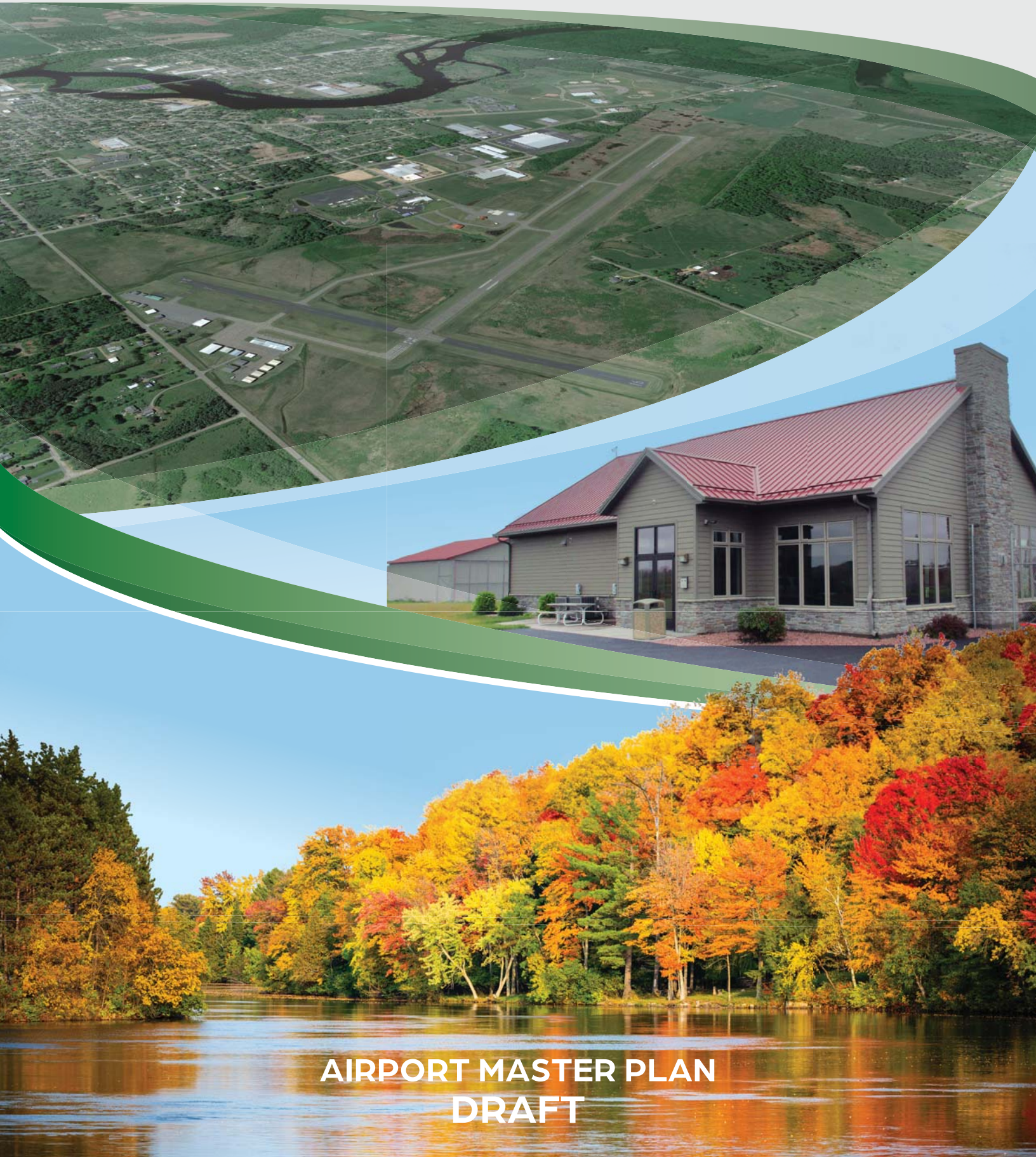
merrill municipal airport



AIRPORT MASTER PLAN
DRAFT

Draft Final

AIRPORT MASTER PLAN

FOR

Merrill Municipal Airport
Merrill, Wisconsin

PREPARED FOR

City of Merrill

BY

Coffman Associates
Airport Consultants

August 2026

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INTRODUCTION

INTRODUCTION

WHAT IS A MASTER PLAN?

The Federal Aviation Administration (FAA) recommends that airports update their long-term planning documents every seven to 10 years or as necessary to address local changes at the airport. The last planning study for Merrill Municipal Airport (RRL) was completed in 2009, with the Airport Layout Plan (ALP) most recently updated and approved in 2016. The City of Merrill, the sponsor of the airport, received a grant from the Wisconsin Department of Transportation (WisDOT) Bureau of Aeronautics (BOA)[1] in 2023 to update this airport master plan. Following approval of the preferred development alternative, the ALP will be updated.

The city is responsible for funding capital improvements at the airport and obtaining FAA Airport Improvement Program (AIP) and WisDOT-BOA development grants. In addition, the city oversees facility enhancements and infrastructure development conducted by private entities at the airport. The master plan provides guidance for future development and justification for projects for which the airport may receive funding through an updated capital improvement program (CIP) by demonstrating the future investment required by the city, the FAA, and the BOA.

The airport master plan follows a systematic approach outlined by the FAA to identify airport needs in advance of the actual need for improvements. This is done to ensure the city can coordinate environmental reviews, project approvals, design, financing, and construction to minimize the negative effects of maintaining and operating inadequate or insufficient facilities. An important outcome of the master plan process is a recommended development plan, which reserves sufficient areas for future facility needs. Such planning will protect development areas and ensure they will be readily available when required to meet future needs. The intended outcome of this study is a detailed on-airport land use concept that outlines specific uses for all areas of airport property, including strategies for revenue enhancement.

[1] WisDOT participates in the State Block Grant Program, which administers federal grants from the Airport Improvement Program (AIP) for the FAA.

The preparation of this study is evidence that the city recognizes the importance of the airport to the surrounding region and the associated challenges inherent in providing for its unique operating and improvement needs. The cost of maintaining an airport is an investment that yields impressive benefits to the local community. With a sound and realistic master plan, the airport can maintain its role as an important link to the regional, state, and national air transportation systems. Moreover, the plan will aid in supporting decisions for directing limited and valuable city resources for future airport development. Ultimately, the continued investments in the airport will allow the city to reap the economic benefits generated by historical investments.

AN AIRPORT MASTER PLAN IS…

- A comprehensive, long-range study of the airport and all air and landside components that describes plans to meet FAA safety standards and future aviation demand.
- Required by the FAA to be conducted every 7-10 years to ensure plans are up to date and reflect current conditions and FAA regulations.
- Funded 90% by a BOA apportionment grant, derived from FAA discretionary funds allocated to the BOA. The remaining 10% is split between the State of Wisconsin and the City of Merrill.
- A local document that will ultimately be presented for approval from the City of Merrill. The FAA/BOA approves only two elements of the master plan: the aviation demand forecasts and the airport layout plan (ALP) drawing set.
- An opportunity for airport stakeholders and the public to engage with airport staff on issues related to the airport, its current and future operations, and environmental and socioeconomic impacts. Two public information workshops will be conducted during the master plan process to facilitate this public outreach effort.

AN AIRPORT MASTER PLAN IS *NOT*…

- A guarantee that the airport will proceed with any planned projects. Master plans are guides that help airport staff plan for future development; however, the need/demand for certain projects might never materialize.
- A guarantee that the City of Merrill, the BOA, or the FAA will fund any planned projects. Project funding is considered on a case-by-case basis and requires appropriate need and demand. Certain projects may require the completion of a benefit-cost analysis.
- A binding or static plan. Elements of the master plan may be updated to reflect changes in aviation activity at the airport, economic conditions of the region, or the goals of the City of Merrill.
- Environmental clearance for specific projects. The master plan includes an environmental overview which identifies potential environmental sensitivities per the *National Environmental Policy Act of 1969* (NEPA) guidelines. Most planned projects will require a separate environmental study prior to construction.

WHO IS PREPARING THE MASTER PLAN?

The city has contracted with Coffman Associates, Inc. to undertake the airport master plan. Coffman Associates is an airport planning and consulting firm that specializes in master planning and environmental studies. Coffman Associates will lead the planning team, with support from the following firms:

- Becher-Hoppe – Engineering support
- Martinez Geospatial – Aerial photography, ground survey, and geographic information system (GIS) products to meet FAA 5300-18B requirements for Airports GIS data submittal

The airport master plan is being prepared in accordance with FAA requirements, including Advisory Circular (AC) 150/5300-13B, *Airport Design*, and AC 150/5070-6B, *Airport Master Plans* (as amended). The plan will be closely coordinated with other planning studies relevant to the area and with aviation plans developed by the FAA and BOA. The plan will also be coordinated with the City of Merrill, as well as other local and regional agencies, as appropriate.

GOALS AND OBJECTIVES

The primary goal of this master plan is to develop and maintain a financially feasible, long-term development program that will satisfy aviation demand of the region; be compatible with community development, other transportation modes, and the environment; and enhance employment and revenue for the local area. Accomplishing this goal requires an evaluation of the existing airport to decide what actions should be taken to maintain a safe, adequate, and reliable facility.

Specific objectives of the study include the following:

- Conduct a thorough inventory of facilities, including the runway safety areas (RSA) for both runways (Runway 7-25 and Runway 16-34) to populate the data required for Appendix 1 of FAA Order 5200.8, *Runway Safety Area Program*.
- Conduct an environmental study, to include an inventory, nearby sensitivities, and an overview with consideration of future impacts based on the recommended plan.
- Outline existing and projected future aviation demand of Merrill Municipal Airport's based aircraft and annualized aircraft operations by type.
- Analyze current aircraft operations to determine the appropriate critical aircraft and associated planning design standards for the current and ultimate planning horizons.
- Consider future terminal building and hangar capacity (expansion/modification/replacement/etc.).
- Evaluate appropriate safety areas and setbacks in consideration of the airport's limited property and constraints.

- Complete a facility requirement analysis for the airfield system to include runway length and width for both runways, as well as taxiway locations/dimensions, and a justification analysis for crosswind Runway 16-34 in FAA funding mechanisms.
- Conduct an airfield geometry analysis, including a direct access taxiway to Runway 16-34 (among others).
- Consider construction of additional corporate hangars.
- Consider larger apron area(s).
- Develop future layout as determined via the planning process.
- Establish a development strategy, to include expanded hangar and apron development to support existing and anticipated based aircraft and itinerant operations.
- Develop a 20-year capital improvement plan (CIP), including a recommended phasing plan.
- Analyze eligibility of CIP projects for AIP funding.
- Provide strategies to protect the airport from encroachment and incompatible land uses.
- Conduct initial environmental planning analyses, including coordination with key agencies.
- Include public outreach and involvement throughout the planning process.
- Review and recommend updates of the airport's rates and charges.
- Complete the planning process as a collaborative measure that is inclusive of key stakeholders and the public.

BASELINE ASSUMPTIONS

A long-range planning study requires several baseline assumptions which will be used throughout this analysis. The baseline assumptions for this study are as follows:

- Merrill Municipal Airport will continue to operate as a local general aviation airport through the 20-year planning period;
- The airport will continue to accommodate general aviation tenants, as well as itinerant and/or local aircraft operations by air taxi, general aviation, and military operators;
- The aviation industry will develop through the planning period as projected by the FAA (specifics of projected changes in national aviation industries are described in Chapter Two – Forecasts);
- The socioeconomic characteristics of the region will generally change as forecast (see Chapter Two); and
- A federal and state airport improvement program will be in place through the planning period to assist in funding future capital development needs.

MASTER PLAN ELEMENTS AND PROCESS

The master plan includes eight elements that are intended to assist in the evaluation of future facility needs and provide the supporting rationale for their implementation. **Exhibit i** provides a graphical depiction of the process involved with the study.

Element 1 – Study Initiation and Organization includes the development of the scope of services and schedule, as well as the establishment of a planning advisory committee (PAC). Study materials will be assembled in a workbook format. General background information will be established that includes outlining the goals and objectives to be accomplished during the master plan. A project-specific website will also be developed to house draft materials and allow for the receipt of comments.

Element 2 – Inventory of Existing Conditions focuses on collecting and assembling relevant data pertaining to the airport and the area it serves. Information on existing facilities and operations is collected. Local economic and demographic data are collected to define the local growth trends, and environmental information is gathered to identify potential environmental sensitivities that might affect future improvements. Planning studies that may have relevance to the master plan are also collected.

Element 3 – Forecasts examines the potential aviation demand at the airport. The analysis utilizes local socioeconomic information and national air transportation trends to quantify the levels of aviation activity that can reasonably be expected to occur at Merrill Municipal Airport over a 20-year period. An existing and ultimate critical aircraft are also established to determine future planning design standards based on AC 150/5000-17, *Critical Aircraft and Regular Use Determination*. The results of this effort are used to determine the types and sizes of facilities that will be required to meet the projected aviation demand at the airport through the planning period. This element is one of two elements that are submitted to the BOA for approval.

Element 4 – Airport Facility Requirements Analysis determines the available capacities of various facilities at the airport; whether they conform with FAA/BOA standards; and what facility updates or new facilities will be needed to comply with FAA/BOA requirements and/or the projected 20-year demand.

Element 5 – Airport Development Alternatives considers a variety of solutions to accommodate projected airside and landside facility needs through the long-term planning period. An analysis is completed to identify the strengths and weaknesses of each proposed development alternative, with the intention of determining a single direction for development.

Element 6 – Recommended Plan and Land Use Compatibility provides both a graphic and narrative description of the recommended plan for the use, development, and operation of the airport. This plan forms the basis of the ALP drawing set. Existing zoning ordinances and other land use management documentation will be reviewed and summarized, and land use management techniques in the airport vicinity will be outlined. This element also includes the formulation of an environmental overview and recycling plan.

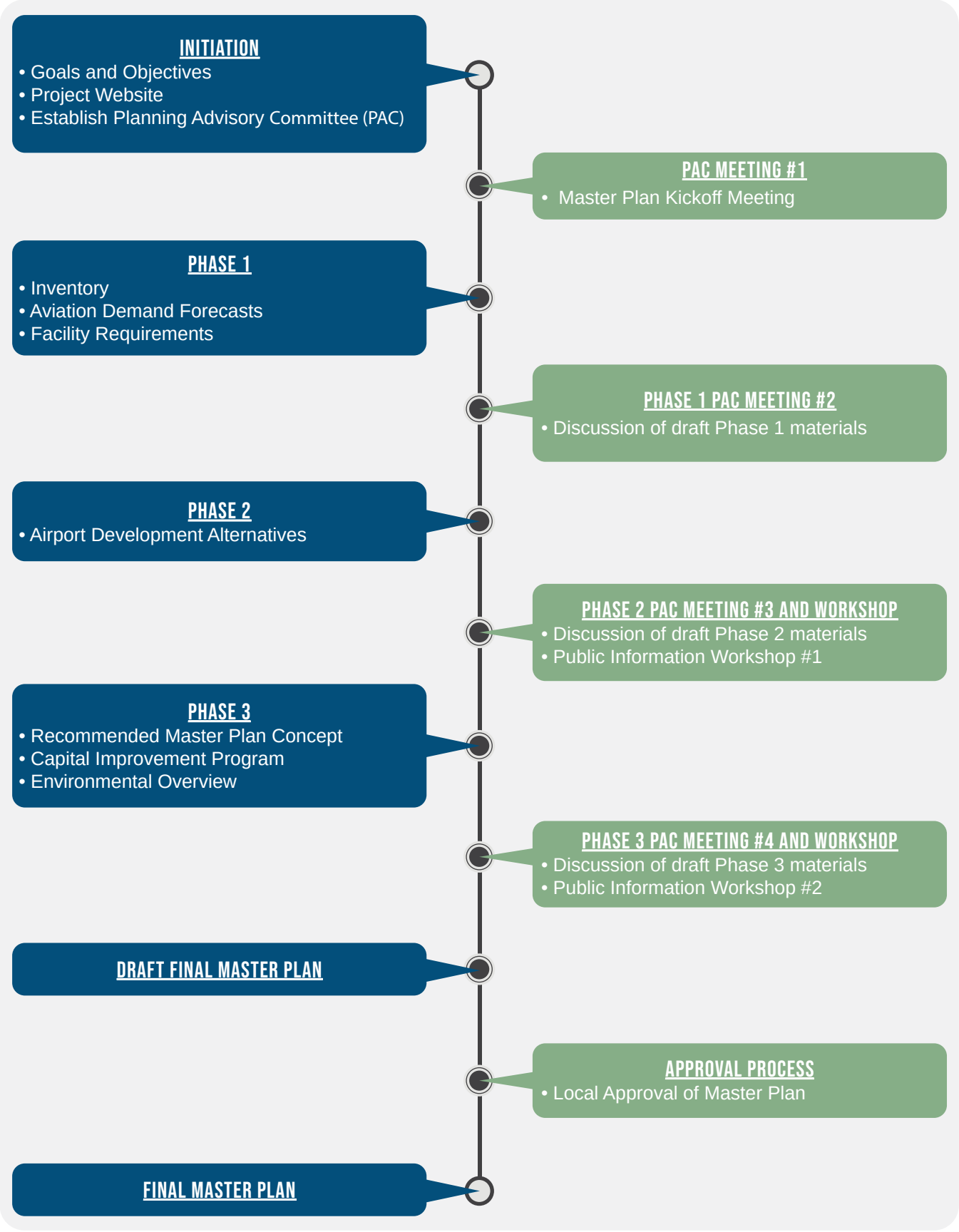

Exhibit i
PROJECT WORKFLOW

Element 7 – Financial Management and Development Program includes a 20-year capital improvement program (CIP). The CIP is established to define the schedules, costs, and funding sources for the recommended development projects.

Element 8 – Final Reports and Approvals provides documents which depict the findings of the study effort and present the study and its recommendations to appropriate local organizations. The final document incorporates the revisions to previous working papers prepared under earlier elements into a usable master plan document.

COORDINATION AND OUTREACH

The Merrill Municipal Airport master plan is of interest to many within the local community and region, including local citizens; local businesses; community organizations; city officials; airport users/tenants; and aviation organizations. As a component of the regional, state, and national aviation systems, the airport is of importance to both state and federal agencies responsible for overseeing the air transportation system.

To assist in the development of the master plan, a PAC was established to act in an advisory role during preparation of the study. Committee members are scheduled to meet four times at designated points during the study to review study materials and provide comments to help ensure the development of a realistic, viable plan.

Draft working paper materials will be prepared at various milestones in the planning process. The working paper process allows for timely input and review during each step in the master plan to ensure all issues are fully addressed as the recommended program develops.

Two open-house public information workshops will also be conducted as part of the study coordination and outreach efforts. Workshops are designed to allow all interested persons to become informed and provide input concerning the master plan process. Notices of meeting times and locations will be advertised through local media outlets and all draft reports, meeting notices, and materials will be made available to the public on the project website at https://merrill.airportstudy.net.

SWOT ANALYSIS

A SWOT analysis is a strategic business planning technique used to identify **S**trengths, **W**eaknesses, **O**pportunities, and **T**hreats associated with an action or plan. The SWOT analysis involves identifying an action, objective, or element, and then identifying the internal and external forces that positively and negatively impact that action, objective, or element in a given environment. A SWOT analysis was conducted with the PAC in October 2023. A summary of this exercise and discussion is included below.

SWOT DEFINITIONS

This SWOT analysis groups information into two categories:

- **Internal –** attributes of the airport and market area that may be considered strengths or weaknesses for the action, objective, or element
- **External –** attributes of the aviation industry that may pose as opportunities or threats for the action, objective, or element

The SWOT further categorizes information into one of the following:

- **Strengths –** internal attributes of the airport that are helpful to achieving the action, objective, or element
- **Weaknesses –** internal attributes of the airport that are harmful to achieving the action, objective, or element
- **Opportunities –** external attributes of the industry that are helpful to achieving the action, objective, or element
- **Threats –** external attributes of the industry that are harmful to achieving the action, objective, or element

It is important to note that some attributes may fit into multiple categories. An attribute might be considered both a strength and a weakness, depending on the perspective of the person or entity describing it. **Exhibit ii** summarizes the SWOT exercise that was conducted with the PAC.

S **STRENGTHS**	• RRL is business-oriented, with a focus on revenue production and self-sustainability. • Primary Runway 7-25 is 5,100' long and is capable of accommodating a wide range of GA aircraft, including small to mid-sized jets. • There is a crosswind runway (16-34) which increases the airport's utility. • The airport has close proximity to town and its location in central Wisconsin makes it convenient for medical transport. • RRL is well-situated for future growth, with shovel-ready hangar sites. • The primary runway has uncomplicated LPV GPS approaches that are easy to fly. • There is a full-time FBO with aircraft maintenance service, which is not common in the area.	• A late model courtesy car is available for airport users. • The terminal is modern, attractive, and well-equipped for pilots and airport visitors. • The airport property is fully enclosed with perimeter fencing; enhancing safety, security, and preventing wildlife entry. • There are publicly owned hangars available, which is an excellent revenue source for the city. • Avigation easements are currently in place, serving to protect airspace by limiting incompatible land use development around the airport. • Flight training is offered at RRL. • A turf landing area is available adjacent the primary runway.
W **WEAKNESSES**	• Crosswind Runway 16-34 is 2,997' long, which is too short to accommodate many airport users, and does not have a full-length parallel taxiway. The runway is also in need of rehabilitation/reconstruction, but its eligibility for federal funding assistance is in question. • The airport's proximity to town adds an element of risk in the form of noise complaints and the potential for nearby incompatible land use development.	• There are wetlands on the airport, which is an environmental risk factor. • The current maintenance facility is too small. • There are not enough hangars to accommodate demand for aircraft storage. • The turf landing area adds maintenance costs and can be considered a risk. • There is no approach lighting system at RRL.
O **OPPORTUNITIES**	• There is opportunity to educate the public and increase awareness about the value RRL brings to the community. • RRL could accommodate Advanced Air Mobility (AAM) activity in the future. • The hangar waiting list indicates clear demand for aircraft storage facilities.	• RRL provides an important connection to larger communities in the region. • Funding sources in addition to annual entitlement funding, including BIL money, is available.
T **THREATS**	• The airport is perceived by some as only accessible to wealthy people, with limited utility for the larger public. • AAM has many unknowns regarding its integration into existing operational practices.	• Congress has not increased the amount of funding available through the FAA Reauthorization Act in more than 20 years, while inflation has significantly increased.*

*Since the SWOT was conducted, Congress authorized an increase in Airport Improvement Program funding, from $3.35 billion to $4.0 billion.

Chapter 1

INVENTORY

Chapter 1

INVENTORY

The inventory chapter of existing conditions is the initial step in the preparation of the Merrill Municipal Airport (RRL) Master Plan. The inventory will serve as an overview of the airport's physical and operational features, including facilities, users, and activity levels, as well as specific information related to the airspace, air traffic activity, and role of the airport. Finally, a summary of socioeconomic characteristics and review of existing environmental conditions on and adjacent to the airport are thoroughly detailed, which will provide further input into the study process.

Information provided in Chapter One serves as the baseline for the remainder of the master plan, which is compiled using a wide variety of resources, including: applicable planning documents; on-site visits; interviews with airport staff, tenants, and users; aerial and ground photography; federal, state, and local publications; and project record drawings. Specific sources are listed below, and environmental resources are detailed at the end of this chapter.

Inventory Source Documents:

- 2009 Merrill Municipal Master Plan/Airport Layout Plan (ALP) Update; 2016 ALP Update
- City of Merrill's airport website (https://ci.merrill.wi.us/airport)
- City of Merrill Strategic Plan, 2020-2024
- City of Merrill Comprehensive Plan (2017)
- Merrill Municipal Airport Federal Aviation Administration (FAA) Form 5010, *Airport Master Record*

AIRPORT SETTING AND BACKGROUND

LOCALE

The City of Merrill is located in Lincoln County in north-central Wisconsin, approximately 160 miles north of Madison and 110 miles northwest of Green Bay. Merrill serves as the county seat, and with a population of 9,347 as of the 2020 Census, it is the largest community within Lincoln County. The "City of Parks,"

as it is known locally, is situated along the banks of the Wisconsin River and at the edge of Wisconsin's Northwoods, an area encompassing more than 500,000 acres that is known for its abundant forests and lakes. In this locale, residents and visitors enjoy diverse scenery, a rich history, and a thriving local economy. Major employment industries in the area include insurance, manufacturing, finance, education, and retail.

Merrill Municipal Airport is situated within the Merrill city limits on the northwest edge of town, near the Merrill Industrial Park. The airport encompasses approximately 430 acres and sits at an elevation of 1,318.2 feet above mean sea level (MSL). The surrounding major surface roadways include U.S. Route 51, which runs north/south on the east side of Merrill, and Wisconsin Highway 107 (WIS 107), which borders the airport's west side and connects to Taylor Street. From Taylor Street, Champagne Drive and Airport Road provide access to airport property. **Exhibit 1A** depicts the airport in its regional setting.

AIRPORT ADMINISTRATION

Merrill Municipal Airport is owned and operated by the City of Merrill. An Airport Commission is responsible for operational and fiscal oversight management of the airport. The Commission consists of five members (including one alderperson) who are appointed by the mayor and confirmed by the city council. The Commission is responsible for electing its own chairman and secretary to maintain records and report to council on a monthly basis. Airport commissioners serve six-year terms. An airport manager provides day-to-day oversight of the airport and its maintenance and serves as a staff liaison to the Airport Commission. The airport is staffed via the fixed base operator (FBO) acting as airport manager Monday through Friday from 8:00 a.m. to 5:00 p.m.

CLIMATE

Climate and local weather conditions are an important consideration in the master planning process as they can significantly impact an airport's operations. For example, high surface temperatures and humidity increase runway length requirements, and runway orientation is dependent upon predominant wind patterns for the area. Cloud cover percentages and frequency of other climatic conditions also determine the need for navigational aids and lighting.

Merrill experiences a humid continental climate with four distinct seasons. Winters are severe, while summers are generally warm. The weather is generally humid, and there is no dry season. **Exhibit 1B** displays weather patterns in the city. July has the highest average maximum temperature of 80.2 degrees, while January is the coldest month with an average minimum temperature of 3.4 degrees. Annual rainfall totals 33.8 inches and is most plentiful during the summer, with June being the rainiest month, averaging 4.6 inches. Annual snowfall totals 54.3 inches, with January averaging the most snow at 12.4 inches.

LAKE SUPERIOR
MICHIGAN
Superior
53
Spooner
MERRILL
MUNICIPAL AIRPORT
8
8
Marinette
Eau Claire
Green Bay
10
94
51
MINNESOTA
Oshkosh
La Crosse
LAKE
MICHIGAN
43
90
Madison
94
Milwaukee
Racine
61
43
IOWA
ILLINOIS
WISCONSIN

Oneida
RHINELANDER
8
8
Price
14
TOMAHAWK
86
PARISH
45
51
Lincoln
RIB
LAKE
MERRILL
MUNICIPAL AIRPORT
Langlade
Taylor
MERRILL
GOODRICH
ANTIGO
PINE RIVER
64
107
51
ATHENS
HOGARTY
52
Marathon
WAUSAU
29
29
45
MARATHON CITY
29
STRATFORD
MOSINEE
ELDERTON
51
LINCOLN COUNTY

51
K
Alexander Lake
MERRILL
MUNICIPAL AIRPORT
Pesobic
Lake
107
Hillside Drive
107
Pier Street
51
K
Taylor Street
E 14th Street
Wisconsin River
Merrill
64
64
Wisconsin River
S Center Avenue
Joe Snow Road
LOCATION MAP

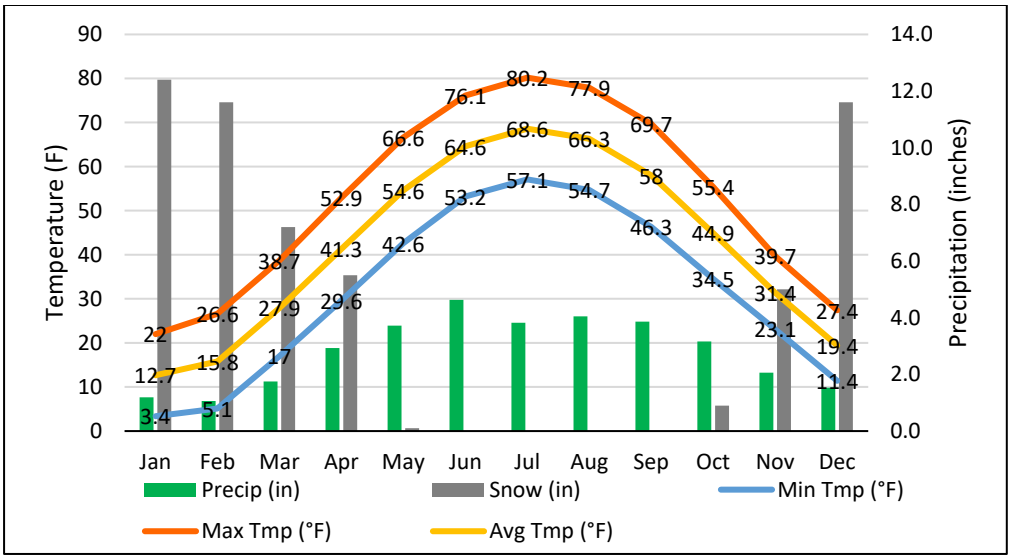

Exhibit 1B – Merrill Weather Patterns

Table 1A indicates that visual meteorological conditions (VMC) occur 87.65 percent of the time. When under VMC conditions, pilots can operate using visual flight rules (VFR) and are responsible for maintaining proper separation from objects and other aircraft. Instrument meteorological conditions (IMC) account for all weather conditions less than VMC conditions that still allow for aircraft to safely operate under instrument flight rules (IFR). Under IFR, pilots rely on instruments in the aircraft to accomplish navigation. IMC conditions occur 7.46 percent of the time. Less than IMC, or poor visibility conditions (PVC), are present 4.89 percent of the time. These weather conditions are lower than instrument approach minimums, making the airport inaccessible to most air traffic.

Table 1A | Weather Conditions

Condition	Cloud Ceiling	Visibility	Percent of Total
VMC	≥ 1,000’ AGL	≥ 3 statute miles	87.65%
IMC	≥ 500’ AGL and < 1,000’ AGL	≥ 1 to < 3 statute miles	7.46%
PVC	< 500’ AGL	< 1 statute mile	4.89%

VMC: Visual Meteorological Conditions
IMC: Instrument Meteorological Conditions
PVC: Poor Visibility Conditions
AGL: Above Ground Level

Station ID: 72644904891 MERRILL MUNICIPAL AIRPORT, WI US; observations from 1/1/2013 thru 12/31/2022

CAPITAL IMPROVEMENT HISTORY

Significant improvements have been made to the airport since its establishment. To assist in funding capital improvements, the FAA and Wisconsin Department of Transportation - Bureau of Aeronautics (WisDOT BOA) have provided funding assistance to Merrill Municipal Airport primarily through the Airport Improvement Program (AIP). Airport improvement funds are collected through user fees, additional taxes on airline airfares, and aviation fuel taxes. As airports grow, or safety standards change over time,

funding is needed to maintain a safe and efficient airport environment. The *Airport and Airway Development and Revenue Act* of 1970 established the Aviation Trust Fund which funds the AIP. Wisconsin is a member of the FAA's Block Grant Program, giving WisDOT BOA the responsibility, among other things, for administering AIP grants to reliever and general aviation airports, including Merrill Municipal Airport. **Table 1B** summarizes approximately $10.4 million in federal grant-aided capital improvement projects undertaken at the airport since 2002. State grant history since 2001 is also included and totals more than $358,000, with an additional $725,482 in state funds to match the AIP grants. These funds have included a variety of airport improvement projects, as listed in the table.

Table 1B | Grant History

FY	Grant Number	Project Description	TOTAL COST	FAA	State	Local
AIP (Federal Aid) Projects						
2002	AIP-01	Reconstruct Rwy 7/25 & grade extension to 5,000'. Construct hangar taxiways. Design of extension and reconstruction of taxiway	**$1,063,162**	636,000	212,000	215,162
2003	AIP-02	Pave Rwy 7/25 extension & relocate Txwy, reconstruct apron	**$930,419**	608,244	161,088	161,088
2004	AIP-03 and SAP-56	EA for parallel taxiways, new GA hangar area, acquire land for new GA hangar area and approach to Rwy 34	**$260,000**	211,263	24,369	24,369
2005	AIP-04	Install perimeter fence; provide jet fuel facility in new south hangar area; master plan, ALP updates and EA re-write; design and construct watermain and sanitary sewer extension to terminal area	**$1,584,568**	1,505,339	39,614	39,614
2009	AIP-05	Land acquisition and land acquisition activities to include: Mutz parcels 40 & 41 and Berlin parcel 42 to protect the Runway 34 approach	**$442,541**	419,663	11,439	11,439
2009	AIP-06	Design and construct parallel taxiway and new terminal area	**$3,055,193**	2,902,433	76,380	76,380
2011	AIP-07	Crackseal & sealcoat airfield pavements	**$60,033**	57,031	1,501	1,501
2012	AIP-08	Taxiway & terminal area development, Phase 2	**$1,352,654**	1,238,071	57,292	57,292
2014	AIP-09 and SAP-59	Design & construct new terminal building	**$414,048**	330,961	41,543	41,543
2015	AIP-10 and SAP-60	Design and construct apron pavement rehab. And drainage; Runway 16-34 length justification report and RPZ alternatives analysis; convert SAP-60 to AIP funding	**$833,171**	749,854	41,659	41,659
2013	AIP-11	Purchase SRE	**$129,740**	123,253	3,244	3,244
2020	AIP-11	CARES / CRRSAA / APRA Operations and Maintenance Reimbursements	**$75,000**	75,000	NA	NA
2021	AIP-12	Repair airfield pavements: crack fill, preservation; repair existing T-hangar; expand apron - In Progress (estimated amounts)	**$1,320,755**	1,245,978	37,388	37,388
2023	AIP-13	Conduct airport master plan; ALP update - In Progress (estimated amounts)	**$359,330**	323,397	17,967	17,967
2023	AIP-14	AWOS replacement	**TBD**			
2023	AIP-15	Design and construct aircraft maintenance bldg. and t-hangars	**TBD**			
		Federal Grants Subtotals	**$11,880,614**	**$10,426,488**	**$725,482**	**$728,644**

Continues on next page

Table 1B | Grant History (continued)

FY	Grant Number	Project Description	TOTAL COST	FAA	State	Local
SAP (State Aid) Projects						
2001	SAP-56	Acquire land easements to clear obstructions for Rwy 16/34 - moved to and included in AIP-03	**$0**	NA	0	0
2010	SAP-57	Install / upgrade fuel system	**$381,059**	NA	304,847	76,212
2014	SAP-58	Site lighting	**$48,649**	NA	38,919	9,730
2021	SAP-60	Land Loan – land acquisition for Rwy 34 approach protection - moved to and included in AIP-10	**$0**	NA	0	0
2021	SAP-61	Reimburse fuel system card reader upgrade	**$18,176**	NA	14,541	3,635
		State Grants Subtotals	**$447,884**	**NA**	**$358,307**	**$89,577**
		TOTAL GRANT FUNDS	**$12,328,497**	**$10,426,488**	**$1,083,789**	**$818,221**

Source: WisDOT BOA Records

THE AIRPORT'S SYSTEM ROLE

Airport planning takes place at the local, state, and national levels, each of which has a different emphasis and purpose.

- **Local** | Merrill Municipal Airport has an approved Airport Layout Plan, which was last updated in 2016.
- **State** | Merrill Municipal Airport is included within the *State Airport System Plan 2030*.
- **National** | Merrill Municipal Airport is included in the *National Plan of Integrated Airport Systems* (NPIAS), which categorizes overall airport roles and responsibilities based on input from local and state planning efforts (i.e., master plans and state system plans).

LOCAL AIRPORT PLANNING

2009 Airport Layout Plan & Narrative | The *2009 Airport Layout Plan & Narrative* provided a 20-year airport development vision based on aviation demand forecasts for activity levels. The study used 2008 data for its aviation forecasts baseline. The primary recommendations from the 2009 study included: construction of a parallel taxiway to Runway 7-25; relocation of the automated weather observing system (AWOS) and primary wind cone; construction of taxiway pavement serving Runway 16-34; property acquisition for approach protection; and additional landside facilities (aprons/taxilanes/hangars) on the south side of the airfield.

2016 Airport Layout Plan Update | An update to the ALP drawing set was approved in 2016 to reflect as-built conditions at the airport. This included the construction of Taxiway A serving as a parallel taxiway to Runway 7-25, construction of the terminal apron, and relocation of the AWOS and primary wind cone. The plan also depicted the addition of visual approach aids serving Runway 16-34.

STATE AIRPORT PLANNING

The primary planning document for the State of Wisconsin is the *State Airport System Plan 2030*, which was adopted in 2015. The System Plan provides an inventory and evaluation of all public-use airports in the state, with a focus on keeping Wisconsin's airports highly advanced, safe, and responsive to the public's needs. Merrill Municipal Airport is classified as a medium general aviation (GA) airport within the System Plan. The definition for a medium GA Community airport is one that "supports most single and multi-engine GA aircraft, including those aircraft commonly used by businesses. These airports support regional and in-state air transportation needs."

FEDERAL AIRPORT PLANNING

Many of the nation's existing airports were either initially constructed by the federal government or their development and maintenance was partially funded through various federal grant-in-aid programs to local communities. The system of airports existing today is, therefore, mostly due to federal policy that promotes the development of civil aviation. As part of a continuing effort to develop a national airport system, the U.S. Congress has maintained a national plan for the development and maintenance of airports.

The FAA maintains a database of airports that are eligible for AIP funding and are for public use called the *National Plan of Integrated Airport Systems* (NPIAS). The NPIAS is published and used by the FAA in administering the AIP, which is the source of federal funds for airport improvement projects across the country. An airport must be included in the NPIAS to be eligible for federal funding assistance through the AIP.

The most current plan is the NPIAS 2023-2027, which identified 3,287 existing public-use airports and eight proposed nonprimary airports anticipated to open by 2027, that are deemed important to national air transportation. The plan estimates that approximately $62.4 billion in AIP-eligible airport projects will require financial assistance between 2023 and 2027, which is an increase of almost $19 billion identified in the previous NPIAS report.

The NPIAS categorizes airports by the type of activities that take place, including commercial service, cargo service, reliever operations, and general aviation. Merrill Municipal Airport is currently classified as a Local GA airport in the NPIAS. These airports are critical components of the national GA system and account for 36 percent of all NPIAS airports. They are typically located near population centers and have moderate levels of activity. They often accommodate flight training and emergency services, and average approximately 33 based propeller-driven aircraft (no jets) at their facilities.

AIRPORT FACILITIES AND SERVICES

There are three broad categories of facilities and services at the airport: airside, landside, and support.

- **Airside facilities** | Facilities directly associated with aircraft operations, including runways, taxiways, lighting, markings, navigational aids, and weather reporting.
- **Landside facilities** | Facilities necessary to provide a safe transition from surface to air transportation and support aircraft parking, servicing, storage, maintenance, and operational safety.

- **Support facilities** | Serve as a critical link to provide the necessary efficiency to aircraft ground operations, such as fuel storage, airport maintenance, firefighting, and fencing.

AIRSIDE FACILITIES

Runways

As depicted on **Exhibit 1C**, Merrill Municipal Airport has a dual runway system. The runways and their features are detailed below.

Runway 7-25 | Runway 7-25 is the airport's primary runway, measuring 5,100 feet long by 75 feet wide. The runway is oriented northeast/southwest and is constructed of asphalt, which is reported to be in good condition. Runway 7-25 has a weight-bearing capacity of 45,000 pounds for single wheel aircraft (S), 65,000 pounds for dual wheel aircraft (D), and 100,000 pounds for dual tandem wheel aircraft (2D). Both runway ends are equipped with non-precision markings, which support the localizer performance with vertical guidance (LPV) global positioning system (GPS) approaches that are available to each runway end. The runway generally slopes down from the Runway 7 end at a longitudinal gradient of 0.24 percent.

The north side of Runway 7-25 is occasionally used as a turf landing area. This area is equipped with turf markers that define the lateral limits of this landing area.

Runway 16-34 | Runway 16-34, oriented northwest/southeast, serves as the crosswind runway. It is 2,997 feet long and 75 feet wide and is constructed of asphalt that is reported to be in fair condition. Runway 16-34 has a weight-bearing capacity of 26,000 S. It has basic markings and no instrument approach procedures. The longitudinal gradient is 0.48 percent, generally sloping downward from the Runway 16 end.

Taxiways

The taxiway system at Merrill Municipal Airport is identified on **Exhibit 1C**. A parallel taxiway, Taxiway A, serves Runway 7-25, extending from the Runway 7 threshold for approximately 3,500 feet before turning to the east to provide access to Runway 16-34 and east side hangar facilities. Three connector taxiways provide entry/exit points from Runway 7-25 to Taxiway A. Taxiway A, which is 35 feet wide, is separated from the Runway 7-25 centerline by 300 feet.

Taxiway F serves as a partial parallel taxiway to Runway 16-34 and also provides access to the Runway 25 threshold. This taxiway is 40 feet wide and also provides access to landside facilities located on the southeast side of the airport. A connector taxiway located approximately 200 feet north of the Runway 34 threshold provides a route for pilots to back-taxi when departing Runway 34.

Airfield Lighting

Airfield lighting systems extend an airport's usefulness into periods of darkness and/or poor visibility. A variety of lighting systems are installed at the airport for this purpose. These lighting systems, categorized by function, are summarized as follows.

RUNWAY DATA				
Runway Designation	7	25	16	34
Length	5,100'		2,997'	
Width	75'		75'	
End Elevation	1,318.2'	1,306.2'	1,317.8'	1,303.4'
Gradient	0.24%		0.48%	
Surface Material	Asphalt		Asphalt	
Markings	Non-precision		Non-precision	
Lighting	MIRL		MIRL	
Load Bearing Strength - S	45,000 lbs.		26,000 lbs.	
Load Bearing Strength - D	65,000 lbs.		NA	
Load Bearing Strength - 2D	100,000 lbs.		NA	
Visual Approach Aids	PAPI-2 (left) REILs	PAPI-2 (left) REILs	None None	
Instrument Approach Procedures	LPV GPS		None	
Traffic Pattern	Left	Left	Left	Left

TAXIWAY DATA	
Lighting	MITL
Surface Material	Asphalt
Taxiway Width	Taxiway A & Connectors - 35' Taxiway F & Connectors - 40'

WEATHER AND NAVIGATIONAL AIDS
AWOS
Lighted Wind Cone, Supplemental Windcones
Airport Beacon

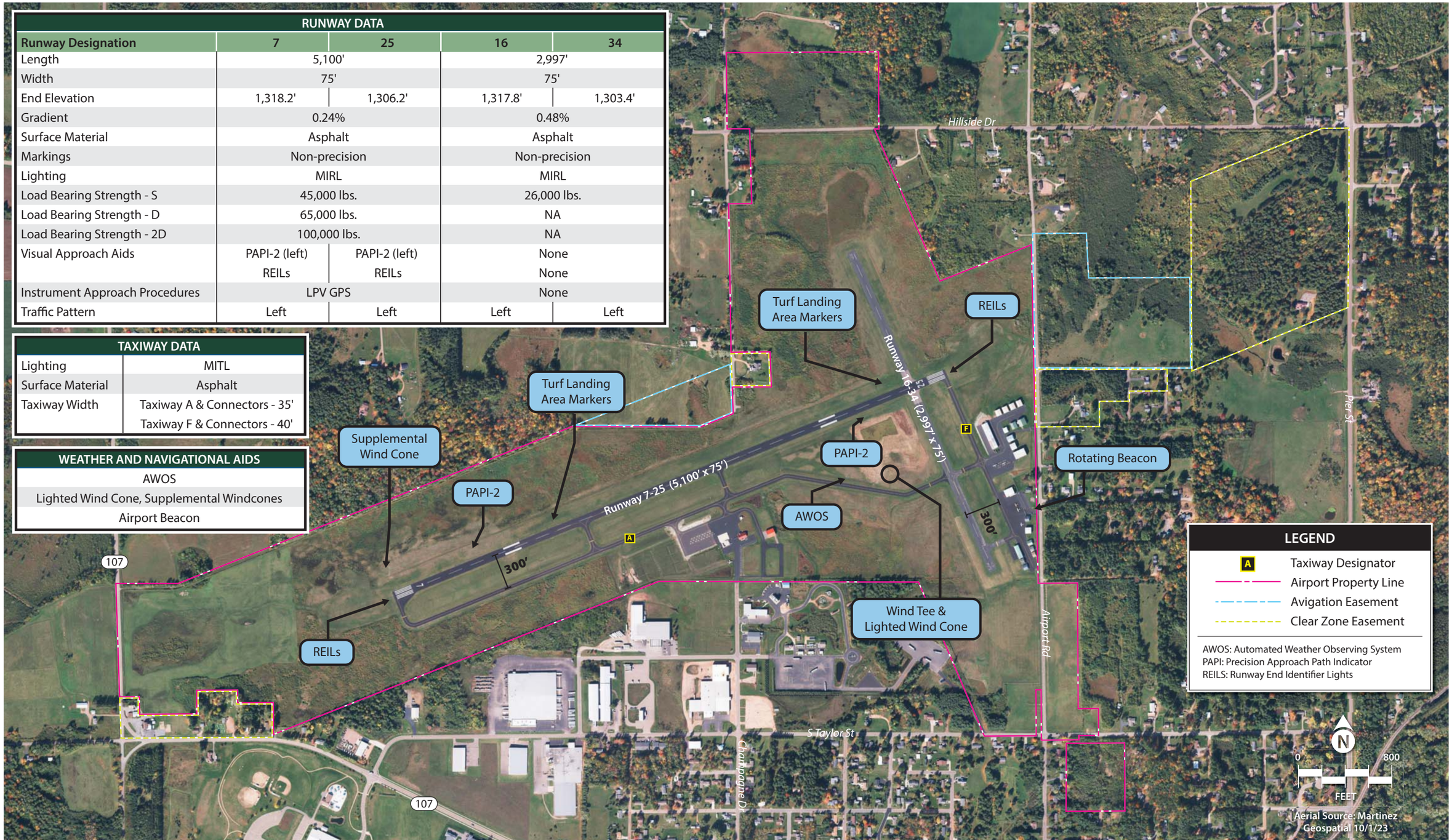

Exhibit 1C
EXISTING AIRSIDE FACILITIES

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Airport Identification Lighting

The location of the airport at night is universally identified by a rotating beacon. The rotating beacon projects two beams of light, one white and one green, 180 degrees apart. The beacon operates from sunset to sunrise and is located on the east side of airport property at the entrance to the public parking area.

Rotating Beacon

Pavement Edge Lighting

Pavement edge lighting defines the lateral limits of the pavement to ensure safe operations during night and/or times of low visibility, and to help maintain safe and efficient access to and from the runway and aircraft parking areas. Both runways are equipped with medium intensity runway lighting (MIRL). Each runway end is equipped with threshold lights, which emit green light outward from the runway and emit red light toward the runway. The green lights indicate the landing threshold to arriving aircraft and red lights indicate the end of the runway for departing or landing aircraft. Taxiways A and F and entrance/exit taxiways at the airport are equipped with medium intensity taxiway lighting (MITL). All edge lights are mounted on frangible bases approximately one foot off the ground.

Visual Approach Aids

Visual approach aids are installed at airports to assist pilots in determining the correct descent path to the runway end during landing. Runway 7-25 is equipped with a two-box precision approach path indicator (PAPI-2) system on each runway end. The PAPIs are installed on the left side of the runway and have been set at the standard 3.00-degree glide path. PAPIs have an effective visual range of three miles during the day and 20 miles at night. There are no visual approach aids on Runway 16-34.

PAPI-2 on Approach to Runway 25

Runway end identification lights (REILs) provide a visual identification of the runway end for landing aircraft. The REILs consist of two synchronized flashing lights, located laterally on each side of the runway end, facing the approaching aircraft. These flashing lights can be seen day or night for up to 20 miles depending on visibility conditions. Runway 7-25 is equipped with REILs on both ends, while Runway 16-34 does not have REILs.

REILs and Threshold Lighting

Pilot-Controlled Lighting

During nighttime hours, pilots can use the pilot-controlled lighting (PCL) system to activate and dim the airfield lights and visual approach aids from their aircraft through a series of clicks of their radio transmitter using the common traffic advisory frequency (CTAF) (122.8 MHz).

Taxiway Lighting and Airfield Signage

Airfield Signage and Markings

Airfield identification signs assist pilots in identifying runways, taxiway routes, holding positions, and critical areas. Merrill Municipal Airport is equipped with lighted runway and taxiway designations and routing/directional signage.

Pavement markings aid in the movement of aircraft along surfaces at the airport and identify closed or hazardous areas. The airport provides and maintains marking systems in accordance with Advisory Circular 150/5340-1, *Standards for Airport Marking*. As mentioned previously, Runway 7-25 is equipped with non-precision markings that include the runway centerline, designation, threshold markings, and aiming points. Runway 16-34 has basic markings which include the runway centerline and designation.

All taxiways at the airport are marked with yellow centerline, holding position markings, and leadoff lines on normally used exits. Centerline markings assist pilots in maintaining proper clearance from pavement edges and objects near the taxiway edges. Aircraft holding positions are marked at each runway/taxiway intersection. All taxiways serving Runway 7-25 are marked with holding positions located 200 feet from the runway centerline, except for Taxiway F where it provides access to the Runway 25 threshold. This holding position is separated from the runway centerline by 125 feet. Taxiway A, where it crosses Runway 16-34, has holding positions located 200 feet from centerline (west side of runway) and 125 feet from centerline (east side of runway). The connector taxiway providing access to the Runway 34 end is marked with a hold line separated from the runway centerline by 125 feet.

Navigational Aids and Instrument Approach Procedures

Navigational aids are electronic devices that transmit radio frequencies that pilots in properly equipped aircraft can translate into point-to-point guidance and position information. The very high omnidirectional range (VOR), in general, provides azimuth readings to pilots of properly equipped aircraft transmitting a radio signal at every degree to provide 360 individual navigational courses. Frequently, distance measuring equipment (DME) is combined with a VOR facility (VOR/DME) to provide distance as well as direction information to the pilot. Military tactical air navigation aids (TACANs) and civil VORs are commonly combined to form a VORTAC. The VORTAC provides distance and direction information to both civil and military pilots. The Merrill area is served by one VOR/DME at Rhinelander, located 28.2 nautical miles (nm) northeast.

A non-directional beacon (NDB) is a radio transmitter at a known location, used as an aviation or marine navigational aid. The signal transmitted does not include *inherent* directional information, in contrast to other navigational aids, such as a VOR. NDB signals follow the curvature of the Earth, so they can be received at much greater distances at lower altitudes, a major advantage over VOR. The Arsha NDB, located 26.1 nm to the north, is the only NDB in the vicinity of Merrill Municipal Airport. NDBs are generally being phased out of use by the FAA.

The global positioning system (GPS) is an additional navigational aid for pilots. GPS was initially developed by the United States Department of Defense for military navigation around the world. GPS differs from an NDB or VOR in that pilots are not required to navigate using a specific facility. GPS uses satellites placed in orbit around the earth to transmit electronic radio signals, which pilots of properly equipped aircraft use to determine altitude, speed, and other navigational information. With GPS, pilots can directly navigate to any airport in the country and are not required to navigate using a specific navigation facility.

Instrument approach procedures assist pilots in locating and landing at an airport during low visibility and cloud ceiling conditions. They are categorized as either precision, approach with vertical guidance (APV), or non-precision. Precision instrument approach aids provide an exact course alignment and vertical descent path for an aircraft on final approach to a runway with a height above threshold (HATh) lower than 250 feet and visibility lower than ¾-mile. APVs also provide course alignment and vertical guidance but have HAThs of 250 feet or more and visibility minimums of ¾-mile or greater. Non-precision instrument approaches provide only course alignment information with no vertical guidance.

Approach minimums are published for different aircraft categories (aircraft categories are described in greater detail in Chapter Two) and consist of a minimum "decision" altitude and required visibility. According to 14 Code of Federal Regulations (CFR) 91.175, a pilot must be able to make a safe landing, have the runway in sight, and the visibility requirement be met. For a precision approach or approach with vertical guidance, the decision altitude (DA) is the point at which the pilot must meet all three criteria for landing, otherwise they cannot land using the published instrument approach. For a non-precision approach, the minimum descent altitude (MDA) is a specified altitude at which the required visual reference must be made, or a missed approach initiated.

At Merrill Municipal Airport, GPS provides for localizer performance with vertical guidance (LPV) via an area navigation (RNAV) GPS instrument approach to each end of Runway 7-25. **Table 1C** details the instrument approach procedures at Merrill Municipal Airport.

Table 1C | Instrument Approach Procedures

	WEATHER MINIMUMS BY AIRCRAFT TYPE			
	Category A	Category B	Category C	Category D
RNAV (GPS) Rwy 7				
LPV DA	1,635' / 1-mile			NA
LNAV/VNAV DA	1,754' / 1¼ -mile			NA
LNAV MDA	1,700' / 1-mile		1,700' / 1⅛-mile	NA
Circling	1,760' / 1-mile	1,780' / 1-mile	1,920' / 1¾ -mile	NA
RNAV (GPS) Rwy 25				
LPV DA	1,640' / 1-mile			NA
LNAV/VNAV DA	1,719' / 1⅛ -mile			NA
LNAV MDA	1,700' / 1-mile		1,700' / 1⅛-mile	NA
Circling	1,760' / 1-mile	1,780' / 1-mile	1,920' / 1¾ -mile	1,760' / 1-mile

Aircraft categories are based on the approach speed of aircraft, which is determined as 1.3 times the stall speed in landing configuration as follows:

- Category A: 0-90 knots (e.g., Cessna 172)
- Category B: 91-120 knots (e.g., Beechcraft KingAir)
- Category C: 121-140 knots (e.g., Canadair Challenger, Boeing 737)
- Category D: 141-166 knots (e.g., Gulfstream IV, Boeing MD-88)
- Category E: Greater than 166 knots (e.g., certain large military or cargo aircraft)

Note: (xxx'/ x-mile) = Decision altitude/Visibility minimum

Source: AirNav https://www.airnav.com/airport/KRRL

Weather and Communication

Merrill Municipal Airport is served by an automated weather observing system (AWOS-3). The system updates weather observations every minute, continuously reporting changes that can be accessed via radio frequency 119.925 MHz or by calling (715) 539-8422. The AWOS reports cloud ceiling, visibility, temperature, dew point, wind direction, wind speed, altimeter setting (barometric pressure), lightning detection and density altitude (airfield elevation corrected for temperature). The AWOS is located on the east side of airport property, adjacent Taxiway A and near the intersection of Runways 7-25 and 16-34.

AWOS

Merrill Municipal Airport also has a lighted wind cone and lighted wind tee located approximately 360 feet east of the AWOS equipment, near the intersection of Runway 16-34 and Taxiway A. The wind cone informs pilots of the wind direction and speed, while the wind tee indicates wind direction only.

Lighted Wind Cone and Wind Tee

AREA AIRSPACE AND AIR TRAFFIC CONTROL

The *FAA Act of 1958* established the FAA as the responsible agency for the control and use of navigable airspace within the U.S. The FAA has established the National Airspace System (NAS) to protect persons and property on the ground, in addition to establishing a safe and efficient airspace environment for civil, commercial, and military aviation. The NAS covers the common network of U.S. airspace, including air navigation facilities; airports and landing areas; aeronautical charts; associated rules, regulations, and procedures; technical information; and personnel and material. The system also includes components shared jointly with the military.

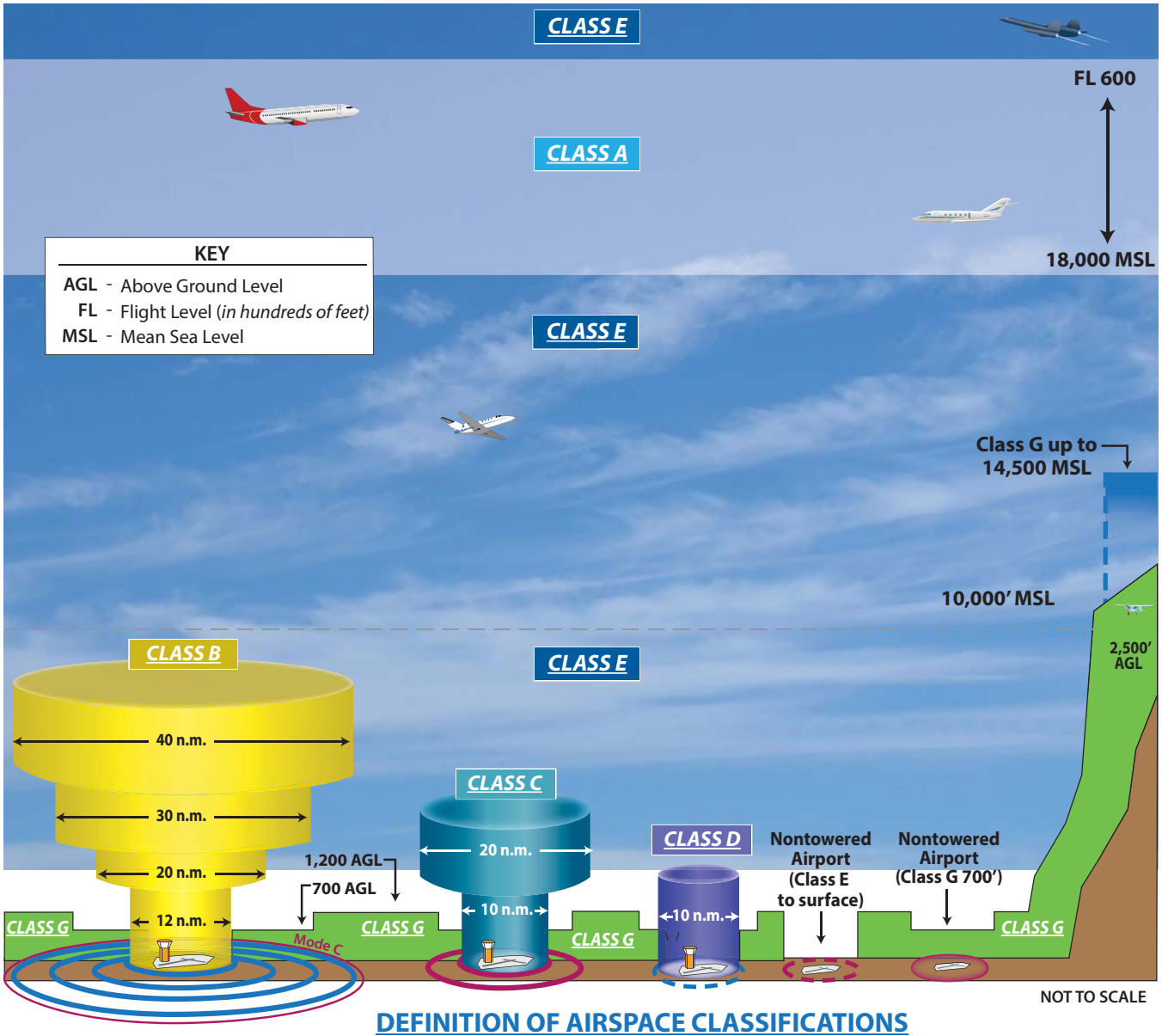
AIRSPACE STRUCTURE

Airspace within the U.S. is broadly classified as either "controlled" or "uncontrolled." The difference between controlled and uncontrolled airspace relates primarily to requirements for pilot qualifications, ground-to-air communications, navigation and air traffic services, and weather conditions. Six classes of airspace have been designated in the U.S., as shown on **Exhibit 1D**. Airspace designated as Class A, B, C, D, or E is considered controlled airspace. Aircraft operating within controlled airspace are subject to varying requirements for positive air traffic control. Airspace near Merrill Municipal Airport is depicted on **Exhibit 1E**.

Class A Airspace | Class A airspace includes all airspace from 18,000 feet MSL to flight level (FL) 600 (approximately 60,000 feet MSL) over the contiguous 48 states and Alaska. This airspace is designated in 14 CFR Part 71.33 for positive control of aircraft. All aircraft must be on an IFR clearance to operate within Class A airspace.

Class B Airspace | Class B airspace has been designated around some of the country's major airports, such as Minneapolis-Saint Paul International Airport (MSP), to separate all aircraft within a specified radius of the primary airport. Each Class B airspace is specifically tailored for its primary airport. This airspace is the most restrictive controlled airspace routinely encountered by pilots operating under VFR in an uncontrolled environment. In order to fly within Class B airspace, an aircraft must be equipped with special radio and navigation equipment and must obtain clearance from air traffic control. A pilot is required to have at least a private pilot certificate or be a student pilot who has met the requirements of F.A.R. Part 61.95, which requires special ground and flight training for Class B airspace. Aircraft are also required to utilize a Mode C transponder within a 30 nautical mile range of the center of the Class B airspace. A mode C transponder allows the airport traffic control tower (ATCT) to track the location and altitude of the aircraft. Merrill Municipal Airport is located approximately 120 nm from MSP's Class B airspace.

Class C Airspace | The FAA has established Class C airspace at approximately 120 airports around the country that have significant levels of IFR traffic. Class C airspace is designed to regulate the flow of uncontrolled traffic above, around, and below the arrival and departure airspace required for high-performance, passenger-carrying aircraft at major airports. To fly inside Class C airspace, an aircraft must have a two-way radio, an encoding transponder, and have established communication with the ATC facility. Aircraft may fly below the floor of the Class C airspace or above the Class C airspace ceiling without establishing communication with ATC. The nearest Class C airspace to Merrill Municipal Airport surrounds Austin Straubel International Airport (GRB) in Green Bay, approximately 70 nm to the southeast.



DEFINITION OF AIRSPACE CLASSIFICATIONS

CLASS A Think A - Altitude. Airspace above 18,000 feet MSL up to and including FL 600. Instrument Flight Rule (IFR) flights only, ADS-B 1090 ES transponder required, ATC clearance required.

CLASS B Think B - Busy. Multi-layered airspace from the surface up to 10,000 feet MSL surrounding the nation's busiest airports. ADS-B 1090 ES transponder required, ATC clearance required.

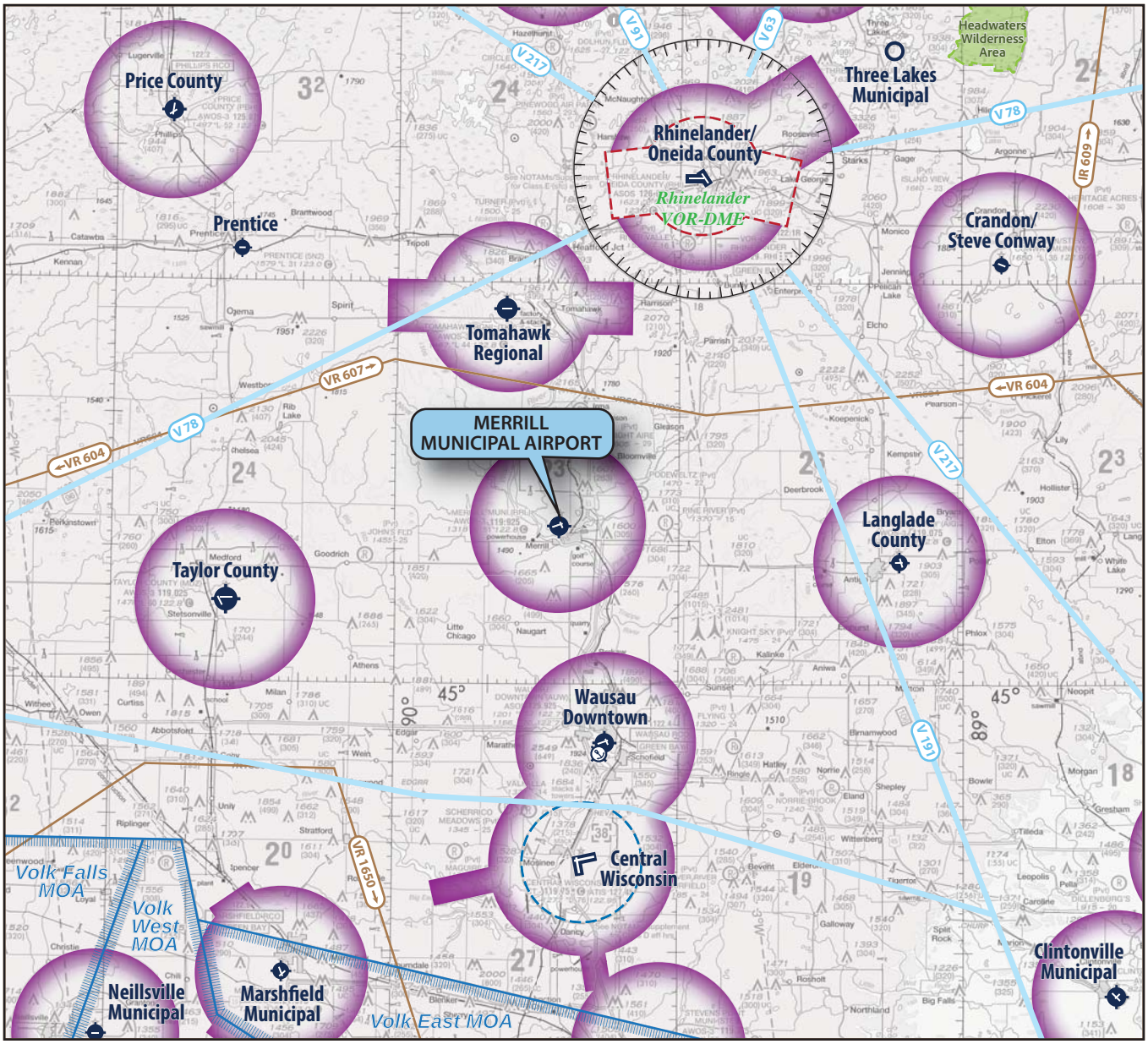
CLASS C Think C - Mode C. Mode C transponder required. ATC communication required. Generally airspace from the surface to 4,000 feet AGL surrounding towered airports with service by radar approach control.

CLASS D Think D - Dialogue. Pilot must establish dialogue with tower. Generally airspace from the surface to minimum 2,500 feet AGL surrounding towered airports.

CLASS E Think E - Everywhere. Controlled airspace that is not designated as any other Class of airspace.

CLASS G Think G - Ground. Uncontrolled airspace. From surface to a 1,200 AGL (in mountainous areas 2,500 AGL) Exceptions: near airports it lowers to 700' AGL; some airports have Class E to the surface. Visual Flight Rules (VFR) minimums apply.

Source: www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak/media/15_phak_ch15.pdf



LEGEND

- Airport with other than hard-surfaced runway
- Airport with hard-surfaced runways 1,500' to 8,069' in length
- Airports with hard-surfaced runways greater than 8,069' or some multiple runways less than 8,069'
- Seaplane Base
- Compass Rose
- Wilderness Area
- Class D Airspace
- Class E Airspace with floor 700 ft. above surface that laterally abuts 1200 ft. or higher Class E airspace
- Class E Airspace (SFC)
- Victor Airways
- Military Training Route
- Military Operations Area (MOA)

NORTH

NOT TO SCALE

Source:
Green Bay Sectional Chart,
US Department of Commerce,
National Oceanic and Atmospheric
Administration, June 15, 2023

Exhibit 1E
VICINITY AIRSPACE

Class D Airspace | Class D airspace is controlled airspace surrounding airports with an ATCT. The Class D airspace typically constitutes a cylinder with a horizontal radius of four or five nautical miles (nm) from the airport, extending from the surface up to a designated vertical limit, typically set at approximately 2,500 feet above the airport elevation. Aircraft operators planning to operate within Class D airspace are required to contact air traffic control prior to entering or departing airspace and must maintain contact while within the controlled airspace to land or to transverse the area. The nearest Class D airspace surrounds Central Wisconsin Airport (CWA), approximately 20 nm south of Merrill Municipal Airport.

Class E Airspace | Class E airspace consists of controlled airspace designed to contain IFR operations near an airport and while aircraft are transitioning between the airport and enroute environments. Unless otherwise specified, Class E airspace terminates at the base of the overlying airspace. Only aircraft operating under IFR are required to be in contact with ATC when operating in Class E airspace. While aircraft conducting visual flights in Class E airspace are not required to be in radio communications with ATC facilities, visual flight can only be conducted if minimum visibility and cloud ceilings exist. Merrill Municipal Airport is in Class E airspace with the surface beginning at 700 feet above ground level (AGL). Airspace below 700 feet AGL surrounding the airport is Class G airspace.

Class G Airspace | Airspace not designated as Class A, B, C, D, or E is considered uncontrolled, or Class G, airspace. Air traffic control does not have the authority or responsibility to exercise control over air traffic within this airspace. Class G airspace lies between the surface and the overlaying Class E airspace (700 feet AGL).

While aircraft may technically operate within this Class G airspace without any contact with ATC, it is unlikely that many aircraft will operate this low to the ground. Furthermore, federal regulations specify minimum altitudes for flight. F.A.R. Part 91.119*, Minimum Safe Altitudes*, generally states that except when necessary for takeoff or landing, pilots must not operate an aircraft over any congested area of a city, town, or settlement, or over any open-air assembly of persons, at an altitude of 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft.

Over less congested areas, pilots must maintain an altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure. Helicopters may be operated at less than the minimums prescribed above if the operation is conducted without hazard to persons or property on the surface. In addition, each person operating a helicopter shall comply with any routes or altitudes specifically prescribed for helicopters by the FAA.

Victor Airways | For aircraft arriving or departing the regional area using VOR facilities, a system of Federal Airways, referred to as Victor Airways, has been established. Victor Airways are corridors of airspace eight miles wide that extend upward from 1,200 feet above ground level (AGL) to 18,000 feet MSL and extend between VOR navigational facilities. Victor Airways near Merrill Municipal Airport are identified on **Exhibit 1E**.

Alert Areas / Military Operations Area (MOA) & Military Training Routes (MTRs) / Restricted Areas | Alert areas, MOAs, MTRs, and restricted areas are depicted on aeronautical charts to inform nonparticipating pilots of areas that may contain a high volume of pilot training, military operations/activities, or an unusual type of aerial activity. Pilots should exercise caution near and within these areas. All activity within these areas, if granted by the controlling agency, should be conducted in accordance with regulations, without waiver, and pilots of participating aircraft, as well as pilots transitioning the area, are equally responsible for collision avoidance. The nearest MOA to the airport is the Volk East MOA, 35 nm to the south. A restricted area (R-6904A and B) used for live fire munitions training is located approximately 55 nm southeast of the airport.

Wilderness Areas | When operating near designated wilderness areas, aircraft are requested to maintain a minimum altitude of 2,000 feet above the surface of designated National Park areas, which includes wilderness areas and designated breeding grounds. FAA Advisory Circular (AC) 91-36C defines the "surface" as the highest terrain within 2,000 feet laterally of the route of flight or the uppermost rim of a canyon or valley. The Headwaters Wilderness Areas is the nearest to Merrill Municipal Airport, approximately 46 nm to the northeast.

AIRSPACE CONTROL

The FAA has established 21 Air Route Traffic Control Centers (ARTCCs) throughout the continental U.S. to control aircraft operating under IFR within controlled airspace and while enroute. An ARTCC assigns specific routes and altitudes along Federal Airways to maintain separation and orderly traffic flow. The Minneapolis Center ARTCC controls IFR airspace enroute to and from Merrill Municipal Airport at altitudes greater than 10,000 feet above ground level (AGL).

Flight Service Stations (FSS) are air traffic facilities which provide pilot briefings, flight plan processing, inflight radio communications, search and rescue (SAR) services, and assistance to lost aircraft and aircraft in emergency situations. FSSs also relay air traffic control clearances, process Notice to Air Mission (NOTAMs), and broadcast aviation meteorological and aeronautical information. The Green Bay FSS is the nearest to Merrill Municipal Airport.

LOCAL OPERATING PROCEDURES

The traffic pattern at the airport is maintained to provide the safest and most efficient use of the airspace. At Merrill Municipal Airport, all runways use a left-hand traffic pattern, which means aircraft conduct left-hand turns within the traffic pattern when operating on the runway. The typical traffic pattern altitude for rotorcraft is 500 feet AGL; piston aircraft is between 800 and 1,000 feet AGL; and 1,500 feet AGL for turbine aircraft.

REGIONAL AIRPORTS

A review of other public-use airports with at least one paved runway within a 30-nm radius of Merrill Municipal Airport was conducted to identify and distinguish the types of air service provided in the region. It is important to consider the capabilities and limitations of these airports when planning for future changes or improvements at Merrill Municipal Airport. **Exhibit 1F** provides basic-level information on the public-use airports within the vicinity of Merrill Municipal Airport.

LANDSIDE FACILITIES

TERMINAL/AIRPORT OPERATIONS OFFICE

Constructed in 2016, the terminal building at Merrill Municipal Airport is located at midfield. From the airside, it can be accessed via Taxiway A. From the landside, it is accessible from Champagne Drive. The terminal features a comfortable lobby, a pilots' lounge, a conference room, a kitchen, and restrooms.

Terminal Building

FIXED BASE OPERATOR AND AVIATION BUSINESSES

A fixed base operator (FBO), Park City Aviation, is currently located on the east side of the airport. The FBO provides aircraft maintenance services and daily on-site management when open. A new, 100-foot by 100-foot maintenance hangar is planned to be constructed south of the terminal building in Fall 2024. Park City Aviation plans to move to this facility once completed. Flight training is offered through another on-airport business, C.E. Plane, LLC.

AIRCRAFT HANGAR FACILITIES

Existing hangar facilities at Merrill Municipal Airport are primarily located on the east side of the airport, with the exception of one hangar located at midfield, as shown on **Exhibit 1G**. These aircraft storage facilities consist of T-hangars, which are designed to accommodate a single, smaller aircraft, and executive box hangars, which can accommodate larger aircraft and typically range in size from 2,500 square feet (sf) to 10,000 sf. There are no conventional hangars on the airport, which are typically greater than 10,000 sf in size and are used to store larger aircraft, including jets.

There is one city-owned T-hangar facility offering 10 individual storage units and comprising approximately 12,600 sf of storage space. There are also 18 executive box hangars, ranging in size from 1,300 to 7,000 sf, that have a combined storage capacity of approximately 47,600 sf.

As of September 2023, all hangar spaces are occupied, and there are 18 individuals on a hangar waiting list.

TOMAHAWK REGIONAL (TKV)

Distance from RRL ..... 17 nm NNW
FAA Service Level ..... Basic GA
Based Aircraft 13
Operations 7,200
Longest Runway 4,401
Lowest Visibility Minimums..... 1-mile

MERRILL MUNICIPAL AIRPORT (RRL)

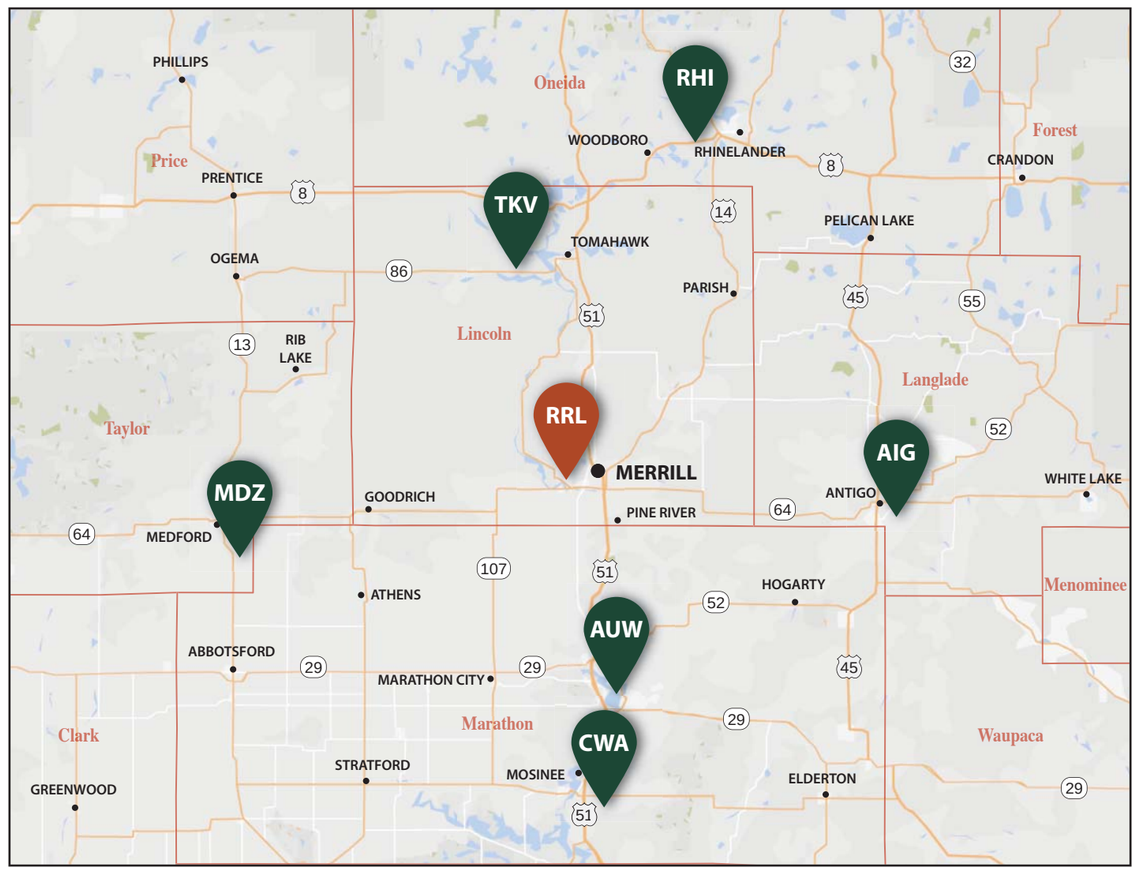
FAA Service Level ..... Local GA
Based Aircraft 45
Operations..... 15,754
Longest Runway..... 5,100
Lowest Visibility Minimums 1-mile

TAYLOR COUNTY (MDZ)

Distance from RRL ..... 26 nm WSW
FAA Service Level ..... Basic GA
Based Aircraft 12
Operations 7,020
Longest Runway 6,000
Lowest Visibility Minimums..... 1-mile

WAUSAU DOWNTOWN (AUW)

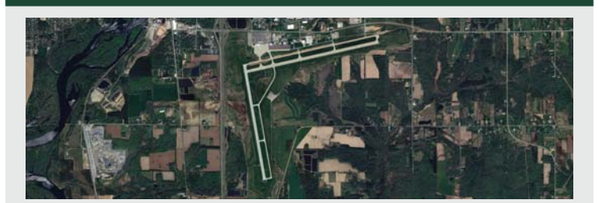
Distance from RRL ..... 17 nm SSE
FAA Service Level ..... Regional GA
Based Aircraft 72
Operations 36,400
Longest Runway 5,200
Lowest Visibility Minimums..... 3/4-mile



LANGLADE COUNTY (AIG)

Distance from RRL ..... 26 nm E
FAA Service Level ..... Local GA
Based Aircraft 18
Operations 8,250
Longest Runway 4,010
Lowest Visibility Minimums..... 1-mile

CENTRAL WISCONSIN (CWA)



Distance from RRL ..... 25 nm S
FAA Service Level ... Primary Commercial Service - Nonhub
Based Aircraft 24
Operations 13,592
Longest Runway 7,723
Lowest Visibility Minimums..... 1/2-mile

RHINELANDER-ONEIDA COUNTY (RHI)

Distance from RRL ..... 28 nm NNE
FAA Service Level ... Primary Commercial Service - Nonhub
Based Aircraft 43
Operations 24,958
Longest Runway 6,800
Lowest Visibility Minimums..... 1/2-mile

Bldg #	Description	Size (sf)
1	Airport Manager Residence	1,500
2	Terminal Building	3,200
3	Fuel Farm	NA
4	Executive Box Hangar	4,300
5	FBO (Park City Aviation)	4,700
6	City-owned T-Hangars (10 units)	12,600
7	Executive Box Hangar	2,500
8	Executive Box Hangar	2,500
9	Executive Box Hangar	2,500
10	Executive Box Hangar	2,500
11	Executive Box Hangar	3,800
12	Executive Box Hangar	2,600
13	Executive Box Hangar	1,600

Bldg #	Description	Size (sf)
14	City-owned SRE Building	2,600
15	Executive Box Hangar	2,700
16	Executive Box Hangar	7,000
17	Executive Box Hangar	1,600
18	Executive Box Hangar	2,600
19	Executive Box Hangar	1,700
20	Executive Box Hangar	1,300
21	Executive Box Hangar	1,300
22	Executive Box Hangar	1,500
23	Executive Box Hangar	1,300
24	Executive Box Hangar	4,400
25	Electrical Vault	NA

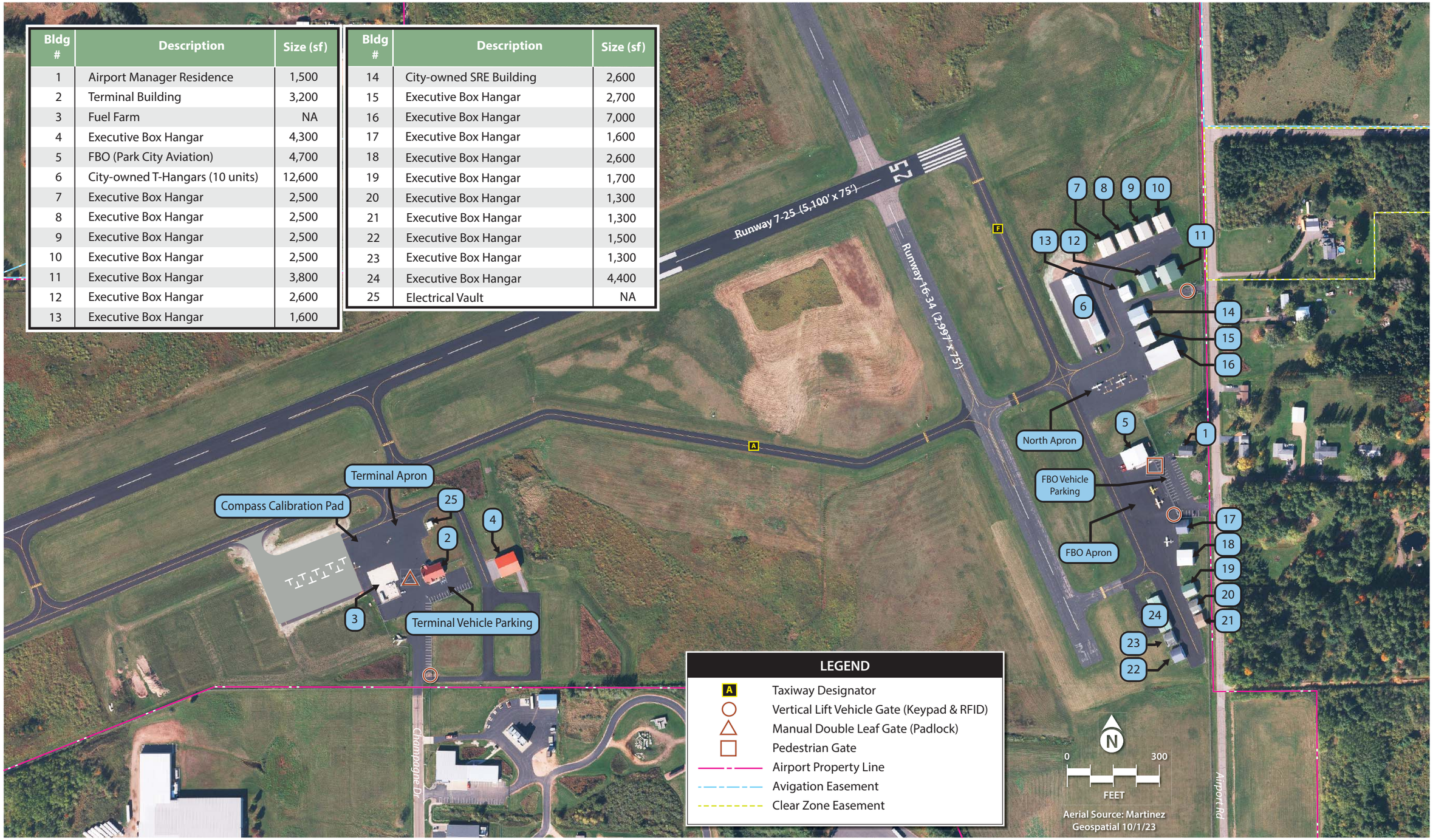


Exhibit 1G
EXISTING LANDSIDE FACILITIES

City-owned T-hangars

Executive Box Hangars

AIRCRAFT PARKING APRONS

There are three aircraft parking aprons at Merrill Municipal Airport: the terminal apron, the north apron, and the FBO apron. The terminal apron located at midfield was expanded in Summer 2023 and now offers approximately 12,000 square yards (sy) of pavement and includes nine marked parking positions for fixed wing aircraft. The FBO apron, located on the east side of the airport, comprises approximately 3,500 sy of pavement and has three marked aircraft parking positions. The north apron, located immediately north of the FBO apron, is approximately 3,200 sy and provides six marked tiedown positions. The airport's fuel farm is located on the terminal apron. Aircraft parking aprons are identified on **Exhibit 1G**.

