (3,704 m) represents a 2 nm nominal value for planning purposes.
Note 5: For other runway width values, interpolation is required to determine the value of "B", the Section 2 angle, and the Section transverse slope.

Figure 3-9. Instrument Departure Surface



Note 1: The half-width of Section 1 is calculated by the formula:
Section $1_{\text{Half Width}}$ = (1/2 RWY Width) + (Tan 15° × X), where X = distance from the departure end of the runway.

Source: FAA AC 150/5300-13B Table 3-5

Instrument Procedures

Instrument approach procedures to a runway end are used by landing aircraft to navigate to the airport during instrument conditions when the cloud ceiling is less than 1,000 feet and/or visibility is less than 3 miles. Establishing approaches with the lowest possible weather minimums allow the airport to maximize its operational utility. Each approach type requires differing infrastructure and navigational aids. Types of approach procedures include non-precision approach (NPA), approach with vertical guidance (APV) and precision approach (PA). FAA airport design standards must be met as shown in **Figure B-11** and **Figure B-12**. Coordination with FAA Flight Procedures Office is recommended to review the feasibility of implementing any new approach procedure.

Figure B-11 – FAA Airport Design Standards for Instrument Approach Procedures

Table K-1. Criteria to Support Instrument Flight Procedure Development

Standards [1]	Visibility Minimums [1]			
	< 3/4 statute mile (1.2 km)	3/4 (1.2 km) to < 1 statute mile (1.6 km)	≥ 1 statute mile (1.6 km) straight-in	Circling [2] ≥ 1 statute mile (1.6 km)
HAT [3]	≤ 250 ft	≥ 250 ft	≥ 250 ft	≥ 350 ft
POFZ (PA and APV only)	Required	Not Required	Not Required	Not Required
IT-OFZ	Required	Not Required	Not Required	Not Required
ALP [4]	Required	Required	Required	Required
Minimum Runway Length	4,200 ft	3,200 ft [5]	3,200 ft [5]	3,200 ft [5]
Paved Surface	Required	Recommended [6]	Recommended [6]	Recommended [6]
Runway Markings (See AC 150/5340-1)	Precision	Non-precision	Non-precision	Visual
Holding Position Signs and Markings (See AC 150/5340-1, AC 150/5340-18)	Required	Required	Required	Required [6]
Runway Edge Lights [7]	HIRL or MIRL	HIRL or MIRL	MIRL or LIRL	MIRL or LIRL (Required only for night minimums)
Parallel Taxiway [8]	Required	Required	Recommended	Recommended
Approach Lights [9]	Required	Recommended [10]	Recommended [10]	Not Required
VGSI [11]	Recommended	Recommended	Recommended	Recommended
Applicable Runway Design Standards, (Reference online Runway Design Standards Matrix Tool or Appendix G)	Lower than 3/4 mile (1.2 km) visibility minimums	Not lower than 3/4 mile (1.2 km) visibility minimums	Not lower than 1 mile (1.6 km) visibility minimums	Not lower than 1 mile (1.6 km) visibility minimums
Approach or Departure Surface to be Met (Reference paragraph 3.6.1)	See Table 3-3 or Table 3-4	See Table 3-3 or Table 3-4	See Table 3-3 or Table 3-4	Table 3-3
Optimum Survey Type [12]	VGS	VGS	NVGS	NVGS [13]

Note: 1 ft = 0.305 m

Source: FAA AC 150/5300-13B, Airport Design, Table K-1

Figure B-12 – FAA Airport Design Standards for Instrument Approach Procedures Notes

Numbered Notes for Table K-1:

Note 1: Visibility minimums and described standards are subject to the application of FAA Order 8260.3 (TERPS) and associated orders. For each level of visibility, meet or exceed the optimum conditions within the column.

Note 2: For runways authorized for circling, meet requirements for threshold siting (reference paragraph 3.5) and OFZ (reference paragraph 3.11).

Note 3: HAA for circling. The HAT/HAA indicated is for planning purposes; actual obtainable HAT/HAA is determined by TERPS and may be higher due to obstacles or other requirements.

Note 4: An ALP is only required for obligated airports in the NPIAS; it is recommended for all others.

Note 5: Runways less than 3,200 ft (975 m) are protected by 14 CFR Part 77 to a lesser extent. However, runways as short as 2,400 ft (732 m) could support an instrument approach provided the lowest HAT is based on clearing any 200-ft (61 m) obstacle within the final approach segment.

Note 6: Unpaved runways require case-by-case evaluation by the IFP Validation Team (IVT).

Note 7: Runway edge lighting is required for night approach minimums. High intensity lights and an RVR touchdown zone sensor are required for RVR-based minimums.

Note 8: A full-length parallel taxiway leading to and from the thresholds is advisable to achieve the lowest possible minimums, and minimizes the time aircraft are on the runway. Refer to the minimum visibility requirements on airport conditions in FAA Order 8260.3. Construction of a parallel taxiway, while advisable, is not a requirement for publication of an IFP with visibility minima ≥ 1 statute mile (1.6 km).

Note 9: Not applicable to Performance Based Navigation procedures. The following standards are applicable to conventional, ground-based procedures. A full approach light system (ALSF-1, ALSF-2, Simplified Short Approach Light System with Runway Alignment (SSALR), or MALSR) is required for visibility < 3/4 statute mile (1.2 km). Intermediate (MALSF, MALS, SSALF, SSALS, Short Approach Lighting System (SALS)/SALSF) or Basic (ODALs) systems will result in higher visibility minimums. An ALSF-1 or ALSF-2 is required for CAT II/III ILS. HAT < 250 ft (76 m) without MALSR, SSALR, or ALSF is permitted with visibility not less than 3/4 statute mile.

Note 10: ODALS, MALS, SSALS, and SALS are acceptable. Approach lights are recommended where a visibility minima improvement of at least 1/4 statute mile (0.4 km) can be achieved.

Note 11: To preclude a non-standard IFP, it is critical the instrument approach vertical descent angle (VDA) or glidepath angle (GPA) is coincident with the VGSI angle.

Note 12: See AC 150/5300-18 for VGS and non-Vertically Guided Survey (NVGS) requirements. When an AC 150/5300-18 VGS is not available, the equivalent legacy vertically guided (VG) surveys are area navigation approach precision vertical landing (ANAPV)/ localizer performance with vertical guidance (LPV)/PC, and PIR.

Note 13: Absence of a survey does not preclude authorization to establish circling to a runway but may result in the procedure being restricted to daytime only operations.

Taxiway Design Standards

Taxiways provide for the safe and efficient movement of aircraft between the runway and other operational areas of the airport. The taxiway system should provide critical links to airside infrastructure, increase capacity and reduce the risk of an incursion with traffic on the runway.

System Design

FAA has placed a renewed emphasis on taxiway design in their updated airport design standards. Fundamental elements help develop and efficient system to meet demands, reduce pilot confusion and enhance safety. Considerations include:

- Design taxiways to meet FAA design standards for existing and future users considering expandability of airport facilities.

- Design taxiway intersections so the cockpit is over the centerline with a sufficient taxiway edge safety margin.
- Simplify taxiway intersections to reduce pilot confusion using the three-node concept, where a pilot has no more than three choices at an intersection.
- Eliminate "hot spots" identified by the FAA Runway Safety Action Team where enhanced pilot awareness is encouraged.
- Minimize the number of runway crossings and avoid direct access from the apron to the runway.
- Eliminate aligned taxiways whose centerline coincides with a runway centerline.
- Other considerations include avoiding wide expanses of pavement and avoiding "high energy intersections" near the middle third of a runway.

Design Standards

Taxiways are subject to FAA design requirements such as pavement width, edge safety margins, shoulder width, and safety and object free area dimensions. The design standards vary based on individual aircraft geometric and landing gear characteristics. The Taxiway Design Group (TDG) and Airplane Design Group (ADG) identified for the design aircraft using a taxiway. The FAA standards in relation to taxiways (as defined in FAA AC 150/5300-13B) are described below. See **Figure B-13** for Taxiway Design Standards.

- **Taxiway Width**: The physical width of the taxiway pavement.
- **Taxiway Edge Safety Margin**: The minimum acceptable distance between the outside of the airplane wheels and the pavement edge.
- **Taxiway Shoulder Width**: Taxiway shoulders provide stabilized or paved surfaces to reduce the possibility of blast erosion and engine ingestion problems associated with jet engines which overhang the edge of the taxiway pavement.
- **Taxiway/Taxilane Safety Area (TSA)**: The TSA is located on the taxiway centerline and shall be cleared and graded, properly drained, and capable, under dry conditions, of supporting snow removal equipment, ARFF equipment, and the occasional passage of aircraft without causing structural damage to the aircraft.
- **Taxiway Edge Safety Margin (TESM):** The minimum acceptable distance between the outside of the airplane wheels and the pavement edge.
- **Taxiway/Taxilane Object Free Area (TOFA):** The TOFA is centered on the taxiway centerline and prohibits service vehicle roads, parked airplanes, and above ground objects, except for objects that need to be in the TOFA for air navigation or aircraft ground maneuvering purposes.
- **Taxiway Separation Standards:** Separation standards between the taxiways and other airport facilities are established to ensure operational safety of the airport and are as follows:
    - Taxiway centerline to parallel taxiway/taxilane centerline
    - Taxiway centerline to fixed or moveable object

Other design standards include taxiway shoulder width to prevent jet blast soil erosion or debris ingestion for jet engines and required separation distances to other taxiways/taxilanes.

Figure B-13 – Taxiway Design Standards Table 4-1 and 4-2

Table 4-1. Design Standards Based on Airplane Design Group (ADG)

Item	ADG					
	I	II	III	IV	V	VI
Taxiway and Taxilane Protection						
TSA (maximum ADG wingspan)	49 ft (14.9 m)	79 ft (24.1 m)	118 ft (36 m)	171 ft (52 m)	214 ft (65 m)	262 ft (80 m)
TOFA [2]	89 ft (27.1 m)	124 ft (38 m)	171 ft (52 m)	243 ft (74 m)	285 ft (87 m)	335 ft (102 m)
TLOFA [2]	79 ft (24.1 m)	110 ft (34 m)	158 ft (48 m)	224 ft (68 m)	270 ft (82 m)	322 ft (98 m)
Taxiway and Taxilane Separation						
Taxiway centerline to parallel taxiway centerline [1]	70 ft (21.3 m)	102 ft (31 m)	144 ft (44 m)	207 ft (63 m)	249 ft (76 m)	298 ft (91 m)
Taxiway centerline to fixed or movable object [2]	44.5 ft (13.6 m)	62 ft (18.9 m)	85.5 ft (26.1 m)	121.5 ft (37 m)	142.5 ft (43 m)	167.5 ft (51 m)
Taxilane centerline to parallel taxilane centerline [1]	64 ft (19.5 m)	94 ft (29 m)	138 ft (42 m)	198 ft (60 m)	242 ft (74 m)	292 ft (89 m)
Taxilane centerline to fixed or movable object [2]	39.5 ft (12.2 m)	55 ft (16.8 m)	79 ft (24.1 m)	112 ft (34 m)	135 ft (41 m)	161 ft (49 m)
Wingtip Clearance						
Taxiway wingtip clearance	20 ft (6.1 m)	23 ft (7 m)	27 ft (8.2 m)	36 ft (11 m)	36 ft (11 m)	36 ft (11 m)
Taxilane wingtip clearance	15 ft (4.6 m)	16 ft (4.9 m)	20 ft (6.1 m)	27 ft (8.2 m)	28 ft (8.5 m)	30 ft (9.1 m)

Note 1: See Figure 4-5.
Note 2: See Figure 4-6.
Note 3: See paragraphs 4.5.3.1 and 4.5.4.1 for TSA and TOFA standards at fillets.

Table 4-2. Design Standards Based on Taxiway Design Group (TDG)

Item	TDG							
	1A	1B	2A	2B	3	4	5	6
Taxiway/Taxilane Width [1]	25 ft (7.6 m)	25 ft (7.6 m)	35 ft (10.7 m)	35 ft (10.7 m)	50 ft (15.2 m)	50 ft (15.2 m)	75 ft (22.9 m)	75 ft (22.9 m)
Taxiway Edge Safety Margin [1]	5 ft (1.5 m)	5 ft (1.5 m)	7.5 ft (2.3 m)	7.5 ft (2.3 m)	10 ft (3 m)	10 ft (3 m)	14 ft (4.3 m)	14 ft (4.3 m)
Taxiway Shoulder Width [2]	10 ft (3 m)	10 ft (3 m)	15 ft (4.6 m)	15 ft (4.6 m)	20 ft (6.1 m)	20 ft (6.1 m)	30 ft (9.1 m)	30 ft (9.1 m)
Taxiway/Taxilane Centerline to Parallel Taxiway/Taxilane Centerline w/180 Degree Turn	See Table 4-6 and Table 4-7.							

Note 1: See Figure 4-4.
Note 2: When the most demanding aircraft has four engines and is ADG-VI, the standard taxiway shoulder width is 40 feet (12.2 m).

