



Spencer

Municipal Airport

Airport Master Plan



AIRPORT MASTER PLAN

For

**Spencer Municipal Airport
Spencer, Iowa**

Prepared for

The City of Spencer

By

Coffman Associates, Inc.

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CITY *of*
SPENCER

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Introduction and Executive Summary



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Introduction and Executive Summary

A master plan provides an evaluation of an airport's aviation demand and an overview of the systematic development that will best meet that demand. The master plan establishes development objectives and provides for a 20-year planning period that details the rationale for various study elements, including airfield configuration, facility development, on-airport land use recommendations, and support facilities. It also serves as a strategic tool for establishing airport improvement priorities and justifying the need for federal and state funding assistance.

The Federal Aviation Administration (FAA) recommends that airports update their master plans every seven to 10 years, or as necessary, to address local changes at the airport. The last master plan for Spencer Municipal Airport (SPW) was completed in 2008. The preparation of this master plan is necessary as a timely reassessment of the development direction of SPW to meet the needs of the local economy and an ever-changing air transportation industry.

The airport master plan has been initiated by the City of Spencer to evaluate the airport's capabilities and role, to forecast future aviation demand, and to plan for the development of new or expanded facilities that may be required to meet that demand. The goal of the master plan is to provide guidelines for the airport's overall maintenance, development, and operation in an environmentally and fiscally responsible manner while adhering to appropriate FAA standards.



An important outcome of the planning process is a recommended development concept that 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 which outlines specific uses for all areas of airport property, including strategies for revenue enhancement.

With a sound and realistic master plan in place, SPW can take steps to achieve the goals and strategies that have been set forth. Furthermore, the airport will continue to remain an important link to the regional and national air transportation systems, as well as maintain the public and private investments in its facilities.

STUDY OVERVIEW

The City of Spencer is responsible for funding capital improvements at the airport, as well as obtaining FAA and development grants. In addition, the city oversees facility enhancements and infrastructure development conducted by private entities at the airport. The master plan is intended to provide guidance for future development and justification for projects for which the airport may receive funding through an updated capital improvement program (CIP) to demonstrate the future investment required by the city, as well as the FAA.

The master plan will follow a systematic approach outlined by the FAA to identify existing and future airport needs in advance of the actual need for improvements. This is done to ensure the City of Spencer can coordinate environmental reviews, project approvals, design, financing, and construction to minimize the negative effects of maintaining and operating inadequate or insufficient facilities. The recommended development concept will outline the proposed use for all areas of the airport.

The City of Spencer has contracted with the airport planning firm of Coffman Associates, Inc. to undertake the Airport Master Plan. The study is prepared in accordance with FAA requirements, including Advisory Circular (AC) 150/5070-6B, *Airport Master Plans* and AC 150/5300-13A, *Airport Design*.

MASTER PLAN GOALS AND OBJECTIVES

The primary objective of the airport master plan is to develop and maintain a financially feasible, long-term development program which will satisfy aviation demand of the region, while also being compatible with area development, other transportation modes, and the environment. Accomplishing this objective requires an evaluation of the existing airport to decide what actions should be taken to maintain a safe, adequate, and reliable airport facility.

This master plan is intended to provide guidance through an updated capital improvement and financial program to demonstrate the future investments required by the City of Spencer. The new planning study also provides justification for new priorities. The plan will be closely coordinated with other planning studies in the area and with aviation plans developed by the FAA. This study will also utilize historical planning efforts that have been undertaken at SPW.

While the master plan must be developed per FAA requirements, it can also be prepared in a manner which makes it useful in strategic planning for the airport. The FAA requires specific elements within a master plan. These elements, to be detailed in the following section, are guidelines which allow for a systematic and technical approach to reach the final recommended plan.

Specific goals and objectives to be considered in the master plan include, but are not limited to, the following:

- Research factors likely to affect all air transportation demand segments in the Spencer/Iowa Great Lakes region over the next 20 years, including the potential for airline passengers as well as general aviation and military demand.
- Determine projected needs of airport users for the next 20 years, taking into consideration recent revisions to FAA design standards and the airport's conformance requirements, global positioning system (GPS) approaches or other new technology, and the impact of commercial and general aviation fleet transitions on design standards and ongoing efforts to attract commercial service to the region.
- Recommend improvements that will enhance the terminal area's ability to satisfy future aviation needs taking into consideration general aviation and, potentially, airline needs.
- Analyze the existing airfield system in order to determine the existing and ultimate runway requirements to satisfy the airport's critical aircraft. This analysis will evaluate the need for each runway, including future improvements necessary to aid in supporting forecast demand. Also, the analysis will consider the potential for closure and removal of any airfield pavement(s) not deemed necessary and/or justified for future capital expenditures.
- Produce accurate base maps of existing and proposed facilities and updated Airport Layout Plan (ALP) drawings consistent with the FAA's Standard Operating Procedure (SOP) No. 2.0. While this project will not conclude with an "Electronic ALP" or "eALP," the digital Geographic Information System (GIS) data will be submitted into FAA's Airport Data and Information Portal (ADIP) system as an "airspace evaluation." This task will conform to the Survey Requirements Matrix contained in FAA AC 150/5300-18B. The data will be submitted to the FAA AGIS system per the Airport Layout Plan (ALP) column of Table 2-1.
- Review future use and zoning of airport property and approaches to each runway for future protection. This will involve the development of noise exposure contours, application of current land use compatibility guidelines, review of local land use controls and plans, and analysis of land use management techniques.
- Examine the physical condition of existing properties, evolving changes in security measures and threat mitigation, and the feasibility of extending utilities, drainage improvements, and other related services into new development areas on the airport property.

- Establish a schedule of development priorities and a program for improvements proposed in the master plan, consistent with the FAA's capital improvement program planning.
- Consider sustainability efforts, specifically waste and recycling improvements as part of FAA's updated standards.

MASTER PLAN TASKS

The master plan for SPW specifically addresses the following tasks:

- Assist the City of Spencer, through a Technical Advisory Committee (TAC) and a series of Public Information Workshops, in determining a vision for the airport.
- Establish goals and priorities for the airport to meet that vision, based on the realistic evaluation of the facility in terms of configuration, condition, amenities, location, competition, and forecasted aviation demand.
- Conduct a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis, identifying strengths, weaknesses, realistic markets, goals, resources, and strategies to move forward. This analysis will factor the strengths and weaknesses of SPW to include physical and operational features.
- Identify airfield alternatives based on goals and opportunities, as well as FAA applicable design standards. The analysis will include an evaluation of the airfield geometry to address potential non-standard conditions.
- Provide a landside development plan that identifies areas for accommodating the forecasted growth of aviation and aviation-related businesses and, if appropriate, areas for non-aviation revenue-producing opportunities. Consideration will be given to the potential for new or expanded aviation facilities, including, but not limited to, terminal facilities, aircraft storage hangar capacity and apron capacity, and airport support facilities.
- Assess compatible land uses near the airport.

BASELINE ASSUMPTIONS

A study such as this typically requires some baseline assumptions that will be used throughout the analysis. The baseline assumptions for this study include:

- The airport will continue to operate as a publicly owned, regional general aviation airport through the 20-year planning period.

- SPW will continue to serve general aviation tenants and itinerant and/or local aircraft operations by air taxi, general aviation, and military operators.
- The general aviation industry will grow through the planning period as projected by the FAA. Specifics of projected growth in the national general aviation industry are contained in Chapter Two of the master plan.
- A federal airport improvement program will be in place through the planning period to assist in funding capital development needs.

MASTER PLAN ELEMENTS AND PROCESS

The airport master plan is being prepared in a fashion pursuant to the scope of services that has been coordinated with the City of Spencer. The study has nine specific elements that are intended to assist in the identification of future facility needs and which provide the supporting rationale for their implementation. **Exhibit iA** provides a graphical depiction of the elements and process involved with the study.

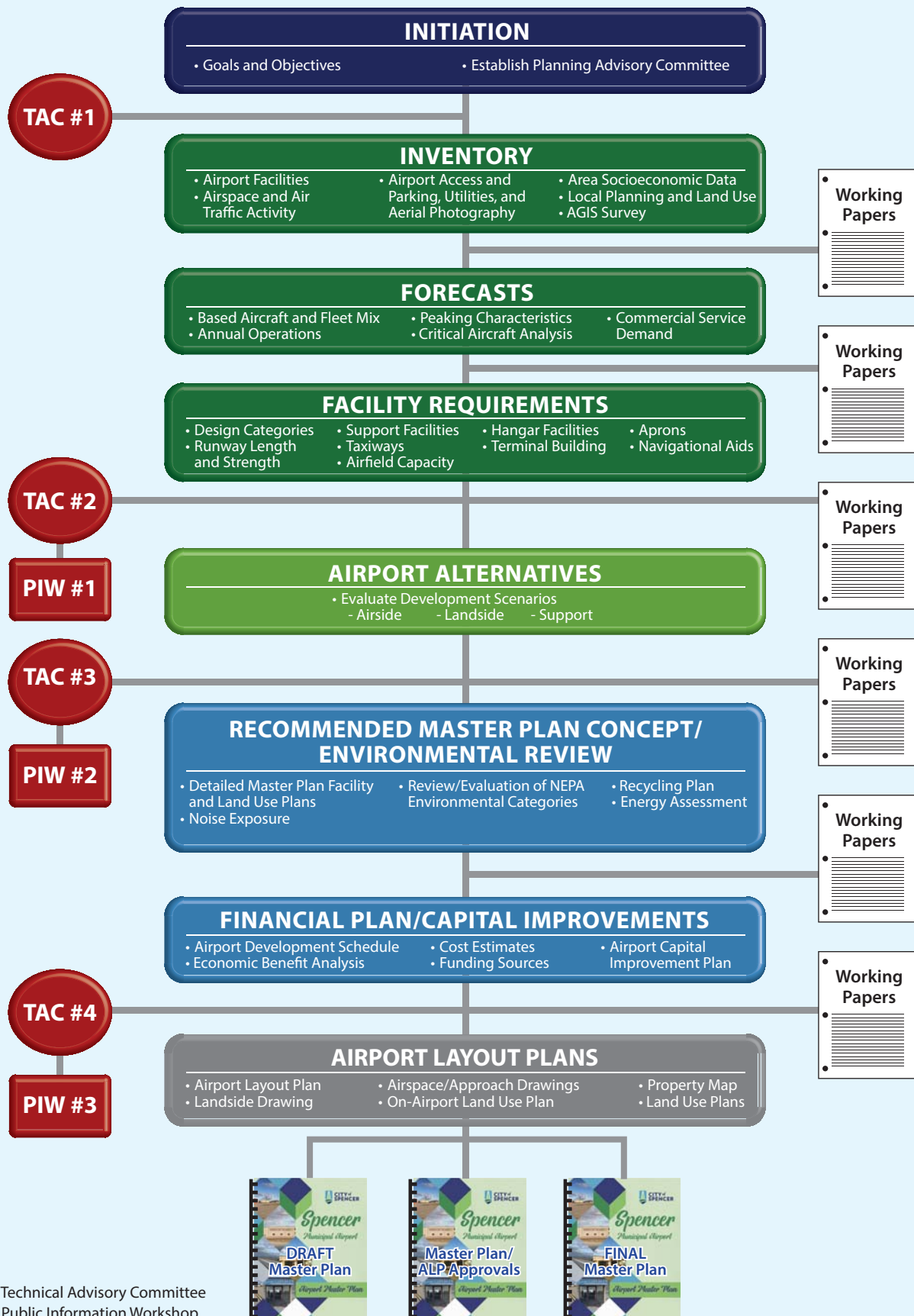
Element 1 – Study Initiation and Organization includes the development of the scope of services, schedule, and study website. A TAC is also formed, and study material will be assembled in a workbook format. General background information will be established that includes outlining the goals and objectives to be accomplished during the master plan.

Element 2 – Inventory of Existing Conditions is focused on collecting and assembling relevant data pertaining to the airport and the area it serves. Information is collected on existing airport facilities and operations. Local economic and demographic data is collected to define the local growth trends, and environmental information is gathered to identify potential environmental sensitivities that might affect future improvements. Planning studies which 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, as well as national air transportation trends to quantify the levels of aviation activity which can reasonably be expected to occur at SPW over a 20-year period. The results of this effort are used to determine the types and sizes of facilities which will be required to meet the projected aviation demand at the airport through the planning period.

Element 4 – Demand/Capacity and Facility Requirements converts aviation demand needs into types and volumes of actual physical facilities required to meet existing and forecast demands in aviation activity. The critical design aircraft and physical planning criteria based upon AC 150/5300-13A, *Airport Design*, is also established in preparation of a needs assessment for airside and landside facilities.

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 – Airport Plans/Land Use Compatibility provides both a graphic and narrative description of the recommended plan for the use, development, and operation of the airport. An environmental overview is provided to analyze potential environmental impacts of proposed airport development projects, and a waste audit and recycling plan is also conducted to identify opportunities for the airport to be more sustainable in its approach to waste management. The official ALP drawings that are produced based on the recommended development concept and used by the FAA in determining grant eligibility will also be included.

Element 7 – Financial Management and Development Program provides a proposed capital needs program which defines the schedules, costs, and funding sources for the recommended development projects.

Element 8 – Geographical Information System (GIS) Services includes several objectives to equip the airport with a digital model of the facility and its surrounding environment. These objectives include airspace analysis, a ground survey, and current orthophotography, which will provide the airport with a complete GIS dataset that is in conformance with current FAA standards.

Element 9 – Final Reports and Approval 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.

STUDY PARTICIPATION

The Airport Master Plan is of interest to many within the local community and region. This includes local citizens and businesses, community organizations, City of Spencer officials, airport users, airport tenants, and aviation organizations. As a component of the regional, state, and national aviation systems, the master plan is of importance to both state and federal agencies responsible for overseeing the air transportation system.

To assist in the development of the Airport Master Plan, the city has identified a group of stakeholders to act in an advisory role in the development of the master plan. The Technical Advisory Committee (TAC) is comprised of airport users and stakeholders with a vested interest in the future development of SPW as well as local governmental agencies. Members of the TAC will meet four times at designated points during the planning process to review study materials and provide comments to help ensure that a realistic and viable plan is developed.

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

A series of open-house Public Information Workshops are also conducted as part of the study coordination effort. These workshops are designed to allow any and all interested persons to become informed and provide input concerning the master plan process. Notices of meeting times and locations are advertised through local media outlets. Draft working papers and other information related to the master plan are available at: www.spencer.airportstudy.com.

SWOT ANALYSIS

A SWOT analysis is a strategic business planning technique used to identify **Strengths**, **Weaknesses**, **Opportunities**, and **Threats** 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 are positively and negatively impacting that action, objective, or element in each environment. For this study, the SWOT analysis factors are being applied to SPW within the confines of the master plan. As a result, it provides a continuous vision and direction for the development of the master plan.

SWOT DEFINITIONS

As previously discussed, this particular SWOT analysis groups information into two categories:

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

SWOT ANALYSIS EXERCISE

The SWOT analysis for SPW is based upon information gathered, including a kick-off TAC meeting that was conducted in November 2019. As previously discussed, the TAC is a diversified group of stakeholders, community leaders, and governmental agencies that represent several interests in the airport. A SWOT analysis was conducted with this group to identify key factors that might be addressed in the master plan. A summary of the results from the SWOT analysis exercise is shown in **Table iA** on the next page. These results were used to frame the subjective or judgmental processing of the data presented in the master plan.

**TABLE iA | SWOT Analysis
Spencer Municipal Airport**

Strengths	Weaknesses
• The airport is well-maintained, clean, and has a good overall aesthetic • Protected airspace and height restrictions • Well-positioned for economic growth due to proximity to large businesses and Lake Okoboji and associated tourism • Easy to fly into and out of • Pavement surfaces are in good condition • New LED lighting on airfield • Three businesses located on the airport bring in different types of activity • Efficient ground transportation around airport • Adequate parking lots for terminal/hangars • Great management • At 930 acres, there is a lot of room for growth • Very competitive compared to other airports in the region	• No lighting on east side hangars • Need for thicker concrete to attract bigger jets • Proximity of municipal wells • Inadequate radar coverage due to terrain
Opportunities	Threats
• New hangar space • Infrastructure • Pilot training • Community activities to bring people to the airport • Increased awareness of airport so public recognizes value • Integrated transportation segment • Commercial/fractional ownership • Aviation program at Iowa Lakes Community College – Estherville	• Weather (minimums) • Pilot shortage • Funding • Geography • Other regional airports investing in their facilities

SUMMARY AND RECOMMENDATIONS

Proper facility planning must consider the demand that may occur in the future. For SPW, this involved updating forecasts to identify potential future aviation demand. Because of the cyclical nature of the economy, as well as unpredictable events that can impact the aviation industry, such as COVID-19, it is virtually impossible to predict with certainty year-to-year fluctuations in activity when looking five, ten, and twenty years into the future.

Recognizing this reality, the master plan is keyed more to potential demand “horizon” levels than future dates in time. These planning horizons were established as levels of activity that will call for consideration of the implementation of the next step in the master plan program. By developing the airport to meet the aviation demand levels instead of specific points in time, the airport will serve as a safe and efficient aviation facility which will meet the operational demands of its users, while being developed in a cost-efficient manner. This program allows the City of Spencer to adjust specific development in response to unanticipated needs or demand. The forecast planning horizons are summarized in **Table iB**.

TABLE iB | Planning Horizon Activity Levels
Spencer Municipal Airport

	BASE YEAR	PLANNING HORIZONS		
	2020	Short Term	Intermediate Term	Long Term
Commercial Operations*				
Air Carrier	0	0	0	0
Other Air Taxi	2,400	3,000	3,000	3,600
<i>Total Commercial Operations</i>	<i>2,400</i>	<i>3,000</i>	<i>3,000</i>	<i>3,600</i>
General Aviation Operations				
Itinerant	9,862	10,100	10,400	11,100
Local	6,612	6,800	7,000	7,300
Total General Aviation Operations	16,475	16,900	17,400	18,400
Military Operations				
Itinerant	0	0	0	0
Local	0	0	0	0
<i>Total Military Operations</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>
Total Airport Operations	18,875	19,900	20,400	22,000
Based Aircraft	41	44	47	53

Note: Totals have been rounded

*Commercial operations have been projected in the event that demand for this service materializes at SPW. These projections are not included as part of the master plan forecasts to be approved by the FAA.

The Airport Layout Plan (ALP) drawing set has also been updated to act as a blueprint for everyday use by management, planners, programmers, and designers. The major development items over the planning horizons include the following:

Short Term

- Runway pavement repairs
- Terminal building improvements
- Property acquisition for increased control over runway safety areas

Intermediate Term

- Taxiway expansion/redesign to meet FAA standards
- Apron expansion to support construction of new hangars
- Airfield lighting system upgrades

Long Term

- Apron expansion to support construction of new hangars
- Extension of primary Runway 12-30
- Property acquisition to support runway extension and landside development
- Terminal building expansion for limited commercial service

The full implementation of the master plan would involve a financial commitment of approximately \$15.7 million, excluding upgrades to the airport to become Part 139 certified (explained in greater detail in Chapters 5 and 6). The majority of these project costs would be eligible for federal or state grant funding.

The master plan is evidence that the City of Spencer is committed to providing high quality aviation services to northwest Iowa and recognizes the importance of Spencer Municipal Airport to the community and region. By maintaining a sound, flexible master plan, the airport will continue to be a major economic asset to the area.

Chapter One

Inventory



**CITY of
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Inventory

The inventory chapter of existing conditions is the initial step in the preparation of the Spencer Municipal Airport (SPW) 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 detailed, which will provide further input into the study process.

Information provided in this chapter 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 include those listed below. Environmental resources are detailed at the end of this chapter.

- Spencer Municipal Airport Layout Plan, approved June 2008
- *Iowa Aviation System Plan 2010-2030*
- *2017 Spencer Comprehensive Land Use Plan*
- City of Spencer website (www.spenceriowacity.com)
- Clay County website

AIRPORT SETTING

LOCALE

SPW is located approximately four miles northwest of the City of Spencer in Clay County, Iowa, at the confluence of the Little Sioux and Ocheyedan Rivers. Clay County is in northwest Iowa, adjacent to Dickinson County to the north, in a region known as the Iowa Great Lakes. The lakes include West Okoboji, East Okoboji, and Spirit Lake, which are located roughly 20 miles north of the City of Spencer. During the summer months, the lakes are a popular vacation destination and draw a significant number of tourists. The City of Spencer is also home to the Clay County Fairgrounds, which attracts more than 300,000 visitors annually during the weeklong county fair.

Spencer can be accessed via Highway 71 from the north and south and Highway 18 from the east and west. From Highway 18, the airport can be accessed via M44 to the south, or from the east via West 18th Street/340th Street. **Exhibit 1A** depicts the regional setting.

LAND USE

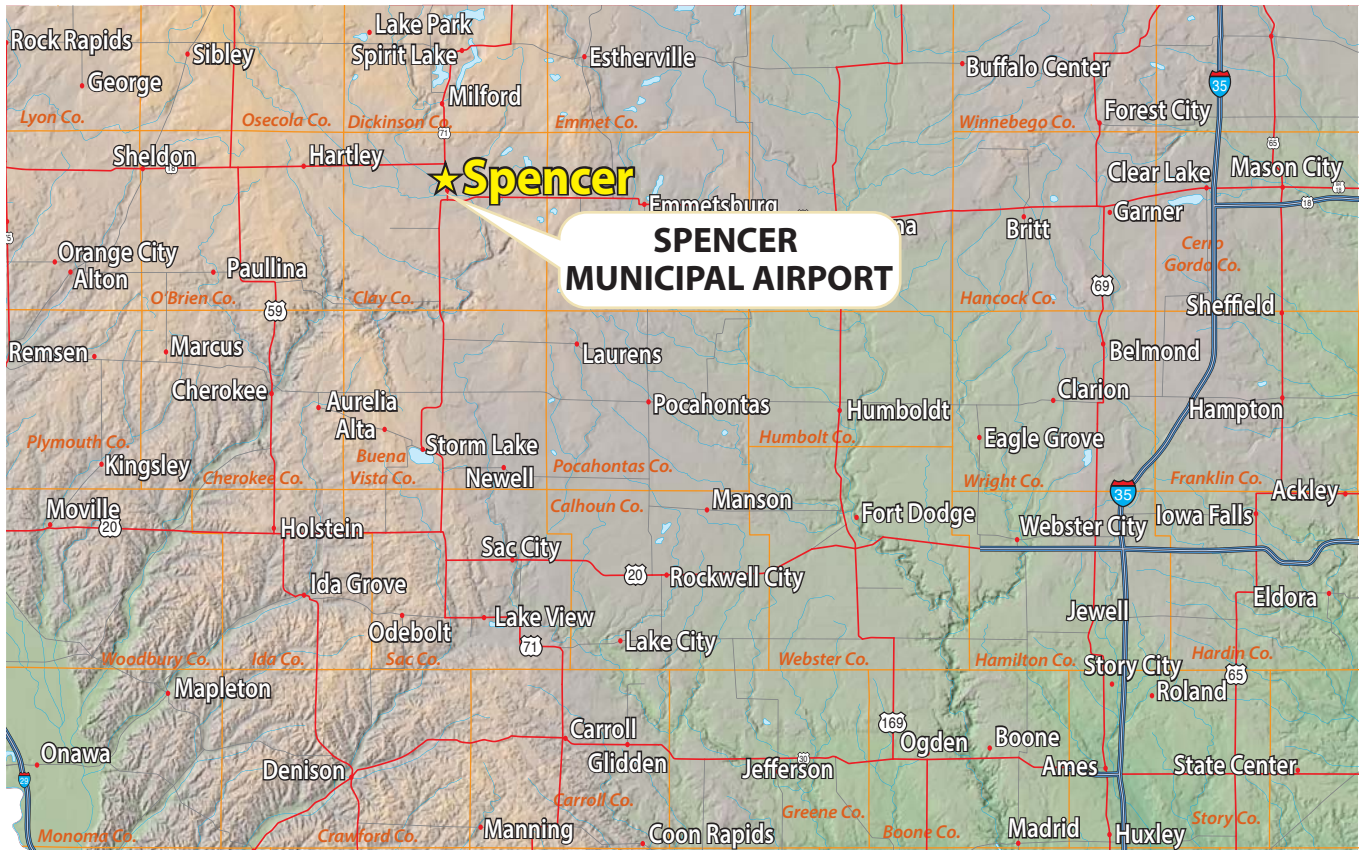
The airport is situated at an elevation of 1,339 feet above mean sea level (MSL) on approximately 930 acres. According to the *2017 Spencer Comprehensive Land Use Plan*, the airport is only partially contained within City of Spencer limits, with the remainder of the facility within unincorporated county land. However, the city does plan to expand its boundaries in the future to include all airport property.

Land uses surrounding the airport include industrial and agriculture, with small pockets of residential to the south. The airport itself is zoned for civic and public uses. On-airport land uses are dominated by the airport operations area (AOA), which consists of the runways, taxiways, and navigational aids. General aviation (GA) makes up the remaining developed areas consisting of the aprons, hangars, terminal building, and adjacent fixed base operator (FBO). The remainder of airport property is undeveloped. **Exhibit 1B** details land uses on and around the airport.

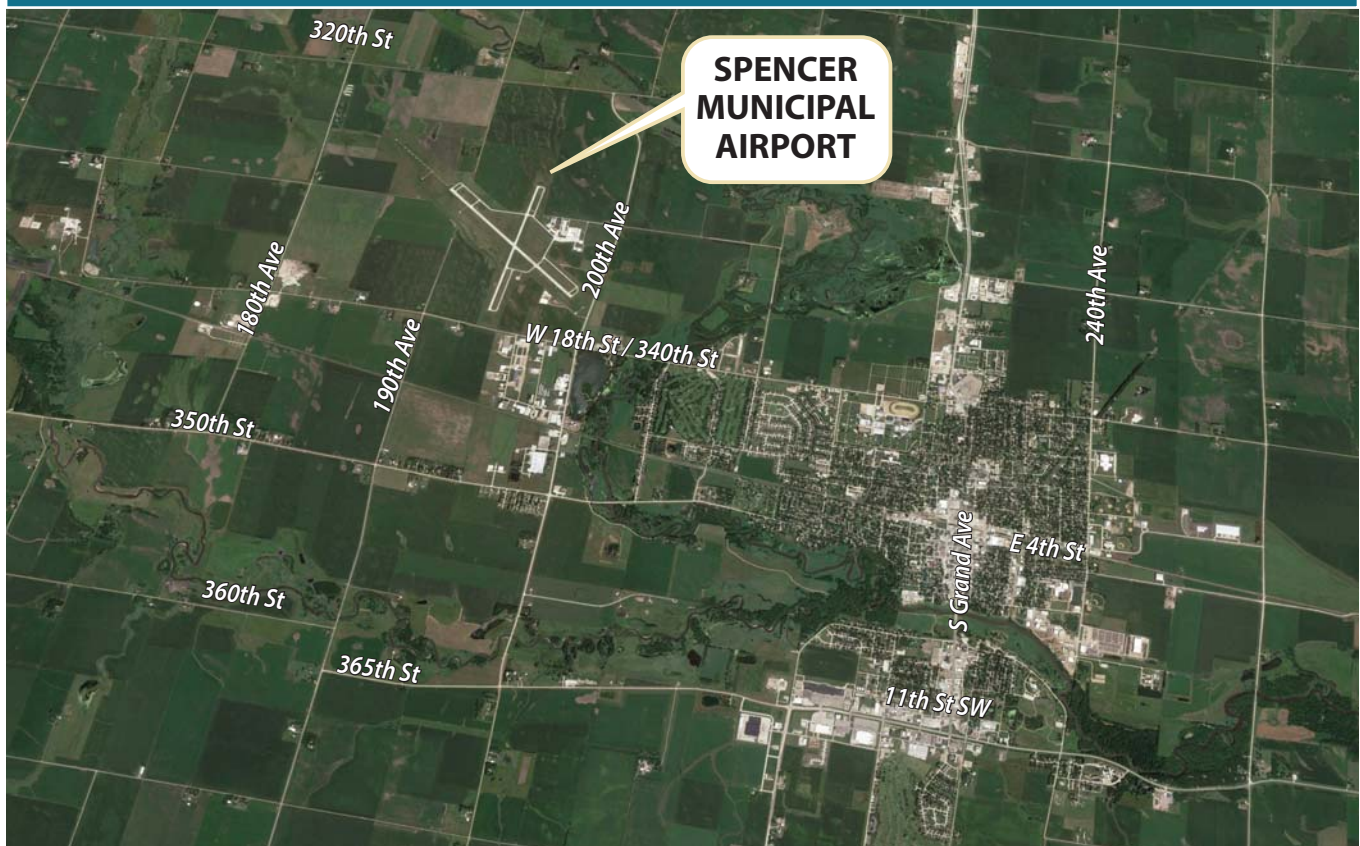
CLIMATE

Local weather conditions can significantly impact an airport's operations. Knowledge of the local climate allows an airport to be better prepared for regional conditions and greatly enhances a pilot's flying capabilities. High surface temperatures and high humidity increase runway length requirements. Runway orientation is dependent on predominant wind patterns for the area. Cloud cover percentages and frequency of other climatic conditions also determine the need for navigational aids and lighting.

Figure 1A summarizes the weather conditions at SPW with data sourced from the on-site Automated Surface Observation System (ASOS) equipment. Spencer has a humid continental climate that averages 28.71 inches of precipitation each year with an average annual temperature of 45.9 degrees. July experiences the highest average annual temperatures at 72.7 degrees and January is the coldest with an average temperature of 15.9 degrees. June sees the most precipitation over the course of the year with 4.44 inches and February is the driest at 0.35 inches on average. The region experiences significant



▲ LOCATION / VICINITY ▼



snowfall amounts, totaling 38 inches during the winter months on average each year. Wind patterns for the airport indicate winds are typically out of the northwest. Wind speeds reach their peak in the spring-time, with April averaging the fastest wind speeds at 12.38 knots.

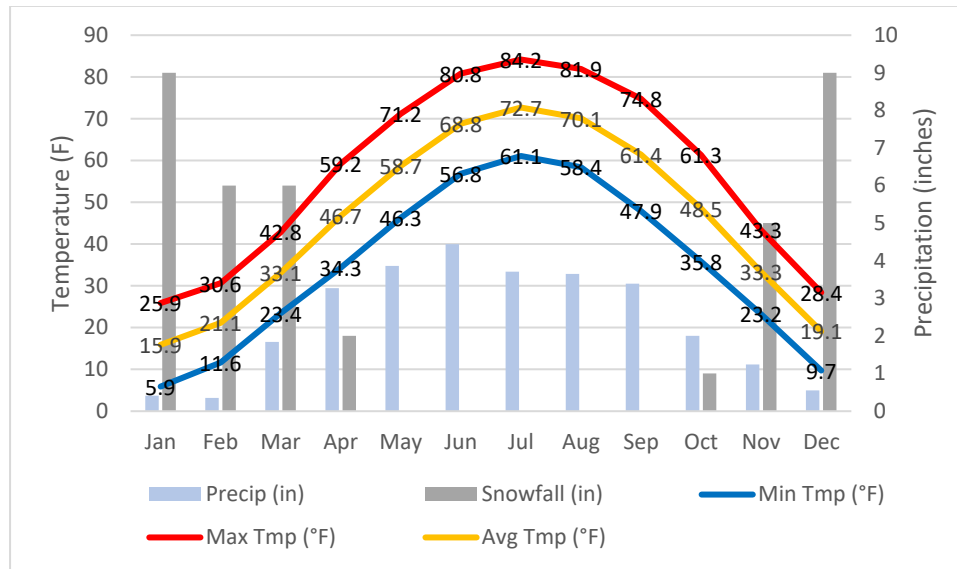


Figure 1A
Climate Summary

Table 1A details weather conditions at the airport over a continuous ten-year period. Visual meteorological conditions (VMC) at SPW occur 89.27 percent of the time. When under VMC conditions, pilots are able to 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 approximately 6.49 percent of the time. When weather conditions are lower than the available approach minimums, the airport is essentially closed to traffic. Less than IMC conditions are present approximately 4.24 percent of the time.

TABLE 1A | Weather Conditions
Spencer Municipal Airport

Condition	Cloud Ceiling	Visibility	Percent of Total
VMC	> 1,000' AGL	> 3 statute miles	89.27%
IMC	≥500' AGL and ≤ 1,000' AGL	1-3 statute miles	6.49%
PVC	< 500' AGL	< 1 statute mile	4.24%

VMC - Visual Meteorological Conditions

PVC - Poor Visibility Conditions

IMC - Instrument Meteorological Conditions

AGL - Above Ground Level

Source: National Oceanic and Atmospheric Administration (NOAA) - National Climatic Data Center. Airport observations from January 2009 – December 2018.



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AIRPORT HISTORY

Like many other communities during World War II, Spencer established its first airport to support war efforts. This facility was located south of Highway 18 on land that is now used for residential and lodging purposes. After a fire occurred at this location, the city government decided to build a new facility at the current site. This facility, the Spencer Municipal Airport, also referred to as the Northwest Iowa Regional Airport, began serving the community in 1942. In addition to a turf runway, the airport consisted of a small concrete building containing an office and meeting room, as well as the orange hangar and beacon which remain today.



That same year, the airport was leased to the Hunter Flying Club, a private company that held an Army contract to train glider pilots. From May to October 1942, hundreds of students trained at SPW to become glider pilots, until cold weather forced the Army to move its training operations south. After the war ended, activity at the airport consisted primarily of civilian operations. Throughout the 1950s and 1960s, expansion efforts became the focal point, with Runway 12-30 paved in 1956 and additional hangars constructed. The runway was extended twice during the early 1970s, and the very high frequency omni-directional range (VOR) and nondirectional beacon (NDB) were installed in 1974. Other improvements, including terminal expansion and runway lighting, also occurred during this time period.

In 1981, the newly formed Great Lakes Airlines began service between Spencer and Des Moines, with their headquarters established near the airport. As the airline grew and added more flights and destinations, SPW expanded along with it, adding a crosswind runway, taxiway ramps, additional lighting and signage, the ILS, updated fuel storage, and a 22,000-square-foot (sf) hangar addition. In 2000, Great Lakes discontinued service from SPW and relocated its headquarters to Cheyenne, Wyoming. With the departure of Great Lakes Airlines, scheduled commercial service at SPW ceased and, since that time, the airport has returned to civilian use primarily.

Throughout the 2000s and 2010s, the airport has undergone several upgrades and improvements, including apron expansion, lighting upgrades, and access road rehabilitation. Today, the airfield is recognized by the city and beyond as a vital asset to the community that has a total economic output of approximately \$5,814,400¹.

¹ Iowa Aviation System Plan 2010-2030

Capital Improvement History

To assist in ongoing capital improvements, the FAA and the Iowa Department of Transportation (DOT) provide funding to SPW through the Airport Improvement Program (AIP). **Table 1B** summarizes airport capital improvement projects and maintenance undertaken since 2000 that received AIP funding, as well as state-funded projects since 2010. During these periods, the airport received \$268,590 from the Iowa DOT since 2010, and \$2,808,200 from the FAA since 2000.

**TABLE 1B | Capital Improvement History – Federal and State Funding
Spencer Municipal Airport**

Year	Project Number	Description	Amount
Federal AIP Funding			
2000	11	Install guidance signs on airport	\$140,640
2001	12	Rehabilitate apron A-2 and Taxiway F	\$157,692
2003	13	Rehabilitate Apron; rehabilitate taxiway	\$160,370
2005	14	Acquire SRE	\$134,710
2005	15	Construct taxiway, expand building	\$131,260
2006	16	Expand apron	\$115,061
2007	17	Rehabilitate Runway 18-36	\$113,467
2008	18	Construct taxiway	\$103,883
2009	19	Rehabilitate apron, rehabilitate Runway 1836, rehabilitate taxiway	\$142,666
2011	20	Rehabilitate runway lighting 18-36, rehabilitate taxiway lighting	\$234,611
2013	21	Rehabilitate taxiway lighting	\$327,433
2014	22	Rehabilitate taxiway lighting	\$202,547
2015	23	Rehabilitate access road, rehabilitate taxiway	\$217,945
2017	24	Reconstruct apron	\$330,765
2019	25	Update Master Plan	\$295,150
Total AIP Funding			\$2,808,200
State Funding			
2010		Install self-fueling system with card reader	\$14,000
2011		Rehabilitate hangar roofs	\$91,000
2013		Rehabilitate hangar	\$17,600
2014		Rehabilitate hangar approaches	\$36,000
2016		Rehabilitate hangar floor	\$45,990
2017		Hangar rehabilitation	\$47,600
2019		Rehabilitate hangar Bi-fold doors	\$16,400
Total State Funding			\$268,590

Sources: FAA and Iowa DOT grant history records

Locally, the City of Spencer has also invested substantial funds in the airport over the years. The city's budget includes an Airport Reserve fund that accounts for capital projects, which are funded by surplus Airport Operations revenue. According to airport records, the City of Spencer has invested upwards of \$4.0 million in the airport, with approximately \$16,500,000 total invested in SPW, including federal, state, and local funds.

AIRPORT ADMINISTRATION

The airport is owned by the City of Spencer, with the city's public works department having primary maintenance responsibility. An Airport Board of Trustees has been established by the city to provide guidance in airport management. The Board of Trustees consists of five members who are appointed by the mayor with council approval and who serve four-year terms. Leading Edge Aviation, the on-airport FBO, oversees day-to-day operations of the airport, including hangar rental, fueling, charter flights, and GA services.

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** – SPW has an airport master plan, which was last updated in 2008.
- **State** – The Iowa DOT prepared the *Iowa Aviation System Plan 2010-2030*, which focused on Iowa's public-use airports and goals and objectives to meet current and future needs.
- **National** – The 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

The most common local airport planning document is an airport master plan, which the FAA recommends an airport update every seven to 10 years. In addition to a master plan, entities often provide additional local planning through a variety of studies, including strategic plans, sub-area plans, etc.

The airport master plan is the primary planning document at the local level. It is intended to provide a 20-year vision for airport development based on aviation demand forecasts. Over time, the forecast element of the master plan typically becomes less reliable due to changes in aviation activity and/or the economy. The most recent update to the airport's master plan was done in 2008. Therefore, this is an appropriate time to update the master plan and revisit development assumptions from the previous planning study.

STATE AIRPORT PLANNING

As mentioned, the primary planning document for the State of Iowa is the *Iowa Aviation System Plan 2010-2030*. This document identifies the public-use aviation facilities in the state with a primary focus on ensuring the state's airport system meets current and future transportation needs and, at the same time, supports the state's economy. The plan classifies airports into one of five roles based on their capability to support different types of aircraft and aviation users. These roles are: Commercial Service,

Enhanced Service, General Service, Basic Service, and Local Service. The System Plan classifies SPW as an Enhanced Service airport, which means it has a runway greater than 5,000 feet with facilities and services that support a full range of general aviation activity.

The System Plan further details specific targets and recommendations for SPW moving forward. Projects noted in the plan include:

- Airport Layout Plan (ALP) updates for 2016 and 2024 – in progress
- Replace Taxiway D and E lighting – completed 2011
- Replace Runway 18-36 lighting – completed 2011
- Rehabilitate Taxiway A and B lighting – completed 2013
- Rehabilitate Taxiway C lighting – completed 2014

FEDERAL AIRPORT PLANNING

The role of the federal government in the development of airports cannot be overstated. 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. In large measure, the system of airports existing today is due, in part, to the existence of federal policy that promotes the development of civil aviation. As part of a continuing effort to develop a national airport system to meet the needs of civil aviation and promote air commerce, the United States Congress has continually maintained a national plan for the development and maintenance of airports.

The current national airport system plan is the NPIAS 2019-2023. A primary purpose of the NPIAS is to identify the airports that are important to national transportation, which includes all commercial service airports, all reliever airports, and selected general aviation airports. The NPIAS identifies 3,328 public-use airports (3,321 existing and 7 proposed), which are eligible to receive development grants under the FAA Airport Improvement Program (AIP). The plan categorizes airports by the type of activities that take place, including commercial service, cargo service, reliever operations, and general aviation, as seen in **Table 1C**.

Spencer Municipal Airport is classified as a GA airport in the NPIAS, and further categorized as a Regional GA airport in *General Aviation Airports: A National Asset (ASSET 1)*. According to the FAA, these airports "support regional economies with interstate and some long-distance flying and have high levels of activity, including some jets and multiengine propeller aircraft."

TABLE 1C | Categories of Airport Activities

Airport Classifications		Hub Type: Percentage of Annual Passenger Boardings (enplanement)	Common Name
Commercial Service: Publicly owned airports that have at least 2,500 passenger boardings each calendar year and receive scheduled passenger service	Primary: Have more than 10,000 passenger boardings each year	Large: 1% or more	Large Hub
		Medium: At least 0.25%, but less than 1%	Medium Hub
		Small: At least 0.05%, but less than 0.25%	Small Hub
		Nonhub: More than 10,000, but less than 0.05%	Nonhub Primary
	Nonprimary	Nonhub: At least 2,500 and no more than 10,000	Nonprimary Commercial Service
Nonprimary (Except Commercial Service)		Not Applicable	Reliever General Aviation

Source: https://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/categories/

AVIATION ACTIVITY

Records of the airport's operational activity are the basis for determining the types and sizes of facilities and eligibility for federal funding. Airport staff and the FAA maintain statistics on aircraft operations and based aircraft, which are analyzed to aid in projecting future trends.

AIRCRAFT OPERATIONS

Records of airport operational activities are essential for determining required facilities (types and sizes), as well as eligibility for federal funding. Since the airport is non-towered, a detailed account of aircraft operations (takeoffs and landings) is not available. The current FAA Form 5010 – Airport Master Record for the Airport (data effective date: December 5, 2019) estimates total operations at 15,090 for the 12 months ending May 16, 2019. The total operations breakdown includes 4,672 GA local operations, 6,748 GA itinerant operations, and 3,670 air taxi operations. There were no military operations during this period.

The FAA's *Terminal Area Forecast* (TAF), which was most recently issued in January 2020, is another source for historical operations estimates. **Table 1D** provides a summary of the TAF operations statistics from 1990 to 2018, with estimates for years 2019-2020.

BASED AIRCRAFT

Identifying the current number of based aircraft is an important part of the master plan process; however, it can be challenging to be accurate given the transient nature of aircraft storage. Based aircraft counts help determine demand for a number of different facilities, including aircraft storage hangar space, parking aprons, pilot and passenger services, and various other aircraft support facilities.

According to the FAA TAF, there were 35 based aircraft at SPW in 2018. Historic based aircraft data from the FAA TAF is shown on **Table 1D**. This history shows that SPW has ranged between 22 and 43 based aircraft from 1990 through 2018. The peak of 43 was reached in 2014, which is a sharp increase from the low of 22 based aircraft during the years 2010-2012.

The airport's 5010 Master Record reports 33 based aircraft, while a validated count of 39 based aircraft was reported in April 2019. However, airport records as of December 2019 reflect a total of 41 based aircraft. Included in this count are 33 single engine aircraft, five multi-engine, one turboprop, and two jets. For the purposes of this study, the airport count of 41 aircraft will be utilized as the baseline since it is the most current data available.

TABLE 1D | FAA Terminal Area Forecast – Aviation Activity History
Spencer Municipal Airport

Fiscal Year	Enplanements			Itinerant Operations					Local Operations			Total Ops	Based Aircraft
	Air Carrier	Commuter	Total	Air Carrier	Air Taxi & Commuter	GA	Military	Total	Civil	Military	Total		
1990	0	5,599	5,599	0	5,000	7,000	400	12,400	4,000	0	4,000	16,400	39
1991	0	5,195	5,195	0	7,072	13,000	400	20,472	9,000	0	9,000	29,472	39
1992	0	7,568	7,568	0	7,072	13,000	400	20,472	9,000	0	9,000	29,472	39
1993	0	8,975	8,975	0	7,072	13,000	400	20,472	9,000	0	9,000	29,472	39
1994	0	9,079	9,079	0	7,072	13,000	400	20,472	9,000	0	9,000	29,472	39
1995	0	8,603	8,603	0	7,072	13,000	400	20,472	9,000	0	9,000	29,472	39
1996	0	7,095	7,095	0	7,072	13,000	400	20,472	9,000	0	9,000	29,472	41
1997	0	5,236	5,236	0	7,072	13,000	400	20,472	9,000	0	9,000	29,472	41
1998	0	5,380	5,380	0	7,072	13,000	400	20,472	9,000	0	9,000	29,472	41
1999	0	6,314	6,314	0	7,072	13,000	400	20,472	9,000	0	9,000	29,472	32
2000	0	4,944	4,944	0	7,072	13,000	400	20,472	9,000	0	9,000	29,472	32
2001	0	1,439	1,439	0	7,072	13,000	400	20,472	9,000	0	9,000	29,472	28
2002	0	1,439	1,439	0	7,072	13,000	400	20,472	9,000	0	9,000	29,472	32
2003	0	0	0	0	7,072	13,000	400	20,472	9,000	0	9,000	29,472	30
2004	0	0	0	0	7,072	13,000	400	20,472	9,000	0	9,000	29,472	30
2005	0	0	0	0	7,072	13,000	400	20,472	9,000	0	9,000	29,472	30
2006	0	0	0	0	7,072	13,000	400	20,472	9,000	0	9,000	29,472	30
2007	0	0	0	0	3,670	6,748	210	10,628	4,672	0	4,672	15,300	36
2008	0	0	0	0	3,670	6,748	210	10,628	4,672	0	4,672	15,300	32
2009	0	0	0	0	3,670	6,748	0	10,418	4,672	0	4,672	15,090	32
2010	0	1	1	0	3,670	6,748	0	10,418	4,672	0	4,672	15,090	22
2011	0	0	0	0	3,670	6,748	0	10,418	4,672	0	4,672	15,090	22
2012	0	0	0	0	3,670	6,748	0	10,418	4,672	0	4,672	15,090	22
2013	0	0	0	0	3,670	6,748	0	10,418	4,672	0	4,672	15,090	23
2014	0	0	0	0	3,670	6,748	0	10,418	4,672	0	4,672	15,090	43
2015	0	0	0	0	3,670	6,748	0	10,418	4,672	0	4,672	15,090	38
2016	0	0	0	0	3,670	6,748	0	10,418	4,672	0	4,672	15,090	40
2017	0	0	0	0	3,670	6,748	0	10,418	4,672	0	4,672	15,090	40
2018	0	0	0	0	3,670	6,748	0	10,418	4,672	0	4,672	15,090	35
2019*	0	0	0	0	3,670	6,748	0	10,418	4,672	0	4,672	15,090	35
2020*	0	0	0	0	3,670	6,748	0	10,418	4,672	0	4,672	15,090	37

*Projected

Source: FAA Terminal Area Forecast (TAF), January 2020

AIRPORT FACILITIES AND SERVICES

There are four broad categories of facilities and services at the airport: airfield, landside, aviation, and support.

- **Airfield facilities** are directly associated with aircraft operations, including runways, taxiways, lighting, markings, navigational aids, and weather reporting.
- **Landside facilities** are necessary to provide a safe transition from surface to air transportation and support aircraft parking, servicing, storage, maintenance, and operational safety, including non-aviation facilities that typically provide a revenue stream to the airport.
- **Aviation services** are organizations or facilities that provide aviation services, including aircraft fueling, aircraft parking, hangar space/leasing, flying clubs, flight instruction, air medical services, and aircraft maintenance.
- **Support facilities** serve as a critical link to provide the necessary efficiency to aircraft ground operations, such as aircraft rescue and firefighting (ARFF), airport maintenance, and fuel storage.

AIRFIELD FACILITIES

Airfield facilities are detailed on **Exhibit 1C** and summarized in the sections below.

RUNWAYS

SPW has two intersecting runways, both constructed of concrete. Runway 12-30 is the primary runway and measures 6,001 feet in length and 100 feet wide. It is in fair condition and has weight-bearing capacities of 30,000 pounds single wheel loading (SWL) and 50,000 pounds double wheel loading (DWL). The runway slopes slightly from the Runway 12 end to the Runway 30 end by 4.5 feet, resulting in a gradient of 0.07 percent. Runway 30 has a 500-foot displaced threshold, reducing the operational length to 5,501 feet for aircraft landing on this runway.

Crosswind Runway 18-36 is in good condition and is 5,100 long by 75 feet wide. The weight-bearing capacities of this runway are the same as the primary runway at 30,000 pounds SWL and 50,000 pounds DWL. The elevation difference between the two runway ends is 2.3 feet for a gradient of 0.05 percent.



Runway 18-36

TAXIWAYS

The taxiway system at SPW consists of partial parallels, connectors, access, and bypass taxiways. All taxiways are 35 feet wide measured from pavement edge to edge and are equipped with light-emitting diode (LED) medium intensity taxiway lighting (MITL). The taxiway system at the airport is designed to efficiently and quickly route aircraft between the runway and the originating/destination location, with all runway ends served by a partial parallel taxiway. Bypass taxiways also extend from Taxiways B and C to serve the Runway 12-30 ends. **Exhibit 1C** and **Table 1E** detail the taxiway system at the airport.

TABLE 1E | Taxiway Data
Spencer Municipal Airport

Designation	Width (ft)	Description
A	35	Connector taxiway extending from apron to Taxiway D. Transverses Runway 12-30.
B	35	Access/partial parallel taxiway from Taxiway A to Runway 30 end.
C	35	Connector/access/partial parallel taxiway extending from apron and leading to Taxiway E before traversing Runway 12-30 and leading to Runway 12 end.
D	35	Access/partial parallel taxiway from Taxiway A to Runway 36 end.
E	35	Access/partial parallel taxiway from Taxiway C to Runway 18 end.

Source: Coffman Associates analysis.

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. They are categorized by function as follows:

Airport Identification Lighting: The location of the airport at night or during low-visibility weather is universally identified by a rotating beacon. A rotating beacon projects two beams of light, one white and one green, 180 degrees apart. The airport beacon is located immediately north of the FBO facility atop a 95-foot tower.

Runway Pavement and Edge Lighting: Pavement edge lighting utilizes light fixtures placed near the edge of the pavement to define the lateral limits of the pavement. This lighting is essential for safe operations during night and/or times of low visibility in order to maintain safe and efficient access to and from the runway and aircraft parking areas. Both runways are equipped with medium intensity runway lighting (MIRL) systems.

Approach Lighting System (ALS): An ALS is a configuration of lights positioned symmetrically along the extended runway centerline to supplement navigational aids, such as an instrument landing system (ILS), to provide lower visibility minimums. Examples include the ALS with Flashing Lights (ALSF); ALS with Sequenced Flashers I & II (ALSF-1/ALSF-2); Medium Intensity ALS with Runway Alignment (MALSR); and



Rotating Beacon



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the Medium Intensity ALS (MALSR). Airports equipped with an ILS are typically equipped with a MALSR, which extends approximately 2,400 feet from the runway threshold. SPW is equipped with a MALSR supporting the approach to Runway 12; the system begins 200 feet northwest of the runway end.

Visual Approach Lighting: Visual approach aids have been installed at the airport to assist pilots in determining the correct descent path to the runway end during an approach. A four-light precision approach path indicator (PAPI-4) is available on approaches to both ends of Runway 18-36. When the system of red and white lights is interpreted by the pilot, they are given an indication of being above, below, or on the designated descent path to the runway threshold. A PAPI system has a range of five miles during the day and up to 20 miles at night. Each PAPI-4 at SPW provides a standard 3.00-degree glide path.

Runway 12-30 is equipped with a visual approach slope indicator (VASI) lighting system. The approach to Runway 12 has a four-light system, while the Runway 30 approach is equipped with a two-box system. Like the PAPI, the VASI system has a daytime range of five miles and a nighttime range of 20 miles and provides a 3.00-degree glide path.



MALSR



PAPI-4 serving Runway 18-36

Runway End Identifier Lights (REILs): 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. Runways 30, 18, and 36 are equipped with REILs.

Taxiway Lighting: All taxiways are equipped with MITL that is elevated on mounted units on each side of the taxiway.

Pilot-Controlled Lighting: During nighttime hours, pilots can utilize the pilot-controlled lighting system (PCL) to activate certain airfield lights from their aircraft through a series of clicks of their radio transmitter utilizing the CTAF frequency (123.0 MHz).

AIRFIELD SIGNAGE AND MARKINGS

Airfield identification signs assist pilots in identifying runways, taxiway routes, holding positions, and critical areas. The airfield at SPW is equipped with lighted signs located at each taxiway intersection.

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*.

Runway 12 has precision instrument markings, while Runways 30, 18, and 36 are equipped with nonprecision markings. Both runway and taxiway markings at the airport indicate thresholds, holding position markings, and centerlines.

All taxiways at SPW 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. Holding positions are at least 250 feet from centerline on Runway 12-30 and at least 200 feet from centerline on Runway 18-36.



Airfield Signage and Taxiway Lighting

NAVIGATIONAL AIDS

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 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.



VOR/DME

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.

The types of electronic navigational aids available for aircraft flying to or from SPW include a VOR/DME facility and the global positioning system (GPS). The Spencer VOR/DME is centrally located between the Runway 36 and 30 ends, midway between the runway ends and where they intersect.

INSTRUMENT LANDING SYSTEM (ILS) EQUIPMENT

Airports offering full ILS approaches are equipped with both a glide slope antenna and localizer antenna array. Runway 12 is equipped with ILS equipment. The glide slope antenna is co-located with the automated surface observation system (ASOS) south of Runway 12 near the bypass taxiways. The glide slope antenna provides vertical guidance to landing aircraft.

The localizer antenna array provides horizontal guidance and is used to establish and maintain an approaching aircraft's position relative to the runway centerline until visual contact confirms the runway alignment and location. Typically, the localizer antenna array is sited on the extended runway centerline between 1,000 feet and 2,000 feet from the end of the runway. At SPW, the localizer antenna is located approximately 550 feet beyond the Runway 30 end. The equipment shelter, which houses electronic equipment, is located approximately 250 feet from the localizer antenna, as required by the FAA.

Exhibit 1D details the instrument approach procedures at Spencer Municipal Airport.

WEATHER AND COMMUNICATION

SPW is served by an ASOS. This system updates weather observations every minute, continuously reporting changes in conditions. The ASOS reports cloud ceiling, visibility, temperature, dew point, wind direction, wind speed, altimeter setting (barometric pressure), and density altitude (airfield elevation corrected for temperature). As mentioned, the ASOS equipment is co-located with the glide slope antenna south of Runway 12 near the bypass taxiways. Weather information can be obtained from the ASOS via radio frequency 126.625 MHz or by calling 712-262-8885.

SPW also has a lighted wind cone centrally located on the airfield, east of the intersection of Runways 12-30 and 18-36.



Localizer Antenna Array



Glide Slope Antenna and ASOS

WEATHER MINIMUMS BY AIRCRAFT TYPE								
	Category A		Category B		Category C		Category D	
	CH	VIS	CH	VIS	CH	VIS	CH	VIS
Runway 12 ILS or LOC								
Straight-in ILS	200	½	200	½	200	½	200	½
Straight-in LOC	600	½	600	½	600	1	600	1
Circling	600	1	600	1	800	2 ¼	800	2 ½
Rwy 12 RNAV (GPS)								
LPV DA	200	½	200	½	200	½	200	½
LNAV/VNAV DA	400	¾	400	¾	400	¾	400	¾
LNAV MDA	401	½	401	½	401	¾	500	1
Circling	500	1	500	1	500	1 ½	800	2 ¼
Rwy 18 RNAV (GPS)								
LPV DA	300	1	300	1	NA	NA	NA	NA
LNAV/VNAV DA	300	1	300	1	NA	NA	NA	NA
LNAV MDA	500	1	500	1	NA	NA	NA	NA
Circling	500	1	500	1	NA	NA	NA	NA
Rwy 30 RNAV (GPS)								
LPV DA	300	¾	300	¾	300	¾	300	¾
LNAV/VNAV DA	300	7/8	300	7/8	300	7/8	300	7/8
LNAV MDA	400	1	400	1	400	1 ½	400	1 ½
Circling	500	1	500	1	800	2 ¼	800	2 ½
Rwy 36 RNAV (GPS)								
LPV DA	300	1	300	1	NA	NA	NA	NA
LNAV/VNAV DA	300	1	300	1	NA	NA	NA	NA
LNAV MDA	400	1	400	1	NA	NA	NA	NA
Circling	500	1	500	1	NA	NA	NA	NA
Rwy 30 VOR								
S-31	800	1	800	1 ¼	800	2	800	2
Circling	800	1	800	1 ¼	800	2 ¼	800	2 ½



ABBREVIATIONS

CH	Cloud Height (in feet above ground level)
DA	Decision Altitude (used for vertically guided approaches)
GPS	Global Positioning System
ILS	Instrument Landing System
MDA	Minimum Descent Altitude
LNAV	A technical variant of GPS (Lateral, Vertical Navigation)
VNAV	A technical variant of GPS (Lateral, Vertical Navigation)
LOC	Localizer
LPV	Localizer Performance with Vertical Guidance
VOR	Very High Frequency Omnidirectional Range
VIS	Visibility (in miles)

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

Category A	0-90 knots (e.g., Cessna 172)
Category B	91-120 knots (e.g. Beechcraft King Air)
Category C	121-140 knots (e.g., B-737, Regional Jets, Canadair Challenger)
Category D	141-166 knots (e.g., B-747, Gulfstream IV)

Source: AirNav

LANDSIDE FACILITIES

TERMINAL BUILDING

The terminal building at Spencer Municipal Airport is located on the northeast side of the airfield along 330th Street. Built in 1961, the terminal encompasses approximately 3,400 sf. Over the years, it has been expanded upon and updated and currently includes a lobby, museum, meeting space, restrooms, and a storm shelter.

The vehicle parking lot on the north side of the building provides 206 vehicle spaces as well as four handicapped parking spaces. This lot serves both the terminal building and the adjacent FBO facility.



Airport Terminal Building

AIRCRAFT HANGAR FACILITIES

Existing hangar facilities at SPW are identified on **Exhibit 1E**, along with footprint area (in square feet). Hangar facilities are concentrated on the northeast side of the airfield and are accessible via 330th Street. As shown on the exhibit, hangar types at the airport include T-hangars, conventional hangars, and maintenance hangars ranging in size from 6,000 sf to more than 46,000 sf.

AIRCRAFT PARKING APRONS

There are three aircraft parking aprons serving the airport. The terminal/FBO apron is the largest, encompassing approximately 14,300 square yards (sy). To the west is another apron adjacent to the Quonset hangar that measures approximately 3,340 sy. A third apron is located north of the FBO maintenance hangar. This apron is approximately 4,600 sy.

All existing landside facilities are depicted on **Exhibit 1E**.



Terminal Lobby

AVIATION SERVICES

FIXED BASE OPERATOR (FBO)

There is one FBO at the airport, Leading Edge Aviation. Leading Edge has served SPW since 2001 and provides a variety of services from its building adjacent to the terminal. Some of these services include: Part 135 air charter, Jet A and 100LL fuel services, flight instruction, ground handling, and aircraft maintenance. A pilots' lounge, flight planning room, conference room, and vending area are some of the amenities available at the facility. Leading Edge is also contracted as the Airport Manager and oversees the day-to-day operations at the airport.

ON-AIRPORT BUSINESSES

In addition to the FBO, there are two other businesses located on the airport: CammAir and Spencer Avionics. CammAir, which occupies an 11,400 sf hangar located on the west side of the airfield, specializes in aviation maintenance of business jets, turboprops, and aircraft used for agricultural purposes. Spencer Avionics specializes in avionics and autopilot sales and services and occupies a 12,400 sf hangar south of the CammAir hangar.

SUPPORT FACILITIES

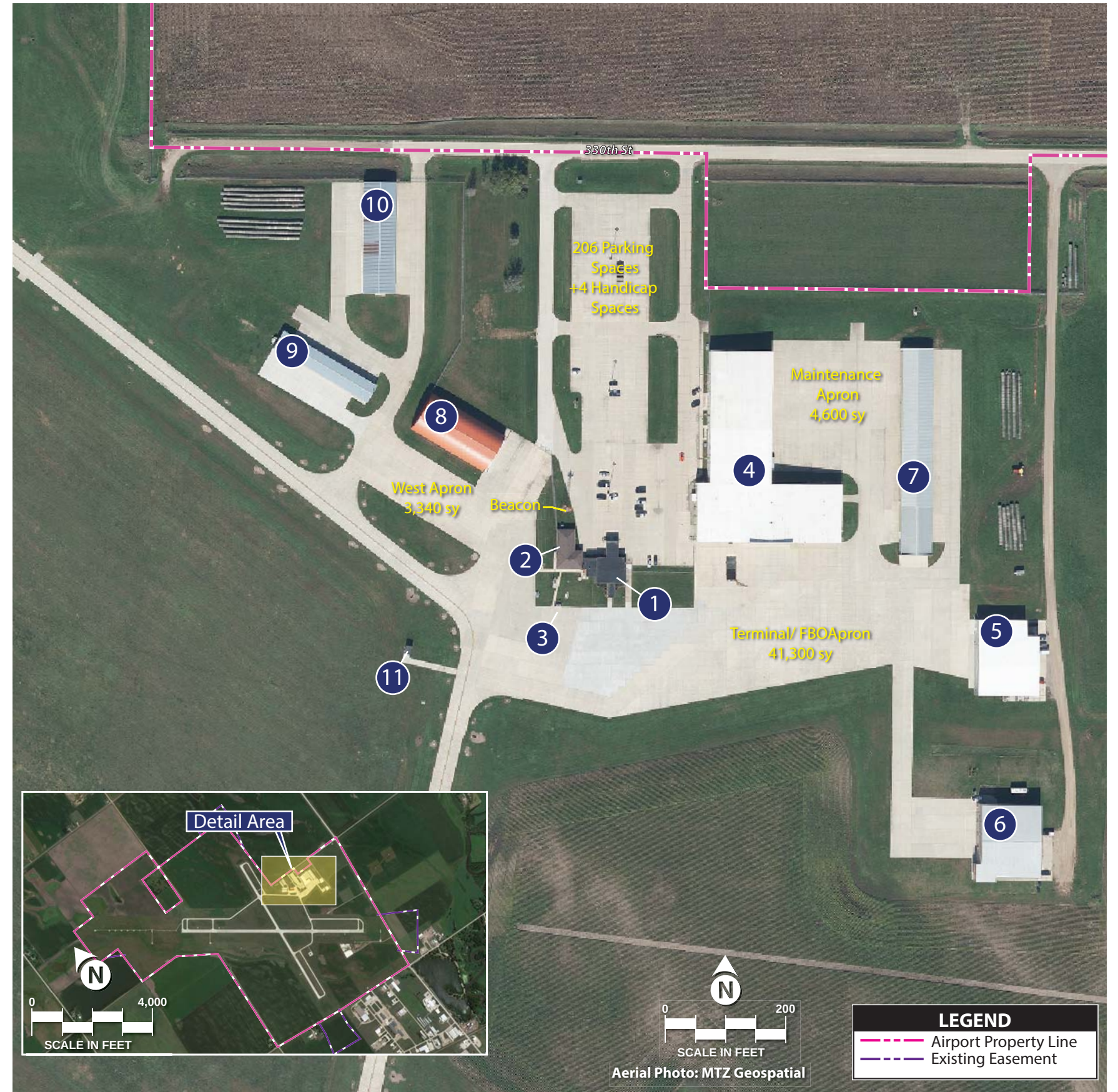
FIRE STATION AND ARFF

14 CFR Part 139 airports are required to provide aircraft rescue and firefighting (ARFF) services during air carrier operations that require a Part 139 certificate. Each certificated airport maintains equipment and personnel based on an ARFF index established according to the length of aircraft and scheduled daily flight frequency. There are five indices, A through E, with A applicable to the smallest aircraft and E the largest (based on wingspan).

SPW is not a certificated Part 139 airport; therefore, it is not required to maintain ARFF services or equipment. Firefighting services are provided by the City of Spencer Fire and Rescue, located approximately five miles from the airport in the city's historic downtown commercial district.

FUEL STORAGE

Spencer Municipal Airport offers both 100LL and Jet A fuel service, which is provided by the FBO. Fuel is stored in two underground tanks, with capacities of 10,000 gallons for 100LL and 12,000 gallons for Jet A fuel.



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VEHICLE AIRFIELD ACCESS AND PERIMETER FENCING

The airport does not have a paved perimeter service road; however, service and emergency vehicles are able to utilize the existing public roadway network to access all areas of the airfield via secured access gates located at various points along the airport's perimeter. The perimeter of the airfield is also protected by a combination of fencing. In the area of the terminal building and hangars, there is six-foot tall chain-link fencing topped with barbed wire. The remainder of airport property is bounded by three-strand barbed-wire fencing.

AREA AIRSPACE AND AIR TRAFFIC CONTROL

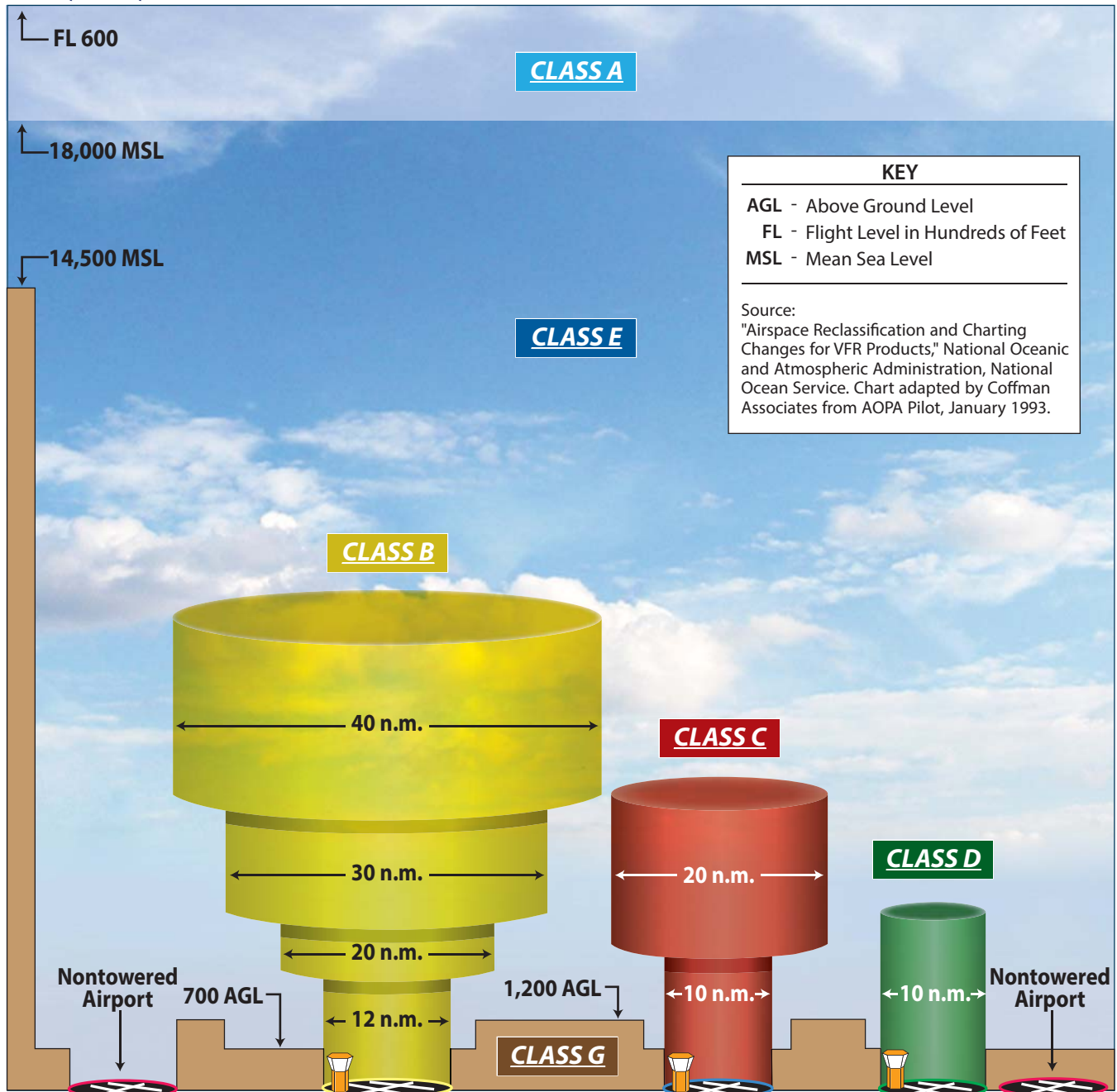
Airspace within the United States is broadly classified as either "controlled" or "uncontrolled." The difference between controlled and uncontrolled airspace relates primarily to requirements for pilot qualifications, ground-to-air communications, navigation and air traffic services, and weather conditions. Six classes of airspace have been designated in the United States, as shown on **Exhibit 1F**. 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 in the vicinity of SPW is depicted on **Exhibit 1G**.

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 Federal Aviation Regulation (F.A.R.) 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-St. 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. All aircraft operating within Class B airspace must have air traffic control clearance. Certain minimum aircraft equipment and pilot certification requirements must also be met. This airspace is the most restrictive controlled airspace routinely encountered by pilots operating under VFR in an uncontrolled environment. The nearest Class B airspace supports MSP, approximately 134 nautical miles (nm) to the northeast of SPW.

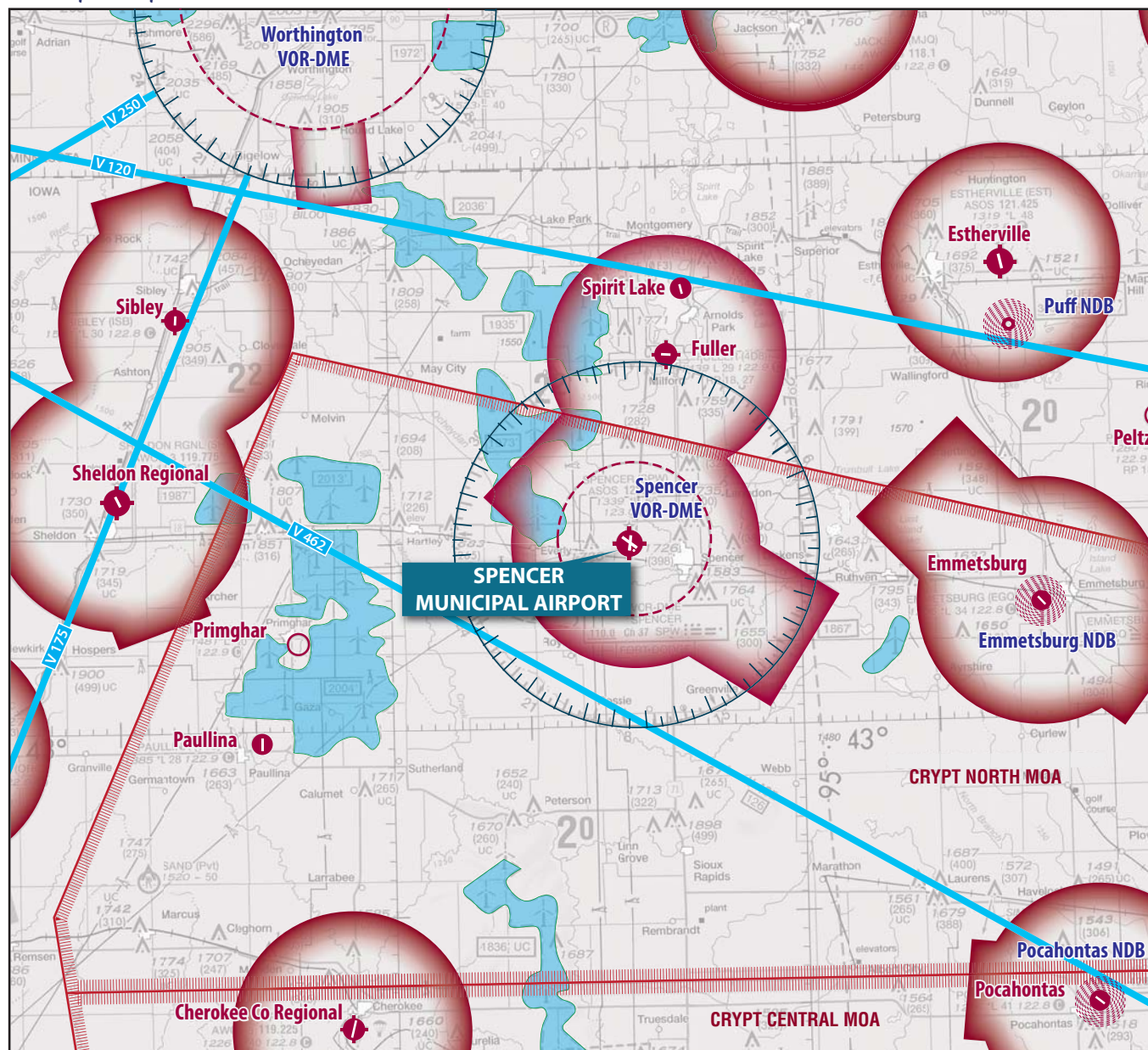
Class C Airspace | The FAA has established Class C airspace at approximately 120 airports around the country that have significant levels of IFR traffic. Class C airspace is designed to regulate the flow of uncontrolled traffic above, around, and below the arrival and departure airspace required for 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 SPW surrounds Eppley Airfield in Omaha, approximately 105 nm to the southwest.

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



DEFINITION OF AIRSPACE CLASSIFICATIONS

- CLASS A** Generally airspace above 18,000 feet MSL up to and including FL 600.
- CLASS B** Generally multi-layered airspace from the surface up to 10,000 feet MSL surrounding the nation's busiest airports.
- CLASS C** Generally airspace from the surface to 4,000 feet AGL surrounding towered airports with service by radar approach control.
- CLASS D** Generally airspace from the surface to 2,500 feet AGL surrounding towered airports.
- CLASS E** Generally controlled airspace that is not Class A, Class B, Class C, or Class D.
- CLASS G** Generally uncontrolled airspace that is not Class A, Class B, Class C, Class D, or Class E.



LEGEND

- Airports with other than hard-surfaced runways
- Airports with hard-surfaced runways 1,500' to 8,069' in length
- Compass Rose
- Class E Airspace to the surface
- Class E Airspace to 700 feet AGL
- Victor Airways
- Alert Area and Military Operations Area (MOA)
- Non-directional Radiobeacon (NDB)
- Wind Turbine Farm

Source: US Department of Commerce, National Oceanic and Atmospheric Administration; Omaha, July 18, 2019

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. Joe Foss Field in Sioux Falls is the nearest Class D airspace airport, beginning approximately 55 nm northwest of SPW.

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.

SPW is a Class E airspace airport with the surface beginning at 700 feet above ground level (AGL) for a five-mile radius around the airport. Airspace below 700 feet AGL is Class G airspace. As shown on **Exhibit 1G**, SPW's Class E airspace partially overlaps with the Class E airspace surrounding Fuller Airport and Spirit Lake Municipal Airport to the north.

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 overlying Class E airspace (700 to 1,200 feet above ground level).

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.

SPECIAL USE AIRSPACE

Special use airspace is defined as airspace where activities must be confined because of their nature or where limitations are imposed on aircraft not taking part in those activities. The designation of special use airspace identifies for other users the areas where military activity occurs, provides for segregation of that activity from other fliers, and allows charting to keep airspace users informed. These areas are depicted on **Exhibit 1G**.

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 are shown with blue lines on **Exhibit 1G**. There are three Victor Airways within the vicinity of SPW: V462 to the south, V120 to the north, and V175 to the west.

Alert Areas / Military Operations Areas (MOAs) / Restricted Areas | Alert Areas, MOAs, 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.

As shown on **Exhibit 1G**, SPW is located within the Crypt North Military Operations Area (MOA), with the Crypt Central and Crypt South MOAs located immediately to the south. These MOAs are used by the Iowa Air National Guard, 133rd Air Control Squadron, based in Fort Dodge. Designated operational altitudes for the MOAs are from 8,000 feet MSL to, but not including, flight level (FL) 180. Their published times of use are from 9:30 a.m. to 11:00 a.m. and 2:00 p.m. to 3:30 p.m., Tuesday through Saturday, and at other times as issued by notices to airmen (NOTAM). The controlling agency for the MOAs is the Minneapolis Air Route Traffic Control Center (ARTCC).

AIRSPACE CONTROL

The FAA has established 21 ARTCCs throughout the U.S., including Alaska and Hawaii, 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 ARTCC controls IFR airspace enroute to and from SPW.

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 Airmen (NOTAMs), broadcast aviation meteorological and aeronautical information, and notify Customs and Border Protection of trans border flights. The Fort Dodge FSS is the nearest to SPW.

FLIGHT PROCEDURES

Flight procedures are a set of predetermined maneuvers established by the FAA, using electronic or visual navigational aids that assist pilots in locating and landing or departing from an airport. For SPW, there are instrument approach procedures as shown previously on **Exhibit 1D**.

Instrument Approach Procedures

Instrument approach procedures are a series of predetermined maneuvers established by the FAA, using electronic navigational aids that assist pilots in locating and landing at an airport, especially during instrument flight conditions. There are currently six published instrument approach procedures, including an ILS approach to Runway 12. Precision instrument approaches provide vertical descent information and course guidance information to the pilot. Non-precision approaches only provide course guidance to the pilot; however, the GPS localizer performance with vertical guidance (LPV) approaches are currently categorized by the FAA as a non-precision approach even though it provides vertical guidance.

The visibility and cloud height minimums associated with the approach define the capability of an instrument approach procedure. Visibility minimums define the horizontal distance the pilot must be able to see to complete the approach. Cloud height defines the lowest level a cloud layer (defined in feet above the ground) can be situated for the pilot to complete the approach. If the observed visibility or cloud ceilings are below the minimums prescribed for the approach, the pilot cannot complete the instrument approach.

The most sophisticated instrument approach procedures at SPW are associated with the ILS to Runway 12. The ILS or localizer (LOC) approach to Runway 12 provides visibility minimums as low as ½-mile and cloud heights of 200 feet above ground level (AGL).

Instrument approaches based on GPS have become very common across the country. GPS is inexpensive, as it does not require a significant investment in ground-based systems by an airport or FAA. All runway ends at SPW are served by GPS approaches. GPS LPV approaches provide both horizontal and vertical guidance information to pilots. Advancements in GPS technology have allowed for instrument approach procedures to provide minimums as low as ILS systems. Currently, all GPS approaches at SPW include an LPV component.

Runway 30 has another published approach that utilizes very high frequency omnidirectional range (VOR) technology and provides straight-in and circling minimums. Circling minimums allow pilots the flexibility to land on the runway most closely aligned with the prevailing wind at that time. This flexibility generally requires circling approaches to have higher visibility minimums than the straight-in approaches. This is done to provide pilots with sufficient visibility and ground clearance to navigate visually from the approach to the desired runway end for landing. This circling instrument approach procedure is non-precision in nature.

Local Operating Procedures: The traffic pattern at the airport is maintained to provide the safest and most efficient use of the airspace. At SPW, all runway ends use a left-hand traffic pattern. 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.

SPW does not have aircraft restrictions, curfews, or a mandatory noise abatement program, as these programs would violate the *Federal Airport Noise and Capacity Act (ANCA)* of 1990. Federal law requires the airport to remain open 24 hours a day, 7 days a week, and to accept all civilian and military aircraft that can be safely accommodated.

AREA AIRPORTS

There are nine airports open to the public within a 30-nm radius of SPW. The closest is Fuller Airport, located 10 nm north-northeast in Milford, IA. This airport is not included in the NPIAS. It has two runways: asphalt Runway 9-27 at 2,873 feet long with GPS and VOR approaches, and turf Runway 18-36 at 1,990 feet long. The nearest public-use airport with comparable facilities and services to SPW is Estherville Municipal Airport (EST), located 25 nm west. EST has a 4,797-foot-long runway; a turf crosswind runway; an on-site ASOS; a one-mile GPS approach to the runway; and services including Jet A and 100LL fuel, aircraft tiedowns and storage, and aircraft maintenance. A summary and comparison of the most competitive public-use airports within 30 nm of SPW is provided in **Exhibit 1H**. Three airports (Primghar – 19 nm west-southwest, Paulina Municipal – 23 nm southwest, and Sibley Municipal – 27 nm northwest) are not included on the exhibit as their services are the least comparable to SPW.

SOCIOECONOMIC CHARACTERISTICS

Socioeconomic characteristics are collected and examined to derive an understanding of the dynamics of growth near the airport. This information is essential in determining aviation demand level requirements, as most general aviation demand is directly related to the socioeconomic condition of the surrounding region. Statistical analysis of population, employment, income, and gross regional product (GRP) trends provide a picture of the economic strength of the region, as well as the ability of the area to sustain a strong economic base into the future. Additional socioeconomic data will be used in the forecast chapter; however, the information provided in this chapter will introduce socioeconomic trends in the study area.

POPULATION

Population is an important socioeconomic factor to consider when planning for future airport needs. Historical and forecast trends in population provide an indication of the potential of the region to sustain growth in aviation activity. Population data for the City of Spencer, Clay County, the State of Iowa, and the United States are discussed to provide the past and present population metrics of the region within which the airport operates.

Historic population trends for the City of Spencer, Clay County, the State of Iowa, and the United States are detailed in **Table 1F**. In 2020, the State of Iowa is projected to have over 3.1 million residents. According to this data, the state has grown over the past 20-year period by 249,702 residents, for a compound annual growth rate (CAGR) of 0.41 percent. Over the same period, the United States experienced population growth at 0.83 percent CAGR. Between 2000 and 2020, Clay County experienced a CAGR of -0.39 percent, losing over 1,300 new residents. However, according to the *2017 Spencer Comprehensive Land Use Plan*, the City of Spencer is expected to see a slight growth in population by 2020, with 11,680 residents projected. This is reflective of a 0.15 percent CAGR.

TABLE 1F | Population Statistics

	2000	2005	2010	2015	2020 ¹	CAGR (2000-2020)
City of Spencer ¹	11,317	NA	11,233	NA	11,680	0.15%
Clay County	17,360	16,848	16,633	16,508	16,047	-0.39%
State of Iowa	2,929,067	2,964,454	3,050,223	3,118,473	3,178,769	0.41%
United States	282,162,374	295,516,551	309,338,364	321,041,857	332,701,863	0.83%

¹ Projected population

CAGR: Compound Average Growth Rate

Sources: Woods and Poole, *The Complete Economic and Demographic Data Source*, 2019; 2017 Spencer Comprehensive Land Use Plan

EMPLOYMENT

Analysis of an area's employment base can be valuable in determining the overall well-being of the general area. In most cases, the area's makeup and health is significantly impacted by the availability of jobs, variety of employment opportunities, and types of wages provided by local employers. **Table 1G** provides historical employment characteristics from 2000 to 2020 for Clay County, the State of Iowa, and the United States. Employment data for the City of Spencer was not available. Total employment in Clay County has decreased over the 20-year period, at a CAGR of -0.13 percent, while the state and national employment rates have grown, with CAGRs of 0.56 and 1.07 percent, respectively. **Table 1H** details the major employers in the City of Spencer.

TABLE 1G | Employment Statistics

	2000	2005	2010	2015	2020 ¹	CAGR (2000-2020)
Clay County	12,614	12,002	12,298	12,175	12,301	-0.13%
State of Iowa	1,915,268	1,933,916	1,950,437	2,059,516	2,143,537	0.56%
United States	165,370,795	172,338,389	172,901,697	190,317,817	204,675,442	1.07%

¹ Projected population

CAGR: Compound Average Growth Rate

Sources: Woods and Poole, *The Complete Economic and Demographic Data Source*, 2019

TABLE 1H | City of Spencer Top Employers

Employer Name	Product/Service
Manufacturing	
Simonsen Iron Works Maurer Manufacturing Metal Works, Inc. Morton Buildings Shine Brothers Corp. Tecton Industries VanderHaag's Inc.	ATV accessories Grain and misc. trailers Cupolas and ridge vents Metal buildings Scrap metal processing Precision machining Used truck sales, parts, service & equipment
Financial	
Community State Bank Farmer's Trust & Savings Bank Northwest Bank State Bank US Bank	Financial Services
Other Major Employers	
Spencer Hospital Spencer Community Schools St. Luke Homes & Services, Inc.	Medical Education Long-term healthcare

Source: 2017 Spencer Comprehensive Land Use Plan

FULLER AIRPORT (4D8)		
Airport NPIAS Classification	NA	
FAA Asset Study Classification . .	NA	
Location from SPW.	10 nm NNE	
Elevation	1,439	
Weather Reporting	None	
ATCT	None	
Annual Operations	3,848	
Based Aircraft	10	
Enplaned Passengers	None	
		
Runways	9/27	18/36 (Turf)
Length (ft.)	2,873	1,990
Width (ft.)	50	100
<i>Pavement Strength (pounds)</i>		
SWL	NA	NA
DWL	NA	NA
Lighting	LIRL	LIRL
Marking	Basic	NA
Approach Aids	None	None
Instrument Approach Procedures	None	None
Services Provided: Self-serve 100LL fuel, aircraft tiedowns		

EMMETSBURG MUNICIPAL AIRPORT (EGQ)			
Airport NPIAS Classification . . .	GA		
FAA Asset Study Classification . .	NA		
Location from SPW.	22 nm ESE		
Elevation	1,206		
Weather Reporting	None		
ATCT	None		
Annual Operations	2,236		
Based Aircraft	10		
Enplaned Passengers	None		
			
Runways	13/31	4/22 (Turf)	17/35 (Turf)
Length (ft.)	3,401	2,537	2,157
Width (ft.)	60	120	150
Pavement Strength (pounds)			
SWL	29,000	NA	NA
DWL	NA	NA	NA
Lighting	MIRL	None	None
Marking	NPI	None	None
Approach Aids	PAPI-4, REILs	None	None
Instrument Approach Procedures	GPS, NDB	GPS, NDB	GPS, NDB
Services Provided: 100LL fuel, hangars and tiedowns			

ESTHERVILLE MUNICIPAL AIRPORT (EST)		
Airport NPIAS Classification . . .	GA	
FAA Asset Study Classification . .	Local	
Location from SPW	25 nm NE	
Elevation	1,319	
Weather Reporting	ASOS	
ATCT	None	
Annual Operations	9,490	
Based Aircraft	20	
Enplaned Passengers	None	
		
Runways	16/34	6/24 (Turf)
Length (ft.)	4,797	2,989
Width (ft.)	75	90
<i>Pavement Strength (pounds)</i>		
SWL	11,000	NA
DWL	NA	NA
Lighting	MIRL	NA
Marking	NPI	None
Approach Aids	PAPI-4, REILs	None
Instrument Approach Procedures	GPS	GPS
<i>Services Provided:</i> 100LL and Jet A fuel, aircraft maintenance, aircraft hangars		

SPIRIT LAKE MUNICIPAL AIRPORT (0F3)	
Airport NPIAS Classification . . .	NA
FAA Asset Study Classification . .	NA
Location from SPW.	14 nm NNE
Elevation	1,434
Weather Reporting	None
ATCT	None
Annual Operations	4,160
Based Aircraft	19
Enplaned Passengers	None
	
Runways	16/34
Length (ft.)	3,015
Width (ft.)	50
Pavement Strength (pounds)	
SWL	NA
DWL	NA
Lighting	LIRL
Marking	Basic
Approach Aids	REILs
Instrument Approach Procedures	None
Services Provided: Hangars and tiedowns	

SHELDON REGIONAL AIRPORT (SHL)	
Airport NPIAS Classification . . .	GA
FAA Asset Study Classification . .	Local
Location from SPW.	28 nm W
Elevation	1,419
Weather Reporting	AWOS
ATCT	None
Annual Operations	9,490
Based Aircraft	20
Enplaned Passengers	None
	
Runways	15/33
Length (ft.)	4,199
Width (ft.)	75
Pavement Strength (pounds)	
SWL	28,000
DWL	NA
Lighting	MIRL
Marking	NPI
Approach Aids	PAPI-2, REILs
Instrument Approach Procedures	GPS
Services Provided: 100LL and Jet A fuel, aircraft tiedowns and hangars, aircraft maintenance	

CHEROKEE COUNTY REGIONAL AIRPORT (CKP)		
Airport NPIAS Classification . . .	GA	
FAA Asset Study Classification. .	Local	
Location from SPW.	30 nm SW	
Elevation	1,226	
Weather Reporting	AWOS	
ATCT	None	
Annual Operations	11,315	
Based Aircraft	21	
Enplaned Passengers	None	
		
Runways	18/36	1/19 (Turf)
Length (ft.)	4,001	2,621
Width (ft.)	75	100
<i>Pavement Strength (pounds)</i>		
SWL	15,000	NA
DWL	NA	NA
Lighting	MIRL	None
Marking	NPI	None
Approach Aids	PAPI-2,REILs	None
Instrument Approach Procedures	GPS	GPS
<i>Services Provided:</i> 100LL and Jet A fuel, hangars and tiedowns, aircraft maintenance		

KEY	
ASOS	Automated Surface Observing System
ATCT	Air Traffic Control Tower
AWOS	Automated Weather Observing System
DWL	Dual Wheel Loading
FAA	Federal Aviation Administration
GPS	Global Positioning System
LIRL	Low Intensity Runway Lights
MIRL	Medium Intensity Runway Lights
N/A	Not Applicable
NDB	Non-Directional Radio Beacon
NM	Nautical Mile
NPIAS	National Plan of Integrated Airport Systems
NPI	National Provider Identifier
PAPI	Precision Approach Path Indicator
REIL	Runway End Identification Light
SWL	Single Wheel Loading



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ENVIRONMENTAL INVENTORY

The environmental inventory addresses existing conditions at Spencer Municipal Airport and its environs. This inventory is intended to help identify relevant environmental issues that should be considered during the preparation of the Airport Master Plan. The inventory is organized using the resource categories contained in FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures* (2015). Available information regarding the environmental conditions at the airport and within the surrounding area has been derived from internet resources, agency maps, and existing literature. A comprehensive list of the resources is included in this section.