VEHICLE PARKING

There are two public vehicle parking lots at Merrill Municipal Airport. The parking lot adjacent to the terminal building contains 40 parking spaces, plus two handicapped spaces. A second lot is located near the FBO building and has 34 parking spaces plus one handicapped space. Tenants of the box/T-hangar facilities on the airport are authorized to pass through secured gates with their vehicles, so most of these facilities do not have separate vehicle parking areas.

SUPPORT FACILITIES

Firefighting Services

As a general aviation airport, Merrill Municipal Airport is not required to maintain on-site aircraft rescue and firefighting (ARFF) equipment or services. Firefighting services are provided by the Merrill Fire Department, which operates from a station located at 110 Pier Street, approximately two miles southeast of the airport.

Fuel Storage

Fuel storage facilities at Merrill Municipal Airport are located on the south side of the airport on the terminal apron fronting the terminal building, as shown on **Exhibit 1G**. There are two underground tanks, one for 100LL fuel and one for Jet A. Both tanks have a 12,000-gallon capacity and are owned by the City of Merrill. Both fuel types are dispensed via a self-service pump on the terminal apron that is equipped with a credit card reader. There is one city-owned, 5,000-gallon Jet A fuel truck which is parked near the fuel farm.

Fuel Farm

Airport Maintenance Facilities

Maintenance equipment is stored in the snow removal equipment (SRE) building on the airport's east side (see Building #14 on **Exhibit 1G**). This includes a McCormick tractor with blower and mowing attachments, a single axle dump truck with a snow blade, a Chevy one ton truck with a box plow, a Ford F-150, and various maintenance tools and small equipment.

PERIMETER FENCING

The airfield perimeter is equipped with 10-foot-tall security fencing to restrict entry to unauthorized persons and vehicles. Three motorized vertical pivot gates allow access to landside areas to authorized personnel only. Two of these are located on the east side of the airport, and the third is located on the south side near the terminal building. Three non-motorized gates also provide access to various points on the airport and are secured with padlocks.

Security Fencing

UTILITIES

The availability and capacity of the utilities serving the airport are factors in determining the development potential of the airport property, as well as the land immediately adjacent to the facility. Of primary concern in the inventory investigation is the availability of water, gas, sewer, and power sources. Providers are detailed below:

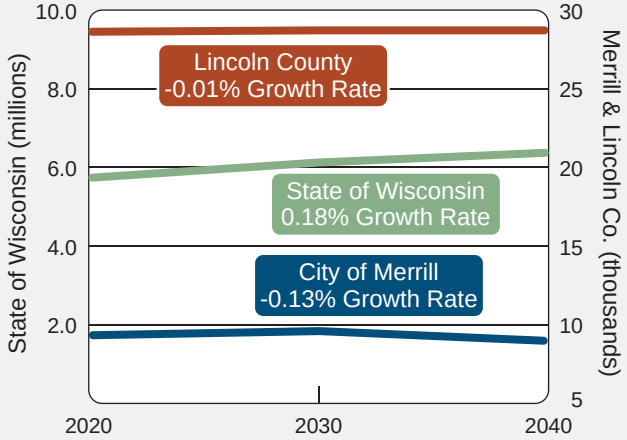
- Electric/Gas – Wisconsin Public Service
- Water/Sanitary Sewer/Solid Waste/Communications (including high speed fiber optic cable) – City of Merrill

COMMUNITY PROFILE

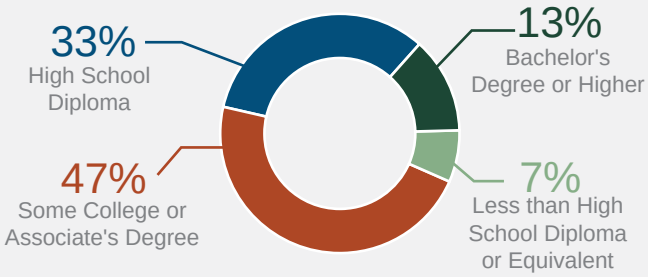
For an airport planning study, a profile of the local community, including its socioeconomic characteristics, is created and examined in order to understand the growth dynamics of the study area. The community profile for the City of Merrill on **Exhibit 1H** is derived from several sources, including the city's comprehensive plan, the North Central Wisconsin Regional Planning Commission, Woods & Poole, and the U.S. Census Bureau.

From a population perspective, city growth is projected to increase slightly between now and 2030, before entering a declining period, with just under 9,000 residents estimated by 2040. Lincoln County reflects a similar trend, with slightly fewer residents in 2040 (28,354) as compared to 2020 (28,415). The state's population, however, is expected to steadily increase over the next several years, adding more than 300,000 residents between 2020 and 2040, for a compound annual growth rate (CAGR) of 0.18 percent. Key industries in Merrill include manufacturing, educational services, and retail, and these, along with others, support a labor force of more than 3,200 people.

POPULATION



EDUCATION

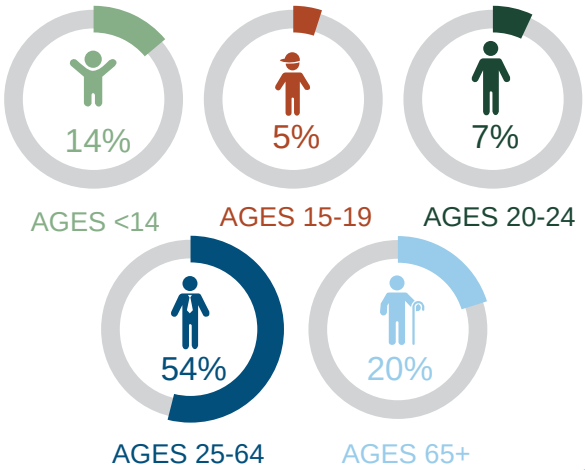


MAJOR EMPLOYERS

(Manufacturing, Transportation, Retail Finance and Insurance, Health Care)

- Agra Industries, Inc.
- Harley-Davidson Motor Company
- Hurd Windows & Doors
- Interflex
- Packaging Corporation of America
- Sierra Pacific
- Pioneer Transportation
- Dave's County Market
- Walmart Supercenter
- Church Mutual Insurance
- Aspirus Health Care

POPULATION BY AGE



HOUSEHOLDS

Median Household Income (2022)

Merrill	Lincoln Co.
$48,378	*$64,314*

Merrill Total Households (2022)

4,190

Merrill Avg. Home Value (Jan. 2024)

$98,900

EMPLOYMENT BY SECTOR

Sources: U.S. Census Bureau; Woods & Poole Complete Economic and Demographic Data Source; City of Merrill Comprehensive Plan (2017), North Central Wisconsin Regional Planning Commission

ENVIRONMENTAL INVENTORY

The purpose of the following environmental inventory is to identify potential environmental sensitivities that should be considered when planning future improvements at the airport. Research was performed for each of the 13 impact categories within FAA Order 1050.1G, *FAA National Environmental Policy Act Implementing Procedures* (§1.2(b)(1)). When considering the effects to the impact categories listed below, the FAA may examine both the short and long-term effects, beneficial and adverse effects, effects on public health and safety, economic effects, and the effects on the quality of life to American people.

i. Aviation Emissions and Air Quality
ii. Biological Resources (including fish, wildlife, and plants)
iii. Coastal Resources
iv. *Department of Transportation Act*, Section 303 (referred to as "Section 4(f)") and Land and Water Conservation Fund (referred to as "Section 6(f)")
v. Farmlands
vi. Hazardous Materials, Solid Waste, and Pollution Prevention
vii. Historical, Architectural, Archeological, and Cultural Resources
viii. Land Use
ix. Natural Resources and Energy Supply
x. Noise and Noise-Compatible Land Use
xi. Socioeconomic and Children's Health and Safety Risks
xii. Visual Effects (including light emissions)
xiii. Water Resources (including wetlands, floodplains, surface waters, groundwater, and wild and scenic rivers)

AVIATION AND AIR QUALITY

The concentration of various pollutants in the atmosphere defines the local air quality. The significance of a pollutant's concentration is determined by comparing it to the state and federal air quality standards. In 1971, the U.S. Environmental Protection Agency (EPA) established standards that specify the maximum permissible short- and long-term concentrations of various air contaminants. The National Ambient Air Quality Standards (NAAQS) consist of primary and secondary standards for criteria pollutants: ozone (O_3), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), coarse particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), and lead (Pb).

Based on federal air quality standards, a specific geographic area can be classified as an "attainment," "maintenance," or "nonattainment" area for each pollutant. The threshold for nonattainment designation varies by pollutant.

Merrill Municipal Airport is located one mile northwest of Merrill in Lincoln County, Wisconsin. Lincoln County is in attainment for all federal criteria pollutants, as of August 31, 2023.[1]

[1] U.S. EPA – Green book – Wisconsin Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants (https://www3.epa.gov/airquality/greenbook/anayo_wi.html)

BIOLOGICAL RESOURCES

Biotic resources include the various types of plants and animals that are present in an area. The term also applies to rivers, lakes, wetlands, forests, and other habitat types that support plants and animals.

The U.S. Fish and Wildlife Service (USFWS) is charged with overseeing the requirements contained within Section 7 of the *Endangered Species Act* (ESA). The ESA provides a framework to conserve and protect animal or plant species whose populations are threatened by human activities. The FAA and USFWS review projects to determine if a significant impact to protected species will result from implementation of a proposed project. Significant impacts occur when a proposed action could jeopardize the continued existence of a protected species or would result in the destruction or adverse modification of federally designated critical habitat in the area. The USFWS Information for Planning and Consultation (IPaC) resource list describes species and habitats protected under ESA within the vicinity of the airport (**Table 1D**).

In addition to this, in 1972, the State of Wisconsin passed a state endangered species law. This law is established and defined in Chapter NR 29.604, Wis. Adm. Code. Under the Wisconsin Department of Natural Resources, the state outlined rules and regulations that identified which species to protect under the state's endangered species law.

Section 3 of the ESA is used to protect critical habitat areas. Designated critical habitat areas are geographically defined and have been determined to be essential to the recovery of a specific species. There are no critical habitats at Merrill Municipal Airport.

The federal *Migratory Bird Treaty Act* (MBTA) protects migratory birds, their eggs, nests, and their feathers. Potential impacts to species protected under the MBTA are evaluated by USFWS in consultation with other federal agencies.

Habitat for migratory birds may occur if bushes or other ground nesting substrate is present.

Table 1D | U.S. Fish and Wildlife Service List of Federally Endangered, Threatened and Candidate Species within Airport Boundaries

Common Name (*Scientific Name*)	Federal Status	Habitat and Range	Potential for Occurrence
Birds			
Whooping crane (*Grus americana*)	Experimental (Non-essential)	A migratory species that has been observed in a variety of areas including coastal marshes and estuaries, inland marshes, lakes, open ponds, shallow bays, salt marshes, wet meadows and rivers, and pastures and agricultural fields.	Potential to occur. Land in proximity to the airport contains freshwater ponds that may be used as habitat for this species.
Clams			
Salamander mussel (*Simpsonaias ambigua*)	Proposed Endangered	The salamander mussel is a freshwater mussel that inhabits swift-flowing rivers and streams within areas of shelter under rocks or crevices.	Unlikely to occur. The airport does not contain suitable habitat for this species.

Insects			
Monarch butterfly (*Danaus plexippus)*	Proposed Threatened	A migratory species found in a variety of habitats; the monarch butterfly requires milkweed (*Asclepias* spp.) for breeding. In the southwestern U.S., migrating monarch butterflies often occur near water sources (e.g., rivers, creeks, riparian corridors, roadside ditches, and irrigated gardens).	May occur. Wisconsin is home to several species of milkweed, and the airport property may contain flowering plants that monarchs could use for foraging.

*USFWS Status Definitions for federally listed species:

Candidate: A species for which the USFWS has sufficient information on biological vulnerability and threats to support proposals to list the species as endangered or threatened under the ESA; however, these proposed rules have not yet been issued because such actions are precluded at present by other listing activity.

Endangered: An animal or plant species that is in danger of extinction throughout all or a significant portion of its habitat range.

Proposed Endangered: Any species USFWS has determined is in danger of extinction throughout all or a significant portion of its range and the USFWS has proposed a draft rule to list the species as endangered.

Threatened: An animal or plant species in danger of extinction throughout all or a significant portion of its habitat range.

Proposed Threatened: an animal or plant species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Experimental population, Non-essential: A population that has been re-established within its historical range under section 10(j) of the ESA to aid in recovery of the species.

Source: USFWS, IPaC (https://ipac.ecosphere.fws.gov/); USFWS, Species habitats (various) (https://www.fws.gov/); USFWS, Listing Status (https://ipac.ecosphere.fws.gov/status/list); Nature Serve Explorer (https://explorer.natureserve.org/Search)

COASTAL RESOURCES

Federal activities involving or affecting coastal resources are governed by the *Coastal Barriers Resource Act*, the *Coastal Zone Management Act*, and Executive Order (E.O.) 13089, *Coral Reef Protection*.

The airport is not located within a coastal zone. The nearest National Marine Sanctuary is the Thunder Bay National Marine Sanctuary located 263 miles away from the airport.[2]

DEPARTMENT OF TRANSPORTATION ACT, SECTION 4(f)

Section 4(f) of the *Department of Transportation Act,* which was recodified and renumbered as Section 303(c) of 49 United States Code, provides that the Secretary of Transportation will not approve any program or project that requires the use of any publicly or privately owned historic sites, public parks or recreation areas, or waterfowl and wildlife refuges of national, state, regional, or local importance unless there is no feasible and prudent alternative to the use of such land, and the project includes all possible planning to minimize harm resulting from the use.[3]

[2] Google Earth Aerial Imagery (January 2023)

[3] 49 U.S. Code § 303 - Policy on lands, wildlife and waterfowl refuges, and historic sites

Table 1E and **Exhibit 1J** identify potential Section 4(f) resources within one mile of the airport. School playgrounds or athletic fields may be considered a Section 4(f) resource if the recreational facilities at the school are readily available to the public.

Table 1E | U.S. Dept. of Transportation Section 4(f)

Potential Resource	Location	Distance from Airport (miles)	Direction from Airport
Public Recreational Facilities			
Stange's Park	209 W 3rd St	0.90 miles	South
Marc Softball Complex	1100 Marc Dr	0.09 miles	Southwest
Smith Multi-Purpose Center	1100 Marc Dr	0.09 miles	Southwest
Ott's Park	501 N Foster Street	0.90 miles	South
Merrill Dog Park	Merrill, WI 544452	0.40 miles	South
Prairie Trails Park	N2121 Co Rd K	1 mile	East
Council Grounds State Park	N 1895 Council Grounds Dr	0.50 miles	Southeast
Krueger Pines State Natural Area	Council Grounds Rd	0.90 miles	Southeast
Public Schools[1]			
Prairie River Middle School	106 N Polk Street	0.90 miles	Southeast
Kate Goodrich Elementary	505 W 10th Street	0.50 miles	South
National Register of Historic Places (NRHP) Resources			
Merrill Post Office	430 E. Second St.	0.70 miles	Southeast
Center Avenue Historic District	Bounded by Cedar, Park, Third, Center and Seventh Streets	0.90 miles	Southeast
First Street Bridge	1st St. Spanning the Prairie River	0.80 miles	South
Merrill City Hall	717 E. 2nd St.	1.00 mile	Southeast
Scott, T.B., Free Library	E. 1st St.	0.90 miles	South

[1] Only public schools that have playgrounds and/or athletic fields open for public use are considered a Section 4(f) resource.

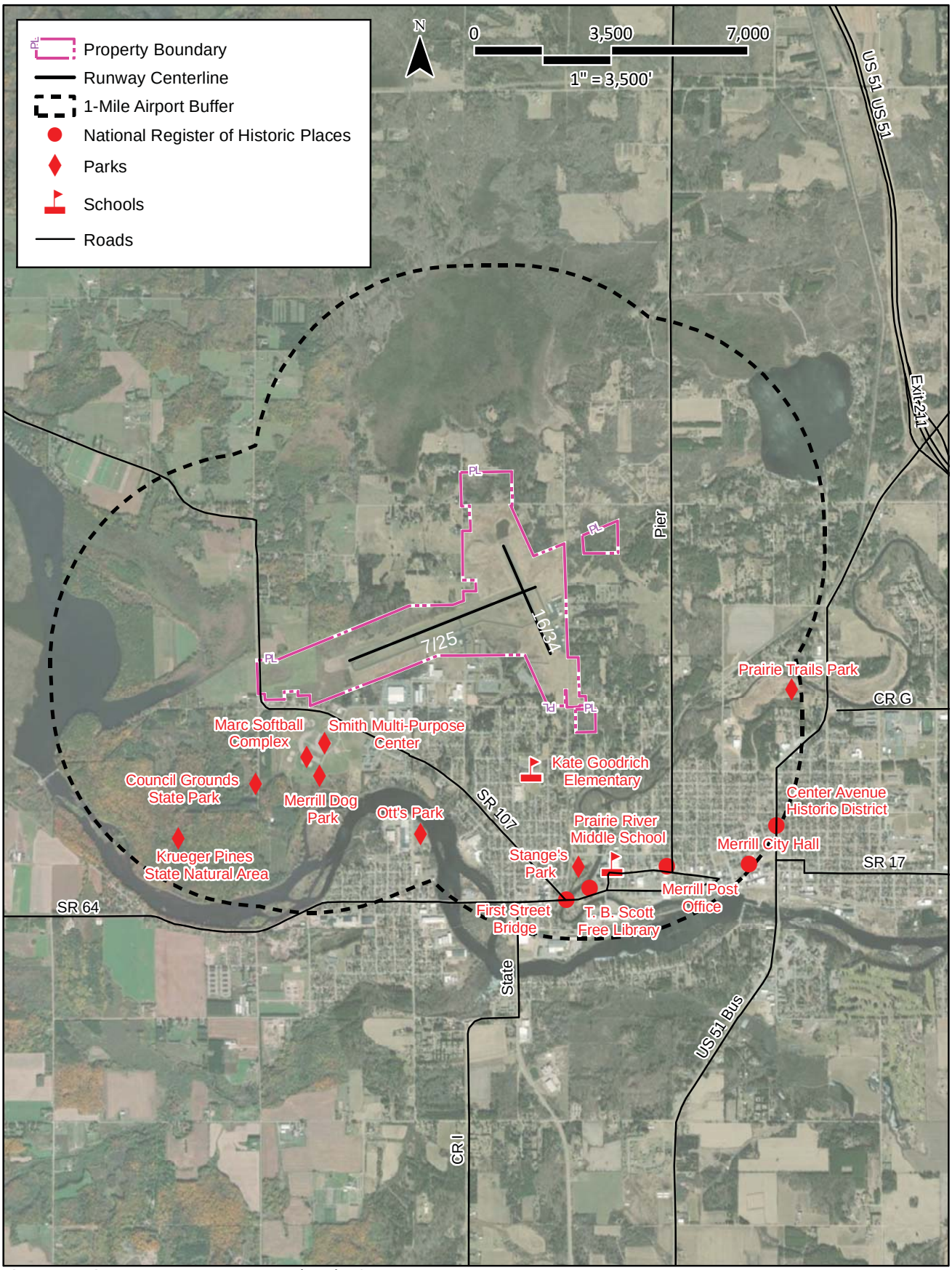
Source: Google Earth Aerial Imagery (March 2023); U.S. Department of the Interior, National Park Service, National Register of Historic Places (https://www.nps.gov/maps/full.html?mapId=7ad17cc9-b808-4ff8-a2f9-a99909164466)

There are no waterfowl and wildlife refuges within one mile of the airport. The nearest wilderness and national recreation areas are listed below:

- Nearest Wilderness Area: Headwaters Wilderness (51 miles from airport)
- Nearest National Recreation Area: Mississippi National River and Recreation Area (151 miles from airport)

FARMLANDS

Under the *Farmland Protection Policy Act* (FPPA), federal agencies are directed to identify and consider the adverse effects of federal programs on the preservation of farmland, to consider appropriate alternative actions which could lessen adverse effects, and to assure that such federal programs are, to the extent practicable, compatible with state or local government programs and policies to protect farmland. The FPPA guidelines, developed by the U.S. Department of Agriculture (USDA), apply to farmland classified as prime, unique, or of state or local importance as determined by the appropriate government agency, with concurrence by the Secretary of Agriculture.



Source: ESRI Basemap Imagery, Lincoln County, WI.

The U.S. Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS) Web Soil Survey shows the types of soils and their farmland classification on and adjacent to the airport. The airport is classified into three types of farmland classification "all areas are prime farmland," "prime farmland if drained," and "not prime farmland," with the majority of the land within the airport recognized as "prime farmland if drained" (**Exhibit 1K**). **Table 1F** describes the farmland classification based on the soil inhabiting the airport's boundaries. The airport is located outside of urbanized area boundaries.[4]

Table 1F | Farmland Classification – Summary by Map Unit Shasta County Area, California (CA607)

Web Soil Survey symbol	Soil Type	Farmland Rating
FsB	Freeon-Sconsin silt loams, 2 to 6 percent slopes	All areas are prime farmland
Lu	Lupton and Cathro soils, 0 to 1 percent slopes	Not prime farmland
MgB	Magnor, very stony-Ossmer complex, 0 to 4 percent slopes	Prime farmland if drained
NpC	Newood-Pence complex, 6 to 15	Prime farmland if irrigated

Source: USDA-NRCS, Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx)

HAZARDOUS MATERIALS, SOLID WASTE, AND POLLUTION PREVENTION

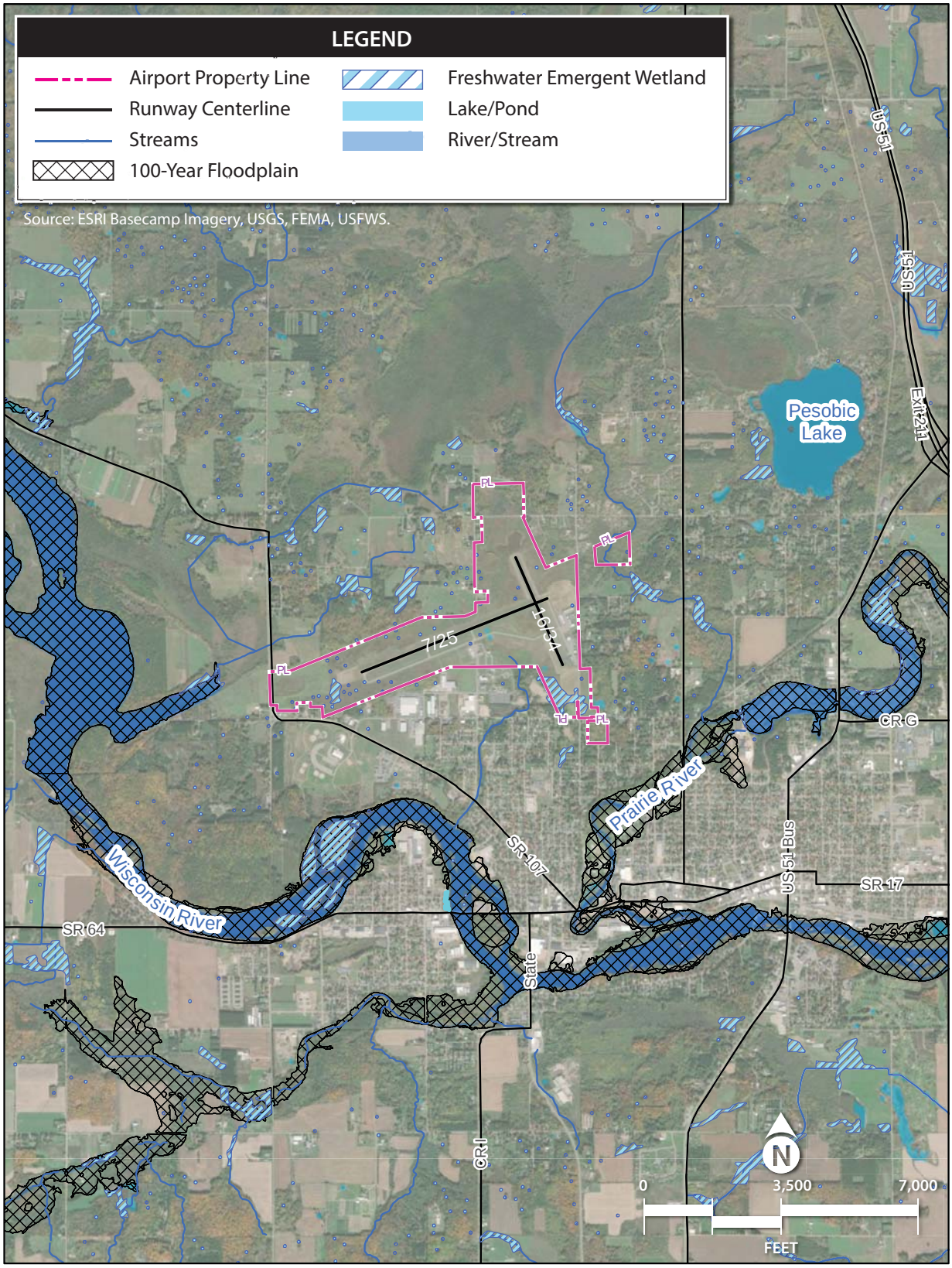
Federal, state, and local laws regulate hazardous materials use, storage, transport, and disposal. These laws may extend to past and future landowners of properties containing these materials. In addition, disrupting sites containing hazardous materials or contaminants may cause significant impacts to soil, surface water, groundwater, air quality, and the organisms using these resources. According to the U.S. EPA's *NEPAssist* online tool, there are no Superfund or brownfield sites within one mile of the airport. [5]

National Pollutant Discharge Elimination System (NPDES) permits outline the regulatory requirements of municipal storm water management programs and establish requirements to help protect the beneficial uses of the receiving waters. They require permittees to develop and implement Best Management Practices (BMPs) to control/reduce the discharge of pollutants to waters of the United States to the maximum extent practicable (MEP). The NPDES program manages wastewater, construction, stormwater, and pretreatment. In Wisconsin, the Wisconsin Department of Natural Resources (DNR) regulates the discharge of pollutants to waters of the state through the Wisconsin Pollutant Discharge Elimination System (WPDES) program. In addition to this, the DNR has outlined erosion control plans that contain specific practices to reduce erosion, divert storm water from disturbed or exposed sites areas, and control the transport of sediment and other pollutants.[6]

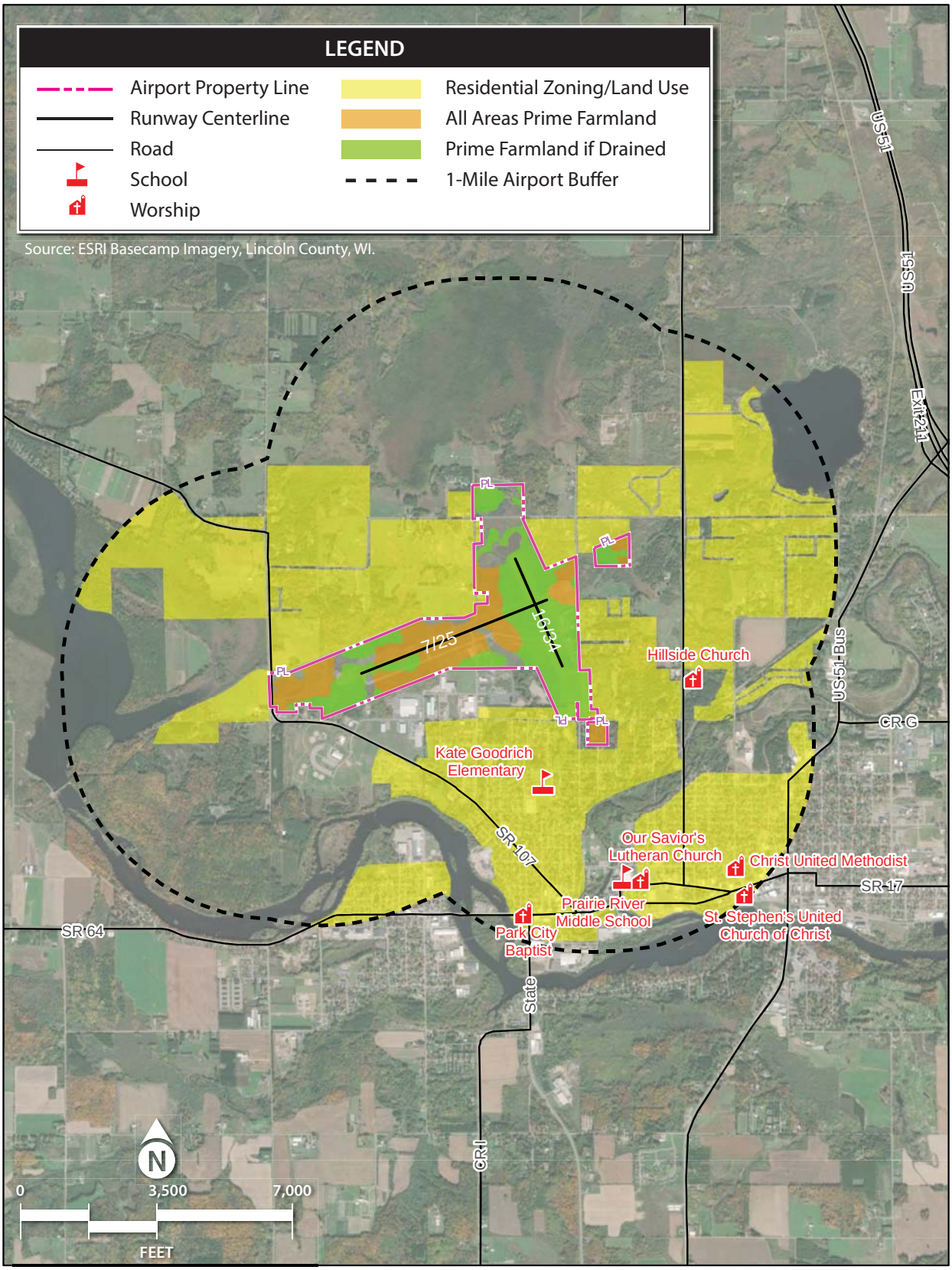
The closest landfill is the Lincoln County landfill, approximately seven miles northeast of the airport.

[4] U.S. EPA, NEPAssist (https://nepassisttool.epa.gov/nepassist/nepamap.aspx) (July2025)
[5] U.S.EPA NEPAssist, (https://nepassisttool.epa.gov/nepassist/nepamap.aspx) (July 2025)
[6] Wisconsin Department of Natural Resources – Construction Site Storm Water Permits (https://dnr.wisconsin.gov/topic/Stormwater/construction)

Natural Resources



Farmland and Urban Resources



HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Determination of a project's environmental impact to historic and cultural resources is made under guidance in the *National Historic Preservation Act* (NHPA) *of 1966*, as amended, the *Archaeological and Historic Preservation Act* (AHPA) *of 1974*, the *Archaeological Resources Protection Act* (ARPA), and the *Native American Graves Protection and Repatriation Act* (NAGPRA) *of 1990*. In addition, the *Antiquities Act of 1906*, the *Historic Sites Act of 1935*, and the *American Indian Religious Freedom Act of 1978* also protect historical, architectural, archaeological, and cultural resources. Impacts may occur when a proposed project causes an adverse effect on a resource which has been identified (or is unearthed during construction) as having historical, architectural, archaeological, or cultural significance.

A cultural survey has been conducted at the airport. A review of historic aerial photography does not indicate the presence of historic structures located within airport property.[7]

The nearest tribal lands to the airport are the Ho-Chunk Nation Off-Reservation Trust Land, located 30 miles southeast of the airport.

LAND USE

Land use regulations near airports are achieved through local government codes, city policies, and plans that include airport districts and planning areas. Regulations are used to avoid land use compatibility conflict around airports.

To enforce land use restrictions in land adjacent to the airport, clear zone easements and avigation easements have been implemented in properties near the airport (refer to **Exhibit 1C**). These easements are property rights that are acquired from the landowner and that grant the airport sponsor control over what improvements or objects can be implemented/installed on any portion of the land controlled by easements.[8]

The majority of the airport is located within the municipal boundary, with a portion on the southwestern area of the airport located in Lincoln County's jurisdiction. Based on Lincoln County's zoning, the southwestern end of the airport is zoned as general industrial, and a portion of airport property on the eastern side of the airport is zoned as rural lands (**Exhibit 1L**).

According to the City of Merrill Zoning Map, the portion of airport property that is located within municipal boundaries is primarily zoned as park recreation and public.[9] South of Runway 7-25 along W Taylor Street, land uses are zoned as industrial, park recreation, and public (**Exhibit 1M**).

[7] Historic Aerials (https://www.historicaerials.com/viewer)
[8] *Avigation Easements*, Wisconsin Bureau of Aeronautics, (https://wisconsindot.gov/Documents/doing-bus/aeronautics/resources/av-ease.pdf)
[9] City of Merrill Zoning (https://merrill.maps.arcgis.com/home/webmap/viewer.html?webmap=c3f2748bdd204300919bd3c265a5878d)

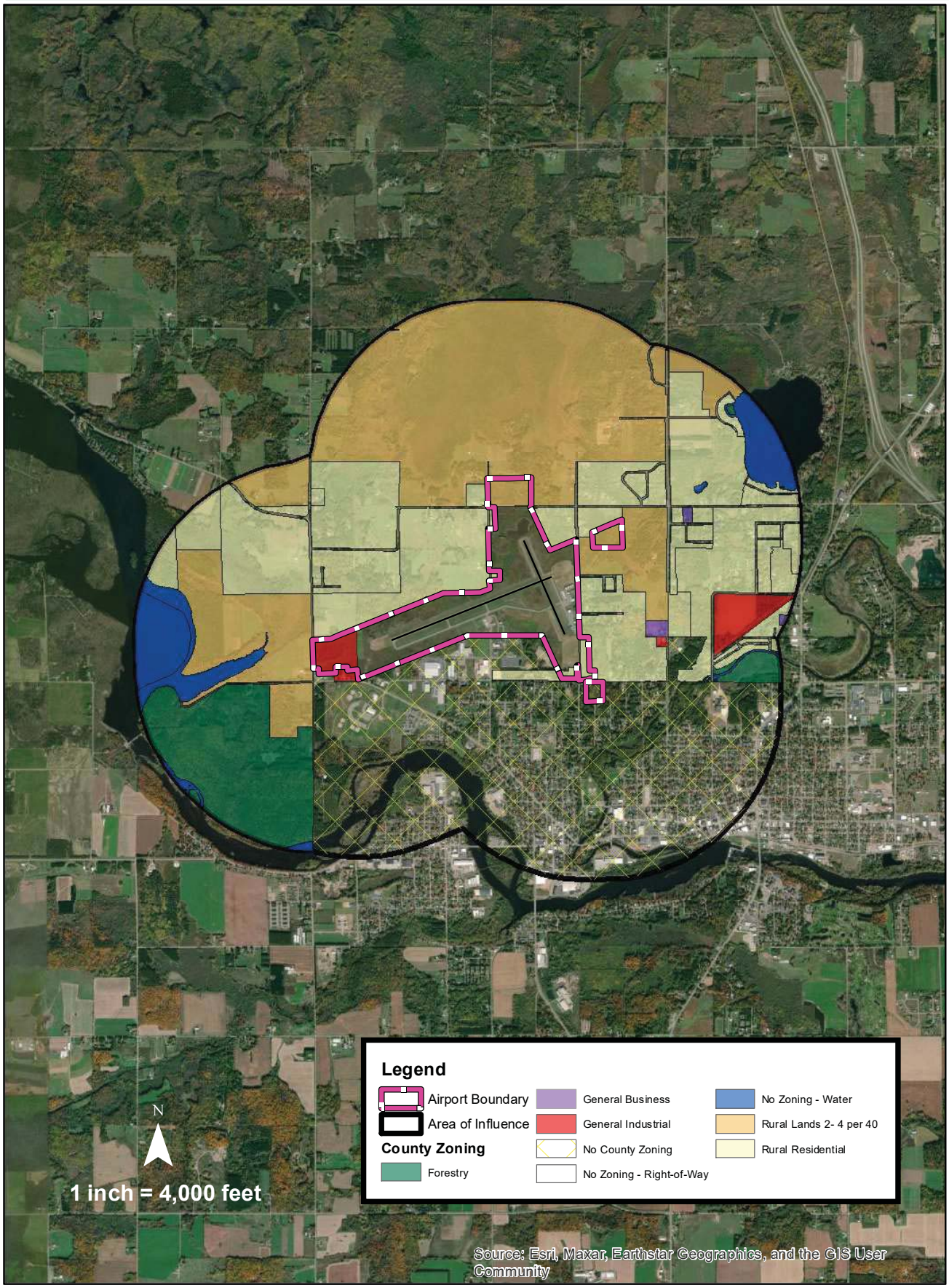
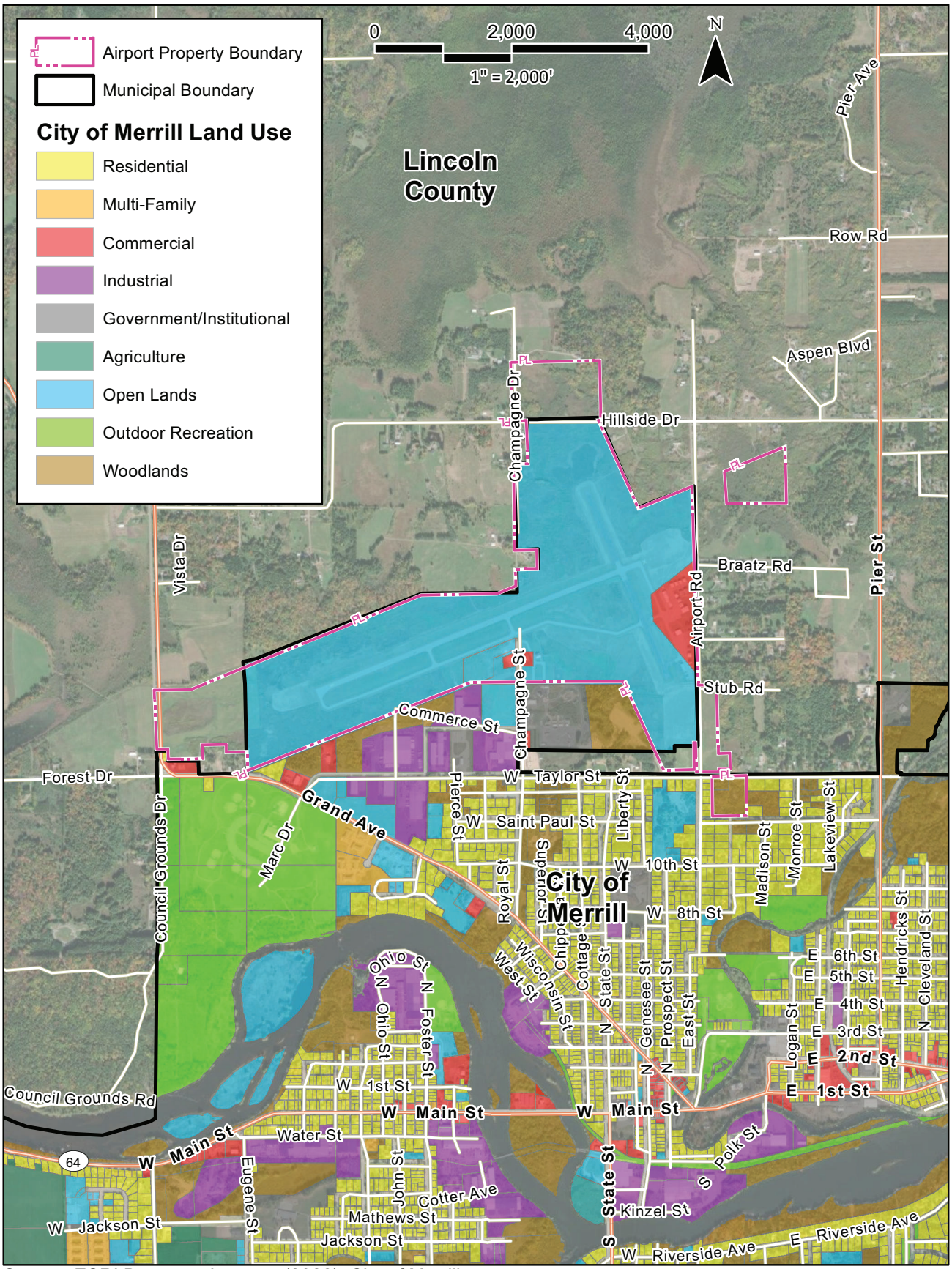


Exhibit 1L
LINCOLN COUNTY ZONING



Source: ESRI Basemap Imagery (2022), City of Merrill.

Exhibit 1M
CITY OF MERRILL ZONING

Currently, there are no city land use zoning ordinances for parcels of land adjacent to the airport; the State of Wisconsin, however, recommends establishing a zoning ordinance as outlined in the *Wisconsin State Airport System Plan 2030.*

Based on the City of Merrill's Comprehensive Plan adopted in 2017 (Map 5), existing land uses on airport property are shown as open lands and commercial. South of Runway 7-25, existing land uses have been identified as industrial, governmental/institutional, and commercial (**Exhibit 1N**).

The future land use plan map (Map 6 in the Comprehensive Plan) identifies the land uses on the airport to be redesignated as airport land uses instead of the existing designation of open lands and commercial land uses. South of the airport, the future land use map designates land uses as governmental/public/institutional and industrial (**Exhibit 1P**).

NATURAL RESOURCES AND ENERGY SUPPLY

Natural resources and energy supply provide an evaluation of a project's consumption of natural resources. It is the policy of FAA Order 1053.1C, *Energy and Water Management Program for FAA Buildings and Facilities*, to encourage the development of facilities that exemplify the highest standards of design, including principles of sustainability.

The Wisconsin DNR was formally established July 1, 1968, and was created to preserve, conserve, and enhance the environment, to ensure public health, environmental quality, and economic vitality. Continuing with its initial mission, the DNR created its governing body, the State of Wisconsin Natural Resources Board, to oversee and implement rules pertaining to the state's natural resources.

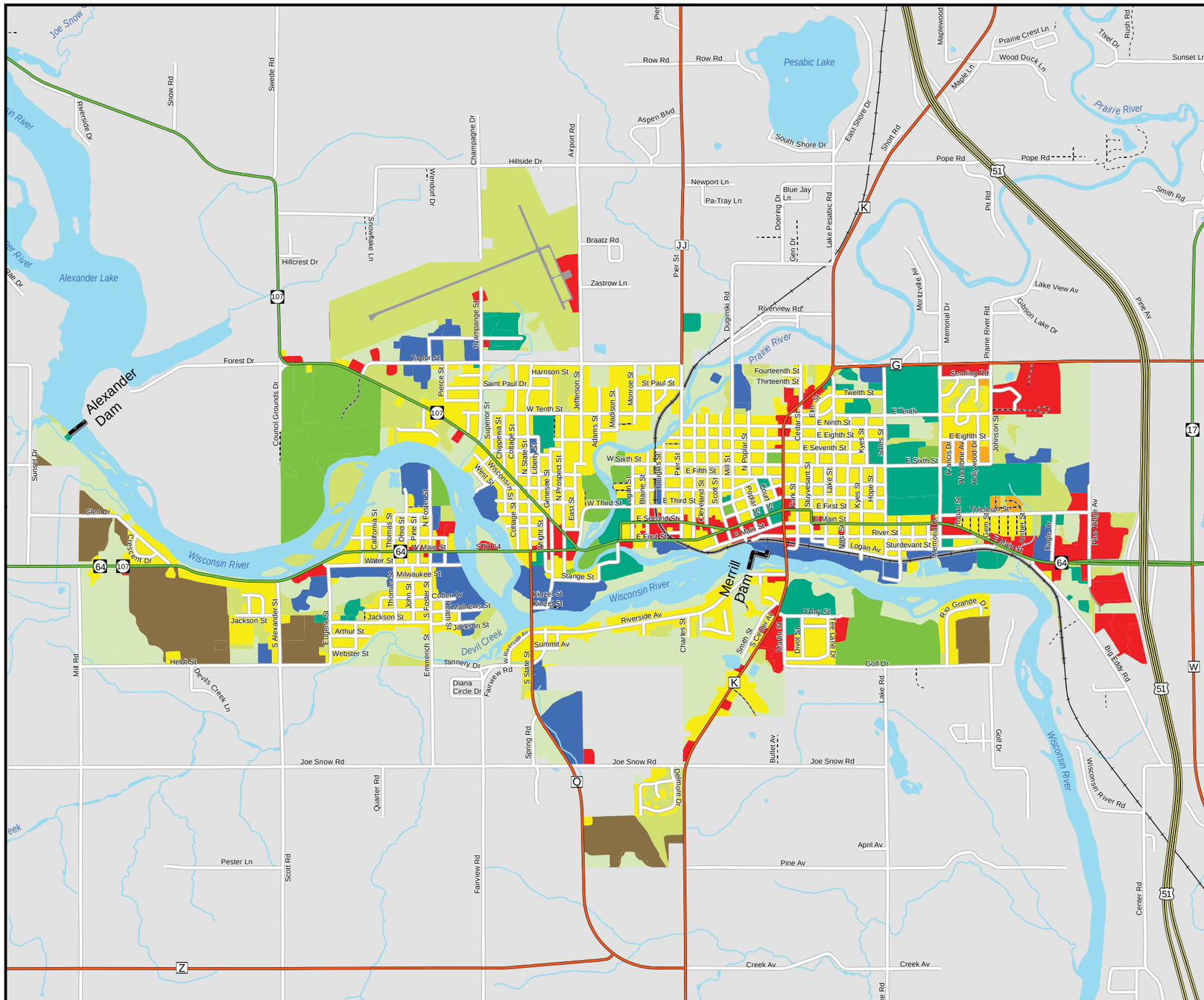
Water at the airport is supplied by the City of Merrill. The city's water supply is obtained from an established groundwater supply via wells.[10] The airport property does not contain any groundwater retrieval wells.

NOISE AND NOISE COMPATIBLE LAND USE

Federal land use compatibility guidelines are established under 14 Code of Federal Regulations (CFR) Part 150, *Airport Noise Compatibility Planning*. According to 14 CFR Part 150, residential land and schools are noise-sensitive land uses that are not considered compatible with a 65 decibel (dB) Day-Night Average Sound Level (Ldn or DNL). Other noise-sensitive land uses (such as religious facilities, hospitals, or nursing homes), if located within a 65 dB DNL contour, are generally compatible when an interior noise level reduction of 25 dB is incorporated into the design and construction of the structure. Special consideration should also be given to noise-sensitive areas within Section 4(f) properties where the land use compatibility guidelines in 14 CFR Part 150 do not account for the value, significance, and enjoyment of the area in question.[11]

[10] Merrill – Water Utilities – Water Treatment Plan (https://ci.merrill.wi.us/water#:~:text=Water%20Treatment%20Plant&text=Water%20was%20taken%20from%20the,filtration%20processes%20followed%20by%20chlorination.)

[11] 49 U.S. Code § 47141 – Compatible land use planning and projects by state and local governments



Map 5

Existing Land Use

City of Merrill

Legend

- US Highway
- State Highways
- County Highways
- Local Roads
- Private Roads
- Railroad
- Dams
- Water
- Agriculture
- Commercial
- Governmental / Institutional
- Industrial
- Multi-Family
- Open Lands
- Outdoor Recreation
- Residential
- Transportation
- Woodlands

0 0.5 1 Miles

Source: WI DNR, NCWRPC, Landuse 2015

This map is neither a legally recorded map nor a survey of the actual boundary of any property depicted. This drawing is a compilation of records, information and data used for reference purposes only. NCWRPC is not responsible for any inaccuracies herein contained.

NCWRPC North Central Wisconsin Regional Planning Commission
210 McClellan St., Suite 210, Wausau, WI 54403
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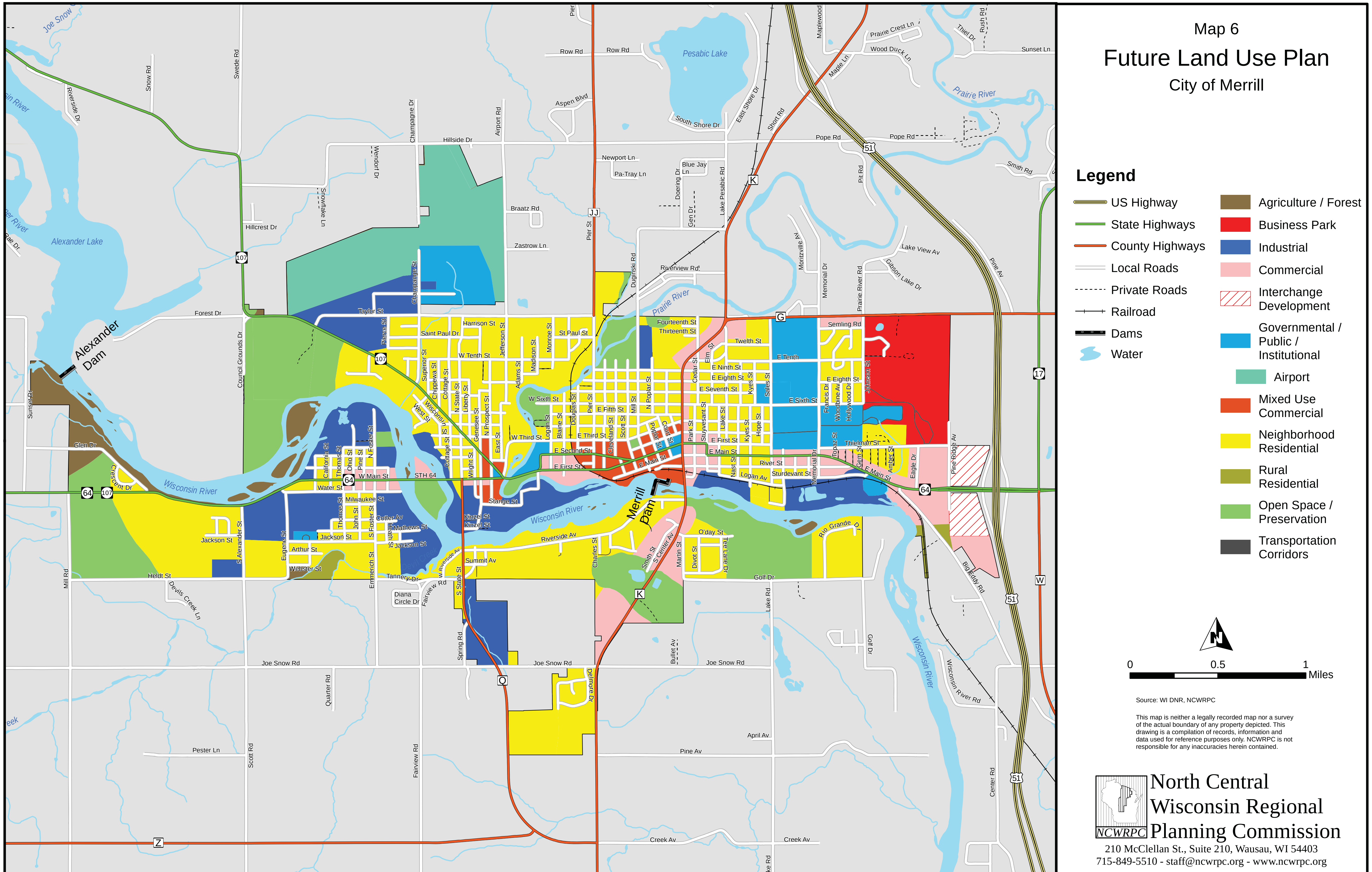

Map 6
Future Land Use Plan
City of Merrill
Legend
US Highway
State Highways
County Highways
Local Roads
Private Roads
Railroad
Dams
Water
Agriculture / Forest
Business Park
Industrial
Commercial
Interchange Development
Governmental / Public / Institutional
Airport
Mixed Use Commercial
Neighborhood Residential
Rural Residential
Open Space / Preservation
Transportation Corridors
0
0.5
1
Miles
Source: WI DNR, NCWRPC
This map is neither a legally recorded map nor a survey of the actual boundary of any property depicted. This drawing is a compilation of records, information and data used for reference purposes only. NCWRPC is not responsible for any inaccuracies herein contained.
NCWRPC
North Central Wisconsin Regional Planning Commission
210 McClellan St., Suite 210, Wausau, WI 54403
715-849-5510 - staff@ncwrpc.org - www.ncwrpc.org
Alexander Lake
Alexander Dam
Merrill Dam
Pesabic Lake
Wisconsin River
Prairie River
Hillside Dr
Pope Rd
Forest Dr
Joe Snow Rd
Pine Av
Creek Av
Heldt St
Golf Dr
E Main St
W Main St
STH 64
Riverside Av
Council Grounds Dr
Pier St
Swede Rd
Scott Rd
Lake Rd
Mill Rd
Fairview Rd
Center Rd

Table 1G below identifies noise-sensitive land uses within one mile of the airport. These land uses are also shown on **Exhibit 1K** (Urban Resources). The closest residential areas are located on the eastern side of Airport Road abutting airport property.

Table 1G | Noise-Sensitive Land Uses

Facility	Location	Distance from Airport (Miles)	Direction from Airport
Schools			
Kate Goodrich Elementary	505 W 10th Street	0.50 miles	South
Prairie River Middle School	106 N Polk Street	0.90 miles	Southeast
Places of Worship			
Hillside Cathedral	1501 Pier Street	0.60 miles	Southeast
Our Savior's Lutheran Church	300 Logan Street	1.00 mile	South
Christ United Methodist	East 3rd Street	0.90 miles	Southeast
Park City Baptist Church	216 Grand Avenue	0.90 miles	South
St. Stephen's United Church of Christ	903 E 2nd Street	1.00 miles	South

Source: U.S. EPA, EJScreen (https://ejscreen.epa.gov/mapper/); Google Earth Aerial Imagery (March 2023)

SOCIOECONOMICS AND CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISKS

Socioeconomics | *Socioeconomics* is an umbrella term used to describe aspects of a project that are either social or economic in nature. A socioeconomic analysis evaluates how elements of the human environment such as population, employment, housing, and public services might be affected by the proposed action and alternative(s).

FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures* specifically requires that a federal action causing disproportionate impacts to an environmental justice population (i.e., a low-income or minority population) be considered, as well as an evaluation of environmental health and safety risks to children. The FAA has identified factors to consider when evaluating the context and intensity of potential environmental impacts.

Would the proposed action?

- Induce substantial economic growth in an area, either directly or indirectly;
- Disrupt or divide the physical arrangement of an established community;
- Cause extensive relocation when sufficient replacement housing is unavailable;
- Cause extensive relocation of community business what would cause severe economic hardship for affected communities;
- Disrupt local traffic patterns and substantially reduce the levels of service of roads serving an airport and its surrounding communities; or
- Produce a substantial change in the community tax base.

Children's Environmental Health and Safety | Federal agencies are directed, per E.O. 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, to make it a high priority to identify and assess the environmental health and safety risks that may disproportionately impact children. Such risks include those that are attributable to products or substances that a child is likely to encounter or ingest (air, food, water – including drinking water) or to which they may be exposed.

See **Tables 1E** and **1G** for lists of schools and recreational facilities within one mile of the airport that are used by children.

VISUAL EFFECTS

Visual effects deal broadly with the extent to which a proposed action or alternative(s) would either (1) produce light emissions that create an annoyance or interfere with activities; or (2) contrast with, or detract from, the visual resources and/or the visual character of the existing environment. Each jurisdiction will typically address outdoor lighting, scenic vistas, and scenic corridors in zoning ordinances and their general plan.

Light Emissions | These impacts typically relate to the extent to which any light or glare results from a source that could create an annoyance for people or would interfere with normal activities. Generally, local jurisdictions will include ordinances in the local code addressing outdoor illumination to reduce the impact of light on surrounding properties.

Airfield lighting at the airport includes a rotating beacon, medium intensity runway lighting (MIRL) on Runway 7-25 and Runway 16-34, and runway end identifier lights (REILS) on Runway 7-25. Additionally, the airport has two-box precision approach path indicator lights (PAPI-2) at each end of Runway 7-25. The airfield lights utilize pilot-controlled lighting (PCL) and are only lit when activated by pilots using the airport. For further information, see the discussion of the types of airfield lighting and visual approach aids presented earlier in this chapter.

Visual Resources and Visual Character | *Visual character* refers to the overall visual makeup of the existing environment where a proposed action or its alternative(s) would be located. For example, areas near densely populated areas generally have a visual character that could be defined as urban, whereas less developed areas could have a visual character defined by the surrounding landscape features, such as open grass fields, forests, mountains, deserts, etc.

Visual resources include buildings, sites, traditional cultural properties, and other natural or manmade landscape features that are visually important or have unique characteristics. Visual resources may include structures or objects that obscure or block other landscape features. In addition, visual resources can include the cohesive collection of various individual visual resources that can be viewed at once or in concert from the area surrounding the site of the proposed action or alternative(s).

Although the airport environment is not within an urban area, visually it is characterized not only by trees and vegetated open areas, but by both buildings and streets. The airport is visible from surrounding

roadways on the northern portion of airport property boundaries (along Hillside Drive) and eastern portion of airport property boundaries (along Airport Road). Long-range views of the airport are not readily available from off airport property due to the relatively flat topography of the airport environs.

There are two nationally designated scenic byways in Wisconsin, but neither are located within Lincoln County, and therefore are not proximate to the airport.[12]

WATER RESOURCES

Wetlands | The U.S. Army Corps of Engineers regulates the discharge of dredged and/or fill material into waters of the United States, including wetlands with a continuous surface connection to a traditional navigable water, under Section 404 of the *Clean Water Act* (CWA). Wetlands are defined in E.O. 11990, *Protection of Wetlands*, as "those areas that are inundated by surface or groundwater with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction." Wetlands can include swamps, marshes, bogs, sloughs, potholes, wet meadows, river overflows, mudflats, natural ponds, estuarine areas, tidal overflows, and shallow lakes and ponds with emergent vegetation. Wetlands exhibit three characteristics: the soil is inundated or saturated to the surface at some time during the growing season (hydrology), has a population of plants able to tolerate various degrees of flooding or frequent saturation (hydrophytes), and soils that are saturated enough to develop anaerobic (absent of air or oxygen) conditions during the growing season (hydric).

The USFWS manages the National Wetlands Inventory on behalf of all federal agencies. The National Wetlands Inventory (NWI) identifies surface waters and wetlands in the nation.[13] Based on the NWI, there are several freshwater emergent and freshwater forested shrub wetlands located on the airport. There is a freshwater forested/shrub wetland located near the approach end of Runway 16. The NWI also identified a few freshwater ponds located on the southeastern portion of the airport.

Floodplains | E.O. 11988, *Floodplain Management*, directs federal agencies to take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values served by the floodplains. A review of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) panel numbers 55069C0528D and 55069C0529D effective August 16, 2011, indicates that the airport is in Zone X, an area of minimal flood hazard.[14] Therefore, the airport is not located on a 100-year or 500-year floodplain.

Surface Waters | The CWA establishes water quality standards, controls discharges, develops waste treatment management plans and practices, prevents or minimizes the loss of wetlands, and regulates other issues concerning water quality. Water quality concerns related to airport development most often

[12] U.S. Department of Transportation, Federal Highways Administration, National Scenic Byways & All-American Roads (https://fhwaapps.fhwa.dot.gov/bywaysp/States/Show/WI)
[13] National Wetlands Inventory (https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/)
[14] FEMA Flood Map https://msc.fema.gov/portal/search?AddressQuery=merill%20%20municipal%20airport)

relate to the potential for surface runoff and soil erosion, as well as the storage and handling of fuel, petroleum products, solvents, etc. Additionally, Congress has mandated (under the CWA) the NPDES.

Lincoln County is located in the Upper Wisconsin River drainage basin. Within the county, there are thirteen watersheds. The airport is in the Lower Prairie River and Joe Snow Creek-Wisconsin watersheds.[15] There are two impaired waterbodies within these watersheds: the Wisconsin River (southwest and south of the airport) and Lake Pesobic (northeast of the airport).

Groundwater | Groundwater is subsurface water that occupies the space between sand, clay, and rock formations. The term aquifer is used to describe the geologic layers that store or transmit groundwater, such as wells, springs, and other water sources. Examples of direct impacts to groundwater could include withdrawal of groundwater for operational purposes or reduction of infiltration or recharge area due to new impervious surfaces.

Based on Wisconsin's DNR groundwater retrieval network, there are no groundwater wells located on the airport property.[16]

U.S. EPA's Sole Source Aquifer (SSA) Program was established under Section 1424(e) of the *Safe Drinking Water Act* (SDWA). Since 1977, it has been used by communities to help prevent contamination of groundwater from federally funded projects, and it has increased public awareness of the vulnerability of groundwater resources. The SSA program is authorized by Section 1424(e) of the SDWA (Public Law 93-523, 42 U.S.C. 300 et. seq), which states:

> "*If the Administrator determines, on his own initiative or upon petition, that an area has an aquifer which is the sole or principal drinking water source for the area and which, if contaminated, would create a significant hazard to public health, he shall publish notice of that determination in the Federal Register.*"[17]

According to the U.S. EPA Sole Source Aquifer for Drinking Water website, there are no sole source aquifers located within airport boundaries. The nearest sole source aquifer is the Mille Lacs Sole Source Aquifer located approximately 190 miles northwest of the airport.[18]

Wild and Scenic Rivers | The *National Wild and Scenic Rivers Act* was established to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations.

The Nationwide River Inventory (NRI) is a list of over 3,400 rivers or river segments that appear to meet the minimum *Wild and Scenic Rivers Act* eligibility requirements based on their free-flowing status and resource values. The development of the NRI resulted from Section 5(d)(1) in the *Wild and Scenic*

[15] U.S. EPA – How's My Waterway (https://mywaterway.epa.gov/community/merrill%20municipal%20airport/overview)
[16] The Groundwater Retrieval Network (https://dnr.wisconsin.gov/topic/Groundwater/GRN.html)
[17] U.S. EPA, Overview of the Drinking Water Sole Source Aquifer Program (https://www.epa.gov/dwssa/overview-drinking-water-sole-source-aquifer-program#Authority)
[18] U.S. EPA, Sole Source Aquifers (https://epa.maps.arcgis.com/apps/webappviewer/index.html?id=9ebb047ba3ec41ada1877155fe31356b)

Rivers Act, directing federal agencies to consider potential wild and scenic rivers in the comprehensive planning process.

The closest designated National Wild and Scenic River identified is the Wolf River, located more than 50 miles from the airport.[19] The nearest National River Inventory feature is the Wisconsin River, located just over one mile away from the airport.[20]

[19] U.S. Department of the Interior, National Park Service, National Wild and Scenic River System in the U.S. (https://nps.maps.arcgis.com/apps/MapJournal/index.html?appid=ba6debd907c7431ea765071e9502d5ac#)

[20] U.S. Department of the Interior, National Park Service, Nationwide River Inventory (https://www.nps.gov/maps/full.html?mapId=8adbe798-0d7e-40fb-bd48-225513d64977)

Chapter 2

FORECASTS

Chapter 2

FORECASTS

The definition of demand that may reasonably be expected to occur during the useful life of an airport's key components (e.g., runways, taxiways, terminal buildings, etc.) is an important factor in facility planning. In airport master planning, this involves projecting potential aviation activity for at least a 20-year timeframe. Aviation demand forecasting for Merrill Municipal Airport (RRL) will primarily consider based aircraft, aircraft operations, peak activity periods, and the critical aircraft.

The Federal Aviation Administration (FAA) has oversight responsibility to review and approve aviation forecasts developed in conjunction with airport planning studies. Historically, the FAA reviewed individual airport forecasts with the objective of comparing them to its *Terminal Area Forecasts* (TAF) and the *National Plan of Integrated Airport Systems* (NPIAS). Even though the TAF is updated annually, there was almost always a disparity between the TAF and master planning forecasts. This was primarily because the TAF forecasts are the result of a top-down model that does not consider local conditions or recent trends. While the TAF forecasts are a point of comparison for master plan forecasts, they serve other purposes, such as asset allocation by the FAA.

When reviewing a sponsor's forecast (from the master plan), the FAA must ensure that the forecast is based on reasonable planning assumptions, uses current data, and is developed using appropriate forecast methods. According to the FAA, forecasts should be:

- Realistic;
- Based on the latest available data;
- Reflective of current conditions at the airport (as a baseline);
- Supported by information in the study; and
- Able to provide adequate justification for airport planning and development.

New guidance for forecast review and approval was issued in an FAA Memorandum dated August 12, 2024. The memo outlines primary principles for approving forecasts and makes a distinction between forecasts developed for towered airports and non-towered, low-activity airports. At these non-towered facilities, where current activity levels do not exceed 90,000 annual operations nor are they expected to over the 20-year planning period, preparation of a detailed forecast is not necessary. Rather, the key forecasting component is the identification of critical aircraft, which is the most physically demanding aircraft operating at the airport at least 500 times per year.

The forecast process for an airport master plan consists of a series of basic steps that vary in complexity depending upon the issues to be addressed and the level of effort required. The steps include a review of previous forecasts, determination of data needs, identification of data sources, collection of data, selection of forecast methods, preparation of the forecasts, and documentation and evaluation of the results. FAA Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*, outlines seven standard steps involved in the forecast process, including:

1) **Identify Aviation Activity Measures**: The level and type of aviation activities likely to impact facility needs. For general aviation, this typically includes based aircraft and operations.
2) **Review Previous Airport Forecasts**: May include the FAA *Terminal Area Forecast*, state or regional system plans, and previous master plans.
3) **Gather Data**: Determine what data are required to prepare the forecasts, identify data sources, and collect historical and forecast data.
4) **Select Forecast Methods**: There are several appropriate methodologies and techniques available, including regression analysis, trend analysis, market share or ratio analysis, exponential smoothing, econometric modeling, comparison with other airports, survey techniques, cohort analysis, choice and distribution models, range projections, and professional judgment.
5) **Apply Forecast Methods and Evaluate Results**: Prepare the actual forecasts and evaluate for reasonableness.
6) **Summarize and Document Results**: Provide supporting text and tables as necessary.
7) **Compare Forecast Results with FAA's TAF**: Based aircraft and total operations are considered consistent with the TAF if they meet the following criteria:
   - Forecasts differ by less than 10 percent in the five-year forecast period, and 15 percent in the 10-year forecast period, or
   - Forecasts do not affect the timing or scale of an airport project, or
   - Forecasts do not affect the role of the airport as defined in the current version of FAA Order 5090.5, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS) *and the Airports Capital Improvement Plan* (ACIP).

Aviation activity can be affected by many influences on the local, regional, and national levels, making it virtually impossible to predict year-to-year fluctuations of activity over 20 years with any certainty. Therefore, it is important to remember that forecasts are to serve only as guidelines, and planning must remain flexible enough to respond to a range of unforeseen developments.

The following forecast analysis for the airport was produced following these basic guidelines. Existing forecasts are examined and compared against current and historic activity. The historic aviation activity is then examined along with other factors and trends that can affect demand. The intent is to provide an

updated set of aviation demand projections for the airport that will permit airport management to make planning adjustments as necessary to maintain a viable, efficient, and cost-effective facility.

The forecasts for this master plan will utilize a base year of 2023 with a long-range forecast out to 2043.

NATIONAL AVIATION TRENDS

Each year, the FAA updates and publishes a national aviation forecast. Included in this publication are forecasts for large air carriers, regional/commuter air carriers, general aviation, and FAA workload measures. The forecasts are prepared to meet the budget and planning needs of the FAA and provide information that can be used by state and local authorities, the aviation industry, and the general public. The current edition upon preparation of this chapter was *FAA Aerospace Forecast – Fiscal Years 2023-2043*, published in May 2023. The FAA primarily uses the economic performance of the United States as an indicator of future aviation industry growth. Similar economic analyses are applied to the outlook for aviation growth in international markets. The following discussion is summarized from the *FAA Aerospace Forecast*.

Since its deregulation in 1978 and the Great Recession of 2007-2009, the U.S. commercial air carrier industry has been characterized by boom-to-bust cycles. The volatility associated with these cycles was thought by many to be a structural feature of an industry that was capital intensive but cash poor; however, the Great Recession of 2007-2009 marked a fundamental change in the operations and finances of U.S. airlines. Since the end of the recession in 2009, U.S. airlines have revamped their business models to minimize losses by lowering operating costs, eliminating unprofitable routes, and grounding older, less fuel-efficient aircraft. To increase operating revenues, carriers initiated new services that customers were willing to purchase and started charging separately for services that were historically bundled in the price of a ticket. The industry experienced an unprecedented period of consolidation, with three major mergers occurring within five years. The results of these efforts were impressive: 2019 marked the eleventh consecutive year of profitability for the U.S. airline industry.

The COVID-19 pandemic in 2020 effectively ended those boom years, with airline activity and profitability plummeting almost overnight. In response, airlines cut capacity and costs, and most were able to weather the storm. Some small regional carriers ceased operations as a result of the pandemic, but no mainline carriers did. Some segments of aviation were less impacted: cargo activity surged, boosted by consumer purchases, and general aviation generally maintained pre-pandemic levels of activity. By the middle of 2021, leisure travel began to rebound with the introduction of vaccines and the lifting of some local restrictions. Two new low-cost carriers were formed and one regional carrier that had ceased operations in 2020 was revived. By the third quarter of 2021, industry profitability neared the breakeven point, and by the end of 2022, U.S. airlines reported that business demand had recovered to 70-80 percent of pre-pandemic levels. Higher fares accompanied the strong rebound in leisure demand, leading to positive financial results. The top nine U.S. passenger carriers posted operating and net profits, proving strong success for the new business models air carriers have been utilizing to weather the pandemic.

The business changes that airlines implemented due to the pandemic will shape the industry long after recovery is complete. Airlines retired older, less fuel-efficient aircraft and encouraged voluntary employee separations. This has led to airlines seeking newer aircraft investments while meeting the current demand for the rebuilding of business and international travel, which has lagged behind leisure traffic during the recovery. There is confidence that U.S. airlines can generate solid returns on capital and sustained profits; however, over the long term, aviation demand will be driven by economic activity as the growing U.S. and world economies provide the basis for aviation growth.

ECONOMIC ENVIRONMENT

According to the FAA forecast, the annual gross domestic product (GDP) of the U.S. is expected to increase by 1.8 percent over the next 20 years. U.S. carriers posted an unexpected profit in 2022, and the FAA expects carriers to remain profitable over the next few years as demand rises, despite higher fares which offset the raised labor and fuel costs. As yields stabilize and carriers return to levels of capacity consistent with their fixed costs and shed excess debt, consistent profitability should continue. Over the long term, we see a competitive and profitable aviation industry characterized by increasing demand for air travel, and airfares growing more slowly than overall inflation, reflecting growing U.S. and global economies.

Prior to the COVID-19 pandemic, the U.S. economy was recovering from the most serious economic downturn and slow recovery since the Great Depression. Demand for aviation is fundamentally driven by economic activity; as economic growth picks up, so will growth in aviation activity. Overall, the FAA forecast calls for annual passenger growth over the next 20 years to average 2.7 percent. Oil prices surged to $93 per barrel in 2022 – largely due to the Russian invasion of Ukraine – after averaging $55 per barrel over the five-year period from 2016 to 2021. Prices are expected to ease over the next two years before slowly climbing to $113 per barrel by the end of the forecast period in 2043.

FAA GENERAL AVIATION FORECASTS

The long-term outlook for general aviation (GA) is promising, as growth at the high end of the segment offsets continuing retirements at the traditional low end. The active general aviation fleet is forecast to remain relatively stable between 2023 and 2043, increasing by just 0.2 percent. While steady growth in both GDP and corporate profits results in continued growth of the turbine and rotorcraft fleets, the largest segment of the fleet – fixed-wing piston aircraft – continues to shrink over the forecast period.

The FAA forecasts the fleet mix and hours flown for single-engine piston (SEP) aircraft; multi-engine piston (MEP) aircraft; turboprops; business jets; piston and turbine helicopters; and light sport, experimental, and other aircraft (e.g., gliders and balloons). The FAA forecasts active aircraft, not total aircraft. An active aircraft is one that is flown at least one hour during the year. From 2010 through 2013, the FAA undertook an effort to have all aircraft owners re-register their aircraft. This effort resulted in a 10.5 percent decrease in the number of active general aviation aircraft, mostly in the piston category. **Table 2A** shows the primary general aviation demand indicators as forecast by the FAA.

TABLE 2A | FAA General Aviation Forecast

Demand Indicator	2023	2043	CAGR
General Aviation Fleet			
Total Fixed-Wing Piston	136,290	118,975	-0.7%
Total Fixed-Wing Turbine	26,645	39,740	2.0%
Total Helicopters	10,320	13,870	1.5%
Total Other (experimental, light sport, etc.)	35,840	43,810	1.0%
Total GA Fleet	**209,095**	**216,395**	**0.2%**
General Aviation Operations			
Local	14,801,816	16,622,293	0.6%
Itinerant	15,077,947	16,704,132	0.5%
Total General Aviation Operations	**29,879,763**	**33,326,425**	**0.5%**
CAGR = Compound Annual Growth Rate (2023-2043)			

Source: FAA Aerospace Forecast – FY 2023-2043

General Aviation Fleet Mix

For 2023, the FAA estimates there are 136,290 piston-powered fixed-wing aircraft in the national fleet. That number is forecast to decline by 0.7 percent by 2043, resulting in 118,975 aircraft. This includes a decline of 0.7 percent in SEP aircraft and a decline of 0.2 percent in MEP aircraft.

Total turbine aircraft are forecast to grow at an annual rate of 2.0 percent through 2043. The FAA estimates there are 26,645 fixed-wing turbine-powered aircraft in the national fleet in 2023 and there will be 39,740 by 2043. Turboprops are forecast to grow by 0.8 percent annually, while business jets are projected to grow by 2.7 percent annually through 2043.

Total helicopters are projected to grow by 1.5 percent annually in the forecast period. There are an estimated 10,320 total helicopters in the national fleet in 2023, and that number is expected to grow to a total of 13,870 by 2043. This includes annual growth rates of 0.5 percent for piston helicopters and 1.8 percent for turbine helicopters.

The FAA also forecasts experimental aircraft, light sport aircraft (LSA), and others. Combined, there are an estimated 35,840 other aircraft in 2023 that are forecast to grow to 43,810 by 2043, for an annual growth rate of 1.0 percent.

General Aviation Operations

The FAA also forecasts total operations based on activity at control towers across the United States. Operations are categorized as air carrier, air taxi/commuter, general aviation, and military. While the fleet size remains relatively level, the number of general aviation operations at towered airports is projected to increase from 29.9 million in 2023 to 33.3 million in 2043, with an average increase of 0.5 percent per year as growth in turbine, rotorcraft, and experimental hours offsets a decline in fixed-wing piston hours. This includes annual growth rates of 0.6 percent for local general aviation operations and

0.5 percent for itinerant general aviation operations. **Exhibit 2A** presents the historical and forecast U.S. active general aviation aircraft and operations.

General Aviation Aircraft Shipments and Revenue

On an annual basis, the General Aviation Manufacturers Association (GAMA) publishes an aviation industry outlook that documents past and current trends and provides an assessment of the future condition of the general aviation industry. **Table 2B** presents historical data related to general aviation aircraft shipments.

Worldwide shipments of general aviation airplanes increased in the year 2022, with a total of 2,818 units delivered around the globe, compared to 2,646 units in 2021 – the second year in a row to experience an increase after the drop during 2020, when only 2,408 units were delivered. Worldwide general aviation billings were the highest in 2014. In 2022, an increase in new aircraft shipments generated more than $22 billion, compared to $21.6 billion in the previous year. North America continues to be the largest market for general aviation aircraft and leads in the manufacturing of piston, turboprop, and jet aircraft. The Asia-Pacific region is the second largest market for piston-powered aircraft, while Latin America is the second leading in the turboprop market. Europe leads in business jet deliveries.