Source: FAA AC 150/5300-13B Tables 4-1 and 4-2

Airspace Protection

Airspace is an important resource around airports that is essential for safe flight operations. There are established standards to identify airspace obstructions around airports. FAA grant assurances (obligations) require the airport sponsor to take appropriate action to assure that airspace is adequately

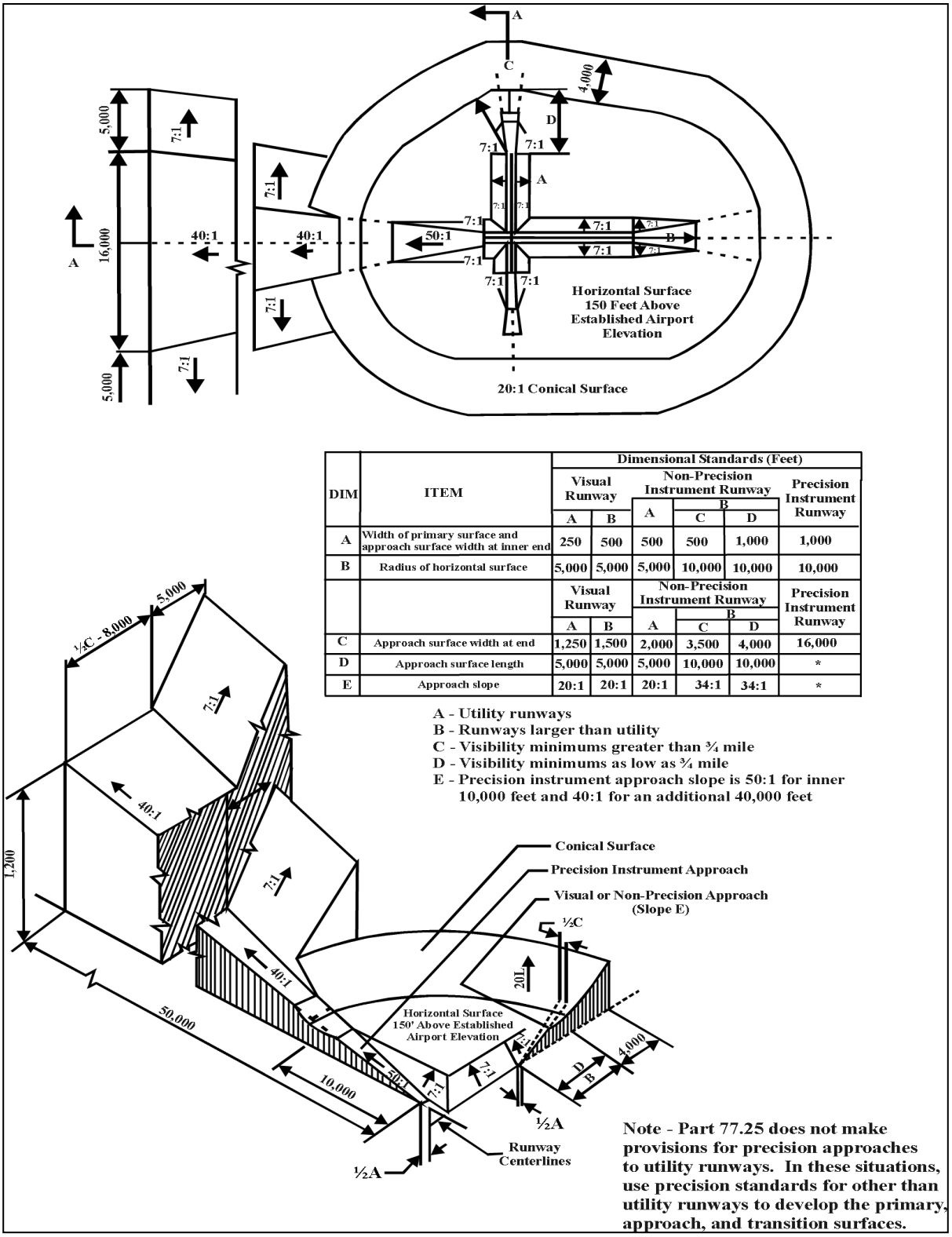
cleared to protect instrument and visual flight operations by removing, lowering, relocating, marking or lighting, or otherwise mitigating existing airport hazards and preventing the establishment or creating of future airport hazards. Examples of obstructions include trees, buildings, poles, towers, terrain, mobile objects, and aircraft tails. Sufficiently clear airspace near the approach and departure runway ends are vitally important for safe airport operations. An FAA aeronautical study should be completed to determine the operational impacts and necessary mitigation of obstructions (i.e. lowering, lighting, marking, publish operational restrictions).

Part 77 Civil Airport Imaginary Surfaces

Title 14 CFR (Code of Federal Regulations) Part 77 *Safe, Efficient Use, and Preservation of the Navigable Airspace* is used to determine whether man-made or natural objects penetrate these "imaginary" three-dimensional airspace surfaces and become obstructions. Federal Aviation Regulation (FAR) Part 77 surfaces are the protective surfaces most often used to provide height restriction zoning protection around an airport. Sufficiently clear airspace is necessary for the safe and efficient use of aircraft arriving and departing an airport. The most demanding approach to a runway defines the Part 77 airspace standards for that runway. These airspace surfaces include the primary, approach, transitional, horizontal, and conical surfaces each with different standards. The slope of an airspace surface is defined as the horizontal distance traveled for each one vertical foot (i.e. 50:1). Part 77 standards are shown in **Figure B-14**.

Of note are the primary surfaces which should be kept clear of non-essential objects above the runway centerline elevation. The approach surface extends upward and outward from the runway. A slope is defined as the horizontal distance traveled for each one vertical foot.

Figure B-14 – FAR Part 77



DIM	ITEM	Dimensional Standards (Feet)					
		Visual Runway		Non-Precision Instrument Runway			Precision Instrument Runway
					B		
		A	B	A	C	D	
A	Width of primary surface and approach surface width at inner end	250	500	500	500	1,000	1,000
B	Radius of horizontal surface	5,000	5,000	5,000	10,000	10,000	10,000
		Visual Runway		Non-Precision Instrument Runway			Precision Instrument Runway
					B		
		A	B	A	C	D	
C	Approach surface width at end	1,250	1,500	2,000	3,500	4,000	16,000
D	Approach surface length	5,000	5,000	5,000	10,000	10,000	*
E	Approach slope	20:1	20:1	20:1	34:1	34:1	*

A - Utility runways
B - Runways larger than utility
C - Visibility minimums greater than ¾ mile
D - Visibility minimums as low as ¾ mile
E - Precision instrument approach slope is 50:1 for inner 10,000 feet and 40:1 for an additional 40,000 feet

Note - Part 77.25 does not make provisions for precision approaches to utility runways. In these situations, use precision standards for other than utility runways to develop the primary, approach, and transition surfaces.

Source: FAA

APPENDIX C: MEETINGS & PUBLIC INVOLVEMENT

Introduction

The Mercer County Regional Airport (HZE) understands the importance of public involvement in the Master Plan Update process. During the scoping meeting, the Airport and KLJ designed a transparent process that allows opportunities for stakeholders to be actively engaged. The Airport also believes that members of the public should have an opportunity to comment on decisions about actions that could affect their lives. This involvement took place in the form of public open houses, website information sessions, and stakeholder outreach efforts. The Airport appreciates that public participation improves the decision-making process by recognizing and communicating the needs and interests of all participants. As a result of the public participation process, we feel that the airport master plan offers a valuable path for developing the Mercer County Regional Airport.

Stakeholders

As part of the planning process the following groups/people were contacted for their insight into the Mercer County Regional Airport:

1. Master Plan Advisory Committee
    a. Steve Frovarp – Airport Manager
    b. Marv Sutheimer – Airport Board
    c. Shawn Stromme – Airport Board
    d. Thomas Kaspari – Basin Electric
    e. Ron Muth - Pilot
2. Airport Board
    a. Wilbert Harsch – Pick City
    b. Kelly Muth - Hazen
3. FAA /State Planning
    a. Brian Schuck – FAA Planner
    b. Travis Schmit – FAA Program Manager

Key Issues/Public Involvement Goals

This planning effort completed typical aspects of airport master plans from reviewing existing conditions to forecasts to alternative development but also focused on key issues which we learned from our scoping meeting. These issues were as follows:

1. Evaluate the space for the possibility of a turf crosswind runway
2. Optimize instrument approach procedures
3. Generate various layouts of terminal area updates for more hangar space
4. Gather Aeronautical Survey to develop and update Airport Layout Plan (ALP), airfield, and safety surface to current FAA and AGIS standards

From the scope meeting it was determined that documentation of existing conditions, forecasting future aviation activity levels, identifying future facility requirements, formulating and evaluating alternatives,

preparing implementation plans and engaging the public and other government agencies were main goals for the future of HZE.

The following table specifies the type of public outreach achieved along with a location of specific meeting materials located in this appendix.

Table C-1 – Public Outreach Activities

Date of Outreach	Type of Public Process	Attendance	Information Conveyed	Page in Appendix
10/10/2023	Master Plan Kickoff	5	Roles, master plan, planning, existing conditions, public involvement	C-3
12/12/2023	Airfield Alternatives Meeting	6	Present alternative for the overall for input	C-15
02/05/2024	Crosswind Runway Alternatives Meeting	7	Review last meeting options and present revised runway alternatives for decision	C-26
05/14/2024	Terminal Area Alternatives Meeting	6	Terminal & apron alternatives and input	C-34
06/18/2024	Refined Terminal Area Alternatives Meeting	10	Review refined terminal area alternatives for decision	C-43
8/13/2024	Airport Board Crosswind Review Meeting	8	Crosswind runway alternatives were presented to the Board	C-51

Source: KLJ


Mercer County Regional Airport
Airport Master Plan Kickoff Meeting – October 10, 2023
KLJ
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1


Agenda
Introductions
Airport Master Plan
Roles & Responsibilities
Existing Conditions
Questions/Comments
MERCER COUNTY
REGIONAL AIRPORT
AL JOERSZ FIELD
TERMINAL 1/2 MILE
KLJ
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2

Introductions

- Project Team
  - Aviation Planner – Kent Penney & Amber Channel
  - Airport Engineer – Shane Steiner & Quinn Dalziel
- Mercer County Regional Airport Authority
- Agencies Involved
  - FAA – Brian Schuck
  - ND Aeronautics Commission – Grant Erwin
- Planning Committee
  - Ron Muth – Pilot
  - Marvin Sutheimer – Airport Board
  - Shawn Stromme – Airport Board
  - Thomas Kaspari – Medical/Basin Electric
  - Steve Frovarp – Airport Board

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Airport Planning



"Road Map" for meeting aviation needs



Preserves flexibility to respond to future demands



Allows airport to cost-effectively keep pace with aviation growth



Considers environmental and socioeconomic impact of development

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4

Why is Airport Planning Needed Now?

Airport Planning Study Objectives

- Crosswind Runway
- Split Terminal/Hangar Area
- Additional Hangars
- Optimize Instrument Approach Procedures
- Approach Lighting for Runway

Last Airport Master Plan was completed in 1992

Last Airport Layout Plan (ALP) was approved in 2008

Need to bring the ALP up to current FAA Design Standards

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Roles & Responsibilities

KLJ Planning Team
- Manage Study, Complete Technical Work, Provide Analysis and Recommendations

Planning Advisory Committee
- Identify Wants & Needs
- Ask Questions & Review Analysis
- Provide Feedback & Recommendations

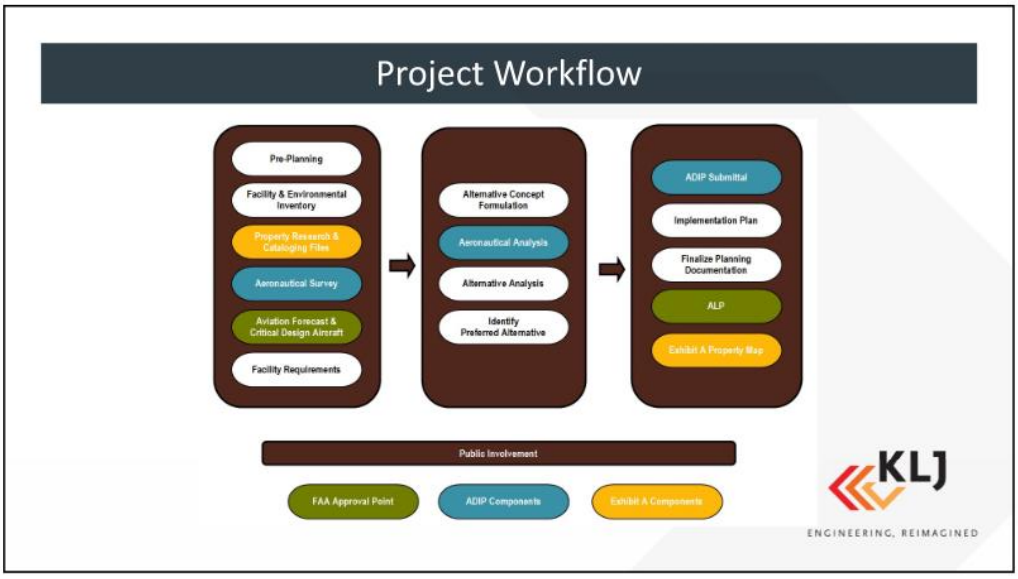
Mercer County Regional Airport Authority
- Provide Guiding Principles, Make Decision(s), Review and Approve Planning Documents & ALP

FAA / ND Aeronautics Commission
- Provide Technical Guidance, Approve Aviation Forecasts, Review Airport Plan, Approve ALP

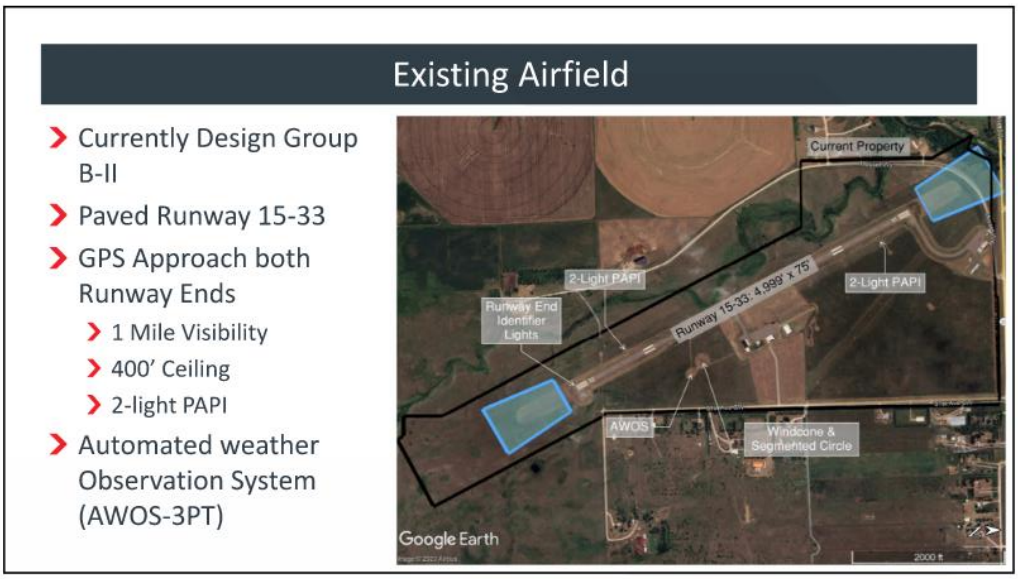


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Project Workflow
Pre-Planning
Facility & Environmental Inventory
Property Research & Cataloging Files
Aeronautical Survey
Aviation Forecast & Critical Design Aircraft
Facility Requirements
Alternative Concept Formulation
Aeronautical Analysis
Alternative Analysis
Identify Preferred Alternative
ADIP Submittal
Implementation Plan
Finalize Planning Documentation
ALP
Exhibit A Property Map
Public Involvement
FAA Approval Point
ADIP Components
Exhibit A Components
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7


Existing Airfield
Currently Design Group B-II
Paved Runway 15-33
GPS Approach both Runway Ends
1 Mile Visibility
400' Ceiling
2-light PAPI
Automated weather Observation System (AWOS-3PT)
Current Property
2-Light PAPI
2-Light PAPI
Runway End Identifier Lights
Runway 15-33: 4,999' x 75'
AWOS
Windcone & Segmented Circle
Google Earth

8

South Apron

- Apron
  - 9,300 SY
  - 8 asphalt tiedowns
  - 2 concrete tiedowns (20k)
  - 35' taxilanes
- 4 hangars / units
  - Terminal & SRE buildings
- Fuel, underground tanks
  - Single point Jet-A
  - 24-hour self serve 100LL



