

# *Manassas Regional Airport Master Plan Update*



***Chapter 1***  
***Introduction/Visioning***



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Chapter 1 Introduction/Visioning

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CHAPTER 1

*INTRODUCTION/VISIONING*

## 1.1 INTRODUCTION

Manassas Regional Airport (HEF or Airport) is a general aviation airport. The City of Manassas oversees the day-to-day operation and management of the Airport. The Airport occupies over 863 acres and is bounded by Prince William Parkway to the east and Nokesville Road (Route 28) to the northwest. The Airport is one of 57 GA airports within the Virginia Department of Aviation (DOAV) Airport System and identified as Reliever Airport, as described in the 2016 Virginia Air Transportation System Plan (VATSP). HEF is the busiest general aviation airport in the Commonwealth of Virginia. The airport is classified in the Federal Aviation Administration's (FAA) National Plan of Integrated Airport Systems (NPIAS) 2025-2029 Report as a public National Reliever airport. The airport is located thirty miles south of Washington D.C. in the City of Manassas and Prince William County, Virginia.

During the lifecycle of the 2022 Airport Master Plan Update, the airport introduced plans to receive commercial air service during the twenty-year planning period which would result in change of classification in the VATSP and the NPIAS. The introduction of commercial air service to a general aviation airport fundamentally impacts the airport's infrastructure, operational dynamics, funding opportunities, and development strategy. To meet the fundamental requirements for Master Plan approval by the FAA and DOAV, the airport adjusted direction to develop an amended Aviation Activity Forecast incorporating Air Carrier operations and passenger enplanements for the twenty-year planning period. Forecast metrics (e.g. GA operations, military operations, commuter/air taxi operations, and based aircraft) from the initial Aviation Activity Forecast approved in June 2022 were carried into the amended Aviation Activity Forecast chapter. The FAA approved the amended Aviation Activity Forecast in August 2024. The Airport Layout Plan set, associated ALP Narrative chapter, and Implementation & Financial Feasibility chapter include modifications supporting commercial service in alignment with the amended Aviation Activity Forecast chapter. The Inventory & Facility Requirement chapter and Alternatives chapter were developed following approval of the initial Aviation Activity Forecast (approved June 2022). No additional technical analysis for these two chapters to incorporate findings from the amended Aviation Activity Forecast were completed in the Master Plan.

## 1.2 PURPOSE OF THE STUDY

The purpose of the Master Plan is to establish a long-range development strategy or "blueprint" for the sustained, and fiscally responsible, growth of the Airport through a twenty-year planning period, which seeks to balance airport growth against the need to minimize impacts on the surrounding environment. In doing so, the study focuses on optimizing operations at the Airport, providing flexible options for growth, while identifying possible areas on-airport suitable for new facilities, by performing the following:

- » Aviation Activity Forecasts
- » Inventory of Existing Facilities and Services
- » Facility Requirements (preceded by Demand/Capacity Analyses)
- » Justifiable Alternatives for Facility Improvements
- » Phased Capital Improvement Program
- » Airport Layout Plan Drawing Set

The Master Plan improvements should satisfy projected aviation demand, ensure the safety of airport operations, and be compatible with the environment, community development and other transportation modes. Above all else, the Master Plan must be technically sound, practical and economically feasible.

The airport plans are submitted to the FAA for approval and for FAA's use in evaluating grant requests and other actions involving the Airport. Thus, the Master Plan provides guidance on the priority of airport development projects to be submitted to the FAA for funding. As such, this study will update previous master planning efforts. In general, the Master Plan will develop a framework for Manassas Regional Airport to provide guidance for future airport development in a financially feasible manner, to maximize its safe and efficient use, and to enhance the environmental soundness of the Airport within its environs.

Specifically, the purpose of the Master Plan Update is to:

- » Illustrate through demand forecasts, the growth in activity that is anticipated at HEF.
- » Provide an indication of plans for infrastructure enhancements in light of its continued role.
- » Provide a useful tool for communicating to a broad range of stakeholders including tenants, local government, community groups, and state and federal agencies, to allow them to make well informed decisions.
- » Supplement long-term resource planning for local and regional bodies, particularly in the preparation of local plans and strategies.
- » Establish the key milestones of airport development, carefully triggered by demand, and supported by adequate justification for implementation.
- » Demonstrate the probable costs required over the twenty-year planning period and ensure that the program is financially viable.
- » Enable the City of Manassas and others to assess local social and environmental impacts and provide an opportunity to develop preliminary proposals on how those impacts could be mitigated, as appropriate.
- » Provide a consistent and publicly available vehicle for the continued involvement by government, users, and the general public.

### 1.3 VISIONING / EMPHASIS ITEMS

Identification of goals and emphasis items is a crucial step in the master planning process. These elements provide direction for the planning process and form the basis for determining future airport development. Throughout the evaluation process, the goals and emphasis items were consistently referenced to assess development alternatives and recommend a plan of action.

At the onset of the Master Plan team members met with airport staff to initiate the planning process and discuss project goals and emphasis items. Based on these meetings the following goals and emphasis items were established.

- » **Vehicle Access:** Regional improvements to VA State Route 234 and toll lanes on I-66 could attract more business travelers and increase operations at Manassas Regional Airport. RS&H will coordinate with local agencies to integrate these plans into the airport's development.

- » **Multimodal Pedestrian Access:** Proposed VRE improvements at Broad Run Station, including an additional track, will be integrated into the development plan. RS&H will collaborate with VRE and the City of Manassas to enhance connectivity and pedestrian access.
- » **Terminal Area:** The master plan will assess optimal land use for the terminal and surrounding areas, focusing on parking, roadway alignment, apron layout, and future aircraft needs.
- » **FBO Expansion:** Plans will include integrating Chantilly Air's FBO expansion into the airport layout, with guidance on land use, drainage, and future facility growth, revisiting the NE Quadrant Study as needed.
- » **East Side Expansion:** The plan will evaluate the development potential of the last greenfield site, addressing utilities, access, environmental impacts, and floodplain challenges, along with a detailed implementation strategy.
- » **Runway Extension:** A potential extension of Runway 16L-34R will be explored to support increasing corporate aircraft activity, with justification for its inclusion in the capital improvement plan.
- » **Northwest Development Area:** The master plan will review opportunities for development on the West Apron following Dulles Aviation's closure, aligning with the airport's long-term strategy.
- » **ATCT:** Relocation of the Air Traffic Control Tower will be reviewed to ensure it does not penetrate the Part 77 Transitional surface, incorporating the preferred location into the development plan.
- » **Broad Run:** A comprehensive review of Broad Run's flooding impact on the airport's development areas will be conducted, exploring solutions to mitigate environmental impacts.
- » **Southwest Expansion:** The master plan will examine acquiring adjacent land for aeronautical development or Broad Run relocation to enhance future growth potential.
- » **Land Use Review:** The plan will review airport-owned land for potential non-aeronautical revenue, considering the FAA's increased flexibility for such development.
- » **Airport Layout Plan:** An updated ALP will be created, including new imagery, safety-critical data, and an Exhibit A Airport Property Inventory Map.
- » **Sustainability Plan:** The master plan will integrate sustainability initiatives per DOAV's guidelines, focusing on resilience, energy and water conservation, and waste reduction.
- » **Commercial Service:** During the Master Plan, The Airport outlined plans to incorporate commercial air service within the planning period. This change will significantly affect infrastructure, operations, funding opportunities, and the overall development strategy.

## 1.4 MASTER PLAN PROCESS

The Master Plan elements were conducted in accordance with FAA guidelines established in Advisory Circulars 150/5070-6B, Airport Master Plans, and 150/5300-13A, Airport Design. The Master Plan includes specific elements, with its documentation organized into the following chapters:

- » Aviation Activity Forecast
- » Aviation Activity Forecast Amendment
- » Inventory and Facility Requirements

- » Alternatives Development
- » Implementation & Financial Feasibility Plan
- » Environmental Overview
- » Airport Layout Plan Narrative
- » Airport Layout Plan Set

In addition to the technical reports, the Master Plan includes supporting appendices as follows:

- » Environmental Conditions
- » Runway Length Analysis
- » Sustainability Initiatives
- » Recycling, Reuse, and Waste Reduction Plan
- » Southwest Quadrant Land Acquisition

**Chapter 2**  
**Aviation Activity Forecast**



**RS&H**

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*CHAPTER 2*

*AVIATION ACTIVITY FORECAST*

## 2.1 INTRODUCTION

A critical element in the planning and development of airport facilities is estimating the levels of aircraft operations and based aircraft that can be expected during a prescribed planning time period. This chapter discusses the projected activity levels of aircraft operations and based aircraft that might be expected at Manassas Regional Airport within the 20-year planning horizon. It also describes the methodology used to estimate those volumes. The chapter concludes with recommended operations and based aircraft forecasts that will be used in this study to plan the requirements for future infrastructure and facilities. The forecast is presented in five- and ten-year increments, beginning with a base year of 2021 and projecting outward to 2026, 2031, and 2041.

The Federal Aviation Administration (FAA) annually prepares its Terminal Area Forecast (TAF) for 264 FAA towered airports, 252 federal contract tower airports, 31 terminal radar approach control facilities, and 2,818 non-towered airports. Manassas Regional Airport (HEF) is one of only 84 general aviation (GA) airports in the United States categorized as a national airport.<sup>1</sup> National airports are described by FAA as those that support flights within the nation and globally, accommodating operations by the most sophisticated general aviation aircraft in the fleet. HEF is one of two national airports in Virginia, the other being Leesburg Executive Airport.

For the purposes of this Master Plan Update, the baseline forecasts of aircraft operations and based aircraft annual volumes will be used to plan various airport facility requirements. A review of the Airport's recent historical aviation activity has a critical role in the development of a forecast. Most importantly it provides a means for comparing the projected growth of the forecast with what has happened in the past. This forecast document references historical aviation activity data from 2009 or more recent, depending on the analysis and the data that was available. The historical review contains multiple data sources including the Airport's records and information from the FAA TAF while the basis for comparison of forecasts is the FAA TAF 2022<sup>2</sup> published in March 2022. The FAA TAF compares data on a fiscal year basis, i.e., October 1 of a year through September 30 of the next year, as opposed to calendar year (CY) which begins January 1 and ends December 31. The forecasts being developed as part of the Master Plan update will use the same fiscal year methodology as the FAA TAF for purposes of direct comparison. Data in calendar year format is identified as year rather than a fiscal year as shown in **Section 2.4.2**.

The Base Case Forecast includes an average annual growth rate (AAGR) that is slightly higher than the AAGR of the FAA TAF 2022. The Base Case Forecast provides a different perspective for the Airport's future. In recognition of the Airport's role as an integral part of the region's general aviation (GA) activity, the Forecast was developed using local characteristics, socioeconomic projections, and the baseline FAA TAF 2022 which makes projections beginning in 2021 and continues over the 20-year forecast period that ends in 2041

- » Short-Term Forecast Period: 2021-2026

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<sup>1</sup> *General Aviation Airports: A National Asset*, FAA, May 2012

<sup>2</sup> *Terminal Area Forecast: taf.faa.gov*, March 2022

- » Intermediate-Term Forecast Period: 2027-2031
- » Long-Term Forecast Period: 2032-2041

## 2.2 AIRPORT ROLE AND HISTORY

The Manassas area has made aviation a point of emphasis for the Washington D.C. Metro area since the 1930s. Beginning in the year 1930, with a community of about 1,200 people, the City Council thought an airport should be developed. Within a year, investors purchased nearly 95 acres of land and leased it to the City of Manassas. The first Manassas airport opened on June 8, 1932. Growth in Manassas triggered the housing development to surround the Airport. It was decided to move the Airport further out, and by September of 1964, Manassas Regional Airport was in its new location.

The Airport continued to grow and evolve and in 1992, an Air Traffic Control Tower (ATCT) was recycled from Centennial Airport near Denver, Colorado and reassembled in Manassas. Additional improvements were implemented, including the construction of a new terminal completed in September 1996. In the years to follow, additional development occurred on the east side of the airfield. A runway extension for Runway 16L-34R was completed in 2012 and is now 6,200 feet. Runway 16R-34L was rehabilitated in 2000 and is 3,715-foot-long. Runway 16L-34R will be rehabilitated in 2023.

Manassas Regional Airport is located thirty miles south of Washington D.C. in Prince William County, Virginia. The City of Manassas oversees the day-to-day operation and management of the Airport. The Airport occupies over 863 acres and is bounded by Prince William Parkway to the east and Nokesville Road (Route 28) to the northwest.

HEF is not certificated by the FAA under 14 CFR Part 139 to serve scheduled air carrier aircraft over 10 seats or commuter aircraft with more than 30 seats. Scheduled service is what typical commercial passenger service airports such as Richmond International Airport provide. Air taxi/commuter operations occurring at HEF are all non-scheduled flights in aircraft with less than 30 seats (mostly private charters).

The Airport is classified in the FAA's National Plan of Integrated Airport Systems (NPIAS) 2021-2025 Report as a public National Reliever airport. National reliever airports are defined as airports that are designated by the FAA to relieve congestion at Commercial Service airports and to provide improved GA access to the overall community. GA airports are public use airports that do not have scheduled service or has service scheduled with less than 2,500 passenger boardings each year. The Manassas Regional Airport is the busiest GA airport in the Commonwealth of Virginia. HEF is one of 57 GA airports within the Virginia Department of Aviation (DOAV) Airport System and identified as Reliever Airport, as described in the 2016 Virginia Air Transportation System Plan (VATSP). With the classification of a Reliever Airport in the VATSP, HEF is eligible for Air Carrier/Reliever discretionary funding from the Commonwealth Airport Fund as opposed to General Aviation discretionary funding which applies to majority of GA airports in the Commonwealth of Virginia.

## 2.3 GENERAL AVIATION TRENDS

In forecasting aviation demand, it is prudent to consider current and predicted trends related to general aviation. This Master Plan Update will include a chapter section dedicated to this topic within the Facility Requirements, but critical trends that influenced this forecast are detailed below.