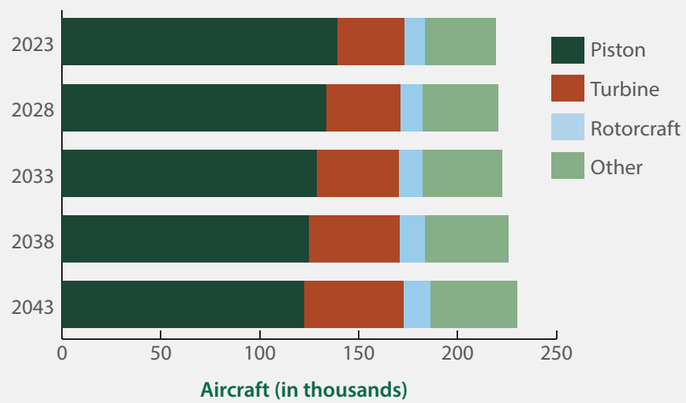
TABLE 2B | Annual General Aviation Airplane Shipments

Manufactured Worldwide and Factory Net Billings						
Year	Total	SEP	MEP	TP	J	Net Billings ($ million)
2002	2,677	1,591	130	280	676	11,778
2003	2,686	1,825	71	272	518	9,998
2004	2,962	1,999	52	319	592	12,093
2005	3,590	2,326	139	375	750	15,156
2006	4,054	2,513	242	412	887	18,815
2007	4,277	2,417	258	465	1,137	21,837
2008	3,974	1,943	176	538	1,317	24,846
2009	2,283	893	70	446	874	19,474
2010	2,024	781	108	368	767	19,715
2011	2,120	761	137	526	696	19,042
2012	2,164	817	91	584	672	18,895
2013	2,353	908	122	645	678	23,450
2014	2,454	986	143	603	722	24,499
2015	2,331	946	110	557	718	24,129
2016	2,268	890	129	582	667	21,092
2017	2,324	936	149	563	676	20,197
2018	2,441	952	185	601	703	20,515
2019	2,658	1,111	213	525	809	23,515
2020	2,408	1,164	157	443	644	20,048
2021	2,646	1,261	148	527	710	21,603
2022	2,818	1,366	158	582	712	22,866

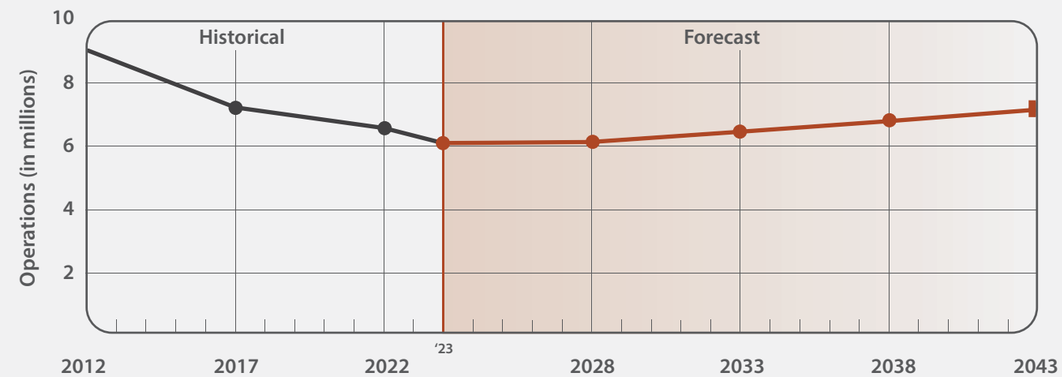
SEP = Single-Engine Piston
MEP = Multi-Engine Piston
TP = Turboprop
J = Jet

Source: General Aviation Manufacturers Association (GAMA) 2022 Annual Report

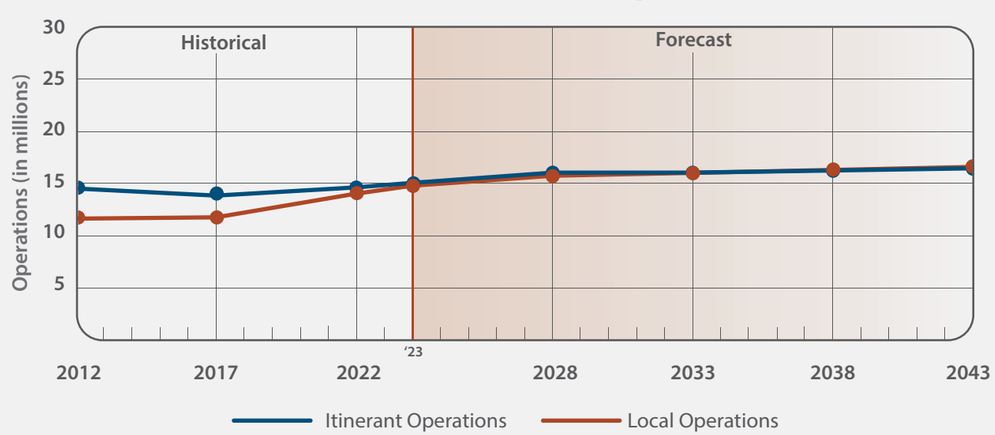
U.S. Active General Aviation Aircraft



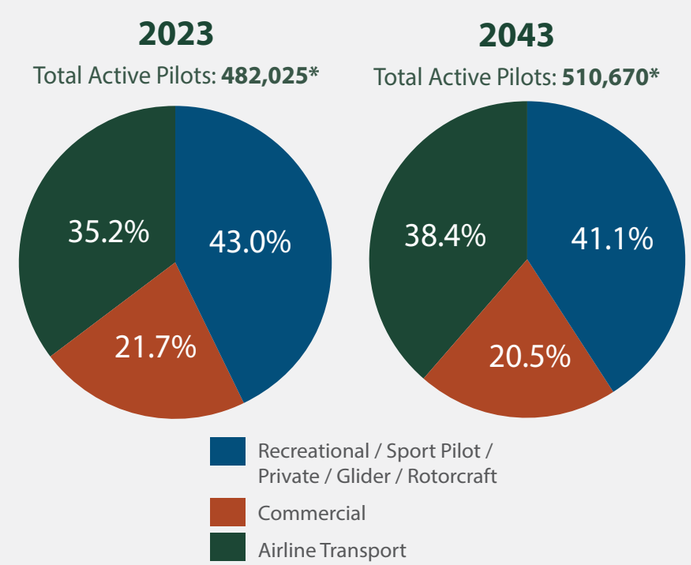
U.S. Air Taxi Operations



U.S. General Aviation Operations



Active Pilots By Certificate



**Excludes Student Pilot Certificates*

Source: FAA Aerospace Forecasts FY2023-2043

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Business Jets | Business jet deliveries increased from 710 units in 2021 to 712 units in 2022. The North American market accounted for 67.6 percent of business jet deliveries, which is a 1.7 percent increase in market share compared to 2021.

Turboprops | Turboprop shipments increased from 527 in 2021 to 582 in 2022. North America's market share of turboprop aircraft increased by 3.1 percent in the last year. The European, Middle East and Africa, and Asia-Pacific market shares decreased, while the market share of Latin American markets increased.

Pistons | In 2022, piston airplane shipments increased to 1,524 units from 1,409 units in the prior year. North America's market share of piston aircraft deliveries rose 1.2 percent from the year 2021. The European, Latin American, and Middle East and Africa regions experienced a positive rate in market shares during the past year, while the Asia-Pacific market saw a decline.

U.S. PILOT POPULATION

There were 476,346 active pilots certificated by the FAA at the end of 2022, with 482,025 active pilots projected in 2023. All pilot categories – except private and recreational-only certificates – are expected to continue to increase for the forecast length. Excluding student pilots, the number of active pilots is projected to increase by about 28,645 (up 0.3 percent annually) between 2023 and 2043. The airline transport pilot (ATP) category is forecast to increase by 26,200 (up 0.7 percent annually). Sport pilots are predicted to increase by 2.5 percent, commercial pilots will remain steady over the forecast period, and private pilot certificates are projected to decrease at an average annual rate of 0.2 percent through 2043. The FAA has currently suspended the student pilot forecast.

RISKS TO THE FORECAST

While the FAA is confident that its forecasts for aviation demand and activity can be reached, they are dependent on several factors, including the strength of the global economy, security (including the threat of international terrorism), and oil prices. Higher oil prices could lead to further shifts in consumer spending away from aviation, dampening a recovery in air transport demand. The COVID-19 pandemic introduced a new risk, and although the industry has rebounded, the threat of future global health emergencies and potential economic fallout remains.

AIRPORT SERVICE AREA

The initial step in determining the aviation demand for an airport is to define its generalized service area for various segments of aviation. The service area is determined primarily by evaluating the location of competing airports, their capabilities, their services, and their relative attraction and convenience. In determining the aviation demand for an airport, it is necessary to identify the role of the airport, as well as the specific areas of aviation demand the airport is intended to serve. Merrill Municipal Airport is classified as a Local General Aviation (GA) airport within the NPIAS, meaning that its primary role is to

provide the community with access to local and regional markets. Within the 2030 *Wisconsin State Aviation System* Plan, the airport is classified as a medium GA Community airport, meaning its role is to accommodate most single and multi-engine GA aircraft and support regional and in-state air transportation needs. General aviation, which includes all segments of the aviation industry except commercial air carriers and the military, is the largest component of the national aviation system. It includes activities such as pilot training, recreational flying, and the use of sophisticated turboprop and jet aircraft for business and corporate use.

The service area for an airport is a geographic region from which an airport can be expected to attract the largest share of its activity. The definition of the service area can then be used to identify other factors, such as socioeconomic and demographic trends, that influence aviation demand at an airport. Aviation demand will be impacted by the proximity of competing airports, the surface transportation network, and the strength of general aviation services provided by an airport and competing airports.

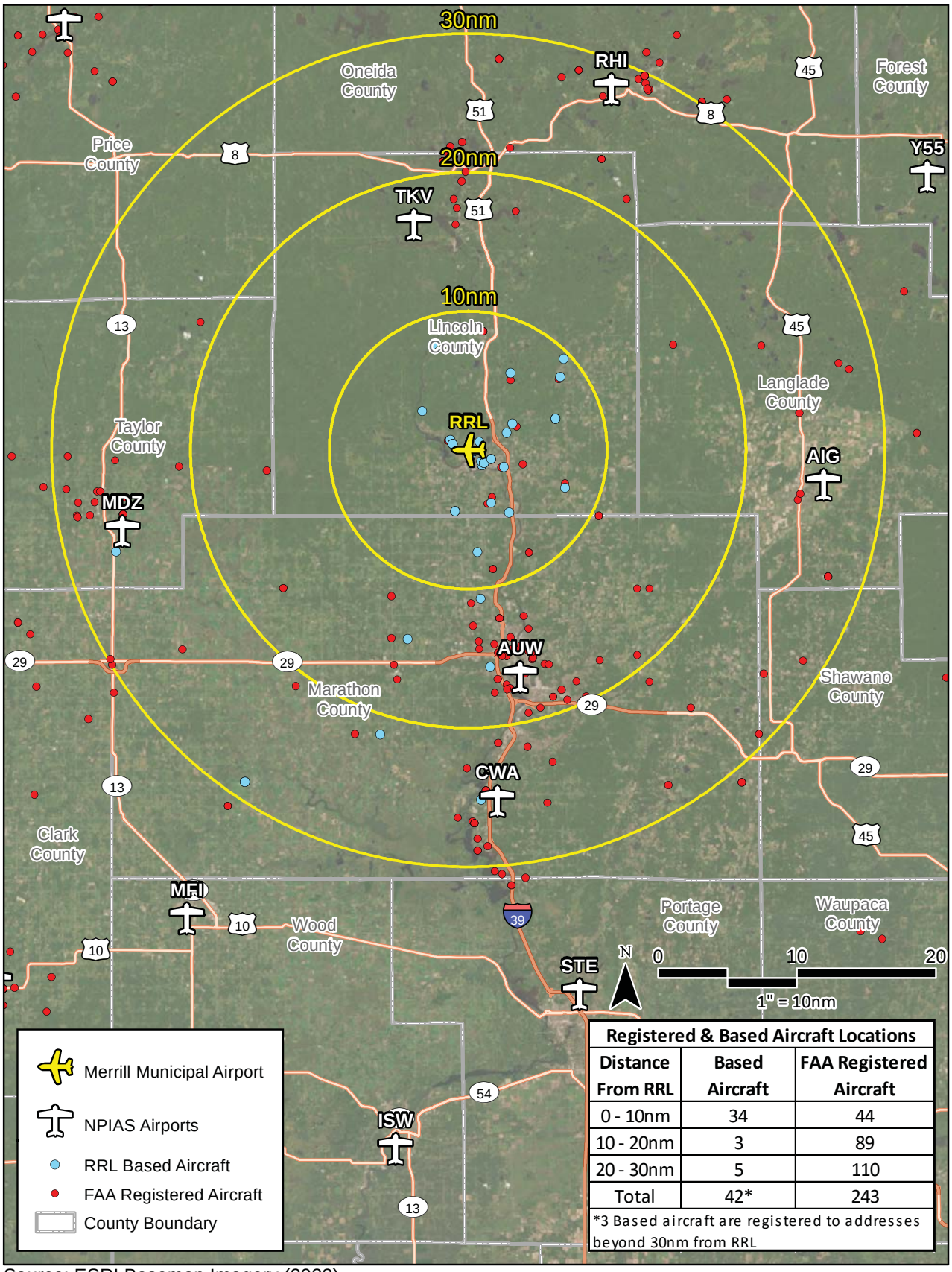
As in any business enterprise, the more attractive the facility is in terms of service and capabilities, the more competitive it will be in the market. If an airport's attractiveness increases in relation to nearby airports, so will the size of its service area. If facilities and services are adequate and/or competitive, some level of aviation activity might be attracted to an airport from more distant locales.

As a Local GA airport, Merrill Municipal Airport's service area is driven by aircraft owners/operators and where they choose to base their aircraft. The primary consideration of aircraft owners/operators when choosing where to base their aircraft is convenience (i.e., easy access and proximity to the airport). As a general rule, an airport's service area can extend up to and beyond 30 miles. The proximity and level of general aviation services are largely a defining factor when describing the general aviation service area. A description of nearby airports was previously completed in Chapter One, as presented on Exhibit 1F. There are six public-use airports within 30 nautical miles (nm) of Merrill Municipal Airport: Tomahawk Regional, Wausau Downtown, Central Wisconsin, Taylor County, Langlade County, and Rhinelander-Oneida County.

When discussing the general aviation service area, two primary demand segments need to be addressed. The first component is the airport's ability to attract based aircraft. Under this circumstance, the most effective method of defining the airport's service area is by examining the number of registered aircraft owners in proximity to the airport. As previously mentioned, aircraft owners typically choose to base at an airport near their home or business. Based on the current registered aircraft data, presented on **Exhibit 2B**, there are 243 registered aircraft within 30 nm of Merrill Municipal Airport. Of these aircraft, 45, or approximately 19 percent, are based at the airport.

The second demand segment to consider is itinerant aircraft operations. In most instances, pilots will opt to utilize airports nearer their intended destination; however, this is also dependent on the airport's capabilities in accommodating the aircraft operator. As a result, airports offering better services and facilities are more likely to attract itinerant operators in the region.

With several competing airports in the region, Merrill Municipal Airport's primary service area is defined by its convenience to its users and its ability to compete for based aircraft. The only other airport in Lincoln County is Tomahawk Regional, which is included as a Basic GA airport in the NPIAS and offers a



Registered & Based Aircraft Locations		
Distance From RRL	Based Aircraft	FAA Registered Aircraft
0 - 10nm	34	44
10 - 20nm	3	89
20 - 30nm	5	110
Total	42*	243

*3 Based aircraft are registered to addresses beyond 30nm from RRL

Source: ESRI Basemap Imagery (2022), FAA Registered Aircraft Database.

single 4,400-foot runway and limited services. Neighboring counties are home to more substantial facilities, including Wausau Downtown Airport and Central Wisconsin Airport in Marathon County and Rhinelander-Oneida County Airport in Oneida County. Each of these airports offers at least two runways and a full array of aviation services and amenities. For this reason, the primary service area for Merrill Municipal Airport is established as Lincoln County, which RRL is well-equipped to serve and from which the airport currently draws the majority of its based aircraft owners.

FORECASTING APPROACH

The development of aviation forecasts proceeds through both analytical and judgmental processes. A series of mathematical relationships is tested to establish statistical logic and rationale for projected growth. However, the judgment of the forecast analyst, based upon professional experience, knowledge of the aviation industry, and assessment of the local situation, is important in the final determination of the preferred forecast. The most reliable approach to estimating aviation demand is through the utilization of more than one analytical technique. Methodologies frequently considered include trend line/time-series projections, correlation/regression analysis, and market share analysis. The forecast analyst may elect not to use certain techniques depending on the reasonableness of the forecasts produced using other techniques.

Trend line/time-series projections are probably the simplest and most familiar of the forecasting techniques. By fitting growth curves to historical data, then extending them into the future, a basic trend line projection is produced. A basic assumption of this technique is that outside factors will continue to affect aviation demand in much the same manner as in the past. As broad as this assumption may be, the trend line projection does serve as a reliable benchmark for comparing other projections.

Correlation analysis provides a measure of direct relationship between two separate sets of historical data. Should there be a reasonable correlation between the data sets, further evaluation using regression analysis may be employed.

Regression analysis measures statistical relationships between dependent and independent variables, yielding a "correlation coefficient." The correlation coefficient (Pearson's "r") measures association between the changes in the dependent variable and the independent variable(s). If the "r^2" value (coefficient determination) is greater than 0.95, it indicates good predictive reliability. A value less than 0.95 may be used, but with the understanding that the predictive reliability is lower.

Market share analysis involves a historical review of the airport activity as a percentage, or share, of a larger regional, state, or national aviation market. A historical market share trend is determined, providing an expected market share for the future. These shares are then multiplied by the forecasts of the larger geographical area to produce a market share projection. This method has the same limitations as trend line projections but can provide a useful check on the validity of other forecasting techniques.

Forecasts will age, and the farther one is from the base year, the less reliable a forecast may become, particularly due to changing local and national conditions. Nonetheless, the FAA requires that a 20-year forecast be developed for long-range airport planning. Facility and financial planning usually require at

least a ten-year view since it often takes more than five years to complete a major facility development program; however, it is important to use forecasts which do not overestimate revenue-generating capabilities or understate demand for facilities needed to meet public (user) needs.

A wide range of factors is known to influence the aviation industry and can have significant impacts on the extent and nature of aviation activity in both the local and national markets. Historically, the nature and trend of the national economy has had a direct impact on the level of aviation activity. Recessionary periods have been closely followed by declines in aviation activity. Nonetheless, over time, trends emerge and provide the basis for airport planning.

Future facility requirements, such as hangar, apron, and terminal needs, are derived from projections of various aviation demand indicators. Using a broad spectrum of local, regional, and national socioeconomic and aviation information, and analyzing the most current aviation trends, forecasts are presented for the following aviation demand indicators:

- Based Aircraft
- Based Aircraft Fleet Mix
- General Aviation Operations
- Air Taxi and Military Operations
- Operational Peaks

EXISTING FORECASTS

Consideration is given to any forecasts of aviation demand for the airport that have been completed in the recent past. For Merrill Municipal Airport, the previous forecasts reviewed are those in the FAA *Terminal Area Forecast* (TAF), the 2009 Merrill Municipal Airport Layout Plan (ALP) Update & Narrative, and the 2030 *Wisconsin State Aviation System Plan* (SASP) that used a base year of 2010.

FAA *TERMINAL AREA FORECAST*

The FAA publishes the TAF for each airport included in the *National Plan of Integrated Airport Systems* (NPIAS) on an annual basis. The TAF is a generalized forecast of airport activity used by the FAA for internal planning purposes primarily. It is available to airports and consultants to use as a baseline projection and important point of comparison while developing local forecasts. The current TAF was published in February 2023 and is based on the federal fiscal year (October-September).

As presented in **Table 2C**, the TAF projects general aviation activity at the airport to remain static over the next 20 years which is the common practice by FAA for airports not served by an airport traffic control tower (ATCT). Given that there is currently no commercial service activity at Merrill Municipal Airport, the TAF does not reflect any existing and/or forecast air carrier operations; however, the TAF does reflect 700 air taxi operations over the forecast period. Operations are projected to be dominated by local and itinerant GA operations, which are estimated to account for 96 percent of the total operations over the planning period. Military operations are projected to account for less than one percent of total operations, with 10 operations projected for each of the plan years. Based aircraft are also projected to

remain flat at 23 aircraft over the next 20 years, which again is a common practice for non-towered general aviation airports. As noted previously, even though the TAF is generic and presents no real forecast growth, the FAA will compare the new forecasts developed for this master plan to the TAF.

Table 2C | 2023 FAA Terminal Area Forecast – Merrill Municipal Airport

	2023	2028	2033	2043	CAGR 2023-2043
ANNUAL OPERATIONS					
Itinerant					
Air Carrier	0	0	0	0	0.0%
Air Taxi	700	700	700	700	0.0%
General Aviation	9,000	9,000	9,000	9,000	0.0%
Military	10	10	10	10	10
Total Itinerant	*9,710*	*9,710*	*9,710*	*9,710*	*0.0%*
Local					
General Aviation	9,000	9,000	9,000	9,000	0.0%
Military	0	0	0	0	0.0%
Total Local	*9,000*	*9,000*	*9,000*	*9,000*	*0.0%*
Total Operations	***18,710***	***18,710***	***18,710***	***18,710***	0.0%
BASED AIRCRAFT					
Based Aircraft	***23***	***23***	***23***	***23***	0.0%

Source: FAA Terminal Area Forecast (TAF), February 2023

PREVIOUS FORECASTS

Forecasts of aviation activity at Merrill Municipal Airport were previously prepared within older, less currently relevant documents including the 2009 ALP Update & Narrative and the 2030 SASP. **Table 2D** summarizes the forecasts of operations and based aircraft at Merrill Municipal Airport that were prepared for these studies. It should be noted that, since the completion of the previous planning, a national recession caused a significant reduction in aviation activity not only at Merrill Municipal Airport but across the country. As a result, the projections from the previous study are no longer relevant.

The SASP projections were prepared more recently and account for the effects of the recession. The SASP, which used a base year of 2010, forecasted total operations to grow from 21,800 in 2010 to 25,640 by 2030, and based aircraft to increase slightly from 26 to 31 by 2030. In terms of based aircraft, the airport has exceeded these projections, with 45 validated based aircraft at the time of this writing (January 2024). Based on recent activity trends at Merrill Municipal Airport and in the region, along with the time that has passed since the preparation of these previous forecasts, it is necessary to develop new forecasts utilizing the most current information available.

Table 2D | Previous Forecasts – Merrill Municipal Airport

Year	Itinerant Operations	Local Operations	Total Operations	Based Aircraft
2009 ALP Update & Narrative (2008 Base Year)				
2008	9,569	13,771	23,340	30
2013	10,845	15,607	26,452	34
2018	13,078	18,820	31,898	41
2028	14,673	21,115	35,788	46
2030 *Wisconsin State Aviation System Plan* Update (2010 Base Year)				
2010	NA	NA	21,800	26
2015	NA	NA	22,380	27
2020	NA	NA	23,040	27
2030	NA	NA	25,640	31
Note: The SASP forecast includes total operations only; forecasts were not developed for itinerant and local operations separately				

Sources: 2009 ALP Update & Narrative; 2030 Wisconsin State Aviation System Plan Update

GENERAL AVIATION FORECASTS

The following forecast analysis examines each of the aviation demand categories expected at Merrill Municipal Airport over the next 20 years. Each segment will be examined individually, and then collectively, to provide an understanding of the overall aviation activity at the airport through 2043. Forecasts for airport activities include the following:

- Service Area Registered Aircraft
- Based Aircraft
- Based Aircraft Fleet Mix
- General Aviation Operations – Local and Itinerant
- Air Taxi and Military Operations
- Peaking Conditions
- Critical Aircraft

The remainder of this chapter will examine historical trends with regard to these areas of general aviation and project future demand for these segments of general aviation activity at the airport. These forecasts, once approved by the FAA, will become the basis for planning future facilities, both airside and landside.

REGISTERED AIRCRAFT FORECASTS

The most basic indicator of general aviation demand at an airport is the total number of aircraft based at the facility. Before a projection of based aircraft can be developed, however, it is important to first ascertain the number, or pool, of aircraft in the market area from which RRL based aircraft will be generated. The methodology for identifying the market pool is to offer an examination and forecast of registered aircraft in the airport's service area.

Table 2E presents the historical registered aircraft for Lincoln County for 2003 through 2023. These figures are derived from the FAA aircraft registration database that categorizes aircraft registrations by

county based on the zip code of the aircraft owner. Although this information generally provides a correlation to based aircraft, it is not uncommon for some aircraft to be registered in the county but be based at an airport outside the county or vice versa.

Table 2E | Historic Registered Aircraft – Lincoln County

Year	Single-Engine Piston	Multi-Engine Piston	Turboprop	Jet	Helicopter	Other[1]	Total
2003	76	3	5	0	1	2	87
2004	72	3	5	0	1	2	83
2005	75	3	5	0	1	2	86
2006	74	4	2	0	1	2	83
2007	72	4	2	0	1	2	81
2008	78	5	1	0	1	2	87
2009	79	4	1	0	1	2	87
2010	80	2	2	0	1	3	88
2011	82	3	2	0	1	4	92
2012	82	3	2	0	1	4	92
2013	73	3	1	0	0	3	80
2014	73	3	1	0	0	3	80
2015	68	3	1	0	0	3	75
2016	68	3	1	0	1	3	76
2017	68	3	1	0	1	3	76
2018	68	3	1	0	0	2	74
2019	68	3	0	0	0	2	73
2020	64	3	0	0	0	3	70
2021	61	3	1	0	0	3	68
2022	63	3	0	0	0	3	69
2023[2]	64	4	0	0	0	3	71

[1] The 'Other' aircraft category includes aircraft such as gliders, electric aircraft, balloons, and dirigibles
[2]As of 11/14/2023

Source: FAA Aircraft Registration Database

The registered aircraft in the service area show a somewhat declining trend over the last several years, with the historic high recorded in 2011 and 2012 with 92 registered aircraft. As previously stated, the FAA required aircraft owners to re-register their aircraft during this timeframe, which likely accounts for the notable decrease from 92 registered aircraft in 2012 to 80 in 2013. Since then, registered aircraft in Lincoln County generally dropped until 2022. The most recent count for 2023 shows 71 reported registrations in the county.

Although there are no recently prepared forecasts for Lincoln County regarding registered aircraft, one was prepared for this study using market share, ratio, and historic growth rate projection methods. Several regression forecasts were considered as well, including single- and multi-variable regressions examining registered aircraft's correlation with the service area population, employment, income, and gross regional product, and with U.S. active general aviation aircraft. Regression analysis measures the statistical relationship between dependent and independent variables, yielding a "correlation coefficient." The correlation coefficient (Pearson's 'r') measure associations between the changes in a dependent variable and independent variable. If the r^2 value is greater than 0.90, it indicates good predictive reliability. **Table 2F**

details the results of this analysis, which considered the correlation between registered aircraft (dependent variable) and several independent variables, as described above.

Only one of the regressions resulted in an r^2 value greater than 0.90 – the relationship between registered aircraft and historic county income. A forecast based on this regression resulted in the following projections: 65 registered aircraft in 2028, 60 registered aircraft in 2033, and 50 registered aircraft in 2043. This is reflective of a -1.70 percent CAGR.

Table 2F | Regression Analysis

Independent Variable	r^2
Year	0.85
Population	0.58
Employment	0.55
Income	0.94
Gross Regional Product	0.01
U.S. Active Aircraft	0.12

Source: Coffman Associates analysis

Table 2G and **Exhibit 2C** present several other projections of registered aircraft for the service area, with a goal of presenting a planning envelope that shows a range of projections based on historic trends. The first set of forecasts is based on market share, which considers the relationship between registered aircraft located in Lincoln County and active aircraft within the United States. The next set of projections is based on a ratio of the number of aircraft per 1,000 county residents. Lastly, a projection based on the 10-year historic growth rate was also prepared.

Market Share Projections

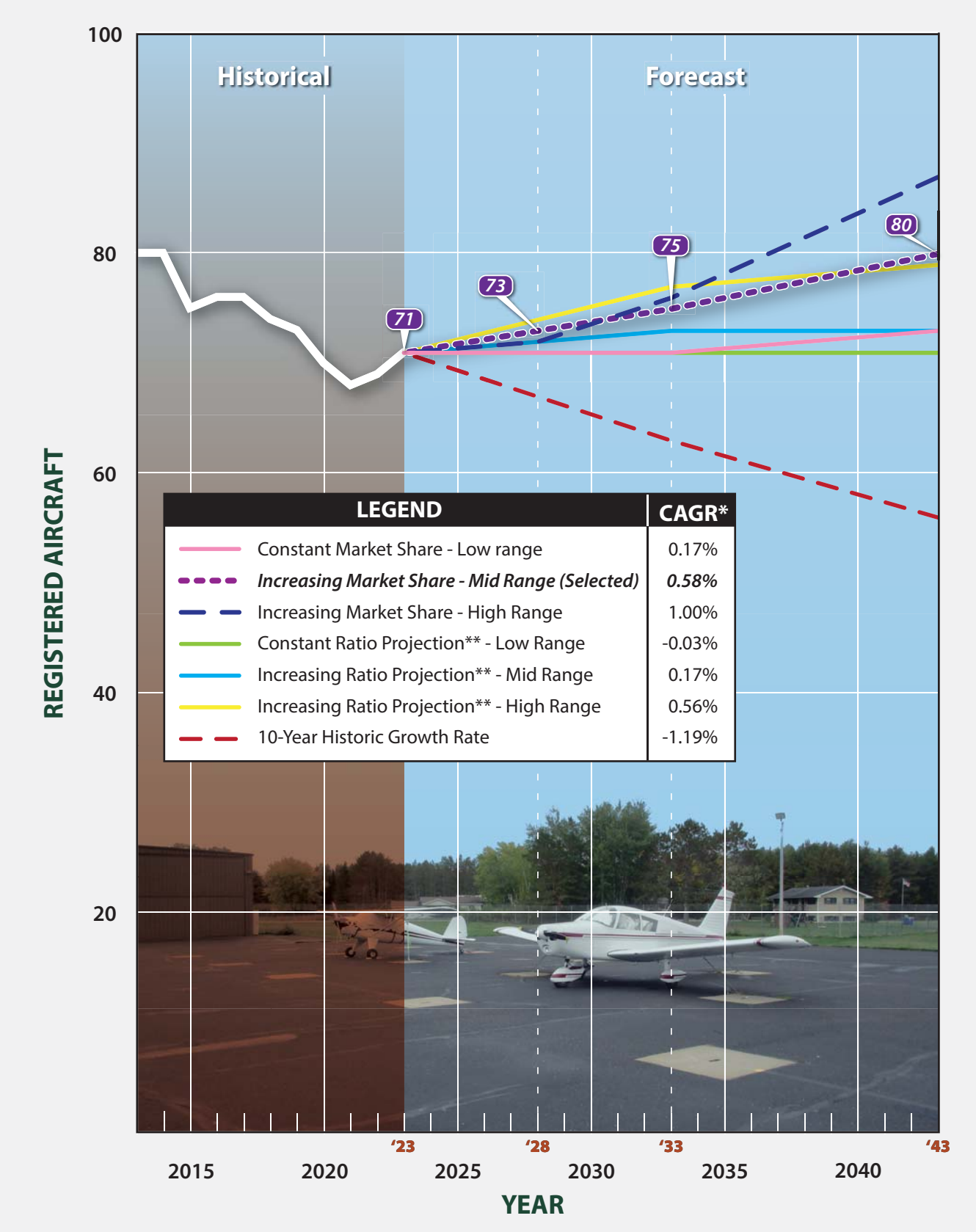
- ***Constant Market Share*** – This forecast maintains the 2023 market share of county residents (0.0340%) throughout the planning period. The result is no growth in registrations in the short and intermediate terms, followed by the addition of two aircraft by the long term. This results in 73 registered aircraft projected for 2043 and a CAGR of 0.17 percent.
- ***Increasing Market Share*** – Two increasing market share forecasts were also considered. The first evaluated a high-range market share forecast based upon a return to the county's record high market share, which occurred in 2013 with 0.0400 percent. This produced a CAGR of 1.00 percent, or 87 registered aircraft in the county by 2043. A mid-range scenario based on the median CAGR between the constant and high-range scenarios was also considered, which increased the market share to 0.0369 percent, resulting in 80 registered aircraft in Lincoln County by the end of the planning period at a CAGR of 0.58 percent.

Ratio Projections

- ***Constant Ratio*** – In 2023, there were 2.50 registered aircraft per 1,000 county residents. Carrying this ratio forward through the plan years results in no change to the number of registrations in the county, with 71 aircraft projected for each of the plan years.
- ***Increasing Ratio*** – Mid- and high-range increases were also projected. The mid-range projection was based on the historic average ratio and resulted in 73 registered aircraft by 2043, which equates to a CAGR of 0.17 percent. The high-range projection, which is based on a return to the historic high ratio of 2.81, results in 79 aircraft by 2043, for a CAGR of 0.56 percent.

Growth Rate Projection

The historic growth rate was also examined. Over the last 10 years, Lincoln County aircraft registrations have generally declined at a rate of -1.19 percent. If this trend is applied to the forecast years, there is



***CAGR** - Compound Annual Growth Rate ** per 1,000 County Residents

Sources: FAA Aircraft Registration Database, FAA Aerospace Forecast - Fiscal Years 2023-2043, Woods & Poole 2023

Exhibit 2C
REGISTERED AIRCRAFT PROJECTIONS

an obvious reduction in county aircraft registrations, from 71 aircraft in the base year to 56 by the end of the planning period.

Table 2G | Registered Aircraft Projections - Lincoln County

Year	Service Area Registrations	U.S. Active Aircraft	Market Share of U.S. Aircraft	Service Area Population	Aircraft per 1,000 Residents
2013	80	199,927	0.0400%	28,560	2.80
2014	80	204,408	0.0391%	28,450	2.81
2015	75	210,031	0.0357%	28,296	2.65
2016	76	211,794	0.0359%	28,362	2.68
2017	76	211,757	0.0359%	28,349	2.68
2018	74	211,749	0.0349%	28,376	2.61
2019	73	210,981	0.0346%	28,373	2.57
2020	70	204,140	0.0343%	28,429	2.46
2021	68	209,194	0.0325%	28,453	2.39
2022	69	209,140	0.0330%	28,376	2.43
2023	71	209,095	0.0340%	28,404	2.50
Constant Market Share of U.S. Active Aircraft - Low Range (CAGR 0.17%)					
2028	71	209,510	0.0340%	28,500	2.50
2033	71	210,455	0.0340%	28,508	2.51
2043	73	216,395	0.0340%	28,250	2.60
Increasing Market Share of U.S. Active Aircraft - High Range (CAGR 1.00%)					
2028	72	209,510	0.0345%	28,500	2.54
2033	76	210,455	0.0360%	28,508	2.66
2043	87	216,395	0.0400%	28,250	3.07
Increasing Market Share of U.S. Active Aircraft - Mid Range (CAGR 0.58%) – Selected Forecast					
2028	73	209,510	0.0349%	28,500	2.56
2033	75	210,455	0.0358%	28,508	2.64
2043	80	216,395	0.0369%	28,250	2.82
Constant Ratio Projection per 1,000 County Residents - Low Range (CAGR -0.03%)					
2028	71	209,510	0.0340%	28,500	2.50
2033	71	210,455	0.0339%	28,508	2.50
2043	71	216,395	0.0326%	28,250	2.50
Increasing Ratio Projection per 1,000 County Residents - High Range (CAGR 0.56%)					
2028	74	209,510	0.0353%	28,500	2.59
2033	77	210,455	0.0364%	28,508	2.69
2043	79	216,395	0.0367%	28,250	2.81
Increasing Ratio Projection per 1,000 County Residents - Mid Range (CAGR 0.17%)					
2028	72	209,510	0.0343%	28,500	2.52
2033	73	210,455	0.0345%	28,508	2.55
2043	73	216,395	0.0339%	28,250	2.60
10-Year Historic Registered Aircraft Growth Rate (CAGR -1.19%)					
2028	67	209,510	0.0319%	28,500	2.35
2033	63	210,455	0.0299%	28,508	2.21
2043	56	216,395	0.0258%	28,250	1.98

Sources: FAA Aircraft Registration Database; FAA Aerospace Forecast - Fiscal Years 2023-2043; Woods & Poole 2023; Coffman Associates analysis

Selected Forecast

Each of these forecasts offers a projection of what aircraft registrations in the service area could look like over the next 20 years. The projection based on the regression analysis included in **Table 2F** and the growth rate forecast provide the low-end projections, and the high-range increasing ratio forecast makes

up the top end of the planning envelope. Even though county registrations have generally declined, and the service area population is expected to remain stagnant, it is not unreasonable to expect some level of growth in aircraft registrations over the next 20 years. This is predicated on the anticipated growth in the national fleet of active aircraft, as well as the slow uptick in registrations over the three years. Therefore, the mid-range increasing market share of U.S. active aircraft is considered the most reasonable registered aircraft forecast. At a CAGR of 0.58 percent, this forecast shows slow but steady growth in aircraft registrations in Lincoln County, with the addition of two aircraft by 2028, four by 2033, and nine by 2043, for a total of 80 registered aircraft in the service area in 2043.

The registered aircraft projection is one data point to be used in the development of a based aircraft forecast. The following section will present several potential based aircraft forecasts, as well as the selected based aircraft forecast, to be utilized in this study.

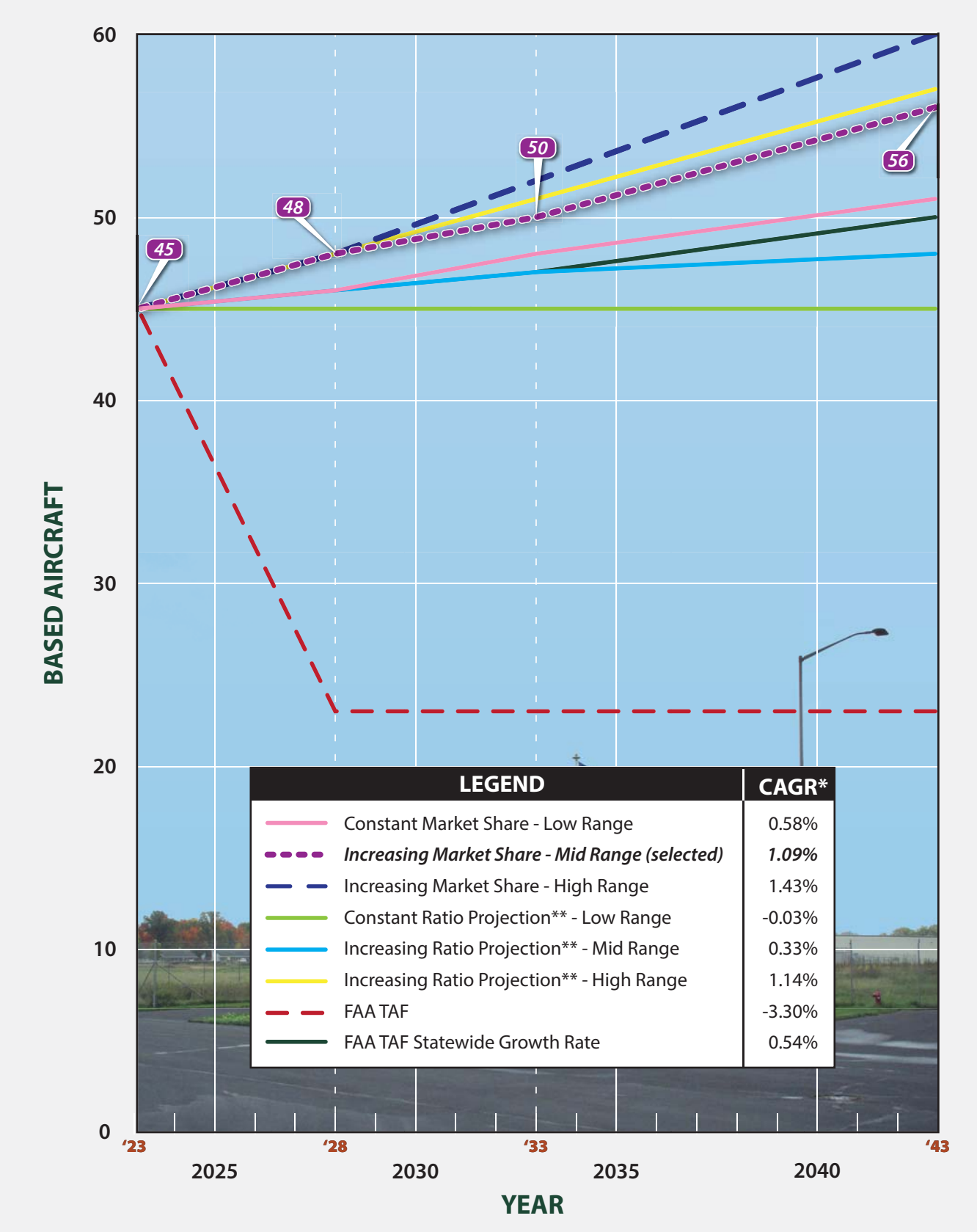
BASED AIRCRAFT FORECAST

Determining the number of based aircraft at an airport can be a challenging task. Aircraft storage can be somewhat transient in nature, meaning aircraft owners can and do move their aircraft. Some aircraft owners may store their aircraft at an airport for only part of the year. For many years, the FAA did not require airports to report their based aircraft counts, nor did they validate based aircraft at airports; however, this has changed in recent years, and now the FAA mandates that airports report their based aircraft levels. These counts are recorded in the National Based Aircraft Inventory program and maintained and validated by the FAA to ensure accuracy.

According to the FAA's database, Merrill Municipal Airport has 44 based aircraft, a count which was most recently confirmed in January 2024. Airport staff indicates that an additional aircraft is currently in the process of being validated as based at RRL. As such, for forecasting purposes, 45 aircraft will serve as the base year count[1].

Like the registered aircraft forecasts, several projections have been made for based aircraft at Merrill Municipal Airport, including market share, ratio, and growth rate forecasts. The market share is based on the airport's percentage of based aircraft as compared to registered aircraft in the service area, while the ratio projection is based on the number of based aircraft per 1,000 county residents. The growth rate projection considers the FAA's TAF projection for the State of Wisconsin. The results of these analyses are detailed in **Table 2H** and depicted graphically in **Exhibit 2D**. It should be noted that there was no historic based aircraft data available; as such, an assumptive analysis was made based on the experience of the forecast preparer and knowledge of regional and national based aircraft trends. The overarching assumption is that RRL will experience some level of growth in based aircraft over the planning period, for the following reasons: 1) this reflects national and state estimates for increased aircraft ownership, as noted in the FAA TAF; 2) there is existing demand for aircraft storage space at RRL; and 3) there

[1] Since the preparation of this chapter in January 2024 and subsequent submittal to WisDOT BOA for approval, three additional aircraft have been added to the airport's records of based aircraft, for a total of 48 aircraft based at RRL as of September 2025. This includes 45 single-engine piston aircraft, two multi-engine piston aircraft, and one jet (Cessna Citation). Additional information concerning the RRL's based aircraft, operations, and services and capabilities are detailed in Appendix D, Forecast Addendum, as supplementary data for future planning purposes.



***CAGR** - Compound Annual Growth Rate **per 1,000 Residents
Sources: basedaircraft.com; 2023 FAA TAF; Woods & Poole CEDDS 2023

Exhibit 2D
BASED AIRCRAFT FORECASTS

are currently several shovel-ready sites available for hangar development, and it is not unreasonable to assume that construction of new aircraft hangars will occur.

Table 2H | Based Aircraft Forecasts for Merrill Municipal Airport

Year	Merrill Municipal Airport Based Aircraft	Service Area Registrations	Market Share	Service Area Population	Aircraft Per 1,000 Residents
2023	45	71	63.4%	28,404	1.58
Constant Market Share - Low Range (CAGR 0.58%)					
2028	46	73	63.4%	28,500	1.63
2033	48	75	63.4%	28,508	1.67
2043	51	80	63.4%	28,250	1.79
Increasing Market Share - Mid Range (CAGR 1.09%) – *Selected Forecast*					
2028	48	73	65.0%	28,500	1.67
2033	50	75	66.7%	28,508	1.76
2043	56	80	70.0%	28,250	1.98
Increasing Market Share - High Range (CAGR 1.43%)					
2028	48	73	66.3%	28,500	1.70
2033	52	75	69.2%	28,508	1.83
2043	60	80	75.0%	28,250	2.12
Constant Ratio per 1,000 Residents (CAGR -0.03%)					
2028	45	73	61.8%	28,500	1.58
2033	45	75	60.0%	28,508	1.58
2043	45	80	56.1%	28,250	1.58
Increasing Ratio per 1,000 Residents - Mid Range (CAGR 0.33%)					
2028	46	73	62.9%	28,500	1.61
2033	47	75	62.2%	28,508	1.64
2043	48	80	60.2%	28,250	1.70
Increasing Ratio per 1,000 Residents - High Range (CAGR 1.14%)					
2028	48	73	65.8%	28,500	1.69
2033	51	75	67.9%	28,508	1.79
2043	57	80	70.8%	28,250	2.00
FAA TAF (CAGR -3.30%)					
2028	23	73	31.5%	28,500	0.81
2033	23	75	30.6%	28,508	0.81
2043	23	80	28.8%	28,250	0.81
FAA TAF Statewide Growth Rate (CAGR 0.54%)					
2028	46	73	63.2%	28,500	1.62
2033	47	75	63.1%	28,508	1.67
2043	50	80	62.8%	28,250	1.77

Sources: Based aircraft records; 2023 FAA TAF; Woods & Poole CEDDS 2023; Coffman Associates analysis

Market Share Projections

- ***Constant Market Share*** – In 2023, the airport had 45 based aircraft, which equates to 63.4 percent of the market share of registered aircraft in Lincoln County. Carrying this percentage throughout the plan years results in a small increase in based aircraft, reflective of a 0.58 percent CAGR. This projection yielded 51 based aircraft by 2043.
- ***Increasing Market Share*** – Two increasing market share forecasts were also evaluated. The mid-range scenario considered a 70.0 percent market share by 2043 and resulted in an increase in based aircraft to 56, or a 1.09 percent CAGR, by the end of the planning period. The high-range

market share forecast evaluated a stronger growth scenario that considered Merrill Municipal Airport holding 75.0 percent of the market share by the end of the planning period. This resulted in 60 based aircraft by 2043, for a CAGR of 1.43 percent.

Ratio Projections

- ***Constant Ratio*** – In 2023, the ratio of based aircraft per 1,000 county residents stood at 1.58. Maintaining this at a constant through 2043 resulted in a no growth in based aircraft, due to the stagnant nature of the county population projections. Under this scenario, the airport would remain at 45 based aircraft over the planning period.
- ***Increasing Ratio*** – Mid- and high-range growth scenarios were also evaluated. The mid-range scenario is based on a slow-growing ratio of 1.70 based aircraft per 1,000 residents by 2043. Applying this figure to the end of the planning period results in 48 based aircraft at the airport by 2043, at a CAGR of 0.33 percent. The high-range scenario considers more aggressive growth, with 2.00 based aircraft per 1,000 residents by the end of the planning period. Applying this ratio produces 57 based aircraft forecast by 2043.

As a point of comparison, the FAA TAF projections for based aircraft at Merrill Municipal Airport are also included. The TAF shows no growth in based aircraft, with the count flatlined at 23 throughout the planning period; this results in a negative CAGR when considering the actual count of based aircraft in 2023. The TAF for the State of Wisconsin was also examined, and the statewide growth rate for based aircraft of 0.54 percent was applied. This resulted in 50 based aircraft at Merrill Municipal Airport by the end of the planning period.

Selected Forecast

The forecasts produce a planning envelope ranging from 23 to 60 based aircraft on the airport by 2043. As of September 2023, there are no hangar vacancies, and 18 individuals are on a wait list for hangar space. This is indicative of strong demand for aircraft storage space at the airport. Combined with favorable trends in aircraft ownership both locally and nationally, along with the clear demand for hangar space and approximately 27 shovel-ready sites for hangar development, it is reasonable to assume a more robust growth rate for based aircraft at RRL. Therefore, the mid-range increasing ratio forecast has been selected as the preferred projection. With a CAGR of 1.09 percent, this forecast shows an increase of 11 based aircraft by the end of the planning period, for a total of 56 aircraft based at RRL by 2043.

Based Aircraft Fleet Mix Forecast

It is important to have an understanding of the current and projected based aircraft fleet mix at an airport. This will ensure the planning of proper facilities in the future. The forecast mix of based aircraft was determined by comparing existing and forecast U.S. general aviation fleet trends to the fleet mix at the airport. The national trend in general aviation is toward a greater percentage of larger, more sophisticated aircraft as part of the national fleet. Merrill Municipal Airport is capable of accommodating all

types of general aviation aircraft, from small piston-powered aircraft up to small- and mid-size business jet aircraft.

As indicated in **Table 2J**, single engine piston aircraft presently make up the majority of the fleet mix at the airport, comprising 98 percent of the aircraft based at the airport. The one multi-engine piston currently based at RRL accounts for the remainder of the fleet mix.

Table 2J | Total Based Aircraft Fleet Mix

	EXISTING		FORECAST					
Aircraft Type	**2023**	**%**	**2028**	**%**	**2033**	**%**	**2043**	**%**
Single Engine Piston	44	98%	46	96%	47	94%	48	86%
Multi-Engine Piston	1	2%	1	2%	1	2%	0	0%
Turboprop	0	0%	1	2%	2	4%	3	5%
Jet	0	0%	0	0%	0	0%	2	4%
Helicopter	0	0%	0	0%	0	0%	1	2%
Other	0	0%	0	0%	0	0%	2	4%
Totals	**45**	**100%**	**48**	**100%**	**50**	**100%**	**56**	**100%**

Source: Airport records; Coffman Associates analysis

The FAA predicts piston-powered aircraft will decline in numbers nationwide, with aircraft ownership trends shifting to the more sophisticated turboprops and jets. However, it is anticipated that piston aircraft will continue to comprise the majority of the fleet mix at Merrill Municipal Airport, with slower growth in turbine aircraft. The table details the based aircraft fleet mix projections for the airport over the next 20 years. Single engine pistons are projected to increase from the 44 currently based at the airport, to 48 by 2043. The multi-engine piston is expected to phase out by the end of the planning period, in line with national trends, while three turboprops, two jets, and a helicopter are anticipated to be added to the fleet mix by 2043. The 'other' category, which includes experimental, ultralight, and unmanned aerial system (UAS) aircraft, is also expected to account for two based aircraft, as this category is also predicted to increase in numbers in the future.

OPERATIONS FORECASTS

Operations at Merrill Municipal Airport are classified as either general aviation, air taxi, or military. General aviation operations include a wide range of activity from recreational use and flight training to business and corporate uses. Air taxi operations are those conducted by aircraft operating under 14 Code of Federal Regulations (CFR) Part 135, otherwise known as "for-hire" or "on-demand" activity. Military operations include those operations conducted by various branches of the U.S. military.

Aircraft operations are further classified as local and itinerant. A local operation is a takeoff or landing performed by an aircraft that operates within sight of an airport, or which executes simulated approaches or touch-and-go operations at an airport. Generally, local operations are characterized by training activity. Itinerant operations are those performed by aircraft with a specific origin or destination away from an airport. Typically, itinerant operations increase with business and commercial use since business aircraft are used primarily to transport passengers from one location to another.

As previously stated, according to recent FAA guidelines outlined in the "Forecast Review and Approval Instructions" memo dated August 2024, a traditional, detailed forecast of operations is not necessary for non-towered airports experiencing less than 90,000 annual operations. However, one was prepared for Merrill Municipal Airport prior to the memo's release and thus is included in the master plan.

Because Merrill Municipal Airport is not equipped with an airport traffic control tower (ATCT), precise operational (takeoff and landing) counts are not available. Sources for estimated operational activity at the airport include the FAA Form 5010 Airport Master Record, the FAA TAF, and the 2030 Wisconsin State Airport System Plan. The 2023 FAA TAF indicates a total of 18,710 operations in 2023, as does Form 5010 for the 12-month period ending June 22, 2023. In both estimates, there is an even split of local and itinerant operations, with each comprising 48.1 percent of the total operations count. Air taxi and military operations are estimated at 3.7 percent and 0.05 percent of the total, respectively. On a more local level, the State System Plan provided an estimate of 21,800 total operations with a base year of 2010. The State System Plan did not categorize operations by local or itinerant.

Additional calculations to estimate annual operations were also conducted for comparison purposes. The first, Equation 15 in FAA's "Model for Estimating General Aviation Operations at Non-towered Airports Using Towered and Non-towered Airport Data," factors in regional population and based aircraft data to develop a baseline operational count. When this data was input, the result was 15,393 annual operations, as shown in **Table 2K**.

Table 2K | FAA Model for Operations Estimates

Inputs		
Population Within 25nm	161,334	
Population Within 100 nm	2,054,056	
Based aircraft	45	
Based AC at airports within 100 nm	1,348	
Equation 15		
755		775
241 (BA)	+	10845
0.14 (BA^2)	-	284
31,478 (% in 100 mi)	+	1051
5,557 (VITFSnum)	+	0
0.001 (Pop100)	+	2,054
3,736 (WACAORAK)	-	0
12,121 (Pop25/100)	+	952
Estimate of Total Ops		**15,393**

775 = Constant
BA = Based aircraft
VITFSnum = # of FAR 141 pilot schools on airport
WACAORAK = 1 if CA, OR, WA, AK; 0 otherwise

Source: Equation 15, Model for Estimating General Aviation Operations at Non-towered Airports Using Towered and Non-towered Airport Data, GRA, Inc. (2001)

The second calculation multiplies validated based aircraft by an estimated number of operations per based aircraft (OPBA), as outlined in Airport Cooperative Research Program (ACRP) Report 129, *Evaluating Methods for Counting Aircraft Operations at Non-Towered Airports*. In FAA Order 5090.5, the FAA recommends using a multiplier of 350 OPBA for local GA airports. This resulted in an estimated 15,750 total annual operations.

Records from FlightAware were also used in an attempt to quantify operations at RRL. FlightAware is an aviation technology company that provides flight tracking data using the ADS-B network, which is a surveillance technology that combines an aircraft's positioning source, avionics, and ground infrastructure to determine information about an aircraft. Aircraft equipped with ADS-B Out broadcast information including GPS location, altitude, ground speed, and other data. Data from FlightAware was analyzed for the years 2021, 2022, and 2023.[2] According to this data, there were 711 operations in 2021,

[2] 2023 FlightAware data is reflective of reported operations occurring between January 1, 2023 and November 7, 2023.

601 in 2022, and 774 in 2023. It should be noted that this does not represent the total number of operations occurring at RRL during this period. The data is likely limited due to a number of factors, including inadequate radar coverage around RRL and aircraft that are operating without ADS-B Out.

Lastly, The FAA's Traffic Flow Management System Count (TFMSC) database was examined to assist in determining total annual operations at RRL. The TFMSC database captures an operation when a pilot files a flight plan and/or when flights are detected by the National Airspace System, usually via radar. It includes documentation of commercial traffic (air carrier and air taxi), general aviation, and military aircraft. Due to certain factors, such as incomplete flight plans, limited radar coverage, and VFR operations, TFMSC data does not account for all aircraft activity at an airport by a given aircraft type. The TFMSC reports 166 operations occurring at RRL during 2023 and is considered to be a limited dataset.

In summary, the following estimates of annual operations as derived from various sources are:

- FAA Form 5010 – 18,710 annual operations
- 2023 FAA TAF – 18,710 annual operations
- 2030 Wisconsin State Airport System Plan – 21,800 (2010 base year estimate)
- FAA Equation 15 – 15,393 annual operations
- OPBA with 350 multiplier – 15,750 annual operations
- FlightAware – 774 operations (January 1, 2023 through November 7, 2023)
- TFMSC – 166 operations (2023)

Based on activity levels in the region and at similar airports, the OPBA estimation of 15,750 annual operations is considered to be most in line with actual operations. A 50/50 split between local and itinerant operations is assumed, based on what is reported in the FAA TAF and the Form 5010. As such, the following figures will be carried forward for use as the base year count:

- 7,875 annual itinerant GA operations (50 percent of total)
- 7,875 annual local GA operations (50 percent of total)

General Aviation Operations Forecast

Market Share Projections

Table 2L presents three market share forecasts for local and itinerant GA operations, based on the airport's current market share of total U.S. itinerant GA operations. In 2023, the airport held a 0.052 percent market share of national itinerant operations and 0.053 percent of the market share for local operations. The first forecast carries this figure forward as a constant through the planning period, resulting in 8,720 itinerant operations and 8,840 local operations by 2043, for CAGRs of 0.51 percent and 0.58 percent, respectively. As growth in both itinerant and local operations is expected to occur nationally, two increasing market share forecasts were also developed. The first considers a slower growth scenario, with an increase to 10,520 itinerant operations and 10,470 local operations by 2043. This produced CAGRs of 1.46 percent and 1.43 percent, respectively. A faster growth scenario evaluated market shares at 0.075

percent for both itinerant and local operations. This resulted in 12,530 itinerant operations by 2043 at a CAGR of 2.35 percent, and 12,470 local operations at a CAGR of 2.32 percent.

TABLE 2L Operations Forecasts – Market Share

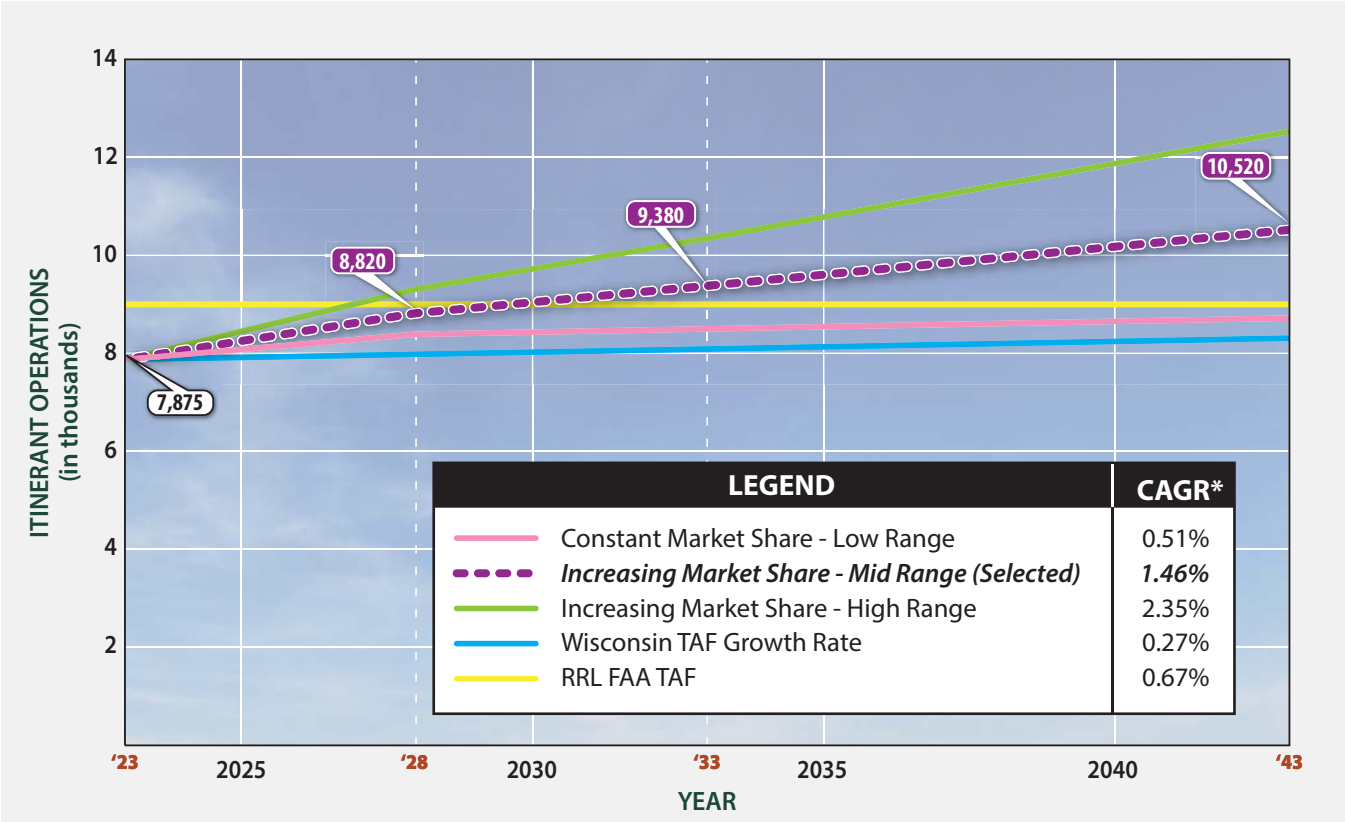
Year	RRL GA Itinerant	U.S. GA Itinerant	Market %	RRL GA Local	U.S. GA Local	Market %
2023	7,875	15,077,947	0.052%	7,875	14,801,816	0.053%
Constant Market Share - Low Range						
2028	8,390	16,067,702	0.052%	8,390	15,767,731	0.053%
2033	8,500	16,274,397	0.052%	8,540	16,043,229	0.053%
2043	8,720	16,704,132	0.052%	8,840	16,622,293	0.053%
CAGR	0.51%			0.58%		
Increasing Market Share - Mid Range – Selected Forecast						
2028	8,820	16,067,702	0.055%	8,780	15,767,731	0.056%
2033	9,380	16,274,397	0.058%	9,320	16,043,229	0.058%
2043	10,520	16,704,132	0.063%	10,470	16,622,293	0.063%
CAGR	1.46%			1.43%		
Increasing Market Share - High Range						
2028	9,310	16,067,702	0.058%	9,250	15,767,731	0.059%
2033	10,350	16,274,397	0.064%	10,280	16,043,229	0.064%
2043	12,530	16,704,132	0.075%	12,470	16,622,293	0.075%
CAGR	2.35%			2.32%		

Sources: FAA Aerospace Forecast - Fiscal Years 2023-2043; Coffman Associates analysis

Other Projections

Lastly, projections presented in the FAA TAF and the Wisconsin TAF growth rate were considered, with the TAF projections included primarily for comparison purposes. The TAF estimates both itinerant and local operations at Merrill Municipal Airport to remain flatlined at 9,000 over the course of the planning period. The statewide TAF growth rate for itinerant operations is estimated at 0.27 percent, which, when applied to the base year count, results in 8,310 itinerant operations at Merrill Municipal Airport by 2043. The Wisconsin TAF growth rate for local operations is estimated at 0.23 percent, which results in 8,250 local operations 2043 when applied to the base year count.

Exhibit 2E presents graphs of the itinerant and local GA operation projections, while **Table 2M** summarizes each forecast. In terms of itinerant operations, the forecasts present a planning envelope ranging from 8,310 (Wisconsin TAF growth rate forecast) to 12,530 itinerant operations (high-range market share forecast). Local operations show a very similar scenario, ranging from 8,250 (Wisconsin TAF growth rate) to 12,470 (high-range market share forecast) local operations. With growth in itinerant and local operations anticipated both nationally and regionally, it is reasonable to assume a moderate increase in this type of traffic over the next 20 years. As such, the mid-range increasing market share forecast is the selected projection for each operational category. For itinerant operations, this is reflective of a 1.46 percent CAGR, or 10,520 operations by the end of the planning period; and for local operations, the result is 10,470 operations at a CAGR of 1.43 percent. Overall, this represents a somewhat conservative yet realistic growth scenario. Combined, these forecasts illustrate growth from an estimated 15,750 total GA operations in 2023 to 21,090 total operations by 2043 – an increase of 5,340 operations.



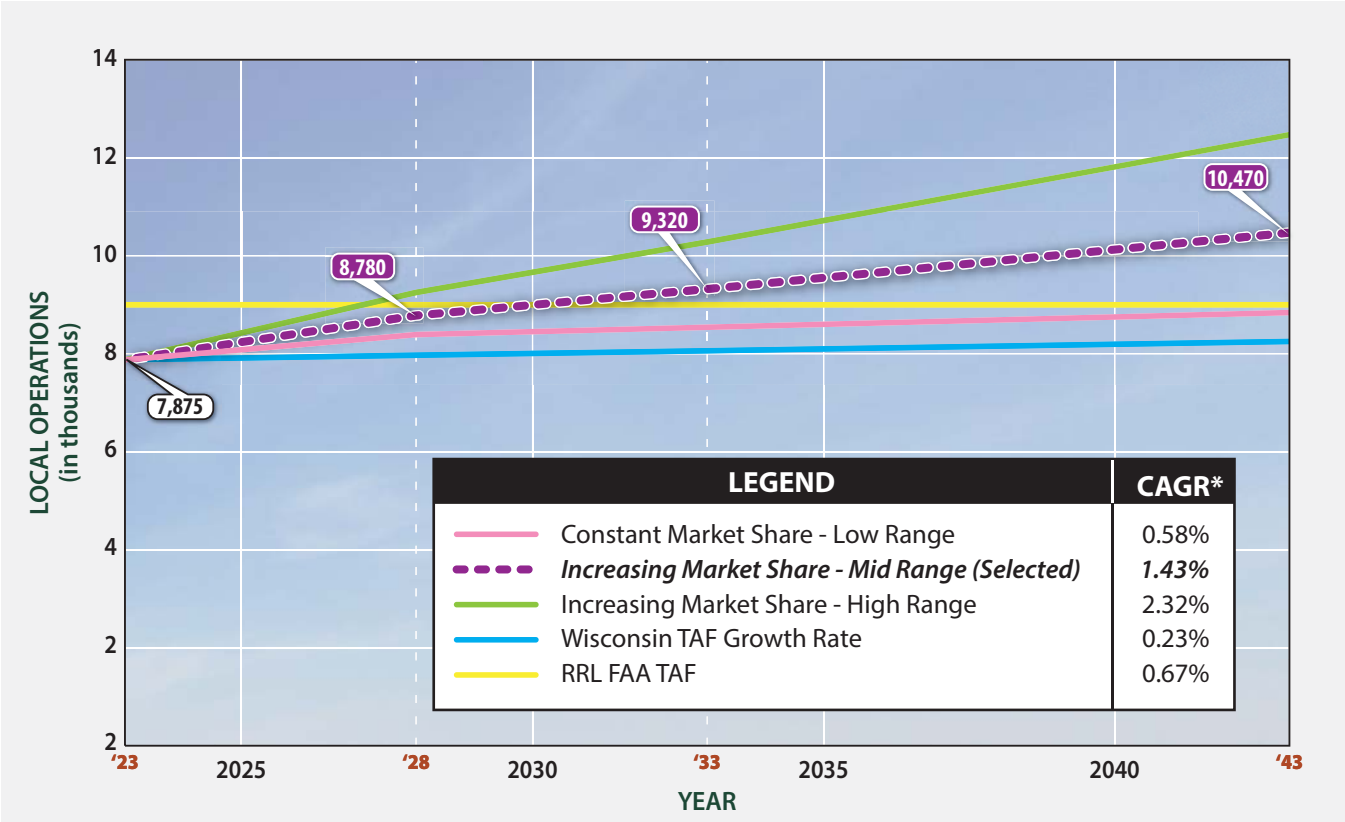


Exhibit 2E
ITINERANT AND LOCAL GA FORECASTS

Table 2M | RRL Operations Forecast Summary

Projections	2028	2033	2043	CAGR
Itinerant GA				
Constant Market - Low Range	8,390	8,500	8,720	0.51%
Increasing Market - Mid Range	**8,820**	**9,380**	**10,520**	**1.46%**
Increasing Market - High Range	9,310	10,350	12,530	2.35%
Wisconsin TAF Growth Rate	7,980	8,090	8,310	0.27%
RRL FAA TAF	9,000	9,000	9,000	0.67%
Local GA				
Constant Market - Low Range	8,390	8,540	8,840	0.58%
Increasing Market - Mid Range	**8,780**	**9,320**	**10,470**	**1.43%**
Increasing Market - High Range	9,250	10,280	12,470	2.32%
Wisconsin TAF Growth Rate	7,970	8,060	8,250	0.23%
RRL FAA TAF	9,000	9,000	9,000	0.67%

Air Taxi Operations Forecast

The air taxi category, which is a subset of the itinerant operations category, is comprised of operations that are conducted by aircraft operating under 14 CFR Part 135. Part 135 operations are "for-hire" or "on-demand" and include charter and commuter flights, air ambulance, or fractional ownership aircraft operations. The FAA projects a 0.8 percent CAGR increase in air taxi operations between 2023 and 2043. The primary reasons for this increase are the technological advancements of the electric vertical takeoff and landing aircraft (eVTOL) and the continued national growth in the business jet segment of the air taxi category.

TABLE 2N | Historic and Projected Air Taxi Operations

Year	Air Taxi Operations
2014	90
2015	86
2016	112
2017	4
2018	4
2019	8
2020	148
2021	136
2022	18
2023*	4
Air Taxi Operations Forecast	
2028	100
2033	100
2043	100
Note: 2023 counts are from 1/1/23-12/4/23	

Source: AirportIQ

Historic air taxi records at Merrill Municipal Airport were not available. The FAA TAF and Form 5010 both report 700 air taxi operations. AirportIQ, a company which records Part 135 operations, was consulted to determine a more accurate air taxi count. Over the last 10 years, air taxi operations as reported by AirportIQ at RRL have fluctuated significantly, as can be seen in **Table 2N**. For this reason, and due to the generally low number of this type of operation, a flat count of 100 air taxi operations will be considered for each of the plan years.

Military Operations Forecast

Military aircraft can and do utilize civilian airports across the country, including Merrill Municipal Airport. However, it is inherently difficult to project future military operations due to their national security nature and the fact that missions can change without notice. Thus, it is typical for the FAA to use a flat-line number for military operations. For this planning study, military operations at Merrill Municipal Airport

are projected to stay constant through the plan years at 10 itinerant operations and will likely constitute helicopter activity.

Peak Period Forecasts

Peaking characteristics play an important role in determining airport capacity and facility requirements. Because Merrill Municipal Airport does not have a control tower, the generalized peaking characteristics of other non-towered general aviation airports have been used for the purposes of this study. The peaking periods used to develop the capacity analysis and facility requirements are described below.

- Peak month – the calendar month in which traffic activity is the highest
- Design day – the average day in the peak month, derived by dividing the peak month by the number of days in the month
- Design hour – the average hour within the design day
- Busy day – the busiest day of a typical week in the peak month

For the purposes of this study, the peak month for total operations was estimated at 10 percent of the annual operations. By 2043, the estimated peak month is projected to reach 2,109 operations. The design day is estimated by dividing the peak month by the number of days in the month (31), and the busy day is calculated at 1.25 times the design day. The design hour is then calculated at 15 percent of the design day. These projections are included in **Table 2P**.

Table 2P | Peak Period Forecasts – Merrill Municipal Airport

	2023	2028	2033	2043
Annual	15,754	17,700	18,800	21,090
Peak Month	1,575	1,770	1,880	2,109
Design Day	51	57	61	68
Design Hour	8	9	9	10
Busy Day	64	71	75	82

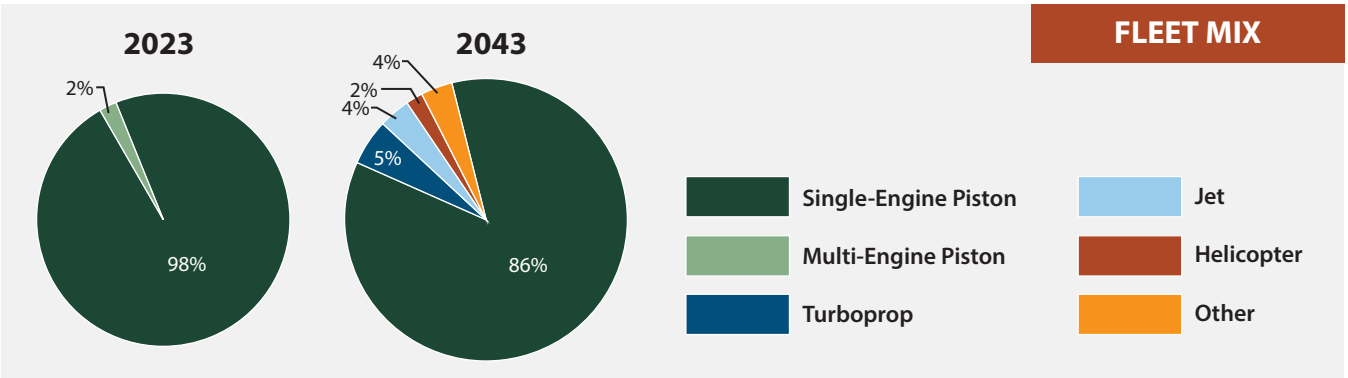
Source: Coffman Associates analysis

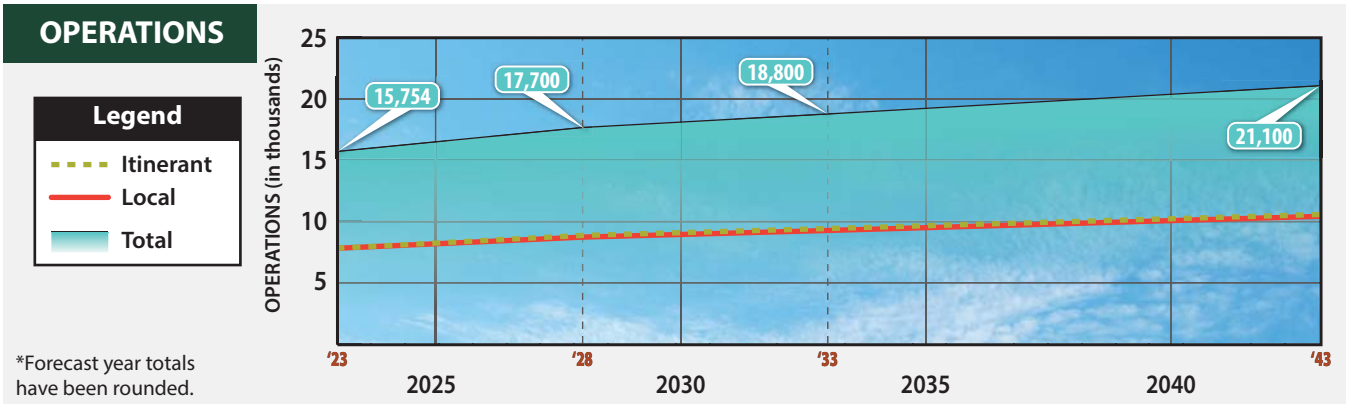
FORECAST SUMMARY

This chapter has outlined the various activity levels that might be reasonably anticipated over the planning period. **Exhibit 2F** presents a summary of the aviation forecasts prepared in this chapter. The base year for these forecasts is 2023, with a 20-year planning horizon to 2043, which allowed for the development of a conceptual forecast scenario to serve as a basis for planning purposes. The primary aviation demand indicators are based aircraft and operations. Based aircraft are forecast to increase from 45 in 2023 to 56 by 2043 (1.09 percent CAGR). Total operations at Merrill Municipal Airport are forecast to increase from 15,754 in 2023 to 21,100 by 2043 (1.47 percent CAGR).

Projections of aviation demand will be influenced by unforeseen factors and events in the future; therefore, it is not reasonable to assume that future demand will follow the exact projection line, but over time, forecasts of aviation demand tend to fall within the planning envelope. The forecasts developed for this master planning effort are considered reasonable for planning purposes. The need for additional facilities will be based upon these forecasts; however, if demand does not materialize as projected, then

	Base Year	Forecast		
	2023	2028	2033	2043
OPERATIONS				
Itinerant				
Air Carrier	0	0	0	0
Air Taxi	4	100	100	100
General Aviation	7,875	8,820	9,380	10,520
Subtotal*	***7,879***	***8,920***	***9,480***	***10,620***
Local				
General Aviation	7,875	8,780	9,320	10,470
Subtotal	***7,875***	***8,780***	***9,320***	***10,470***
TOTAL OPERATIONS*	**15,754**	**17,700**	**18,800**	**21,100**
PEAKING				
Peak Month	1,575	1,770	1,880	2,109
Design Day	51	57	61	68
Design Hour	8	9	9	10
Busy Day	64	71	75	82
BASED AIRCRAFT				
Single-Engine Piston	44	46	47	48
Multi-Engine Piston	1	1	1	0
Turboprop	0	1	2	3
Jet	0	0	0	2
Helicopter	0	0	0	1
Other	0	0	0	2
TOTAL BASED AIRCRAFT	**45**	**48**	**50**	**56**





*Forecast year totals have been rounded.

implementation of facility construction can be slower. Likewise, if demand exceeds these forecasts, the airport may accelerate construction of new facilities.

FORECAST COMPARISON TO THE FAA TAF

Historically, forecasts have been submitted to the FAA for evaluation and to be compared to the TAF. The FAA preferred that forecasts differ by less than 10 percent in the 5-year period and 15 percent in the 10-year period. Where the forecasts do differ, supporting documentation was necessary to justify the difference.

Table 2Q presents a summary of the selected forecasts and a comparison to the FAA TAF. The direct comparison between the master plan forecasts and the TAF is presented at the bottom of the table. The operations forecast is within the TAF tolerance for the both the 5-year and 10-year periods.

Table 2Q | Comparison of Master Plan Forecasts to FAA TAF

	2023	2028	2033	2043	CAGR
Total Operations					
Master Plan Forecast	15,754	17,700	18,800	21,100	1.5%
TAF	18,710	18,710	18,710	18,710	0.0%
% Difference	17.15%	5.55%	0.48%	12.01%	
Based Aircraft					
Master Plan Forecast	45	48	50	56	1.4%
TAF	23	23	23	23	0.0%
% Difference	64.71%	70.42%	73.97%	83.54%	

In terms of based aircraft, the master plan forecast is outside the TAF tolerance for both the 5- and 10-year periods. This is due in part to the TAF count being well below the FAA-validated count for the base year based aircraft, as well as the flatlined growth projection for based aircraft over the next 20 years.

AIRCRAFT/AIRPORT/RUNWAY CLASSIFICATION

The FAA has established several aircraft classification systems that group aircraft types based on their performance (approach speed in landing configuration) and design characteristics (wingspan and landing gear configuration). These classification systems are used to determine the appropriate airport design standards for specific airport elements, such as runways, taxiways, taxilanes, and aprons.

AIRCRAFT CLASSIFICATION

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using, or are expected to use, an airport. The critical aircraft is used to define the design parameters for an airport. The critical aircraft may be a single aircraft type or a composite aircraft representing a collection of aircraft with similar characteristics. The critical aircraft is classified by three parameters: Aircraft Approach Category (AAC), Airplane Design Group (ADG), and Taxiway Design Group (TDG). FAA AC 150/5300-13B, *Airport*

Design, describes the following airplane classification systems, the parameters of which are presented on **Exhibit 2G**.

Aircraft Approach Category (AAC): A grouping of aircraft based on a reference landing speed (V_{REF}), if specified, or if V_{REF} is not specified, 1.3 times stall speed (V_{SO}) at the maximum certificated landing weight. V_{REF}, V_{SO}, and the maximum certificated landing weight are those values as established for the aircraft by the certification authority of the country of registry.

The AAC generally refers to the approach speed of an aircraft in landing configuration. The higher the approach speed, the more restrictive the applicable design standards. The AAC, depicted by a letter A through E, is the aircraft approach category and relates to aircraft approach speed (operational characteristics). The AAC generally applies to runways and runway-related facilities, such as runway width, runway safety area (RSA), runway object free area (ROFA), runway protection zone (RPZ), and separation standards.

Airplane Design Group (ADG): The ADG, depicted by a Roman numeral I through VI, is a classification of aircraft which relates to aircraft wingspan or tail height (physical characteristics). When the aircraft wingspan and tail height fall in different groups, the higher group is used. The ADG influences design standards for taxiway safety area (TSA), taxiway object free area (TOFA), taxilane object free area, apron wingtip clearance, and various separation distances.

Taxiway Design Group (TDG): A classification of airplanes based on outer-to-outer Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance. The TDG relates to the undercarriage dimensions of the critical aircraft. The TDG is classified by an alphanumeric system: 1A, 1B, 2A, 2B, 3, 4, 5, 6, and 7. The taxiway design elements determined by the application of the TDG include the taxiway width, taxiway edge safety margin, taxiway shoulder width, taxiway fillet dimensions, and, in some cases, the separation distance between parallel taxiways/taxilanes. Other taxiway elements, such as the taxiway safety area (TSA), taxiway/taxilane object free area (TOFA), taxiway/taxilane separation to parallel taxiway/taxilanes or fixed or movable objects, and taxiway/taxilane wingtip clearances, are determined solely based on the wingspan (ADG) of the critical aircraft utilizing those surfaces. It is appropriate for taxiways to be planned and built to different TDG standards based on expected use.

The back side of **Exhibit 2G** summarizes the classification of the most common aircraft in operation today. Generally, recreational and business piston and turboprop aircraft will fall in AAC A and B, and ADG I and II. Business jets typically fall in AAC B and C, while the larger commercial aircraft will fall in AAC C and D.

AIRPORT AND RUNWAY CLASSIFICATIONS

Airport and runway classifications, along with the aircraft classifications defined previously, are used to determine the appropriate FAA design standards to which the airfield facilities are to be designed and built.

Runway Design Code (RDC): A code signifying the design standards to which the runway is to be built. The RDC is based upon planned development and has no operational component.