9

North Apron

- Apron
  - Roughly 5,000 SY
  - Three asphalt tiedown spots
  - 1,000' x 35' Taxiway
- 6 hangars / units
  - 4 T-hangars & garage, 4 box hangars, 1 storage



10

Pavement Condition & Project History

Map Type: PCI Timeline: 2021



Year	Project	Entitlement	Discretionary	COVID	Total
2006	Rehabilitate Runway	10,000			10,000
2006	Update Airport Master Plan Study	76,642			76,642
2007	Construct Building	309,788	8,492		318,280
2007	Rehabilitate Runway	10,000			10,000
2008	Construct Fuel Farm/Rehabilitate Runway	45,149			45,149
2009/10	Acquire Snow Removal Equipment	172,921			172,921
2011	Install Airport Beacons	83,050			83,050
2011	Rehabilitate Runway	26,387			26,387
2013	Rehabilitate Runway	46,278			46,278
2015	Construct Apron	80,000			80,000
2015	Improve Building	169,400			169,400
2015	Rehabilitate Apron, Runway and Taxiway	143,036			143,036
2017	Reconstruct Taxiway & NAVAIDS	42,030	2,255		44,285
2018	Reconstruct Taxiway & NAVAIDS	311,415			311,415
2019	Rehabilitate Apron, Runway and Taxiway	138,000			138,000
2020/21	CARES & CRRSA Act Funds			$43,000	43,000
2021	Rehabilitate Runway/Reconstruct Runway Lighting	574,043	1,860,457	$270,500	2,705,000
2022	General ARPA			$32,000	32,000
	Totals	$2,238,597	$1,871,204	$335,500	$4,445,301

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Aircraft Data

- Operations
  - 730 total itinerant
  - 800 total local
  - 1,530 Total operations
- Based Aircraft
- 16 single engine aircraft



Data gathered from FAA 2021 TAF & Based Aircraft Inventory

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Wind Analysis

ALL-WEATHER WIND COVERAGE				
CONFIGURATION	CROSSWIND COMPONENT			
	10.5 KNOTS	13 KNOTS	16 KNOTS	20 KNOTS
RUNWAY 15-33	93.50%	97.60%	99.17%	-
	-	-	-	-
	-	-	-	-
COMBINED	93.50%	97.60%	99.17%	-
SOURCE: KHZE AWOS (2012-2021, HOURLY) FROM NATIONAL CLIMATIC DATA CENTER				
83,657 TOTAL OBSERVATIONS				

INSTRUMENT FLIGHT RULES (IFR) WIND COVERAGE				
CONFIGURATION	CROSSWIND COMPONENT			
	10.5 KNOTS	13 KNOTS	16 KNOTS	20 KNOTS
RUNWAY 15-33	91.19%	96.67%	98.97%	-
	-	-	-	-
	-	-	-	-
COMBINED	91.19%	96.67%	98.97%	-
SOURCE: KHZE AWOS (2012-2021, HOURLY) FROM NATIONAL CLIMATIC DATA CENTER				
5,233 TOTAL OBSERVATIONS				
IFR = VISIBILITY LOWER THAN 3 MILES OR CEILING LOWER THAN 1,000 FEET				

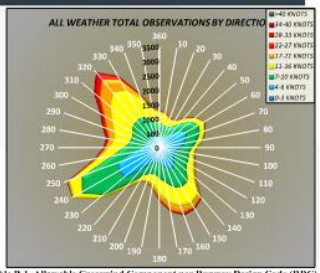


Table B-1. Allowable Crosswind Component per Runway Design Code (RDC)

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

Note: * Includes A-I and B-I small aircraft.

13

Crosswind Options



- 15-33 Existing
- 95% coverage with any alignment other than 140° to 180°
- Local Preferences
- Optimum 9-27 (98.8% Coverage)
- Runway (RSA/OFA/Approach/RPZ)

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Open Discussion

- Issues
- Users
- Airfield Capabilities
- Terminal/Hangar Needs



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Next Steps

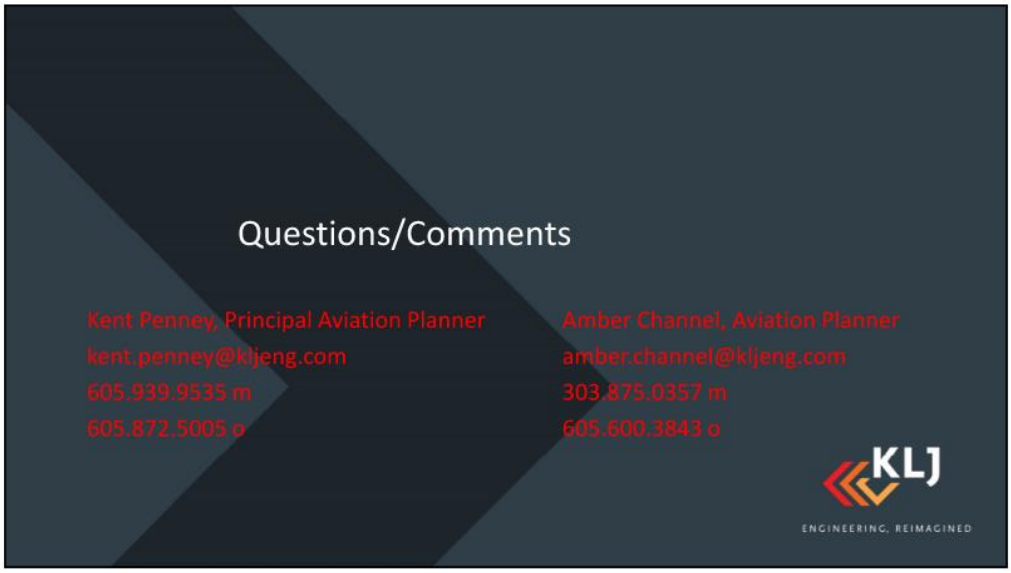
- Complete Airport Inventory
- Outreach to Stakeholders (Mary Lynch)
- Draft Aviation Forecasting
- Draft Facility Requirements

- Next Meeting: Facility Requirements & Airfield Alternatives

- Website: inputcentral.com/hze-airportplan

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Questions/Comments
Kent Penney, Principal Aviation Planner
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605.872.5005 o
Amber Channel, Aviation Planner
amber.channel@kljeng.com
303.875.0357 m
605.600.3843 o
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9

DATE 10-10-2023

PURPOSE Mercer County Airport

CUE COLUMN

NOTES

Name	Organization
Steve Froucup	Clerk - MCRAA
Shane Steiner	KLJ
Quinn Dalziel	KLJ
Tom KASPARI	
Kent Penney	KLJ

SUMMARY

Meeting Minutes

Date: 10/10/2023 **Facilitator:** Kent Penney
Time: 2:00 PM **Minutes:** Master Plan Kickoff Meeting
Attendees: Steve Frovarp - Airport Manager, Tom Kaspari - Basin & Pilot, Quinn Dalziel - KLJ, Shane Steiner - KLJ, Kent Penney - KLJ

Agenda Topics

Turf Runway

1. Needed for tail draggers & those who want to save their tiers
2. Coulee to the west will impeded a crosswind or parallel turf runway option

Action Items: Create turf runway alternative options to present at next meeting.

Airport Needs/Wants from Operators

1. The airport is needed for life flight but needs more aircraft (there are more at Beulah)
2. Need hangar space and mechanic (mechanic at Stanley & Beulah)
3. A grooved runway is needed for planned Basin Electric Embraer Phenom
    a. aircraft slid off runway & Embraer stipulated a need for grooving on runways
    b. A minimum of 5" of asphalt is needed to add grooving
4. Sanford Health Medical from Fargo and items they need are;
    a. Terminal
    b. Crew car
    c. Hangar storage (tug/tow bars) for B-200 (14'10" tail height)
    d. Deicing
    e. Runway cleared
    f. AWOS-III full functional (HZE ceilometer was out of service)
    g. Instrument capability

Action Items: Review overall airfield and create alternatives to meet needs/wants if able.

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REGIONAL EXPERTISE
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Other Notes or Information

Terminal area alternatives for hangars will be presented at a later date.

Next Meeting Information

Date: 12/12/2023
Time: 5:00 PM

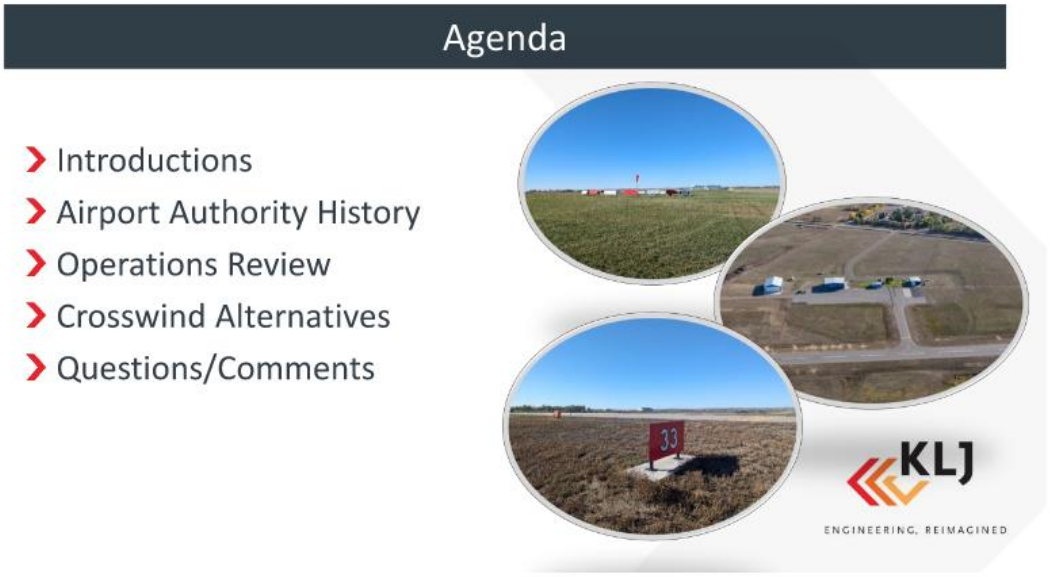
Facilitator: Kent Penney
Minutes: Airfield Alternative Meeting

NATIONAL PERSPECTIVE
REGIONAL EXPERTISE
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10/10/2023


Mercer County Regional Airport
Airfield Alternatives Meeting
December 12, 2023
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Agenda
Introductions
Airport Authority History
Operations Review
Crosswind Alternatives
Questions/Comments
33
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2

10/10/2023

Why Hazen was Chosen

- Beulah and Hazen had their own airport and in 1989 the cities agreed to accept a single airport site.
- There were other aviation needs to serve the community other than Beulah and Hazen as far as agriculture, recreation, energy, medical, and business and bring in light business jet traffic.
- Three sites were evaluated last master plan; Beulah Municipal Airport, Hazen Municipal Airport, and an undeveloped site.
- A main determination was based on a site able to accommodate a 4,400-foot runway with anticipation to expand to a 5,500-foot-long runway and instrument approach capability.
- The Hazen site was recognized most practical for development.

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3

Operations Review

- According to the TAF in 2022…

Based Aircraft	Air Taxi/Commuter Ops.	GA Itinerant Ops.	Military Itinerant Ops.	Total Itinerant Ops.	Total Local Ops.
16	200	500	30	730	800

- According to the TFMS in 2022, 222 IFR operations were reported.
- Fuel from the previous six years

Year	100LL (Gallons Sold)	Jet A (Gallons Sold)	Total Gallons (Annual)
2016	11,712	13,535	25,247
2017	7,241	12,874	20,115
2018	8,667	10,291	18,958
2019	6,776	10,775	17,551
2020	11,476	1,967	13,443
2021	8,875	3,203	12,078
2022	9,660	8,008	17,668

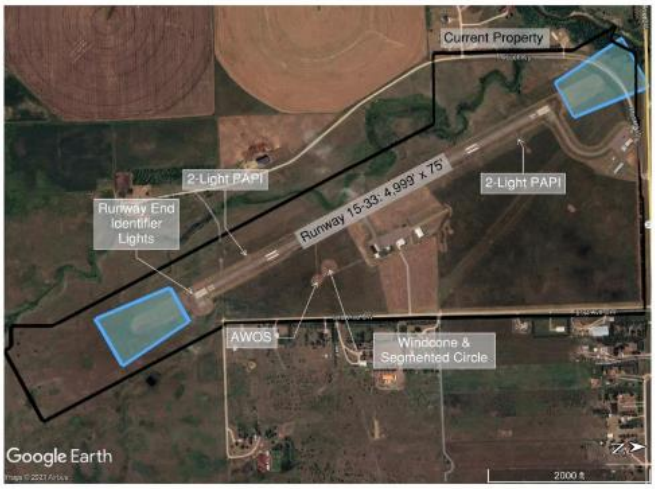
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4

10/10/2023

Current Facilities

- 10.5 knot all-weather wind coverage is at 93.50%
- 13 knot all-weather wind coverage is at 97.60%
- Not currently meeting 95% wind coverage for 10.5 knots



7

Options Eliminated



- North-South Crosswind East Side
  - Would not meet the 95% wind coverage
- East of the 33 End Crosswind
  - Safety areas will restrict terminal area development
  - Would not increase wind coverage

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8

10/10/2023

Parallel to Runway 15-33 Options

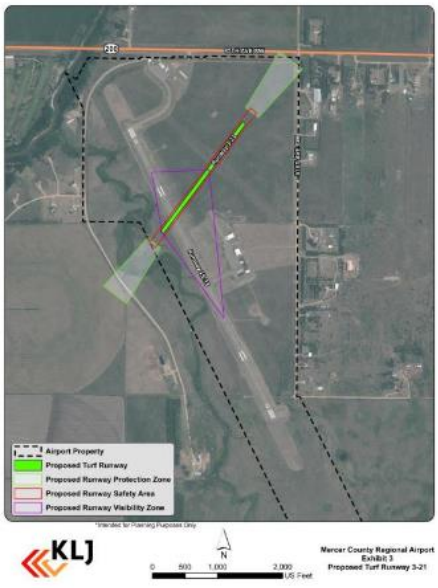
- Within the Runway Safety Area (RSA)
  - 2,800' long
  - Runway 15-33 paved and turf are considered the same runway
- 300' Centerline Separation
  - 1,800' long
  - No additional property needed



9

Runway 3-21 Alignment

- 2,000' long
- Exceeds 95% wind coverage (97.22%)
- Intersects with Runway 15-33
- Runway Visibility Zone (RVZ) requirements would restrict future terminal area development
- Roads within both RPZs