- » **Pilot Trends:** Pilots within the 40 to 60-year-old age group, a usual pillar in the general aviation industry due to an increase in disposable income and available time, has experienced a sharp decline as a percent of the total certificates between 2012 and 2017<sup>3</sup>. This is related to the fact that many “baby boomers” are now beyond 60 years old, and that recreational flying has become prohibitively expensive. However, pilot and flight instructor certificates began to increase in 2018. Airlines, charter operators, and flight departments are experiencing a pilot shortage, and there are now great incentives for people to pursue their airline transport pilot ratings. These trends are evident in the fact that airline transport and flight instructor certificates increased over the past three years. Locally, HEF may experience decreased recreational pilot demand for T-hangars or tie-downs due to fewer recreational flyers taking to the skies. However, strong airline pilot demand and regulation changes requiring an increase in flight hours for certification are driving substantial growth in flight training. HEF flight schools are experiencing growth and may likely need additional fleet, storage, and office space to meet demand.
- » **Existing Aircraft Fleet Trends:** The small twin and single engine piston fleet continues to decline nationally. This is due to numerous factors, including the increase in cost of avgas fuel, increasing operating and ownership expenses for aircraft, and an older fleet of aircraft that is becoming cost prohibitive to keep in operation. The fleet continues to see some replacement by modern piston aircraft, such as Cirrus and new Cessna brand aircraft, which are most often used for mission-specific purposes instead of solely recreational use. Regarding corporate jet aircraft, there has been a trend of owners upgrading from mid-size to large aircraft. Older aircraft are generally flying fewer hours and the business jet market fleet is becoming younger. Cost does not correlate to the aircraft purchases, but aircraft are generally becoming larger.
- » **Future Aircraft Fleet Trends:** The future aircraft fleet is expected to eventually contain electric powered aircraft. Additionally, many companies are working to develop electric vertical take-off and landing (e-VTOL) aircraft. Uber is one company pushing to develop these aircraft and add them as part of their on-demand transportation services.

Electric aircraft, both e-VTOL and fixed-wing, will significantly impact general aviation. However, these leading-edge technologies are not expected to impact HEF, at least to a measurable extent, within the twenty-year planning period. Due to the Airport’s proximity to Washington D.C. and secure airspaces, helicopter activity is not typical in the HEF area. Coupled with winter weather, HEF may not be conducive for this type of technology to operate. E-VTOL operations in bad weather pose challenges for e-VTOLs at this time as significant electrical power needs to be

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<sup>3</sup> FAA United States Civil Airmen Statistics, 2021

extracted for de-icing. This could greatly reduce usability in areas prone to snow and ice conditions. However, HEF may consider reserving a location or facility space designated for vertical take-off aircraft should e-VTOL activity happen during the planning period.

For the purpose of this forecast, it was deemed speculation to consider these aircraft as being able to come online and fully integrate into the national airspace system within this study's planning period. Thus, the operations and based aircraft forecast for HEF was developed exclusive of these developments. In addition, HEF may need to plan for additional fuel farm space to allow FBOs to offer alternative fuel options and electric charging stations within the first 10 years in the planning period.

## 2.4 AIRPORT SERVICE AREA

In determining demand at an airport, it is necessary to examine the demographic and socioeconomic conditions of the airport's service area. An airport service area is a broadly-based geographical area around the airport where it is reasonable to assume that a market exists for airport services. In forecasting aviation demand, the socioeconomic characteristics of the service area are examined to identify correlation with previous patterns and forecasted trends as it relates to aviation activity.

As the largest general aviation airport in the Commonwealth of Virginia in terms of based aircraft population, Manassas Regional Airport (HEF) is also the busiest GA airport in terms of total operations for a GA airport in Virginia. The Airport is within the Washington D.C. Special Flight Rules Area and offers private aircraft access to Washington D.C. Due to its proximity to Washington D.C., several government agencies are based on-site. The Airport is home to two full-service fixed base operators, multiple aircraft sales and rental companies, charter companies, robust flight training schools, leading edge aircraft manufacturers, corporate flight departments, and other niche firms related to all aspects of general aviation. HEF also has a U.S. Customs and Border Patrol facility with helicopters and small fixed-wing aircraft.

### 2.4.1 Geographic Attributes

Manassas Regional Airport is located on the southwest side of the Washington D.C. Metro area within Prince William County which includes the Maryland, Washington D.C. and Alexandria, VA metro area. The Airport is one of four reliever GA airports for Dulles International Airport with the others being Leesburg Executive Airport (JYO) located 21.5 nautical miles north of HEF, Stafford Regional Airport (RMN) located 19.6 nautical miles south of HEF, and Warrenton/Fauquier Airport (HWY) located 12.2 nautical miles southwest of HEF. JYO has a virtual air traffic control tower at this time.

Drive time distances of 30 to 40 minutes from an airport is typically the primary factor determining the geographic area a general aviation airport will serve. For itinerant and local users of an airport, location is critical, as the primary intent of using aircraft is to reduce overall time spent traveling. In this case, the location of Manassas Regional Airport within Virginia, the region, and the nation influences how it is used within the National Airspace System.

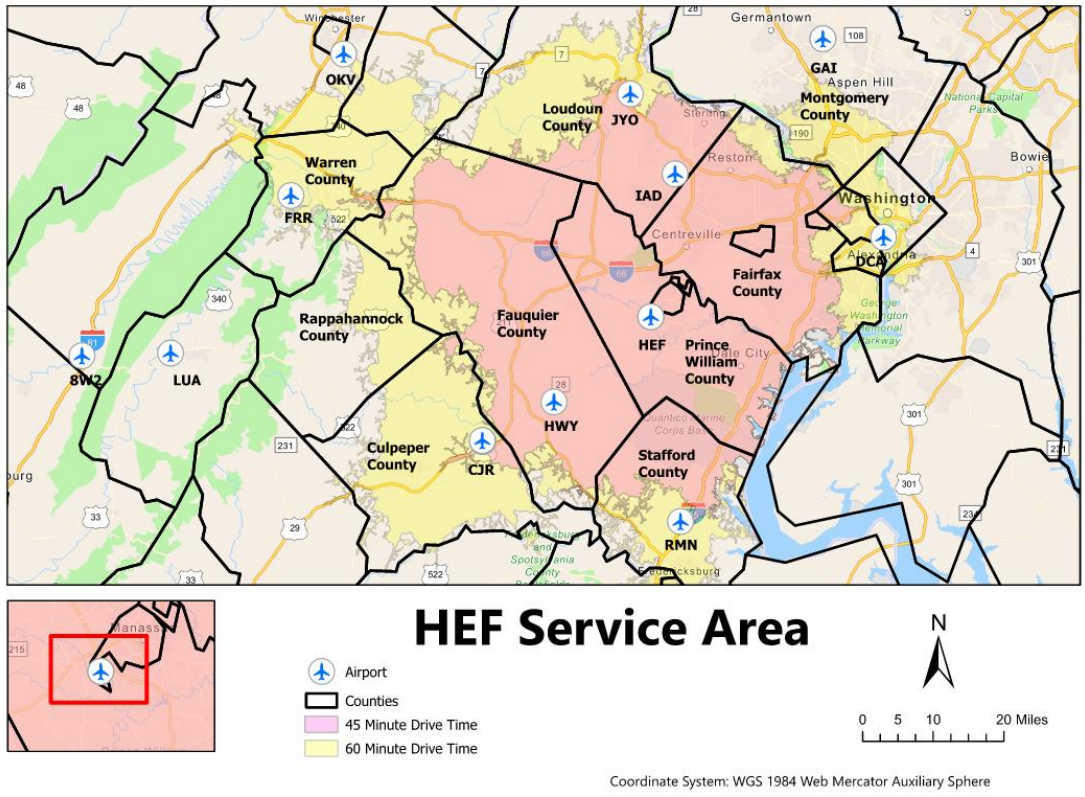
The HEF service area is defined as the maximum boundary from which Airport customers are anticipated to travel through HEF, considering drive time, cost, and the types of services unique to HEF over other airports. Defining the service area plays a major role in the forecast, because it determines the values of the socioeconomic variables that will be considered in analyzing the Airport’s traffic growth. Specifically, Interviews with Airport staff were conducted and a drive-time analysis map (**Figure 2-1**) was created. The drive-time analysis map displays the counties within a 45-minute and 60-minute drive time and indicates the typical distance Airport users are willing to drive. In determining the service area of HEF, a heat map was created using based aircraft owner’s addresses (illustrated in Error! Reference source not found.) to identify where the majority of airport tenants live. As shown on the map, the majority of airport tenants live within 45 minutes of the airport. The counties and independent cities included in the HEF service area and economic data base used to provide forecasted information socioeconomic variables are listed in **Table 2-1**.

**TABLE 2-1**  
**HEF SERVICE AREA AND INDEPENDENT CITIES**

<i>Service Area</i>
<i>County/Independent City</i>
Alexandria City
Arlington County
Clarke County
Culpeper County
District of Columbia
Fairfax City
Fairfax County
Falls Church City
Fauquier County
Frederick County
Loudoun County
Manassas City
Manassas Park City
Prince William County
Rappahannock County
Shenandoah County
Stafford County
Warren County

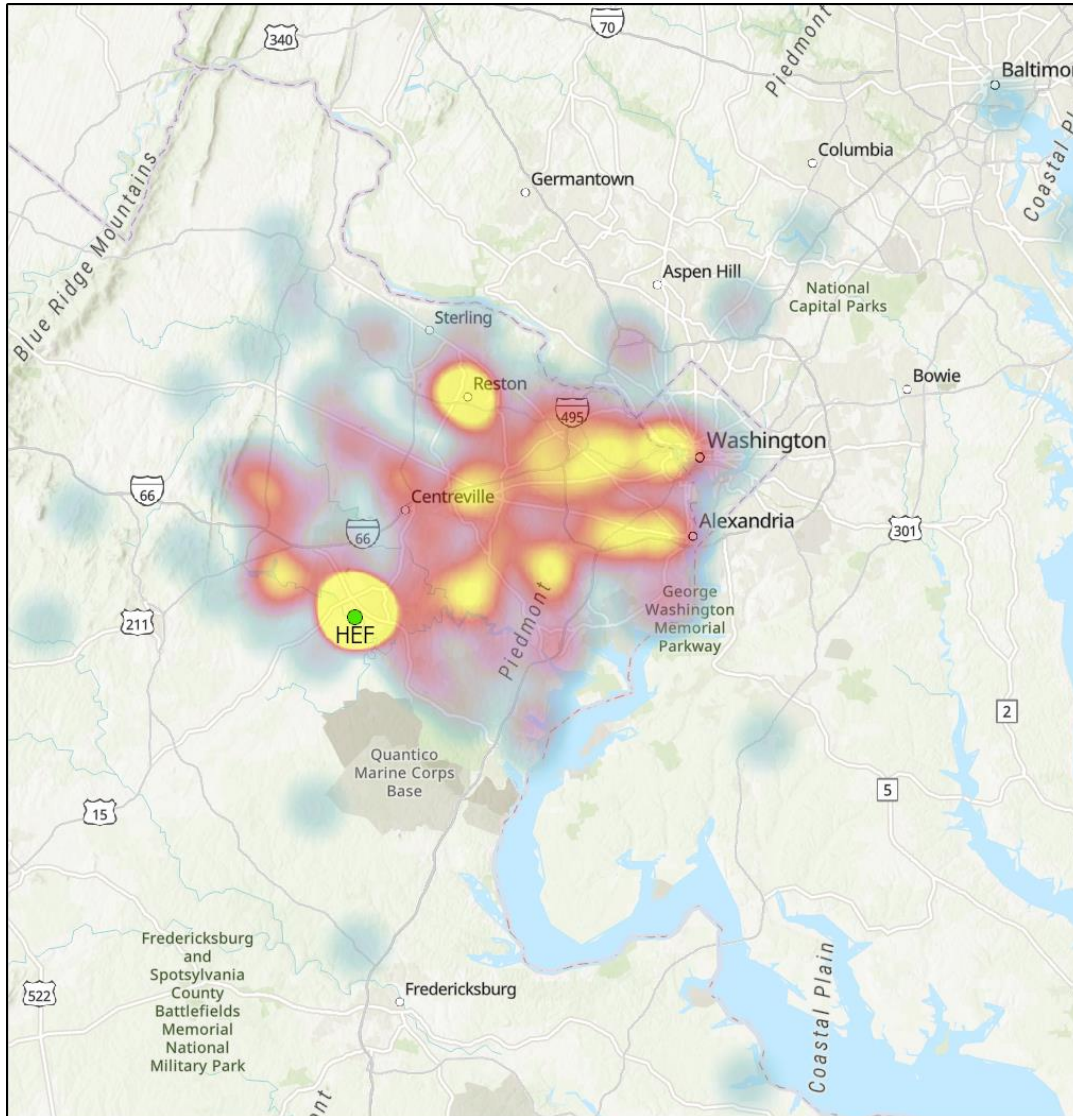
Source: RS&H, 2021; Woods & Poole, Inc., 2021