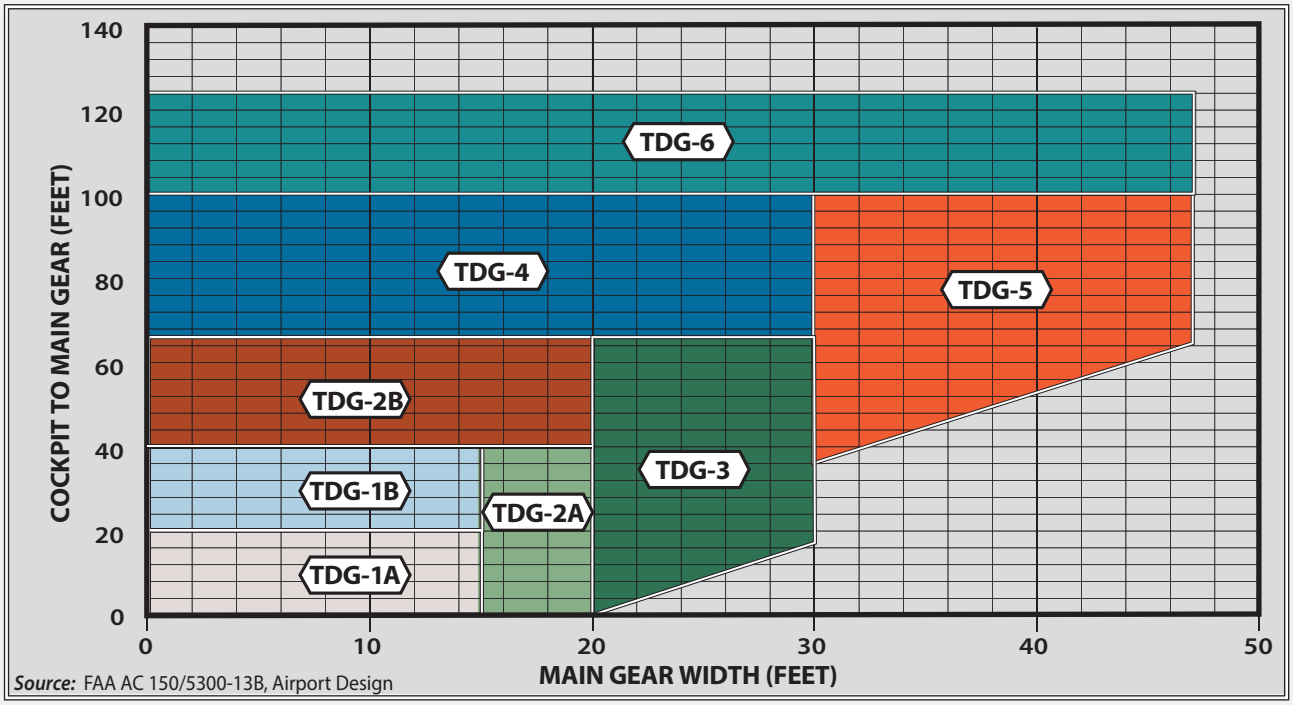
AIRCRAFT APPROACH CATEGORY (AAC)	
Category	**Approach Speed**
A	Less than 91 knots
B	91 knots or more but less than 121 knots
C	121 knots or more but less than 141 knots
D	141 knots or more but less than 166 knots
E	166 knots or more

AIRPLANE DESIGN GROUP (ADG)		
Group #	**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
VI	66≤80	214≤262

VISIBILITY MINIMUMS	
RVR* (ft)	**Flight Visibility Category (statute miles)**
VIS	3-mile or greater visibility minimums
5,000	Not lower than 1-mile
4,000	Lower than 1-mile but not lower than ¾-mile
2,400	Lower than ¾-mile but not lower than ½-mile
1,600	Lower than ½-mile but not lower than ¼-mile
1,200	Lower than ¼-mile

***RVR**: Runway Visual Range

TAXIWAY DESIGN GROUP (TDG)



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

Exhibit 2G
AIRCRAFT CLASSIFICATION PARAMETERS

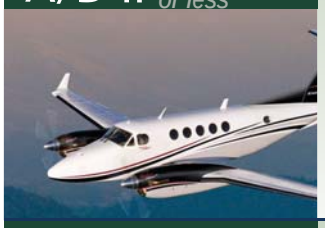
A-I

Aircraft	TDG
• Beech Baron 55	1A
• **Beech Bonanza**	**1A**
• Cessna 150, 172	1A
• Eclipse 500	1A
• Piper Archer, Seneca	1A

B-I

• **Beech Baron 58**	**1A**
• Beech King Air 90	1A
• Cessna 421	1A
• Cessna Citation CJ1 (525)	1A
• Cessna Citation 1(500)	2
• Embraer Phenom 100	1B

A/B-II *12,500 lbs. or less*



• **Beech Super King Air 200**	**2**
• Cessna 441 Conquest	1A
• Cessna Citation CJ2 (525A)	2
• Pilatus PC-12	1A

B-II *over 12,500 lbs.*

• Beech Super King Air 350	2
• Cessna Citation CJ3(525B), Bravo (550), V (560)	2
• **Cessna Citation CJ4 (525C)**	**1B**
• Cessna Citation Latitude/Longitude	1B
• Embraer Phenom 300	1B
• Falcon 10, 20, 50	1B
• Falcon 900, 2000	2
• Hawker 800, 800XP, 850XP, 4000	1B
• Pilatus PC-24	1B

A/B-III

• Bombardier Dash 8	3
• **Bombardier Global 5000**, 6000, 7000, 8000	**2**
• Falcon 6X, 7X, 8X	2

Note: Aircraft pictured is identified in bold type.

C/D-I

Aircraft	TDG
• **Lear** 25, 31, 45, 55, **60**	**1B**
• Learjet 35, 36 (D-I)	1B

C/D-II

• Challenger 600/604/ 800/850	1B
• Cessna Citation VII, X+	1B
• Embraer Legacy 450/500	1B
• **Gulfstream IV**, 350, 450 (D-II)	**2**
• Gulfstream G200/G280	1B
• Lear 70, 75	1B

C/D-III *less than 150,000 lbs.*

• Gulfstream V	2
• **Gulfstream** G500, 550, 600, **650 (D-III)**	**2**

C/D-III *over 150,000 lbs.*

• Airbus A319-100, 200	3
• **Boeing 737 -800**, 900, BBJ2 (D-III)	**3**
• MD-83, 88 (D-III)	4

C/D-IV

• Airbus A300-100, 200, 600	5
• Boeing 757-200	4
• **Boeing 767**-300, **400**	**5**
• MD-11	6

D-V

• Airbus A330-200, 300	5
• Airbus A340-500, 600	6
• Boeing 747-100 - 400	5
• Boeing 777-300	6
• **Boeing 787-8**, 9	**5**

Exhibit 2G
AIRCRAFT REFERENCE CODES

The AAC, ADG, and runway visual range (RVR) are combined to form the RDC of a runway. The RDC provides the information needed to determine certain design standards that apply. The first component, depicted by a letter, is the AAC and relates to aircraft approach speed (operational characteristics). The second component, depicted by a Roman numeral, is the ADG and relates to either the aircraft wingspan or tail height (physical characteristics), whichever is most restrictive. The third component relates to the available instrument approach visibility minimums expressed by RVR values in feet of 1,200 (⅛-mile), 1,600 (¼-mile), 2,400 (½-mile), 4,000 (¾-mile), and 5,000 (1-mile). The RVR values approximate standard visibility minimums for instrument approaches to the runways. The third component reads "VIS" for runways designed for visual approach use only.

Approach Reference Code (APRC): A code signifying the current operational capabilities of a runway and associated parallel taxiway with regard to landing operations. Like the RDC, the APRC is composed of the same three components: the AAC, ADG, and RVR. The APRC describes the current operational capabilities of a runway under particular meteorological conditions where no special operating procedures are necessary, as opposed to the RDC, which is based upon planned development with no operational component. The APRC for a runway is established based upon the minimum runway-to-taxiway centerline separation.

Departure Reference Code (DPRC): A code signifying the current operational capabilities of a runway and associated parallel taxiway with regard to takeoff operations. The DPRC represents those aircraft that can take off from a runway while any aircraft are present on adjacent taxiways, under particular meteorological conditions with no special operating conditions. The DPRC is similar to the APRC but is composed of two components: AAC and ADG. A runway may have more than one DPRC depending on the parallel taxiway separation distance.

***Airport Reference Code (ARC)*:** An airport designation that signifies the airport's highest Runway Design Code (RDC), minus the third (visibility) component of the RDC. The ARC is used for planning and design only and does not limit the aircraft that may be able to operate safely at an airport. The current ALP for Merrill Municipal Airport identifies the existing ARC as B-II.

CRITICAL AIRCRAFT

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using, or are expected to use, an airport. The critical aircraft is used to define the design parameters for an airport. The critical aircraft may be a single aircraft or a composite aircraft representing a collection of aircraft classified by the three parameters: AAC, ADG, and TDG.

The first consideration is the safe operation of aircraft likely to use an airport. Any operation of an aircraft that exceeds design criteria of an airport may result in a lesser safety margin; however, it is not the usual practice to base the airport design on an aircraft that uses the airport infrequently.

The critical aircraft is defined as the most demanding aircraft type, or grouping of aircraft with similar characteristics, that make regular use of the airport. Regular use is 500 annual operations, excluding touch-and-go operations. Planning for future aircraft use is of importance since the design standards are used to plan separation distances between facilities. These future standards must be considered now to ensure that short-term development does not preclude the reasonable long-range potential needs of the airport.

According to FAA AC 150/5300-13B, *Airport Design*, "airport designs based only aircraft currently using the airport can severely limit the airport's ability to accommodate future operations of more demanding aircraft. Conversely, it is not practical or economical to base airport design on aircraft that will not realistically use the airport." Selection of the current and future critical aircraft must be realistic in nature and supported by current data and realistic projections.

AIRPORT CRITICAL AIRCRAFT

There are three elements for classifying the airport critical aircraft. The three elements are the AAC, ADG, and the TDG. The AAC and ADG are examined first, followed by the TDG.

As discussed, the FAA's TFMSC database captures certain operations (i.e., those where a flight plan is filed and those detected by radar). While the TFMSC data does not account for all aircraft activity at an airport by a given aircraft type, it does provide an accurate reflection of IFR activity. Operators of high-performance aircraft, such as turboprops and jets, tend to file flight plans at a high rate.

Exhibit 2H presents the TFMSC operational mix at the airport for turbine aircraft operations for the last 10 years.[3] As can be seen, there has been limited reporting of activity by turboprops and business jets, with no single aircraft or family of aircraft having conducted 500 or more operations at the airport over the last 10 years. In 2023, the greatest number of operations in any single design family was 42 in B-I, which accounted for approximately 82 percent of logged turbine aircraft activity was conducted by the Beechcraft King Air 90/100. The remaining operations recorded in the TFMSC were conducted by aircraft in A-I/II (seven operations) and B-II (two operations).

FlightAware data was also analyzed for the years 2021, 2022, and 2023[4]. Like the TFMSC, the FlightAware data presents limited operations but likely does not reflect the entirety of operations occurring at Merrill Municipal Airport due to radar coverage limitations and other factors mentioned earlier. According to the data received for 2023, the most frequent operator at the airport is a Cessna 172, with 174 operations, followed by a Piper Cherokee with 98 operations. Both of these aircraft are classified within the A-I family of aircraft. The third most frequent operator according to the FlightAware data was a King Air 100, which is a B-I aircraft, and for which 55 operations were recorded.

[3] 2023 TFMSC data is reflective of operations occurring between November 1, 2022 through October 31, 2023.
[4] 2023 FlightAware data is reflective of reported operations occurring between January 1, 2023 and November 7, 2023.

When planning for new facilities at Merrill Municipal Airport, it is necessary to consider the types of aircraft operating most frequently at the airport to identify the existing, future, and ultimate critical aircraft. Future refers to a period between now and 10 years, while ultimate refers to the long-range, 20-year outlook. When extrapolating data from the TFMSC, it is reasonable to assume that aircraft in category A/B-I are conducting more than 500 annual operations at RRL. Operations by aircraft in this family have historically dominated; however, operations by B-II aircraft also make up a significant percentage of the total in recent years. Therefore, the existing/future critical aircraft for Merrill Municipal Airport has been determined to fall within ARC A-I, with the Cessna 172 serving as the representative aircraft, and the ultimate critical aircraft has been determined as B-II, with the King Air 200/300/350 or small to midsized corporate jets in the Cessna Citation family as representative aircraft. It should be noted that single engine pistons will likely continue to lead in terms of operations at the airport over the planning period, with some turboprop and jet operations. The ultimate B-II critical aircraft determination serves as a conceptual forecast intended to preserve future planning options for aeronautical development.

Airport Critical Aircraft Summary

While previous planning determined the existing critical aircraft to be B-II and the ultimate critical aircraft to be C-II, more specific information has become available regarding the types of aircraft most frequently operating at Merrill Municipal Airport (i.e., the TFMSC and FlightAware). Based on this recent data, the existing/future aircraft approach category is identified as “A,” and the existing/future airplane design group is “I.” Over the last 10 years, the most active A-I airplane at Merrill Municipal Airport has been the Cessna 172, which is TDG 1A aircraft. B-II aircraft, such as the King Air 200/300/350, also operate at the airport currently, and as the national fleet mix evolves to include more turboprop and jet aircraft, are likely to operate more frequently in the coming years. Therefore, the existing/future critical aircraft for Merrill Municipal Airport is classified as A-I-1A, represented by the Cessna 172, and the ultimate critical aircraft is classified as B-II-2A, represented by the King Air 200/300/350.

RUNWAY DESIGN CODE

The RDC relates to specific FAA design standards that should be met in relation to a runway. The RDC takes into consideration the AAC, ADG, and the RVR. In most cases, the critical design aircraft will also be the RDC for the primary runway.

Runway 7-25

Runway 7-25, as the primary runway, should be designed to accommodate the overall airport design aircraft. The primary runway is 5,100 feet long, 75 feet wide, and has non-precision instrument approaches with visibility minimums as low as one mile on each runway end. It has been established that the existing/future critical aircraft falls within ARC A-I; therefore, when factoring in the RVR, the existing/future RDC for Runway 7-25 is A-I-5000, while the ultimate RDC is classified as B-II-4000, which plans for the potential for lower visibility minimums in the future.

ARC	Aircraft	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023*
A-I	Cirrus Vision Jet	0	0	0	0	0	0	0	0	0	2	0
	Eclipse 400/500	0	0	0	0	0	0	2	0	0	0	0
	Epic Dynasty	0	0	0	0	0	0	0	0	2	0	0
	Piper Malibu/Meridian	2	0	0	0	0	0	2	2	0	0	0
	Socata TBM 7/850/900	144	114	132	148	0	4	4	4	2	0	2
	Total	146	114	132	148	0	4	8	6	4	2	2
A-II	Cessna Caravan	0	0	2	4	0	2	0	0	2	2	2
	Pilatus PC-12	4	56	6	18	6	4	0	4	6	6	3
	Total	4	56	8	22	6	6	0	4	8	8	5
B-I	Cessna 425 Corsair	0	0	0	0	0	0	0	0	2	0	0
	Citation CJ1	2	0	2	0	2	0	0	0	0	0	0
	Citation M2	0	0	0	0	0	0	2	2	0	0	0
	Citation Mustang	0	0	0	0	0	4	14	6	8	0	0
	Falcon 10	0	0	0	0	0	2	2	0	0	0	0
	Hawker 1000	0	0	0	0	0	0	0	0	2	0	0
	King Air 90/100	0	2	2	4	2	20	0	4	0	0	42
	Mitsubishi MU-2	0	0	0	0	0	0	0	0	12	0	0
	Piaggio Avanti	0	0	0	0	0	2	0	0	0	0	0
	Piper Cheyenne	0	0	0	4	2	0	4	0	0	2	0
	Premier 1	2	0	0	0	0	0	0	0	0	0	0
	Total	4	2	4	8	6	28	22	12	24	2	42
B-II	Cessna Conquest	6	0	0	0	0	4	0	8	0	0	0
	Citation CJ2/CJ3/CJ4	2	2	2	2	2	2	2	0	0	0	0
	Citation II/SP/Latitude	0	0	0	0	4	2	2	4	18	0	0
	Citation V/Sovereign	0	4	4	0	0	0	0	4	0	0	0
	Citation XLS	2	8	4	6	0	0	0	0	2	0	0
	Embraer EMB-110/120	0	0	0	2	0	0	0	0	0	0	0
	Falcon 20/50	0	0	0	4	4	0	2	0	0	0	0
	King Air 200/300/350	4	2	4	4	4	10	2	4	10	2	0
	Phenom 300	0	0	0	0	0	0	0	0	2	0	0
	Hawker 4000	0	0	0	0	0	0	0	0	0	0	2
	Swearingen Merlin	0	0	2	0	0	0	0	0	0	0	0
	Total	14	16	16	18	14	18	8	20	32	2	2
C-I	Learjet 31	0	0	2	6	2	0	0	0	0	0	0
	Learjet 40 Series	2	2	0	2	0	0	0	0	0	0	0
	Total	2	2	2	8	2	0	0	0	0	0	0
C-II	Challenger 300	2	0	0	0	0	0	0	0	0	2	0
	Challenger 600/604	0	0	0	0	2	0	0	0	0	0	0
	Hawker 800 (Formerly BAe-125-800)	2	2	0	0	0	0	0	0	0	0	0
	Total	4	2	0	0	2	0	0	0	0	2	0
D-I	Learjet 35/36	0	0	0	0	2	0	2	2	2	0	0
	Total	0	0	0	0	2	0	2	2	2	0	0

AIRPORT REFERENCE CODE (ARC) SUMMARY

ARC	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023*
A-I	146	114	132	148	0	4	8	6	4	2	2
A-II	4	56	8	22	6	6	0	4	8	8	5
B-I	4	2	4	8	6	28	22	12	24	2	42
B-II	14	16	16	18	14	18	8	20	32	2	2
C-I	2	2	2	8	2	0	0	0	0	0	0
C-II	4	2	0	0	2	0	0	0	0	2	0
D-I	0	0	0	0	2	0	2	2	2	0	0
Total	174	192	162	204	32	56	40	44	70	16	51

APPROACH CATEGORY

AAC	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023*
A	150	170	140	170	6	10	8	10	12	10	7
B	18	18	20	26	20	46	30	32	56	4	44
C	6	4	2	8	4	0	0	0	0	2	0
D	0	0	0	0	2	0	2	2	2	0	0
Total	174	192	162	204	32	56	40	44	70	16	51

DESIGN GROUP

ADG	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023*
I	152	118	138	164	10	32	32	20	30	4	44
II	22	74	24	40	22	24	8	24	40	12	7
Total	174	192	162	204	32	56	40	44	70	16	51

Source: TFMSC 2013-2022. Data normalized annually
**2023 Data From 11/1/22 Through 10/31/23*

Exhibit 2H
HISTORIC TURBOPROP AND JET OPERATIONS

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Runway 16-34

Runway 16-34 is the airport's crosswind runway. It measures 2,997 feet long by 75 wide and does not currently offer instrument approach capability. Presently, the RDC for Runway 16-34 is classified as A-I-VIS (visual approach capability only). This runway is designed to meet the minimum requirements for AAC A and B aircraft that utilize the airport; however, as part of this master plan, the continued eligibility of this runway will be examined based on the FAA's wind coverage requirements for crosswind components up to 10.5 knots (to be discussed in the next chapter). If Runway 16-34 is maintained over the 20-year planning period, it should be planned to meet RDC A-I-5000 standards, with consideration for the possible implementation of an instrument approach procedure with visibility minimums not lower than one-mile. The visibility requirements for each runway will be considered in the next chapter.

Note: Since the preparation of this chapter, the FAA issued "Reauthorization Program Guidance Letter (R-PGL) 25-01: Runway Projects," which clarified provisions in the FAA Reauthorization Act of 2024, including those related to crosswind runways. The PGL includes a definition for "legacy crosswind runways," which is a new runway type that is eligible for Airport Improvement Program (AIP) funding. These runways are "existing runways previously funded to function as a crosswind runway that is not parallel to the primary runway, when the primary runway alone achieves greater than 95 percent wind coverage." Following issuance of R-PGL, Runway 16-34 at Merrill Municipal Airport was determined by the FAA to meet the criteria for a legacy crosswind runway, therefore remaining eligible for AIP-funded projects.

APPROACH AND DEPARTURE REFERENCE CODES

The approach and departure reference codes (APRC and DPRC) describe the current operational capabilities of each runway and the adjacent parallel taxiways, where no special operating procedures are necessary. Essentially, the APRC and DPRC describe the current conditions at an airport in runway classification terms when considering the parallel taxiway.

The parallel taxiway for Runway 7-25 is located a minimum of 300 feet from the runway (centerline to centerline). Each runway end has non-precision instrument approaches with one-mile visibility minimums. The APRC for Runway 7-25 is B/III/4000 and D/II/4000 and its DPRC is B/III and D/II.

Runway 16-34 is also separated from its partial parallel taxiway by 300 feet and has no published instrument approaches. Therefore, its APRC is B/III/4000 and D/II/4000 and its DPRC is B/III and D/II.

AIRPORT AND RUNWAY CLASSIFICATION SUMMARY

Table 2R summarizes the airport and runway classification currently and in the future. The existing critical aircraft is now defined by those aircraft in ARC B-I, with a transition to ARC B-II by the end of the planning period.

Table 2R | Airport and Runway Classifications

	Runway 7-25		Runway 16-34
	Existing/Future	Ultimate	Existing & Ultimate
Airport Reference Code (ARC)	A-I	B-II	A-I
Airport Critical Aircraft	A-I-1A	B-II-2A	A-I-1A
Critical Aircraft (Typ.)	Cessna 172	King Air 200/300/350	Cessna 172
Runway Design Code (RDC)	A-I-5000	B-II-4000	A-I-VIS*
Approach Reference Code (APRC)	B/III/4000 & D/II/4000	Same	B/III/4000 & D/II/4000
Departure Reference Code (DPRC)	B/III & D/II	Same	B/III & D/II
Taxiway Design Group (TDG)	1A	2A	1A
* If Runway 16-34 is maintained over the 20-year period, an instrument approach procedure with visibility minimums not lower than one-mile should be considered. This would result in an RDC of A-I-5000.			

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

SUMMARY

This chapter has outlined the various activity levels that might reasonably be anticipated over the planning period, as well as the critical aircraft for the airport. Total based aircraft are forecast to grow from 45 currently to 56 by 2043. Operations are forecast to grow from an estimated 15,754 in 2023 to 21,100 by 2043. The projected growth is driven by FAA's positive outlook for general activity nationwide, as well as generally positive outlooks for the region.

The critical aircraft for the airport was determined by examining the FAA TFMSC database of flight plans and FlightAware data. The current critical aircraft is described as A-I-1A and is best represented by a Cessna 172, a small piston aircraft typically utilized for recreational flying. The ultimate critical aircraft is a King Air 200/300/350, which is classified as a B-II-2A aircraft.

The next step in the planning process is to assess the capabilities of the existing facilities to determine what upgrades may be necessary to meet future demands. The range of forecasts developed here will be taken forward in the next chapter as planning horizon activity levels that will serve as milestones or activity benchmarks in evaluating facility requirements.

Chapter 3

FACILITY REQUIREMENTS

Chapter 3

FACILITY REQUIREMENTS

Proper airport planning requires the translation of forecast aviation demand into the specific types and quantities of facilities that can adequately serve the identified demand. This chapter will analyze the existing capacities of Merrill Municipal Airport (RRL) facilities. The existing capacities will then be compared to the forecast activity levels prepared in Chapter Two to determine the adequacy of existing facilities, as well as to identify whether deficiencies currently exist or may be expected to materialize in the future. This chapter will present the following elements:

- Planning Horizon Activity Levels
- Airfield Capacity
- Airport Physical Planning Criteria
- Airside and Landside Facility Requirements

This exercise is intended to identify the adequacy of existing airport facilities, outline what new facilities may be needed, and determine when these may be needed to accommodate forecast demands. Once the facility needs have been identified, various alternatives for providing these facilities will be detailed for both the airside and the landside. Each alternative will be evaluated to determine the most feasible, cost-effective, and efficient means for implementation.

The facility requirements for Merrill Municipal Airport were evaluated using guidance contained in several Federal Aviation Administration (FAA) publications, including the following:

- Advisory Circular (AC) 150/5300-13B, *Airport Design*
- AC 150/5060-5, *Airport Capacity and Delay*
- AC 150/5325-4B, *Runway Length Requirements for Airport Design*
- Federal Aviation Regulation (FAR) Part 77, *Objects Affecting Navigable Airspace*
- FAA Order 5090.5, *Formulation of the National Plan of Integrated Airport Systems* (*NPIAS) and the Airports Capital Improvement Plan (ACIP)*

DEMAND-BASED PLANNING HORIZONS

An updated set of aviation demand forecasts for Merrill Municipal Airport has been established and was detailed in Chapter Two. These activity forecasts include annual aircraft operations, based aircraft, aircraft fleet mix, and peaking characteristics. With this information, specific components of the airfield and land-side system can be evaluated to determine their capacity to accommodate future demand.

Cost-effective, efficient, and orderly development of an airport should be based more on actual demand at an airport than on a time-based forecast figure. In order to develop a master plan that is demand-based rather than time-based, a series of planning horizon milestones has been established which takes into consideration the reasonable range of aviation demand projections. The planning horizons are the short term (years 1-5), the intermediate term (years 6-10), and the long term (years 11-20).

It is important to consider that the actual activity at the airport may be higher or lower than what the annualized forecast portrays. By planning according to activity milestones, the resultant plan can accommodate unexpected shifts or changes in the area's aviation demand by allowing airport management the flexibility to make decisions and develop facilities based on need generated by actual demand levels, rather than dates in time. The demand-based schedule provides flexibility in development, as development schedules can be slowed or expedited according to demand at any given time over the planning period. The resultant plan provides airport officials with a financially responsible and needs-based program. **Table 3A** presents the short-, intermediate-, and long-term planning horizon milestones for each aircraft activity level forecasted in Chapter Two.

TABLE 3A | Aviation Demand Planning Horizons

	Base Year (2023)	Short Term (1-5 Years)	Intermediate Term (6-10 Years)	Long Term (11-20 Years)
BASED AIRCRAFT				
Single-Engine	44	46	47	48
Multi-Engine	1	1	1	0
Turboprop	0	1	2	3
Jet	0	0	0	2
Helicopter	0	0	0	1
Other	0	0	0	2
TOTAL BASED AIRCRAFT	**45**	**48**	**50**	**56**
ANNUAL OPERATIONS				
Itinerant				
Air Carrier	0	0	0	0
Air Taxi	4	100	100	100
General Aviation	7,875	8,820	9,380	10,520
Total Itinerant	7,879	8,920	9,480	10,620
Local				
General Aviation	7,875	8,780	9,320	10,470
Total Local	7,875	8,780	9,320	10,470
TOTAL OPERATIONS*	**15,754**	**17,700**	**18,800**	**21,100**

*Total operations have been rounded

Source: Coffman Associates analysis

AIRFIELD CAPACITY

An airfield's capacity is expressed in terms of its annual service volume (ASV). ASV is a reasonable estimate of the maximum level of aircraft operations that can be accommodated in a year without incurring significant delay factors. As aircraft operations near or surpass the ASV, delay factors increase.

RRL's ASV was examined using FAA Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay*. Several factors were evaluated to calculate the airport's ASV, including:

- Runway configuration
- Runway use
- Exit taxiways
- Weather conditions
- Aircraft mix
- Percent arrivals
- Touch-and-go activity
- Peak period operations

Each factor represents an airfield or operational element that can contribute to delay. When examined together, the ASV at Merrill Municipal Airport is approximately 230,000 annual operations. This does not indicate a point of absolute gridlock, but it does represent a point at which delay for each operation increases exponentially and capacity becomes constrained.

Current operational estimates for RRL represent approximately six percent of the airfield's ASV. By the end of the long-term planning period, total annual operations are expected to represent approximately eight percent of the airfield's ASV. FAA guidance recommends that improvements for airfield capacity purposes should begin to be considered once operations reach 60 to 75 percent of the ASV. At the 80 percent level, planned improvements should be made. As existing and forecast operations remain well below these levels, no significant capacity improvements are planned; however, other options to improve airfield efficiency, such as taxiway geometry improvements, will still be considered.

AIRSIDE FACILITY REQUIREMENTS

Airside facilities include those facilities related to the arrival, departure, and ground movement of aircraft. Airside facility requirements are based primarily upon the runway design code (RDC) for each runway. Analysis in Chapter Two identified the existing/future RDC for Runway 7-25 as A-I-5000 and the ultimate RDC as B-II-4000. For Runway 16-34, the existing/ultimate RDC is A-I-VIS; however, an RDC of A-I-5000 is considered in the ultimate condition in the event that an instrument approach procedure with visibility minimums not below one-mile were to be implemented. (This will be discussed in a later section.)

RUNWAYS

Runway conditions, such as orientation, length, width, and pavement strength, were analyzed at Merrill Municipal Airport. From this information, requirements for runway improvements were determined for the airport.

Runway Orientation

Key considerations in the runway configuration of an airport involve the orientation for wind coverage and the operational capacity of the runway system. FAA AC 150/5300-13B, *Airport Design*, recommends that a crosswind runway should be made available when the primary runway orientation provides less than 95 percent crosswind component coverage for an aircraft design group. **Table 3B** details the allowable crosswind component for each RDC.

TABLE 3B | Allowable Crosswind Component by RDC

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

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

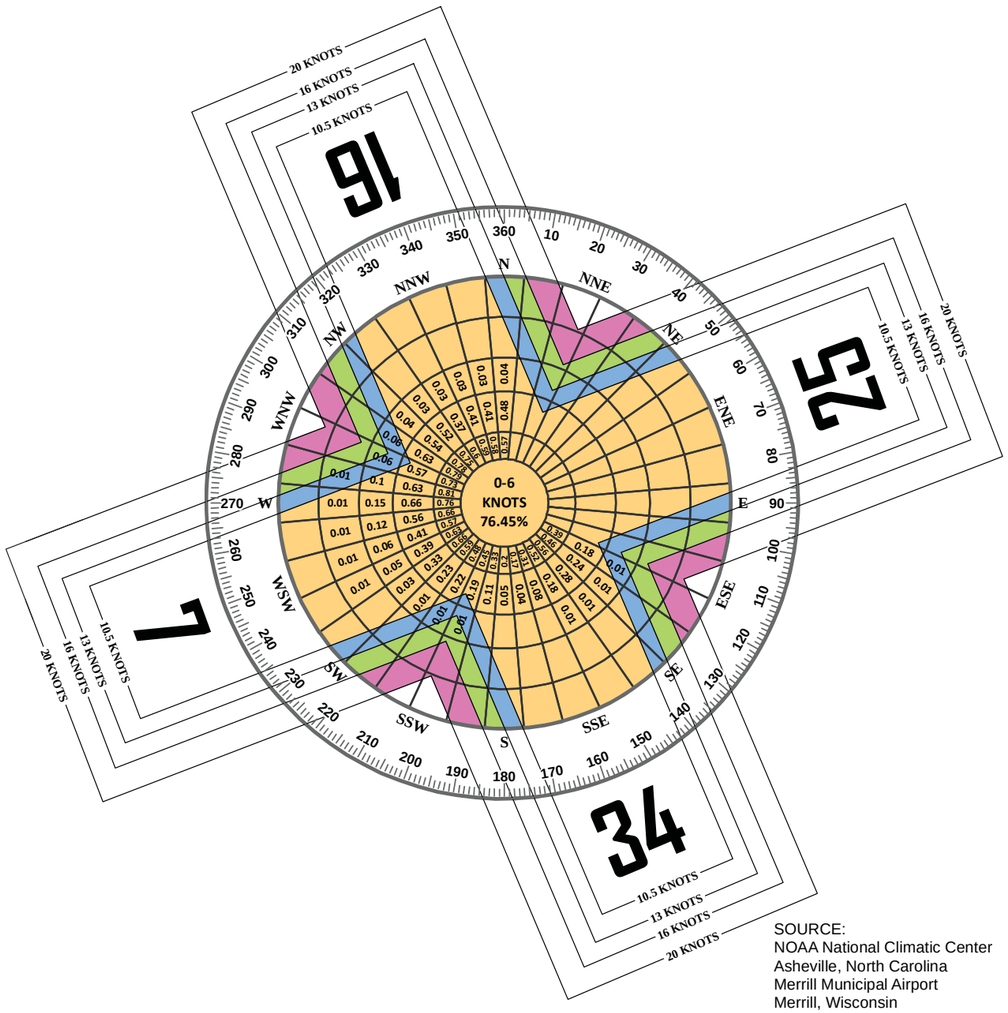
Exhibit 3A presents the generalized, FAA-accepted all-weather and instrument flight rules (IFR) wind roses for the airport. The previous 10 years of wind data[1] were obtained from the on-airport automated weather observation station (AWOS) and have been analyzed to identify wind coverage provided by the existing runway orientations. At Merrill Municipal Airport, the orientation of Runway 7-25 provides 95.80 percent coverage for the 10.5-knot component and greater than 98 percent coverage for 13-, 16-, and 20-knot components in all weather conditions. Runway 16-34 provides greater than 95 percent coverage in each crosswind component category. Combined, the runways provide 99.61 percent coverage in all-weather conditions. In IFR conditions, the individual and combined runways provide greater than 97.00 percent coverage for each crosswind component. *It should be noted that the calculations described above exclude gusting conditions, which the FAA does not consider when determining runway orientation. Gusting conditions, specifically wind gust velocities, affect what runway a pilot chooses to use; however, the FAA does not support using gusts as a means to determine crosswind runway eligibility or justification.*

Wind data for Merrill Municipal Airport have been further analyzed at the monthly and hourly levels, with nighttime data (between 10:00 p.m. and 6:00 a.m.) excluded, as the majority of operations at RRL typically occur during daytime hours. The results of this analysis are included on the back side of **Exhibit 3A**. This analysis goes beyond what is required by the FAA and demonstrates that wind patterns for a specific area can change relatively significantly throughout the year. Moreover, in many midwestern locales, winds vary during daytime and nighttime hours, with daytime hours more important as the vast majority of operations occur during those hours, and wind velocities are typically higher and gustier during daytime hours due to heat from the sun.

When first considering total monthly wind data (daytime and nighttime) for all weather conditions (VFR and IFR combined), the data indicate that primary Runway 7-25 offers less than 95 percent wind coverage for 10.5-knot crosswind components seven months out of the year. When the analysis is further

[1] 251,945 observations were collected for the period January 1, 2013, through December 31, 2022.

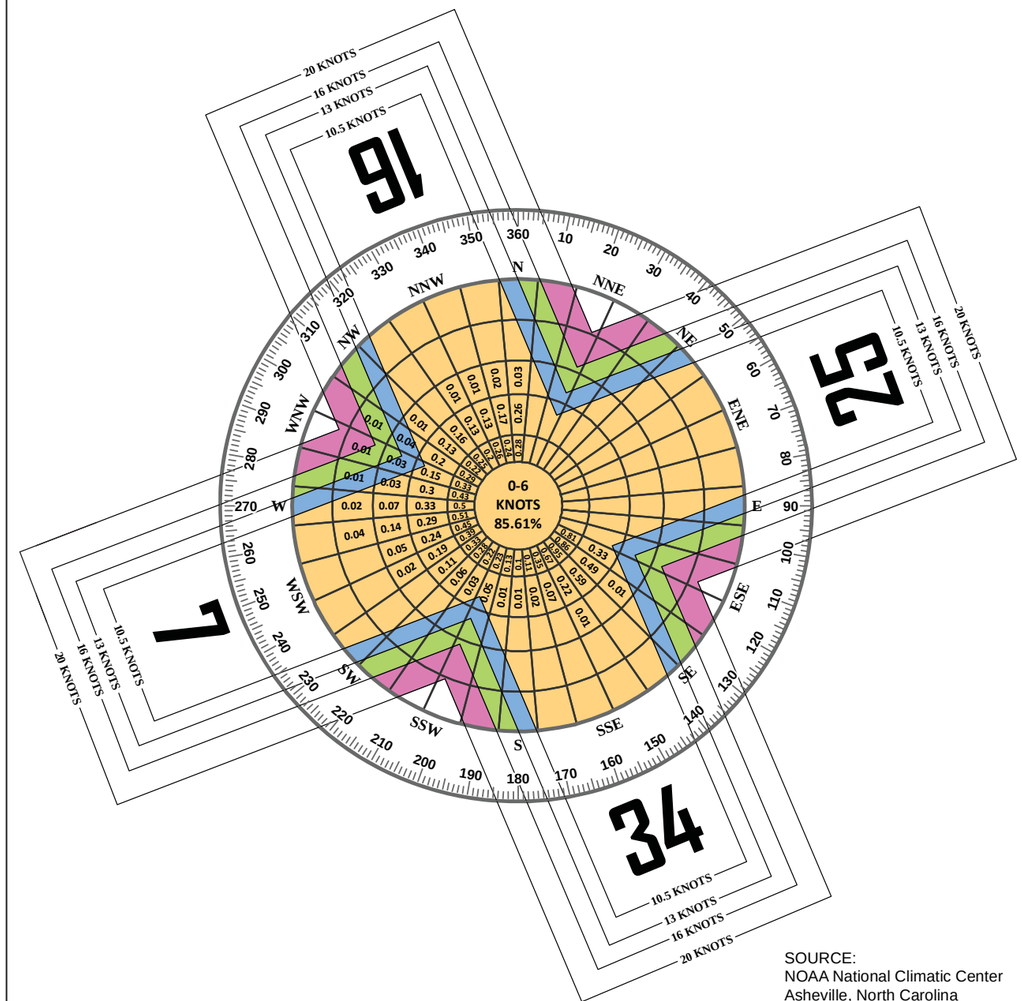
ALL WEATHER WIND COVERAGE				
Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 7/25	95.80%	98.00%	99.71%	99.97%
Runway 16/34	95.63%	97.72%	99.43%	99.89%
All Runways	99.61%	99.95%	99.99%	100.00%



SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Merrill Municipal Airport
Merrill, Wisconsin

OBSERVATIONS:
251,945 All Weather Observations
Jan. 1, 2013 - Dec, 31 2022

IFR WIND COVERAGE				
Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 7/25	97.57%	98.83%	99.84%	99.98%
Runway 16/34	97.25%	98.52%	99.60%	99.89%
All Runways	99.78%	99.95%	99.99%	99.99%



SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Merrill Municipal Airport
Merrill, Wisconsin

OBSERVATIONS:
34,072 IFR Observations
Jan. 1, 2013 - Dec, 31 2022

TOTAL MONTHLY WIND ROSE

Month	Runways	ALL WEATHER WIND COVERAGE				IFR WIND COVERAGE			
		10.5 Knots	13 Knots	16 Knots	20 Knots	10.5 Knots	13 Knots	16 Knots	20 Knots
JANUARY	Runway 7-25	93.32%	96.88%	99.66%	99.97%	95.20%	97.59%	99.66%	99.96%
	Runway 16-34	94.73%	97.44%	99.61%	99.96%	95.94%	97.95%	99.77%	99.99%
	All Runways	99.54%	99.95%	100.00%	100.00%	99.60%	99.96%	100.00%	100.00%
FEBRUARY	Runway 7-25	92.56%	96.17%	99.34%	99.90%	94.65%	97.15%	99.25%	99.85%
	Runway 16-34	92.14%	95.63%	98.79%	99.71%	90.49%	93.67%	96.61%	98.67%
	All Runways	99.35%	99.86%	99.96%	99.99%	98.83%	99.57%	99.91%	100.00%
MARCH	Runway 7-25	91.21%	95.63%	99.30%	99.91%	96.84%	98.60%	99.71%	99.92%
	Runway 16-34	93.25%	96.48%	98.85%	99.63%	94.32%	97.39%	99.49%	99.92%
	All Runways	99.91%	99.81%	99.97%	100.00%	99.60%	99.93%	99.98%	100.00%
APRIL	Runway 7-25	90.60%	95.52%	99.29%	99.85%	94.80%	97.48%	99.32%	99.77%
	Runway 16-34	90.38%	94.78%	98.51%	99.67%	90.63%	94.75%	98.70%	99.78%
	All Runways	98.95%	99.82%	99.98%	99.99%	99.11%	99.75%	99.94%	100.00%
MAY	Runway 7-25	93.29%	96.76%	99.53%	99.94%	96.58%	98.66%	99.96%	100.00%
	Runway 16-34	92.95%	96.30%	99.12%	99.83%	97.09%	98.53%	99.89%	100.00%
	All Runways	99.52%	99.96%	100.00%	100.00%	99.90%	100.00%	100.00%	100.00%
JUNE	Runway 7-25	95.35%	97.89%	99.73%	99.97%	97.98%	98.99%	99.94%	100.00%
	Runway 16-34	94.55%	97.08%	99.19%	99.86%	98.70%	99.21%	99.88%	100.00%
	All Runways	99.52%	99.93%	99.98%	100.00%	99.95%	100.00%	100.00%	100.00%
JULY	Runway 7-25	97.53%	98.99%	99.93%	99.99%	98.88%	99.26%	99.73%	99.96%
	Runway 16-34	95.57%	97.76%	99.64%	99.94%	98.86%	99.29%	99.82%	99.94%
	All Runways	99.77%	99.98%	100.00%	100.00%	99.83%	99.83%	99.92%	100.00%
AUGUST	Runway 7-25	97.44%	98.86%	99.90%	99.99%	99.19%	99.54%	99.84%	99.96%
	Runway 16-34	96.24%	98.06%	99.70%	99.95%	98.89%	99.45%	99.91%	99.93%
	All Runways	99.82%	99.99%	100.00%	100.00%	99.91%	99.97%	100.00%	100.00%
SEPTEMBER	Runway 7-25	96.33%	98.31%	99.75%	99.98%	97.56%	98.94%	99.91%	100.00%
	Runway 16-34	95.87%	98.04%	99.72%	99.97%	98.65%	99.59%	99.98%	100.00%
	All Runways	99.61%	99.94%	99.99%	100.00%	99.84%	100.00%	100.00%	100.00%
OCTOBER	Runway 7-25	93.72%	96.93%	99.54%	99.95%	97.04%	98.44%	99.84%	99.98%
	Runway 16-34	93.14%	96.57%	99.39%	99.91%	96.86%	98.29%	99.71%	99.96%
	All Runways	99.48%	99.94%	100.00%	100.00%	99.93%	100.00%	100.00%	100.00%
NOVEMBER	Runway 7-25	92.18%	96.09%	99.32%	99.92%	93.03%	96.66%	99.88%	100.00%
	Runway 16-34	93.48%	96.76%	99.24%	99.81%	96.58%	98.33%	99.78%	99.97%
	All Runways	99.25%	99.99%	100.00%	100.00%	99.82%	99.99%	100.00%	100.00%
DECEMBER	Runway 7-25	95.84%	98.31%	99.83%	99.98%	97.00%	98.59%	99.88%	99.98%
	Runway 16-34	92.52%	95.78%	98.41%	99.51%	95.69%	97.55%	99.21%	99.72%
	All Runways	99.50%	99.94%	99.99%	100.00%	99.88%	100.00%	100.00%	100.00%

DAYTIME MONTHLY WIND ROSE

Month	Runways	ALL WEATHER WIND COVERAGE				IFR WIND COVERAGE			
		10.5 Knots	13 Knots	16 Knots	20 Knots	10.5 Knots	13 Knots	16 Knots	20 Knots
JANUARY	Runway 7-25	93.13%	96.77%	99.65%	99.96%	96.32%	98.12%	99.72%	99.97%
	Runway 16-34	94.17%	97.18%	99.58%	99.94%	96.33%	98.06%	99.63%	99.93%
	All Runways	99.49%	99.94%	100.00%	100.00%	99.69%	99.94%	99.99%	100.00%
FEBRUARY	Runway 7-25	91.92%	95.79%	99.23%	99.88%	95.97%	97.92%	99.56%	99.92%
	Runway 16-34	90.98%	94.88%	98.51%	99.63%	94.86%	96.83%	98.71%	99.53%
	All Runways	99.26%	99.83%	99.95%	99.99%	99.33%	99.73%	99.92%	99.99%
MARCH	Runway 7-25	90.37%	95.21%	99.22%	99.90%	96.75%	98.39%	99.73%	99.94%
	Runway 16-34	92.11%	95.91%	98.77%	99.68%	96.28%	98.09%	99.65%	99.93%
	All Runways	99.01%	99.80%	99.97%	100.00%	99.75%	99.96%	99.99%	100.00%
APRIL	Runway 7-25	88.61%	94.59%	99.13%	99.84%	96.41%	98.28%	99.70%	99.94%
	Runway 16-34	88.97%	94.03%	98.21%	99.61%	95.40%	97.53%	99.42%	99.87%
	All Runways	98.69%	99.78%	99.99%	100.00%	99.63%	99.93%	99.99%	100.00%
MAY	Runway 7-25	91.87%	96.05%	99.41%	99.92%	96.80%	98.49%	99.81%	99.96%
	Runway 16-34	91.59%	95.58%	98.92%	99.80%	96.74%	98.23%	99.66%	99.93%
	All Runways	99.44%	99.95%	100.00%	100.00%	99.80%	99.96%	99.99%	100.00%
JUNE	Runway 7-25	94.37%	97.45%	99.69%	99.96%	97.00%	98.49%	99.79%	99.96%
	Runway 16-34	93.28%	96.40%	99.00%	99.82%	96.86%	98.27%	99.65%	99.92%
	All Runways	99.42%	99.91%	99.98%	100.00%	99.80%	99.95%	99.99%	100.00%
JULY	Runway 7-25	97.09%	98.81%	99.93%	100.00%	97.00%	98.48%	99.75%	99.95%
	Runway 16-34	94.67%	97.30%	99.55%	99.93%	96.83%	98.25%	99.62%	99.91%
	All Runways	99.75%	99.98%	100.00%	100.00%	99.77%	99.92%	99.98%	100.00%
AUGUST	Runway 7-25	97.01%	98.66%	99.87%	99.99%	97.24%	98.61%	99.76%	99.95%
	Runway 16-34	95.67%	97.74%	99.64%	99.94%	96.99%	98.35%	99.66%	99.91%
	All Runways	99.80%	99.99%	100.00%	100.00%	99.81%	99.96%	99.99%	100.00%
SEPTEMBER	Runway 7-25	95.55%	97.97%	99.69%	99.97%	96.88%	98.50%	99.79%	99.96%
	Runway 16-34	95.05%	97.68%	99.68%	99.97%	96.87%	98.37%	99.67%	99.93%
	All Runways	99.50%	99.93%	99.99%	100.00%	99.77%	99.95%	99.99%	100.00%
OCTOBER	Runway 7-25	93.08%	96.70%	99.51%	99.94%	96.80%	98.38%	99.77%	99.96%
	Runway 16-34	91.81%	95.85%	99.23%	99.88%	96.35%	97.97%	99.58%	99.92%
	All Runways	99.37%	99.92%	99.99%	100.00%	99.81%	99.96%	99.99%	100.00%
NOVEMBER	Runway 7-25	91.38%	95.65%	99.22%	99.89%	96.06%	98.11%	99.80%	99.97%
	Runway 16-34	93.09%	96.59%	99.18%	99.78%	96.57%	98.20%	99.63%	99.92%
	All Runways	99.25%	99.90%	100.00%	100.00%	99.77%	99.95%	99.99%	100.00%
DECEMBER	Runway 7-25	95.67%	98.28%	99.84%	99.99%	96.78%	98.44%	99.84%	99.97%
	Runway 16-34	92.44%	95.75%	98.48%	99.57%	96.43%	98.00%	99.53%	99.85%
	All Runways	99.49%	99.94%	100.00%	100.00%	99.82%	99.96%	99.99%	100.00%

Note: Months in red indicate less than 95% coverage on the primary runway in 10.5-knot crosswind components.

narrowed to include only daytime operations, Runway 7-25 has less than 95 percent wind coverage for eight months out of the year for the 10.5-knot component. It should be noted that, for the 13-knot crosswind component which includes aircraft categorized as B-II, Runway 7-25 meets the 95 percent minimum for all 12 months under the monthly analysis and for 11 months under the daytime-only analysis.

Evaluations of wind data were also conducted by the airport's engineer in 2022. This evaluation considered 11 years of wind data sourced from RRL's AWOS and was based on a methodology that included operational weighting and the FAA's IFP, Operations, Airspace Analytics (IOAA) tool. Using this data, the busiest times of airport usage were determined. Wind measurements recorded during the busiest hours were then given more consideration than those that occurred during times of little use. The result shows wind coverage at 94.8 percent on primary Runway 7-25 for a 10.5-knot max crosswind component. This analysis was submitted to the FAA for consideration in November 2022. The FAA ultimately determined that the weighted-hourly operations analysis was correctly calculated and indicated that primary Runway 7-25 provides less than 95 percent wind coverage for A-I/B-I aircraft; therefore, crosswind Runway 16-34 is an eligible crosswind runway. **Appendix B** includes the FAA memorandum outlining Runway 16-34's crosswind eligibility.

Summary

Runway 7-25 is currently classified as an A-I runway with a forecasted potential to become a B-II runway when operations dictate (i.e., when at least 500 annual operations by aircraft within the B-II family are documented). As detailed in **Table 3B**, the allowable crosswind component for an A-I runway is 10.5 knots. The monthly analysis described above suggests that Runway 7-25 is not a viable option for most pilots operating at RRL for seven months out of the year, and for eight months out of the year when the daytime-only analysis is considered. Other analysis included weighting operations based on when they occurred, which resulted in wind coverage of 94.8 percent on the primary runway. The FAA concurred with this analysis and conclusion in a December 2023 memorandum (**Appendix B**). As such, it is prudent to continue to maintain the current crosswind runway orientation designed to meet A/B-I aircraft operations at Merrill Municipal Airport.

As noted in Chapter Two, this analysis was completed prior to the release of additional guidance from the FAA regarding crosswind runway eligibility (Reauthorization Program Guidance Letter [R-PGL] 25-01: *Runway Projects*). The FAA has since determined that Runway 16-34 functions as a "legacy crosswind runway," meaning it can and should be maintained and is eligible for Airport Improvement Program (AIP) funding.

Runway Designations

A runway's designation is based on its magnetic headings, which are determined by the magnetic declination for the area. The magnetic declination near Merrill Municipal Airport is 2° 56' W ± 0° 2' W per year. The runway has a true heading of 076°/256°. Adjusting for the magnetic declination, the current magnetic heading of Runway 7-25 is 072°/252° and the heading of Runway 16-34 is 160°/340°. As such, no change to either runway designation is necessary.

Runway Length | AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides guidance for determining runway length needs. The determination of runway length requirements for the airport is based on five primary factors:

- Mean maximum temperature of the hottest month
- Airport elevation
- Runway gradient
- Critical aircraft type expected to use the runway
- Stage length of the longest nonstop destination (specific to larger aircraft)

The mean maximum daily temperature of the hottest month for Merrill Municipal Airport is 80.2 degrees Fahrenheit (F), which occurs in July. The airport elevation is 1,318.2 feet mean sea level (MSL). Runway 7-25 has a longitudinal gradient of 0.24 percent, while Runway 16-34 has a gradient of 0.48 percent. Both of these conform to FAA design standards for gradient.

Airplanes operate on a wide variety of available runway lengths. Many factors govern the sustainability of runway lengths for aircraft, such as elevation, temperature, wind, aircraft weight, wing flap settings, runway condition (wet or dry), runway gradient, vicinity airspace obstructions, and any special operating procedures. Airport operators can pursue policies that maximize the sustainability of the runway length. Policies such as area zoning and height and hazard restricting can protect an airport's runway length. Airport ownership (fee simple easement) of land leading to the runway ends reduces the possibility of natural growth or human-made obstructions. Planning for runways should include an evaluation of aircraft types expected to use the airport now and in the future. Future planning should be realistic, supported by the FAA-approved forecasts, and based on the critical aircraft (or family of aircraft).

General Aviation Aircraft

Most operations occurring at Merrill Municipal Airport are conducted using smaller GA aircraft weighing less than 12,500 pounds. Following guidance from AC 150/ 5325-4B, to accommodate 95 percent of these small aircraft with fewer than 10 passenger seats, a runway length of 3,400 feet is recommended. For 100 percent of these small aircraft, a runway length of 4,000 feet is recommended. For small aircraft with 10 or more passenger seats, 4,300 feet of runway length is recommended.

The airport is also utilized by aircraft weighing more than 12,500 pounds, including small- to medium-sized business jet aircraft. Runway length requirements for business jets weighing less than 60,000 pounds have also been calculated. These calculations take into consideration the runway gradient and landing length requirements for contaminated (wet) runways. Business jets tend to need greater runway length when landing on wet surfaces because of their increased approach speeds. AC 150/5325-4B stipulates that runway length determination for business jets considers a grouping of airplanes with similar operating characteristics. The AC provides two separate family groupings of airplanes, each of which is based on its representative percentage of aircraft in the national fleet. The first grouping is those business jets that make up 75 percent of the national fleet, and the second group is those making up 100 percent of the national fleet. **Table 3C** presents a partial list of common aircraft in each aircraft grouping. A third group considers business jets weighing more than 60,000 pounds. Runway length determination for these aircraft must be based on the performance characteristics of the individual aircraft.

TABLE 3C | Business Jet Categories for Runway Length Determination

Aircraft	MTOW (lbs.)
75 Percent of the National Fleet	
Lear 35	20,350
Lear 45	20,500
Cessna 550	14,100
Cessna 560XL	20,000
Cessna 650 (VII)	22,000
IAI Westwind	23,500
Beechjet 400	15,800
Falcon 50	18,500
75-100 Percent of the National Fleet	
Lear 55	21,500
Lear 60	23,500
Hawker 800XP	28,000
Hawker 1000	31,000
Cessna 650 (III/IV)	22,000
Cessna 750 (X)	36,100
Challenger 604	47,600
IAI Astra	23,500
Greater than 60,000 Pounds	
Gulfstream II	65,500
Gulfstream IV	73,200
Gulfstream V	90,500
Global Express	98,000
Gulfstream 650	99,600
MTOW = maximum takeoff weight	

Source: FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*

Table 3D presents the results of the runway length analysis for business jets that was developed following the guidance provided in AC 150/5325-4B. To accommodate 75 percent of the business jet fleet at 60 percent useful load, a runway length of 5,500 feet is recommended. This length is derived from a raw length of 4,766 feet which is adjusted, as recommended, for runway gradient and consideration of landing length needs on a contaminated (wet and slippery) runway. To accommodate 100 percent of the business jet fleet at 60 percent useful load, 5,500 feet is also the recommended runway length.

TABLE 3D | Runway Length Requirements

Fleet Mix Category	TAKEOFF LENGTHS		LANDING LENGTHS	Final Runway Length
	Raw Runway Length from FAA AC	Runway Length with Gradient Adjustment (+360')	Wet Surface Landing Length for Jets (+15%)*	
75% of Fleet at 60% Useful Load	4,766	4,768	5,480	5,500
100% of Fleet at 60% Useful Load	5,451	5,453	5,500	5,500
75% of Fleet at 90% Useful Load	6,083	6,085	6,995	7,000
100% of Fleet at 90% Useful Load	7,995	7,997	7,000	8,000
*Max. 5,500' for 60% useful load and max. 7,000' for 90% useful load in wet condition				

Source: FAA AC 150/5325-4B, Runway Length Requirements for Airport Design

Utilization of the 90 percent category for runway length determination is generally not considered by the FAA unless there is a demonstrated need at an airport, such as documented activity by a business jet operator that flies out frequently with heavy loads. To accommodate 75 percent of the business jet fleet at 90 percent useful load, a runway length of 7,000 feet is recommended. To accommodate 100 percent of business jets at 90 percent useful load, a runway length of 8,000 feet is recommended.

Another method to determine runway length requirements for aircraft at Merrill Municipal Airport is to examine aircraft flight planning manuals under conditions specific to the airport. Several aircraft were analyzed for takeoff length requirements at a design temperature of 80.2 degrees F and a field elevation of 1,318.2 feet MSL with a 0.24 percent runway grade. **Table 3E** provides a detailed runway length analysis for some of the most common turbine aircraft in the national fleet. This data was obtained from Ultranav software, which computes operational parameters for specific aircraft based on flight manual data. The analysis includes the maximum takeoff weight (MTOW) allowable and the percent useful load from 60 percent to 100 percent.

TABLE 3E | Business Aircraft Takeoff Length Requirements – Runway 7-25

		TAKEOFF LENGTH REQUIREMENTS (feet)				
		Useful Load				
Aircraft Name	MTOW	60%	70%	80%	90%	100%
Pilatus PC-12	9,921	2,085	2,254	2,431	2,617	2,811
King Air C90B	10,100	2,573	2,765	2,966	3,176	3,396
King Air C90GTi	10,100	2,638	2,828	3,034	3,239	3,445
Citation Mustang	8,645	2,766	2,976	3,226	3,563	3,929
King Air 350	15,000	3,360	3,499	3,641	3,883	4,204
Citation II (550)	13,300	2,913	3,205	3,517	3,851	4,207
Citation CJ3	13,870	3,561	3,780	4,006	4,270	4,588
Citation 560 XLS	20,200	3,694	3,989	4,279	4,639	5,053
Beechjet 400A	16,300	3,907	4,202	4,512	4,835	5,184
Lear 40	21,000	4,070	4,382	4,712	5,104	5,604
Hawker 4000	39,500	4,159	4,511	4,888	5,281	5,736
Falcon 50 EX	41,000	4,201	4,638	5,102	5,595	6,052
Challenger 300	38,850	4,330	4,738	5,162	5,598	6,057
Hawker 800/850 XP	28,000	4,238	4,677	5,086	5,582	6,083
Gulfstream 280	39,600	4,171	4,590	5,062	5,590	6,154
Citation III	21,500	4,405	4,807	5,245	5,718	6,226
Citation X	35,700	4,370	4,874	5,341	5,821	6,308
Gulfstream 450	74,600	4,370	4,800	5,273	5,786	6,355
Global 5000	92,500	4,394	4,884	8,397	5,935	6,495
Falcon 900EX	49,200	4,150	4,670	5,260	5,910	6,500
Falcon 7X	70,000	4,335	4,823	5,347	5,904	6,552
Falcon 2000	35,800	4,661	5,083	5,593	6,083	6,814
Challenger 604/605	48,200	4,788	5,284	5,840	6,433	7,036
Gulfstream 650	99,600	4,785	5,281	5,807	6,433	7,119
Lear 60	23,500	4,922	5,405	5,986	6,530	7,125
Global Express	98,000	4,797	5,371	5,975	6,609	7,271
Westwind II	23,500	4,881	5,386	5,912	6,455	Climb Limited

Note: Green cell values are less than or equal to the length of the primary runway at Merrill Municipal Airport; orange cell values are greater than the length of the primary runway at Merrill Municipal Airport.
MTOW = maximum takeoff weight
Climb Limited = input data is outside the operating limits of the aircraft planning manual

Source: Ultranav software

All of the aircraft analyzed are capable of departing at MTOW on the existing runway length during hot weather with useful loads up to 60 percent, and the majority can operate with loads up to 70 percent. Beyond that, the fleet mix analyzed becomes more weight-restricted or, in some cases, unable to take off at loads exceeding 80 percent.

Table 3F presents the runway length required for landing under three operational categories: Title 14 Code of Federal Regulations (CFR) Part 91, CFR Part 135, and CFR Part 91k. CFR Part 25 operations are those conducted by private individuals or companies that own their aircraft. CFR Part 135 applies to all for-hire charter operations, including most fractional ownership operations. CFR Part 91k includes operations in fractional ownership that utilize their own aircraft under direction of pilots specifically assigned to said aircraft. Part 91k and Part 135 rules regarding landing operations require operators to land at the destination airport within 60 percent of the effective runway length. An additional rule allows for operators to land within 80 percent of the effective runway length if the operator has an approved destination airport analysis in the airport's program operating manual. The landing length analysis accounts for both scenarios.

TABLE 3F | Business Aircraft Landing Length Requirements – Runway 7-25

		LANDING LENGTH REQUIREMENTS (feet)					
		Dry Runway Condition			Wet Runway Condition		
Aircraft Name	MLW	Part 91	80% Rule	60% Rule	Part 91	80% Rule	60% Rule
Westwind II	19,000	2,470	3,088	4,117	2,840	3,550	4,733
Global 5000	78,600	2,733	3,416	4,555	3,143	3,929	5,238
Global Express	78,600	2,733	3,416	4,555	3,143	3,929	5,238
King Air 350	15,000	2,873	3,591	4,788	3,304	4,130	5,507
Falcon 7X	62,400	3,005	3,756	5,008	3,455	4,319	5,758
Falcon 50 EX	35,715	3,007	3,759	5,012	3,458	4,323	5,763
Gulfstream 280	32,700	3,015	3,769	5,025	3,467	4,334	5,778
Citation Mustang	8,000	2,557	3,196	4,262	3,585	4,481	5,975
Lear 40	19,200	2,876	3,595	4,793	3,643	4,554	6,072
Falcon 2000	33,000	3,210	4,013	5,350	3,691	4,614	6,152
Hawker 4000	33,500	3,271	4,089	5,452	3,762	4,703	6,270
Hawker 800/850 XP	23,350	2,730	3,413	4,550	4,093	5,116	6,822
Citation CJ3	12,750	3,084	3,855	5,140	4,200	5,250	7,000
Falcon 900EX	44,500	3,769	4,711	6,282	4,335	5,419	7,225
Challenger 604/605	38,000	2,877	3,596	4,795	4,396	5,495	7,327
Lear 60	19,500	3,660	4,575	6,100	4,887	6,109	8,145
Challenger 300	33,750	2,669	3,336	4,448	5,116	6,395	8,527
Gulfstream 650	83,500	3,895	4,869	6,492	5,118	6,398	8,530
Citation 560 XLS	18,700	3,492	4,365	5,820	5,499	6,874	9,165
Citation X	31,800	3,889	4,861	6,482	5,549	6,936	9,248
Beechjet 400A	15,700	3,762	4,703	6,270	5,592	6,990	9,320
Gulfstream 450	66,000	3,349	4,186	5,582	5,716	7,145	9,527
Citation II (550)	12,700	2,475	3,094	4,125	5,982	7,478	9,970
Citation III	19,000	4,173	5,216	6,955	6,050	7,563	10,083
King Air C90GTi	9,600	1,405	1,756	2,342	N/A	N/A	N/A
King Air C90B	9,600	1,370	1,713	2,283	N/A	N/A	N/A
Pilatus PC-12	9,921	2,336	2,920	3,893	N/A	N/A	N/A

Note: Green cell values are less than or equal to the length of the primary runway at Merrill Municipal Airport; orange cell values are greater than the length of the primary runway at Merrill Municipal Airport.
MLW = maximum landing weight
N/A = not applicable; some turboprop aircraft landing lengths are not adjusted for wet runway conditions

Source: Ultranav software

The landing length analysis shows that all Part 91 and most Part 91k/Part 135 operations (with the Citation III as the exception) can land on the available runway length at Merrill Municipal Airport during dry runway conditions, under the 80 percent rule. About half of the aircraft analyzed can land in dry runway conditions under the 60 percent rule. During wet (or contaminated) runway conditions, a majority of the aircraft analyzed and operating under Part 91 can land, but fewer aircraft are able to operate under the 80 percent and 60 percent rules.

Runway Length Summary

Many factors are considered when determining appropriate runway length for safe and efficient operations of aircraft at Merrill Municipal Airport. The airport should strive to accommodate smaller business jets and turboprop aircraft to the greatest extent possible, as demand dictates. Primary Runway 7-25 is currently 5,100 feet long and, as detailed in the tables above, can accommodate many of the more common business jets operating at Merrill Municipal Airport under moderate loading conditions.

Justification for any runway extension to meet the needs of turbine aircraft would require regular use (500 annual itinerant operations) by these aircraft, which is the minimum threshold required to obtain FAA grant funding assistance. While the primary runway at RRL currently exceeds the recommended length for all small aircraft, the runway length recommendation per FAA AC 150/5325-4B is 5,500 feet to accommodate at least 75 percent of the business jet fleet at 60 percent useful load. Moreover, roughly half of the turbine aircraft currently using and anticipated to use the runway at Merrill Municipal Airport are unable to operate when taking on useful loads of 80 percent and greater, according to Ultranav calculations. As such, runway extension options should be considered.

Consideration should also be given to the potential for extending Runway 16-34, which is currently 2,997 feet long. As detailed previously, guidance from AC 150/ 5325-4B recommends a length of 3,400 feet to accommodate 95 percent of small aircraft with fewer than 10 passenger seats. A runway length justification report previously completed for the crosswind runway also determined that a length of 3,400 feet would be justified. This report, which is included as **Appendix C**, was prepared in 2018 by the airport's engineer and a representative from the Wisconsin Department of Transportation (WisDOT) Bureau of Aeronautics (BOA). As such, the alternatives in the next chapter will examine potential extensions up to 5,500 feet for Runway 7-25, and up to 3,400 feet for Runway 16-34 while considering appropriate safety design standards (these standards will be detailed later in this chapter).

Runway Width | Runway width design standards are primarily based on the critical aircraft but can also be influenced by the visibility minimums of published instrument approach procedures. For primary Runway 7-25, existing/future RDC A-I-5000 design criteria stipulate a runway width of 60 feet, while ultimate RDC B-II-4000 standards call for a width of 75 feet. Runway 7-25 is currently 75 feet wide, which should be maintained throughout the planning period.

For crosswind Runway 16-34, the RDC is A-I-VIS in the existing condition with the potential to convert to A-I-5000 if an instrument approach procedure with minimums not lower than one mile were to be implemented. The runway width standard for both scenarios is 60 feet. Crosswind Runway 16-34 is currently 75 feet wide. While the additional width provides added safety enhancements for aircraft that operate at the airport, it is likely that the FAA will only participate in maintaining the recommended width of 60 feet for Runway 16-34, should this runway continue to be eligible for grant funding assistance. If so, it should be noted that future maintenance/rehabilitation projects should account for the potential that the airport sponsor may be responsible for maintaining the additional width beyond the standard on the runway in the event it wants to maintain 75 feet.

Pavement Strength | An important feature of airfield pavement is its ability to withstand repeated use by aircraft of varying weights. The FAA reports the pavement strength for primary Runway 7-25 as 45,000 pounds for single wheel aircraft (S), 65,000 pounds for dual wheel aircraft (D), and 100,000 pounds for dual tandem wheel aircraft (2D). Crosswind Runway 16-34 is reported to have a weight-bearing capacity of 26,000 S.

The strength rating of a runway does not preclude aircraft weighing more than the published strength rating from using the runway. All federally obligated airports must remain open to the public, and it is typically up to the pilot of the aircraft to determine if a runway can safely support their aircraft. An airport sponsor cannot restrict an aircraft from using the runway simply because its weight exceeds the published strength rating. On the other hand, the airport sponsor has an obligation to properly maintain and protect the useful life of the runway, typically for 20 years.

The strength rating of a runway can change over time. Regular usage by heavier aircraft can decrease the strength rating, while periodic runway resurfacing can increase the strength rating. The current runway strength rating on each runway is adequate to accommodate the aircraft that currently and are anticipated to operate at the airport. The ultimate critical aircraft, represented by the King Air 350, can weigh 15,000 pounds on dual-wheel main landing gear; therefore, the existing pavement strength rating for each runway is sufficient throughout the planning period.

Runway Line-of-Sight and Gradient | The FAA has instituted various line-of-sight requirements to facilitate coordination among aircraft and between aircraft and vehicles that are operating on active runways. This allows departing and arriving aircraft to verify the location and actions of other aircraft and vehicles on the ground that could create a conflict.

Line-of-sight standards for an individual runway are based on whether there is a parallel taxiway available. When a partial-parallel taxiway is available, then any point five feet above the runway centerline must be mutually visible with any other point five feet above the runway centerline. Both runways meet the line-of-sight standard.

The surface gradient of a runway affects aircraft performance and pilot perception. The surface gradient is the maximum allowable slope for a runway. For runways designated for approach categories A and B, the maximum longitudinal grade is 2.0 percent. Runway 7-25 has a longitudinal grade of 0.24 percent, while Runway 16-34 has a longitudinal grade of 0.48 percent. Both runways meet the gradient standard.

SAFETY AREA DESIGN STANDARDS

The FAA has established several imaginary surfaces to protect aircraft operational areas and keep them free from obstructions. These include the runway safety area (RSA), runway object free area (ROFA), runway obstacle free zone (ROFZ), and runway protection zone (RPZ).

The entire RSA, ROFA, and ROFZ must be under the direct ownership of the airport sponsor to ensure these areas remain free of obstacles and can be readily accessed by maintenance and emergency personnel. RPZs should also be under airport ownership. An alternative to outright ownership of the RPZ is the purchase of avigation easements (acquiring control of designated airspace within the RPZ) or having sufficient land use control measures in place which ensure the RPZ remains free of incompatible development. The various airport safety areas and their dimensions, as sourced from FAA AC 150/5300-13B, *Airport Design*, are presented graphically on **Exhibit 3B**.

Runway Safety Area | The RSA is defined in FAA AC 150/5300-13B, *Airport Design,* as a "defined area surrounding the runway consisting of a prepared surface suitable for reducing the risk of damage to aircraft in the event of undershoot, overshoot, or excursion from the runway." The RSA is centered on the runway and dimensioned in accordance with the approach speed of the critical aircraft using the runway. The FAA requires the RSA to be cleared and graded, drained by grading or storm sewers, capable of accommodating the critical aircraft and fire and rescue vehicles, and free of obstacles not fixed by navigational purpose, such as runway edge lights or approach lights.

The FAA places high significance on maintaining adequate RSA at all airports. Under Order 5200.8, effective October 1, 1999, the FAA established the *Runway Safety Area Program.* The Order states, "The objective of the Runway Safety Area Program is that all RSAs at federally obligated airports…shall conform to the standards contained in AC 150/5300-13, *Airport Design*, to the extent practicable." Each Regional Airports Division of the FAA is obligated to collect and maintain data on the RSA for all runways and perform airport inspections.

As shown on **Exhibit 3B**, for existing/future RDC A-I-5000 design standards on primary Runway 7-25, the FAA calls for the RSA to be 120 feet wide and extend 240 feet beyond the runway ends. In the ultimate RDC B-II-4000 environment, the dimensions of the Runway 7-25 RSA increase to 150 feet wide and extending 300 feet beyond the end of the runway. For crosswind Runway 16-34 in both the existing and ultimate runway environment, the RSA dimensions are 120 wide and extending 240 feet beyond the runway ends. For both runways, at the dimensions detailed above, the RSA is fully contained within airport property and free of obstructions.

Runway Object Free Area | The ROFA is "a clear area limited to equipment necessary for air and ground navigation and provides wingtip protection in the event of an aircraft excursion from the runway." It is a two-dimensional ground area surrounding runways, taxiways, and taxilanes which is clear of objects, except for objects with locations fixed by function (i.e., airfield lighting). The ROFA does not have to be graded and level like the RSA; instead, the primary requirement for the ROFA is that no object in the ROFA penetrates the lateral elevation of the RSA. The ROFA is centered on the runway, extending out in accordance with the critical aircraft utilizing the runway.

EXISTING RUNWAY DATA	7 - 25	16 - 34
Runway Design Code (RDC)	A-I-5000	A-I-VIS
Runway Safety Area (RSA)	120' wide x 240' beyond runway end	120' wide x 240' beyond runway end
Runway Object Free Area (ROFA)	400' wide x 240' beyond runway end	400' wide x 240' beyond runway end
Runway Obstacle Free Zone (ROFZ)	400' wide x 200' beyond runway end	250' wide x 200' beyond runway end
Runway Protection Zones		
Approach (inner width x outer width x length)	1,000' x 500' x 700'	1,000' x 500' x 700'
Departure (inner width x outer width x length)	1,000' x 500' x 700'	1,000' x 500' x 700

ULTIMATE RUNWAY DATA	7 - 25	16 - 34
Runway Design Code (RDC)	B-II-4000	A-I-5000
Runway Safety Area (RSA)	150' wide x 300' beyond runway end	Same as Existing
Runway Object Free Area (ROFA)	500' wide x 300' beyond runway end	Same as Existing
Runway Obstacle Free Zone (ROFZ)	Same as Existing	Same as Existing
Runway Protection Zones		
Approach (inner width x outer width x length)	1,700'x 1,000' x 1,510'	Same as Existing
Departure (inner width x outer width x length)	Same as Existing	Same as Existing

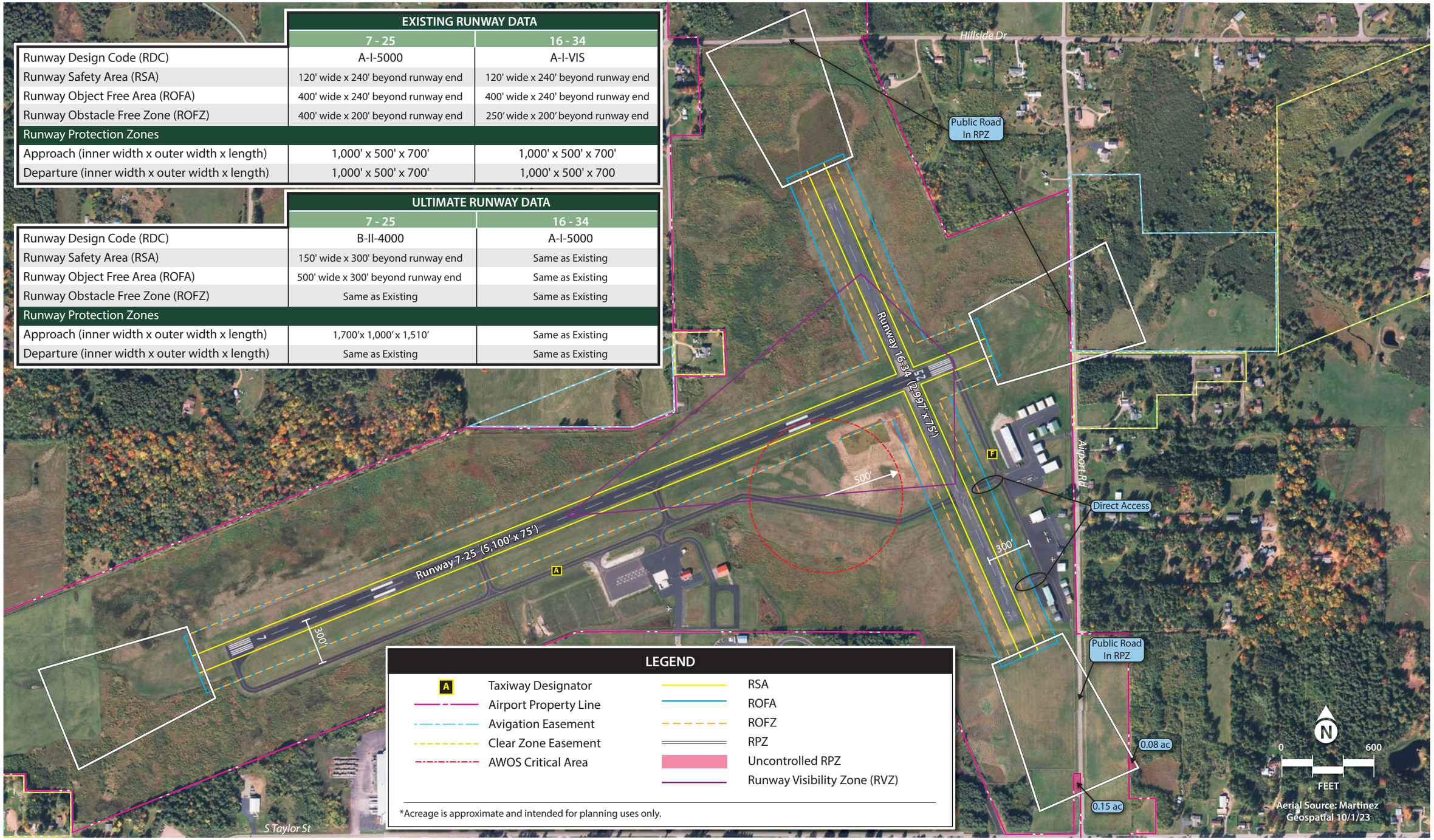


Exhibit 3B
EXISTING RUNWAY SAFETY AREAS

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The ROFA design standards associated with primary Runway 7-25 for existing/future RDC A-I-5000 are set at 400 feet wide and extending 240 feet beyond the runway end. These dimensions increase to 500 feet wide and extending 300 feet beyond the end of the runway in the ultimate B-II-4000 environment. For crosswind Runway 16-34, the ROFA dimensions are 400 feet wide and extending 240 feet beyond the end of the runway for both the existing and ultimate conditions. The ROFAs associated with each runway in both the existing and ultimate scenarios are fully contained on airport property. In the existing condition, the ROFAs are free of obstructions; however, in the ultimate condition, the supplemental wind cone near Runway 7 would become an obstruction. The alternatives will consider relocation of the supplemental wind cone outside of this safety area.

Obstacle Free Zone | The ROFZ is an imaginary surface that precludes object penetrations, including taxiing and parked aircraft. The only allowance for ROFZ obstructions is navigational aids mounted on frangible bases which are fixed in their locations by function, such as airfield signs. The ROFZ is established to ensure the safety of aircraft operations. If the ROFZ is obstructed, the airport's approaches could be removed or approach minimums could be increased.

For all runways serving aircraft over 12,500 pounds, the ROFZ is 400 feet wide, centered on the runway, and extends 200 feet beyond the runway ends. This standard applies to primary Runway 7-25 at Merrill Municipal Airport. For runways serving small aircraft under 12,500 pounds but with approach speeds greater than or equal to 50 knots, the ROFZ is 250 feet wide, centered on the runway, and extends 200 feet beyond the runway ends. This standard applies to crosswind Runway 16-34. Under the current evaluation with available data, there are no ROFZ obstructions at the airport.

Runway Protection Zone | An RPZ is a trapezoidal area centered on the extended runway centerline beginning 200 feet from the end of the runway. This safety area is established to protect the end of the runway from airspace penetrations and incompatible land uses. The RPZ dimensions are based on the established RDC and the approach visibility minimums serving the runway. While the RPZ is intended to be clear of incompatible objects or land uses, some uses are permitted with conditions and other land uses are prohibited. According to AC 150/5300-13B, the following land uses are permissible within the RPZ:

- Farming that meets the minimum buffer requirements;
- Irrigation channels, as long as they do not attract birds;
- Airport service roads, as long as they are not public roads and are directly controlled by the airport operator;
- Underground facilities, as long as they meet other design criteria, such as RSA requirements, as applicable;
- Unstaffed navigational aids (NAVAIDs) and facilities, such as those required for airport facilities that are fixed by function in regard to the RPZ; and
- Aboveground fuel tanks associated with backup generators for unstaffed NAVAIDS.

In September 2022, the FAA published AC 150/5190-4B, *Airport Land Use Compatibility Planning*, which states that airport owner control over RPZs is preferred. Airport owner control over RPZs may be achieved through:

- Ownership of the RPZ property in fee simple;
- Possessing sufficient interest in the RPZ property through easements, deed restrictions, etc.;
- Possessing sufficient land use control authority to regulate land use in the jurisdiction containing the RPZ;
- Possessing and exercising the power of eminent domain over the property; or
- Possessing and exercising permitting authority over proponents of development within the RPZ (e.g., where the sponsor is a state).

AC 150/5190-4B further states that "control is preferably exercised through acquisition of sufficient property interest and includes clearing RPZ areas (and keeping them clear) of objects and activities that would impact the safety of people and property on the ground." The FAA recognizes that land ownership, environmental, geographical, and other considerations can complicate land use compatibility within RPZs; regardless, airport sponsors must comply with FAA grant assurances, including but not limited to Grant Assurance 21, *Compatible Land Use*. Sponsors are expected to take appropriate measures to "protect against, remove, or mitigate land uses that introduce incompatible development within RPZs." For proposed projects that would shift an RPZ into an area with existing incompatible land uses, such as a runway extension or construction of a new runway, the sponsor is expected to have or secure sufficient control of the RPZ, ideally through fee simple ownership. Where existing incompatible land uses are present, the FAA expects sponsors to "seek all possible opportunities to eliminate, reduce, or mitigate existing incompatible land uses" through acquisition, land exchanges, right-of-first-refusal to purchase, agreement with property owners on land uses, easements, or other such measures. These efforts should be revisited during master plan or ALP updates, and periodically thereafter, and documented to demonstrate compliance with FAA grant assurances. If new or proposed incompatible land uses impact an RPZ, the FAA expects the airport to take the above actions to control the property within the RPZ, along with adopting a strong public stance opposing the incompatible land uses.

For new incompatible land uses that result from a sponsor-proposed action (i.e., an airfield project such as a runway extension, a change in the critical aircraft that increases the RPZ dimension, or lower minimums that increase the RPZ dimension), the airport sponsor is expected to conduct an Alternatives Evaluation. The intent of the Alternatives Evaluation is to "proactively identify a full range of alternatives and prepare a sufficient evaluation to be able to draw a conclusion about what is 'appropriate and reasonable.'" For incompatible development off-airport, the sponsor should coordinate with the Airports District Office (ADO) as soon as the sponsor is aware of the development, with the alternatives evaluation conducted within 30 days of the sponsor's first awareness of the development within the RPZ. The following items are typically necessary in an alternatives evaluation:

- Sponsor's statement of the purpose and need of the proposed action (airport project, land use change, or development)
- Identification of any other interested parties and proponents
- Identification of any federal, state, and local transportation agencies involved
- Analysis of sponsor control of the land within the RPZ
- Summary of all alternatives considered, including:
    - Alternatives that preclude introducing the incompatible land use within the RPZ (e.g., zoning action, purchase, and design alternatives, such as implementation of declared distances, displaced thresholds, runway shift or shortening, raising minimums)

  - Alternatives that minimize the impact of the land use in the RPZ (e.g., rerouting a new roadway through less of the RPZ, etc.)
  - Alternatives that mitigate risk to people and property on the ground (e.g., tunnelling, depressing and/or protecting a roadway through the RPZ, implementing operational measures to mitigate any risks, etc.)
- Narrative discussion and exhibits or figures depicting the alternative
- Rough order of magnitude cost estimates associated with each alternative, regardless of potential funding sources
- Practicability assessment based on the feasibility of the alternative in terms of cost, constructability, operational impacts, and other factors

Once the alternatives evaluation has been submitted to the ADO, the FAA will determine whether the sponsor has made an adequate effort to pursue and give full consideration to appropriate and reasonable alternatives. **The FAA will not approve or disapprove the airport sponsor's preferred alternative; rather, the FAA will only evaluate whether an acceptable level of alternatives analysis has been completed before the sponsor makes the decision to allow or not allow the proposed land use within the RPZ.**

In summary, the RPZ guidance published in September 2022 shifts the responsibility of protecting the RPZ to the airport sponsor. The airport sponsor is expected to take action to control the RPZ or to demonstrate that appropriate actions have been taken. The decision to permit or disallow existing or new incompatible land uses within an RPZ is ultimately up to the airport sponsor, with the understanding that the sponsor still has grant assurance obligations, and the FAA retains the authority to review and approve or disapprove portions of the ALP that would adversely impact the safety of people and property within the RPZ.