AIR QUALITY

The concentration of various pollutants in the atmosphere describes the local air quality. The significance of a pollution 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 (O₃), carbon monoxide (CO), sulfur dioxide (SO₂), nitrogen dioxide (NO₂), coarse particulate matter (PM₁₀), fine particulate matter (PM_{2.5}), and lead (Pb).

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

Clay County is designated as an attainment area for all federal criteria pollutants.²

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 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 1973 *Endangered Species Act* (ESA). The ESA was put into place to protect animal or plant species whose populations are threatened by human activities. Along with the FAA, the USFWS reviews projects to determine if a significant impact to protected species will result in the implementation of a proposed project. Significant impacts occur when the 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.

According to the USFWS Information for Planning and Consultation (IPaC) report, there are three species federally listed as threatened which have the potential to occur in the vicinity of the airport, identified in **Table 1J** below. The IPaC report notes that habitat for these species is not found on airport property.

² U.S. Environmental Protection Agency *Green Book* – State of Iowa (https://www3.epa.gov/airquality/green-book/anayo_ia.html); December 2019.

**TABLE 1J | Federally Listed Endangered Species
Spencer Municipal Airport – Clay County, Iowa**

Common Name (<i>Scientific Name</i>)	Federal Status	Habitat
Mammal		
Northern long-eared bat (<i>Myotis septentrionalis</i>)	Threatened	The northern long-eared bat hibernates in areas of consistent temperature and high humidity with little air movement, typically caves and mines. During the summer, this bat roosts singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. The range of the northern long-eared bat is eastern and northcentral United States, including Canada. ¹
Flowering Plants		
Prairie bush-clover (<i>Lespedeza leptostachya</i>)	Threatened	The prairie bush clover is native to the tall-grass prairie region in four midwestern states of the upper Mississippi River Valley, Iowa included. ²
Western prairie fringed orchid (<i>Platanthera praeclara</i>)	Threatened	The western prairie fringed orchid occurs most often in mesic to wet unplowed tall-grass prairies and meadows. ³

¹ <https://www.fws.gov/midwest/endangered/mammals/nleb/nlebFactSheet.html>

² <https://www.fws.gov/midwest/Endangered/plants/prairieb.html>

³ <https://www.fws.gov/midwest/Endangered/plants/prairief.html>

Source: U.S. Fish and Wildlife Service: Information for Planning and Consulting (<https://ecos.fws.gov/ipac/>); January 2020.

An additional federal law that may be applicable to the airport is the *Migratory Bird Treaty Act* (MBTA), which prohibits activities that would harm migratory birds, their eggs, or nests. Birds protected under the MBTA may nest, winter, or migrate throughout the area, including those protected by the ESA. Under the requirements of the MBTA, all project proponents are responsible for complying with the appropriate regulations protecting birds when planning and developing a project. The IPaC report lists two migratory bird species that could be present at the airport, identified in **Table 1K**.

**TABLE 1K | Birds Protected Under the *Migratory Bird Treaty Act*
Spencer Municipal Airport – Clay County, IA**

Common Species Name	Scientific Name	Breeding Season
Buff-breasted sandpiper	<i>Calidris subruficollis</i>	Breeds elsewhere
Lesser yellowlegs	<i>Tringa flavipes</i>	Breeds elsewhere

Source: U.S. Fish and Wildlife Service: Information for Planning and Consulting (<https://ecos.fws.gov/ipac/>); January 2020.

COASTAL RESOURCES

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

Spencer Municipal Airport is located approximately 290 miles southwest from Lake Superior, the nearest U.S. protected coastal area. Therefore, the airport is not located within a coastal zone. The closest National Marine Sanctuary is Thunder Bay National Marine Sanctuary, located in northwestern Lake Huron within the Great Lakes region³, sited over 560 miles northeast of the airport.

CLIMATE

The EPA's *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2017*, found that the transportation sector, which includes aviation, accounted for 28.9 percent of U.S. greenhouse gas (GHG) emissions in 2017. Of this, the aviation sector contributed 175.0 million metric tons (MMT) of carbon dioxide equivalent (CO₂e), or nearly 9.4 percent of all transportation emissions.^{4, 5} Transportation sources include cars, trucks, ships, trains, and planes. Most GHGs from transportation sources are CO₂ emissions resulting from the combustion of petroleum-based products in internal combustion engines. Relatively insignificant amounts of methane (CH₄), hydrofluorocarbon (HFC), and nitrous oxide (N₂O) are emitted during fuel combustion. From 1990 to 2017, total transportation emissions increased. The upward trend is largely due to increased demand for travel; however, much of this travel was done in passenger cars and light-duty trucks. In addition to transportation-related emissions, **Figure 1** shows all 2017 GHG emissions sources in the U.S.

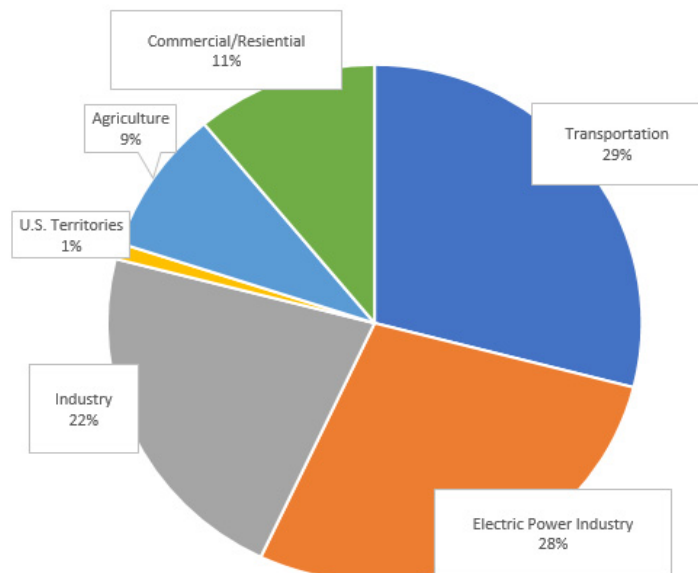


Figure 1 - 2017 Sources of Greenhouse Gas Emissions in the U.S.
Source: U.S. EPA (2019)

Increasing concentrations of GHGs can affect global climate by trapping heat in the Earth's atmosphere. Scientific measurements have shown that Earth's climate is warming with concurrent impacts, including warmer air temperatures, rising sea levels, increased storm activity, and greater intensity in precipitation events. This climate change is a global phenomenon that can also have local impacts.⁶ GHGs, such as water vapor (H₂O), carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and ozone (O₃), are both naturally occurring and anthropogenic (man-made).

³ National Oceanic and Atmospheric Administration National Marine Sanctuaries (<https://thunderbay.noaa.gov/about/welcome.html>); January 2020.

⁴ Aviation activity consists of emissions from jet fuel and aviation gasoline consumed by commercial aircraft, general aviation, and military aircraft.

⁵ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2017, Table 2-13 (<https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2017>); December 2019.

⁶ Intergovernmental Panel on Climate Change *AR5 Synthesis Report: Climate Change 2014* (<https://www.ipcc.ch/>)

Research has also shown a direct correlation between fuel combustion and GHG emissions. GHGs from anthropogenic sources include CO₂, CH₄, N₂O, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆). CO₂ is the most important anthropogenic GHG because it is a long-lived gas that remains in the atmosphere for up to 100 years.

In 2010, and later updated in 2016, the Council on Environmental Quality issued the *Federal Greenhouse Gas Accounting and Reporting Guidance* (Federal Protocol).⁷ The Federal Protocol, drafted in response to E.O. 13514,⁸ *Federal Leadership in Environment, Energy, and Economic Performance*, and E.O. 13693, *Planning for Federal Sustainability*,⁹ is the guide for the federal government on official GHG calculation and reporting. As outlined in FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, the Federal Protocol sets standards for federal agencies, such as FAA and FAA actions, to report GHGs in a standard metric. The Federal Protocol recommends the following considerations:

1. Potential effects of a proposed federal action or alternatives on climate change as indicated by GHG emissions.
2. The implications of climate change and environmental impacts of a proposed action or alternative.

The impacts of GHG emissions on climate are generally addressed with individual actions through National Environmental Policy Act (NEPA) requirements of a Documented Categorical Exclusion (CatEx), Environmental Assessment, or Environmental Impact Statement.

Information regarding the climate in the City of Spencer, including wind, temperature, and precipitation, can be found earlier in Chapter One.

DEPARTMENT OF TRANSPORTATION ACT, SECTION 4(f)

Section 4(f) of the DOT Act, which was recodified and renumbered as Section 303(c) of 49 United States Code (USC), provides that the Secretary of Transportation will not approve any program or project that requires the use of any publicly or privately owned land from a historic site, public parks, 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.

Table 1L summarizes the nearest properties of each type that may be protected under Section 4(f) of the DOT Act:

⁷ Council of Environmental Quality *Federal Greenhouse Gas Accounting and Reporting Guidance* (<https://www.sustainability.gov/resources.html>); January 17, 2016.

⁸ Executive Order 13514, *Federal Leadership in Environment, Energy, and Economic Performance* was revoked by Executive Order 13831 May 17, 2018.

⁹ Executive Order 13693 *Planning for Federal Sustainability*. 80 *Federal Register* 15869, March 19, 2015.

**TABLE 1L | Department of Transportation Section 4(f) Resources
Spencer Municipal Airport – Clay County, IA**

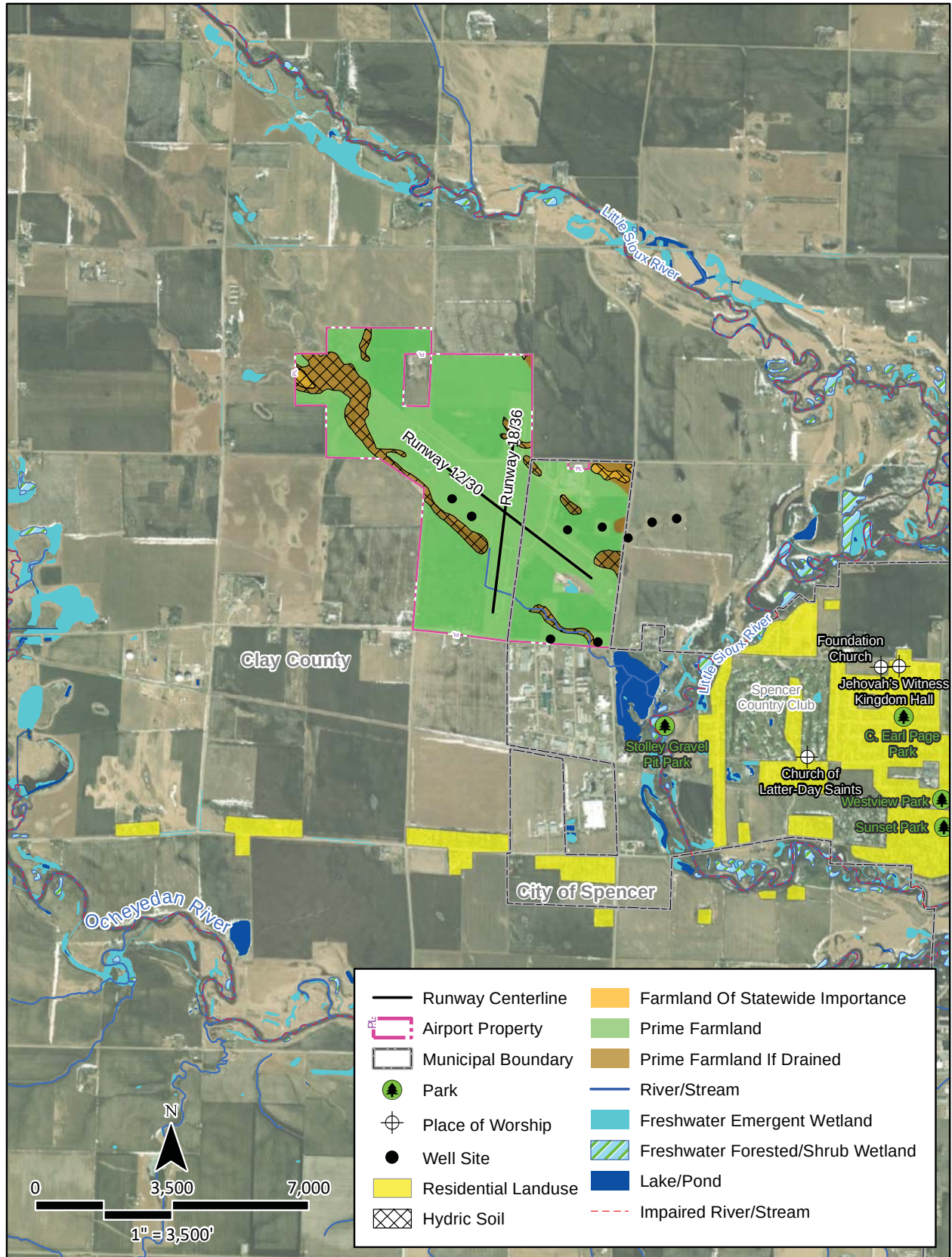
Facility	Distance from Airport (miles)	Direction from Airport
National Register of Historic Places		
Little Sioux River Bridge	1.0	East
Adams-Higgins House	2.4	Southeast
Grand Avenue Historic Commercial District	2.4	Southeast
National Recreation Area		
Mississippi National River Recreation Area	152.9	Northeast
Wilderness Area		
Fort Niobrara Wilderness Area	262.3	Southwest
Wildlife Refuge		
Bob Howe – Thunder Bridge Wildlife Refuge	1.3	Southeast
Ocheyedan River State Game Refuge	2.3	Southwest
Union Slough National Wildlife Refuge	51.7	Northeast
Parks		
Stolley Gravel Pit Park	0.1	Southeast
Yellowthroat Wildlife Area	0.8	East
C. Earl Page Park	1.5	East
Westview Park	1.8	Southeast
Sunset Park	1.9	Southeast
Tuttle March Area	3.9	Northwest
Scharnberg County Park	4.3	West

Sources: National Register of Historic Places; United States Fish and Wildlife Service; Recreation.gov; Google Earth Aerial Imagery (dated July 25, 2016); Coffman Associates analysis

FARMLANDS

Under the *Farmland Protection Policy Act (FPPA)*, federal agencies are directed to identify and take into account 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 or unique, or of state or local importance as determined by the appropriate government agency, with concurrence by the Secretary of Agriculture.

Information obtained from the Natural Resource Conservation Service’s (NRCS) Web Soil Survey (WSS) indicates that soils indicative of important farmlands are present throughout the airport property. The airport has soils classified as either “prime farmland,” “prime farmland if drained,” or “prime farmland of statewide importance.” According to the NRCS WSS, less than one percent of the airport is not considered prime farmland. **Table 1M** below breaks down the ratio of each soil type and is depicted in **Exhibit 1J**.



ESRI Basemap Imagery (2016), U.S. Department of Agriculture, U.S., Geological Survey, Environmental Protection Agency.

TABLE 1M | Farmland Classification
Spencer Municipal Airport – Clay County, IA

Farmland Classification	Acres of Farmland	Percent of Airport
Prime Farmland	809.2	87.0%
Prime Farmland if Drained	103.6	11.1%
Farmland of Statewide Importance	9.2	1.0%
Not Prime Farmland	8.1	0.9%
Total	930.1	100.0%

Source: U.S. Department of Agriculture Natural Resources Conservation Service Web Soil Survey (<https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>); January 2020.

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 EPA's *EJSCREEN*, there are no Superfund or brownfield sites within five miles of the airport.¹⁰

The Spencer Sanitation Department operates a solid waste transfer station facility along 340th Street, approximately 0.20 miles southeast of the airport.

Located approximately 350 feet south of Runway 12-30 are two depressed storage areas of lime sludge originating from the Spencer water treatment facility. The cell closest to the runway is full and no longer accepting sludge material. In 2005, a second cell was opened alongside the first to continue accepting deposits.

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 the proposed project causes an adverse effect on a property which has been identified (or is unearthed during construction) as having historical, architectural, archaeological, or cultural significance.

Table 1N lists those properties identified on the National Register of Historic Places (NRHP) within the City of Spencer, IA.

¹⁰ U.S. Environmental Protection Agency *EJSCREEN* (<https://ejscreen.epa.gov/mapper/>); December 2019.

**TABLE 1N | Properties on the National Register of Historic Places
Spencer Municipal Airport – Clay County, IA**

Historic Resource	Year Constructed	Distance from Airport (miles)	Direction from Airport
Little Sioux River Bridge	Approximately 1900	1.0	East
Adams-Higgins House	1884	2.4	Southeast
Grand Avenue Historic Commercial District	Late 19 th Century/ Early 20 th Century	2.4	Southeast
North Grand Avenue Residential Historic District	Late 19 th Century/ Early 20 th Century	2.4	Southeast
Clay County Courthouse	1901	2.5	Southeast
Spencer High School and Auditorium	1913	2.8	Southeast

Source: National Park Service – National Register of Historic Places (<https://www.nps.gov/subjects/nationalregister/index.htm>); February 2020.

The airport conducted a building inventory to determine the approximate age of existing structures on airport property. In order to be considered for NRHP listing, buildings, structures, or places at must be at least 50 years old. **Table 1P** below identifies the buildings and structures on airport property constructed prior to 1980. At this time, none of these structures are listed on the NRHP.

**TABLE 1P | Airport Structures Constructed Prior to 1980
Spencer Municipal Airport – Clay County, IA**

Building Name	Approximately Year Constructed	Approximate Age of Building (Years)	Notes
Orange Hangar	1942	78	Orange Quonset Hangar
Airport Terminal	1942	78	Office Building/Meeting room
Rotating Beacon Tower	1942	78	95-foot lattice tower

Source: Onsite building inventory by Spencer Municipal Airport (July 2020)

LAND USE

As previously discussed and depicted on **Exhibit 1B**, primary land uses around the airport include both agricultural and industrial uses. The airport is located in both the City of Spencer, IA city limits and within unincorporated Clay County.

Height Regulations. Airport height regulations are outlined in Title 9, Chapter 15 of the *City of Spencer City Code*¹¹, also known as the *Northwest Iowa Regional Airport Height Regulations Ordinance* (height regulations). The purpose and intent of these regulations are:

- to prevent the construction of airspace obstructions to the airport;
- to minimize the hazards and conflicts with the airport; and
- to address federal regulations regarding Part 77 airspace protections,¹² along with other federal and state laws which regulate hazards to air navigation.

¹¹ *City of Spencer City Code*, Chapter 15, Title 9, *Northwest Iowa Regional Airport Height Regulations Ordinance* (October 17, 1977, Ordinance 210; amended March 1, 2010, Ordinance 697)

¹² 14 CFR Part 77 – *Safe, Efficient Use, and Preservation of the Navigable Airspace* (www.faa.gov)

Lands subject to the height regulations are located within identified protected airport zones de-fined in the City of Spencer City Code. Within these zones, no structure is to be erected, altered, or maintained, and no tree permitted to grow to heights provided in Title 9, Chapter 15 of the City Code. The airport zones are as follows:

- Approach Surface Zone
- Inner Approach Surface Zone
- Runway with a Precision Instrument Approach Zone
- Runway Protection Zone (RPZ)
- Runway 30 and Runway 36 Instrument Approach Zone
- Transitional Zones
- Horizontal Zone
- Conical Zone
- Primary Surface Zone

Airport height limitations within Clay County are outlined in Section 16.10: Airport Height Limitations (height limitations) of the *Clay County, Iowa 2011 Zoning Ordinance and Subdivision Regulations*.¹³ The height limitations apply specifically to the Spencer Municipal Airport and are intended to address development within airport zones referenced below. The code will not permit any structure to be constructed, altered, or maintained, and no tree allowed to grow to a height in excess of the maximum height determined for each zone established in the code. Zones established by the height limitations code include:

- Primary Surface Zone
- Approach Zone
- Transitional Zone
- Horizontal Zone
- Conical Zone

Use Restrictions. Both Title 9, Chapter 15 of the *City of Spencer City Code* and Section 16.10 of the *Clay County 2011 Zoning Ordinance and Subdivision Regulations* establish similar use restrictions within the aforementioned airport zones. Prohibited uses include any that create electrical interference with navigational aids or radio communication between the airport and aircraft, make it difficult for pilots to distinguish between airport lights and others, create glare for pilots, impair visibility in the vicinity of the airport, create wildlife hazards, or cause any danger or interfere with the landing, takeoff, or maneuvering of aircraft using the airport.

Other use restrictions described in Title 9, Chapter 15 of the *City of Spencer City Code* include:

- Land uses within the RPZ are generally restricted to agricultural uses, other uses that will not involve the congregation of people, or other uses/structures that cause obstructions. Land use criteria within the RPZ include:

¹³ *Clay County, Iowa 2011 Zoning Ordinance and Subdivision Regulations*, Article XVI Supplemental District Regulations (May 17, 2011; Resolution 2011-21)

- Permitted uses within the RPZ cannot cause wildlife hazards, must be located outside the runway object free area, and will not interfere with navigational aids.
- Land uses prohibited in the RPZ include residential and assembly uses, such as places of worship, schools, hospitals, office buildings, and shopping areas.
- Unless approved by the FAA and the City of Spencer, no structures are to be constructed within the building restriction line.¹⁴
- Use restrictions don't apply to airport operations.

NATURAL RESOURCES AND ENERGY SUPPLY

E.O. 13423, *Strengthening Federal Environmental, Energy, and Transportation Management* instructs federal agencies to advance the nation's energy security and environmental performance by achieving specified goals. Natural resources and energy supply provide an evaluation of a project's consumption of natural resources. It is the policy of FAA Order 1053.1, *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.

Airport fuel supply is discussed earlier in this chapter under "Fuel Storage."

NOISE AND NOISE-COMPATIBLE LAND USE

Federal land use compatibility guidelines are established under 14 Code of Federal Regulations (CFR) Part 150 (Part 150), *Airport Noise Compatibility Planning*. According to 14 CFR Part 150, residential land uses and schools are noise-sensitive land uses that are not considered compatible with a 65 decibel (dB) Day-Night Average Sound Level (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 also needs to 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 (FAA 2015).

Noise-sensitive land uses near the airport consist primarily of residential uses to the south and east. Additional noise-sensitive land uses within the vicinity of the airport are outlined in **Table 1Q** below.

¹⁴ The building restriction line (BRL) is defined as "a line which identifies suitable building area locations on airports. The BRL should encompass the runway protection zones, the runway object free area, the runway visibility zones, NAVAID critical area required for terminal instrument procedures, and areas addressed under 14 CFR Part 77(C) airport imaginary surfaces to appoint where the surfaces obtain a height of at least thirty-five feet (35 ft) above the primary surface." (Section 9-15-2 of Title 9, Chapter 15 of the *City of Spencer City Code*)

TABLE 1Q | Noise-Sensitive Land Uses the Vicinity of the Airport
Spencer Municipal Airport – Clay County, Iowa

Facility	Distance from Airport (miles)	Direction from Airport
Schools/Child Care Centers		
WF Johnson Elementary School	2.0	Southeast
Lincoln Elementary School	2.5	Southeast
Fairview Elementary School	2.8	Southeast
Old Spencer Middle School	3.2	Southeast
Spencer High School	3.3	Southeast
Places of Worship		
Foundation Church	1.3	Southeast
Jehovah's Witness Kingdom Hall	1.4	Southeast
Church of Latter-day Saints	1.4	Southeast
Hospitals/Health Care/Senior Care Facilities		
Longhouse Care Center	1.9	Southeast
Beehive Homes of Spencer	2.4	East
Cobble Creek Assisted Living	2.4	East
Abben Cancer Center	2.5	Southeast
Spencer Hospital	2.5	Southeast
Hospice of Northwest Iowa	2.6	Southeast
St. Croix Hospice	3.3	Southeast
Parks/Recreational Facilities		
Stolley Gravel Pit Park	0.1	Southeast
Yellowthroat Wildlife Area	0.8	East
C. Earl Page Park	1.5	East
Westview Park	1.8	Southeast
Sunset Park	1.9	Southeast
Tuttle March Area	3.9	Northwest
Scharnberg County Park	4.3	West

Sources: Google Earth Aerial Imagery (August 28, 2018); Coffman Associates analysis

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

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).

Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental, and commercial operations or policies. Meaningful involvement¹⁵ ensures that:

¹⁵ Requirements for meaningful public involvement by minority and low-income populations are addressed in Paragraph 2-5.2.b of FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*.

- people have an opportunity to participate in decisions about activities that may affect their environment and/or health;
- the public's contribution can influence the regulatory agency's decision;
- their concerns will be considered in the decision-making process; and
- the decision-makers seek out and facilitate the involvement of those potentially affected.

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 EPA's *EJSCREEN* online tool identifies the presence of environmental justice areas within the airport environs. The population within five miles of the airport is approximately 11,550, of which 34 percent of the population is considered low income and eight percent is considered a minority population. Likewise, according to *EJSCREEN*, seven percent of the population is under the age of five within a five-mile radius of the airport.

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 include any light that originates from a source into the surrounding environment, such as airfield and apron flood lighting, navigational aids, parking lot illumination, and roadway lighting. Glare is a type of light emission that occurs when light is reflected off a surface, including solar panels or window glass.

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).

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, 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, or deserts, etc.

Light Emissions. Light emission impacts typically relate to the extent to which any light or glare result 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.

Lighting in the vicinity of the airport and within the City of Spencer city limits is addressed in Title 9, Chapter 15: *Airport Height Regulations*. Certain land uses are prohibited, includes those uses which could imitate airport lighting, such as “all lights or illumination used in conjunction with streets, parking, signs or use of land and structures shall be arranged and operated in such a manner that is not misleading or dangerous to aircraft operating from the [sic] Northwest Iowa Regional airport, or in the vicinity thereof;...”

Section 16.10: *Airport Height Limitations* of the *Clay County, Iowa Zoning Ordinance and Subdivision Regulations*¹⁶ address lighting in the immediate vicinity of the airport under county jurisdiction. The language in Section 16.10 is identical to that found in Chapter 15 of the City of Spencer’s *Zoning Ordinance*.

Visual Resources and Visual Character. Visual resources and visual character generally relate to the aesthetic quality of a region as it relates to development, construction, and demolition. Impacts considered to the visual resource and character of area include whether there is the potential to affect the nature of the character of an area, whether there is potential contrast, and whether a view will be blocked or otherwise obstructed. Local jurisdictions typically will address visual resources and character in their comprehensive plans and ordinances.

The City of Spencer’s Zoning Ordinance does not address visual resources or character. According to the City of Spencer’s Comprehensive Land Use Plan (2017)¹⁷, the overall goal of the comprehensive plan is to preserve the character of developed areas while designing future land uses.

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 (WOTUS), including adjacent wetlands, 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).¹⁸

According to USFWS, which manages the National Wetlands Inventory on behalf of all federal agencies, there is a riverine and freshwater emergent wetlands on airport property, although it is important to note that these areas were identified as wetlands based on a review of color infrared imagery from 2002.

¹⁶ Clay County, IA Zoning Department *Clay County, Iowa Zoning Ordinance and Subdivision Regulations* (2011) (<https://www.co.clay.ia.us/offices/zoning/index.htm>); December 2019.

¹⁷ City of Spencer, IA *2017 Comprehensive Land Use Plan* (<http://spenceriowacity.com/government/planning-department/>)

¹⁸ National Resources Conservation Service – U.S. Department of Agriculture (https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/use/hydric/?cid=nrcs142p2_053961); January 2020.

Upon review of Google Earth Imagery, dated July 26, 2016, the riverine appears to be an engineered channel designed to drain water from the runway and direct it off the airport into Stolley Pond at the southeast corner of West 18th Street/340th Street and 32nd Avenue West.

Based on information from the NRCS-WSS, hydric soils are present on airport property. The hydric soils are identified on **Exhibit 1J**.

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. Based on a review of Federal Emergency Management Agency (FEMA) Community Panel No. 190857-0001A (effective date June 7, 1977), it indicates that the south end of Runway 18-36 is within a Special Flood Hazard Area, Zone A, which is within the 100-year flood plan and is subject to flooding. Since the FEMA FIRM Map is not available for digital download, **Exhibit 1K** is provided on the county website to identify the 100-year and 500-year floodplains around the City of Spencer.¹⁹ The airport is located northwest of the intersection of West 18th Street/340th Street and 200th Avenue, at the west end of the city.

Surface Waters. The CWA provides the authority to establish water quality standards, control discharges, develop waste treatment management plans and practices, prevent or minimize the loss of wetlands, and regulate other issues concerning water quality. Water quality concerns related to airport development are most often associated with the potential for surface runoff and soil erosion, as well as the storage and handling of fuel, petroleum products, solvents, etc.

In 1972, Congress mandated (under the CWA) the National Pollutant Discharge Elimination System (NPDES). This program addresses non-agricultural stormwater discharges, and through the use of NPDES permits, certain procedures are required to prevent contamination of water bodies from stormwater runoff. The EPA can delegate this permitting authority to individual states. In Iowa, the Iowa Department of Natural Resources (IDNR) administers the NPDES program. Under the state's NPDES program, all facilities that discharge pollutants from any point source into a WOTUS or waters of the state are required to obtain an NPDES permit. The airport operates under the NPDES General Permit No. 1 issued by the IDNR, valid through February 2023.²⁰ The EPA *EJSCREEN* indicates that there are three water bodies defined under Section 303(d) of the CWA as impaired. These water bodies are listed in **Table 1R** below.

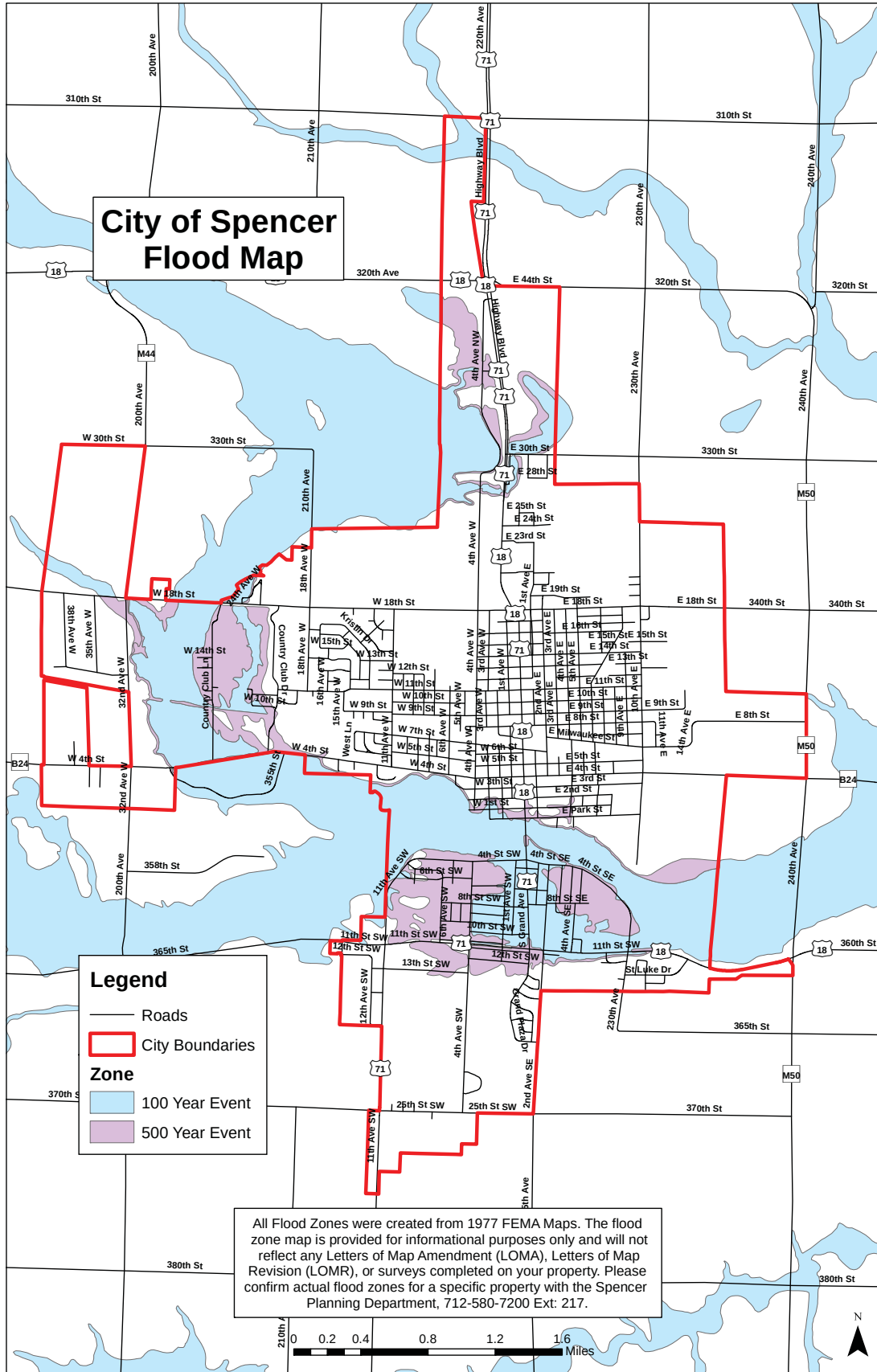
TABLE 1R | Impaired Waters under Section 303(d) of the *Clean Water Act*
Spencer Municipal Airport – Clay County, Iowa

Water Body	Source of Contamination	Distance from Airport (miles)	Direction from Airport
Little Sioux River	indicator bacteria	approximately 1.0	East and North
Stony Creek	cause unknown – biological integrity	approximately 2.8	West
Ocheyedan River	indicator bacteria	approximately 2.6	South and West

Source: U.S. Environmental Protection Agency *EJSCREEN* (<https://ejscreen.epa.gov/mapper/>); December 2019.

¹⁹ Clay County, Iowa Zoning Department (<https://www.co.clay.ia.us/offices/zoning/>); February 2020.

²⁰ Iowa Department of Natural Resources National Pollutant Discharge Elimination System General Permit No. 1 effective March 1, 2018 through February 28, 2023.



Source: Clay County, Iowa Zoning Department

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 current and future generations. The closest designated Wild and Scenic River is a portion of the Missouri River, located approximately 82 miles southwest of the airport.²¹

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 Rivers Act*, directing federal agencies to consider potential wild and scenic rivers in the comprehensive planning process.²² The river closest to the airport, which appears on the NRI, is a segment of the Des Moines River-West Fork, located approximately 27.6 miles 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 to 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. The airport is underlain by rock that is minimally permeable but may contact locally productive aquifers.²³ There is no sole source aquifer near the airport.²⁴

Numerous wells have been identified on airport property. These wells are depicted on **Exhibit 1J**.

ENVIRONMENTAL INVENTORY SOURCES

A variety of resources were used during the inventory process. The following listing reflects a compilation of these sources.

U.S. Environmental Protection Agency, Currently Designated Nonattainment Areas for All Criteria Pollutants: https://www3.epa.gov/airquality/greenbook/anayo_ia.html

U.S. Environmental Protection Agency, *EISCREEN*: <http://www.epa.gov/ejscreen>

U.S. Environmental Protection Agency Sole Source Aquifers: <https://epa.maps.arcgis.com/>

FEMA Flood Map Service Center:

<https://msc.fema.gov/portal/search?AddressQuery=waco%20regional%20airport#searchresultsanchor>

Natural Resources Conservation Service, Web Soil Survey:

<http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>

²¹ National Wild and Scenic Rivers System (<https://rivers.gov/wsr-act.php>); December 2019.

²² National Park Service – Nationwide Rivers Inventory (<https://www.nps.gov/subjects/rivers/nationwide-rivers-inventory.htm>); December 2019.

²³ U.S. Geological Survey – Groundwater Information (<https://water.usgs.gov/ogw/aquifer/101514-wall-map.pdf>); December 2019.

²⁴ U.S. Environmental Protection Agency - Sole Source Aquifers (<https://epa.maps.arcgis.com/>); December 2019.

U.S. Fish and Wildlife Service Information, Planning and Consultation System:
<https://ecos.fws.gov/ipac/>

U.S. Fish and Wildlife Service National Wetlands Inventory:
<http://www.fws.gov/wetlands/Data/Mapper.html>

USGS National Map: <http://nationalmap.gov/>

Chapter Two

Forecasts



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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 Spencer Municipal Airport (SPW) will focus on demand indicators, such as based aircraft, based aircraft fleet mix, operations, and peaking operational periods.

The Federal Aviation Administration (FAA) has oversight responsibility to review and approve aviation forecasts developed in conjunction with airport planning studies. In addition, aviation activity forecasts may be an important input to future benefit-cost analyses associated with airport development, and FAA reviews these analyses when federal funding requests are submitted.

The FAA will review individual airport forecasts with the objective of comparing them to its *Terminal Area Forecast* (TAF) and the *National Plan of Integrated Airport Systems* (NPIAS). Even though the TAF is updated annually, in the past there was almost always a disparity between the TAF and master planning forecasts. This was primarily because the TAF forecasts did not consider local conditions or recent trends. In recent years, however, the FAA has improved its forecast model to be a demand-driven forecast for aviation services based upon local and national economic conditions, as well as conditions within the aviation industry.

As stated in FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS), 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.

The forecast process for an airport master plan consists of a series of basic steps that vary in complexity depending on 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 evaluation and documentation of the results. FAA Advisory Circular (AC) 150/5070-6C, *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:** Follow guidance in FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems*. In part, the Order indicates that forecasts should not vary significantly (more than 10 percent) from the TAF. When there is a greater than 10 percent variance, supporting documentation should be supplied to the FAA. (The FAA has provided additional guidance indicating forecasts are consistent with the TAF when they differ by less than 10 percent in the first five years, and less than 15 percent in the 10-year period.)

The following forecast analysis for SPW was produced following these basic guidelines. Existing forecasts are examined and compared against current and historic activity. The historical 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 SPW that will permit the City to make planning adjustments as necessary to maintain a viable, efficient, and cost-effective facility.

The potential for commercial service demand has also been evaluated, based on SPW's historic commercial operations and enplanements, as well as those of airports in similar markets.

It is important to note that 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, forecasts are to serve only as guidelines, and planning must remain flexible enough to respond to a range of unforeseen developments.

One notable influence has been the COVID-19 pandemic, which struck late in the preparation of this planning document. Day-to-day aviation activity as a whole was significantly impacted during the health crisis. It is recognized that the suggested implementation timeframes for the long-term development this report outlines may be affected by the economic downturn associated with the pandemic. However, based upon the types of aircraft using SPW throughout its long history, the proposed existing and ultimate design aircraft to be presented are still considered reasonable and valid for planning purposes.

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.

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 historic 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.

It is important to note that one should not assume a high level of confidence in forecasts that extend beyond five years. Facility and financial planning usually require at least a 10-year purview 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.

NATIONAL AVIATION TRENDS AND FORECASTS

The forecasts developed for the airport must consider national, regional, and local aviation trends. The following section describes trends in aviation. This information is utilized both in statistical analysis and to aid the forecast preparer in making any manual adjustments to the forecasts as necessary.

NATIONAL TRENDS

Each year, the FAA updates and publishes a national aviation forecast. Included in this publication are forecasts for the large air carriers, regional/commuter air carriers, general aviation, and FAA workload measures. The forecasts are prepared to meet budget and planning needs of the FAA and to provide information that can be used by state and local authorities, the aviation industry, and the general public. The current edition when this chapter was prepared was *FAA Aerospace Forecasts – Fiscal Years 2019-2039*, published in February 2019. 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 Forecasts*.

Economic Environment

According to the FAA forecast report, as the economy continues to recover from the most serious economic downturn and slow recovery since the Great Depression, aviation will continue to grow over the long run. Fundamentally, demand for aviation is driven by economic activity. As economic growth picks up, so will growth in aviation activity. The FAA forecast calls for passenger growth over the next 20 years to average 1.9 percent annually. The uptick in passenger growth since 2014 will continue into 2019 spurred on by favorable economic conditions in the U.S. and the world. In 2018, oil prices averaged \$64 per barrel, but are projected to decline to \$61 in 2019. However, increases in oil prices are forecast to occur in the early 2020s, ultimately reaching \$98 per barrel by 2039.

Solid economic growth in 2018 in the U.S. and generally around the world is beginning to ease and will return to trend. Some obstacles that have been present in recent years remain, such as the uncertainty surrounding Brexit and the difficulties China faces with its economic slowdown. Additional potential headwinds for the global economy include a slowdown in global trade, political tensions in several countries, and economic downturns in Germany and Italy. While the U.S. economy is projected to moderate from the growth pace set in recent years, the economic expansion that has occurred since the Great Recession is the longest on record.

FAA General Aviation Forecasts

The FAA forecasts the fleet mix and hours flown for single engine piston aircraft, multi-engine piston aircraft, turboprops, business jets, piston and turbine helicopters, light sport, experimental, and others (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.

The long-term outlook for general aviation is stable. The FAA projects the active general aviation fleet to drop slightly from 212,875 aircraft in 2018 to 211,575 aircraft in 2039 – a difference of 1,300 aircraft. 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 FAA’s forecast.

In 2018, the FAA estimated there were 146,260 piston-powered aircraft in the national fleet. The total number of piston-powered aircraft in the fleet is forecast to decline by 0.9 percent from 2019-2039, resulting in 122,230 by 2039. This reflects a decline of -1.0 percent annually for single engine pistons and -0.4 percent for multi-engine pistons.

Total turbine aircraft are forecast to grow at an annual growth rate of 1.8 percent through 2039. The FAA estimates there were 31,880 turbine-powered aircraft in the national fleet in 2018, and there will be 46,085 by 2039. This includes annual growth rates of 1.3 percent for turboprops, 2.2 percent for business jets, and 1.6 percent for turbine helicopters.

While comprising a much smaller portion of the general aviation fleet, experimental aircraft, typically identified as home-built aircraft, are projected to grow annually by 0.9 percent through 2039. The FAA estimates there were 27,365 experimental aircraft in 2018, and these are projected to grow to 33,040 by 2039. Sport aircraft are forecast to grow 3.5 percent annually through the long-term, growing from 2,665 in 2018 to 5,555 by 2039. **Exhibit 2A** presents the historical and forecast U.S. active general aviation aircraft.

The FAA also forecasts total operations based upon activity at control towers across the U.S. Operations are categorized as air carrier, air taxi/commuter, general aviation, and military. General aviation operations, both local and itinerant, declined significantly with the 2008-2009 recession and subsequent slow recovery. Through 2039, total general aviation operations are forecast to grow 0.3 percent annually.

General Aviation Aircraft Shipments and Revenue

The 2008-2009 economic recession had a negative impact on general aviation aircraft production, and the industry has been slow to recover. Aircraft manufacturing declined for three straight years from 2008 through 2010. Since this time, aircraft manufacturing has stabilized and returned to growth. According to the General Aviation Manufacturers Association (GAMA), there is optimism that aircraft manufacturing will continue to show gains in the coming years, especially in the turbine aircraft market. **Table 2A** presents currently available historical data related to general aviation aircraft shipments.

**TABLE 2A | Annual General Aviation Airplane Shipments
Manufactured Worldwide and Factory Net Billings**

Year	Total	SEP	MEP	TP	J	Net Billings (\$millions)
1994	1,132	544	77	233	278	3,749
1995	1,251	605	61	285	300	4,294
1996	1,437	731	70	320	316	4,936
1997	1,840	1043	80	279	438	7,170
1998	2,457	1508	98	336	515	8,604
1999	2,808	1689	112	340	667	11,560
2000	3,147	1,877	103	415	752	13,496
2001	2,998	1,645	147	422	784	13,868
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	2,443	954	185	601	703	20,564
2019	2,658	1,111	213	525	809	23,515

SEP - Single Engine Piston; MEP - Multi-Engine Piston; TP - Turboprop; J - Turbofan/Turbojet

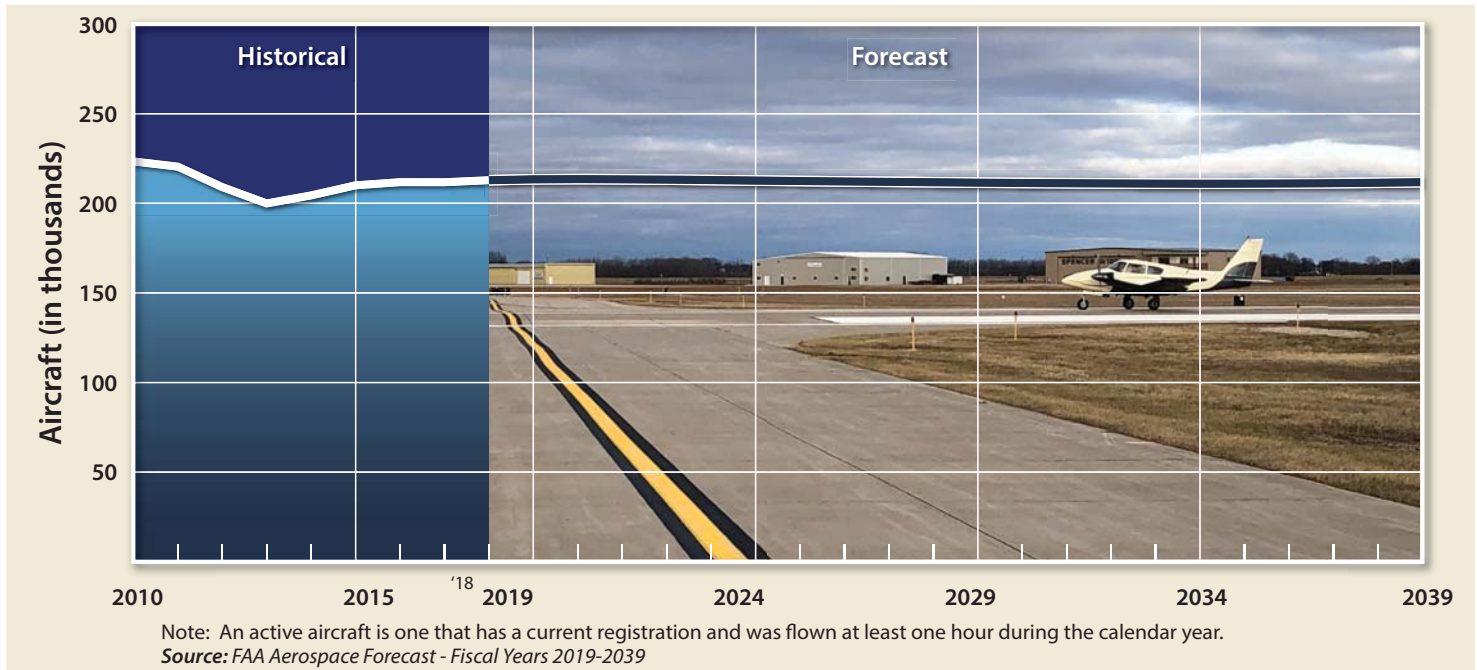
Source: General Aviation Manufacturers Association, *2019 Databook*

Worldwide shipments of general aviation airplanes have increased each of the last three years with a total of 2,658 units delivered around the globe, compared to 2,268 units in 2016. Worldwide general aviation billings were also highest since 2014. In 2019, \$23.515 billion in new general aviation aircraft were shipped as compared to \$20.564 billion in 2018. North America continues to be the largest market for general aviation aircraft and leads the way in the manufacturing of piston, turboprop, and jet aircraft. The Asian-Pacific region is the second largest market for piston-powered and turboprop aircraft.

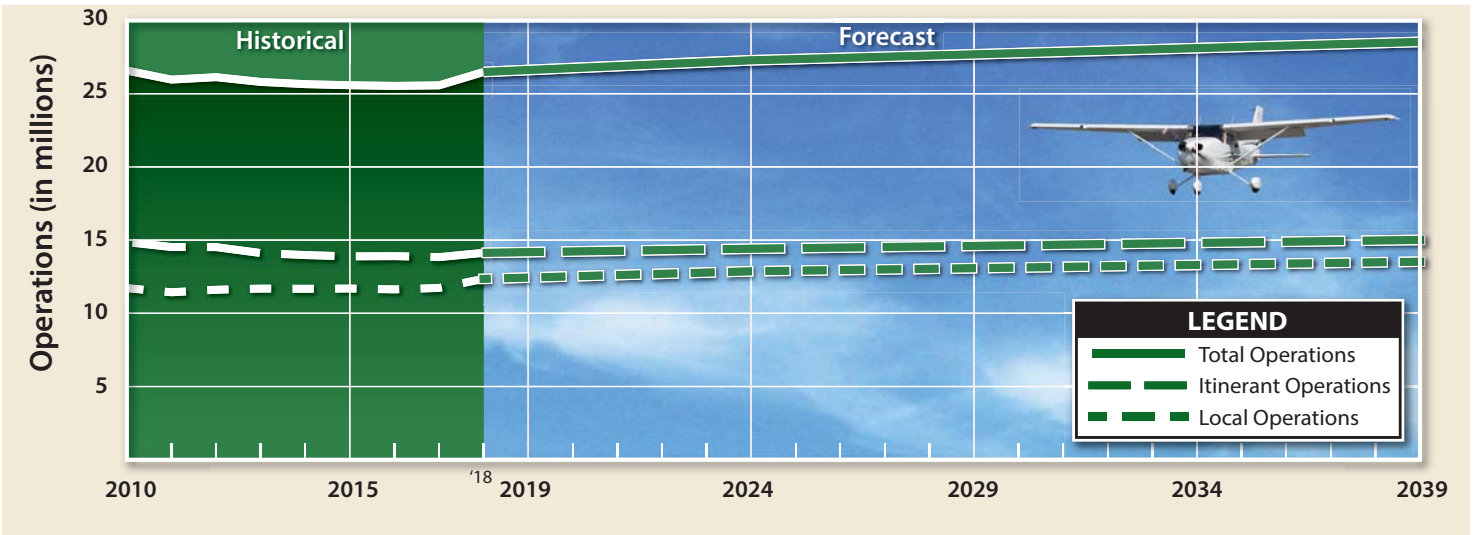
Business Jets: Business jet deliveries grew from 703 units in 2018 to 809 units in 2019, the most since 2009. The North American market accounted for 67.1 percent of business jet deliveries, which is a 2.0 percent increase in market share compared to 2018.

Turboprops: Turboprop shipments were down from 601 in 2018 to 525 in 2019. North America's market share of turboprop aircraft, however, increased by 0.5 percent in the last year. The Latin America and Middle East African markets also increased while the European and Asian-Pacific markets decreased their market share.

	2018 Estimate	2024	2029	2039	AAGR 2019-2039
Fixed Wing					
Piston					
Single Engine	129,885	123,145	116,360	105,195	-1.0%
Multi-Engine	13,040	12,805	12,575	12,085	-0.4%
Turbine					
Turboprop	9,925	10,135	10,770	12,810	1.3%
Turbojet	14,585	17,025	19,110	23,050	2.2%
Rotorcraft					
Piston	3,335	3,775	4,150	4,950	1.9%
Turbine	7,370	8,075	8,700	10,225	1.6%
Experimental					
	27,365	29,465	30,880	33,040	0.9%
Sport Aircraft					
	2,665	3,420	4,100	5,555	3.5%
Other					
	4,715	4,820	4,865	4,890	0.2%
Total Pistons	146,260	139,725	133,085	122,230	-0.9%
Total Turbines	31,880	35,235	38,580	46,085	1.8%
Total Fleet	212,885	212,665	211,510	211,800	0.0%

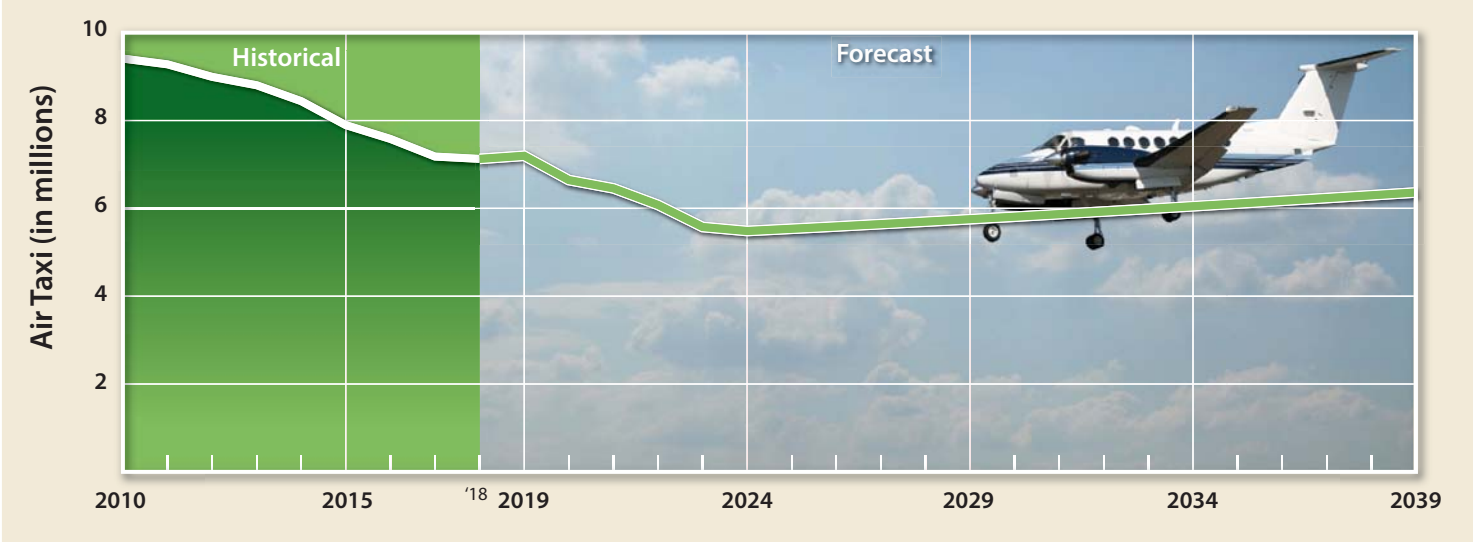


	2018 Estimate	2024	2029	2039	AAGR 2019-2039
Itinerant					
	14,130,000	14,412,000	14,606,000	15,012,000	0.3%
Local					
	12,354,000	12,870,000	13,081,000	13,526,000	0.3%
Total GA Operations	26,485,000	27,282,000	27,687,000	28,538,000	0.3%



U.S. AIR TAXI

	2018 Estimate	2024	2029	2039	AAGR 2019-2039
Air Taxi/Commuter Operations					
Itinerant	7,126,000	5,484,000	5,752,000	6,361,000	-0.6%



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Pistons: In 2018, piston airplane shipments grew to 1,111 units over 2017's shipment of 954 units. North America's market share of piston aircraft deliveries recovered from a 4.1 percent decline in 2018 with a 4.9 percent increase in 2019. The Asian-Pacific and Latin American markets experienced declines in market share during the past year.

RISKS TO THE FORECASTS

While the FAA is confident that its forecasts for aviation demand and activity can be achieved, this hinges on several factors, including the strength of the global economy, security (including the threat of international terrorism), and the level of oil prices. Higher oil prices could lead to further shifts in consumer spending away from aviation, dampening a recovery in air transport demand. In the long term, the FAA foresees a competitive and profitable industry characterized by increasing demand for air travel and airfares growing more slowly than inflation.

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. SPW is classified as a Regional General Aviation (GA) airport within the NPIAS, meaning that its primary role is to support regional economies with interstate and some long-distance flying. General aviation is a term used to describe a diverse range of aviation activities, which includes all segments of the aviation industry except commercial air carriers and the military. General aviation is the largest component of the national aviation system and 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, which 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 Regional GA airport, SPW'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

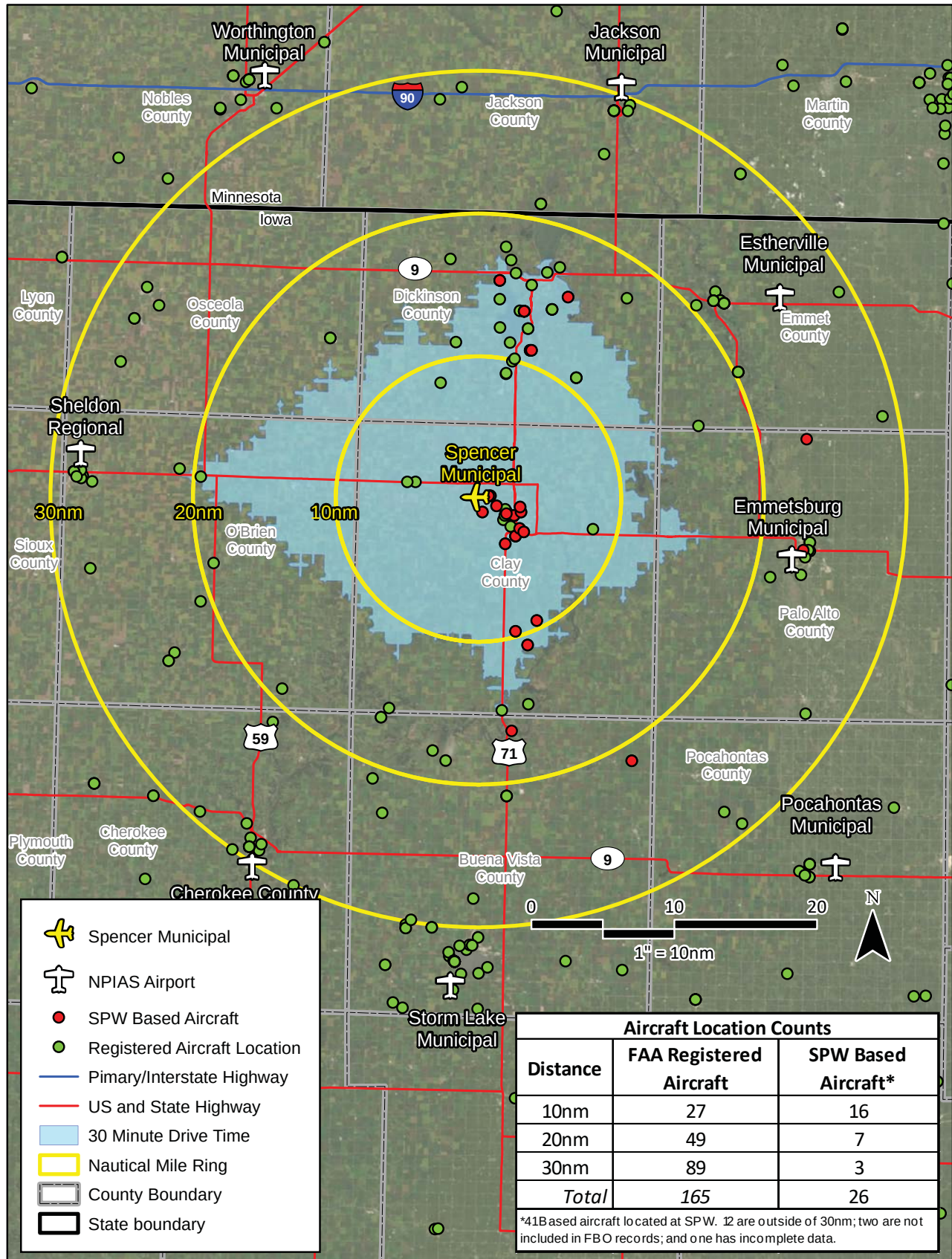
rule, an airport's service area can extend up to and beyond 30 miles. The proximity and level of general aviation services are largely a defining factor when describing the general aviation service area. A description of nearby airports was previously completed in Chapter One, as presented on Exhibit 1H. There are nine public-use airports within 30 nautical miles (nm) of SPW, with six of the more competitive airports detailed on the exhibit.

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 38 registered aircraft within a 30-minute drive time of SPW. The 30-minute drive time is centered on Clay County and extends out into a significant portion of Dickinson County and smaller portions of Osceola, O'Brien, and Palo Alto Counties. The registered aircraft data shows clusters of aircraft registered to addresses in Spencer and communities around Lake Okoboji, which are within the 30-minute drive time. Beyond this area but still within the 30 nm radius, other clusters of registered aircraft exist near Sheldon, Cherokee, Emmetsburg, and Estherville, which is reasonable as each of these communities has a public-use airport. Remaining registered aircraft are sporadically located throughout the region.

Within the 30 nm radius, Sheldon Regional Airport (SHL) and Estherville Municipal (EST) provide the highest level of service competition for SPW. SHL's single runway of 4,199 feet is shorter than that available at SPW, but the airport offers both Jet A and 100LL fuel, tiedowns and hangars, and aircraft maintenance. SHL's published instrument approaches visibility minimums of one-mile are higher than at SPW, which has ½-mile minimums. The visual approach aids available (PAPI-2) are not conducive to jet operations. EST offers a slightly longer runway at 4,797 feet, and its PAPI-4 system can be utilized by jets on visual approach to the airfield. The lowest approach minimums at the airport are one mile and there is a 2,989 turf crosswind runway is available. It is not anticipated that any of these facilities should significantly detract from the local demand that SPW can expect to experience.

The second demand segment to consider is itinerant aircraft operations. In most cases, itinerant aircraft operators will also elect to utilize airports nearer their intended destination. This, however, is highly dependent on the airport's capabilities to accommodate the aircraft and its operator. As a result, airports with better services and facilities are more likely to attract a larger portion of the region's itinerant aircraft operations. The other competing public-use airports within a 30 nm range have significantly shorter runways and limited general aviation services compared to SPW. SPW's facilities and available services provide it a competitive advantage over the other airports in the region, which can ultimately help generate greater potential for transient or itinerant traffic.

In summary, given the convenience of SPW for aircraft owners and pilots of Clay and Dickinson Counties, as well as regional competition from other public-use airports, the primary general aviation service area for SPW consists of Clay and Dickinson Counties. While Dickinson County is served by both Fuller Airport and Spirit Lake Municipal Airport, runway length and limited services at these two airports has made SPW attractive to some Dickinson County aircraft owners as well as many transient aircraft users visiting the Iowa Great Lakes. Outside of these counties, there are several other general airports in the region that are more convenient to users in the surrounding counties.



Source: FAA Registered Aircraft Database (2018)

SOCIOECONOMIC TRENDS

The socioeconomic conditions provide an important baseline for preparing aviation demand forecasts. Local socioeconomic variables, such as population, employment, and income, are indicators for understanding the dynamics of the community and can relate to local trends in aviation activity. Analysis of the demographics of the airport service area will give a more comprehensive understanding of the socioeconomic situations affecting the region which supports SPW. The following is a summary of the historical demographic trends for Clay County, as presented in Chapter One, as well as those for Dickinson County. Forecasts of these socioeconomic characteristics have also been included. Data has been sourced from Woods and Poole, *The Complete Economic and Demographic Data Source*, which is updated annually and is recognized by the Iowa State Data Center.

Table 2B summarizes historical and forecast population, employment, and income estimates for Clay and Dickinson Counties and the state of Iowa. The population of Clay County is projected to decrease by approximately 600 people between 2020 and 2040, resulting in a compound annual growth rate (CAGR) of -0.25 percent. However, employment in the county is projected to grow at 0.37 percent CAGR over the forecast period, turning around from the decline that occurred during the last two decades in this area. Per capita personal income (PCPI) is also projected to increase at 1.24 percent CAGR between 2020 and 2040. In Dickinson County, the population between 2020 and 2040 is expected to grow at a CAGR of 0.15 percent, or about 270 people. Employment and PCPI are also expected to rise, at CAGRs of 0.58 percent and 1.01 percent, respectively.

TABLE 2B | Socioeconomic History and Forecasts
Clay County, IA and State of Iowa

	HISTORIC				FORECAST			
	2000	2010	2020	CAGR 2000-2020	2025	2030	2040	CAGR 2020-2040
Clay County, IA								
Population	17,360	16,633	16,047	-0.39%	15,843	15,643	15,249	-0.25%
Employment	12,614	12,298	12,301	-0.13%	12,658	12,951	13,254	0.37%
Income (PCPI)	\$35,327	\$41,187	\$46,518	1.39%	\$50,285	\$53,890	\$59,531	1.24%
Dickinson County, IA								
Population	16,460	16,670	17,373	0.27%	17,619	17,796	17,889	0.15%
Employment	12,615	12,357	14,263	0.62%	14,814	15,301	16,014	0.58%
Income (PCPI)	39,993	46,007	\$54,297	1.54%	\$57,768	\$61,090	\$66,403	1.01%
State of Iowa								
Population	2,929,067	3,050,223	3,178,769	0.41%	3,230,704	3,276,838	3,342,825	0.25%
Employment	1,915,267	1,950,437	2,143,537	0.56%	2,239,890	2,328,420	2,467,796	0.71%
Income (PCPI)	\$35,195	\$39,858	\$46,553	1.41%	\$50,007	\$53,338	\$58,876	1.18%

CAGR: Compound annual growth rate

PCPI: Per capita personal income (\$2012)

Source: Woods and Poole, *The Complete Economic and Demographic Data Source*, 2019

Compared to the state of Iowa, the population of Clay County trails the state's growth by a full percentage point over the forecast period. Dickinson County's population growth also trails that of the state, but less significantly. Employment in both counties is expected to increase, along with the state, albeit

at a slower pace. PCPI is also projected to rise in both counties and the state, with income in Clay County outpacing Iowa's forecasted income growth of 1.18 percent and Dickinson County trailing the state's PCPI growth at 1.18 percent.

AVIATION FORECASTS

The following forecast analysis examines each of the aviation demand categories expected at SPW 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 2040. Forecasts for airport activities include the following:

- Based Aircraft
- Based Aircraft Fleet Mix
- General Aviation Operations
- Air Taxi and Military Operations
- Peaking Conditions
- Annual Instrument Approaches
- Critical Design 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.

FAA TERMINAL AREA FORECAST

On an annual basis, the FAA publishes the *Terminal Area Forecast* (TAF) for each airport included in the National Plan of Integrated Airport Systems (NPIAS). The TAF is a generalized forecast of airport activity used by FAA for internal planning purposes. It is available to airports and consultants to use as a point of comparison for development of local forecasts. **Table 2C** presents the *Terminal Area Forecast's* data for SPW.

As presented in the table, the TAF projects general aviation activity at the airport to remain static over the next 20 years. Given that there is currently no commercial service activity at SPW, the TAF does not reflect any existing and/or forecast passenger enplanements. Operations are forecast to be dominated by local and itinerant GA operations, which are projected to account for approximately 45 percent and 31 percent of operations, respectively, over the planning period. Military operations are not projected to occur at all over planning period, while air taxi operations are flatlined at 3,670, or 24 percent of total operations. Based aircraft are forecast to increase by four additional aircraft over the next 20 years. As noted previously, the FAA will compare the new forecasts developed for this Master Plan to the TAF.

TABLE 2C | 2020 FAA Terminal Area Forecast
Spencer Municipal Airport

	2020	2025	2030	2040	CAGR 2020-2040
ENPLANEMENTS					
Air Carrier	0	0	0	0	0.00%
Commuter	0	0	0	0	0.00%
Total	0	0	0	0	0.00%
ANNUAL OPERATIONS					
Itinerant					
Air Carrier	0	0	0	0	0.00%
Air Taxi	3,670	3,670	3,670	3,670	0.00%
General Aviation	6,748	6,748	6,748	6,748	0.00%
Military	0	0	0	0	0.00%
Total Itinerant	10,418	10,418	10,418	10,418	0.00%
Local					
General Aviation	4,672	4,672	4,672	4,672	0.00%
Military	0	0	0	0	0.00%
Total Local	4,672	4,672	4,672	4,672	0.00%
Total Operations	15,090	15,090	15,090	15,090	0.00%
Based Aircraft	37	41	41	41	0.51%

CAGR: Compound Annual Growth Rate

Source: FAA Terminal Area Forecast (TAF); January 2020

PREVIOUS LOCAL FORECASTS

It is also important to consider previous forecasts that were prepared at the state and local levels. While the 2008 Master Plan forecasts were not available at the time of this writing, the Iowa Department of Transportation (IDOT) prepared the *Iowa Aviation System Plan (2010-2030)* (IASP) in 2010, which included an updated set of based aircraft and aircraft operation projections for each airport included in the state system. These forecasts were developed utilizing a base year of 2010 and are presented in **Table 2D**. While an update to the IASP is currently underway, these remain the most current IASP forecasts during the preparation of the master plan forecasts.

As reported in the IASP, SPW had 35 based aircraft in 2010. The based aircraft count was expected to grow by 10, resulting in a CAGR of 1.26 percent over the 20-year planning period. During the same period, annual operations were estimated at 12,250 and were expected to grow at a CAGR of 1.26 percent to 15,750 operations by 2030.

**TABLE 2D | IASP Aviation Forecasts
Spencer Municipal Airport**

	2010	2015	2020	2025	2030
BASED AIRCRAFT					
Total Based Aircraft	35	37	40	42	45
ANNUAL AIRCRAFT OPERATIONS					
Total Operations	12,250	12,950	14,000	14,700	15,750

Source: Iowa Aviation System Plan 2010-2030.

BASED AIRCRAFT

The number of based aircraft is the most basic indicator of general aviation demand. By first developing a forecast of based aircraft for the airport, other general aviation activity and demand can be projected. The process of developing forecasts of based aircraft begins with an analysis of aircraft ownership in the primary general aviation service area through a review of historical aircraft registrations.

Area Aircraft Ownership (Registered Aircraft)

Table 2E presents the historical registered aircraft for Clay and Dickinson Counties for years 1993 to 2020. These figures are derived from the FAA aircraft registration database that categorized registered aircraft by county based on the zip code of the registered aircraft. Although this information generally provides a correlation to based aircraft, it is not uncommon for some aircraft to be registered in the county but based at an airport outside the county or vice versa.

The registered aircraft in the service area show a generally steady trend over the last several years. In 2001, there was a sharp decline in registered aircraft, due to Great Lakes Airlines moving its headquarters and operations from SPW to Cheyenne, Wyoming. Another period of slow decline followed in years 2003 to 2006, before ownership rose again in 2007. Since that time, aircraft registrations in Clay and Dickinson Counties have steadily increased, with 70 aircraft reported in 2020.

Although there are no recently prepared forecasts for Clay and Dickinson Counties regarding registered aircraft, one was prepared for this study using market share projection and ratio 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. None of the regressions produced a strong correlation (r^2 value over 0.9); therefore, the regression forecasts were not considered further.

**TABLE 2E | Historical Service Area Registered Aircraft
Clay and Dickinson Counties, IA**

Year	MEP	Other ¹	SEP	Turbojet	Turboprop	UAV	Helicopter	Total
1993	7	0	53	0	19	0	0	79
1994	7	0	54	0	32	0	0	93
1995	6	0	52	0	35	0	0	93
1996	6	1	53	0	26	0	0	86
1997	6	1	53	0	26	0	0	86
1998	6	1	55	0	36	0	0	98
1999	5	0	51	0	35	0	0	91
2000	5	0	51	0	34	0	0	90
2001	5	0	51	1	3	0	0	60
2002	5	0	52	1	2	0	0	60
2003	2	0	43	1	7	0	0	53
2004	3	0	40	1	9	0	0	53
2005	2	0	39	2	9	0	0	52
2006	5	0	42	0	5	0	0	52
2007	2	0	52	0	4	0	0	58
2008	2	0	55	0	4	0	0	61
2009	2	0	54	0	5	0	0	61
2010	3	1	49	1	5	0	0	59
2011	3	1	51	1	4	0	0	60
2012	2	1	50	2	3	0	0	58
2013	2	1	50	2	3	0	0	58
2014	3	0	50	2	3	0	0	58
2015	3	0	51	2	5	1	0	62
2016	4	0	53	2	5	2	0	66
2017	4	0	55	2	2	3	0	66
2018	4	0	55	2	2	3	1	67
2019	5	1	58	2	2	2	1	71
2020 ²	5	2	56	2	2	2	1	70

MEP: Multi-Engine Piston

SEP: Single-Engine Piston

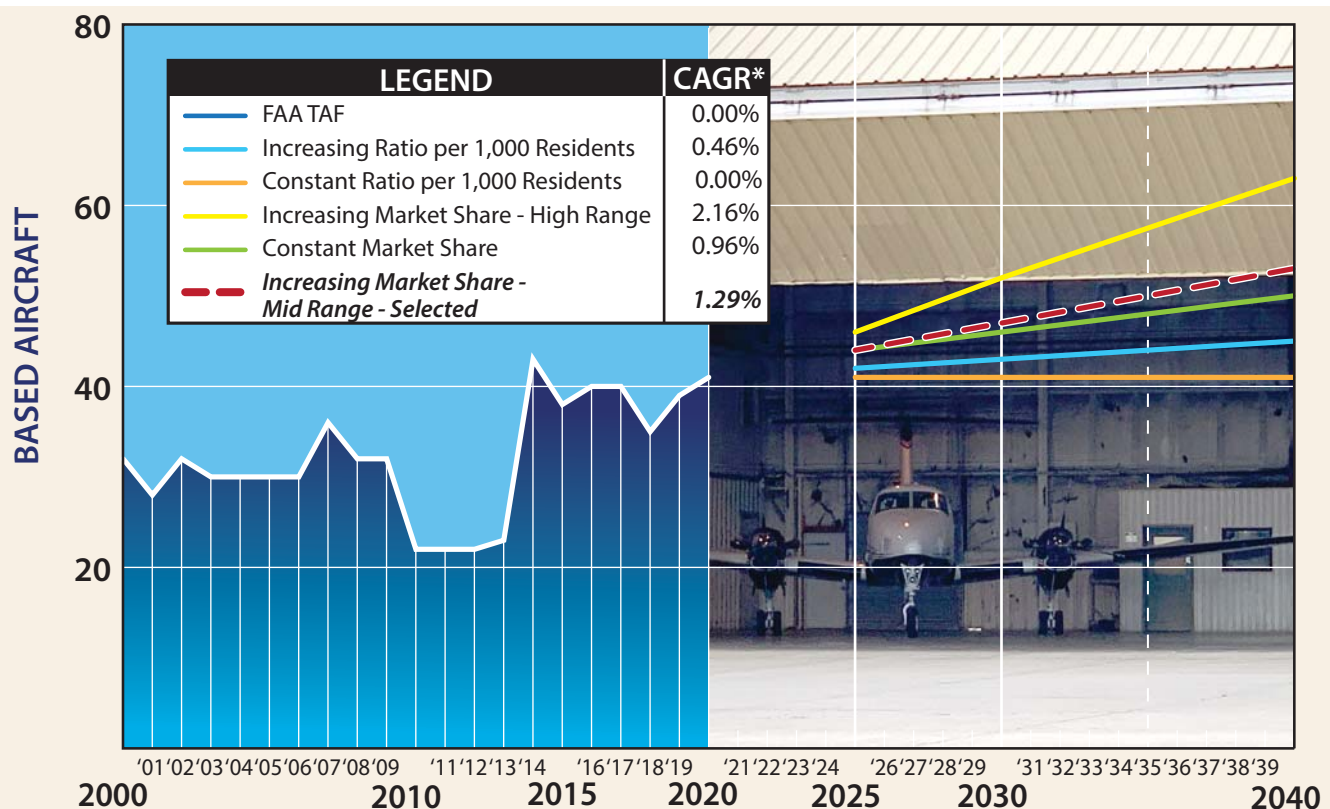
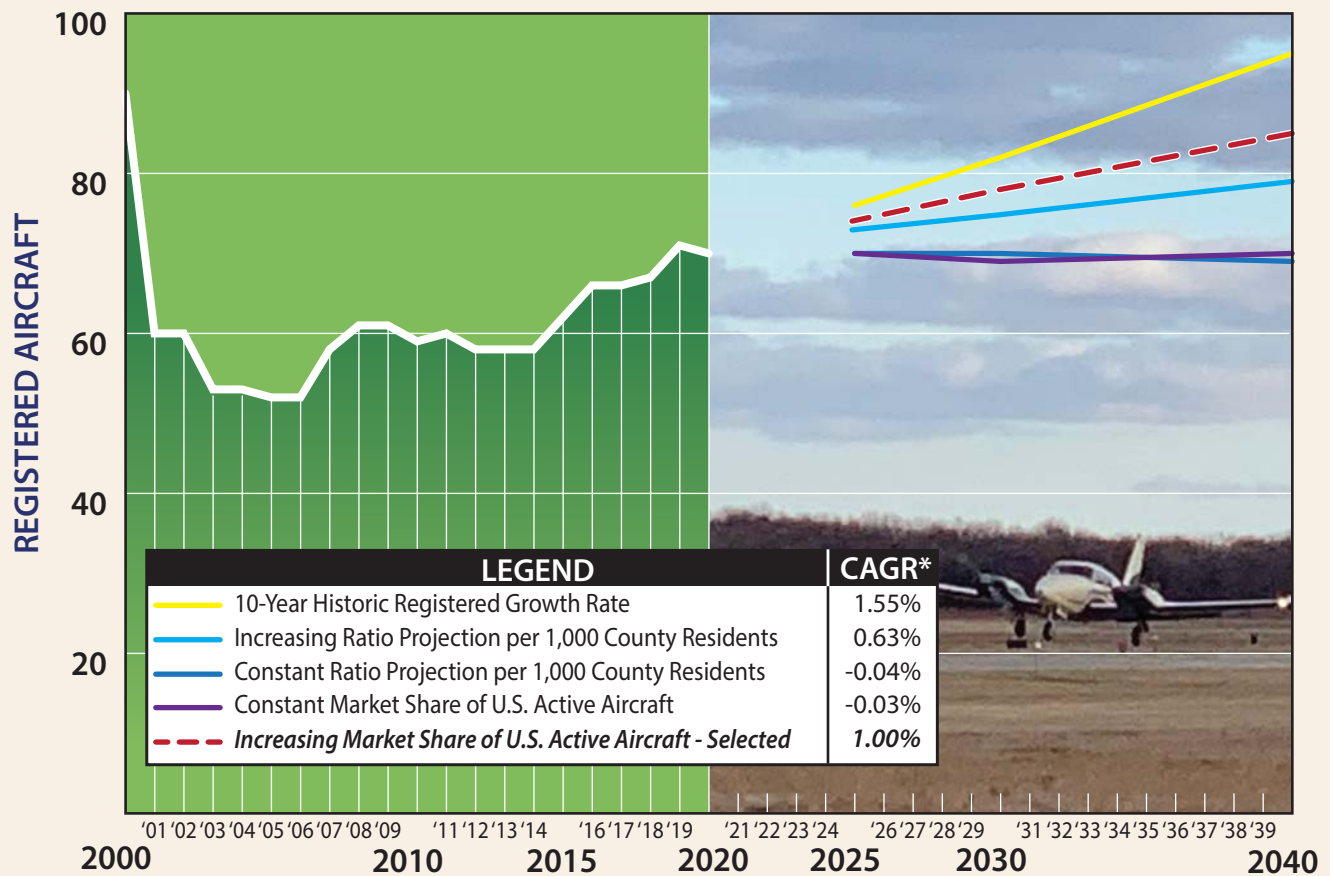
UAV: Unmanned Aerial Vehicle

¹ The "Other" aircraft category refers to aircraft, such as gliders, electric aircraft, balloons, and dirigibles.

² 2020 aircraft registrations are derived from FAA Registered Aircraft dated January 28, 2020

Source: FAA Registered Aircraft

Table 2F and **Exhibit 2C** present five different projections of registered aircraft for the service area: two market share projections, two ratio projections, and a growth rate projection. The market share projections consider the relationship between registered aircraft located in Clay and Dickinson Counties and active aircraft within the United States. The first market share projection is based upon the service area maintaining a constant share within the U.S. active aircraft market, at 0.0328 percent. This results in a negative growth rate (CAGR -0.03 percent) and no growth in registered aircraft in the counties by 2040.



*CAGR: Compound annual growth rate

Table 2F | Registered Aircraft Projections
Clay and Dickinson Counties, IA

Year	Service Area Registrations ¹	U.S. Active Aircraft ²	Market Share of U.S. Aircraft	Service Area Population ³	Aircraft per 1,000 Residents
2000	90	217,533	0.0414%	33,820	2.66
2001	60	211,446	0.0284%	33,733	1.78
2002	60	211,244	0.0284%	33,437	1.79
2003	53	209,606	0.0253%	33,324	1.59
2004	53	219,319	0.0242%	33,466	1.58
2005	52	224,257	0.0232%	33,492	1.55
2006	52	221,942	0.0234%	33,479	1.55
2007	58	231,606	0.0250%	33,359	1.74
2008	61	228,664	0.0267%	33,387	1.83
2009	61	223,876	0.0272%	33,374	1.83
2010	59	223,370	0.0264%	33,303	1.77
2011	60	220,453	0.0272%	33,452	1.79
2012	58	209,034	0.0277%	33,464	1.73
2013	58	199,927	0.0290%	33,318	1.74
2014	58	204,408	0.0284%	33,321	1.74
2015	62	210,031	0.0295%	33,498	1.85
2016	66	211,794	0.0312%	33,429	1.97
2017	66	211,757	0.0312%	33,369	1.98
2018	67	212,885	0.0315%	33,391	2.01
2019	71	213,375	0.0333%	33,406	2.13
2020	70	213,495	0.0328%	33,420	2.09
Constant Market Share of U.S. Active Aircraft – CAGR -0.03%					
2025	70	212,435	0.0328%	33,462	2.08
2030	69	211,355	0.0328%	33,439	2.07
2040	70	211,969	0.0328%	33,138	2.10
Increasing Market Share of U.S. Active Aircraft – CAGR 1.0% -- Selected Forecast					
2025	74	212,435	0.0350%	33,462	2.22
2030	78	211,355	0.0370%	33,439	2.34
2040	85	211,969	0.0400%	33,138	2.56
Constant Ratio Projection per 1,000 County Residents – CAGR -0.04%					
2025	70	212,435	0.0330%	33,462	2.09
2030	70	211,355	0.0331%	33,439	2.09
2040	69	211,969	0.0327%	33,138	2.09
Increasing Ratio Projection per 1,000 County Residents – CAGR 0.63%					
2025	73	212,435	0.0342%	33,462	2.17
2030	75	211,355	0.0355%	33,439	2.25
2040	79	211,969	0.0374%	33,138	2.40
10-Year Historic Registered Aircraft Growth Rate – CAGR 1.55%					
2025	76	212,435	0.0356%	33,462	2.26
2030	82	211,355	0.0386%	33,439	2.44
2040	95	211,969	0.0449%	33,138	2.88

CAGR: Compound Annual Growth Rate

Note: Figures for 2020 U.S. active aircraft and service area population are estimates

Sources:

¹ FAA Aircraft Registration Database

² FAA Aerospace Forecast - Fiscal Years 2019-2039

³ Woods & Poole 2019

The next projection evaluates an increase in market share for Clay and Dickinson Counties. In 1999, the service area reached its historical high over the last 20 years, with 91 registered aircraft representing 0.0414 percent of active aircraft within the U.S. However, this figure includes the Great Lakes Airlines

aircraft that were registered in the service area while the airline was headquartered at SPW. While it is not unreasonable to project a return to this record high, a more modest growth rate in market share is considered. A market share of 0.0400 percent would result in 85 registered aircraft in the service area by 2040 for a CAGR of 1.00 percent.

The next two projections consider the ratio of registered aircraft per 1,000 residents within the two counties. The first projection considers a constant ratio. In 2020, the service area had 2.09 aircraft per 1,000 residents, a figure which was held constant through the planning period. This resulted in aircraft registrations remaining steady at 70 registered aircraft through 2030, then decreasing by one to 69 aircraft by 2040. This is reflective of a -0.04 percent CAGR.

The second projection examines an increasing ratio of registered aircraft per 1,000 residents. Under this scenario, the growth in the ratio over the last ten years was analyzed and carried forward to result in 2.40 registrations per 1,000 residents by 2040. This equates to a total of 79 aircraft registrations in the service area, for a CAGR of 0.63 percent.

The final projection evaluated the 10-year historic growth rate of aircraft registrations in Clay and Dickinson Counties. This growth rate was then applied to the forecast years, resulting in 95 registered aircraft by 2040 at a CAGR of 1.55 percent.

Each of these forecasts offers a projection of what aircraft registrations in the service area could look like over the next twenty years, with the constant market share and constant ratio forecasts providing the low-end projections, and the 10-year historical registered aircraft growth rate making up the high end of the planning envelope. Based on historic counts, it is reasonable to assume some growth in the number of registrations. However, as the population of the two counties is expected to remain steady, a significant increase in aircraft registrations is not anticipated, compounded by the number of U.S. active aircraft also stagnating over the planning period. Therefore, the increasing market share of U.S. active aircraft is considered the most reasonable registered aircraft forecast. At a CAGR of 1.00 percent, this forecast shows steady growth in aircraft registrations in the two counties, with the addition of four aircraft by 2025, eight by 2030, and 15 by 2040, for a total of 85 registered aircraft in the service area in 2040.

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 based aircraft records; therefore, historical records are often incomplete or non-existent.

Historic and current based aircraft counts at SPW were compiled using the FAA TAF, FAA Form 5010-Airport Master Record, and airport records. As of December 2019, there were 41 aircraft based at SPW, as reported by the airport. Historic data from the FAA TAF range in based aircraft counts from a low of

22 in 2010-2012 to a high of 43 in 2014. In the last five years, the TAF counts have remained consistent. The 41 based aircraft as reported by the airport differ from the TAF's total of 37 estimated aircraft in 2020 by four aircraft. The airport's market share within the service area has fluctuated significantly over the years, from a high of 74.1 percent reached in 2014 to a low of 35.6 percent in 2000.

Table 2G and **Exhibit 2C** present six different forecasts that were used to project based aircraft totals for SPW over the planning horizon. Like the registered aircraft forecasts, market share and the ratio per 1,000 service area residents were analyzed. The FAA TAF is also included for comparison purposes.