**FIGURE 2-1**  
**HEF SERVICE AREA MAP**



Source: ESRI ArcGIS, Prepared by RS&H, 2021

**FIGURE 2-2**  
**FREQUENT AIRPORT USER LOCATION HEAT MAP**

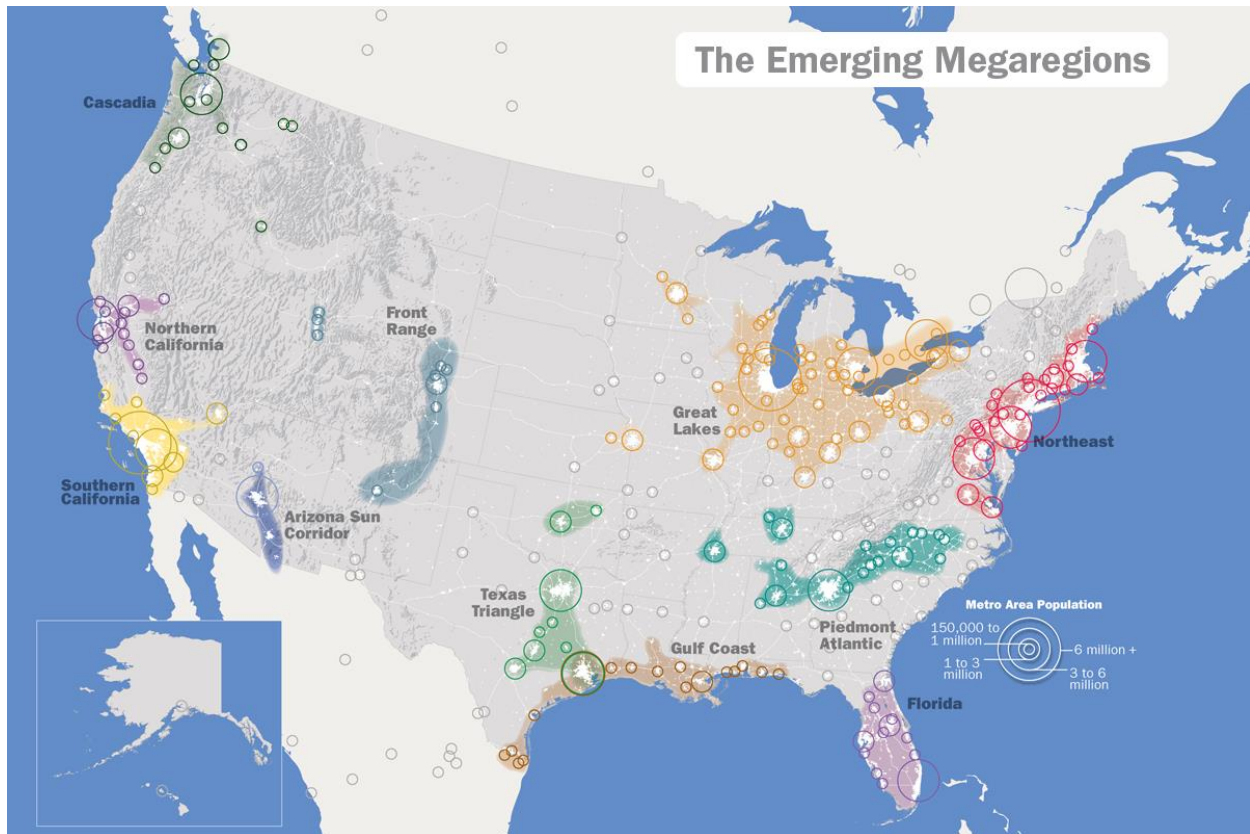


Source: HEF Access Database, ESRI ArcGIS, Prepared by RS&H, 2022

The location of HEF within the metro area directly influences the amount and type of aviation demand seen historically and forecasted. HEF also sits in the upper middle of the Northeast Megaregion, as shown in **Figure 2-3**. Megaregions are roughly defined as metropolitan areas made up of cities that have grown together to form one large economic center. The Northeast Megaregion extends from northern Boston to northern Virginia. It is recognized as the most populous megaregion including the major cities of Boston, Hartford, New York City, Newark, Philadelphia, Baltimore, and Washington D.C. Manassas sits on the southwestern side of this megaregion and is in close proximity to some of the most populated cities within the megaregion. In addition, an Air Defense Identification Zone has existed since 2003 around the Baltimore-Washington Metropolitan Area to restrict air traffic near Washington D.C. The fact that HEF is part of a megaregion means that there is infrastructure in place to ensure easier and less expensive access

to aviation fuels, aircraft parts, and specialty services not often found in rural areas. These geographic factors play heavily into why HEF has grown into the prosperous general aviation airport that it is today.

**FIGURE 2-3**  
**UNITED STATES MEGAREGIONS**



Source: Regional Plan Association, <https://commons.wikimedia.org/wiki/File:MapofEmergingUSMegaregions.png>

## 2.4.2 Socioeconomic Characteristics

Consideration of a community's economic character is particularly important when comparing the vigor and potential growth for travel and general aviation activity to state and national trends. Current and projected economic trends and population projections for HEF's service area were examined and compared to the United States. The service area for HEF includes the counties and independent cities listed in **Table 2-1**.

One of the leading objective sources for assessing economic indices related to economic issues affecting market growth in the U.S. is Woods & Poole. The Woods & Poole's database contains more than 900 variables of economic data and demographic data for the U.S. and all states, regions, counties, and Core Based Statistical Areas for every year from 1970 to 2050. This comprehensive database is updated annually. Relevant economic data from this database for the counties within HEF's service area were used to provide forecasted information on population, per capita personal income (PCPI), employment growth,

and gross regional product (GRP) within the local region. Where relevant some of this information was compared to information provided by the City of Manassas and found to be comparable. Overall, the historical and forecasted socioeconomic characteristics of the HEF service area clearly project continued economic growth for the 20-year planning period.

The following summarizes the Woods & Poole demographic information examined:

- » Historical population annual growth rates of the HEF service area have remained relatively strong with an average annual growth rate of 1.1 percent from 2011-2019 in comparison to the United States which had an average annual growth rate (AAGR) of 0.65 percent for the same time period. Manassas population growth is anticipated to remain strong and increase at an average annual growth rate of 1.26 percent.
- » Historical PCPI growth rates for the HEF service area showed growth with an average annual growth rate of 2.57 percent from 2011-2019. This rate closely aligns with the United States AAGR of 2.58 percent during the same historical time period. Forecast PCPI growth for the HEF service area is expected to increase at a much higher AAGR of 4.43 percent for 2019-2041.
- » The employment forecast for the HEF service area is expected to increase at an average annual growth rate of 1.77 percent from 2019-2041. Historical employment growth for the HEF service area showed a 2.15 percent average annual growth rate from 2011-2019. Both the projected and historical employment for the HEF service area are higher than that of the United States as a whole.
- » Historical GRP growth rates for the HEF service area had an average annual growth rate of 1.93 percent from 2011-2019. Forecast GRP growth of the HEF service area remains strong and above the projected national forecast at 2.60 percent average annual growth from 2019-2041.

**Table 2-2** shows key socioeconomic indicator growth rates for the HEF service area from 2011-2019 and forecast years from 2019-2041. **Table 2-3** shows the projected socioeconomic indicator values for the baseline year of 2021, and the four forecast years 2026, 2031, 2036, and 2041.

**TABLE 2-2**  
**COMPARISON OF KEY SOCIOECONOMIC INDICATOR GROWTH RATES**

	Years	
	Historical (CY 2011-2019)	Projected (CY 2019-2041)
<b>HEF Service Area</b>		
Population	1.19%	1.26%
Employment	2.15%	1.77%
PCPI	2.57%	4.43%
GRP	1.93%	2.60%
<b>United States</b>		
Population	0.65%	0.65%
Employment	1.74%	1.09%
PCPI	2.58%	1.85%
GRP	2.44%	1.71%

Note: 1– Percentages are rounded; 2– Calendar Year (CY)

Source: RS&H, 2021; Woods & Poole, Inc., 2021

**TABLE 2-3**  
**FORECAST- KEY ECONOMIC SOCIOECONOMIC INDICATOR VALUES (2021-2041)**

	2021	2026	2031	2036	2041
Population	3,812,363	4,041,545	4,277,132	4,517,013	4,759,043
Employment	4,410,566	4,740,780	5,064,778	5,381,667	5,691,357
Personal Income Per Capita (Weighted Average)	\$83,902	\$103,487	\$130,439	\$165,022	\$208,564
Gross Regional Product (\$ millions)	\$375,293,701	\$425,687,031	\$479,056,810	\$535,303,587	\$594,410,499

Notes: Per Capita Personal Income Per Capita and Gross Regional/Domestic Product are shown in 2012 dollars; Average Annual Growth Rates (AAGRs) are rounded to the nearest 0.1 percent; Years represented are calendar years.

Source: Woods & Poole, 2021

## 2.5 HISTORICAL ACTIVITY AND FORECAST REVIEW

This section provides a review of historical records of aircraft operations and based aircraft. Additionally, all relevant forecasts previously completed for HEF are reviewed.

### 2.5.1 Historical Operational Activity

An aircraft operation is defined as either a takeoff or a landing. The FAA records annual aircraft operations in the following four categories:

- » **Air Carrier** - An air carrier operation involves an aircraft with a seating capacity of more than 60 seats or a cargo payload capacity of more than 18,000 pounds. Additionally, air carrier operations are those carrying passengers or cargo for hire or compensation.
- » **Air Taxi / Commuter** – Air taxi operations represent scheduled commercial flights, nonscheduled commercial flights, and charter flights with aircraft with 60 seats or fewer or a cargo payload capacity of 18,000 pounds or less. Additionally, air taxi operations are those carrying passengers or cargo for hire or compensation.
- » **Military** - Military operations include all classes of U.S. military or federal government aircraft.
- » **General Aviation** - General aviation operations are any type of operation that is not included in one of the previous defined categories and can include aircraft that are categorized as narrow bodies or larger. Specialized GA airports such as HEF, with its long runways and configuration, can expect to see a large variety of aircraft types in the general aviation fleet from time to time. These are typically privately-owned aircraft used for training, recreation, business, or personal use.

**Table 2-4** details historical operational activity from Fiscal Year (FY) 2010 to 2021. Overall, annual operations have remained relatively steady after rebounding from the lowest point in 2015. Local GA operations include those that stay within the Airport’s Class D airspace. These are predominantly touch-and-go flight training operations. Local GA operations has decreased since FY 2016 according to the TAF. Airport staff indicated that local GA initially declined due to an eight-year recession combined with an on-going pandemic. Due to the unknown circumstances at the time industry publications and discussions

generally expected that a minimum 5-year recover rate would equal levels of service at airports nationwide. However, operations had a dramatic increase in FY 2021 when compared to past years. HEF saw an increase in operations of 27% in 2021 when compared to 2020<sup>4</sup>. Although COVID-19 depressed activity on the aviation industry, the general aviation industry saw significant (3%-7%) positive gains<sup>5</sup>. While business-related GA travel in large metropolitan markets may have declined due to the pandemic and changing business needs, GA activity in many smaller markets returned to increased levels in the past two years, and close to pre-pandemic levels. Representatives of the GA industry, FBOs, GA aircraft manufacturers, state aviation agencies, and business aviation have indicated that charter activity and recreational flying are up and flight training has also returned to pre-COVID-19 levels. With many businesses continuing to promote telecommuting coupled with the lower cost of living, individuals are choosing to move outside major urban areas to smaller communities. Pilots or aircraft owners who have relocated from urban areas may choose to re-base their aircraft closer to new homes as opposed to commuting to large airports with longer ground times. This may result in more frequent operations by the larger aircraft that typically fly into the Airport should owners decide to relocate their aircraft to HEF.

Information gained during interviews with the Airport tenants, including a flight school, indicated that flight schools experiencing large (25%-30%) increases in flight training has factored into the increase in overall local traffic<sup>6</sup>. Within the past three years, three new flight schools have opened at HEF. There are now a total of six flight schools based at HEF. Increases in flight training demand has been seen at airports nation-wide as students seek career opportunities to fill the current shortage of commercial pilots.

Itinerant GA operations include any operation related to aircraft that land at HEF from outside the Airport's Class D airspace, or that depart HEF Class D airspace. Itinerant GA operations include most corporate/businesses aircraft operations and some flight training operations. Corporate itinerant GA activity is steady at HEF. These FBO interviews also verified there has been a trend of operators upgrading to larger aircraft. This may be due to both a strong economy and the COVID-19 pandemic that has brought renewed interest in private aviation travel as opposed to commercial air travel.

Charter operations, accounted for as air taxi operations in the forecast, often have a relationship with commercial airline fares. Air taxi operations have seen a steady increase as customers increase their use of private charter during the COVID-19 pandemic. Air taxi operations have steadily increased as customers have been using private charter as opposed to commercial travel. Itinerant military and local military operations have steadily increased from 2011-2021. Interviews with Airport FBOs indicated that modest (1% - 3%) growth in the future is expected for charter operators<sup>7</sup>.

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<sup>4</sup> FAA TAF HEF, 2022

<sup>5</sup> Terminal Area Forecast: taf.faa.gov, March 2022

<sup>6</sup> Percentage developed from stakeholder interviews

<sup>7</sup> Percentage developed from stakeholder interviews

**TABLE 2-4**  
**HEF HISTORICAL OPERATIONAL ACTIVITY**

Year	Itinerant Air Carrier	Itinerant Air Taxi	Itinerant GA	Itinerant Military	Itinerant Total	Local GA	Local Military	Total Annual Operations
2010	108	6,585	40,239	648	47,580	45,578	88	93,246
2011	89	7,003	39,011	208	46,311	37,830	85	84,226
2012	34	7,883	37,994	353	46,264	41,561	80	87,905
2013	5	8,134	32,564	341	41,044	42,034	99	83,177
2014	5	10,867	33,465	545	44,882	35,275	234	80,391
2015	11	9,936	32,590	856	43,393	34,780	342	78,515
2016	6	8,285	34,903	543	43,737	43,405	170	87,312
2017	2	9,066	36,275	555	45,898	41,203	88	87,189
2018	3	10,580	34,918	598	46,099	32,481	140	78,720
2019	5	11,374	35,165	695	47,239	38,920	213	86,372
2020	1	8,949	31,902	1,390	42,242	30,103	402	72,747
CAGR								
2010-2021	-37.4%	3.1%	-2.3%	7.9%	-1.2%	-4.1%	16.4%	-2.5%

Note- Compound Annual Growth Rate (CAGR) Source: RS&H, 2022; FAA TAF, 2022

### 2.5.1.1 Historical Based Aircraft

FAA now maintains an online database for based aircraft at GA airports, the FAA National Based Aircraft Inventory Program (the database can be accessed at basedaircraft.com). Airport operators upload to this database the FAA-issued aircraft registration number (the 'N' number) of aircraft based at their airport. FAA checks these entries to ensure the aircraft are airworthy and not being claimed by multiple airports. Should an aircraft be claimed by multiple airports, an airport operator must demonstrate to the FAA that the aircraft owner has an agreement with the airport for storage and the aircraft spends more than six months at the airport.