RPZs have been further designated as approach and departure RPZs. The approach RPZ is a function of the aircraft approach category (AAC) and approach visibility minimums associated with the approach runway end. The departure RPZ is a function of the AAC and departure procedures associated with the runway. For a particular runway end, the more stringent RPZ requirements (usually associated with the approach RPZ) will govern the property interests and clearing requirements the airport sponsor should pursue.

As shown on **Exhibit 3B**, the existing RPZs associated with each runway end are almost entirely controlled by the airport through outright ownership or through protections associated with clear zone and avigation easements. The only uncontrolled areas are located within the Runway 34 RPZ, with two small areas outside the airport's boundary. One of these areas encompasses 0.15-acres and abuts Airport Road. The second uncontrolled area is a 0.08-acre area on the southeast corner of the RPZ. There are public roadways that pass through the RPZs associated with Runways 25, 16, and 34. As mentioned previously, public roadways are generally considered incompatible uses within an RPZ; however, the FAA considers existing roads to be grandfathered so that no corrective action is necessary. It should be noted that a change to the runway environment that alters the size of the RPZ may negate the grandfathered condition. If, in the future, the runways were equipped with lower instrument visibility minimums, then the area contained within the applicable RPZs would increase; thus, the level of potentially incompatible land uses within the larger RPZ would also increase. To lower the visibility minimums, the airport will have to develop a plan of action to mitigate the newly introduced incompatible land uses and work in consultation with the FAA to determine if the additional incompatible land is acceptable. The alternatives discussion in the next chapter will discuss options to mitigate potential incompatibilities (i.e., roads).

SEPARATION STANDARDS

There are several other standards related to separation distances from runways and taxiways. Each is designed to enhance the safety of the airfield.

Runway/Taxiway Separation

The design standard for the separation between runways and parallel taxiways is a function of the critical aircraft and the instrument approach visibility minimum. The separation standard for primary Runway 7-25 in the existing/future RDC A-I-5000 condition is 225 feet from the runway centerline to the parallel taxiway centerline. In the ultimate B-II-4000 environment, the separation standard increases to 240 feet. Parallel Taxiway A is currently separated from the runway by 300 feet and should be maintained in its current location. For crosswind Runway 16-34, the runway-to-taxiway separation standard in both the existing and ultimate conditions is 225 feet. Taxiway F is located 300 feet from Runway 16-34 and should be maintained in its current location.

Hold Line Position Separation

Hold line position markings are placed on taxiways leading to runways. When instructed, pilots are to stop short of the holding position marking line. The existing and ultimate design standards for both runways call for holding positions to be separated from the runway centerline by 200 feet.

Exhibit 3C – Hold Line Separation

At Merrill Municipal Airport, each hold line position marking on taxiways leading to primary Runway 7-25 is situated 200 feet from the runway centerline, with the exception of the hold line on Taxiway F where it connects to Runway 25, as shown on **Exhibit 3C**. This holding position is located 125 feet from the runway centerline. The holding positions on taxiways connecting to crosswind Runway 16-34 on the east side are situated 125 feet from the runway centerline, while the hold line on the west side of the runway is located 200 feet from the centerline. The alternatives in the next chapter will consider relocating the hold lines that do not meet the 200-foot separation standard.

Aircraft Parking Area Separation

According to FAA AC 150/5300-13B, aircraft parking positions should be located to ensure that aircraft components (wings, tail, and fuselage) do not:

1. Conflict with the object free area for adjacent runway or taxiways:
   a. Runway object free area (ROFA)
   b. Taxiway object free area (TOFA)
   c. Taxilane object free area (TLOFA)
2. Violate any of the following aeronautical surfaces and areas:
   a. Runway approach or departure surface
   b. Runway visibility zone (RVZ)
   c. Runway obstacle free zone (ROFZ)
   d. Navigational aid equipment critical areas

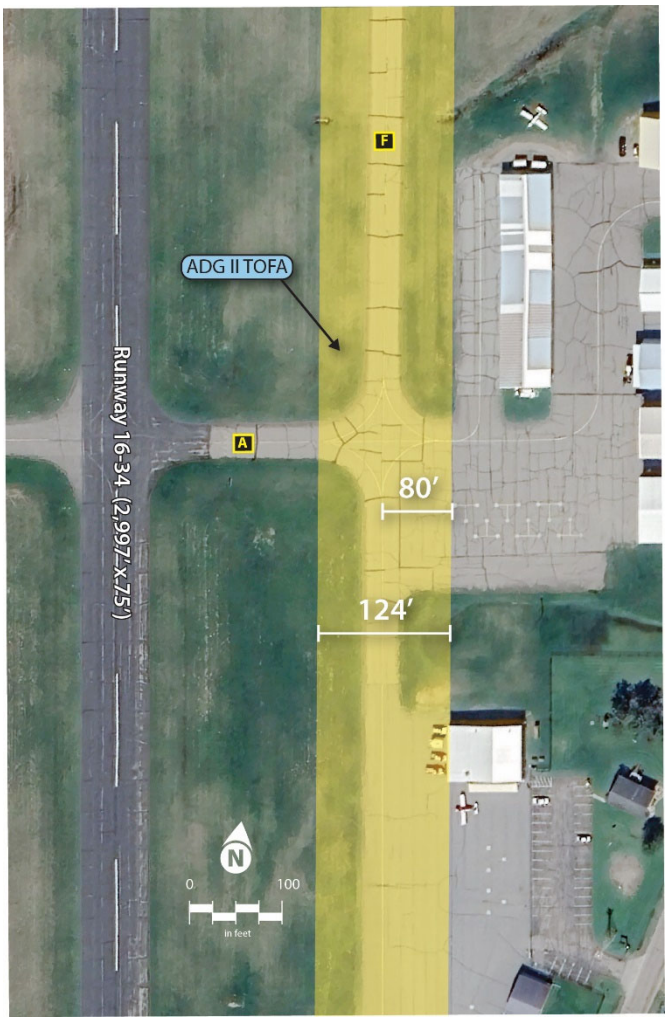

Exhibit 3D – Aircraft Parking Area Separation

Existing aircraft parking positions at Merrill Municipal Airport are located on each of the three aircraft parking aprons. In their existing locations, each marked aircraft parking position at RRL is clear of the safety areas, as well as the aeronautical surfaces and areas detailed above. When considering each area detailed above, the nearest marked tiedown is located on the FBO apron and is separated from the taxiway centerline by approximately 80 feet. As illustrated in **Exhibit 3D**, this parking position is clear of the TOFA[2] associated with Taxiway F.

TAXIWAYS

The design standards associated with taxiways are determined by the taxiway design group (TDG) or the ADG of the critical aircraft. As determined previously, the applicable ADG for both runways in the existing condition is ADG I, with primary Runway 7-25 identified as ADG II in the ultimate condition. **Table 3G** presents the various taxiway design standards related to both ADG I and II. The table also shows those taxiway design standards related to TDG. The TDG standards are based on the main gear width (MGW) and cockpit to main gear (CMG) distance of the critical aircraft expected to use those taxiways. Different taxiway and taxilane pavements can and should be planned to the most appropriate TDG design standards based on usage.

[2] The TOFA illustrated in Exhibit 3D is representative of an Airplane Design Group (ADG) II TOFA, which measures 124 feet wide, centered on the taxiway centerline.

The current design for all taxiways at RRL is TDG 2A, which dictates a width of 35 feet. Taxiway A and its associated connectors are currently 35 feet wide, while Taxiway F and its connectors are 40 feet wide. While the 40-foot width provides an added safety margin for aircraft operating at the airport, the BOA may elect not to fund regular pavement maintenance for the portions of taxiway pavement that exceed the standard. If the airport chooses to maintain the taxiways at their current widths, the costs may need to come from a local funding source, rather than federal or state grant monies. Certain portions of the landside area that are utilized exclusively by small aircraft, such as the T-hangar areas, should adhere to TDG 1A/1B standards.

Table 3G | Taxiway Dimensions and Standards

STANDARDS BASED ON WINGSPAN	ADG I	ADG II
Taxiway and Taxilane Protection		
Taxiway Safety Area Width (TSA)	49’	79’
Taxiway Object Free Area Width (TOFA)	89’	124’
Taxilane Object Free Area Width (TLOFA)	79’	110’
Taxiway and Taxilane Separation		
Taxiway Centerline to Parallel Taxiway Centerline	70’	101.5’
Taxiway Centerline to Fixed or Moveable Object	44.5’	62’
Taxilane Centerline to Parallel Taxilane Centerline	64’	94.5’
Taxilane Centerline to Fixed or Moveable Object	39.5’	55’
Wingtip Clearance		
Taxiway Wingtip Clearance (feet)	20’	22.5’
Taxilane Wingtip Clearance (feet)	15’	15.5’
STANDARDS BASED ON TDG	**TDG 1A/B**	**TDG 2A/B**
Taxiway Width Standard	25’	35’
Taxiway Edge Safety Margin	5’	7.5’
Taxiway Shoulder Width	10’	15’

ADG = airplane design group
TDG = taxiway design group
Note: All dimensions are in feet.

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

Exhibit 3E depicts the TOFA and TLOFA, which are based upon ADG I standards in the existing condition. The TOFA for taxiways serving either runway is 89 feet wide, while the TLOFA for taxilanes serving hangar areas is 79 feet wide. Like the ROFA, these areas should be cleared of objects and parked aircraft, except for objects needed for air navigation or aircraft ground maneuvering purposes. The TOFAs associated with the airfield taxiways and TLOFAs associated with hangar areas are clear of obstructions, except for potential penetrations of the TLOFAs between the hangars on the southeast side of the airport and adjacent the T-hangar on the north side. Currently, there is approximately 78 feet of separation between the hangars on the southeast side, which is just shy of a standard ADG I TLOFA. On the north side, the western edge of the T-hangar is situated approximately 26 feet from the taxilane centerline. When applying the 79-foot standard TLOFA to this taxilane, a penetration to the TLOFA results; however, taxilanes can be designed based on the types of aircraft using that pavement, meaning that a smaller TLOFA standard could apply depending on the type of aircraft using those taxilanes.

In the ultimate B-II-4000 condition, ADG II standards would apply to taxiways serving primary Runway 7-25. The width of the TOFA in this environment increases to 124 feet wide, centered on the taxiway. When this standard is applied, the TOFA on taxiways serving crosswind Runway 7-25 remains clear of obstructions.

Exhibit 3E
TAXIWAY AND TAXILANE OBJECT FREE AREAS

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Taxiway and Taxilane Design Considerations

FAA AC 150/5300-13B, *Airport Design*, provides guidance on recommended taxiway and taxilane layouts to enhance safety by avoiding runway incursions. A runway incursion is defined as "any occurrence at an airport involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft." The following is a list of the taxiway design guidelines and the basic rationale behind each recommendation included in the current AC, as well as previous FAA safety and design recommendations.

1. **Taxiing Method**: Taxiways are designed for cockpit-over-centerline taxiing with pavement that is wide enough to allow a certain amount of wander. On turns, sufficient pavement should be provided to maintain the edge safety margin from the landing gear. When constructing new taxiways, existing intersections should be upgraded to eliminate judgmental oversteering, which is when a pilot must intentionally steer the cockpit outside the marked centerline in order to assure the aircraft remains on the taxiway pavement.
2. **Curve Design**: Taxiways should be designed such that the nose gear steering angle is no more than 50 degrees, which is the generally accepted value to prevent excessive tire scrubbing.
3. **Three-Path Concept**: To maintain pilot situational awareness, taxiway intersections should provide a pilot with a maximum of three choices of travel. Ideally, these are right, left, and a continuation straight ahead.
4. **Channelized Taxiing**: To support visibility of airfield signage, taxiway intersections should be designed to meet standard taxiway width and fillet geometry.
5. **Designated Hot Spots and Runway Incursion Mitigation (RIM) Locations**: A hot spot is a location on the airfield with elevated risk of a collision or runway incursion. Mitigation measures should be prioritized for areas the FAA designates as hot spots or RIM locations.
6. **Intersection Angles**: Design turns to be 90 degrees wherever possible. For acute-angle intersections, standard angles of 30, 45, 60, 120, 135, and 150 degrees are preferred.
7. **Runway Incursions**: Design taxiways to reduce the probability of runway incursions.
   - *Increase Pilot Situational Awareness*: A pilot who knows where he/she is on the airport is less likely to enter a runway improperly. Complexity leads to confusion. Keep taxiway systems simple by using the three-path concept.
   - *Avoid Wide Expanses of Pavement*: Wide pavements require placement of signs far from a pilot's eye. This is especially critical at runway entrance points. Where a wide expanse of pavement is necessary, avoid direct access to a runway.
   - *Limit Runway Crossings*: The taxiway layout can reduce the opportunity for human error. The benefits are twofold – through a simple reduction in the number of occurrences and a reduction in air traffic controller workload.
   - *Avoid High Energy Intersections*: These are intersections in the middle third of runways. By limiting runway crossings to the first and last thirds of the runway, the portion of the runway where a pilot can least maneuver to avoid a collision is kept clear.
   - *Increase Visibility*: Right-angle intersections, between both taxiways and runways, provide the best visibility. Acute-angle runway exits provide greater efficiency in runway usage but should not be used as runway entrance or crossing points. A right-angle turn at the end of a parallel taxiway is a clear indication of approaching a runway.

- *Avoid Dual Purpose Pavements*: Runways used as taxiways and taxiways used as runways can lead to confusion. A runway should always be clearly identified as a runway, and only a runway.
- *Direct Access*: Do not design taxiways to lead directly from an apron to a runway. Such configurations can lead to confusion when a pilot typically expects to encounter a parallel taxiway.
- *Hot Spots*: Confusing intersections near runways are more likely to contribute to runway incursions. These intersections must be redesigned when the associated runway is subject to reconstruction or rehabilitation. Other hot spots should be corrected as soon as practicable.

8. **Runway/Taxiway Intersections**

- *Right Angle*: Right-angle intersections are the standard for all runway/taxiway intersections, except where there is a need for an acute-angled exit. Right-angle taxiways provide the best visual perspective to a pilot approaching an intersection with the runway to observe aircraft in both the left and right directions. They also provide optimal orientation of the runway holding position signs so they are visible to pilots.
- *Acute Angle*: Acute angles should not be larger than 45 degrees from the runway centerline. A 30-degree taxiway layout should be reserved for high-speed exits. The use of multiple intersecting taxiways with acute angles creates pilot confusion and improper positioning of taxiway signage. The construction of high-speed exits is typically only justified for runways with regular use by jet aircraft in approach categories C and above.
- *Large Expanses of Pavement*: Taxiways must never coincide with the intersection of two runways. Taxiway configurations with multiple taxiway and runway intersections in a single area create large expanses of pavement, making it difficult to provide proper signage, marking, and lighting.

9. **Taxiway/Runway/Apron Incursion Prevention**: Apron locations that allow direct access into a runway should be avoided. Increase pilot situational awareness by designing taxiways in a manner that forces pilots to consciously make turns. Taxiways originating from aprons and forming a straight line across runways at mid-span should be avoided.

- *Wide Throat Taxiways*: Wide throat taxiway entrances should be avoided. Such large expanses of pavement may cause pilot confusion and make lighting and marking more difficult.
- *Direct Access from Apron to a Runway*: Avoid taxiway connectors that cross over a parallel taxiway and directly onto a runway. Consider a staggered taxiway layout or a no-taxi island that forces pilots to make a conscious decision to turn.
- *Apron to Parallel Taxiway End*: Avoid direct connection from an apron to a parallel taxiway at the end of a runway.

The taxiway system at Merrill Municipal Airport generally provides for the efficient movement of aircraft, and there are no FAA-designated hot spots at the airport; however, there is direct access from both aprons on the east side of the airport, as shown on **Exhibit 3F**. Additionally, the lack of taxiway access to Runway 16 requires pilots to back-taxi, which could be considered a dual purpose use of Runway 16-34 (i.e., the runway being used as a taxiway). Potential solutions to correct this issue will be examined in the alternatives chapter. Analysis in the next chapter will also consider improvements that could be implemented on the airfield to minimize runway incursion potential, improve efficiency, and conform to FAA standards for taxiway design.

Taxilane Design Considerations

Taxilanes are distinguished from taxiways in that they do not provide access to or from the runway system directly. Taxilanes typically provide access to hangar areas and can be planned to varying design standards, depending on the type of aircraft utilizing the taxilane, as described previously.

Exhibit 3F – Direct Access

NAVIGATIONAL AND APPROACH AIDS

Navigational aids are devices that provide pilots with guidance and position information when utilizing the runway system. Electronic and visual guidance to arriving aircraft enhance the safety and capacity of the airfield. Such facilities are vital to the success of an airport and provide additional safety to pilots and passengers using the air transportation system. While instrument approach aids are especially helpful during poor weather, they are often used by pilots conducting flight training and operating larger aircraft when visibility is good.

Instrument Approach Aids

Merrill Municipal Airport has two published instrument approaches. A localizer performance with vertical guidance (LPV) via an area navigation (RNAV) GPS instrument approach is available to each end of Runway 7-25. This approach has visibility minimums down to one-mile for Categories A, B, and C aircraft, but is not available to Category D aircraft. These approaches are considered adequate for primary Runway 7-25 at this time. If, however, a reduction in the visibility minimums to lower than one-mile but not below ¾-mile were implemented, it would result in an increase to the RPZ dimensions for the affected runway. **Exhibit 3G** presents a comparison of the RPZs currently serving Runways 7 and 25 versus what they would be if visibility minimums not lower than ¾-mile were to be implemented. As can be seen in the graphic, the RPZs would increase significantly in size, resulting in areas of uncontrolled property containing potentially incompatible land uses, including residential land uses. If Runway 7-25 is extended in the future, additional property would be uncontrolled with potentially incompatible land uses. For planning purposes, the alternatives to follow in the next chapter will depict instrument approaches with not lower than ¾-mile minimums on Runway 7-25, which correlates to the ultimate B-II-4000 environment.

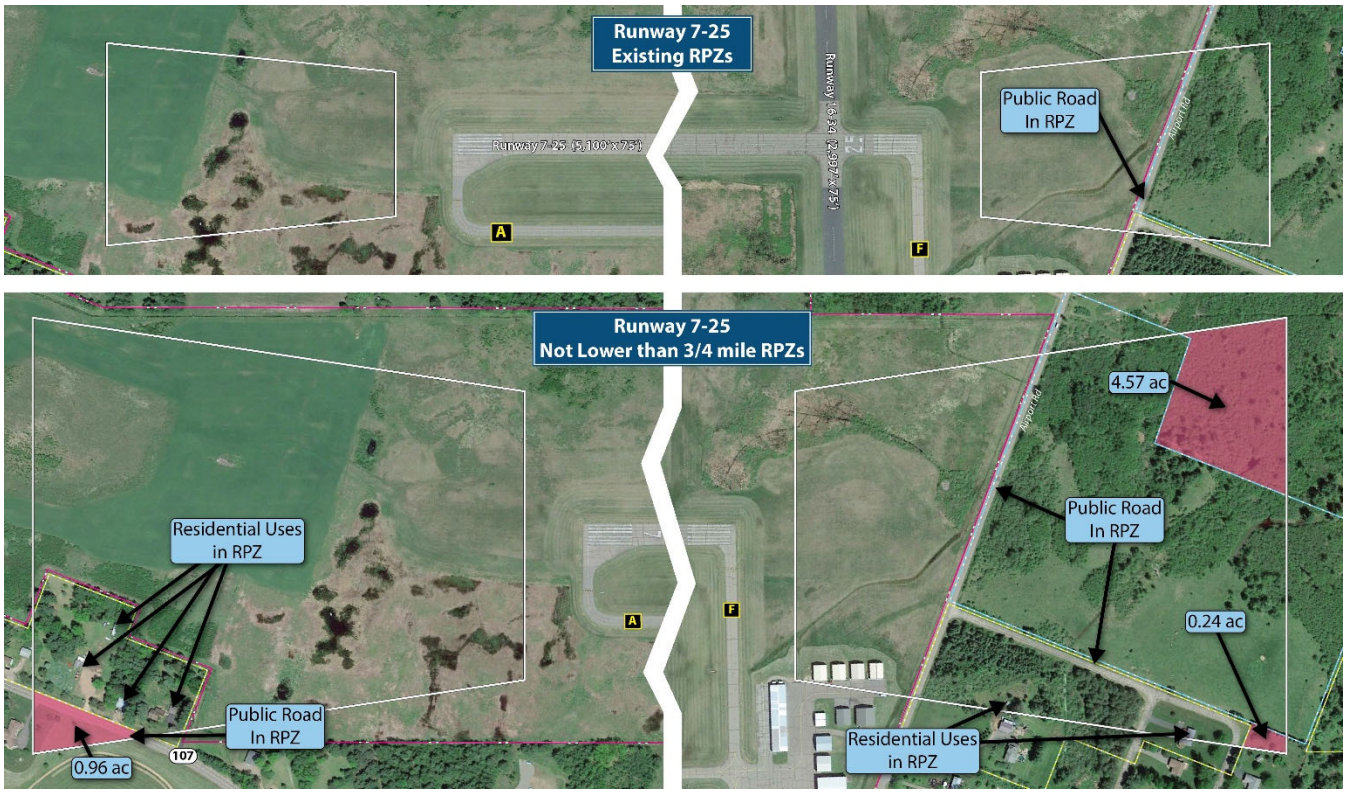

Exhibit 3G – RPZ Dimension Comparison

Crosswind Runway 16-34 is currently a visual runway with no published instrument approach procedures. For future planning purposes, the alternatives will consider the possible implementation of an instrument approach procedure with visibility minimums not lower than one-mile. This would not alter the size of the existing RPZs associated with Runway 16-34.

Visual Approach Aids

In most instances, the landing phase of any flight must be conducted in visual conditions. To provide pilots with visual guidance information during landings to the runway, electronic visual approach aids are commonly provided at airports. Both ends of primary Runway 7-25 are currently equipped with a two-box precision approach path indicator (PAPI-2). As more turbine aircraft begin to operate at the airport, consideration should be given to upgrading the PAPI-2 to a PAPI-4 (four-box system) on each runway end.

Runway end identification lights (REILs) are flashing lights located at the runway threshold end that facilitate rapid identification of the runway end at night and during poor visibility conditions. REILs provide pilots with the ability to identify the runway thresholds and distinguish the runway end lighting from the other lighting on the airport and in the approach areas. The FAA indicates that REILs should be considered for all lighted runway ends not planned for more sophisticated approach lighting systems. Both ends of primary Runway 7-25 are equipped with REILs, which should be maintained.

Crosswind Runway 16-34 is not equipped with any visual approach aids. Consideration should be given to installing PAPI-2 systems and REILs at each runway end, especially if the runway is to be served by a published instrument approach procedure.

Weather Reporting Aids

Merrill Municipal Airport has a lighted wind cone and wind tee, which are centrally located near the intersection of the two runways and adjacent Taxiway A. A supplemental wind cone is located near Runway 7. These provide information to pilots regarding wind speed and direction and should be maintained through the planning period. A segmented circle is often co-located with an airport's primary wind cone. The segmented circle consists of a system of visual indicators designed to provide traffic pattern information to pilots. RRL does not have a segmented circle, and consideration should be given to installing one.

The airport is also equipped with an automated weather observation station (AWOS-3), which provides weather observations 24 hours per day. The system updates weather observations every minute, continuously reporting significant weather changes as they occur in real time. This information is transmitted via a designated radio frequency at regular intervals. FAA siting criteria indicate that the AWOS should be located between 1,000 and 3,000 feet from the runway threshold and between 500 to 1,000 feet perpendicular to the runway centerline. The AWOS also has a 500-foot radius critical area which must be kept free of obstructions that could interfere with its sensors. The AWOS at Merrill Municipal Airport should be maintained in its current location through the planning period.

AIRFIELD LIGHTING, MARKING, AND SIGNAGE

Several lighting and pavement marking aids serve pilots using the airport. These aids assist pilots in locating the airport and runway at night or in poor visibility conditions. They also serve aircraft navigating the airport environment on the ground when transitioning to/from aircraft parking areas to the runway.

Airport Identification Lighting | Merrill Municipal Airport's rotating beacon is located on the east side of the airport property at the entrance to the public parking area. The beacon is in poor condition. Consideration should be given to removing the existing beacon and installing a new beacon near the terminal building.

Runway and Taxiway Lighting | Both runways are equipped with a medium intensity runway lighting (MIRL) system. This system is adequate and should be maintained. Taxiways A and F and their associated taxiways are equipped with medium intensity taxiway lighting (MITL). This system is also adequate and should be maintained. Planning should consider expansion of both MIRL and MITL systems if/when new pavements are constructed.

Airfield Signs | Airfield identification signs assist pilots in identifying their location on the airfield and directing them to their desired location. Lighted signs are installed on the runway and taxiway systems on the airfield. The signage system includes lighted runway and taxiway designations and routing/directional signage. All of these signs should be maintained throughout the planning period.

It should be noted that many airports are transitioning to light emitting diode (LED) systems. LEDs have many advantages, including lower energy consumption, longer lifespan, increased durability, reduced size, greater reliability, and faster switching. While a larger initial investment is required up front, the energy savings and reduced maintenance costs will outweigh any additional costs in the long run. At Merrill Municipal Airport, the taxiway lighting on parallel Taxiway A is LED, while the runway lighting, PAPIs, and REILs have incandescent bulbs. When these systems need to be repaired/replaced, consideration should be given to upgrading them to LED systems.

Pavement Markings | Runway markings are typically designed to the type of instrument approach available on the runway. FAA AC 150/5340-1K, *Standards for Airport Markings*, provides guidance necessary to design airport markings. Runway 7-25 is equipped with non-precision markings, while Runway 16-34 has basic markings. These runway markings should be maintained throughout the long-term planning horizon, with consideration given to upgrading Runway 16-34 to non-precision markings. Non-precision markings would be necessary if an instrument approach were to be established to Runway 16-34.

A summary of the airside facilities at Merrill Municipal Airport is presented on **Exhibit 3H**.

LANDSIDE FACILITY REQUIREMENTS

Landside facilities are those necessary for the handling of aircraft and passengers while on the ground. These facilities provide the essential interface between the air and ground transportation modes. The capacity of the various components of each element was examined in relation to projected demand to identify future landside facility needs. At Merrill Municipal Airport, this includes components for general aviation needs, such as:

- General Aviation Terminal Facilities and Auto Parking
- Aircraft Storage Hangars
- Aircraft Parking Aprons
- Airport Support Facilities

Projections made for aircraft storage hangars, aircraft parking aprons, and marked parking positions are based on the number of aircraft currently based and forecast to base on the airport property over the 20-year planning horizon. Terminal facilities, auto parking, and other airport support facilities are based on the annual number of operations projected to occur over the planning period.

In addition to landside facility requirements, potential non-aeronautical land uses will also be evaluated in subsequent chapters. These are portions of airport property that are suitable for non-aviation purposes and can generate revenue for the airport, such as agriculture or industrial uses. While airport property is generally subject to AIP grant assurances, airports can request a release from aeronautical federal obligations for certain areas of property that are not necessary for aviation uses. These requests are facilitated under the *FAA Reauthorization Act of 2018*, Section 163, which governs the FAA's authority over non-aeronautical development.

	Runway 7-25 Existing/Future	Runway 7-25 Ultimate	Runway 16-34 Existing	Runway 16-34 Ultimate
Runways				
Runway Design Code (RDC)	A-I-5000	B-II-4000	A-I-VIS	A-I-5000
Dimensions	5,100' x 75'	Consider extenstion; maintain width	2,997' x 75'	Consider extenstion; maintain width if feasible
Pavement Strength	45,000 lbs S | 65,000 lbs D | 100,000 lbs 2D	Maintain	26,000 lbs S	Maintain
Safety Areas				
RSA	Standard RSA	Maintain	Standard RSA	Maintain
ROFA	Standard ROFA	Relocate obstruction (wind cone)	Standard ROFA	Maintain
ROFZ	Standard ROFZ	Maintain	Standard ROFZ	Maintain
RPZ	RPZs on airport property or controlled through easement; public road in Runway 25 RPZ	Consider mitigation of potential incompatible uses	Portion of Runway 34 RPZ uncontrolled and public roads in both RPZs	Consider mitigation of potential incompatible uses
Taxiways				
Design Group (TDG)	2A	Maintain	2A	Maintain
Parallel Taxiway	Taxiway A (partial parallel)	Maintain	Taxiway F (partial parallel)	Maintain
Parallel Taxiway Separation from Runway	300'	Maintain	300'	Maintain
Widths	35' (Taxiway A and connectors)	Maintain	40' (Taxiway F and connectors)	Maintain if feasible
Holding Position Separation	125' & 200'	Re-mark at 200'	125' & 200'	Re-mark at 200'
Notable Conditions	None	Maintain	Direct access from east aprons; dual-purpose pavement	Consider corrective measures
Navigational and Weather Aids				
Instrument Approaches	LPV GPS (7, 25)	Maintain	Visual only	Consider GPS approach
Weather Aids	AWOS, wind cones, rotating beacon	Maintain equipment; relocate/install new beacon		
Approach Aids	PAPI-2 & REILS on both runway ends	Consider upgrade to PAPI-4; maintain REILs	None	Consider PAPI-2s and REILs
Lighting and Marking				
Runway Lighting	MIRL	Maintain	MIRL	Maintain
Runway Marking	Non-precision	Maintain	Basic	Consider non-precision markings
Taxiway Lighting	MITL	Maintain	MITL	Maintain

KEY

AWOS - Automated Weather Observing System
D - Dual Wheel
2D - Dual Tandem Wheel
MIRL - Medium Intensity Runway Lighting
MITL - Medium Intensity Taxiway Lighting
PAPI - Precision Approach Path Indicator
RDC - Runway Design Code
REIL - Runway End Identification Lights
ROFA - Runway Object Free Area
ROFZ - Runway Obstacle Free Zone
RPZ - Runway Protection Zone
RSA - Runway Safety Area
S - Single Wheel
TDG - Taxiway Design Group

Exhibit 3H
AIRSIDE FACILITY REQUIREMENTS

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GENERAL AVIATION TERMINAL SERVICES

The general aviation terminal facilities at an airport often provide corporate officials and visitors with their first impression of the community. General aviation terminal facilities at an airport provide space for passenger waiting, a pilots' lounge, flight planning, concessions, management, storage, and many other various needs. This space is not necessarily limited to a single, separate terminal building, but can include space offered by fixed base operators (FBOs) and other specialty operators for these functions and services. At Merrill Municipal Airport, general aviation terminal services are provided in the terminal building, which includes a lobby, a pilots' lounge, a conference room, a kitchen, and restrooms.

The methodology used in estimating general aviation terminal facility needs was based on the number of airport users expected to utilize general aviation facilities during the design hour. This methodology is a general airport planning practice and is not considered exacting, as each airport terminal serves unique functions. The space requirements for terminal building facilities were based on providing 125 square feet (sf) per design hour itinerant passenger. A multiplier of 2.5 in the short term, increasing to 4.0 in the long term, was also applied to terminal facility needs to better determine the number of passengers associated with each itinerant aircraft operation. This increasing multiplier indicates an expected increase in larger aircraft operations throughout the long term. These operations typically support larger turboprop and jet aircraft, which can accommodate an increasing passenger load factor. Such is the case at Merrill Municipal Airport, where an increasing number of turbine operations are anticipated.

Table 3H outlines the space requirements for general aviation terminal services at Merrill Municipal Airport through the long-term planning period. The amount of space currently offered in the terminal building is approximately 3,200 sf. As shown in the table, this is adequate through the long-term planning period.

Table 3H | General Aviation Terminal Area Facilities

	Currently Available	Short-Term Need	Intermediate-Term Need	Long-Term Need
Terminal Building (sf)	3,200	1,400	1,900	2,600
General Aviation Design Hour Passengers		11	15	21
Passenger Multiplier		2.5	3.2	4.0
Visitor/Tenant Vehicle Parking	77	52	63	73

Source: Coffman Associates analysis

General aviation vehicle parking demands have also been determined for the airport. Space determinations for passengers were based on an evaluation of existing airport use, as well as standards set forth to help calculate projected terminal facility needs. There are currently 77 marked individual vehicle spaces provided at the airport; 42 spaces are located at the terminal and 35 spaces are on the east side of the field by Park City Aviation. Most based aircraft owners park near their hangars. As can be seen in the table, vehicle parking is another segment that is adequate throughout the planning period. Nevertheless, proposed hangar facility layouts will include dedicated vehicle parking for tenants, as will be illustrated in the next chapter.

AIRCRAFT HANGARS

Utilization of hangar space varies as a function of local climate, security, and owner preference. The trend in general aviation aircraft is toward more sophisticated (and consequently, more expensive) aircraft; therefore, many aircraft owners prefer enclosed hangar space as opposed to outside tiedowns.

The demand for aircraft storage hangars is dependent on the number and type of aircraft expected to be based at the airport in the future. For planning purposes, it is necessary to estimate hangar requirements based on forecast operational activity; however, hangar development should be based on actual demand trends and financial investment conditions.

While most aircraft owners prefer enclosed aircraft storage, some will still use outdoor tiedown spaces, usually due to lack of available hangar space, high hangar rental rates, or operational needs; therefore, enclosed hangar facilities do not necessarily need to be planned for each based aircraft.

Hangar types vary greatly in size and function. T-hangars, box hangars, and shade hangars are popular with aircraft owners who need to store one private aircraft. These hangars often provide individual spaces within a larger structure or in standalone portable buildings. There is approximately 12,600 sf of T-hangar storage space at the airport. For determining future aircraft storage needs, a planning standard of 1,200 sf per aircraft is utilized for this type of hangar.

Executive box hangars are open-space facilities with no interior supporting structure. These hangars can vary in size from 1,500 and 2,500 sf to nearly 10,000 sf. They are typically able to house single-engine, multi-engine, turboprop, and jet aircraft, as well as helicopters. Executive box hangar space at Merrill Municipal Airport is estimated at 47,600 sf. For future planning, a standard of 3,000 sf per turboprop, 5,000 sf per jet, and 1,500 sf per helicopter is utilized for executive box hangars.

Conventional hangars are large, open-space facilities with no supporting interior structure. These hangars provide for bulk aircraft storage and are often utilized by airport businesses, such as FBOs or aircraft maintenance operators. Conventional hangars are generally larger than executive box hangars and can range in size from 10,000 sf to more than 20,000 sf. Often, a portion of a conventional hangar is utilized for non-aircraft storage needs, such as maintenance or office space. There are no conventional hangars at Merrill Municipal Airport. For planning purposes, the same aircraft sizing standards utilized for executive hangars are also utilized for conventional hangars.

Requirements for maintenance/service hangar area have also been calculated. There is one maintenance/service provider on the airport which operates out of an executive hangar approximately 4,700 sf in size. To determine service hangar needs, a planning standard of 250 sf per based aircraft has been calculated.

Future hangar requirements for the airport are summarized in **Table 3J**. While most based aircraft owners prefer enclosed hangar space, it is assumed that some will use tiedowns on the apron. The analysis shows that future hangar requirements indicate a potential need for almost 50,000 sf of new hangar storage capacity through the long-term planning period. This includes a mixture of hangar types, with

the largest need projected in the executive/conventional hangar category. Due to the projected increase in based aircraft, the existing demand for hangar space, annual general aviation operations, and hangar storage needs, facility planning will consider additional hangars at the airport. It is expected that the aircraft storage hangar requirements will continue to be met through a combination of hangar types.

Table 3J | Aircraft Hangar Requirements

	Currently Available	Short-Term Need	Intermediate-Term Need	Long-Term Need	Difference
Total Based Aircraft	45	48	50	56	+11
Hangar Area Requirements					
T-Hangar Area (sf)	12,600	22,200	28,200	28,100	+15,500
Executive Box/Conventional Hangar Area (sf)	47,600	53,600	58,100	72,600	+25,000
Service Hangar Area (sf)	4,700	12,000	12,500	14,000	+9,300
Total Hangar Area (sf)	**64,900**	**87,800**	**98,800**	**114,700**	**+49,800**

Source: Coffman Associates analysis

It should be noted that hangar requirements are general in nature and are based on the aviation demand forecasts. The actual need for hangar space will further depend on the usage within the hangars. For example, some hangars may be utilized entirely for non-aircraft storage, such as maintenance; yet they have an aircraft storage capacity from a planning standpoint. Therefore, the needs of an individual user may differ from the calculated space necessary.

AIRCRAFT PARKING APRONS

The aircraft parking apron is an expanse of paved area intended for aircraft parking and circulation. Typically, a main apron is centrally located near the airside entry point, such as the terminal building or FBO facility. Ideally, the main apron is large enough to accommodate transient airport users as well as a portion of locally based aircraft. Smaller aprons are often available adjacent to FBO or specialty aviation service operator (SASO) hangars and at other locations around the airport. The apron layout at Merrill Municipal Airport generally follows this typical pattern, with aprons adjacent to both the terminal and the FBO facility (Park City Aviation). A third apron, located north of Park City Aviation, provides additional dedicated aircraft parking space.

To determine future apron needs, the FAA-recommended planning criterion[3] of 330 square yards (sy) was used for single- and multi-engine itinerant aircraft, while a planning criterion of 791 sy was used to determine the area for transient turboprop and jet aircraft. A parking apron should also provide space for locally based aircraft that require temporary tiedown storage. Locally based tiedowns typically will be utilized by smaller single-engine aircraft; thus, a planning standard of 230 sy per position is utilized.

The total apron parking requirements are presented in **Table 3K**. The existing apron pavement area at Merrill Municipal Airport currently encompasses approximately 18,700 sy of space divided among the three apron areas. Approximately 7,800 sy of this space is used exclusively for aircraft parking. Using the

[3] Refer to Advisory Circular (AC) 150/5300-13B, *Airport Design*, Appendix E

planning standards described above and factoring in assumptions regarding operational and based aircraft growth, additional apron space is projected to be needed, with an additional 2,600 sy of aircraft parking apron pavement estimated to be needed over the next 20 years.

There are currently 18 marked parking positions available for based and itinerant aircraft at the airport. There is no helicopter parking. As shown in the table, additional aircraft parking is projected to be needed beginning in the short term, including dedicated parking for helicopters and small corporate jets.

Table 3K | Aircraft Parking Apron Requirements

	Available	Short Term	Intermediate Term	Long Term
Aircraft Parking Positions				
Based/Local GA Aircraft		2	3	3
Transient GA Aircraft		18	19	21
Corporate Jet Aircraft		1	2	3
Helicopter		1	1	2
Total Parking Positions	**18**	**22**	**25**	**29**
Total Apron Area	**7,800**	**7,500**	**8,700**	**10,400**

Source: Coffman Associates analysis

SUPPORT FACILITIES

Various other landside facilities that play a supporting role in overall airport operations have also been identified. These support facilities include:

- Aviation Fuel Storage
- Perimeter Fencing and Gates

Aviation Fuel Storage

The airport's fuel storage tanks are located on the terminal apron. There is one 12,000-gallon aboveground tank for 100LL Avgas and one 12,000-gallon tank for Jet A fuel. Fuel flowage records for the airport were not available, so it is unclear whether existing capacity meets demand. As the fleet mix transitions to include more frequent operations by turbine aircraft, fuel storage and capacities should be evaluated to ensure an adequate supply of fuel is available. Planning should also consider an additional tank to store unleaded aviation fuel (100UL). The FAA has recently approved the use of 100UL in piston-powered aircraft, although unknowns regarding infrastructure and distribution remain. Nevertheless, the alternatives will include placeholders for these facilities.

Maintenance and Snow Removal Equipment (SRE) Facility

Maintenance equipment is currently stored in a hangar on the airport's east side (identified as Building #14 on Exhibit 1G). This includes a McCormick tractor with blower and mowing attachments, a single-axle dump truck with a snow blade, a Chevy truck with a box plow, a Ford F-150, and various maintenance

tools and small equipment. While this facility is adequately sized for accommodating this equipment, it may be better served as an aircraft storage facility due to its location (i.e., accessibility to taxiways and proximity to other aircraft storage hangars). As such, alternatives presented in the next chapter will assess other locations on the airfield that may be better suited as a maintenance and SRE facility.

Perimeter Fencing and Gates

Perimeter fencing is used at airports primarily to secure the aircraft operational area. The physical barrier of perimeter fencing provides the following functions:

- Gives notice of legal boundary of the outermost limits of the facility or security-sensitive areas;
- Assists in controlling and screening authorized entries into a secured area by deterring entry elsewhere along the boundary;
- Supports surveillance, detection, assessment, and other security functions by providing a zone for installing intrusion detection equipment and closed-circuit television (CCTV);
- Deters casual intruders from penetrating the aircraft operations areas on the airport;
- Creates a psychological deterrent;
- Demonstrates a corporate concern for facilities; and
- Limits inadvertent access to the aircraft operations area by wildlife.

As detailed in Chapter One, Merrill Municipal Airport operations areas are completely enclosed by 10-foot security fencing and controlled access gates are available for use at the airport. All fencing and gates should be maintained throughout the planning period and should be regularly inspected to ensure they are functioning properly and are undamaged.

A summary of the overall general aviation landside facilities is presented in **Exhibit 3J**.

SUMMARY

This chapter has outlined the safety design standards and facilities required to meet potential aviation demand projected at Merrill Municipal Airport for the next 20 years. In an effort to provide a more flexible master plan, the yearly forecasts from Chapter Two have been converted to planning horizon levels. The short term roughly corresponds to a five-year timeframe, the intermediate term is approximately 10 years, and the long term is 20 years. By utilizing planning horizons, airport management can focus on demand indicators for initiating projects and grant requests rather than on specific dates in the future.

In Chapter Four, potential improvements to the airside and landside systems will be examined through a series of airport development alternatives. Most of the alternatives discussion will focus on those capital improvements that would be eligible for federal and state grant funds. Other projects of local concern will also be presented. Ultimately, an overall airport development plan that presents a vision beyond the 20-year scope of this master plan will be developed for Merrill Municipal Airport.

	Available	Short Term	Intermediate Term	Long Term
Aircraft Storage Hangar Requirements				
Aircraft to be Hangared	45	46	48	53
T-Hangar Area (sf)	12,600	22,200	28,200	28,100
Executive/Conventional Hangar Area (sf)	47,600	53,600	58,100	72,600
Service/Maintenance Area (sf)	4,700	12,000	12,500	14,000
Total Hangar Storage Area (sf)	64,900	87,800	98,800	114,700
Aircraft Parking Apron				
Aircraft Parking Positions	18	22	25	29
Total Public Apron Area (sy)	7,800	7,500	8,700	10,400
General Aviation Terminal Facilities and Parking				
Building Space (sf)	3,200	1,400	1,900	2,600
Total GA Parking Spaces	77	52	63	73

Exhibit 3J
LANDSIDE FACILITY REQUIREMENTS

Chapter 4

DEVELOPMENT ALTERNATIVES

Chapter 4

DEVELOPMENT ALTERNATIVES

In the previous chapter, aviation facilities required to satisfy airside and landside demand through the long-term planning period of the master plan were identified. In addition, various Federal Aviation Administration (FAA) and Wisconsin Department of Transportation (WisDOT) – Bureau of Aeronautics (BOA) standards were discussed that apply to airfield design. The next step in the planning process is to evaluate reasonable ways in which these facilities can be provided and the design standards can be met. The purpose of this chapter is to formulate and examine rational development alternatives that address the short-, intermediate-, and long-term planning horizon levels. Because there are a multitude of possibilities and combinations, it is necessary to focus on those opportunities that have the greatest potential for success. Each alternative provides a differing approach to meet existing and future facility needs, and these layouts are presented for purposes of evaluation and discussion.

Some airports become constrained due to limited availability of space, while others may be constrained due to adjacent land use development. Careful consideration should be given to the layout of future facilities and impacts to potential airfield improvements at Merrill Municipal Airport (RRL). Proper planning at this time can ensure the long-term viability of the airport for aviation and economic growth.

The primary goal of this planning process is to develop a feasible plan for meeting applicable safety design standards and the needs that result from the projected market demand over the next 20 years. The plan of action should be developed in a manner that is consistent with the future goals and objectives of the City of Merrill, airport users, the local community, and the surrounding region, all of which have a vested interest in the development and operation of RRL.

The goal is to develop an underlying rationale that supports the final recommended concept. Through this process, an evaluation of the highest and best uses of airport property will be made, while also weighing local development goals, efficiency, physical and environmental factors, capacity, and appropriate safety design standards.

The alternatives presented in this chapter have been formulated as potential means to meet the overall program objectives for the airport in a balanced manner. Through coordination with the City of Merrill, airport management, the planning advisory committee (PAC), and the public, an alternative

(or combination of alternatives) will be refined and modified as necessary into a recommended development concept; therefore, the planning considerations and alternatives presented in this chapter can be considered a beginning point in the evolution of a recommended concept for the future of RRL.

PLANNING OBJECTIVES

A set of basic planning objectives has been established to guide the alternatives development process. It is the goal of this master planning effort to produce a development plan for the airport that addresses forecast aviation demand and meets FAA and/or BOA design standards to the greatest degree possible. As owner and operator, the City of Merrill provides the overall guidance for the operation and development of the airport. It is of primary concern that RRL is marketed, developed, and operated for the betterment of the community and its users. The following basic planning principles and objectives will be utilized as general guidelines during this planning effort:

- Develop a safe, attractive, and efficient aviation facility in accordance with applicable federal, state, and local regulations
- Preserve and protect public and private investments in existing airport facilities
- Provide a means for the airport to grow, as dictated by demand
- Establish a plan to ensure the long-term viability of the airport and promote compatible land uses surrounding the airport
- Develop a facility that is responsive to the changing needs of all aviation users
- Reflect and support the long-term planning efforts that are currently applicable to the region
- Develop a facility with a focus on self-sufficiency in both operational and developmental cost recovery
- Ensure that future development is environmentally compatible

REVIEW OF PREVIOUS AIRPORT PLANS

At RRL, an Airport Layout Plan & Narrative report was completed in 2009. More recently, the airport layout plan (ALP) was updated in 2016 to reflect as-built conditions at the airport. The existing ALP includes the following primary recommendations:

- Maintain primary Runway 7-25 length at 5,100 feet long; widen runway to 100 feet
- Maintain crosswind Runway 16-34 at 2,997 feet long by 75 feet wide
- Extension of parallel Taxiway F to the Runway 16 threshold
- Additional landside development in the form of apron pavement and hangars

The analysis presented in this chapter will revisit some of the recommendations presented on the ALP drawing and in the previous planning study, along with new development options to meet the existing/ultimate airport reference code (ARC) and runway design code (RDC) outlined in the previous

chapters. Since the completion of the last plan, the FAA has made significant modifications to design standards, as outlined in the previous chapter. As such, some of the previous plan's elements may be carried over to this master plan and others may be changed or removed from further consideration.

NO ACTION/NON-DEVELOPMENT ALTERNATIVES

The City of Merrill is charged with managing the airport for the economic betterment of the community and region. In some cases, alternatives may include a no action option; however, for RRL, this would effectively reduce the quality of services being provided to the public, affect the aviation facility's ability to meet FAA design standards, and impact the region's ability to support aviation needs. The ramifications of a no action alternative extend into impacts on the economic well-being of the region. If facilities are not maintained and improved so the airport provides a pleasant experience for the visitor or business traveler, or if delays become unacceptable, then activity and business may shift elsewhere. The no action alternative is also inconsistent with the primary long-term goal of the FAA and the BOA, which is to enhance local and interstate commerce. Additionally, the acceptance and use of state and federal grants carry an obligation, called grant assurances, which requires the City of Merrill to maintain and allow for the improvement of RRL as needed to serve local and regional demand. Other significant considerations are previous investments and outstanding contractual agreements with all airport tenants and users. Not continuing active management and development of the airport would require the city to breach these obligations and could create associated legal actions; therefore, a no action alternative is not considered further in this master plan.

This study will not consider the relocation of services to another airport or development of a new airport site. The development of a new facility like RRL is a very complex and expensive option. A new site would require greater land area, duplication of investment in facilities, installation of supporting infrastructure that is already available at the existing site, and greater potential for negative impacts to natural, biological, and cultural resources.

The purpose of this study is to examine aviation needs at RRL over the course of the next 20 years; therefore, this master plan will examine the needs of the existing airport and will present a program of needed capital improvement projects to cover the scope of the plan. The airport is a lucrative business, transportation utility, and economic asset for the region. It can accommodate existing and future demand and should be developed accordingly to support the interests of local residents and businesses that rely upon it. Ultimately, the final decision regarding pursuing development rests with the City of Merrill, the FAA, and the BOA on an individual project basis. The following analysis considers airside and landside development alternatives that take into account an array of facility demands, including safety, capacity, access, and efficiency.

AIRSIDE ALTERNATIVES

The development alternatives are categorized into two functional areas: airside and landside. The airside relates to runways, taxiways, navigational aids, lighting and marking aids, etc., which require the greatest

commitment of land area to meet the physical layout of an airport and the required airfield safety standards. The design of the airfield also defines minimum setback distances from the runway and object clearance standards; these criteria are defined first to ensure that the fundamental needs of RRL are met. The landside includes terminal services, hangars, and aircraft parking aprons, as well as utilization of remaining property to provide revenue support for the airport and to benefit the economic development and well-being of the regional area.

Each functional area interrelates and affects the development potential of the others. As such, all areas must be examined individually and then coordinated as a whole to ensure the final plan is functional, efficient, and cost-effective. The total impact of these factors must be evaluated to determine if the investment in RRL will meet the needs of the surrounding area, both during and beyond the planning period of this study.

AIRSIDE CONSIDERATIONS

Airside planning considerations generally relate to airport elements that contribute to the safe and efficient transition of aircraft and passengers from air transportation to the landside facilities at the airport. Planning must factor and balance many airside items, including meeting FAA design parameters of the established design aircraft, instrument approach capability, airfield capacity, runway length, taxiway layouts, and pavement strengths. Each of these elements for RRL was analyzed in the previous chapter. The alternatives to follow will examine airside improvement opportunities to meet design standards and/or capacity constraints. A summary of the primary airside planning issues to be considered in this alternatives analysis is included below.

Airside Planning Considerations
1. Meet ultimate design standards on both runways (RDC B-II-4000 on primary Runway 7-25 and RDC A-I-5000 on crosswind Runway 16-34)
2. Analyze extension options for both runways
3. Mitigate non-standard conditions in safety areas
4. Improved instrument approach capability
5. Corrective measures for non-standard taxiway geometry and holding position separation
6. Upgraded/new visual approach aids to both runways
7. New/upgraded runway markings and taxiway lighting

Consideration #1 – Meet Ultimate Design Standards

The critical aircraft analysis in Chapter Two concluded that primary Runway 7-25 should meet RDC B-II-4000 design standards in the ultimate condition. The runway is currently categorized as RDC A-I-5000; however, due to anticipated growth in operations and based aircraft by larger, more demanding aircraft, including turboprops and jets, it is prudent to plan facilities to accommodate these users. A transition to this higher design code corresponds to larger safety areas, and the alternatives to follow will illustrate options to protect both existing and ultimate safety areas.

Crosswind Runway 16-34 is currently classified as RDC A-I-VIS, meaning it supports smaller aircraft and is a visual runway only, without published instrument approach procedures. This runway is planned to meet ultimate RDC A-I-5000 if an instrument approach is implemented, which would not result in a change to safety areas or other design standards.

Consideration #2 – Analyze Runway Extension Options

Primary Runway 7-25 is currently 5,100 feet long and 75 feet wide. The width exceeds existing/future RDC A-I-5000 design standards but meets the ultimate B-II standards and should be maintained. Regarding the potential for a runway extension, the runway length analysis in the previous chapter illustrated that some turbine operators are weight-restricted or unable to operate on the existing runway length, especially during hot weather. An extension is not currently justified via regular use by aircraft that need it; however, such a change could reasonably occur over the next 20 years.

Crosswind Runway 16-34 is 2,997 feet long and 75 feet wide. This width exceeds the existing/ultimate standard, which calls for a 60-foot-wide runway. As discussed in the previous chapter, the extra width provides an additional safety margin and should be maintained, if feasible, with the understanding that the BOA/FAA may not participate in funding maintenance projects for the additional width. The alternatives to follow will depict options for both scenarios: continued maintenance of the 75-foot width *or* reduction in width to 60 feet. In terms of runway length, crosswind Runway 16-34 falls short of the recommended length of 3,400 feet to accommodate small aircraft.

Extension options will be analyzed for both the primary and crosswind runways in the airside alternatives to follow. These options will carefully weigh the cost/benefit of extending one or both runways when considering existing constraining factors, including adjacent off-airport development.

Consideration #3 – Mitigate Non-standard Conditions in Safety Areas

The runway safety area (RSA), runway obstacle free zone (ROFZ), and runway object free area (ROFA) associated with each runway meet existing design standards. At such a time that primary Runway 7-25 transitions from RDC A-I to B-II, the safety area dimensions will increase in size, resulting in an obstruction to the ultimate ROFA associated with this runway – the supplemental wind cone near Runway 7. The alternatives to follow will include an option to relocate this wind cone outside of the ROFA.

In terms of runway protection zone (RPZ) incompatibilities, portions of the Runway 34 RPZ are unowned or not controlled through easement. Additionally, three of the existing RPZs (Runways 34, 25, and 16) contain public roadways. While common for most airports, this is not a best practice. The alternatives will examine options for mitigating these potentially incompatible uses.

Consideration #4 – Instrument Approach Procedures

RRL is currently equipped with two published instrument approach procedures. Each end of Runway 7-25 has a localizer performance with vertical guidance (LPV) via an area navigation (RNAV) global

positioning system (GPS) approach. Currently, the visibility minimums for these approaches are not lower than one-mile for Category A, B, and C aircraft.[1] There are currently no instrument approaches to crosswind Runway 16-34.

As described in Chapter Three, the approach visibility minimums serving a particular runway end help dictate the size of the RPZ. The RPZs associated with Runway 7-25 currently measure 1,000 feet (length) by 500 feet (inner width) by 700 feet (outer width). If an instrument approach with visibility minimums below one-mile but not lower than ¾-mile is implemented, the size of the RPZ will increase to dimensions measuring 1,700 feet (length) by 1,000 feet (inner width) by 1,510 feet (outer width)[2]. The ¾-mile RPZ encompasses a much larger area and extends beyond airport-controlled property, introducing new and potentially incompatible land uses; however, for long-term planning purposes, it is prudent to plan for the potential for this improved instrument approach capability, and the alternatives will depict such options. The alternatives will also depict the potential for an instrument approach to Runway 16-34 with visibility minimums not lower than one-mile. The addition of this instrument approach would not change the size of the RPZs currently associated with the crosswind runway.

Consideration #5 – Corrective Measures for Non-standard Taxiway Features

Direct Access

FAA taxiway geometry design standards recommend offsetting taxiway connections between aprons and runways to mitigate the potential for pilots who are unfamiliar with the airport layout to unintentionally taxi directly onto a runway, resulting in a runway incursion. The two taxiway connectors extending from Taxiway F to Runway 16-34 allow for direct access to the runway from the east apron area, which is a non-standard design. The airside alternatives present options for eliminating the direct access point and forcing pilots to make turns, which increases pilots' situational awareness.

Dual Purpose Pavement

Taxiway F is a partial-parallel taxiway serving crosswind Runway 16-34. The taxiway terminates on the north end at the Runway 25 threshold, so pilots departing on Runway 16 are required to back-taxi in order to access the Runway 16 threshold. This is considered dual use of this pavement, which is not recommended by the FAA. Back-taxi operations can be considered historically common; however, they present hazards to flight and runway incursion opportunities. As such, the alternatives to follow will depict an extension of Taxiway F to connect with Runway 16 and function as a full-length parallel taxiway.

Consideration #6 – Visual Aids

Both ends of primary Runway 7-25 are equipped with two-light precision approach path indicator (PAPI-2) systems. A four-light PAPI (PAPI-4) is recommended for airports serving turbine aircraft operations. As RRL currently serves and is anticipated to be utilized more frequently by turboprops and jets,

[1] LPV GPS instrument approaches to Runways 7 and 25 are not available for use by Category D aircraft.
[2] Refer to Exhibit 3G for a graphic comparison of the one-mile and ¾-mile RPZs.

PAPI-4s are recommended for each runway end when the need arises. Runway end identifier lights (REILs) are available on both ends of Runway 7-25. These systems are recommended for runway ends not served by a more sophisticated approach light system. Approach light systems are only required for instrument approaches that provide lower than ¾-mile visibility minimums but are recommended for approaches with minimums between ¾-mile and one-mile. As such, the alternatives to follow will depict an option with the inclusion of a medium intensity approach lighting system (MALS) on Runway 7, which is the runway most commonly used during instrument flight rules (IFR) conditions.

Crosswind Runway 16-34 is not equipped with any visual approach aids. Each alternative exhibit to follow reflects the installation of PAPI-2s and REILs on Runway 16-34.

Consideration #7 – New/Upgraded Markings and Lighting

Both runways are equipped with medium intensity runway lights (MIRL), which are planned to remain. Medium intensity taxiway lights (MITL) is available on all taxiway pavement. In terms of runway markings, primary Runway 7-25 has non-precision markings, while crosswind Runway 16-34 has basic markings. Alternatives will depict an upgrade to non-precision markings on Runway 16-34.

The existing and ultimate design standards for both runways call for holding positions to be separated from the runway centerline by 200 feet. This standard is generally met, except on Taxiway F where it connects to Runway 25 and on the connector taxiways that extend from the east apron area to Runway 16-34. Each of these holding positions is situated 125 feet from the runway centerline and thus falls short of the standard. Alternatives will consider re-marking non-standard holding positions at a 200-foot separation from the runway centerline.

AIRSIDE ALTERNATIVE 1

Depicted on **Exhibit 4A**, Airside Alternative 1 considers several upgrades to the airfield. Primary Runway 7-25 is proposed to remain at its existing dimensions (5,100 feet long by 75 feet wide) and with its current instrument approach capability to each runway end. While the Facility Requirements chapter identified a potential need for a longer runway, maintaining the existing length is an important scenario to consider because an extension to the runway is not a certainty. A runway extension requires justification to the FAA to be eligible for funding through the Airport Improvement Program (AIP). Justification typically involves documentation of at least 500 annual operations by aircraft and operators expressing a need for the additional runway. An environmental assessment (EA) process would also need to be completed, along with public outreach. If justification for a runway extension is not achieved for several years (or ever), a contingency airfield plan should be available.

Airside Alternative 1 does, however, consider an extension to crosswind Runway 16-34. At 2,997 feet long, this runway falls short of the FAA's recommended runway length to accommodate 95 percent of small aircraft users. The FAA-recommended length to serve this grouping of aircraft is 3,400 feet. To meet this recommendation, Alternative 1 depicts a 403-foot extension to the north, which would

bring Runway 16-34 to 3,400 feet long. Extension options to the south were also considered but were ultimately rejected due to safety area impacts. A 403-foot extension to Runway 34 would place Airport Road within the ROFA, which is generally not allowable[3], and would introduce new, potentially incompatible land uses (including residential) into the shifted Runway 34 RPZ. While the northern extension also results in a shifted Runway 16 RPZ, this RPZ already contains a public road (Hillside Drive), and the proposed extension does not change this scenario.

In addition to the Runway 16 RPZ, the RPZs off the Runway 34 and 25 ends contain potentially incompatible land uses, with public roads traversing both. Additionally, small portions of the Runway 34 RPZ (less than 0.5 acres total) are not controlled by the airport. The FAA prefers property within an RPZ to be owned by the airport sponsor, or land use controls to be implemented via planning/zoning or through an avigation easement, and for the area to remain free of land uses that attract people (such as homes, businesses, roads, etc.); however, this is not a requirement. Recent guidance states that it is the airport sponsor's responsibility to allow or not allow a particular land use within an RPZ. Airside Alternative 1 does not reflect any modifications to the surrounding road network; however, it does propose avigation easements over the unowned portions of the RPZs to protect these areas from future development that could be incompatible with aeronautical activity.

It should be noted that Alternative 1 does not include a change in instrument approach capability to primary Runway 7-25 and is reflective of RDC B-II-5000. Lower minimums and the implications in terms of RPZ dimensions will be shown in Alternatives 2 and 3.

Other features of Airside Alternative 1 include:

1. Relocation of the supplemental wind cone near the Runway 7 end outside of the B-II ROFA.
2. Inclusion of no-taxi islands to mitigate the direct access points on the east apron areas. A no-taxi island is an area of either natural turf or artificial turf/paint that functions to force pilots to make a turn prior to entering the runway environment, thereby improving pilot situational awareness and reducing the risk of a runway incursion. Alternative 1 depicts painted no-taxi islands on these aprons. This action will potentially impact some of the existing tiedowns on this apron, depending on the amount of pavement removed; this will ultimately be determined during engineering design.
3. Extension of Taxiway F to the north to provide access to Runway 16.
4. An upgrade of the PAPI-2 systems serving Runway 7-25 to PAPI-4s when dictated by need (i.e., increased jet operations). Both ends of Runway 16-34 are also proposed to be equipped with PAPI-2s.
5. Maintenance of existing REILs on Runway 7-25 and installation of REILs on Runway 16-34.

[3] Under certain circumstances, the FAA will issue a Modification to Standard to a Runway Object Free Area, but only when all other reasonable options have been exhausted.

Exhibit 4A
AIRSIDE ALTERNATIVE 1

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6. Upgrading runway markings on Runway 16-34 from basic markings to non-precision markings. This is proposed in the event the runway is equipped with an instrument approach procedure. The additional markings would include threshold markings and aiming points.
7. Re-marking of the holding positions located on Taxiway F at the Runway 25 threshold and on the Taxiway F connectors where they lead to Runway 16-34. These markings are currently separated from the runway centerline by 125 feet, while the standard in the ultimate condition calls for a 200-foot separation.

AIRSIDE ALTERNATIVE 2

Depicted on **Exhibit 4B**, Airside Alternative 2 has several similarities to Airside Alternative 1, including the proposed extension to crosswind Runway 16-34 and Taxiway F, upgraded/new visual approach aids (i.e., PAPIs and REILs), and upgraded or new pavement markings. Alternative 2 does, however, consider some notable differences on both the primary and crosswind runways.

The first consideration is an extension to primary Runway 7-25 to accommodate a greater number of turbine operators and provide increased utility during hot weather. The previous chapter determined a potential need for a 400-foot runway extension to primary Runway 7-25, bringing the ultimate runway length to 5,500 feet. Alternative 2 proposes this extension on the Runway 7 end, with a corresponding extension of Taxiway A and a new threshold connector. Other actions related to the runway extension would include clearing/grading of the shifted safety area, installation of additional runway lighting and signage, and relocation of the PAPIs and REILs serving this runway end.

Alternative 2 also considers the implementation of an improved instrument approach procedure to Runway 7, with visibility minimums not below ¾-mile. As previously detailed, the lower visibility minimums would increase the size of the RPZ serving Runway 7, encompassing approximately 2.8 acres of property not owned or controlled by the airport. This land also includes potentially incompatible land uses, including residential structures and public roads. For comparison purposes, the RPZ for the existing instrument approach with one-mile visibility minimums is shown, as indicated on **Exhibit 4B**. Even with the 400-foot extension, the RPZ is located almost entirely on airport property, except for a small portion in the southwestern corner; however, a clear zone easement that was previously acquired by the airport controls the height of structures in this area.

For crosswind Runway 16-34, Alternative 2 depicts a 403-foot extension to the north and considers a width reduction from the existing 75-foot width to 60 feet. As outlined previously, the design standard for an A-I runway is 60 feet wide. While the sponsor has indicated a desire to maintain the runway at its existing width, the FAA/BOA may not participate in funding assistance for the additional width, and local funding sources would be necessary for continued maintenance of this portion of pavement. As such, it is prudent to illustrate a scenario in which Runway 16-34 is narrowed to 60 feet wide, allowing decision-makers the opportunity to carefully weigh both options prior to the development of a recommended concept for the airport.

Additional features of Airside Alternative 2 include:

1. Relocation of the supplemental wind cone near the Runway 7 end outside of the B-II ROFA.
2. Removal of a portion of pavement on the FBO apron to mitigate the direct access from this area to Runway 16-34. This action will potentially impact some of the existing tiedowns on this apron, depending on the amount of pavement removed, which will ultimately be determined during engineering design.
3. Removal of the connector taxiway located just north of the Runway 34 threshold. This taxiway serves as a second direct access point from the east apron, and this option considers complete removal of this pavement and construction of new taxiway pavement from the south end of the apron. A no-taxi island is proposed to mitigate the direct access via the new taxiway. The hangars on the west side of the apron, which are aging and in poor condition, are proposed to be removed.
4. Extension of Taxiway F to the north to provide access to Runway 16.
5. An upgrade of the PAPI-2 systems serving Runway 7-25 to PAPI-4s when dictated by need (i.e., increased jet operations). Both ends of Runway 16-34 are also proposed to be equipped with PAPI-2s.
6. Maintenance of existing REILs on Runway 7-25 and installation of REILs on Runway 16-34.
7. Upgrading runway markings on Runway 16-34 from basic markings to non-precision markings. This is proposed in the event the runway is equipped with an instrument approach procedure. The additional markings would include threshold markings and aiming points.
8. Re-marking of the holding positions located on Taxiway F at the Runway 25 threshold and on the Taxiway F connector that is proposed to remain. These markings are currently separated from the runway centerline by 125 feet, while the standard in the ultimate condition calls for a 200-foot separation. Proposed connector taxiways would be marked with holding positions that meet the design standard.

AIRSIDE ALTERNATIVE 3

Airside Alternative 3 is presented on **Exhibit 4C**. Like the previous alternative, this option also evaluates a 400-foot extension to primary Runway 7-25 but takes a different approach. Rather than extending the runway to the west on the Runway 7 end, the extension is proposed for the Runway 25 end. An extension to Runway 25 is feasible without significant impacts to safety areas while maintaining the existing instrument approach capability to this runway end. As shown on the exhibit, the RSA, ROFZ, and ROFA extending off the Runway 7 end are all contained within airport property, and the majority of the shifted RPZ is controlled by an avigation easement. A 0.23-acre portion of the RPZ extends beyond the easement and is proposed to be purchased fee simple or an easement obtained over this area.

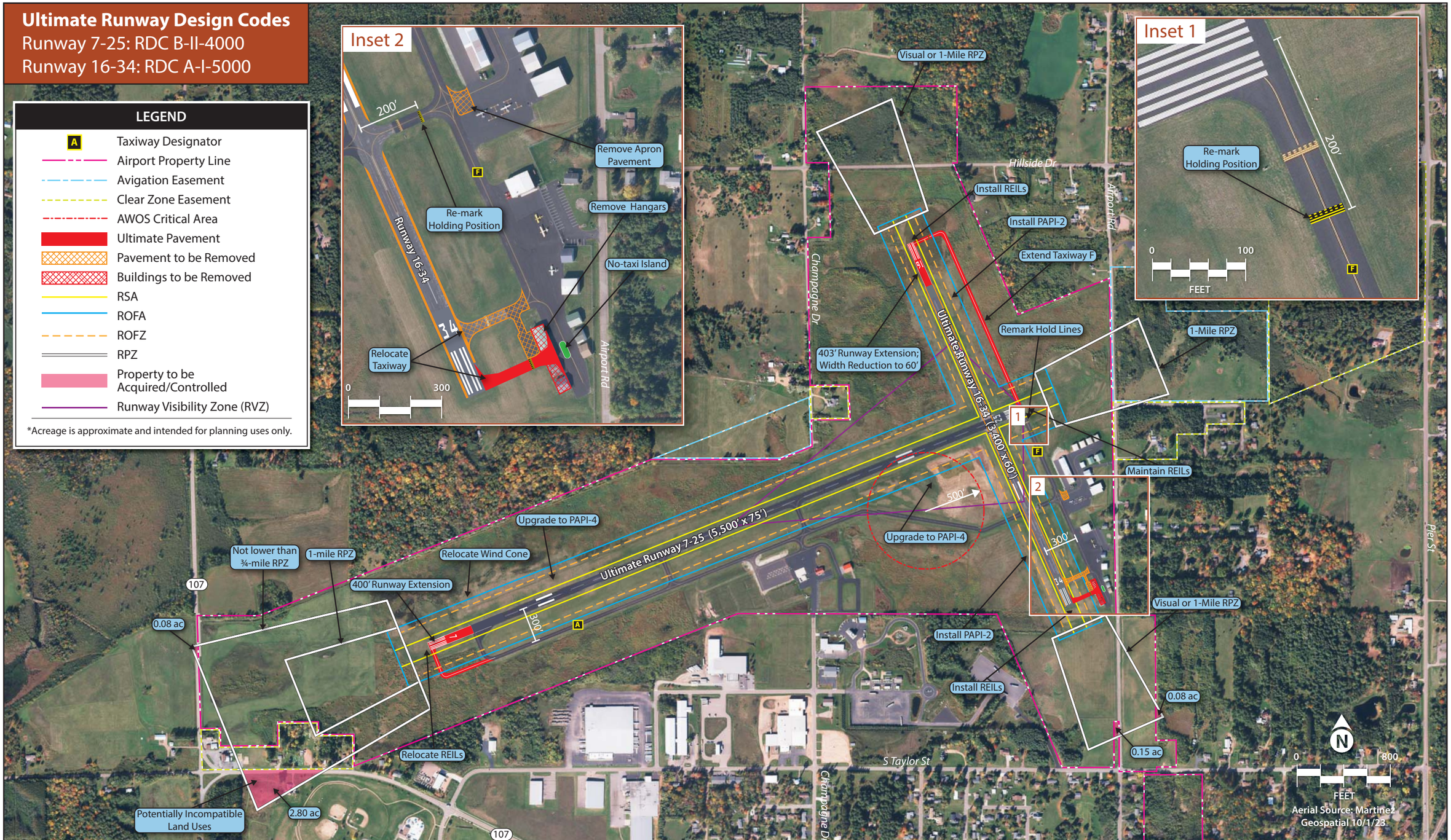

Exhibit 4B
AIRSIDE ALTERNATIVE 2

Exhibit 4C
AIRSIDE ALTERNATIVE 3

Taxiway A is proposed to be reconfigured to function as a full-length parallel taxiway, with new pavement proposed from the point where the taxiway jogs to the southeast to the proposed extended Runway 25 threshold. A portion of existing Taxiway A pavement is proposed to be removed, as indicated on **Exhibit 4C**. While there are benefits to reconfiguring Taxiway A (full-length parallel and elimination of direct access from FBO apron), there are some challenges to consider. Taxiway A was designed to avoid an area southwest of the runways' intersection that experiences poor drainage, and a new, full-length parallel taxiway would pass through this area. The proposed taxiway pavement also passes through the middle third of Runway 16-34, which is considered the "high-energy" portion of the runway. The FAA recommends that runway crossings be limited to the outer thirds of the runway, keeping the middle third clear so pilots can maneuver to avoid potential collisions.

Alternative 3 depicts a ¾-mile RPZ on Runway 7. Without an extension to this runway end, the majority of the RPZ is located on airport property or on land controlled via clear zone easement. A 0.98-acre portion of the RPZ extends beyond the boundaries of owned/controlled property and across a public road (Highway 107). A MALS is also shown. A MALS is a lighting system installed in the approach zone along the extended runway centerline. It consists of steady burning light bars that provide pilots with visual information on runway alignment. While it is recommended for runways offering straight-in approaches with minimums below 1-mile, a MALS is not required unless the minimums are below ¾-mile. This system, if installed, would replace the REILs currently serving Runway 7.

Additional features of Airside Alternative 3 include:

1. Relocation of the supplemental wind cone near the Runway 7 end outside of the B-II ROFA.
2. A 403-foot extension to crosswind Runway 16-34 and continued maintenance of its 75-foot width.
3. Mitigation of direct access from the FBO apron. With the removal of a portion of Taxiway A and construction of new parallel taxiway pavement, as described above, the connector leading from the FBO apron to Runway 16-34 is also proposed to be removed.
4. Removal of a portion of the connector taxiway located just north of the Runway 34 threshold. This taxiway serves as a second direct access point from the east apron, and this option considers removal of a portion of pavement to mitigate this non-standard condition. New taxiway pavement is proposed that would require pilots to make a series of turns prior to entering the runway environment.
5. Extension of Taxiway F to the north to provide access to Runway 16.
6. An upgrade of the PAPI-2 systems serving Runway 7-25 to PAPI-4s when dictated by need (i.e., increased jet operations). Both ends of Runway 16-34 are also proposed to be equipped with PAPI-2s.
7. Maintenance of existing REILs on Runway 25 and installation of REILs on Runway 16-34.
8. Upgrading runway markings on Runway 16-34 from basic markings to non-precision markings. This is proposed in the event the runway is equipped with an instrument approach procedure. The additional markings would include threshold markings and aiming points.

9. Re-marking of the holding positions located on Taxiway F at the Runway 25 threshold and on the Taxiway F connector that is proposed to remain. These markings are currently separated from the runway centerline by 125 feet, while the standard in the ultimate condition calls for a 200-foot separation. Proposed connector taxiways will be marked with holding positions that meet the design standard.

AIRSIDE SUMMARY

The sections above outline three planning considerations for the airfield at Merrill Municipal Airport. The primary issues on the airside are evaluating runway extension options for both the primary and crosswind runways, addressing non-standard taxiway geometry, and upgrading visual approach aids. The runway extension considerations will likely be the most impactful to both the public and the aviation community. For this reason, it is vital that the PAC, airport and city management, and the public offer feedback so that the best course of action is selected.

LANDSIDE CONSIDERATIONS

Generally, landside issues are related to those facilities necessary or desired for the safe and efficient parking and storage of aircraft, movement of pilots and passengers to and from aircraft, airport support facilities, and overall revenue support functions. To maximize airport efficiency, it is important to locate facilities together when they are intended to serve similar functions. The best approach to landside facility planning is to consider the development like a community, where land use planning is the guide. For airports, the land use guide in the terminal area should generally be dictated by aviation activity levels. Consideration should also be given to non-aviation uses that can provide additional revenue support to the airport and contribute to economic development for the region.

Landside planning considerations, summarized below, will focus on strategies following a philosophy of separating activity levels. Potential landside facility development at RRL is focused on the south and east sides of airport property where existing facilities (terminal, FBO, hangars, etc.) are already located. Property on the north side of Runway 7-25 also has development potential and has been reserved for future aviation development on each of the landside alternatives.

Landside Planning Considerations
1. Consider the Building Restriction Line (BRL) when planning vertical infrastructure
2. Increase aircraft storage capacity
3. Expand aircraft parking apron and add additional marked aircraft and helicopter parking
4. Consider appropriate aviation- and non-aviation-related uses for the future development of vacant property, or release of property

Consideration #1 – Building Restriction Line (BRL)

The BRL identifies suitable building area locations on the airport. It encompasses the RPZs, the object free area (OFA), navigational aid critical areas, areas required for terminal instrument procedures, and other areas necessary for meeting airport line-of-sight criteria. Two primary factors contribute to the determination of the BRL: type of runway ("utility" or "other-than-utility") and the capability of the instrument approaches. The BRL is the product of Title 14 Code of Federal Regulations (CFR) Part 77 transitional surface clearance requirements, which stipulate that no object be located in the primary surface. Primary Runway 7-25 is considered an other-than-utility, non-precision instrument runway with visibility minimums greater than ¾-mile, while crosswind Runway 16-34 is an other-than-utility runway with visual approaches. The primary surface for both runways is currently 500 feet wide. From the primary surface, the transitional surface extends outward at a slope of one vertical foot to every seven horizontal feet.

At Merrill Municipal Airport, the 35-foot BRL for each runway is currently set at 495 feet from the runway centerline, and the 25-foot BRL is set at 425 feet from the centerline. Some of the landside facilities on the east side of the airport are located within the BRL, with the nearest structures (the hangars nearest the Runway 34 threshold) located approximately 245 feet from the runway centerline, placing them within the primary surface. The FBO hangar is located approximately 360 feet from the Runway 16-34 centerline, placing it outside the primary surface but inside the BRL. This does not necessarily mean this structure penetrates Part 77 surfaces, and it should be clearly stated that the BRL is not a standard, but rather a guideline to use when planning vertical infrastructure on the airport. The FAA may require structures inside the BRL to be equipped with obstruction lights[4].

It should be noted that the location of the BRL will change if primary Runway 7-25 is provided with an instrument approach with visibility minimums down to ¾-mile. The width of the primary surface increases to 1,000 feet for non-precision runways with ¾-mile and lower visibility minimums, thus shifting the 35-foot BRL from the existing 495 feet from runway centerline to 745 feet from runway centerline. This would result in additional existing structures, including the terminal building, being located in front of the BRL and potentially penetrating the Part 77 transitional surface. Nevertheless, an alternative will be shown depicting potential landside development under this scenario.

Consideration #2 – Hangars

Hangar occupancy at RRL is at 100 percent, with approximately 18 people on a waiting list for hangar space, as of late 2023. With clear demand for additional hangar capacity at the airport, the landside alternatives will consider areas for the development of various hangar styles, including small aircraft facilities, executive/conventional hangars, and service/maintenance hangars. These areas are further defined below.

[4] The FAA typically does not permit structures within Part 77 surfaces and is the final arbiter on whether or not an existing or proposed structure can be located in a particular area, pending airspace analysis.

- **Small aircraft facilities** typically consist of T-hangars/T-shades. These facilities often experience lower levels of activity and, as such, can be located away from the primary apron areas in more remote locations on the airport. Limited utility services are needed for these areas. The airport currently has approximately 12,600 square feet (sf) of T-hangar storage space, with an additional 15,500 sf projected to be needed by the end of the 20-year planning period.

- **Executive/conventional hangars** consist primarily of clear span hangars with no interior supporting structure. Executive hangars are typically less than 10,000 sf and can accommodate small aviation businesses, one larger aircraft, or multiple smaller aircraft, while conventional hangars can range in size from 10,000 sf to 20,000 sf. Both of these hangar types typically require all utilities and segregated roadway access. RRL has approximately 47,600 sf of executive hangar space and no conventional hangar space. An additional 25,000 sf of executive/conventional hangar capacity is estimated to be needed by the end of the planning period.

- **Service/maintenance hangars** house businesses that offer services such as aircraft maintenance, line service, aircraft manufacturing, and aircraft fueling. High levels of activity can be concentrated around these hangars, necessitating adequate apron space for the storage and circulation of aircraft. These facilities are best placed along ample apron frontage with good visibility from the runway system for transient aircraft. Utility services and vehicle parking areas are needed for these types of facilities. Currently, RRL has about 4,700 sf of service/maintenance hangar space available, with an additional 9,300 sf anticipated to be needed by the end of the planning period.

Consideration #3 – Aprons and Marked Aircraft Parking

RRL has approximately 7,800 square yards (sy) of apron space for aircraft parking and circulation, with 18 marked parking positions for fixed-wing aircraft. Based on projected growth in based aircraft and transient operations, an additional 2,600 sy of apron capacity is needed over the next 20 years. Because apron space is typically co-located with hangar facilities, the landside alternatives assume areas of hangar development will also include apron space. Additional marked aircraft parking is also projected to be needed, and the alternatives to follow will depict parking for both fixed-wing aircraft and helicopters.

Consideration #4 – Land Development

The landside alternatives present development and redevelopment areas on the airport for aviation-related and non-aviation-related uses, considering highest and best use potential. Aviation-related uses are typically reserved for property with direct access to the airfield. For property that is segregated from the airfield, the airport could consider non-aviation-related development, following coordination with the FAA. The FAA stipulates that all land with reasonable airside access should be used or reserved for aviation purposes. Generally, airport property is subject to AIP grant assurances; therefore, if the sponsor wishes to pursue non-aeronautical development on airport property acquired with federal grants, they will need to coordinate with the FAA to request a land use change. If the FAA determines that the land is not needed for aeronautical purposes until a long-term condition is met, a land use change may be justified

and granted for a short-term use. Ordinarily, land on or in proximity to the flight line and airport operations area is needed for aeronautical purposes and should not be used or planned for non-aviation purposes. The proceeds derived from the land use change must be used exclusively for the benefit of the airport. They may not be used for a non-airport purpose, and they cannot be diverted to the airport sponsor's general fund or used for general economic development unrelated to the airport.

A land use change of airport property will generally be reviewed on a case-by-case basis at the time the change is necessary; however, the airport land use drawing, which is included as part of the ALP set, shows those areas likely eligible to be released from obligation.

The following sections detail four landside alternatives as they relate to the considerations detailed above. The first alternative is a terminal area layout plan previously developed by the airport's engineer. Three additional alternatives have been prepared to illustrate other potential development plans aimed at meeting the needs of general aviation through the long-term planning period and – in some cases – beyond. It should be noted that the alternatives presented are not the only reasonable options for development. In some cases, a portion of one alternative could be intermixed with another, or some development concepts could be replaced with others. The overall intent of this exercise is to outline basic development concepts to spur collaboration for a final recommended plan. The final recommended plan serves as a guide for the airport, which will aid the City of Merrill in the strategic planning of airport property. Airport operators often change their plans to meet the needs of specific users. The goal in analyzing landside development alternatives is to focus future development so that airport property can be maximized and aviation activity can be protected.