10

10/10/2023

Runway 9-27 Alignment

- 2,000’ long
- Exceeds 95% wind coverage (98.85%)
- Intersects with Runway 15-33
- RVZ does not interfere with future terminal area development
- Roads in both RPZs



11

Runway 13-31 Alignment

- 2,300’ long
- Exceeds 95% crosswind coverage (96.79%)
- Does not interfere with future terminal area development
- Roads in both RPZs and access road
- Crosses north taxiway



12

6

	Parallel within RSA	Parallel outside RSA	3-21	9-27	13-31
Length	2,800'	1,800'	2,000'	2,000'	2,300'
Wind Coverage	94.13%	94.13%	97.22%	98.85%	96.79%
Terminal Area Impact	None	None	Yes	None	None
Things Affected	Use of Runway 15-33	None	Crosses Runway 15-33	Crosses Runway 15-33	Access road & crosses north taxiway
RPZ Items	None	Airport Fence	Mosset Wy, 45th Ave & 51st Ave	Mosset Wy, Archers Ln & 51st Ave	Mosset Wy, 45th Ave & 51st Ave
Land Requirements	None	Less than 0.1 acres needed for RPZs	9.4 acres needed for RPZs	11.7 acres needed for RPZs	6.4 acres needed for RPZs
Fencing	Roughly 333' of fence needs to be moved 43' west	Roughly 4,055' of fence needs to be moved at least 135' west	Roughly 287' of fence needs to be moved 265' west	Roughly 297' of fence needs to be moved 315' west	No change

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13

Open Discussion

- Issues
- Forecast
- Alternatives
- Terminal/Hangar Needs



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10/10/2023

Typical Hangar Attributes

Typical Aircraft Hangar Attributes

	T-Hangars	Small Storage Less than 6,000 sf	Large Storage More than 6,000 sf	FBO/SASO
Photo Examples				
Dedicated Apron	None	None	Equal to depth of hangar	Equal to depth of hangar (plus apron for services)
Airport Apron Access	No	No	No	Yes
Setbacks from Taxilanes	Yes - for Design Group (I or II)	Yes - for Design Group (I or II)	Yes plus Apron - for Design Group (II+)	Yes plus Apron - for Design Group (II+)
Airside Taxi Route	Yes - for Design Group (I or II)	Yes - for Design Group (I or II)	Yes - for Design Group (II+)	Yes - for Design Group (II+)
Public Road Access/Parking	No	Yes or No *	Yes*	Yes*

* Any business/corporate hangar located on an airport should have public road access and parking for customers/passengers. Particularly those customers/passengers who are not trained in driving on an airport.

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Next Steps

- Complete Airport Inventory
- Complete Aviation Forecasting
- Draft Facility Requirements
- Terminal/Hangar Area Alternatives

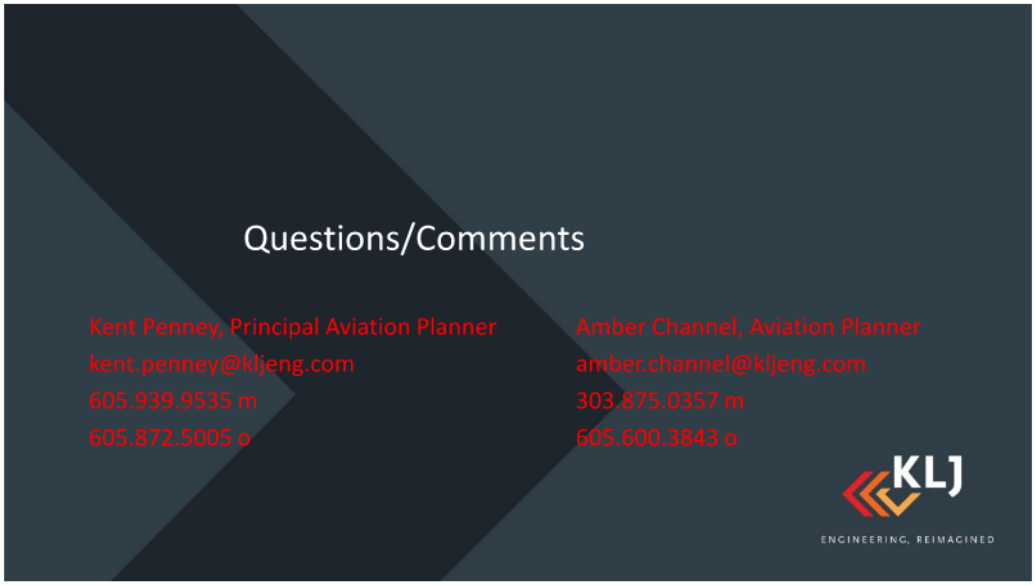
- Next Meeting: Terminal/Hangar Area Alternatives

- Website: inputcentral.com/hze-airportplan

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10/10/2023



17

9

Mercer County Regional Airport – Airfield Alternatives – December 12,2023

ATTENDANCE LIST

Engineering Reimagined

YEAR 2022 | KLJENG.COM

KLJ

Name (please print)	Organization/Business	Phone	Email (optional)
Steve Erovarp	MCRAA Clerk	701-880-9989	Steve_nd@hotmail.com
Shawn Stromme	See / Tres	701-891-1156	shawn.stromme65@Gmail.com
Tom KASPARI		701 880 1088	tdkaspari123@gmail.com
Kent Penney	KLJ		
Amber Channel	KLJ		
Quinn Dalziel	KLJ		

Meeting Minutes

Date: 12/12/2023 **Facilitator:** Kent Penney
Time: 5:00 PM **Minutes:** Airfield Alternatives
Attendees: Steve Frovarp - Airport Manager, Shawn Strommee - Airport Board, Tom Kaspari - Basin & Pilot, Quinn Dalziel - KLJ, Kent Penney - KLJ, Amber Channel - KLJ

Agenda Topics

Operations

1. Spraying operations are intermittent.
2. There is currently no flight training at the airport. A few years ago, people were getting trained through the North Dakota Program.
3. The military operations are from Bismarck, helicopters for night and low level training.
4. The airport averages about three aircraft per day getting fuel during Oshkosh.
5. It is believed that 2023 fuel sales will reflect 2022's. It is also believed that fuel prices affect the operation numbers.

Action Items: Finish forecasting and send a copy of the Traffic Flow Management System (TFMS).

Airfield Improvements

1. 51st Ave SW was supposed to be paved but new board members decided against it. It has been expressed to the airport by the medical flight teams that paving the road is needed.
2. The north area could be used as an area for flight training.
3. Thinking the taxilane to the north could be a connector taxiway for the turf runway.

Action Items: Include all above items in alternatives.

Turf Runway Alternatives

1. Would like a turf runway for the crosswind component.
2. Like Runways 9-27 and 3-21 option.

Action Items: Move 3-21 runway outside of the coolie area, shorten Runway 9-27 options, include turf taxiways on all future alternatives.

Next Meeting Information

Date: Friday in mid to late January **Time:** 1:00 or 2:00 PM

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10/10/2023


Mercer County Regional Airport
Crosswind Runway Alternatives Meeting
February 5, 2024
KLJ
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1


Agenda
Introductions
Review last meeting
Runway 3-21 (Revised)
Runway 9-27 (Revised)
Questions/Comments
MERCER COUNTY
REGIONAL AIRPORT
KLJ
ENGINEERING, REIMAGINED

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10/10/2023

Wind Analysis

ALL-WEATHER WIND COVERAGE				
CONFIGURATION	CROSSWIND COMPONENT			
	10.5 KNOTS	13 KNOTS	16 KNOTS	20 KNOTS
RUNWAY 15-33	93.50%	97.60%	99.17%	-
	-	-	-	-
	-	-	-	-
COMBINED	93.50%	97.60%	99.17%	-
SOURCE: KHZE AWOS (2012-2021, HOURLY) FROM NATIONAL CLIMATIC DATA CENTER 83,657 TOTAL OBSERVATIONS				

INSTRUMENT FLIGHT RULES (IFR) WIND COVERAGE				
CONFIGURATION	CROSSWIND COMPONENT			
	10.5 KNOTS	13 KNOTS	16 KNOTS	20 KNOTS
RUNWAY 15-33	91.19%	96.67%	98.97%	-
	-	-	-	-
	-	-	-	-
COMBINED	91.19%	96.67%	98.97%	-
SOURCE: KHZE AWOS (2012-2021, HOURLY) FROM NATIONAL CLIMATIC DATA CENTER 5,233 TOTAL OBSERVATIONS IFR = VISIBILITY LOWER THAN 3 MILES OR CEILING LOWER THAN 1,000 FEET				

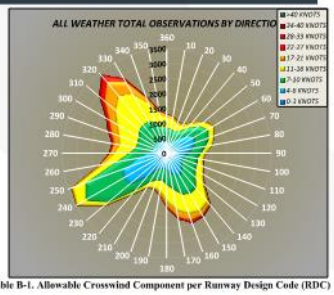


Table B-1. Allowable Crosswind Component per Runway Design Code (RDC)

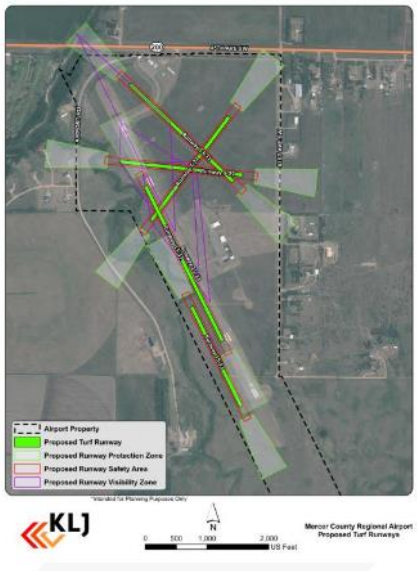
RDC	Allowable Crosswind Component
A-I and B-I *	10.5 knots
A-II and B-II	13 knots
A-III, B-III, C-I through D-III D-I through D-III	16 knots
A-IV and B-IV, C-IV through C-VI, D-IV through D-VI	20 knots
E-I through E-VI	20 knots

Note: * Includes A-I and B-I small aircraft.

3

All Alignments Considered

	Parallel within RSA	Parallel outside RSA	3-21	9-27	13-31
Length	2,800'	1,800'	2,000'	2,000'	2,300'
Wind Coverage	94.13%	94.13%	97.22%	98.85%	96.79%
Things Affected	Use of Runway 15-33	None	Crosses Runway 15-33	Crosses Runway 15-33	Access road & crosses north taxiway
Land Requirements	None	Less than 0.1 acres needed for RPZs	9.4 acres needed for RPZs	11.7 acres needed for RPZs	6.4 acres needed for RPZs



4

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Items Considered for Updates

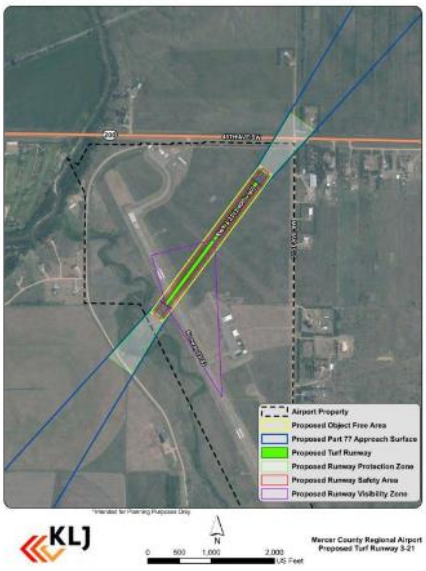
- Current runway lights and PAPI location
- Excavation needed on the west side of the current runway
- Runway Protection Zone (RPZ) placement and Part 77 surfaces
- Making sure aircraft will turnaround out of Runway 15-33 Runway Safety Area (RSA)
  - Threshold for Turf Runway 50' outside of RSA
- Possible runway length

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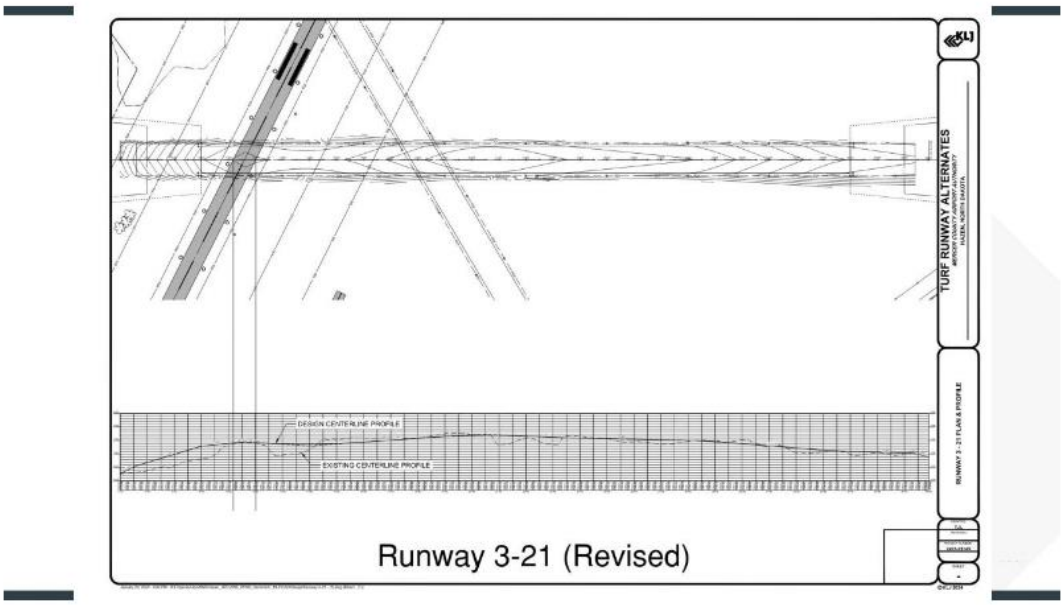
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Runway 3-21 (Revised)

- 2,400' x 60'
- Extended the runway to maximum capacity
- 3 End RPZ up to the front of the residence
- Runway Visibility Zone (RVZ) could affect development north