The FAA makes the final decision on an aircraft's airworthiness and the airport at which it is based. Because some aircraft are stored at multiple airports through the year for mission specific purposes, it often becomes very difficult to determine which of the multiple airports one specific aircraft is stored. Thus, the actual number of accounted based aircraft at an airport can be different in the records kept by the Airport and those reported by the FAA. Historical based aircraft counts, included in the 2022 FAA TAF and Airport records were analyzed. As shown in **Table 2-5**, it is apparent the overall number of based aircraft has remained relatively flat according to the TAF. However, there appears to be a discrepancy in the 2022 TAF and Airport's confirmed based aircraft count (see **Table 2-6**). All airport sponsors in the Commonwealth are required to submit an annual based aircraft survey to DOAV and **Table 2-6** reflects the based aircraft count reported to the Commonwealth annually. Moving forward in this study, the Airport's updated based aircraft count is used as the baseline starting point for forecasting purposes. Airport records verified based aircraft counts from 2009 to 2015.

**TABLE 2-5**  
**FAA TAF HISTORICAL BASED AIRCRAFT**

Year	Total Based Aircraft
2009	399
2010	340
2011	340
2012	339
2013	404
2014	404
2015	392
2016	389
2017	395
2018	368
2019	366
2020	339
2021	344

Source: FAA TAF, 2022

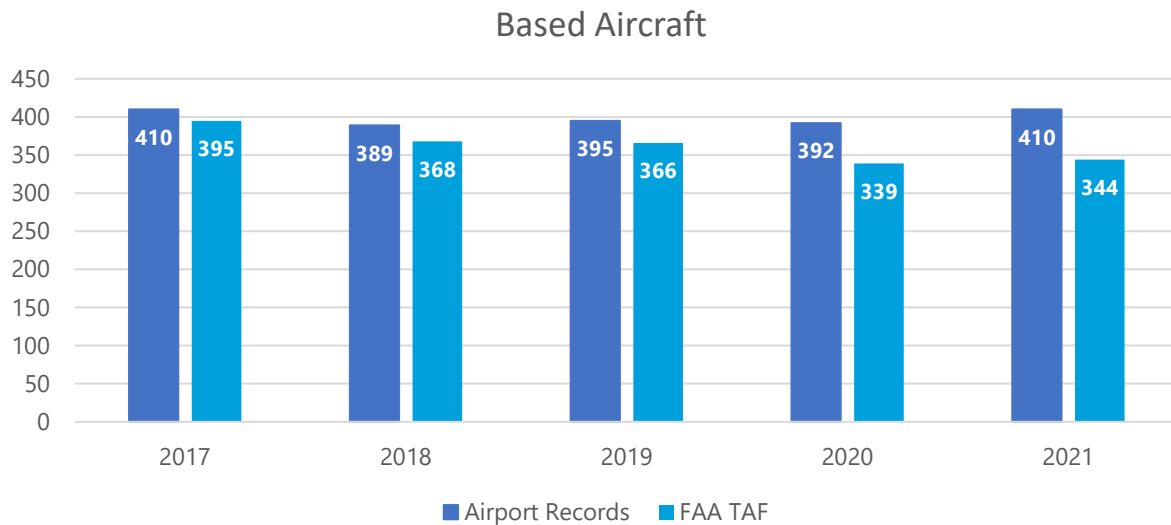
**TABLE 2-6**  
**HEF HISTORICAL BASED AIRCRAFT**

Year	Single Engine	Multi-Engine	Multi-Engine Turboprop	Jet	Helicopter	Ultra-Light	Other	Total
2009	307	41	6	27	17	1	1	400
2010	311	37	6	29	19	1	1	404
2011	315	38	4	30	18	1	1	407
2012	314	30	10	27	22	0	1	404
2013	324	38	10	37	13	0	1	423
2014	311	42	11	37	16	0	1	418
2015	315	40	12	36	14	0	1	418
2016	306	38	12	37	16	0	1	410
2017	303	45	12	31	19	0	0	410
2018	298	38	7	25	19	0	2	389
2019	299	39	6	29	19	0	3	395
2020	305	34	7	25	18	0	3	392
2021	312	35	16	27	18	0	2	410

Source: HEF Records

As shown in **Figure 2-4**, it is apparent the overall number of based aircraft has fluctuated since 2017 but still higher than TAF records. Airport staff noted that records did not account for some aircraft no longer based on the airfield. Also, there is general awareness of duplicative registration of based aircraft at more than one airport in the Commonwealth, which has likely led to discrepancies in reporting. This complicates the process of determining based aircraft and is anticipated to continually create discrepancies between Airport records and FAA counts.

**FIGURE 2-4**  
**HEF AIRPORT RECORDS COMPARISON TO FAA TAF HISTORICAL BASED AIRCRAFT**



Source: Airport Records, 2020; FAA TAF 2022

## 2.5.2 Prior Aviation Forecast Review

This study examined and took into consideration four previously completed aviation demand forecasts including forecasts for the 2002 HEF Airport Layout Plan, the 2022 FAA TAF, the 2021-2041 FAA Aerospace Forecast, and the 2022 Virginia Air Transportation System Plan Update.

### 2.5.2.1 2002 HEF Airport Layout Plan

The 2002 HEF Airport Layout Plan Technical Report was completed in October of 2002, it included 20-year forecasts with a base year of 1999. Considering the events of September 11, 2001, and the subsequent restrictions that occurred on aviation activity, a multi-variate regression analysis was performed to demonstrate forecasted demand and to better represent what the TAF and Virginia Air Transportation System Plan (VATSP) Forecast of Aviation Demand estimated in Northern Virginia. The 2002 Airport Layout Plan assumed annual aircraft operations were forecast to grow to 180,000 in 2020. Based aircraft was forecast to grow to 550 based aircraft by 2020.

### 2.5.2.2 2022 FAA TAF Forecast

As the evolving impacts of the COVID-19 public health emergency occurred in 2020, FAA’s forecasts account for the downturn and recovery from the pandemic based on airport type. This forecast was prepared in 2022 with considerations of COVID-19’s impacts and acknowledged the reduced confidence in growth projections.

Regarding based aircraft, the 2022 FAA TAF forecasted annual growth at 0.90 percent through the planning period. As previously explained, the base year number for 2020 of 339 total aircraft was found to not properly reflect current conditions at HEF and was not used for this study. According to the FAA TAF Detailed 2021 Model, all future growth will materialize in newly based jet aircraft. These factors were considered in the development of the forecast of based aircraft for this Master Plan Update. Between 2009 and 2021, based aircraft grew from 400 to 410. Of that growth, the majority was multi-engine turboprop aircraft growing 1.67 percent from six to 16 between 2009 and 2021.

The 2022 FAA TAF, shown in **Table 2-7**, was published in 2022 and used a base historical year of 2021. Overall, the FAA TAF indicates 2.30 percent growth of total operations between 2021 and 2041. The TAF appears to capture the expected continued increase in local general aviation traffic related to flight training as it shows a 13.50 percent growth between 2017 and 2021 for those operations. The TAF indicates that after 2022, growth will continue. Local and itinerant military operations were held constant from 2021 numbers, as is standard practice for FAA Terminal Area Forecasts.

**TABLE 2-7**  
**2022 FAA TAF FORECAST**

Fiscal Year	Itinerant Air Carrier	Itinerant Air Taxi	Itinerant General Aviation	Itinerant Military	Local General Aviation	Local Military	Total Annual Operations
2009	99	4,378	46,572	231	66,657	16	117,953
2010	108	6,585	40,239	648	45,578	88	93,246
2011	89	7,003	39,011	208	37,830	85	84,226
2012	34	7,883	37,994	353	41,561	80	87,905
2013	5	8,134	32,564	341	42,034	99	83,177
2014	5	10,867	33,465	545	35,275	234	80,391
2015	11	9,936	32,590	856	34,780	342	78,515
2016	6	8,285	34,903	543	43,405	170	87,312
2017	2	9,066	36,275	555	41,203	88	87,189
2018	3	10,580	34,918	598	32,481	140	78,720
2019	5	11,374	35,165	695	38,920	213	86,372
2020*	1	8,949	31,902	1,390	30,103	402	72,747
<b>Forecast</b>							
2021	1	12,890	37,396	2,425	46,766	171	99,649
2026	5	14,156	37,375	2,425	47,684	171	101,816
2031	5	15,553	37,375	2,425	49,342	171	104,871

Fiscal Year	Itinerant Air Carrier	Itinerant Air Taxi	Itinerant General Aviation	Itinerant Military	Local General Aviation	Local Military	Total Annual Operations
2036	5	17,086	37,375	2,425	51,059	171	108,121
2041	5	18,768	37,375	2,425	52,835	171	111,579
CAGR							
2021-2041	<b>8.38%</b>	<b>1.90%</b>	<b>0.00%</b>	<b>0.00%</b>	<b>0.61%</b>	<b>0.00%</b>	<b>0.57%</b>
2021-2026	38.0%	1.9%	0.0%	0.0%	0.4%	0.0%	0.4%
2027-2031	0.0%	1.9%	0.0%	0.0%	0.7%	0.0%	0.6%
2032-2036	0.0%	1.9%	0.0%	0.0%	0.7%	0.0%	0.6%
2037-2041	0.0%	1.9%	0.0%	0.0%	0.7%	0.0%	0.6%

Source: RS&H, 2021; FAA TAF, 2022

### 2.5.2.3 FAA Aerospace Forecast Fiscal Years 2021-2041

The FAA Aerospace Forecast for FY 2021-2041 was also examined as part of this study. While not directly related to HEF, this report provides forecasts of operations and aircraft fleet mix for the nation. The forecast provides a sound benchmark to compare against when forecasting operations and aircraft fleet at specific airports. **Table 2-8** provides the Aerospace Forecast estimates of operations collectively for all towered airports within the Nation. **Table 2-9** details the U.S. GA aircraft fleet forecast and shows the predicted increases/decreases of specific aircraft categories.

**TABLE 2-8**  
**TOTAL COMBINED AIRCRAFT OPERATIONS AT AIRPORTS WITH TOWERS (IN THOUSANDS)**

Fiscal Year	Air Carrier	Air Taxi/Commuter	General Aviation			Military			Total All Ops
			Itinerant	Local	Total	Itinerant	Local	Total	
<b>Historical</b>									
2010	12,658	9,410	14,864	11,716	26,580	1,309	1,298	2,607	51,255
2015	13,755	7,895	13,887	11,691	25,579	1,292	1,203	2,495	49,724
2018	15,686	7,126	14,130	12,354	26,485	1,319	1,155	2,474	51,770
2019	16,192	7,234	14,245	13,109	27,354	1,349	1,134	2,483	53,264
2020	11,737	5,472	12,608	12,333	24,941	1,192	1,020	2,212	44,362
<b>Forecast</b>									
2021	11,219	5,013	13,199	12,744	25,943	1,192	1,020	2,212	44,388
2026	19,050	5,336	15,139	13,632	28,770	1,192	1,020	2,212	55,368
2031	21,337	5,646	15,333	13,877	29,210	1,192	1,020	2,212	58,406
2036	23,490	5,960	15,533	14,131	29,664	1,192	1,020	2,212	61,326
2041	25,571	6,287	15,738	14,393	30,131	1,192	1,020	2,212	64,201
<b>CAGR</b>									
2021-2041	4.20%	1.10%	0.90%	0.60%	0.80%	0.00%	0.00%	0.00%	1.90%

Source: FAA Aerospace Forecast Fiscal Years 2021-2041; FAA Air Traffic Activity

**TABLE 2-9**  
**U.S. GENERAL AVIATION FLEET FORECAST BY AIRCRAFT TYPE**

Year	Piston Engine		Turbine Engine					Total General Aviation Fleet	
	Single Engine	Multi-Engine	Turboprop	Turbojet	Rotorcraft	Experimental	Light Sport		Other
<b>Historical</b>									
2010	139,519	15,900	9,369	11,484	10,102	24,784	6,528	5,684	223,370
2015	127,887	13,254	9,712	13,440	10,506	27,922	2,369	4,941	210,031
2018	130,179	12,861	9,925	14,596	9,989	27,531	2,554	4,114	211,749
2019	128,926	12,470	10,242	14,888	10,198	27,449	2,675	4,133	210,981
2020	127,920	12,395	10,205	15,245	10,155	24,455	2,145	2,460	204,980
<b>Forecast</b>									
2021	126,745	12,320	10,170	15,620	10,215	25,250	2,465	3,085	205,870
2026	120,595	11,970	10,165	17,770	10,815	28,075	3,525	4,160	207,075
2031	114,990	11,720	10,390	20,065	11,580	29,965	4,180	4,180	207,070
2036	109,860	11,520	10,725	22,305	12,445	31,625	4,790	4,215	207,485
2041	105,540	11,365	11,385	24,395	13,390	33,050	5,415	4,250	208,790
<b>CAGR</b>									
2021-2041	-0.90%	-0.40%	-0.60%	2.30%	1.40%	1.40%	4.00%	1.60%	0.10%

Source: FAA Aerospace Forecast Fiscal Years 2021-2041; FAA Air Traffic Activity

#### 2.5.2.4 2022 Virginia Air Transportation System Plan Draft Forecast

The Virginia Air Transportation System Plan (VATSP) 2022 Update, much like a master plan, is an aviation plan of the entire Commonwealth’s airport system that is updated to provide guidance to serve the ongoing growing aviation demand. It is developed by the Virginia Department of Aviation (DOAV) and was most recently updated in 2022. The VATSP identifies HEF as one of its GA airports. The VATSP Update includes an aviation demand forecast published every six years. The forecast draft includes historical and anticipated trends for scheduled air carrier service and general aviation industries. The VATSP analysis indicated that for many aviation demand elements, GA activity was not severely impacted by the COVID-19 pandemic as commercial service operations (see **Figure 2-5**).