The first three forecasts show both constant and increasing market shares for SPW based aircraft. In 2020, the airport held 58.6 percent of the market share. This figure was carried forward through the planning period, resulting in 50 aircraft by 2040 at a CAGR of 0.96%. Two variations of an increasing market share were also evaluated. The mid-range forecast reflects steadily increasing market share growth, with the airport reaching 62.5 percent market share by 2040, or 53 based aircraft, representing a CAGR of 1.29 percent. A high range scenario was also projected, with a return to the historic high of 74.1 percent that was reached in 2014 by 2040. Incremental increases were applied to the short- and intermediate-term forecasts, resulting in based aircraft counts of 46 in 2025, 52 by 2030, and 63 by 2040. The represents a CAGR of 2.16 percent, as well as the high end of the planning envelope.

The next two forecasts evaluate the ratio of based aircraft per 1,000 service area residents. Kept at a constant of 1.23 which was reached in 2020, no growth in based aircraft is projected. Each planning horizon shows a count of 41 based aircraft, which is reflective of the airport's 2020 reported total. However, when an increasing ratio per 1,000 residents is applied, moderate growth in based aircraft does result. This forecast projects the high of 1.36 based aircraft per 1,000 residents being reached in 2040. This figure is derived from the most recent five-year growth rate, which was then applied to the forecast years. The result is a total of 45 aircraft by the end of the planning period.

As a point of comparison, the FAA TAF is also shown. Under this scenario, based aircraft is projected to total 41 throughout the planning horizon, which equates to no growth over the planning period when compared to the aircraft's current based aircraft count. It should be noted, however, that the FAA TAF's 2020 count is 37, as mentioned previously.

These projections result in a forecast range between a low of 41 to a high of 63 based airplanes at SPW by 2040. Currently, all T-hangars at SPW are leased; however, there is some availability within the conventional hangars. There is also a waiting list for T-hangar space, which indicates demand and thus a need for additional aircraft storage space. While the population in the service area is anticipated to remain steady over the planning period, aircraft registrations are projected to increase and growth in based aircraft will likely follow. Therefore, the selected forecast for based aircraft at SPW over the planning period is the mid-range increasing market share projection. This forecast assumes reasonably steady growth in based aircraft, adding three aircraft by 2025, six by 2030, and 12 by 2040.

Table 2G | Based Aircraft Forecasts
Spencer Municipal Airport

Year	SPW Based Aircraft ¹	Service Area Registrations ²	Market Share	Service Area Population ³	Aircraft Per 1,000 Residents
2000	32	90	35.6%	33,820	0.95
2001	28	60	46.7%	33,733	0.83
2002	32	60	53.3%	33,437	0.96
2003	30	53	56.6%	33,324	0.90
2004	30	53	56.6%	33,466	0.90
2005	30	52	57.7%	33,492	0.90
2006	30	52	57.7%	33,479	0.90
2007	36	58	62.1%	33,359	1.08
2008	32	61	52.5%	33,387	0.96
2009	32	61	52.5%	33,374	0.96
2010	22	59	37.3%	33,303	0.66
2011	22	60	36.7%	33,452	0.66
2012	22	58	37.9%	33,464	0.66
2013	23	58	39.7%	33,318	0.69
2014	43	58	74.1%	33,321	1.29
2015	38	62	61.3%	33,498	1.13
2016	40	66	60.6%	33,429	1.20
2017	40	66	60.6%	33,369	1.20
2018	35	67	52.2%	33,391	1.05
2019	39	71	54.9%	33,406	1.17
2020	41	70	58.6%	33,420	1.23
Constant Market Share – CAGR 0.96%					
2025	44	74	58.6%	33,458	1.30
2030	46	78	58.6%	33,450	1.37
2040	50	85	58.6%	33,183	1.50
Increasing Market Share Mid-Range – CAGR 1.29% -- Selected Forecast					
2025	44	74	59.5%	33,458	1.32
2030	47	78	60.5%	33,450	1.41
2040	53	85	62.5%	33,183	1.60
Increasing Market Share High-Range – CAGR 2.16%					
2025	46	74	62.5%	33,458	1.39
2030	52	78	66.4%	33,450	1.55
2040	63	85	74.1%	33,183	1.89
Constant Ratio per 1,000 Residents – CAGR 0.00%					
2025	41	74	55.2%	33,458	1.23
2030	41	78	52.5%	33,450	1.23
2040	41	85	48.0%	33,183	1.23
Increasing Ratio per 1,000 Residents – CAGR 0.46%					
2025	42	74	56.6%	33,458	1.26
2030	43	78	55.2%	33,450	1.29
2040	45	85	53.1%	33,183	1.36
FAA TAF – CAGR 0.00%					
2025	41	74	55.1%	33,458	1.23
2030	41	78	52.4%	33,450	1.23
2040	41	85	48.4%	33,183	1.24

¹Years 2000-2019 are sourced from the FAA TAF; 2020 based aircraft count is derived from airport records.

²FAA Aircraft Registration Database

³ Woods & Poole 2019

CAGR: Compound Annual Growth Rate

Note: 2020 service area population is an estimate

Sources: FAA TAF; SPW records

Based Aircraft Fleet Mix

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. As a regional general aviation airport, SPW is well-suited to accommodate all types of general aviation aircraft, from small-piston powered aircraft up to small- and mid-size business jet aircraft.

At 80 percent, the majority of based aircraft at SPW currently are single engine piston airplanes, such as the Cessna 172. While the FAA projects that piston-powered aircraft will decline in numbers nationwide over the forecast period, it is anticipated that this category of aircraft will continue to account for the majority of airplanes at the airport. However, real growth nationwide is projected to occur within the turboprop and jet categories of aircraft, along with helicopters. At Spencer Municipal Airport, it is projected that nine single engine piston airplanes will be added to the current based aircraft fleet mix at the airport by 2040, representing 79 percent of the fleet mix throughout the planning period. Multi-engine piston may phase out altogether, while the number of turboprops, jets, and helicopters will increase at SPW. The projected fleet mix includes five turboprops, five jets, and one helicopter at the airport by 2040. The based aircraft fleet mix over the planning horizon can be viewed in **Table 2H**.

Table 2H | Based Aircraft Fleet Mix
Spencer Municipal Airport

Aircraft Type	Existing		Forecast					
	2020	%	2025	%	2030	%	2040	%
Single Engine Piston	33	80%	35	80%	37	79%	42	79%
Multi-Engine Piston	5	12%	4	9%	2	4%	0	0%
Turboprop	1	2%	2	4%	3	6%	5	9%
Jet	2	5%	3	7%	4	9%	5	9%
Helicopter	0	0%	0	0%	1	2%	1	2%
Totals	41	100%	44	100%	47	100%	53	100%

Source: Airport records; Coffman Associates analysis

GENERAL AVIATION OPERATIONS

General aviation operations are classified as either local or itinerant. A local operation is a take-off or landing performed by an aircraft that operates within sight of the airport, or which executes simulated approaches or touch-and-go operations at the airport. Generally, local operations are characterized by training operations. Itinerant operations are those performed by aircraft with a specific origin or destination away from the airport. Typically, itinerant operations increase with business and commercial use, since business aircraft are not typically used for large scale training activities.

Since SPW 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 SPW include the FAA Form 5010 Airport Master Record, the FAA TAF, and Equation 15 in FAA’s “Model for Estimating General Aviation Operations at Non-towered Airports Using Towered and Non-towered Airport Data.” The FAA TAF indicates a total of 15,090 GA operations in 2019 (10,418 itinerant / 4,672 local). The FAA Form 5010 indicates the same total and breakdown of operations for the period ending May 16, 2019. Equation 15, which factors in regional population and regional registered and based aircraft, resulted in a total of 16,163 annual general aviation operations at SPW, which will be carried forward as the baseline count.

It should be noted that field cameras were also employed at the airport to capture operations over a two-month period beginning at the end of September 2019 and concluding at the end of November 2019. The results registered an average of 16.7 operations per day, which when annualized using fuel sales, equates to approximately 8,300 annual operations. This figure is substantially lower than any of the operational counts gathered from the other sources detailed above. This may be due to counts being taken during the less active late fall season. The airport’s peak season occurs during the summer months of July and August. The cameras will be placed again during the summer to capture traffic during the peak period to improve the accuracy of the annual operational count.

General Aviation Operations Forecast

Table 2J presents the general aviation operations forecast for Spencer Municipal Airport. As can be seen in the table, the baseline year of 2020 indicates 16,163 GA operations. This estimate, derived from Equation 15, does not include air taxi operations, which will be discussed in the next section. Several forecasts have been prepared for the airport regarding general aviation operations, with the TAF forecast included for comparison purposes.

The first forecast presented examines SPW’s constant market share of itinerant operations. The FAA’s Aerospace Forecast projects itinerant GA operations at towered airports, which can be utilized to establish SPW’s market share of GA itinerant operations. The 2020 baseline operational count results in a market share of 0.0599 percent of total GA operations. Maintaining this at a constant over the planning period results in slow but steady operational growth, with 17,200 GA operations projected by 2040 at a CAGR of 0.31 percent.

Two other market share forecasts were also applied to the baseline count. In each of these projections, an increasing market share was analyzed, representing mid-range and high-range growth scenarios. The first increasing market share forecast applies a CAGR of 0.50 percent to the baseline operations, which is slightly less than double the growth rate produced in the constant market share forecast. At this CAGR, a total of 17,900 operations are projected for 2040. The next forecast applies an even more aggressive growth rate of 1.00 percent, resulting in 19,700 operations by 2040.

Operations per based aircraft were also evaluated to determine potential operational growth. The 2020 count of 394 operations per based aircraft was used as the basis for this forecast and kept at a constant over the planning period. This resulted in a CAGR of 1.29 percent, or 17,400 operations in 2025, 18,700 in 2030, and 20,900 in 2040. This represents this high end of the planning envelope.

The FAA TAF has also been included for comparison. The TAF has flatlined growth in all categories over the planning period and shows 11,420 total GA operations every year from 2020 to 2040. This results in a CAGR of -1.72 percent from the 2020 estimated general aviation operations.

The forecasts produced a wide planning envelope that ranged from a low of 11,420 annual general aviation operations (FAA TAF) to a high of 20,900 annual GA operations (constant operations per based aircraft). Each of these represents an unlikely scenario for SPW; rather, it is more reasonable to anticipate moderate operational growth at SPW that could be driven by the potential for more based aircraft. This moderate growth is also in line with FAA projections for GA operations nationwide. Therefore, the mid-range increasing market share scenario with a CAGR of 0.50 percent will be carried forward as the selected forecast. This projection results in 16,600 GA operations in 2025, 17,000 in 2030, and 17,900 operations by 2040.

**TABLE 2J | General Aviation Operations Forecasts
Spencer Municipal Airport**

Year	SPW Total GA Operations	SPW Itinerant Operations	SPW Local Operations	U.S. ATCT GA Operations	SPW Share %	Based Aircraft	Ops Per Based Aircraft
2020*	16,163	9,550	6,612	26,965,950	0.0599%	41	394
Constant Market Share - Low Range (CAGR 0.31%)							
2025	16,400	9,700	6,700	27,361,840	0.0599%	44	371
2030	16,600	9,800	6,800	27,770,062	0.0599%	47	351
2040	17,200	10,200	7,000	28,625,426	0.0599%	53	325
Increasing Market Share - Mid Range (CAGR 0.50%) -- Selected Forecast							
2025	16,600	9,800	6,800	27,361,840	0.0606%	44	375
2030	17,000	10,000	7,000	27,770,062	0.0612%	47	359
2040	17,900	10,600	7,300	28,625,426	0.0624%	53	337
Increasing Market Share - High Range (CAGR 1.00%)							
2025	17,000	10,000	7,000	27,361,840	0.0621%	44	384
2030	17,900	10,600	7,300	27,770,062	0.0643%	47	377
2040	19,700	11,600	8,100	28,625,426	0.0689%	53	372
Constant Operations per Based Aircraft (CAGR 1.29%)							
2025	17,400	10,300	7,100	27,361,840	0.0637%	44	394
2030	18,700	11,000	7,700	27,770,062	0.0672%	47	394
2040	20,900	12,300	8,600	28,625,426	0.0730%	53	394
FAA TAF (CAGR -1.72%)							
2025	11,420	6,748	4,672	27,361,840	0.0417%	41	279
2030	11,420	6,748	4,672	27,770,062	0.0411%	41	279
2040	11,420	6,748	4,672	28,625,426	0.0399%	41	279

*2020 figures for operations are estimates

Note: Operations forecasts have been rounded

Sources: FAA Aerospace Forecast 2019-2039; FAA Equation No. 15; FAA TAF

AIR TAXI OPERATIONS FORECAST

The air taxi category can be classified as a sub-set of the itinerant operations category and includes aircraft involved in on-demand passenger charter, fractional ownership aircraft operations, small parcel transport, and air ambulance activity. While not typically a large percentage of total airport operations, air taxi operations can be conducted via more sophisticated aircraft, ranging from multi-engine piston aircraft up to large business jet aircraft. As a result, it is important to factor these types of operations at airports that experience air taxi operations.

The FAA national air taxi forecast projects a 2.2 percent CAGR decrease in air taxi operations through 2039, followed by modest increases thereafter. The primary reason for this decrease is the transition by commuter airlines to larger aircraft with more than 60 passenger seats, which are then counted as air carrier operations. While air taxi operations that are represented by commuter airlines using aircraft with fewer than 60 seats are decreasing, the business jet segment of the air taxi category is expected to continue to grow nationally. The facilities and FBO services available at SPW are accommodating to operators of business jets. Therefore, it is reasonable to expect the business jet component of air taxi activity to increase moderately over time at SPW.

Based upon historical air taxi operations reported in AirportIQ, a total of 312 air taxi operations will be used as the base year count for 2020. This totals approximately two percent of total operations at the airport.

Table 2K presents three forecasts for air taxi operations at SPW, along with the TAF projection. Each of the three forecasts evaluates SPW's market share of operations in this category, with low-, mid-, and high-range projections. On the low end, the current market share of 0.0047 percent is maintained at a constant over the planning period. This results in a decline in air taxi operations at the airport by 2040, with 302 operations representing a CAGR of -0.16 percent.

The next forecast shows mid-range growth in air taxi operations. The average market share over the last five years, 0.0079, is projected to be reached by the end of the planning period. This results in a slight decrease in air taxi operations in 2025, and then returning to a growth trend in subsequent years, with 511 operations forecast for 2040. This is reflective of a 2.50 percent CAGR.

Another increasing market share forecast was analyzed as well. This projection assumes a return to the market share high of 0.0109 percent that was reached in 2017. Under this scenario, some growth is projected over the next five years, with 345 air taxi operations, with more substantial growth occurring in ten and 20 years. By 2040, 698 air taxi operations are projected, representing a CAGR of 4.11 percent. The FAA TAF is also included for comparison purposes. As stated previously, the TAF has flatlined every operational category, including air taxi. The number reported for the years 2020 through 2040 is 3,670 air taxi operations, which equates to a 13.12 percent CAGR.

Like the general aviation forecast, the mid-range forecast has been selected as the most reasonable projection for air taxi operational growth at SPW. At a CAGR of 2.5 percent, this forecast is in line with FAA's projections for national air taxi operations, which decline slightly before returning to a growth trend. The increasing market share forecast results in 305 air taxi operations in 2025, 367 in 2030, and 511 in 2040.

**TABLE 2K | Other Air Taxi Operations Forecast
Spencer Municipal Airport**

Year	SPW Air Taxi Operations	U.S. Air Taxi Operations	SPW Market Share
2015	778	7,894,945	0.0099%
2016	696	7,579,584	0.0092%
2017	780	7,179,301	0.0109%
2018	554	7,125,556	0.0078%
2019	382	7,196,959	0.0053%
2020*	312	6,644,162	0.0047%
Constant Market Share - Low-Range (CAGR -0.16%)			
2025	260	5,534,735	0.0047%
2030	273	5,809,266	0.0047%
2040	302	6,426,228	0.0047%
Increasing Market Share - Mid-Range (CAGR 2.50%) - Selected			
2025	305	5,534,735	0.0055%
2030	367	5,809,266	0.0063%
2040	511	6,426,228	0.0079%
Increasing Market Share - High-Range (CAGR 4.11%)			
2025	345	5,534,735	0.0062%
2030	452	5,809,266	0.0078%
2040	698	6,426,228	0.0109%
FAA TAF Forecast Growth Rate (CAGR 13.12%)			
2025	3,670	5,534,735	0.0663%
2030	3,670	5,809,266	0.0632%
2040	3,670	6,426,228	0.0571%

Sources: FAA Aerospace Forecast 2019-2039; AirportIQ

*extrapolated

MILITARY OPERATIONS FORECAST

Military aircraft can and do utilize civilian airports across the country. However, forecasting of military activity is inherently difficult because of the national security nature of their operations and the fact that missions can change often. Thus, it is typical for the FAA to utilize a flat-line forecast number for military operations. The FAA TAF has not projected any military operations occurring at SPW since 2008, and there are no military operations forecast to occur over the planning period. Historical data from the FAA Traffic Flow Management Systems Count (TFMSC) also shows no military operations since 2015, when two operations were conducted by military training aircraft. For planning purposes, annual military operations are forecast to remain at zero through the 20-year planning period.

PEAKING CHARACTERISTICS

Peaking characteristics are an important aspect in generating airport capacity and facility requirements. It should be noted that because SPW 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 as well as fuel flowage records provided by the FBO. 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 highest.
- Design Day – The average day in the peak month. This indicator is derived by dividing the peak month by the number of days in the month.
- Busy Day – The busy day of a typical week in the peak month.
- Design Hour – The peak hour within the design day.

For the purposes of this study, the peak month for total operations was estimated at 23 percent of the annual operations. By 2040, the estimated peak month is projected to reach 4,232 operations. The design day is estimated by dividing the peak month by its number of days, and the design hour is calculated at 15 percent of the design day.

A busy day analysis is prepared for itinerant operations for use in determining transient parking apron needs. Again, fuel flowage records were used to derive an understanding of the peak month, which was estimated at 14 percent of total itinerant operations. The *Traffic Flow Management System Count* (TFMSC) was utilized to determine the airport’s busy day, which averages 24 percent of the week’s traffic. This results in a factor of 1.6 times the design day. The design hour is then calculated at 15 percent of the design day. These projections can be viewed in **Table 2L**.

TABLE 2L | Peak Period Forecasts
Spencer Municipal Airport

Year	2020	2025	2030	2040
Total Operations				
Annual	16,163	16,900	17,400	18,400
Peak Month	3,717	3,887	4,002	4,232
Design Day	120	125	129	137
Design Hour	18	19	19	20
Itinerant Operations				
Annual	9,550	9,800	10,000	10,600
Peak Month	1,337	1,372	1,400	1,484
Design Day	43	44	45	48
Busy Day	69	71	72	77
Design Hour	10	11	11	11

Source: FAA Equation No. 15; Airport fuel records; *Traffic Flow Management System Count* (TFMSC), Coffman Associates analysis

ANNUAL INSTRUMENT APPROACHES

An instrument approach, as defined by the FAA, is “an approach to an airport with the intent to land by an aircraft in accordance with an Instrument Flight Rule (IFR) flight plan, when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude.” To qualify as an instrument approach, aircraft must land at the airport after following one of the published instrument approach procedures in less than visual conditions. Forecasts of annual instrument approaches (AIAs) provide guidance in determining an airport’s requirements for navigational aid facilities, such as an instrument landing system. It should be noted that practice or training approaches do not count as annual AIAs, nor do instrument approaches conducted in visual conditions.

During poor weather conditions, pilots are less likely to fly and rarely would perform training operations. As a result, an estimate of the total number of AIAs can be made based on a percentage of itinerant operations regardless of the frequency of poor weather conditions. An estimate of 2.5 percent of total itinerant (general aviation, air taxi, and military) operations is utilized to forecast AIAs at SPW, as presented in **Table 2M**.

**TABLE 2M | Annual Instrument Approaches
Spencer Municipal Airport**

Year	Annual Instrument Approaches	Itinerant Operations*	Ratio
2020	239	9,550	2.50%
2025	245	9,800	2.50%
2030	250	10,000	2.50%
2040	265	10,600	2.50%

*Estimate

Source: FAA Equation No. 15; Coffman Associates analysis

FORECAST SUMMARY

This section has provided demand-based forecasts of aviation activity at SPW over the next 20 years. An attempt has been made to define the projections in terms of short (1-5 years), intermediate (6-10 years), and long (11-20 years) term planning horizons. **Exhibit 2D** presents a 20-year forecast summary. Elements, such as local socioeconomic indicators, anticipated regional development, historical aviation data, and national aviation trends, were all considered when determining future conditions.

FORECAST COMPARISON TO THE FAA TAF

The FAA will review the forecasts of this master plan and compare them to the TAF. The FAA prefers 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 should be provided.

Table 2N presents a direct comparison of the 2020 FAA TAF to the forecasts in this master plan. In terms of total operations, the master plan shows a difference of 12.0 percent with the 5-year TAF projection. This is outside of the TAF tolerance of ten percent but can be justified by the prospect of additional based aircraft, a projection for national growth in operations, and the fact that the TAF is flatlined through the planning period. The 10-year forecast, with a difference of 15.3%, is also slightly outside the TAF tolerance.

Based aircraft projections reflect a similar level of growth. The 2020 TAF estimate of 37 based aircraft is four aircraft short of the actual count as reported by the airport, and the forecast years of the TAF show based aircraft flatlined at 41 over the planning period. The master plan forecast shows a gradual increase from the 41 based aircraft at SPW in 2020, with 44 aircraft by 2025 and 47 in 2030. By 2040, the master plan projects 53 aircraft. The master plan shows a difference of 9.8% as compared to the 5-year TAF projection and a difference of 14.6 percent when compared to the 10-year TAF projection. Both of these are within the FAA's tolerance, as shown in the table below.

	BASE YEAR	2025	2030	2040
BASED AIRCRAFT				
Single Engine	33	35	37	42
Multi-Engine	5	4	2	0
Turboprop	1	2	3	5
Jet	2	3	4	5
Helicopter	0	0	1	1
Total Based Aircraft	41	44	47	53
ANNUAL OPERATIONS				
<i>Itinerant</i>				
Air Carrier	0	0	0	0
Other Air Taxi	312	305	367	511
General Aviation	9,550	9,800	10,000	10,600
Military	0	0	0	0
Total Itinerant	9,862	10,100	10,400	11,100
<i>Local</i>				
General Aviation	6,612	6,800	7,000	7,300
Military	0	0	0	0
Total Local	6,612	6,800	7,000	7,300
Total Annual Operations	16,475	16,900	17,400	18,400
AIA's	239	245	250	265
PEAKING				
<i>Total Annual GA Operations</i>	<i>16,163</i>	<i>16,900</i>	<i>17,400</i>	<i>18,400</i>
Peak Month	3,717	3,887	4,002	4,232
Design Day	120	125	129	137
Design Hour	18	19	19	20
<i>Total Itinerant Operations</i>	<i>9,550</i>	<i>9,800</i>	<i>10,000</i>	<i>10,600</i>
Peak Month	1,337	1,372	1,400	1,484
Design Day	43	44	45	48
Busy Day	69	71	72	77
Design Hour	10	11	11	11

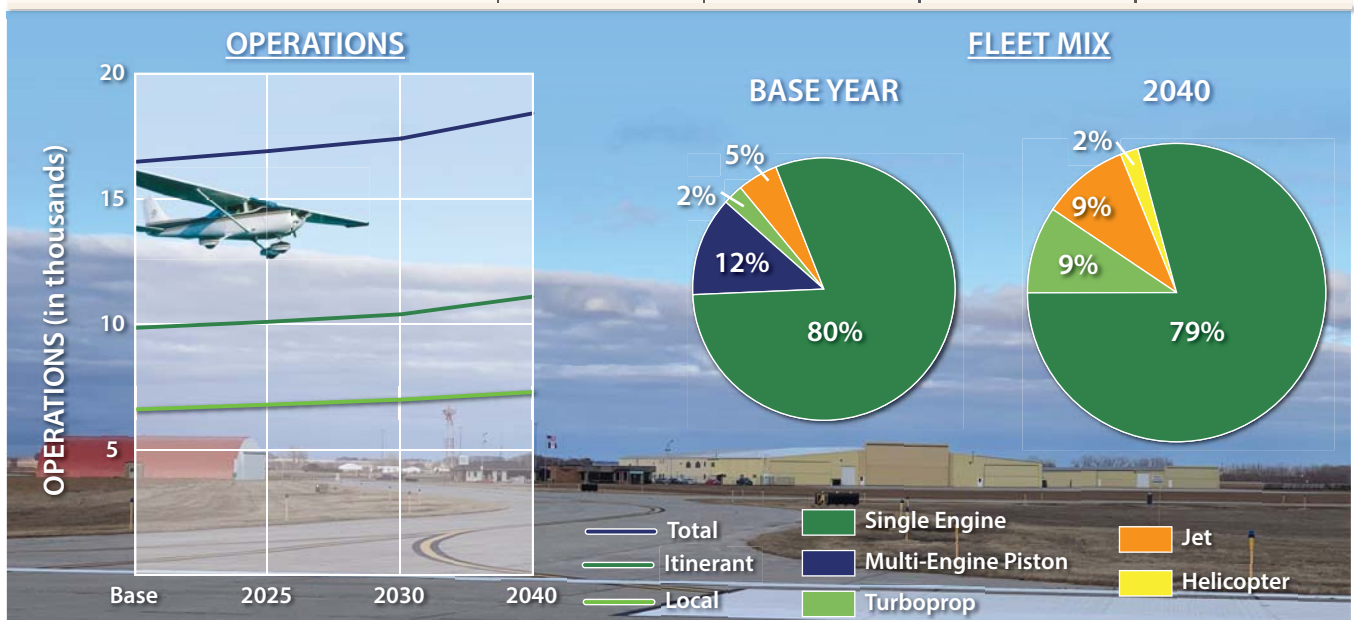


TABLE 2N | Forecast Comparison to the Terminal Area Forecast
Spencer Municipal Airport

	Base Year	Forecast			CAGR
	2020	2025	2030	2040	
Total Operations					
Master Plan Forecast	16,475	16,900	17,400	18,400	0.55%
2020 FAA TAF	15,090	15,090	15,090	15,090	0.00%
% Difference	9.2%	12.0%	15.3%	21.9%	
Based Aircraft					
Master Plan Forecast	41	44	47	53	1.29%
2020 FAA TAF	37	41	41	41	0.51%
% Difference	10.8%	9.8%	14.6%	29.3%	

Source: Coffman Associates analysis

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 design aircraft is used to define the design parameters for an airport. The design aircraft may be a single aircraft type or, more commonly, is a composite aircraft representing a collection of aircraft with similar characteristics. The critical design aircraft is defined by three parameters: Aircraft Approach Category (AAC), Airplane Design Group (ADG), and Taxiway Design Group (TDG). FAA AC 150/5300-13A, *Airport Design*, describes the following airplane classification systems, the parameters of which are presented on **Exhibit 2E**.

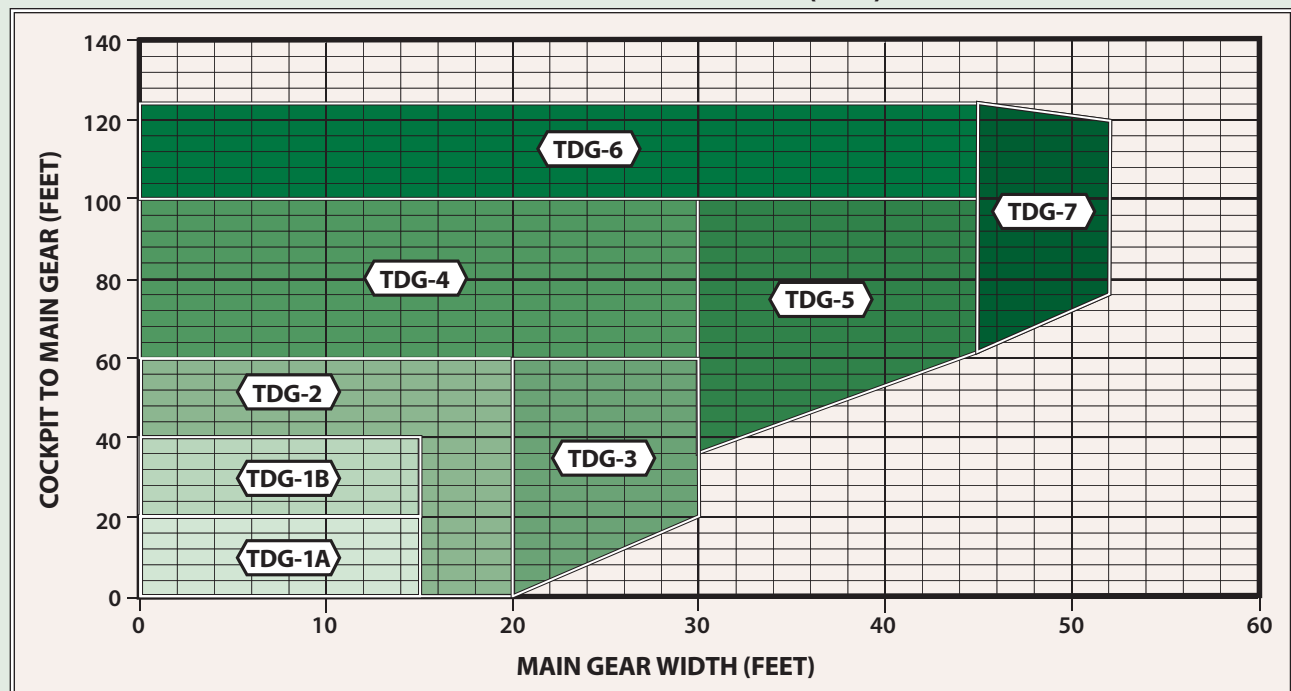
Aircraft Approach Category (AAC): A grouping of aircraft based on a reference landing speed (V_{REF}), if specified, or if V_{REF} is not specified, 1.3 times stall speed (V_{SO}) at the maximum certificated landing weight. V_{REF} , V_{SO} , and the maximum certificated landing weight are those values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

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	70-<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 150/5300-13A, Airport Design

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 characteristic). 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), 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 design aircraft. 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 TSA, 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 design aircraft utilizing those surfaces. It is appropriate for taxiways to be planned and built to different TDG standards based on expected use.

Exhibit 2F presents the aircraft classification of the most common aircraft in operation today.

AIRPORT AND RUNWAY CLASSIFICATION

These 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.

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 on the airport. The previous master plan established C-II as the current ARC.

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. The AAC, ADG, and runway visual range (RVR) are combined to form the RDC of a particular 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 visibility minimums expressed by RVR values in feet of 1,200 ($\frac{1}{8}$ -mile); 1,600 ($\frac{1}{4}$ -mile); 2,400 ($\frac{1}{2}$ -mile); 4,000 ($\frac{3}{4}$ -mile); and 5,000 (1-mile). The RVR values approximate standard visibility minimums for instrument approaches to the runways. The third component should read "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.

A-I	Aircraft	TDG	C/D-I	Aircraft	TDG		
	• Beech Baron 55 • Beech Bonanza • Cessna 150, 172 • Eclipse 500 • Piper Archer, Seneca	1A 1A 1A 1A 1A		• Lear 25, 31, 45, 55, 60 • Learjet 35, 36 (D-I)	1B 1B		
B-I		• Beech Baron 58 • Beech King Air 90 • Cessna 421 • Cessna Citation CJ1 (525) • Cessna Citation 1 (500) • Embraer Phenom 100	1A 1A 1A 1A 2 1B	C/D-II	• Hawker 800, 800XP, 850XP, 4000 • Challenger 600/604/800/850 • Cessna Citation VII, X+ • CRJ-700 • Embraer Legacy 450/500 • ERJ-135, 140, 145 • Gulfstream IV, 350, 450 (D-II) • Gulfstream G200/G280 • Lear 70, 75	1B 1B 1B 2 1B 2 1B 1B	
A/B-II	 12,500 lbs. or less	• Beech Super King Air 200 • Cessna 441 Conquest • Cessna Citation CJ2 (525A) • Pilatus PC-12	2 1A 2 1A	C/D-III	 less than 150,000 lbs.	• Boeing 737-700, BBJ • CRJ-900, 1000 • ERJ-170, 175, 190, 195 • Gulfstream V • Gulfstream G500, 550, 600, 650 (D-III) • MD-81, 82, 87 (D-III)	3 2 3 2 2 4
B-II	 over 12,500 lbs.	• Beech Super King Air 350 • Cessna Citation CJ3(525B), Bravo (550), V (560) • Cessna Citation CJ4 (525C) • Cessna Citation Latitude/Longitude • Embraer Phenom 300 • Falcon 10, 20, 50 • Falcon 900, 2000 • Pilatus PC-24	2 2 1B 1B 1B 1B 2 1B	C/D-III	 over 150,000 lbs.	• Airbus A319-100, 200 • Boeing 737 -800, 900, BBJ2 (D-III) • MD-83, 88 (D-III)	3 3 4
A/B-III		• Bombardier Dash 8 • Bombardier Global 5000, 6000, 7000, 8000 • Falcon 6X, 7X, 8X	3 2 2	C/D-IV		• Airbus A300-100, 200, 600 • Boeing 757-200 • Boeing 767-300, 400 • MD-11	5 4 5 6
			D-V		• Airbus A330-200, 300 • Airbus A340-500, 600 • Boeing 747-100 - 400 • Boeing 777-300 • Boeing 787-8, 9	5 6 5 6 5	

Note: Aircraft pictured is identified in bold type.

The APRC for a runway is established based upon the minimum runway-to-taxiway centerline separation. The runway-to-taxiway centerline separation for Runway 12-30 is 400 feet. Given that Runway 12 is served by precision instrument approach procedures with minimums not lower than ½-mile, Runway 12 meets standards for APRC D/IV/2400 and D/V/2400. Runway 30 is served by non-precision instrument approaches with visibility minimums not lower than ¾-mile, which meets standards for D/IV/4000 and D/V/4000.

Runway 18-36 has 240 feet of separation from the taxiway with non-precision instrument approaches with visibility minimums not lower than 1-mile, which meets standards for B/II/5000.

Departure Reference Code (DPRC): A code signifying the current operational capabilities of a runway and associated parallel taxiway with regard to take-off 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.

The current runway/taxiway centerline separation of 400 feet results in a DPRC of D/IV and D/V for Runway 12-30, while the 240-foot separation between the taxiway and Runway 12-30 results in a DPRC of B/II.

CRITICAL DESIGN 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 design aircraft is used to define the design parameters for an airport. The design aircraft may be a single aircraft or a composite aircraft representing a collection of aircraft classified by the three parameters: AAC, ADG, and TDG. In the case of an airport with multiple runways, a design aircraft is selected for each runway.

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 either an unsafe operation or 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 design aircraft is defined as the most demanding aircraft type, in 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 high 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. Thus, if the critical design aircraft is anticipated to change within the near future, that aircraft (or family of aircraft) should be used as the current critical design aircraft.

According to FAA AC 150/5300-13A, *Airport Design*, “airport designs based only on existing aircraft can severely limit the ability to expand the airport to meet future requirements for larger, more demanding aircraft. Airport designs that are based on large aircraft never likely to be served by the airport are not economical.” Selection of the current and future critical design aircraft must be realistic in nature and supported by current data and realistic projections.

AIRPORT CRITICAL DESIGN AIRCRAFT

It is imperative to have an accurate understanding of what type of aircraft operate at the airport both now and in the future. The type of aircraft utilizing airport facilities can have a significant impact on numerous design criteria. Thus, an aircraft activity study by type and aircraft category can be beneficial in determining future airport standards that must be met in order to accommodate certain aircraft.

The FAA maintains the Traffic Flow Management System Count (TFMSC) database, which documents certain aircraft operations at airports. Information is added to the TFMSC database when pilots file flight plans 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 factors such as incomplete flight plans and limited radar coverage, TFMSC data does not account for all aircraft activity at an airport by a given aircraft type. Some VFR and non-enroute IFR traffic can be excluded. Therefore, it is likely that there are more operations at the airport than are captured by this methodology. TFMSC data is available for activity at SPW and was utilized in this analysis.

Exhibit 2G presents the TFMSC operational mix at the airport for turbine aircraft operations for the last 10 years. As can be seen, the airport experiences activity by a full range of business jets.

In 2019, the greatest number of operations in any single design family was 636 in B-II. These accounted for approximately 42 percent of logged turbine aircraft activity. Over the 10-year period, the B-II design category has averaged approximately 618 annual operations. Representative aircraft in the category include several makes/models in the Cessna Citation and Falcon families. Furthermore, turbine aircraft in the B-I design category constituted approximately 26 percent of logged aircraft activity during 2019.

Overall, the most demanding aircraft to utilize the airport in terms of AAC were the Learjet 35/36 and larger business jets such as the Gulfstream 500/600 series. These aircraft fall within AAC D. Likewise, the most demanding aircraft in terms of ADG to operate at the airport was the Gulfstream 500/600 series. Over the past 10 years, the airport has averaged 173 annual operations by aircraft in AAC C and D combined. **Exhibit 2G** further details the more demanding jet operations in AAC C and D and ADG III. The 2008 ALP designates the existing ARC as C-II. Based upon the TFMSC analysis, as well as based aircraft records, category C-II is not currently the most demanding ARC/RDC designation for SPW per FAA regular use operational threshold standard. Rather, the current TFMSC data shows that aircraft in the B-II category have conducted more than 500 operations each of the last two years. Representative aircraft for this category include the King Air 200 and the Cessna Citation CJ2. No other more demanding ARC category exceeded the 500 operations threshold. Both aircraft are within AAC B, ADG II, and TDG 2.

Thus, AAC-B and ADG-II is the current critical design AAC and ADG. The current critical design aircraft for the airport is best described as ARC B-II and the current TDG is described as TDG-2. While aircraft more demanding than ARC C-II do not currently meet the operational threshold of 500, SPW has historically been planned to an ARC of C-II as evidenced within the current approved ALP and IASP. Additionally, with the projected addition of three jets and four turboprops basing at the airport by 2040, as well as steady operational growth, it is not unreasonable to anticipate growth in C-II operations by the end of the planning period. Therefore, SPW will consider ARC C-II as its ultimate critical design aircraft as well, with the Hawker 800 serving as the representative aircraft.

RUNWAY DESIGN CODE

Once the critical aircraft has been identified, a resulting RDC is assigned to each runway at an airport. The RDC relates to specific FAA design standards that should be planned in relation to each runway, regardless of whether or not the airport currently meets the appropriate design standards (to be discussed in Chapter Three).

Runway 12-30

Runway 12-30 is the primary runway at SPW and measures 6,001 feet long by 100 feet wide. The runway has an ILS instrument approach providing visibility minimums down to ½-mile on Runway 12. It has been established that the current critical design aircraft falls within ARC B-II. Therefore, the existing RDC for Runway 12-30 is B-II-2400. The previous ALP called for an ultimate RDC of C-II-2400 for Runway 12-30, which will also serve as the ultimate RDC for this planning effort.

Runway 18-36

Runway 18-36 is the crosswind runway. It measures 5,100 feet by 75 feet and has a GPS instrument approach providing visibility minimums down to 1-mile. The runway is designed to meet the minimum requirements for AAC B aircraft that utilize the airport as Runway 12-30 does not meet FAA wind coverage requirements for crosswind components up to 13 knots (to be discussed in Chapter Three). Given these characteristics, the existing and ultimate RDC for Runway 18-36 is B-II-5000, which is also in line with previous planning efforts.

AIRPORT DESIGN SUMMARY

Table 2P summarizes the design aircraft components to be applied at the airport. Besides the RDC, the APRC and DPRC are also noted for each runway.

ARC	Aircraft	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
A-I	Eclipse 400/500	0	0	4	2	4	0	0	0	0	0
	Express 2000	2	0	0	0	0	0	0	0	0	0
	Kodiak Quest	0	0	0	2	0	0	0	0	0	0
	Lancair Evolution/Legacy	0	0	0	4	2	0	0	0	0	0
	Piper Malibu/Meridian	28	38	28	28	46	70	34	36	28	60
	Socata TBM 7/850/900	2	2	6	16	48	126	246	266	194	118
	TOTAL	32	40	38	52	100	196	280	302	222	178
A-II	Cessna Caravan	516	518	508	512	530	512	558	544	202	0
	De Havilland Twin Otter	0	0	0	4	0	10	0	0	0	0
	Pilatus PC-12	10	16	22	26	50	30	24	30	42	106
	TOTAL	526	534	530	542	580	552	582	574	244	106
B-I	Beech 99 Airliner	0	0	2	0	0	0	0	0	0	0
	Beechjet 400	48	68	128	132	130	112	144	106	136	46
	Cessna 425 Corsair	2	4	0	2	6	20	68	82	54	42
	Citation CJ1	16	6	18	8	6	20	32	78	66	28
	Citation I/SP	4	2	2	10	0	0	0	4	0	0
	Citation M2	0	0	0	0	0	0	2	0	2	66
	Citation Mustang	14	26	16	16	4	20	10	16	26	2
	Falcon 10	10	12	14	10	40	28	18	18	2	0
	Hawker 1000	6	0	0	2	2	0	0	0	0	0
	King Air 90/100	218	218	220	202	178	182	106	138	180	162
	Mitsubishi MU-2	10	4	6	4	2	10	6	4	2	8
	Phenom 100	0	0	0	8	6	8	0	2	2	4
	Piaggio Avanti	16	24	18	0	0	0	0	0	0	0
	Piper Cheyenne	42	34	28	48	38	38	60	46	14	44
	Premier 1	0	12	0	6	0	2	2	0	2	0
	Rockwell Sabre 40/60	4	0	0	0	0	0	0	0	0	0
	T-6 Texan	2	0	0	2	0	0	0	0	0	0
	TOTAL	392	410	452	450	412	440	448	494	486	402
B-II	Aero Commander 690	0	0	2	0	0	0	0	0	0	0
	BAe Jetstream	0	0	4	0	0	0	0	0	0	0
	Beech 1900	4	2	2	4	0	0	10	0	2	0
	Cessna Conquest	16	8	18	30	44	40	18	12	12	16
	Challenger 300	8	8	16	20	12	22	10	18	48	28
	Citation CJ2/CJ3/CJ4	38	64	170	180	162	152	150	144	140	116
	Citation II/SP/Latitude	22	16	14	14	30	22	12	16	26	72
	Citation V/Sovereign	64	48	34	42	28	42	28	38	98	90
	Citation X	16	22	14	18	26	26	22	24	14	12
	Citation XLS	20	46	14	28	38	28	38	44	66	62
	Embraer EMB-110/120	0	0	0	0	0	0	0	2	0	0

ARC	Aircraft	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
B-II	Falcon 20/50	18	8	12	6	34	22	26	8	4	6
	Falcon 2000	0	2	2	4	10	2	2	4	10	2
	Falcon 900	6	2	0	0	0	4	14	0	4	8
	Hawker 4000	0	0	0	0	0	4	0	2	0	0
	King Air 200/300/350	410	374	232	290	266	286	192	204	208	180
	King Air F90	8	2	4	6	2	6	10	8	18	8
	Phenom 300	0	2	0	4	2	4	4	24	32	34
	Swearingen Merlin	0	2	10	16	8	2	2	0	4	2
	TOTAL	630	606	548	662	662	662	538	548	686	636
B-III	Bombardier Global 5000	0	0	0	0	0	0	2	2	0	0
	Bombardier Global Express	0	0	6	0	2	0	8	0	0	0
	TOTAL	0	0	6	0	2	0	10	2	0	0
C-I	BAe HS 125 Series	0	0	0	0	0	0	0	0	0	2
	BAe Systems Hawk	0	0	0	0	0	2	0	0	0	0
	Learjet 20 Series	0	0	0	0	0	0	0	0	4	0
	Learjet 31	4	8	4	0	0	2	4	2	0	0
	Learjet 40 Series	22	18	10	14	20	14	26	78	92	82
	Learjet 50 Series	0	0	8	0	2	2	0	2	0	0
	Learjet 60 Series	6	2	8	12	0	10	6	10	14	2
	Westwind II	4	0	2	0	0	0	6	0	0	0
	TOTAL	36	28	32	26	22	30	42	92	110	86
C-II	Bombardier CRJ 100/200/700	0	0	0	0	2	0	0	0	0	0
	Challenger 600/604	16	18	24	8	6	16	8	18	6	2
	Citation III/VI	52	28	4	14	36	52	40	28	36	0
	Embraer 500/450 Legacy	0	0	0	0	0	0	0	0	4	4
	Embraer ERJ-135/140/145	0	6	4	10	16	12	14	10	2	8
	Gulfstream 100/150	6	20	16	4	2	4	2	4	0	6
	Hawker 800	26	22	14	24	26	20	18	18	38	34
	(Formerly Bae-125-800)										
	Learjet 70 Series	0	0	0	0	0	4	8	20	22	48
	TOTAL	100	94	62	60	88	108	90	98	108	102
D-I	Learjet 35/36	22	38	62	50	4	2	8	0	4	2
	TOTAL	22	38	62	50	4	2	8	0	4	2
D-II	Gulfstream 200	0	0	2	0	2	10	6	2	0	0
	Gulfstream 450	4	12	0	0	0	2	4	2	0	0
	TOTAL	4	12	2	0	2	12	10	4	0	0
D-III	Gulfstream 500/600	8	0	0	6	2	12	10	20	8	8
	TOTAL	8	0	0	6	2	12	10	20	8	8

Source: Traffic Flow Management System Count

AIRPORT REFERENCE CODE (ARC) SUMMARY

ARC	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
A-I	32	40	38	52	100	196	280	302	222	178
A-II	526	534	530	542	580	552	582	574	244	106
B-I	392	410	452	450	412	440	448	494	486	402
B-II	630	606	548	662	662	662	538	548	686	636
B-III	0	0	6	0	2	0	10	2	0	0
C-I	36	28	32	26	22	30	42	92	110	86
C-II	100	94	62	60	88	108	90	98	108	102
D-I	22	38	62	50	4	2	8	0	4	2
D-II	4	12	2	0	2	12	10	4	0	0
D-III	8	0	0	6	2	12	10	20	8	8
Total	1,750	1,762	1,732	1,848	1,874	2,014	2,018	2,134	1,868	1,520

APPROACH CATEGORY

AC	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
A	558	574	568	594	680	748	862	876	466	284
B	1,022	1,016	1,006	1,112	1,076	1,102	996	1,044	1,172	1,038
C	136	122	94	86	110	138	132	190	218	188
D	34	50	64	56	8	26	28	24	12	10
Total	1,750	1,762	1,732	1,848	1,874	2,014	2,018	2,134	1,868	1,520

DESIGN GROUP

DG	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
I	482	516	584	578	538	668	778	888	822	668
II	1,260	1,246	1,142	1,264	1,332	1,334	1,220	1,224	1,038	844
III	8	0	6	6	4	12	20	22	8	8
Total	1,750	1,762	1,732	1,848	1,874	2,014	2,018	2,134	1,868	1,520

Source: Traffic Flow Management System Count



**TABLE 2P | Design Aircraft Parameters
Spencer Municipal Airport**

Runway Design Parameters	Runway Design Code (RDC)	Approach Reference Code (APRC)	Departure Reference Code (DPRC)
Existing			
Runway 12-30 (400' runway/taxiway separation)	B-II-2400	D/IV/2400 D/V/2400	D/IV D/V
Runway 18-36 (240' runway/taxiway separation)	B-II-5000	B/II/5000	B/II
Ultimate			
Runway 12-30 (400' runway/taxiway separation)	C-II-2400	D/IV/2400 D/V/2400	D/IV D/V
Runway 18-36 (240' runway/taxiway separation)	B-II-5000	B/II/5000	B/II

Source: FAA AC 150/5300-13A, Change 1, *Airport Design*

COMMERCIAL SERVICE POTENTIAL

An airport's commercial airline passenger service potential is influenced by several factors, with competing transportation modes playing a key role. The higher the level of competing factors, the less likely an airport is to capture a large percentage of its service area passengers. This is especially true for regionalized commercial service airports offering limited airline services. Competing transportation modes become much more attractive if airline services at nearby airports are limited. Thus, the first consideration for determining the potential for regaining commercial airline service area at SPW is an examination of the level of commercial air service at the airport in the past, and the level of service available at other airports within reasonable driving distance. Levels of service factors that typically shape the market share include frequency of service, number of airlines, type of aircraft utilized, and non-stop destinations available.

Spencer Municipal Airport has hosted commercial airline service in the past. Great Lakes Airlines got its start at SPW in 1981 offering flights between Spencer and Des Moines. Started by the local FBO, Great Lakes Airlines was headquartered in Spencer. The headquarters were maintained in Spencer until 1999 when they were moved to Wyoming. The airline discontinued air service to Spencer in 2001. **Table 2Q** outlines commercial service enplanements at SPW from 1986 through 2000.

Commercial passenger services to small communities diminished after deregulation of the airlines in 1978. Before deregulation, airlines were subsidized by the U.S. government and provided more point-to-point services. At that time, many smaller and regionalized communities were provided with higher levels of service including access to several markets; however, post deregulation, airlines were freely allowed to choose markets and set market prices. As a result, airlines competed for market share, and profitability of each market-pair (origination and destination airport) became highly scrutinized. The airlines moved away from a generalized point-to-point market system in favor of a hub and spoke system. Unfortunately, the overall result of these changes was the discontinuation or significant reduction of services to many smaller communities.

In response to loss of air service in small communities, the Essential Air Service (EAS) was developed and is administered by the U. S. Department of Transportation (DOT). EAS was put into place to guarantee that small communities beyond a reasonable driving distance to a large hub airport and that were served by certificated air carriers before deregulation maintain a minimal level of scheduled air service. The DOT's mandate has been to provide the EAS communities with access to the national air transportation system. As a general matter, this is accomplished by subsidizing two to four round trips a day, with three being the norm, via regional aircraft, to a major hub airport. The DOT currently subsidizes commuter airlines to serve approximately 113 rural communities across the lower 48 states that otherwise may not receive any scheduled air service. This includes five eligible communities in Iowa – Burlington, Fort Dodge, Mason City, Sioux City, and Waterloo, although Sioux City flights are not currently subsidized.

Great Lakes Airlines grew into a significant regional airline by providing subsidized service to numerous EAS communities. Ironically, its service to Spencer was never subsidized through EAS because SPW never had airline service prior to airline deregulation.

COMMERCIAL AIRLINE SERVICE AREA

As mentioned above various competing factors affect the potential passenger demand for commercial service at Great Lakes Regional Airport. **Exhibit 2H** depicts Spencer and the Iowa Great Lakes region in relation to the proximity of other airports that currently have commercial airline service. The closest air service currently available is at Fort Dodge Regional Airport (FOD) 90 miles driving distance to the south-east. Mason City Regional Airport is located 96 miles away. Both are EAS airports and are currently served by Air Choice One using nine-seat Cessna Caravans with flights to Minneapolis, Chicago, and St. Louis. Both have less than 10,000 annual enplanements and thus are classified by the FAA as non-primary commercial service airports.

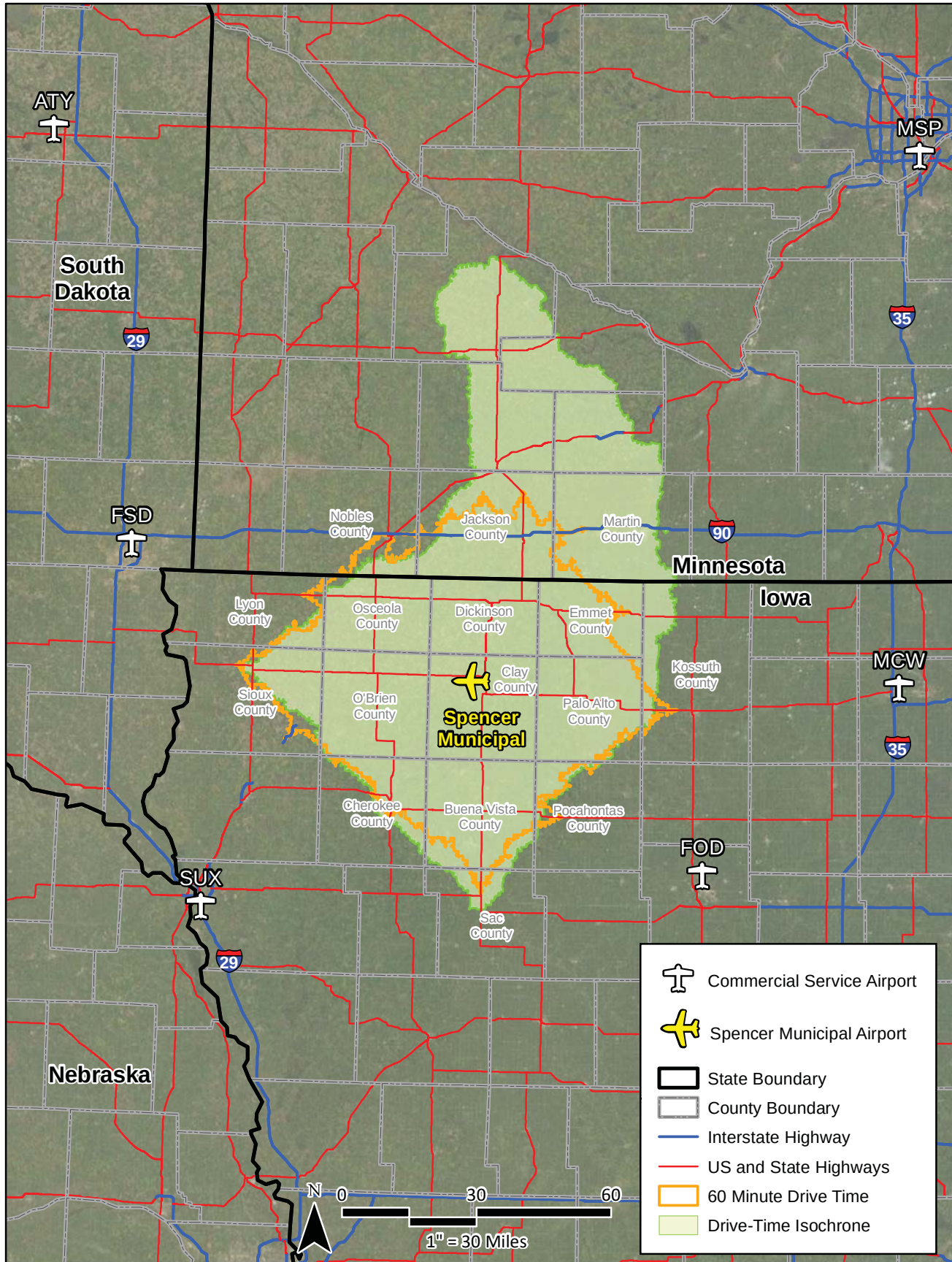
Sioux Gateway Airport (SUX) at 106 miles driving distance from Spencer, has the closest jet service. It is served by American Eagle with flights to Chicago and Dallas-Ft. Worth using 50-seat regional jets. Sioux Gateway is classified as a primary non-hub airport by the FAA. Sioux Falls Regional Airport (FSD) has over 500,000 annual enplanements and is classified as a small hub airport. At 116 miles from Spencer, it is served by six airlines with non-stop jet flights to 13 destinations. **Table 2R** summarizes information about these four airports that serve the northwest Iowa region.

Table 2Q | Airline Enplanement History (1986-2000)
Spencer Municipal Airport

Year	Annual Enplanements	Core Area Population	Travel Propensity Factor (TPF)
1986	2,920	32,584	0.090
1987	3,391	31,971	0.106
1988	3,807	31,920	0.119
1989	5,544	32,298	0.172
1990	5,599	32,494	0.172
1991	5,195	32,816	0.158
1992	7,568	32,980	0.229
1993	8,975	33,046	0.272
1994	9,079	33,056	0.275
1995	8,603	33,111	0.260
1996	7,095	33,304	0.213
1997	5,236	33,642	0.156
1998	5,380	33,683	0.160
1999	6,314	33,530	0.188
2000	4,944	33,831	0.146

Core Area - Clay and Dickinson Counties

TPF - Travel Propensity Factor



Source: ESRI Basemap Imagery (2015)

Table 2R | Commercial Airports Serving Northwest Iowa

Airport	ID	Type	2018 Enplaned	2018 Flights	Drive Dist. from Spencer (mi)
Sioux Falls Regional	FSD	Small Hub	525,282	7,911	116
Sioux Gateway	SUX	Non-Hub	44,236	1,152	106
Fort Dodge Regional	FOD	Non-Primary	8,026	1,500	90
Mason City Regional	MCW	Non-Primary	8,261	1,702	96

Exhibit 2H also presents the drive time isochrone in relation to SPW and existing commercial service airports, as well as the 60-minute drive time from SPW. The 60-minute drive time is relatively similar to the drive-time isochrone, except to the northeast where there are no commercial service airports within three hours. Minneapolis-St. Paul International Airport (MSP) is nearly 200 miles away. Thus, the potential commercial service area for SPW includes Osceola, O’Brien, Emmet, Buena Vista, and Palo Alto Counties in Iowa and possibly extend into Jackson and Martin Counties in Minnesota. The core of the service area, however, is Clay and Dickinson Counties.

COMPARABLE AIRPORT ANALYSIS

The best means to examine airline passenger demand is through an air service study. Such a study, however, is beyond the scope of airport master plans funded by the FAA. The master plan can review past commercial passenger activity at the airport as well as recent activity at commercial serviced airport located in similar markets. Five markets were selected for this comparison. Three are in the upper Midwest (Iowa and South Dakota), while the other two are in Wyoming and Oregon.

The three upper Midwest airports (Fort Dodge Regional, Mason City Municipal, and Watertown Regional) have air service subsidized through the EAS program. Sheridan County Regional in Wyoming and Southwestern Oregon Regional in North Bend are not in the EAS program. It should be noted, however, that the airlines serving these two airports do receive a combination of local and state subsidy guarantees.

Key annual demographic and economic data was collected for each market’s core-based statistical area. Each market is considered a micropolitan statistical area (MICRO). The Office of Management and Budget (OMB) defines a MICRO as a statistical area with at least one urban cluster of at least 10,000 but less than 50,000 population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting. MICROS are defined in terms of whole counties. While most encompass one or two counties, they can have up to four counties. The counties included in each micropolitan statistical area are:

- Mason City, IA – Cerro Gordo and Worth Counties;
- Fort Dodge, IA – Webster County;
- Watertown, SD - Codington and Hamlin Counties;
- Sheridan, WY – Sheridan County; and
- Coos Bay, OR – Coos County.

If specified criteria are met, adjacent MICROS, may become components of a new set of areas called a combined statistical area (CSA). For example, the OMB recognizes the MICROS of Spencer (Clay County) and Spirit Lake (Dickinson County) as the Spencer/Spirit Lake CSA. While Storm Lake (Buena Vista County) is also a MICRO, it is not considered part of any CSA.

Table 2S lists basic comparable information about each market since 2010. This includes population, total employment, and per capita personal income (PCPI) in 2012\$. Certain industries tend to relate more closely to air service demand and growth. These include:

- Finance and Insurance Employment;
- Real Estate, Rental, and Lease Employment;
- Professional and Technical Services Employment;
- Management of Companies and Enterprises Employment;
- Arts, Entertainment, and Recreation Employment; and
- Accommodations and Food Service Employment.

Wealth is another indicator of the propensity for travel. Woods & Poole has developed a Wealth Index that measures relative personal per capita income weighted by the source of that income. The Index is based upon a United States average equal to 100.

The history of passenger enplanements at the airports serving each market are also listed on the exhibit. As previously indicated, there are a variety of local factors that affect the potential for passengers within an area. A key statistic is the relationship between an airport's enplanement level and the population it serves. This ratio of annual enplanements to population is often termed the Travel Propensity Factor (TPF). **Table 2S** also presents the TPF for each of the five comparable airports dating back to 2010.

The TPF for each airport has varied over the nine-year period. Several saw a decline in the TPF around the middle of the decade, when a pilot shortage was affecting many small regional airlines. Watertown and Sheridan have rebounded from that period with the strongest TPF's in 2018 as each of these airports obtained service by regional jets. Fort Dodge and Mason City are each served by nine -passenger aircraft. Coos Bay OR has experienced a general decline in its TPF since 2010 as it has struggled to retain air service. Service frequency has impacted it the most, as the airport currently has just a single daily regional jet flight to San Francisco. Like Spencer, it is less than two hours from a small hub airport with flights to multiple destinations.

**Table 2S | Passenger and Socioeconomic History
Comparable Air Service Markets**

	2010	2012	2014	2016	2018
Spencer/Spirit Lake Combined Statistical Area					
Population	33,303	33,464	33,321	33,429	33,391
Total Employment	24,655	24,536	25,293	25,898	26,161
Air Service-Related Employment	5,565	5,667	5,928	6,046	6,218
Wealth Index	104.54	108.08	106.37	102.80	101.54
PCPI	\$43,600	\$48,020	\$48,289	\$48,194	\$48,935
Watertown Micropolitan Area					
Population	33,137	33,500	33,857	33,911	34,192
Total Employment	23,019	24,185	24,430	24,352	24,770
Air Service-Related Employment	4,670	4,838	4,973	5,297	5,279
Wealth Index	95.82	100.35	92.45	94.04	92.89
PCPI	\$38,096	\$42,195	\$39,992	\$42,082	\$42,792
ATY Enplanements	7,803	8,974	1,968	2,114	11,485
Travel Propensity Factor	0.235	0.268	0.058	0.062	0.336
Fort Dodge Micropolitan Area					
Population	37,883	37,313	37,042	36,752	36,607
Total Employment	23,332	23,073	23,641	24,566	23,800
Air Service-Related Employment	3,975	3,962	3,982	4,079	4,046
Wealth Index	85.59	88.09	88.72	87.02	84.21
PCPI	\$36,120	\$39,419	\$40,922	\$41,990	\$41,521
FOD Enplanements	7,716	5,614	132	6,908	8,026
Travel Propensity Factor	0.204	0.150	0.004	0.188	0.219
Mason City Micropolitan Area					
Population	51,683	51,193	50,728	50,539	50,406
Total Employment	35,057	35,466	34,672	35,051	35,785
Air Service-Related Employment	7,151	7,343	7,201	7,413	7,543
Wealth Index	94.65	97.62	102.53	98.11	94.75
PCPI	\$40,196	\$44,043	\$48,042	\$47,688	\$47,077
MCW Enplanements	13,355	5,863	743	7,663	8,261
Travel Propensity Factor	0.258	0.115	0.015	0.152	0.164
Coos Bay, OR Micropolitan Area					
Population	63,000	62,634	62,333	63,375	63,936
Total Employment	30,173	29,870	30,484	31,027	31,707
Air Service-Related Employment	5,980	5,931	5,967	6,255	6,421
Wealth Index	79.47	76.45	78.40	79.98	79.45
PCPI	\$33,600	\$34,161	\$36,329	\$38,892	\$39,892
OTH Enplanements	22,922	18,001	15,432	14,507	12,127
Travel Propensity Factor	0.364	0.287	0.248	0.229	0.190
Sheridan, WY Micropolitan Area					
Population	29,123	29,528	29,888	30,049	30,401
Total Employment	19,595	19,720	20,409	20,892	21,244
Air Service-Related Employment	5,341	5,353	5,660	5,920	6,020
Wealth Index	134.94	132.34	120.60	114.34	112.02
PCPI	\$53,158	\$54,996	\$51,977	\$51,720	\$52,221
SHR Enplanements	14,130	12,886	8,604	-	13,142
Travel Propensity Factor	0.485	0.436	0.288	-	0.432

The demographics and economics of the Spencer/Spirit Lake CSA do compare relatively strong with those of the five micropolitan areas with air service. The population is comparable to the Fort Dodge, Watertown, and Sheridan micropolitan areas. Employment is higher than each those three. Similarly, employment in the industries that relate most to passenger potential is higher than the three and just below that of Coos Bay. Spencer/Spirit Lake's wealth index and PCPI is higher than all but Sheridan.

COMMERCIAL SERVICE FORECAST SCENARIOS

Table 2Q presented the historic TPF at Spencer Municipal Airport during the last 15 years it hosted commercial service. The TPF peaked at 0.275 in 1994 and averaged 0.208 during the 1990s. In 2018, the TPF of the five comparable airports ranged from 0.164 to 0.432 and averaged 0.270.

Level of service improvements that affect the propensity to travel from an airport include flight frequency, aircraft type and seating capacity, air fares, and proximity to airports offering higher levels of service. Three potential enplanement scenarios were developed utilizing the TPF. Each is outlined in **Table 2T**.

**Table 2T | Commercial Service Enplanement Scenarios
Spencer Municipal Airport**

Year	Enplanements	Spencer/Spirit Lake CSA Population	Travel Propensity Factor (TPF)	U.S. Regional Airline Enplanements (millions)	SPW Market Share
Scenario 1 - Conservative Constant TPF					
2020	7,000	33,420	0.208	163.2	0.00429%
2025	7,000	33,462	0.208	171.7	0.00408%
2030	7,000	33,439	0.208	185.8	0.00377%
2040	6,900	33,138	0.208	222.7	0.00310%
Scenario 2 - Constant Market Share					
2020	7,000	33,420	0.209	163.2	0.00429%
2025	7,400	33,462	0.221	171.7	0.00429%
2030	8,000	33,439	0.239	185.8	0.00429%
2040	9,600	33,138	0.290	222.7	0.00429%
Scenario 3 - Air Service Improvements					
2020	6,700	33,420	0.200	163.2	0.00411%
2025	8,400	33,462	0.250	171.7	0.00489%
2030	11,000	33,439	0.330	185.8	0.00592%
2040	14,200	33,138	0.430	222.7	0.00638%

The first considers a conservative demand for local service at the average TPF experienced with air service in the 1990s. Since the CSA population forecast is flat over the next twenty years, the resulting enplanement projection remains around 7,000 annually. This scenario assumes that the air service attained would be similar to Mason City and Fort Dodge service using nine-seat aircraft. Because growth is flat, the frequency and size remain, thus the same seats available will not fluctuate significantly.

The second scenario considers the same TPF initially but with traffic growing at a similar rate to the FAA's forecast for Regional Airline enplanements in the United States. This would grow the TPF to 0.290 over the next twenty years. Under this scenario size of aircraft would remain at a capacity of nine seats, but the frequency of flights would be adjusted to increase the seats available seating to match the growth in passengers.

The third scenario factors in potential improvements that could attract more travelers to utilize the local air service. Under this scenario the TPF was projected to grow over time to the levels currently experienced at Watertown and Sheridan. At these two airports, the seat capacity of the aircraft increased, but the frequency of flights decreased. Still, the use of 50-seat regional aircraft has increased the daily seats available.

Table 2U provides a projection of the aircraft fleet mix and operations for Scenarios 2 and 3. A primary consideration for an airline in providing service is its load factor. The boarding load factor (BLF) is defined as the ratio of passengers boarding an aircraft to the seating capacity of the aircraft. the percentage of seats that are filled on an aircraft. For example, in 2018, Fort Dodge Regional Airport had 1,500 airline flights, all by the nine-seat Cessna 208 (Caravan). With 8,026 enplanements in 2018, there were an average of 5.4 seats per departure resulting in a BLF of 60 percent. At Watertown Regional Airport there were 553 flights all by 50-seat regional jets. Annual enplanements totaled 11,485 for an average of 20.8 enplanements per departure resulting in a BLF of 41.6 percent. Those flight went to and from Denver with a stop in Pierre, SD. Because the flight was shared with Pierre, the airline's load factor was nearly doubled.

**Table 2U | Airline Fleet Mix and Operations Forecast Scenarios
Spencer Municipal Airport**

Fleet Mix Seat Capacity/Typ. Aircraft	2020	2025	2030	2040
Scenario 2 - Constant Market Share				
40-59/CRJ200, -550	0%	0%	0%	0%
20-39/EMB 120	0%	0%	0%	0%
10-19/B1900	0%	0%	0%	0%
<10/C208, PC12	100%	100%	100%	100%
Total	100%	100%	100%	100%
Average Seats per Departure	9.0	9.0	9.0	9.0
Boarding Load Factor	65%	55%	59%	59%
Enplanements per Departure	5.8	4.9	5.3	5.3
Annual Enplanements	7,000	7,400	8,000	9,600
Annual Departures	1,200	1,500	1,500	1,800
Annual Operations	2,400	3,000	3,000	3,600
Scenario 3 - Air Service Improvements				
40-59/CRJ200, -550	0%	0%	0%	100%
20-39/EMB 120	0%	0%	0%	0%
10-19/B1900	0%	0%	100%	0%
<10/C208, PC12	100%	100%	0%	0%
Total	100%	100%	100%	100%
Average Seats per Departure	9.0	9.0	19.0	50.0
Boarding Load Factor	62%	62%	48%	47%
Enplanements per Departure	5.6	5.6	9.2	23.7
Annual Enplanements	6,700	8,400	11,000	14,200
Annual Departures	1,200	1,500	1,200	600
Annual Operations	2,400	3,000	2,400	1,200

The fleet mix table was prepared assuming that a BLF between 55 and 65 percent would be maintained. It is likely that a subsidy guarantee would still be required at that level. The table shows this BLF can be reasonably managed with nine-seat aircraft, but a move up to 19-seat turboprops or 50-seat regional jets would result in BLF's below this level. An option could be working with another commercial service airport to share a route such as is being done by Watertown and Pierre. For the purposes of this master plan Scenario 2 – Constant Market Share is recommended as the preferred forecast; however, the 2040 projections of Scenario 3 – Air Service Improvements will be maintained as a high range scenario.

While this analysis has examined air service potential, if the community wishes to further pursue returning commercial air service to SPW, it is recommended an independent air service consultant be retained to evaluate the actual ticketed passengers in the service area. This evaluation will not only consider the number of air travelers but also the airport they utilize and their destinations to determine the if service is feasible and if it is, what airlines might best serve the market.

As mentioned earlier, since SPW is not eligible for EAS, starting up new air service will likely take a local financial commitment to guarantee the airline a suitable return. The U.S. Department of Transportation (DOT) does offer federal grants under to the Small Community Air Service Development Program (SCASDP) to address air service and airfare issues. While many participants are communities that already have air service, those without existing air service are also eligible. No more than 40 communities or consortia of communities are chosen to participate in the program each year. Grant sizes in the past have ranged from \$20,000 to \$1.6 million.

The Iowa DOT also has an Air Service Development (ASD) program for providing assistance to commercial service airports in the state to maintain and enhance passenger air service. The target funding is used to attract and retain air service based on the needs and circumstances of an airport's air service market. Unfortunately, participation is limited to airports designated as commercial service airports in the Iowa Aviation System Plan and are currently receiving scheduled service under Part 121 or Part 135. This program would only be an option for SPW after air service has been re-established.

SUMMARY

This chapter has outlined the various activity levels that might reasonably be anticipated over the next 20 years at Spencer Municipal Airport. As previously shown, **Exhibit 2D** presents a summary of the aviation demand forecasts. The forecasting effort extends 20 years to the year 2040.

Forecasts of aviation activity, including based aircraft and operations, are key to determining future facility requirements. There are currently 41 aircraft based at the airport which are forecast to grow to 53 aircraft by 2040, including the addition of three jets, four turboprops, one helicopter, and nine new piston aircraft. It is estimated that the airport experienced 16,475 operations in 2020, which are forecast to grow to approximately 18,400 operations annually by 2020.

The fleet mix operations, or type and frequency of aircraft use, is important in determining facility requirements and environmental impacts. While single-engine piston-powered aircraft are expected to represent the majority of based aircraft, the forecast considers the possibility of more turbine aircraft utilizing and basing at the airport over the course of the planning period, which reflects a national trend toward a more sophisticated general aviation fleet.

The commercial service potential has also examined for Spencer Municipal Airport, with three scenarios presented. The preferred forecast is the constant market share scenario, which results in annual enplanements totaling 9,600 by the end of the planning period. A high range scenario resulting in 14,200 enplanements by 2040 has also been included. It should be noted, however, either scenario would likely

require a local subsidy to attract a commercial service operator. These commercial service forecasts will be considered separate from the forecasts to be approved by the FAA and have been developed in order to provide the airport important facility planning information should commercial service be implemented at SPW.

The next step in the master plan process is to use the forecasts to determine development needs for the airport through 2040. Chapter Three – Facility Requirements will address airside elements, such as safety areas, runways, taxiways, lighting, and navigational aids, as well as landside requirements, including hangars, aircraft aprons, support services, and other facilities necessary to accommodate commercial service operations. The remaining portions of the master plan will lay out how that growth can be accommodated in an orderly, efficient, and cost-effective manner.

Chapter Three

Facility Requirements



Facility Requirements

To properly plan for the future at Spencer Municipal Airport (SPW), it is necessary to translate forecast aviation demand into the specific types and quantities of facilities necessary to adequately serve current and projected demand levels. This chapter uses the results of the aviation demand forecasts, as well as established planning criteria, to determine the airfield (i.e., runways, taxiways, navigational aids, marking and lighting, and support facilities), and landside (i.e., terminal building, hangars, aircraft parking apron, fueling, and vehicle parking and access) facility requirements.

The objective of this effort is to identify the adequacy of existing airport facilities and outline facilities that may be needed and when they may be needed to accommodate forecast demands. Having established these facility requirements, alternatives for providing the facilities will be evaluated to determine the most cost-effective and efficient means for implementation.

PLANNING HORIZONS

Cost-effective, safe, efficient, and orderly development of an airport should rely more upon actual demand than a time-based forecast figure. Thus, in order to develop a master plan that is demand-based rather than time-based, a series of planning horizon milestones have been established, as discussed in Chapter Two - Forecasts, that take into consideration the reasonable range of aviation demand projections.

It is important to consider that, over time, the actual activity at the airport will likely be higher or lower than what the annualized forecast portrays. Aviation trends, especially general aviation trends, tend to be cyclical and most often follow the ebbs and flows of regional and national economic conditions. As a result, the actual growth curve will likely appear more similar to the stock market trendline. By planning according to activity milestones, the resultant plan can accommodate unexpected shifts or changes in the area's aviation demand. It is important to plan for these milestones so that airport officials can respond to unanticipated changes in a timely fashion. The primary benefit is that the milestones provide flexibility in capital investment planning and development, while potentially extending this plan's useful life if aviation trends slow over the period.

The most important reason for utilizing milestones is facilities are developed according to need generated by actual demand levels. Very rarely will aviation demand follow a "if you build it, they will come" philosophy. Moreover, the FAA grant-in-aid programs will require specific justification for proposed facility development. These funds cannot be extended without "proof of current need." The demand-based schedule provides flexibility in development, as the schedule can be slowed or expedited according to actual 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 planning horizon milestones for each activity demand category. It should be noted that the commercial operations projected are reflective of Scenario 2 – Constant Market Share, which is the preferred projection and was detailed in the previous chapter. Scenario 3 – Air Service Improvements details a high range projection and will be used for an ultimate planning condition as will be discussed later in this chapter.

TABLE 3A | Planning Horizon Activity Levels
Spencer Municipal Airport

	BASE YEAR	PLANNING HORIZONS		
	2020	Short Term	Intermediate Term	Long Term
Commercial Operations*				
Air Carrier	0	0	0	0
Other Air Taxi	2,400	3,000	3,000	3,600
Total Commercial Operations	2,400	3,000	3,000	3,600
General Aviation Operations				
Itinerant	9,862	10,100	10,400	11,100
Local	6,612	6,800	7,000	7,300
Total General Aviation Operations	16,475	16,900	17,400	18,400
Military Operations				
Itinerant	0	0	0	0
Local	0	0	0	0
Total Military Operations	0	0	0	0
Total Airport Operations	18,875	19,900	20,400	22,000
Based Aircraft	41	44	47	53

Note: Totals have been rounded

*Commercial operations have been projected in the event that demand for this service materializes at SPW. These projections are not included as part of the master plan forecasts to be approved by the FAA.

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 exponentially. The airport's ASV was examined utilizing the Federal Aviation Administration's (FAA) Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay*.

FACTORS AFFECTING ANNUAL SERVICE VOLUME

This analysis takes into account specific factors about the airfield in order to calculate SPW's ASV. The following describes the input factors as they relate to the airport and include airfield layout, weather conditions, aircraft mix, and operations. These factors are depicted on **Exhibit 3A**.

- **Runway Configuration** – The existing airfield configuration consists of two intersecting runways supported by a taxiway system consisting of partial parallel, connector, access, and bypass taxiways. Primary Runway 12-30 is 6,001 feet long by 100 feet wide, and crosswind Runway 18-36 is 5,100 feet long by 75 feet wide.
- **Runway Use** – Runway use in capacity conditions will be controlled by wind and/or airspace conditions. For SPW, the direction of takeoffs and landings are generally determined by the speed and direction of the wind. It is generally safest for aircraft to takeoff and land into the wind, avoiding a crosswind (wind that is blowing perpendicular to the travel of the aircraft) or tailwind components during these operations.

Based upon available wind data, winds are predominantly out of the north and northwest, resulting in Runway 30 being the preferred use runway end. The availability of instrument approaches is also considered. While each runway end provides instrument approach capability, Runway 12 offers the best option in instrument weather conditions since it is equipped with an instrument landing system (ILS), providing published visibility minimums down to ½-mile.

- **Exit Taxiways** - Exit taxiways have a significant impact on airfield capacity since the number and location of exits directly determine the occupancy time of an aircraft on the runway. The airfield capacity analysis gives credit to taxiway exits located within the prescribed range from a runway's threshold. This range is based upon the mix index of the aircraft that use the runways. Based upon mix, only exit taxiways between 2,000 feet and 4,000 feet from the landing threshold count in the exit rating at SPW. The exits must be at least 750 feet apart to count as separate exit taxiways. Utilizing these standards, Runway 12-30 is not credited with any exit taxiways (except for the Runway 18-36 crossing which can be used as an exit), while Runway 18-36 is provided with one exit taxiway in each direction.
- **Weather Conditions** – Weather conditions can have a significant impact on airfield capacity. Airport capacity is usually highest in clear weather, when flight visibility is at its best. Airfield capacity is diminished as weather conditions deteriorate and cloud ceilings and visibility are reduced. As

AIRFIELD LAYOUT

Runway Configuration



Runway Use



Number of Exits

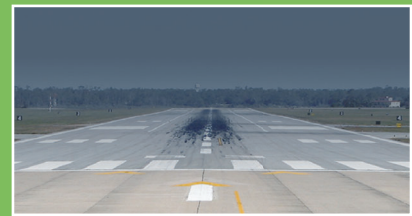


WEATHER CONDITIONS

VMC- Visual Meteorological Conditions



IMC- Instrument Meteorological Conditions



PVC- Poor Visibility Conditions



OPERATIONS

Arrivals



Departures



Touch-and-Go Operations



Total Annual Operations



AIRCRAFT MIX

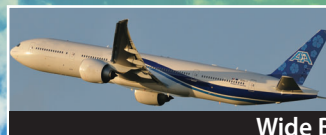
Category A & B Aircraft



Category C Aircraft



Category D Aircraft



Wide Body Jets

weather conditions deteriorate, the spacing of aircraft must increase to provide allowable margins of safety and air traffic vectoring. The increased distance between aircraft reduces the number of aircraft which can operate at the airport during any given period, thus reducing overall airfield capacity.

Meteorological data has been collected from the on-airport automated surface observation system (ASOS). This data set included nearly 117,000 separate observations of weather conditions at SPW during a 10-year timeframe. According to the observation count data, the airport operates under visual meteorological conditions (VMC) approximately 78.56 percent of the time. VMC exist whenever the cloud ceiling is greater than 1,000 feet above ground level (AGL) and visibility is greater than three statute miles. Instrument meteorological conditions (IMC) are defined when cloud ceilings are between 500 and 1,000 feet AGL or visibility is between one and three miles. According to the weather observations, IMC prevailed approximately 8.76 percent of the time. Poor visibility conditions (PVC) apply for cloud ceilings below 500 feet and visibility minimums below one mile. PVC conditions occur approximately 12.68 percent of the time.

This data was further analyzed by the consultant according to the duration of each observation. This produced a total of 5,258,820 minutes of observed data, or about 87,600 hours over the 10-year time period. When analyzed by duration rather than observation count, the results are significantly different, with VMC conditions occurring 89.27 percent of the time, IMC conditions 6.49 percent of the time, and PVC conditions 4.24 percent of the time. **Table 3B** summarizes the weather conditions experienced at the airport over a 10-year period.

**TABLE 3B | Weather Conditions
Spencer Municipal Airport**

Condition	Cloud Ceiling	Visibility	Percent by Observation ¹	Percentage by Duration ²
VMC	> 1,000' AGL	> 3 statute miles	78.56%	89.27%
IMC	≥ 500' AGL and ≤ 1,000' AGL	1-3 statute miles	8.76%	6.49%
PVC	< 500' AGL	< 1 statute mile	12.68%	4.24%

VMC - Visual Meteorological Conditions

IMC - Instrument Meteorological Conditions

PVC - Poor Visibility Conditions

AGL - Above Ground Level

Source: National Oceanic and Atmospheric Administration (NOAA); Spencer Municipal Airport ASOS.

¹ 116,965 weather observations from January 1, 2009 to December 31, 2018

² 5,258,820 minutes from January 1, 2009 to December 31, 2018

- **Aircraft Mix** - Aircraft mix for the capacity analysis is defined in terms of four fixed-wing aircraft classes. Classes A and B consist of small- and medium-sized propeller and some jet aircraft, all weighing 12,500 pounds or less. These aircraft are associated primarily with general aviation activity. Most aircraft operations at SPW are those in Classes A and B. Class C consists of aircraft weighing between 12,500 pounds and 300,000 pounds. These aircraft include a majority of airline aircraft, most business jets (e.g., Cessna Citation Sovereign) and large turboprop aircraft, as well as larger charter aircraft. Class D aircraft consists of large aircraft weighing more than 300,000 pounds. The airport experiences very few operations by Class D aircraft. In the future, aircraft in Class B will continue to constitute a significant number of fixed-wing operations; however, Class C aircraft are projected to contribute regular operational activity at SPW as part of the overall aircraft fleet mix at the airport.

It should be noted that for purposes of determining airfield capacity, helicopter activity is not included in the aircraft mix classification.

- **Percent Arrivals** – The percentage of arrivals as they relate to total operations of the airport is important in determining airfield capacity. Under most circumstances, the lower the percentage of arrivals, the higher the hourly capacity. The aircraft arrival-departure percentage split is typically 50/50, which is the case at SPW.
- **Touch-And-Go Activity** – A touch-and-go operation involves an aircraft making a landing and then an immediate takeoff without coming to a full stop or exiting the runway. A high percentage of touch-and-go traffic normally results in a higher operational capacity because one landing and one takeoff occurs within a shorter time period than individual operations. Touch-and-go operations at SPW have historically been estimated to be approximately 30 percent of total annual operations.
- **Peak Period Operations** – For the airfield capacity analysis, average daily operations and average peak hour operations during the peak month are utilized. Typical operations activity is important in the calculation of an airport's ASV as "peak demand" levels occur sporadically. The peak periods used in the capacity analysis are representative of normal operational activity and can be exceeded at various times throughout the year. For SPW, the peak periods typically occur during the summer and early fall months.

AIRFIELD CAPACITY SUMMARY

Given the factors outlined above, the airfield's ASV will range between 200,000 and 230,000 annual operations. The ASV does not indicate a point of absolute gridlock for the airfield; however, it does represent the point at which operational delay for each aircraft operation will increase exponentially.

Current operational estimates for the airport represent just over eight percent of the airfield's ASV, if the ASV is considered at the low end of the typical range of 200,000 annual operations. By the end of the long-term planning period, total annual operations are expected to represent nine percent of the airfield's ASV.

FAA Order 5090.3B, *Field Formulation of the National Plan of Integrated Airport Systems (NPIAS)*, indicates that improvements for airfield capacity purposes should begin to be considered once operations reach 60 to 75 percent of the annual service volume. This is an approximate level to begin the detailed planning of capacity improvements. At the 80 percent level, the planned improvements should be made. No significant capacity improvements will be necessary as the existing and forecast operations do not exceed even 25 percent of the ASV; however, some options to improve airfield efficiency will still be considered, including the option for additional airfield exit taxiways for Runway 12-30.

AIRFIELD REQUIREMENTS

The analyses of the operational capacity and the critical design aircraft are used to determine airfield needs related to the arrival, departure, and ground movement of aircraft. Dimensional design standards have been established by the FAA in the following areas: Runway Elements, Runway Design Standards, Taxiways, Navigational and Approach Aids, and Airfield Lighting and Signage.

RUNWAY ELEMENTS

The existing runway system at SPW will be analyzed from several perspectives to ensure the overall system adheres to FAA design standards. The runway elements to be examined include orientation, length, width, and strength, as presented below.

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 150/5300-13A, *Airport Design*, recommends that a crosswind runway should be made available when the primary runway orientation provides less than 95 percent wind coverage for any aircraft forecast to use the airport on a regular basis.

The 95 percent wind coverage is computed on the basis of the crosswind component not exceeding 10.5 knots (12 mph) for ARC A-I and B-I; 13 knots (15 mph) for ARC A-II and B-II; 16 knots (18 mph) for ARC A-III, B-III, and C-I through D-II; and 20 knots (23 mph) for ARC C-III through D-IV.

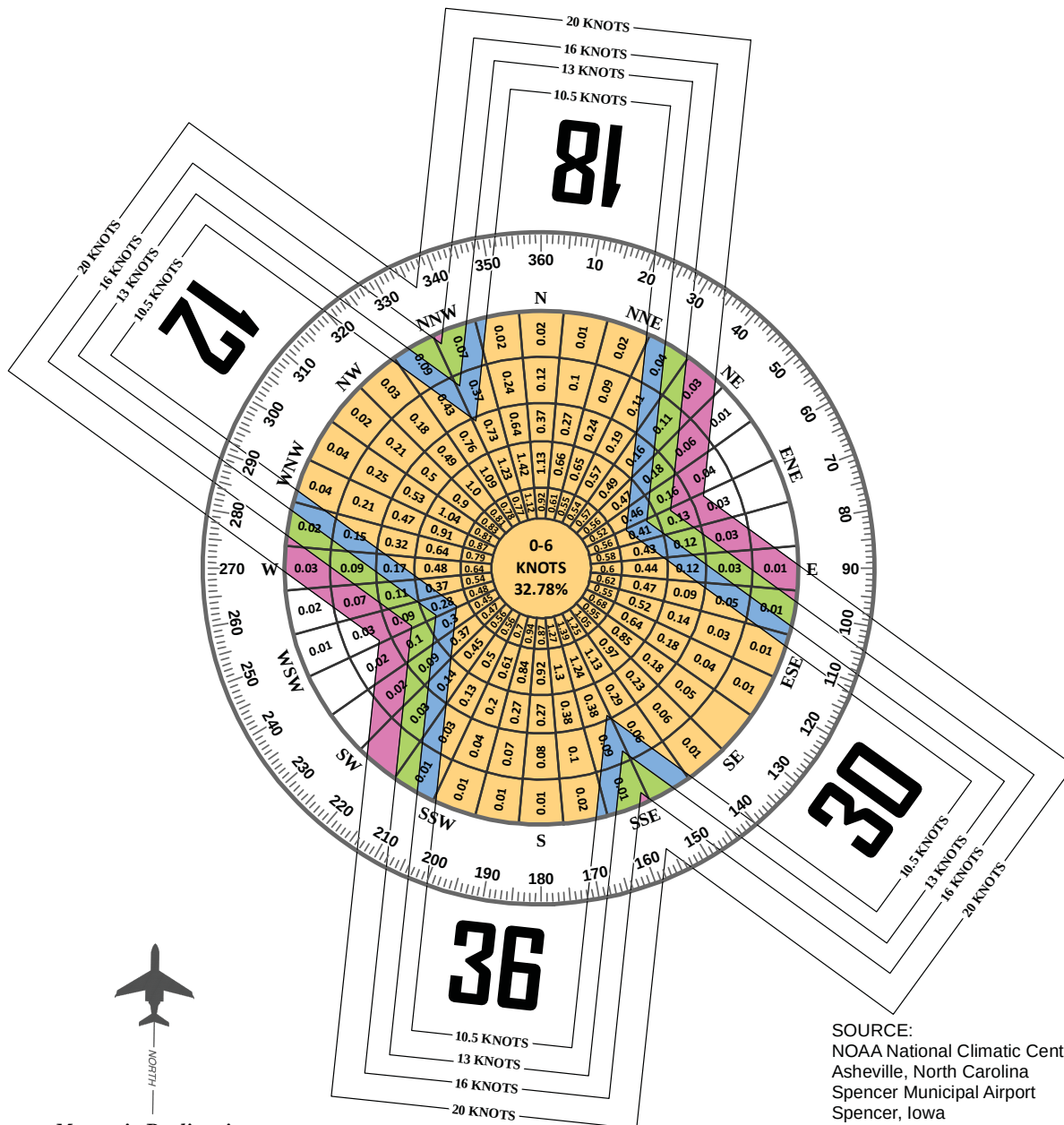
The previous 10 years of wind data was obtained from the on-airport ASOS and has been analyzed to identify wind coverage provided by the existing runway orientations. As detailed on **Exhibit 3B**, at SPW, the orientation of Runway 12-30 provides 83.5 percent coverage for 10.5 knot component; 90.3 percent coverage for 13 knots, and greater than 98 percent coverage for 16 and 20 knot components. Crosswind Runway 18-36 provides 82.69 percent coverage for 10.5 knot component; 89.27 percent coverage for 13 knots, 94.96 percent coverage for 16 knots, and greater than 98 percent coverage for 16 and 20 knot components.