LANDSIDE ALTERNATIVE 1

Depicted on **Exhibit 4D**, Landside Alternative 1 reflects a terminal area plan previously developed by the airport's engineer. This option focuses solely on developable space on the airport's south side, near the terminal building. It should be noted that some grading, site preparation, and stormwater infrastructure have already been completed in this area. A 35-foot BRL based on the airport's existing instrument approach capability (GPS approaches with visibility minimums not lower than one-mile) is also shown.

As shown on the exhibit, the proposed layout includes executive hangars of varying sizes to accommodate a variety of storage needs, as well as an eight-unit T-hangar. New taxilanes accessing each facility are also depicted. Land use reserve areas are shown on the back of the exhibit. Areas along the flightline should generally be reserved for future aeronautical development if/when the need arises, while areas that are inaccessible to the airfield or are considered to be surplus property by airport stakeholders may be considered for release for non-aeronautical development.

Landside Alternative 1 proposes approximately 107,400 total sf of new hangar facilities, with 9,600 sf in the form of T-hangars and 97,800 sf of executive and conventional style hangars.

LANDSIDE ALTERNATIVE 2

Depicted on **Exhibit 4E**, Landside Alternative 2 focuses primarily on expansion of small aircraft storage facilities, including additional apron pavement and aircraft parking. Because there is limited space for construction of new facilities on the east side of the airport, the majority of the proposed development is located in the terminal area. Consideration has also been given to the construction of new vehicle access roads and dedicated parking for tenants in an effort to segregate vehicle and aircraft movements as much as possible. A 35-foot BRL based on the airport's existing instrument approach capability (GPS approaches with visibility minimums not lower than one-mile) is also shown.

The features of Landside Alternative 2 include the following:

1. Construction of two executive box hangars and one T-hangar south of the terminal building on sites that are currently shovel-ready. For planning purposes, the proposed executive box hangars are sized 75 feet by 75 feet and the T-hangar is shown as 72 feet by 210 feet.

2. East of the terminal, five new executive hangars are proposed adjacent to an existing executive box hangar. To access the easternmost of these hangars from the airside, new taxilane pavement would need to be constructed, as depicted on the exhibit. Vehicle access is proposed to extend from the existing roadway serving the proposed T-hangar in this area.

3. The terminal apron is proposed to be expanded to the south by approximately 3,800 sy, with space for additional marked parking for fixed-wing aircraft.

4. West of the terminal, two conventional hangars sized 100 feet by 100 feet are proposed, along with two 60-foot by 60-foot executive hangars and three six-unit T-hangars (60 feet by 158 feet). A new vehicle road extending west from Champagne Drive is proposed to provide access to these facilities.

5. Three hangars are proposed on the east side of the airport and would be accessible via the FBO apron from the airside. As shown on the exhibit, two executive hangars and a two-unit T-hangar are proposed north of the existing city-owned T-hangar.

6. Options for both aeronautical-use and non-aeronautical reserve property are depicted on the second page of **Exhibit 4E**. Landside Alternative 2 depicts an option that maintains the majority of property north and south of primary Runway 7-25 for future aeronautical development, while property east and west of Runway 16 is proposed to be considered for potential release.

Landside Alternative 2 proposes approximately 106,400 total sf of new hangar facilities, including 40,700 sf in the form of T-hangars and linear box hangars, and 65,700 sf of executive and conventional style hangars. Approximately 3,800 sy of aircraft parking apron space is also proposed under this alternative, with additional apron and taxilane pavement planned for proposed hangars.

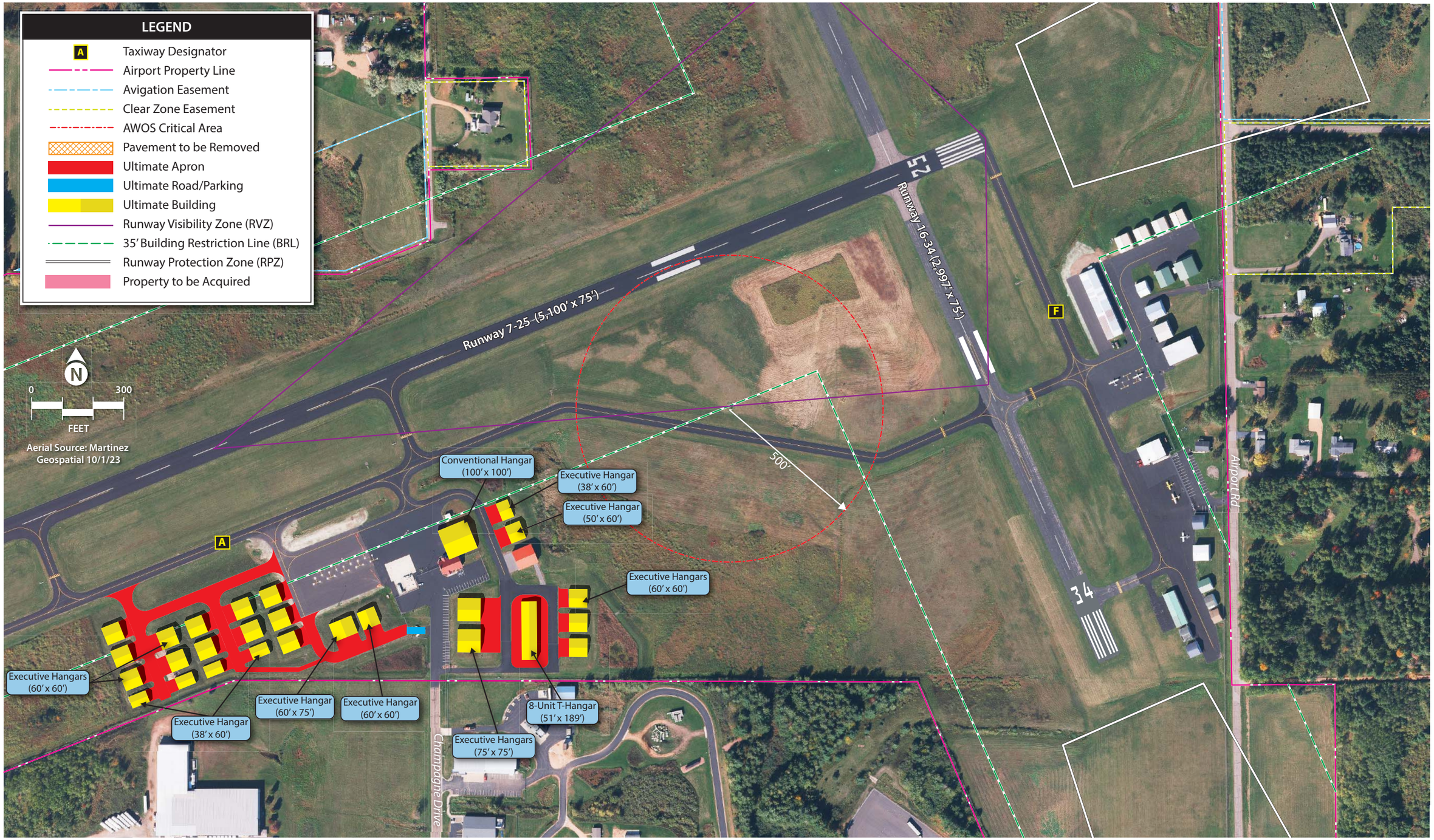

Exhibit 4D
LANDSIDE ALTERNATIVE 1

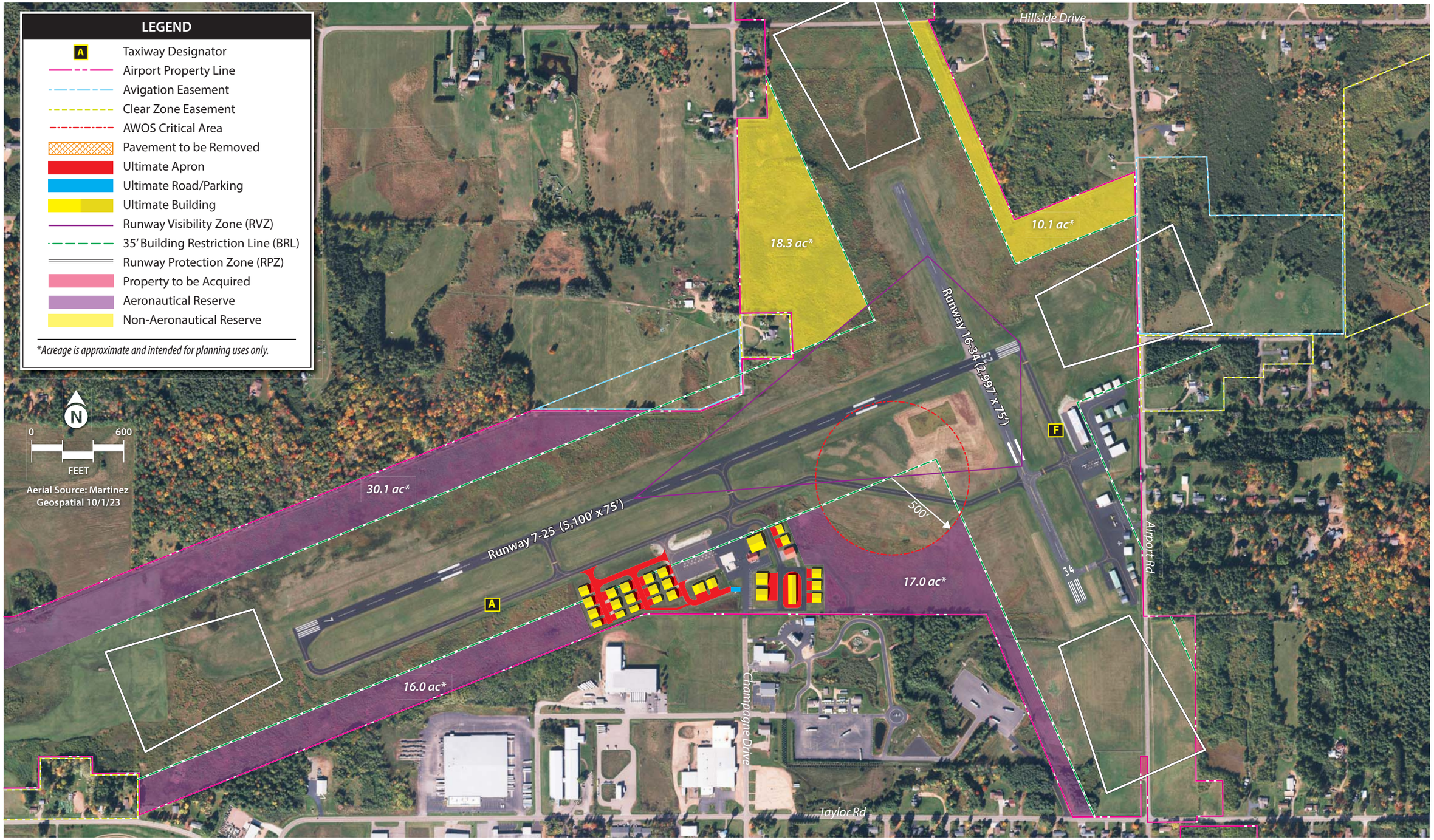

Exhibit 4D
LANDSIDE ALTERNATIVE 1

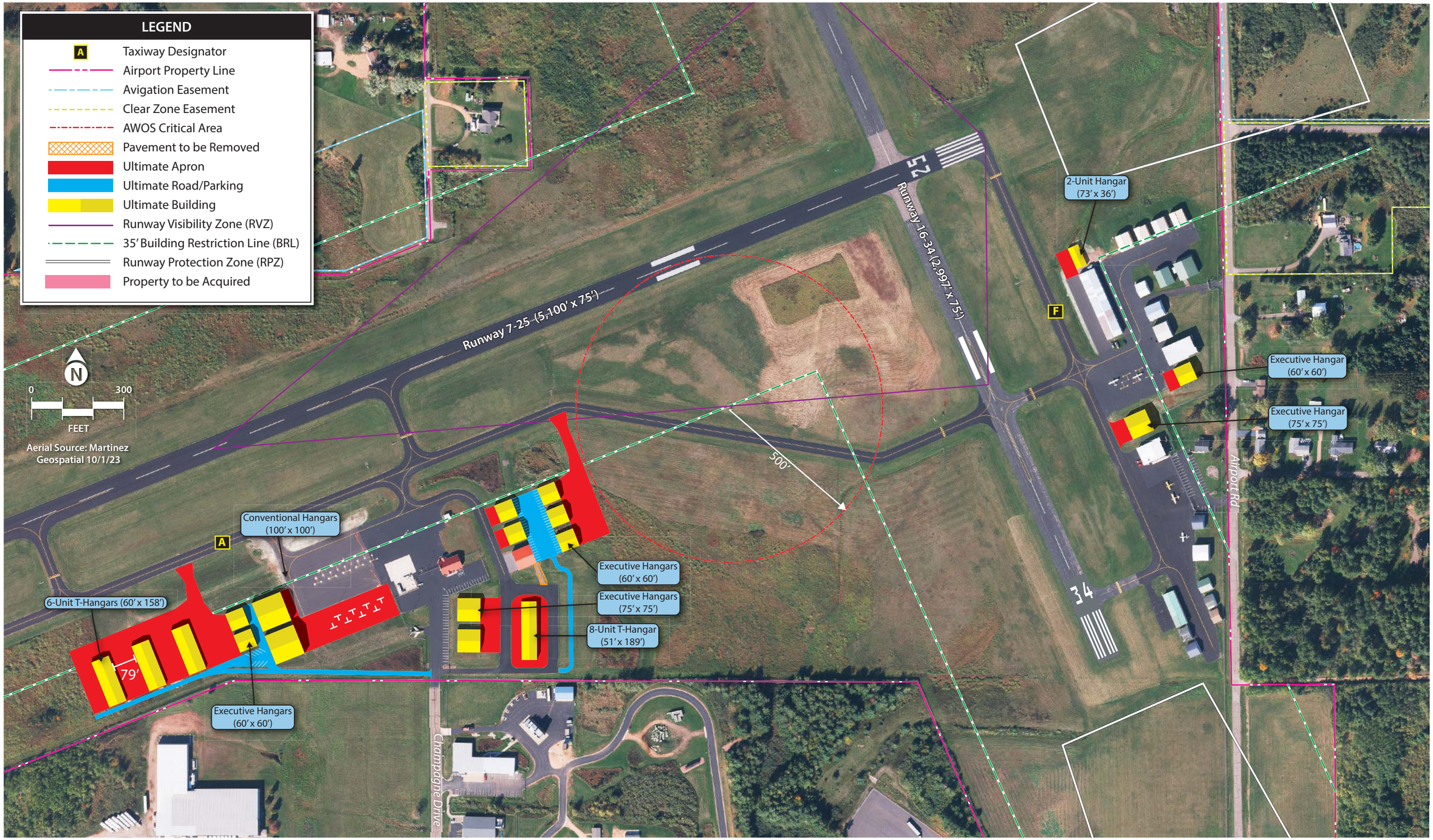

Exhibit 4E
LANDSIDE ALTERNATIVE 2

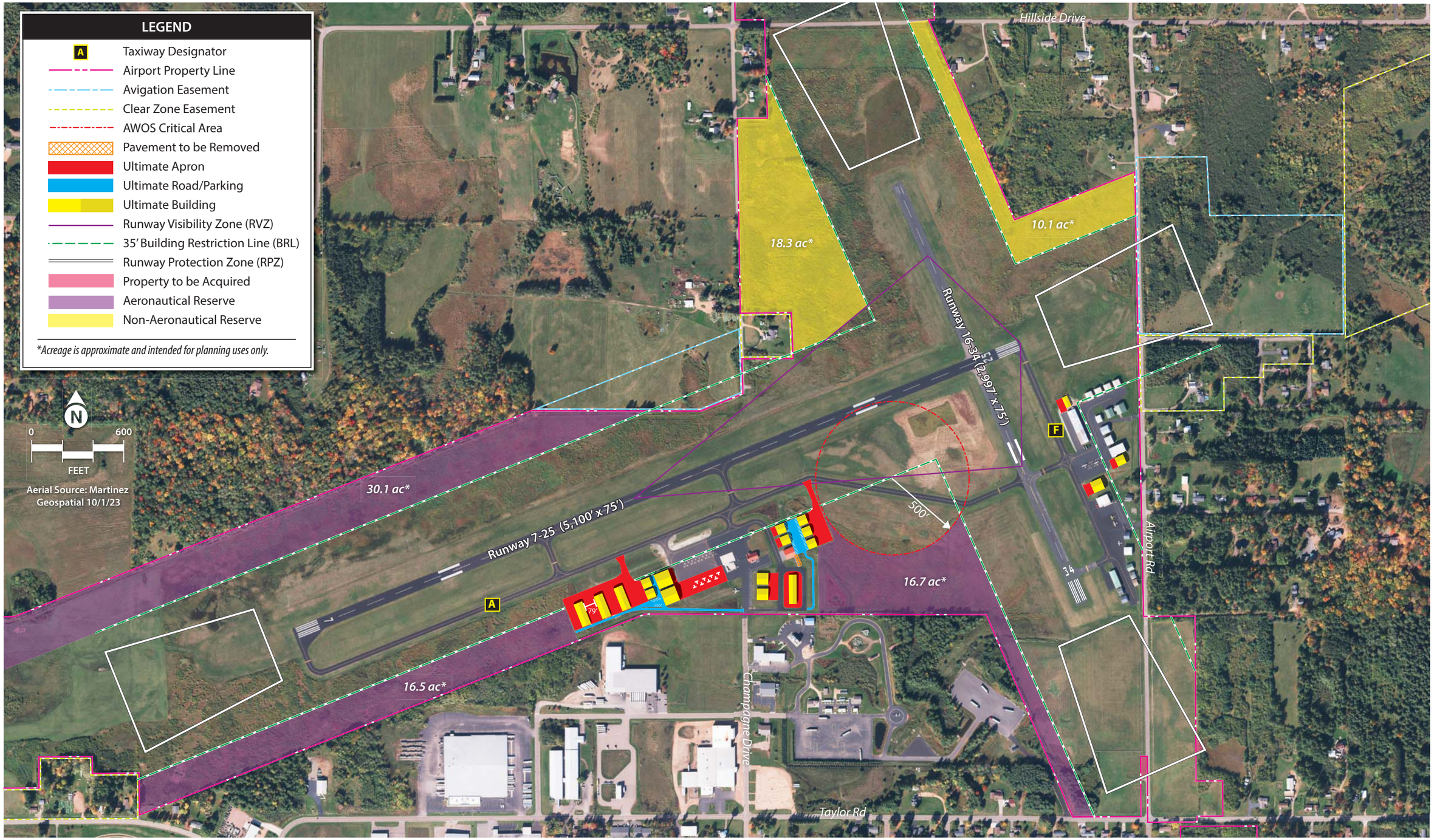

Exhibit 4E
LANDSIDE ALTERNATIVE 2

LANDSIDE ALTERNATIVE 3

Landside Alternative 3, depicted on **Exhibit 4F**, considers a different layout for hangar development at Merrill Municipal Airport. Under this scenario, all proposed structures are located on the west side of the airport, in the vicinity of the terminal, and no vertical development is proposed on the east side. This option considers a greater potential for facility development and earmarks areas that could be reserved for specific hangar types. Like the previous alternative, a 35-foot BRL based on the airport's existing instrument approach capability (GPS approaches with visibility minimums not lower than one-mile) is shown.

The features of Landside Alternative 3 include the following:

1. Construction of two executive hangars and one T-hangar south of the terminal building on sites that are currently shovel-ready. For planning purposes, the proposed hangars are sized 75 feet by 75 feet for the executive hangars and 72 feet by 210 feet for the T-hangar.

2. East of the terminal, a 100-foot by 100-foot conventional hangar is proposed adjacent to the existing executive hangar. Vehicle access is proposed to extend from the existing roadway serving the proposed T-hangar in this area.

3. Like Alternative 1, the terminal apron is proposed to be expanded to the south by approximately 6,600 sy, with space for additional tiedowns for fixed-wing aircraft. An expansion to the west is also proposed, including approximately 2,200 sy of pavement that includes dedicated helicopter parking. A 75-foot by 75-foot executive hangar is proposed south of the expanded apron.

4. A complex of executive hangars is proposed west of the proposed helicopter parking area. As shown on the exhibit, these hangars are sized 75 feet by 75 feet and are situated to avoid a north-facing position as much as possible, given the available developable space. A new vehicle road extending west from Champagne Drive is proposed to provide access to these facilities, with tenant parking provided at the rear of each hangar.

5. No new hangars are proposed on the east side of the airport. The three hangars located nearest Runway 34 and the associated taxilane pavement on the west side are proposed to be removed when these facilities reach the end of their useful life.

6. The FBO apron is proposed to be expanded to the south, with space for four tiedowns provided for fixed-wing aircraft parking.

7. Relocation of the automated weather observing system (AWOS) that is currently located near the intersection of Runways 7-25 and 16-34, adjacent to Taxiway A. Relocating this equipment to the north side of Runway 7-25 allows for greater development potential south of the runway, as the critical area associated with the AWOS equipment restricts vertical development.

8. Two areas that are centrally located on the south side of the airfield are set aside for specific hangar type development, provided that the AWOS is relocated. Closer to primary Runway 7-25, an area is earmarked for expansion of corporate hangar facilities (i.e., executive or conventional style hangars). South of this area and extending to the east along crosswind Runway 16-34,

the area is proposed to be intended for development of T-hangar facilities, with a taxiway depicted on the west side of Runway 34 that would ultimately provide an access point to this area.

9. As depicted on the second page of **Exhibit 4F**, property to be held in reserve for aeronautical or non-aeronautical development is shown. Alternative 2 maintains the majority of property north and south of primary Runway 7-25 for future aeronautical development, while property east and west of Runway 16 is proposed to be considered for potential release.

Landside Alternative 3 proposes approximately 92,700 total sf of new hangar facilities, including 9,600 sf in the form of T-hangars and 83,100 sf of executive and conventional style hangars. Approximately 8,800 sy of aircraft parking apron space is also proposed under this alternative.

LANDSIDE ALTERNATIVE 4

Depicted on **Exhibit 4G**, Landside Alternative 4 considers a different development scenario based on the implementation of an approach with lower visibility minimums (down to ¾-mile). As described, if this were to occur, the primary surface width would increase from its current 500-foot width to a 1,000-foot width, shifting the 35-foot BRL farther from the Runway 7-25 centerline, as shown on the exhibit, and likely limiting the development potential along this runway. Features of Landside Alternative 4 are described as follows:

1. Construction of two executive hangars and one T-hangar south of the terminal building on sites that are currently shovel-ready. For planning purposes, the proposed hangars are sized 75 feet by 75 feet for the executive hangars and 72 feet by 210 feet for the T-hangar.
2. There is limited potential for development west of the terminal due to the shifted BRL; however, some structures may be allowable, depending on their height and through coordination with the FAA. **Exhibit 4G** depicts two proposed T-hangars, which are typically under 35 feet tall, along with additional apron pavement for helicopter parking.
3. East of the terminal, a new apron is proposed to support one 75-foot by 75-foot executive box hangar and two 100-foot by 100-foot conventional hangars. Vehicle access is proposed to extend from the existing roadway serving the proposed T-hangar in this area.
4. A complex of executive hangars is proposed farther to the east, with airside access from Taxiway A and vehicle access from the south.
5. A hangar complex along Runway 16-34 is also proposed, primarily consisting of T-hangars. As shown, 10-unit and four-unit T-hangars are proposed, along with two 50-foot by 50-foot executive hangars, with a vehicle parking lot at the rear.
6. On the east side of the airport, three executive hangars are proposed northeast of the FBO hangar. New apron pavement is also shown with additional parking for fixed-wing aircraft.
7. The three hangars located nearest Runway 34 and the associated taxilane pavement on the west side are proposed to be removed when these facilities reach the end of their useful life.

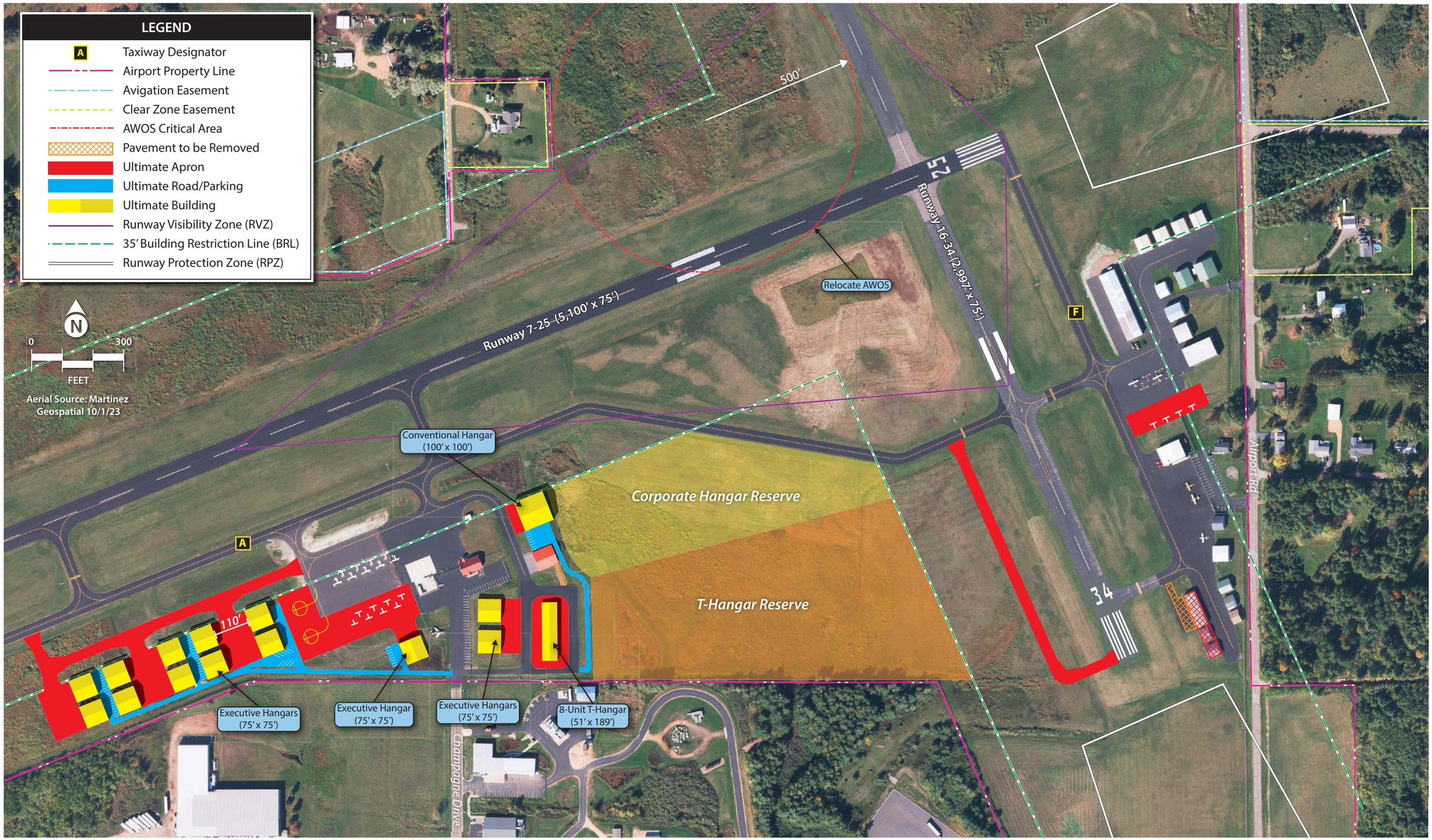

Exhibit 4F
LANDSIDE ALTERNATIVE 3

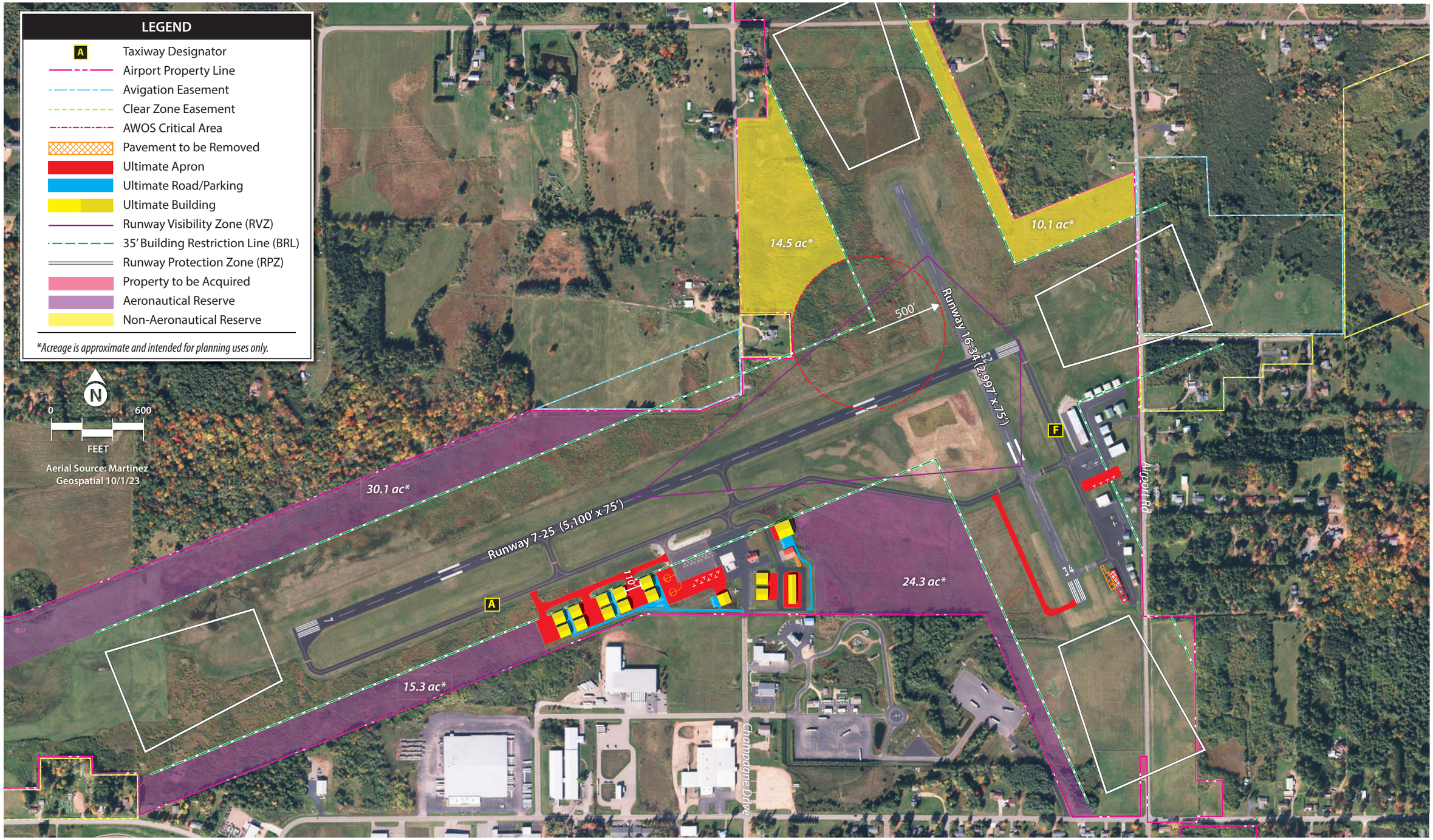

Exhibit 4F
LANDSIDE ALTERNATIVE 3

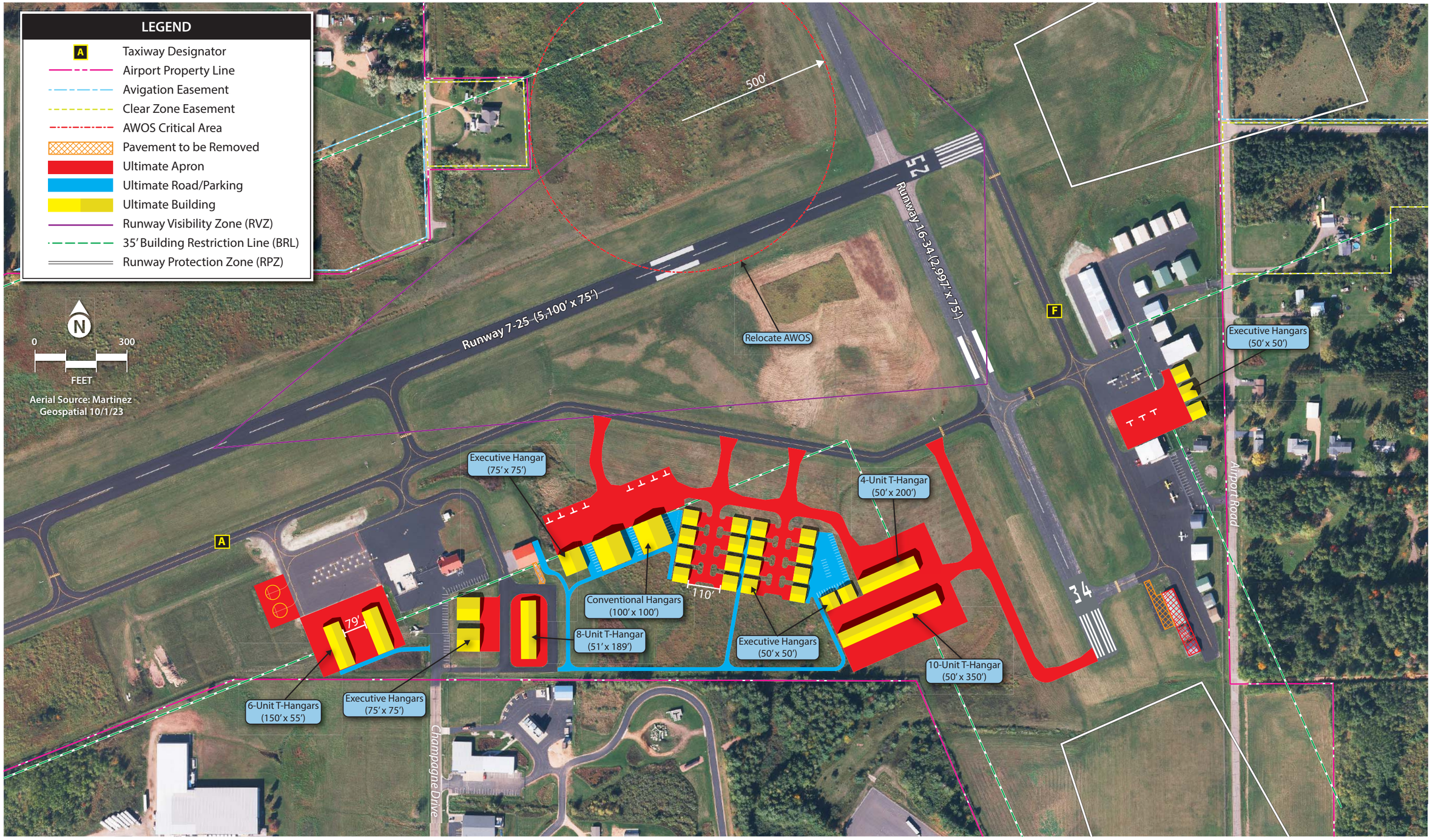

Exhibit 4G
LANDSIDE ALTERNATIVE 4

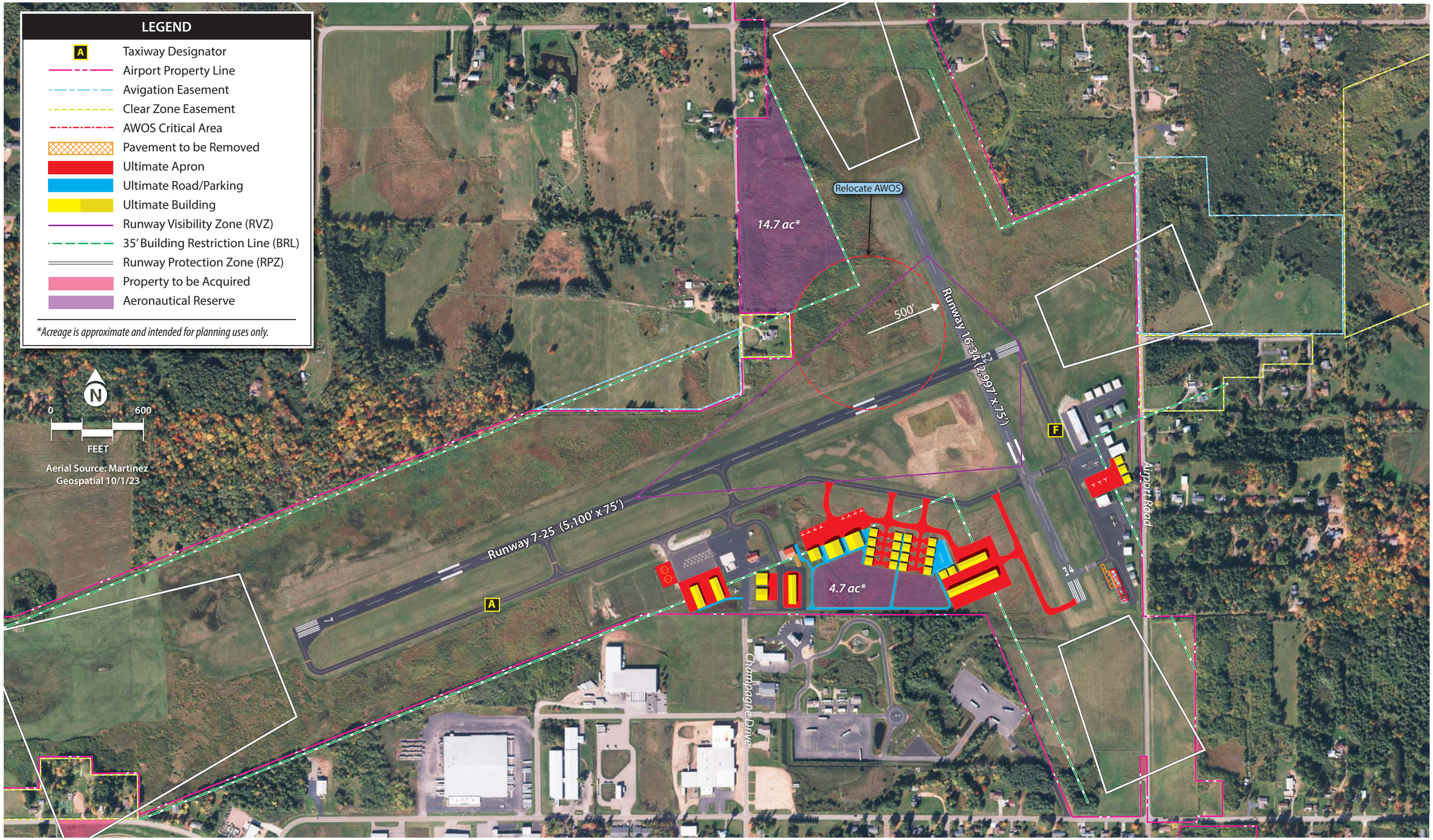

Exhibit 4G
LANDSIDE ALTERNATIVE 4

8. Relocation of the AWOS that is currently located near the intersection of Runways 7-25 and 16-34, adjacent to Taxiway A. Relocating this equipment to the north side of Runway 7-25 allows for greater development potential south of the runway, as the critical area associated with the AWOS equipment restricts vertical development.

9. In terms of reserve property for future development, Alternative 3 depicts two areas that are set aside for future aeronautical development. The first is a 4.7-acre area south of the primary proposed development area. The second is a 14.7-acre area north of Runway 7-25. This alternative does not include any reserved areas for non-aeronautical development.

Landside Alternative 4 proposes approximately 143,000 total sf of new hangar facilities, with 53,600 sf in the form of T-hangars and 89,400 sf of executive and conventional style hangars. Approximately 11,500 sy of new apron pavement is proposed.

LANDSIDE SUMMARY

The landside alternatives presented are intended to accommodate an array of aviation activities that either currently occur or could be expected to occur at RRL in the future. There is current demand for new facilities at RRL, and airport and city management will need to determine how to develop the property in an organized and thoughtful way. It is beneficial to provide a long-term vision for the airport for future generations, and each of the development options considers a long-term vision that would, in some cases, extend beyond the 20-year scope of this master plan. **Table 4A** summarizes the various capacities of hangars and apron space proposed in each alternative.

Table 4A | Landside Alternative Facility Capacities

	Landside Alternative 1	Landside Alternative 2	Landside Alternative 3	Landside Alternative 4
T-Hangar/Linear Box Hangars (sf)	9,600	40,700	9,600	53,600
Executive/Conventional Hangars (sf)	97,800	65,700	83,100	89,400
Apron Space (sy)	NA	3,800	8,800	11,500

Source: Coffman Associates analysis

SUMMARY

This chapter is intended to present an analysis of various options that may be considered for specific airport elements. The need for alternatives is typically spurred by projections of aviation demand growth and/or by the need to resolve non-standard airport elements. FAA design standards are frequently updated with the intent of improving the safety and efficiency of aircraft movements on and around airports, which can lead to pavement geometries that previously qualified as standard becoming classified as non-standard.

Several development alternatives related to both the airside and the landside have been presented. For the airside, the major considerations involve evaluating runway extension options for both the primary

and crosswind runways, addressing non-standard taxiway geometry, and upgrading visual approach aids. For the landside, alternatives were presented to consider additional aviation development, primarily on the south and east sides of the airport, and under different runway environments (i.e., existing and potential improved instrument approach capability).

The next step in the master plan development process is to arrive at a recommended development concept. The participation of the PAC and the public will be important considerations. Additional consultation with the FAA and BOA may also be required. Once a consolidated development plan is identified, a 20-year capital improvement program, including a list of prioritized projects tied to aviation demand and/or necessity, will be presented. Finally, a financial analysis will be presented to identify potential funding sources and show airport/city management what local funds will be necessary to implement the plan.

Chapter 5

RECOMMENDED MASTER PLAN CONCEPT

Chapter 5

RECOMMENDED MASTER PLAN CONCEPT

The airport master plan for Merrill Municipal Airport (RRL) has progressed through a systematic and logical process with a goal of formulating a recommended 20-year development plan. The process began with an evaluation of existing and future operational demand, which aided in creating an assessment of future facility needs. Those needs were then used to develop alternative facility plans to meet projected needs. Each step in the planning process has included the development of draft working papers, which were presented and discussed at previous planning advisory committee (PAC) meetings and a public information workshop and have been made available on the project website.

In the previous chapter, several development alternatives were analyzed to explore options for the future growth and development of RRL. The development alternatives have been refined into a single recommended concept for the master plan. This chapter describes, in narrative and graphic form, the recommended direction for the future use and development of RRL.

The recommended concept provides the ability to meet the disparate needs of various airport operators. The goal of this plan is to ensure the airport can continue and improve in its role of serving general aviation operators. The plan has been specifically tailored to support existing and future growth in all forms of potential aviation activity as demand materializes.

The recommended master plan concept, as shown on **Exhibit 5A**, presents a long-term configuration for the airport that preserves and enhances its role while meeting Federal Aviation Administration (FAA) design standards. The phased implementation of the recommended development concept will be presented in Chapter Six. The following sections describe the key details of the recommended master plan concept.

AIRFIELD PLAN

The airfield plan generally considers improvements related to the runway and taxiway system and navigational aids. The following sections provide descriptions of the airfield recommendations.

DESIGN STANDARDS

The FAA has established design criteria to define the physical dimensions of runways and taxiways, as well as the imaginary surfaces surrounding them, to enhance the safe operation of aircraft at airports. These design standards also define the separation criteria for the placement of landside facilities.

As previously discussed, the design criteria primarily center on the airport's critical aircraft. The critical aircraft is the most demanding aircraft (or family of aircraft) that currently conducts or is projected to conduct 500 or more operations (takeoffs and landings) per year at the airport. Factors included in airport design are an aircraft's wingspan, approach speed, and tail height, as well as the instrument approach visibility minimums for each runway. The FAA has established the runway design code (RDC) to relate these critical design aircraft factors to airfield design standards.

While airfield elements, such as safety areas, must meet design standards associated with the applicable RDC, landside elements can be designed to accommodate specific categories of aircraft. For example, an airside taxiway must meet taxiway object free area (TOFA) standards for all aircraft types that use the taxiway, while the taxilane to a T-hangar area only needs to meet width standards for the smaller single- and multi-engine piston aircraft that are expected to utilize the taxilane.

The applicable RDC and critical design aircraft for each runway at RRL in the existing and ultimate conditions, as established in Chapter Two, are summarized in **Table 5A**.

TABLE 5A | Airport and Runway Classifications

	Runway 7-25		Runway 16-34
	Existing/Future	Ultimate	Existing & Ultimate
Runway Design Code (RDC)	A-I-5000	B-II-4000	A-I-VIS
Taxiway Design Group (TDG)	1A	2A	1A
Critical Aircraft (Typ.)	Cessna 172	King Air 200/300/350	Cessna 172

Sources: FAA AC 150/5300-13B, Airport Design; Coffman Associates analysis

PRIMARY RUNWAY 7-25

Runway Dimensions | Runway 7-25 is currently 5,100 feet long and 75 feet wide. At this length, the runway can accommodate all piston-powered aircraft, as well as most of the more common business jets in the fleet operating under moderate loading conditions; however, when operating with heavier useful loads, many of these aircraft require additional runway length to safely operate (refer to Chapter Three for additional information). As such, a 400-foot extension to Runway 7-25 is planned, as shown on **Exhibit 5A**, bringing the total runway length to 5,500 feet. This is the FAA-recommended length to accommodate the 75 percent and 100 percent categories of the business jet fleet when operating at 60 percent useful load. The existing runway width of 75 feet meets ultimate airport reference code (ARC) B-II design criteria and is planned to be maintained.

Note: Justification for the runway extension will be required prior to project implementation.

Ultimate Runway Design Codes

Runway 7-25: RDC B-II-4000
Runway 16-34: RDC A-I-5000

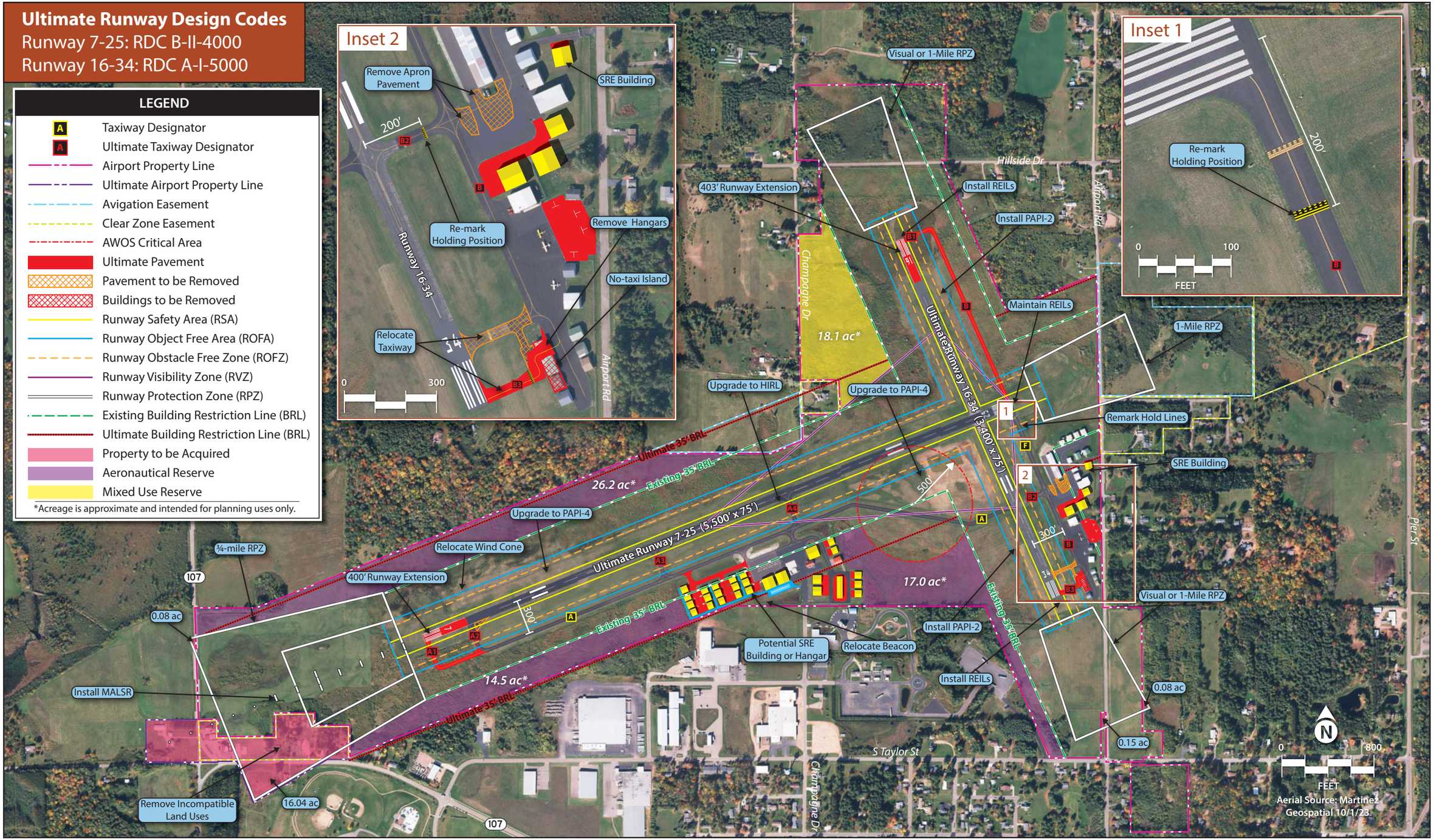

Exhibit 5A
RECOMMENDED DEVELOPMENT CONCEPT

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Pavement Strength | Runway 7-25 is currently strength-rated at 45,000 pounds for single wheel aircraft (S), 65,000 pounds for dual wheel aircraft (D), and 100,000 pounds for dual tandem wheel aircraft (2D). These ratings are sufficient for the ultimate critical aircraft (King Air 200/300/350), which have maximum takeoff weights (MTOW) ranging between 12,500 and 15,000 pounds on dual wheel main landing gear.

Safety Areas and Property Acquisition | In the existing A-I environment associated with Runway 7-25, all safety areas are owned and controlled by the airport sponsor, either as part of airport property or via easements, and are generally free from obstructions or incompatible uses. Airport Road traverses the Runway 25 runway protection zone (RPZ). While the FAA prefers public roads to be located outside the RPZ, it is often infeasible to do so, as mitigative actions typically include either rerouting or closing the roadway or shortening the runway by physically removing pavement or displacing the threshold. None of these options are considered feasible, so the plan does not include any actions to remove the road from the RPZ.

In the ultimate B-II-4000 condition, the dimensions of the runway safety area (RSA) and runway object free area (ROFA) increase, resulting in an obstruction to the ROFA. The wind cone located near Runway 7 is encompassed by the ultimate ROFA and is planned to be relocated to the north, outside this safety area.

The potential for lower visibility minimums associated with the instrument approach to Runway 7 also results in an increase to the size of this runway's RPZ. When combined with the planned extension to this runway, a portion of the ultimate Runway 7 RPZ would extend beyond the airport's existing clear zone easement on the southwest side, along with approximately 0.08 acres of property within the northwest corner of the RPZ. While the clear zone easement that is currently in place protects the airspace in this area by limiting vertical development, it does not allow for circumvention of the FAA's standards where incompatible land uses are concerned. Currently, this area contains homes and businesses, which are considered by the FAA to be incompatible land uses within an RPZ. Prior to reduction of the visibility minimums associated with the area navigation (RNAV) approach to Runway 7, the airport sponsor would need to acquire these properties as they become available and remove the structures located within the RPZ, as indicated on **Exhibit 5A**. Additional coordination with the FAA regarding the introduction of Highway 107 into the RPZ would also be necessary.

Visual Approach Aids | Runway 7-25 is currently equipped with a two-box precision approach path indicator (PAPI-2) system and runway end identifier lights (REILs) at each runway end. The plan includes an upgrade to a four-box PAPI (PAPI-4) system when jet traffic increases to the point the FAA and/or the Wisconsin Department of Transportation (WisDOT) Bureau of Aeronautics (BOA) deems the upgrade necessary and justified.

The REILs associated with each runway are planned to be maintained; however, the plan also includes installation of a medium intensity approach lighting system with runway alignment indicator lights (MALSR) on Runway 7. A MALSR is an approach lighting system that is recommended to be installed on runways equipped with instrument approach procedures with visibility minimums at ¾ mile or lower and is required for approaches with ½-mile or lower minimums. If and when a MALSR is installed on Runway 7, the REILs would no longer be necessary and would be removed. It should also be noted that installation of the MALSR would require property acquisition west of Highway 107 where several of the sequenced flashers would be located.

CROSSWIND RUNWAY 16-34

Runway Eligibility | RRL is served by a crosswind runway, Runway 16-34. As part of this master plan, the eligibility and justification for the continued maintenance of this runway was evaluated. Analysis detailed in Chapter Three considered 10 years of overall historical wind data, as well as scenarios that evaluated monthly wind data and daytime monthly data. Prior to this master plan, analysis was conducted by the airport's engineer that involved weighting operations during peak periods. Both evaluations determined that the primary runway provided less than 95 percent coverage during crosswind conditions, which has historically been the FAA's threshold for eligibility. Ultimately, the FAA concurred and issued a memorandum in 2023 stating that Runway 16-34 is considered eligible (see Appendix B).

More recently, new guidance regarding crosswind runway eligibility was released and is included in Reauthorization Program Guidance Letter (R-PGL) 25-01, *Runway Projects*. The guidance includes a definition for "legacy crosswind runways," which are existing runways that were previously funded to function as crosswind runways, even if the primary runway provides greater than 95 percent wind coverage. These runways are eligible for federal funding, per the new guidance. Runway 16-34 is considered by the FAA to be a legacy crosswind runway; therefore, its continued maintenance is eligible for federal grants.

Runway Dimensions | Runway 16-34 measures 2,997 feet long by 75 feet wide. In terms of length, the runway falls short of the 3,400 feet recommended by the FAA to accommodate 95 percent of the small aircraft fleet. In addition to this FAA-recommended length, additional analysis was conducted by the airport's engineer in coordination with the BOA, which ultimately determined that a length of 3,400 is necessary and justified (refer to Appendix C). As such, the runway is planned to be extended to the north by 403 feet, bringing the total runway length to 3,400 feet. In terms of runway width, the design standard for an A-I runway details a 60-foot width. While Runway 16-34 exceeds the standard, it is planned to be maintained at 75 feet wide, with the airport sponsor potentially funding pavement projects that exceed the standard.

Note: Additional justification for the runway extension will likely be required prior to project implementation.

Pavement Strength | Runway 16-34 is reported to have a strength rating of 26,000 pounds S. This is considered sufficient for the aircraft that currently use and are planned to use the runway, so no changes to the pavement strength are planned.

Safety Areas and Property Acquisition | The RSA, ROFA, and runway obstacle free zone (ROFZ) associated with Runway 16-34 are located entirely on airport property and are free of obstructions. Within the Runway 34 RPZ, there are two small portions of the RPZ that are not under airport control, each of which totals less than 0.2 acres. The plan includes acquisition of these areas, or acquisition of an easement, at a minimum. Both RPZs associated with Runway 16-34 contain public roadways: Hillside Drive on the north end and Airport Road on the south end. No changes to either roadway are planned.

Visual Approach Aids | Runway 16-34 is not equipped with any visual approach aids. The plan includes the installation of a PAPI-2 system and REILs at each runway end.

Runway Markings | Runway 16-34 is equipped with basic markings, which include centerline striping and runway designation markings. The plan includes the addition of threshold markings and aiming points, consistent with non-precision markings, in the event an instrument approach with visibility minimums not lower than one mile is implemented.

TAXIWAY IMPROVEMENTS

The taxiway system at RRL consists of Taxiway A, which serves the majority of Runway 7-25, and Taxiway F, which provides access to Runway 34 and Runway 25. The recommended development concept includes the construction of parallel taxiway pavement to serve the north end of Runway 16-34, along with a new threshold connect to Runway 34. Taxiways serving Runway 7-25 are planned to meet airplane design group (ADG) II and taxiway design group (TDG) 2A design standards, in accordance with the ultimate design standards associated with this runway, which establish a minimum taxiway width of 35 feet. Taxiways serving Runway 16-34 are planned to meet ADG I and TDG 1A standards, which call for a width of 25 feet.

Taxiway Nomenclature | The FAA recommends using the guidelines found in Engineering Brief 89, *Taxiway Nomenclature Convention*, when developing or revising airport plans, such as this master plan. Following the standards presented in the brief, the planned taxiway system at RRL has been given alphanumeric designations to improve the situational awareness of pilots and the safety margins at the airport. Taxiway F, which currently serves the southern portion of crosswind Runway 16-34, is planned to be redesignated as Taxiway B. The ultimate designations are shown on **Exhibit 5A**.

Taxiway A | Taxiway A is planned to be maintained in its current configuration, with the pavement extended in conjunction with the extension of Runway 7-25. The ultimate and existing connector taxiways are planned to be redesignated as A1, A2, A3, and A4, beginning on the west end (Runway 7).

Ultimate Taxiway B | Existing Taxiway F is planned to be redesignated as Taxiway B and extended to the north to provide access to Runway 16. Currently, pilots departing on Runway 16 must back-taxi to utilize this runway, which can be detrimental to safety and runway capacity. Three connector taxiways (B1, B2, and B3) are planned, starting from the north.

Taxiway Geometry Improvements | As detailed in previous chapters, three non-standard conditions currently exist in terms of taxiway geometry, including two direct access points from the aprons on the east side of the airport, as well as the location of the connector taxiway intended to serve Runway 34. To mitigate the direct access point on the north end of the east side apron, a portion of apron pavement is planned to be removed. The removal of this pavement would also require removal of the tiedowns on this apron to allow for unimpeded aircraft circulation. Planned Taxiway B3 is a new threshold connector to Runway 34. Construction of this taxiway as depicted and removal of the existing connector to the north will eliminate the need for pilots to back-taxi when departing on Runway 34. This project will require the demolition of two hangars, as shown on **Exhibit 5A**. The intent behind these projects is to force pilots to make a turn prior to entering an active runway environment, thereby enhancing situational awareness and overall safety.

Holding Position Markings | Holding position markings on the airfield should all be located 200 feet from the runway centerline. While most of these markings are properly located, two do not meet the standard: one on existing Taxiway F (ultimate Taxiway B) prior to Runway 25 and one on ultimate Taxiway B2 east of Runway 16-34. Both are located at a separation of 125 feet from the runway centerlines. These markings are planned to be removed and new markings added at a separation of 200 feet.

WEATHER-REPORTING AND OTHER EQUIPMENT

The airport is equipped with an automated weather observation station (AWOS-3), which is located southwest of the runways' intersection. This equipment meets FAA siting criteria, and the associated 500-foot critical area is located on airport property. No changes are planned for the AWOS or its location.

A wind tee and lighted wind cone are also located southwest of the runways' intersection, while a supplemental wind cone is located north of Runway 7. The wind tee and lighted wind cone are planned to remain in their existing locations; however, as previously stated, the supplemental wind cone obstructs the ultimate ROFA and is planned to be relocated to a new site outside this safety area.

The airport is equipped with a rotating beacon, which is located on the east side of airport property. The beacon is planned to be relocated to the terminal area.

LANDSIDE CONCEPT

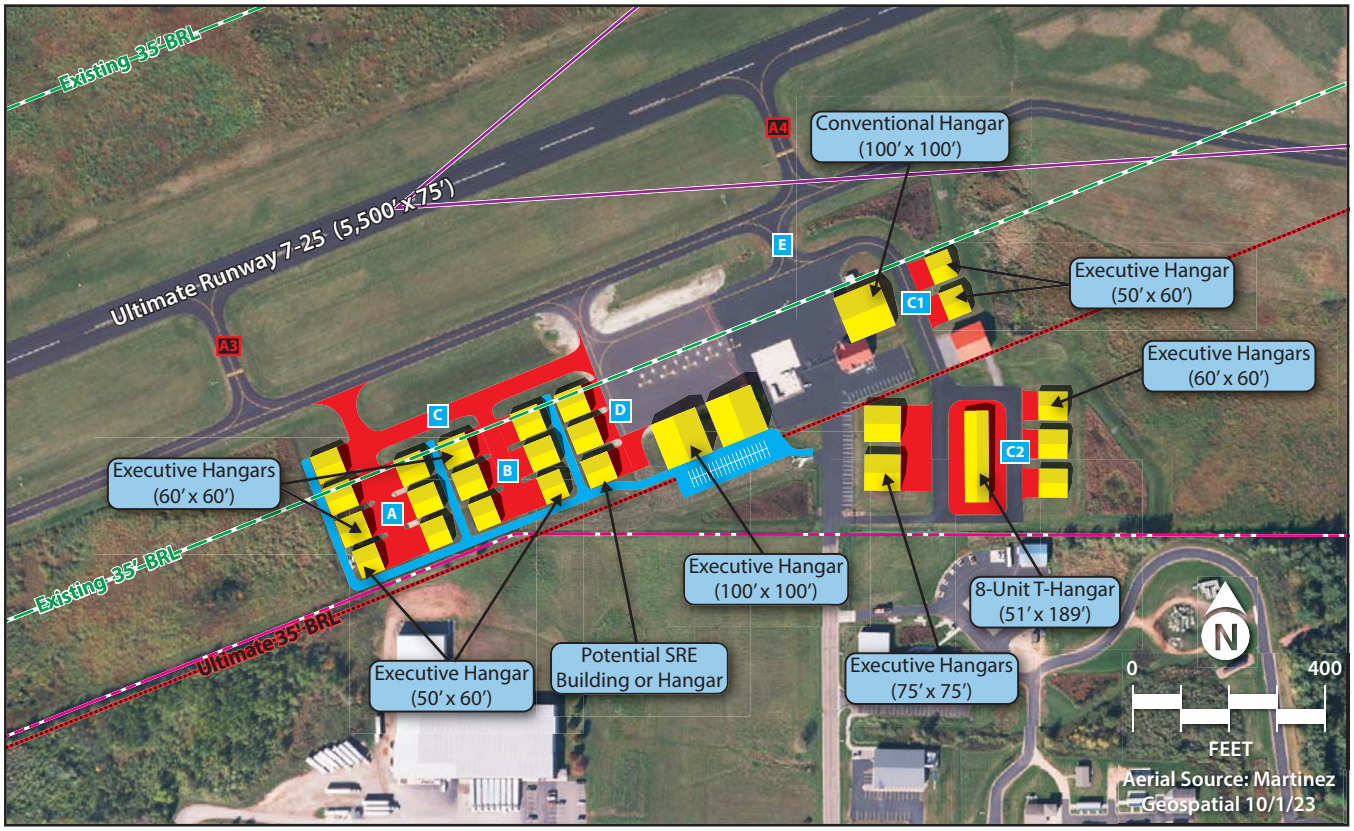
The primary goal of landside facility planning is to provide adequate space to meet reasonably anticipated needs of the various users while optimizing operational efficiency and land use. Achieving these goals yields a development scheme that segregates functional uses while maximizing the airport's revenue potential.

All landside development should occur only as dictated by demand. The locations and sizes of aprons and hangars proposed in the recommended plan are conceptual and may not reflect the needs of future developers and their customers. The recommended concept is strictly intended to be used as a guide for the City of Merrill when considering new developments.

Recommended landside developments are depicted on **Exhibit 5B**.

GENERAL AVIATION FACILITIES

Terminal | The facility requirements evaluation determined that the existing 3,200-square-foot (sf) terminal building is adequately sized for the operation levels projected through the long-term period, so no expansions or other projects to add capacity are planned; however, other improvements to the terminal, such as remodeling or upgrading building systems as needed, may be necessary in the future. Airport management/city staff should periodically inspect the facility to determine if and when upgrades may be needed.



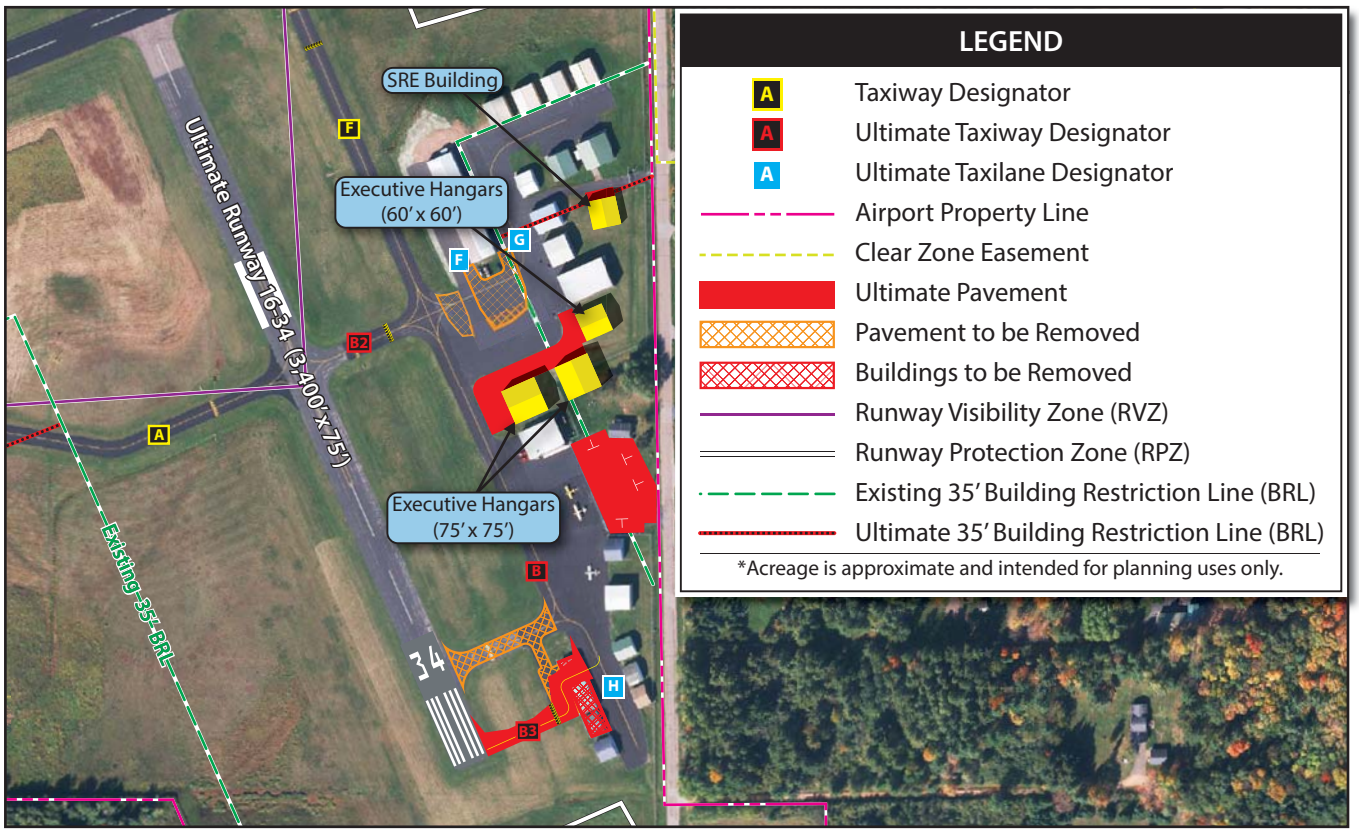


Exhibit 5B
RECOMMENDED LANDSIDE DEVELOPMENT

Apron and Tiedowns| The existing apron capacity at RRL totals approximately 18,700 square yards (sy); about 7,800 sy are used exclusively for aircraft parking, which includes 18 marked aircraft parking positions. The plan includes additional apron pavement associated with proposed hangars, as well as expansion of the east apron for public aircraft parking. This area is currently used as a parking lot for the fixed base operator (FBO) and other hangars in the vicinity; however, with the relocation of the FBO (Park City Aviation) to the terminal apron, this area would be better utilized as additional space for dedicated aircraft parking and would help compensate for the removal of the tiedowns on the east apron.

Hangars | Hangar facilities at RRL currently consist of T-hangars, which are designed to accommodate individual smaller aircraft, and executive box hangars, which can accommodate larger aircraft. The plan includes layouts for new executive hangars and conventional-style hangars, for which demand is greatest, as well as one eight-unit nested T-hangar. The majority of new hangar development is planned west of the terminal apron, where grading, site preparation, and stormwater infrastructure have already been completed. The executive box hangars in this area range in size from 3,000 sf to 3,600 sf. Two 10,000-sf conventional hangars are planned immediately south of the existing apron and are intended to serve corporate users or a specialty aviation service operator (SASO). South and east of the terminal building, additional executive box hangars are planned, ranging in size from 3,000 sf to 5,625 sf, along with the eight-unit T-hangar. A 10,000-sf conventional hangar is planned adjacent to the terminal building (north side) for use by Park City Aviation and is already under construction. On the airport's east side, three additional executive box hangars are planned.

Fuel Storage | Two tanks for aircraft fuel are located on the terminal apron. One is for 100LL Avgas and the other is for Jet A fuel; each has a 12,000-gallon capacity. Fuel flowage records were not available, so it is unclear if the existing capacity meets demand. The airport sponsor should regularly monitor usage to ensure the available capacity is sufficient and should plan to install a third tank for 100UL fuel when warranted.

Snow Removal Equipment Building | Snow removal equipment (SRE) and other maintenance equipment is currently stored in a hangar (identified as Building #14 on Exhibit 1G) that would be better utilized for aircraft storage. The plan includes the construction of an SRE building on the airport's east side. Consideration is also given to a south side location, as shown on **Exhibit 5B**.

Vehicle Parking and Access Roads | Vehicle parking at the airport is currently available adjacent to the terminal building and on the east side near the existing FBO hangar. As previously stated, the east side lot is planned to be used for apron expansion/aircraft parking when the need arises. As such, a second public parking area is planned on the south side at the rear of the conventional hangars, with access from Champagne Drive. A vehicle access road is planned to extend from this parking area to serve tenants of the hangars planned west of the terminal apron.

RESERVE PROPERTY

Airports often have areas of property that are undeveloped but should be classified for future use potential. Generally, areas along the flight line should be reserved for aeronautical development;

however, there are instances where these portions of airport property are inaccessible to the airfield or the surrounding road network and offer limited utility for aviation operations. These areas are typically reserved for non-aeronautical uses that provide opportunities to diversify and expand revenue streams for the airport.

At RRL, there are four portions of property that have no planned development but are set aside for future use. Three of these areas are intended to serve future aeronautical uses and are shown in purple shading on **Exhibit 5A**. If demand arises for hangar development or other aviation-related uses, these areas offer the most potential due to their locations along the flightline and near areas of the airport that have already been developed with aeronautical facilities. A fourth area, shown in yellow shading, is reserved for mixed-use development. A mixed-use designation applies to property that serves or has the potential to serve both aeronautical and non-aeronautical uses. This specific area, which is located along Champagne Drive on the airport's north side, has the potential to support either type of use.

AIRPORT RECYCLING, REUSE, AND WASTE REDUCTION

The primary objective of this section is to provide the City of Merrill and its airport administration with recommendations for ultimate improvements and processes that promote sustainable principles in addressing airport operations and aviation demand. Prioritizing sustainability in the planning process will aid the airport in identifying ways to reduce its overall environmental impact. As a result of implementing sustainability issues in the master plan process, the airport can become a more environmentally friendly economic hub.

REGULATORY GUIDELINES

FAA Modernization and Reform Act of 2012

The *FAA Modernization and Reform Act of 2012* (FMRA), which amended Title 49 United States Code (USC), included several changes to the Airport Improvement Program (AIP). Two of these changes are related to recycling, reuse, and waste reduction at airports.

- Section 132(b) of the FMRA expanded the definition of airport planning to include "developing a plan for recycling and minimizing the generation of airport solid waste, consistent with applicable state and local recycling laws, including the cost of a waste audit."
- Section 133 of the FMRA added a provision requiring airports that have or plan to prepare a master plan and receive AIP funding for an eligible project to ensure the new or updated master plan addresses issues relating to solid waste recycling at the airport, including the following:
    - The feasibility of solid waste recycling at the airport
    - Minimizing the generation of solid waste at the airport
    - Operation and maintenance requirements
    - A review of waste management contracts
    - The potential for cost savings or generation of revenue

State of Wisconsin Solid Waste Management

In the State of Wisconsin, Wisconsin's Department of Natural Resources (DNR) aids in managing solid waste with local governments, private industries, and other organizations to minimize waste and encourage reuse and recycling.[1]

Wisconsin has a strong history of recycling and composting. As a result, Wisconsin has a comprehensive set of laws that ban the disposal and incineration of certain materials in local landfills (**Exhibit 5C**). Wisconsin also has a database that tracks statewide collection areas for recyclables and compostable items, known as *The Wisconsin Recycling Markets Directory.*

SOLID WASTE

Typically, airport sponsors have purview over waste-handling services in facilities they own and operate, such as the airport-owned hangars and maintenance facilities. Tenants of airport-owned buildings/ hangars or tenants that own their own facilities are usually responsible for coordinating their own waste-handling services. While the focus of this plan is airport-operated facilities, the airport should work to incorporate facility-wide strategies that create consistency in waste disposal mechanisms.

For airports, waste can generally be divided into eight categories:[2]

1. **Municipal Solid Waste** (MSW) is more commonly known as trash or garbage and consists of everyday items that are used and then discarded, such as product packaging.
2. **Construction and Demolition Waste** (C&D) is considered non-hazardous trash resulting from land clearing, excavation, demolition, renovation, or repair of structures, roads, and utilities, including concrete, wood, metals, drywall, carpet, plastic, pipe, cardboard, and salvaged building components. C&D is also generally labelled as MSW.
3. **Green Waste** is a form of MSW yard waste that consists of tree, shrub, and grass clippings, leaves, weeds, small branches, seeds, and pods.
4. **Food Waste** includes unconsumed food products or waste generated and discarded during food preparation and is also considered MSW.
5. **Deplaned Waste** is waste removed from passenger aircraft. Deplaned waste includes bottles, cans, mixed paper (newspapers, napkins, paper towels), plastic cups, service ware, food waste, and food-soiled paper/packaging.
6. **Lavatory Waste** is a special waste that is emptied through a hose and pumped into a lavatory service vehicle. The waste is then transported to a triturator[3] facility for pretreatment prior to discharge in the sanitary sewage system. Chemicals in lavatory waste can present environmental and human health risks if mishandled; therefore, caution must be taken to ensure lavatory waste is not released to the public sanitary sewage system prior to pretreatment.

[1] Wisconsin Department of Natural Resources, Solid Waste Management in Wisconsin (https://dnr.wisconsin.gov/topic/Waste/Solid.html)
[2] FAA, Recycling, Reuse, and Waste Reduction at Airports, April 24, 2013
[3] A triturator facility turns lavatory waste into fine particulates for further processing.

Wisconsin Recycles

The following items are banned from landfills and incinerators statewide and should be reused, recycled, or composted.

Containers

- #1 and #2 plastic bottles and jars
- Aluminum containers
- Bi-metal cans
- Glass containers
- Steel (tin) cans

Paper and Cardboard

- Corrugated cardboard
- Magazines, catalogs, and other materials on similar paper
- Newspaper and newsprint materials
- Office paper

Yard Materials

- Grass clippings
- Debris and brush under 6" in diameter
- Leaves

Vehicle Items

- Lead-acid vehicle batteries
- Tires *
- Used oil filters
- Waste oils *

*These items may be burned in a solid waste treatment facililty with energy recovery.

Appliances

- Air conditioners
- Boilers
- Clothes dryers
- Clothes washers
- Dehumidifiers
- Dishwashers
- Freezers
- Furnaces
- Microwaves
- Ovens
- Refrigerators
- Stoves
- Water heaters

Electronics

- Cell phones
- Computers – desktop, laptop, netbook, tablet
- Computer monitors
- Computer keyboards and mice
- Computer scanners
- Computer speakers
- Desktop printers (including those that fax and scan)
- DVD players, VCRs, DVRs, and all other video players
- External hard drives
- Fax machines
- Flash drives/USBs
- Other items that plug into a computer
- Televisions

Source: Wisconsin Department of Natural Resources, Recycling, What to Recycle in Wisconsin, (https://dnr.wisconsin.gov/topic/Recycling/Banned.html)

Why ban items from the landfill and incinerator?

The items on this list are made of materials that can be reused in new products. Some also have toxic components that we do not want in our groundwater, air, or soil. Recycling and composting allow landfills to last longer, provide markets with valuable reusable materials, create jobs, and prevent pollution.

Why not ban more materials?

Corrugated cardboard is banned, while waxed cardboard is not. Some things with plugs, like computers, are banned, while others, like toasters, are not. Why? Current bans cover some of the most easily reusable or most toxic materials on the market today. Eventually, more items may be added to this list as new recycling markets develop or the types of materials we throw away change.

Some communities go above and beyond what is required by state law. Check with your local government or recycling service provider to find out what additional materials are accepted for recycling in your area. For more information about Wisconsin's recycling program, search "recycle" at dnr.wi.gov. Wisconsin's recycling requirements apply to everyone in the state at all residences and places of work or play.

Wisconsin Department of Natural Resources
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DNRWasteMaterials@wisconsin.gov

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Exhibit 5C
RECYCLABLE ITEMS IN WISCONSIN

7. **Spill Clean and Remediation Wastes** are also special wastes and are generated during cleanup of spills and/or the remediation of contamination from several types of sites on an airport.

8. **Hazardous Wastes** are governed by the *Resource Conservation and Recovery Act* (RCRA), as well as regulations for certain hazardous waste, known as universal waste, described in Title 40 Code of Federal Regulations (CFR) Part 237, *The Universal Waste Rule*. Common sources of aviation hazardous waste are included below:

    - Solvents
    - Caustic part washes
    - Heavy metal paint waste and paint chips
    - Wastewater sludges from metal etching and electroplating
    - Unused explosives and monomers
    - Waste fuels and other ignitable products
    - Unusable water conditioning chemicals
    - Nickel cadmium batteries
    - Waste pesticides

As shown on **Exhibit 5D**, there are multiple areas where the airport potentially contributes to the waste stream, including the terminal building, on-airport tenants (FBO/SASOs, etc.), hangars, airfields, aircraft ground support equipment, and airport construction projects. To create a comprehensive waste reduction and recycling plan for the airport, all potential inputs must be considered.

EXISTING SERVICES

At a citywide level, the Merrill Street Department is responsible for the collection and disposal of the city's solid waste and recycling. The Merrill Street Department provides a system of collection and transportation of municipal solid waste and recycling for residential, commercial, and public land uses within the city. Solid waste is collected weekly and recycling is collected every other week. Large item pickup is also available from April through October. The airport and FBO utilize the city's solid waste and recycling services, while tenants are responsible for managing their own waste.

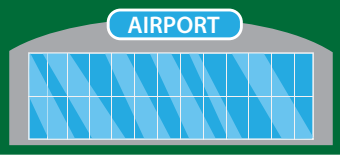
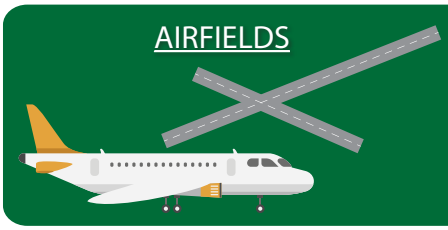
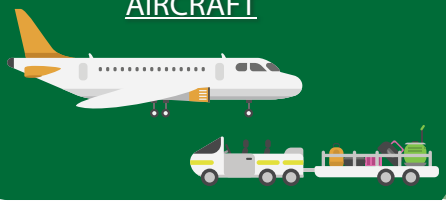
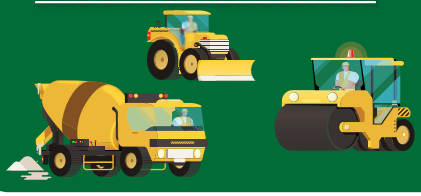
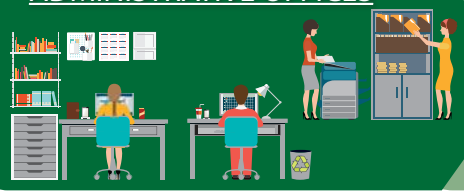
SOLID WASTE MANAGEMENT SYSTEM

An airport generally utilizes either a centralized or decentralized waste management system. The differences between these two methods are described below and summarized on **Exhibit 5E**.