The base year for this forecast is 2019 and shows 491,439 GA operations for the Commonwealth of Virginia (see **Table 2-10**) with based aircraft and fleet mix for 2020. Comparing 2020 GA operations to 2019 GA operations signal a reduction of 12.50 percent. This is a slight decrease than the U.S. national average for GA operations which was down 8.90 percent during the same time frame. The Commonwealth of Virginia’s general aviation operations are forecasted to grow through 2044 at 0.60 percent per year. In the 25- year forecast period, based aircraft is expected to increase by 282 aircraft, from 3,613 in 2019 to 3,895 in 2044 (see **Figure 2-6**). Virginia’s fleet is expected to grow 0.30 percent (see **Table 2-10**) over the forecast period which is consistent with national trends. Business jets are growing the quickest at three percent per year with no growth seen for single engine and multi-engine aircraft. More specifically, business jets share for the Commonwealth’s fleet mix is forecasted to increase from four

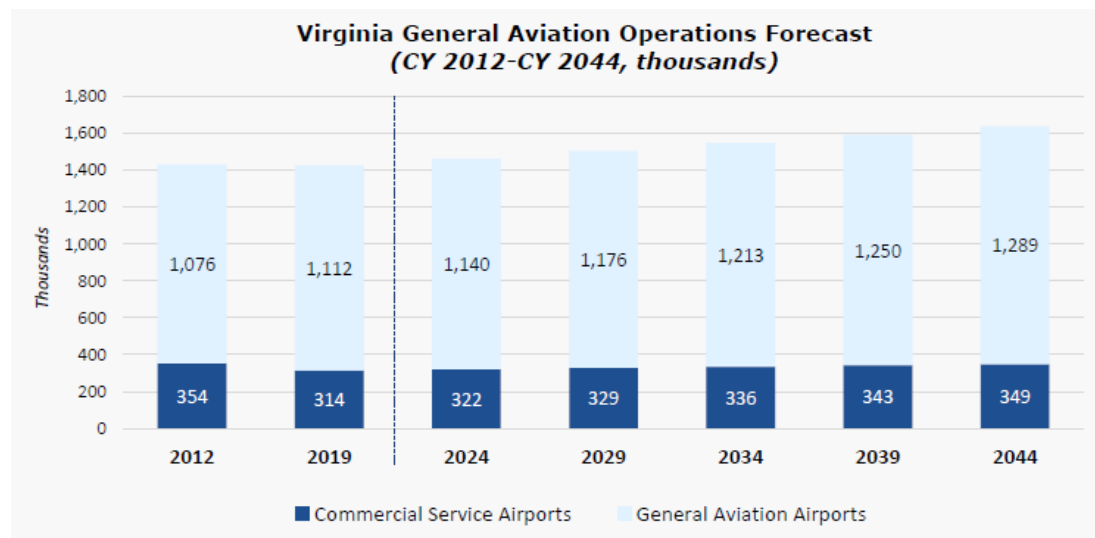
percent in 2019 to eight percent in 2044. For Virginia’s forecasted fleet mix, it is expected to be 73 percent single engine (see **Figure 2-7**) in comparison to the U.S. fleet mix is forecasted to be 51 percent single engine.

**TABLE 2-10**  
**COMMONWEALTH OF VIRGINIA’S GA OPERATIONS AT TOWERED AIRPORTS**

Year	Itinerant	Local	Total
2015	239,836	252,680	492,516
2016	241,795	259,776	501,571
2017	241,458	253,517	494,975
2018	225,457	244,296	469,753
2019	234,841	256,598	491,439
2020	195,685	234,449	430,134

Source: Virginia Air Transportation System Plan (VATSP) 2021

**FIGURE 2-5**  
**COMMONWEALTH OF VIRGINIA’S GA OPERATIONS FORECAST**



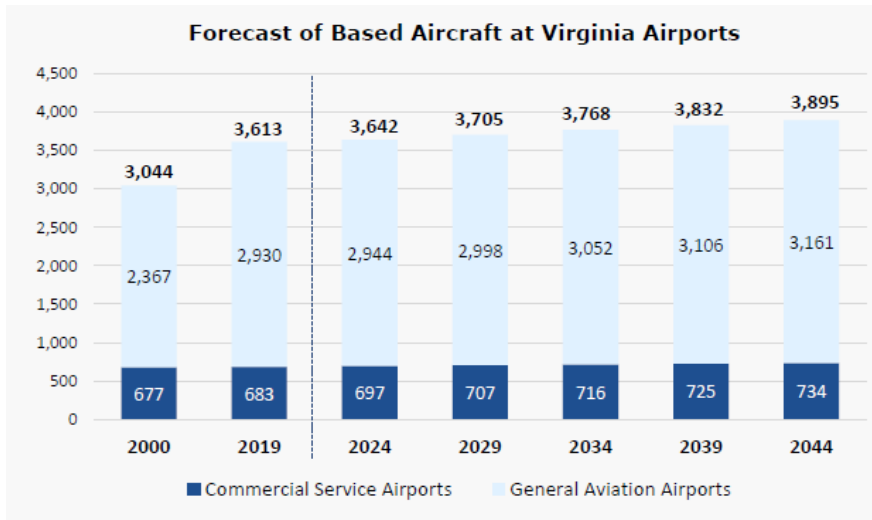
Source: Virginia Air Transportation System Plan (VATSP) 2021

**TABLE 2-11**  
**COMMONWEALTH OF VIRGINIA’S GA FLEET MIX (2019-2044)**

CAGR	Year 2019-2044
Single Engine	0.00%
Multi-Engine	0.10%
Business Jet	3.00%
Helicopter	2.20%
Other	1.10%
Total	0.30%

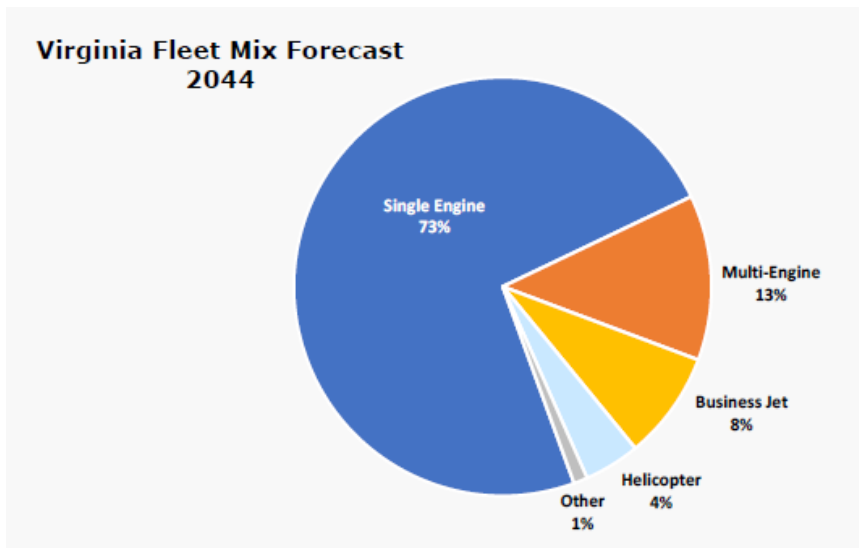
Source: Virginia Air Transportation System Plan (VATSP) 2021

**FIGURE 2-6**  
**COMMONWEALTH OF VIRGINIA'S BASED AIRCRAFT FORECAST**



Source: Virginia Air Transportation System Plan (VATSP) 2021

**FIGURE 2-7**  
**COMMONWELATH OF VIRGINIA'S FLEET MIX FORECAST (2044)**



Source: Virginia Air Transportation System Plan (VATSP) 2021

## 2.6 2021 AVIATION ACTIVITY FORECASTS

The following details the analysis and final forecasts of operations and based aircraft that will be carried forward within this Master Plan Update and used to determine facility requirement needs for HEF.

### 2.6.1 Aircraft Operations Forecast

The operations forecast is broken down by categories which include itinerant air carrier and itinerant air taxi operations, itinerant GA and local GA operations, and military operations. The military forecasts are

equal to the last year of the FAA TAF 2022. The sum of each of these operation subcategories provides the Base Case Forecast of total operations as well as High and Low Growth scenarios.

**2.6.1.1 Itinerant Air Carrier and Air Taxi Operations Forecast**

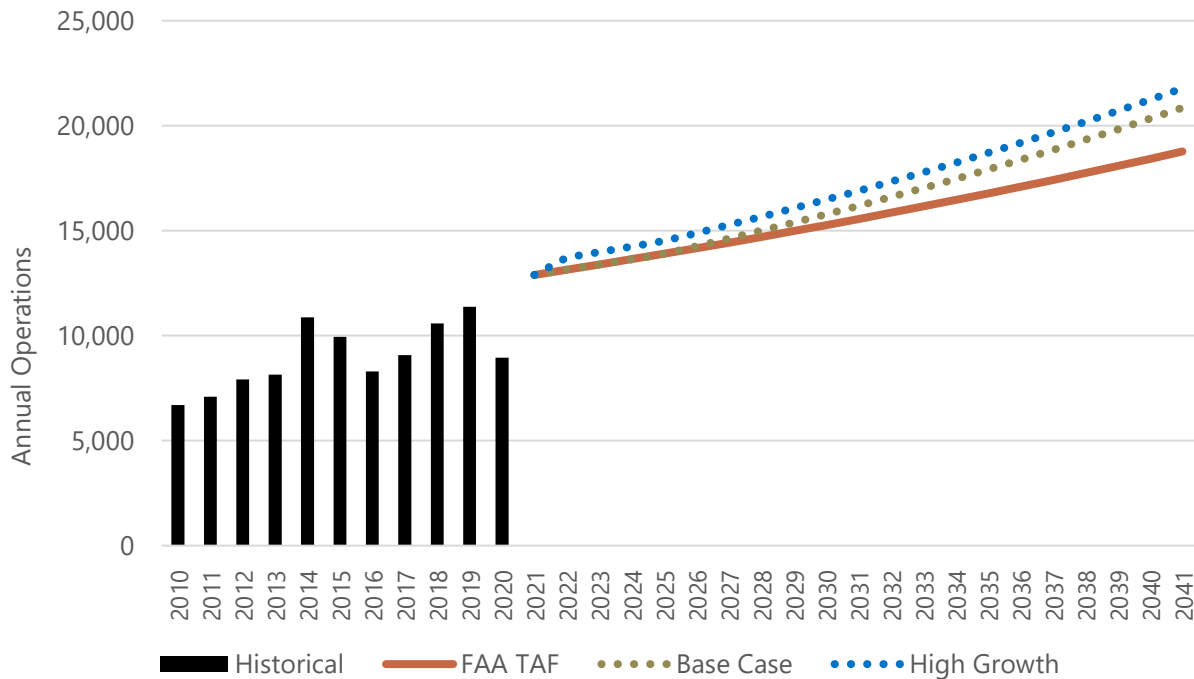
The projections of itinerant air carrier and air taxi operations over the forecast horizon are consistent. **Table 2-12** shows the Base Case Forecast for itinerant air carrier and itinerant air taxi operations from 2021-2041. **Figure 2-8** shows the projected itinerant air carrier and itinerant air taxi operations forecasts. A historical analysis of the HEF service area showed that the AAGR for PCPI increased at a rate of 2.57 percent. The Base Case Forecast is projected to increase at an AAGR of 2.43 percent for 2021-2041 based on the projected PCPI for the HEF service area. Key location and projections for service area’s economy provide the rationale for potentially higher than normal growth. In reviewing Traffic Flow Management System Counts (TFMSC) data for 2019, 17 percent of total annual operations were business aviation operations which account for corporate business travel. Conversations with FBOs indicate that HEF will see more business aviation in the future and believes more corporations and companies will base their aircraft at HEF in the next five years. The AAGR for itinerant operations at HEF is 1.90 percent from 2021-2041 based on the 2022 TAF. HEF experienced a resurgence in traffic due to chartered flights such as residents chartering private planes to go on vacation. Corporate travel also saw a slight uptick, and the Airport’s flight schools cleared the backlog of business that was suspended when operations were shut down in the spring.

**TABLE 2-12**  
**FORECAST ITINERANT AIR CARRIER AND AIR TAXI OPERATIONS (2021-2041)**

Year	FAA TAF	Base Case	Low Growth	High Growth
2019	11,379	11,379	11,379	11,379
2020	8,950	8,950	8,950	8,950
2021	12,891	12,891	12,891	12,891
2026	14,161	14,255	14,161	14,887
2031	15,558	16,182	15,558	16,899
2041	18,773	20,854	18,773	21,778
AAGR				
2021-2026	1.90%	2.03%	1.90%	2.94%
2027-2031	1.90%	2.57%	1.90%	2.57%
2032-2041	1.90%	2.57%	1.90%	2.57%
2021-2041	1.90%	2.43%	1.90%	2.66%

Note- Air Carrier represents aircraft with more than 60 seats. Source: RS&H, 2022; FAA TAF, 2022

**FIGURE 2-8**  
**FORECAST ITINERANT AIR CARRIER AND AIR TAXI SCENARIOS (2021-2041)**



Source: RS&H, 2022; FAA TAF, 2022

### 2.6.1.2 Based Aircraft Fleet

The 2021 based aircraft total was taken from the Airport’s 2021 inventory. The TAF projects a total of 344 aircraft in 2021 while Airport records indicate a total of 410 based aircraft. Each of the forecast scenarios incorporated growth rates associated with **Table 2-5** and **Figure 2-4**.

There was a discrepancy in the based aircraft count listed in the FAA TAF 2021. The FAA TAF 2021 indicated that HEF had a total of 344 based aircraft in 2021 and growing at an AAGR of 1.31 percent over the planning horizon. However, the Airport confirmed that in 2021 it had a total of 410 based aircraft. As a result, the 410 based aircraft were used.

The Base Case Forecast projected a 0.13 percent AAGR for single engine piston from 2021-2026 and overall a 0.19 percent AAGR from 2021-2041. The single engine pistons in the FAA Aerospace Forecast FY 2021-2041 are projected to decrease -0.9 percent AAGR during that time. The based aircraft forecast then adopted a 1.32 percent AAGR for jet aircraft from 2021-2041 to account the projections seen in the FAA Aerospace Forecast and to reflect anticipated growth based on Airport tenant conversations. The Based Aircraft fleet forecast was developed on assumptions based on Airport tenant interviews and industry trends rather than relying completely on TAF projections which analysis deemed too aggressive. Conversations with Airport tenants including a flight training center, reported the flight school purchased multi-engine piston aircraft and anticipates increasing their single-engine aircraft fleet by two aircraft every two-to- five years. The High Growth Forecast has a 0.56 percent AAGR and the Low Growth Scenario Forecast has a 0.36 percent AAGR from 2021-2041. Due to the pandemic, pilot training activity

has seen substantial growth and projects linear growth into the future. Conversations with FBOs anticipate more corporations and companies will base their aircraft at HEF in the next five years. **Table 2-13** shows each of the forecast scenarios for based aircraft from 2021-2041.