The combination of both runways provides for 95.62 percent coverage for the 10.5 knot component, and over 98 percent coverage for 13 knots and greater. The IFR windrose, presented on the back side of the exhibit, provides a similar distribution of coverage for each runway. With combined runway coverage exceeding 95 percent for 10.5 knot conditions in all-weather conditions and 13 knots in IFR conditions, no additional runways or reorientation of existing runways is necessary for crosswind purposes. Because primary Runway 12-30 does not offer 95 percent or greater coverage until beyond 13 knot components, crosswind Runway 18-36 is required and should be maintained to A/B-I standards at a minimum.

Runway Length

The aircraft performance capability is a key factor in determining the runway length needed for takeoff and landing. The performance capability and, subsequently, the runway length requirement of a given

ALL WEATHER WIND COVERAGE				
Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 12-30	83.50%	90.30%	98.78%	98.55%
Runway 18-36	82.69%	89.27%	94.96%	98.09%
All Runways	95.62%	98.19%	99.36%	99.86%

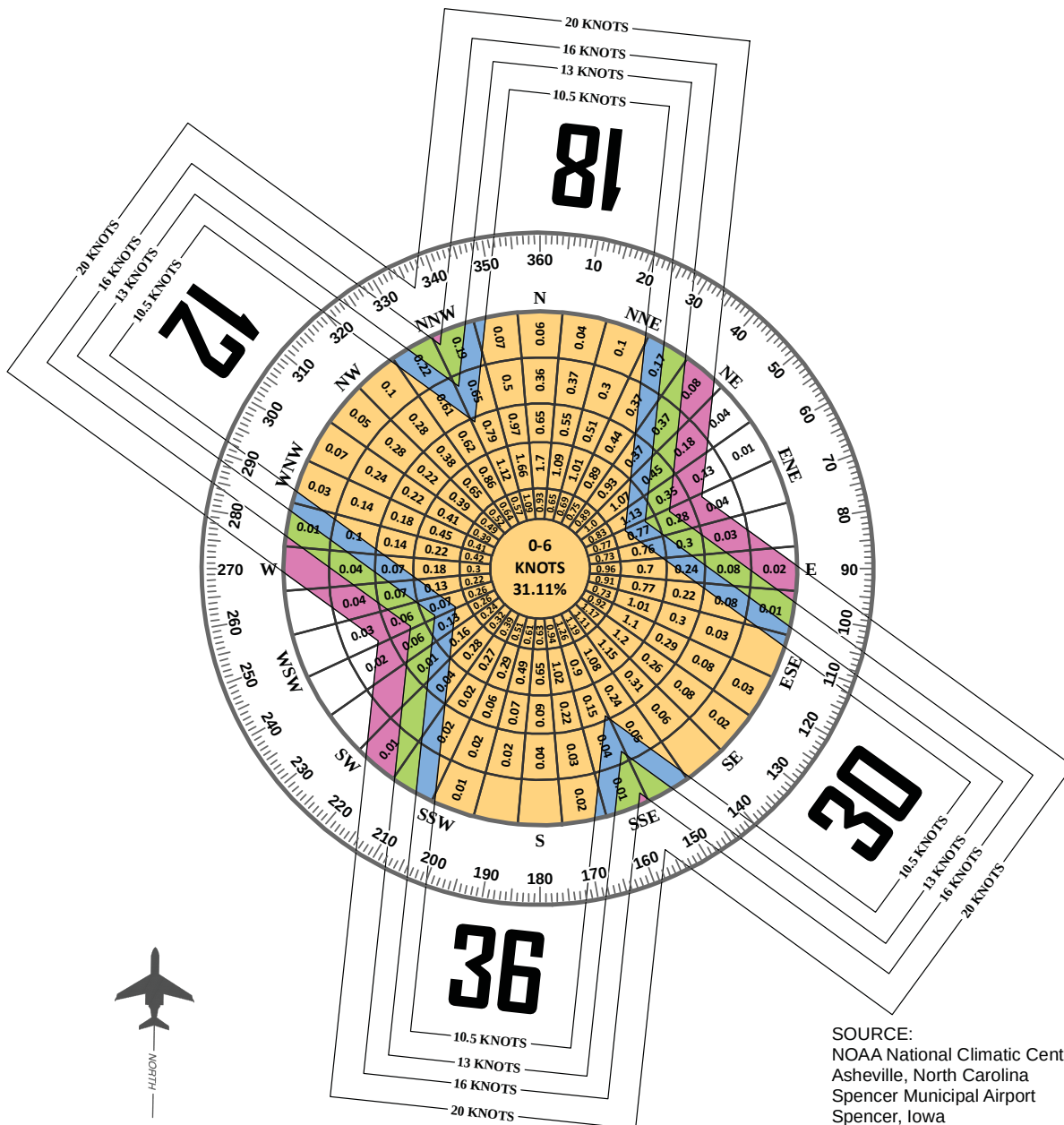


Magnetic Declination
01° 48' 00" East (Dec 2019)
Annual Rate of Change
00° 04' 00" West (Dec 2019)

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Spencer Municipal Airport
Spencer, Iowa

OBSERVATIONS:
116,965 All Weather Observations
Jan. 1, 2009 - Dec. 31 2018

IFR WIND COVERAGE				
Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 12-30	81.00%	88.22%	94.44%	97.94%
Runway 18-36	78.15%	85.99%	92.84%	96.76%
All Runways	93.19%	96.97%	98.97%	99.79%



Magnetic Declination
01° 48' 00" East (Dec 2019)
Annual Rate of Change
00° 04' 00" West (Dec 2019)

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Spencer Municipal Airport
Spencer, Iowa

OBSERVATIONS:
25,073 IFR Observations
Jan. 1, 2009 - Dec. 31 2018

aircraft type can be affected by the elevation of the airport, the air temperature, the gradient of the runway, and the operating weight of the aircraft. Aircraft performance capabilities decline as each of these factors increase.

The airport elevation at SPW is 1,339 feet above mean sea level (MSL). The temperature used for airport design is the mean maximum daily temperature during the hottest month. According to National Oceanic and Atmospheric Administration (NOAA) data, the mean maximum temperature is 84.2 degrees Fahrenheit (F) during the month of July. The published gradient of primary Runway 12-30 is 0.07 percent, and the gradient for crosswind Runway 18-36 is 0.05 percent. This information is utilized in the following runway length analyses.

Small Aircraft

Most operations at SPW are conducted using smaller GA aircraft weighing less than 12,500 pounds. Following guidance from AC 150/5325-4B, to accommodate 100 percent of these small aircraft, a runway length of 4,100 feet is recommended. For small aircraft with 10 or more passenger seats, 4,300 feet of runway length is recommended. **Table 3C** summarizes the runway length needs for small aircraft. Crosswind Runway 18-36 should be maintained at this length at a minimum; however, both runways should be capable of accommodating turboprops such as the Pilatus, Caravan, and/or Super King Air 350. These aircraft could require up to 5,000 feet in Part 135 operational conditions. As a result, the length of Runway 18-36 should be maintained at the current 5,100 feet.

TABLE 3C | Runway Length Requirements (Small Airplanes)
Spencer Municipal Airport

AIRPORT AND RUNWAY DATA	
Airport elevation.....	1,339 feet above MSL
Mean daily maximum temperature of the hottest month	84.2° F (July)
Maximum difference in runway elevation	4.5 feet (Runway 12-30)
RUNWAY LENGTHS RECOMMENDED FOR AIRPORT DESIGN	
Small airplanes with less than 10 passenger seats:	
95 percent of small airplanes	3,500 feet
100 percent of small airplanes	4,100 feet
Small airplanes with 10 or more passenger seats	4,300 feet

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

Business Aircraft

While the majority of general aviation activity is conducted by small piston-powered aircraft, SPW is also used extensively by business jet and turboprop aircraft (Beechcraft King Air family of turboprops, Cessna Citation family of business jets, Learjet 40/70), which have a greater impact upon runway length needs. For aircraft weighing more than 12,500 pounds but less than 60,000 pounds, including most small to mid-sized business jet aircraft, runway length requirements have been calculated. These calculations take into consideration the runway gradient and landing length requirements for contaminated runways (wet). Business jets tend to need greater runway length when landing on a wet surface because of their increased approach speeds. AC 150/5325-4B stipulates that runway length determination for business

jets consider a grouping of airplanes with similar operating characteristics. The AC provides two separate “family groupings of airplanes,” each based upon their 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 3D** 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 3D | Business Jet Categories for Runway Length Determination

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

MTOW: Maximum Take-Off Weight

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

Table 3E presents the results of the runway length analysis for business jets 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 4,807 feet that is adjusted, as recommended, for runway gradient and consideration of landing length needs on a contaminated runway (wet and slippery). To accommodate 100 percent of the business jet fleet at 60 percent useful load, a runway length of 5,700 feet is recommended.

**TABLE 3E | Business Jet Runway Length Requirements
Spencer Municipal Airport**

Airport Elevation	1,339 feet above MSL			
Average High Monthly Temp.	84.2° F (July)			
Runway Gradient	4.5 feet (Runway 12-30)			
Fleet Mix Category	Raw Runway Length from FAA AC	Runway Length With Gradient Adjustment (+45')	Wet Surface Landing Length for Jets (+15%)*	Final Runway Length
75% of fleet at 60% useful load	4,807'	4,852'	5,500'	5,500'
75% of fleet at 90% useful load	6,332'	6,377'	7,000'	7,000'
100% of fleet at 60% useful load	5,601'	5,646'	5,500'	5,700'
100% of fleet at 90% useful load	8,278'	8,323'	7,000'	8,300'

* Max 5,500' for 60% useful load in wet conditions and 7,000' for 90% useful load in wet conditions.

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

A more specific method to determine runway length requirements for jet aircraft at SPW is to examine aircraft flight planning manuals under conditions specific to the airport. Several aircraft were analyzed for takeoff length required with a design temperature of 84.2 degrees F at a field elevation of 1,339 feet

MSL. **Table 3F** provides a detailed runway takeoff length analysis for the most common business jet and turboprop aircraft in the national fleet. This data was obtained from UltrNAV 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. The figures are shaded from green to red based upon their proximity to the current length of Runway 12-30 (6,001 feet) with darker red figures exceeding the current runway length. This analysis shows that during the hottest periods of the year, Runway 12-30 can accommodate all aircraft at 60 percent useful load, and all but one aircraft at 70 percent useful load. Progressively more aircraft are restricted at 80, 90, and 100 percent useful loads. The average takeoff length needed for all business jets analyzed at 80, 90, and 100 percent useful loads is 4,700 feet, 5,100 feet, and 5,500 feet, respectively.

Table 3G presents the runway length required for landing under three operational categories: Title 14 Code of Federal Regulations (CFR) Part 25, CFR Part 135, and CFR Part 91k. CFR Part 25 operations are those conducted by individuals or companies operating their own transport category aircraft (non-commercial). CFR Part 91k includes operations in fractional ownership, which utilize their own aircraft under direction of pilots specifically assigned to said aircraft. CFR Part 135 applies to all for-hire charter operations. 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 conducted accounts for both scenarios.

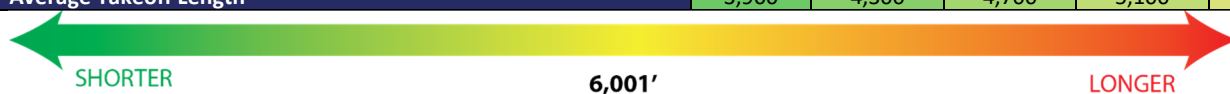
It should also be noted that, though Runway 12-30 is 6,001 feet long, the full length of the runway is not usable for all operations due to the 500-foot displaced threshold on Runway 30. This displacement was initiated under a previous master plan drafted in the 1990s to mitigate an RSA/ROFA obstruction (i.e., localizer equipment). As a result of the displacement, operational length is reduced to 5,501 feet for aircraft landing on either runway end, in order to maintain safety area standards.

The landing length analysis shows that aircraft operating at maximum landing weight (MLW) under Part 135 rules needing to land within 60 percent of the effective runway length during wet conditions is the most restrictive with some aircraft, such as the Cessna Citation II, needing over 10,000 feet. The average length needed for this category is 7,100 feet. Per FAA guidance on determining runway length needs, wet runway conditions do not apply to turboprop aircraft, so figures for the King Air aircraft are only included under the dry runway conditions. Each of the King Airs is capable of landing in approximately 4,700 feet or less.

As previously noted, the FAA will typically only support runway length planning to the 60 percent useful load factor unless it can be demonstrated that business jets are frequently operating fully loaded (90 percent). Most business aircraft can take off on Runway 12-30 at SPW at or above 90 percent useful load. The analysis for landing length shows that several business jets that utilize the airport can be accommodated under Part 25, Part 91k, and Part 135 (dry conditions). When factoring in wet conditions, the landing length increases, and many exceed the current primary runway length. Accumulations of snow and ice will also dramatically increase landing length requirements. The landing length analysis shows an average landing length of 5,400 feet for aircraft operating under CFR Part 91k during wet conditions and an average landing length of 7,200 feet for aircraft operating under CFR Part 135 during wet runway conditions.

Table 3F | Business Aircraft Takeoff Length Requirements

Aircraft Name	MTOW	Takeoff Length Requirements (feet)				
		60%	70%	80%	90%	100%
Pilatus PC-12	9,921	2,335	2,533	2,743	2,964	3,198
King Air C90GTi	10,100	2,665	2,858	3,066	3,275	3,483
King Air C90B	10,100	2,651	2,849	3,056	3,273	3,500
Citation CJ3	13,870	2,873	3,037	3,248	3,482	3,727
Citation I/SP	11,850	2,740	2,974	3,223	3,486	3,766
Citation Ultra	16,300	2,813	3,015	3,268	3,530	3,809
Citation V (Model 560)	15,900	2,799	3,037	3,292	3,565	3,854
Citation Mustang	8,645	2,721	2,954	3,222	3,557	3,891
King Air 200 GT	12,500	3,424	3,535	3,652	3,774	3,901
Citation Sovereign	30,300	3,414	3,456	3,570	3,797	4,044
Citation (525A) CJ2	12,375	3,113	3,359	3,607	3,864	4,136
Citation II (550)	13,300	2,934	3,232	3,553	3,895	4,259
King Air 350	15,000	3,435	3,579	3,726	3,965	4,275
Citation Encore	16,630	3,065	3,320	3,622	3,964	4,335
Citation 560 XL	20,000	3,322	3,562	3,836	4,111	4,428
Citation Bravo	14,800	3,336	3,568	3,833	4,151	4,496
Citation (525) CJ1	10,600	3,034	3,432	3,843	4,268	4,664
Premier 1A	12,500	3,889	4,180	4,490	4,825	5,189
King Air 1900D	17,120	4,048	4,287	4,565	4,894	5,234
Beechjet 400A	16,300	3,958	4,260	4,579	4,916	5,264
Lear 45XR	21,500	4,061	4,352	4,701	5,074	5,516
Hawker 900 XP	28,000	4,425	4,539	4,817	5,227	5,681
Hawker 4000	39,500	4,155	4,497	4,865	5,253	5,686
Gulfstream 350	70,900	4,127	4,483	4,873	5,304	5,764
Citation VII	23,000	4,497	4,791	5,114	5,460	5,845
Challenger 300	38,850	4,301	4,705	5,125	5,560	6,016
Gulfstream III	69,700	4,606	4,743	5,197	5,670	6,160
Citation X	35,700	4,401	4,759	5,208	5,686	6,178
Gulfstream IV	74,600	4,571	4,880	5,381	5,907	6,211
Falcon 900EX	49,200	4,200	4,650	5,150	5,690	6,220
Falcon 7X	70,000	4,340	4,810	5,315	5,855	6,429
Falcon 900B	46,500	4,030	4,530	5,090	5,720	6,430
Gulfstream 450	74,600	4,423	4,856	5,339	5,859	6,435
Global 5000	92,500	4,374	4,859	5,366	5,898	6,453
Falcon 2000	35,800	4,672	5,046	5,424	5,847	6,548
Challenger 604/605	48,200	4,804	5,271	5,804	6,380	6,976
Gulfstream II/IISP	65,500	5,191	5,602	6,060	6,566	7,118
Lear 60	23,500	5,074	5,519	6,014	6,563	7,190
Global Express	98,000	4,773	5,341	5,938	6,565	7,222
Gulfstream 550	91,000	4,604	5,263	5,915	6,624	7,381
Gulfstream V	90,500	4,382	4,907	5,698	6,508	7,489
Lear 55	21,500	5,124	5,684	6,292	6,951	7,664
Canadair 601-3A/R (Challenger 601)	45,100	5,030	5,600	6,230	6,930	7,710
Hawker 800 (With T/R)	27,400	5,719	6,297	6,912	7,545	8,184
Citation III	21,500	4,278	4,666	5,086	O/L	O/L
Falcon 10	18,740	3,710	4,090	4,510	O/L	O/L
Hawker 1000	31,000	5,200	5,810	6,420	7,090	O/L
Average Takeoff Length		3,900	4,300	4,700	5,100	5,500



Runway length calculation assumptions: 1,339 MSL field elevation; 84.2° F ambient temperature; 0.07% runway grade

MTOW – Maximum Takeoff Weight

O/L – Outside Operating Limits

Source: UltrNAV software

Table 3G | Business Aircraft Landing Length Requirements

Aircraft Name	MLW	Landing Lengths Required for:					
		CFR Part 25		CFR Part 91K		CFR Part 135	
		Dry	Wet	Dry (.8)	Wet (.8)	Dry (.6)	Wet (.6)
King Air C90GTi	9,600	1,537	No Data	1,921	No Data	2,562	No Data
Gulfstream II/IISP	58,500	3,205	No Data	4,006	No Data	5,342	No Data
Gulfstream III	58,500	3,239	No Data	4,049	No Data	5,398	No Data
Gulfstream IV	66,000	3,707	No Data	4,634	No Data	6,178	No Data
King Air 200 GT	12,500	1,926	No Data	2,408	No Data	3,210	No Data
King Air C90B	9,600	1,267	No Data	1,584	No Data	2,112	No Data
Pilatus PC-12	9,921	2,331	No Data	2,914	No Data	3,885	No Data
Citation I/SP	11,350	2,422	2,785	3,028	3,481	4,037	4,642
Global 5000	78,600	2,734	3,144	3,418	3,930	4,557	5,240
Global Express	78,600	2,734	3,144	3,418	3,930	4,557	5,240
Falcon 10	17,640	2,840	3,266	3,550	4,083	4,733	5,443
Gulfstream V	75,300	2,869	3,300	3,586	4,125	4,782	5,500
King Air 1900D	16,765	2,960	3,403	3,700	4,254	4,933	5,672
Falcon 7X	62,400	3,006	3,457	3,758	4,321	5,010	5,762
Citation Sovereign	27,100	2,828	3,556	3,535	4,445	4,713	5,927
Citation Mustang	8,000	2,565	3,598	3,206	4,498	4,275	5,997
Lear 45XR	19,200	2,882	3,652	3,603	4,565	4,803	6,087
Falcon 2000	33,000	3,211	3,693	4,014	4,616	5,352	6,155
Hawker 4000	33,500	3,212	3,694	4,015	4,618	5,353	6,157
Gulfstream 350	66,000	3,350	3,853	4,188	4,816	5,583	6,422
Hawker 800 (With T/R)	23,350	3,000	3,870	3,750	4,838	5,000	6,450
Citation (525) CJ1	9,800	2,948	3,985	3,685	4,981	4,913	6,642
Hawker 900 XP	23,350	2,732	3,986	3,415	4,983	4,553	6,643
Hawker 1000	25,000	2,950	4,040	3,688	5,050	4,917	6,733
Citation CJ3	12,750	2,993	4,090	3,741	5,113	4,988	6,817
Canadair 601-3A/R (Challenger 601)	36,000	3,434	4,121	4,293	5,151	5,723	6,868
Falcon 900B	42,000	3,620	4,160	4,525	5,200	6,033	6,933
Citation III	19,000	3,009	4,223	3,761	5,279	5,015	7,038
Citation VII	20,000	3,167	4,275	3,959	5,344	5,278	7,125
Citation (525A) CJ2	11,500	2,987	4,328	3,734	5,410	4,978	7,213
Falcon 900EX	44,500	3,771	4,337	4,714	5,421	6,285	7,228
Premier 1A	11,600	3,430	4,393	4,288	5,491	5,717	7,322
Challenger 604/605	38,000	2,878	4,424	3,598	5,530	4,797	7,373
Citation Ultra	15,200	3,054	4,517	3,818	5,646	5,090	7,528
Citation Encore	15,200	3,010	4,558	3,763	5,698	5,017	7,597
Citation V (Model 560)	15,200	3,100	4,589	3,875	5,736	5,167	7,648
Lear 60	19,500	3,673	4,890	4,591	6,113	6,122	8,150
Gulfstream 550	75,300	2,849	5,021	3,561	6,276	4,748	8,368
King Air 350	15,000	2,841	5,047	3,551	6,309	4,735	8,412
Challenger 300	33,750	2,676	5,129	3,345	6,411	4,460	8,548
Citation X	31,800	3,765	5,338	4,706	6,673	6,275	8,897
Citation 560 XL	18,700	3,423	5,440	4,279	6,800	5,705	9,067
Lear 55	18,000	3,443	5,510	4,304	6,888	5,738	9,183
Beechjet 400A	15,700	3,768	5,543	4,710	6,929	6,280	9,238
Citation Bravo	13,500	3,583	5,623	4,479	7,029	5,972	9,372
Gulfstream 450	66,000	3,350	5,629	4,188	7,036	5,583	9,382
Citation II (550)	12,700	2,485	6,004	3,106	7,505	4,142	10,007
Average Landing Length		2,900	4,300	3,700	5,400	5,000	7,200

SHORTER

6,001'

LONGER

Runway length calculation assumptions: 1,339 MSL field elevation; 84.2° F ambient temperature; 0.07% runway grade

MLW – Maximum Landing Weight

O/L – Outside Operating Limits

Source: UltrNAV software

Commercial Operations

An analysis in Chapter Two considered the potential for commercial activity at SPW, utilizing aircraft such as the Pilatus PC-12 (Scenario 2 – preferred forecast) or a CRJ200 in the ultimate condition (Scenario 3 – high range). As detailed in **Tables 3F** and **3G**, the PC-12 requires a runway length of approximately 3,200 feet to takeoff fully loaded, and a length of approximately 3,900 feet to land in dry conditions under Part 135. Data was not available for this aircraft for landing during wet conditions. If commercial service is implemented in the future by an operator utilizing this aircraft, additional runway length analysis would be required. As a commercial aircraft, the CRJ200 is not included in the tables above; however, it requires a runway length of 6,000 feet to operate at 90 percent payload and 5,600 feet at 80 percent payload.

Runway Length Summary

Many factors are considered when determining appropriate runway length for safe and efficient operations of aircraft at SPW. The airport should strive to accommodate business jets to the greatest extent possible as demand would dictate. Runway 12-30 is currently 6,001 feet long and can accommodate most business jets currently operating at SPW, especially with shorter trip lengths and during cool to warm temperatures. The analysis shows that during hot days and at useful loads of 90 percent or greater, more aircraft are subject to weight restrictions.

The current critical design aircraft, the King Air 200, can operate at its maximum takeoff weight even during the hottest periods of the summer. The ultimate critical design aircraft, the Hawker 800, is weight-restricted during the hot summer periods and requires additional runway length to operate at higher useful loads. In the event that commercial operations resume at SPW in the future, the Pilatus PC-12 or a similar aircraft could operate fully loaded during dry conditions under Part 135; however, additional analysis would be necessary to determine the runway length required for this aircraft to operate in wet conditions.

Justification for any runway extension to meet the needs of business jets would require regular use on the order of 500 annual itinerant operations. This is the minimum threshold required to obtain FAA grant funding assistance. The existing length of Runway 12-30 does not fully provide for all jet activity, especially during hot weather conditions and when jet aircraft are carrying full useful loads. The displaced threshold on Runway 30 introduces further operational restrictions for arriving aircraft intending to land on this runway.

None of the aircraft regularly operating at SPW meet the 500 operations threshold; therefore, an extension to Runway 12-30 is not likely to be approved for FAA grant funding. However, options to extend the runway or remove the displaced threshold in order to maintain full utility of the runway will be explored in the next chapter.

Runway Width

Runway width design standards are based primarily on the airport's critical aircraft but can also be influenced by the visibility minimums of published instrument approach procedures. For primary Runway 12-30, which has an ultimate RDC of C-II-2400, FAA design criteria stipulate a runway width of 100 feet,

which is its current width. As such, this width should be maintained in the future. Runway 18-36 has a current width of 75 feet. FAA design criteria calls for a width of 75 feet to meet the current and projected RDC B-II-5000 for Runway 18-36.

Runway Strength

An important feature of airfield pavement is its ability to withstand repeated use by aircraft of significant weight. Runways are issued strength ratings by the FAA, which is based on design parameters which support a high volume of aircraft at or below the published weight, allowing the pavement to survive its intended useful life. However, the strength rating of a runway does not preclude aircraft weighing more than the published strength rating from using the runway. Aircraft weighing more than the published weight could damage the runway in severe conditions, but more likely will simply reduce the life cycle of the pavement.

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 support their aircraft safely. An airport sponsor cannot restrict an aircraft from using the runway simply because its weight exceeds the published strength rating. On the other hand, an airport sponsor has an obligation to properly maintain the runway and protect the useful life of the runway, typically for 20 years.

At SPW, the strength ratings for both runways are 30,000 pounds single wheel loading (SWL) and 50,000 pounds dual wheel loading (DWL). The current strength ratings on both runways are adequate to accommodate most aircraft that operate at the airport. However, if larger business jets or commercial service aircraft become more common, an increase to 75,000 pounds DWL on Runway 12-30 could be justified in the long term.

Runway Markings

Runway markings are typically designed to the type of instrument approach available on the runway. FAA AC 150/5340-1L, *Standards for Airport Markings*, provides guidance necessary to design airport markings.

Runway 12 is served by precision instrument markings, while Runway 30 is served by non-precision instrument markings. These markings should be maintained through the long-term planning period to accommodate the precision instrument approach serving Runway 12 and the non-precision instrument approach serving Runway 30. Runway 18-36 is currently served by non-precision instrument approaches and has non-precision instrument markings, which should also be maintained throughout the planning horizon.

RUNWAY DESIGN STANDARDS

The FAA has established several safety surfaces to protect aircraft operational areas and keep them free from obstructions that could affect their safe operation. These include the runway safety area (RSA), object free area (OFA), obstacle free zone (OFZ), and runway protection zone (RPZ). **Table 3H** presents the applicable design standards for each runway.

**TABLE 3H | Runway Design Standards
Spencer Municipal Airport**

	Runway 12-30 Existing		Runway 12-30 Ultimate		Runway 18-36 Existing/Ultimate
Runway Design Code	B-II-2400		C-II-2400		B-II-5000
Visibility Minimums	½ mile – Rwy 12 ¾ mile – Rwy 30		½ mile – Rwy 12 ¾ mile – Rwy 30		1 mile
RUNWAY DESIGN					
Runway Safety Area					
Width	300		500		150
Length Beyond Departure End	600		1,000		300
Length Prior to Threshold	600		600		300
Runway Object Free Area					
Width	800		800		500
Length Beyond Departure End	600		1,000		300
Length Prior to Threshold	600		600		300
Runway Obstacle Free Zone					
Width	400		400		400
Length Beyond Runway End	200		200		200
Precision Obstacle Free Zone					
Width	800 (Rwy 12)		800 (Rwy 12)		NA
Length Beyond Runway End	200 (Rwy 12)		200 (Rwy 12)		NA
Approach Runway Protection Zone (RPZ)	12	30	12	30	
Inner Width	1,000	1,000	1,000	1,000	500
Outer Width	1,750	1,510	1,750	1,510	700
Length	2,500	1,700	2,500	1,700	1,000
Departure Runway Protection Zone (RPZ)	12	30	12	30	
Inner Width	500	500	500	500	500
Outer Width	700	700	1,010	1,010	700
Length	1,000	1,000	1,700	1,700	1,000
RUNWAY SEPARATION					
Runway Centerline to:					
Parallel Taxiway	300		400		240
Hold Line Markings	250		250		200
Aircraft Parking Apron	400		500		250

Note: All dimensions in feet unless otherwise noted.

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

The entire RSA, OFZ, and OFA should be under the direct control of the airport sponsor to ensure these areas remain free of obstacles and can be readily accessed by maintenance and emergency personnel. It is not required that the RPZ be under airport ownership, but it is strongly recommended. An alternative to fee-simple ownership of the RPZ is the purchase of avigation easements (acquiring control of designated airspace within the RPZ) or have sufficient land use control measures in place which ensure the RPZ remains free of incompatible development. **Exhibit 3C** depicts the existing and ultimate safety areas at SPW.

Dimensional standards for the various safety areas associated with the runway are a function of the type of aircraft (ARC) expected to use the runway, as well as the approved instrument approach visibility minimums. At SPW, Runway 12-30 has an existing RDC of B-II-2400 but has been designed to meet ARC C-II design standards, which is the ultimate condition. Runway 18-36 is designed to meet B-II standards, which is the existing and ultimate condition for this runway.

Runway Safety Area (RSA)

The RSA is defined in FAA AC 150/5300-13A, *Airport Design*, as a “surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of undershoot, overshoot, or excursion from the runway.” The RSA is centered on the runway and dimensioned in accordance to the approach speed of the critical design aircraft using the runway. The FAA requires the RSA to be cleared and graded, drained by grading or storm sewers, capable of accommodating the design 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 has placed a higher 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 Advisory Circular 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 each runway at the airport and perform airport inspections.

Under existing B-II-2400 conditions, the RSA serving Runway 12-30 is 300 feet wide and extends 600 feet beyond each end of the runway. Under ultimate RDC C-II-2400 conditions, the FAA calls for the RSA to be 500 feet wide and extend 1,000 feet beyond the runway ends for RDC C-II runways with approach visibility minimums lower than ½-mile. As depicted on **Exhibit 3C**, the localizer equipment obstructs the Runway 30 RSA in the existing condition. In the ultimate condition (C-II-2400), the RSA is obstructed by the airport perimeter fencing and 200th Avenue, in addition to the localizer equipment. The RDC C-II-2400 RSA is impacted 445 feet south of the pavement edge, beginning with the localizer equipment. As such, the current environment south of Runway 30 would allow for less than half of the required RSA. Options to meet the long-term RSA standard will be explored in Chapter Four – Alternatives.

For RDC B-II with not lower than one-mile approach visibility minimums, which is the current and long-term planning condition for Runway 18-36, the RSA is 150 feet wide and extends 300 feet beyond the runway ends. This runway currently meets this RSA standard and should be maintained throughout the planning horizon.

Runway Object Free Area (ROFA)

The ROFA is “a two-dimensional ground area, surrounding runways, taxiways, and taxilanes, which is clear of objects except for objects whose location is 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 to the critical design aircraft utilizing the runway.

For Runway 12-30, under existing RDC B-II design standards with approach visibility minimums lower than ½-mile, the ROFA is 800 feet wide and extends 600 feet beyond each end of the runway. For ultimate RDC C-II design standards with approach visibility minimums not lower than ½-mile, the FAA calls for the ROFA to be 800 feet wide, extending 1,000 feet beyond each runway end.





Under the existing B-II conditions, the ROFA beyond Runway 30 is obstructed by the localizer equipment, 200th Avenue, and the airport's perimeter fencing, as shown in **Exhibit 3C**. The fence and the localizer equipment restrict obtaining the full B-II ROFA by 66 feet. Under the ultimate C-II condition, the impact is greater, as the ROFA is required to extend 1,000 feet beyond the runway end, as mentioned. The fence obstructs the ROFA in the ultimate condition by 466 feet. Options for correcting these non-standard conditions will be explored in the next chapter.

For RDC B-II with not lower than one-mile approach visibility minimums, the ROFA is 500 feet wide and extends 300 feet beyond each runway end. There are no obstructions to the ROFA serving Runway 18-36.

Obstacle Free Zones (OFZ)

The ROFZ is an imaginary volume of airspace which 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 location by function, such as airfield signs. The ROFZ is established to ensure the safety of aircraft operations. If the ROFZ is obstructed, an airport's approaches could be removed, or approach minimums could be increased.

The FAA's criterion for runways utilized by aircraft weighing more than 12,500 pounds requires a clear ROFZ to extend 200 feet beyond the runway ends and be 400 feet wide (200 feet on either side of the runway centerline). The ROFZ standards are currently met on Runways 12-30 and 18-36 and should be maintained as such.

The POFZ is defined as "a volume of airspace above an area beginning at the runway threshold, at the threshold elevation, and centered on the extended runway centerline, 200 feet long by 800 feet wide." The POFZ is only in effect when the following operational conditions are met:

- I. Vertically-guided approach
- II. Reported ceiling below 250 feet and/or visibility less than $\frac{3}{4}$ of a statute mile
- III. An aircraft on final approach within two miles of the runway threshold

When these conditions are met, aircraft holding for take-off must hold in such a position so that neither the fuselage nor the tail of the aircraft penetrates the POFZ. However, the wings of the aircraft can penetrate the surface. At present, Runway 12 is the only runway end required to be served by a POFZ as it is served by an ILS with approach visibility minimums down to $\frac{1}{2}$ -mile. As presented on **Exhibit 3C**, the POFZ serving Runway 12 is clear of obstructions under existing and ultimate conditions and should be maintained as such.

Runway Protection Zone (RPZ)

The RPZ is a trapezoidal area centered on the runway, beginning 200 feet beyond the runway end. The RPZ has been established by the FAA to provide an area clear of obstructions and incompatible land uses, in order to enhance the protection of people and property on the ground. The RPZ is comprised of the

central portion of the RPZ and the controlled activity area. The central portion of the RPZ extends from the beginning to the end of the RPZ, is centered on the runway, and is the width of the ROFA. The controlled activity area is any remaining portions of the RPZ. The dimensions of the RPZ vary per the visibility minimums serving the runway and the type of aircraft (design aircraft) operating on 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 150/5300-13A, 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; and,
- Unstaffed navigational aids (NAVAIDs) and facilities, such as required for airport facilities that are fixed by function in regard to the RPZ.

Any other land uses considered within RPZ land owned by the airport sponsor must be evaluated and approved by the FAA Office of Airports. The FAA has published *Interim Guidance on Land Uses Within a Runway Protection Zone* (September 2012), which identifies several potential land uses that must be evaluated and approved prior to implementation. The specific land uses requiring FAA evaluation and approval include:

- Buildings and structures. Examples include, but are not limited to: residences, schools, churches, hospitals or other medical care facilities, commercial/industrial buildings, etc.);
- Recreational land use. Examples include, but are not limited to: golf courses, sports fields, amusement parks, other places of public assembly, etc.);
- Transportation facilities. Examples include, but are not limited to:
 - Rail facilities - light or heavy, passenger or freight,
 - Public roads/highways, and
 - Vehicular parking facilities;
- Fuel storage facilities (above and below ground);
- Hazardous material storage (above and below ground);
- Wastewater treatment facilities; and,
- Above-ground utility infrastructure (i.e., electrical substations), including any type of solar panel installations.

The *Interim Guidance on Land within a Runway Protection Zone* states, “RPZ land use compatibility also is often complicated by ownership considerations. Airport owner control over the RPZ land is emphasized to achieve the desired protection of people and property on the ground. Although the FAA recognizes that in certain situations the airport sponsor may not fully control land within the RPZ, the FAA expects airport sponsors to take all possible measures to protect against and remove or mitigate incompatible land uses.”

Currently, the RPZ review standards are applicable to any new or modified RPZ. The following actions or events could alter the size of an RPZ, potentially introducing an incompatibility:

- An airfield project (e.g., runway extension, runway shift),
- A change in the critical design aircraft that increases the RPZ dimensions,
- A new or revised instrument approach procedure that increases the size of the RPZ, and/or
- A local development proposal in the RPZ (either new or reconfigured).

Since the interim guidance only addresses a new or modified RPZ, existing incompatibilities are generally (but not always) grandfathered under certain circumstances. While it is still necessary for the airport sponsor to take all reasonable actions to meet the RPZ design standard, FAA funding priority for certain actions, such as relocating existing roads in the RPZ, will be determined on a case-by-case basis.

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 that the airport sponsor should pursue.

As presented on **Exhibit 3C**, there are incompatibilities within the existing and ultimate RPZs associated with Runway 30. As noted previously, there is a 500-foot displaced threshold on Runway 30, which reduces the runway's operational landing length on Runway 30 to 5,501 feet. Due to the displaced threshold, the approach and departure RPZs are not co-located, as the approach RPZ is situated 200 feet from the displaced threshold, rather than the end of the pavement. The approach and departure RPZs also have different dimensions, and therefore encompass different areas.

Under the existing B-II condition, both the approach and departure RPZ extend beyond airport property and encompass 200th Avenue. While the departure RPZ is fully controlled through easement, the approach RPZ is not. Approximately two acres of property within the RPZ are outside of the easement, and consideration should be given to controlling this property through fee simple acquisition or avigation easement.

Under the ultimate C-II condition, the approach RPZ dimensions and incompatibilities remain the same as in B-II condition; however, the departure RPZ is enlarged and thus encompasses more property. As detailed in the exhibit, the departure RPZ extends over 200th Avenue and beyond the existing airport easement by approximately 3.8 acres. Part of this unowned property includes a portion of the transfer station associated with the Spencer Sanitation Department, which restricts obtaining the full departure RPZ by 188.48 feet. Both the transfer station and 200th Avenue are incompatible uses in the departure RPZ. Options for correcting this non-standard condition will be explored in the next chapter.

The existing and ultimate RPZ associated with Runway 12 is associated with the lowest approach minimum available at SPW and thus is the largest on the airfield. While there are no incompatibilities within the RPZ, a portion of it does extend beyond airport property. However, the airport currently controls this area in easement.

The existing and ultimate RPZs associated with Runways 18 and 36 also extend off airport property but are controlled by easement. While there are no incompatibilities within the Runway 18 RPZ, the RPZ serving the Runway 36 end encompasses West 18th Street/340th Street. As previously mentioned, since the interim guidance only addresses new or modified RPZs, existing incompatibilities are generally considered grandfathered conditions. For example, roads that are in the current RPZ are typically allowed to remain as grandfathered unless the runway environment changes. The airport sponsor should take reasonable actions to meet RPZ design standards, which could include relocating the roads from within the existing RPZs; however, roadways could be considered acceptable since they existed before the RPZ standards were published. Funding priority for certain actions, such as relocating existing roads in RPZs, will be determined on a case-by-case basis. Further examination of the RPZs associated with each runway end will be undertaken later in this study.

Runway Visibility Zone (RVZ)

The RVZ is an area formed by imaginary lines connecting the line-of-sight points of intersecting runways. The purpose of the RVZ is to facilitate coordination among aircraft and between aircraft and vehicles that are operating on active runways. Having a clear line-of-sight allows departing aircraft and arriving aircraft to verify the location and actions of other aircraft and vehicles on the ground that could create a conflict. Within the RVZ, any point five feet above the runway centerline must be mutually visible with any other point five feet above the centerline of the crossing runway. The RVZ at SPW is depicted on **Exhibit 3C**. Currently, there are no obstructions to the RVZ.

Building Restriction Line (BRL)

The BRL identifies suitable building area locations on the airport. The BRL encompasses the RPZs, the 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. Runway 12-30 is considered a “precision instrument” runway with visibility minimums lower than ½-mile. Runway 18-36 is considered a “non-precision instrument” runway with visibility minimums of not lower than 1-mile. The BRL is the product of CFR Part 77 transitional surface clearance requirements. These requirements stipulate that no object be located in the primary surface, defined as being 1,000 feet wide for precision instrument runways and 500 feet wide for utility runways having instrument approach minimums of not lower than 1-mile. From the primary surface, the transitional surface extends outward at a slope of one vertical foot to every seven horizontal feet.

At SPW, a 35-foot BRL has been established, meaning that buildings up to 35 feet in height may be built beyond the BRL. The 35-foot BRL for Runway 12-30 is set at 745 feet from runway centerline, while the 35-foot BRL for Runway 18-36 is set at 495 feet from centerline. The BRL is depicted on **Exhibit 3C**, and all landside facilities are located beyond the BRL.

Runway/Taxiway Separation

The design standard for the separation between runways and parallel taxiways is a function of the critical design aircraft and the instrument approach visibility minimum. The separation standard for existing B-II and ultimate RDC C-II with lower than $\frac{3}{4}$ -mile visibility minimums is 300 and 400 feet from the runway centerline to the parallel taxiway centerline, respectively. Partial parallel Taxiways C and B serving Runway 12-30 are 400 feet from the runway; therefore, the current location of the taxiway meets the separation standards for current and long-term design conditions and should be maintained accordingly.

Taxiways D and E serving Runway 18-36 are currently 240 feet from the runway, which also meets the FAA design standard of 240 feet for RDC B-II with approach visibility minimums not lower than 1-mile. As such, the airport should maintain the existing runway to taxiway centerline separation through the long-term planning horizon.

Hold Line Separation

Holding position markings are placed on taxiways leading to runways. When approaching the runway, pilots should stop short of the holding position marking line. FAA design standards call for hold lines to be 250 feet from runway centerline for B-II and C-II runways with approach minimums below $\frac{3}{4}$ mile, and 200 feet from runway centerline for B-II runways with approach minimums not lower than 1-mile. The FAA also recommends that hold lines be parallel with the runway so that a pilot is fully perpendicular to the runway with a clear, unobstructed view of the entire runway length.

At SPW, all hold lines leading to the runways meet FAA separation requirements. The holding positions serving Runway 12-30 are 260 feet from runway centerline, while the hold lines serving Runway 18-36 are 200 feet from centerline; however, the hold lines serving Runways 18 and 36 are acute-angled, as is the easternmost hold line at the Runway 30 end. Consideration should be given to relocating these hold lines so that they are parallel with their respective runways.

Aircraft Parking Apron Separation

Under existing and ultimate conditions, aircraft parking areas should be at least 500 feet from the Runway 12-30 centerline, respectively. Currently, all aircraft parking areas exceed this standard as over 1,000 feet of separation exists between the runway and designated aircraft parking aprons to the north.

For Runway 18-36, aircraft parking areas should be at least 250 feet from the runway centerline under existing and ultimate conditions. Currently, the parking areas begin at least 1,000 feet from the runway centerline. The airport should ensure these separation standards are maintained in compliance with FAA regulations should additional apron area be considered (to be discussed).

TAXIWAYS

The design standards associated with taxiways are determined by the taxiway design group (TDG) or the airplane design group (ADG) of the critical design aircraft. As determined previously, the applicable ADG for Runways 12-30 and 18-36 is ADG-II under both the existing and ultimate condition. **Table 3J** presents the various taxiway design standards related to ADG-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 design 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.

**TABLE 3J | Taxiway Dimensions and Standards
Spencer Municipal Airport**

STANDARDS BASED ON WINGSPAN	ADG II
Taxiway Protection	
Taxiway Safety Area width (feet)	79
Taxiway Object Free Area width (feet)	131
Taxilane Object Free Area width (feet)	115
Taxiway Separation	
Taxiway Centerline to:	
Fixed or Movable Object (feet)	65.5
Parallel Taxiway/Taxilane (feet)	105
Taxilane Centerline to:	
Fixed or Movable Object (feet)	57.5
Parallel Taxilane (feet)	97
Wingtip Clearance	
Taxiway Wingtip Clearance (feet)	26
Taxilane Wingtip Clearance (feet)	18
STANDARDS BASED ON TDG	TDG 2
Taxiway Width Standard (feet)	35
Taxiway Edge Safety Margin (feet)	7.5
Taxiway Shoulder Width (feet)	15

ADG: Airplane Design Group

TDG: Taxiway Design Group

Source: FAA AC 150/5300-13A, Change 1, *Airport Design*

The current taxiway design for Runways 12-30 and 18-36 should be TDG 2. As such, the taxiways supporting each runway should be at least 35 feet wide, which is the current taxiway width of all taxiways serving SPW. This taxiway width should be maintained throughout the planning horizon.

Taxiway Design Considerations

FAA AC 150/5300-13A, Change 1, *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 taxiway system at Spencer Municipal Airport generally provides for the efficient movement of aircraft; however, AC 150/5300-13A, Change 1, *Airport Design*, provides recommendations for taxiway design. The following is a list of the taxiway design guidelines and the basic rationale behind each recommendation.

1. **Taxi Method:** Taxiways are designed for “cockpit over centerline” taxiing with pavement being sufficiently wide 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, upgrading existing intersections should be undertaken to eliminate “judgmental oversteering,” which is where the pilot must intentionally steer the cockpit outside the marked centerline in order to assure the aircraft remains on the taxiway pavement.

2. **Steering Angle:** Taxiways should be designed such that the nose gear steering angle is no more than 50 degrees, the generally accepted value to prevent excessive tire scrubbing.
3. **Three-Node Concept:** To maintain pilot situational awareness, taxiway intersections should provide a pilot a maximum of three choices of travel. Ideally, these are right and left angle turns and a continuation straight ahead.
4. **Intersection Angles:** Turns should be designed to 90 degrees wherever possible. For acute angle intersections, standard angles of 30, 45, 60, 120, 135, and 150 degrees are preferred.
5. **Runway Incursions:** Taxiways should be designed 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 using the “three node” 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 simple reduction in the number of occurrences, and through 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, both between taxiways and runways, provide the best visibility. Acute angle runway exits provide for 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.
 - *Indirect 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.
6. **Runway/Taxiway Intersections:**
 - *Right-Angle:* Right-angle intersections are the standard for all runway/taxiway intersections, except where there is a need for a high-speed 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.

- *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.
- 7. **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 such 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 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.

FAA AC 150/5300-13A, Change 1, *Airport Design*, states that “existing taxiway geometry should be improved whenever feasible, with emphasis on designated ‘hot spots.’” Currently, there are no hot spots published by the FAA at SPW.

Primarily, the taxiway system at SPW meets the recommended design and geometry standards set forth by the FAA. However, there are certain non-standard conditions that include:

- Taxiway A could be considered to provide direct access from the aircraft parking apron to Runway 12-30.
- The holding position markings serving Runways 30, 18, and 36 are not parallel with the runway.
- Taxiway fillets are areas of additional pavement designed to maintain the taxiway edge safety margin (TESM) by widening taxiways at the inside of turns. The fillets on the turns of each of the connector taxiways do not meet design standards.

Exhibit 3C identifies these areas of interest. In the alternatives chapter, potential solutions to these non-standard conditions will be presented. Analysis in the next chapter will also consider improvements which could be implemented on the airfield to minimize runway incursion potential, improve efficiency, and better 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. As a result, taxilanes can be designed to varying design standards depending on the type of aircraft utilizing the taxilane. For example, a taxi-lane leading to a T-hangar area only needs to be designed to accommodate those aircraft typically accessing a T-hangar.

The alternatives chapter will consider various designs for improving the safe movement of aircraft via taxiways as hangar and apron facilities expand over time.

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 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. SPW provides the following navigational and approach aids.

Instrument Approach Aids

Instrument approaches are categorized as either precision 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, while non-precision instrument approach aids provide only course alignment information. In the past, most existing precision instrument approaches in the United States have been the ILS; however, with advances in global positioning system (GPS) technology, it can now be used to provide both vertical and lateral navigation for pilots under certain conditions.

SPW currently has straight-in instrument approaches to all runway ends. Runway 12 is served by the ILS or localizer (LOC) approach with minimums down to ½-mile, as well as an area navigation (RNAV) GPS approach. Runway 30 has a ¾-mile localizer performance with vertical guidance (LPV) GPS approach, which provides for both vertical and horizontal GPS guidance, as well as a very-high frequency omnidirectional range (VOR) approach with a 1-mile minimum. Runway 18-36 offers LPV GPS approaches with 1-mile minimums to both ends for A/B aircraft only.

As mentioned in the previous chapter, SPW is classified as a regional general aviation airport. Visibility minimums as low as ¾-mile or ½-mile are common at these airports. As such, the ½-mile and ¾-mile instrument approach visibility minimums currently provided on Runway 12-30 are adequate for airport users. Given that Runway 18-36 is designated as the crosswind runway, instrument approach visibility minimums of not lower than 1-mile should be maintained throughout the planning horizon.

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. The most common visual approach aids at airports include the visual approach slope indicator (VASI) and precision approach path indicator (PAPI). Currently, Runway 12 is served by a four-box VASI, while Runway 30 is equipped with a two-box VASI. VASI lighting systems have begun to be phased-out by FAA and are being replaced by PAPI systems. As such, the airport should consider replacing the VASI approach aids serving Runway 12-30 with four-box PAPIs.

With a ½ mile minimum approach available on Runway 12, it is also served by a medium intensity approach lighting system with runway alignment indicator lights (MALSR), which should be maintained throughout the planning horizon. Runway 30 is equipped with runway end identification lights (REILs), which are flashing lights located at the runway threshold end that facilitate rapid identification of the runway end at night and during poor visibility conditions. They provide pilots with the ability to identify the runway thresholds and distinguish the runway end lighting from other lighting on the airport and in the approach areas.

Runway 18-36 is served by four-box PAPIs and REILs on both runway ends.

Weather Reporting Aids

Spencer Municipal Airport has a lighted wind cone located approximately 400 feet northeast of the intersection of Runways 12-30 and 18-36. The wind cone provides information to pilots regarding wind speed and direction and should be maintained throughout the planning period.

The airport is equipped with an ASOS which provides weather observations 24 hours per day. The system updates weather observations every minute, continuously reporting significant weather changes as they occur. This information is then transmitted on radio frequency 126.625 MHz. In addition, pilots and individuals can call a published telephone number (712-262-8885) and receive the information via an automated voice recording. This system should be maintained through the planning period in its current location.

AIRFIELD LIGHTING AND SIGNAGE

The location of the airport at night is universally indicated by a rotating beacon. For civil airports, a rotating beacon projects two beams of light, one white and one green, 180 degrees apart. The existing beacon at SPW, located atop a 95-foot tower immediately north of the fixed base operator (FBO) facility, should be maintained through the planning period.

Runway lighting provides the pilot with positive identification of the runway and its alignment. Both runways at SPW are served by medium intensity runway lighting (MIRL). Medium intensity taxiway lighting (MITL) is provided on all taxiways at the airport. This system is vital for safe and efficient ground movements. Both runway and taxiway lighting use light emitting diode (LED) technology, which has many advantages, including lower energy consumption, longer lifetime, tougher construction, reduced size, greater reliability, and faster switching. These lighting systems should be maintained in the future.

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 system on the airfield. The signage system includes runway and taxiway designations. All signs should be maintained throughout the planning period, and consideration should be given to gradually replacing all lighted signs with LED technology as necessary.

Consideration should be given to installing distance remaining signage of Runway 12-30 at a minimum. These lighted signs alert pilots to how much runway length remains in 1,000-foot increments.

AIRFIELD FACILITY REQUIREMENTS SUMMARY

A summary of the airside facilities previously discussed at SPW is presented on **Exhibit 3D**.

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 SPW, this includes components for potential commercial service and general aviation needs such as:

- Passenger Terminal Complex
- General Aviation Terminal Facilities
- Aircraft Hangars
- Aircraft Parking Aprons
- Airport Support Facilities

POTENTIAL PASSENGER TERMINAL COMPLEX REQUIREMENTS

Components of a commercial passenger terminal area complex include the terminal building, gate positions, aircraft apron area, vehicle parking, and surface access roads. Based upon the potential commercial enplanements and operations analysis conducted in the forecast chapter, this section identifies potential passenger terminal facilities required to meet enplanements that could occur under two different scenarios. The premise is that at some point in the future, SPW could attract one or more scheduled commercial airline operators. It is important to note that this passenger terminal complex requirements analysis is based entirely on theoretical enplanement and operations levels. The purpose of this section is to simply provide the City of Spencer with an idea of what types and sizes of facilities would be needed should commercial service demand reach this level at SPW.

COMMERCIAL TERMINAL BUILDING

The review of the capacity and requirements for various terminal complex functional areas was performed with guidance from FAA AC 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities*. Also sourced is *Airport Passenger Terminal Planning and Design, Report 25* published by the Airport Cooperative Research Program (ACRP). **Table 3K** summarizes the future capacity requirements for the terminal building under both the constant market share scenario (selected projection) and the air service improvements scenario (ultimate condition), which resulted in projected enplanements of 9,600 and 14,200, respectively.

CATEGORY	EXISTING		ULTIMATE	
RUNWAYS	12-30	18-36	12-30	18-36
Runway Design Code (RDC)	B-II-2400	B-II-5000	C-II-2400	B-II-5000
Dimensions	6,001 x 100	5,100 x 75	Maintain	Maintain
Pavement Strength	30,000 lbs SWL / 50,000 lbs DWL	30,000 lbs SWL 50,000 lbs DWL	Increase to 75,000 lbs DWL if demand warrants	Maintain
Safety Areas	RSA obstruction (localizer equipment)	Standard RSA	RSA obstruction (localizer, roadway & fencing); Mitigate incompatibility	Maintain
	ROFA obstruction (localizer, fencing & roadway)	Standard ROFA	ROFA obstruction (localizer, roadway & fencing); Mitigate incompatibility	Maintain
	Standard OFZ/POFZ	Standard OFZ	Maintain	
	RW 12 RPZ controlled by airport; RW 30 RPZ encompasses incompatible land use (roadway/sanitation facility) and is partially uncontrolled	RPZs controlled by airport; RPZ encompasses incompatible land uses (roadways)	Maintain/secure control; Mitigate incompatibilities	Maintain control; Mitigate incompatibilities
	Standard RVZ		Maintain	
TAXIWAYS	12-30	18-36	12-30	18-36
Design Group	TDG 2			
Parallel Taxiway		Partial parallel	Maintain	
Parallel Taxiway Separation from Runway	400'	240'	Maintain	
Widths	35'	35'	Maintain	
Holding Position Locations from Runway	250'	200'	Maintain distance; re-mark so parallel with runway	
Notable Conditions	Taxiway A provides direct access from the apron	N/A	Consider corrective measures	N/A
NAVIGATIONAL AND WEATHER AIDS	12-30	18-36	12-30	18-36
Instrument Approaches	1/2 mile (Rwy 12); 3/4 mile (Rwy 30)	1 mile	1/2 mile	1 mile
Weather Aids	ASOS, Lighted Wind Cone, and Beacon		Maintain	
LIGHTING AND MARKING	12-30	18-36	12-30	18-36
Runway Lighting	HIRL		Maintain	
Runway Marking	Precision (RW12) / Nonprecision (RW 30)	Nonprecision	Maintain	
Taxiway Lighting	MITL		Maintain	
Approach Aids	MALSR (RW 12) / REILs (RW 30) RNAV GPS (RW 30) / VASI	RNAV GPS / PAPIs / REILs	Consider replacing VASI with PAPI	Maintain

KEY

ASOS - Automated Surface Observation System
DWL - Dual Wheel Loading
GPS - Global Positioning System
HIRL - High Intensity Runway Edge Lighting
MIRL - Medium Intensity Runway Lighting
MITL - Medium Intensity Taxiway Lighting
MALSR - Medium Intensity Approach Lighting
System with Runway Alignment Indicator Lights

PAPI - Precision Approach Path Indicator
OFZ - Obstacle Free Zone
RDC - Runway Design Code
REILs - Runway End Identification Lights
ROFA - Runway Object Free Area
ROFZ - Runway Obstacle Free Zone
RNAV: Area Navigation
RPZ - Runway Protection Zone

RSA - Runway Safety Area
SWL - Single Wheel Loading
TDG - Taxiway Design Group
VASI - Visual Approach Slope Indicator
VORTAC - VOR and TACAN collocated



Passenger terminal building requirements were developed for the following functional areas:

- Airline Ticketing and Operations
- Security Screening
- Departure Facilities – Holdroom and Circulation
- Baggage Claim
- Terminal Services – Rental Cars and Concessions
- Public Use Areas – Restrooms and Lobby Areas
- Administration/Support
- Internal Facilities – Circulation, Mechanical, HVAC

Airline ticketing and check-in, which consists of ticket counters, passenger queuing areas, and the ticket lobby, has been factored at a need for 180 sf under Scenario 2, and 290 sf for Scenario 3. Each scenario considers a single airline operating at SPW, with one agent position. Airline operations, which encompasses all the space necessary for processing passengers, is determined to be at 500 sf for each scenario.

TABLE 3K | Potential Terminal Building Requirements
Spencer Municipal Airport

	Selected Projection Scenario 2 - Constant Market Share	Ultimate Condition Scenario 3 - Air Service Improvements
Project Annual Enplanements	9,600	14,200
Design Hour Passengers	16	60
No. of airlines	1	1
No. of Agent Positions	1	1
Counter Frontage	6 lf	6 lf
Ticketing/Check-in	180 sf	290 sf
Outbound Baggage/Screening (sf)	NA	660 sf
Airline Operations	500 sf	500 sf
TSA Security Screening	NA	1,160 sf
Holdroom Area	640 sf	1,130 sf
Baggage claim area	260 sf	1,310 sf
Rental Car Area	30 sf	140 sf
Concessions	200 sf	290 sf
Public Waiting Lobby/Circulation	450 sf	1,680 sf
Restrooms	80 sf	290 sf
Internal Facilities (HVAC/Mechanical/Stairwells)	320 sf	800 sf
Gross Terminal Building Space (sf)	2,660 sf	8,250 sf

lf: linear feet

sf: square feet

Security screening operations have also been considered. Screening checkpoints are a regulated requirement and must be designed to meet the TSA mandates for operational space and equipment storage. Two scenarios for passenger security screening have been evaluated. Under Scenario 2, it is assumed that passengers will backscreen at their connecting airport. This means that passengers will board the aircraft at SPW without going through security, and instead will undergo the security screening process once they land at their connecting airport and before boarding a larger aircraft to continue to their final destination. Thus, there is no space requirement for security screening under Scenario 2. Under Scenario

3, however, passengers will proceed through security before boarding their aircraft at SPW. With enplanement levels reaching 14,200, this would require functional space totaling 1,160 sf. This would include space for screening equipment, passenger queuing, and TSA operations area.

A holdroom, or waiting area for passengers, would also be necessary to support commercial operations. Scenario 2 calls for approximately 640 sf of space for a passenger holdroom, while Scenario 3 would require nearly double that at 1,130 sf. Under this scenario, the holdroom would also need to be secure as passengers waiting here will have already completed the screening process.

The arrivals process includes space for baggage claim and circulation, which totals 260 sf in Scenario 2 and 1,310 sf in Scenario 3. The additional space in Scenario 3 would accommodate claim device floor area as well as inbound baggage operations.

Terminal services including rental car services, concessions, and retail have also been factored based on projected enplanement levels. Each scenario includes the addition of an on-site car rental service, which would require space for counter and office area as well as a customer queuing. Scenario 2 calls for 30 sf of space, while 140 sf would be necessary under Scenario 3. Food, beverage, and retail services are also typically offered at airports providing commercial service, with approximately 200 sf needed to accommodate passengers in Scenario 2 and 290 sf needed for Scenario 3.

Publicly accessible areas, such as a waiting lobby and restrooms, should also be provided. Under Scenario 2, 80 sf would be needed for restrooms and 450 sf for a public waiting area. Scenario 3 would require 290 sf for restrooms and 1,680 sf of public lobby space. It should be noted that, under Scenario 3, restrooms should be made available on both the secure and non-secure sides of the facilities.

Lastly, internal facilities such as mechanical/HVAC, stairwells, and storage areas must be considered. Approximately 320 sf of space would be necessary for these functions under Scenario 2, while 800 sf would be needed if Scenario 3 were realized.

In total, approximately 2,700 square feet (sf) of building space would be required to support commercial service operations under Scenario 2, which would result in 9,600 annual enplanements. Under Scenario 3, or the ultimate condition, with 14,200 projected annual enplanements, more than 8,200 sf of gross terminal building space would be needed. However, terminal building space requirements are purely scenario-based and are for advisory purposes only.

COMMERCIAL AIRCRAFT APRON

The primary consideration for assessing the adequacy of the commercial aircraft apron is the characteristics of the aircraft projected to use the apron. These characteristics include the aircraft size and engine type. The need for ground loading or loading bridges will also be factors. Other considerations may include movement of ground servicing equipment and personnel.

At 14,300 square yards, the existing terminal/FBO apron at SPW can accommodate several aircraft at the same time. For example, a Pilatus PC-12 could occupy the apron simultaneously with other aircraft

that typically operate at SPW, such as a Citation II or a King Air 200, and maintain proper wingtip clearance and separation. The apron can also accommodate larger commercial service aircraft, such as a CRJ200. Therefore, the existing FBO/terminal apron is adequate to support commercial service operations through the long-term planning horizon.

GROUND ACCESS REQUIREMENTS

Terminal curb frontage and vehicle parking requirements have also been developed to accommodate passengers based on enplanement levels for the two commercial service scenarios. Curb frontage is calculated based on projected design hour enplanements/deplanements average dwell time. Public parking requirements are a function of peak hour visitors and design day passengers. Employee parking is calculated at 0.05 percent of annual enplanements, while rental car parking estimates are estimated at 10 percent of daily passengers. **Table 3L** details curb frontage and parking requirements should commercial service be offered at SPW. Currently, the airport has 210 public parking spaces and approximately 60 feet of curb fronting the existing GA terminal building.

**TABLE 3L | Terminal Automobile Requirements
Spencer Municipal Airport**

	Scenario 2	Scenario 3
Projected Enplanements	9,600	14,200
Design Day Enplanements	33	49
Peak Hour Passengers	16	60
Terminal Curb	16 ft	59 ft
Vehicle Parking		
Public Parking	40	80
Employee	5	7
Rental Car	5	8
Total	50	95

Source: Coffman Associates analysis

GENERAL AVIATION FACILITIES

General aviation (GA) facilities are those necessary for handling general aviation aircraft, passengers, and cargo while on the ground. This section is devoted to identifying future GA facility needs during the planning period for the following types of facilities normally associated with general aviation terminal areas:

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

HANGARS

Utilization of hangar space varies as a function of local climate, security, and owner preferences. The trend in general aviation aircraft, whether single or multi-engine, is toward more sophisticated aircraft (and, consequently, more expensive aircraft); therefore, many aircraft owners prefer enclosed hangar space to outside tie-downs.

The demand for aircraft storage hangars is dependent upon 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 upon forecast operational activity. However, actual hangar construction should be based upon actual demand trends and financial investment conditions.

It is important to note that the types of hangars detailed in this section are categorized based on the proposed size and layout of the facility, and do not necessarily correspond with the locally designated hangar facility categories. For example, certain categories, such as T-hangars and linear box hangars, can be grouped into the same category. Other hangar types, such as condominium box hangars, aircraft storage hangars, fixed base operator (FBO), and specialized aviation service operator (SASO) hangars, correspond to conventional style hangars detailed in this section.

There are a variety of aircraft storage options typically available at an airport, including shade hangars, T-hangars, linear box hangars, executive/box hangars, and bulk storage conventional hangars. Shade hangars are the most basic form of aircraft protection and are common in warmer climates. These structures provide a roof covering, but no walls or doors. There are no shade hangars at SPW.

T-hangars are intended to accommodate one small single engine piston aircraft or, in some cases, one multi-engine piston aircraft. T-hangars are so named because they are in the shape of a “T,” providing a space for the aircraft nose and wings, but no space for turning the aircraft within the hangar. Basically, the aircraft can be parked in only one position. T-hangars are commonly “nested” with several individual storage units to maximize hangar space. In these cases, taxiway access is needed on both sides of the nested T-hangar facility. T-hangars are popular with aircraft owners with tighter budgets as they tend to be the least expensive enclosed hangar space to build and lease. There are currently 29 T-hangar units at SPW, totaling 33,200 sf of aircraft storage capacity.

Conventional hangars are the large, clear span hangars typically located facing the main aircraft apron at airports. These hangars provide for bulk aircraft storage and are often utilized by airport businesses, such as an FBO and/or SASOs (an aircraft maintenance business, for example). Conventional hangars generally range in size from 4,000 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 four conventional hangars at SPW encompassing approximately 79,400 sf. Some of this total space is utilized for maintenance/repair and associated services by the FBO, Cammair, and Spencer Avionics.

Planning for future aircraft storage needs is based on typical owner preferences and standard sizes for hangar space. For determining future aircraft storage needs, a planning standard of 1,200 square feet per single-engine piston aircraft and 1,500 square feet per multi-engine piston aircraft is utilized for T-hangars. For conventional hangars, a planning standard of 3,000 square feet is utilized for turboprop aircraft, 5,000 square feet is utilized for business jet aircraft, and 1,500 square feet is utilized for helicopter storage needs.

SPW has a total of 41 based aircraft. Currently, all T-hangar units are leased and there is a waiting list of aircraft owners desiring T-hangar space at the airport. With the trend toward aircraft owners preferring enclosed aircraft storage space, no growth is projected for aircraft that utilize outside tiedowns. Providing a mix of aircraft storage options is preferred when planning storage needs in order to meet the varied needs of aircraft owners. **Table 3M** provides a summary of the aircraft storage needs through the long-term planning horizon.

TABLE 3M
Aircraft Hangar Requirements
Spencer Municipal Airport

	Available	Short Term	Intermediate Term	Long Term
Total Based Aircraft	41	44	47	53
Hangar Area Requirements				
T-Hangar Hangar Units	29	31	30	33
T-Hangar Hangar Area (sf)	33,200	35,100	33,200	35,900
Conventional Hangar Area (sf)	48,600	56,600	66,100	77,100
Service/Maintenance Area (sf)	26,700	11,300	11,800	13,300
Total Hangar Area (sf)	108,500	103,000	111,100	126,300

Source: Coffman Associates analysis

The analysis shows that future hangar requirements indicate that there is a potential need for approximately 18,000 square feet of new hangar storage capacity through the long-term planning period. This includes a mixture of T-hangar and conventional hangar capacity. Due to the projected increase in based aircraft, 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. The largest need could involve the construction of conventional-style hangars that are better suited to accommodate larger turboprop and jet aircraft. T-hangar storage space requirements are also projected to grow over time as new piston-driven aircraft base at SPW.

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

AIRCRAFT PARKING APRON

FAA Advisory Circular 150/5300-13A, *Airport Design*, suggests a methodology by which transient apron requirements can be determined from knowledge of busy-day operations. At SPW, the number of itinerant spaces required was determined to be approximately 15 percent of the busy-day itinerant operations for general aviation operations. A planning criterion of 800 square yards (sy) per aircraft was applied to determine future transient apron requirements for single and multi-engine aircraft. For business jets, a planning criterion of 1,600 sy per aircraft position was used. In addition, SPW has based aircraft

that utilize outside aircraft tiedowns for storage on occasion. It is assumed that these aircraft require less space than transient aircraft; therefore, a planning criterion of 650 sy per aircraft was applied. Apron parking requirements are presented in **Table 3N**. Transient apron parking needs are divided into business jet needs and smaller single and multi-engine aircraft needs.

TABLE 3N | Aircraft Parking Apron Requirements
Spencer Municipal Airport

	Available	Short Term	Intermediate Term	Long Term
Aircraft Positions				
Based/Local GA Aircraft	8	3	3	4
Transient GA Aircraft	8	11	11	11
Corporate Jet Aircraft	0	1	2	3
Total Parking Positions	16	15	16	18
Total Apron Area	22,240	12,400	14,100	16,000

Source: Coffman Associates analysis

Currently, the existing parking aprons at SPW encompass approximately 22,400 sy of space. This is divided among three aprons: the terminal/FBO apron (14,300 sy), the north apron (4,600 sy), and the apron fronting the Quonset hangar (3,340). Available apron space is sufficient to meet long-term needs of GA activity at SPW.

In addition to fixed-wing aircraft parking, areas should also be dedicated for helicopter parking. Helicopter operations should be segregated to the extent practicable to increase safety and efficiency of aircraft parking aprons. Long-term facility planning will continue to consider dedicated helicopter activity areas at the airport.

GENERAL AVIATION TERMINAL FACILITIES

General aviation terminal facilities have several functions. Space is required for a pilots' lounge, flight planning, concessions, management, storage, and various other needs. This space is not necessarily limited to a single, separate terminal building, but can include space offered by FBOs for these functions and services. Currently, GA terminal services are provided within the terminal building, which includes a pilots' lounge, a conference room, and restrooms.

The methodology used in estimating general aviation terminal facility needs was based upon the number of airport users expected to utilize general aviation facilities during the design hour. Space requirements for terminal facilities were based on providing 125 square feet per design hour itinerant passenger. A multiplier of 2.0 in the short term, increasing to 3.0 in the long term, was also applied to terminal facility needs in order to better determine the number of passengers associated with each itinerant aircraft operation. This increasing multiplier indicates an expected increase in business and recreational operations through the long term. These operations often support larger turboprop and jet aircraft, which accommodate an increasing passenger load factor.

Table 3P outlines the space requirements for general aviation terminal services at SPW through the long-term planning period. As shown in the table, up to 4,300 square feet of space could be needed in the long term for general aviation passengers. The amount of space currently offered by the terminal building is approximately 3,400 square feet, with the adjacent FBO providing an additional 2,400 of space. To meet the potential need for additional space in the future, consideration could be given to utilizing some of the FBO facility for terminal services.

TABLE 3P
General Aviation Terminal Area Facilities
Spencer Municipal Airport

	Available	Short Term	Intermediate Term	Long Term
Terminal Services Building (sf)	3,400	2,600	3,400	4,300
Design Hour Passengers		21	27	34
Passenger Multiplier		2.0	2.5	3.0
Terminal Parking Spaces		21	27	34
Based Owner Spaces		23	24	27
FBO Spaces		19	20	22
Total Parking Spaces	210	63	71	83

Source: Coffman Associates analysis

General aviation vehicular parking demands have also been determined for SPW. Space determinations for itinerant passengers were based on an evaluation of existing airport use, as well as standards set forth to help calculate projected terminal facility needs. The parking requirements of based aircraft owners should also be considered. Although some owners prefer to park their vehicles in their hangar, safety can be compromised when automobile and aircraft movements are intermixed. For this reason, separate parking requirements, which consider one-half of based aircraft at the airport, were applied to general aviation automobile parking space requirements. Utilizing this methodology, parking requirements for general aviation activity call for approximately 23 spaces in the short term, increasing to approximately 34 spaces in the long-term planning horizon. Spaces for other terminal and FBO users were also evaluated, as detailed in the table. There are approximately 210 total vehicle parking spaces available at SPW, located in one lot that serves the terminal building, FBO, and other tenants. These parking spaces are adequate to serve all GA users over the planning period.

FUEL STORAGE

Fuel at SPW is provided by the FBO and stored in two underground tanks, with capacities of 10,000 gallons for 100LL and 12,000 gallons for Jet A fuel. Based on historic fuel flowage records provided by the FBO, in 2019, the airport pumped 138,800 gallons of Jet A and 19,168 gallons of 100LL. Based upon operations reported by the FAA's Traffic Flow Management System Count database, the number of turbine operations in 2019 totaled 1,501, with the remainder being piston operations. Dividing the total fuel flowage by the total number of operations provides a ratio of fuel flowage per operation. In 2019, the airport pumped approximately 92 gallons of Jet A per turbine operation and 1.3 gallons of 100LL per piston operation. It is anticipated that, over the course of the planning period, the Jet A flowage ratio will increase slightly as the airport accommodates larger jets and the AvGas flowage ratio will remain static.

Maintaining a 14-day fuel supply would allow the airport to limit the impact of a disruption of fuel delivery. Currently, the airport has enough static fuel storage to meet the 14-day supply criteria for both Jet A and 100LL fuel. The forecasted fuel storage requirements are summarized in **Table 3Q**. In the future, based on these usage assumptions, additional Jet A fuel storage capacity could be needed to meet demand.

TABLE 3Q | Fuel Storage Requirements
Spencer Municipal Airport

			Planning Horizon		
	Available	Current Need	Short Term	Intermediate Term	Long Term
Jet A					
Daily Usage (gal.)		380	450	584	853
14-Day Supply (gal.)	12,000	5,300	6,300	8,200	11,900
Annual Usage (gal.)		138,800	164,200	213,300	311,400
100LL					
Daily Usage (gal.)		53	53	54	55
14-Day Supply (gal.)	10,000	700	700	800	800
Annual Usage (gal.)		19,168	19,500	19,600	20,000

Sources: Historic fuel flowage data provided by the airport; fuel supply projections prepared by Coffman Associates.

14 CFR PART 139 CERTIFICATION OF AIRPORTS

Based upon Scenario 3 of the commercial service projections that were presented previously, SPW may be required to become a 14 CFR Part 139 certificated airport. The regulation (which implemented provisions of the *Airport and Airway Development Act of 1970*, as amended November 27, 1971) set standards for: the marking and lighting of areas used for operations, firefighting and rescue equipment and services, the handling and storing of hazardous materials, the identification of obstructions, and safety inspection and reporting procedures.

The 14 CFR Part 139 certification requirements applicable to SPW under this potential scenario, relate to the type of aircraft serving the airport. In helping to define the airport's class, it is important to understand the distinction between the definition of large and small air carrier aircraft.

- A large air carrier aircraft is designed for 31 passenger seats or more.
- A small air carrier aircraft is designed for 10 to 30 passenger seats.

It should be noted that 14 CFR Part 139 does not apply to airports served by scheduled air carrier aircraft with nine seats or less and/or unscheduled air carrier aircraft with 30 seats or less, which would be the case for Scenario 2.

14 CFR Part 139 defines four airport classifications as follows:

- **Class I** - an airport certificated to serve scheduled operations of large air carrier aircraft that also can serve unscheduled passenger operations of large air carrier aircraft and/or scheduled operations of small air carrier aircraft. A Class I airport may serve any class of air carrier operations.

- **Class II** - an airport certificated to serve scheduled operations of small air carrier aircraft and the unscheduled passenger operations of large air carrier aircraft. A Class II airport cannot serve scheduled large air carrier aircraft.
- **Class III** - an airport certificated to serve scheduled operations of small air carrier aircraft. A Class III airport cannot serve scheduled or unscheduled large air carrier aircraft.
- **Class IV** - an airport certificated to serve unscheduled passenger operations of large air carrier aircraft. A Class IV airport cannot serve scheduled large or small air carrier aircraft.

Airports that meet the requirements for Part 139 certification are issued an Airport Operating Certificate (AOC). AOCs serve to ensure safety in air transportation. To obtain a certificate, an airport must agree to operational and safety standards and provide for certain safety services and facilities. These requirements vary depending on the size of the airport and the type of flights available. The regulation, however, does allow FAA to issue certain exemptions to airports that serve few passengers yearly and for which some requirements might create a financial hardship.

According to 14 CFR Part 139, the following steps would need to be taken in order for SPW to receive an AOC:

1. Prepare and submit an Airport Certification Manual (ACM) to the FAA.
2. Prepare ground vehicle operating rules and regulations.
3. Prepare a ground vehicle training program.
4. Prepare a training program for airport personnel involved with Part 139 implementation.
5. Ensure that FBOs comply with the fuel training requirements.
6. Develop a record-keeping system for the following:
 - a. Personnel training (24 months)
 - b. Emergency personnel training (24 months)
 - c. Airport tenant fueling inspection (12 months)
 - d. Airport tenant fueling agent training (12 months)
 - e. Self-inspection (6 months)
 - f. Movement areas and safety areas training (24 months)
 - g. Accident and incident (12 months)
 - h. Airport Condition (6 months)
7. Prepare and submit an Airport Emergency Plan to the FAA.
8. Acquire an ARFF vehicle and comply with ARFF training and operational requirements.

The ACM is a required document that defines the procedures to be followed in the routine operation of the airport and for response to emergency situations. The ACM is a working document that is updated annually. It reflects the current condition and operation of the airport and establishes the responsibility, authority, and procedures as required. There are required sections for the ACM covering administrative detail and procedural detail. Each section independently addresses who (primary/secondary), what, how, and when as it relates to each element.

The administrative sections of the ACM cover such elements as the organizational chart, operational responsibilities, maps, descriptions, weather sensors, access, and cargo. The procedural elements cover

such items as paved and unpaved areas, safety areas, lighting and marking, communications and navigational aids, airport rescue and firefighting (ARFF), handling of hazardous material, utility protection, public protection, self-inspection program, ground vehicle control, obstruction removal, wildlife management, and construction supervision.

AIRCRAFT RESCUE AND FIRE FIGHTING (ARFF)

Part 139 airports are required to provide Aircraft Rescue and Fire Fighting services during air carrier operations. Each certificated airport maintains equipment and personnel based on an ARFF index established according to the length of aircraft and scheduled daily flight frequency. In terms of flight frequency, an airport's ARFF index is determined by the longest aircraft conducting at least five or more daily departures. In terms of aircraft length, there are five indices, A through E, with A applicable to the smallest aircraft and E the largest. **Table 3R** presents the vehicle requirements and capacities for each index level.

TABLE 3R | ARFF Index Requirements

Index	Aircraft Length	Requirements
Index A	<90'	1. One ARFF vehicle with 500 lbs. of sodium-based dry chemical or 2. One vehicle with 450 lbs. of potassium-based dry chemical and 100 lbs. of water and AFFF for simultaneous water and foam application
Index B	90'-126'	1. One vehicle with 500 lbs. of sodium-based dry chemical and 1,500 gallons of water and AFFF or 2. Two vehicles, one with the requirements for Index A and the other with enough water and AFFF for a total quantity of 1,500 gallons
Index C	126'-159'	1. Three vehicles, one having Index A, and two with enough water and AFFF for all three vehicles to combine for at least 3,000 gallons of agent or 2. Two vehicles, one with Index B and one with enough water and ARFF for both vehicles to total 3,000 gallons
Index D	159'-200'	1. One vehicle carrying agents required for Index A and 2. Two vehicles carrying enough water and AFFF for a total quantity by the three vehicles of at least 4,000 gallons
Index E	>200'	1. One vehicle with Index A and 2. Two vehicles with enough water and AFFF for a total quantity of the three vehicles of 6,000 gallons

AFFF: Aqueous Film-Forming Foam

ARFF: Aircraft Rescue and Fire Fighting

Source: 14 CFR Part 139

Under the ultimate condition (Scenario 3), with a CRJ200 providing commercial service, SPW would fall under Index A. The airport would need to acquire one ARFF vehicle, as detailed in the table.

LANDSIDE FACILITY REQUIREMENTS SUMMARY

A summary of the landside facilities previously discussed at SPW is presented on **Exhibit 3E**.

	AVAILABLE	SHORT-TERM	INTERMEDIATE-TERM	LONG-TERM
AIRCRAFT STORAGE HANGAR REQUIREMENTS				
T-Hangar Units	29	31	30	33
T-Hangar Area (s.f.)	33,200	35,100	33,200	35,900
Conventional Hangar Area (s.f.)	48,600	56,600	66,100	77,100
Service/Maintenance Area (s.f.)	26,700	11,300	11,800	13,300
Total Hangar Storage Area (s.f.)	108,500	103,000	111,100	126,300
				
AIRCRAFT PARKING APRON				
Aircraft Parking Positions	16	15	16	18
Total Apron Area (s.y.)	22,240	12,400	14,100	16,000
				
GENERAL AVIATION TERMINAL FACILITIES AND PARKING				
Building Space (s.f.)	3,400	2,600	3,400	4,300
Total GA Parking Spaces	210	63	71	83
				
SUPPORT FACILITIES				
14-Day Fuel Storage - 100LL	10,000	700	800	800
14-Day Fuel Storage - Jet A	12,000	6,300	8,200	11,900
				

SUMMARY

The intent of this chapter has been to outline the facilities required to meet potential aviation demands projected for SPW for the planning horizon. A summary of the airside and landside requirements is presented on **Exhibits 3D** and **3E**, respectively.

Following the facility requirements determination, the next step is to determine a direction of development which best meets these projected needs through a series of airport development alternatives. The remainder of the master plan will be devoted to outlining this direction, its schedule, and its cost.

Chapter Four

Airport Alternatives



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Airport Alternatives

Airside and landside facilities required to satisfy the demand through the long-term planning period were identified in the previous chapter. The next step in the master planning process is to evaluate reasonable ways these facilities can be provided. The design alternatives presented in this chapter include airside and landside concepts the airport can pursue to meet future demand and safety standards. Some alternatives have greater potential for implementation, while others are included to illustrate “worst case” or “build-out” scenarios that are unlikely to be realized, but must be considered, nonetheless. There can be numerous combinations of design alternatives, and the ultimate preferred alternative may include elements of several concepts.

Any development option proposed in a master plan is evolved from an analysis of projected needs for a set period of time. Though the needs were determined by utilizing industry-accepted statistical methodologies, unforeseen future events could impact the timing of the needs identified. The master planning process attempts to develop a viable concept for meeting the needs caused by projected demands for the next 20 years; however, no plan of action should be developed which may be inconsistent with the future goals and objectives of the City of Spencer, which has a vested interest in the development and operation of Spencer Municipal Airport (SPW).

The development alternatives for the airport can be categorized into two functional areas: **airside** (runways, navigational aids, taxiways, etc.) and **landside** (passenger terminal, hangars, aprons, and support facilities). Within each of these areas, specific capabilities and facilities are required or desired. In addition, the utilization of airport property to provide revenue support and to benefit the economic development and well-being of the local area must be considered.

Each functional area interrelates and affects the development potential of the others. Therefore, all areas are examined individually, and then coordinated as a whole, to ensure the final plan is functional, efficient, and cost-effective. The total impact of all these factors on the airport must be evaluated to determine if the investment in SPW will meet the needs of the City of Spencer and the Iowa Great Lakes region, both during and beyond the 20-year planning period.

The alternatives considered later in this chapter will be evaluated by a variety of methods to determine which concepts will best fulfill the local aviation needs. With this information, as well as input from various airport stakeholders, a final airport concept can evolve into a realistic development plan.

NON-DEVELOPMENT ALTERNATIVES

Prior to the presentation of development alternatives for SPW, there are several non-development options that must be considered. Non-development alternatives include a “no-build” or “do-nothing” alternative, development of a new replacement airport at a new location, or closure of the existing airport with the transfer of aviation demand and services to another existing airport. The following presents a discussion of the three primary non-development alternatives and the impact of pursuing each.

NO-BUILD/DO-NOTHING ALTERNATIVE

The no-build alternative involves making no new capital investments in the airport. Limited maintenance and upkeep would continue so that the airport remains safe for aviation activity; however, no new hangars or apron area would be planned to be built by the airport sponsor. A private entity would be permitted to construct hangars, though, if they chose to do so. Under a no-build scenario, the airport would ultimately be unable to accommodate forecasted demand for aviation services in the area.

The primary reason a community might choose a no-build alternative is to ultimately not be bound by the grant assurances associated with the acceptance of airport development grants. Grant assurances are Federal provisions that are part of the grant package contract that the airport sponsor commits to when accepting a development grant from the Federal Aviation Administration (FAA). As such, airport sponsors are bound to maintain facilities developed or equipment acquired for an airport development project for the duration of the items’ useful life. Useful life is a term not to exceed twenty (20) years from the date of acceptance of a grant offer of federal (FAA) funds for a project; however, there is no limit on the duration of the terms, conditions, and assurances with respect to real property acquired with federal funds.

The unavoidable consequence of the no-build alternative is that the capability of the airport would diminish over time. SPW’s ability to serve as a Regional General Aviation (GA) airport, as classified by the FAA, would deteriorate. A lack of development would lead to reduced activity levels and would ultimately negatively impact the local and regional economies. Safety concerns would arise, especially if the necessary routine maintenance were deferred, and the liability for damage to aircraft or accidents would increase. The long-term consequences of the no-build alternative would be to reduce the quality of the existing airport facilities over time, producing undesirable results. This scenario would result in an overall unpleasant experience for regular users and visitors.

SPW has received more than \$2.8 million in FAA development grants since 2000. These grants represent a direct economic stimulus that has lasting positive economic impacts. The city has a vested interest in maintaining and improving airport facilities for general aviation users. Without a commitment to ongoing improvement of the airport, users of the airport will be constrained from taking full advantage of the facility's air transportation capabilities.

RELOCATE AIRPORT ALTERNATIVE

This option considers constructing a new airport to replace the existing Spencer Municipal Airport. Construction of a new airport would have to be completed prior to closure of the existing airport, and additional studies beyond the scope of this master plan would also be required. These would include, at a minimum, a feasibility study, a site selection study, a master plan for the replacement site, and appropriate environmental documentation of the new site (typically an environmental assessment [EA] or environmental impact statement [EIS]).

An important consideration is the potential cost associated with both constructing a new airport and closing the existing airport. A broad estimate for a replacement airport could exceed \$100 million to construct a new airport with similar capabilities as the existing airport. Moreover, with an ever-growing focus on sustainability and environmental consciousness, the political costs of constructing a new airport would be extremely high. This is especially true for a farming region where the likelihood is also high that the new airport would require the acquisition and transformation of farmland to airport use.

A more detailed analysis would need to be undertaken to identify an acceptable site and to refine the project cost estimates. A large portion of the development costs would be eligible for FAA grant funding. Generally, non-revenue-producing facilities, such as aviation businesses to be located within the airport property line, are ineligible for FAA funding. New passenger terminal buildings are eligible for FAA grant funding; however, funding eligibility is restricted to public-use areas only. Elements outside the property line, such as utility extension and surface roads, and other privatized facilities are generally not eligible for funding. Moreover, the city could have other financial costs, such as the cost of retiring existing leases with private or public entities or even relocation of existing aviation facilities to the new site. As an example, private operators and businesses on the airport could need to be compensated for their facilities and, in some cases, loss of business, potentially resulting in costs extending into millions of dollars.

Often the trigger for pursuing a replacement airport is incompatible land use encroachment upon the existing airport to the point where it can no longer fulfill its role in the national aviation system. This is not the case at SPW, as land uses surrounding the airport consist primarily of agriculture and industrial, with a few small areas of single-family residential to the south. None of these uses poses a threat for encroachment on the airport or its ability to safely operate.