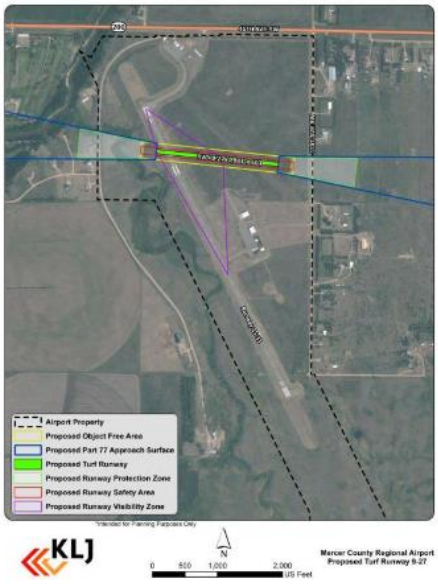
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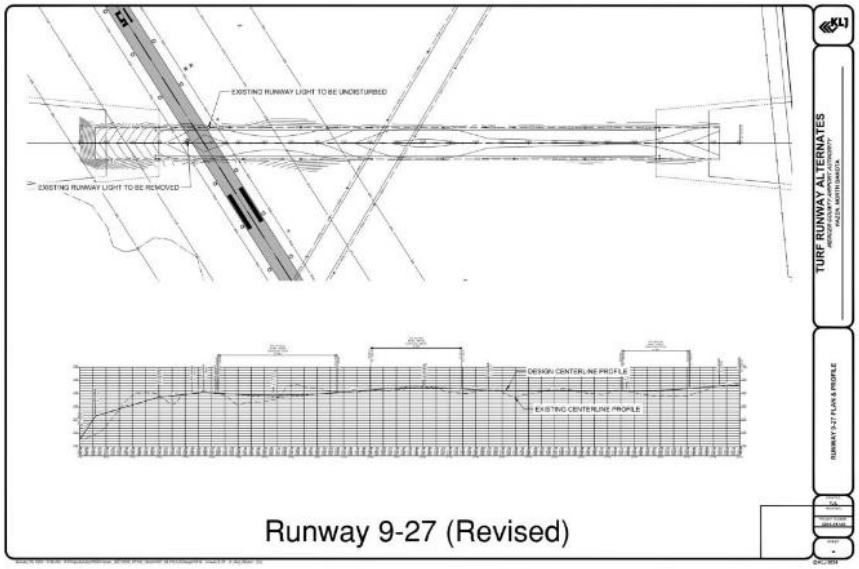
Runway 9-27 (Revised)

- 1,883' x 60'
- Had to shorten from previous option (2,000')
- Would need easements right away to ensure limited development in the RPZs



8

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9

Comparison

	3-21 (Revised)	9-27 (Revised)
Length	2,400	1,833
Combined Wind coverage	97.22%	98.85%
Possible Easement Area	11.0 acres	9.0 acres (portion currently developable)
Unclassified Excavation	20,600 cubic yards	12,200 cubic yards
Topsoiling (obtained on-site)	5,500 cubic yards	4,400 cubic yards
Estimated Cost	$940,000	$620,000
Items Affected	1 current runway light. Apron development could be limited.	1 current runway light. Must limit development within the RPZs.

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Crosswind Alternatives Open Discussion



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Next Steps

- Complete Airport Inventory
- Complete Aviation Forecasting
- Complete Facility Requirements
- Terminal/Hangar Area Alternatives

- Next Meeting: Terminal/Hangar Area Alternatives

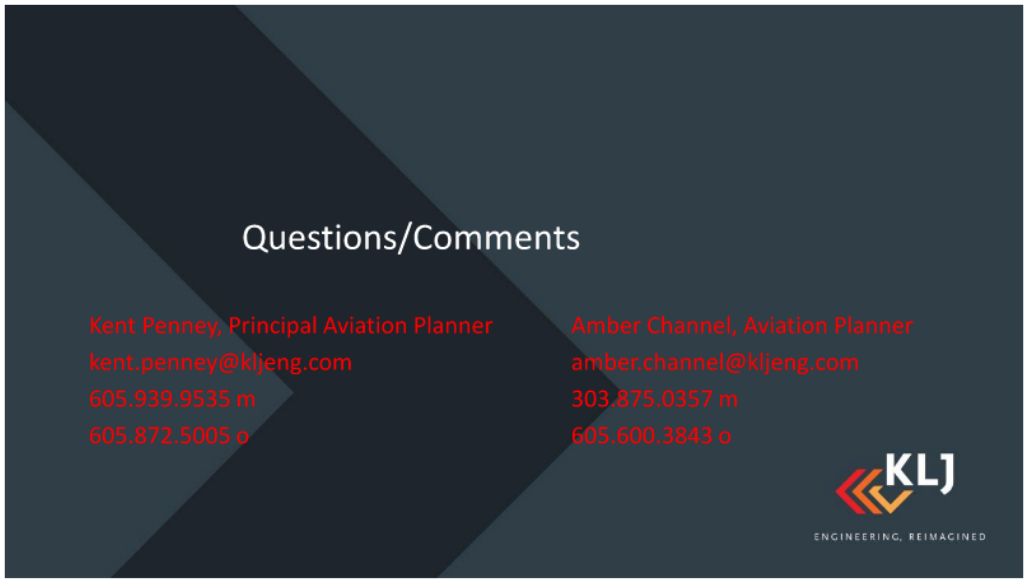
- Website: inputcentral.com/hze-airportplan

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Questions/Comments
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Meeting Minutes

Date: 2/5/2024 **Facilitator:** Kent Penney
Time: 1:00 PM **Minutes:** Crosswind Runway Alternatives
Attendees: Steve Frovarp - Airport Manager, Shawn Stromme - Airport Board, Michael Berg - Tenant, Quinn Dalziel - KLJ, Shane Steiner - KLJ, Kent Penney - KLJ, Amber Channel - KLJ

Agenda Topics

Turf Option 3-21

1. Roughly about halfway through the current north taxilane of the terminal area will be omitted due to the Runway Visibility Zone (RVZ)
2. Would like to see the current north taxilane extended to be a connector for the turf

Action Items: N/A

Turf Option 9-27

1. Like where the west end is located and asked about keeping that but shifting the northeast side of 3-21 further north
    a. The location of the coolie and the PAPIs interfere with that plan
2. The east RPZ is concerning for the group because they believe it would not be easy to get an easement for that area

Action Items: *N/A*

Decision

1. Majority ruled in favor of turf crosswind option 3-21 for the length

Action Items: *Will keep the length but remind group it can be shortened to get the RPZ out of the residential lot*

Next Meeting Information

Date: 5/14/2024 **Facilitator:** Kent Penney
Time: 5:00 PM **Minutes:** Terminal Area Alternatives

NATIONAL PERSPECTIVE
REGIONAL EXPERTISE
TRUSTED ADVISOR

5/20/2024


Mercer County Regional Airport
Terminal Area Alternatives Meeting
May 14, 2024
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Agenda
Introductions
Review Crosswind Runway 3-21
Terminal Area Alternative Options
Questions/Comments
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5/20/2024

Crosswind Runway 3-21

- 2,500' x 100'
- Runway 3 RPZ approx. 130' feet from the residence
- Runway 21 threshold is 50' outside of Primary RSA
- Runway Visibility Zone (RVZ) does impact hangar development



3

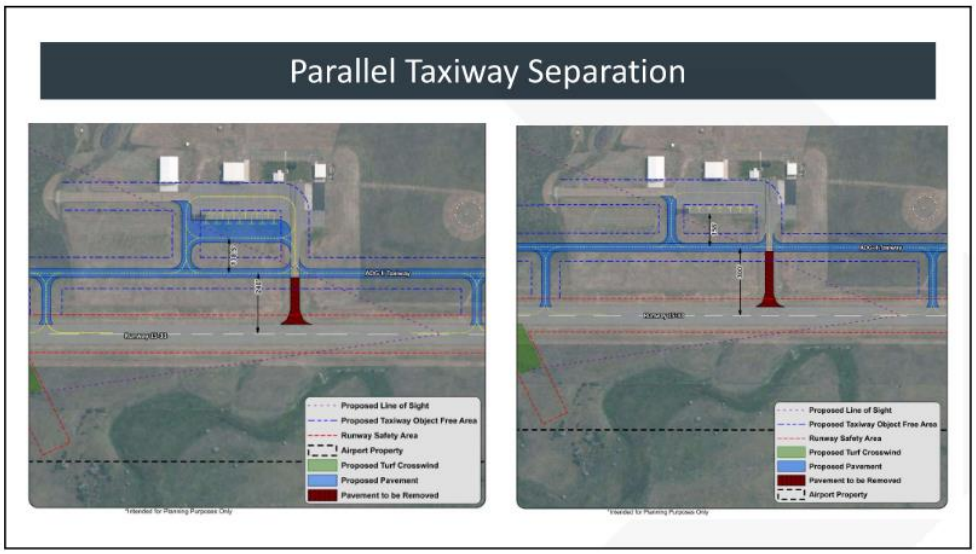
Items Considered for Terminal/Hangar Alternatives

- Apron layout
- Group I T-Hangars and individual box hangars
- Large hangars on Apron for Group II aircraft
- Accommodate relocation of all North Tenants to Central Area
- New fuel farm location
- Area for FBO/Maintenance Operator
- Avoiding the drainage swale/electrical cooridor
- Landside access

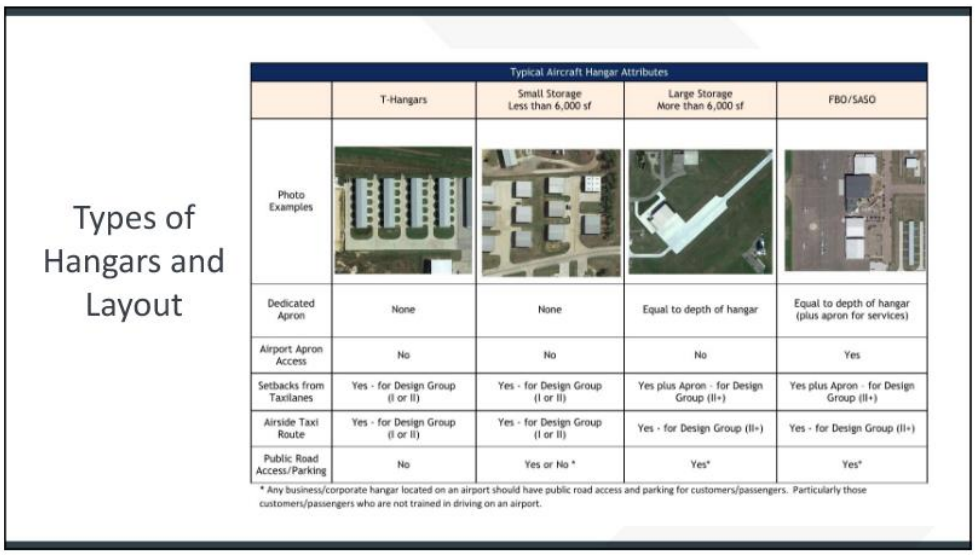
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Parallel Taxiway Separation
Proposed Line of Sight
Proposed Taxiway Object Free Area
Runway Safety Area
Airport Property
Proposed Turf Crosswind
Proposed Pavement
Pavement to be Removed
*Intended for Planning Purposes Only
Proposed Line of Sight
Proposed Taxiway Object Free Area
Runway Safety Area
Proposed Turf Crosswind
Proposed Pavement
Pavement to be Removed
Airport Property
*Intended for Planning Purposes Only

5


Types of Hangars and Layout
Typical Aircraft Hangar Attributes
T-Hangars
Small Storage Less than 6,000 sf
Large Storage More than 6,000 sf
FBO/SASO
Photo Examples
Dedicated Apron
None
None
Equal to depth of hangar
Equal to depth of hangar (plus apron for services)
Airport Apron Access
No
No
No
Yes
Setbacks from Taxilanes
Yes - for Design Group (I or II)
Yes - for Design Group (I or II)
Yes plus Apron - for Design Group (II+)
Yes plus Apron - for Design Group (II+)
Airside Taxi Route
Yes - for Design Group (I or II)
Yes - for Design Group (I or II)
Yes - for Design Group (II+)
Yes - for Design Group (II+)
Public Road Access/Parking
No
Yes or No *
Yes*
Yes*
* Any business/corporate hangar located on an airport should have public road access and parking for customers/passengers. Particularly those customers/passengers who are not trained in driving on an airport.

6

5/20/2024


Alternative 1
A
B
C
D
E
SF
Airside Pavement
Landside Pavement
Hangars/Buildings
Pavement Removal
500 ft
Google Earth

7

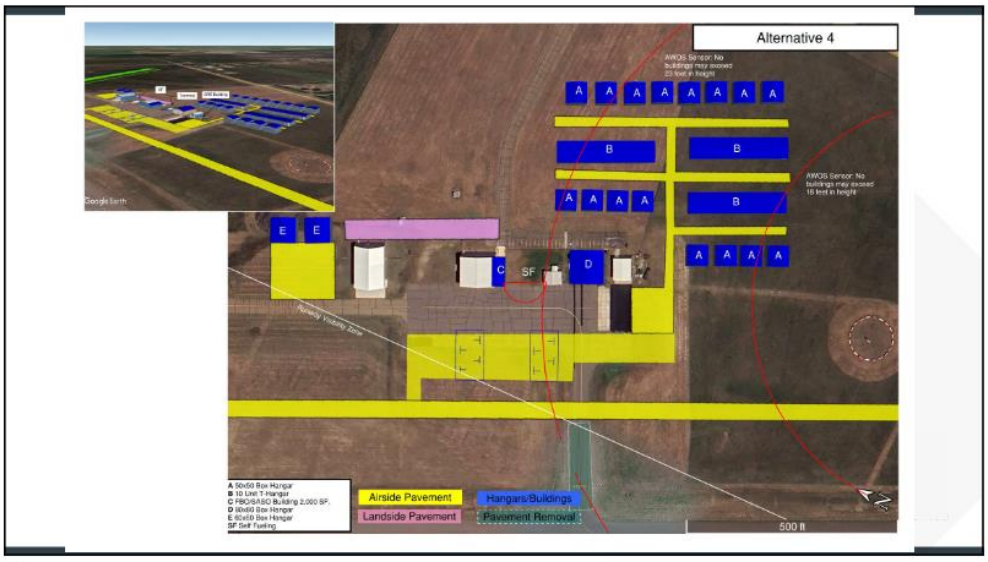

Alternative 2
A
B
C
SF
Airside Pavement
Landside Pavement
Hangars/Buildings
Pavement Removal
500 ft
Google Earth

8

5/20/2024



9



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5

5/20/2024



11



12

Metric	Alternatives					
	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Runway to Parallel Taxiway Separation	240'	300'	240'	300'	240'	240'
Self-Fueling Location	South	North	Terminal building and storage hangar	Terminal building and storage hangar	South	Terminal building and storage hangar
FBO/Maintenance Operator		South Addition to Hangar	North Addition to Hangar	South Addition to Hangar		
Apron Hangars	Add 2 60x60 and 1 80x80 Hangars	Add 80x80 Hangar	Add 1 80x80 and 2 100x100 Hangars	Add 2 60x60 and 1 80x80 Hangar	Add 60x60 Hangar	Add 1 60x60 and 2 100x100 Hangars
Storage Hangars	N-S Opening 33 spaces	S-E-W Open 27 spaces	E-W Open 25 spaces	E-W Open 46 spaces	N-S Open 33 spaces	E-W Open 52 spaces
Additional Impacts	None	RVZ	None	AWOS Sensor	None	RVZ
Group I Tiedowns	12	8	20	8	10	12