**TABLE 2-13**  
**FORECAST BASED AIRCRAFT SCENARIOS (2021-2041)**

Base Case							
Year	SEP <sup>1</sup>	MEP <sup>2</sup>	METP <sup>3</sup>	Jet	Rotor <sup>4</sup>	Other	Total
2021	312	35	16	27	18	2	410
2026	314	35	16	30	18	2	415
2031	319	36	16	32	18	2	424
2036	322	37	17	33	19	2	431
2041	324	37	18	35	20	2	436
High Growth							
Year	SEP <sup>1</sup>	MEP <sup>2</sup>	METP <sup>3</sup>	Jet	Rotor <sup>4</sup>	Other	Total
2021	312	35	16	27	18	2	410
2026	317	36	18	31	20	2	424
2031	320	38	19	34	21	2	433
2036	324	39	20	38	22	2	445
2041	328	41	21	42	23	3	458
Low Growth							
Year	SEP <sup>1</sup>	MEP <sup>2</sup>	METP <sup>3</sup>	Jet	Rotor <sup>4</sup>	Other	Total
2021	312	35	16	27	18	2	410
2026	313	35	16	28	18	2	413
2031	316	36	17	30	18	2	420
2036	318	37	17	32	19	2	425
2041	321	37	17	33	19	2	430

Note: 1-SEP=Single engine piston aircraft; 2-MEP=Multi-engine piston aircraft; 3-METP=Multi-engine turboprop aircraft; Jet=Turbojet aircraft; 4-Rotor=Helicopter/Rotorcraft  
Source: RS&H, 2022; FAA TAF, 2022

### 2.6.1.3 Itinerant GA and Local GA Operations Forecast

The FAA TAF projects the GA operations to increase by nearly 6,000 operations from the 2021-2041 with a 0.21 percent AAGR from 2021-2026. Through interviews with flight schools at the Airport it was clear HEF tenants are expecting and planning for an increase in students and resulting additional based aircraft. This activity will reflect in an increase beyond historic numbers of annual operations at HEF. The FAA TAF 2022 indicated that HEF will have a total of 90,210 GA operations in 2041 and is projected to grow at an AAGR of 0.35 percent from 2021-2041.

A review of historic data yielded a high statistical correlation between airport operations and population growth within the HEF service area. As such, the Base Case Forecast was determined considering a 1.19 percent AAGR which is similar to the projected AAGR of HEF's service area. The projected GA operations distribution average is applied to each of the forecasts to generate projected civil and itinerant GA

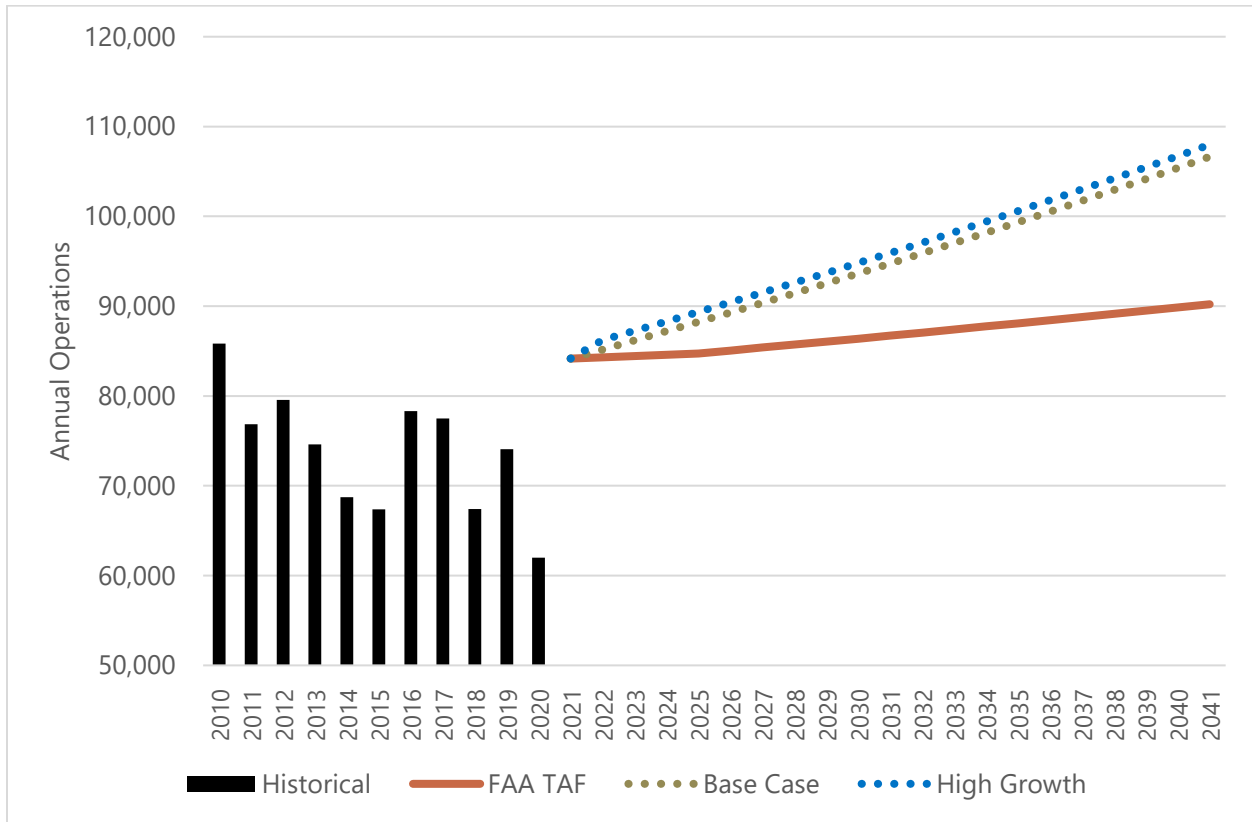
operations. Although the TAF shows GA itinerant operations with a flat growth at 37,375 operations through 2041, the applied growth factor to the Base Case indicates a forecasted growth in GA itinerant and local operations due to GA operations correlation to population growth. Comparatively, the GA operations of the Commonwealth of Virginia general aviation operations are forecasted to grow through 2044 at 0.60 percent per year. **Table 2-14** and **Figure 2-9** provide the GA operations projections by forecast from 2021-2041.

**TABLE 2-14**  
**FORECAST GA OPERATIONS SCENARIOS (2021-2041)**

Year	FAA TAF	Base Case	Low Growth	High Growth
2019	74,085	74,085	74,085	74,085
2020	62,005	62,005	62,005	62,005
2021	84,162	84,162	84,162	84,162
2026	85,059	89,293	85,059	90,416
2031	86,717	94,736	86,717	95,928
2041	90,210	106,638	90,210	107,980
AAGR				
2021-2026	0.21%	1.19%	0.21%	1.45%
2027-2031	0.39%	1.19%	0.39%	1.19%
2032-2041	0.40%	1.19%	0.40%	1.19%
2021-2041	0.35%	1.19%	0.35%	1.25%

Source: RS&H, 2022; FAA TAF, 2022

**FIGURE 2-9**  
**FORECAST GA OPERATIONS SCENARIOS (2021-2041)**



Source: RS&H, 2022; FAA TAF, 2022

### 2.6.1.4 Military Operations

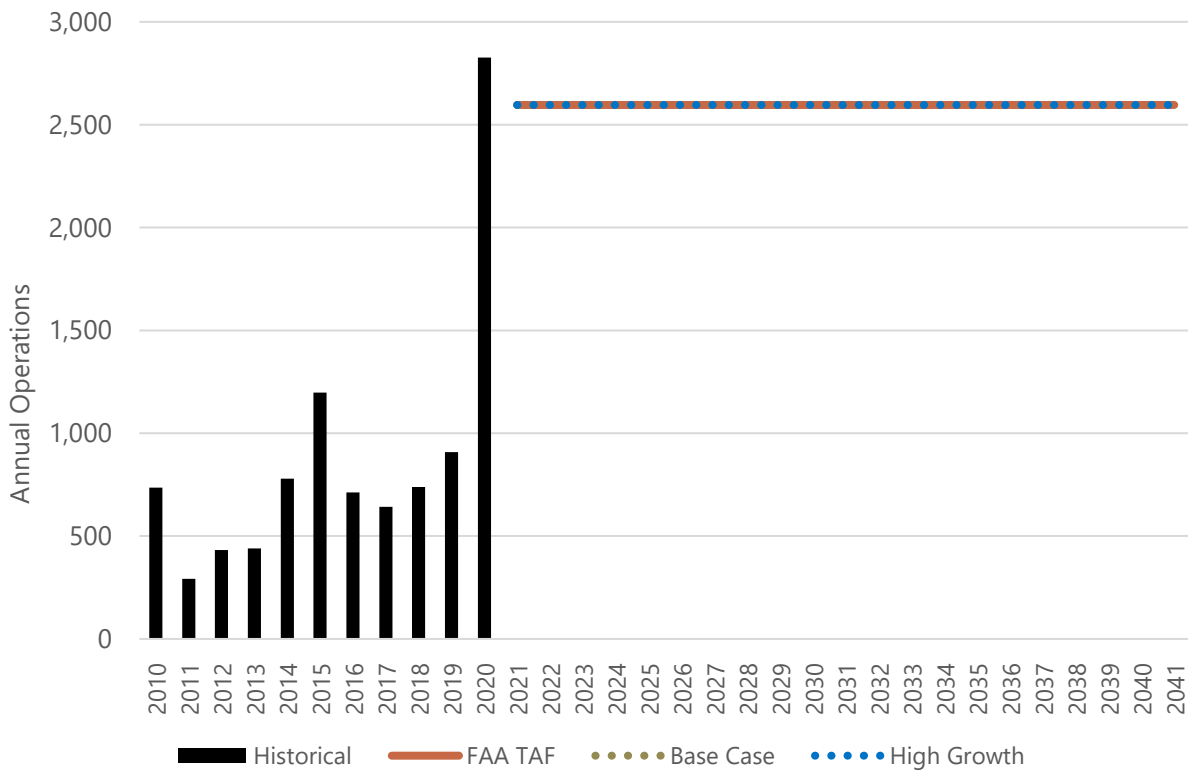
The itinerant and local military aircraft that operate out of HEF represented only 2.6 percent of all 99,949 operations as identified within FAA TAF 2022. This forecast does not make any changes to the number of local or itinerant military operations. Instead, as is a customary practice and done within FAA TAF's numbers, it holds the existing count of 2,596 operations for local and itinerant military operations constant from 2021-2041. **Table 2-15** and **Figure 2-10** shows the military operations and represents military operations forecasts for the Base Case, High Growth, and Low Growth Forecasts.

**TABLE 2-15**  
**FORECAST MILITARY OPERATIONS (2021-2041)**

Year	FAA TAF	Base Case	Low Growth	High Growth
2019	2,596	2,596	2,596	2,596
2020	2,596	2,596	2,596	2,596
2021	2,596	2,596	2,596	2,596
2026	2,596	2,596	2,596	2,596
2031	2,596	2,596	2,596	2,596
2041	2,596	2,596	2,596	2,596
AAGR				
2021-2026	0.00%	0.00%	0.00%	0.00%
2027-2031	0.00%	0.00%	0.00%	0.00%
2032-2041	0.00%	0.00%	0.00%	0.00%
2021-2041	0.00%	0.00%	0.00%	0.00%

Source: RS&H, 2022; FAA TAF, 2022

**FIGURE 2-10**  
**FORECAST- MILITARY OPERATIONS (2021-2041)**



Source: RS&H, 2022; FAA TAF, 2022

### 2.6.1.5 Total Operations

The forecast total operations for the Airport are a summation of the air taxi, GA, and military operation forecasts presented in previous sections. **Table 2-16** and **Figure 2-11** show the projected totals from 2021-2041 for each scenario. The FAA TAF 2022 projects an AAGR of 0.57 percent from 2021-2041 to increase total annual operations to 111,579 by 2041. This rate was also used for the Low Growth Forecast. The Base Case Forecast projects a slightly greater trend in the growth of the Airport’s total annual operations over the planning horizon increasing to a total of 130,088 by 2041, at an AAGR of 1.34 percent.