TRANSFER SERVICE TO ANOTHER AIRPORT ALTERNATIVE

The feasibility of transferring services to an alternate airport relies on answering two primary questions: first, is a capable alternative airport reasonably located to accommodate SPW's primary air service area

(Clay and Dickinson Counties) and, second, can a nearby airport accommodate SPW's existing and projected aviation demand factors? An analysis of regional airports has been completed to determine if transferring aviation demand is reasonable.

There are nine public-use general aviation airports within 30 nautical miles of SPW, with six providing the most comparable services to SPW: Fuller Airport (4D8); Emmetsburg Municipal (EGQ); Estherville Municipal (EST); Spirit Lake Municipal (OF3); Sheldon Regional (SHL); and, Cherokee County Regional (CKP). None of these airports offer dual paved runways; however, four of the six do provide turf cross-wind runways. EST has the longest runway available at 4,797 feet, followed by SHL with a 4,199-foot runway. GA services at these airports range from hangars and tiedowns to fuel and aircraft maintenance. While a couple of these facilities (SHL and EST) provide a reasonable opportunity for replacing SPW, none of them are positioned to readily accept a transfer of service from SPW. SPW currently has 41 based aircraft with a potential to attract an additional 12 aircraft and more than 18,000 annual operations over the planning period. Moreover, transferring services to another airport would ultimately preclude the City of Spencer from the economic benefits of owning and operating an airport. The loss of service would likely result in business and economic losses for the city and community as a whole.

As mentioned, the City of Spencer has accepted more than \$2.8 million dollars in federal development grant funding through the Airport Improvement Program (AIP) for projects at SPW since 2000. As previously discussed, acceptance of development grants obligates the airport sponsor, through grant assurances, to maintain the airport as an airport. Closing the existing airport and transferring services to another existing airport would be considered a violation of these grant assurances, requiring repayment of grants not yet fully depreciated. The city would also be required to buy out leases of existing tenants, as well as pay for investments made on the airport by private entities. The investments made, as well as the economic benefits received from the airport, both public and private, could not readily be shifted or regenerated to another airport without significant costs/losses. As such, this alternative is not considered practical, reasonable, and/or financially feasible.

NON-DEVELOPMENT ALTERNATIVES SUMMARY

Information pertaining to the three most common non-development alternatives has been presented. These are the no-build, relocate/replacement alternatives, and transfer of services. This evaluation is not intended as a recommendation to pursue one of these alternatives; instead, it is for informational purposes only. If the airport sponsor were to pursue one of these alternatives, additional study beyond the scope of this master plan would be required.

Two of the three non-development alternatives would lead to the closure, or a significantly reduced operation, of the existing airport. There is a lengthy process to obtain approval for this course of action. As outlined, the primary hindrance to considering airport closure is the fact that airports have accepted federal development grants that include certain grant assurances, one of which is to maintain the improvement for its useful life (20 years). If an airport is closed in the interim, then the sponsor could be required to refund all or a portion of the past federal investment. Moreover, private investments by any airport operator would also require some form of repayment based on negotiated lease terms.

The non-development options are not found to be feasible, practical, or prudent. SPW is a vital component in the local and regional economies with plenty of remaining growth potential. As such, the non-development alternatives will no longer be considered further in this planning process. The purpose of this master plan is to examine aviation needs at SPW 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. Nonetheless, various non-development alternatives may be considered further by the airport sponsor if so desired.

REVIEW OF THE PREVIOUS AIRPORT PLAN

The last master plan was completed in 2008. The following is a summary of major facility recommendations that were included on the Airport Layout Plan (ALP) drawing, which is included as **Exhibit 4A**.

1. Eliminate the nondirectional beacon (NDB) approach.
2. Acquire control of Runway 30 RPZ through easement.
3. Reroute 200th Avenue outside of safety areas associated with Runway 30.
4. Displace the Runway 30 threshold to accommodate the runway object free area (ROFA) and runway safety area (RSA).
5. Relocate localizer antenna array beyond the Runway 30 ROFA.
6. Construct additional hangars and tiedowns.
7. Reserve airport property to develop Spencer Airport Business Park, an industrial use area on the northeast side of the airport.

AIRSIDE PLANNING CONSIDERATIONS

Airside planning considerations generally relate to those 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 SPW 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 listed below.

Airside Planning Considerations

- Meet ultimate runway design code (RDC) C-II-2400 standards on Runway 12-30
- Mitigate ROFA/RSA obstructions on Runway 30
- Mitigate RPZ incompatibilities on Runways 30 and 36
- Corrective measures for non-standard taxiway geometry (direct access to Runway 12-30, non-standard hold line markings, non-standard taxiway fillets)
- Replace VASI light system with PAPI-4 on Runway 12-30
- Relocate localizer outside of ROFA/RSA associated with Runway 30

AIRFIELD DESIGN STANDARDS

As detailed in Chapter One, SPW is classified in the FAA's *National Plan of Integrated Airport Systems* (NPIAS) as a Regional general aviation airport. As a Regional GA airport, SPW should be capable of supporting regional economies with high levels of activity that include operations by jet and turboprop aircraft. The critical design aircraft analysis in Chapter Two concluded that Runway 12-30 should meet Runway Design Code (RDC) C-II-2400 design standards in the ultimate condition, due to operational growth and anticipated greater use by larger, more demanding aircraft. This also reflects the existing and ultimate RDC that was established in the previous master plan. Crosswind Runway 18-36 should continue to meet RDC B-II-5000 design standards, which is in line with regular use by smaller GA aircraft that currently conduct most operations at SPW.

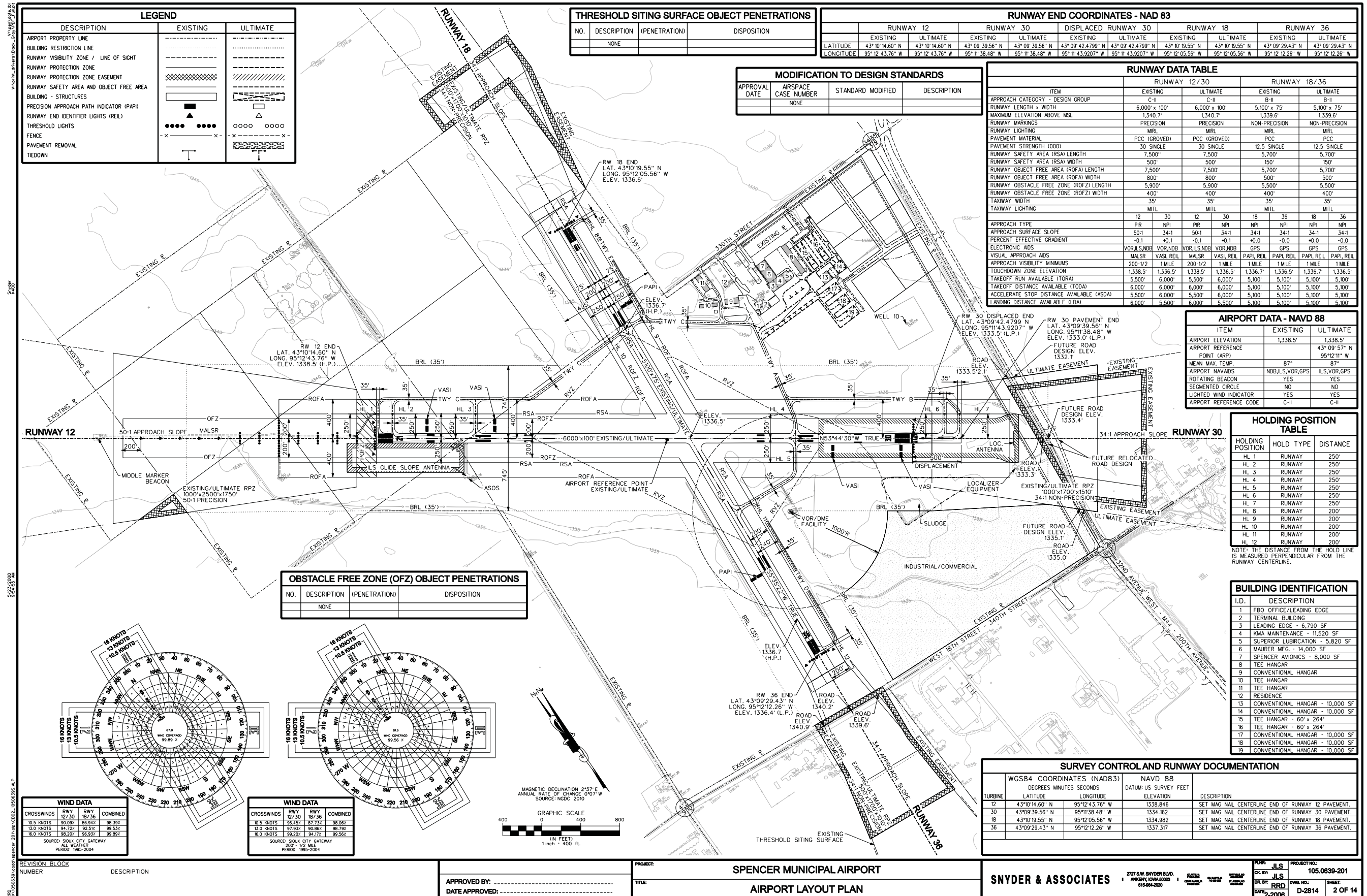
SAFETY AREAS

As identified in the previous chapter, there are obstructions to the existing and ultimate Runway 30 ROFA, including the localizer equipment, airport perimeter fencing, and 200th Avenue. The RSA is obstructed by perimeter fencing and 200th Avenue in the ultimate condition. The RPZs serving Runways 30 and 36 also have incompatibilities in the existing and ultimate conditions. These include public roadways: 200th Avenue (Runway 30 RPZ) and West 18th Street/340th Street (Runway 36 RPZ). The Runway 30 RPZ also extends beyond airport-controlled property. The alternatives to follow will explore options to mitigate these non-standard conditions.

RUNWAY LENGTH

The runway length analysis in the previous chapter concluded that the airport's longest runway, Runway 12-30 at 6,001 feet, is long enough to support the majority of aircraft utilizing SPW. The existing critical design aircraft, the King Air 200, can operate fully loaded, even during hot summer months. The ultimate critical design aircraft, the Hawker 800, would be weight-restricted during hot periods; however, an extension to the runway is not likely to be approved for grant funding unless an aircraft has demonstrated 500 annual operations. If commercial service is implemented at the airport in the future, the current length of Runway 12-30 is adequate to support these operations. However, the 500-foot displaced threshold on Runway 30 limits the usable landing length to 5,501 feet for aircraft utilizing either end of the runway for landing. Therefore, operations to restore full utility of this runway for all operations will be discussed in the alternatives to follow.

Crosswind Runway 18-36's current length of 5,100 feet is adequate to safely accommodate the small GA aircraft that operate at SPW, as well as use by some jets and turboprops. During periods that the primary runway is temporarily closed for maintenance or emergency situations, this runway can serve as a backup runway for most operations, limiting service interruptions. Therefore, an extension of this runway is not deemed necessary or recommended at this time.



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TAXIWAY CONFIGURATION

The existing taxiway configuration at SPW is generally efficient for the movement of aircraft; however, there are several non-standard conditions that must be addressed. These include:

1. Taxiway A could be considered to provide direct access from the aircraft parking apron to Runway 12-30.
2. The holding position markings serving Runways 30, 18, and 36 are not parallel with the runway.
3. Taxiway fillets on each of the connector taxiways do not meet design standards.

These conditions can increase the potential for runway incursions or inadvertent access to runways. As a result, the FAA requires the planning process to include potential solutions for improvement.

Taxiway nomenclature is also recommended to be updated. Current taxiway designations at SPW do not follow FAA's Engineering Brief 89, *Taxiway Nomenclature Convention* standards. According to the Engineering Brief, stub taxiways associated with a parallel taxiway should be designated with a letter and number. In the case of SPW, the exits should be A1, A2, A3, etc. beginning with the westernmost stub or B1, B2, B3, etc. beginning with the northernmost stub. Consideration should be given to re-designating the taxiways in conformance with FAA's standards, which will impact both existing and future taxiways should the taxiway system be expanded upon.

AIRFIELD LIGHTING AND NAVIGATIONAL EQUIPMENT

Other factors to be considered in the alternatives to follow include improvements to airport lighting systems and relocation of navigational equipment to meet FAA recommendations. Runway 12-30 is currently served by an FAA-owned/maintained VASI approach aid; however, this system is now considered obsolete. Each of the airside alternatives recommends replacing the VASI with a PAPI-4 light system, which must be done via request to the FAA Air Traffic Organization (ATO) as they own and maintain the VASI equipment. Consideration should also be given to relocating the localizer equipment serving Runway 12-30. This equipment currently obstructs the RSA and ROFA in both the existing and ultimate conditions.

AIRSIDE ALTERNATIVES

Four airfield alternatives have been prepared to address the issues outlined above. The details of each alternative are described below, along with the associated advantages and disadvantages.

AIRSIDE ALTERNATIVE 1

Airside Alternative 1, shown on **Exhibit 4B**, focuses primarily on bringing the safety areas associated with Runway 30 into compliance with FAA standards, with minimal changes to the existing runway environment. This is accomplished through the implementation of declared distances, which will change the usable length of Runway 12-30. Declared distances are used to define the effective runway length for landing and takeoff when a standard safety area cannot be achieved. The declared distances include:

- Takeoff Run Available (TORA) – the runway length declared available and suitable for the ground run of an aircraft taking off (factors in the positioning of the departure RPZ);
- Takeoff Distance Available (TODA) – the TORA plus the length of any remaining runway or clearway beyond the far end of the TORA; the full length of the TODA may need to be reduced because of obstacles in the departure area;
- Accelerate-Stop Distance Available (ASDA) – the runway plus stopway length declared available and suitable for the acceleration and deceleration of an aircraft aborting a takeoff (factors in the length of RSA/ROFA beyond the runway end); and
- Landing Distance Available (LDA) – the runway length declared available and suitable for landing an aircraft (factors in the length of RSA/ROFA beyond the runway end and the positioning of the approach RPZ).

Presently, Runway 30 has a 500-foot displaced threshold; however, declared distances were never published. As such, Alternative 1 examines two scenarios in which declared distances would be published. The first scenario, which is presented on the front side of **Exhibit 4B**, examines the runway at its current RDC of B-II-2400. While Runway 12-30 is projected to experience an increase in C-II operations and subsequently move to a design code of C-II-2400 in the ultimate condition, consideration should also be given to correcting safety area obstructions for the existing B-II condition. As shown previously on Exhibit 3C, the B-II ROFA extends beyond airport property and is obstructed by the airport perimeter fence and 200th Avenue. Measuring from the end of the ROFA to the perimeter fence results in approximately 66 feet necessary to achieve the full B-II ROFA. This alternative proposes displacing the threshold by 75 feet, which would effectively shift the ROFA and bring it to standard. The exhibit illustrates the use of declared distances to mitigate these obstructions to the ROFA. With a 75-foot displaced threshold, the full length of Runway 12-30 is usable for pilots taking off from either end of the runway. However, the ASDA and LDA for Runway 12 and the LDA for Runway 30 is reduced by 75 feet, resulting in a usable runway length of 5,926 feet for some operations.

The next scenario, which is shown on the back side of **Exhibit 4B**, considers an ultimate condition of RDC C-II-2400 for Runway 12-30. Under C-II standards, the ROFA and RSA extend 1,000 feet beyond the end of the runway, resulting in fence and roadway obstructions to both safety areas. To meet the full ROFA and RSA, approximately 466 feet of unobstructed distance is necessary, as shown previously on the back side of Exhibit 3C. Thus, a 500-foot displaced threshold was previously implemented, as the last master plan determined an RDC of C-II-2400 for this runway. The displaced threshold is carried forward for this scenario. However, in order to maintain the full runway length, Alternative 1 (ultimate condition) also proposes the addition of 500 feet of pavement to the Runway 12 end. This extension would allow for at least 6,001 feet of usable runway length for any operation, with 6,501 feet available for pilots taking off from either Runway 12 or Runway 30. Additional environmental analysis to determine the feasibility of an extension to Runway 12 will need to be performed prior to any construction. The back side of **Exhibit 4B** illustrates these usable runway lengths for Alternative 1 in the ultimate C-II-2400 condition.





In both Alternative 1 scenarios (existing and ultimate conditions), 200th Avenue remains within the Runway 30 RPZ, as the displaced threshold and declared distances only correct the ROFA and RSA obstructions. While the FAA recommends public roadways not be located within an RPZ, they may be permitted in certain situations (i.e., they are grandfathered as existing, traffic volume is low, etc.). Further, approximately 2.4 acres of property within the Runway 30 RPZ are uncontrolled, and it is recommended the airport expand the existing easement to maintain full control of the RPZ. The RPZ serving Runway 36 encompasses W. 18th Street/340th Street, which could be considered an incompatible use.

Airfield Alternative 1 also proposes corrections to the non-standard taxiway issues at SPW. The direct access from the apron to Runway 12-30 is eliminated by the addition of new Taxiway A pavement that turns southwest before connecting at a right angle to Taxiway B, which is extended to the northwest. This change would force pilots to make a turn prior to crossing the runway, improving situational awareness and reducing the risk for a runway incursion. The non-standard hold lines serving Runways 18, 36, and 30 are remarked so they are parallel with the runway. On Runways 18 and 36, the new hold lines are separated from the runway centerline by 200 feet to meet RDC B-II standards for a runway with a one-mile approach, while the hold line serving Runway 30 is separated by 250 feet, in accordance with C-II standards. The outermost taxiway connector serving Runway 30 is also redesigned for a right-angle connection. Taxiway fillets are also updated to meet current design standards.

Lighting upgrades are also considered. As mentioned previously, it is recommended that the airport submit a request to the FAA for the VASI approach light system serving Runway 12-30 to be replaced with a four-box PAPI.

Advantages	Disadvantages
- Non-standard conditions are all resolved, with the exception of Runways 30 and 36 incompatibilities - Minimal impact to existing runway/taxiway environment - In the ultimate condition, takeoff operations will have an additional 500 feet of length on Runway 12-30	- Public roadways remain within Runways 30 and 36 RPZs - In the existing condition, pilots will not have the full Runway 12-30 length available to them for some operations

AIRSIDE ALTERNATIVE 2

Depicted on **Exhibit 4C**, Airside Alternative 2 shows another option for correcting the safety area and non-standard taxiway issues. Under this alternative, 200th Avenue is proposed to be rerouted outside the Runway 30 RSA, ROFA, and RPZ, connecting to W. 18th Street/340th Street at a point east of the sanitation facility. The portion of 200th Avenue that currently obstructs the ROFA and RSA would be removed, along with unnecessary pavement on either side, as shown on the exhibit. Rerouting this public roadway would eliminate the need for a displaced threshold, allowing for the full 6,001 feet of Runway 12-30 to be used for both landing and takeoff. Prior to any changes to the existing roadway, further study and coordination with the city, county, property owners, and the FAA should be conducted to ensure the proposed realignment is feasible. The road closure and rerouting would also trigger an

environmental analysis, as *National Environmental Policy Act* (NEPA) impact categories such as wetlands, floodplains, and farmlands may be affected. The localizer equipment that obstructs the Runway 30 ROFA and RSA is proposed to be moved to the east, within the easement-controlled RPZ, and the perimeter fence should be moved outside the RSA and ROFA. Approximately 0.5 acre of land should be acquired under the easement to maintain full control of the RPZ.

The direct access point on Taxiway A would be resolved by a new connection to Taxiway B approximately 300 feet from the existing connection. This would force pilots taxiing from the apron to make a turn to the east prior to accessing the runway, reducing the risk for runway incursions. As shown, a new taxiway connector would extend southwest from Taxiway B, cross Runway 12-30, and connect with existing Taxiway A on the south side of the airfield. A portion of existing Taxiway A would be removed on the north and south sides of Runway 12-30 to accomplish the new alignment.

Like Airside Alternative 1, the non-standard hold lines associated with Runway 18-36 would be remarked so they are parallel with the runway, while the easternmost taxiway serving Runway 30 would be squared off and remarked with a parallel hold line 250 feet from the runway centerline. Taxiway fillets are also updated to meet current design standards.

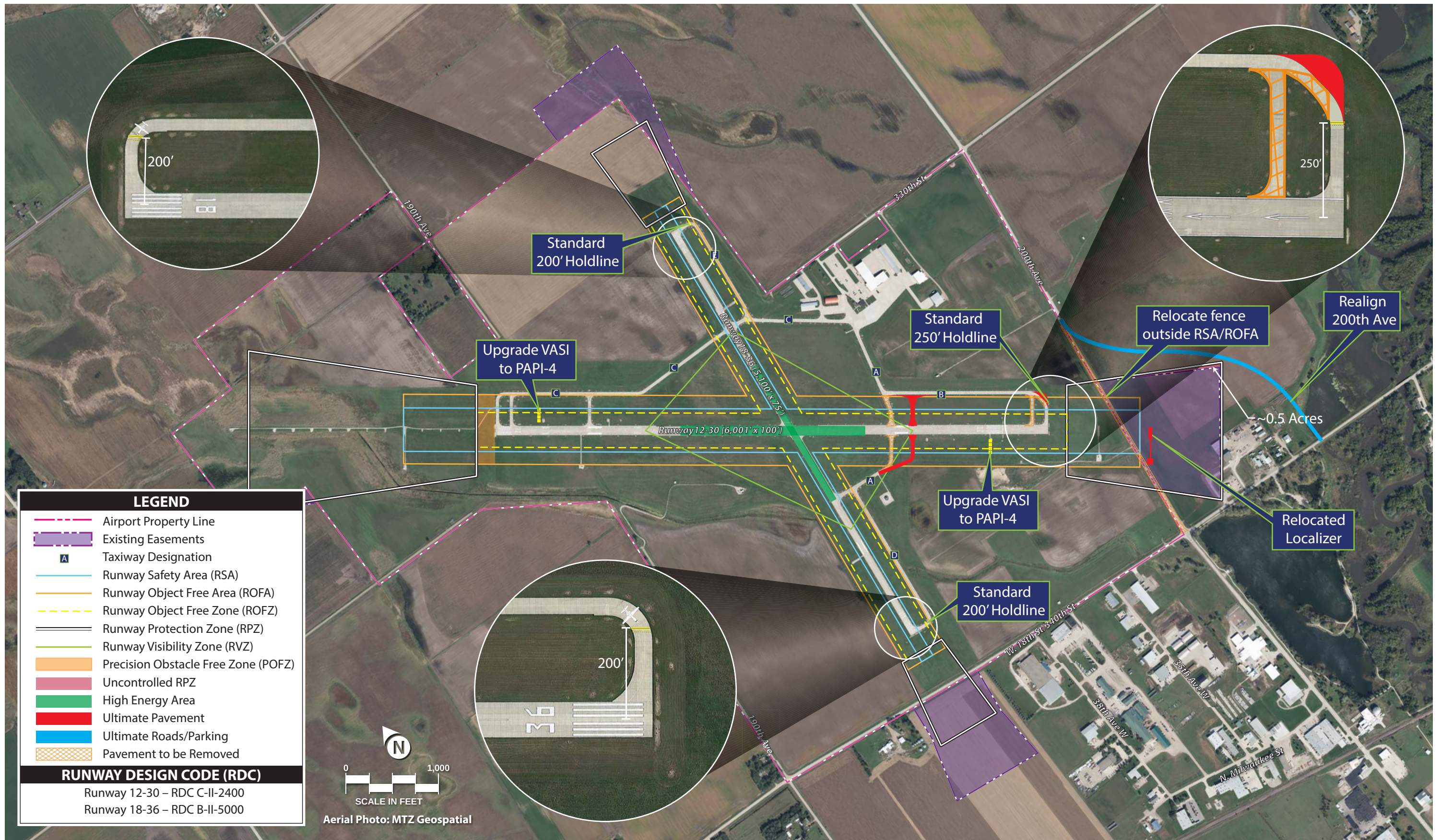
Lastly, the VASI approach serving Runway 12-30 is proposed to be upgraded to a PAPI-4, pending FAA approval.

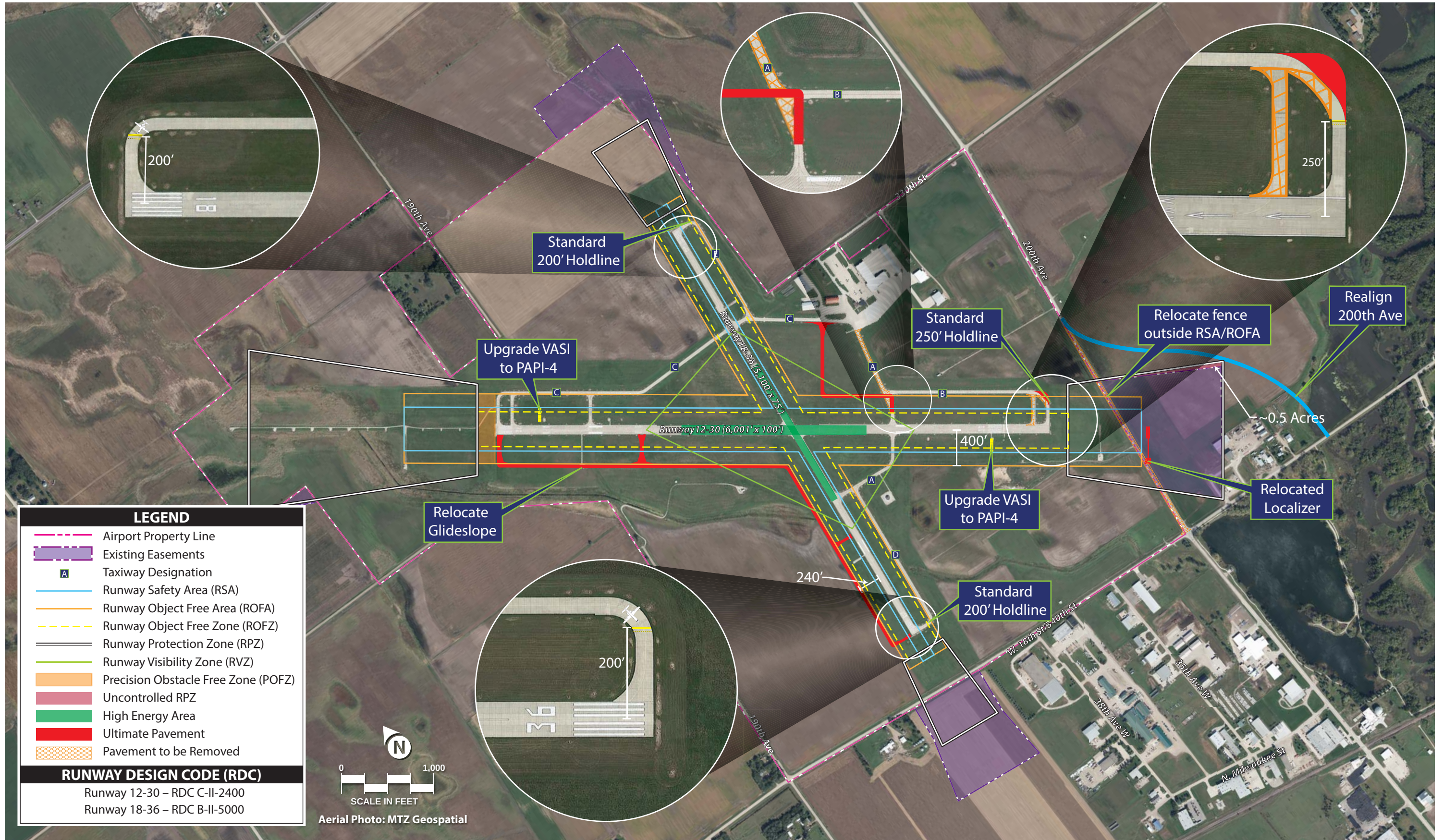
Advantages	Disadvantages
- All non-standard conditions are resolved - Minimal impact to existing runway/taxiway environment	- The realignment of 200th Avenue would come with disruption and expense, and possibly opposition from the landowner(s) and nearby residents - The road realignment would also require environmental analysis that may result in NEPA impacts

AIRSIDE ALTERNATIVE 3

As detailed on **Exhibit 4D**, Airside Alternative 3 examines a major expansion to the existing taxiway system, as well as correcting non-standard taxiway and safety area conditions and upgrading the approach lighting system serving Runway 12-30. As in the previous alternative, this alternative envisions a realignment of 200th Avenue around the Runway 12 RSA, ROFA, and RPZ, with a portion of 200th Avenue closed and removed. The localizer equipment and perimeter fencing are relocated outside the RSA and ROFA in the easement-controlled RPZ. Within the RPZ, approximately 0.5 acre would need to be acquired for the airport to maintain control of the full RPZ. This alternative would enable the airport to eliminate the displaced threshold on Runway 30.

New taxiways to support potential landside development are considered south of Runway 12-30 and west of Runway 18-36. At the Runway 12 end, a new taxiway would be constructed 400 feet from runway centerline, in accordance with C-II standards. However, this would require relocation of the glideslope antenna, as noted on the exhibit. It should be very clearly stated that the southside taxiway system would be necessary only to accommodate future land use development in the southwestern





quadrant of the airport. One option would be to simply move the equipment south of the new taxiway, but further study would be necessary to determine the best site for the relocated equipment. A new taxiway is also proposed west of Runway 18-36, serving the Runway 36 end. This taxiway would be separated from the runway centerline by 240 feet to meet B-II standards. Both new taxiways would provide additional exits to their respective runways.

Corrections to non-standard taxiway conditions are also included in Airside Alternative 3. Like the previous alternatives, the hold lines on Runways 18, 36, and 30 would be remarked so they are parallel with their respective runways, and the easternmost connector to Runway 30 would be realigned so it connects at a right angle.

The direct access from the apron to Runway 12-30 would be resolved with the addition of taxiway pavement west of existing Taxiway A. The pavement would extend southwest from Taxiway C to connect with an extended Taxiway B. A new right-angle connection would replace the portion of pavement that currently connects Taxiway A to Runway 12-30 from the east, and segments of Taxiway A would be removed, as depicted in the exhibit. This would allow for this taxiway to be marked with a parallel hold line 250 feet from the runway centerline. Realigning this taxiway and removing that portion of Taxiway A also opens up this area for prime landside development, which will be considered later in the chapter. Taxiway fillets are also updated to meet current design standards.

Advantages	Disadvantages
- All non-standard conditions are resolved - Additional taxiways will support future landside development that may occur in the southwest quadrant of the airport - A realigned Taxiway A leading from the apron allows for more landside development south of the existing apron area	- The realignment of 200th Avenue would come with disruption and expense, and possibly opposition from the landowner(s) and nearby residents - The road realignment would also require environmental analysis that may result in NEPA impacts

AIRSIDE ALTERNATIVE 4

Airside Alternative 4, depicted on **Exhibit 4E**, considers a different approach to mitigating the non-standard safety area conditions that exist. Under this scenario, both runways would shift, with Runway 12-30 moving approximately 1,554 feet to the northwest, and Runway 18-36 moving approximately 605 feet to the north. As proposed, relocation of the runways would serve to also shift their associated safety areas, effectively removing the obstructions and incompatible uses that are found in the existing safety areas. The Runway 30 RSA and ROFA would remain clear with this movement. The Runway 30 RPZ would be brought back fully onto airport property as well. This would also allow for the removal of the displaced threshold, bringing the total operational length of the runway to 6,001 feet for all operations. However, the new pavement added to the Runway 12 end would push the Runway 12 RPZ beyond existing airport property, requiring the acquisition of approximately 31 acres. Additionally, there may be wetland impacts associated with this extension, which will require additional analysis. Taxiway C would need to be extended to the northwest to serve the relocated Runway 12 end, with a new connector added near the midpoint of the runway. Two existing connectors would be removed, while a third would be utilized as an additional exit. Associated lighting systems would also need to be relocated to

accommodate the shifted runway. At the Runway 30 end, approximately 1,554 feet of the runway and associated Taxiway B would be removed. A new connector extending from Taxiway B to Taxiway D would be added to serve the relocated Runway 30. New hold lines would be remarked at 250 feet from the runway centerline on each taxiway serving Runway 12-30. The localizer equipment serving the runway would need to be relocated nearer the new Runway 30 end, but outside the RSA/ROFA.

Runway 18-36 would be shifted approximately 605 feet to the north, bringing the Runway 36 RPZ north of W. 18th Street/340th Street and removing this road from the RPZ. At the Runway 18 end, the shifted RPZ would remain within airport-controlled property, as shown on the exhibit. A portion of Taxiway D would be removed to accommodate this shift, and a new connector added. Taxiway E would be extended to the north to match the relocated runway, with a new connector added to the Runway 36 end. This shift does result in a new, non-standard condition: a high-energy crossing via Taxiway C. To correct this, new pavement connecting Taxiway C to Runway 18-36 would be added outside the high-energy area, depicted in green shading on the exhibit.

Airside Alternative 4 also presents another option for resolving the direct access issue presented by Taxiway A. Under this scenario, the northern portion of Taxiway A remains in place, with new pavement added to connect with Taxiway B at a right angle. Taxiway B is then extended farther to the west, then turns north as an extension of Taxiway E. Taxiway fillets are also updated to meet current design standards.

Advantages	Disadvantages
- All non-standard conditions are resolved, and all safety areas would be free of obstructions and incompatibilities - No impacts to the surrounding road network - Full length of Runway 12-30 is available; no displaced threshold	- Shifting these runways would be a very costly project that is likely to be met with both local and FAA opposition - A significant property acquisition or easement would be required to control the shifted Runway 12 RPZ

LANDSIDE PLANNING CONSIDERATIONS

Landside development alternatives include consideration of the general aviation services and support areas, as well as potential revenue enhancement opportunities. Landside considerations for SPW are listed below:

Landside Planning Considerations
- Identify locations for hangar and apron development - Fuel farm expansion - Terminal building expansion to accommodate potential commercial service

For non-aviation related developments on airport property, it is important to note that the FAA typically requires airports to receive approval through a land-use release to lease airport-owned land for non-aviation related purposes. The FAA stipulates that all land with reasonable airside access should be used or reserved for aviation purposes. Those areas on the airport not readily linked to the airfield can be considered favorably in a land-use release. In some cases, the FAA will be hesitant to release land use if the airport has limited development areas near the airfield system.



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The alternatives to follow focus on maximizing the development potential of existing airport property, but also consider growth potential beyond the existing property boundary. Each alternative meets FAA design standards and satisfies long-term horizon facility demand identified in the previous chapter. The landside element of the recommended master plan concept, to be presented in the next chapter, may be one of these alternatives or, more likely, a combination of elements from each of them.

The **primary surface** is centered longitudinally along the runway and extends 200 feet beyond each runway end.

The **transitional surface** elevates out from the edge of the primary surface at a ratio of one vertical foot for every seven horizontal feet.

AIRPORT LAND USE

Exhibit 4F depicts the proposed land use within airport property. As detailed, areas are proposed for both aviation use and non-aviation use reserve. Aviation use reserve has been calculated at 1,200 feet from the centerline of primary Runway 12-30 and 1,000 feet from the Runway 18-36 centerline. This area, shaded in pink, represents land the airport should reserve for both airside and landside aviation-related development. The blue area on the exhibit represents airport-owned property that is more distant from the airfield and could be earmarked for non-aviation businesses or uses, such as agriculture or industrial. Some of these areas are already used for agriculture purposes.

Each quadrant of the airport has been identified as Area 1, Area 2, Area 3, and Area 4. Much of the aviation land use area in Area 1 has already been built-out, as this is where all SPW's existing landside facilities are located. However, there is still a significant portion of developable area in this location. This area is the most practical for new development, as it is afforded prime flightline access and utilities are already in place. Area 2 is the next likely location for new landside facilities to be constructed, as it is closest to previously developed areas within the city, as well as utilities. Area 3 is similar to Area 2 in terms of access and utilities and represents another area for potential development. Area 4 also has excellent development opportunities in terms of space and runway access; however, significant work would be required in order to develop in this area (i.e., utilities and road access). The alternatives to follow show development options in Areas 1 through 3 only, as development in Area 4 is unlikely to be realized by the long-term planning horizon.

A 35-foot building restriction line (BRL) is also shown on the exhibit. The BRL is a product of 14 CFR Part 77 primary and transitional surface clearance requirements and identifies suitable building locations on the airport. Given that the strength rating for both runways is over 12,500 pounds, they are classified as "other than utility" runways. The width of the primary surface for other than utility visual and non-precision instrument runways having minimums greater than $\frac{3}{4}$ -statute mile is 500 feet. The width of the primary surface serving other than utility runways having minimums of $\frac{3}{4}$ -statute mile or lower is 1,000 feet. Based upon these criteria and building height, the BRL or obstructions to the BRL can be determined.

Each alternative to follow depicts the BRL associated with each development scenario. Each BRL depicted is located at a separation from the runway centerline based upon instrument approach capabilities and the selected allowable structure height (35 feet). It should be noted that it is typical for existing

building obstructions to the BRL to be mitigated by equipping the building with red obstruction lighting. Moreover, any trees obstructing the primary or transitional surface must be cleared, topped, or trimmed to fully comply with 14 CFR Part 77.

AREA 1 LANDSIDE ALTERNATIVES

Area 1 Landside Alternative A

As the prime location for new development at SPW, Area 1 offers excellent potential for increasing the amount of aircraft storage and ramp area, locating a new aviation business, and expanding the terminal area. The first option, Area 1 Landside Alternative A, illustrated on **Exhibit 4G**, shows an extension of two existing apron and hangar areas. On the north side, the apron associated with the T-hangars is expanded to accommodate two new T-hangars. A 6-unit T-hangar could be built immediately west of the existing 8-unit T-hangar, and a new 8-unit structure built farther west. These locations and hangar sizes would allow for proper wingtip clearance based on ADG 2 standards, which require 79 feet of separation.

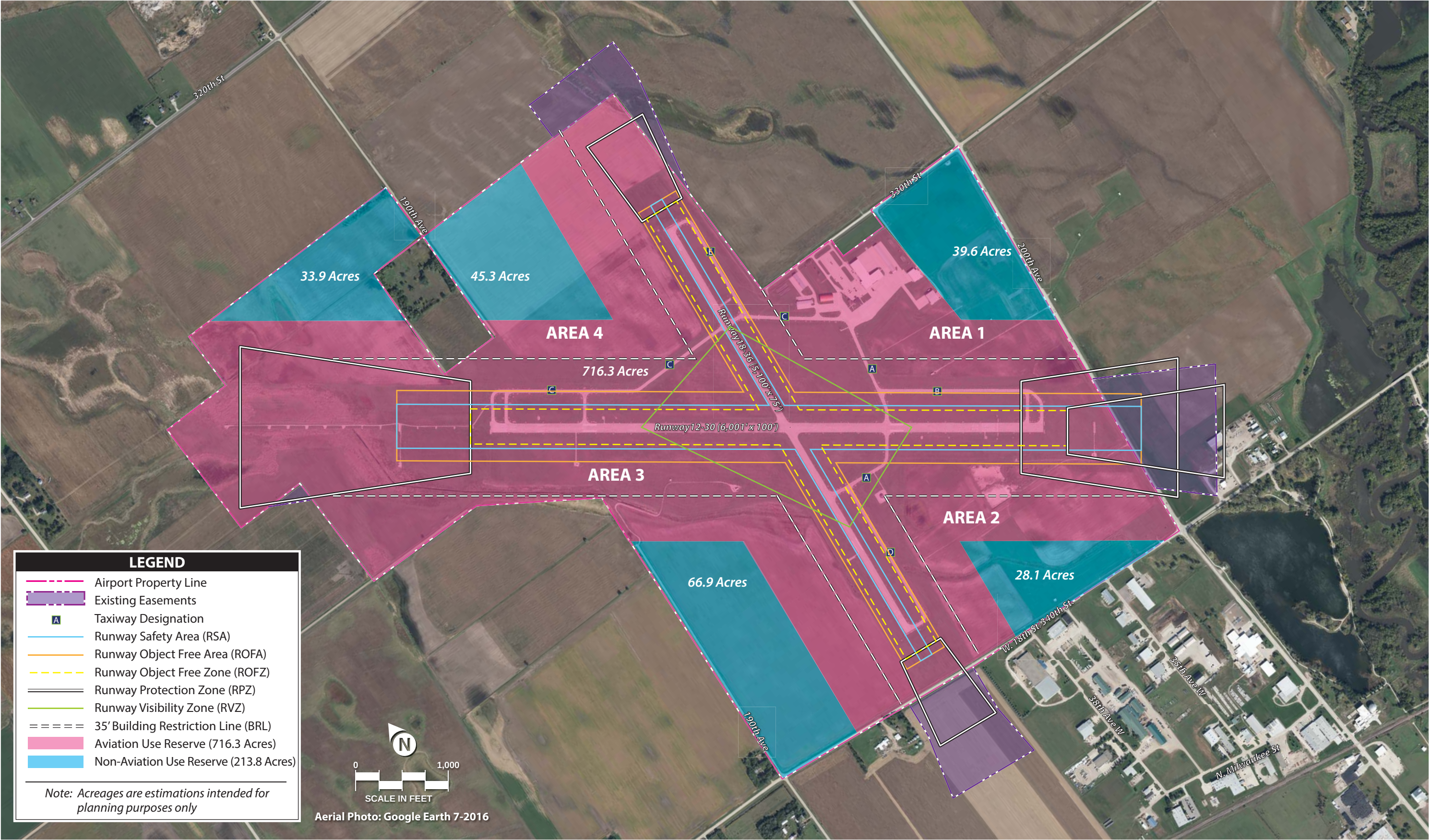
The apron and taxiway fronting Spencer Avionics are also targeted for expansion. The taxiway is proposed to be widened, and new apron pavement added to the south, which could accommodate both conventional hangars and T-hangars. The exhibit illustrates an option with two 10,000 square foot (sf) conventional hangars, with vehicle access provided via an extension of the existing road that leads from 330th Street. On the south side of the new apron, there is space for two more 8-unit T-hangars. Marked tie-downs are also included to accommodate transient aircraft, and a taxiway connecting the apron to Taxiway B would provide easy access to Runway 30.

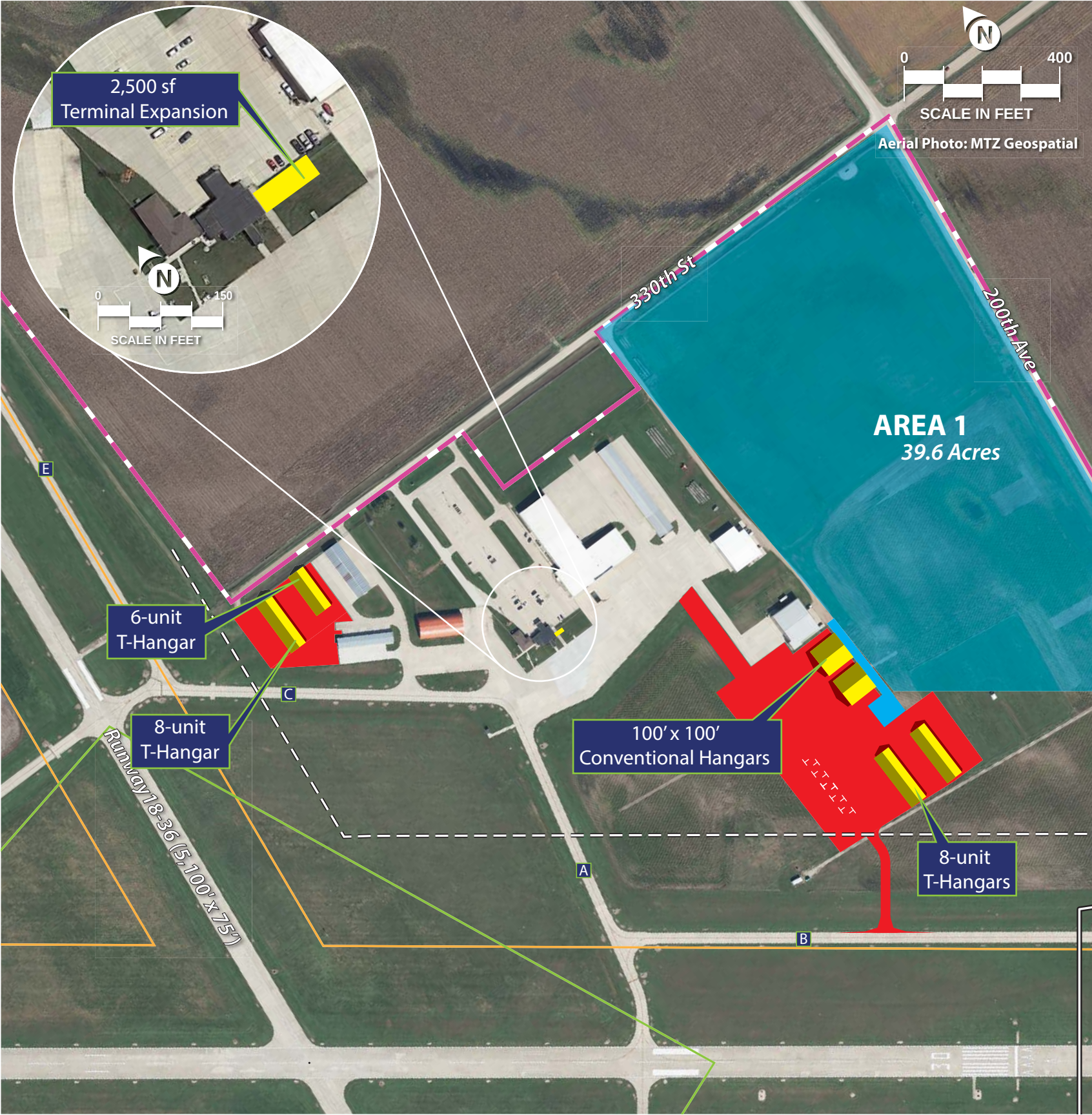
As shown on the exhibit, there are approximately 40 acres within Area 1 that should be reserved for non-aviation use. Currently, the airport has approximately 24 acres of that space earmarked for non-aviation development. This area, called the Spencer Airport Business Park on the 2008 ALP, includes eight parcels ranging in size from 2.5 to 3.8 acres. As of 2020, the area remains undeveloped.

Finally, Alternative A also proposes a 2,500 sf expansion to the GA terminal building. The existing building would be expanded to the east in an area that is currently vacant. This would more than provide for the 900 sf of additional space that was identified in Chapter Three for GA needs, and nearly account for the approximately 2,700 sf necessary if the airport begins offering scheduled commercial service (utilizing the Scenario 2 projection detailed in Chapters Two and Three).

Area 1 Landside Alternative B

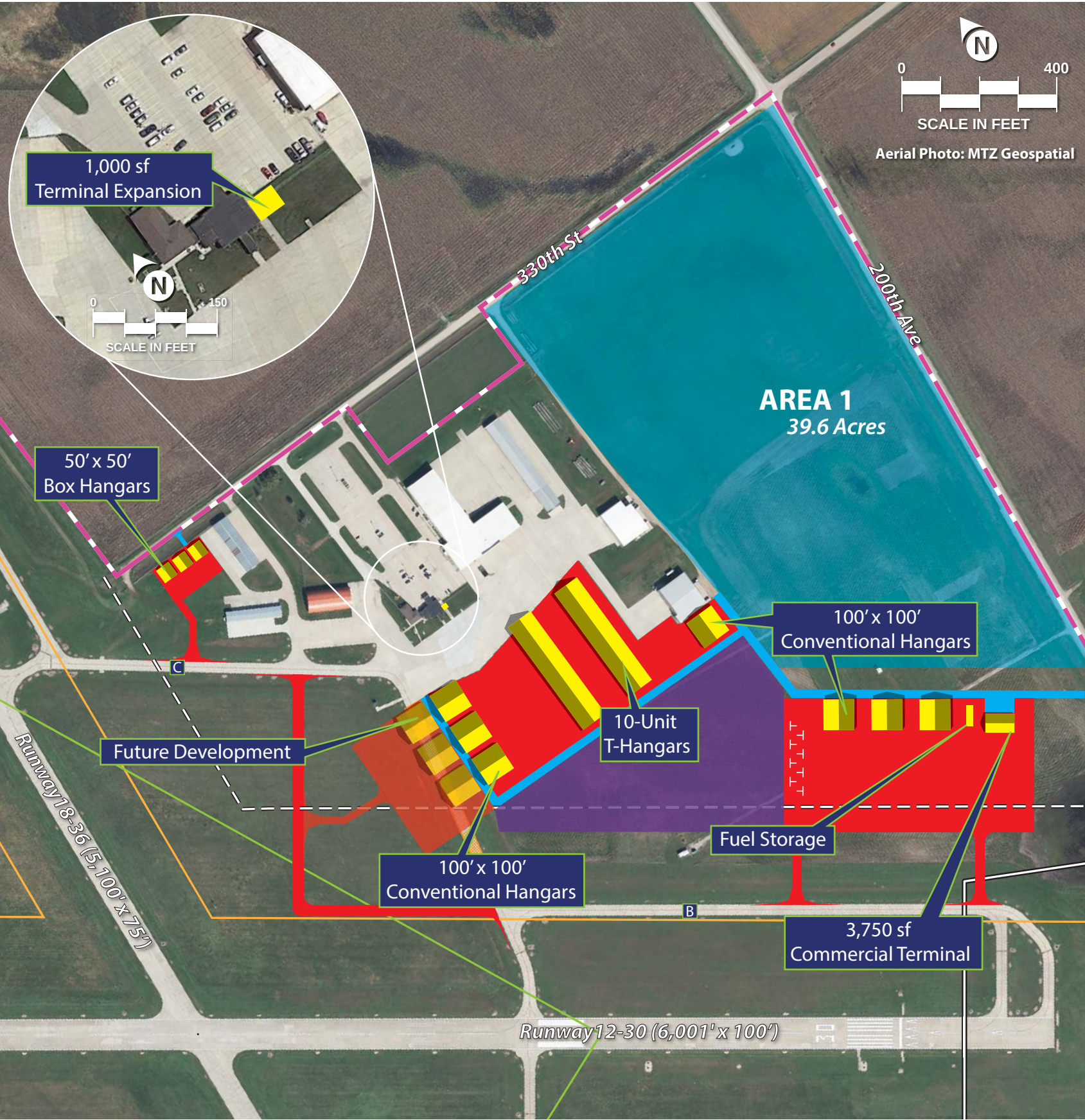
Area 1 Landside Alternative B shows a second development option for the aviation use portion of Area 1. This plan, depicted on **Exhibit 4H**, includes a third development area, including space for a new terminal building to accommodate potential commercial operations. Like the first option, Alternative B proposes an expansion of the apron area near the existing T-hangars on the northwest side of the land-side area. However, instead of constructing additional T-hangars in this space, three 2,500 sf conventional hangars are proposed, with a new connector providing access to Taxiway C.





LEGEND	
	Airport Property Line
	Taxiway Designation
	Runway Object Free Area (ROFA)
	Runway Protection Zone (RPZ)
	Runway Visibility Zone (RVZ)
	35' Building Restriction Line (BRL)
	Ultimate Pavement
	Ultimate Buildings
	Ultimate Roads/Paving
	Non-Aviation Use Reserve

Note: Acreages are estimations intended for planning purposes only



LEGEND			
	Airport Property Line		Ultimate Pavement
	Taxiway Designation		Pavement to be Removed
	Runway Object Free Area (ROFA)		Ultimate Buildings
	Runway Protection Zone (RPZ)		Ultimate Roads/Paving
	Runway Visibility Zone (RVZ)		Non-Aviation Use Reserve
	35' Building Restriction Line (BRL)		Aviation Use Reserve

Note: Acreages are estimations intended for planning purposes only

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The main apron is also planned for expansion to the south and west. As noted on the exhibit, a portion of existing Taxiway A would be closed and the apron enlarged, which would allow for construction of additional conventional and T-hangars. Expansion of this apron could be phased depending on demand. The initial phase could include two 10-unit T-hangars on the central portion of the proposed apron and three 10,000 sf conventional hangars on the west side. If additional demand materializes, the apron could be expanded farther to the west and new hangars built, as shown on the exhibit in lighter shading. This area would be accessible via a new access road that would extend from the existing access road that currently terminates behind Spencer Avionics. The apron fronting Spencer Avionics is also proposed for expansion so that an additional 10,000 sf conventional hangar could be constructed south of the Spencer Avionics building.

The access road leading from 330th Street would be extended to the south before turning to the east to provide access to a third new development area. The proposed apron would provide space for three additional 10,000 sf conventional hangars, as well as additional fuel storage and a new 3,750 sf terminal building. This terminal building would serve commercial passengers and operators and would be adequately sized to accommodate the projected enplanement levels identified in Chapter Two. The terminal and adjacent vehicle parking lot would be accessible via a new road extending from 200th Avenue. Marked tiedowns would be included on the west side of the apron, and two new connector taxiways would provide access to Runway 30 via Taxiway B. A smaller 1,000 sf expansion is planned for the existing terminal to accommodate projected growth in general aviation activity.

The central area between the proposed aprons should be reserved as a future development area if additional apron space and aircraft storage are needed.

AREAS 2 AND 3 LANDSIDE ALTERNATIVES

As mentioned previously, Areas 2 and 3 also have good potential for development. **Exhibit 4J**, Areas 2 and 3 Landside Alternative A, illustrates the first development scenario for these quadrants of the airfield. Two new aprons are proposed on either side of Runway 36, with each capable of supporting six 8-unit T-hangars. On the east side, a new taxiway would connect the apron to Taxiway D and provide access to the Runway 36 end, while a new road extending north from W. 18th Street/340th Street would provide vehicle access to the parking lot serving this new T-hangar area. On the west side, a new partial-parallel taxiway serving the runway would need to be constructed at a separation of 240 feet, centerline to centerline, in accordance with B-II design standards, with a connector providing access to the hangar area. A new road leading from W. 18th Street/340th Street would provide vehicle access.

Exhibit 4K depicts Areas 2 and 3 Landside Alternative B. This option considers a similar T-hangar development fronting the east side of Runway 36, but instead of six T-hangars, four are proposed on a smaller apron. A smaller apron is considered on the west side of Runway 36, which would be capable of accommodating eight 2,500 sf conventional hangars. Both hangar areas would be accessible via new roads extending from W. 18th Street/340th Street.

A third development is proposed south of Runway 12-30 in Area 3. A new taxiway would extend from the Runway 12 end to provide access to an apron that could support four 10,000 sf conventional hangars, with an access road leading from 190th Avenue. To develop in this area, however, several actions would

need to be taken prior to construction. In addition to the utility requirements which would be necessary for any development in Areas 2 and 3, the glideslope antenna would need to be relocated. Currently, the glideslope antenna is situated approximately 400 feet south of the runway, near the Runway 12 end. The proposed taxiway serving the new development requires 400 feet of separation to meet C-II standards, resulting in the need to relocate the glideslope antenna. There is also a well head in this area that would potentially need to be relocated so it is accessible to city employees for maintenance.

Development was also considered south of Runway 30 in the Area 2 quadrant. However, this area is currently being used by Spencer Municipal Utilities to dispose of lime sludge from the city's water treatment facility. Preliminary consultation with the Department of Natural Resources did not uncover any potential environmental impacts that would exclude development in this area; however, the sludge would have to be dispersed prior to development. This could be cost-prohibitive and may result in a need for additional environmental analysis as well. As such, no development has been proposed for this area.

It should also be noted that any development occurring on the south side of the airfield should remain clear of the VOR critical area, which has a 1,000-foot radius, so as not to interfere with the VOR signal.

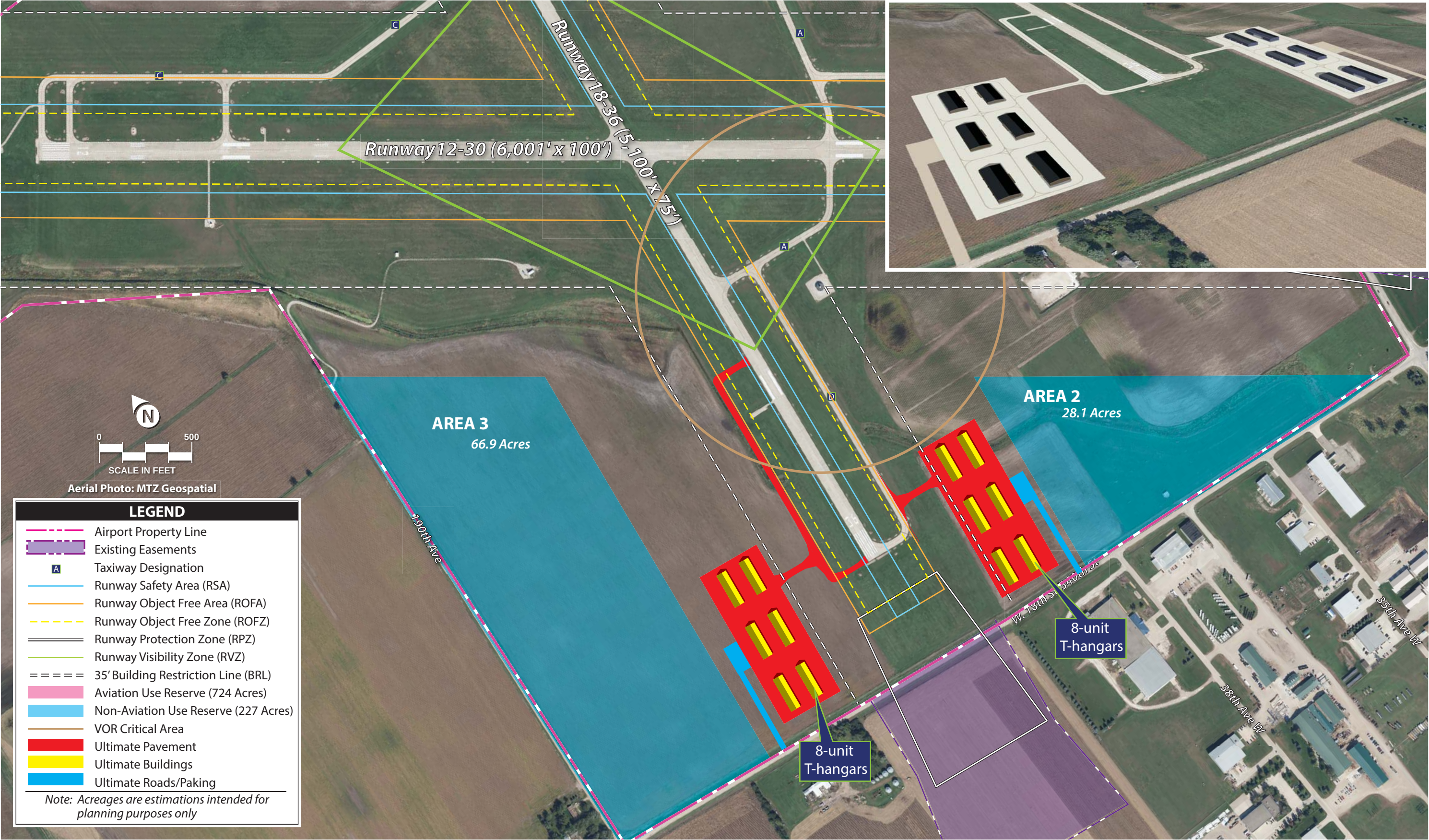
ALTERNATIVES SUMMARY

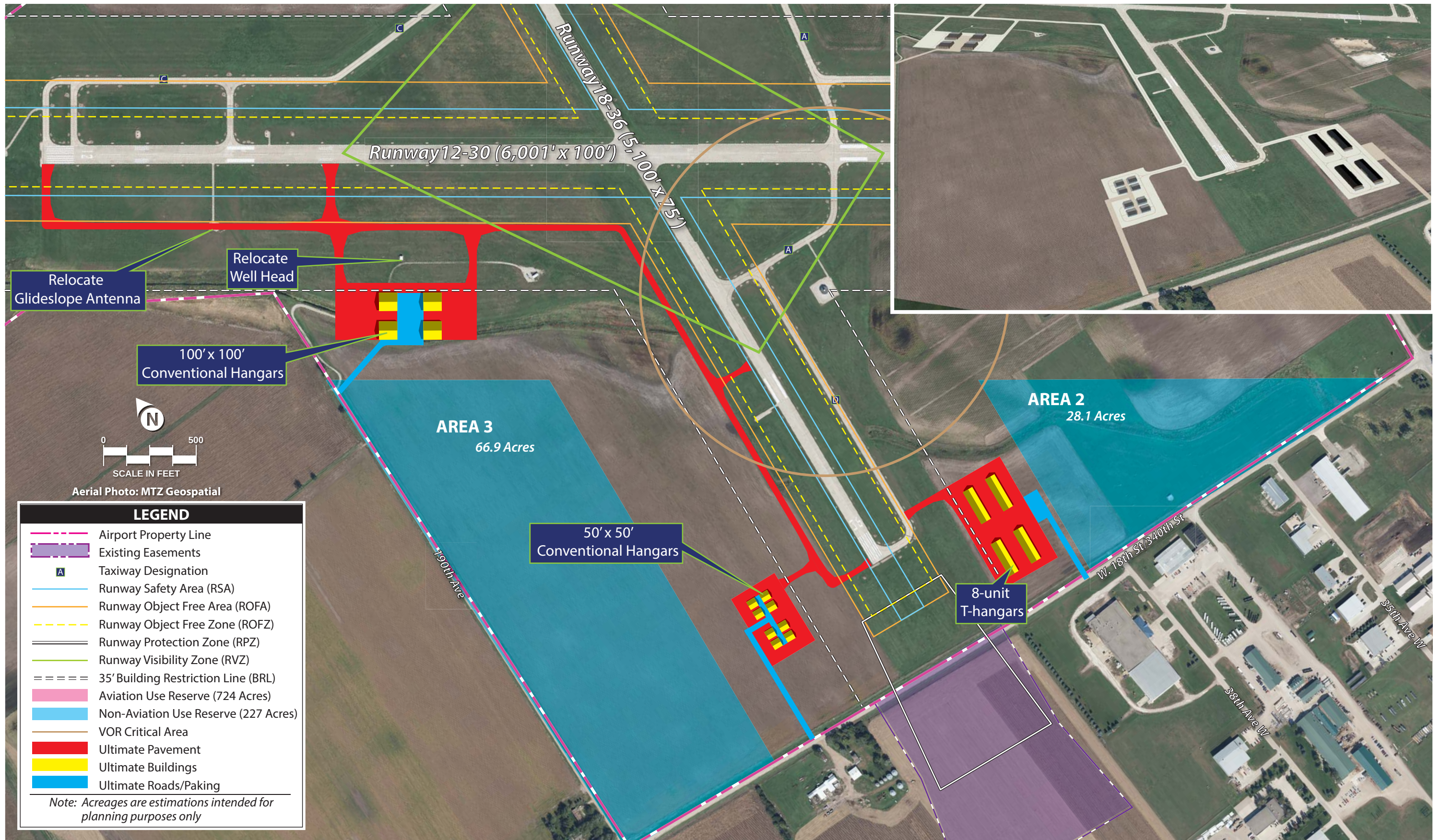
The process utilized in assessing airside, terminal, and general aviation development alternatives involves a detailed analysis of facility requirements, as well as future growth potential. Current airport design standards were considered at each stage of development.

It is important to note that analysis presented in this chapter has been conducted from a standpoint that assumes the airport's commitment to funding future infrastructure development, and airside and land-side alternatives assume the realization of forecast demand presented in Chapter Two. Considering forecast future potential demand and assumed commitment to funding infrastructure development, alternatives presented in this chapter consider options to develop individualized areas on the airport.

On the airside, the major considerations involve resolving the Runway 30 RSA and ROFA obstructions and considering options for removing RPZ incompatibilities for Runways 30 and 36. Nonstandard taxiway geometry has also been examined, with several solutions proposed, particularly for the direct access issue. Lighting upgrades for Runway 12-30 and relocating the localizer equipment were also considered.

SPW has significant space for landside development. Landside alternatives explored options for increasing aircraft storage space with both T-hangars and conventional hangars, as well as additional apron area and tiedowns. Functional space increases for the GA terminal were also examined, as well as an option to build a separate terminal for scheduled commercial service, should the airport offer this in the future. The airport also has approximately 214 acres of property that is considered for non-aviation use reserve. These areas could support industrial operations, as is already planned in Area 1, or continued agricultural operations in the other areas to generate revenue for the airport. All options for future hangar and apron development meet or exceed the forecast 20-year need. After review by the Planning Advisory Committee, the City of Spencer, and the public, a recommended concept and environmental overview of the proposed plan will be presented in the next chapter. Beyond that, a financial plan and development schedule will be drafted, and funding options analyzed.





Chapter Five

Recommended Master Plan Concept



Recommended Master Plan Concept

The process for the preparation of the Airport Master Plan has included technical efforts in the previous chapters intended to establish the role of Spencer Municipal Airport (SPW), forecast potential aviation demand, establish airside and landside facility needs, and evaluate options for improving the airport to meet those facility needs. The planning process has included the development of draft working papers that have been presented to a Planning Advisory Committee (PAC), which is a group comprised of stakeholders/constituents with an investment or interest in the airport and surrounding area. These diverse groups have provided extremely valuable input into the Master Plan. Additionally, a series of Public Information Workshops have been conducted as part of this planning process, providing the public an opportunity to be involved with and educated about the study.

The alternatives that outlined future growth and development scenarios in the previous chapter have been refined into a recommended development concept for the Master Plan, which is included for presentation in this chapter. Environmental conditions that need to be considered during development are also examined later in the chapter.

One of the objectives of the Master Plan is to allow decision-makers the ability to either accelerate or slow development goals based on actual demand. If demand slows, development of the airport beyond routine safety and maintenance projects could be minimized. If aviation demand accelerates, development could be expedited. Any plan can account for limited development, but the lack of a plan for accelerated growth can sometimes be challenging.

Therefore, to ensure flexibility in planning and development to respond to unforeseen needs, the recommended Master Plan concept considers the full and balanced development potential for SPW.

MASTER PLAN CONCEPT

SPW is a vital aviation asset within the National Airspace System (NAS), as evidenced by the role that the Federal Aviation Administration (FAA) assigns it. The airport is classified by the FAA as a Regional General Aviation (GA) airport within the *National Plan of Integrated Airport Systems* (NPIAS). NPIAS airports are considered important to the national aviation system and are eligible for development grant funding from the FAA. Regional GA airports support regional economies with interstate and some long-distance flying and have high levels of activity. As previously detailed, SPW experiences a broad range of aviation operations and services and is currently home to 41 based aircraft. At the state level, the *Iowa Aviation System Plan* (IASP) classifies SPW as an Enhanced Service airport, which means that it has a runway longer than 5,000 feet with facilities and services that support a full range of GA activity. The airport is a vital asset which supports the local City of Spencer economy, as well as the needs of the greater regional area, which includes the Iowa Great Lakes.

The recommended development concept, shown on **Exhibit 5A**, presents the recommended configuration for the airport, preserving its role while also meeting FAA design and safety standards to the extent practicable. It is important to note that the concept provides for anticipated facility needs over the next 20 years, as well as establishing a vision and direction for facility needs beyond the 20-year planning period of this study. A phased capital program associated with implementing the recommended concept is presented in Chapter Six.

While the Master Plan concept makes recommendations for the future of the airport, it is important to continue to obtain local perspective and input on important development goals and objectives as the study process moves toward completion. The following sections describe the recommended development concept. When assessing future development potential, the development plan has separated the airport into airside and landside functional areas.

AIRSIDE DEVELOPMENT CONCEPT

The airside plan generally considers those improvements related to the runway and taxiway system, and often requires the greatest commitment of land area to meet the necessary physical features and associated safety areas required to support flight operations. Operational activity at SPW is anticipated to grow through the 20-year planning horizon of this Master Plan. The airport is projected to continue to serve the full range of general aviation aircraft operations, along with providing the capability of supporting commercial service should a regional operator establish service.

The major airside issues addressed in the Master Plan concept include the following:



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- Conform to Runway Design Code (RDC) B-II-2400 design standards for the existing airfield condition.
- Improve to RDC C-II-2400 design standards in the ultimate airfield condition.
- Extend Runway 12-30 to an ultimate length of 6,501 feet, with a 500-foot displaced threshold on Runway 30, to allow for full utility of 6,001 feet for all operations.
- Acquire additional property to accommodate approach protection on Runway 12-30.
- Realign existing taxiways to correct nonstandard airfield geometry and safety standards.
- Upgrade visual approach aids to four-box precision approach path indicator (PAPI-4) systems on both ends of Runway 12-30.
- Install distance remaining signs on Runway 12-30.

RUNWAY DIMENSIONAL STANDARDS

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

As discussed previously, the design criteria primarily center on an airport's critical design aircraft. The critical design aircraft is the most demanding aircraft, or family of aircraft, which currently or are projected to conduct 500 or more operations (takeoffs or landings) per year at an airport. Factors included in airport design are an aircraft's wingspan, approach speed, tail height, and, in some cases, the instrument approach visibility minimums for each runway. The FAA has established the RDC to relate these design aircraft factors to airfield design standards. The most restrictive RDC is also considered the overall Airport Reference Code (ARC) for an airport with more than one runway.

Analyses at the end of Chapter Two concluded that the current RDC for Runway 12-30 is B-II-2400. Future planning for Runway 12-30 considers an ultimate RDC of C-II-2400 for the following reasons:

- The runway should be planned for the most demanding aircraft that will reasonably operate at the airport on a regular basis in the future;
- The based aircraft fleet mix is projected to add three jets and four turboprops, which will result in more C-II operations by the long-term planning horizon;
- The currently approved Airport Layout Plan (ALP) historically planned for the same ultimate ARC C-II design standard for Runway 12-30; and,
- SPW's classification as an Enhanced Service airport within the IASP sets a minimum facility objective of RDC C-II design standards.

For Runway 18-36, the existing and ultimate RDC was determined to be B-II-5000. This runway currently meets design standards for this RDC and should be maintained accordingly.

Table 5A provides a summary of the RDC for Runways 12-30 and 18-36 based upon the Master Plan concept. In addition to the physical and operational components of an aircraft, the RDC also considers the instrument approach capabilities for each runway expressed in runway visual range (RVR) values.

For Runway 12-30, the RVR value of 2,400 feet indicates approach visibility minimums down to ½-mile. For Runway 12, ½-mile visibility minimums are provided by the instrument landing system (ILS) and the area navigation (RNAV) localizer performance with vertical guidance (LPV) global positioning system (GPS) approaches. Runway 30 also has an RNAV LPV GPS approach, with visibility minimums down to ¾-mile, which has an RVR value of 4,000 feet. RNAV LPV GPS approaches are also available to both ends of Runway 18-36, with visibility minimums down to 1-mile, which equates to an RVR of 5,000 feet. Additional discussion related to instrument approach capabilities is undertaken later in this chapter.

**TABLE 5A | Runway Design Codes
Spencer Municipal Airport**

Runway	Existing RDC	Ultimate RDC*
12-30	B-II-2400	C-II-2400
18-36	B-II-5000	Same

* The ultimate ARC for the Airport is C-II based upon the most demanding RDC associated with the runway.

PRIMARY RUNWAY 12-30

Primary Runway 12-30 is currently 6,001 feet long and 100 feet wide, which meets ultimate RDC C-II-2400 design standards. At these dimensions, the runway is capable of accommodating all small general aviation aircraft, as well as the fleet of business jets in most operating conditions. There is a 500-foot displaced threshold on Runway 30, which functions to bring the RSA and ROFA onto airport property and remove obstructions to these safety areas (perimeter fence and 200th Avenue). However, the displaced threshold results in a reduction of available runway length during certain operations. While declared distances are not currently published for Runway 12-30, the displaced threshold results in changes in the usable runway length. As described previously in Chapter Four, the declared distances are:

- Takeoff Run Available (TORA) – the runway length declared available and suitable for the ground run of an aircraft taking off (factors in the positioning of the departure RPZ);
- Takeoff Distance Available (TODA) – the TORA plus the length of any remaining runway or clearway beyond the far end of the TORA; the full length of the TODA may need to be reduced because of obstacles in the departure area;
- Accelerate-Stop Distance Available (ASDA) – the runway plus stopway length declared available and suitable for the acceleration and deceleration of an aircraft aborting a takeoff (factors in the length of RSA/ROFA beyond the runway end); and
- Landing Distance Available (LDA) – the runway length declared available and suitable for landing an aircraft (factors in the length of RSA/ROFA beyond the runway end and the positioning of the approach RPZ).

As detailed in **Table 5B**, at the existing length of 6,001 feet, the LDA for landing operations to either end of Runway 12-30 are impacted, with 5,501 feet of usable runway pavement. In order to provide the full 1,000 feet of RSA/ROFA, the ASDA is also affected for takeoff operations on Runway 12, which currently have 5,501 feet of available runway length.

The planning process identified a need to maintain the 500-foot displaced threshold on Runway 30. The displacement and the use of declared distances shifts the RSA and ROFA sufficiently to ensure they are not obstructed by the perimeter fence, 200th Avenue, and the localizer equipment. As mentioned, the existing runway length is suitable for most of the aircraft using the airport currently, even with the displaced threshold impacting certain operations. However, larger corporate aircraft that require longer takeoff and landing lengths are anticipated to utilize the airport more frequently in the future. Therefore, a 500-foot extension to Runway 12 is planned, as depicted on **Exhibit 5A**, bringing the runway length to 6,501 feet. At this increased length, even with the displaced threshold on Runway 30, all operators will have at least 6,001 feet of usable runway pavement in takeoff or landing situations on either runway end. **Table 5B** and **Exhibit 5B** detail the runway lengths that would be available to pilots if Runway 12-30 were extended to 6,501 feet.

TABLE 5B | Runway 12-30 Available Length Utilizing Declared Distances
Spencer Municipal Airport

Runway Length	Existing – 6,001'		Ultimate – 6,501'	
Runway	12	30	12	30
TORA	6,001'	6,001'	6,501'	6,501'
TODA	6,001'	6,001'	6,501'	6,501'
ASDA	5,501'	6,001'	6,001'	6,501'
LDA	5,501'	5,501'	6,001'	6,001'

TORA: Take Off Run Available

TODA: Take Off Distance Available

ASDA: Accelerate Stop Distance Available

LDA: Landing Distance Available

It should be clearly noted that the runway extension is included for planning purposes only and is not currently justified. An extension project would require additional aircraft operations before the FAA will offer grant funding assistance for its construction.

A runway extension would also result in several connected actions, including:

- Relocation of the medium intensity approach lighting system with runway alignment indicator lights (MALSR) at the Runway 12 end
- Shifting the visual approach lighting on Runway 12
- Acquiring approximately 3.9 acres of property to maintain control of the shifted RPZ associated with Runway 12
- Installation of high intensity runway edge lighting (HIRL) on new runway pavement
- Extension of Taxiway C and construction of a new connector to the Runway 12 end

Prior to extending the runway, an environmental analysis will need to be conducted to determine the potential for environmental impacts to occur.

Runway 12-30 is currently strength-rated for 30,000 pounds single wheel loading (SWL) and 50,000 pounds dual wheel loading (DWL). This strength rating is adequate for the current level and type of operations occurring at the airport; however, if larger business jets or commercial service aircraft become more

frequent, Runway 12-30 should be strengthened to 75,000 dual wheel loading (DWL). As such, the development concept includes a recommendation to strengthen the runway's pavement.

CROSSWIND RUNWAY 18-36

Runway 18-36 is 5,100 feet long and 75 feet wide. This meets existing and ultimate RDC B-II dimensional standards and is adequate for the type of aircraft the crosswind runway is meant to serve on a regular basis. Therefore, no modifications to the runway dimensions are currently justified or planned.

Runway 18-36 is strength-rated at 30,000 pounds SWL and 50,000 DWL. These ratings are adequate over the long-term planning horizon, so no recommendation is made to strengthen this runway.

TAXIWAYS

The recommended development concept considers correction of nonstandard taxiway conditions. The non-standard conditions that currently exist include: 1) direct access from the primary apron to Runway 12-30; 2) non-standard holding position markings on Runways 30, 18, and 36; and 3) taxiway fillets currently do not meet taxiway edge safety margins (TESM).

Direct Access

To eliminate the direct access condition, it is recommended that Taxiway A be realigned to connect with Taxiway B at a right angle, as depicted in **Figure 5A**. New pavement will be constructed, and a portion of existing Taxiway A pavement will be removed. Taxiway B will be extended by approximately 150 feet to the northwest to meet with the new portion of Taxiway A. This realignment will force pilots taxiing from the apron to make a series of turns before accessing the runway, reducing the risk of inadvertent access to Runway 12-30.



Figure 5A



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Holding Positions

In adherence with ultimate C-II design standards on Runway 12-30, holding positions should be located 250 feet from runway centerline. While all the holding position markings associated with this runway are spaced in accordance with the standard, the markings on Taxiway A (north side of the runway) and the outermost connector to Runway 30 are not situated parallel to the runway, which excludes the ability for aircraft to hold perpendicular to the runway. For aircraft holding in these locations, the non-parallel marking limits a pilot's field of vision up and down the runway. As such, the FAA recommends parallel hold lines, which afford pilots a full view of the runway.

The non-standard holding position marking on Taxiway A will be corrected with the realignment of this taxiway, as shown on **Figure 5A**. At the connection to Runway 30, the current layout prohibits a parallel hold line with a 250-foot separation that allows for a pilot to position their aircraft perpendicular to the runway. To meet FAA standards, new pavement will be constructed to allow for a right-angle connection and parallel hold line, allowing aircraft to hold perpendicular to the runway. Portions of existing Taxiway B and connector pavements will be removed, as shown in **Figure 5A**.

Parallel taxiway offsets are planned for Runways 18 and 36. Like Runway 30, the holding position markings on Runways 18 and 36 are not currently aligned parallel to the runway, limiting a pilot's range of vision. For a B-II runway, hold lines should be separated from the runway centerline by 200 feet. Simply squaring off the taxiways does not provide enough distance for an aircraft to turn to achieve a 200-foot separation between the hold line and the runway centerline. Thus, parallel taxiway offsets are planned to provide the necessary distance for standard hold line markings. As shown on **Figure 5B**, portions of Taxiways E and D will be removed, and parallel taxiway offsets will be constructed to allow for standard holding position markings to Runways 18 and 36.



Figure 5B

Taxiway Fillets

Taxiway fillets, which are areas of additional pavement designed to maintain the TESM, serve to widen taxiways at the inside of turns. This increases the safety margin for taxiing aircraft when pilots are navigating turns. Fillet dimensions are a function of the taxiway design group (TDG), which is group 2, for SPW. **Figure 5C** depicts updated fillets on existing Taxiways A and C and ultimate Taxiways C2 and C3, in

accordance with FAA design standards for the taxiway system at the airport. The fillets on the connectors leading to Runways 18 and 36 are also planned to be updated to the new standards, as shown previously in **Figure 5B**.



Figure 5C

NAVIGATIONAL AND APPROACH AIDS

Instrument Approach Aids

As detailed previously, straight-in instrument approach procedures are currently offered on all runway ends at SPW. Currently, the ILS approach serving Runway 12 provides for approach visibility minimums down to ½-mile. Runway 12 also has an RNAV LPV approach with ½-mile visibility minimums, while Runway 30 has an RNAV LPV approach with ¾-mile minimums, and Runways 18 and 36 have RNAV LPV approaches with minimums down to 1-mile. These instrument approaches are considered adequate for the airport and no additional approach procedures are recommended at this time.

Visual Approach Aids

Analysis in the previous chapter determined that the airport's existing visual approach slope indicator (VASI) lighting system serving Runway 12-30 should be replaced by the more sophisticated four-box precision approach path indicator (PAPI-4). The recommended development concept depicts the removal of the existing VASI and installation of a PAPI-4 approach lighting system on Runway 12-30. Runway 18-36 is already equipped with a PAPI-4 system, which is recommended to be maintained over the planning period.

LAND ACQUISITION FOR AIRSIDE DEVELOPMENT AND APPROACH PROTECTION

The FAA recommends that the airport sponsor have full control over RPZ property, with a preference being to own the RPZ property in fee simple ownership. When fee simple ownership is not feasible, positive land use measures should be implemented to protect an airport from encroachment by incompatible land uses or obstructions.

For Runway 12-30, portions of the existing and ultimate RPZs serving the runway are not controlled by the airport. Thus, the Master Plan concept includes the acquisition of approximately 3.9 acres of property on the Runway 12 end, as mentioned previously and shown on **Exhibit 5A**. On the Runway 30 end, approximately 15.5 acres are planned for acquisition. In both the existing and ultimate conditions, the RPZs serving Runway 18-36 are owned by the airport either in full or by easement.

As depicted on the exhibit, the Runway 30 and Runway 36 RPZs will still extend over public roadways (200th Avenue and W 18th Street/340th Street). However, because there are no planned changes to the existing RPZs, they are considered as grandfathered and can remain. If the runway environment were to be altered in a way that resulted in a change to either of the RPZs, the FAA would have to decide if the RPZ incompatibilities could remain. However, in order to protect the RPZ at the local level from incompatible development, both Clay County and the City of Spencer prohibit residential land uses, places of public assembly (such as places of worship, schools, or hospitals), uses which are considered wildlife attractants, or uses which create electrical interference or glare.

AIRFIELD LIGHTING AND SIGNAGE UPGRADES

SPW has replaced its incandescent airfield lighting with LED systems for all runway and taxiway lights. The Master Plan recommends the airport continue the transition to LED for all remaining airfield lighting systems, including signage systems. LED systems lower energy consumption and provide a more efficient airfield electrical system.

The plan also recommends that lighted distance remaining signage be installed on Runway 12-30. These signs, spaced at 1,000-foot intervals, increase safety by alerting pilots to how much runway length is remaining.

LANDSIDE DEVELOPMENT CONCEPT

Landside components include terminal buildings, hangars, aircraft parking aprons, and aviation support services, as well as the utilization of remaining airport property to provide revenue support and to benefit the economic well-being of the regional area. The primary goal of landside facility planning is to provide adequate terminal facilities and aircraft storage space to meet forecast needs, while also maximizing operational efficiencies and land uses. Also important is identifying the overall land use classification of airport property to preserve the aviation purpose of the facility well into the future.

Several facility layout concepts were considered. Detailed plans of potential landside facilities were presented in the previous chapter that included various hangar development layouts and the placement of aviation support services. The primary focus for landside development is identifying areas for new hangar and apron construction, as well as increasing the size of the terminal to accommodate anticipated growth. The Master Plan concept, presented on **Exhibit 5A**, provides the layout of proposed landside facilities, which attempts to maximize potential aviation development space on the airfield.

TERMINAL FACILITIES

The Facility Requirements chapter determined a need for additional space (900 sf) in the general aviation terminal, with the potential for an additional 2,660 sf needed in the event commercial service is offered at SPW. The Alternatives chapter considered two options for expanding the terminal to meet projected demand. The first option included a 2,500-sf expansion of the existing facility in the vacant area east of the building. The second option evaluated a smaller expansion (1,000 sf) of the existing facility, with a new, separate terminal building constructed to accommodate potential commercial passengers.

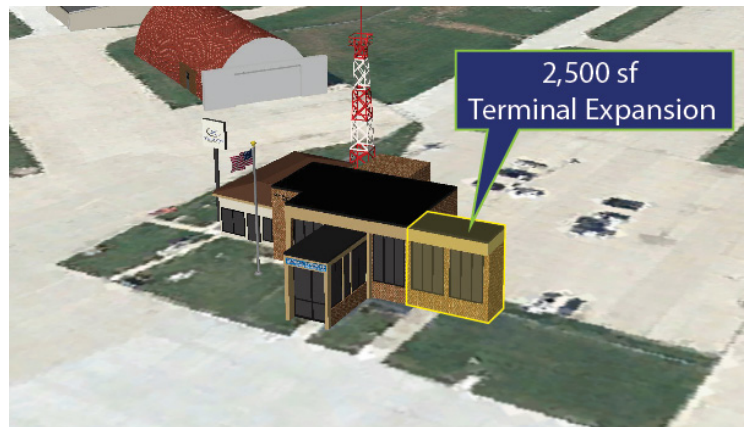


Figure 5D

The preferred development concept recommends a 2,500-sf expansion of the existing terminal building, as depicted on **Figure 5D**. On top of the need that was determined for general aviation operations, this option provides an additional 1,600 sf of space. If commercial service is established at the airport, this expansion could accommodate enplaning/deplaning travelers in the short term. Any construction plans should include the option for additional building expansion if greater demand (i.e., increased passenger enplanements) materializes.

The previous chapters evaluated different commercial service scenarios. The preferred projection outlined a potential for service by nine-seat aircraft throughout the planning period, with approximately 9,600 enplanements by 2040. In this scenario, an air carrier serving SPW would operate under a Part 135 certificate, which would not trigger the need for airport upgrades associated with Part 139 certification.

A second, more aggressive scenario was also considered, which included a transition from nine-seat aircraft in the short term to 50-seat aircraft by 2040. If this scenario were to be realized, additional infrastructure improvements would be necessary. Along with terminal expansion, the airport would need to comply with Part 139 requirements, which would include improvements, such as the installation of security fencing and cameras, passenger screening, and aircraft rescue and firefighting (ARFF) capabilities, among others.

There is no information currently to suggest that commercial service beyond that provided by a Part 135 air charter utilizing up to nine-seat aircraft will occur. Therefore, the recommended development concept does not include facility upgrades beyond the 2,500-sf expansion detailed above. It should be noted, however, that additional analysis may be required to determine specific facility improvements that would be necessary to support passenger service.

HANGAR AND APRON DEVELOPMENT

To meet projected demand at the airport, the landside development plan depicted on **Exhibit 5A** proposes future landside development concentrated in the northeast quadrant of the airfield. Planned developments include the expansion of existing apron areas, construction of new apron areas, and construction of a variety of hangar types/sizes. Approximately 2.8 acres of property south of 330th Street are planned to be acquired to support future development. Focusing future growth in the northeast portion of the airfield will be less costly in terms of utility extension, expansion of public roads, and other construction costs as this area is already developed. While the airport also has substantial property for new landside facilities in the northwest, southeast, and southwest quadrants, development in these areas is likely beyond the lifespan of this Master Plan and has not been included in the recommended development concept.

Development plans for the northeast quadrant include:

- Expansion of apron adjacent to Taxiway C to support two new T-hangars (one 8-unit and one 6-unit).
- Construction of a new apron west of the vehicle parking lot. This apron is planned to support a new snow removal equipment (SRE) building and three additional executive hangars.
- Acquisition of approximately 2.8 acres south of 330th Street.
- Construction of a new apron north of the existing FBO maintenance hangar and 10-unit T-hangar, on which three new T-hangars could be constructed.
- Expansion of the apron west of the existing 10-unit T-hangar, which would serve as frontage for new executive hangar facilities accessible from 330th Street.
- Extension of the existing access road leading from 330th Street to the south to provide access to new apron/hangar development.
- Construction of new apron west of the access road; this apron will support one conventional hangar with vehicle parking provided at the rear of the hangar.

In total, the recommended master plan concept plans for the addition of approximately 14,900 square yards of new aircraft parking apron and 118,500 square feet of new aircraft storage space. While this exceeds the need identified in Chapter Three, Facility Requirements, the locations and sizes of hangars proposed in the recommended concept are conceptual and may not reflect the needs of future developers and their customers. The recommended concept is intended to be used strictly as a guide for airport staff when considering new landside facility developments. ***All hangar-related development should occur only as dictated by demand.*** Figure 5E depicts a close-in view of the landside facility plans for the airport.

AVIATION / NON-AVIATION RESERVE

With all the existing landside facilities concentrated in the northwest quadrant of the airport, a significant portion of airport property is currently undeveloped. While this study does not include a plan to develop most of these areas, they should be categorized for future use in terms of aviation or non-aviation reserve. Areas classified as aviation reserve are generally found along the flightlines of runways, as

this property is necessary for both airfield equipment and is best suited for the development of aviation facilities, such as aprons and hangars. In contrast, property that is inaccessible to the airfield or otherwise offers limited utility for aviation operations should be reserved for non-aviation uses that provide an opportunity to diversify and expand the revenue streams for the airport.