13

Terminal Area Alternatives Open Discussion

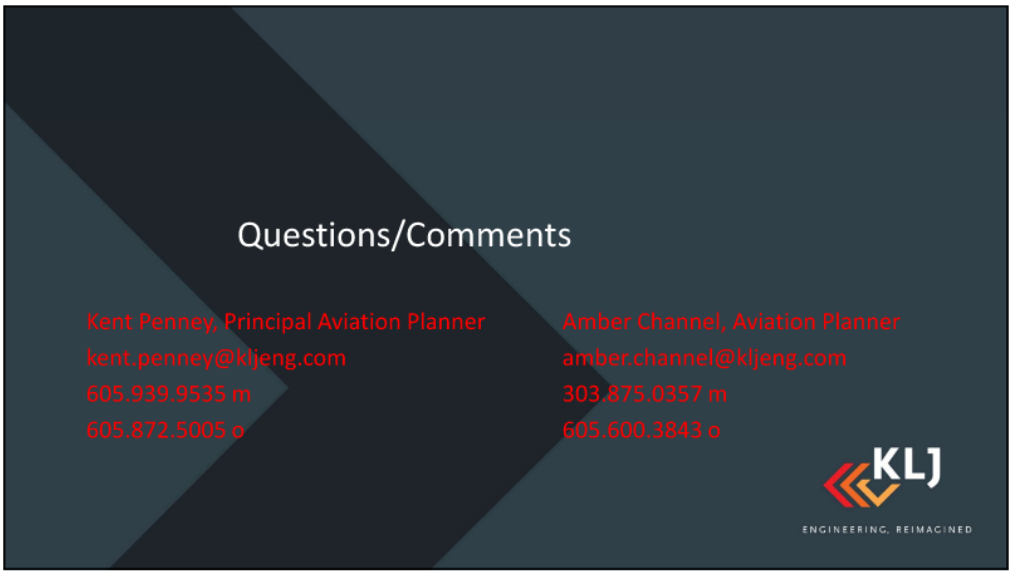


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Next Steps
Revise Terminal Area Alternatives
Select Preferred Alternative
Prepare Airport Layout Plan
Prepare Implementation Plan
Next Meeting: Revised Terminal Area Alternatives
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15


Questions/Comments
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Mercer County Regional Airport – Terminal Alternatives – May 14, 2024

ATTENDANCE LIST

Engineering Reimagined

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Name (please print)	Organization/Business	Phone	Email (optional)
Kent Penney	KLJ		
Steve Frovarp	MCRAA		
Quinn Dalziel	KLJ		
Shane Steiner	KLJ		
Amber Channel	KLJ - online		
Jack Vogt	KLJ - online		

Meeting Minutes

Date: 5/14/2024 **Facilitator:** Kent Penney
Time: 5:00 PM **Minutes:** Terminal Area Alternatives
Attendees: Steve Frovarp - Airport Manager, Quinn Dalziel - KLJ, Kent Penney - KLJ, Amber Channel - KLJ, Jack Vogt - KLJ

Agenda Topics

Buildings on the Apron

1. Like adding north onto the current apron hangar for an FBO
2. Like the Hangar D on Alternative 3 for a maintenance shop or long term transient customers

Action Items: For Alternative 1 add a lean-to onto the current large hangar to the south of the building.

Tiedown Spots/Apron Space

1. Like the nested tiedowns that Alternative 1, could phase these into the west
2. The layout in Alternative 2 would require the buildout of the apron though could flip the tiedowns
3. The extra apron space on Alternative 3 could be for agricultural spray operations
4. Alternative 5 apron layout was eliminated for the group said it looked like a maze for pilots to maneuver and did not offer room for buildings to be placed on the apron

Action Items: *N/A*

Fuel Farm

1. Alternative 1 fuel location eliminates a hangar layout to the south like that of Alternative 4
2. Do not like the fuel location on Alternative 2 because this would have the trucks on the apron
3. Like the fuel location on the north side of the terminal for the ease of the truck entrance
4. The question was asked if a fuel farm could be placed between the current hangar and the new taxilane as that in Alternative 3; yes but could but it would be a high cost and a route would need to be laid out so fueling aircraft and taxiing aircraft could move around each other

Action Items: *Look at vertical tanks if space is restricted and in tandem*

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TRUSTED ADVISOR

Other Items

1. Like the roadside access presented on Alternative 3

Action Items: N/A

Other Notes or Information

Will revise Alternative 1 and 3

Next Meeting Information

Date: 6/18/2024
Time: 6:20 PM
Facilitator: Kent Penney

Minutes: Refined Terminal Area Alternatives

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REGIONAL EXPERTISE
TRUSTED ADVISOR

6/18/2024


Mercer County Regional Airport
Refined Terminal Area Alternatives Meeting
June 18, 2024
KLJ
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Agenda
Introductions
Refined Terminal Area Alternatives
Comparison
Questions/Comments
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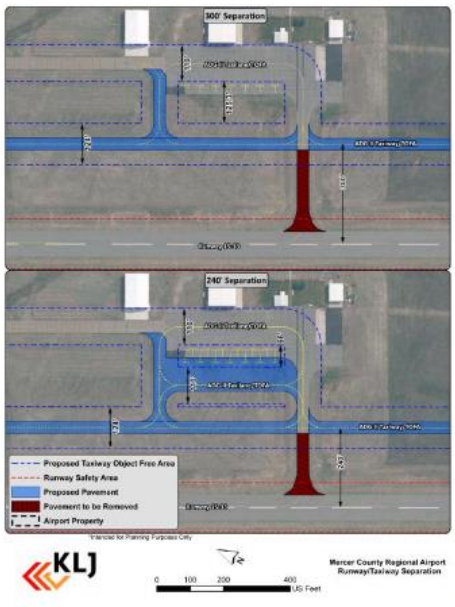
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Items Considered for Terminal/Hangar Alternatives

- Apron layout
- Group I T-Hangars and individual box hangars
- Large hangars on Apron for Group II aircraft
- Accommodate relocation of all North Tenants to Central Area
- New fuel farm location
- Area for FBO/Maintenance Operator
- Avoiding the drainage swale/electrical cooridor
- Landside access

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4

2

6/18/2024


Alternative 1 Revised
Airside Pavement
Landside Pavement
Hangars/Buildings
Pavement Removal
800 ft
Google Earth

5


Alternative 3 Revised
Airside Pavement
Landside Pavement
Hangars/Buildings
Pavement Removal
600 ft
Google Earth

6

6/18/2024

Alternatives Comparison

Metric	Alternatives	
	Refined Alternative 1	Refined Alternative 3
Runway to Parallel Taxiway Separation	240'	240'
Self-Fueling Location	South	Terminal building and storage hangar
FBO/Maintenance Operator	South Addition to Hangar	North Addition to Hangar
Apron Hangars	Add 2 60x60 and 1 80x80 Hangars	Add 1 80x80 and 2 100x100 Hangars
Storage Hangars	E-W-S Opening 33 spaces	E-W Open 25 spaces
Additional Impacts	None	None
Group I Tiedowns	12	20

7

Terminal Area Alternatives Open Discussion



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6/18/2024

Next Steps

- Prepare Airport Layout Plan
- Prepare Implementation Plan

Website: inputcentral.com/hze-airportplan

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Questions/Comments

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Mercer County Regional Airport – Refined Terminal Alternatives – June 18, 2024

ATTENDANCE LIST

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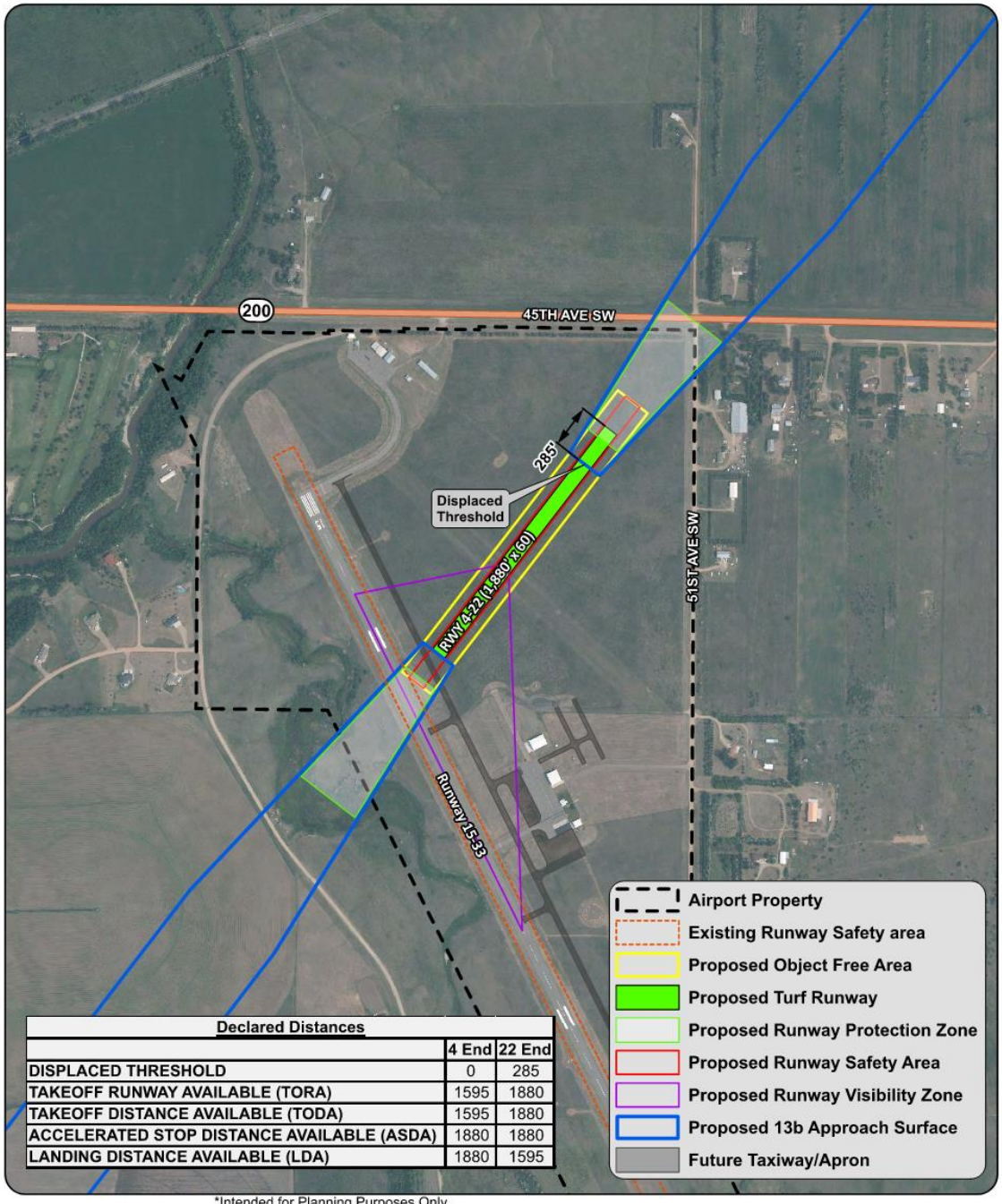
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Kelly Mott	MCRA	701-880-0400	
Marvin Sutheimer	MCRA	701-948-2805	
Tom Kazsas		701 880-1988	
Shane Steiner	KLJ	701-355-8400	
Kent Penney	KLJ		
Amber Channel	KLJ		

Airport Board Crosswind Review Meeting – August 2024

**After further review, the correct length of this alternative was found to be 1,990 feet long.



Declared Distances		
	4 End	22 End
DISPLACED THRESHOLD	0	285
TAKEOFF RUNWAY AVAILABLE (TORA)	1595	1880
TAKEOFF DISTANCE AVAILABLE (TODA)	1595	1880
ACCELERATED STOP DISTANCE AVAILABLE (ASDA)	1880	1880
LANDING DISTANCE AVAILABLE (LDA)	1880	1595

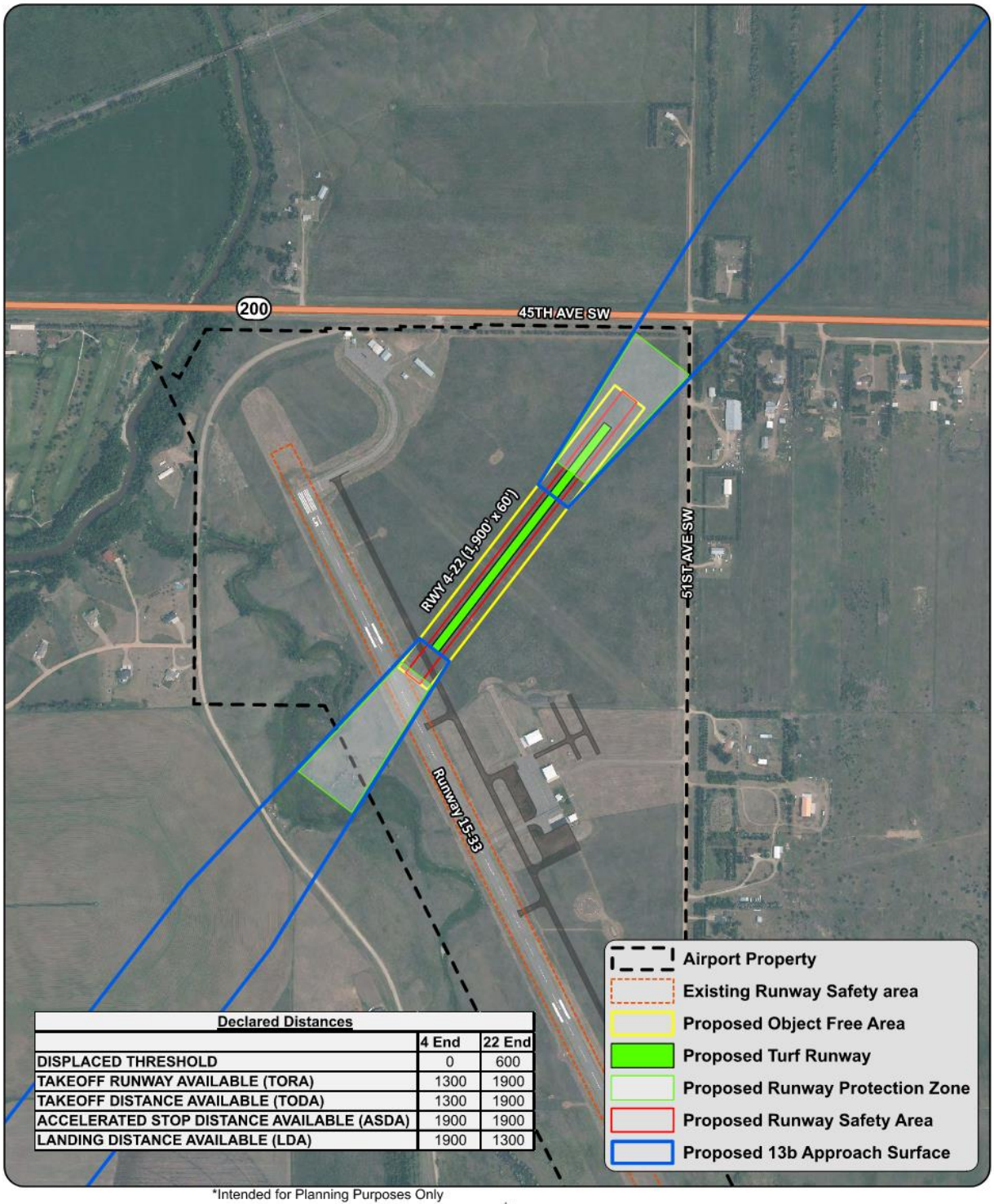
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0 500 1,000 2,000 US Feet