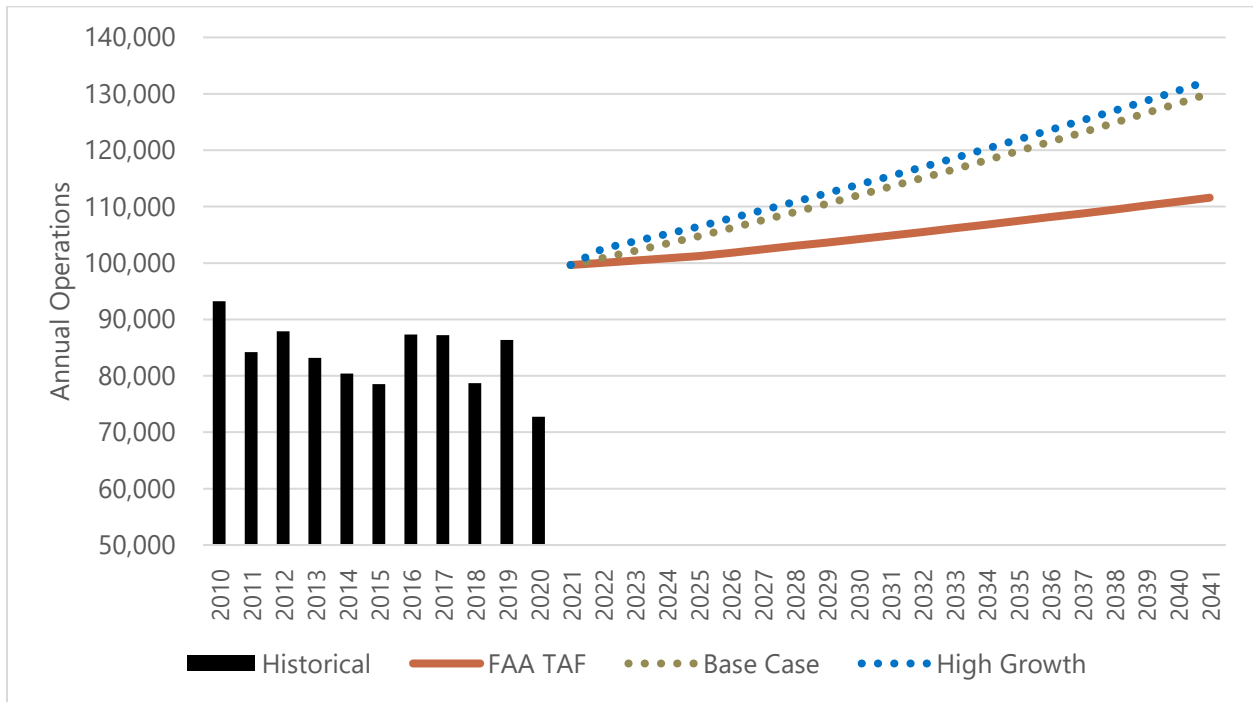
**TABLE 2-16**  
**FORECAST TOTAL OPERATIONS SCENARIOS (2021-2041)**

Year	Historical	FAA TAF	Forecasts		
			Base Case	Low Growth	High Growth
2010	93,246	93,246	93,246	93,246	93,246
2011	84,226	84,226	84,226	84,226	84,226
2012	87,905	87,905	87,905	87,905	87,905
2013	83,177	83,177	83,177	83,177	83,177
2014	80,391	80,391	80,391	80,391	80,391
2015	78,515	78,515	78,515	78,515	78,515
2016	87,312	87,312	87,312	87,312	87,312
2017	87,189	87,189	87,189	87,189	87,189
2018	78,720	78,720	78,720	78,720	78,720
2019	86,372	86,372	86,372	86,372	86,372
2020	72,747	72,747	72,747	72,747	72,747
2021	99,649	99,649	99,649	99,649	99,649
2022		100,041	100,896	100,041	102,550
2023		100,432	102,159	100,432	103,837
2024		100,828	103,438	100,828	105,140
2025		101,228	104,735	101,228	106,462
2026		101,816	106,144	101,816	107,899
2027		102,410	107,573	102,410	109,358
2028		103,013	109,024	103,013	110,840
2029		103,627	110,498	103,627	112,344
2030		104,245	111,994	104,245	113,872
2031		104,871	113,514	104,871	115,424
2032		105,507	115,058	105,507	117,000
2033		106,148	116,625	106,148	118,601
2034		106,798	118,217	106,798	120,227
2035		107,457	119,834	107,457	121,878
2036		108,121	121,477	108,121	123,556
2037		108,795	123,145	108,795	125,261
2038		109,475	124,840	109,475	126,992
2039		110,167	126,562	110,167	128,751
2040		110,869	128,311	110,869	130,539

Year	Historical	FAA TAF	Forecasts		
			Base Case	Low Growth	High Growth
2041		111,579	130,088	111,579	132,354
<b>AAGR</b>					
2021-2026		0.43%	1.27%	0.43%	1.61%
2027-2031		0.59%	1.35%	0.59%	1.36%
2032-2041		0.62%	1.37%	0.62%	1.38%
2021-2041		0.57%	1.34%	0.57%	1.43%

Source: RS&H, 2022; FAA TAF, 2022

**FIGURE 2-11**  
**TOTAL OPERATIONS FORECAST COMPARISON (2021-2041)**



Source: RS&H, 2022; FAA TAF, 2022

## 2.7 CRITICAL AIRCRAFT

Critical aircraft are defined by the use within specific areas of the Airport to determine appropriate airfield design requirements. The FAA defines a critical aircraft as the most demanding aircraft with 500 or more operations annually. A representative group type can be used in some cases if no single aircraft model has sufficient operations to achieve the threshold. A critical aircraft must be determined for each runway, and sometimes for specific portions of the terminal/hangar area. Ultimately, the critical aircraft provides details for airport design which include Aircraft Approach Category (AAC), Airplane Design Group (ADG), and Taxiway Design Group (TDG). The AAC (see **Table 2-17**), depicted by a letter, relates to aircraft landing speeds. The ADG (see **Table 2-18**), depicted by a Roman numeral, relates to airplane wingspan and height. The TDG (see

**Table 2-19**), classified by number, relates to the outer-to-outer main gear width and the distance between the cockpit and main gear. These parameters serve as the basis of the design and construction of airport infrastructure.

### 2.7.1 Existing Critical Aircraft

The 2012 Master Plan identified the critical aircraft for Runway 16L-34R as the Gulfstream V and the Dash 8 as the critical aircraft for Runway 16R-34L. The Gulfstream V is a business jet that is an AAC-C, ADG-III, and TDG-2B aircraft. The Dash 8 is a turboprop aircraft that is an AAC-B, ADG-III, and a TDG-3. The latest ALP update completed in 2021 following the 16R-34L Rehabilitation Project identifies the critical aircraft for Runway 16R-34L as the Citation Sovereign while the critical aircraft for Runway 16L-34R remained the same, the Gulfstream V. The Citation Sovereign is a business jet that is an AAC-B, ADG-II, and TDG-1B. Forecasting the future critical aircraft will assist in identifying triggering events that would cause specific development to be required.

**TABLE 2-17**  
**AIRCRAFT APPROACH CATEGORY**

AAC	Approach Speed
A	Approach speed less than 91 knots
B	Approach speed 91 knots or more but less than 121 knots
C	Approach speed 121 knots or more but less than 141 knots
D	Approach speed 141 knots or more but less than 166 knots
E	Approach speed 166 knots or more

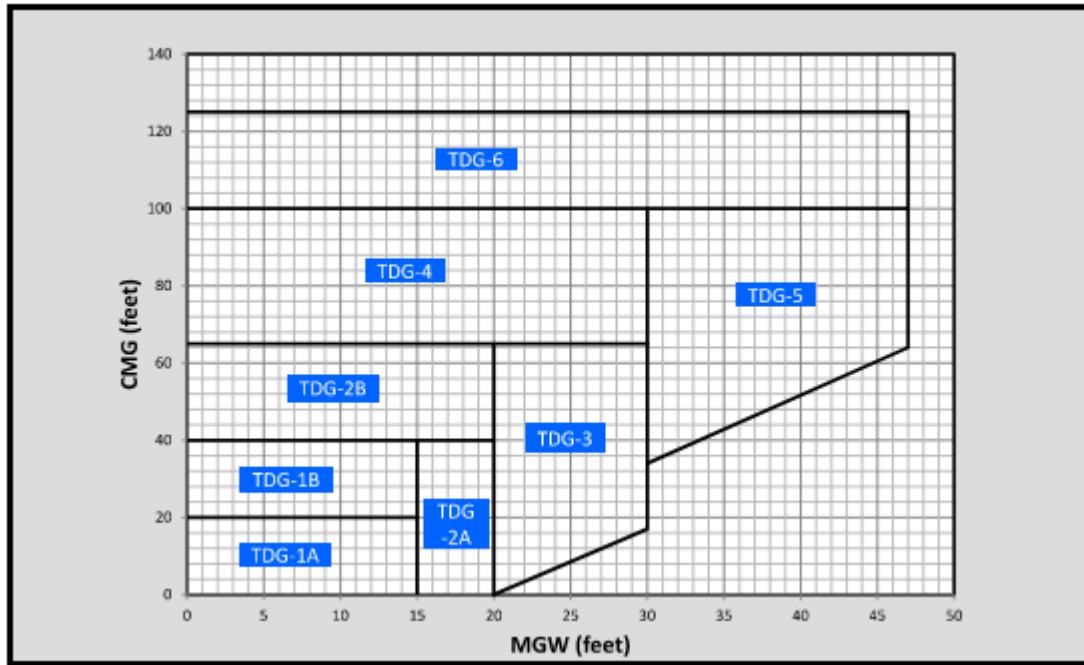
Source: FAA AC 150/5300-13A, Change 1, Airport Design

**TABLE 2-18**  
**AIRCRAFT DESIGN GROUP**

Group #	Tail Height (ft)	Wingspan (ft)
I	< 20'	< 49'
II	20' - < 30'	49' - < 79'
III	30' - < 45'	79' - < 118'
IV	45' - < 60'	118' - < 171'
V	60' - < 66'	171' - < 214'
VI	66' - < 80'	214' - < 262'

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

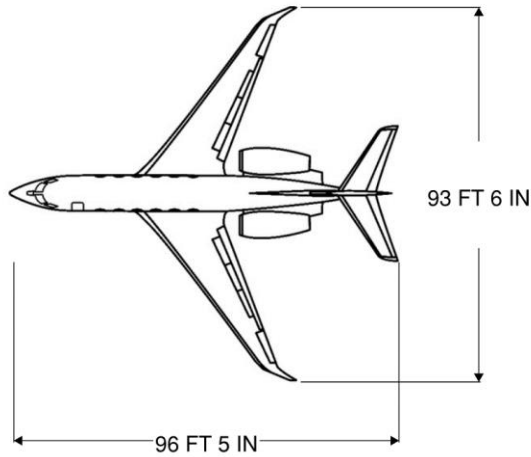
**TABLE 2-19**  
**TAXIWAY DESIGN GROUP**



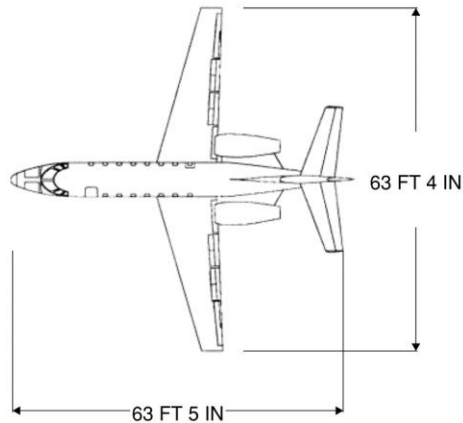
Source: FAA AC 150/5300-13B, Airport Design

**FIGURE 2-12**  
**EXISTING CRITICAL AIRCRAFT**

### **Gulfstream G500**



### **Citation Sovereign**



#### **2.7.2 Future Critical Aircraft**

Advisory Circular 150/5000-17 (Critical Aircraft and Regular Use Determination) defines the critical aircraft as the most demanding aircraft type, or grouping of aircraft with similar characteristics, that make regular use of the airport. Regular use is 500 annual operations, including both itinerant and local operations but excluding touch-and-go operations.

For the purpose of identifying a Critical Aircraft, "similar characteristics" refers to the practice of grouping aircraft by comparable operational performance and/or physical dimensions. The composite aircraft will represent a group of aircraft with the most demanding Aircraft Approach Category (AAC) and Airplane Design Group (ADG). To define the airport's future critical aircraft, grouping aircraft with similar characteristics together instead of identifying a single aircraft type is necessary.

**Table 2-20** shows the composite grouping of operations which will define the future critical aircraft for Runway 16L-34R. The data was obtained from the airport’s operations tracking software VirTower which allows tracking of all airport operations, inclusive of government operations typically omitted from FAA offload data.

**TABLE 2-20**  
**2021 OPERATIONS ON RWY 16L-34R BY AIRCRAFT TYPE**

AAC/ADG	Aircraft	CY 2021 Operations
A-III	Boeing Douglas DC-3	20
B-III	Bombardier Global Express 6000	24
C-III	Bombardier Dash 8 Q300	731
	Bombardier Dash 8 Q400	
	Embraer 190	
	Gulfstream V	
D-III	Gulfstream VI	30

Source: HEF VirTower Data, 2021

Aircraft classified as C-III account for over 700 operations in 2021, with the Gulfstream V (305 operations) making up nearly half of those operations, making it the largest category to exceed the 500 annual operations threshold. While aircraft in the D-III category occasionally operate at HEF, their total operations do not currently exceed the operations threshold to constitute regular use. For this reason, the future critical aircraft will remain the C-III Gulfstream V.

With the Airport preparing for expected growth and development on the west side during the forecast period coupled with aircraft becoming faster and more complex (pistons to turbine and jets), it’s prudent to plan for a facility that aligns with the existing critical aircraft for RWY 16R-34L. As stated in the Virginia Air Transportation System Plan draft, business jet share for the Commonwealth’s fleet mix is forecasted to increase from four percent in 2019 to eight percent in 2044. Business jets are growing the quickest with no growth seen for single engine and multi-engine aircraft. Therefore, the future critical aircraft will remain the Citation Sovereign as identified in the latest ALP update.

## 2.8 FORECAST COMPARISON TABLES

This section compares the FAA TAF 2022 published March 2022 with the Base Case Forecast. In accordance with FAA Order 5050.4B, National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions, paragraph 706.b(3), the FAA uses the following parameters to assess aviation forecasts, including those prepared for airport master plans. To be consistent with the FAA TAF:

- » The 5-year forecast should be within 10 percent of the TAF; and,
- » The 10-year forecast should be within 15 percent of the TAF.

Each of the forecasts used fiscal years for enplanements and operations to be directly comparable with the FAA TAF.

The Base Case Forecast was generated through extensive analysis of regional socioeconomic statistics, trends, and existing data sources, as well as through in-depth interviews with key stakeholders within the Manassas regional area. Based on these inputs, a best-fit model was produced. In addition to the Base Case Forecast, alternative High and Low Growth Forecasts were developed to provide varying levels of activity due to unanticipated local or national events. The existing military operations from TAF 2022 are projected to remain constant over the 20-year planning horizon.

**Table 2-21** shows the comparison of the preferred Base Case Forecast with the FAA TAF 2022. In all cases the preferred Base Case Forecast meets the five year and 10-year percent parameters established by the FAA for assessing forecast differences.

The summary of aviation forecasts as it relates to itinerant operations, local operations, based aircraft, and instrument approach operations is provided in **Table 2-22**.