Figure 5E

Exhibit 5A details these land use reserves. In the northwest corner, approximately 27.9 acres had been identified previously for use as a future business park, a non-aviation use. However, with limited development potential south of the primary aircraft apron due to the wells located in this area (to be discussed in the next section), this area is now being planned for future expansion of the general aviation area. In the event demand for landside development beyond what is depicted in this plan materializes, this area can be used to expand aviation development without impacting the wells. The orange shading on the exhibit depicts the other portions of airport property which should be reserved for aviation use, and the blue shaded areas are earmarked for future non-aviation use. In total, approximately 400 acres of airport property are planned for aviation reserve, and approximately 192 acres are set aside for future non-aviation uses. It should be noted that, outside of the northwest quadrant, additional challenges to development (i.e., lack of existing utilities, presence of lime sludge in the southeast quadrant) exist.

Since some airport property being considered for non-aviation related uses may be subject to Airport Improvement Program (AIP) grant assurances, the airport may need to request a release of this property from these federal obligations by the FAA. The release would allow the airport to transition the property from aviation use to non-aviation use. Once this release is issued, the airport would be able to lease or even sell these portions of airport property to support revenue diversification and generation. The *FAA Reauthorization Act of 2018*, Section 163 changed how the FAA's Office of Airport's staff reviews and

considers the release of airport property for non-aviation uses. The section focuses FAA's review and approval of ALPs to those portions of the ALP that materially impact the safe and efficient operation of airports; the safety of people and property on the ground adjacent to the airport; and the value of prior federal investments to a significant extent. In effect, this new guidance is intended to ease the process of gaining FAA approval of land releases.

DEVELOPMENT CONSIDERATIONS

It is noted there are several public wells, owned by the City of Spencer, located on airport property. The general location of these wells is east of Runway 18-36, although there are two wells west of Runway 18-36 and south of Runway 12-30.

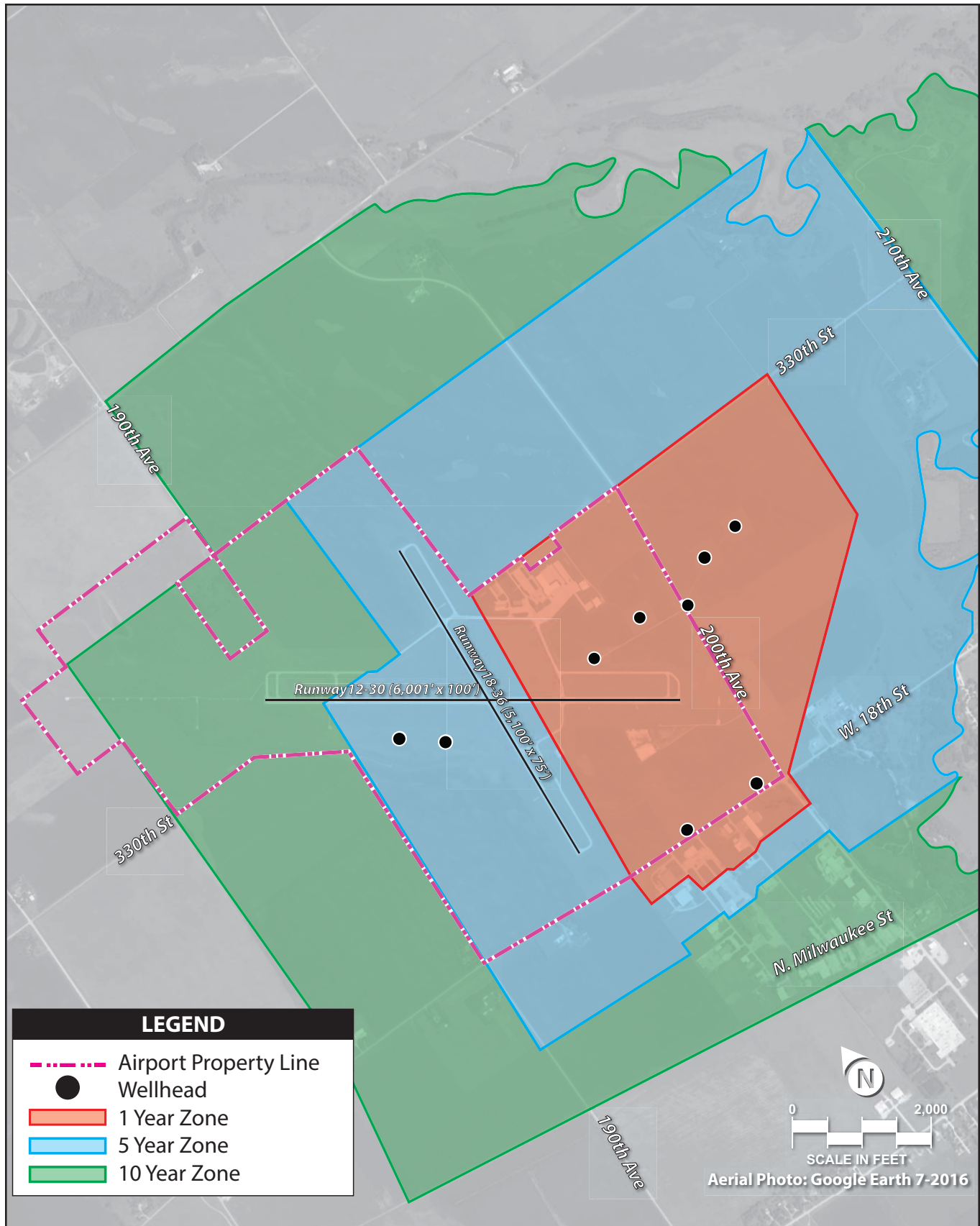
In 1999, the City of Spencer adopted the *Public Water Supply Protection Overlay District*, intended to protect the City's groundwater from potential contamination which may result from land use activities.¹ The overlay district is in place to set restrictions on land use, in addition to the land use restrictions within the base zoning district, and is divided into three zones based on a "time to travel" formula consisting of when a contaminant is introduced into the ground to the point when it enters the public water system.

- Zone A – the amount of time for a contaminate to affect the public water from initiation into the supply is one year or less. Wells within Zone A are the most susceptible to contamination and, therefore, land use is most restrictive; such permitted uses include agricultural, public utilities, and recreational open space. The use of pesticides, other extermination services, and storage for the on-site use of inorganic and organic contaminants are some uses which are prohibited within Zone A.
- Zone B – the amount of time for a contaminate to affect the public water system is one to five years. While wells in this zone are not as susceptible to contamination as those located in Zone A, there are restrictions on land use. Unlike Zone A, the application of fertilizers, pesticides, or herbicides is allowed in Zone B, as well as a wider range of other permitted uses.
- Zone C – the amount of time for a contaminate to affect the public water system is five to ten years. Zone C is the least restrictive zone within the overlay district.

The airport is entirely located within the overlay district; each zone is represented within the airport boundary. Zone A, which is the most vulnerable, is located in the eastern portion of the airport where most of the wells are located (**Exhibit 5C**). The other two wells west of Runway 18-36 are within Zone B.

The regulations identify prohibited principle and accessory uses in each overlay zone, with an increasing scale of prohibited uses in each more vulnerable zone. Examples of uses prohibited in all three zones include: automotive service stations; petroleum product storage and process; and the manufacturing, processing, sale, commercial storage, or disposal of chemicals, toxic or hazardous materials, or pollutants. However, the code does offer exceptions from outlined provisions which relate to specific airport activities. Such activities conducted under the jurisdiction and control of the airport, including aircraft and motor

¹ City of Spencer, IA Planning Department – City of Spencer *City Code*, Title 9, Chapter 2 *Public Water Supply Protection Overlay District* (https://codelibrary.amlegal.com/codes/spencercityia/latest/spencercity_ia/0-0-0-5201), Ordinance 518 – August 2, 1999.



Source: "City of Spencer, IA (1999)," U.S. Geological Survey,

vehicle construction, reconstruction, painting and repair, aircraft deicing, and use or storage of petroleum products, are exempt from the overlay district regulations. However, before undertaking any development in the areas where the wells are located, additional analysis may need to be completed.

ENVIRONMENTAL OVERVIEW

An analysis of potential environmental impacts associated with proposed airport projects is an essential consideration in the master plan process. The primary purpose of this discussion is to review the recommended development concept plan and associated capital program at the airport to determine whether projects identified in the master plan could, individually or collectively, significantly impact existing environmental resources. The information contained in this section was obtained from previous studies, official internet websites, and analysis by the consultant.

On October 5, 2018, the *FAA Reauthorization Act of 2018* (Act) was signed into law, necessitating changes how the FAA historically operates with respect to airport oversight. Section 163 of the Act limits the FAA’s approval authority over certain projects. Pursuant to Section 163, when a sponsor submits a change to the ALP, requests a change in land use from aeronautical to non-aeronautical, or requests to dispose of airport-owned land, the FAA would need to determine if the proposal would be subject to the agency’s approval authority. This approval is a two-step process. The FAA would exercise its regulatory authority consistent with the Act and separately examine and reach a determination regarding its authority under both steps. First, the FAA would determine if they had ALP approval authority under Section 163 of the Act. The second step is to determine how the land was acquired and if land release obligations are required. Projects depicted on the ALP approved prior to the Act must be evaluated to determine whether FAA retains their approval authority.

Projects not categorically excluded under FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, compliance with the *National Environmental Policy Act* (NEPA) is generally satisfied through the preparation of an Environmental Assessment (EA). In instances where significant environmental impacts are expected, as determined by the FAA, an Environmental Impact Statement (EIS) may be required. While this portion of the Master Plan is not designed to satisfy the NEPA requirements, 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.

The environmental inventory included in Chapter One provides baseline information about the airport environs. This section provides an overview of potential impacts to existing resources that could result from implementation of the planned improvements outlined in the recommended concept plan.

POTENTIAL ENVIRONMENTAL CONCERNS

Table 5C summarizes potential environmental concerns associated with implementation of the recommended development concept for Spencer Municipal Airport. Analysis under NEPA includes direct, indirect, and cumulative impacts. Direct impacts are caused by the action and occur at the same time and place (see 40 Code of Federal Regulations [CFR] § 1508.8[a]). Examples of direct impacts include:

- Construction of a facility or runway in a wetland which results in the loss of a portion of the wetland; or
- Noise generated by the proposed action or alternative(s) which adversely affects noise-sensitive land uses.

Indirect impacts are caused by an action, although are later in time or farther removed in distance and are reasonably foreseeable (see 40 CFR § 1508.8(b)). Indirect impacts may include growth-inducing impacts and other effects related to induced changes in the pattern of land use, population density or growth rate, and related impacts on air and water and other natural systems, including ecosystems (see 40 CFR § 1508.8[b]).

Cumulative impacts are those that take into consideration the environmental impact of past, present, and future actions. Cumulative impacts vary based on the project type, geographic location, potential to impact resources, and other factors, such as the current condition of potentially affected impact categories.

TABLE 5C | Summary of Potential Environmental Concerns
Spencer Municipal Airport - Clay County, Iowa

Air Quality	
FAA Order 1050.1F, <i>Significance Threshold/Factors to Consider</i>	Threshold: 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 <i>Clean Air Act</i> , for any of the time periods analyzed, or to increase the frequency or severity of any such existing violations.
Potential Environmental Concerns	No Impact. Although the projected increase in operations over the 20-year planning horizon of the recommended development concept plan (Exhibit 5A) will likely result in additional emissions, Clay County currently meets federal NAAQS requirements. Therefore, general conformity review per the <i>Clean Air Act</i> is not required. According to the most recent FAA <i>Aviation Emissions and Air Quality Handbook</i> (2015), an emissions inventory under NEPA may be necessary for any proposed action that will result in a reasonably foreseeable increase in emissions due to plan implementation. For construction emissions, a qualitative or quantitative emissions inventory under NEPA may be required, depending on the type of environmental review needed for projects outlined in the recommended concept plan.
Biological Resources	
FAA Order 1050.1F, <i>Significance Threshold/Factors to Consider</i>	Threshold: 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. FAA has not established a significance threshold for non-listed species. However, factors to consider are if 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 their 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	For federally listed species No Impact. The USFWS Information for Planning and Consultation (IPaC) report identified three threatened or endangered species: the northern long-eared bat (threatened mammal), the prairie bush-clover (threatened flowering plant), and the western prairie-fringed orchid (threatened flowering plant). Impacts to these species may need to be assessed as part of the NEPA process prior to implementation and may require consultation with the USFWS. Northern long-eared bat generally roosts singly or in colonies underneath bark, cavities, or within crevices of both live and dead trees in the summer and hibernates in caves during the winter. Airport actions outlined in the recommended development concept plan are unlikely to affect the northern long-eared bat because there are no trees present at the airport, nor are caves present in the vicinity. The presence of the prairie bush-clover and western prairie-fringed orchid is unlikely due to past ground disturbance resulting from previous airport construction and ongoing grounds maintenance by the airport by mowing. For designated critical habitat No Impact. Critical habitat has not been identified within the vicinity of the airport. For non-listed species Potential Impact. Non-listed species of concern include those protected by the <i>Migratory Bird Treaty Act</i>. The potential for impacts to migratory birds should be evaluated on a project-specific basis. This may include pre-construction surveys or scheduling construction outside of nesting seasons for these species.
Climate	
FAA Order 1050.1F, Significance Threshold/Factors to Consider	FAA has not established a significance threshold for Climate; refer to FAA Order 1050.1F's, <i>Desk Reference</i>, for the most up-to-date methodology for examining impacts associated with climate change.
Potential Environmental Concerns	Potential Impact. An increase in greenhouse gas (GHG) emissions could occur over the 20-year planning horizon of the recommended development concept plan. A project-specific analysis may be required per the FAA Order 1050.1F, <i>Environmental Impacts: Policies and Procedures</i>, based on the parameters of the individual projects.
Coastal Resources	
FAA Order 1050.1F, Significance Threshold/Factors to Consider	FAA has not established a significant threshold for Coastal Resources.
Potential Environmental Concerns	No Impact. The airport is not located within a coastal zone.
Department of Transportation Act, Section 4(f) (now codified in 49 United States Code [U.S.C.] § 303)	
FAA Order 1050.1F, Significance Threshold/Factors to Consider	Threshold: 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 an 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. The airport has three historic-era structures, which are the terminal building, orange quonset hangar building, and the rotating beacon tower. Due to their age, these structures may need to be evaluated for historical significance during a NEPA evaluation. The FAA will work with all appropriate federal, state, and local agencies having jurisdiction over these structures to determine whether both a physical and constructive use will substantially impair these resources. The closest Section 4(f) resource beyond the airport is Stolley Gravel Pit Park, approximately 0.1 mile southeast of the airport at the intersection of West 18th Street and 32nd Avenue West. Although the park is in proximity to the airport, future airport improvements delineated in the recommended development concept plan will not result in physical use of this Section 4(f) property. It is also unlikely constructive use of the park will result from short-term construction activities or long-term airport activities. The recommended development concept plan does not propose extending the length of the Runway 30 end or Runway 36 end, which could affect aircraft traffic patterns. The significance or enjoyment of Stolley Gravel Pit Park, and the activities, features, or attributes of the park, will not be substantially impaired.

	The FAA is responsible for determining which federal, state, or local entities need to be consulted to determine whether impacts will substantially impair these resources. If necessary, the Section 4(f) compliance process can involve the preparation of a Section 4(f) statement, which evaluates other feasible alternatives.
Farmlands	
FAA Order 1050.1F, Significance Threshold/Factors to Consider	Threshold: The total combined score on Form AD-1006, <i>Farmland Conversion Impact Rating</i>, ranges between 200 and 260. (Form AD-1006 is used by the U.S. Department of Agriculture, Natural Resources Conservation Service [NRCS] to assess impacts under the <i>Farmland Protection Policy Act</i> [FPPA].) 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 FPPA apply. These exemptions include: - When land is not considered “farmland” under FPPA; such as land 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. - When land is already committed to urban development. - When land is committed to water storage. - The construction of non-farm structures necessary to support farming operations. - The construction/land development for national defense purposes.
Potential Environmental Concerns	Potential Impact. A significant portion of airport property is classified as “prime farmland,” “farmland of statewide importance,” or “prime farmland if drained” by the NRCS, identified on Exhibit 1J. Many of the proposed projects outlined on the concept plan are within areas of prime farmland. Additionally, according to the U.S. Census Bureau 2010 Census², the airport is located in a non-urbanized area. Because project areas are in non-urbanized areas, important farmlands are identified, and agricultural uses are present, FPPA may apply. As part of the NEPA process associated with airport projects, the airport may be required to coordinate with the NRCS on the completion of Form AD-1006. FPPA may apply for the 19.4-acre land acquisition for the ultimate Runway Protection Zone (RPZ) for Runway 12-30 and the 2.8-acre proposed acquisition along 330th Street. As part of the NEPA process for land acquisition, coordination with the NRCS on the completion of Form AD-1006 may be required.
Hazardous Materials, Solid Waste, and Pollution Prevention	
FAA Order 1050.1F, Significance Threshold/Factors to Consider	FAA has not established a significance threshold for Hazardous Materials, Solid Waste, and Pollution Prevention. However, factors to consider are if 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; or - Adversely affect human health and the environment.
Potential Environmental Concerns	Potential Impact. The airport has a fuel island, fuel storage, and provides opportunity for aircraft maintenance activities that could involve fossil fuels or other types of hazardous materials or wastes; these operations are regulated and monitored by the appropriate regulatory agencies, such as the U.S. EPA and the Iowa Department of Natural Resources. The airport has a tenant who provides aerial topdressing, a method of fertilizer or pesticide distribution onto cropland from an airplane. At times, pesticides are stored at the airport inside a hangar. Iowa Administrative Code (IAC) requires on-site pesticide containment containers to be located within a watertight secondary containment facility.³ The pesticides stored at the airport are within

² U.S. Census Bureau Urbanized Area Maps (https://www2.census.gov/geo/maps/dc10map/UAUC_RefMap/ua/)

³ Iowa Administrative Code (2019). Chapter 44 – *On-site Containment of Pesticides, Fertilizers, and Soil Containers*; Section 21.44.2 – *On-site Containment of Pesticides*. Available at: <https://www.legis.iowa.gov/law/administrativeRules/rules?agency=21&chapter=44&pubDate=05-08-2019>

	the hangar, not located in a tank near the edge of the apron, so if a spill were to occur, pesticides would remain within the hangar and not affect the wells located on site. The recommended development concept plan does not anticipate land uses that would produce an appreciably different quantity or type of hazardous waste. However, should this type of land use be proposed, further NEPA review and/or permitting would be required. There are no known hazardous materials or waste contamination sites currently on airport property. The recommended development concept plan proposes the acquisition of approximately 19.4 acres of land for the ultimate RPZ for Runway 12-30 and the 2.8-acre proposed acquisition along 330th Street. Therefore, an Environmental Due Diligence Audit (EDDA) will be required as part of the land acquisition process.
Historical, Architectural, Archaeological, and Cultural Resources	
FAA Order 1050.1F, Significance Threshold/Factors to Consider	FAA has not established a significance threshold for Historical, Architectural, Archaeological, and Cultural Resources. Factors to consider are if an action would result in a finding of “adverse effect” through the Section 106 process. However, an adverse effect finding does not automatically trigger preparation of an EIS (i.e., a significant impact).
Potential Environmental Concerns	Potential Impact. As identified in Chapter One (Table 1P), there are three historic-era structures on airport property identified through an on-site building inventory. These structures, constructed around 1942, are the orange Quonset hangar, the terminal building, and the rotating beacon tower. Due to their age, these structures may need to be evaluated for historical significance during a NEPA evaluation. The closest listed resource is the Little Sioux River Bridge located approximately one mile east of the airport. The recommended development concept plan proposes an airport terminal expansion of 2,500 square feet. Additionally, both the orange Quonset hangar and beacon tower are located near potential airport projects. Due to the potential effect airport construction activities may have on these historic-eligible structures, a Section 106 review under the <i>National Historic Preservation Act</i> may be required. The FAA will make the determination on the level of impact on these resources. The recommended development concept plan proposes expansion into undisturbed areas of the airport. For airport projects encroaching onto undisturbed land, consultation with the Iowa State Historic Preservation Office (SHPO) may be required to determine if an archaeological survey is warranted.
Land Use	
FAA Order 1050.1F, Significance Threshold/Factors to Consider	FAA has not established a significance threshold for Land Use. There are also 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. There are three historic-era structures on airport property, although currently unregistered on the NRHP, which could be affected by projects proposed on the recommended development concept plan. The closest listed NRHP resource is the Little Sioux River Bridge located approximately one mile east of the airport; it is unlikely to be impacted by airport activities. The proposed master plan concept includes 19.4 acres of land acquisition for the ultimate RPZ to prevent incompatible land use development in these areas and a 2.8-acre proposed acquisition along 330th Street.
Natural Resources and Energy Supply	
FAA Order 1050.1F, Significance Threshold/Factors to Consider	FAA has not established a significance threshold for Natural Resources and Energy Supply. However, factors to consider are if an action would have the potential to cause demand to exceed available or future supplies of these resources.
Potential Environmental Concerns	Potential 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 service providers is recommended.

Noise and Noise-Compatible Land Use	
FAA Order 1050.1F, Significance Threshold/Factors to Consider	Threshold: The action would increase noise by Day-Night Average Sound Level (DNL) 1.5 decibel (dB) or more for a noise-sensitive area that is exposed to noise at or above the DNL 65 dB noise exposure level, or that will be exposed at or above the DNL 65 dB level due to a DNL 1.5 dB or greater increase, when compared to the no action alternative for the same timeframe. Another factor to consider is that special consideration needs to 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 Code of Federal Regulations (CFR) Part 150 are not relevant to the value, significance, and enjoyment of the area in question.
Potential Environmental Concerns	Potential Impact. Exhibit 5D depicts both existing and future noise contours for the Spencer Municipal Airport. As shown on the exhibit for the 2020 condition, the DNL 65 dB noise exposure contour remains on airport property. The DNL 65 dB noise exposure contour in the 2040 forecast expands around the airfield due to the anticipated forecast condition, with the most prominent expansion at the Runway 12 end corresponding with the proposed 500-foot runway extension. Similar to the 2020 condition, however, the DNL 65 dB contour remains on airport property. It is important to note that operational growth, unless tied to a specific project, will not result in noise impacts under FAA Order 1050.1F. Impacts to noise-sensitive land uses are only identified through NEPA documentation for specific projects
Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks	
Socioeconomics	
FAA Order 1050.1F, Significance Threshold/Factors to Consider	FAA has not established a significance threshold for Socioeconomics. However, factors to consider are if an action would have the potential to: • induce substantial economic growth in an area, either directly or indirectly (e.g., through establishing projects in an undeveloped area); • 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 plan for the airport could potentially encourage temporary economic growth for the City of Spencer and Clay County due to new construction jobs that could boost the local economy.
Environmental Justice	
FAA Order 1050.1F, Significance Threshold/Factors to Consider	FAA has not established a significance threshold for Environmental Justice. However, factors to consider are if an action would have the potential to lead to a disproportionately high and adverse impact to an environmental justice population (i.e., a low-income or minority population), due to: • Significant impacts in other environmental impact categories; or • Impacts on the physical or natural environment that affect an environmental justice population in a way that FAA determines is unique to the environmental justice population and significant to that population.
Potential Environmental Concerns	Potential Impact. Both low-income and minority populations have been identified in the vicinity of the airport. Executive Order (E.O.) 12898, <i>Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations</i>, and the accompanying Presidential Memorandum, and Order DOT 5610.2, <i>Environmental Justice</i>, require the FAA to provide for meaningful public involvement for minority and low-income populations, as well as analysis that identifies and addresses potential impacts on these populations that may be disproportionately high and adverse. Environmental justice impacts may be avoided or minimized through early and consistent communication with the public and by allowing ample time for public consideration. If disproportionately high or adverse impacts are noted, mitigation and enhancement measures and offsetting benefits can be taken into consideration.





Children's Health and Safety Risks	
FAA Order 1050.1F, Significance Threshold/Factors to Consider	FAA has not established a significance threshold for Children's Environmental Health and Safety Risks. However, factors to consider are if an action would have the potential to lead to a disproportionate health or safety risk to children.
Potential Environmental Concerns	Potential Impact. Per E.O. 13045, <i>Protection of Children from Environmental Health Risks and Safety Risks</i>, federal agencies are directed to identify and assess environmental health and safety risks that may disproportionately affect children. These risks include those that are attributable to products or substances that a child is likely to encounter or ingest, such as air, food, drinking water, recreational waters, soil, or products to which they may be exposed. Within a close vicinity of the airport, seven schools have been identified (the location of these schools are labeled on Exhibit 1M in the Environmental Inventory). Best management practices should be implemented to decrease environmental health risks to children. During construction of the projects outlined in the recommended concept plan, appropriate measures should be taken to prevent access by unauthorized persons to construction project areas.
Visual Effects and Light Emissions	
Light Emissions	
FAA Order 1050.1F, Significance Threshold/Factors to Consider	The FAA has not established a significant 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; and • Affect the visual character of the area due to the light emissions, including the importance, uniqueness, and aesthetic value of the affected visual resource.
Potential Environmental Concerns	Potential Impact. New lighting associated with the recommended development concept plan would remain on the airfield and other developed portions of the airport. Permanent lighting would most likely be associated with new development, such as wall pack lighting on new hangars and edge lighting for the extended runway and taxiways. If nighttime work is needed, there may be temporary affects to neighboring properties associated with construction lighting. It may be necessary to evaluate whether there are any factors in context and intensity to determine if there will be a significant lighting impact and warrant a special illumination study. The airport is responsible for the undertaking of the lighting study.
Visual Resources and Character	
FAA Order 1050.1F, Significance Threshold/Factors to Consider	FAA has not established a significance threshold for Visual Resources/Visual Character. However, a factor to consider is the extent an action would have on 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	Potential Impact. Development planned in the recommended development concept plan could change the overall visual character of the airport with additional structures planned on-site. New development could change the rural character of the area and contrast with the visual character from surrounding uses. While there may be changes to the visual character of the airport as a result of the recommended development concept plan, this area is not designated as unique or visually important by the City of Spencer or Clay County.
Water Resources (Wetlands, Floodplains, Surface Waters, Wild and Scenic Rivers, and Groundwater)	
Wetlands	
FAA Order 1050.1F, Significance Threshold/Factors to Consider	Threshold: 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 supporting wildlife and fish habitat or economically important timber, food, or fiber resources of the affected or surrounding wetlands. 5. Promote 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. A stream described as a wetland has been identified on airport property, although this information is based on an aerial photography interpretation from 2002. As discussed in Chapter One, this stream appears to be an engineered channel designed to direct water from the runway to Stolley Pond, located at the southeast corner of West 18th Street and 32nd Avenue West. Field surveys and wetland delineations may be required to determine the presence or absence of wetlands in project areas. Project areas which could be affected include the extension of the Runway 12 end of Runway 12-30 and the development of new hangars and associated apron adjacent to West 18th Street/340th Street at the south end of the airport. Removal or relocation of wetlands may require a Section 404 permit under the <i>Clean Water Act</i>, which regulates the discharge of dredged or fill material into waters of the United States, including wetlands.
Floodplains	
FAA Order 1050.1F, Significance Threshold/Factors to Consider	Threshold: 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 DOT Order 5650.2, <i>Floodplain Management and Protection</i>.
Potential Environmental Concerns	Potential Impact. A 100-year floodplain was identified by FEMA on airport property (Exhibit 1K). E.O. 11988, <i>Floodplain Management</i>, requires federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of 100-year floodplains and to avoid direct or indirect support of floodplain development where there is a practicable alternative. The new hangars and apron, as well as the realignment of Taxiway D, at the south end of the airport may be located within a 100-year floodplain. Therefore, a <i>Flood Plain Development Application</i> may be required from Clay County for development considered in a floodway. The airport is responsible for obtaining proper floodplain permitting. Per E.O. 11988, <i>Floodplain Management</i>, and Department of Transportation Order (DOT) 5650.2, <i>Floodplain Management and Protection</i>, agencies are required to provide the public an opportunity for early public review of any plan or proposal encroaching into a floodplain.
Surface Waters	
FAA Order 1050.1F, Significance Threshold/Factors to Consider	Threshold: 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 are when 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 water 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 impact when obtaining a permit or authorization.
Potential Environmental Concerns	Potential Impact. The airport manages airport stormwater discharges with a National Pollutant Discharge Elimination System (NPDES) Industrial Stormwater General Permit issued and regulated by the Iowa Department of Natural Resources. Improvements to the airport will require a revised permit to be issued addressing operational and structural source controls, treatment BMPs, and sediment and erosion control. FAA's Advisory Circular (AC) 150/5370-10G, <i>Standards for Specifying Construction of Airports, Item P-156, Temporary Air and Water Pollution, Soil Erosion and Siltation Control</i> should also be implemented during construction projects at the airport.

Wild and Scenic Rivers	
FAA Order 1050.1F, Significance Threshold/Factors to Consider	FAA has not established a significance threshold for Wild and Scenic Rivers. Factors to consider are when 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 under study for designation); • Introducing a visual, audible, or other 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. The nearest designated Wild and Scenic River, the Missouri River, is over 80 miles from the airport. The closest river on the NRI is a segment of the Des Moines River – West Fork, which is located approximately 28 miles northeast of the airport. The recommended airport projects will not have adverse effects on the river's outstanding remarkable values (i.e., scenery, recreation, geology, fish, wildlife, and history).
Groundwater	
FAA Order 1050.1F, Significance Threshold/Factors to Consider	Threshold: 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: • Adversely affect natural and beneficial groundwater values to a degree that substantially diminishes or destroys such values; • 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 • Present difficulties based on water quality impacts when obtaining a permit or authorization.
Potential Environmental Concerns	No Impact. Proposed projects will not substantially change the amount of water used by the airport. Additionally, the airport property does not serve as a significant source of groundwater recharge and is not located near a sole source aquifer.

Source: Coffman Associates, Inc. analysis

LAND USE COMPATIBILITY

Land use planning in the area surrounding Spencer Municipal Airport occurs through regulatory and non-regulatory means. The primary regulatory tool for directing land use is the zoning ordinance, which limits the type, size, and density of land uses in various locations. Examples of land use types include residential, commercial, industrial, and agricultural. Non-regulatory means of land use controls include the comprehensive or strategic land use plan. These documents can be adopted for the greater municipality or for specific areas.

It is important to note the distinction between primary land use concepts used in evaluating development within the airport environs and existing land use, comprehensive plan, and zoning land use. Existing land use refers to property improvements as they exist today, according to county records.

The comprehensive plan land use map identifies the projected or future land use, according to the goal and policies of the locally adopted comprehensive plan. This document guides future development within the city and county planning area and provides the basis for zoning designations.

Zoning identifies the type of land use permitted on a given piece of property, according to the city and county zoning ordinances and maps. Local governments are required to regulate the subdivision of all lands within their corporate limits. Zoning ordinances should be consistent with the general plan, where one has been prepared. In some cases, the land use prescribed in the zoning ordinance or depicted in the general plan may differ from the existing land use.

The following sections describe the applicable land use policies for the area within the vicinity of Spencer Municipal Airport. Specifically, these sections pertain to the lands within the 65 day-night noise level metric (DNL) contours and the Part 77 Approach Surface out to one mile from the end of the runways. For the purposes of this analysis, a study area consisting of a one-mile buffer from each runway end was established, incorporating 6,544.7 acres, including the airport. The airport encompasses approximately 930 acres, equivalent to 14.2 percent of the study area.

EXISTING LAND USE

Spencer Municipal Airport is located both within unincorporated Clay County and the City of Spencer. The eastern one-third portion of the airport is located within the City of Spencer. Most of the land use immediately surrounding the airport is low-intensity development of rural residential, agricultural, and some light industrial. The downtown business district for the City of Spencer is approximately 2.6 miles southeast of the airport.

EXTRATERRITORIAL JURISDICTION

Under Iowa Code Section 414.23, land use powers by incorporated cities may be extended beyond the corporate limits into unincorporated areas by up to two miles if no county zoning ordinance exists.⁴ This is called the extraterritorial jurisdiction (ETJ). Under Iowa Code, a city's long-range planning jurisdiction is extended into the ETJ to ensure the most appropriate and beneficial use of land, water, and other natural resources are consistent with the public interest. Additionally, the ETJ allows a city to exercise subdivision review of development plans within the ETJ. In other words, when development application is submitted within ETJ, the city will also have an opportunity to review and comment on the project.

The City of Spencer's land use enforcement into the unincorporated areas around the city is limited since Clay County has an adopted zoning ordinance which is enforced; therefore, there is no ETJ around the city. Land use controls are divided between Clay County and the City of Spencer; however, the entire airport is located within the City of Spencer's future growth boundary⁵.

⁴ Iowa Code Title IX, Chapter 414, Section 23 *Extending Beyond City Limits* (<https://www.legis.iowa.gov/law/iowaCode/sections?codeChapter=414&year=2020>)

⁵ Future growth boundary - additional land areas beyond the city's jurisdictional boundaries depicted on the City of Spencer Future Land Use Map to guide the City's Planning and Zoning Commission when determining land use and development decisions and zoning controls (as defined in the *City of Spencer Comprehensive Land Use Plan* [2017]).

COMPREHENSIVE PLAN

The comprehensive plan is a general policy document used by government agencies to identify and describe communities' characteristics, articulate goals and policies, and explore alternative plans for future growth, which in turn forms subdivision regulations and zoning ordinances to carry out the plan's goals. Often, municipalities will include goals and policies for their airports, which are typically contained in a separate policy document from an Airport Master Plan. Comprehensive plans aid local decision-makers regarding complicated issues during the development process or a maintenance issue. The most current comprehensive plans within the study area include:

- City of Spencer – *City of Spencer, IA Comprehensive Land Use Plan (2017)*⁶
- Clay County – *Clay County, IA Comprehensive Land Use Plan (2010)*⁷

For purposes of this study, specific land use classifications in the two jurisdictions around Spencer Municipal Airport have been recategorized into generalized future land use designations. **Table 5D** represents the future land use classifications for each jurisdiction and how the land use classifications are organized into a generalized future land use category.

As shown on **Exhibit 5E** and summarized in **Table 5E**, land use classifications within the study area include agriculture, low- and multiple-density residential, commercial, industrial, and public/quasi-public.

Table 5E identifies the primary future land use as Agricultural, accounting for approximately 35.3 percent of the planned land use within the study area. Commercial future land use accounts for an additional 22.5 percent of planned land use. Industrial future

**TABLE 5D | Generalized Classification of Future Land Use Districts
Spencer Municipal Airport**

Generalized Zoning Category	City of Spencer	Clay County
Agricultural	Agriculture	Agriculture
Low-Density Residential	Single-family residential Future residential uses	Residential use
Multiple-Density Residential	Multiple-Family residential	N/A
Commercial	Commercial Uses Future Commercial Uses	Commercial Uses Future Commercial Uses
Industrial	Industrial Uses Future Industrial Uses	Future Industrial Uses
Public/Quasi-Public	Civic & Public Uses	N/A
Parks and Recreation	Parks and Recreation Uses	N/A
Conservation/Open Space	Conservation/Open Space Future Conservation Uses	N/A
Right-of-Way	Right-of-Way	N/A
Unassigned Land Use	No Assigned Land Use	N/A

N/A: Not Applicable

Sources: City of Spencer, IA Planning Department; Clay County, IA Department of Zoning; Coffman Associates analysis.

**TABLE 5E | General Plan Land Use Classification
Study Area Summary**

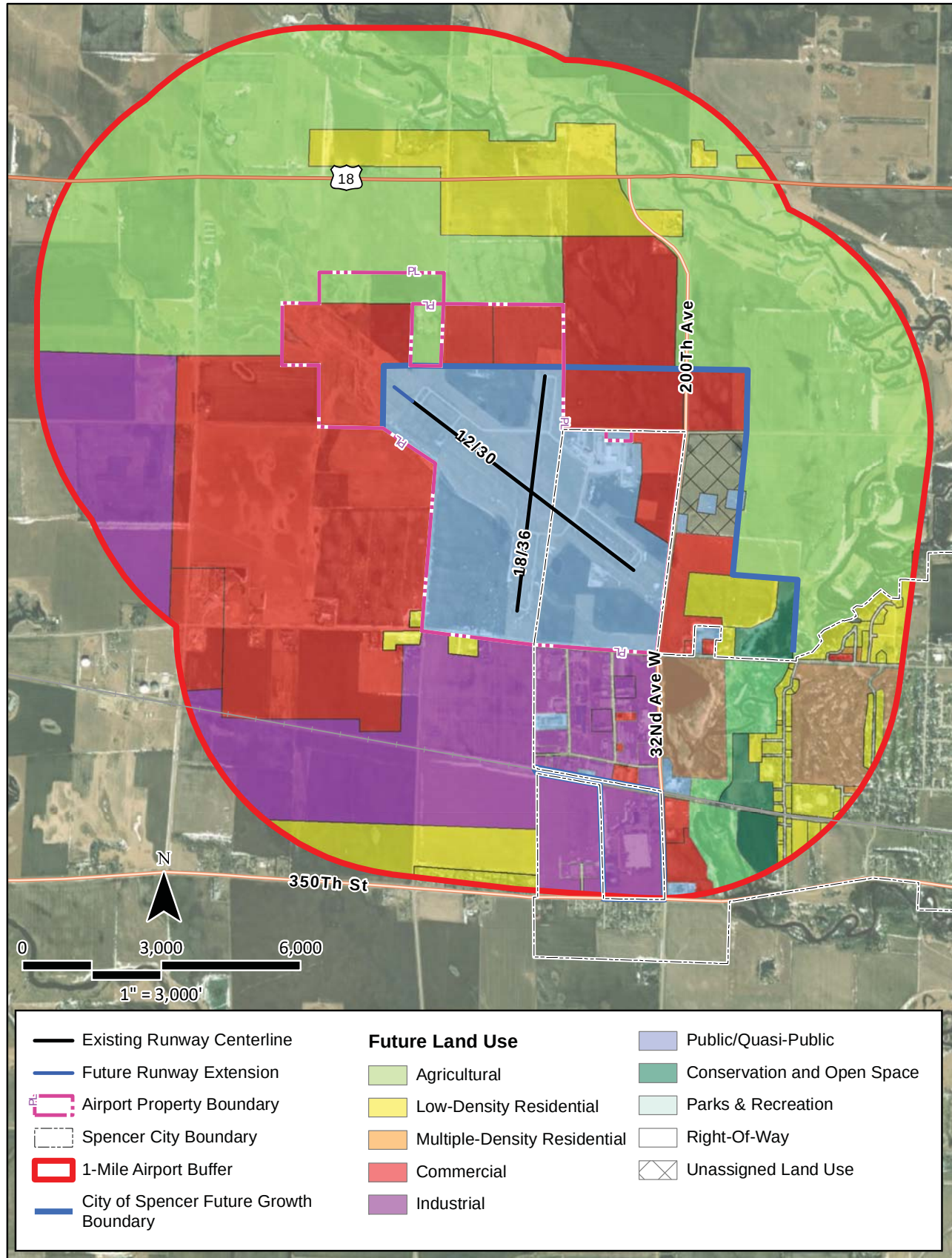
General Land Use Designation	Acreage	Percent of Study Area ¹
Agricultural	2,308.4	35.3%
Low-Density Residential	588.2	9.0%
Multiple-Density Residential	3.3	<0.0%
Commercial	1,469.9	22.5%
Industrial	1,019.6	15.6%
Public/Quasi-Public	715.2	10.9%
Parks and Recreation	187.6	2.9%
Conservation and Open Space	168.9	2.6%
Right-of-Way	28.2	0.4%
Unassigned	55.4	0.8%
Study Area Total	6,544.7	100.0%

¹ Percentage totals may differ slightly due to rounding of numbers.

Sources: City of Spencer, IA Planning Department; Clay County, IA Department of Zoning; Coffman Associates analysis.

⁶ City of Spencer Planning Department, *City of Spencer Comprehensive Land Use Plan (2017)* (<http://spenceriowacity.com/businesses/planning-department/>)

⁷ Clay County Department of Zoning, *Clay County, IA Comprehensive Land Use Plan (2010)* (<https://www.co.clay.ia.us/offices/zoning/index.htm>)



Source: ESRI Basemap Imagery (2020),
City of Spencer, Clay County Comprehensive Plan

land use accounts for approximately 15.6 percent of the planned land use in the study area. Other significant general plan land uses include Public/Quasi-Public (10.9 percent), Low-Density Residential (nine percent), Parks and Recreation (2.9 percent), and Conservation and Open Space (2.6 percent).

ZONING

Used in conjunction with subdivision regulations and an essential tool to achieve goals and policies outlined in the comprehensive plan, zoning regulations divide land into districts, or zones, and then regulate land use activities in those districts, specify permitted uses and the intensity and density of each use, and the bulk sizes of each building. Traditional zoning ordinances separate land into four basic uses: residential, commercial (including office), industrial, and agricultural. Both the City of Spencer and Clay

County created sub-categories under each basic land use based on intensity, density, and community impact. For purposes of this study, specific zoning districts in both jurisdictions around the airport have been recategorized into generalized zoning designations. **Table 5F** represents the zoning districts for each jurisdiction and how those zoning districts fit into a generalized zoning land use category.

**TABLE 5F | Generalized Classification of Zoning Districts
Spencer Municipal Airport**

Generalized Zoning Category	City of Spencer	Clay County
Agricultural	N/A	A-1
Rural Residential	N/A	R-1
Single-Family Residential	A	N/A
Multi-Family Residential	B	N/A
Commercial	C-1	GC
Light Industrial	D	N/A
Heavy Industrial	E	I-2

Notes:

N/A: Not Applicable

Sources: City of Spencer, IA Planning Department; Clay County, IA Department of Zoning; Coffman Associates analysis.

City of Spencer

Title 9 of the City of Spencer Zoning Regulations⁸ focuses on zoning and land division requirements for the city. The following zoning districts in the study area around Spencer Municipal Airport are within the city's jurisdiction:

- **Residential District (A).** The "A" district permits both single-family and two-family dwellings, civic uses, daycare facilities, local utilities, and park and recreation services.
- **Multiple Residential District (B).** The intent of the "B" district is to permit both single-family and two-family dwellings, townhouses, civic uses, or daycare facilities.
- **General Commercial District (C-1).** The C-1 district is designed to provide non-retail commercial and business/professional activities along arterial and collector streets, intended to be compatible with adjacent residential districts.

⁸ City of Spencer, IA Planning Department – City of Spencer City Code, Title 9 Zoning Regulations (<http://spenceriowacity.com/government/planning-department/>)

- **Light Industrial (D).** The light industrial district allows for light manufacturing, processing, assembly, commercial activities, and aviation facilities.
- **Heavy Industrial (E).** The heavy industrial district allows a variety of commercial uses, such as auto repair, industrial uses, and civic uses. Aviation facilities are permitted in the “E” district.

Clay County

The Clay County Zoning Ordinance⁹ outlines the zoning classifications used to regulate the general growth of the county. The following zoning districts are within the study area around Spencer Municipal Airport under the Clay County jurisdiction:

- **Agriculture (A-1).** The intent of the A-1 district is to preserve land suited for agricultural uses from the encroachment of incompatible land uses and suburban sprawl.
- **Rural Residential (R-1).** The rural residential district allows for low-density residential dwelling units with a limited number of activities interrelated to agricultural uses. In addition to low-density residential, other uses permitted in the R-1 district include places of worship, parks and recreation, or wildlife refuges/preserves. Assisted living facilities/skilled nursing, daycare facilities, and educational facilities are allowed with an approved conditional use permit.
- **General Commercial (GC).** The general commercial district is intended to permit commercial and certain light-industrial activities that generally have operations and vehicular requirements that require access to major roadways. Permitted uses include daycare centers, healthcare facilities, public assembly, and professional services. Aviation activities are permitted when conditionally approved by the County Planning and Zoning Commission.
- **Heavy Industrial (I-2).** The Heavy Industrial district is intended to permit intense industrial activities, which typically conflict with residential or less intense uses. A wide range of uses are allowed in the I-2 district, including aviation uses, college/university/trade schools, and equipment sales and storage.

STUDY AREA LAND USE SUMMARY

Using zoning maps available from both the City of Spencer and Clay County, the zoning districts within the study area are summarized in **Table 5G** and depicted on **Exhibit 5F**.

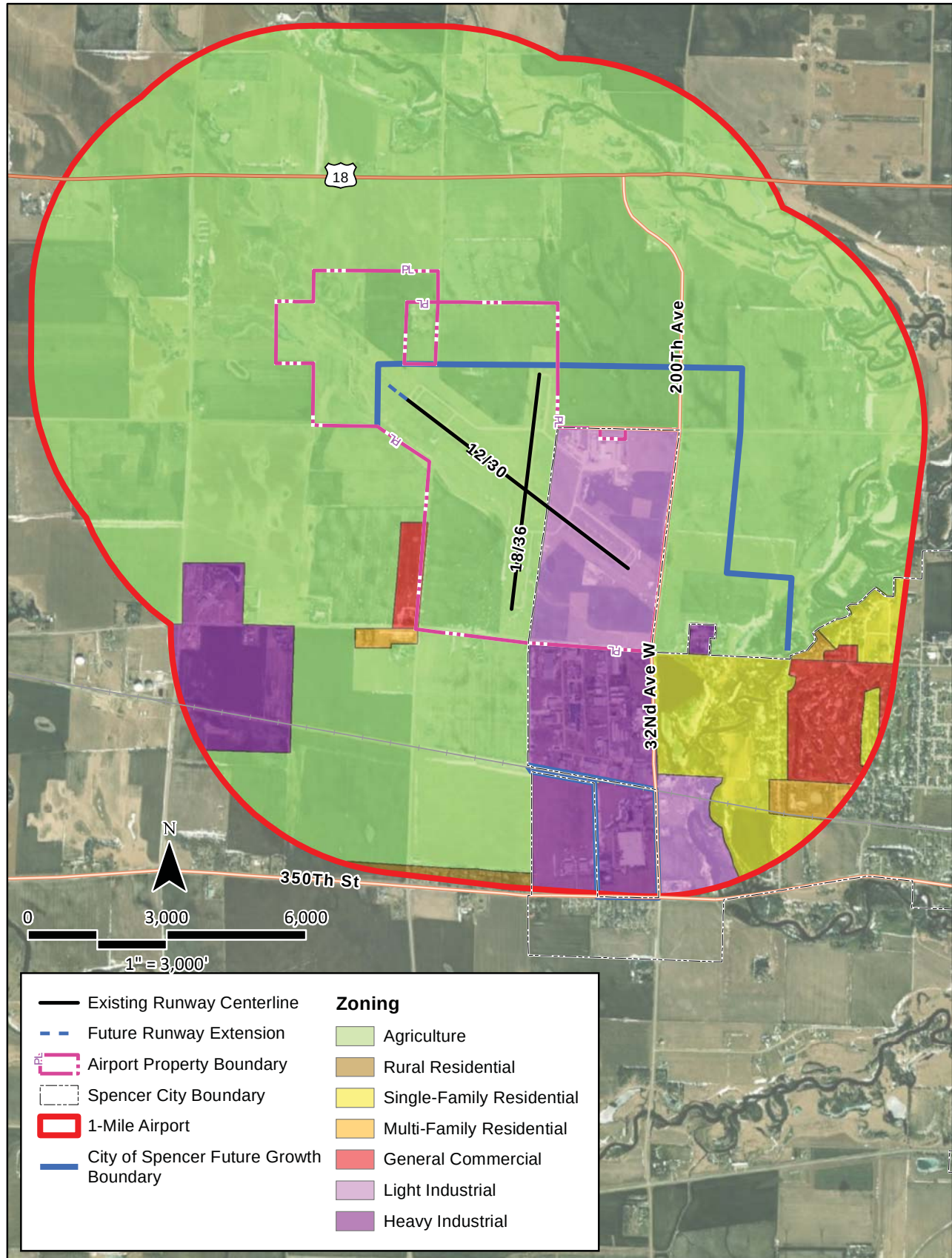
**TABLE 5G | General Zoning
Study Area Summary**

General Land Use Designation	Acreage	Percent of Study Area ¹
Agricultural	5,144.6	78.6%
Rural Residential	33.1	0.5%
Low-Density Residential	297.9	4.6%
Multi-Family Residential	35.3	0.5%
Commercial	143.4	2.2%
Light Industrial	366.7	5.6%
Heavy Industrial	523.7	8.0%
Study Area Total	6,544.7	100.0%

¹ Percentage totals may differ slightly due to rounding of numbers.

Sources: City of Spencer, IA Planning Department; Clay County, IA Department of Zoning; Coffman Associates analysis.

⁹ Clay County Department of Planning and Zoning, *Clay County Zoning Ordinance* (2011) (<https://www.co.clay.ia.us/offices/zoning/index.htm>)



Source: ESRI Basemap Imagery (2020),
City of Spencer, Clay County Zoning Ordinances

Agricultural land use accounts for over 78 percent of the study area (78.6 percent). Industrial (both Light Industrial and Heavy Industrial combined) account for another 13.6 percent of the study area. Other zoning districts include Low-Density Residential (4.6 percent), Commercial (2.2 percent), with Rural Residential and Multi-Family Residential each comprising 0.5 percent of the study area. Note that there are no areas zoned to be vacant.

Table 5H summarizes the minimum lot areas, maximum density in FAR unless otherwise noted, and maximum height, known as bulk standards, for each zoning district within the study area.

TABLE 5H | Zoning Ordinance Summary

Bulk Standards

Zoning District	Minimum Lot Area	Maximum Density		Maximum Height (feet)
		Percentage of Lot Coverage	Dwelling Units per Acre	
City of Spencer				
Residential District (A)	6,000 sf ¹	70% lot coverage	N/A ²	45 ft ³ or 3 Stories
Multiple Residential District (B)	5,000 sf	70% lot coverage	N/A	75 ft
General Commercial District (C-1)	6,000 sf	90% lot coverage	N/A	45 ft or 3 Stories
Light Industrial District (D)	15,000 sf	80% lot coverage	N/A	100 ft
Heavy Industrial District (E-1)	40,000 sf	80% lot coverage	N/A	None, except as required if located within an “air-port clear zone.”
Clay County				
Agricultural District (A-1)	43,560 sf	N/A	1 DU/acre ⁴	35 ft
Rural Residential (R-1)	43,560 sf	N/A	1 DU/acre (residential)	35 ft
General Commercial (GC)	15,000 sf	N/A	N/A	35 ft
Heavy Industrial (I-2)	43,560 sf	N/A	N/A	60 ft

Notes:

¹ sf – square feet

² N/A – Not Applicable

³ ft – feet

⁴ DU/acre – Dwelling Units per Acre

Sources: City of Spencer, IA Planning Department; Clay County, IA Department of Zoning

SUBDIVISION REGULATIONS

Subdivision regulations are legal devices employed to administer the division of land into two or more lots, parcels, or sites for the building and location, design, and installation of supporting infrastructure. The subdivision regulations are one of two instruments commonly employed to carry out the goals and policies outlined in the comprehensive plan.

Subdivision regulations can be used to specify requirements for airport-compatible land development by requiring developers to plat and develop land to minimize noise impacts or reduce noise exposure to new development. Subdivision regulations can also be used to protect the airport proprietor from litigation for

noise impacts at a later date. The most common requirement is the dedication of a noise or aviation easement to the airport sponsor by the land developer as a condition of the development approval. Easements typically authorize overflights of property, with noise levels attendant to such operations.

City of Spencer Code of Ordinances: Title 9 Zoning Regulations, Chapter 13 Subdivisions

Title 9, Chapter 13 of the City of Spencer *Code of Ordinance* addresses subdivision regulations for the city. This chapter of the code does not address subdivision standards in relation to the airport.

Clay County Subdivision Regulations (2011)

The *Clay County Subdivision Regulations*¹⁰ codify the county's minimum requirements regarding the subdivision and design of land. The subdivision regulations guarantee that existing land uses or new developments will be established in an orderly manner, and ensure adequate utility and public infrastructure are in place, and that development will be consistent with the county's comprehensive plan. The county's subdivision regulations do not address the subdivision of land in relation to the airport.

BUILDING CODE

Building codes were established to provide minimum standards to safeguard life, limb, health, and public welfare by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all buildings and structures. Building codes may be required to provide sound insulation in new residential, office, and institutional buildings when warranted by existing or potential high aircraft noise levels.

The City of Spencer adopted the 2015 International Building Code into the City of Spencer Code of Ordinances; however, aircraft noise attenuation is not currently enforced.¹¹

Clay County does not have an adopted building code and currently adheres to the State of Iowa State Building Code Uniform Building Code.¹² The Clay County Code does have noise standards for certain land uses; however, these standards are not specific to airport land uses or aircraft.

NON-COMPATIBLE DEVELOPMENT ANALYSIS

Areas with the potential for non-compatible development, when compared to the noise exposure contours and height restrictions within the Part 77 approach surfaces out to one mile, have been evaluated. Further discussion of these areas can be found in Chapter One. This was accomplished by evaluating city-

¹⁰ Clay County Department of Planning and Zoning, *Clay County, Iowa Subdivision Regulations* (2011) (<https://claycounty.iowa.gov/offices/zoning/zoningforms.htm>)

¹¹ City of Spencer, IA Building Codes (<http://spenceriowacity.com/government/planning-department/building-codes/>)

¹² McKeever, Tammy. Clay County Zoning Office. Phone call with Michelle Kriks with Coffman Associates on October 21, 2020.

and county-adopted land use plans and zoning designations for those parcels encompassed by the noise contours to determine if noise-sensitive land uses could be developed in those areas. Both the noise contours and height restrictions within the Part 77 approach surface area are addressed below.

Noise Exposure Contours

The standard methodology for analyzing noise conditions at airports involves the use of a computer simulation model. The purpose of the noise model is to produce noise exposure contours that are overlain on a map of the airport and vicinity to graphically represent aircraft noise conditions. When compared to land use, zoning, and general plan maps, the noise exposure contours may be used to identify areas that are currently, or have the potential to be, exposed to aircraft noise.

To achieve an accurate representation of an airport's noise conditions, the noise model uses a combination of industry-standard information and user-supplied inputs specific to the airport. The software provides noise characteristics, standard flight profiles, and manufacturer-supplied flight procedures for aircraft which commonly operate at Spencer Municipal Airport. As each aircraft has different design and operating characteristics (number and type of engines, weight, and thrust levels), each aircraft emits different noise levels. The most common way to spatially represent the noise levels emitted by an aircraft is a noise exposure contour.

Airport-specific information, including runway configuration, flight paths, aircraft fleet mix, runway use distribution, local terrain and elevation, average temperature, and numbers of daytime and nighttime operations, are also used in modeling inputs.

Based on assumptions provided by the user, the noise model calculates average 24-hour aircraft sound exposure within a grid covering the airport and surrounding areas. The grid values, representing the DNL at each intersection point on the grid, signify a noise level for that geographic location. To create the noise contours, an isoline (similar to those on a topographic map) is drawn connecting points of the same DNL noise value. In the same way that a topographic contour represents the same elevation, the noise contour identifies areas of equal noise exposure.

DNL is the metric currently accepted by the FAA, U.S. EPA, and Department of Housing and Urban Development (HUD) as an appropriate measure of cumulative noise exposure. These three agencies have each identified the 65 DNL noise contour as the threshold of incompatibility.

The guidelines summarized on **Exhibit 5G** indicate that all land uses are acceptable in areas below 65 DNL. At or above the 65 DNL threshold, residential land uses without acoustic treatment, mobile homes, and transient lodging are all incompatible. The exhibit notes that homes of standard construction and transient lodging may be considered compatible where local communities have determined these uses are permissible; however, acoustic treatment of these structures is recommended to meet noise level reduction thresholds when comparing the outdoor noise level to the indoor noise level. Schools and other public use facilities are also generally considered to be incompatible with noise exposure above 65 DNL. As with residential development, communities can make a policy decision that these uses are acceptable with appropriate sound attenuation measures. Hospitals and nursing homes, places of worship, auditoriums, and concert halls are structures which are generally compatible if measures to achieve noise level reduction are

LAND USE		Yearly Day-Night Average Sound Level (DNL) in Decibels					
		Below 65	65-70	70-75	75-80	80-85	Over 85
Residential							
	Residential, other than mobile homes and transient lodgings	Y	N ¹	N ¹	N	N	N
	Mobile home parks	Y	N	N	N	N	N
	Transient lodgings	Y	N ¹	N ¹	N ¹	N	N
Public Use							
	Schools	Y	N ¹	N ¹	N	N	N
	Hospitals and nursing homes	Y	25	30	N	N	N
	Churches, auditoriums, and concert halls	Y	25	30	N	N	N
	Government services	Y	Y	25	30	N	N
	Transportation	Y	Y	Y ²	Y ³	Y ⁴	Y ⁴
	Parking	Y	Y	Y ²	Y ³	Y ⁴	N
Commercial Use							
	Offices, business and professional	Y	Y	25	30	N	N
	Wholesale and retail-building materials, hardware and farm equipment	Y	Y	Y ²	Y ³	Y ⁴	N
	Retail trade-general	Y	Y	25	30	N	N
	Utilities	Y	Y	Y ²	Y ³	Y ⁴	N
	Communication	Y	Y	25	30	N	N
Manufacturing and Production							
	Manufacturing, general	Y	Y	Y ²	Y ³	Y ⁴	N
	Photographic and optical	Y	Y	25	30	N	N
	Agriculture (except livestock) and forestry	Y	Y ⁶	Y ⁷	Y ⁸	Y ⁸	Y ⁸
	Livestock farming and breeding	Y	Y ⁶	Y ⁷	N	N	N
	Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational							
	Outdoor sports arenas and spectator sports	Y	Y ⁵	Y ⁵	N	N	N
	Outdoor music shells, amphitheaters	Y	N	N	N	N	N
	Nature exhibits and zoos	Y	Y	N	N	N	N
	Amusements, parks, resorts, and camps	Y	Y	Y	N	N	N
	Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

The designations contained in this table do not constitute a federal determination that any use of land covered by the program is acceptable under federal, state, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally-determined land uses for those determined to be appropriate by local authorities in response to locally-determined needs and values in achieving noise compatible land uses.

See other side for notes and key to table.

KEY

Y (Yes)	Land Use and related structures compatible without restrictions.
N (No)	Land Use and related structures are not compatible and should be prohibited.
NLR	Noise Level Reduction (outdoor-to-indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
25, 30, 35	Land Use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structure.

NOTES

1. Where the community determines that residential or school uses must be allowed, measures to achieve outdoor-to-indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB, respectively, should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide an NLR of 20 dB; thus, the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.
2. Measures to achieve NLR of 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.
3. Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.
4. Measures to achieve NLR of 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.
5. Land use compatible provided special sound reinforcement systems are installed.
6. Residential buildings require an NLR of 25.
7. Residential buildings require an NLR of 30.
8. Residential buildings not permitted.

Source: **14 CFR Part 150**, Appendix A, Table 1.

incorporated into the design and construction of structures. Outdoor music shells and amphitheaters are not compatible and should be prohibited within the 65 DNL noise contour. Additionally, agricultural uses and livestock farming are generally considered compatible except for related residential components of these uses, which should incorporate sound attenuation measures.

Noise exposure contours were prepared for Spencer Municipal Airport for a baseline condition (2019) and a long-range condition (2039) established on the operational forecasts presented in Chapter Two. The resulting contours are shown on **Exhibit 5C**. As shown on the exhibits, noise contours out to the 65 DNL noise contour remain entirely on airport property in both the baseline and long-range forecast.

Height Restrictions

Using a similar process to the non-compatible development analysis for noise contours, the zoning and future land use within the Part 77 approach surface area out to one mile from the end of the runways were evaluated. Future land use designations are not included in this analysis, as both the City of Spencer's *Comprehensive Land Use Plan* and Clay County's *Comprehensive Land Use Plan* does not specify height limitations for future land uses.

As identified on **Exhibit 5H**, areas within the Part 77 approach surface area out to one mile of the runway ends are zoned Agricultural, Single-Family Residential, Multi-Family Residential, General Commercial, Light Industrial, and Heavy Industrial. As noted in **Table 5H** above, the maximum height limit for the residential districts is 45 ft for lower density residential and 75 ft for multiple-family residential. The Heavy Industrial district within the City of Spencer does not have a maximum height limit; however, structure height is limited if the parcel is located within an airport clear zone, which refers to the Part 77 approach surfaces, transitional surfaces, and conical surfaces identified in Chapter One.

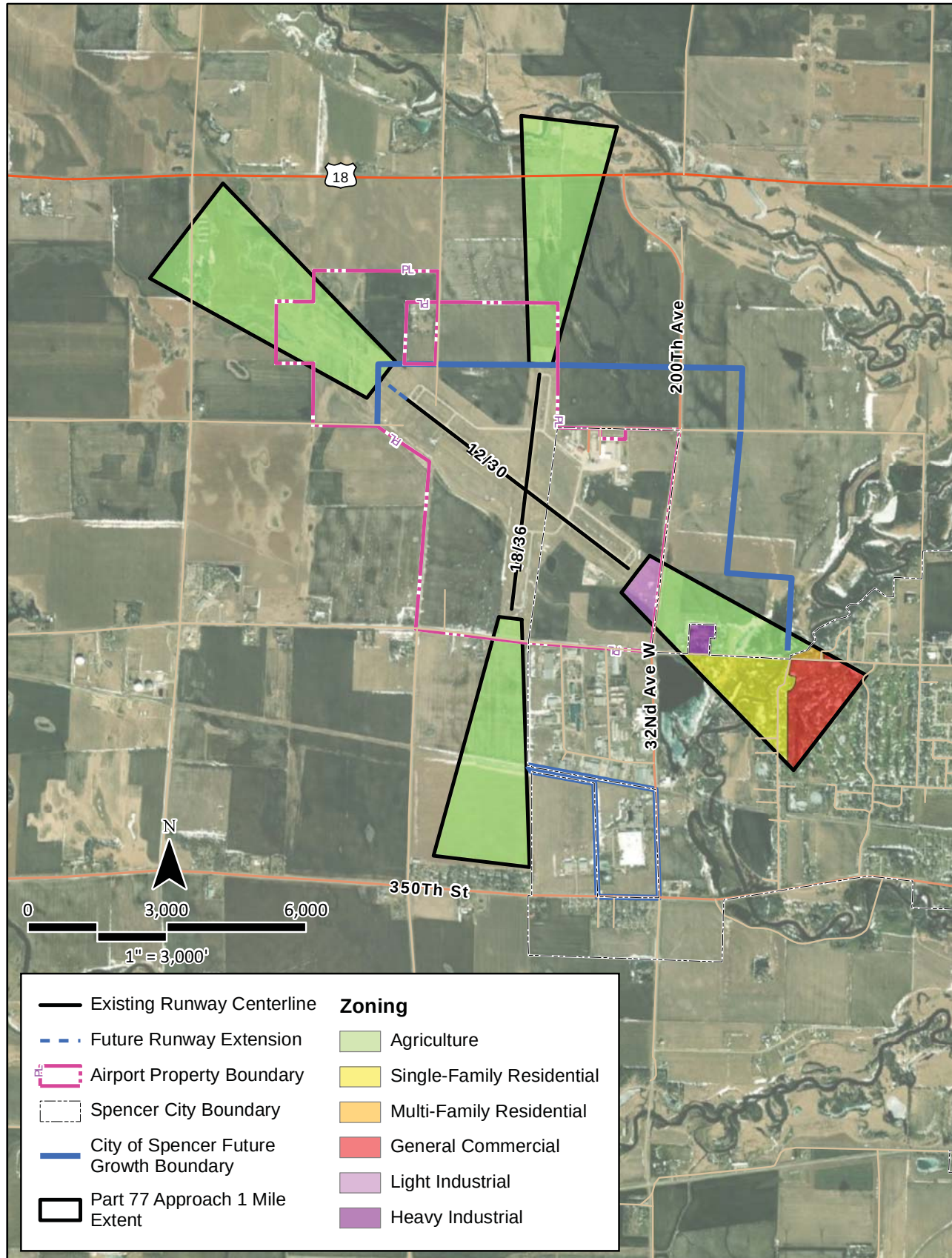
Airport Overlays and Height Protection Zones

Initially discussed in Chapter One, both the City of Spencer and Clay County have established zoning requirements to protect the airport from incompatible land uses in the surrounding environment. The primary goal of these districts is to reduce the consequences of accidents related to aviation and to ensure land use compatibility related to noise, pollution, and height.

City of Spencer

Airport height regulations are outlined in Title 9, Chapter 15 of the *City of Spencer City Code*¹³, also known as the *Northwest Iowa Regional Airport Height Regulations Ordinance*. Lands subject to the height regulations are located within the identified protected airport zones defined in the city code. Within these zones, no structure is to be erected, altered, or maintained, and no tree permitted to grow to heights provided in Title 9, Chapter 15 of the code. The airport zones were discussed in Chapter One.

¹³ *City of Spencer City Code*, Chapter 15, Title 9, *Northwest Iowa Regional Airport Height Regulations Ordinance* (October 17, 1977, Ordinance 210; amended March 1, 2010, Ordinance 697)



Source: ESRI Basemap Imagery (2020),
City of Spencer, Clay County

As identified in **Table 5H** above, parcels located in the Heavy Industrial district do not have a maximum height limit except when located within an airport clear zone. As outlined in the *Northwest Iowa Regional Airport Height Regulations Ordinance*, the airport clear zone refers to the Part 77 approach surfaces, transitional surfaces, and conical surfaces.

The City of Spencer *Northwest Iowa Regional Airport Height Regulations Ordinance* does restrict land uses within the Runway Protection Zone (RPZ) to safeguard from incompatible uses which may jeopardize either aircraft or persons on the ground. Such uses that are prohibited include residential land uses, places of assembly (such as places of worship, schools, hospitals, or offices), land uses which may attract wildlife, create glare, or any use which may interfere with navigational aids.

Clay County

Airport height limitations within Clay County are outlined in Section 16.10: *Airport Height Limitations* of the *Clay County, Iowa 2011 Zoning Ordinance and Subdivision Regulations*.¹⁴ The height limitations are specific to the Spencer Municipal Airport and intended to focus on development within airport zones referenced in Chapter One. The code will not permit structures to be constructed, altered, or maintained, and no tree allowed to grow to a height more than the maximum height determined for each zone established in the code.

For those parcels zoned I-2, it is also important to note that while the maximum height is 60 ft (**Table 5H** above), structures in this zoning district are not permitted to encroach into the Part 77 approach zone, clear zone, or into restricted airspace to ensure the safety of the aircraft within the vicinity of the airport.

The Clay County Zoning Ordinance provides land use restrictions within the RPZ to protect the area from incompatible land uses. Permitted land uses in the RPZ include agricultural uses or other uses that do not encourage the congregation of people. Similar to the City of Spencer code, prohibited land uses include residential, places of assembly, wildlife attractants, those which create glare, or any use which may interfere with navigational aids.

East of the airport and 200th Avenue, within the Clay County jurisdiction, a ground-mounted photovoltaic (PV) array is proposed. FAA requires the use of the Solar Glare Hazardous Analysis Tool (SGHAT) which, with user inputs specific to the airport and operating conditions, is used to determine the potential for ocular impact to pilots or the air traffic control tower during typical operations at an airport, which could compromise the safety of the air transportation system. Using sun positioning information, characteristics of the PV array, and user-defined observation points or paths, the SGHAT calculates potential ocular hazards over the entire calendar year in one-minute intervals. Hazards are classified as follows:

- Low potential for temporary after-image effects (“flash blindness” or “glint”)¹⁵
- Potential for temporary after-image (“glare”)
- Potential for permanent eye damage

¹⁴ *Clay County, Iowa 2011 Zoning Ordinance and Subdivision Regulations*, Article XVI Supplemental District Regulations (May 17, 2011; Resolution 2011-21)

¹⁵ A low potential for after-image effects means there is the low potential for “flash blindness,” or a momentary flash of bright light. This is also referred to “glint.” (ForgeSolar. <https://www.forgesolar.com/>)

Based on FAA Interim Policy, *FAA Review of Solar Energy System Projects on Federally Obligated Airports*,¹⁶ the airport must demonstrate that a proposed solar energy system meets the following standards:

1. No potential for glint or glare in the existing Airport Traffic Control Tower (ATCT) cab; and
2. No potential for glare or “low potential for after-image” along the final two-mile approach for any existing-to-planned landing threshold as shown on the current FAA-approved ALP. The final approach path is defined as two (2) miles from 50 feet (ft) above the landing threshold using a standard three (3) degree glidepath.

In accordance with the FAA Interim Policy, a glint and glare study was conducted on the proposed array. A summary of the results is below, and the full report is available in **Appendix C**.

- There is a low potential for after-image effects from the array on Flight Path 1 (Runway 30 end) two miles from the airport in the months of May and July for less than 10 minutes. According to the analysis, there is no potential for after-image effects when the aircraft is closer to the airport.
- There is a low potential for after-image effect from the array on Flight Path 2 (Runway 12 end) up to two miles from airport. This potential for after-image effects can occur between 0600 and 0900 in the months of January through March and October through December.
- The array is not anticipated to have ocular effects on the usage of Runway 18-36.

Iowa Department of Transportation, Iowa Airport Land Use Guidebook

The *Iowa Airport Land Use Guidebook*¹⁷ (IALUG) provides airport sponsors and their host communities a resource document that sets guidelines to address land use compatibility issues and protect airports. The Guidebook recognizes the importance of maintaining safe operational environments for both the airport and the surrounding community to determine the primary factor for how land use compatibility relates to land uses around the airport. The IALUG defines certain land uses that are not compatible, limited in compatibility, or allowed in certain defined geographic areas around the airport, and prescribes recommended land use zoning districts and compatible land uses within each district. The IALUG employed FAA AC 150/5300-13, *Airport Design*, and FAR Part 77, *Objects Affecting Navigable Airspace*, to determine appropriate land uses around an airport.

RECOMMENDATIONS

Based on the information presented above and the non-compatible development analysis, the following recommendations are provided to maintain airport land use compatibility in the vicinity of Spencer Municipal Airport.

¹⁶ Federal Aviation Administration. *FAA Review of Solar Energy System Projects on Federally Obligated Airports*, Federal Register Volume 78, No. 205

¹⁷ Iowa Department of Transportation – Office of Aviation *Iowa Airport Land Use Guidebook* (January 2008) (<https://iowadot.gov/aviation/airports>)

Incorporate Airport Land Use Compatibility Goals and Policies into Comprehensive Plans for both the City of Spencer and Clay County. A comprehensive plan is the starting point guiding a city's and county's development and is the recommending policy document for development. It is recommended the city and county include, with input from the Spencer Municipal Airport, goals, policies, and objectives for the airport when the comprehensive plans are scheduled for updates.

Update both the City of Spencer and Clay County zoning ordinances to reflect the height limitation based on the updated Part 77 Airport Airspace drawing. To ensure the city and county height limitation codes are most up-to-date with the needs of the airport, it is recommended the city and county incorporate the most current Part 77 Airport Airspace drawing to prohibit incompatible uses or structures that could affect the airport. However, the airspace determination from the FAA addressing airspace studies should not have provisions which create an adverse impact to the airport.

Incorporate land division guidelines for airport-compatible development into local subdivision regulations. Subdividing land is typically the initial step of the development process. It is important to ensure at this stage that land arrangement is compatible with the airport and appropriate aviation easements are dedicated.

Adopt Fair Disclosure Requirements for Real Estate Transactions within the Vicinity of Spencer Municipal Airport. Fair disclosure regulations in real estate transactions are intended to ensure that prospective buyers of property are informed that the property is or will be exposed to potentially disruptive aircraft noise or overflights. It is not uncommon, around even the busiest airports, for newcomers to report having bought property without having been informed about airport noise levels. At the most formal level, fair disclosure can be implemented through a city and county ordinance requiring a deed notice for property within the vicinity based on an existing boundary, such as the Part 77 Horizontal Surface. The following is an example of a disclosure statement notifying potential property owners of the proximity of an airport and expectations for living in the vicinity of the airport. A sample disclosure statement is included in the IALUG and is provided below:

The tract of land situated at (address of property) in (city and county), consisting of approximately _____ acres (County and State), which is being conveyed from _____ to _____ lies within _____ miles of (airport name), may be subjected to varying noise levels, as the same is shown and depicted on the official Zoning Maps.

The disclosure should be signed by the potential purchaser and attached to the final sales agreement.

AIRPORT RECYCLING, REUSE, and WASTE REDUCTION

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 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 FMRA added a provision requiring airports that have or plan to prepare a master plan, and that receive AIP funding for an eligible project, to ensure that the new or updated master plan addresses issues relating to solid waste recycling at the airport, including:
 - 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; and
 - The potential for cost savings or the generation of revenue.

State of Iowa Code 455D: Waste Volume Reduction and Recycling

In July 1988, the State of Iowa enacted goals to obtain state-wide waste reduction through the decrease of waste volume and an increase in recycling efforts. The state is divided into comprehensive planning areas charged with preparing comprehensive plans focused on waste reduction within that planning area. The state has prescribed waste reduction goals that each planning area must address, with an intermediate goal of 25 percent waste reduction and a final goal of 50 percent.¹⁸ A predetermined date to attain these goals was not set; however, landfill planning areas are subject to annual audits on their progress.

The City of Spencer and unincorporated areas of Clay County are within the Northern Plains Regional Landfill comprehensive planning area. In June 2002, the City of Spencer took control of the Northern Plains Regional Landfill. In the most recent comprehensive plan update for the Northern Plains Regional Landfill (2015), the amount of waste generated was approximately 34,868 tons.¹⁹ As of the 2018 annual report, there was an increase of approximately 1,800 pounds of solid waste diverted into recycling from the previous year. However, the Northern Plains Regional Landfill planning area has yet to reach a 25 percent decrease of reduced or diverted waste codified in the 1988 waste reduction legislation.

¹⁸ State of Iowa Code 455D: *Waste Volume Reduction and Recycling* (<https://www.iowadnr.gov/Environmental-Protection/Land-Quality/Solid-Waste/Comprehensive-Planning>)

¹⁹ State of Iowa Department of Natural Resources *Northern Plains Regional Planning Area 7th Round Solid Waste Comprehensive Plan Update – Notice of Approval* (January 15, 2016) (<https://www.iowadnr.gov/Environmental-Protection/Land-Quality/Solid-Waste/Comprehensive-Planning>)

SOLID WASTE

Typically, airport sponsors have purview over solid waste handling services in facilities it owns and operates, such as the terminal building or maintenance facilities. Tenants of airport-owned buildings/hangars or tenants that own their own facilities are typically responsible for coordinating their own waste handling services. While the focus of this plan is on airport-operated facilities, the airport could work to incorporate facility-wide strategies that create consistency in waste disposal mechanisms. This would ultimately result in the reduction of materials sent to the landfill.

For airports, waste can generally be divided into eight categories:²⁰

- **Municipal Solid Waste (MSW)** is more commonly known as trash or garbage consisting of everyday items that are used and then discarded (i.e., product packaging).
- **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 labeled as MSW.
- **Green Waste** is a form of MSW yard waste consisting of tree, shrub and grass clippings, leaves, weeds, small branches, seeds, and pods.
- **Food Waste** includes unconsumed food products or waste generated and discarded during food preparation and is also considered MSW.
- **Deplaned Waste** is waste removed from passenger aircrafts. Deplaned waste includes bottles, cans, mixed paper (newspapers, napkins, paper towels), plastic cups, service ware, food waste, and food-soiled paper/packaging. Deplaned waste can represent as much as 20 percent of an airport's total MSW stream.
- **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 triturator²¹ facility for pretreatment prior to discharge in the sanitary sewage system. Due to the chemicals in lavatory waste, it can present environmental and human health risks if mishandled. Caution must be taken to ensure lavatory waste is not released to the public sanitary sewage system prior to pretreatment.
- **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.
- **Hazardous Wastes** are governed by the *Resource Conservation Recovery Act*, as well as the regulations in 40 Code of Federal Regulations (CFR) Subtitle C, Parts 260 to 270. The U.S. Environmental Protection Agency (EPA) developed less stringent regulations for certain hazardous waste, known as universal waste, described in 40 CFR Part 237, *The Universal Waste Rule*.

²⁰ Recycling, Reuse and Waste Reduction at Airports, FAA (April 24, 2013)

²¹ A triturator facility turns lavatory waste into fine particulates for further processing.

As seen on **Exhibit 5J**, there are multiple areas where Spencer Municipal Airport potentially contributes to the waste stream, including the terminal/administrative offices, airfield, hangars, aircraft, airport construction projects, and aircraft galleys. To create a comprehensive waste reduction and recycling plan for the airport, all potential inputs must be considered.

EXISTING SERVICES

Currently, all waste management services for the airport and tenants are through the City of Spencer. MSW dumpsters for each tenant are located airside adjacent to their hangars. No information is available regarding the weight of MSW hauled or the cost of service. Each tenant is currently responsible for scheduling their individual times to collect waste, which is not necessarily on the same day each week or is scheduled on an as-needed basis. At this time, there is not a designated individual or department onsite at the airport to oversee waste management for the facility.

The airport currently engages in recycling services, also provided by the City of Spencer. Recyclables are collected weekly or on an as-needed basis, and the most common recycled materials at the airport include paper, cardboard, and plastics.²² All materials accepted for recycling by the City of Spencer are depicted in **Figure 5F**.²³

Recycle Right

catalogs direct mail coupons STATIONERY notebooks
 shredded paper phone books paperback books
 COLA BOTTLES detergent bottles yogurt containers
 JON VIALS picnic cups milk jugs GLASS wine bottles

Spencer Curbside Recycling

Acceptable Items:

- Newspaper and newspaper inserts made of paper
- Magazines, phone books, and catalogs
- Paper junk mail and envelopes
- Flattened cardboard
- Office and school paper (colored paper, too)
- Boxboard/paperboard (e.g., cereal boxes)
- Aluminum cans
- Plastic bags and plastic film (multiple bags within one bag)
- Plastic containers, bottles, detergent bottles, milk jugs & caps (anything with a neck)

Unacceptable Items:

- Food, yard, or pet waste
- Diapers, toilet paper, paper towels, or facial tissue
- Batteries, wiring, or electronics
- Household hazardous waste & medical waste
- New or used clothing
- Styroform (e.g., plates, cups, or egg cartons)
- Ceramics and light bulbs
- Glass or lumber
- Dinner or glassware
- Big durable plastics like lawn furniture & kids toys
- Explosive or hazardous materials like ammunition
- Liquids in containers

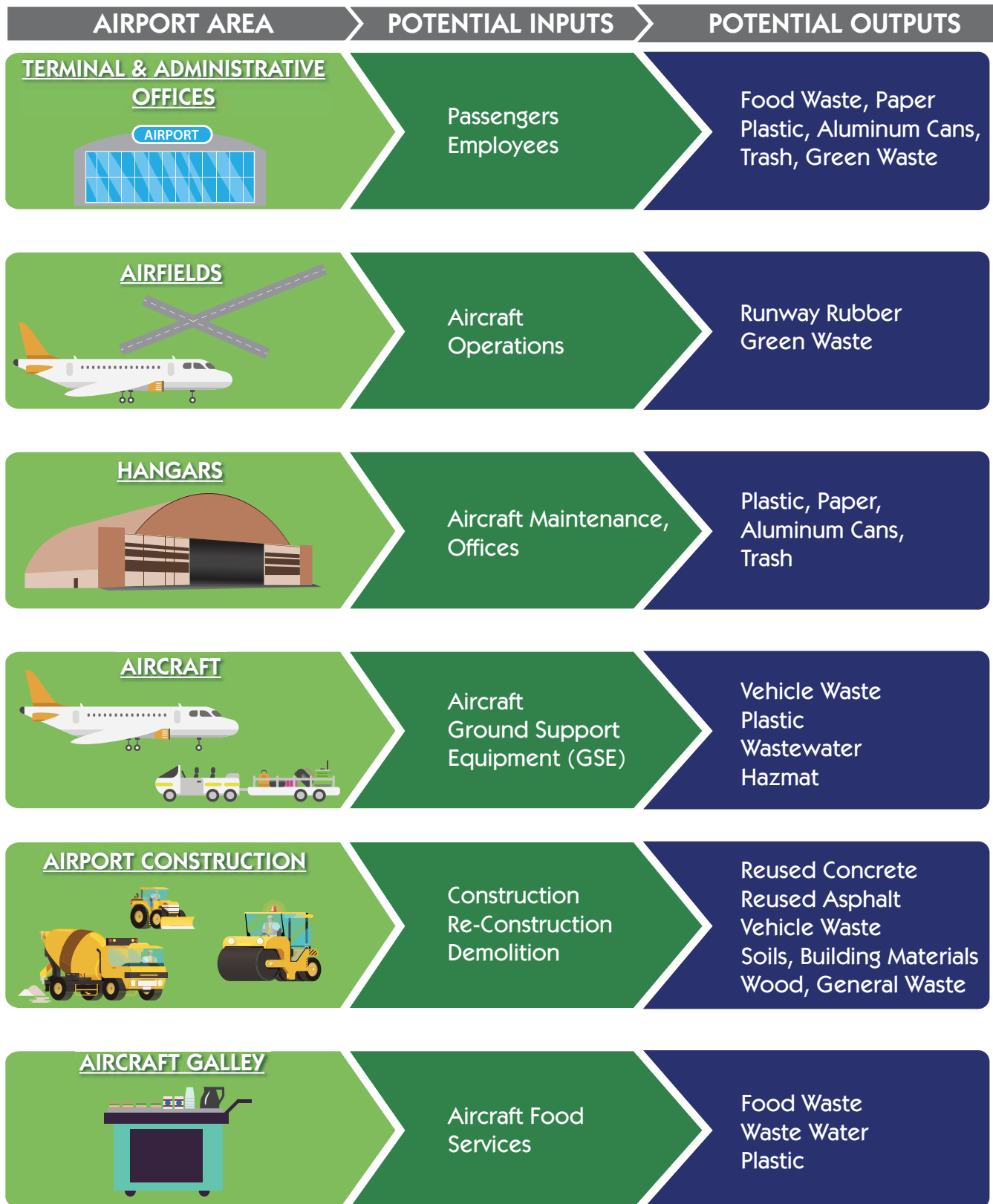
Source: City of Spencer (2020)

Figure 5F

²² Brandt, Gayle. Leading Edge Aviation. Email to Michelle Kriks on October 13, 2020.

²³ City of Spencer, IA Public Works (<http://spenceriowacity.com/government/public-works/garbage-recycling/>)

AIRPORT WASTE STREAMS



Source: Recycling, Reuse, and Waste Reduction at Airports, FAA (April 24, 2013)

SOLID WASTE MANAGEMENT SYSTEM

Airports employ either a *centralized* or a *decentralized* waste management system when managing solid waste and recycling efforts at their facility. The differences between these two methods are summarized on **Exhibit 5K** and are discussed in further detail below.

- **Centralized waste management system.** With a centralized waste management system, the airport provides receptacles for the collection of waste, recyclables, or compostable materials and contracts for the removal by a single local provider.²⁴ The centralized waste management system allows for more participation from airport tenants who may not be incentivized to recycle on their own and can reduce the overall cost of service for all involved. A centralized 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 in that it has less players involved in the overall management of the solid waste and recycling efforts and allows for 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 their own containers.
- **Decentralized waste management system.** A decentralized waste management system happens when an airport provides waste containers and contracts for the hauling of waste materials in airport-operated spaces only. However, airport tenants, such as fixed-base operators, retail shops, and other tenants, manage the waste from their leased spaces with separate contracts, billing, and hauling schedules. A decentralized waste management system can increase both the number of receptacles on airport property and the number of trips by a waste collection service provider, should the collection schedule for the tenant differ from the airport.

Currently, the airport participates in a decentralized waste management system since airport tenants are responsible to oversee their individual waste management needs. Airport tenants include Leading Edge Aviation, Spencer Avionics, and CammAir. Airport staff should actively engage tenants to create a centralized waste management system at the airport to streamline waste management and recycling efforts at Spencer Municipal Airport.

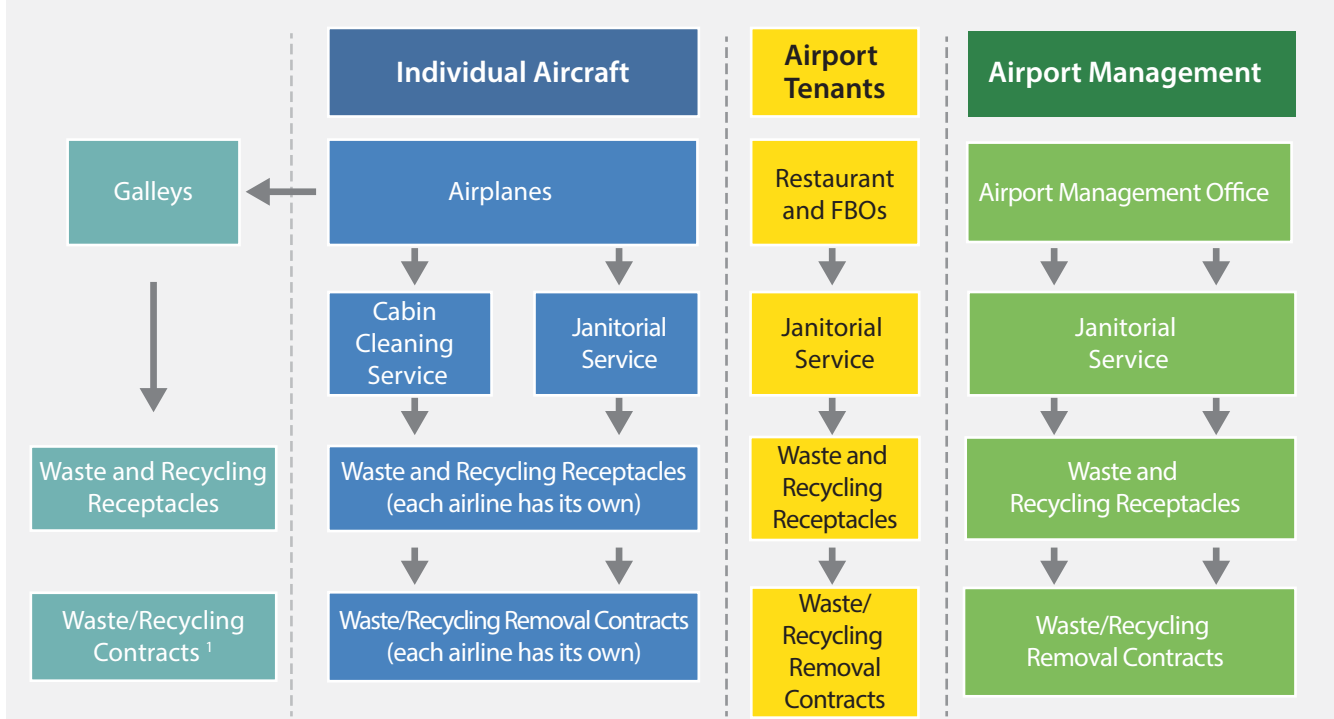
GOALS AND RECOMMENDATIONS

Solid Waste and Recycling Goals

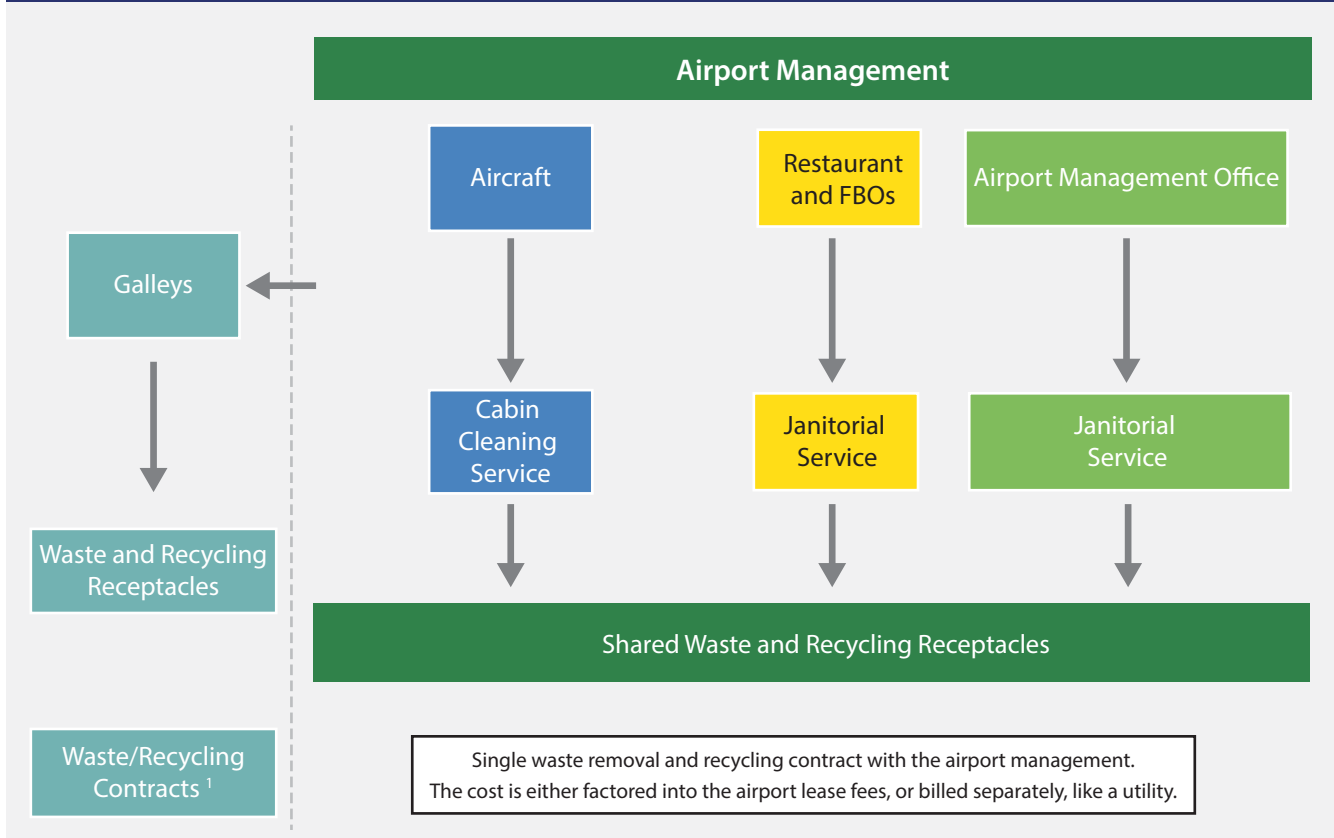
While the airport may or may not expand the existing waste management system with additional land-side recycle dumpsters in other locations at the airport, there are other opportunities for improvement. **Table 5J** outlines objectives that could help reduce waste generation and increase recycling efforts at the airport. To increase the effectiveness of tracking progress at the airport, a baseline statement of all suggested metrics should be established to provide a comparison over time.