Mercer County Regional Airport
Proposed Turf Runway 4-22
Displaced Threshold



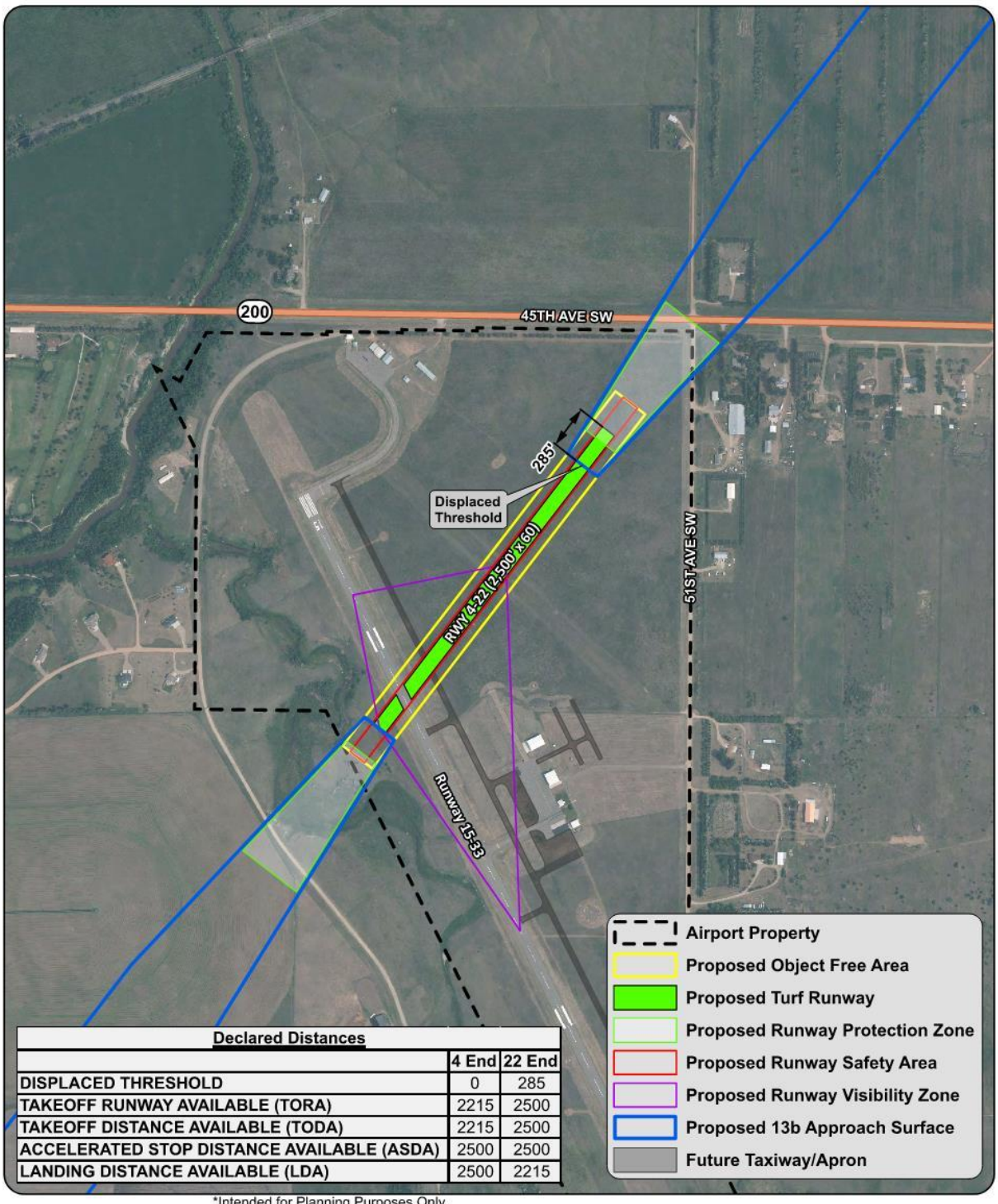
Declared Distances		
	4 End	22 End
DISPLACED THRESHOLD	0	600
TAKEOFF RUNWAY AVAILABLE (TORA)	1300	1900
TAKEOFF DISTANCE AVAILABLE (TODA)	1300	1900
ACCELERATED STOP DISTANCE AVAILABLE (ASDA)	1900	1900
LANDING DISTANCE AVAILABLE (LDA)	1900	1300

*Intended for Planning Purposes Only

N

0 500 1,000 2,000 US Feet

Mercer County Regional Airport
Proposed Turf Runway 4-22



Declared Distances		
	4 End	22 End
DISPLACED THRESHOLD	0	285
TAKEOFF RUNWAY AVAILABLE (TORA)	2215	2500
TAKEOFF DISTANCE AVAILABLE (TODA)	2215	2500
ACCELERATED STOP DISTANCE AVAILABLE (ASDA)	2500	2500
LANDING DISTANCE AVAILABLE (LDA)	2500	2215

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N

0 500 1,000 2,000 US Feet

Mercer County Regional Airport
Proposed Turf Runway 4-22
Displaced Threshold

APPENDIX D: RUNWAY LENGTH ANALYSIS

Purpose

A runway length analysis was completed to FAA standards identified in FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design* in this airport master plan study for the Mercer County Regional Airport (HZE). Due to the technical nature of this analysis, a separate appendix has been prepared to calculate recommended runway lengths for the design aircraft identified in the aviation forecasts.

Small Airplanes Up to 12,500 Pounds

FAA Design Curves

The FAA design approach identified in Chapter 2 of FAA AC 150/5325-4B for most small aircraft less than 12,500 pounds requires several steps to be performed to determine runway length:

1. **Identify Number of Passenger Seats:** Classify design aircraft as one of two categories; "Less than 10 Passenger Seats" and "10 Passenger Seats or Greater"
2. **Select Percentage of Fleet:** Airplanes classified as "Less than 10 Passenger Seats" are grouped into two percentage categories based on the airport's location and the amount of existing or planned aviation activities. The categories include "95 Percent of Fleet" and "100 Percent of Fleet".
3. **Consider Future Airport Expansion:** Consider runway length requirements during Instrument Meteorological Conditions (IMC) or expansions to accommodate airplanes more than 12,500 pounds.
4. **Determine Airport Data:** Evaluate the airport elevation, mean daily temperature in hottest month and runway condition to adjust runway length.
5. **Calculate Runway Length Based on Curves:** Utilize FAA runway length curves published in AC 150/5325-4B.

Table D-1 – FAA AC 150/5345-4B Runway Length Requirements (≤ 12,500 lbs.)

Airport and Runway Data		
Longest Runway Length (Runway 15-33)	4,999 feet	
Airport Elevation	1,814 ft	
Mean Daily Maximum Temperature of Hottest Month	84°F	
Aircraft Classification	**Recommended Turf Runway Length**	
Small Airplanes 12,500 Pounds or less		
10 or more passenger seats	4,410 feet	
Less than 10 passenger seats at 100 percent of fleet	4,280 feet	
Less than 10 passenger seats at 95 percent of fleet	3,700 feet	
Small Aircraft Runway Length Analysis Tool	**Dry**	**Wet**
Cessna 172	2,070 feet	2,381 feet
Cessna 182	1,945 feet	2,237 feet
Cessna 402B	4,069 feet	4,679 feet
Cessna T206	2,349 feet	2,701 feet
Cirrus SR 22 Turbo	2,938 feet	3,379 feet
Mooney M20J	3,654 feet	4,202 feet

Air Tractor 502	3,330 feet	3,830 feet
Air Tractor 802	**5,300 feet**	**6,095 feet**
Beechcraft King Air 200	3,905 feet	4,491 feet
Cessna 208	2,647 feet	3,044 feet
Pilatus PC 12	3,619 feet	4,162 feet
Piper Malibu Meridian	3,063 feet	3,522 feet
Cessna 560 XL	4,838 feet	**5,564 feet**
Phenom 300	4,427 feet	**5,091 feet**

*Source: FAA AC 150/5325-4B, KLJ Analysis. Note: *Wet conditions are not allowed to be considered for turf runways.*

For other small general aviation aircraft, the FAA runway length requirements of 95 percent of fleet would apply at HZE due to its number of current and forecasted operations. The recommended turf runway length for small general aviation aircraft is **3,700 feet** which is 1,299 feet less than Runway 15-33 at 4,999 feet long.

Individual Aircraft

The Airport Cooperative Research Program (ACRP) released the Small Aircraft Runway Length Analysis Tool (SARLAT) in late 2022. This tool allows multiple general aviation aircraft to be applied to the airport environment to evaluate the runway length needed for said airport. It is also recommended to use airplane flight manuals in lieu of FAA Figure 2-1 or 2-2. We applied the aircraft listed in **Table D-1** along with some other frequent aircraft seen at Hazen, and the SARLAT calculated the takeoff and landing length needed in wet and dry conditions.

The results the tool provides can be seen in **Figure D-1**. The piston aircraft (Cessna 182 Skylane to Cessna T210 Turbo Centurion) have an AAC of A and an ADG-I and maximum takeoff weight (MTOW) between 3,100 lbs. and 3,800 lbs. The turboprop aircraft (Beechcraft King Air 350ER and Cessna 208 Caravan) has an AAC-A/B and ADG-II with MTOW of 9,062 lbs. to 15,000 lbs.

SARLAT does not have all general aviation listed in the program and it was important to evaluate the Air Tractor 502's landing and takeoff distance needed since it is a frequent aircraft seen at the airport. It was determined that 3,330 feet where needed for takeoff which is well within the current length of Runway 15-33 at 4,999 feet. This information can be seen in **Figure D-2**.

Turf Runway

During the planning study it was discovered that a 95% crosswind coverage is not met with only Runway 15-33. It was also expressed by airport users the desire for a turf runway. The Advisory Circular states that 100% of the recommended runway length determined for the lower crosswind capable airplanes using the primary runway for non-scheduled service. These airplanes include the Cessna 172, 182, and 402B and Mooney M20J. Of theses aircraft the longest runway length needed is 4,069 feet for the Cessna 402B. Unfortunately, due to land restriction at Mercer County Regional Airport that length could not be accomplished.

The All Weather Total Wind Observations showed a runway alignment of 6-24 would help accomplish the 95% required crosswind component and proposed crosswind runway options were evaluated based on that general alignment along with proposed Runway Protection Zone (RPZ) locations. Please see **Chapter 2** for more details about the proposed options. It was determined a crosswind runway option in the alignment of 4-22 and a length of 2,500 feet was best suited to meet the needs of the crosswind component and airport user needs.