- **Centralized Waste Management System |** Under a centralized waste management system, the airport provides receptables for the collection of waste, recyclables, or compostable materials and contracts for their removal by a single local provider.[4] The centralized waste management system allows for more participation from airport tenants, which may not be incentivized to recycle on their own, and can reduce the overall cost of service for all involved. A centralized

[4] National Academies of Sciences, Engineering, and Medicine Airport Cooperative Research Program, Synthesis 92, Airport Waste Management and Recycling Practices, 2018

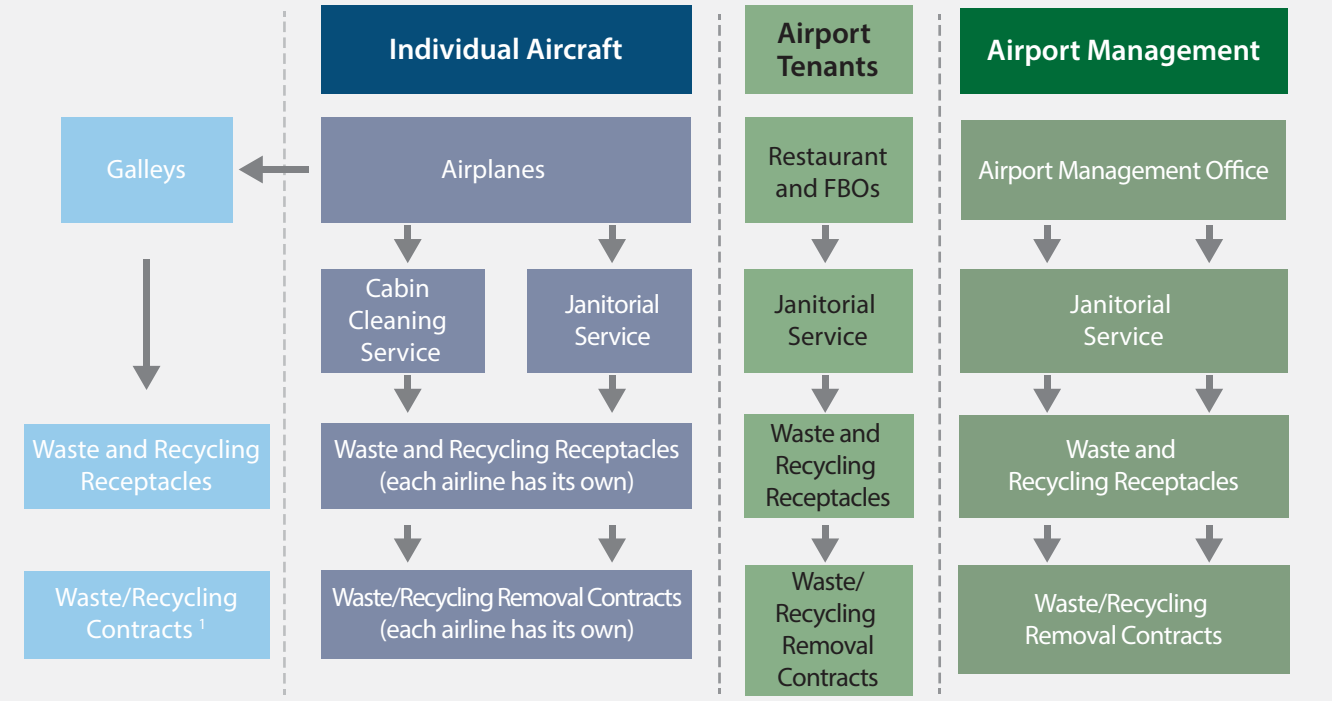
AIRPORT WASTE STREAMS

AIRPORT AREA	POTENTIAL INPUTS	POTENTIAL OUTPUTS
TERMINALS 	Restaurants Shops Passengers Employees	Food Waste, Paper Plastic, Aluminum Cans Trash, Grease & Oil Green Waste Deplaned Waste
AIRFIELDS 	Aircraft Operations	Runway Rubber Green Waste
AIRCRAFT 	Aircraft Ground Support Equipment (GSE)	Vehicle Waste Plastic Wastewater Hazmat
AIRPORT CONSTRUCTION 	Construction Re-Construction Demolition	Reused Concrete Reused Asphalt Vehicle Waste Soils, Building Materials Wood, General Waste
ADMINISTRATIVE OFFICES 	Employees	Food Waste Paper, Plastic Aluminum Cans Trash

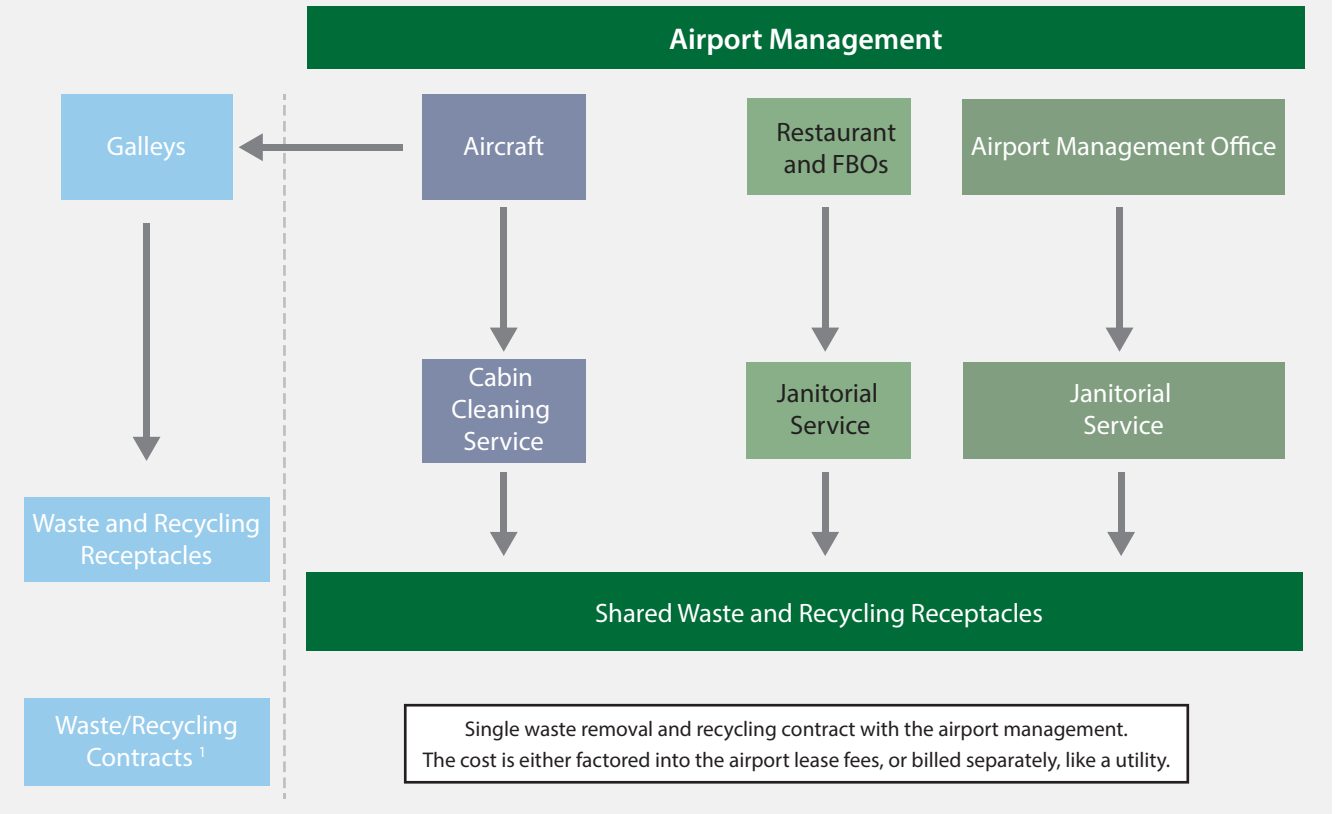
Source: Recycling, Reuse, and Waste Reduction at Airports, FAA (April 24, 2013)

Exhibit 5D
AIRPORT WASTE STREAMS

Components of a Decentralized Airport Waste Management System



Components of a Centralized Airport Waste Management System



[1] Galleys usually manage their own waste even if an airport relies on a centralized system

Source: Natural Resources Defense Council, Trash Landings: How Airlines and Airports Can Clean Up Their Recycling Programs, December 2006.

Exhibit 5E
WASTE MANAGEMENT SYSTEMS

strategy can be inefficient for some airports, as it requires more effort and oversight on the part of airport management; however, the centralized system is advantageous because it involves fewer players in the overall management of the solid waste and recycling efforts and allows greater control by the city over the type, placement, and maintenance of dumpsters, thereby saving space and eliminating the need for each tenant to have its own container(s).

- **Decentralized Waste Management System |** Under a decentralized waste management system, the airport provides waste containers and contracts for the hauling of waste materials in airport-operated spaces only; however, airport tenants manage the waste from their leased spaces with separate contracts, billing, and hauling schedules. A decentralized waste management system can increase the number of receptacles on airport property, as well as the number of trips by a waste collection service provider if the collection schedule for a tenant differs from the airport's collection schedule.

RRL generally operates under a decentralized waste system, as the majority of tenants are responsible for their own waste management.

GOALS AND RECOMMENDATIONS

The following recommendations are made to maximize waste reduction and introduce recycling efforts at the airport.

Goal 1: Reduce the Amount of Solid Waste Generated

- Create a centralized waste management system at the airport. Currently, RRL participates in a decentralized waste management system. Airport tenants are responsible for overseeing their own waste management. Airport staff could consider engaging tenants to create a centralized waste management system at the airport to streamline waste management efforts at the airport.
    - Considerations:
        - Any lease agreements that are up for renewal should be reviewed/revised to include language that would require tenants to enact recycling practices.
        - Implementation of incentives for tenants to either enhance existing recycling practices or join the airport's recycling program should be considered.
- Assign the responsibility of waste management to a dedicated individual or group. Having one person or a group of people oversee and manage solid waste at the airport would create efficient and cost-saving solid waste management solutions. People dedicated to this operational aspect of the airport would gain familiarity with waste processes and could help identify areas of improvement and cost-saving measures.
- Provide education for airport employees. To minimize waste within the airport, it is crucial to inform airport employees and provide them with a thorough education on waste management at both individual and group levels. As part of the onboarding process, new employees should be given the tools needed to achieve a thorough understanding of the airport's solid waste goals.

- Audit the current waste management system. The continuation of an effective program requires accurate data on current waste rates. An airport can gain insight into its waste stream in several ways, such as requesting weights from the hauler, tracking the volume, or reviewing the bills; however, managing the waste system starts with a waste audit, which is an analysis of the types of waste produced. A waste audit is the most comprehensive and intensive way to assess waste stream composition, opportunities for waste reduction, and capture of recyclables and should include the following actions:
    - Examination of records
        - Evaluate waste hauling and disposal records and contracts
        - Examine supply and equipment invoices
        - Identify other waste management costs (commodity rebates, container costs, etc.)
        - Track waste from the point of origin
        - Establish a baseline for metrics
    - Facility walk-through conducted by the airport
    - Gather qualitative waste information to determine major waste components and waste-gathering practices
- Create a tracking and reporting system. Tracking solid waste generated will allow the airport to identify areas where a significant amount of waste is generated, which will help the airport estimate annual waste volumes. Understanding the cyclical nature of waste generation will allow the airport to estimate costs and identify areas of improvement.

Goal 2: Create a Comprehensive Recycling Management Plan at RRL

- Introduce an airport-wide recycling program. To guarantee the airport reduces the amount of waste hauled to the landfill, materials that cannot be reused or avoided should be recycled, if possible. The airport/city should review internal procedures to ensure there are no unacceptable items contaminating recycling containers or recyclables thrown in the trash.
- Reduce waste through controlled purchasing practices and the consumption of nonessential products. The airport can control the amount of waste generated by prioritizing the purchase of items or supplies that are reusable, recyclable, compostable, or made from recycled materials.
- Provide tenant education. It is crucial to encourage participation to ensure buy-in of any future recycling efforts that may be undertaken at RRL. To ensure recycling is part of the airport's everyday business, airport administration should provide training and education to support personnel, tenants, and others that conduct business at the airport. In-person meetings with airport tenants could be held to create mutual understanding of the airport's solid waste and recycling goals and how tenants play a vital role in the airport's overall success.

Goal 3: Establish Construction and Demolition Goals

- Implement construction waste requirements in contracts for construction projects. Construction contracts should highlight ways to repurpose and reuse materials/salvage and explain how recyclable materials are defined in the construction process. Additionally, these contracts should establish standards and specifications in the procurement process and contracting when starting a new construction project at RRL. Other action items to consider when drafting a contract for a construction project include preparing a construction waste management (CWM) plan, assigning a waste management coordinator, and tracking and reporting requirements under the CWM plan.

- Create a CWM plan. The airport and its contractors should adopt a CWM plan when applicable. A typical CWM plan should encompass goals and strategies to manage a project's C&D waste. A CWM plan should also identify the types and quantities by weight for any proposed demolition, site-clearing, and/or construction waste that may be generated by the project. Other items to include in a CWM plan include the following:

    - Complete a materials handling estimate worksheet for all applicable project waste streams.
    - Identify where recyclable materials storage and collection points will be situated.
    - Create a plan to communicate recycling goals with employees and subcontractors.
    - Create a waste reduction work plan to identify what materials can be salvaged or recycled, how waste is disposed of, and the method for collecting and transporting waste streams.

  At the end of each project, as part of the CWM plan, documentation that includes tracking, reporting, and invoicing should also be submitted to demonstrate which CWM plan goals were met.

The construction waste management plan should consider the following construction and demolition debris for recycling or reuse:	
Earth, soil, dirt	Sand
Concrete reclaimed asphalt pavement	Wood
Bricks/masonry (cinder blocks, mortar, etc.)	Gypsum drywall
Rock, stone, gravel	Plastics
Ferrous metal (iron, steel, etc.)	Plaster
Nonferrous metal (aluminum, copper, etc.)	Paint
Roofing shingles and other roof materials	Plumbing fixtures and piping
Cardboard, paper, packaging	Land-clearing debris
Non-asbestos insulation	

ENVIRONMENTAL OVERVIEW

An analysis of potential environmental impacts associated with proposed airport projects is an essential consideration in the airport master plan process. The primary purpose of this discussion is to review the recommended development concept (**Exhibit 5A**) and the airport's capital program to determine whether projects identified in the airport plan could, individually or collectively, significantly impact existing environmental resources. Information contained in this section was obtained from previous

studies, official internet websites, and analysis by the consultant. This section provides an overview of potential impacts to existing resources that could result from the implementation of the planned improvements outlined on the recommended development concept.

If the FAA retains approval authority over a project, then the project is typically subject to the *National Environmental Policy Act* (NEPA). For projects not categorically excluded under FAA 1050.1G, *FAA National Environmental Policy Act Implementing Procedures*, compliance with NEPA is generally satisfied through the preparation of an environmental assessment (EA). In instances where significant environmental impacts are expected, an environmental impact statement (EIS) may be required.

The *FAA Reauthorization Act of 2024* introduced a variety of updated and new environmental guidelines. The primary updates related to environmental impacts are outlined in two sections: Section 743 and Section 783.

- Section 743 details the FAA's authority to regulate uses of airport property for projects on land acquired without federal assistance and outlines limitations imposed on non-aeronautical review. Section 743 also states that a notice of intent for proposed projects outside FAA jurisdiction should be submitted by an airport sponsor to the FAA.

- Section 783 outlines the airport capacity enhancement projects, terminal development projects, and general aviation airport improvement projects that will be subject to coordinated and expedited environmental review requirements.

The following portion of the master plan is not designed to satisfy NEPA requirements for a specific development project, but it provides a preliminary review of environmental issues that may need to be considered in more detail within the environmental review processes. It is important to note that the FAA is ultimately responsible for determining the level of environmental documentation required for airport actions.

Table 5B summarizes potential environmental concerns associated with implementation of the ultimate recommended development concept for RRL. Analysis under NEPA requires federal agencies to prepare a "detailed statement" for proposed "major federal actions significantly affecting the quality of the human environment," as amended by the *Fiscal Responsibility Act of 2023* (FRA), Public Law 118-5. This statement must include the following:

1. The reasonably foreseeable environmental effects of the proposed agency action;
2. The reasonably foreseeable adverse environmental effects that cannot be avoided;
3. A reasonable range of alternatives to the proposed agency action (including an analysis of any negative environmental impacts of not implementing the proposed agency action in the case of a no-action alternative) that are technically and economically feasible and meet the purpose and need of the proposal;
4. The relationship between local short-term uses of the human environment and the maintenance and enhancement of long-term productivity; and
5. Any irreversible and irretrievable commitments of resources that would be involved in the proposed action.

TABLE 5B| Summary of Potential Environmental Concerns

AVIATION EMISSIONS AND AIR QUALITY	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The action would cause pollutant concentrations to exceed one or more of the National Ambient Air Quality Standards (NAAQS), as established by the United States (U.S.) Environmental Protection Agency (EPA) under the Clean Air Act, for any of the time periods analyzed, or to increase the frequency or severity of any such existing violations.***
Potential Environmental Concerns	**Potential Impact.** An increase in operations could occur over the 20+ years outlined in the aviation demand forecasts as part of this airport master plan that would likely result in additional emissions; however, Lincoln County is in attainment for all federal criteria pollutants. For construction or operational emissions, project-specific qualitative or quantitative emissions inventories under NEPA may be required depending on the type of environmental review needed for specific projects defined on the development concept plan. *Source: U.S. EPA, Wisconsin Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants, accessed October 2025*
BIOLOGICAL RESOURCES (INCLUDING FISH, WILDLIFE, AND PLANTS)	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS) determines that the action would be likely to jeopardize the continued existence of a federally listed threatened or endangered species or would result in the destruction or adverse modification of federally designated critical habitat.*** ***The FAA has not established a significance threshold for non-listed species; however, factors to consider include whether an action would have the potential for:*** • ***Long-term or permanent loss of unlisted plant or wildlife species;*** • ***Adverse impacts to special status species or their habitats;*** • ***Substantial loss, reduction, degradation, disturbance, or fragmentation of native species' habitats or populations; or*** • ***Adverse impacts on a species' reproductive rates, non-natural mortality, or ability to sustain the minimum population levels required for population maintenance.***
Potential Environmental Concerns	**Federally Protected Species** **Potential Impact.** According to the USFWS *Information for Planning and Consultation* (IPaC) report, there is potential for three proposed endangered, proposed threatened, and non-essential experimental species at RRL: • whooping crane (non-essential experimental) • salamander mussel (proposed endangered) • monarch butterfly (proposed threatened) Based on a review of aerial imagery, RRL appears to contain freshwater forested/shrub wetlands and freshwater emergent wetlands throughout the airport (**Exhibit 1K**). A biological resources evaluation may be needed to ensure no suitable habitat for the whooping crane and monarch butterfly is located within the proposed development footprint for projects identified on **Exhibit 5A**. Suitable habitat for the salamander mussel is not present at RRL. **Designated Critical Habitat** **No Impact.** There is no designated critical habitat within airport boundaries. *Continues…*

	Non-Listed Species **Potential Impact.** Non-listed species of concern include those protected by the *Migratory Bird Treaty Act* (MBTA) and the *Bald and Golden Eagle Protection Act*. Bird species protected by the MBTA could be adversely affected if construction occurs during the nesting and breeding seasons (December 31 to August 31). Pre-construction surveys of vegetated areas at the airport are recommended for projects that involve ground-clearing projects unless such projects are outside the nesting and breeding seasons. *Source: USFWS, IPaC (https://ipac.ecosphere.fws.gov/location/index), accessed October 2025*
COASTAL RESOURCES	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The FAA has not established a significance threshold for Coastal Resources. Factors to consider include whether an action would have the potential to:*** • ***Be inconsistent with the relevant state coastal zone management plan(s);*** • ***Impact a coastal barrier resources system unit;*** • ***Pose an impact on coral reef ecosystems;*** • ***Cause an unacceptable risk to human safety or property; or*** • ***Cause adverse impacts on the coastal environment that cannot be satisfactorily mitigated.***
Potential Environmental Concerns	**No Impact.** As mentioned in Chapter One, the airport is not located within a coastal zone; therefore, airport development depicted on **Exhibit 5A** would not impact coastal resources.
***DEPARTMENT OF TRANSPORTATION ACT*, SECTION 4(F)** (NOW CODIFIED IN TITLE 49 UNITED STATES CODE [U.S.C.] § 303)	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The action involves more than a minimal physical use of a Section 4(f) resource or constitutes a constructive use based on an FAA determination that the aviation project would substantially impair the Section 4(f) resource. Resources that are protected by Section 4(f) are publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance; and publicly or privately owned land from a historic site of national, state, or local significance. Substantial impairment occurs when the activities, features, or attributes of the resource that contribute to its significance or enjoyment are substantially diminished.***
Potential Environmental Concerns	**Potential Impact.** There are several Section 4(f) resources within one mile of the airport, as outlined in **Table 1G** of the master plan. The recommended development concept proposes property acquisition that would contain a portion of land associated with a softball complex, which is associated with the Smith Multi-Purpose Center. A Section 4(f) evaluation may be necessary to determine the extent of physical impacts, if any, on this Section 4(f) resource.
FARMLANDS	

FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The total combined score on Form AD-1006, Farmland Conversion Impact Rating, ranges between 200 and 260. Form AD-1006 is used by the U.S. Department of Agriculture (USDA, Natural Resources Conservation Service (NRCS) to assess impacts under the Farmland Protection Policy Act (FPPA).***
	
	The FPPA applies when airport activities meet the following conditions:
	
	• *Federal funds are involved;*
	• *The action involves the potential for the irreversible conversion of important farmlands to non-agricultural uses; important farmlands include pastureland, cropland, and forest considered to be prime, unique, or statewide or locally important land; or*
	• *None of the exemptions to the FPPA apply. These exemptions include:*
	  ○ *Land that is not considered farmland under the FPPA, such as land that is already developed or already irreversibly converted (these instances include when land is designated as an urban area by the U.S. Census Bureau or the existing footprint includes rights-of-way);*
	  ○ *Land that is already committed to urban development;*
	  ○ *Land that is committed to water storage;*
	  ○ *Construction of non-farm structures necessary to support farming operations; and construction/land development for national defense purposes.*

Potential Environmental Concerns	**Potential Impact.** According to the USDA-NRCS Web Soil Survey, portions of the airport include prime farmland and may be subject to the FPPA (**Exhibit 1K**). The recommended development concept depicts the extension of Runway 7 and Runway 16, the construction of new taxiway pavement serving the north end of Runway 16-34, and the construction of hangars, taxilanes, and apron pavement in areas with farmable soils; therefore, prior to the construction of these projects, coordination with the USDA may be required to assess potential impacts to these soils. *Source: USDA-NRCS, Web Soil Survey (https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx), accessed October 2025*
HAZARDOUS MATERIALS, SOLID WASTE, AND POLLUTION PREVENTION	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The FAA has not established a significance threshold for Hazardous Materials, Solid Waste, and Pollution Prevention; however, factors to consider include whether an action would have the potential to:*** • ***Violate applicable federal, state, tribal, or local laws or regulations regarding hazardous materials and/or solid waste management;*** • ***Involve a contaminated site;*** • ***Produce an appreciably different quantity or type of hazardous waste;*** • ***Generate an appreciably different quantity or type of solid waste or use a different method of collection or disposal and/or would exceed local capacity;*** • ***Use a different method of waste collection, treatment, storage, or disposal that, as an action, would adversely impact the site, surroundings, or affected community, and/or would exceed state, tribal, or local capacity; or*** • ***Adversely affect human health and the environment.***
Potential Environmental Concerns	**No Impact.** There are no identified brownfields or Superfund sites within a one-mile buffer of the airport. Due to existing regulatory environmental management, no impacts related to ultimate airport development are anticipated. Furthermore, no long-term impacts related to solid waste disposal based on the projects outlined on **Exhibit 5A** are expected. Solid waste, such as the buildings and pavement proposed to be removed from the airfield, will be properly disposed of in local landfills. *Source: U.S. EPA, NEPAssist (https://nepassisttool.epa.gov/nepassist/nepamap.aspx), accessed October 2025*
HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The FAA has not established a significance threshold for Historical, Architectural, Archaeological, and Cultural Resources. Factors to consider include whether an action would result in a finding of adverse effect through the Section 106 process; however, an adverse effect finding does not automatically trigger the preparation of an EIS (i.e., a significant impact).***
Potential Environmental Concerns	**Potential Impact.** There are no listed National Register of Historic Places (NRHP) resources on or near RRL. As mentioned in Chapter One of the master plan, a cultural survey has been conducted on airport property, but this survey was conducted for project-specific development and no known systematic airport-wide cultural survey has been conducted at RRL; therefore, while much of the airport has been developed or disturbed by construction, there is still a potential that intact cultural resources may be present on the ground surface or subsurface. If previously undocumented buried cultural resources are identified during ground-disturbing activities for future airport development, all work must immediately cease within 30 meters (100 feet) until a qualified archaeologist has documented the discovery and evaluated its eligibility for the NRHP, as appropriate. Work must not resume in the area without the approval of the FAA. *Source: Becher-Hoppe Associates, Inc., Final Environmental Assessment, Proposed Airport Development Consisting of the Following: Construction of New Terminal Area, Construction of a Parallel Taxiway for Runway 7-25, Completion of a Parallel Taxiway for Runway 16-34, March 2007*

LAND USE	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The FAA has not established a significance threshold for Land Use and there are no specific independent factors to consider. The determination that significant impacts exist is normally dependent on the significance of other impacts.***
Potential Environmental Concerns	**Potential Impact. Exhibit 5A** depicts property to be acquired southwest of Runway 7 to allow the airport sponsor to maintain control over the ultimate Runway 7 RPZ, remove/relocate incompatible land uses within the RPZ, and install a MALSR. The relocation of a private residence would be subject to the *Uniform Relocation Assistance and Real Property Acquisitions Act*. All other proposed projects on **Exhibit 5A** would occur within the existing airport boundaries and would not directly affect off-airport land uses. It should be noted that property acquisition is planned to occur as these parcels become available for sale.
NATURAL RESOURCES AND ENERGY SUPPLY	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The FAA has not established a significance threshold for Natural Resources and Energy Supply; however, factors to consider include whether the action would have the potential to cause demand to exceed available or future supplies of these resources or adversely impact extant federal, tribal, state, or local resource planning that is already in place.***
Potential Environmental Concerns	**No Impact.** Planned development projects at the airport could increase demands on energy utilities, water supplies and treatment, and other natural resources during construction; however significant long-term impacts are not anticipated. Should long-term impacts be a concern, coordination with local service providers is recommended.
NOISE AND NOISE-COMPATIBLE LAND USE	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The significance threshold applies to all civil aviation activities, including aircraft and airports; unmanned aircraft systems (UAS) and hubs; advanced air mobility (AAM) and vertiports; and commercial space vehicles and launch and reentry sites.*** ***The action would result in noise exposure from impulsive noise sources (e.g., sonic booms) that meet or exceed 60 continuous day-night average sound level (CDNL) (equivalent to a DNL of 65 dBA [A-weighted decibels]).*** ***The action would increase noise by a DNL of 1.5 decibels (dB) or more for a noise-sensitive area that is exposed to noise at or above the 65-dB DNL noise exposure level, or that will be exposed at or above the 65-dB DNL level due to a DNL increase of 1.5 dB or greater, when compared to the no-action alternative for the same timeframe.*** ***Another factor to consider is that special consideration should be given to the evaluation of the significance of noise impacts on noise-sensitive areas within Section 4(f) properties where the land use compatibility guidelines in Title 14 CFR Part 150 are not relevant to the value, significance, and enjoyment of the area in question.***
Potential Environmental Concerns	**Potential Impact.** There are no hospitals or live-in medical facilities within one mile of the airport; however, other noise-sensitive land uses, such as schools and places of worship, are located within one mile of the airport. The closest residential areas are located on the east side of Airport Road, adjacent to airport boundaries. It is important to note that operational growth, unless tied to a specific project, will not result in noise impacts under FAA Order 1050.1G. Impacts to noise-sensitive land uses are evaluated through NEPA documentation for specific projects, such as the proposed runway extensions, or through the voluntary Part 150 process.

SOCIOECONOMICS AND CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISKS	
Socioeconomics	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The FAA has not established a significance threshold for Socioeconomics; however, factors to consider include whether an action would have the potential to:*** • ***Disrupt or divide the physical arrangement of an established community;*** • ***Cause extensive relocation when sufficient replacement housing is unavailable;*** • ***Cause extensive relocation of community businesses that would cause severe economic hardship for affected communities;*** • ***Disrupt local traffic patterns and substantially reduce the levels of service of roads serving the airport and its surrounding communities; or*** • ***Produce a substantial change in the community tax base.***
Potential Environmental Concerns	**Potential Impact.** The proposed development depicted on **Exhibit 5A** could encourage economic growth in the City of Merrill. This growth could include new construction jobs, new jobs for the airport and other commercial uses, new housing, and increases to the local tax base. **Exhibit 5A** depicts hangar development in the in the terminal area and on the airport's east side. No long-term traffic impacts are anticipated as a result of this development, as hangars are typically low traffic generators.
Children's Health and Safety Risks	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The FAA has not established a significance threshold for Children's Environmental Health and Safety Risks; however, factors to consider include whether an action would have the potential to lead to a disproportionate health or safety risk to children.***
Potential Environmental Concerns	**No Impact.** No disproportionately high or adverse impacts are anticipated to affect children living near the airport because of the proposed ultimate development. The airport is in an access-controlled facility and children will not be granted access to the airfield or landside facilities without adult supervision. All construction areas should be controlled to prevent unauthorized access, as well.
VISUAL EFFECTS	
Light Emissions	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The FAA has not established a significance threshold for Light Emissions; however, a factor to consider is the degree to which an action would have the potential to:*** • ***Create annoyance or interfere with normal activities from light emissions; or*** • ***Affect the nature of the visual character of the area due to light emissions, including the importance, uniqueness, and aesthetic value of the affected visual resources.***
Potential Environmental Concerns	**Potential Impact.** The proposed recommended development would include the installation of runway end identifier lights (REILs) and two-light PAPI systems on Runway 16-34. Proposed lighting upgrades to Runway 7-25 would include replacing the existing PAPI-2 systems with PAPI-4 systems. These light fixtures would be installed at ground level and would not be seen from nearby roadways. The proposed development concept also proposes the installation of a MALSR serving Runway 7. This lighting system would require property acquisition southwest of the airport where the sequenced flashers of the system would be located. This system would also require support for the lights to be mounted upon, which may be seen depending on the ground clearing that would occur as a result of the installation of these lights and the property acquisition. The rotating beacon is planned to be relocated from the east side of the airport to the terminal area. *Continues…*

	Construction of the proposed 400-foot extension to Runway 7 and 403-foot extension to Runway 16 may require nighttime construction. Night lighting during construction phases within the runway environment is typically directed downward to the construction work area to prevent lighting spilling outside the airport boundaries. Other ultimate projects, such as hangar construction, would include new light fixtures. Building security lights would be directed downward and would not create glare issues for users on nearby roadways. Similarly, if buildings are constructed in the reserve areas slated for aeronautical and/or non-aeronautical development, lights installed for building security would be directed downward to minimize the potential for glare issues.
Visual Resources/Visual Character	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The FAA has not established a significance threshold for Visual Resources/Visual Character; however, a factor to consider is the extent to which an action would have the potential to:*** • ***Affect the nature of the visual character of the area, including the importance, uniqueness, and aesthetic value of the affected visual resources;*** • ***Contrast with the visual resources and/or visual character in the study area; and*** • ***Block or obstruct the views of the visual resources, including whether these resources would still be viewable from other locations.***
Potential Environmental Concerns	**No Impact.** There are no national scenic byways, state scenic byways, or scenic corridors near RRL; therefore, while short-range views of the airport are available on roadways along the northern and eastern portion of the airport, the development proposed on **Exhibit 5A** would not block or obstruct views of visual resources.
WATER RESOURCES	
Wetlands	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The action would:*** 1. ***Adversely affect a wetland's function to protect the quality or quantity of municipal water supplies, including surface waters and sole source and other aquifers;*** 2. ***Substantially alter the hydrology needed to sustain the affected wetland system's values and functions or those of a wetland to which it is connected;*** 3. ***Substantially reduce the affected wetland's ability to retain floodwaters or storm runoff, thereby threatening public health, safety, or welfare (the term welfare includes cultural, recreational, and scientific resources or property important to the public);*** 4. ***Adversely affect the maintenance of natural systems that support wildlife and fish habitat or economically important timber, food, or fiber resources of the affected or surrounding wetlands;*** 5. ***Promote the development of secondary activities or services that would cause the circumstances listed above to occur; or*** 6. ***Be inconsistent with applicable state wetland strategies.***
Potential Environmental Concerns	**Potential Impact.** Based on the National Wetlands Inventory (NWI), several freshwater forested/shrub wetlands are located throughout RRL. It is important to note that this information is based on aerial photography interpretation based on images dated from 2003. To determine if wetlands are present at the airport, a field survey and/or wetland delineation may be required. Based on the NWI imagery, there are wetlands located in an area currently depicted for new taxilane and apron pavement. *Source: USFWS, National Wetlands Inventory (https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/), accessed October 2025*

Floodplains	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The action would cause notable adverse impacts on natural and beneficial floodplain values. Natural and beneficial floodplain values are defined in Paragraph 4.k of U.S. Department of Transportation (DOT) Order 5650.2, Floodplain Management and Protection.***
Potential Environmental Concerns	**No Impact.** Based on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM), the majority of RRL is located in Zone X (unshaded), an area of minimal flood hazard (**Exhibit 1K**). Projects depicted on the recommended development concept would remain outside the 100-year and 500-year floodplains. *Source: FEMA Flood Map Service (https://msc.fema.gov/portal/search?AddressQuery=merril%20municipal%20airport), accessed October 2025*
Surface Waters	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The action would:*** ***1. Exceed water quality standards established by federal, state, local, and tribal regulatory agencies; or*** ***2. Contaminate public drinking water supply such that public health may be adversely affected.*** ***Factors to consider include whether a project would have the potential to:*** • ***Adversely affect natural and beneficial water resource values to a degree that substantially diminishes or destroys such values;*** • ***Adversely affect surface waters such that the beneficial uses and values of such waters are appreciably diminished or can no longer be maintained and such impairment cannot be avoided or satisfactorily mitigated; or*** • ***Present difficulties based on water quality impacts when obtaining a permit or authorization.***
Potential Environmental Concerns	**Potential Impact.** The proposed development depicted on **Exhibit 5A** would increase impervious surfaces at RRL with the construction of additional roads/parking and ultimate runway, taxiway, and apron pavements. A Wisconsin Pollutant Discharge Elimination System (WPDES) General Permit will be required for all projects involving ground disturbance over one acre. Improvements outlined on **Exhibit 5A** will require revisions to the airport's stormwater pollution prevention plan (SWPPP), if available, to address operational and structural sources, best management practices (BMPs), and sediment and erosion control. FAA Advisory Circular (AC) 150/5370-10H, *Standards for Specifying Construction of Airports*, Item C-102, *Temporary Air and Water Pollution, Soil Erosion, and Siltation Control*, should also be implemented during construction projects at the airport.
Groundwater	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The action would:*** ***1. Exceed groundwater quality standards established by federal, state, local, and tribal regulatory agencies: or*** ***2. Contaminate an aquifer used for public water supply such that public health may be adversely affected*** ***Factors to consider are when a project would have the potential to:*** ***3. Adversely affect natural and beneficial groundwater values to a degree that substantially diminishes or destroys such values;*** ***4. Adversely affect groundwater quantities such that the beneficial uses and values of such groundwater are appreciably diminished or can no longer be maintained and such impairment cannot be avoided or satisfactorily mitigated; or*** ***5. Present difficulties based on water quality impacts when obtaining a permit or authorization.***

Potential Environmental Concerns	**No Impact.** According to the University of Wisconsin *Well Water Quality* database, there are no reported abnormalities in the groundwater in Lincoln County. Furthermore, the closest sole source aquifer is the Mille Lacs Sole Source Aquifer, which is located over 190 miles northwest of the airport. *Sources: U.S. EPA, Sole Source Aquifers (https://epa.maps.arcgis.com/apps/webappviewer/index.html?id=9ebb047ba3ec41ada1877155fe31356b), accessed October 2025; University of Wisconsin, Stevens Point, Center for Watershed Science and Education (https://www3.uwsp.edu/cnr-ap/watershed/Pages/WellWaterViewer.aspx), accessed October 2025*
Wild and Scenic Rivers	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The FAA has not established a significance threshold for Wild and Scenic Rivers. Factors to consider include whether an action would have an adverse impact on the values for which a river was designated (or considered for designation) through:*** • ***Destroying or altering a river's free-flowing nature;*** • ***A direct and adverse effect on the values for which a river was designated (or is under study for designation);*** • ***Introducing a visual, audible, or another type of intrusion that is out of character with the river or would alter outstanding features of the river's setting;*** • ***Causing the river's water quality to deteriorate;*** • ***Allowing the transfer or sale of property interests without restrictions needed to protect the river or the river corridor; or*** • ***Any of the above impacts preventing a river on the Nationwide Rivers Inventory (NRI) or a Section 5(d) river that is not included in the NRI from being included in the Wild and Scenic River System or causing a downgrade in its classification (e.g., from wild to recreational).***
Potential Environmental Concerns	**No Impact**. As discussed in Chapter One, RRL is not located near a listed river on the National Wild and Scenic Rivers list. The closest river segment identified within the National Wild and Scenic River System is the Wolf River, which is located over 50 miles from the airport. The nearest river segment on the NRI is the Wisconsin River, which is located over one mile west and south of the airport. Based on the recommended development concept, proposed projects would be confined to existing airport property and would not be near the Wolf River or Wisconsin River; therefore, planned projects as shown on **Exhibit 5A** would not have adverse effects on these rivers' outstanding remarkable values (i.e., scenery, geology, fish, wildlife, and history). *Sources: National Wild and Scenic Rivers System (https://rivers.gov/wisconsin), accessed October 2025; National Park Service, Nationwide Rivers Inventory (https://www.nps.gov/subjects/rivers/nationwide-rivers-inventory.htm), accessed October 2025*

SUMMARY

This chapter was prepared to help the airport sponsor make decisions on the future growth and development of RRL by narratively and graphically describing the development concept. The plan represents an airfield facility that fulfills aviation needs for the airport while conforming to safety and design standards, to the extent practicable. It also provides a guide for a landside complex that can be developed as demand dictates.

Flexibility will be crucial to future development at the airport, as activity may not occur as predicted. The development concept provides airport stakeholders with a general guide that, if followed, can maintain the airport's long-term viability and allow the airport to continue to provide general aviation services for the region. The next chapter of this master plan will consider strategies for funding the recommended improvements and will provide a reasonable schedule for undertaking the projects over the next 20 years and beyond, based on safety and demand.

Chapter 6

CAPITAL FINANCIAL PLAN

Chapter 6

CAPITAL FINANCIAL PLAN

The master plan concept presented in the previous chapter outlined airside and landside improvements for Merrill Municipal Airport (RRL) that provide the City of Merrill with a plan to preserve and develop the airport to meet future aviation demands. Using the development concept as a guide, this chapter will provide a description and overall cost for the projects identified in the capital improvement program (CIP) and development schedule. The program has been evaluated from a variety of perspectives and represents a comparative analysis of basic budget factors, demand, and priority assignments.

The presentation of the capital program is organized into two sections. First, the airport's CIP and associated cost estimates are presented in narrative and graphic form. The CIP has been developed following Federal Aviation Administration (FAA) guidelines for master plans and primarily identifies those projects that are likely eligible for FAA and Wisconsin Department of Transportation (WisDOT) Bureau of Aeronautics (BOA) grant funding. Second, capital improvement funding sources on the federal, state, and local levels are identified and discussed.

AIRPORT CAPITAL IMPROVEMENT PROGRAM

With the recommended concept, specific needs, and improvements for the airport established, the next step is to determine a realistic schedule for project implementation and the associated costs for the plan. The capital program considers the interrelationships among the projects to determine an appropriate sequence of projects while remaining within reasonable fiscal constraints.

The CIP is programmed by planning horizons and has been developed to cover the short-term (1-5 years), intermediate-term (6-10 years), and long-term (11-20 years) planning horizons. By using planning horizons instead of specific years, the City of Merrill will have greater flexibility to adjust capital needs as demand dictates. **Table 6A** summarizes the key aviation demand milestones projected at RRL for each of the three planning horizons.

TABLE 6A | Aviation Demand Planning Horizons

	Base Year (2023)	Short Term (1-5 Years)	Intermediate Term (6-10 Years)	Long Term (11-20 Years)
BASED AIRCRAFT				
Single-Engine	44	46	47	48
Multi-Engine	1	1	1	0
Turboprop	0	1	2	3
Jet	0	0	0	2
Helicopter	0	0	0	1
Other	0	0	0	2
TOTAL BASED AIRCRAFT	**45**	**48**	**50**	**56**
ANNUAL OPERATIONS				
Itinerant				
Air Carrier	0	0	0	0
Air Taxi	4	100	100	100
General Aviation	7,875	8,820	9,380	10,520
Total Itinerant	*7,879*	*8,920*	*9,480*	*10,620*
Local				
General Aviation	7,875	8,780	9,320	10,470
Total Local	*7,875*	*8,780*	*9,320*	*10,470*
TOTAL OPERATIONS*	**15,754**	**17,700**	**18,800**	**21,100**

*Total operations have been rounded

Source: Coffman Associates analysis

A key aspect of this planning document is the use of demand-based planning milestones. The short-term planning horizon contains items of highest need and/or priority, many of which have been previously defined by airport management. As short-term horizon activity levels are reached, planning should begin for the intermediate term, based on the next activity milestones. Likewise, when the intermediate-term milestones are reached, planning should begin for the long-term activity milestones.

Many development items included in the recommended concept will need to follow these demand indicators. For example, the plan includes development of new landside facilities to support aircraft activity. Demand for new based aircraft will be a primary indicator for these projects. If based aircraft growth occurs as projected, additional hangars should be constructed to meet the demand. If growth slows or does not occur as forecasted, some projects may be delayed. As a result, capital expenditures are planned on an as-needed basis, which will lead to more responsible use of capital assets. Some development items do not depend on demand, such as airfield improvements to meet FAA design standards. These projects need to be programmed in a timely manner, regardless of changes in demand indicators, and should be regularly monitored by airport management.

At RRL, the 10-unit T-hangar is owned and managed by the City of Merrill, while other hangars are privately owned and managed on land leased from the airport. Due to economic realities, many airports rely on private developers to construct new hangars. In some cases, private developers can keep construction costs lower, which lowers the monthly lease rates necessary to amortize a loan. The CIP for RRL assumes that the majority of hangar construction will be private, so costs associated with the construction of these facilities and associated apron pavement are not included; however, a cost estimate for the eight-unit T-hangar is included, as the construction of this building will potentially be funded by the local sponsor. Ultimately, the City of Merrill will determine whether to self-fund landside facility development or rely on private developers based on demand and the specific needs of a potential developer.

Because a master plan is a conceptual document, implementation of the capital projects should only be undertaken after further refinement of their designs and costs through architectural and/or engineering analysis. Moreover, a project may require additional infrastructure improvements (e.g., drainage improvements, extension of utilities, etc.) that may increase the estimated cost of the project or the timeline for completion.

Project-specific cost estimates have been prepared by the airport's engineer, Becher Hoppe. **Capital costs should be viewed only as order-of-magnitude estimates that are subject to further refinement during engineering/architectural design**; nevertheless, they are considered sufficient for planning purposes. Cost estimates for the development projects in the CIP are based on present-day construction and administration costs. Adjustments will need to be applied over time to account for inflation, as well as changes in construction and capital equipment costs. Cost estimates for all of the development projects in the CIP were prepared using current (2026) dollars.

Exhibit 6A presents the proposed 20-year CIP for RRL. Most, but not all, of the projects identified are eligible for *Airport Improvement Program* (AIP) grant funding because this master plan follows FAA guidelines and focuses on those projects that are eligible for funding assistance. Another source for federal grants is the *Infrastructure Investment and Jobs Act* (IIJA), which was signed into law in 2022 and plans for $25 billion to be invested into America's airports over a five-year period. The airport will have a variety of capital expenses that are not eligible for grant funding and are not presented in detail in this CIP. **AIP-funded projects are eligible for up to 90 percent of the total project cost; the remaining 10 percent is split between the state and the local sponsor.**

The FAA/BOA utilizes a priority ranking system to help objectively evaluate potential airport projects. Projects are weighted toward safety, infrastructure preservation, standards, and capacity enhancement. The FAA/BOA will participate in the highest-priority projects before considering lower-priority projects, even if a lower-priority project is considered a more urgent need by the local sponsor; nevertheless, the project should remain a priority for the airport and funding support should continue to be requested in subsequent years.

The most important feature of the CIP is that future projects for which the airport may request AIP/BOA funding are included on the list. The CIP is updated and reviewed with these agencies on an annual basis. Projects on the CIP will be moved higher and lower on the list depending on priority and funding availability. Periodically, new projects will arise that can be added to the CIP and presented to the FAA/BOA.

Many of the projects identified in the CIP will require environmental documentation. The level of documentation necessary for each project must be determined in consultation with the FAA. There are three major levels of environmental review to be considered under the *National Environmental Policy Act* (NEPA): categorical exclusion (CatEx), environmental assessment (EA), and environmental impact statement (EIS). Each level requires more time to complete and more detailed information. Guidance on the level of documentation required for a specific project is provided in FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures.* The environmental overview presented in Chapter Five addresses NEPA and provides an evaluation of various environmental categories for RRL.

Project No.	PROJECT DESCRIPTION	Total Project Cost	Federal Share	State/ BOA Share	Local Share
SHORT TERM (1-5 Years)					
1	Runway 16-34 Reconstruction; Lighting/Signage/NAVAID Replacement - Existing Runway	$4,243,000	$3,818,700	$212,150	$212,150
2	Runway 16 Obstruction Removal - Existing/Future	$126,000	$113,400	$6,300	$6,300
3	Runway 34 Obstruction Removal - Existing	$15,000	$113,400	$750	$750
4	Runway 34 Obstruction Removal - Future	$444,000	$399,600	$22,200	$22,200
5	Property Acquisition for RPZ Protection (Runway 34)	$110,000	$99,000	$5,500	$5,500
6	Runway 16-34 Extension to 3,400'; Install PAPI-2 and REILs (Runways16 and 34)	$1,461,000	$1,314,900	$73,050	$73,050
7	Runway 16-34 Parallel Taxiway Construction/Reconstruction	$3,910,000	$3,519,000	$195,500	$195,500
8	Runway 7-25 Obstruction Removal - Existing	$104,000	$93,600	$5,200	$5,200
9	Routine Pavement Maintenance	$678,000	$610,200	$33,900	$33,900
	SHORT-TERM TOTAL	$11,091,000	$9,981,900	$554,550	$554,550
INTERMEDIATE TERM (6-10 Years)					
10	Construct Ultimate Taxiway B3 and Mitigate Direct Access	$721,000	$648,900	$36,050	$36,050
11	Relocate Taxilane G and Extend Taxilane F	$538,000	$484,200	$26,900	$26,900
12	Taxilanes C1 and C2 - Reconstruct to TDG 1A	$675,000	$607,500	$33,750	$33,750
13	Taxilanes C, D, and E - Update to TDG 2A	$598,000	$538,200	$29,900	$29,900
14	Runway 7-25 Parallel Taxiway Rehabilitation; Lighting/Signage Replacement	$3,173,000	$2,855,700	$158,650	$158,650
15	Construct Hangar	$1,683,000	-	-	$1,683,000
16	Construct SRE building	$1,683,000	$1,514,700	$84,150	$84,150
17	Reconstruct Taxilane H	$409,000	$368,100	$20,450	$20,450
18	T-Hangar Construction	$3,046,000	-	-	$3,046,000
19	Runway 7-25 Rehabilitation	$4,822,000	$4,339,800	$241,100	$241,100
20	Relocate Supplemental Wind Cone and Rotating Beacon	$148,500	$133,650	$7,425	$7,425
	INTERMEDIATE-TERM TOTAL	$17,496,500	$11,490,750	$638,375	$5,367,375
LONG-TERM (11-20 Years and Beyond)					
21	Runway 16-34 Parallel Taxiway Maintenance	$121,000	$108,900	$6,050	$6,050
22	Construct Vehicle Parking and Access Road	$1,252,000	$1,126,800	$62,600	$62,600
23	Construct Taxilane and Apron Pavement	$810,000	$729,000	$40,500	$40,500
24	Property Acquisition for Ultimate RPZ Protection (Runway 7)	$3,013,000	$2,711,700	$150,650	$150,650
25	Runway 7 Obstruction Removal - Ultimate	$177,000	$159,300	$8,850	$8,850
26	Extend Runway 7-25 400'	$1,059,000	$953,100	$52,950	$52,950
27	Extend Taxiway A 400'	$874,000	$786,600	$43,700	$43,700
28	Install PAPI-4 (Runway 7-25)	$295,000	$265,500	$14,750	$14,750
29	Install MALSR	$2,457,000	$2,211,300	$122,850	$122,850
30	Expand East Apron	$521,000	$468,900	$26,050	$26,050
	LONG-TERM TOTAL	$10,579,000	$9,521,100	$528,950	$528,950

SHORT-TERM TOTAL	$11,091,000	$9,981,900	$554,550	$554,550
INTERMEDIATE-TERM TOTAL	$17,496,500	$11,490,750	$638,375	$5,367,375
LONG-TERM TOTAL	$10,579,000	$9,521,100	$528,950	$528,950
TOTAL CIP	$39,166,500	$30,993,750	$1,721,875	$6,450,875

The following sections describe the projects identified for the airport over the next 20 years in greater detail. The projects are grouped based on a detailed evaluation of existing and projected demand, safety, rehabilitation needs, and local priority. While the CIP identifies the priority rankings of the projects, the list should be evaluated and revised on a regular basis. It is also important to note that certain projects, while listed separately for purposes of evaluation in this study, could be combined with other projects during the time of construction/implementation.

SHORT-TERM PROGRAM

The short-term projects are those anticipated to be needed during the next five years. The projects listed are subject to change based on federal and state funding priorities. Projects that relate to safety and maintenance generally have the highest priority. This applies to the projects identified in the short-term CIP. **Exhibit 6B** illustrates the staging of each project included in the overall CIP, and the following provides a detailed breakdown of each project.

Project #1: Runway 16-34 Reconstruction; Lighting/Signage/NAVAID Replacement (Existing Runway)
Description | Runway 16-34 is in critical need of reconstruction. This project provides for reconstruction of the runway at its existing length of 2,997 feet and 75 feet wide, as well as replacement of runway lighting and signage. Environmental documentation and wetland mitigation are included as part of this project.
Cost Estimate | $4,243,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #2: Runway 16 Obstruction Removal – Existing/Future
Description | This project plans for the removal of obstructions to the existing and future approach surface for Runway 16.
Cost Estimate | $126,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #3: Runway 34 Obstruction Removal – Existing
Description | This project plans for the removal of obstructions to the existing approach surface for Runway 34.
Cost Estimate | $15,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #4: Runway 34 Obstruction Removal – Future
Description | This project plans for the removal of obstructions to the future approach surface for Runway 34.
Cost Estimate | $444,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #5: Property Acquisition for RPZ Protection (Runway 34)
Description | Property acquisition is necessary to protect the runway protection zone (RPZ) associated with Runway 34. This project plans for acquisition of property interest to limit vertical development in the RPZs.
Cost Estimate | $110,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #6: Runway 16-34 Extension to 3,400'; Install REILs/PAPIs on Runway 16-34
Description | This project includes a 403-foot extension to Runway 16, bringing the total runway length to 3,400 feet. Runway 16-34 is not currently equipped with any visual approach aids. To enhance safety and improve visibility, runway end identifier lights (REILs) and a two-box precision approach path indicator (PAPI-2) system are planned. Wetland mitigation and environmental documentation are included in the cost.
Cost Estimate | $1,461,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

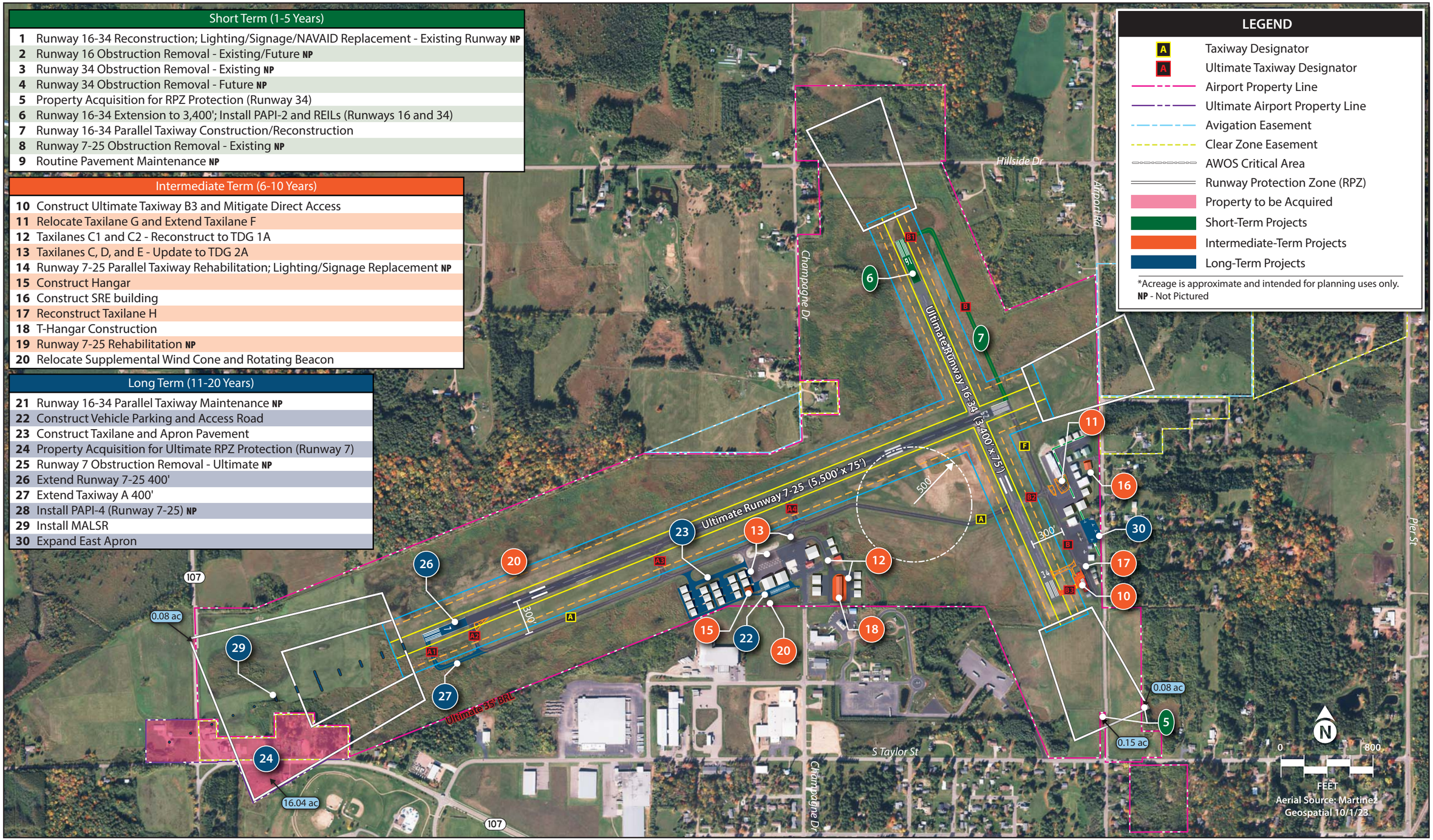
Project #7: Runway 16-34 Parallel Taxiway Construction/Reconstruction
Description | The partial-parallel taxiway currently serving Runway 16-34 is planned to be reconstructed, with new taxiway pavement constructed north of the Runway 25 threshold and extending to the extended Runway 16 threshold. Removal of non-standard holding positions is also planned on existing taxiway pavement, with new markings applied at a separation of 200 feet. This applies to the holding positions located on Taxiway F (ultimate Taxiway B) south of Runway 25 and the marking on ultimate Taxiway B2. New airfield signage with updated taxiway nomenclature is also planned. Wetland mitigation and environmental documentation are included in the cost.
Cost Estimate | $3,910,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #8: Runway 7-25 Obstruction Removal – Existing
Description | This project plans for the removal of obstructions to the existing approach surfaces for Runways 7 and 25. Project includes environmental documentation.
Cost Estimate | $104,000

Project #9: Routine Pavement Maintenance
Description | This project serves as a placeholder for miscellaneous airfield pavement rehabilitation projects needed in the 3-5 year timeframe.
Cost Estimate | $678,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Short-Term Program Summary

The short-term CIP includes projects that enhance the overall safety, efficiency, and maintenance of the airfield. The total investment necessary for the short-term CIP is approximately $11.1 million, as detailed on **Exhibit 6A**. Of the overall short-term CIP total, approximately $10.5 million is eligible for federal and state funding assistance. Sponsor funding is estimated at approximately $554,550 for the short-term program.



Short Term (1-5 Years)	
1	Runway 16-34 Reconstruction; Lighting/Signage/NAVAID Replacement - Existing Runway NP
2	Runway 16 Obstruction Removal - Existing/Future NP
3	Runway 34 Obstruction Removal - Existing NP
4	Runway 34 Obstruction Removal - Future NP
5	Property Acquisition for RPZ Protection (Runway 34)
6	Runway 16-34 Extension to 3,400'; Install PAPI-2 and REILs (Runways 16 and 34)
7	Runway 16-34 Parallel Taxiway Construction/Reconstruction
8	Runway 7-25 Obstruction Removal - Existing NP
9	Routine Pavement Maintenance NP

Intermediate Term (6-10 Years)	
10	Construct Ultimate Taxiway B3 and Mitigate Direct Access
11	Relocate Taxilane G and Extend Taxilane F
12	Taxilanes C1 and C2 - Reconstruct to TDG 1A
13	Taxilanes C, D, and E - Update to TDG 2A
14	Runway 7-25 Parallel Taxiway Rehabilitation; Lighting/Signage Replacement NP
15	Construct Hangar
16	Construct SRE building
17	Reconstruct Taxilane H
18	T-Hangar Construction
19	Runway 7-25 Rehabilitation NP
20	Relocate Supplemental Wind Cone and Rotating Beacon

Long Term (11-20 Years)	
21	Runway 16-34 Parallel Taxiway Maintenance NP
22	Construct Vehicle Parking and Access Road
23	Construct Taxilane and Apron Pavement
24	Property Acquisition for Ultimate RPZ Protection (Runway 7)
25	Runway 7 Obstruction Removal - Ultimate NP
26	Extend Runway 7-25 400'
27	Extend Taxiway A 400'
28	Install PAPI-4 (Runway 7-25) NP
29	Install MALSR
30	Expand East Apron

LEGEND

- Taxiway Designator
- Ultimate Taxiway Designator
- Airport Property Line
- Ultimate Airport Property Line
- Avigation Easement
- Clear Zone Easement
- AWOS Critical Area
- Runway Protection Zone (RPZ)
- Property to be Acquired
- Short-Term Projects
- Intermediate-Term Projects
- Long-Term Projects

*Acreage is approximate and intended for planning uses only.
NP - Not Pictured

Exhibit 6B
DEVELOPMENT STAGING

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INTERMEDIATE-TERM PROGRAM

The intermediate-term projects are those anticipated to be necessary in years six through 10 of the master plan. These projects are not tied to specific years of implementation; instead, they have been prioritized so that airport management has the flexibility to determine when they need to be pursued, based on current conditions. It is not unusual for certain projects to be delayed or advanced because of changing conditions, such as funding availability or changes in the aviation industry. This planning horizon includes 11 projects for this five-year timeframe, as listed on **Exhibit 6A** and depicted on **Exhibit 6B**. This section includes a description of each project. Unless otherwise noted, all projects include environmental documentation.

Project #10: Construct Ultimate Taxiway B3 and Mitigate Direct Access
Description | The taxiway connector currently serving Runway 34 is offset from the runway threshold, which is non-standard. This project plans for the demolition of the existing connector and construction of a new threshold connector, ultimate Taxiway B3. To avoid direct access from the apron, Taxiway B3 is not a straight connector and includes a turn.
Cost Estimate | $721,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #11: Relocate Taxilane G and Extend Taxilane F
Description | Direct access currently exists from the east apron to Runway 16-34 via ultimate Taxiway B2. To mitigate this non-standard condition, a portion of the apron pavement is planned to be removed and Taxilanes G and F relocated and extended. Aircraft tiedowns on the east apron are planned to removed.
Cost Estimate | $538,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #12: Taxilane C1 & C2 – Reconstruct to TDG 1A
Description | This project plans for the reconstruction of Taxilane C1 and C2, which accommodate small aircraft exclusively, to meet taxiway design group (TDG) 1A standards.
Cost Estimate | $675,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #13: Taxilane C, D, & E – Update to TDG 2A
Description | This project plans for Taxilanes C, D, and E to meet TDG 2A standards to serve all aircraft using the airport.
Cost Estimate | $598,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #14: Runway 7-25 Parallel Taxiway Rehabilitation; Lighting/Signage Replacement
Description | Rehabilitation of Taxiway A will be needed at some point during the intermediate period. The airport's engineer will evaluate the taxiway condition to determine the scope of work necessary to extend the useful life of the taxiway pavement and will coordinate with the airport sponsor and BOA on the timing and programming of this project. Project also includes lighting and signage replacement and wetland mitigation.

Cost Estimate | $3,173,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #15: Construct Hangar
Description | Construction of a 60-foot by 60-foot executive box hangar is planned. It is assumed this project will be funded using local sources. Environmental documentation is not included.
Cost Estimate | $1,683,000
Funding Breakdown | AIP – 0% / BOA – % / Airport Sponsor – 100%

Project #16: Construct SRE Building
Description | A snow removal equipment (SRE) building is planned for the storage of SRE and other airfield maintenance equipment. This project plans for the design and construction of a 60-foot by 60-foot building to house this equipment. Environmental documentation is not included.
Cost Estimate | $1,683,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #17: Reconstruct Taxilane H
Description | This project plans for the reconstruction of Taxilane H to meet TDG 1A standards. Wetland mitigation is included in the project cost.
Cost Estimate | $409,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #18: T-Hangar Construction
Description | An eight-unit T-hangar is planned south of the terminal building. This project plans for the construction of this facility. Environmental documentation is not included.
Cost Estimate | $3,046,000
Funding Breakdown | AIP – 0% / BOA – 0% / Airport Sponsor – 100%

Project #19: Runway 7-25 Rehabilitation
Description | Rehabilitation of Runway 7-25 will be needed at some point during the intermediate period. The airport's engineer will evaluate the runway condition to determine the scope of work necessary to extend the useful life of the runway pavement and will coordinate with the airport sponsor and BOA on the timing and programming of this project. Wetland mitigation is included in the project cost.
Cost Estimate | $4,822,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #20: Relocate Supplemental Wind Cone and Rotating Beacon
Description | The supplemental wind cone located near Runway 7 obstructs the ultimate runway object free area (ROFA). This project plans to relocate this equipment outside the ultimate ROFA. The rotating beacon that is currently located on the airport's east side is planned to be relocated to the terminal area. Environmental documentation is not included.
Cost Estimate | $148,500
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Intermediate-Term Program Summary

The total costs associated with the intermediate-term program are estimated at $17.5 million and presented on **Exhibit 6A**. Of this total, approximately $12.1 million could be eligible for federal/state funding, and the airport sponsor share is projected at $5.4 million, due in large part to the construction of the executive box and T-hangar.

LONG-TERM PROGRAM

The long-term planning horizon considers 10 projects for the 10+ year period that are mainly demand-driven. These projects and their associated costs are listed on **Exhibit 6A** and graphically depicted on **Exhibit 6B**. Unless otherwise noted, all projects include environmental documentation.

Project #21: Runway 16-34 Parallel Taxiway Maintenance
Description | Rehabilitation of Taxiway B will be needed at some point during the long-term period. The airport's engineer will evaluate the taxiway condition to determine the scope of work necessary to extend the useful life of the taxiway pavement and will coordinate with the airport sponsor and BOA on the timing and programming of this project. Project also includes lighting and signage replacement; project does not include environmental documentation.
Cost Estimate | $121,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #22: Construct Vehicle Parking and Access Road
Description | A new vehicle parking lot and access road to support a new hangar development west of the terminal is planned. Wetland mitigation is included in the project cost.
Cost Estimate | $1,252,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #23: Construct Taxilane and Apron Pavement
Description | Taxilanes and aprons that are not exclusively used by a single tenant are eligible for grant funds. This project includes the construction of a 25-foot-wide taxilane connecting to Taxiway A and the terminal apron to provide access to planned executive box hangars.
Cost Estimate | $810,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #24: Acquire Property in Runway 7 Ultimate RPZ
Description | Approximately 12 acres of property within the ultimate runway protection zone (RPZ) associated with Runway 7 is not owned by the airport. While a portion is protected by a clear zone easement, there are structures located in this area, including residences, so fee simple acquisition is necessary. This plan includes acquisition of this property, as well as the environmental documentation that will be required prior to purchase. Acquisition of approximately 3.8 acres that will be necessary to site the ultimate MALSR equipment is also included as well as removal of structures within this area. While the project cost shown below includes the total estimated amount for these actions, it should be noted that these parcels are intended to be acquired as they become available, so pricing/timing will be variable.

Cost Estimate | $3,013,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #25: Runway 7 Obstruction Removal – Ultimate
Description | This project plans for the removal of obstructions to the ultimate approach surface for Runway 7.
Cost Estimate | 177,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #26: Extend Runway 7-25 by 400 Feet
Description | Previous analysis determined a potential need to extend the length of primary Runway 7-25 to better accommodate turbine users. This project includes the design and construction phases to extend the runway by 400 feet to the southwest, bringing the ultimate runway length to 5,500 feet. The project also includes relocation of visual approach aids (PAPIs and REILs) and signage and installation of new high intensity runway lighting (HIRL). Wetland mitigation is included in the total project cost estimate.
Cost Estimate | $1,059,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #27: Extend Taxiway A by 400 Feet
Description | To provide access to the extended Runway 7 threshold, an extension of Taxiway A and a new threshold connector (ultimate Taxiway A1) are also planned. This project also includes installation of medium intensity taxiway lighting (MITL) and directional/location signage for all connectors serving Runway 7-25. Wetland mitigation is included.
Cost Estimate | $874,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #28: Install PAPI-4 (Runway 7-25)
Description | PAPI-2s are installed at each end of Runway 7-25 to serve as a visual aid for pilots on approach. The FAA recommends that four-box systems (PAPI-4s) be made available for runways that support jet traffic. As there is no operational trigger to determine justification for this upgrade, this project should be closely coordinated with the BOA/FAA to determine timing and need. The project also includes an upgrade to high intensity runway lighting (HIRL). Project cost does not include environmental documentation.
Cost Estimate | $295,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #29: Install MALSR
Description | An approach lighting system is planned to support the potential for improved approach procedures to Runway 7. This project includes the installation of a MALSR. Wetland mitigation is also included.
Cost Estimate | $2,457,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Project #30: Expand East Apron
Description | The east apron is planned to be expanded to provide additional aircraft parking space and tiedowns. This project includes the construction of apron pavement on the current east side parking area and the addition of four tiedowns.
Cost Estimate | $521,000
Funding Breakdown | AIP – 90% / BOA – 5% / Airport Sponsor – 5%

Long-Term Program Summary

The total investment necessary for the long-term CIP (detailed on **Exhibit 6A**) is approximately $10.6 million. Approximately $10.1 million is eligible for federal/state funding assistance. The sponsor share of long-term projects is projected at $529,000.

CAPITAL IMPROVEMENT PROGRAM SUMMARY

The CIP is intended as a road map of improvements to help guide the City of Merrill, the FAA, and the WisDOT BOA. The plan, as presented, will help accommodate increases in forecasted demand at RRL over the next 20 years and beyond. The sequence of projects may change due to availability of funds or changing priorities based on annual review by airport management, the FAA, and the WisDOT BOA; nevertheless, this is a comprehensive list of capital projects the airport should consider in the next 20 years.

The total CIP proposes approximately $39.2 million in airport development needs. Of this total, approximately $32.7 million could be eligible for federal and/or state funding assistance. The sponsor funding estimate for the proposed CIP is $6.5 million.

CAPITAL IMPROVEMENT FUNDING SOURCES

The four different sources of funds generally used to finance airport development include the following:

- Airport cash flow
- Revenue and general obligation bonds
- Federal/state/local grants
- Passenger facility charges (reserved for commercial service airports)

Access to these sources of financing varies widely among airports. Some large airports maintain substantial cash reserves, while smaller commercial service and general aviation airports often require subsidies from local governments to fund operating expenses and finance modest improvements.

Financing for capital improvements at RRL will not rely solely on the financial resources of the airport sponsor. Capital improvement funding is available through various grant-in-aid programs on the federal and state levels. Historically, the airport has received both federal and state grants. While more funds could be available some years, the CIP has been developed with project phasing to remain realistic and within the range of anticipated grant assistance. The following discussion outlines key sources of funding potentially available for capital improvements at the airport.

FEDERAL GRANTS

Through federal legislation over the years, various grant-in-aid programs have been established to develop and maintain the system of public-use airports across the United States. The purposes of this system and its federally based funding are to maintain national defense and promote interstate commerce. As previously noted, the *FAA Reauthorization Act of 2024* authorized the FAA's AIP at $4.0 billion for FY 2025 through 2028. Section 708 of this law increased the federal share of allowable AIP-funded project costs at nonhub and nonprimary airports to 95 percent for FY 2025 and FY 2026. After FY 2026, the federal share will revert to 90 percent for AIP-funded projects.

The source for AIP funds is the Aviation Trust Fund. The Aviation Trust Fund was established in 1970 and provides funding for aviation capital investment programs (aviation development, facilities and equipment, and research and development). The Aviation Trust Fund also finances the operation of the FAA. It is funded by user fees, including taxes on airline tickets, aviation fuel, and various aircraft parts.

Several projects identified in the CIP are eligible for FAA funding through the AIP, which provides entitlement funds to airports based (in part) on annual enplaned passengers and pounds of landed cargo weight. Additional AIP funds that are designated as discretionary may also be used for eligible projects based on the FAA's national priority system. Although the AIP has been reauthorized several times and the funding formulas have been periodically revised to reflect changing national priorities, the program has remained essentially the same. Public-use airports that serve civil aviation, like RRL, may receive AIP funding for eligible projects, as described in the FAA's *Airport Improvement Program Handbook*. The airport must fund the costs of the remaining projects using a combination of other funding sources, which are discussed in the following sections.

Funding for AIP-eligible projects is undertaken through a cost-sharing arrangement in which the FAA/BOA typically provides up to 90 percent of the cost and the remaining share is split evenly between the BOA and the airport sponsor (five percent each). In exchange for this level of funding, the airport sponsor is required to meet various grant assurances, including maintenance of each improvement for its useful life (usually 20 years).

Another source for federal grants is the IIJA, which was previously known as the *Bipartisan Infrastructure Law*. The IIJA was signed into law in 2022 and plans for $25 billion to be invested into U.S. airports over a five-year period.

IIJA funds are sourced from the U.S. Treasury General Fund and are split into three funding buckets:

- Airport Infrastructure Grants (AIG) – $15 billion
- Airport Terminal Program (ATP) – $5 billion
- Air traffic control facilities and equipment – $5 billion

Under the IIJA, RRL has a total allocation of $585,000[1] in allocated AIG funding for FY 2022–2025. This money can be used for the repair and maintenance of existing infrastructure or the construction of new facilities (e.g., airfield pavement, navigational aids, lighting, terminal building, etc.). ATP and air traffic control facility grants can be used for multimodal terminal development and the relocation,

[1] FAA, Bipartisan Infrastructure Law, Airport Infrastructure Grants (AIG) (https://www.faa.gov/bil/airport-infrastructure)

reconstruction, repair, or improvement of an airport traffic control tower. The federal share for AIG funds is the same as an AIP grant (90 percent with a 10 percent local match), while the federal share for ATP grants is 95 percent for nonprimary airports. The grant assurances that apply to AIP grants also apply to IIJA grants. IIJA and AIP grants cannot be combined into a single grant.

Apportionment (Entitlement) Funds | The AIP provides funding for eligible projects at airports through an apportionment (entitlement) program. Nonprimary airports that are included in the *National Plan of Integrated Airport Systems* (NPIAS), such as RRL, receive a guaranteed minimum level of up to $150,000 each year in nonprimary entitlement (NPE) funds. These funds can be carried over and combined for up to four years, thereby allowing for the completion of a more expensive project.

The FAA also provides a state apportionment based on a federal formula that considers land area and population. For the State of Wisconsin, the BOA distributes these funds for projects at various airports throughout the state.

Small Airport Fund | If a large-hub or medium-hub commercial service airport chooses to institute a passenger facility charge (PFC), which is a fee of up to $4.50 per airline ticket for funding of capital improvement projects, the airport's apportionment is reduced. A portion of the reduced apportionment goes to the small airport fund, which is reserved for small-hub primary commercial service airports, nonhub commercial service airports, reliever airports, and general aviation airports. As a general aviation airport, RRL is eligible for funds from this source.

Discretionary Funds | Airports may face major projects that will require funds that total more than the airport's annual entitlements; thus, additional funds from discretionary apportionments under the AIP become desirable. The primary feature of discretionary funds is that they are distributed on a priority basis. The priorities are established by the FAA with a code system under which projects are ranked by purpose. Projects that ensure airport safety and security are ranked as the most important priorities, followed by projects that maintain current infrastructure development, mitigate noise and other environmental impacts, meet design standards, and increase system capacity.

It is important to note that competition for discretionary funding is not limited to airports within the State of Wisconsin or those within the FAA Great Lakes Region. The funds are distributed to all airports in the country and, as such, are more difficult to obtain; high-priority projects often fare favorably, while lower-priority projects may not receive discretionary grants.

FAA Facilities and Equipment (F&E) Program | The Airway Facilities Division of the FAA administers the F&E Program, which provides funding for the installation and maintenance of various navigational aids and equipment of the National Airspace System. Under the F&E Program, funding is provided for FAA airport traffic control towers, en-route navigational aids, on-airport navigational aids, and approach lighting systems.

While the F&E Program still installs and maintains some navigational aids, on-airport facilities at general aviation airports have not been a priority; therefore, airports often request funding assistance for navigational aids through the AIP and maintain the equipment on their own.[2]

[2] Guidance on the eligibility of a project for federal AIP grant funding can be found in FAA Order 5100.38D, Airport Improvement Program Handbook, Change 1 (effective February 26, 2019).

STATE FUNDING PROGRAMS

The State of Wisconsin participates in the federal State Block Grant Program. Under this program, the FAA annually distributes general aviation state apportionment and discretionary funds to the WisDOT BOA, which distributes grants to airports within the state. In compliance with the BOA's legislative mandate that it "apply for, receive, and disburse" federal funds for general aviation airports, the BOA acts as the agent of the local airport sponsor. Although these grants are distributed by the BOA, they contain all federal obligations.

All publicly owned airports and federally designated privately owned reliever airports are eligible for state financial aid; however, the state's designation of airport classification in the state aviation system plan (SASP) determines the extent to which an airport can be developed with these funds. Development beyond these guidelines may not be eligible for funding, depending on the justification of need for the specific development. This determination is made on a case-by-case basis. State financial aid is available through the BOA and is provided by the issuance of a finding approved by the governor. Appropriation of funds depends on individual airport needs and BOA priorities. For projects that receive federal financial aid, the airport owner and BOA equally share the non-federal costs.

For projects that do not involve federal financial aid, the state normally pays 80 percent of the cost of eligible airside and landside development and 50 percent of some planning projects. The state's contribution toward the cost of eligible buildings is limited to $1.25 million. The state cannot participate in the cost of hangars. In addition, the State of Wisconsin provides a five percent funding match for airport projects that are federally funded. The five percent state funding match covers a portion of the 10 percent local match, which leaves the airport sponsor responsible for the remaining five percent of the project cost. This state-funded portion of the local match greatly increases the affordability of projects for many airport sponsors throughout the State of Wisconsin.

Advance Land Acquisition Loan Program | The Advance Land Acquisition Loan Program was created to lend state funds to the owners of public-use airports included in the SASP. These funds are used for purchasing land essential for airport development and approach protection.

It is BOA policy that all land needed for airport development projects seeking state or federal aid be purchased prior to funding approval. The program is available to airport owners to assist them in meeting this requirement and also assists airport owners with purchasing properties when they come up for sale and the airport owner has not budgeted for such purchases. The program operates as a revolving fund wherein loan repayments are made available for future loans. Acquisition of land before receipt of federal financial aid allows construction to begin at the earliest possible date and minimizes the need for funding amendments caused by land cost overruns.

In addition to property acquisition costs, other costs associated with the project are eligible for loans through this program, including the following:

- Feasibility studies
- Land surveys
- Airport layout plan updates

- Environmental studies (including agricultural impact statements)
- Project plans and specifications
- Other incidental expenses of acquisition (such as appraisals, relocation plans, hazardous materials surveys, and closing costs)
- Legal services associated with land acquisition

These loans are available for up to 80 percent of eligible costs, for a maximum term of five years, with simple interest payable annually at the rate of four percent on the unpaid balance. The airport owner must provide 20 percent of the estimated eligible project costs up front.

Funding Flow | For land loan projects, the airport owner's share of the project is used to begin the preliminary work. The funds for the preliminary work are then applied to the airport owner's share of the land loan and, ultimately, the state or federal aid project. This procedure allows work to begin on a project before state or federal airport development funds are available. As previously stated, funds for preliminary work are also applied to the airport owner's share. In some cases, a third party (i.e., a private corporation or individual) may donate funds toward the airport owner's share. The airport owner must commit its share of the project funds before state and federal funds can be secured. An airport owner may include one or several listed items in a request for financial aid. Funding consideration is given for each work item listed and work that will enhance safety or keep the airport operational is prioritized.

Five-Year Airport Improvement Program | Although a work item may be eligible for funding, its eligibility does not guarantee funding, or funding on the airport's stated schedule. The BOA always receives more funding requests than it can cover. The state and federal priority systems help the BOA make decisions regarding what work to include in the Five-Year Airport Improvement Program, as well as the schedule of work included. The Five-Year Airport Improvement Program is the BOA's tool for scheduling individual airport projects that are eligible for federal and state assistance. Projects with the highest priority will be included in the program for early consideration. The first two years of the program's five-year schedule primarily include projects that have been formally petitioned by an airport owner. Many of the projects included in the last three years of the program are tentative; the program is dynamic and changes due to fluctuating funding levels at federal, state, and local levels of government.

LOCAL FUNDING

After consideration has been given to grants, the balance of project costs must be funded through local resources. A goal for any airport is to generate enough revenue to cover all operating and capital expenditures, if possible. Several local financing options are available to consider when funding future development at airports, including airport revenues, issuance of various bond types, leasehold financing, customer facility charge (CFC) implementation, pursuit of non-aviation development potential, and collection of money from special events. These strategies could be used to fund the local matching share or complete a project if grant funding cannot be arranged. This section includes brief descriptions of the most common local funding options.

Airport Revenues | An airport's daily operations are conducted through the collection of various rates and charges. These airport revenues are generated specifically by airport operations and there are

restrictions on the use of revenues collected by the airport. All receipts (excluding bond proceeds or related grants and interest) are irrevocably pledged to the punctual payment of operating and maintenance expenses, payment of debt service for as long as bonds remain outstanding, or additions or improvements to airport facilities.

All airports should establish standard base rates for various leases. All lease rates should be set to adjust to a standard index, such as the consumer price index (CPI), to ensure fair and equitable rates continue to be charged in the future. Many factors impact what the standard lease rate should be for a particular facility or ground parcel. For example, ground leases for aviation-related facilities should have different lease rates than non-aviation leases. When an airport owns hangars, a separate facility lease rate should be charged. The lease rate for any individual parcel or hangar may vary due to availability of utilities, condition, location, and other factors; nevertheless, standard lease rates should fall within an acceptable range.

Bonding | Bonding is a common method to finance large capital projects at airports. A bond is an instrument of indebtedness of the bond issuer to the bond holders; a bond is a form of loan or "IOU." While bond terms are negotiable, the bond issuer is typically obligated to pay the bond holder interest at regular intervals and/or repay the principal at a later date.

Leasehold/Third-Party Financing | Leasehold or third-party financing refers to a developer or tenant financing improvements under a long-term ground lease. The advantage of this arrangement is that it relieves the airport of the responsibility of raising capital funds for the improvement. For example, a hangar developer might consider constructing hangars and charging fair market lease rates while paying the airport sponsor for a ground lease. A fuel farm can be undertaken in the same manner; under such an arrangement, the developer of the facility would pay the airport a fuel flowage fee.

Many airports use third-party funding when planned improvements will primarily be used by a private business or other organization because such projects are not ordinarily eligible for federal funding. Projects of this kind typically include hangars, fixed base operator facilities, fuel storage, exclusive aircraft parking aprons, industrial aviation-use facilities, non-aviation office/commercial/industrial developments, and other similar projects. Private development proposals are considered on a case-by-case basis. Airport funds for infrastructure, preliminary site work, and site access are often required to facilitate privately developed projects on airport property.

Customer Facility Charge (CFC) | A CFC is the imposition of an additional fee charged to customers for the use of certain facilities. The most common example is when an airport constructs a consolidated rental car facility and imposes a fee for each rental car contract; that fee is then used by the airport to pay down the debt incurred from building the facility. A landing fee is another example, wherein operators of aircraft pay the airport a set amount for use of the airfield; a landing fee can often be waived with the purchase of aviation fuel, which offers another revenue source for the airport.