²⁴ *Airport Waste Management and Recycling Practices* (2018) The National Academies of Sciences, Engineering, and Medicine Airport Cooperative Research Program, Synthesis 92.

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.

TABLE 5J | Waste Management and Recycling Goals
Spencer Municipal Airport – Clay County, IA

Goals	Objectives
Reduce amount of solid waste generated	• Switch to online bill pay to eliminate monthly paper bills • Conduct a waste audit to identify most common types of waste • Eliminate purchase of items that are not recyclable (i.e., Styrofoam, plastic bags)
Reuse of materials or equipment	• Reuse grass clippings as mulch • Offer reusable dishes to employees • Reuse cardboard boxes
Increase amount of material recycled	• Promote the expansion of recycling services to all areas of the airport • Improve waste and recycling tracking and data management • Incorporate recycling requirements and/or recommendations into tenant lease agreements • Expand recycling marketing and promotion efforts throughout public areas • Require contractors to implement strategies to reduce, reuse and recycle construction and demolition waste

Source: Coffman Associates, Inc.

Recommendations

To maximize waste reduction and increase recycling efforts at the airport, the following recommendations are made:

- **Create a centralized waste management system at the airport.** The airport should actively engage tenants to create a centralized waste management system at the airport to streamline waste management and recycling efforts at Spencer Municipal Airport.
- **Assign the responsibility of waste management to a dedicated individual(s).** Having one person or a group of people oversee and manage solid waste and recycling at the airport will create efficient and cost saving solutions to solid waste management. People dedicated to this operational aspect of the airport will have a familiarity with processes and can help identify areas of improvement and cost-cutting measures.
- **Audit the current waste management system.** The continuation of an effective program requires accurate data of current waste and recycling rates. There are several ways an airport can gain insight into their waste stream, such as requesting weights from the hauler, tracking the volume, or reviewing the bills. However, managing the waste system first starts with a waste audit. A waste audit is an analysis of the types of waste produced and it is the most comprehensive and intensive way to assess waste stream composition, opportunities for waste reduction, and capture of recyclables. A waste audit should include the following actions:
 - Examination of records
 - Waste hauling and disposal records and contracts
 - Supply and equipment invoices
 - 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
 - Qualitative waste information to determine major waste components and waste-generating processes
 - Identify the locations of the airport that generate waste
 - Identify what type of waste is generated by the airport to determine what can be reduced, reused, or recycled
 - Understand waste pickup and hauling practices
- Waste sorting
 - Provide quantitative data on total airport waste generation
 - Allows problem solving design/enhancing the recycling program for the airport
- **Create a tracking and reporting system.** Continuing to track solid waste generated will allow the airport to identify areas where a significant amount of waste is generated and 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. Because the airport engages in recycling services, the airport can track recycling rates and waste quantities to identify cost-saving measures that are currently unidentified simply based on the lack of quantitative data.
- **Reduce waste through controlled purchasing practices.** 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.
- **Enhance the existing recycling program at the airport.** To guarantee the airport continues to reduce the amount of waste hauled to the landfill, materials that cannot be reused or avoided should be recycled, if possible. The city should review internal procedures to ensure there are no unacceptable items contaminating recycling containers, or recyclables thrown in the trash. Clearly marked signage of what is and is not accepted placed near the solid waste and recycling containers is another significant component of a consistent, effective recycling program. Spencer Municipal Airport should actively work with Public Works, who oversees waste management for the city, to ensure waste and recycling containers are right-sized to the existing operation, as well as be on a collection schedule that picks up only when the containers are full.
- **Provide ongoing tenant education.** It is crucial to encourage tenant participation to assure buy-in of the airport's recycling efforts. To ensure recycling is part of the airport's everyday business, airport administration can provide training and educational support to personnel, tenants, and others who conduct business at the airport. In-person meetings with airport tenants could be held to create a mutual understanding of the airport's solid waste and recycling goals and how tenants play a vital role in the airport's overall success.
- **Incorporate an airport-wide waste reduction strategic plan.** Designing an airport-wide waste reduction strategic plan will create consistency in waste disposal mechanisms, ultimately resulting in the reduction of materials sent to the landfill.

SUMMARY

This chapter has been prepared to help the City of Spencer make decisions about the future growth and development of SPW by describing, both narratively and graphically, the Master Plan concept and detailing environmental and land use conditions that must be taken into consideration when implementing the development plan. The plan represents an airfield facility that fulfills aviation needs for the airport, while also conforming to safety and design standards to the extent practicable. It also provides a landside complex that can be developed as demand dictates and is subject to further refinement pending comments from the Master Plan PAC, the City, and the general public.

Flexibility will be very important to future development at the airport, as activity may not occur as predicted. The recommended Master Plan concept provides stakeholders with a general guide that, if followed, can maintain SPW's long-term viability and allow it to continue providing air transportation services to the region. The next chapter will provide a reasonable schedule for undertaking the projects based on safety and demand over the course of the next 20 years and consider strategies for funding the recommended improvements.

Chapter Six

Capital Financial Plan



CITY *of*
SPENCER

Capital Financial Plan

The analyses completed in previous chapters evaluated development needs at Spencer Municipal Airport (SPW) over the next 20 years, based on forecast activity, facility requirements, safety standards, and operational efficiency. Now that the recommended master plan concept has been developed and specific needs and improvements for the airport have been established, the next step is to determine a realistic schedule for project implementation as well as the associated costs for the plan. This chapter will provide a description and overall cost for each project 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 CIP has been organized into three sections. First, the airport's capital program needs are recognized by various categories, ranging from enhancing safety to satisfying demand. Second, the airport development schedule and project cost estimates are presented in narrative and graphic form. Third, capital improvement funding sources on the state/federal and local levels are identified and discussed.

The CIP is developed following Federal Aviation Administration (FAA) guidelines for Master Plans and primarily identifies those projects that are likely eligible for grant funding through the Federal Airport Improvement Program (AIP). Other aviation projects that are not programmed to receive federal funding participation are also presented.

AIRPORT DEVELOPMENT SCHEDULE AND COST SUMMARIES

With the recommended Master Plan concept developed and specific needs and improvements for the airport having been established, the next step is to determine a realistic implementation timeline and associated costs for the plan. The recommended improvements are grouped by planning horizon: short term (0-5 years), intermediate term (6-10 years), and long term (11-20 years). **Table 6A** summarizes key activity milestones for the three planning horizons.

TABLE 6A | Planning Horizon Activity Levels
Spencer Municipal Airport

	BASE YEAR	PLANNING HORIZONS		
	2020	Short Term	Intermediate Term	Long Term
Commercial Operations*				
Air Carrier	0	0	0	0
Other Air Taxi	2,400	3,000	3,000	3,600
<i>Total Commercial Operations</i>	2,400	3,000	3,000	3,600
General Aviation Operations				
Itinerant	9,862	10,100	10,400	11,100
Local	6,612	6,800	7,000	7,300
<i>Total General Aviation Operations</i>	16,475	16,900	17,400	18,400
Military Operations				
Itinerant	0	0	0	0
Local	0	0	0	0
<i>Total Military Operations</i>	0	0	0	0
Total Airport Operations	18,875	19,900	20,400	22,000
Based Aircraft	41	44	47	53

Note: Totals have been rounded

* Commercial operations have been projected in the event that demand for this service materializes at SPW. These projections are not included as part of the master plan forecasts to be approved by the FAA.

A key aspect of this Master Plan is the use of demand-based planning milestones. Many projects should be considered based on actual demand levels. As short-term horizon activity levels are reached, it will then be time to program for the intermediate term based upon the next activity milestones. Similarly, when the intermediate-term milestones are reached, it will be time to program 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 new hangar development. Based aircraft necessitating the need for additional hangar development and the need to accommodate growth in overall airport activity will be the 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 forecast, some projects may be delayed. As a result, capital expenditures are planned to be made on an as-needed basis, which leads to a more responsible use of capital assets.

Because of economic realities, many airports are relying on private developers to construct new hangars. In some cases, private developers can keep construction costs lower, which in turn lowers the monthly rental fees necessary to amortize the cost of development. The CIP for SPW assumes a potential for

future hangars to be constructed by private entities. This assumption does not preclude the possibility of the airport constructing new hangars. Ultimately, the City of Spencer will determine, based upon demand and the specific needs of a potential developer, whether to self-fund hangar construction or to rely on private developers; however, for purposes of the CIP, all future hangar development is assumed to be privately funded. This includes apron pavement associated with conventional hangars, which is considered exclusive-use pavement and generally not eligible for federal grant funding. Taxilane pavement associated with T-hangars, which is not exclusive-use pavement, is eligible for AIP funding, so those areas are included in the CIP.

Not all projects identified are necessary to meet projected demand. Other projects are necessary to enhance the safety and efficiency of the airport, maintain existing pavement infrastructure, or to address FAA design standards. Each proposed project is categorized as follows:

1. **Safety/Security (SS)** – these are capital needs considered necessary for operational safety and protection of aircraft and/or people and property on the ground near the airport.
2. **Environmental (EN)** – these are capital needs which are identified to enable the airport to operate in an environmentally acceptable manner.
3. **Maintenance (MN)** – these are capital needs required to maintain the existing infrastructure at the Airport.
4. **Efficiency (EF)** – these are capital needs intended to optimize aircraft ground operations or users of landside facilities.
5. **Demand (DM)** – these are capital needs required to accommodate levels of aviation demand. The implementation of these projects should only occur when demand for these needs is verified.
6. **Opportunities (OP)** – these are capital needs intended to take advantage of opportunities afforded by the airport setting. Typically, this will involve improvements to property intended for lease to aviation or non-aviation related development.

Since an Airport Master Plan is a conceptual document, implementation of the capital projects should only be undertaken after further refinement of their design and costs through architectural and engineering analyses. Moreover, some projects may require additional unforeseen infrastructure improvements (i.e., drainage improvements, extension of utilities, etc.) that may increase the estimated cost of the project or increase the timeline for completion.

Once a list of necessary projects is identified and refined, project-specific cost estimates are developed. The cost estimates include design, engineering, construction administration, and contingencies that may arise on the project. Cost estimates for each of the development projects in the CIP are based on present-day construction, design, and administration costs. Adjustments will need to be applied over time as construction costs or capital equipment costs change. Capital costs presented here should be viewed only as estimates subject to further refinement during design. Nevertheless, they are considered sufficient for planning purposes.

Exhibit 6A presents the proposed 20-year CIP for SPW. An estimate of federal funding eligibility has been included, although actual funding is not guaranteed. For projects that are eligible for federal funding, AIP grants provide up to 90 percent of the total project cost. The remaining 10 percent is the airport sponsor's responsibility; however, the Iowa Department of Transportation (DOT) has an aviation funding program that may be used for some projects. The Iowa Transportation Commission reviews, approves, and allocates this funding. This process will be explained in more detail later in the chapter.

Some 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) that include categorical exclusions (CatEx), Environmental Assessments (EA), and Environmental Impact Statements (EIS). Each level requires more time to complete and more detailed information. Guidance on what level of documentation is 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 potential environmental impacts for SPW.

The following sections will describe in greater detail the projects identified for the airport over the next 20 years. The short-term projects are subdivided into yearly increments and refer to the federal fiscal year (FY) (October – September). The intermediate and long terms are grouped by local priority. While the CIP shows the priority ranking of the projects, the list should be evaluated and revised on a regular basis. It should also be noted that certain projects, while listed separately for purposes of evaluation in this study, could be combined with other projects at the time of construction/implementation.

SHORT-TERM PROGRAM (YEARS 0-5)

The short-term planning period is the only planning horizon separated into single years. This is to allow the CIP to be coordinated with the planning cycle of the FAA. If any of these projects cannot be funded in the timeframe indicated, the City of Spencer should consider the project for the following year. The short-term program considers six projects for the planning period as presented on **Exhibit 6A** and depicted on **Exhibit 6B**. The following provides a detailed breakdown of each project within FY 2021 through 2025.

Project #1 – FY 2021: Seal Runway 12-30 Pavement Surface and Joints

Description: Runway 12-30 is in need of repair for pavement cracking and breaking. As part of a routine airport maintenance, this project has been included to ensure that the airport maintains existing infrastructure as well as a safe operating environment.

Cost Estimate: \$330,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

Project #2 – FY 2021: Improve/Modify/Rehab Terminal Building

Description: Tuckpoint and energy-efficient upgrades are planned for the existing building, with Iowa's *General Aviation Vertical Infrastructure Program* providing the funding for these improvements.

Cost Estimate: \$140,000

Funding Eligibility: State – 100 percent | Airport or Local – 0 percent

Project # and Description		Project Category	Total Project Cost Estimate	Federal/State Share	Local Share
SHORT-TERM PROJECT DESCRIPTION (2021-2025)					
Planning Year 2021					
1	Seal Runway 12/30 pavement surface and joints	SS/MN	\$330,000	\$297,000	\$33,000
2	Improve/modify/rehab terminal building (tuck point and energy efficient upgrades)*	MN	\$140,000	\$140,000	
Planning Year 2023					
3	Catergorical Exclusion for the acquisition of 15.5 acres in Runway 30 RPZ	EN/SS	\$5,000	\$4,500	\$500
Planning Year 2024					
4	Acquire property (approx 15.5 acres)in the Runway 30 RPZ	SS	\$165,000	\$148,500	\$16,500
5	Repair gravel access road	MN	\$250,000	\$0	\$250,000
6	Routine pavement maintenance	SS/MN	\$500,000	\$450,000	\$50,000
TOTAL SHORT-TERM PROGRAM			\$1,390,000	\$1,040,000	\$350,000
INTERMEDIATE-TERM PROJECT DESCRIPTION (2026-2040)					
7	Square off Taxiway B to Runway 30 - Planning and Design	SS	\$115,000	\$103,500	\$11,500
8	Square off Taxiway B to Runway 30	SS	\$950,000	\$855,000	\$95,000
9	Expand west T-hangar apron	DM/OP	\$540,000	\$486,000	\$54,000
10	Taxiway Realignment (Alpha / Bravo connection) - Planning and Design	SS	\$97,000	\$87,300	\$9,700
11	Taxiway Realignment (Alpha / Bravo connection)	SS	\$1,115,000	\$1,003,500	\$111,500
12	Construct parallel taxiway offset - Taxiway E to Runway 18	SS	\$700,000	\$630,000	\$70,000
13	Construct parallel taxiway offset - Taxiway D to Runway 36	SS	\$700,000	\$630,000	\$70,000
14	Construct a Snow Removal Equipment (SRE) Building	MN	\$300,000	\$270,000	\$30,000
15	Replace Runway 12-30 VASI with PAPI-4	SS	\$150,000	\$135,000	\$15,000
16	Construct apron west of parking lot	DM/OP	\$155,000	\$77,500	\$77,500
17	Construct new fillets on Taxiway C connectors	SS	\$465,000	\$418,500	\$46,500
18	Install perimeter fencing	SS	\$750,000	\$675,000	\$75,000
19	Install distance remaining signage on Runway 12-30	SS	\$60,000	\$54,000	\$6,000
20	Replace snow removal equipment	MN	\$230,000	\$207,000	\$23,000
21	Routine pavement maintenance	SS/MN	\$1,000,000	\$900,000	\$100,000
TOTAL INTERMEDIATE-TERM PROGRAM			\$7,327,000	\$6,532,300	\$794,700
LONG-TERM PROJECT DESCRIPTION (Beyond 2040)					
22	Construct apron adjacent to Spencer Avionics hangar	DM/OP	\$154,000		\$154,000
23	Expand apron to the east, adjacent to T-hangar	DM/OP	\$130,000		\$130,000
24	Environmental Assessment for the Runway 12-30 extension	EN/DM/OP	\$150,000	\$135,000	\$15,000
25	Acquire property (approx 3.9 acres) for Runway 12 RPZ	SS	\$53,000	\$47,700	\$5,300
26	Construct Runway 12-30 extension - 500'	DM/OP	\$2,500,000	\$2,250,000	\$250,000
27	Categorical Exclusion for the acquisition of 2.8 acres to develop hangar facilities	EN/DM/OP	\$50,000	\$45,000	\$5,000
28	Expand primary apron to the north	DM/OP	\$1,200,000	\$1,080,000	\$120,000
29	Terminal expansion for limited commercial service*	DM/OP	\$625,000	\$562,500	\$62,500
30	Construct deicing pad with associated facilities	EN	\$100,000	\$90,000	\$10,000
31	Terminal expansion for Part 139 service*	DM/OP	\$750,000	\$637,500	\$112,500
32	Strengthen Runway 12-30 to 75,000 lbs. DWL	DM/OP	\$12,000,000	\$10,200,000	\$1,800,000
33	Routine pavement maintenance	SS/MN	\$2,000,000	\$1,800,000	\$200,000
TOTAL LONG-TERM PROGRAM (EXCLUDING PART 139 UPGRADES)			\$6,962,000	\$6,010,200	\$1,912,500
		Part 139 Upgrades	\$12,750,000	\$10,837,500	\$75,000
CAPITAL IMPROVEMENT PROGRAM TOTAL (EXCLUDING PART 139 UPGRADES)			\$15,679,000	\$13,582,500	\$2,096,500

NOTE: An estimate of FAA and IDOT funding eligibility has been included, although actual funding is not guaranteed.

Intermediate/Long-term costs estimated in 2026 dollars

*State funded project

Category Legend:

SS - Safety/Security
EN - Environmental

MN - Maintenance
DM - Demand

OP - Opportunity

Project #3 – FY 2023: Categorical Exclusion for the Acquisition of ~15.5 acres with the Runway 30 RPZ (Environmental)

Description: Portions of the Runway 30 RPZ extend beyond existing airport property. These areas, along with portions of property already controlled by easement, are planned to be acquired fee simple to maintain control and ensure development incompatible with the airport does not occur. The Categorical Exclusion (CatEx) evaluates potential environmental impacts.

Cost Estimate: \$5,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

Project #4 – FY 2024: Acquire Approximately 15.5 Acres of Property in the Runway 30 RPZ

Description: Portions of the Runway 30 RPZ extend beyond existing airport property. These areas, along with portions of property already controlled by easement, are planned to be acquired fee simple to maintain control and ensure development incompatible with the airport does not occur.

Cost Estimate: \$165,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

Project #5 – FY 2024: Repair Gravel Access Road

Description: The gravel road on the east side of the airfield that extends from 330th Street and provides access to Camm Air and Spencer Avionics is in need of repair. Currently, gravel is being pushed to the sides, creating a “curb” and resulting in water retention. This project plans for the gravel to be regraded to help with water runoff.

Cost Estimate: \$250,000

Funding Eligibility: FAA or State – 0 percent | Airport or Local – 100 percent

Project #6 – FY 2025: Routine Pavement Maintenance

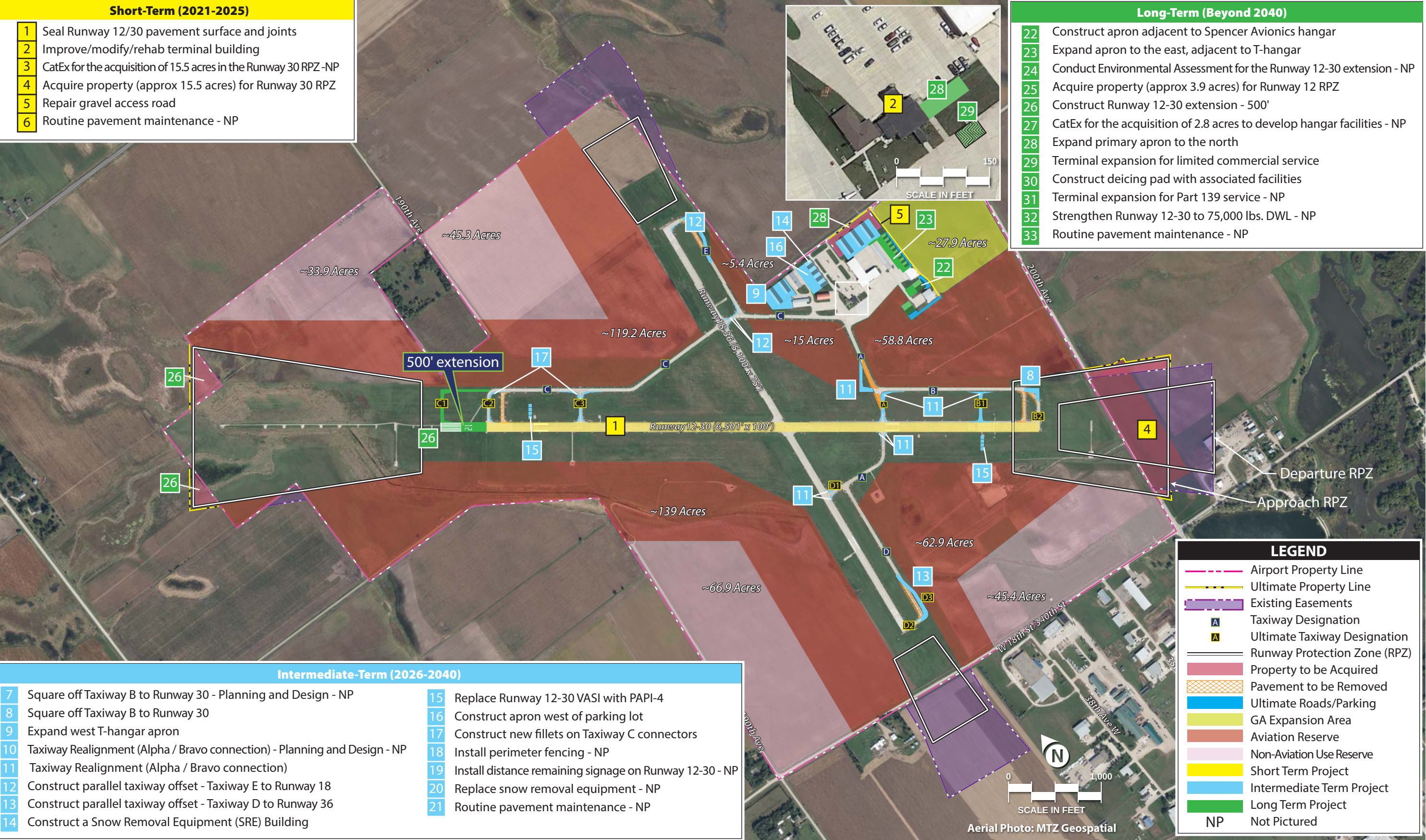
Description: As airfield pavements deteriorate over time, it is necessary to undergo overlay/rehabilitation/reconstruction projects. This project plans for various maintenance projects that may be necessary over the course of the short-term planning period.

Cost Estimate: \$500,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

INTERMEDIATE-TERM PROGRAM (YEARS 6-10)

The intermediate-term projects are those that are anticipated to be necessary in years six through 10 of the Master Plan. These projects are not tied to specific years for 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 based on changing conditions, such as funding availability or changes in the aviation industry. This planning horizon includes 15 projects as listed on **Exhibit 6A** and depicted on **Exhibit 6B**. The following section includes a description of each project.



Intermediate-Term (2026-2040)

7

Square off Taxiway B to Runway 30 - Planning and Design - NP

8

Square off Taxiway B to Runway 30

9

Expand west T-hangar apron

10

Taxiway Realignment (Alpha / Bravo connection) - Planning and Design - NP

11

Taxiway Realignment (Alpha / Bravo connection)

12

Construct parallel taxiway offset - Taxiway E to Runway 18

13

Construct parallel taxiway offset - Taxiway D to Runway 36

14

Construct a Snow Removal Equipment (SRE) Building

15

Replace Runway 12-30 VASI with PAPI-4

16

Construct apron west of parking lot

17

Construct new fillets on Taxiway C connectors

18

Install perimeter fencing - NP

19

Install distance remaining signage on Runway 12-30 - NP

20

Replace snow removal equipment - NP

21

Routine pavement maintenance - NP

LEGEND

--- Airport Property Line

--- Ultimate Property Line

--- Existing Easements

A

 Taxiway Designation

A

 Ultimate Taxiway Designation

--- Runway Protection Zone (RPZ)

Property to be Acquired

Pavement to be Removed

Ultimate Roads/Parking

GA Expansion Area

Aviation Reserve

Non-Aviation Use Reserve

Short Term Project

Intermediate Term Project

Long Term Project

NP

 Not Pictured

Capital Financial Plan

6-7

Exhibit 6B
DEVELOPMENT STAGING

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Project #7: Construct Standard Connection between Taxiway B and Runway 30 (Planning & Design)

Description: The existing connection between Taxiway B and Runway 30 is non-standard. This project is the design phase to realign the connector to a standard right angle, remove the secondary connector, and construct a new connector (ultimate Taxiway B1).

Cost Estimate: \$115,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

Project #8: Construct Standard Connection between Taxiway B and Runway 30

Description: The existing connection between Taxiway B and Runway 30 is non-standard. This project corrects this by realigning the connector (ultimate Taxiway B2) to a standard right angle, removing the secondary connector, and constructing a new connector (ultimate Taxiway B1). The project also includes the installation of medium intensity taxiway lighting (MITL), pavement marking, and LED signage.

Cost Estimate: \$950,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

Project #9: Expand West T-hangar Apron

Description: In anticipation of additional based aircraft, the existing west T-hangar area is planned for expansion. Approximately 4,000 square yards (sy) of pavement is planned to be used for aircraft movement, including taxilanes.

Cost Estimate: \$540,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

Project #10: Taxiway A Realignment (Planning & Design)

Description: Existing Taxiway A provides direct access from the aircraft parking apron to Runway 12-30. The holding position marking on the northeast side of Runway 12-30 is also non-standard. This project includes the design element to correct these non-standard conditions.

Cost Estimate: \$97,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

Project #11: Taxiway A Realignment

Description: Existing Taxiway A provides direct access from the aircraft parking apron to Runway 12-30. The holding position marking on the northeast side of Runway 12-30 is also non-standard. This project involves an extension of Taxiway B to the northwest by approximately 150 feet. A portion of existing Taxiway A will be removed and approximately 300 feet of new pavement added to connect with Taxiway B at a right-angle. A second portion of Taxiway A (between Taxiway B and Runway 12-30) is planned for removal with new pavement constructed to create a right-angle connection between Taxiway B and Runway 12-30. This project also includes additional fillet pavement to meet taxiway design group (TDG) 2 standards, installation of MITL, LED signage, and pavement markings.

Cost Estimate: \$1,115,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

Project #12: Construct Parallel Taxiway Offset – Taxiway E to Runway 18

Description: The existing connection from Taxiway E to Runway 18 does not allow for parallel hold lines with adequate separation from the runway centerline. To allow for the standard 200-foot separation, a parallel taxiway offset is planned that will provide the additional pavement necessary for aircraft to hold perpendicular to the runway. This project includes planning/design phase and construction.

Cost Estimate: \$700,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

Project #13: Construct Parallel Taxiway Offset – Taxiway D to Runway 36

Description: The existing connection from Taxiway D to Runway 36 does not allow for parallel hold lines with adequate separation from the runway centerline. To allow for the standard 200-foot separation, a parallel taxiway offset is planned that will provide the additional pavement necessary for aircraft to hold perpendicular to the runway. This project includes planning/design phase and construction.

Cost Estimate: \$700,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

Project #14: Construct a Snow Removal Equipment (SRE) Building

Description: This project includes the construction of a new SRE building. Currently, SRE is stored in the FBO maintenance hangar.

Cost Estimate: \$300,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

Project #15: Upgrade Approach Lighting on Runway 12-30

Description: Runway 12-30 is currently equipped with a visual approach slope indicator (VASI) lighting system. These lights are being phased out and replaced with the more sophisticated precision approach path indicator (PAPI) lighting systems. This project plans for the replacement of the VASI system on Runway 12-30 with a PAPI-4 system.

Cost Estimate: \$150,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

Project #16: Construct New Apron West of the Vehicle Parking Lot

Description: This project is for the construction of a new apron to support planned development of conventional hangars west of the vehicle parking lot. This area, which is currently undeveloped, plans for the construction of an aircraft parking apron approximately 4,000 sy in size. The cost estimate is reflective of 1,000 sy of new pavement, with the remaining apron pavement assumed to be exclusive-use and therefore privately funded.

Cost Estimate: \$155,000

Funding Eligibility: FAA or State – 50 percent (estimated) | Airport or Local – 50 percent (estimated)

Project #17: Construct New Pavement to Meet Taxiway Fillet Standards

Description: The fillets on ultimate Taxiways C2 and C3 do not meet current FAA design standards. This project plans for the construction of additional pavement to meet TDG fillet design standards on these taxiway connectors.

Cost Estimate: \$465,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

Project #18: Install Perimeter Fencing

Description: The airport is currently secured by a combination of fencing, including six-foot tall chain-link fencing topped with barbed-wire and three-strand barbed-wire fencing. This project involves the addition of new fencing or replacement of existing fencing with wildlife fencing, which will enhance security of the airfield and help prevent wildlife access. Before this project commences, justification must be provided in the form of a Wildlife Hazard Assessment (WHA) and Wildlife Hazard Management Plan (WHMP).

Cost Estimate: \$750,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

Project #19: Install Distance Remaining Signage on Runway 12-30

Description: The FAA recommends that distance remaining signage be installed on runways to alert pilots to how much runway length remains in 1,000-foot increments. This project plans for the installation of this signage on Runway 12-30.

Cost Estimate: \$60,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

Project #20: Replace Snow Removal Equipment (SRE)

Description: The SRE at the airport is aging and will need to be replaced. Acquisition of a new vehicle with a blade/broom is planned with this project.

Cost Estimate: \$230,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

Project #21: Routine Pavement Maintenance

Description: As airfield pavements deteriorate over time, it is necessary to undergo overlay/rehabilitation/reconstruction projects. This project plans for various maintenance projects that may be necessary over the course of the intermediate-term planning period.

Cost Estimate: \$1,000,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

LONG-TERM PROGRAM (YEARS 11-20+)

The long-term planning horizon considers 12 projects for the 11 through 20-year period and beyond. This includes two projects that would be necessary if Part 139 commercial service were to be established at the airport. As mentioned in the previous chapter, there is nothing to suggest this will occur during this Master Plan's lifetime, and it is more likely that scheduled Part 135 service conducted by nine-seat, or fewer, aircraft will occur. However, for planning purposes, improvements associated with Part 139 upgrades have been included as line items to assist in long-range planning. The long-term planning projects are presented on **Exhibits 6A and 6B**.

Project #22: Construct New Apron Between Spencer Avionics and CammAir

Description: This project plans for new development in the vacant area between the Spencer Avionics and CammAir hangars. An approximate 900 sy apron is planned to support a third specialized aviation service operator (SASO) in this area, or to accommodate expanded facilities associated with one of the existing operators.

Cost Estimate: \$154,000

Funding Eligibility: FAA or State – 0 percent | Airport or Local – 100 percent

Project #23: Apron Expansion on East Side of Hangar Area

Description: This project is for the construction of a new apron to support planned development of executive hangars east of the existing 10-unit T-hangar and north of Cammair. Approximately 900 sy of apron pavement is planned, which could support eight 50-foot by 50-foot hangars. Vehicle parking would be provided at the rear of the hangars, accessible from 330th Street.

Cost Estimate: \$154,000

Funding Eligibility: FAA or State – 0 percent | Airport or Local – 100 percent

Project #24: Prepare Environmental Assessment for Runway 12-30 Extension Project (Environmental)

Description: Environmental documentation is required prior to major airfield projects requiring property acquisition, such as the extension of a runway. As Runway 12-30 is planned to be extended to the northwest, an Environmental Assessment (EA), at a minimum, is necessary to determine potential environmental impacts.

Cost Estimate: \$150,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

Project #25: Acquire Property for Runway 12-30 Extension Project

Description: Property acquisition northwest of Runway 12 is necessary in order for the airport to maintain control of the Runway 12 RPZ once the extension is complete. Approximately 3.9 acres will need to be purchased.

Cost Estimate: \$53,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

Project #26: Extend Runway 12-30 to the Northwest

Description: This project is for the 500-foot extension of Runway 12 that will compensate for the 500-foot displaced threshold on Runway 30. This extension will allow for increased runway utility, with at least 6,001 feet of pavement available for all operations. The project also includes clearing and grading of the RSA; clearing the ROFA; extension of Taxiway C and construction of connector C1; removal of an existing taxiway connector; relocation of the MALSR, glideslope antenna, and PAPI-4; installation of MIRL and MITL; and runway markings and LED signage.

Cost Estimate: \$2,500,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

Project #27: Prepare CatEx for Property Acquisition for Future Hangar Development (Environmental)

Description: Environmental documentation is required prior to property acquisition to determine potential environmental impacts. A full Environmental Assessment is not anticipated to be needed, so a CatEx is planned prior to the acquisition of approximately 2.8 acres on the south side of 330th Street. This acquisition will be undertaken to support future hangar development.

Cost Estimate: \$50,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

Project #28: Expand Primary Apron to the North

Description: This project is for the construction of a new apron to support planned development of T-hangars north of the primary apron. Approximately 8,100 sy of apron pavement is planned, which could support three 8-unit T-hangars.

Cost Estimate: \$1,200,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

Project #29: Terminal Building Expansion

Description: A 2,500-square-foot (sf) expansion of the existing terminal building is planned for this project. The expansion area is focused on the east side of the building, in an area that is currently undeveloped. An expansion of this size will provide the additional space that is estimated by the long term for GA users, as well as space to support limited passenger service.

Cost Estimate: \$625,000

Funding Eligibility: State – 85 percent (estimated) | Airport or Local – 15 percent (estimated)

Project #30: Construct Deicing Pad with Associated Facilities

Description: A deicing pad is planned east of the terminal building on the primary aircraft parking apron. This project includes equipment, such as pump and tank for the collection and storage of deicing fluid.

Cost Estimate: \$100,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

Project #31: Terminal Building Expansion and Other Upgrades for Part 139 Service

Description: In the event that Part 139 commercial service is established at the airport, additional improvements will be necessary. This includes a greater expansion of the terminal building, qualified ARFF personnel and equipment on-site, passenger screening equipment and personnel, and security upgrades, such as fencing and cameras.

Cost Estimate: \$750,000

Funding Eligibility: State – 85 percent (estimated) | Airport or Local – 15 percent (estimated)

Project #32: Strengthen Runway 12-30 to 75,000 lbs. DWL for Part 139 Service

Description: In the event that Part 139 commercial service is established at the airport, Runway 12-30's current pavement strength should be increased to 75,000 lbs. dual wheel loading (DWL) to support larger business jets and commercial service aircraft.

Cost Estimate: \$12,000,000

Funding Eligibility: State – 85 percent (estimated) | Airport or Local – 15 percent (estimated)

Project #33: Routine Pavement Maintenance

Description: As airfield pavements deteriorate over time, it is necessary to undergo overlay/rehabilitation/reconstruction projects. This project plans for various maintenance projects that may be necessary over the course of the long-term planning period.

Cost Estimate: \$2,000,000

Funding Eligibility: FAA or State – 90 percent | Airport or Local – 10 percent

CAPITAL IMPROVEMENT PROGRAM SUMMARY

The list of projects needed to accomplish the vision for SPW has been prioritized and cost estimates developed. Projects considered for the short-term planning horizon (Years 0-5) have been divided into yearly increments, and projects planned for the intermediate- and long-term planning horizons have been grouped together. These groupings allow the airport and city more flexibility in longer range planning, where priorities may shift and adjustments need to be made. Additionally, each year, the airport and the FAA draft and review a five-year ACIP. Therefore, the list of projects and their prioritization can change in the future, and likely will based on current needs and trends.

Short-Term Program Summary

The short-term CIP includes projects that enhance the overall safety, efficiency, and maintenance of the airfield, as well as maintenance of the terminal building. The total investment necessary for the short-term CIP is approximately \$1.4 million. Of this, approximately \$1,000,000 is eligible for federal funding, while the local/state share is approximately \$350,000.

Intermediate-Term Program Summary

The total cost associated with projects in the intermediate term is approximately \$7.3 million. Of this, about \$6.5 million would be eligible for federal or state funding. The remaining \$795,000 would be a local or airport responsibility. As mentioned previously, hangar development is assumed to be privately funded. Likewise, some of the pavement associated with new conventional/executive hangars would be considered exclusive use and would be the responsibility of the developer.

Long-Term Program Summary

The long-term CIP covers projects that are anticipated to occur beyond 10 years. The total of these projects is approximately \$7.0 million, not including improvements that would be necessary to implement Part 139 commercial service. Of this total, approximately \$6.0 million would be eligible for federal and state grant funding, with approximately \$950,000 relying on local funding mechanisms. The cost to develop facilities to support Part 139 operation is approximately \$12.8 million, with approximately \$10.8 million potentially eligible for federal funding. Hangar development is assumed to be privately funded.

CIP Summary

The CIP is intended as a road map of improvements to help guide the airport, the City of Spencer, the Iowa DOT, and the FAA. The plan as presented will help accommodate increases in forecast demand at SPW over the next 20 years and beyond. While the sequence of projects may change due to availability of funds or changing priorities, this is a comprehensive list of capital projects the airport should consider in the next 20+ years.

The total CIP, as detailed previously on **Exhibit 6A**, proposes approximately \$15.7 million in airport development costs (excluding Part 139 improvements) over the next 20 years and beyond. Of this total, approximately \$13.6 million could be eligible for federal/state funding assistance. The local funding estimate for the proposed CIP is \$2.1 million. These figures do not include private development, which will account for a significant portion of the landside development. Cost estimates for projects in the short term are in 2021 dollars, while intermediate and long-term costs are based on 2026 dollars. As such, some project costs may change depending on when the project is undertaken.

CAPITAL IMPROVEMENT FUNDING SOURCES

There are generally four sources of funds used to finance airport development: airport cash flow, revenue/general obligation bonds, federal/state/local grants, and passenger facility charges (PFCs), which are only available for commercial service airports. Access to these sources of financing varies widely among airports, with some large airports maintaining substantial cash reserves and most small commercial service and general aviation airports often requiring subsidies from their sponsors (local and state governments) to fund operating expenses and to finance modest improvements.

Financing capital improvements at the airport does not rely solely on the financial resources of the city. Capital improvement funding is available through various grant-in-aid programs on both the state and federal levels. While some years more funds could be available, the CIP was developed with project phasing in order to appropriately space projects. The following discussion outlines key sources of funding potentially available for capital improvements at SPW.

FEDERAL GRANTS

Through federal legislation over the years, various grant-in-aid programs have been established to develop and maintain a system of public-use airports across the United States. The purpose of this system and its federally based funding is to maintain national defense and to promote interstate commerce. The most recent legislation affecting federal funding was enacted in October 2018 and is titled, the *FAA Reauthorization Act of 2018*. The law authorizes FAA appropriations (AIP) at \$3.35 billion through fiscal year 2023.

Some airport projects are eligible for FAA funding through the AIP, which provides entitlement funds to airports based, in part, on their annual enplaned passengers and pounds of landed cargo weight. Additional AIP funds, 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 SPW may receive AIP funding for eligible projects, as described in FAA's *Airport Improvement Program Handbook*. The airport must fund the remaining project costs using a combination of other funding sources, as discussed further below.

Eligible airports, which include those in the *National Plan of Integrated Airport Systems* (NPIAS), such as SPW, can apply for airport improvement grants. **Table 6B** presents the approximate distribution of the AIP funds. Currently, the airport is eligible to apply for grants which may be funded through several categories.

Funding for AIP-eligible projects is undertaken through a cost-sharing arrangement in which the FAA share varies by airport size and is generally 75 percent for large and medium hub airports and 90 percent for all other airports (including SPW). In exchange for this level of funding, the airport sponsor is required to meet various grant assurances, including maintaining the improvement for its useful life, usually 20 years.

The source for AIP funds is the Aviation Trust Fund. The Aviation Trust Fund was established in 1970 to provide 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.

Apportionment (Entitlement) Funds

AIP provides funding for eligible projects at airports through an apportionment (entitlement) program. Non-primary airports included in the NPIAS, such as SPW, can receive up to \$150,000 each year in non-primary entitlement (NPE) funds. These funds can be carried over and combined for up to four years, thereby allowing for completion of a more expensive project.

The FAA also provides a state apportionment based on a federal formula that considers area and population. The FAA then distributes these funds for projects at various airports throughout the state.

TABLE 6B | Federal AIP Funding Distribution

Funding Category	Percent of Total	Funds*
Apportionment/Entitlement		
Passenger Entitlements	26.6%	\$891,100,000
Cargo Entitlements	3.5%	\$117,250,000
Alaska Supplemental	0.7%	\$23,450,000
State Apportionment for Nonprimary Entitlements	12.5%	\$418,750,000
State Apportionment Based on Area and Population	7.4%	\$247,900,000
Carryover	22.1%	\$740,350,000
Small Airport Fund		
Small Hubs	2.2%	\$73,700,000
Nonhubs	8.7%	\$291,450,000
Nonprimary (GA and Reliever)	4.3%	\$144,050,000
Discretionary		
Capacity/Safety/Security/Noise	5.4%	\$180,900,000
Pure Discretionary	1.8%	\$60,300,000
Set-Asides		
Noise	4.2%	\$140,700,000
Military Airports Program	0.5%	\$16,750,000
Reliever	0.1%	\$3,350,000
Totals	100.00%	\$3,350,000,000

* FAA Modernization and Reform Act of 2012 – expired September 30, 2015

AIP: Airport Improvement Program

Source: FAA Order 5100.38D, Airport Improvement Program Handbook

Small Airport Fund

If a large or medium hub commercial service airport chooses to institute a PFC, which is a fee of up to \$4.50 on each airline ticket for funding of capital improvement projects, then their apportionment is reduced. A portion of the reduced apportionment goes to the small airport fund. The small airport fund is reserved for small-hub primary commercial service airports, non-hub commercial service airports, and general aviation airports. As a general aviation airport, SPW is eligible for funds from this source.

Discretionary Funds

In a number of cases, airports face major projects that will require funds in excess of the airport's annual entitlements. Thus, additional funds from discretionary apportionments under AIP become desirable. The primary feature about discretionary funds is that they are distributed on a priority basis. The priorities are established by the FAA, utilizing a priority code system. Under this system, projects are ranked by their purpose. Projects ensuring airport safety and security are ranked as the most important priorities, followed by maintaining current infrastructure development, mitigating noise and other environmental impacts, meeting standards, and increasing system capacity.

It is important to note that competition for discretionary funding is not limited to airports in the State of Iowa or those within the FAA Central Region. The funds are distributed to all airports in the country and, as such, are more difficult to obtain as competition for these grants is high. High priority projects will often fare favorably, while lower priority projects may not receive discretionary grants.

Set-Aside Funds

Portions of AIP funds are set-asides designed to achieve specific funding minimums for noise compatibility planning and implementation, select former military airfields (Military Airport Program), and select reliever airports. It is not anticipated that SPW will be eligible for this funding category.

FAA Facilities and Equipment (F&E) Program

The Airway Facilities Division of the FAA administers the Facilities and Equipment (F&E) Program. This program 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 (ATCTs), enroute navigational aids, on-airport navigational aids, and approach lighting systems.

While F&E 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 AIP and then maintain the equipment on their own¹.

COVID-19 Economic Stimulus Packages

In response to the COVID-19 pandemic that struck in early 2020, Congress authorized funds to be awarded to eligible airports as economic relief. The first piece of legislation, titled the *Coronavirus Aid, Relief, and Economic Security (CARES) Act*, was signed into law on March 27, 2020 and included \$10 billion to be issued to airports that are part of the national airport system. This included all commercial service airports, all reliever airports, and some publicly owned general aviation airports. SPW received \$69,000 as a result of the CARES Act.

¹ Guidance on the eligibility of a project for federal AIP grant funding can be found in FAA Order 5100.38D, *Airport Improvement Program Handbook*, which can be accessed at: http://www.faa.gov/airports/aip/aip_handbook/media/AIP-Handbook-Order-5100-38D

A second piece of legislation, called the *Coronavirus Response and Relief Supplemental Appropriation Act* (CRRSAA), was signed into law on December 27, 2020 and included nearly \$2 billion in funds to provide additional economic relief. Of this, non-primary commercial service and general aviation airports will share \$45 million based on their airport categories. SPW received \$23,000 of CRRSAA funds.

The *American Rescue Plan Act* (ARPA) was a third stimulus package passed by Congress and signed into law on March 11, 2021. The \$1.9 trillion plan earmarked \$8 billion for airports, with \$100 million for nonprimary commercial service and general aviation airports with a 100 percent federal share. SPW received \$59,000 in ARPA funds.

At the time of this writing (March 2021), SPW has not applied for nor received funds from the CRRSAA or American Rescue Plan bills.

STATE GRANTS

The State of Iowa recognizes the valuable contribution to the state's transportation economy that airports make. Therefore, the Iowa DOT administers two major categories of state aviation funding: the Airport Improvement Program and the Vertical Infrastructure Program. Funding allocation for the programs and project selection are approved by the Iowa Transportation Commission.

Airport Improvement Program

The Airport Improvement Program, funded by the State Aviation Fund, includes aviation safety programs and aviation planning and development programs. These programs assist airports and Iowa DOT in preserving and enhancing the air transportation system in the state. The categories of funding are:

Aviation Safety

- **Immediate Safety Enhancements (ISE):** This program is intended to assist airports with repairs to safety-related equipment and infrastructure that may malfunction or become damaged outside of the typical grant application process. Typical projects include airport lighting, communication equipment, navigational aids, obstruction removal, and pavement repair. The state share is 70 percent, with a maximum grant of \$10,000.
- **Wildlife Mitigation:** This program is intended to assist airports in mitigating and removing wildlife from airports to reduce the potential for wildlife strikes. An initial Wildlife Hazard Assessment is required. Eligible projects include wildlife harassment and control. The state share is 85 percent.

Aviation Planning and Development

- **Airport Development Grants:** This grant program aids airport sponsors in the preservation and development of the airfield and related infrastructure. Eligible projects include runway, apron, taxiway construction and rehabilitation; pavement maintenance; drainage; obstruction removal; signage and lighting; hangar and terminal renovations; navigation and communication aids; land acquisition; fuel facilities; certain security-related projects; and certain planning studies. The state share is up to 85 percent, with a minimum grant of \$5,000. The provision of additional local share increases the prioritization of the project.
- **Air Service Development – Sustainment:** This program aims to sustain and/or increase capture rates of existing demand through ongoing marketing and educational programs. Eligible projects include ongoing marketing and educational programs; leverage of local and federal funds in the collection of data, additional studies, or matching funds for federal grants, such as the Small Community Air Service Development Program. The state share is 80 percent with a grant maximum of \$28,000.
- **Air Service Development – Enhancement:** This program is available when opportunities arise that may require financial incentives or market entry support. Eligible projects include incentives or other support for service on new routes, entry of a new carrier into the market, and increasing seat capacity or flight frequencies. The state share will vary, and a significant local share is expected.
- **Land Use Planning and Zoning:** This program is designed to encourage airports, cities, and counties to enact airport zoning that protects compatible land uses near airports. Eligible projects include updating existing airport zoning or development of new airport zoning. The state share is up to 85 percent with a maximum grant of \$25,000.

Vertical Infrastructure Programs

Vertical infrastructure programs assist airports in preserving and enhancing vertical infrastructure at the airports. Vertical infrastructure funding for general aviation and commercial service airports depends on annual appropriations from the Rebuild Iowa Infrastructure Fund and/or Restricted Capital Accounts.

General Aviation Vertical Infrastructure Program (GAVI)

- This program provides for the preservation and development of the vertical infrastructure at general aviation airports. Eligible projects include landside construction and major renovation of airport terminals, hangars, maintenance buildings, and fuel facilities. The state share is up to 85 percent with a minimum grant of \$5,000. The provision of additional local share increases the prioritization of the project. Maximum cap may vary depending on funding availability.

Commercial Service Vertical Infrastructure Program (CSVI)

- This program provides for the preservation and development of the vertical infrastructure at commercial service airports. Eligible projects include landside construction and renovation of airport terminals, hangars, maintenance buildings, and fuel facilities. No local match is required. Funds are distributed to the commercial service airports by a 50/40/10 formula: one-half of the funds are allocated equally between each airport; 40 percent of the funds are allocated based on the percentage of enplaned passengers at each airport versus the total number of enplaned passengers in the state; and 10 percent of the funds are allocated based on the percentage of the air cargo tonnage at each airport versus the total tonnage in the state. Given SPW's current status as an enhanced service airport within the *Iowa Aviation System Plan (2010-2013)*, the airport is not eligible for funding through the CSVI program. However, if commercial service is offered at SPW in the future, the airport will be eligible to receive CSVI funds.

LOCAL FUNDING

The balance of project costs, after consideration has been given to grants, must be funded through local resources. The goal for any airport is to generate enough revenue to cover all operating and capital expenditures, if possible. For most airports, this is not always possible and other financing methods may be needed.

There are several local financing options to fund future development at airports, including airport revenues, issuance of a variety of bond types, and leasehold financing. These strategies could be used to fund the local matching share or complete a project if grant funding cannot be arranged. Below is a brief description of the most common local funding options:

Leasehold/Third-Party Financing: Leasehold or third-party financing refers to a developer or tenant financing improvements under a long-term ground lease. The obvious advantage of such an arrangement is that it relieves the airport of all responsibility for raising the capital funds for improvements; however, the private development of facilities on a ground lease, particularly on property owned by the airport, produces a unique set of concerns. In particular, it may be more difficult to obtain private financing as only the improvements and the right to continue the lease can be claimed in the event of a default. Ground leases normally provide for the reversion of improvements to the airport at the end of the lease term, which reduces their potential value to a lender taking possession. Also, companies that want to own their property as a matter of financial policy may not locate where land is only available for lease.

Bonding: Bonding is a common method used to finance large capital projects at airports. A bond is an instrument of indebtedness of the bond issuer to the bond holders; thus, a bond is a form of loan or IOU. While bond terms are negotiable, typically the bond issuer is obligated to pay the bond holder interest at regular intervals and/or repay the principal at a later date.

General Revenue: Airport operations generate revenues, which are secured by federal grant assurances to be utilized at 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 for additions or improvements to airport facilities.

All public-use airports should establish standard basis rates for various leases. All lease rates should be set to adjust to a standard index, such as the Consumer Price Index, to assure that fair and equitable rates continue to be charged into the future. The condition and location of hangar space should also be considered when establishing the lease rates. Standard basis rates should be established for sponsor-owned hangars, terminal building office space, and ground leases. Fuel flowage fees and aircraft tie-down fees should also be uniform.

MASTER PLAN IMPLEMENTATION

The best means to begin implementation of the recommendations in the Master Plan is to first recognize that planning is a continuous process that does not end with completion and approval of this document. Rather, the ability to continuously monitor the existing and forecast status of airport activity must be provided and maintained. The issues upon which the Master Plan is based will remain valid for a number of years. The primary goal is for the airport to best serve the air transportation needs of the region, while continuing to be economically self-sufficient.

The actual need for facilities is most appropriately established by airport activity levels rather than a specified date. For example, projections have been made as to when additional aprons and hangars should be constructed. However, the timeframe in which the development is needed may be substantially different. Actual demand may be slower to develop than expected. On the other hand, high levels of demand may establish the need to accelerate the development. Although every effort has been made in this master planning process to conservatively estimate when facility development may be needed, actual aviation demand will dictate when facility improvements need to be delayed or accelerated.

The real value of a usable Master Plan is in keeping the issues and objectives in the minds of the managers and decision-makers so they are better able to recognize change and its effect. In addition to adjustments in aviation demand, decisions made as to when to undertake the improvements recommended in the Master Plan will impact the period that the plan remains valid. The format used in this Master Plan is intended to reduce the need for formal and costly updates by simply adjusting the timing. Updating can be done by the airport sponsor, thereby improving the plan's effectiveness.

In summary, the planning process requires airport management to consistently monitor the progress of the airport in terms of aircraft operations and based aircraft. Analysis of aircraft demand is critical to the timing and need for certain airport facilities. The information obtained from continually monitoring airport activity will provide the data necessary to determine if the development schedule should be accelerated or decelerated.

Appendix A

Glossary of Terms



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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 nonregulatory 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.

AIRCRAFT: A transportation vehicle that is used or intended for use for flight.

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 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: The planner's concept of 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.

AIR ROUTE TRAFFIC CONTROL CENTER: A facility which provides en route air traffic control service to aircraft operating on an IFR flight plan within controlled airspace over a large, multi-state region.

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.

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 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 en route phase of flight.

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.

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 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.

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

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.

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.

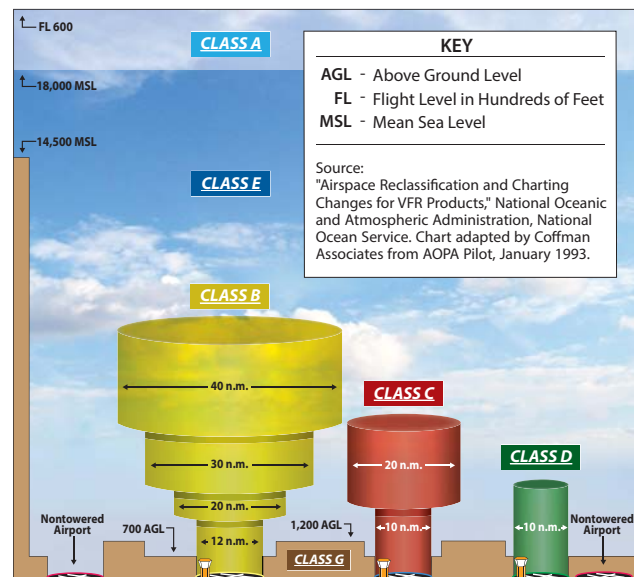
CATEGORY I: An Instrument Landing System (ILS) that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 200 feet above the horizontal plane containing the runway threshold.

CATEGORY II: An ILS that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 100 feet above the horizontal plane containing the runway threshold.

CATEGORY III: An ILS that provides acceptable guidance information to a pilot from the coverage limits of the ILS with no decision height specified above the horizontal plane containing the runway threshold.

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: 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.
- **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 air port 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.

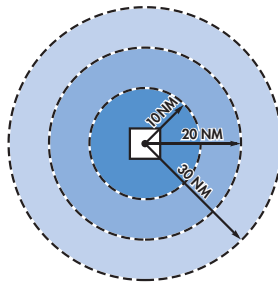
- **TAKEOFF DISTANCE AVAILABLE (TODA):** The TORA plus the length of any remaining runway and/or clear way beyond the far end of the TORA.
- **ACCELERATE-STOP DISTANCE AVAILABLE (ASDA):** The runway plus stopway length declared available for the acceleration and deceleration of an aircraft aborting a 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 are 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: 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 pre-flight

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:

1. Electronic components emitting signals which provide vertical guidance by reference to airborne instruments during instrument approaches such as ILS; or
2. Visual ground aids, such as VASI, 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 48 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.

H

HELIPAD: A designated area for the takeoff, landing, and parking of helicopters.

HIGH INTENSITY RUNWAY LIGHTS: 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: A long radius taxiway designed to expedite aircraft turning off the runway after landing (at speeds to 60 knots), thus reducing runway occupancy time.

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.

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.
2. Glide Slope.
3. Outer Marker.
4. Middle Marker.
5. Approach Lights.

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 not based at a specified airport.

K

KNOTS: A unit of speed length used in navigation that is equivalent to the number of nautical miles traveled in one hour.

L

LOCAL-AREA AUGMENTATION SYSTEM: (LAAS) is an all-weather aircraft landing system based on real-time differential correction of the GPS signal.

LANDSIDE: The portion of an airport that provides the facilities necessary for the processing of passengers, cargo, freight, and ground transportation vehicles.

LANDING DISTANCE AVAILABLE (LDA): See declared distances.

LARGE AIRPLANE: An airplane that has a maximum certified takeoff weight in excess of 12,500 pounds.

LOCAL AREA AUGMENTATION SYSTEM: A differential GPS system that provides localized measurement correction signals to the basic GPS signals to improve navigational accuracy integrity, continuity, and availability.

LOCAL OPERATIONS: Aircraft operations performed by aircraft that are based at the airport and 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.

LOCAL TRAFFIC: Aircraft operating in the traffic pattern or within sight of the tower, or aircraft known to be departing or arriving from the local practice areas, or aircraft executing practice instrument approach procedures. Typically, this includes touch and-go training operations.

LOCALIZER: 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.

LONG RANGE NAVIGATION SYSTEM (LORAN): Long range navigation is an electronic navigational aid

which determines aircraft position and speed by measuring the difference in the time of reception of synchronized pulse signals from two fixed transmitters. Loran is used for en route navigation.

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.

MICROWAVE LANDING SYSTEM (MLS): An instrument approach and landing system that provides precision guidance in azimuth, elevation, and distance measurement.

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:

1. When the aircraft has descended to the decision height and has not established visual contact; or
2. 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: The network of air traffic control facilities, air traffic control areas, and navigational facilities through the U.S.

NATIONAL PLAN OF INTEGRATED AIRPORT SYSTEMS: 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 nondirectional 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.

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 AIRMEN: 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.

ONE-ENGINE INOPERABLE SURFACE: A surface emanating from the runway end at a slope ratio of 62.5:1. Air carrier airports are required to maintain a technical drawing of this surface depicting any object penetrations by January 1, 2010.

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 minima less than Category II.

PRECISION APPROACH PATH INDICATOR (PAPI):

A lighting system providing visual approach slope guidance to aircraft during a landing approach. It is similar to a VASI but provides a sharper transition between the colored indicator lights.

PRECISION APPROACH RADAR: A radar facility in the terminal air traffic control system used to detect and display with a high degree of accuracy the direction, range, and elevation of an aircraft on the final approach to a runway.

PRECISION OBJECT FREE AREA (POFA): An area centered on the extended runway centerline, beginning at the runway threshold and extending behind the runway threshold that is 200 feet long by 800 feet wide. The POFA is a clearing standard which requires the POFA to be kept clear of above ground objects protruding above the runway safety area edge elevation (except for frangible NAVAIDs). The POFA applies to all new authorized instrument approach procedures with less than 3/4 mile visibility.

PRIMARY AIRPORT: A commercial service airport that enplanes at least 10,000 annual passengers.

PRIMARY SURFACE: 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 en route 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.

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 en route 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: 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 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.

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 minima.

RUNWAY REFERENCE CODE: A code signifying the current operational capabilities of a runway and associated 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.

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 en route 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: The portion of the aircraft parking area used for access between taxiways and aircraft parking positions.

TAXIWAY: A defined path established for the taxiing of aircraft from one part of an airport to another.

TAXIWAY 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 en-route and terminal segment of air traffic in the airspace surrounding airports with moderate to high levels of air traffic.

TETRAHEDRON: A device used as a landing direction indicator. The small end of the tetrahedron points in the direction of landing.

THRESHOLD: The beginning of that portion of the runway available for landing. In some instances the landing threshold may be displaced.

TOUCH-AND-GO: An operation by an aircraft that lands and departs on a runway without stopping or exiting the runway. A touch-and go is recorded as two operations: one operation for the landing and one operation for the takeoff.

TOUCHDOWN: The point at which a landing aircraft makes contact with the runway surface.

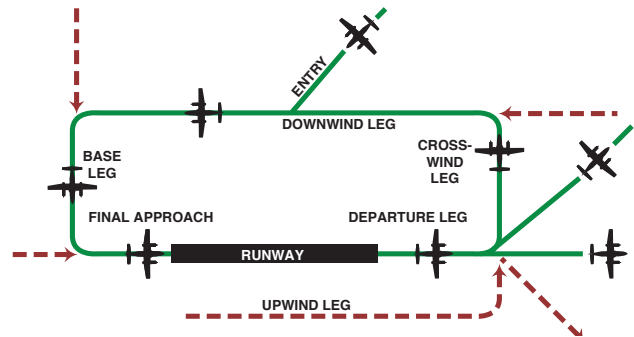
TOUCHDOWN AND LIFT-OFF AREA (TLOF): A load bearing, generally paved area, normally centered in the FATO, on which the helicopter lands or takes off.

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 (TDZ) LIGHTING: Two rows of transverse light bars located symmetrically about the runway centerline normally at 100-foot intervals. The basic system extends 3,000 feet along the runway.

TRAFFIC PATTERN: The traffic flow 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.



U

UNCONTROLLED AIRPORT: An airport without an air 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 nongovernment communication facility which may provide airport information at certain airports. Locations and frequencies of UNICOM's are shown on aeronautical charts and publications.

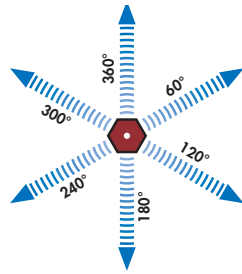
UPWIND LEG: A flight path parallel to the landing runway in the direction of landing. See "traffic pattern."

V

VECTOR: A heading issued to an aircraft to provide navigational guidance by radar.

VERY HIGH FREQUENCY/ OMNIDIRECTIONAL 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 control area or portion thereof established in the form of a corridor, the centerline of which is defined by radio navigational aids.

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 by radiating a directional pattern of high intensity red and white focused light beams which indicate to the pilot that he is on path if he sees red/white, above path if white/white, and below path if red/red. Some airports serving large aircraft have three-bar VASI's which provide two visual guide paths to the same runway.

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

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

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

Abbreviations

AC: advisory circular

ACIP: airport capital improvement program

ADF: automatic direction finder

ADG: airplane design group

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

APV: instrument approach procedure with vertical guidance	GS: glide slope
ARC: airport reference code	HIREL: high intensity runway edge lighting
ARFF: aircraft rescue and fire fighting	IFR: instrument flight rules (FAR Part 91)
ARP: airport reference point	ILS: instrument landing system
ARTCC: air route traffic control center	IM: inner marker
ASDA: accelerate-stop distance available	LAAS: local area augmented system
ASR: airport surveillance radar	LDA: localizer type directional aid
ASOS: automated surface observation station	LDA: landing distance available
ATC(T): airport traffic control tower	LIREL: low intensity runway edge lighting
ATIS: automated terminal information service	LMM: compass locator at middle marker
AVGAS: aviation gasoline - typically 100 low lead (100LL)	LOM: compass locator at outer marker
AWOS: automatic weather observation station	LORAN: long range navigation
BRL: building restriction line	MALS: medium intensity approach lighting system with indicator lights
CFR: Code of Federal Regulation	MIREL: medium intensity runway edge lighting
CIP: capital improvement program	MITL: medium intensity taxiway edge lighting
DME: distance measuring equipment	MLS: microwave landing system
DNL: day-night noise level	MM: middle marker
DWL: runway weight bearing capacity of aircraft with dual-wheel type landing gear	MOA: military operations area
DTWL: runway weight bearing capacity of aircraft with dual-tandem type landing gear	MSL: mean sea level
FAA: Federal Aviation Administration	NAVAID: navigational aid
FAR: Federal Aviation Regulation	NDB: nondirectional radio beacon
FBO: fixed base operator	NM: nautical mile (6,076.1 feet)
FY: fiscal year	NPDES: National Pollutant Discharge Elimination System
GA: general aviation	NPIAS: National Plan of Integrated Airport Systems
GPS: global positioning system	NPRM: notice of proposed rule making

ODALS: omnidirectional approach lighting system

OFA: object free area

OFZ: obstacle free zone

OM: outer marker

PAC: planning advisory committee

PAPI: precision approach path indicator

PFC: porous friction course

PFC: passenger facility charge

PCL: pilot-controlled lighting

PIW: public information workshop

PLASI: pulsating visual approach slope indicator

POFA: precision object free area

PVASI: pulsating/steady visual approach slope indicator

PVC: poor visibility and ceiling

RCO: remote communications outlet

RRC: Runway Reference Code

RDC: Runway Design Code

REIL: runway end identification lighting

RNAV: area navigation

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

VASI: visual approach slope indicator

VFR: visual flight rules (FAR Part 91)

VHF: very high frequency

VOR: very high frequency omni-directional range

VORTAC: VOR and TACAN collocated

WAAS: wide area augmentation system

Appendix B

Forecast Approval Letter





U.S. Department
of Transportation

**Federal Aviation
Administration**

Central Region
Iowa, Kansas
Missouri, Nebraska

901 Locust
Kansas City, Missouri 64106
(816) 329-2600

March 09, 2020

Mr. Mark White
Director of Public Works
Spencer Municipal Airport
418 2nd Avenue West
Spencer, IA 51301

Dear Mr. White:

Forecast/Critical Design Aircraft Approval
Spencer Municipal (SPW), Spencer, IA
AIP No. 3-19-0086-025-2019

The submitted Aviation Demand Forecast is Approved.

The proposed existing Critical Design Aircraft, **B-II family**, is **Approved**. The proposed ultimate Critical Design Aircraft, **C-II family**, is **Approved**.

Please have the operations numbers updated on your 5010 Master Record to match the current year information from the forecast.

You may proceed with developing the remainder of the report and the Airport Layout Plan drawings. If you have any questions regarding this project, please call me at (816) 329-2637 or via email at jeff.deitering@faa.gov.

Sincerely,

Jeffrey D. Deitering, P.E.
Iowa State Planner

CC: Mike Dmyterko, Coffman Associates, Inc.
Shane Wright, Iowa DOT Aviation Bureau

Appendix C

Glint and Glare Report



CITY of
SPENCER

FORGESOLAR GLARE ANALYSIS

Project: **Spencer IA**

7MW AC ground mount

Site configuration: **Untitled**

Analysis conducted by Brad Wilson (bwilson@natrs.com) at 16:25 on 18 Aug, 2020.

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
2-mile flight path(s)	PASS	Flight path receptor(s) do not receive yellow glare
ATCT(s)	N/A	No ATCT receptors designated

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at <https://www.federalregister.gov/d/2013-24729>

SITE CONFIGURATION

Analysis Parameters

DNI: peaks at 1,000.0 W/m²
 Time interval: 1 min
 Ocular transmission
 coefficient: 0.5
 Pupil diameter: 0.002 m
 Eye focal length: 0.017 m
 Sun subtended angle: 9.3
 mrad
 Site Config ID: 42251.7684



PV Array(s)

Name: PV array 1
Axis tracking: Single-axis rotation
Tracking axis orientation: 180.0°
Tracking axis tilt: 0.0°
Tracking axis panel offset: 0.0°
Max tracking angle: 50.0°
Resting angle: 0.0°
Rated power: 7000.0 kW
Panel material: Light textured glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	43.163300	-95.190000	1326.80	7.00	1333.80
2	43.164000	-95.190000	1323.53	7.00	1330.53
3	43.164000	-95.183900	1321.97	7.00	1328.97
4	43.166200	-95.184000	1324.76	7.00	1331.76
5	43.166200	-95.180900	1325.30	7.00	1332.30
6	43.163100	-95.180800	1325.79	7.00	1332.79

Flight Path Receptor(s)

Name: FP 1

Description:

Threshold height: 34 ft

Direction: 306.0°

Glide slope: 3.0°

Pilot view restricted? Yes

Vertical view: 30.0°

Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	43.160995	-95.194107	1330.51	34.00	1364.51
Two-mile	43.144000	-95.162002	1324.14	593.82	1917.96

Name: FP 2

Description:

Threshold height: 45 ft

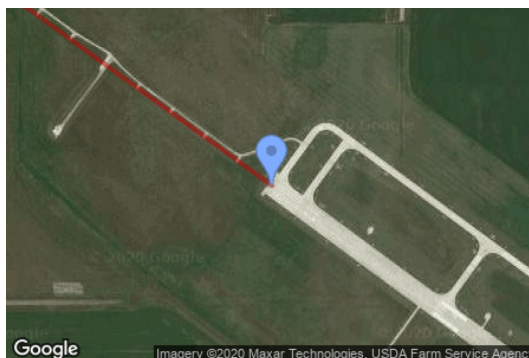
Direction: 126.0°

Glide slope: 3.0°

Pilot view restricted? Yes

Vertical view: 30.0°

Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	43.170730	-95.212163	1335.78	45.00	1380.79
Two-mile	43.187724	-95.244273	1344.96	589.28	1934.24

Name: FP 3

Description:

Threshold height: 53 ft

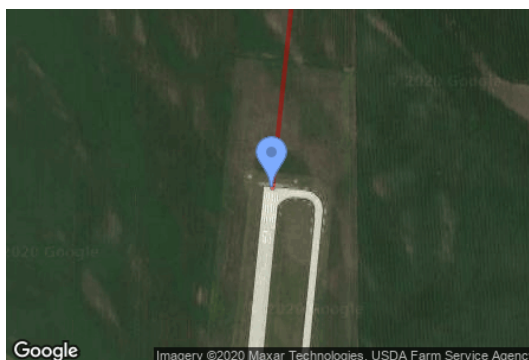
Direction: 186.0°

Glide slope: 3.0°

Pilot view restricted? Yes

Vertical view: 30.0°

Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	43.172378	-95.201516	1330.24	53.00	1383.25
Two-mile	43.201132	-95.197367	1354.77	581.93	1936.70

Name: FP 4

Description:

Threshold height: 53 ft

Direction: 6.0°

Glide slope: 3.0°

Pilot view restricted? Yes

Vertical view: 30.0°

Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	43.158481	-95.203389	1333.73	53.00	1386.74
Two-mile	43.129727	-95.207536	1321.97	618.22	1940.19

GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
PV array 1	SA tracking	SA tracking	804	0	14,320,000.0

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
FP 1	8	0
FP 2	796	0
FP 3	0	0
FP 4	0	0

Results for: PV array 1

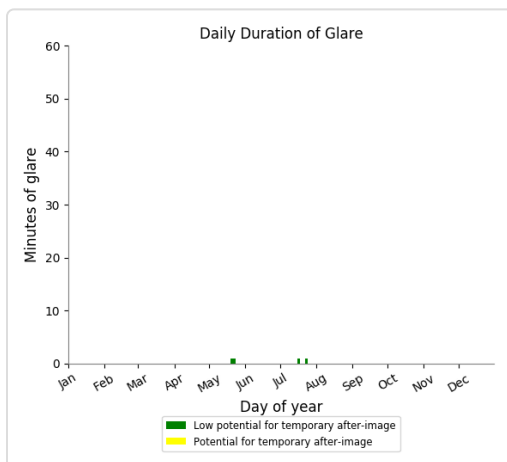
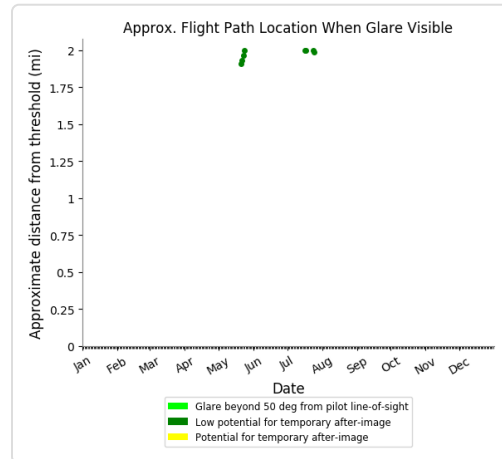
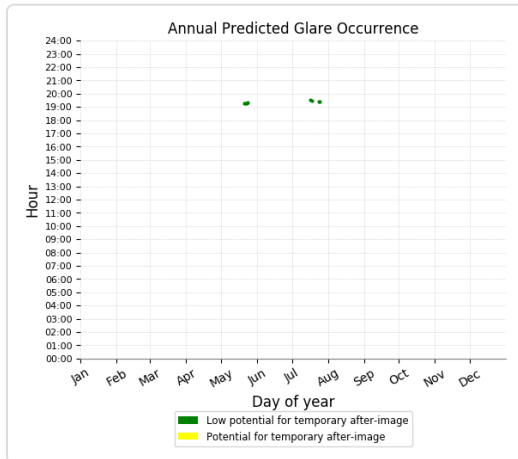
Receptor	Green Glare (min)	Yellow Glare (min)
FP 1	8	0

Receptor	Green Glare (min)	Yellow Glare (min)
FP 2	796	0
FP 3	0	0
FP 4	0	0

Flight Path: FP 1

0 minutes of yellow glare

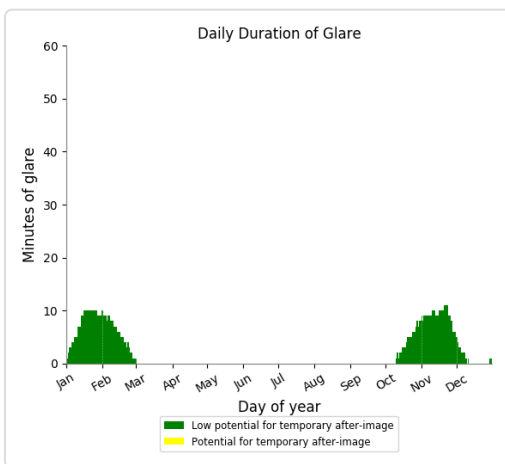
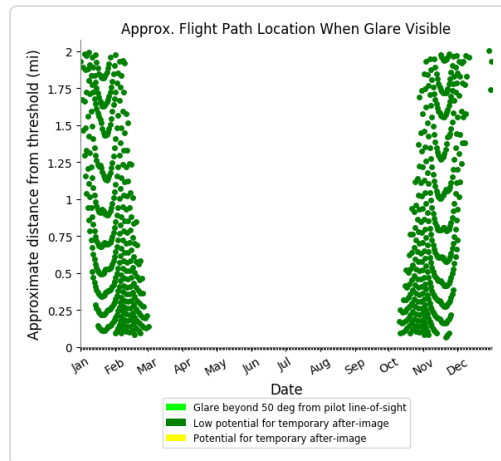
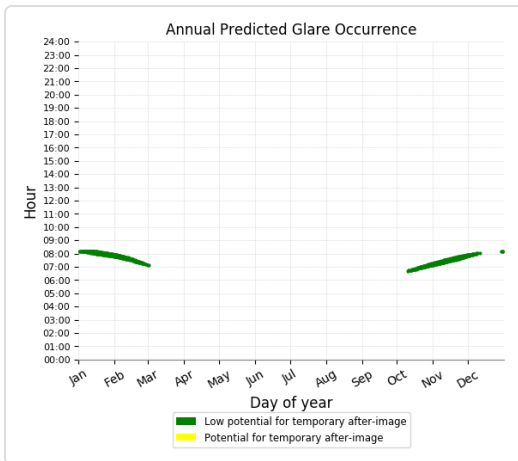
8 minutes of green glare



Flight Path: FP 2

0 minutes of yellow glare

796 minutes of green glare



Flight Path: FP 3

0 minutes of yellow glare
0 minutes of green glare

Flight Path: FP 4

0 minutes of yellow glare
0 minutes of green glare

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.

"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.

Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.

Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.

Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.

The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size.

Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)

Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.

Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.

The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual results and glare occurrence may differ.

Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.

Refer to the Help page at www.forgesolar.com/help/ for assumptions and limitations not listed here.

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Appendix D

Airport Layout Plans





U.S. Department
of Transportation

**Federal Aviation
Administration**

Central Region
Iowa, Kansas
Missouri, Nebraska

901 Locust
Kansas City, Missouri 64106
(816) 329-2600

December 07, 2021

Mr. Mark White
Director of Public Works
City of Spencer
418 2nd Avenue West
Spencer, IA 51301

Dear Mr. White:

ALP Conditional Approval
Spencer Municipal (SPW), Spencer, IA
AIP No. 3-19-0086-025-2019

The Spencer Municipal Airport Layout Plan (ALP), prepared by Coffman Associates, Inc., and bearing your signature, is approved pursuant to Title 49 USC § 47107(a)(16), as amended by House Resolution 302, "FAA Reauthorization Act of 2018", Section 163(d). A signed copy of the approved ALP is enclosed.

Although future structures on or near the airport may be in conformance with the ALP, all future alterations or new structures will be subject to the notice provisions of Federal Aviation Regulations (FAR) Part 77. An aeronautical study (no.2021-ACE-2759-NRA) was conducted on the proposed development. This determination does not constitute FAA approval or disapproval of the physical development involved in the proposal.

In making this determination, the FAA has considered matters such as the effects the proposal would have on existing or planned traffic patterns of neighboring airports, the effects it would have on the existing airspace structure and projected programs of the FAA, the effects it would have on the safety of persons and property on the ground, and the effects that existing or proposed manmade objects (on file with the FAA), and known natural objects within the affected area would have on the airport proposal.

The FAA has only limited means to prevent the construction of structures near an airport. The airport sponsor has the primary responsibility to protect the airport environs through such means as local zoning ordinances, property acquisition, aviation easements, letters of agreement or other means.

The approval, indicated by my signature, is given subject to the condition that the following may not be undertaken without environmental approval by the Federal Aviation Administration:

- 1) 500'x100' extension at 12 end of Runway 12-30**
- 2) Taxiway construction**
- 3) Taxilane construction**

All items of development shall comply with the requirements of the National Environmental Policies Act of 1969 (P.L. 91-190). Approval of the plan does not indicate that the United States will participate in the cost of any development proposed. AIP funding requires evidence of eligibility and justification at the time a funding request is ripe for consideration.

When construction of any proposed structure or development indicated on the plan is undertaken, such construction requires normal 45-day advance notification to FAA for review in accordance with applicable Federal Aviation Regulations (i.e., Parts 77, 157, 152, etc.). More notice is generally beneficial to ensure that all statutory, regulatory, technical and operational issues can be addressed in a timely manner.

A link to the electronic set of the conditionally approved ALP drawings will be provided. We are keeping one hard copy set of the conditionally approved ALP drawing sets for the official FAA files. Copies of this letter with links to the conditionally approved ALP drawings are being furnished to the Iowa DOT Aviation Bureau and your consultant.

If you have any questions, you may contact me by telephone at (816) 329-2637 or via email at jeff.deitering@faa.gov.

Sincerely,

A handwritten signature in blue ink, appearing to read "Jeffrey D. Deitering".

Jeffrey D. Deitering, P.E.
Iowa State Planner

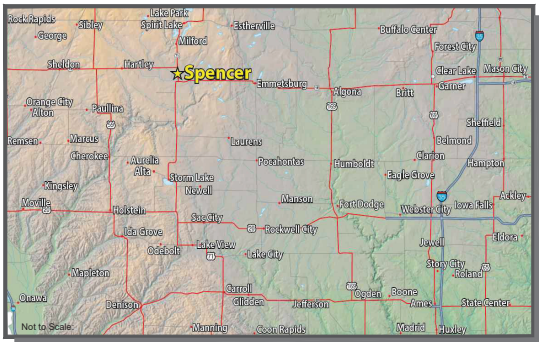
CC: Mike Dmyterko, Coffman Associates, Inc.
Shane Wright, Iowa DOT Aviation Bureau

AIRPORT LAYOUT PLAN

for the

SPENCER MUNICIPAL AIRPORT

Prepared for
the City of Spencer, Iowa



LOCATION MAP



COUNTY MAP

DRAWING INDEX

- 01 TITLE SHEET
- 02 AIRPORT DATA SHEET
- 03 AIRPORT LAYOUT PLAN DRAWING
- 04 AIRPORT AIRSPACE DRAWING I
- 05 AIRPORT AIRSPACE DRAWING II
- 06 APPROACH SURFACE PROFILE I
- 07 APPROACH SURFACE PROFILE II
- 08 INNER PORTION OF RUNWAY 12 APPROACH SURFACE DRAWING
- 09 INNER PORTION OF RUNWAY 30 APPROACH SURFACE DRAWING
- 10 INNER PORTION OF RUNWAY 18 APPROACH SURFACE DRAWING
- 11 INNER PORTION OF RUNWAY 36 APPROACH SURFACE DRAWING
- 12 RUNWAY 12-30 DEPARTURE SURFACE DRAWING
- 13 RUNWAY 18-36 DEPARTURE SURFACE DRAWING
- 14 TERMINAL AREA DRAWING
- 15 LAND USE DRAWING
- 16 EXHIBIT "A" AIRPORT PROPERTY INVENTORY MAP



VICINITY MAP

FOR APPROVAL BY
Mark White
Airport Manager: 11/19/21

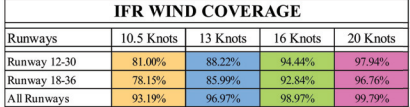
NO.	REVISIONS	DATE	BY	APPD.

SPENCER MUNICIPAL AIRPORT	
TITLE SHEET	
SPENCER, IOWA	
PLANNED BY: C. Burks	
DETAILED BY: M. Beaver	
APPROVED BY: M. Dmyterko	
November 2021	SHEET 1 OF 16



AIRPORT NAVAID (Owned by FAA)
ASOS (AUTIMATED SURFACE OBSERVING SYSTEM)
DME (DISTANCE MEASURING EQUIPMENT)
LOC (LOCALIZER)(RWY 12)
GS (GLIDESLOPE)(RWY 12)
LOM (COMPASS LOCATOR AT OUTER MARKER)(RWY 12)
MALS (MEDIUM INTENSITY APPROACH LIGHTING SYSTEMS WITH RUNWAY ALIGNMENT INDICATOR LIGHTS)(RWY 12)
OM (OUTER MARKER)(RWY 30)
RCO (REMOTE COMMUNICATIONS OUTLET)
REIL (RUNWAY END IDENTIFIER LIGHTING)(RWY 30)
TDS
VASI (VISUAL APPROACH SLOPE INDICATOR)
VOR (VHF OMNIDIRECTIONAL RANGE)

ALL WEATHER WIND COVERAGE				
Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 12-30	83.50%	90.30%	98.78%	98.55%
Runway 18-36	82.69%	89.27%	94.96%	98.09%
All Runways	95.62%	98.19%	99.36%	99.86%



1 PAVEMENT STRENGTHS ARE EXPRESSED IN SINGLE (S), DUAL (D), DUAL TANDEM (2D) WHEEL LOAD CAPACITIES

TAXIWAY/TAXILANE DATA TABLE

Per SOP-2 Item D-26 on pg. A-17: List any objects located inside the TWY/TLN OFA. Also provide the distance from the TWY/TLN centerline to the fixed or movable object.