Figure D-1 – STARLAT Runway Analysis

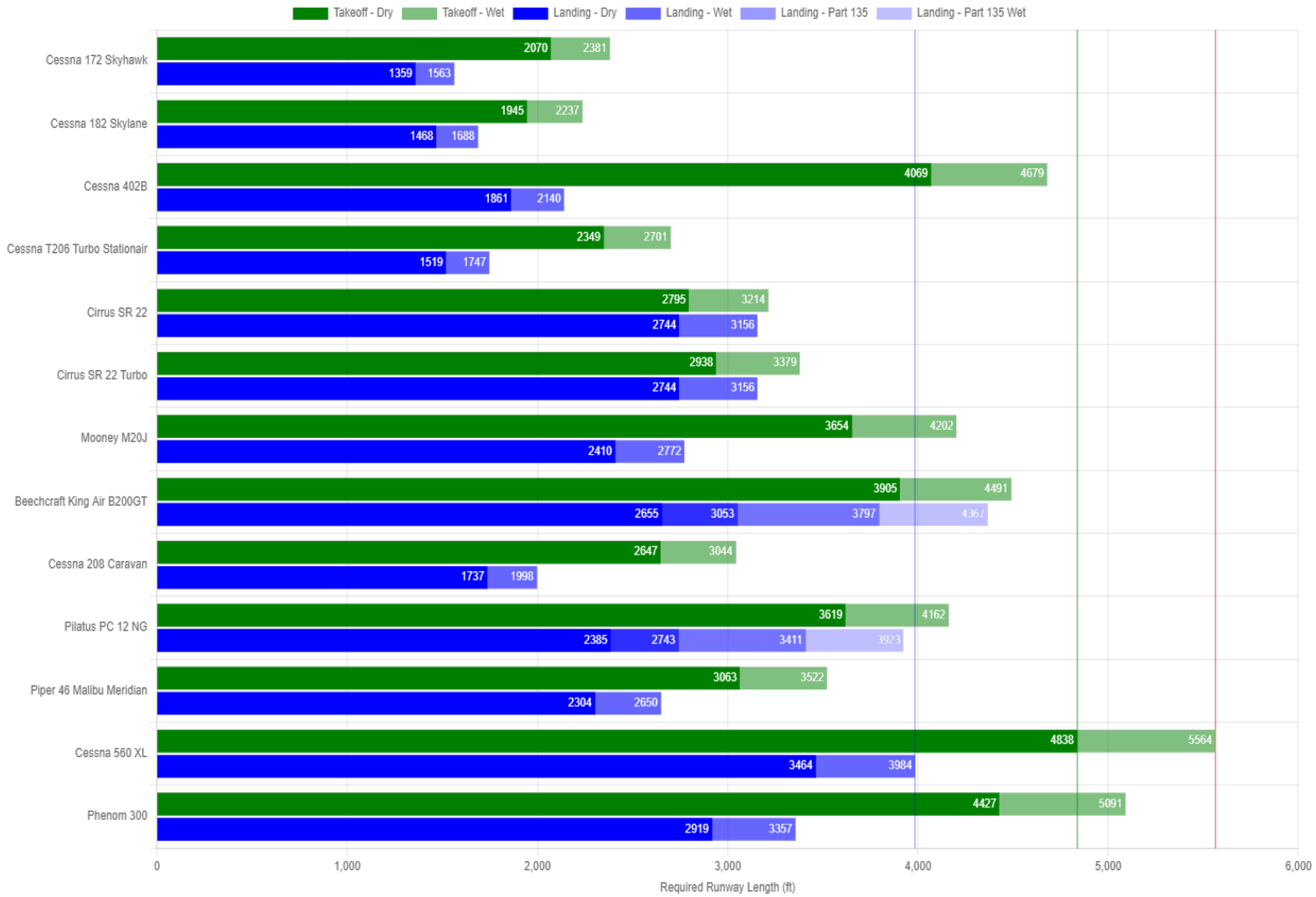
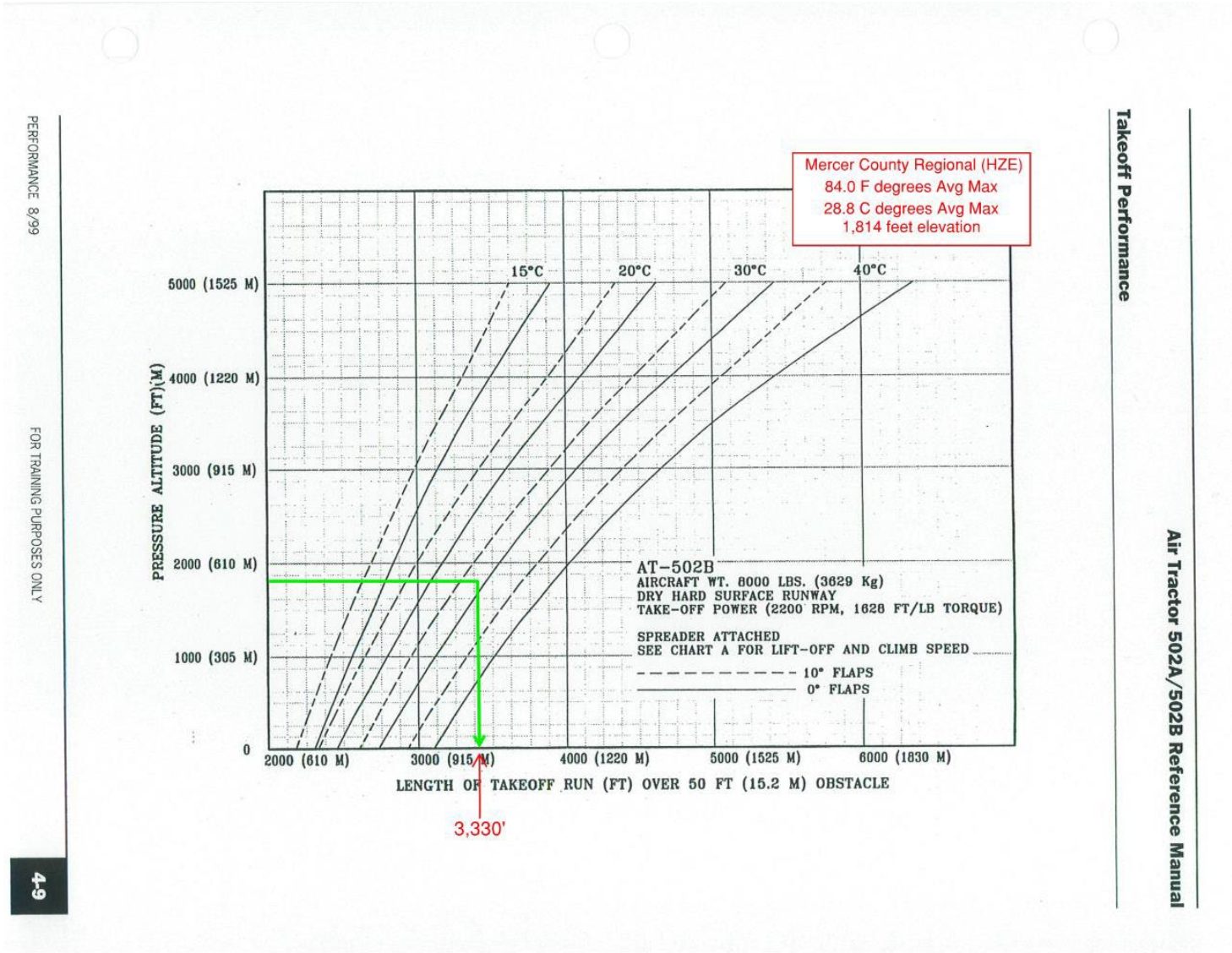


Figure D-2 – Air Tractor 502B Runway Length Requirements



APPENDIX E: RECYCLING & SOLID WASTE

Introduction

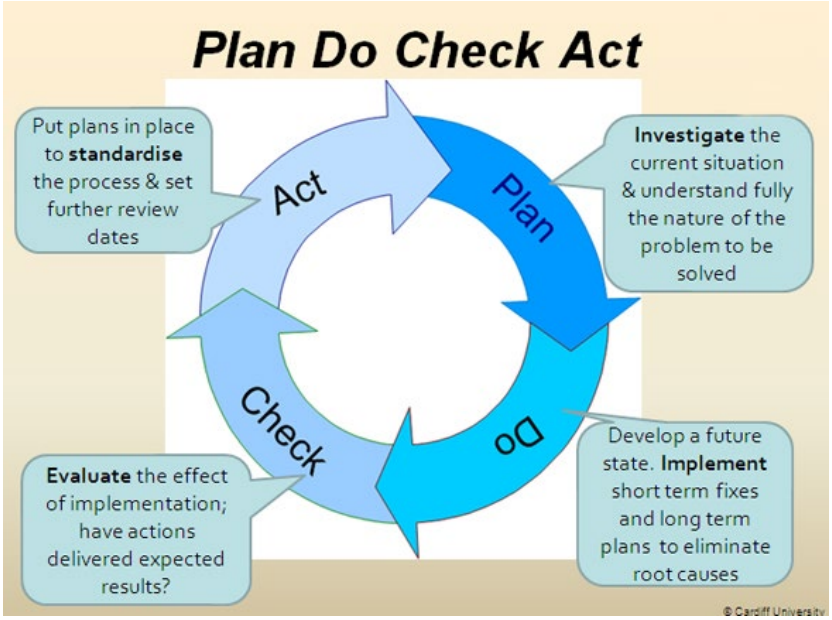
In the FAA Modernization and Reform Act of 2012 (Public Law 112-95), the Airport Improvement Program language was amended (49 USC Section 47106(a)) to include the evaluation of airport solid waste recycling. The change stipulates that the following issues will be addressed:

- Feasibility of Solid Waste Recycling at the Airport,
- Minimizing the Generation of Solid Waste at the Airport,
- Operation and Maintenance Requirements Related to Solid Waste,
- Review of Waste Management Contracts, and
- Potential Cost Savings or Generation of Revenue from Solid Waste Recycling.

To accomplish these objectives this appendix will include:

- Examination of Existing Solid Waste Handling and Recycling
    - Existing Practices including Operations and Maintenance Issues
    - Existing Waste Management Contracts
- Examination of Recycling Opportunities
- Alternatives to Minimize Generation of Solid Waste and
- Cost Savings/Revenue Potential from Recycling

The FAA released a memorandum on September 30, 2014 titled *Guidance on Airport Recycling, Reuse, and Waste Reduction Plans* that provides technical guidance on preparing airport recycling plans. The FAA also published Recycling, Reuse and Waste Reduction at Airports – A Synthesis Document on April 24, 2013. Please note, a Solid Waste Recycling plan is one element of an Environmental Management System (EMS). This appendix will not address all elements of an EMS but information regarding an EMS can be found in FAA AC 150/5050-8, *Environmental Management Systems for Airport Sponsors*. The EMS concept follows the "Plan, Do, Check, Act" model which will also be the way the Solid Waste Recycling can be continually evaluated and improved.



The content and scope of a solid waste recycling plan can vary based upon availability of information and the unique environment at every airport. This appendix represents a baseline review of existing practices and opportunities. A comprehensive analysis of components such as quantity and composition of waste, program performance, and financial analysis would be completed during a waste audit.

Existing Solid Waste Handling & Recycling

There are four types of waste typically generated at an airport. These are: 1) Municipal Solid Waste, 2) Construction/Demolition Waste, 3) Compostable Waste, and 4) Deplaned Waste. These are further described in **Table E-1**.

Table E-1 – Waste Types

Waste Type	Description
Municipal Solid (MSW)	Consists of everyday items that are used and discarded. Recyclable MSW at airports includes, but is not limited to, aluminum and steel, glass bottles and containers, plastic bottles and containers, packaging, bags, paper products, and cardboard.
Construction /Demolition (C&D)	Generally categorized as MSW. C&D debris is any non-hazardous solid waste that results from land clearing, excavation, or construction, demolition, renovation, or repair of structures, roads, and utilities. C&D debris includes, but is not limited to, concrete, wood, metals, soil, bricks and masonry material, asphalt, rock, stone, gravel, sand, roofing materials, drywall, carpet, plastic, pipe, rocks, earthwork, land-clearing debris, cardboard, and salvaged building components. In some instances, C&D debris requires special handling and may be subject to special requirements. Examples include tar-impregnated roofing materials and asbestos- containing building materials.
Compostable Waste	Generally categorized as MSW. They are sometimes referred to as green waste and food waste. Green waste consists of tree, shrub, and grass clippings, leaves, weeds, small branches, seeds, pods, and similar debris generated by landscape maintenance activities. Food waste is food that is not consumed, or generated during food preparation activities and discarded.

Deplaned Waste	A type of MSW removed from passenger aircraft. These materials include bottles and cans, newspaper and mixed paper, plastic cups and utensils, food waste, food-soiled paper, magazines, unconsumed or surplus food, and paper towels.

Source: FAA Guidance on Airport Recycling, Reuse and Waste Reduction Plans, September 30th, 2014

Existing Practices

The Mercer County Regional Airport has two dumpsters. One at the north apron by the paint FBO and one by the central apron. The City of Hazen collects waste weekly on Fridays. There are no recycling services offered in the area. The Airport also has a 100-gallon container used to discard used motor oil. A local service station picks it up. It is unknown what tenants in private hangars do to dispose of their trash.

Existing Waste Management Contracts

The disposal of waste is a specialized service not regularly performed by airports. For the HZE, the City of Hazen handles solid waste pick up. All the solid waste locations are listed in **Table E-2** Waste Management Contracts.

Table E-2 – Waste Types

Contractor	Type of Waste	Container Size/Locations	Collection Frequency	Tenant(s)
City of Hazen	**All**	**3-yard dumpster / Central Apron**	**Weekly (Friday)**	**Terminal**
City of Hazen	**All**	**2-yard dumpster / North Apron**	**Weekly (Friday)**	**Paint FBO**

Source: Airport Staff & Tenants

Airport Efforts to Minimizing the Generation of Solid Waste

No efforts are underway to reduce solid waste at the Mercer County regional Airport. When construction projects occur, any debris can be used in the project such as recycled pavement is reused when possible.

Recycling Opportunities

The first option for airports regarding recyclables depends upon private/public parties that accept certain types of recyclable material in the nearby area. There are currently no recycling opportunities in Hazen or the surrounding area.

Alternatives to Minimize Solid Waste Generation

The common theme for this is “Reduce, Reuse, Recycle”.

Promoting Reduce, Reuse, Recycle



This is more than marketing. It is promoting, incentivizing, and eliminating barriers to enable ‘reduce, reuse, recycle’ to be common practice.

Cost Savings/Revenue Potential from Recycling

The potential for cost savings or revenue potential is dependent upon the value of the recycled commodity in the market, the volume of the waste type generated and the ability to manage the waste collection to prevent contamination.

The Airport currently has light-emitting diode (LED) bulbs in hangars owned by airport authority as well as their snow removal equipment building. The airport also utilizes LED light bulbs for outside lighting.

When developing a recycling program, it is important to note that all planning for recycling must start with the disposal or the recycling destination in mind. If a destination facility is capable of efficiently sorting the comingled recyclable materials than a single-stream program would be possible. This allows all allowable recyclables to be deposited into a single bin by the depositor. Single stream recycling garners the highest participation rate from the population and has the biggest reduction in products going to the landfill. However, if the destination does not have the means to efficiently sort comingled recyclable materials than a multi-stream recycling program should be planned. This is where the depositor sorts recyclable materials into separate containers and are handled separately throughout the recycling process. The capabilities and requirements of the destination facility should periodically be reassessed to identify any changes and capture new opportunities.

Facilities in the City of Hazen do not support the efficient sorting of comingled recyclables. A multi-stream recycling program should be planned where the depositor separates the materials. They must be delivered to the collection points.

Areas Where Gains Can Be Made at the Airport

It is recommended that the Mercer County Regional Airport begin a new collection and sorting procedure for recyclables and solid waste. The Airport should recognize and establish four ‘streams’ for waste. The four streams are:

- Trash – all trash not otherwise identified as recyclable. Dispose in standard waste containers.
- Plastic Containers – Plastic #1 and #2 - these two types of materials may be comingled in a single receptacle. Plastic products should be deposited in a separate container with a sealed lid. Materials are brought to the county collection site where they are processed by a private recycling company.
- Paper Products – Newspapers, magazines, and phone books are required to be sorted separately. Select the product(s) that diverts the greatest volume from going to the landfill.

Paper products are sensitive to moisture and if exposed the quality of the recyclable is lost. They should be deposited in a separate container with a tightly sealed lid. Materials are brought to the county collection site where a private recycling company processes them.

- Aluminum Cans – Aluminum beverage containers should be deposited in a separate container with a sealed lid. Materials are brought to the county collection site where a private recycling company processes them.

Disseminating the waste/recycle streams and processes to the tenants of the airport would be beneficial. The waste/recycle streams are portrayed in **Figure 4 - Recommended Waste & Recycling Streams.**

Other Methods Which Would Reduce Environmental Impacts of the Airport

1. Complete a Comprehensive Waste Audit to assess volume of waste and recyclables and results of recycling program changes.
2. Complete an energy audit to see where improvements in existing buildings could be made.
3. Develop minimum standards for tenants to reduce waste and energy usage.
4. Encourage green building policies and practices. Explore the following methods:
    a. LED lighting – reduce energy usage
    b. White roofs – reduce heat in the summer
    c. Solar wall heating – reduce cost to heat or cool buildings
    d. Wind and phot-voltaic renewable energy system

Potential Cost Savings/Revenue Potential from Recycling

While exact numbers are not known now, taking solid municipal waste, deplaned waste, food waste and several other wastes out of the waste stream should help reduce the cost for collection services paid by the Airport and its tenants. It is recommended that the Airport work with the solid municipal waste collectors to develop a baseline of trash and recyclables collected at the Mercer County Regional Airport. A monthly report would show potential areas of improvement and should lead to cost savings in trash collection.

Figure 3 – Recommended Waste & Recycling Streams