Non-Aeronautical Development | In addition to generating revenue from traditional aviation sources, airports with excess land can permit compatible non-aeronautical development. Generally, an airport will extend a long-term lease for land that is not anticipated to be needed for aviation purposes in the future. The developer will then pay the monthly lease rate and construct and use the compatible facility.

The recommended development concept includes approximately 18.1 acres of property that has been reserved for potential non-aeronautical development. Any future non-aviation development must be reviewed and approved by both the FAA and BOA.

Special Events | Another common revenue-generating option is permitted use of airport property for temporary or single events. Pancake "fly-ins" and airshows are two popular examples of special events. Airports can also permit portions of their facilities to be used for non-aviation special events, such as car shows or video production of commercials. This type of revenue generation must be approved by the FAA.

Airport Rates and Fees Information | Each year, the BOA completes a survey of public-use airports in Wisconsin to gauge the rates, charges, and related activities for state airports. Per Wisconsin Administrative Code, Chapter Trans 55, airports are required to submit responses as a condition of receiving state funding. The survey offers a comparative tool to help airports gauge financial practices and needs. Of the 96 SASP airports, 92 airports provided responses to the survey. (Complete rates and charges survey data can be found on the BOA's website at https://wisconsindot.gov/av-pubs.) RRL qualifies as a medium general aviation airport; summary averages and/or detailed information for specific rates/fees are included in **Table 6B**.

TABLE 6B | BOA Rates and Charges Survey Results (2024) – Medium GA Airports

100LL Fuel – Available at 100% of Responding Medium GA Airports	
100LL Price on 12/31/2024	$5.26
Gallons of 100LL Sold	21,500
Jet A Fuel – Available at 74% of Responding Medium GA Airports	
Jet A Price on 12/31/2024	$4.77
Gallons of Jet A Sold	45,000
Landing Fees – Charged at 15% of Responding Medium GA Airports	
Tiedown Fees – Charged at 32% of Responding Medium GA Airports	
Daily Tiedown Rate for a Cessna 172	$9
Daily Tiedown Rate for a Beechcraft King Air	$42
Daily Tiedown Rate for a Hawker 800	$72
Rented T-Hangars – Available at 51% of Responding Medium GA Airports	
Non-Heated, T-Hangar – Monthly Rate for a Cessna 172	$176
Heated, T-Hangar – Monthly Rate for a Cessna 172	$256
Community Hangars – Available at 45% of Responding Medium GA Airports	
Non-Heated, Community Hangar – Daily Rate for a Cessna 172	$35
Non-Heated, Community Hangar – Monthly Rate for a Cessna 172	$233
Heated, Community Hangar – Daily Rate for a Cessna 172	$61
Heated, Community Hangar – Monthly Rate for a Cessna 172	$697
Ground Leases – Available at 99% of Responding Medium GA Airports	
Private Hangar Rate	$0.11 per square foot
Corporate Hangar Rate	$0.16 per square foot
Commercial Hangar Rate	$0.37 per square foot
Financial Self-Sustainability – 79% of Responding Medium GA Airports Required Local Subsidy	
Local Tax Levy Subsidy	$101,000

MASTER PLAN IMPLEMENTATION

To implement the master plan recommendations, it is key to recognize that planning is a continuous process and does not end with approval of this document. The airport should implement measures that allow it to track various demand indicators, such as based aircraft, hangar demand, and operations. The issues on which this master plan is based will remain valid for a number of years. The primary goal is for RRL to best serve the air transportation needs of the region while achieving economic self-sufficiency. The CIP and phasing program presented will change over time. An effort has been made to identify and prioritize all major capital projects that would require federal or state grant funding; nevertheless, the airport and the BOA should review the five-year CIP on an annual basis.

The primary value of this study is that it keeps the issues and objectives at the forefront of the minds of decision-makers. In addition to adjustments in aviation demand, decisions regarding when to undertake any projects or improvements recommended in this master plan will impact how long the plan remains valid. The format of this plan reduces the need for formal and costly updates by simply adjusting the timing of project implementation. Updates can be performed by airport management, thereby improving the effectiveness of the master plan; nevertheless, airports are typically encouraged to update their master plans every seven to 10 years, or sooner if significant changes occur in the interim.

In summary, the planning process requires the City of Merrill to constantly monitor the progress of the airport. The information obtained from continually monitoring activity will provide the data necessary to determine if the development schedule should be accelerated or decelerated.

APPENDIX A

GLOSSARY OF TERMS

GLOSSARY OF TERMS

A

Above Ground Level: The elevation of a point or surface above the ground.

Accelerate-Stop Distance Available (ASDA):
See declared distances.

Advisory Circular: External publications issued by the FAA consisting of non-regulatory material providing for the recommendations relative to a policy, guidance and information relative to a specific aviation subject.

Air Carrier: An operator which: (1) performs at least five round trips per week between two or more points and publishes flight schedules which specify the times, days of the week, and places between which such flights are performed; or (2) transports mail by air pursuant to a current contract with the U.S. Postal Service. Certified in accordance with Federal Aviation Regulation (FAR) Parts 121 and 127.

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.

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: A service operated by an appropriate organization for the purpose of providing for the safe, orderly, and expeditious flow of air traffic.

Air Traffic Control System Command Center:
A facility operated by the FAA which is responsible for the central flow control, the central altitude reservation system, the airport reservation position system, and the air traffic service contingency command for the air traffic control system.

Air Traffic Hub: A categorization of commercial service airports or group of commercial service airports in a metropolitan or urban area based upon the proportion of annual national enplanements existing at the airport or airports. The categories are large hub, medium hub, small hub, or non-hub. It forms the basis for the apportionment of entitlement funds.

Air Transport Association Of America:
An organization consisting of the principal U.S. airlines that represents the interests of the airline industry on major aviation issues before federal, state, and local government bodies. It promotes air transportation safety by coordinating industry and governmental safety programs and it serves as a focal point for industry efforts to standardize practices and enhance the efficiency of the air transportation system.

Aircraft: A device that is used or intended to be used for flight in the air.

Aircraft Approach Category: A grouping of aircraft based on 1.3 times the stall speed in their landing configuration at their maximum certificated landing weight. The 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 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 the airport property designed to protect all aspects related to aircraft operations.

Aircraft Owners And Pilots Association: A private organization serving the interests and needs of general aviation pilots and aircraft owners.

Aircraft Rescue and Fire Fighting: A facility located at an airport 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 which contains the facilities necessary for the operation of aircraft.

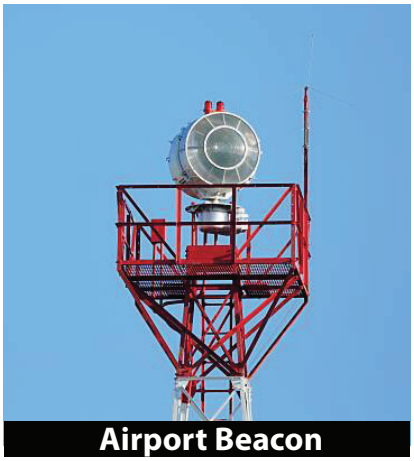
Airline Hub: An airport at which an airline concentrates a significant portion of its activity and which often has a significant amount of connecting traffic.

Airplane Design Group (ADG): A grouping of aircraft based upon wingspan. The groups are as follows:

- **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 public 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 which displays a rotating light beam to identify whether an airport is lighted.


Airport Beacon

Airport Capital Improvement Plan: The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute funds for airport development and the needs of the National Airspace System to meet specified 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: A program authorized by the Airport and Airway Improvement Act of 1982 that provides funding for airport planning and development.

Airport Layout Drawing (ALD): The drawing of the airport showing the layout of existing and proposed airport facilities.

Airport Layout Plan (ALP): A scaled drawing of the existing and planned land and facilities necessary for the operation and development of the airport.

Airport Layout Plan Drawing Set: A set of technical drawings depicting the current and future airport conditions. The individual sheets comprising the set can vary with the complexities of the airport, but the FAA-required drawings include the Airport Layout Plan (sometimes referred to as the Airport Layout Drawing (ALD), the Airport Airspace Drawing, and the Inner Portion of the Approach Surface Drawing, On-Airport Land Use Drawing, and Property Map.

Airport Master Plan: A local planning document that serves as a guide for the long-term development of an airport.

Airport Movement Area Safety System: A system that provides automated alerts and warnings of potential runway incursions or other hazardous aircraft movement events.

Airport Obstruction Chart: A scaled drawing depicting the Federal Aviation Regulation (FAR) Part 77 surfaces, a representation of objects that penetrate these surfaces, runway, taxiway, and ramp areas, navigational aids, buildings, roads and other detail in the vicinity of an airport.

Airport Reference Code (ARC): A coding system used to relate airport design criteria to the operational (Aircraft Approach Category) to the physical characteristics (Airplane Design Group) of the airplanes intended to operate at the airport.

Airport Reference Point (ARP): The latitude and longitude of the approximate center of the airport.

Airport Sponsor: The entity that is legally responsible for the management and operation of an airport, including the fulfillment of the requirements of laws and regulations related thereto.

Airport Surface Detection Equipment: A radar system that provides air traffic controllers with a visual representation of the movement of aircraft and other vehicles on the ground on the airfield at an airport.

Airport Surveillance Radar: The primary radar located at an airport or in an air traffic control terminal area that receives a signal at an antenna and transmits the signal to air traffic control display equipment defining the location of aircraft in the air. The signal provides only 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/ground communications and/or radar, visual signaling and other devices to provide safe and expeditious movement of terminal air traffic.

Airside: The portion of an airport that contains the facilities necessary for the operation of aircraft.

Airspace: The volume of space above the surface of the ground that is provided for the operation of aircraft.

Alert Area: See Special-use Airspace.

Altitude: The vertical distance measured in feet above mean sea level.

Annual Instrument Approach (AIA): 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.

Approach Lighting System (ALS): An airport lighting facility which 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 final approach and landing.

Approach Lighting System

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: An imaginary obstruction limiting surface defined in FAR Part 77 which is longitudinally centered on an extended runway centerline and extends outward and upward from the primary surface at each end of a runway at a designated slope and distance based upon the type of available or planned approach by aircraft to a runway.

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

Area Navigation: The air navigation procedure that provides the capability to establish and maintain a flight path on an arbitrary course that remains within the coverage area of navigational sources being used.

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

Automatic Dependent Surveillance–Broadcast (ADS–B): An advanced surveillance technology that combines an aircraft's positioning source, aircraft avionics, and a ground infrastructure to create an accurate surveillance interface between aircraft and ATC.

Automatic Direction Finder (ADF): An aircraft radio navigation system which senses and indicates the direction to a non-directional radio beacon (NDB) ground transmitter.

Avigation Easement: A contractual right or a property interest in land over which a right of unobstructed 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).

B

Base Leg: A flight path at right angles to the landing runway off its approach end. The base leg normally extends from the downwind leg to the intersection of the extended runway centerline. See "traffic pattern."

Based Aircraft: The general aviation aircraft that 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 adjacent to the end of a runway for the purpose of eliminating the erosion of the ground surface by the wind forces produced by airplanes at the initiation of takeoff operations.

Blast Fence

Building Restriction Line (BRL): A line which identifies suitable building area locations on the airport.

C

Capital Improvement Plan: The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute Airport Improvement Program funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

Cargo Service Airport: An airport served by aircraft providing air transportation of property only, including mail, with an annual aggregate landed weight of at least 100,000,000 pounds.

Ceiling: The height above the ground surface to the location of the lowest layer of clouds which is reported as either broken or overcast.

Circling Approach: A maneuver initiated by the pilot to align the aircraft with the runway for landing when flying a predetermined circling instrument approach under IFR.

Class A Airspace: See Controlled Airspace.

Class B Airspace: See Controlled Airspace.

Class C Airspace: See Controlled Airspace.

Class D Airspace: See Controlled Airspace.

Class E Airspace: See Controlled Airspace.

Class 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 identified in the appropriate aeronautical chart which is designated for the purpose of transmitting airport advisory information and procedures while operating to or from an uncontrolled airport.

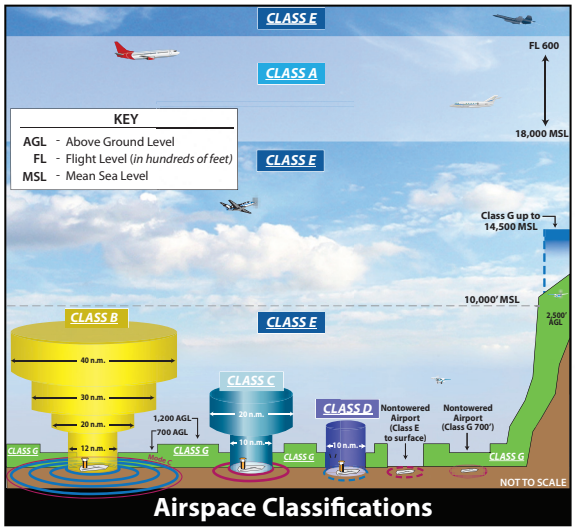
Compass Locator (LOM): A low power, low/medium frequency radio-beacon installed in conjunction with the instrument landing system at one or two of the marker sites.

Conical Surface: An imaginary obstruction- limiting 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.

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 in accordance with the airspace classification. 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. All persons must operate their aircraft under IFR.



Airspace Classifications

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 air space and is designed to contain all published instrument approach procedures to the airport. An air traffic control clearance is required for all aircraft to operate in the area.

CLASS C: Generally, the airspace from the surface to 4,000 feet above the airport elevation (charted 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 (charted as MSL) surrounding those airports that have an operational control tower. Class D airspace is individually tailored and configured to encompass published instrument approach procedure. Unless otherwise authorized, all persons 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: A flight path at right angles to the landing runway off its upwind end. See "traffic pattern."

D

Decibel: A unit of noise representing a level relative to a reference of a sound pressure 20 micro newtons per square meter.

Decision Height/Decision Altitude: The height above the end of the runway surface at which a decision must be made by a pilot during the ILS or Precision Approach Radar approach to either continue the approach or to execute a missed approach.

Declared Distances: The distances declared available for the airplane's takeoff runway, takeoff distance, accelerate-stop distance, and landing distance requirements. The distances are:

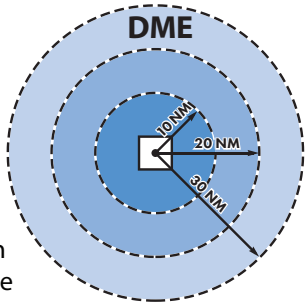
- **Takeoff Run Available (TORA):** The runway length declared available and suitable for the ground run of an airplane taking off.
- **Takeoff Distance Available (TODA):** The TORA plus the length of any remaining runway and/or clear way beyond the far end of the TORA.
- **Accelerate-stop Distance Available (ASDA):** The runway plus stopway length declared available for the acceleration and deceleration of an aircraft aborting a takeoff.
- **Landing Distance Available (LDA):** The runway length declared available and suitable for landing.

Department Of Transportation: The cabinet level federal government organization consisting of modal operating agencies, such as 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 based upon 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 designated beginning of the runway.

Distance Measuring Equipment (DME): Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.



DNL: The 24-hour average sound level, in decibels, obtained after the addition of ten decibels to sound levels for the periods between 10 p.m. and 7 a.m. as averaged over a span of one year. It is the FAA standard metric for determining the cumulative exposure of individuals to noise.

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. Also see "traffic pattern."

E

Easement: The legal right of one party to use a portion of the total rights in real estate owned by another party. This may include the right of passage over, on, or below the property; certain air rights above the property, including view rights; and the rights to any

specified form of development or activity, as well as any other legal rights in the property that may be specified in the easement document.

Elevation: The vertical distance measured in feet above mean sea level.

Enplaned Passengers: The total number of revenue passengers boarding aircraft, including originating, stop-over, and transfer passengers, in scheduled and nonscheduled services.

Enplanement: The boarding of a passenger, cargo, freight, or mail on an aircraft at an airport.

Entitlement: Federal funds for which a commercial service airport may be eligible based upon its annual passenger enplanements.

Environmental Assessment (EA): An environmental analysis performed pursuant to the National Environmental Policy Act to determine whether an action would significantly affect the environment and thus require a more detailed environmental impact statement.

Environmental Audit: An assessment of the current status of a party's compliance with applicable environmental requirements of a party's environmental compliance policies, practices, and controls.

Environmental Impact Statement (EIS):
A document required of federal agencies by the National Environmental Policy Act for major projects or legislative proposals affecting the environment. It is a tool for decision-making describing the positive and negative effects of a proposed action and citing alternative actions.

Essential Air Service: A federal program which guarantees air carrier service to selected small cities by providing subsidies as needed to prevent these cities from such service.

F

Federal Aviation Regulations: The general and permanent rules established by the executive departments and agencies of the Federal Government for aviation, which are published in the Federal Register. These are the aviation subset of the Code of Federal Regulations.

Federal Inspection Services: The provision of customs and immigration services including passport inspection, inspection of baggage, the collection of duties on certain imported items, and the inspections for agricultural products, illegal drugs, or other restricted items.

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. See "traffic pattern."

Final Approach and Takeoff Area (FATO):
A defined area over which the final phase of the helicopter approach to a hover, or a landing is completed and from which the takeoff is initiated.

Final Approach Fix: The designated point at which the final approach segment for an aircraft landing on a runway begins for a non-precision approach.

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 users of an airport. Such services include, but are not limited to, hangaring, fueling, flight training, repair, and maintenance.

Flight Level: A measure of altitude used by aircraft flying above 18,000 feet. Flight levels are indicated by three digits representing the pressure altitude in hundreds of feet. An airplane flying at flight level 360 is flying at a pressure altitude of 36,000 feet. This is expressed as FL 360.

Flight Service Station (FSS): An operations facility in the national flight advisory system which utilizes data interchange facilities for the collection and dissemination of Notices to Airmen, weather, and administrative data and which provides preflight and in-flight advisory services to pilots through air and ground based communication facilities.

Frangible Navaid: A navigational aid which 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.

G

General Aviation: That portion of civil aviation which encompasses all facets of aviation except air carriers holding a certificate of convenience and necessity, and large aircraft commercial operators.

General Aviation Airport: An airport that provides air service to only general aviation.

Glideslope (GS): Provides vertical guidance for aircraft during approach and landing. The glideslope consists of the following:

- Electronic components emitting signals which provide vertical guidance by reference to airborne instruments during instrument approaches such as ILS; or
- Visual ground aids, such as PAPI, which provide vertical guidance for VFR approach or for the visual portion of an instrument approach and landing.

Global Positioning System (GPS): A system of satellites used as reference points to enable 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.

Ground Based Augmentation System (GBAS): A program that augments the existing GPS system by providing corrections to aircraft in the vicinity of an airport in order to improve the accuracy of these aircrafts' GPS navigational position

H

Helipad: A designated area for the takeoff, landing, and parking of helicopters.

High Intensity Runway Lights (HIRL): The highest classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

High-speed Exit Taxiway: An acute-angled exit taxiway forming a 30 degree angle with the runway centerline, designed to allow an aircraft to exit a runway without having to decelerate to typical taxi speed.

Horizontal Surface: An imaginary obstruction-limiting surface defined in FAR Part 77 that is specified as a portion of a horizontal plane surrounding a runway located 150 feet above the established airport elevation. The specific horizontal dimensions of this surface are **a** function of the types of approaches existing or planned for the runway.

Hot Spot: A location on an airport movement area with a history of potential risk of collision or runway incursion, and where heightened attention by pilots and drivers is necessary.

I

Initial Approach Fix: The designated point at which the initial approach segment begins for an instrument approach to a runway.

Instrument Approach Procedure: A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to 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 aircraft is operating.**

Instrument Landing System (ILS): A precision instrument approach system which normally consists of the following electronic components and visual aids:

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

Instrument Meteorological Conditions: Meteorological conditions expressed in terms of specific visibility and ceiling conditions that are less than the minimums specified for visual meteorological conditions.

Itinerant Operations: Operations by aircraft that are arriving from outside the traffic pattern or departing the airport traffic pattern.

K

Knots: A unit of speed length used in navigation that is equivalent to the number of nautical miles traveled in one hour.

L

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 Operations: Aircraft operations performed by aircraft that operate in the local traffic pattern or within sight of the airport, that are 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. Typically, this includes touch and-go training operations.

Localizer: The component of an ILS which provides course guidance to the runway.

Localizer Type Directional Aid (LDA): A facility of comparable utility and accuracy to a localizer but is not part of a complete ILS and is not aligned with the runway.

Localizer

Low Intensity Runway Lights: The lowest classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

M

Medium Intensity Runway Lights:
The middle classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

Military Operations: Aircraft operations that are performed in 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 affected, and occurring normally:

- When the aircraft has descended to the decision height and has not established visual contact; or
- When directed by air traffic control to pull up or to go around again.

Movement Area: The runways, taxiways, and other areas of an airport which are utilized for taxiing/hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. At those airports with a tower, air traffic control clearance is required for entry onto the movement area.

N

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:
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 length used in navigation which is equivalent to the distance spanned by one minute of arc in latitude, that is, 1,852 meters or 6,076 feet. It is equivalent to approximately 1.15 statute mile.

Navaid: A term used to describe any electrical or visual air navigational aids, lights, signs, and associated supporting equipment (i.e., PAPI, VASI, ILS, etc.)

Navigational Aid: A facility used as, available for use as, or designed for use as an aid to air navigation.

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 beacon transmitting non-directional signals whereby the pilot of an aircraft equipped with direction finding equipment can determine their bearing to and from the radio beacon and home on, or track to, the station. When the radio beacon is installed in conjunction with the Instrument Landing System marker, it is normally called a Compass Locator.

NDB

Non-precision Approach Procedure: A standard instrument approach procedure in which no electronic glide slope is provided, such as VOR, TACAN, NDB, or LOC.

Notice To Air Missions (NOTAM): A notice containing information concerning the establishment, condition, or change in any component of or hazard in the National Airspace System, the timely knowledge of which is considered essential to personnel concerned with flight operations.

O

Object Free Area (OFA): An area on the ground centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

Obstacle Free Zone (OFZ): The airspace below 150 feet above the established airport elevation and along the runway and extended runway centerline that 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, in order to provide clearance for aircraft landing or taking off from the runway, and for missed approaches.

Operation: The take-off, landing, or touch-and-go procedure by an aircraft on a runway at an airport.

Outer Marker (OM): An ILS navigation facility in the terminal area navigation system located four to seven miles from the runway edge on the extended centerline, indicating to the pilot that he/she is passing over the facility and can begin final approach.

P

Pilot-controlled Lighting: Runway lighting systems at an airport that are controlled by activating the microphone of a pilot on a specified radio frequency.

Precision Approach: A standard instrument approach procedure which provides runway alignment and glide slope (descent) information. It is categorized as follows:

- **CATEGORY I (CAT I):** A precision approach which provides for approaches with a decision height of not less than 200 feet and visibility 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 which provides for approaches with a decision height of not less than 100 feet and visibility not less than 1200 feet RVR.
- **CATEGORY III (CAT III):** A precision approach which provides for approaches with minimal less than Category II.

Precision Approach Path Indicator (PAPI):
A lighting system providing visual approach slope guidance to aircraft during a landing approach. A PAPI normally consists of four light units but an abbreviated system of two lights is acceptable for some categories of aircraft.

Precision Approach Path Indicator

Precision Approach Radar: 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 Zone (POFZ):
An area centered on the extended runway centerline, beginning at the runway threshold and extending behind the runway threshold that is 200 feet long by 800 feet wide. The POFZ is a clearing standard which requires the POFZ to be kept clear of above ground objects protruding above the runway safety area edge elevation (except for frangible NAVAIDS). The POFA is only in effect when the approach includes vertical guidance, the reported ceiling is below 250 feet, and an aircraft is on final approach within two miles of the runway threshold.

Primary Airport: A commercial service airport that enplanes at least 10,000 annual passengers.

Primary Surface: An imaginary obstruction limiting 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 types of approaches existing or planned for the runway.

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.

R

Radial: A navigational signal generated by a Very High Frequency Omni-directional Range or VORTAC station that is measured as an azimuth from the station.

Regression Analysis: A statistical technique that seeks to identify and quantify the relationships between factors associated with a forecast.

Remote Communications Outlet (RCO):
An unstaffed transmitter receiver/facility remotely controlled by air traffic personnel. RCOs serve flight service stations (FSSs). RCOs were 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 ARTCCs.

Remotely Piloted Unmanned Aircraft System (RPAS):
A set of configurable elements consisting of a remotely-piloted aircraft, its associated remote pilot station(s), the required command and control links and any other system elements as may be required, at any point during flight operation.

Reliever Airport: An airport to serve general aviation aircraft which might otherwise use a congested air-carrier served airport.

Restricted Area: See Special-use Airspace.

RNAV: Area navigation - airborne equipment which permits flights over determined tracks within prescribed accuracy tolerances without the need to overfly 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 would be designated Runway 18. The runway 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). Aircraft can takeoff or land from either end of a runway, depending upon wind direction.

Runway Alignment Indicator Light (RAIL): A series of high intensity sequentially flashing lights installed on the extended centerline of the runway usually in conjunction with an approach lighting system.

Runway Design Code: A code signifying the FAA design standards to which the runway is to be built.

Runway End Identification Lighting (REIL): Two synchronized flashing lights, one on each side of the runway threshold, which provide rapid and positive identification of the approach end of a particular runway.

REIL

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. Its dimensions are determined by the aircraft approach speed and runway approach type and minimal.

Runway Reference Code: A code signifying the current operational capabilities of a runway and taxiway.

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): An area on the airport to be kept clear of permanent objects so that there is an unobstructed line of sight from any point five feet above the runway centerline to any point five feet above an intersecting runway centerline.

Runway Visual Range (RVR): An instrumentally derived value, in feet, representing the horizontal distance a pilot can see down the runway from the runway end.

S

Scope: The document that identifies and defines the tasks, emphasis, and level of effort associated with a project or study.

Segmented Circle: A system of visual indicators designed to provide traffic pattern information at airports without operating control towers, often co-located with a wind cone.

Shoulder: An area adjacent to the edge of paved runways, taxiways, or aprons providing a transition between the pavement and the adjacent surface; support for aircraft running off the pavement; enhanced drainage; and blast protection. The shoulder does not necessarily need to be paved.

Slant-range Distance: The straight line distance between an aircraft and a point on the ground.

Small Aircraft: An aircraft 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 wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon aircraft operations that are not a part of those activities. Special-use airspace classifications include:

- **ALERT AREA:** Airspace which 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 wherein 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 the flight of aircraft is prohibited.
- **RESTRICTED AREA:** Airspace designated under Federal Aviation Regulation (FAR) 73, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. 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 which may contain hazards to nonparticipating aircraft.

Standard Instrument Departure (SID): A preplanned coded air traffic control IFR departure routing, preprinted for pilot use in graphic and textual form only.

Standard Instrument Departure Procedures: A published standard flight procedure to be utilized following takeoff to provide a transition between the airport and the terminal area or enroute airspace.

Standard Terminal Arrival Route (STAR): A preplanned coded air traffic control IFR arrival routing, preprinted for pilot use in graphic and textual or textual form only.

Stop-and-go: A procedure wherein an aircraft will land, make a complete stop on the runway, and then commence a takeoff from that point. 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 that is designed to support an aircraft during an aborted takeoff without causing structural damage to the aircraft. It is not to be used for takeoff, landing, or taxiing by aircraft.

Straight-in Landing/approach: A landing made on a runway aligned within 30 degrees of the final approach course following completion of an instrument approach.

T

Tactical Air Navigation (TACAN):
An ultrahigh frequency electronic air navigation system which provides suitably equipped aircraft 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: A taxiway designed for low speed and precise taxiing. Taxilanes are usually, but not always, located outside the movement area and provide access to from taxiways to aircraft parking positions and other terminal areas.

Taxiway: A defined path established for the taxiing of aircraft from one part of an airport to another.

Taxiway Design Group: A classification of airplanes based on outer to outer Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance.

Taxiway Safety Area (TSA): A defined surface alongside 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:
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.

Tetrahedron

Threshold: The beginning of that portion of the runway available for landing. In some instances, the 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.

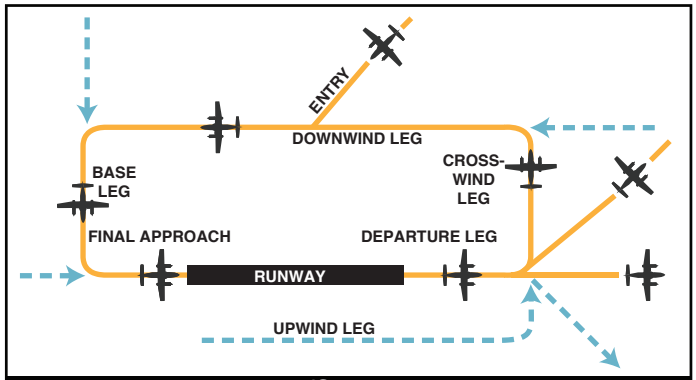
Touchdown and Lift-off Area (TLOF):
A load bearing, generally paved area, normally centered in the FATO, on which a helicopter lands or takes off.

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 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 that is 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.



Traffic Pattern

U

Uncontrolled Airport: An airport without an airport traffic control tower at which the control of Visual Flight Rules traffic is not exercised.

Uncontrolled Airspace: Airspace within which aircraft are not subject to air traffic control.

Universal Communication (UNICOM): A non-government communication facility which may provide airport information at certain airports. Locations and frequencies of UNICOMs are shown on aeronautical charts and publications.

Unmanned Aircraft System (UAS): An unmanned aircraft and the equipment necessary for the safe and efficient operation of that aircraft. An unmanned aircraft is a component of a UAS. It is defined by statute as an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft (Public Law 112-95, Section 331(8)).

Upwind Leg: A flight path parallel to the landing runway in the direction of landing. See "traffic pattern."

V

Vector: A heading issued to an aircraft to provide navigational guidance by radar.

Very High Frequency Omni-directional Range (VOR): A ground-based electronic navigation aid transmitting very high frequency navigation 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 Omni-directional Range/Tactical Air Navigation (VORTAC): A navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance-measuring equipment (DME) at one site.

Victor Airway: A system of established routes that run along specified VOR radials, from one VOR station to another.

Visual Approach: An approach wherein an aircraft on an IFR flight plan, operating in VFR conditions under the control of an air traffic control facility and having an air traffic control authorization, may proceed to the airport of destination in VFR conditions.

Visual Approach Slope Indicator (VASI): An airport lighting facility providing vertical visual approach slope guidance to aircraft during approach to landing. The VASI is now obsolete and is being replaced with the PAPI.

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, it is used by pilots and controllers to indicate type of flight plan.

Visual Meteorological Conditions: Meteorological conditions expressed in terms of specific visibility and ceiling conditions which are equal to or greater than the threshold values for instrument meteorological conditions.

Visual Runway: A runway without an existing or planned instrument approach.

VOR: See "Very High Frequency Omni-directional Range."

VORTAC: See "Very High Frequency Omni-directional Range/Tactical Air Navigation."

W

Warning Area: See Special-use Airspace.

Wide Area Augmentation System: 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.

Windsock/Windcone: A visual aid that indicates the prevailing wind direction and intensity at a particular location.

Windsock/Windcone

Abbreviations

AAM: advanced air mobility

AC: advisory circular

ACIP: airport capital improvement program

ADF: automatic direction finder

ADG: airplane design group

ADS-B: automatic dependent surveillance-broadcast

AFSS: automated flight service station

AGL: above ground level

AIA: annual instrument approach

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)

AOA: Aircraft Operation Area

APRC: approach reference code

APV: instrument approach procedure with vertical guidance

ARC: airport reference code

ARFF: aircraft rescue and fire fighting

ARP: airport reference point

ARTCC: air route traffic control center

ASDA: accelerate-stop distance available

ASR: airport surveillance radar

ASOS: automated surface observation station

ASV: annual service volume

ATC: airport traffic control

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 Regulation

CIP: capital improvement program

DME: distance measuring equipment

DNL: day-night noise level

DPRC: departure reference code

DWL: runway weight bearing capacity of aircraft with dual-wheel type landing gear

DTWL: runway weight bearing capacity of aircraft with dual-tandem type landing gear

eVTOL: electric vertical takeoff and landing aircraft

FAA: Federal Aviation Administration

FAR: Federal Aviation Regulation

FBO: fixed base operator

FY: fiscal year

GA: general aviation

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

LDA: localizer type directional aid

LDA: landing distance available

LIRL: low intensity runway edge lighting

LMM: compass locator at middle marker

LNAV: lateral navigation

LOC: localizer

LOM: compass locator at outer marker

LP: localizer performance

LPV: localizer performance with vertical guidance

MALS: medium intensity approach lighting system

MALSR: MALS with runway alignment indicator lights

MALSF: MALS with sequenced flashers

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

MTOW: maximum takeoff weight

NAVAID: navigational aid

NDB: non-directional radio beacon

NEPA: National Environmental Policy Act

NM: nautical mile (6,076.1 feet)

NPDES: National Pollutant Discharge Elimination System

NPIAS: National Plan of Integrated Airport Systems

NPRM: notice of proposed rule making

ODALS: omni-directional approach lighting system

OFA: object free area

OFZ: obstacle free zone

OM: outer marker

PAPI: precision approach path indicator

PFC: porous friction course

PFC: passenger facility charge

PCI: pavement condition index

PCL: pilot-controlled lighting

PIW: public information workshop

POFZ: precision object free zone

PVC: poor visibility and ceiling

RCO: remote communications outlet

RDC: runway design code

REIL: runway end identification lighting

RNAV: area navigation

RPAS: remotely piloted aircraft system

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

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 runway alignment indicator lights

STAR: standard terminal arrival route

SWL: runway weight bearing capacity for aircraft with single-wheel tandem type landing gear

TACAN: tactical air navigational aid

TAF: Federal Aviation Administration (FAA) Terminal Area Forecast

TDG: taxiway design group

TLOF: Touchdown and lift-off

TDZ: touchdown zone

TDZE: touchdown zone elevation

TODA: takeoff distance available

TORA: takeoff runway available

TRACON: terminal radar approach control

UAS: unmanned aircraft system

VASI: visual approach slope indicator

VFR: visual flight rules (FAR Part 91)

VHF: very high frequency

VOR: very high frequency omni-directional range

VORTAC: very high frequency omni-directional range/tactical air navigation

WAAS: wide area augmentation system

APPENDIX B

CROSSWIND RUNWAY ELIGIBILITY MEMO

Federal Aviation Administration

Memorandum

Date: December 18, 2023

To: Richard M Kula, AGL-610 Planning/Programing Branch

From: Kent Duffy, APP-410; MICHAEL K DUFFY Digitally signed by MICHAEL K DUFFY Date: 2023.12.18 16:59:39 -05'00'
Anna Walker, AGL-610 Regional Planner ANNA M WALKER Digitally signed by ANNA M WALKER Date: 2023.12.18 15:38:58 -06'00'

Cc: Deb Bartell, Chicago ADO Manager

Subject: Merrill Municipal Airport (RRL)- Runway 16/34 Crosswind Eligibility

Purpose: The Merrill Municipal Airport (RRL), in Merrill, WI, has requested FAA's review of the primary Runway 7/25 wind coverage, in consideration of the need for a crosswind runway. In accordance with FAA Order 5100.38D Change 1, *AIP Handbook*, the ADO must make a specific determination if a crosswind runway is required for the operation of the airfield under established 95% crosswind coverage criteria. Therefore, the specific question for this memo is to validate if the Sponsor's weighted hourly operations wind coverage calculation has been correctly applied.

Background: RRL has two runways, Runway 7/25 is the primary runway (5,100ft x 75ft) and Runway 16/34 (2,997ft x 75ft) which was constructed as a crosswind runway. The wind data was analyzed to determine if the primary runway provides adequate wind coverage for the airport.

The wind coverage was reevaluated in 2019, after the RRL AWOS had been operational for 10 years, using the using the common ADIP wind tool. The analysis indicated that the primary runway provided greater than 95% wind coverage, which per AIP criteria means the crosswind runway does not meet eligibility criteria using common methodologies.

Additional coordination resulted in the Sponsor submitting a memo utilizing a weighted-hourly operations evaluation of the wind coverage, which is permitted by AC 150/5300-13B. This higher-fidelity analysis evaluated the historical times that aircraft were operating and comparing that to the corresponding wind conditions at the time of those operations. As is common, wind velocity and variability is higher during daytime heating, which is also when most aircraft operations occur. This analysis resulted in a primary runway wind coverage of 94.8%. FAA reviewed the Sponsor's analysis and determined that the Sponsor had applied proper use of this weighted-hourly operations methodology.

The weighted-hourly operations calculation of 94.8% wind coverage uses 10+ years of continuous wind data, which is the minimum requirement per the AC. While using all of the available wind data (2001-2021) brings the wind coverage of the primary runway, to 95.08%, it's still true that the minimum threshold criterion with of 10 contiguous years showing wind coverage need has been met.

The Sponsor also submitted additional discussion on the potential use of wind gusts as part of the analysis. FAA reviewed this specific portion of the analysis for proper utilization. Wind gusts are generally conditions that have a duration of less than 20 seconds, whereas the sustained wind velocities recorded by NOAA and used in the wind coverage analysis are the highest 2-minute recorded value during the period of observation. The sustained wind metric effectively covers much of the variation in wind velocity that is occurring at the airport, since it is using the peak sustained value. In contrast, applying a wind velocity with a duration of 20 seconds or less to a full hour (3,600 seconds) of operations is not mathematically valid. Accordingly, as stated in AC 150/5300-13B Appendix B (B.2.1), the FAA does not consider other conditions (including wind gusts) in reviewing wind coverage.

Determination: AGL and APP-410 concur that the Sponsor's weighted-hourly operations analysis is correctly calculated, indicating that the primary runway currently has less than 95% wind coverage for A-I/B-I aircraft. Therefore, the ADO can determine that Runway 16/34 is an eligible crosswind runway. Because there are long-term changes in wind patterns, this wind coverage determination is valid only for the crosswind runway once reconstructed. As is standard practice, re-evaluation of crosswind coverage is needed for future rehabilitation and other related projects.

This concurrence does not provide project-level justification for Runway 16/34 as it is only validation of the airport's primary runway's wind coverage and subsequent crosswind eligibility.

Per the Order 5100.38, Table 3-18 row (b), the AIP-justified width and length of the Runway 16/34 will need to be assessed based upon the current, validated operations data, including regular use by the critical aircraft, when considering the need for reconstruction of the runway prior to grant issuance.

APPENDIX C

RUNWAY 16-34 LENGTH JUSTIFICATION REPORT

Runway Length Justification Report

Merrill Municipal Airport (KRRL), Runway 16/34

Merrill, Wisconsin

Prepared by: Lucas Ward and Mark Graczykowski (WisDOT BOA) and Karl Kemper (Becher Hoppe)

Purpose and Need:

The 2013 Pavement Management Report for KRRL has identified the need for major rehabilitation/reconstruction of the crosswind runway, Runway 16/34. The crosswind runway serves primarily B-I and smaller aircraft with an allowable crosswind component of 10.5 knots. The primary runway, Runway 7/25, doesn't provide adequate crosswind coverage for B-1 aircraft. The recommended runway length for Runway 16/34 is 3,400 feet to serve 95% of the fleet.

Purpose: Improve safety of Runway 16/34.
Need: Extend Runway 16/34 to 3,400'.

Airport Data based on latest ALP signed in 2010:

WIND COVERAGE			
	10.5 KNOTS	13 KNOTS	16 KNOTS
RUNWAY 7/25	91.9% ALL	96.42% ALL	99.37% ALL
	91.61% VFR	96.29% VFR	99.34% VFR
	93.98% IFR	97.37% IFR	99.55% IFR
RUNWAY 16/34	89.33% ALL	94.66% ALL	98.59% ALL
	89.34% VFR	94.70% VFR	98.63% VFR
	88.90% IFR	94.13% IFR	98.25% IFR
COMBINED RUNWAY 7/25 16/34	98.42% ALL	99.63% ALL	99.94% ALL
	98.38% VFR	99.63% VFR	99.94% VFR
	98.69% IFR	99.65% IFR	99.93% IFR

SOURCE: NATIONAL CLIMATIC DATA CENTER, ASHEVILLE, NC
PERIOD: WAUSAU MUNICIPAL AIRPORT, PERIOD 1998-2007

Airport Elevation: 1318' MSL
Approach Speed of aircraft: > 50 knots
Number of passengers: < 10 passengers
Mean Max. Temp. of Hottest Month: 80 degrees Fahrenheit
Operations: General Aviation
Maximum Certificated Takeoff Weight: 12,500 or less

Runway Length Eligibility:

Advisory Circular 150/5325-4B was used.to determine the recommended, and AIP eligible, runway length. According to AC 150/5325-4B a crosswind runway is recommended when 95% wind coverage cannot be met with the primary runway. As can be seen in the aforementioned wind coverage table, 95% wind coverage is not being obtained on the primary runway 7/25 at 10.5 knots. The existence of a crosswind runway is eligible to obtain at least 95% wind coverage at 10.5 knots.

Following along with AC 150/5325-4B, Table 1-1 shows which sections of the AC will be used to determine the recommended runway length. Using the airport information, and Table 1-1, the design guidelines that should be used are Chapter 2, Paragraph 205, Figure 2-1. Below is Table 1-1 with the path highlighted.

Table 1-1. Airplane Weight Categorization for Runway Length Requirements

Airplane Weight Category Maximum Certificated Takeoff Weight (MTOW)			Design Approach	Location of Design Guidelines
12,500 pounds (5,670 kg) or less	Approach Speeds less than 30 knots		Family grouping of small airplanes	Chapter 2; Paragraph 203
	Approach Speeds of at least 30 knots but less than 50 knots		Family grouping of small airplanes	Chapter 2; Paragraph 204
	Approach Speeds of 50 knots or more	With Less than 10 Passengers	Family grouping of small airplanes	Chapter 2; Paragraph 205 Figure 2-1
		With 10 or more Passengers	Family grouping of small airplanes	Chapter 2; Paragraph 205 Figure 2-2
Over 12,500 pounds (5,670 kg) but less than 60,000 pounds (27,200 kg)			Family grouping of large airplanes	Chapter 3; Figures 3-1 or 3-2 [1] and Tables 3-1 or 3-2
60,000 pounds (27,200 kg) or more or Regional Jets [2]			Individual large airplane	Chapter 4; Airplane Manufacturer Websites (Appendix 1)

Note [1]: When the design airplane's APM shows a longer runway length than what is shown in figure 3-2, use the airplane manufacturer's APM. However, users of an APM are to adhere to the design guidelines found in Chapter 4.

Note [2]: All regional jets regardless of their MTOW are assigned to the 60,000 pounds (27,200 kg) or more weight category.

Before moving to the design guidelines, Table 1-3 must also be addressed as it may affect the overall length that is determined by the guidelines. Table 1-3 can be seen below with the applicable section highlighted. RRL is a general aviation airport so 100% of the eligible runway length determined from the AC should be used.

Table 1-3. Runway Length for Crosswind Runway

Runway Service	Runway Length for Crosswind Runway Equals
Scheduled [1] Such as Commercial Service Airports	100 % of primary runway length when built for the same individual design airplane or airplane design group that uses the primary runway
	100% of the recommended runway length determined for the lower crosswind capable airplanes using the primary runway
Non-Scheduled [2] Such as General Aviation Airports	100% of the recommended runway length determined for the lower crosswind capable airplanes using the primary runway

Note [1]: Transport service operated over routes pursuant to published flight schedules that are openly advertised with dates or times (or both) or otherwise made readily available to the general public or pursuant to mail contracts with the U.S. Postal Service (Bureau of Transportation Statistics, Department of Transportation (DOT)).

Note [2]: Revenue flights, such as charter flights that are not operated in regular scheduled service, and all non-revenue flights incident to such flights (Bureau of Transportation Statistics, DOT). For Federally funded programs, such as AIP, there must be at least 500 annual itinerant operations and 100% of the class.

Before using the design guidelines in Chapter 2, Figure 2-1, the percentage of fleet used must be determined. KRRL serves a medium to small size population so only 95% of the fleet should be used for design purposes. Using this information along with the mean max temp. of the hottest month and the elevation of the airport, Figure 2-1 can be used as shown below.

Figure 2-1. Small Airplanes with Fewer than 10 Passenger Seats
(Excludes Pilot and Co-pilot)

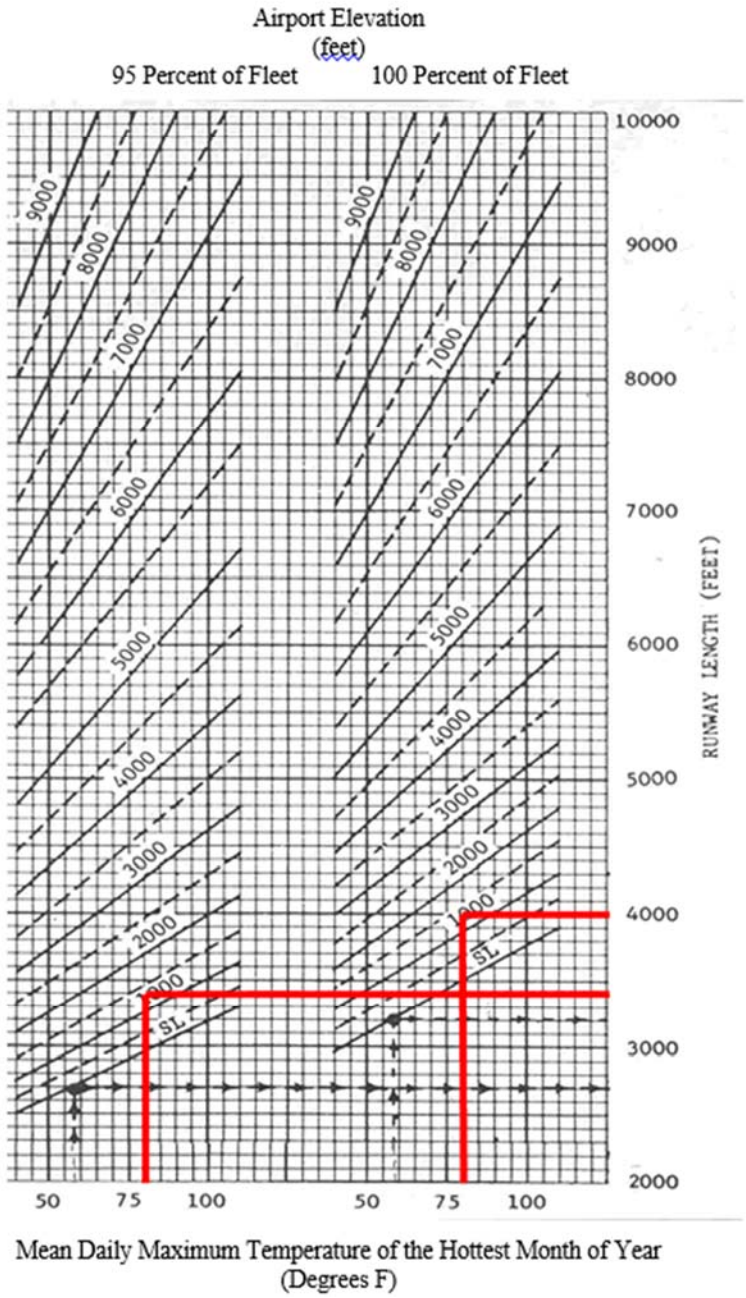
Merrill Municipal Airport:

Temperature (mean day max hot month): 80° F
Airport Elevation: 1318' above MSL

Note: Dashed lines shown in the table are mid values of adjacent solid lines.

Recommended Runway Length:

For 95% = 3,400 feet
For 100% = 4,000 feet



Runway Length Justification:

FAA AC 150/5325-4B, Runway Length Requirements for Airport Design was also used to determine the justified length for KRRL's crosswind runway, Runway 16/34.

- Paragraph 102.a.(8) defines the substantial use threshold, and says that: "Federally funded projects require that critical design airplanes have at least 500 or more annual itinerant operations at the airport (landings and takeoffs are considered as separate operations) for an individual airplane or a family grouping of airplanes…" Runway length is justified when this threshold is met.
- Paragraph 102.a.(2) defines critical design airplanes as: "The listing of airplanes (or a single airplane) that results in the longest recommended runway length. The listed airplanes will be evaluated either individual or as a single family grouping to obtain a recommended runway length."
- Table 1-1, Airplane Weight Categorization for Runway Length Requirements, requires that a family grouping of small airplanes be used for runways designed to serve aircraft of 12,500 lbs. or less, with approach speeds of 50 knots or more, with less than 10 passengers. Therefore, all small airplanes are the critical design airplane for Runway 16/34 at KRRL. The guidelines for the runway length are located in Figure 2-1.
- Figure 2-1 provides a recommended runway length of 3,400' for the applicable family grouping of small airplanes, which is the critical design airplane. The runway length is justified because the substantial use threshold is met, as described below.

FAA AC 150/5000-17, Critical Aircraft and Regular Use Determination was used to confirm critical aircraft and substantial/regular use for KRRL's crosswind runway, Runway 16/34. All information contained in this AC is consistent with the rationale summarized from AC 150/5325-4B above, except for minor terminology changes, such as replacing "substantial use" with "regular use." AC 150/5000-17, paragraph 3.2.1 says: "Evaluate each runway separately at an airport. Choose the single aircraft, or grouping of aircraft with similar operational requirements, that have the longest runway length requirement that makes regular use of the runway. In some cases, the Critical Aircraft for runway length may be different from the Critical Aircraft that establishes the most demanding RDC for the runway." Again, using the guidance contained in this AC, the critical aircraft for determining the runway length requirement is the family grouping of small aircraft previously highlighted in Table 1-1, yielding 3,400' from Figure 2-1 above. Chapter 2 of this AC states that existing critical aircraft determinations can be made through aircraft operator letters that document existing levels of use by aircraft type. This data is provided later in the report.

The FAA terminal area forecast (TAF) was the first data source used estimate critical aircraft operations. The TAF is populated from information gathered during the Airport Master Record (5010) Inspection, which is completed by the WisDOT BOA on behalf of the Airport. The TAF, issued January 2017, shows that the estimated actual and forecasted annual itinerant operations at KRRL from 2014 to 2045 is 9,710 operations. Of those operations, 700 are estimated to be "air taxi & commuter" and 10 are anticipated to be "military." It is reasonable and conservative to estimate that all operations other than "air taxi & commuter" and "military" at KRRL are small airplanes, which results in the estimated number of annual itinerant small airplane operations at KRRL as 9,000 operations. Per the airport layout plan (ALP) wind

coverage data, Runway 16/34 has 2.57% less wind coverage for small airplanes (10.5 knots) than the primary runway. Therefore, without consideration for instrument operations, it would be reasonable to estimate that Runway 16/34 is used 2.57% less of the time by small aircraft, which would result in its estimated usage 47.43% of the time by small aircraft. Due to the fact that the primary runway supports instrument landing operations, and the crosswind runway does not, it is reasonable and conservative to estimate that 10% of small aircraft use the primary runway for instrument landings regardless of wind coverage. Thus, it can reasonably and conservatively be estimated that the number of annual itinerant small airplane/critical design airplane operations on Runway 16/34 is 37.43% of the total small airplane operations, which equals 3,368 annual itinerant small aircraft operations. This greatly exceeds the substantial use threshold.

As another way to approximate critical aircraft operations, letters were solicited and received from *local* users, which document over 1,700 annual operations per year on Runway 16/34 (see **Attachment 1**). The data contained in the letters has been tabulated as shown in **Attachment 2**. This documents approximately 1,442 annual operations by *locally* owned critical aircraft on Runway 16/34. There are many more operations that occur on Runway 16/34 by non-local users which are not accounted for in the submitted letters. This greatly exceeds the substantial use threshold.

A new flight school started at KRRL in 2017, which has further increased the number of annual itinerant operations. It also means that there are more student pilots operating at the airport, whose skills are less than average. This further supports the need to increase the runway length for the purpose of increasing safety.

Determination:

The eligible and justified runway length for the crosswind runway, Runway 16/34, at Merrill Municipal Airport is 3,400'. The crosswind runway with a length of 3,400' is eligible due to lack of wind coverage on the primary runway and the length was determined using AC 150/5325-4B. The crosswind runway with a length of 3,400' is justified because it meets the substantial/regular use threshold of at least 500 operations per year.

CITY OF MERRILL

Merrill Municipal Airport

Airport Commission

1004 E. First St., Merrill, Wisconsin • 54452

Phone (715) 539-0782 • FAX (715) 539-2668

MERRILL

WISCONSIN

City of Parks

Merrill Municipal Airport
2241 Airport Road
Merrill Wisconsin 54452

March 8, 2018

Gary Wilson
Program Manager – Airport Planner
2300 E. Devon Ave
Des Plains IL. 60018

Mr. Wilson,

I will address your response to our request to extend our crosswind runway, 16/34, at Merrill Municipal Airport (KRRL) on several different levels. First as a pilot of twenty-two years flying aerobatic capable, and high-performance category general aviation aircraft. Second as the Chairman of the Merrill Municipal Airport Commission for the past fifteen years, and third as a frequent observer of activity at Merrill Municipal Airport. I can attest as a pilot, a user, and a frequent observer of Merrill Airport that the conclusions drawn by the FAA Great Lakes Region of our request to extend 16/34 to 3,400 feet as part of a rebuild of that runway are incorrect. The majority of operations at this airport are by light general aviation aircraft. Light aircraft pilots are taught to operate on the runway which the wind favors, because

crosswind adds to the risk of an accident. As you know take-off and landing operations account for a large percentage of all general aviation accidents.

Hard data shows that the wind favors the crosswind runway 47% of the time at Merrill. Thus, that would indicate a relatively high usage of 16/34 by VFR light aircraft. The fact that the primary runway has coverage for the maximum crosswind component 91% of the time does not, and should not, suggest that this is its actual usage. Again, it is less safe for a light airplane to make use of a runway while using the maximum crosswind component capability of that aircraft than to use a runway aligned with the wind.

As a pilot of a high performance/complex aircraft I always consider the runway with the most favorable cross wind component when making my final decision on which runway to take off or land on. A two or three knot difference in component will affect my decision.

As the Chair of the commission I reject your notion that there are less than five hundred operations per year on 16/34 and I have attached here letters from some users of the Merrill Airport. This data is taken primarily from their log books. The provided letters document that just in these responses there are over 1,600 operations per year on 16/34. Please note that these letters do not include all pilots that use 16/34 and certainly do not include any number of transient aircraft.

I also would like to note that in phone conversations I was told that FAA's data indicated that there were only sixteen aircraft based at Merrill. I pointed out that there were over thirty aircraft based at Merrill and that had been the case for decades. I was told that the number of aircraft considered for our project request would stay at sixteen because that was the number in the FAA data base. Merrill has always cooperated with FAA surveys as to aircraft based at the airport and had even provided N numbers for those

aircraft.

As a frequent observer at the Merrill Municipal Airport in my role as Chair of the Commission I can attest to hundreds more operations on 16/34 per year from local and transient aircraft that I cannot offer you any proof of.

By not accepting the justification to extend the crosswind runway to 3,400', which was completed in accordance with published FAA guidance using FAA data, FAA is suggesting pilots at this airport should choose between two potentially unsafe situations:

1. Operate on the primary runway at their maximum crosswind component.
2. Operate on the crosswind runway which is less than the FAA recommended length for small aircraft.

The Merrill Airport Commission is disheartened by the FAA's unwillingness to participate in the increased safety of this facility that the extended runaway would provide. Isn't it FAA's goal to ensure the safety of our National Airspace System? Reconstruction and extension of this runway is absolutely justified and needed by the Airport as soon as possible.

This Airport is used frequently for both private and commercial operations, and a Merrill based flight school operation. It is also used by other area flight school operations for flight training, and IFR training.

I have also attached a simple spread sheet of Wisconsin airports. I became curious as to what had been built at other Wisconsin airports for crosswind or secondary runways. I included only airports that have two hard surface runways and did not have towers or commercial airline service. The spread sheet indicates that the average for the thirty-four airports that fit this criterion was 3,575 feet. Curiously this outcome closely matches FAA

engineering guidelines for airports similar to Merrill.

In conclusion we have proven that the aircraft total based at Merrill and the operations on the airport by far exceed your proposed guidelines to allow us to go forward with the runway 16/34 reconstruction and extension to 3,400 feet. We cannot stress enough our sense of urgency to keep this project progressing through completion to allow Merrill to be as safe as possible for the National Airspace System, and the general aviation component thereof.

Respectfully submitted

Gary L Schwartz Chairman
Merrill Airport Commission

BECHER HOPPE
330 N. 4th Street, Wausau, WI 54403-5417
715-845-8000 | becherhoppe.com

February 15, 2018

Subject: Merrill Municipal Airport – Runway 16/34 Extension

To Whom It May Concern,

I am writing to summarize my operations at Merrill Municipal Airport (KRRL), and provide my personal and professional opinion on the proposed 400' extension of Runway 16/34.

I am an instrument rated private pilot and professional civil engineer who works on airport improvement projects throughout Wisconsin. I currently own a Cessna 172 Skyhawk, and anticipate acquiring a larger, faster aircraft within the next year. I have flown 285 hours in the past 2 years.

I have reviewed my logbook entries dating back to 1/19/2016, and found that I've performed 90 operations at KRRL since then. During my flight training, I was taught to select the runway which the wind favors unless extenuating circumstances exist. The wind favors Runway 16/34 approximately 47% of the time per the current Airport Layout Plan. Therefore, my operations on Runway 16/34 are estimated at 42 operations over this 2-year period, or **approximately 21 operations per year on Runway 16/34.** I anticipate my usage of KRRL will remain constant, or increase, into the future.

The proposed extension of Runway 16/34 to 3,400' will be an important safety improvement for all aircraft which use the runway. Per the performance manual, my Skyhawk *can* take-off and land in less than 3,400'. However, that assumes ideal conditions, a new aircraft, and a perfect takeoff or landing operation. These conditions rarely occur, especially simultaneously. I have been forced to perform a go-around maneuver on Runway 16/34 within the past year. Go-arounds increase pilot workload, which increases risk for an incident. Had the runway extension been constructed, that go-around may have been prevented. I am aware of accidents that have occurred on this runway, which also may have been prevented had the runway been the correct length.

Per FAA AC 150/5325-4B, Runway Length Requirements for Airport Design, the critical aircraft for Runway 16/34 is a family grouping of small airplanes. Therefore, all aircraft which use Runway 16/34 are defined as the critical aircraft. The recommended runway length curves in Figure 2-1 in the AC were developed using performance manuals from airplanes in this family grouping and accounting for various factors of safety, as described in Section 206. Therefore, per FAA's guidance, Runway 16/34 needs to be 3,400' to provide the appropriate level of safety.

Thank you for your consideration.

Sincerely,

Karl Kemper

Karl R. Kemper, PE
Project Manager

To Whom It May Concern,

My name is Luke Lazare. I fly a 1960 Piper Tripacer PA-22 and a 1957 Piper SuperCub PA-18. I Received My Pilots license in 2016 and have both my planes hangered at KRRL. In 2016 I did 206 take offs and 206 landings at KRRL. I estimate that 103 take offs and 103 landings were done on 16/34. In 2017 I have 223 take offs and 223 landings at KRRL. I estimate that 100 take offs and 100 landings were done on 16/34. KRRL is a great airport and an excellent facility that contributes to the City of Merrill. I look forward to the continuing upkeep and improvement of the facilities and runways in hopes that my kids will have a great place to fly when they get old enough.

Thanks for your time and consideration

Luke Lazare

To Whom It May Concern:

January 22, 2018

Please consider that Wausau Flying Service does an extensive amount of training using the Merrill Airport. Runway 16/34 is used on a regular basis by our student pilots and CFIs. I would estimate that we use 16/34 for an average of 5-10 operations weekly for a total of 500 operations annually.

jpc

"Keep your head on a swivel!"

John P. Chmiel,"Practicing the Art of Flight"
Wausau Flying Service, Inc.
Wausau Downtown Airport
(715) 845-3400
taildraggerflyer@yahoo.com

January 22, 2018

To Whom It May Concern:

RE: Merrill Municipal Airport runway 16-34

extension and resurface.

I am presently providing flight instruction at the Merrill airport (KRRL) for Park City Flight Training (PCFT). Although runway 7-25 is the primary runway used, winds dictate the active on any given day. We are currently averaging 70 operations a month with approximately 23 on runway 16-34.

With the current runway 16-34 length of less than 3,000 feet, primary training can be somewhat restricted for touch and go's and cross wind training. With future plans to offer multi engine training the extension of runway 16-34 will facilitate and enhance safety of flight while instructing.

I feel strongly that increasing the length of runway 16-34 would pay operational dividends in the future.

Sincerely,

Richard J. Lussow

ATP 1635019 CFI ASERH CFII A&H

JAN 10 2018

MY NAME IS CHARLES ERCEGOVAC. I OWN AN AERONCA CHIEF, N36960. MY AIRCRAFT IS BASED AT THE MERRILL AIRPORT ABOUT 6 MONTHS OF THE YEAR, AND AT A GRASS FIELD 7 MILES NORTH-EAST THE REST OF THE YEAR.

AFTER A LOOK AT MY LOGBOOK, I CAN SAY I HAVE MADE AT THE VERY LEAST, 40 TAKE-OFFS + 40 LANDINGS ON RUNWAY 16/34.

TO LENGTHEN THE RUNWAY WOULD CERTIANLY UP THE SAFTY FACTOR.

I CAN BE CONTACTED MOST OF THE TIME AT 715-536-8956 IF THERE ARE ANY QUESTIONS.

THANK-YOU

Charles Ercegovac

CHARLES ERCEGOVAC
1005 E 4TH ST
MERRILL WI

01/09/2018

To: FAA Chicago Region

Hello my name is Steven A Krueger and I am a flight instructor at the Merrill Municipal Airport in Merrill Wisconsin.

It is with great safety that I suggest runway 16/34 at KRRL be extended to accommodate business, pleasure, and the growing fleet of newer larger aircraft.

My current operations on runway 16/34 are 150 operations annually.

The concern of this runway length at 2997 is not adequate for the modern day municipal airport.

Please consider the lengthening runway 16/34 to provide additional safety to aviation at the Merrill Municipal Airport.

Sincerely,

Steve Krueger

Steve Krueger

N2543 State Highway 107

Merrill WI 54452

CFI 3110670

FAA and Wisconsin BOA,

I am writing in regard to the runway expansion at Merrill Municipal Airport (RRL). My family has been flying in and out of RRL for the past 25 years. For 13 years we rented a Cessna 172 to fly, but for the last 12 years we are flying a Lancair 320.

One of the things that is a main concern is runway length on 16/34. Even with a C172 this runway is too short if an aborted takeoff is needed at rotation speed. With my current aircraft, a Lancair 320 there is no way to stop before going off the end of the runway, if an abort is needed. Take off roll is approximately 1200 to 1500 feet depending on air temperature, wind speed and aircraft load. This aircraft has a Lycoming O-320 with a -fixed pitch propeller. Crosswind component is 10 knots with this pilot. I always try to land into the wind due to limited aileron control when below 70 knots to counter act drift from crosswinds. I have landed with winds 15 to 18 knots gusting to 25 knots, but always straight into the wind, or 20 degrees off the nose.

Stall speed on the aircraft is approximately 63 knots, approach on final over numbers is 80 knots indicated. Landing roll will vary on wind speed and final touch down speed which is 65 to 68 knots. The roll out distance is due to differential braking and a castering nose wheel maybe 1500 to 1800 feet. Touch down is usually 1000 feet down runway due to flare with this aircraft.

As you can see I am using 2500 to 2800 feet of a runway which is 2997 long. This leaves very little safety room for wet or snowy runway conditions. I fly about 45 hours per year. Looking in my logbook from October 2017 to December 2017 I have 10 landings at RRL. Half of these landings were on 16/34 runway due to wind conditions.

Thank you for taking the time to read this. I would like to conclude I always chose my airports with a minimum of 3500 feet runways for safety. Please consider extending this runway for the safety of the pilots using RRL. With the student training currently at RRL we need this extra length due to lack of experience and slow reaction time if an event happens with these students.

Joseph Malsack Private Pilot

606 E 6th St.

Merrill, WI 54452

715-536-5266

1-18-2018

To Whom it may concern,

I am submitting this letter to define my usage of the runway system at Merrill municipal airport, KRRL.

I currently own and operate an Experimental aircraft that I keep in a hangar, which I also own, on the field. My aircraft is a Kitfox Model IV, N826DM. This is a short coupled, tail dragger style aircraft of very light weight. This type of aircraft is very dependent on wind direction and must be cautiously flown if the wind is not directly down the runway. With this in mind I often use the cross wind runway at KRRL.

I operate my airplane on an average of 125 hours per year. Reviewing my log book, I average 4.5 operations from the field per hour of airplane run time. This equates to approximately 563 operations per year. I would estimate that I operate off the cross wind runway, 16/34, 30% of this time. Simple math shows, on average, I conduct 169 operations from 16/34 per year.

Although my airplane operates off very short runway length, I am not the only pilot conducting operations from this runway. On busy days it is not uncommon for there to be 3-4 planes waiting to back taxi on the crosswind runway due to its short length and lack of a parallel taxiway. I have witnessed several occasions where pilots have diverted away from KRRL in order to avoid this congestion or to find runways of longer length to operate from.

I am only one of approximately 33 aircraft based at KRRL. We are a growing concern here in northern Wisconsin and we are attempting to further the financial benefit of this beautiful airport to our community. This crosswind runway expansion is critical now and to the future of our community.

Thank you for your attention to this matter.

Sincerely,

Lawrence V. Wenning, 3127396
Pilot and Aircraft, hangar, business owner

Use of Runway 16/34 by RV9A N63MS

Year	Operations on 16/34
2010	39
2011	30
2012	47
2013	33
2014	19
2015	21
2016	24
2017	21
	234

From Logbook enteries

N63MS 2006 RV-9A

Signed Burton J Schnur III

Dated January 8, 2018

TO WHOM IT MAY CONCERN:
01/03/2018

Date: 1/3/2018

RE: Proposed Lengthening of RWY 16/34 at KRRL (Merrill Municipal Airport, Merrill, Wisconsin)

BACKGROUND: I am a Private Pilot with an Instrument Rating, and Multi Engine Rating. I've flown and based aircraft consistently from KRRL for over 52 years, approximately 15 different planes over those years. I've flown over 6000 hours from KRRL. I am also the recipient of a Wright Brothers Master Pilot Award. I am an active 73 year old Private Pilot.

My wife, Beverly, is also a private pilot and has flown several of our aircraft out of KRRL for over 40 years. My wife is also an active 73 year old Private Pilot.

We are both still very active pilots operating three aircraft based at KRRL.

We own and currently operate the following Aircraft based at KRRL.

(1) N3561W 1966 Piper PA-32-260 (Cherokee Six)
(2) N6754E 1959 Cessna 175A with Avcon Lycoming 180 HP/CS Prop Conversion
(3) N4942P 1963 Piper PA-23-235/250 Twin Engine Piper Apache in early Piper Aztec Configuration.

My wife presently flies the Cessna 175A and I fly all three of our aircraft regularly.

At this stage of our lives we are flying approximately 125 to 150 hours a year out of KRRL using our three aircraft.

WIND INFLUENCING CHOICE OF RWYS AT KRRL:

When operating the CHEROKEE SIX and the CESSNA 175A we will always choose to take off and land INTO THE PREVAILING WIND, and choose the Runway that is most aligned with the wind.

When I operate our heavier (4800 pound gross) Piper Apache 235/250 I will choose the longer RWY 7/25 until the cross wind exceeds 6 knots. After that I will choose the most favorable Rwy depending upon the direction of the wind, especially in a crosswind, or a crosswind that is shifting back and forth between 30 degrees and 70 to 90 degrees, or whenever there is a "GUST FACTOR" of more the 5 knots over the base level of the wind., or shifting crosswind or gusting crosswind.

We frequently find ourselves utilizing RWYs 16/34 at KRRL.

All of our operations are under VFR CONDITIONS presently.

NUMBER OF ANNUAL OPERATIONS TO or FROM RWY 16/34 at KRRL BY OUR THREE PLANES:

Our best estimates from looking over our log books for "annual operations from or to RWY 16/34 at KRRL " are as follows:

1963 APACHE 235/250	100 - 125 operations annually averaged
1959 Cessna 175A	40 - 50 operations annually averaged
1966 Cherokee Six	30 -40 operations annually averaged

SAFETY of OPERATIONS when OPERATING from the Present RWY 16/34 at KRRL:

Take off and Landing distances are adequate for our Cessna 175A and Cherokee Six. However, in the event of an engine failure upon departure to the south (southeast), there isn't a practical "stopping distance" or suitable landing area once past the present Rwy environment. Residential Housing begins almost immediately and then the downtown area of the City is under the departure flight path.

To the north (northwest) when departing from RWY 34 and when landing on RWY 34, presently there is not an adequately required "safety overrun" area past the departure end of RWY 34. About 100 to 150 feel past the departure end of RWY 34 is a "BOG" in the departure overrun area. This area will "snag" an aircraft traveling into it . In the past a smaller high wing Luscombe was destroyed when it overran RWY 34 and traveled into this bog area. The aircraft became ensnarled and flipped over onto it's back. Injuries were minor, but the Aircraft was destroyed.

This "BOG" area should be removed in any case to provide a safe, and legally effecctive overrun area just past the deaprture end of RWY 34.

When I operate our Twin Engine Piper Apache 235/250 from either RWY 16 or RWY 34 I have an adequate length for TAKE OFF or LANDING provided both engines are operating properly and I do not LOSE an ENGINE. Upon landing on the presently length 2997' of RWYs 16/34 I do have to "give up" BLUE LINE Airspeed at some point on approach and am committed to landing should I lose an engine in the Approach. The RWY is too short to keep up BLUE LINE SPEED and land and stop safely. Upon departure from RWYs 16/34 BLUE LINE Airspeed plus 10 mph or 20 mph is not obtained until I am well past the point of stopping safely on the existing 16/34 RWYs.

In our operations of the Twin Engine Piper Apache 235/250, we are most comfortable with RWYs that are 3300 to 3600 in lengh. The safety margins are greatly increased for our Twin Engine operations when utilizing RWY's with these lengths.

Even though we are operating a heavier aircraft with the Twin Piper Apache 235/250 (4800 pounds gross), we will still choose to land INTO THE WIND as I indicated above.

Airplanes Take off and Land into the wind whenever possible and/or practical. The risk of a RWY Excursion or RWY LOC (loss of control) increases dramatically when this rule is not followed. The odds go up proportionally of a RWY Excursion or RWY LOC with increased wind, shifting winds, and/or gusting and/or gusting shifting crosswinds that are not aligned with the landing RWY.

It would make our Twin Engine operations safer and increase our margins of safety if RWY 16/34 were extended approximately to a useable length of 3400 feet with adequate Safety Over Runs on the "north" end as well as on the "south end".

If you look at the POH (Pilots Owners Handbook) for our upgraded 1963 Piper PA-23 Apache 235/250, you will see numbers that indicate reasonable TO and LANDING distances and Accelerate Stop Distances. POH's are always a bit optimistic about these figures to make the Aircraft look and appear favorable to potential purchasers. However, the truth of these numbers, although accurate and achieveable, is that they were determined by a very sharp "test pilot", using brand new airplanes with new engines. Even good pilots are taught and frequently add about 50% to those POH numbers to come up with truly practical useful safe operating numbers. Please bear that in mind. And we haven't even begun to discuss wet, snow covered, or icy RWY conditions in this discussion.

I am a 73 year old pilot, flying an older 1963 Aircraft that is over 55 years old with midtime to higher time engines. I always tend to increase those early and rather primitive POH Numbers by a 50% margin to account for my age, and the age of my aircraft and engines. Again, I am much more comfortable with a RWY of 3330 to 3600 feet when I'm flying our 1963 Piper PA-23 Apache 235/250.

NUMBER OF AIRCRAFT BASED AT KRRL:

We are not approaching "40" aircraft based at KRRL. About 10 to 12 are presently in or under construction or repair. About 30 are active and flying. Our Airport Commission, of which I am a longterm senior member, instructs our Airport Manager to accurately report our "number of Aircraft" annually to the FAA. However, presently it appears that the FAA does not keep this reporting up to date, thereby indicating considerably fewer aircraft based at KRRL than are actually based at KRRL. We are growing both in based aircraft and in operations presently and for the past 3 years. Our New Terminal Bldg and our New Fuel Farm, Aircraft Powder Coating Shop, Aircraft Maintenance Shop, and New Flight School are rapidly adding to our number of operations at KRRL. We now have 28 new Hangar Sites available for Private or Corporate Hangar construction and interest has been expressed and voiced for future Hangar Construction. All of our original sites for Private of Corporate Hangars are now filled on the older original area of KRRL.

The Airport Commission has been slowly and continuously improving the Airport dramatically over the past 15 years, making it much more attractive to corporate aircraft

and transient aircraft operations. Those transient and corporate operations have increased accordingly. Our Fuel Sales for 100 LL Avgas bear this out. We have increased sales of 100LL Avgas almost four fold in the past three years. These sales reflect the continually increasing number of Airport Operations at KRRL, many of which utilize RWY 16/34 depending upon wind conditions.

Many of our Airport Operations are presently also happening due to the increased number of Light Sport type Aircraft, either factory built of homebuilt, based at and operating from KRRL. These aircraft have very light wing loadings and pay close attention to wind conditions for their departure and arrival operations. As much as 3 knots of wind is a strong consideration for the choice of RWY to these aircraft with light wing loading. they will land and depart into the wind.

We also now have an active Flight School at KRRL, and training and flight operations for Private Licenses, Instrument Ratings, and Light Sport Licenses have increased.

A typical Student Private Pilot candidate, operating under supervised solo and/or receiving instruction for a Private License, when using the present RWY 16/34 environment, often has to land, stop and taxi back inefficiently after each landing rather than conduct "Touch and Go" operations on the 2997' Rwy. This is a waste of time, money and fuel. A longer RWY would help alleviate this situation.

It's my present understanding that FAA Considerations for RWY lengthening are now often primarily based on IFR Operations, but we at KRRL are primarily a VFR operations Airport, as are most of the Airports in the State of Wisconsin Airport Program....Many of these Airports see a lot more VFR operations than IFR Operations. I would suggest and respectfully request that both VFR and IFR Operations be used to determine "Need" for RWY Lengthening.

VFR Operations built the GA System in our country, especially following WWII as many of our present Airports were built and, over time, developed. Although IFR operations are now on the increase, it's still the basic VFR flying that sustains GA in the United States. If you doubt that, just go visit OSHKOSH during an annual week long AIRVENTURE EVENT and see the busiest Airport in the World handling almost entirely VFR operations.

In conclusion, with all of the above in mind, I respectfully support and request the "EXTENSION of RWY 16/34" at KRRL. It would make our VFR Operations safer, especially so for those Operations of our Twin Engine Piper PA-23 Apache 235/250.

Sincerely,

Gary E. Schulz (and Beverly A. Schulz)

Merrill Municipal Airport – Runway Length Justification Report
Summary of Operations from Local User Letters

Pilot	Aircraft	Approach Speed (1.3 x Stall Speed)	Runway Design Code	Crosswind Runway Takeoff	Crosswind Runway Landing	
Luke Lazare	1960 Piper Tripacer PA-22	54.6	A-I	103	103	
Karl Kemper	Cessna 172 Skyhawk N7543G	61.1	A-I	10.5	10.5	
John Chmiel	Cessna 150 N11454, Cessna 172 N441DP, Cessna 172 N172TK	54.6, 61.1, 61.1	A-I	250	250	
Richard Lussow	Beech Sundowner	66.3	A-I	138	138	
Charles Ercegovac	Aeronca Chief N36960	57.2	A-I	40	40	
Steve Krueger	Aeronca Champ N83355	49.4	A-I	75	75	
Joseph Malsack	Lancair 320	81.9	A-I	5x12=60	5x12=60	
Lawrence Wenning	Kitfox Model IV, N826DM	48.1	A-I	84.5	84.5	
Burton Schwin	RV9A, N63MS	57.2	A-I	12	12	
Gary Schulz	1966 Piper PA-32-260, Cherokee Six	71.5	A-I	20	20	
Gary Schulz	1959 Cessna 175A	59.8	A-I	25	25	
Gary Schulz	1963 Piper PA-23-235/250, Piper Apache	70.2	A-I	62.5	62.5	
			Total	880.5	880.5	1761
			Total with Approach Speed >=50 kts (critical aircraft)	721	721	1442

APPENDIX D

FORECAST ADDENDUM

Addendum to Chapter 2 Forecasts.

Merrill Municipal Airport (KRRL)

It is clear that airport forecasts are quite complicated and use very sophisticated, required tools, and methodologies to arrive at decisions on appropriate forecasting for a given airport's future structural attributes.

Merrill was established in the early 1930s when two local gentlemen bought some land and called it an airport. The airport grew slowly and although FAA indicated that there were only 13 registered aircraft on the field in 2002, there were actually 25 aircraft on the field. Merrill Municipal has grown now to forty-eight registered aircraft based at Merrill, and currently with twenty-one aircraft owners on a waiting list for hangar space to base their aircraft at Merrill. Merrill has maintained a "hangar waiting list" for over twenty years and that list has never had fewer than sixteen aircraft owners wanting, looking for hangar space.

Forecasting operations are required to rely on electronic means such as Flight Plans filed, ADSB out data, and Flight Aware. ADSB out using Mode C is remarkably unreliable at Merrill. We are able to prove thru Flight Aware data that aircraft landing at Merrill are often shown by ADSB to have landed at other airports as far away as fifty air miles and more. Published readily available information indicates that only fifty to sixty percent of GA aircraft are currently equipped with ADSB out. It is not known how many of this sixty percent group of GA Aircraft are using the remarkably unreliable Mode C for their position broadcast during the approach/landing phase of a flight. This problem with Mode C negatively impacts Merrill's operations count, and therefore forecasting.

Two things that the Merrill Forecast data does not take into consideration is that Merrill is only twenty minutes from Wausau by car, and maybe ten by airplane. There are sixty plus aircraft at Wausau. A quite busy flight training company at Wausau often uses Merrill for pilot training activities

One crucial point to keep in mind when Forecasting is that Merrill has had continuous full-time maintenance by appropriately credentialed individuals based at the airport since the later part of the 1940s. We still, have full time

maintenance available five days a week or more, by four FBO employees. Merrill's FBO is also involved in a high school training program for future maintenance staff. There are currently two individuals in our program.

It is widely accepted that aircraft maintenance is getting harder and harder to acquire for GA aircraft. Merrill is the only airport in the wider central Wisconsin area that has full time maintenance offered to the GA fleet. Merrill is currently building a new FBO maintenance hangar which will triple the working space from our current hanger to accommodate the demand in an area approximately eighty miles in any direction from Merrill. This includes all 243 regional aircraft as pointed out in the Forecast within 30 nautical miles of Merrill. As a further demonstration of the scarcity of aircraft maintenance in the region Merrill's FBO is contracted with the airlines operating in and out of Central Wisconsin Airport (CWA), a towered commercial transportation airport to provide emergency type service to them.

Gary Schwartz, Chair

Merrill Municipal Airport Commission

APPENDIX E

FORECAST APPROVAL

Wisconsin Department of Transportation
Office of the Secretary
4822 Madison Yards Way, S903
Madison, WI 53705

Governor Tony Evers
Secretary Kristina Boardman
wisconsindot.gov
Telephone: (608) 266-1114
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October 1, 2025

Gary Schwartz, Airport Commission Chair
Merrill Municipal Airport (RRL)
N2241 Airport Rd
Merrill, WI 54452

Merrill Municipal Airport (RRL)
Merrill, WI
Approval of Forecast

Dear Mr. Schwartz:

The Wisconsin Department of Transportation Bureau of Aeronautics (BOA) under the State Block Grant Program (SBGP) per 49 USC § 47128, is responsible for reviewing aviation demand forecasts following the Federal Aviation Administration's (FAA) Forecast Review and Approval Instructions (August 2024). The Merrill Municipal Airport (RRL), included in this program, submitted its aviation demand Forecast Chapter dated September 2025 and was reviewed by the BOA. As RRL is a non-towered airport and the sponsor has attested that the operations are less than 90,000 annually, a detailed forecast is not warranted.

The BOA approves the existing and 10-year outlook period (future) critical aircraft for the Primary Runway 7/25 as A-I. In consultation with the FAA Chicago Airport District Office (ADO), Runway 16/34 has been designated as a Legacy Crosswind. While regular use for Runway 16/34 is not currently documented, A/B-I can be used for planning purposes.

The approval of this forecast does not automatically constitute a commitment on the part of the United States to participate in any development recommended in the Master Plan or shown on the Airport Layout Plan (ALP). Justification for future projects will be made based on activity levels at the time the project is requested for development, in accordance with criteria in FAA Orders 5090.5 and 5100.38. Documentation of actual activity levels meeting planning activity levels will be necessary to justify Airport Improvement Program (AIP) funding for eligible projects. Further, the forecast may be subject to additional analyses if there's a change in the fundamental rationale or critical aircraft.

Sincerely,

Brenda Hanson

Thomas S. "Max" Platts

Brenda Hanson
Aviation Planner, BOA

Thomas Platts
Technical Services Section Chief, BOA

cc: Thomas Platts, Technical Services Section Chief, BOA; Evan Krueger, Airport Specialist, BOA; Malika Hainer, Community Planner, FAA; Chandra Burks, Coffman Associates, Inc.

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