SPENCER MUNICIPAL AIRPORT

SPENCER, IOWA

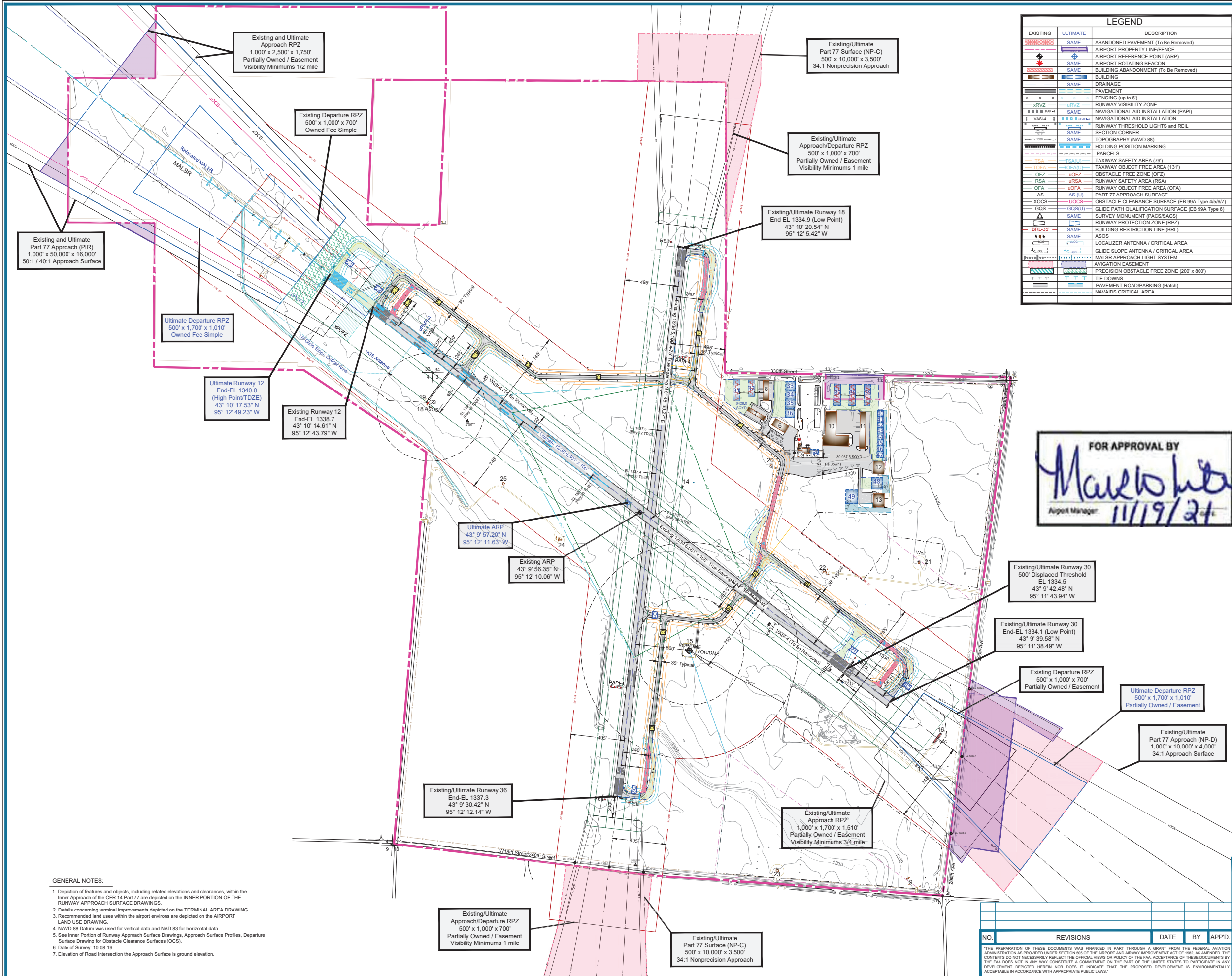
APPROVED BY: M. Dmyterko

November 2021

SHEET 2 OF 16

Coffman Associates
Airport Consultants
www.coffmanassociates.com

Coffman Associates C:\Users\Maggie Beaver\Documents\Projects\Spencer Airport\ALP\ALP_2021.dwg Printed Date: 11-15-21 01:45:50 PM Maggie Beaver



LEGEND		
EXISTING	ULTIMATE	DESCRIPTION
		ABANDONED PAVEMENT (To Be Removed)
		AIRPORT PROPERTY LINE/FENCE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		BUILDING ABANDONMENT (To Be Removed)
		BUILDING
		DRAINAGE
		PAVEMENT
		FENCING (up to 6')
		RUNWAY VISIBILITY ZONE
		NAVIGATIONAL AID INSTALLATION (PAPI)
		NAVIGATIONAL AID INSTALLATION
		RUNWAY THRESHOLD LIGHTS and REEL
		SECTION CORNER
		TOPOGRAPHY (NAVD 88)
		HOLDING POSITION MARKING
		PARCELS
		TAXIWAY SAFETY AREA (TSA)
		TAXIWAY OBJECT FREE AREA (TOFA)
		OBSTACLE FREE ZONE (OFZ)
		RUNWAY SAFETY AREA (RSA)
		RUNWAY OBJECT FREE AREA (OFA)
		PART 77 APPROACH SURFACE
		OBSTACLE CLEARANCE SURFACE (EB 99A Type 4/5/6/7)
		OBSTACLE CLEARANCE SURFACE (EB 99A Type 6)
		GLIDE PATH QUALIFICATION SURFACE (EB 99A Type 6)
		SURVEY MONUMENT (PACS/SACS)
		RUNWAY PROTECTION ZONE (RPZ)
		BUILDING RESTRICTION LINE (BRL)
		ASOS
		LOCALIZER ANTENNA / CRITICAL AREA
		GLIDE SLOPE ANTENNA / CRITICAL AREA
		MALS APPROACH LIGHT SYSTEM
		AVIGATION EASEMENT
		PRECISION OBSTACLE FREE ZONE (200' x 800')
		TIE-DOWNS
		PAVEMENT ROAD/PARKING (Hatch)
		NAVD83 CRITICAL AREA

EXISTING FACILITIES		
NO.	DESCRIPTION	ELEVATION (Top MSL)
1	TERMINAL BUILDING	1342.2'
2	FBO OFFICE	1362.5'
3	FLAG POLE	1371.1'
4	FUEL PUMP	1338.5'
5	AIRPORT ROTATING BEACON	1390.3'
6	CONVENTIONAL HANGAR	1365.2'
7	T-HANGAR (6 units)	1348.5'
8	T-HANGAR (8 units)	1351.8'
9	WELL	1343.5'
10	MAINTENANCE HANGAR	1365.6'
11	T-HANGAR (15 units)	1350.6'
12	CAMMAIR HANGAR	1359.1'
13	SPENCER AVIONICS HANGAR	1359.5'
14	WINDSOCK	1354.4'
15	VOR/DME	1348.5'
16	LOCALIZER ANTENNA	1337.9'
17	LOCALIZER DME	1340.9'
18	ASOS	1348.4'
19	GLIDE SLOPE ANTENNA	1346.2'
20	ELECTRICAL VAULT	1343.9'
21	WELL	1343.4'
22	WELL	1344.6'
23	WELL	1343.5'
24	WELL	1345.1'
25	WELL	1348.2'

ULTIMATE BUILDINGS/FACILITIES		
NO.	DESCRIPTION	ELEVATION (MSL)
30	TERMINAL EXPANSION	25' AGL
31	T-HANGAR (8 UNIT)	22' AGL
32	T-HANGAR (8 UNIT)	22' AGL
33	SRE BUILDING	30' AGL
34	EXECUTIVE HANGAR	30' AGL
35	EXECUTIVE HANGAR	30' AGL
36	EXECUTIVE HANGAR	30' AGL
37	T-HANGAR (8 UNIT)	30' AGL
38	T-HANGAR (8 UNIT)	25' AGL
39	T-HANGAR (8 UNIT)	25' AGL
40	EXECUTIVE HANGAR	25' AGL
41	EXECUTIVE HANGAR	25' AGL
42	EXECUTIVE HANGAR	25' AGL
43	EXECUTIVE HANGAR	25' AGL
44	EXECUTIVE HANGAR	25' AGL
45	EXECUTIVE HANGAR	25' AGL
46	EXECUTIVE HANGAR	25' AGL
47	EXECUTIVE HANGAR	25' AGL
48	CONVENTIONAL HANGAR	30' AGL
49	CONVENTIONAL HANGAR	30' AGL

FOR APPROVAL BY

Marek White

Airport Manager: 11/19/21

FAA APPROVAL STAMP

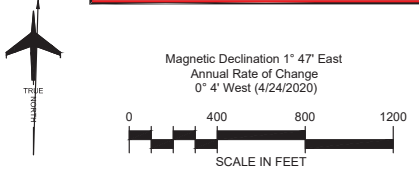
CONDITIONAL APPROVAL

The approval of this ALP is limited to existing facilities only (or those specific areas that FAA retains approval authority). Under Title 49 U.S.C. § 4710(a)(16) (as revised per section 163(d) of Pub.L. 115-254), FAA will separately determine whether it retains approval authority for each individual proposed facility depicted on the ALP before construction occurs and whether or not environmental review is required under NEPA. This is more fully described in our approval letter dated **December 7, 2021**. This approval action does not imply any commitment for Federal funding, or approval of future structures requiring notice under FAR Part 77.

Jeffrey D. Detering

Digitally signed by JEFFREY DETERING
Date: 2021.12.07 06:09:20 -06'00'

Airport Planner, FAA Central Region



SPENCER MUNICIPAL AIRPORT

AIRPORT LAYOUT PLAN DRAWING

SPENCER, IOWA

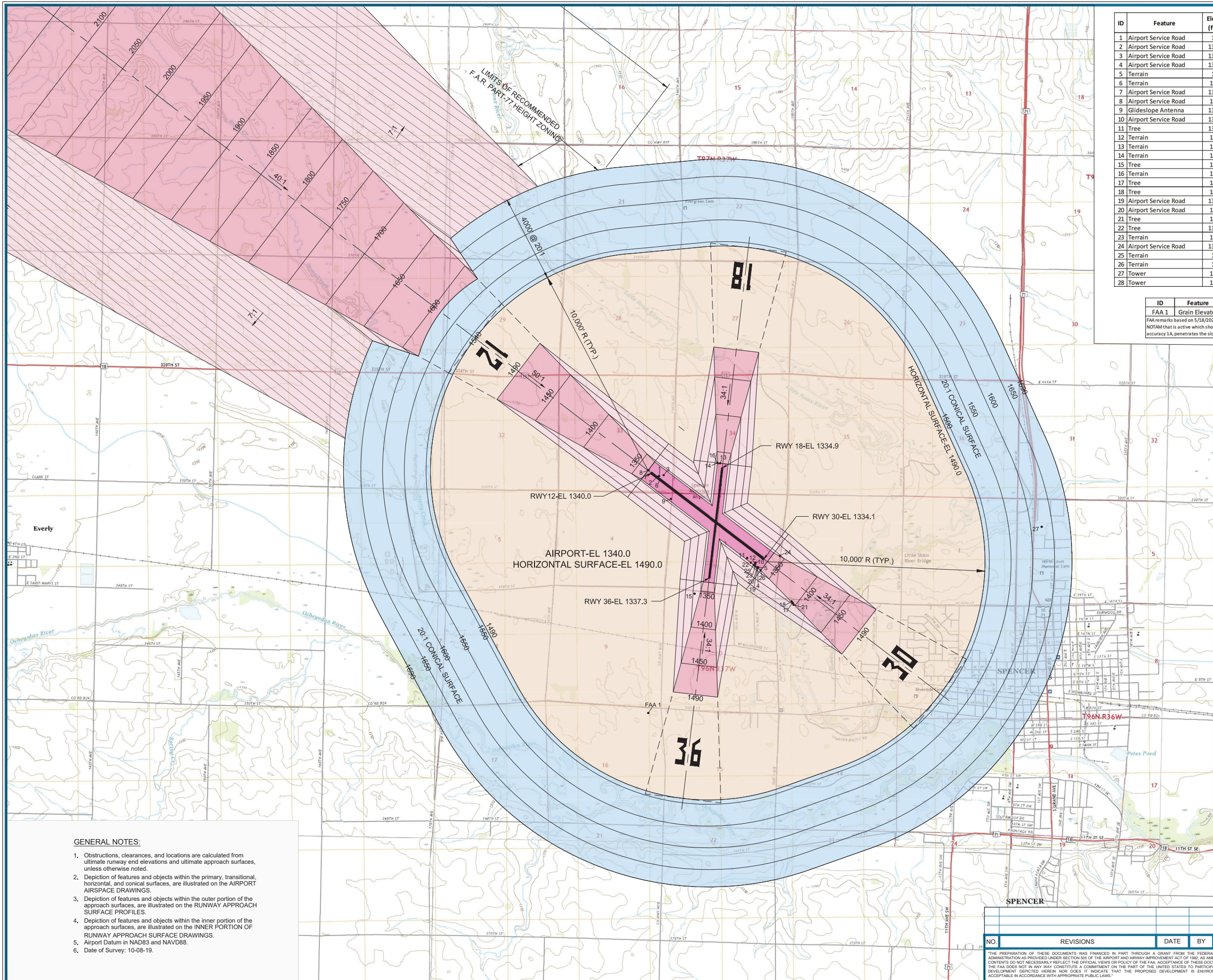
PLANNED BY: C. Burks
DETAILED BY: M. Beaver
APPROVED BY: M. Dmyterko

November 2021 SHEET 3 OF 16



NO.	REVISIONS	DATE	BY	APP'D.

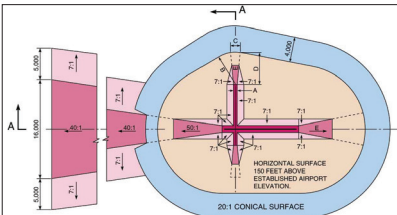
THE PREPARATION OF THESE DOCUMENTS WAS FINANCED IN PART THROUGH A GRANT FROM THE FEDERAL AVIATION ADMINISTRATION AS PROVIDED UNDER SECTION 605 OF THE AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982, AS AMENDED. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THESE DOCUMENTS BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED HEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.



ID	Feature	Elevation (ft. msl.)	AGL (ft.)	Surface Obstructed	Penetration Value (ft.)	Proposed Disposition
1	Airport Service Road	1347.7	10	Primary	8.97	To Remain - Airport Controlled Road
2	Airport Service Road	1348.205	10	Primary	9.48	To Remain - Airport Controlled Road
3	Airport Service Road	1347.828	10	Primary	9.09	To Remain - Airport Controlled Road
4	Airport Service Road	1345.206	10	Primary	11.17	To Remain - Airport Controlled Road
5	Terrain	1337.4	N/A	Primary	3.36	Re-Grade
6	Terrain	1339.02	N/A	Primary	0.29	Re-Grade
7	Airport Service Road	1348.457	10	Primary	9.74	To Remain - Airport Controlled Road
8	Airport Service Road	1348.36	10	Primary	9.64	To Remain - Airport Controlled Road
9	Glideslope Antenna	1383.213	46.74	Primary	44.39	To Remain - No Action Required
10	Airport Service Road	1342.493	10	Primary	8.47	To Remain - Airport Controlled Road
11	Tree	1338.855	9.72	Primary	4.08	Remove
12	Terrain	1337.34	N/A	Primary	3.29	Re-Grade
13	Terrain	1335.84	N/A	Primary	0.92	Re-Grade
14	Terrain	1335.48	N/A	Primary	0.56	Re-Grade
15	Tree	1397.46	61.26	Transitional	61.26	Remove
16	Terrain	1335.96	N/A	Transitional	0.85	Re-Grade
17	Tree	1415.64	91.62	Transitional	15.55	Remove
18	Tree	1408.14	83.4	Transitional	11.69	Remove
19	Airport Service Road	1345.239	10	Transitional	10.82	To Remain - Airport Controlled Road
20	Airport Service Road	1345.25	10	Transitional	9.36	To Remain - Airport Controlled Road
21	Tree	1412.46	89.4	Transitional	5.33	Remove
22	Tree	1339.612	8.46	Transitional	4.84	Remove
23	Terrain	1337.22	N/A	Transitional	1.73	Re-Grade
24	Airport Service Road	1346.656	15	Transitional	0.91	To Remain - Airport Controlled Road
25	Terrain	1335.6	N/A	Transitional	0.67	Re-Grade
26	Terrain	1335.3	N/A	Transitional	0.54	Re-Grade
27	Tower	1718.82	394.56	Conical	94.61	Obstruction Lighted - No Action Required
28	Tower	1723.14	382.2	Conical	139.37	Obstruction Lighted - No Action Required

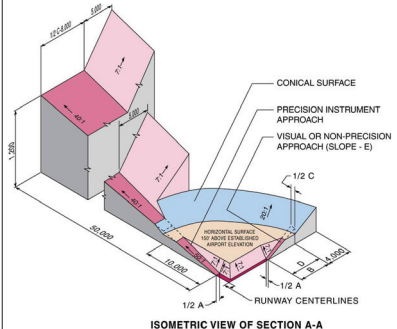
ID	Feature	Latitude	Longitude	Elevation (ft. msl.)	Survey Source
FAA 1	Grain Elevator	43° 8' 28.580" N	95° 12' 48.380" W	1,452.96	Survey ID: SPW-258110

FAA remarks based on 5/18/2021 obstacle survey: The RNAV GPS RWY 36 will be increased from DA 1588/HAT 250 to DA 1732/394. There is a NOTAM that is active which shows the increase for the UNAV/VNAV. Elevator: 19-062458, 430828.58N/0951248.38W, 124 FT AGL/1453 FT MSL accuracy 1A penetrates the sloping surface by 0.27 FT



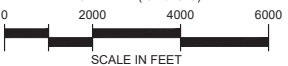
DIM	ITEM	DIMENSIONAL STANDARDS (FEET)							
		VISUAL RUNWAY				NON-PRECISION INSTRUMENT RUNWAY			
		A	B	A	B	C	D		
A	WIDTH OF PRIMARY SURFACE AND APPROACH SURFACE WIDTH AT INNER END	250	500	500	500	1,000	1,000		
B	RADIUS OF HORIZONTAL SURFACE	5,000	5,000	5,000	5,000	10,000	10,000		
		VISUAL APPROACH				NON-PRECISION INSTRUMENT APPROACH			
		A	B	A	B	C	D		
C	APPROACH SURFACE WIDTH AT END	1,200	1,500	2,000	3,500	4,000	16,000		
D	APPROACH SURFACE LENGTH	5,000	5,000	5,000	10,000	10,000			
E	APPROACH SLOPE	20:1	20:1	20:1	34:1	34:1			

- A - UTILITY RUNWAYS
B - RUNWAYS LARGER THAN UTILITY
C - VISIBILITY MINIMUMS GREATER THAN 3/4 MILE
D - VISIBILITY MINIMUMS AS LOW AS 3/4 MILE
E - PRECISION INSTRUMENT APPROACH SLOPE IS 50:1 FOR INNER 10,000 FEET AND 40:1 FOR AN ADDITIONAL 40,000 FEET



SOURCE: 14 CFR Part 77, Section 77.25, Civil Airport Imaginary Surfaces.

Magnetic Declination 1° 47' East
Annual Rate of Change
0° 4' West (4/24/2020)



SPENCER MUNICIPAL AIRPORT AIRPORT AIRSPACE DRAWING I

SPENCER, IOWA

PLANNED BY: C. Burks
DETAILED BY: M. Beaver
APPROVED BY: M. Dmyterko

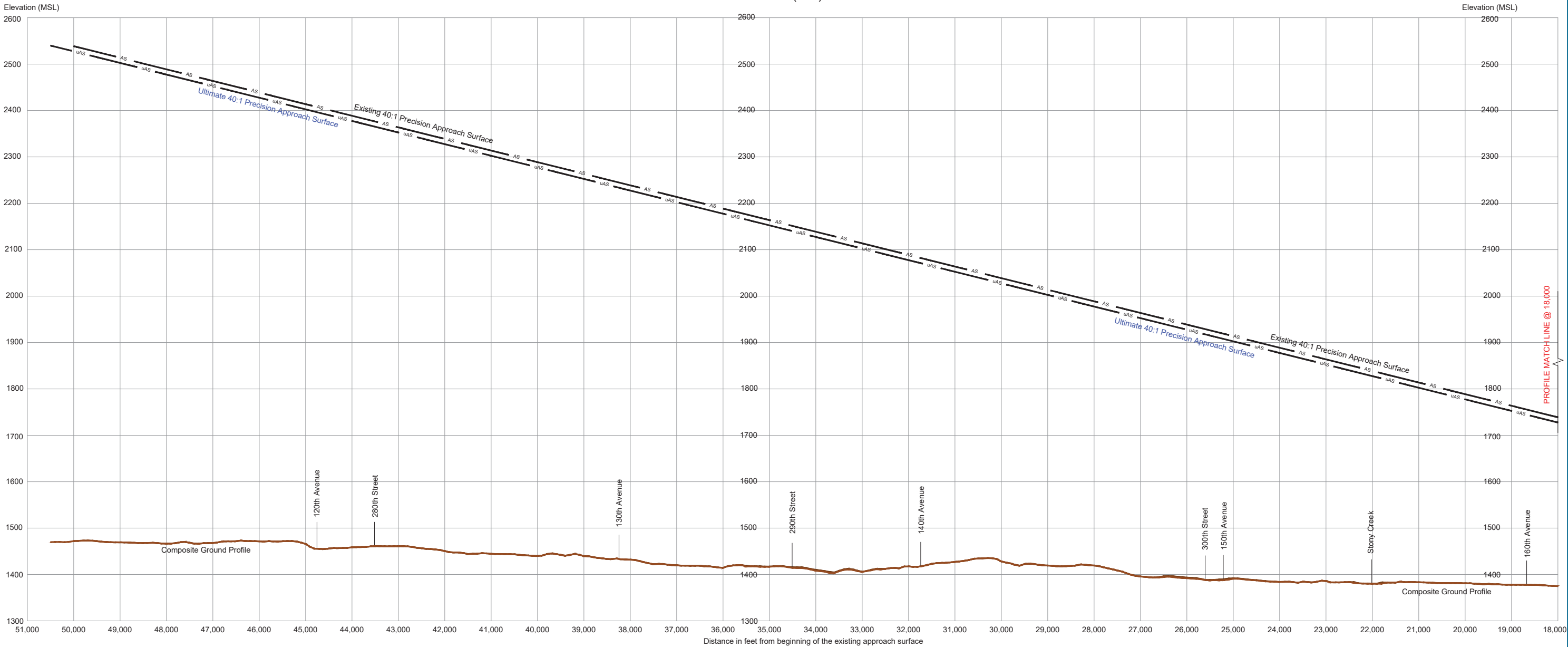
November 2021 SHEET 4 OF 16



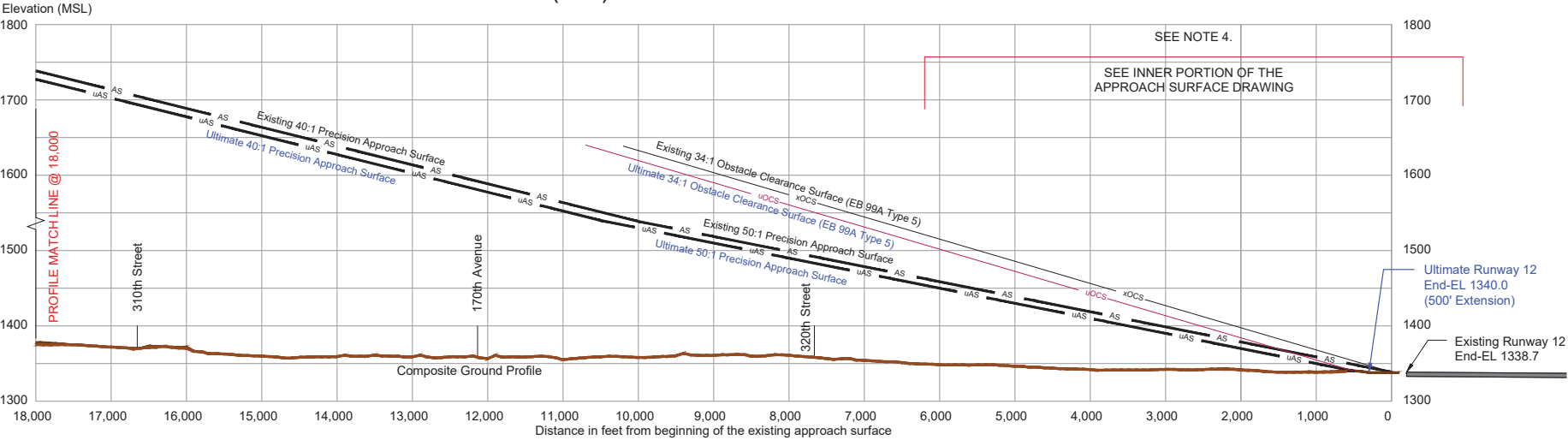
NO.	REVISIONS	DATE	BY	APPD.

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RUNWAY 12 (PIR) APPROACH SURFACE

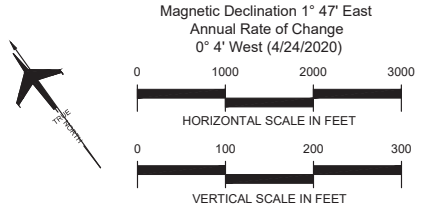


RUNWAY 12 (PIR) APPROACH SURFACE



OUTER PORTION OF RUNWAY 12 OBSTRUCTION TABLE					
No.	Description	Elevation Top MSL	Part 77 Approach Surface Penetration	Existing Obstacle Clearance Surface Penetration	Ultimate Obstacle Clearance Surface Penetration
	None				

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 - Depiction of features and objects within the primary, transitional, horizontal, and conical surfaces, are illustrated on the AIRPORT AIRSPACE DRAWINGS.
 - Depiction of features and objects within the outer portion of the approach surfaces, are illustrated on the RUNWAY APPROACH SURFACE PROFILES.
 - Depiction of features and objects within the inner portion of the approach surfaces, are illustrated on the INNER PORTION OF RUNWAY APPROACH SURFACE DRAWINGS.
 - Vertical Datum NAVD 88 and Horizontal Datum NAD 83.
 - FAA Memorandum July 24, 2020, All Airports Regional Division Managers, Engineering Brief No. 99A. This Engineering Brief (EB) provides the latest versions of Table 3-2 (Approach and Departure Standards) and Table 3-4 (Standards for Instrument Approach Procedures). Reference the tables in this EB until a new version of Advisory Circular (AC) 150/5300-13A Airport Design, is published.
 - Date of Survey: 10-08-19.



NO.	REVISIONS	DATE	BY	APPD.

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SPENCER MUNICIPAL AIRPORT

APPROACH SURFACE PROFILE I

SPENCER, IOWA

PLANNED BY: C. Burks

DETAILED BY: M. Beaver

APPROVED BY: M. Dmyterko

November 2021

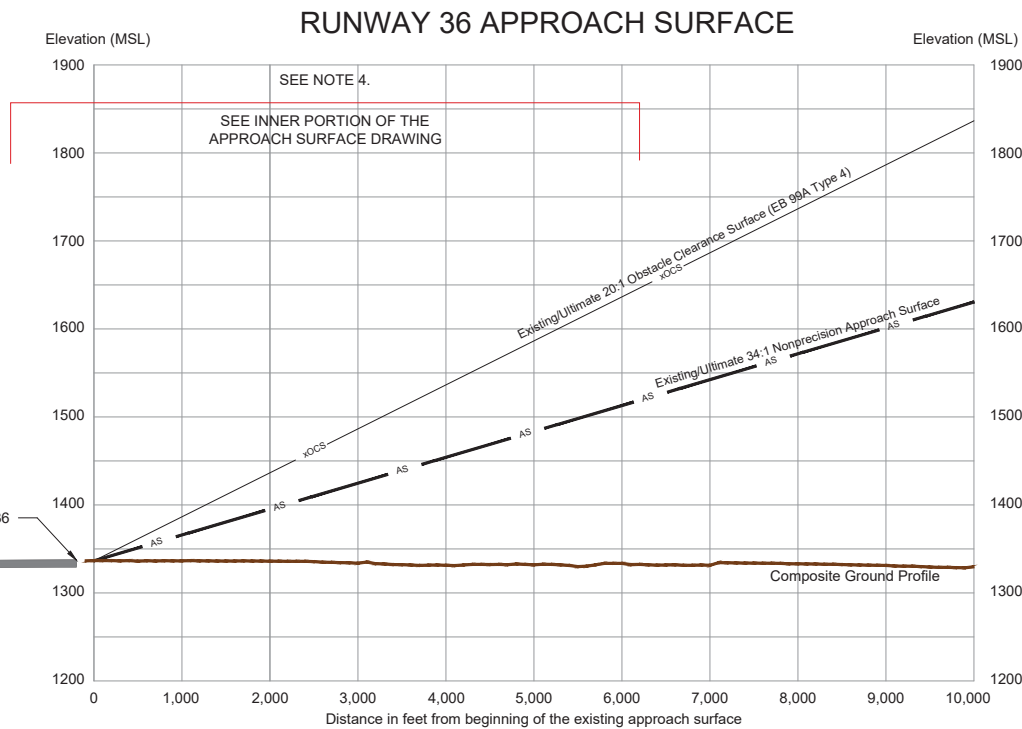
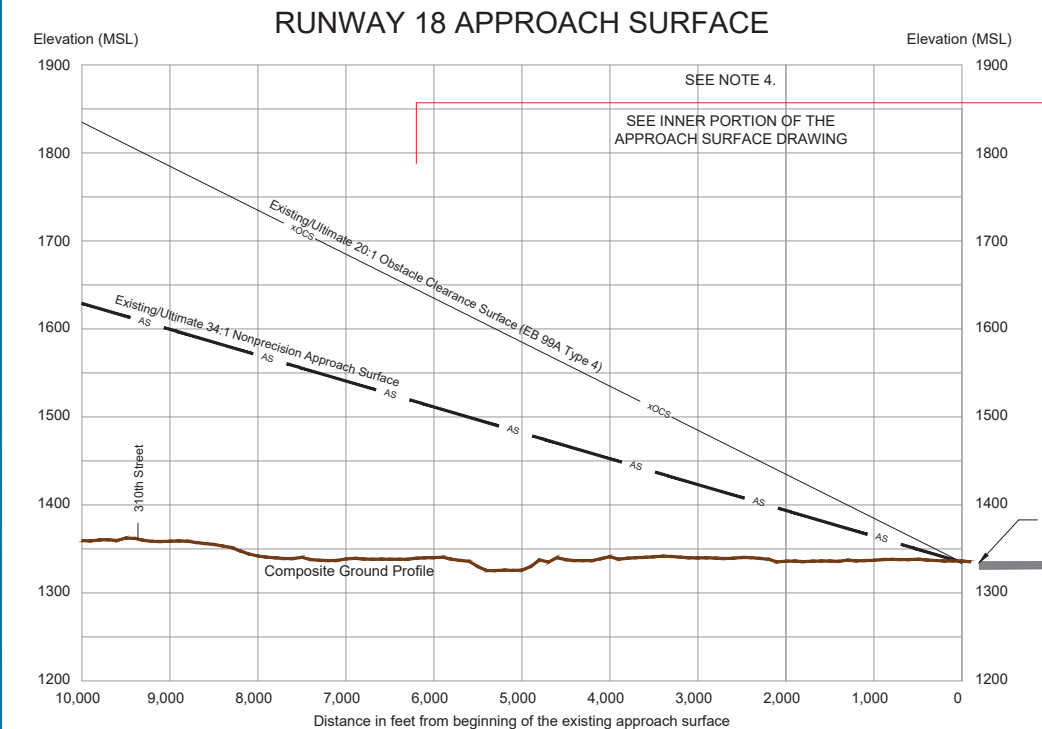
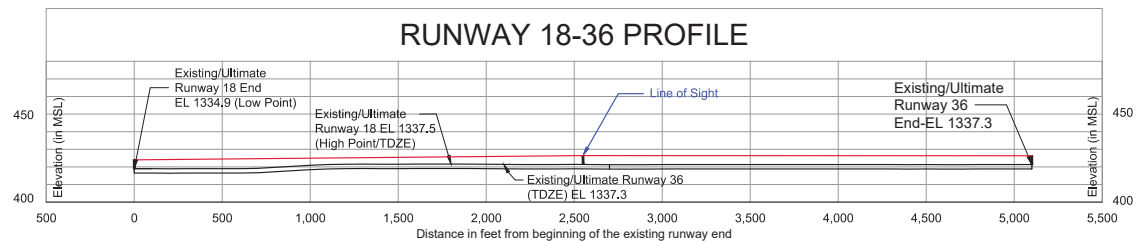
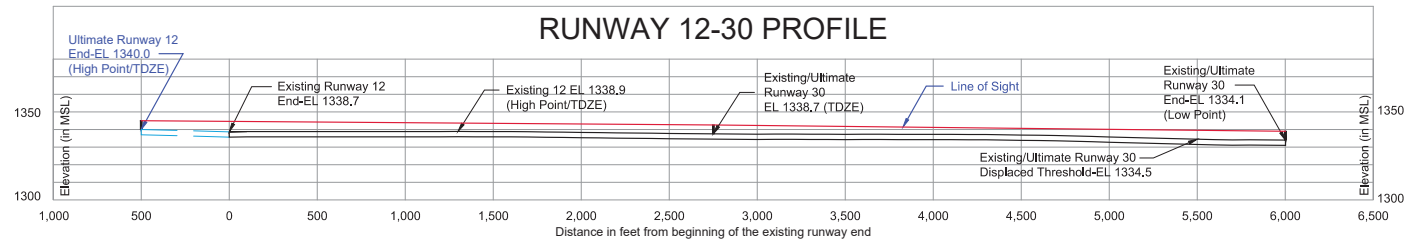
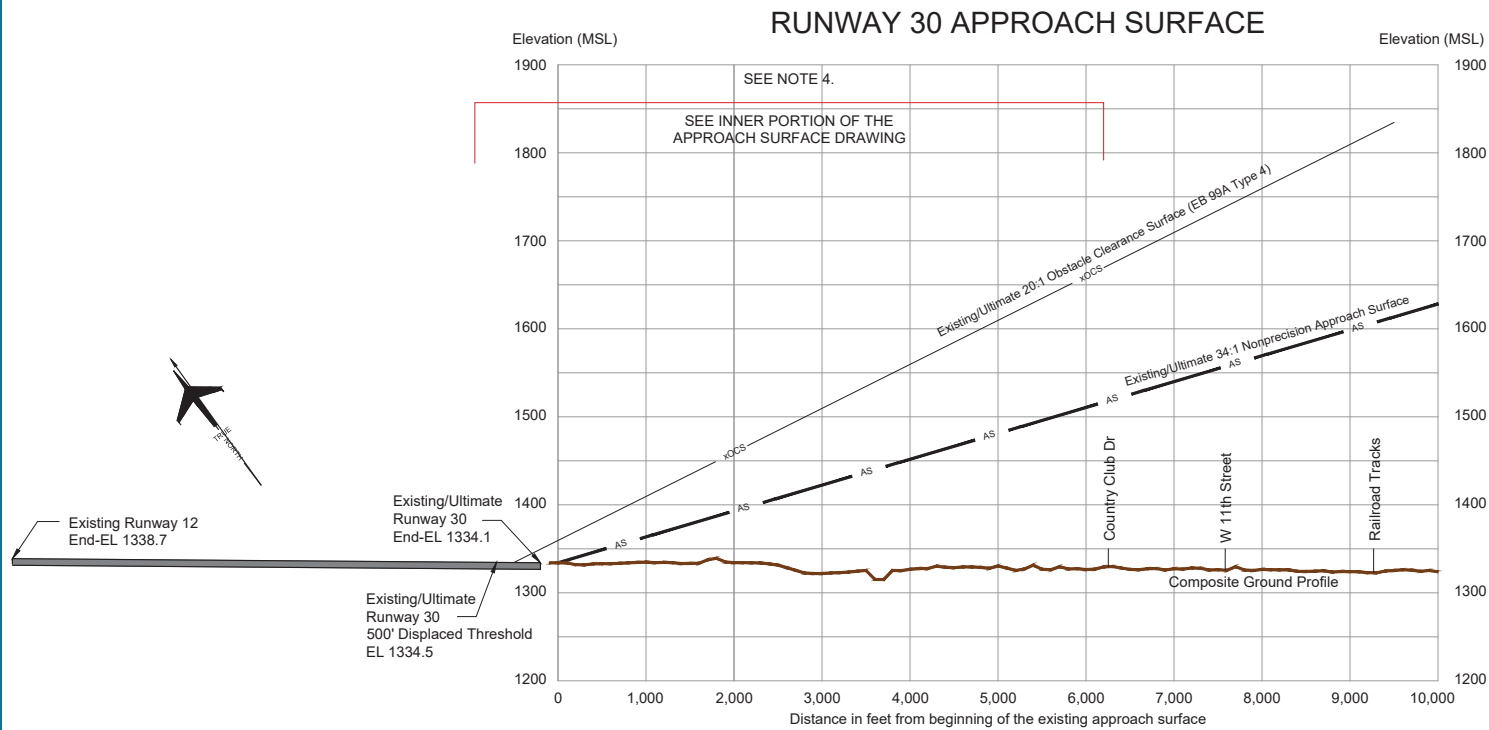
SHEET 6 OF 16

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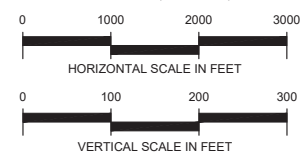
C:\Users\Magpie Beaver\Coffman Associates, Inc\Coffman - SP_Municipal Airport - 2021.dwg Printed Date: 11-18-21 01:45:18 PM Magpie Beaver



GENERAL NOTES:

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- Vertical Datum NAVD 88 and Horizontal Datum NAD 83.
- FAA Memorandum July 24, 2020, All Airports Regional Division Managers, Engineering Brief No. 99A. This Engineering Brief (EB) provides the latest versions of Table 3-2 (Approach and Departure Standards) and Table 3-4 (Standards for Instrument Approach Procedures). Reference the tables in this EB until a new version of Advisory Circular (AC) 150/5300-13A Airport Design, is published.
- Date of Survey: 10-08-19.

Magnetic Declination 1° 47' East
Annual Rate of Change
0° 4' West (4/24/2020)



OUTER PORTION OF RUNWAY 13 OBSTRUCTION TABLE						
No.	Description	Elevation Top MSL	Part 77 Approach Surface Penetration	Existing Obstacle Clearance Surface Penetration	Ultimate Obstacle Clearance Surface Penetration	Proposed Remediation
	None					

OUTER PORTION OF RUNWAY 36 OBSTRUCTION TABLE						
No.	Description	Elevation Top MSL	Part 77 Approach Surface Penetration	Existing Obstacle Clearance Surface Penetration	Ultimate Obstacle Clearance Surface Penetration	Proposed Remediation
	None					

REVISIONS					DATE	BY	APPD.
NO.							
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SPENCER MUNICIPAL AIRPORT

APPROACH SURFACE PROFILE II

SPENCER, IOWA

PLANNED BY: C. Burks

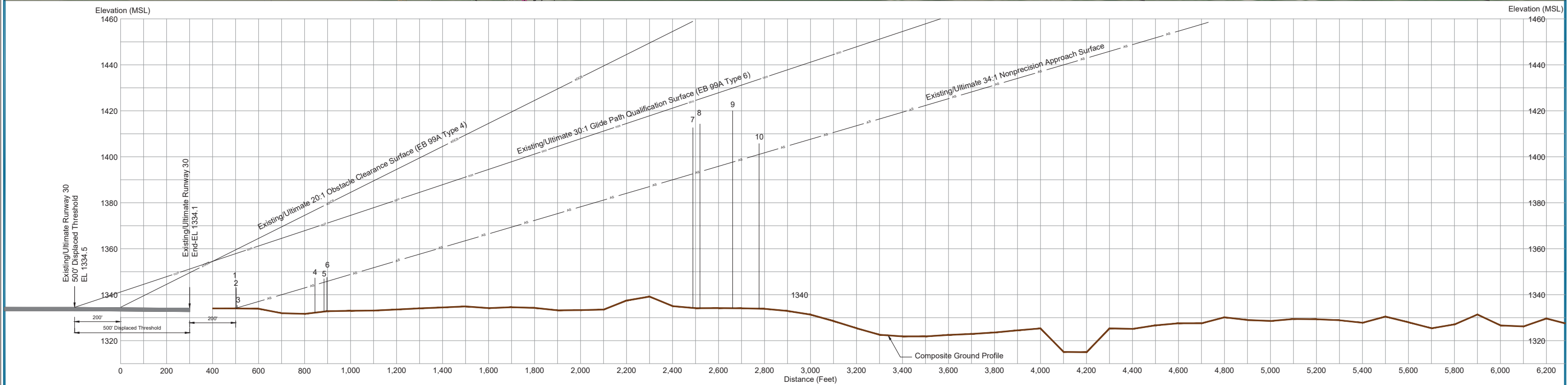
DETAILED BY: M. Beaver

APPROVED BY: M. Dmyterko

November 2021

SHEET 7 OF 16

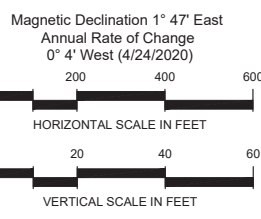




Survey date for Spencer is October 8, 2019.

Runway 30 Obstruction Table					
ID	Feature	Elevation (ft. msl.)	Penetration Value (ft.)		Proposed Disposition
			Part 77 Approach Surface	OCS #6	
1	Airport Service Road	1,342.68	8.56	N/A	To Remain - Airport Controlled Road
2	Airport Service Road	1,343.19	9.07	N/A	To Remain - Airport Controlled Road
3	Terrain	1,335.42	1.15	N/A	Re-Grade
4	200th Avenue	1,347.27	3.06	N/A	To remain
5	200th Avenue	1,346.90	1.53	N/A	To remain
6	200th Avenue	1,347.53	1.79	N/A	To remain
7	Tree	1,412.64	20.09	N/A	Remove
8	Tree	1,414.26	20.81	N/A	Remove
9	Tree	1,420.08	22.45	N/A	Remove
10	Tree	1,405.74	4.74	N/A	Remove

- GENERAL NOTES:
- Obstructions, clearances, and locations are calculated from ultimate runway end elevations and ultimate approach surfaces, unless otherwise noted. Road obstructions reflect a safety clearance of 10' for dirt Roads or private Roads, 15' for non-interstate Roads, 17' for interstate Roads, and 23' for railroad.
 - Depiction of features and objects within the primary, outer-approach, transitional, horizontal, and conical, Part 77 surfaces, are illustrated on the AIRPORT AIRSPACE DRAWING.
 - Vertical Datum NAVD 88 and Horizontal Datum NAD 83.
 - Obstruction grid shows locations with multiple obstructions. Each full grid square is 200' x 200' and contains the most penetrating terrain, and/or natural, and/or manmade feature.
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NO.	REVISIONS	DATE	BY	APPD.

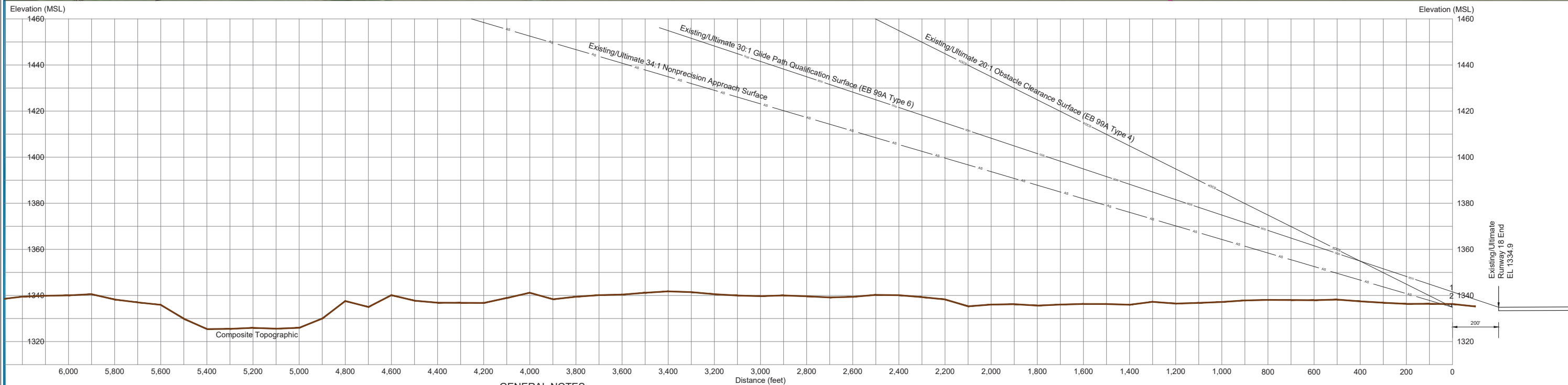
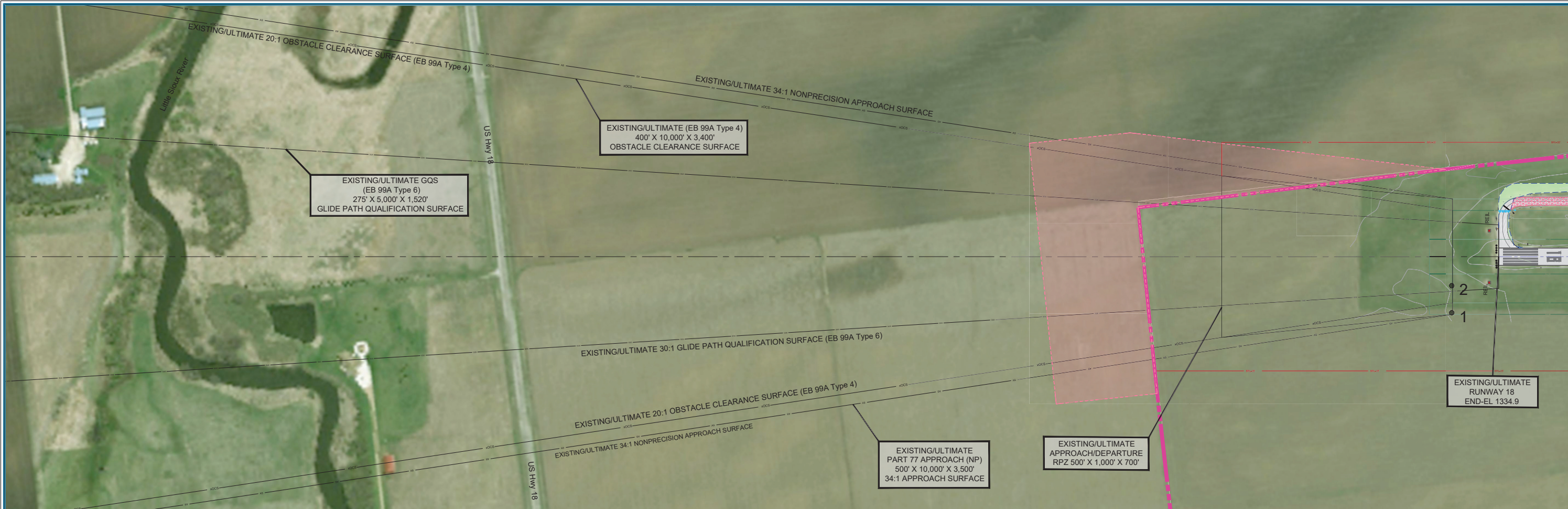
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SPENCER MUNICIPAL AIRPORT
INNER PORTION OF RUNWAY 30
APPROACH SURFACE DRAWING
SPENCER, IOWA

PLANNED BY: C. Burks
DETAILED BY: M. Beaver
APPROVED BY: M. Dmyterko

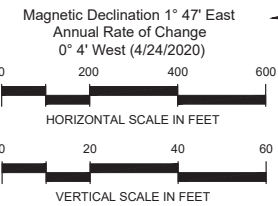
November 2021 SHEET 9 OF 16

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GENERAL NOTES:

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Survey date for Spencer is October 8, 2019.

Runway 18 Obstruction Table						
ID	Feature	Elevation (ft. msl.)	Penetration Value (ft.)			Proposed Disposition
			Part 77 Approach Surface	OCS #6	OCS #4	
1	Terrain	1,335.96	0.93	N/A	N/A	Re-Grade
2	Terrain	1,336.02	0.98	N/A	0.89	Re-Grade

SPENCER MUNICIPAL AIRPORT

INNER PORTION OF RUNWAY 18

APPROACH SURFACE DRAWING

SPENCER, IOWA

PLANNED BY: C. Burks

DETAILED BY: M. Beaver

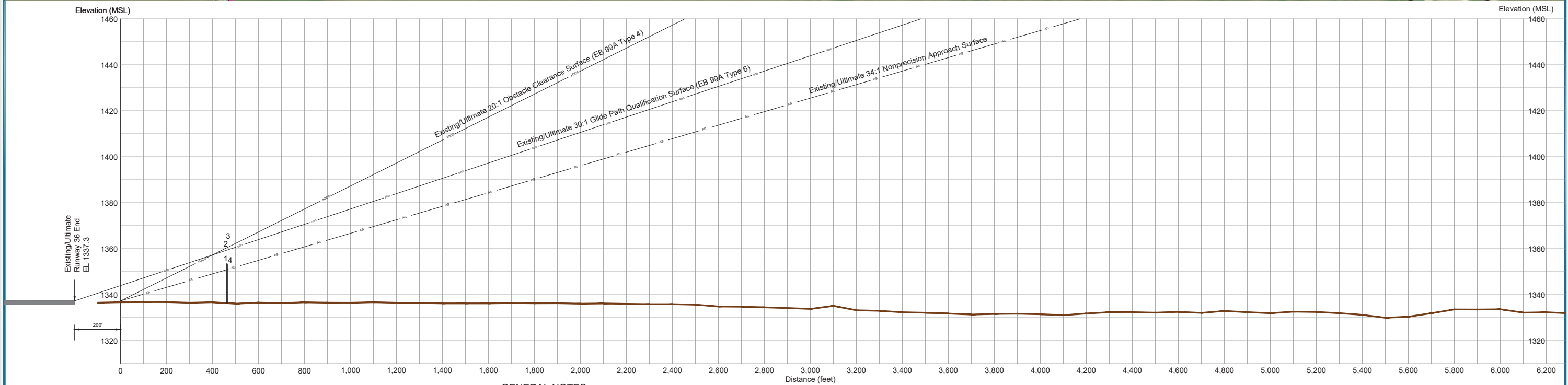
APPROVED BY: M. Dmyterko

November 2021

SHEET 10 OF 16



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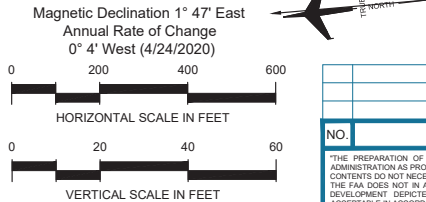


GENERAL NOTES:

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Survey date for Spencer is October 8, 2019.

Runway 36 Obstruction Table						
ID	Feature	Elevation (ft. msl.)	Penetration Value (ft.)			Proposed Disposition
			Part 77 Approach Surface	OCS #6	OCS #4	
1	W 18th Street/340th Street	1,353.68	2.85	N/A	N/A	To Remain
2	W 18th Street/340th Street	1,353.51	2.62	N/A	N/A	To Remain
3	W 18th Street/340th Street	1353.44	2.48	N/A	N/A	To Remain
4	W 18th Street/340th Street	1353.37	2.35	N/A	N/A	To Remain



SPENCER MUNICIPAL AIRPORT

INNER PORTION OF RUNWAY 30

APPROACH SURFACE DRAWING

SPENCER, IOWA

PLANNED BY: C. Burks

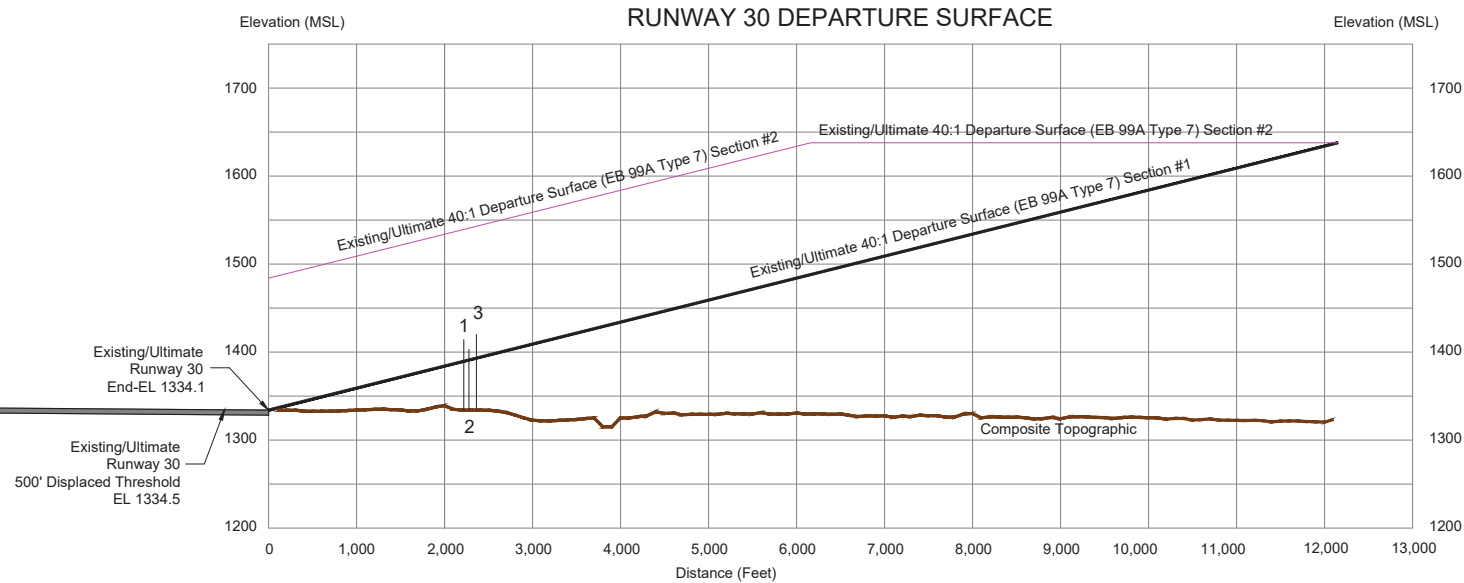
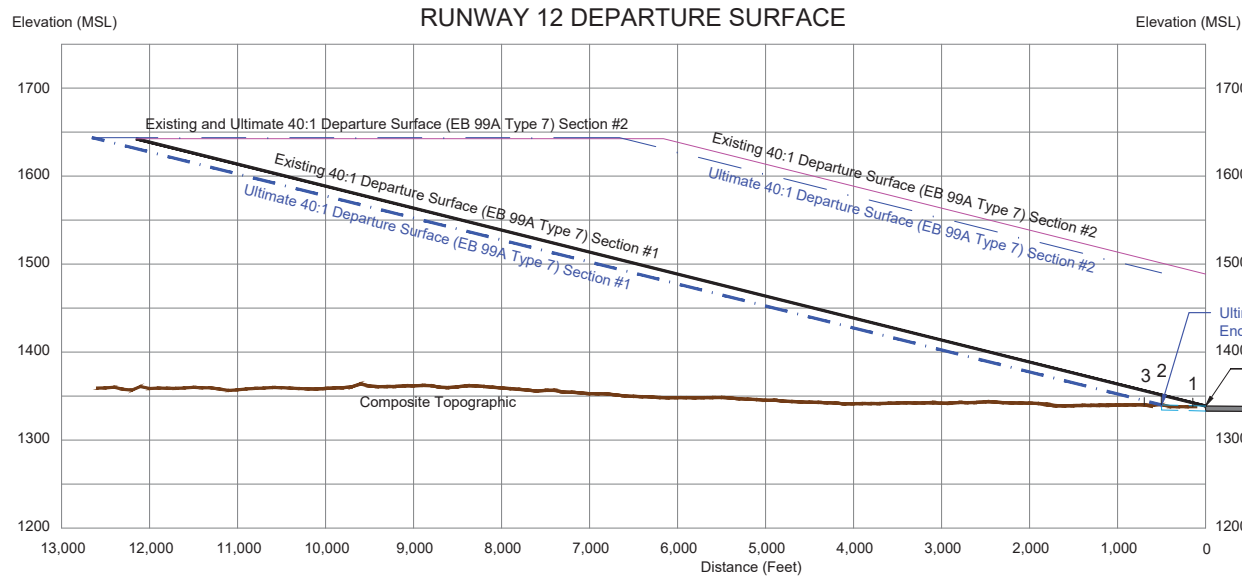
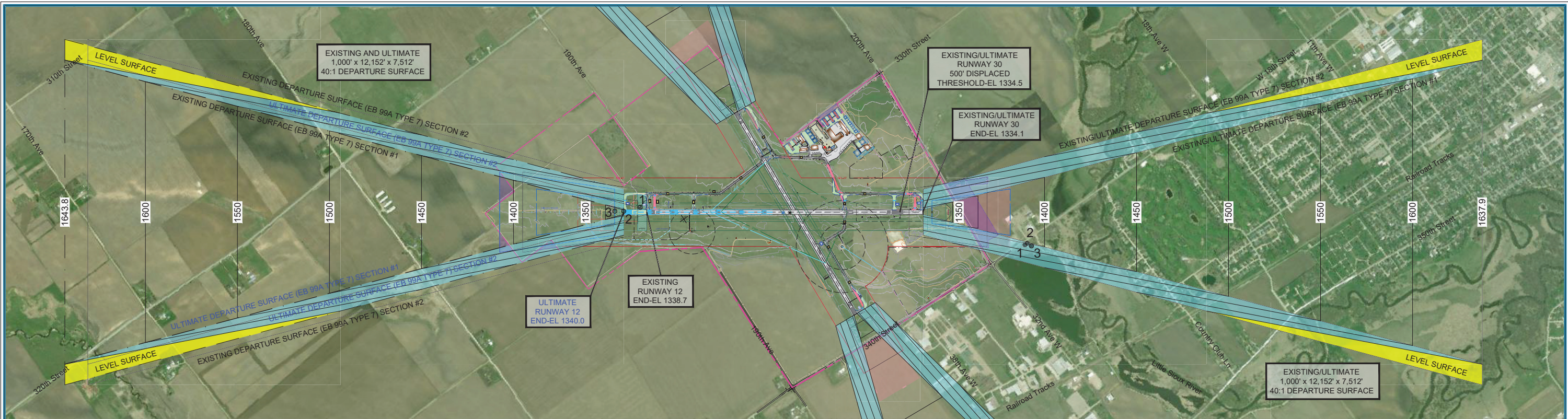
DETAILED BY: M. Beaver

APPROVED BY: M. Dmyterko

November 2021

SHEET 11 OF 16

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GENERAL NOTES:

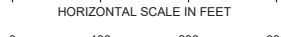
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- Date of Survey: 10-08-19.

Runway 12 End Departure Obstruction Table					
ID	Feature	Elevation (ft. msl.)	Existing Penetration Value (ft.)	Ultimate Penetration Value (ft.)	Proposed Disposition
1	Airport Service Road	1,347.74	0.76	N/A	To Remain - Airport Controlled Road
2	Airport Service Road	1,352.82	N/A	9.69	To Remain - Airport Controlled Road
3	Airport Service Road	1,348.46	N/A	8.06	To Remain - Airport Controlled Road

Runway 30 End Departure Obstruction Table					
ID	Feature	Elevation (ft. msl.)	Penetration Value (ft.)	Proposed Disposition	
1	Tree	1,414.26	3.09	To Remain - Airport Controlled Road	
2	Tree	1,403.01	6.60	To Remain - Airport Controlled Road	
3	Tree	1,420.08	10.29	To Remain - Airport Controlled Road	



Magnetic Declination 1° 47' East
Annual Rate of Change
0° 4' West (4/24/2020)



REVISIONS					DATE	BY	APPD.
NO.							
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SPENCER MUNICIPAL AIRPORT

RUNWAY 12-30

DEPARTURE SURFACE DRAWING

SPENCER, IOWA

PLANNED BY: C. Burks

DETAILED BY: M. Beaver

APPROVED BY: M. Dmyterko

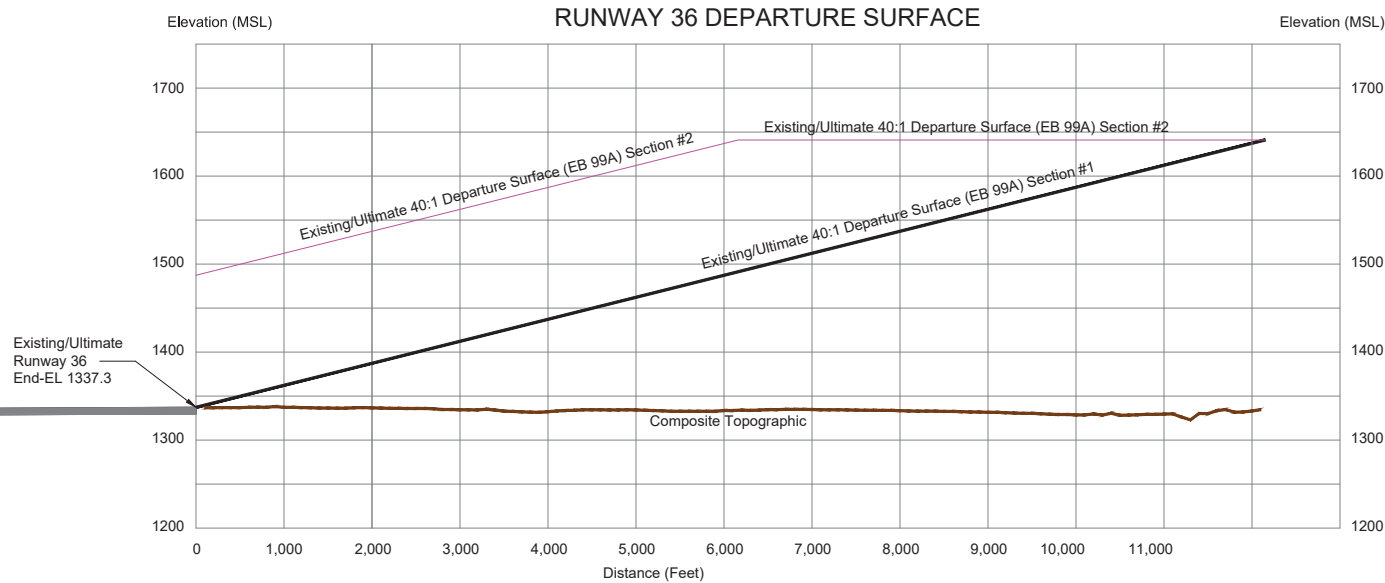
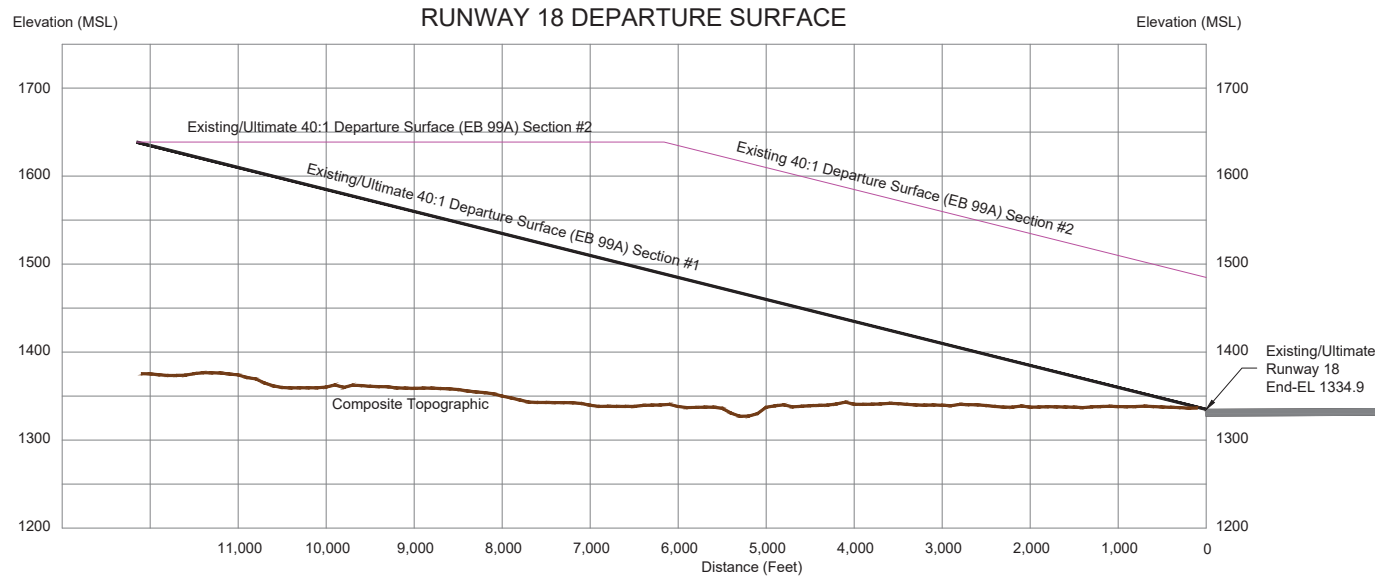
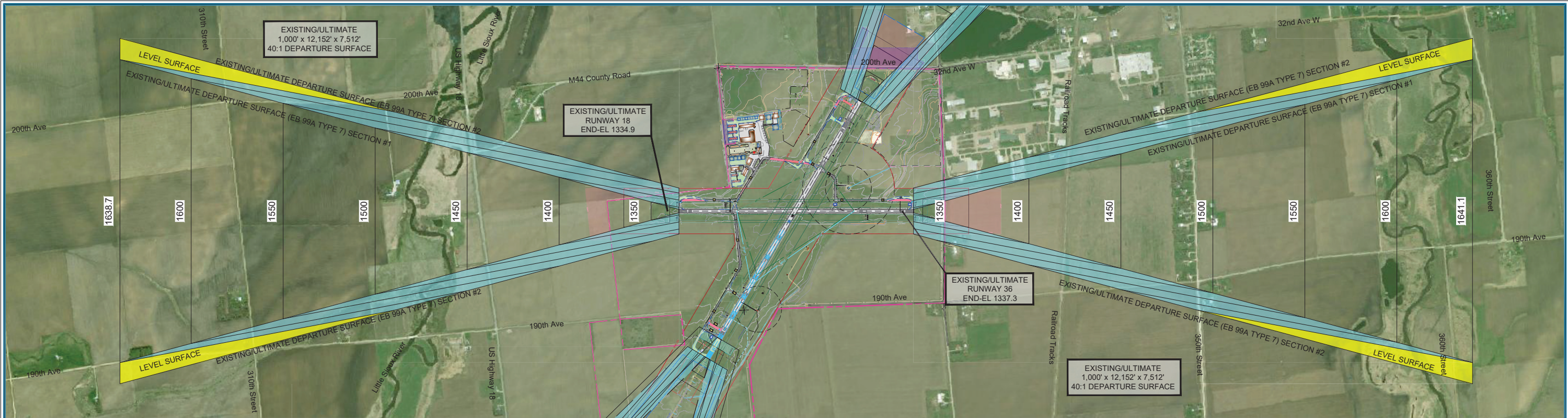
November 2021

SHEET 12 OF 16

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GENERAL NOTES:

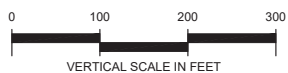
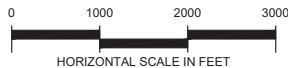
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- Date of Survey: 10-08-19.

Runway 18 End Departure Obstruction Table				
ID	Feature	Elevation (ft. msl.)	Penetration Value (ft.)	Proposed Disposition
No Obstructions				

Runway 36 End Departure Obstruction Table				
ID	Feature	Elevation (ft. msl.)	Penetration Value (ft.)	Proposed Disposition
No Obstructions				



Magnetic Declination 1° 47' East
Annual Rate of Change
0° 4' West (4/24/2020)



NO.	REVISIONS	DATE	BY	APPD.
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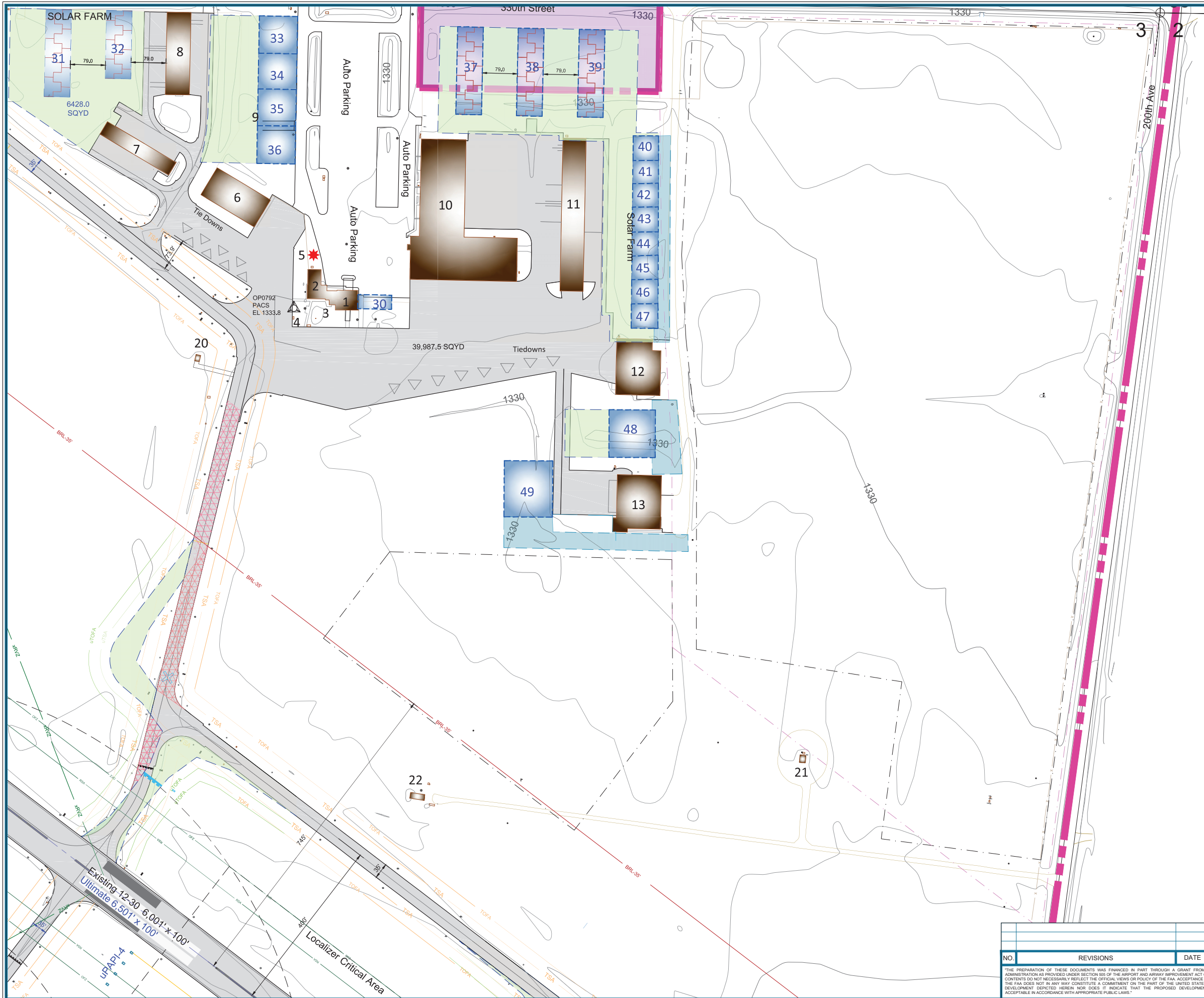
SPENCER MUNICIPAL AIRPORT
RUNWAY 18-36
DEPARTURE SURFACE DRAWING
SPENCER, IOWA

PLANNED BY: C. Burks
DETAILED BY: M. Beaver

APPROVED BY: M. Dmyterko

November 2021 SHEET 13 OF 16





EXISTING FACILITIES		
NO.	DESCRIPTION	ELEVATION (Top MSL)
1	TERMINAL BUILDING	1342.2'
2	FBO OFFICE	1362.5'
3	FLAG POLE	1371.1'
4	FUEL PUMP	1338.5'
5	AIRPORT ROTATING BEACON	1390.3'
6	CONVENTIONAL HANGAR	1365.2'
7	T-HANGAR (6 units)	1348.5'
8	T-HANGAR (8 units)	1351.8'
9	WELL	1343.5'
10	MAINTENANCE HANGAR	1365.6'
11	T-HANGAR (15 units)	1350.6'
12	CAMMAIR HANGAR	1359.1'
13	SPENCER AVIONICS HANGAR	1359.5'
14	WINDSOCK	1354.4'
15	VOR/DME	1348.5'
16	LOCALIZER ANTENNA	1337.9'
17	LOCALIZER DME	1340.9'
18	ASOS	1348.4'
19	GLIDE SLOPE ANTENNA	1346.2'
20	ELECTRICAL VAULT	1343.9'
21	WELL	1343.4'
22	WELL	1344.6'

ULTIMATE BUILDINGS/FACILITIES		
NO.	DESCRIPTION	ELEVATION (MSL)
30	TERMINAL EXPANSION	25' AGL
31	T-HANGAR (8 UNIT)	22' AGL
32	T-HANGAR (8 UNIT)	22' AGL
33	SRE BUILDING	30' AGL
34	EXECUTIVE HANGAR	30' AGL
35	EXECUTIVE HANGAR	30' AGL
36	EXECUTIVE HANGAR	30' AGL
37	T-HANGAR (8 UNIT)	30' AGL
38	T-HANGAR (8 UNIT)	25' AGL
39	T-HANGAR (8 UNIT)	25' AGL
40	EXECUTIVE HANGAR	25' AGL
41	EXECUTIVE HANGAR	25' AGL
42	EXECUTIVE HANGAR	25' AGL
43	EXECUTIVE HANGAR	25' AGL
44	EXECUTIVE HANGAR	25' AGL
45	EXECUTIVE HANGAR	25' AGL
46	EXECUTIVE HANGAR	25' AGL
47	EXECUTIVE HANGAR	25' AGL
48	CONVENTIONAL HANGAR	30' AGL
49	CONVENTIONAL HANGAR	30' AGL

LEGEND		
EXISTING	ULTIMATE	DESCRIPTION
		ABANDONED PAVEMENT (To Be Removed)
		AIRPORT PROPERTY LINE/FENCE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		BUILDING ABANDONMENT (To Be Removed)
		BUILDING
		DRAINAGE
		PAVEMENT
		FENCING (up to 6')
		RUNWAY VISIBILITY ZONE
		NAVIGATIONAL AID INSTALLATION (PAPI)
		NAVIGATIONAL AID INSTALLATION
		TOPOGRAPHY (NAVD 83)
		HOLDING POSITION MARKING
		PARCELS
		OBSTACLE FREE ZONE (OFZ)
		RUNWAY SAFETY AREA (RSA)
		RUNWAY OBJECT FREE AREA (OFA)
		SURVEY MONUMENT (PACSSACS)
		BUILDING RESTRICTION LINE (BRL)
		LOCALIZER ANTENNA / CRITICAL AREA
		PAVEMENT ROAD/PARKING (Hatch)
		NAVAIDS CRITICAL AREA



Magnetic Declination 1° 47' East
Annual Rate of Change
0° 4' West (4/24/2020)

0 100 200 300
SCALE IN FEET

SPENCER MUNICIPAL AIRPORT
TERMINAL AREA DRAWING
SPENCER, IOWA

PLANNED BY: C. Burks
DETAILED BY: M. Beaver
APPROVED BY: M. Dmyterko

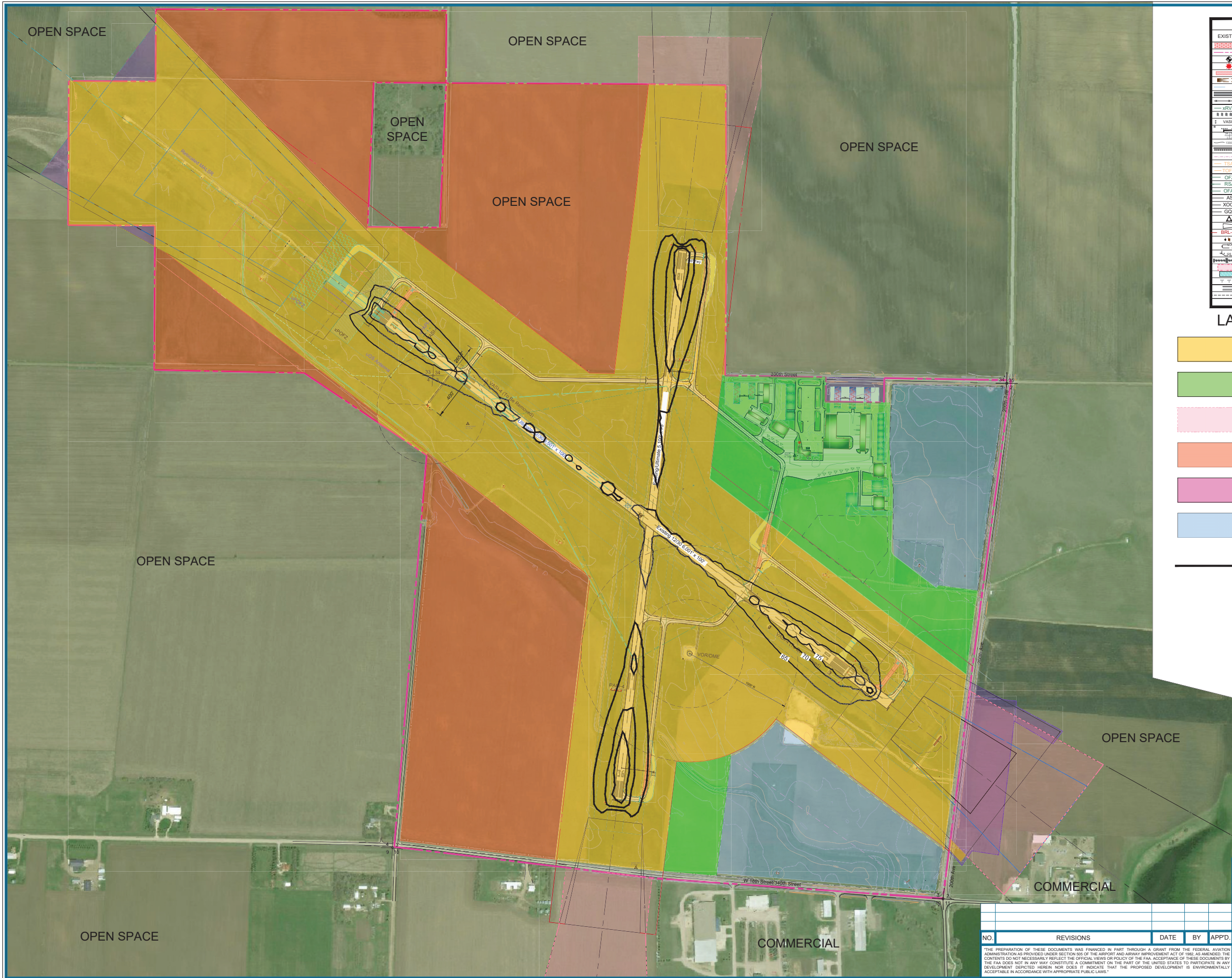
November 2021 SHEET 14 OF 16



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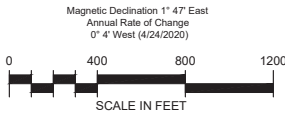
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LEGEND		
EXISTING	ULTIMATE	DESCRIPTION
		ABANDONED PAVEMENT (To Be Removed)
		AIRPORT PROPERTY LINE/ENCE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		BUILDING ABANDONMENT (To Be Removed)
		BUILDING
		DRAINAGE
		PAVEMENT
		FENCING (up to 6')
		RUNWAY VISIBILITY ZONE
		NAVIGATIONAL AID INSTALLATION (PAPI)
		NAVIGATIONAL AID INSTALLATION
		RUNWAY THRESHOLD LIGHTS and REIL
		SECTION CORNER
		TOPOGRAPHY (NAVD 88)
		HOLDING POSITION MARKING
		PARCELS
		TAXIWAY SAFETY AREA (TSA)
		TAXIWAY OBJECT FREE AREA (TFOF)
		OBSTACLE FREE ZONE (OFZ)
		RUNWAY SAFETY AREA (RSA)
		RUNWAY OBJECT FREE AREA (OFA)
		PART 77 APPROACH SURFACE
		OBSTACLE CLEARANCE SURFACE (EB 99A Type 4/5)
		GLIDE PATH QUALIFICATION SURFACE (EB 99A Type 6)
		SURVEY MONUMENT (PACS/SACS)
		RUNWAY PROTECTION ZONE (RPZ)
		BUILDING RESTRICTION LINE (BRL)
		ASOS
		LOCALIZER ANTENNA / CRITICAL AREA
		GLIDE SLOPE ANTENNA / CRITICAL AREA
		MALSR APPROACH LIGHT SYSTEM
		AVIGATION EASEMENT
		PRECISION OBSTACLE FREE ZONE (200' x 800')
		TIE-DOWNS
		PAVEMENT ROAD/PARKING (Hatch)
		NAVAIDS CRITICAL AREA

LAND USE LEGEND

- AIRPORT OPERATION (AO)
- GENERAL AVIATION (GA)
- EXISTING AVIGATION EASEMENT
- OPEN SPACE (OS)
- ULTIMATE PROPERTY
- REVENUE SUPPORT
(Non Aviation Use)
- 2020 DNL 65



SPENCER MUNICIPAL AIRPORT

LAND USE DRAWING

SPENCER, IOWA

PLANNED BY: C. Burks
DETAILED BY: M. Beaver

APPROVED BY: M. Dmyterko

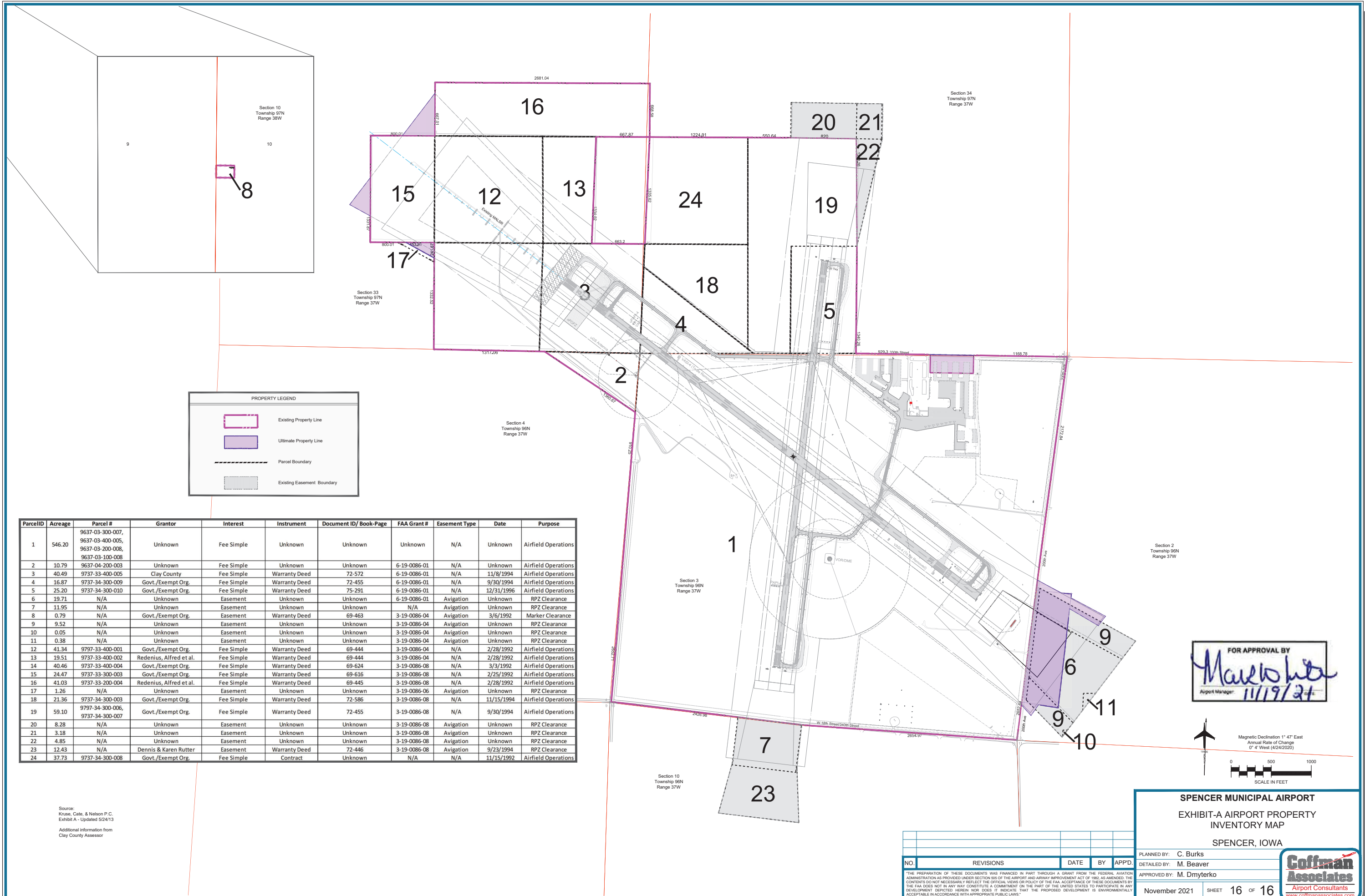
November 2021 SHEET 15 OF 16



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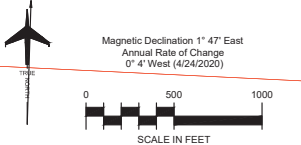


Parcel ID	Acreage	Parcel #	Grantor	Interest	Instrument	Document ID/ Book-Page	FAA Grant #	Easement Type	Date	Purpose
1	546.20	9637-03-300-007, 9637-03-400-005, 9637-03-200-008, 9637-03-100-008	Unknown	Fee Simple	Unknown	Unknown	Unknown	N/A	Unknown	Airfield Operations
2	10.79	9637-04-200-003	Unknown	Fee Simple	Unknown	Unknown	6-19-0086-01	N/A	Unknown	Airfield Operations
3	40.49	9737-33-400-005	Clay County	Fee Simple	Warranty Deed	72-572	6-19-0086-01	N/A	11/8/1994	Airfield Operations
4	16.87	9737-34-300-009	Govt./Exempt Org.	Fee Simple	Warranty Deed	72-455	6-19-0086-01	N/A	9/30/1994	Airfield Operations
5	25.20	9737-34-300-010	Govt./Exempt Org.	Fee Simple	Warranty Deed	75-291	6-19-0086-01	N/A	12/31/1996	Airfield Operations
6	19.71	N/A	Unknown	Easement	Unknown	Unknown	6-19-0086-01	Avigation	Unknown	RPZ Clearance
7	11.95	N/A	Unknown	Easement	Unknown	Unknown	N/A	Avigation	Unknown	RPZ Clearance
8	0.79	N/A	Govt./Exempt Org.	Easement	Warranty Deed	69-463	3-19-0086-04	Avigation	3/6/1992	Marker Clearance
9	9.52	N/A	Unknown	Easement	Unknown	Unknown	3-19-0086-04	Avigation	Unknown	RPZ Clearance
10	0.05	N/A	Unknown	Easement	Unknown	Unknown	3-19-0086-04	Avigation	Unknown	RPZ Clearance
11	0.38	N/A	Unknown	Easement	Unknown	Unknown	3-19-0086-04	Avigation	Unknown	RPZ Clearance
12	41.34	9797-33-400-001	Govt./Exempt Org.	Fee Simple	Warranty Deed	69-444	3-19-0086-04	N/A	2/28/1992	Airfield Operations
13	19.51	9737-33-400-002	Redenius, Alfred et al.	Fee Simple	Warranty Deed	69-444	3-19-0086-04	N/A	2/28/1992	Airfield Operations
14	40.46	9737-33-400-004	Govt./Exempt Org.	Fee Simple	Warranty Deed	69-624	3-19-0086-08	N/A	3/3/1992	Airfield Operations
15	24.47	9737-33-300-003	Govt./Exempt Org.	Fee Simple	Warranty Deed	69-616	3-19-0086-08	N/A	2/25/1992	Airfield Operations
16	41.03	9737-33-200-004	Redenius, Alfred et al.	Fee Simple	Warranty Deed	69-445	3-19-0086-08	N/A	2/28/1992	Airfield Operations
17	1.26	N/A	Unknown	Easement	Unknown	Unknown	3-19-0086-06	Avigation	Unknown	RPZ Clearance
18	21.36	9737-34-300-003	Govt./Exempt Org.	Fee Simple	Warranty Deed	72-586	3-19-0086-08	N/A	11/15/1994	Airfield Operations
19	59.10	9797-34-300-006, 9737-34-300-007	Govt./Exempt Org.	Fee Simple	Warranty Deed	72-455	3-19-0086-08	N/A	9/30/1994	Airfield Operations
20	8.28	N/A	Unknown	Easement	Unknown	Unknown	3-19-0086-08	Avigation	Unknown	RPZ Clearance
21	3.18	N/A	Unknown	Easement	Unknown	Unknown	3-19-0086-08	Avigation	Unknown	RPZ Clearance
22	4.85	N/A	Unknown	Easement	Unknown	Unknown	3-19-0086-08	Avigation	Unknown	RPZ Clearance
23	12.43	N/A	Dennis & Karen Rutter	Easement	Warranty Deed	72-446	3-19-0086-08	Avigation	9/23/1994	RPZ Clearance
24	37.73	9737-34-300-008	Govt./Exempt Org.	Fee Simple	Contract	Unknown	N/A	N/A	11/15/1992	Airfield Operations

Source:
Krusc, Cate, & Nelson P.C.
Exhibit A - Updated 5/24/13

Additional information from
Clay County Assessor

FOR APPROVAL BY
Mario Weber
Airport Manager: 11/19/21



SPENCER MUNICIPAL AIRPORT
EXHIBIT-A AIRPORT PROPERTY
INVENTORY MAP
SPENCER, IOWA

NO.	REVISIONS	DATE	BY	APPD.

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November 2021 SHEET 16 OF 16





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