**TABLE 2-21**  
**BASE CASE FORECAST COMPARISON WITH FAA TAF 2021**

Category	2021		2026		2031		2041	
	Base Case	TAF 2021	Base Case	TAF 2021	Base Case	TAF 2021	Base Case	TAF 2021
Air Carrier & Air Taxi Operations	12,891	12,891	14,255	14,161	16,182	15,558	20,854	18,773
GA & Local GA Operations	84,162	84,162	89,293	85,059	94,736	86,717	106,638	90,210
Military Operations	2,596	2,596	2,596	2,596	2,596	2,596	2,596	2,596
Total Operations	99,649	99,649	106,144	101,816	113,514	104,871	130,088	111,579
GA Based Aircraft	410	410	415	412	424	396	436	446
<b>Comparison with FAA TAF 2021 (percent different)</b>								
Air Carrier & Air Taxi Operations	0.00%		0.66%		3.86%		9.98%	
GA & Local GA Operations	0.00%		4.74%		8.46%		15.41%	
Military Operations	0.00%		0.00%		0.00%		0.00%	
Total Operations	0.00%		4.08%		7.61%		14.23%	
GA Based Aircraft	0.00%		0.72%		6.60%		-2.29%	

Source: RS&H, 2022; FAA TAF, 2022

TABLE 2-22  
 AVIATION FORECASTS SUMMARY

	Average Annual Compound Growth Rates								
	<u>Base Yr.</u>	<u>Base</u>	<u>Base</u>	<u>Base</u>	<u>Base Yr. to +5</u>			<u>Base Yr. to +10</u>	<u>Base Yr. to +20</u>
	<u>Level</u>	<u>Yr.+5yrs.</u>	<u>Yr.+10yrs.</u>	<u>Yr.+20yrs.</u>					
	2021	2026	2031	2041	2026			2031	2041
<b>Operations</b>									
<u>Itinerant</u>									
Air carrier	1	5	5	5	37.97%			17.46%	8.38%
Commuter/air taxi	12,890	14,250	16,177	20,849	2.03%			2.30%	2.43%
General aviation	37,396	39,676	42,094	47,383	1.19%			1.19%	1.19%
Military	2,425	2,425	2,425	2,425	0.00%			0.00%	0.00%
<u>Local</u>									
General aviation	46,766	49,617	52,642	59,255	1.19%			1.19%	1.19%
Military	171	171	171	171	0.00%			0.00%	0.00%
<b>TOTAL OPERATIONS</b>	<b>99,649</b>	<b>106,144</b>	<b>113,514</b>	<b>130,088</b>	<b>1.27%</b>			<b>1.31%</b>	<b>1.34%</b>
<b>Based Aircraft</b>									
Single Engine	312	314	319	324	0.13%			0.22%	0.19%
Multi Engine	51	51	52	55	0.00%			0.19%	0.38%
Jet Engine	27	30	32	35	2.13%			1.71%	1.31%
Helicopter	18	18	18	20	0.00%			0.00%	0.53%
Other	2	2	2	2	0.00%			0.00%	0.00%
<b>TOTAL</b>	<b>410</b>	<b>415</b>	<b>423</b>	<b>436</b>	<b>0.24%</b>			<b>0.31%</b>	<b>0.31%</b>
<b>Instrument Operations</b>	<b>8,985</b>	<b>9,581</b>	<b>10,319</b>	<b>12,013</b>	<b>1.29%</b>			<b>1.39%</b>	<b>1.46%</b>

**Chapter 2A**  
**Aviation Activity Forecast Amendment**



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*CHAPTER 2A*  
*AVIATION ACTIVITY FORECAST*  
*AMENDMENT*

## 2.1 INTRODUCTION

The Aviation Activity Forecast (the Forecast) for Manassas Regional Airport (HEF or the Airport) was completed and approved by the Federal Aviation Administration (FAA) in 2022 as part of the Master Plan process. In 2023 the HEF Board signed an agreement with a private airport operator to bring commercial passenger air service to HEF.

HEF has historically operated as a general aviation airport with no airline passenger commercial activity. Considering this major change in proposed activity it is necessary for HEF to update its recently approved forecasts by integrating commercial passenger service into the 20-year master plan planning period. Knowing future levels of activity from commercial passenger operations will allow HEF to determine the impact and needs they will have on current and future airport facilities.

Aviation activity forecasting is an analytical and subjective process providing future order of magnitude traffic level estimates. The methodology used in estimating future commercial passenger activity at HEF described in future sections of this document follows FAA guidance included in FAA's AC 150/5070-6B Airport Master Plans Chapter 7 and Forecasting Aviation Activity report from FAA's office of Aviation Policy and Plans (APO).

The updated forecast will focus only on adding commercial passenger enplanements and operations values to the previously approved FAA forecast numbers, shown in **Table 2A-1**, considering that previously forecasted values are trending closely with current numbers.

Per FAA guidance forecast will include projected activity levels for passenger enplanements and aircraft operations expected within the 20-year planning period from Fiscal Year (FY) 2021<sup>1</sup> to FY 2041 (the Forecast Period) The forecast will be presented in five and ten-year increments beginning with the base year FY 2021 outward to FY 2026, FY 2031, and FY 2041.

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<sup>1</sup> 2021 is used as the base year in this analysis to remain consistent with the forecast created and approved by the FAA in 2022.

TABLE 2A-1 HEF 2022 FAA APPROVED FORECAST SUMMARY

	Compound Annual Growth Rates							
	<u>Base Yr. Level</u>	<u>Base Yr. +5yrs.</u>	<u>Base Yr. +10yrs.</u>	<u>Base Yr. +20yrs.</u>	<u>Base Yr. to +5</u>	<u>Base Yr. to +10</u>	<u>Base Yr. to +20</u>	
	2021	2026	2031	2041	2026	2031	2041	
<b>Operations</b>								
<b><u>Itinerant</u></b>								
Air carrier	1	5	5	5	37.97%	17.46%	8.38%	
Commuter/air taxi	12,890	14,250	16,177	20,849	2.03%	2.30%	2.43%	
General aviation	37,396	39,676	42,094	47,383	1.19%	1.19%	1.19%	
Military	2,425	2,425	2,425	2,425	0.00%	0.00%	0.00%	
<b><u>Local</u></b>								
General aviation	46,766	49,617	52,642	59,255	1.19%	1.19%	1.19%	
Military	171	171	171	171	0.00%	0.00%	0.00%	
<b>TOTAL OPERATIONS</b>	<b>99,649</b>	<b>106,144</b>	<b>113,514</b>	<b>130,088</b>	<b>1.27%</b>	<b>1.31%</b>	<b>1.34%</b>	
<b>Based Aircraft</b>								
Single Engine	312	314	319	324	0.13%	0.22%	0.19%	
Multi Engine	51	51	52	55	0.00%	0.19%	0.38%	
Jet Engine	27	30	32	35	2.13%	1.71%	1.31%	
Helicopter	18	18	18	20	0.00%	0.00%	0.53%	
Other	2	2	2	2	0.00%	0.00%	0.00%	
<b>TOTAL</b>	<b>410</b>	<b>415</b>	<b>423</b>	<b>436</b>	<b>0.24%</b>	<b>0.31%</b>	<b>0.31%</b>	

## 2.2 HEF BACKGROUND

At a national level, the National Plan of Integrated Airport Systems (NPIAS) classifies HEF as a reliever airport. HEF acts as a reliever to Dulles International Airport (IAD) located 16 miles as the crow flies north of HEF and Ronald Reagan Washington National Airport (DCA) located 27 miles as the crow flies northeast of HEF. As a reliever HEF's main purpose is to relieve congestion at IAD and DCA though also offering a range of services to the general aviation community. In 2022 HEF had over 110,000 aircraft operations making it the busiest general aviation airport in Virginia.

## 2.3 FACTORS AFFECTING COMMERCIAL AVIATION DEMAND

Commercial aviation demand is impacted by a variety of key socioeconomic qualitative and quantitative factors and non-economic factors within the HEF service area.

### 2.3.1 HEF Catchment Area

The HEF catchment area (Catchment Area) is defined in Section 1.5 and includes the six immediate counties within proximity to the Airport including Prince William County/City of Manassas, Arlington County, Fairfax County, Fauquier County, Loudoun County, Stafford County. The following sections provide historic and forecast information of the key socioeconomic factors that have been identified as having the most impact in commercial passenger growth at HEF for the Catchment Area.

### 2.3.2 Key Socioeconomic Factors

There are numerous socioeconomic factors that contribute to the growth of commercial passenger service considering the many reasons that contribute to the decision of passengers traveling by air from a particular airport. Potential for growth in commercial passenger traffic can be quantified when statistically compared with relevant key local, state, and national socioeconomic indicators and trends. For example, as regional manufacturing expands, so does employment associated with the growth in industry and regional per capita income as well as the propensity of the regional population to travel. Similarly, establishing headquarters, national businesses, healthcare, and/or educational facilities can further drive the population, jobs, employment and associated income of the market area. The presence of businesses and industries within the region coupled with growth in population, employment, income, and manufactured goods provides a strong baseline for air service and its potential progression.

The 2023 Woods and Poole Economics, Inc. (W&P), economic and demographic data sets provide key socioeconomic data and forecasts key socioeconomic elements that commonly impact commercial air travel including: population, employment, personal income, and per capita personal income (PCPI) in the local region, statewide and nationally.

#### 2.3.2.1 Population

**Table 2A-2** shows the population size of the counties that are within the Catchment Area. The historical and forecasted population for the Catchment Area is broken out by county and compared to the entire Commonwealth of Virginia and the United States as a whole. As seen in the table, the Catchment Area is growing at a higher rate than the Commonwealth of Virginia and the United States at 1.2 percent throughout the Forecast Period.

TABLE 2A-2 HEF CATCHMENT AREA - POPULATION

	Population									
	Calendar Year	Prince William/Manassas	Arlington	Fairfax	Fauquier	Loudoun	Stafford	Manassas Catchment Area	Virginia Total	U.S.
<i>Historical</i>	<b>2010</b>	458,846	209,319	1,121,203	65,433	315,486	129,857	2,300,144	8,024,004	309,327,089
	<b>2015</b>	512,915	228,227	1,164,303	69,264	374,119	141,534	2,490,362	8,390,283	321,753,440
	<b>2020</b>	542,643	238,799	1,187,410	72,990	422,669	157,746	2,622,257	8,636,471	331,511,512
<i>Baseline</i>	<b>2021</b>	545,052	233,574	1,180,582	74,022	428,435	161,584	2,623,249	8,657,365	332,031,554
<i>Forecast</i>	<b>2022</b>	546,288	233,574	1,177,752	74,664	432,085	163,380	2,627,743	8,683,619	333,287,557
	<b>2023</b>	555,561	236,005	1,187,370	75,283	443,870	166,319	2,664,408	8,754,269	335,546,979
+ 5 years	<b>2026</b>	583,909	241,948	1,215,815	77,170	480,838	175,457	2,775,137	8,967,442	342,320,505
+ 10 Years	<b>2031</b>	632,379	251,381	1,260,701	80,422	547,664	191,814	2,964,361	9,321,044	353,366,671
+ 15 years	<b>2036</b>	681,926	260,059	1,301,621	83,811	621,094	209,698	3,158,209	9,669,260	363,987,894
+ 20 years	<b>2041</b>	732,010	267,812	1,337,758	87,343	701,166	229,248	3,355,337	10,008,938	374,072,743
<b>Compound Annual Growth Rate (CAGR)</b>										
<b>2010 - 2019</b>		1.8%	1.4%	0.7%	1.2%	3.1%	2.0%	1.4%	0.8%	0.7%
<b>2019 - 2020</b>		0.8%	0.7%	-0.1%	0.3%	1.9%	2.0%	0.6%	0.4%	0.4%
<b>2020 - 2022</b>		0.3%	-1.1%	-0.4%	1.1%	1.1%	1.8%	0.1%	0.3%	0.3%
<b>2022 - 2023</b>		1.7%	1.0%	0.8%	0.8%	2.7%	1.8%	1.4%	0.8%	0.7%
<b>2021 - 2041</b>		1.5%	0.7%	0.6%	0.8%	2.5%	1.8%	1.2%	0.7%	0.6%

Source: Woods & Poole Economics, Inc; RS&H Analysis, 2023

### 2.3.2.2 Employment

Based on W&P data, the trades within the Catchment Area with the highest level of employment are federal, state, and local government, construction, healthcare, accommodations, and retail trade. In addition to the many governmental entities within the area, some of the top employers within the Catchment Area include Lockheed Martin, Nestle, Virginia Hospital, Amazon, Inova Health System, and Northrop Gruman. Being in close proximity to the Nation's capital makes the area more attractive to select individual trades. For example, accommodations rank high in employment because not only due to numerous lawmakers and business travelers commute frequently to this area, but it is also a major domestic and international tourist attraction due to its vast American history and cultural sites, architecture, museums and national memorials.

The employment history for the Prince William/Manassas County had a CAGR of 3.1 percent between CY 2010 thru CY 2019 which is almost twice as high as the remaining Catchment Area counties, the Commonwealth of Virginia as a whole, and the entire United States. Due to the COVID-19 Pandemic between CY 2019 and CY 2020, the employment rate within Prince William/Manassas County dropped to 0.6 percent, but not as much as the rest of the Catchment Area counties, the Commonwealth of Virginia, or the United States which saw a drop of -1.3 percent, -2.0 percent, and -3.1 percent, respectively during that same period.

The forecast indicates a strong return from the COVID-19 Pandemic with Prince William/Manassas County at a 3.9 percent growth rate between CY 2020 thru CY 2022 with the remaining catchment counties, following close behind.

**Table 2A-3** depicts the historical and forecasted employment totals for the Catchment Area counties and the total Catchment Area.

TABLE 2A-3 HEF CATCHMENT AREA - EMPLOYMENT

	Employment				
	Calendar Year	Prince William/Manassas	Catchment Area Counties Total	Virginia Total	U.S.
<i>Historical</i>	<b>2010</b>	194,470	1,498,252	4,743,187	172,901,666
	<b>2015</b>	228,558	1,926,935	5,060,281	190,325,771
	<b>2020</b>	256,562	1,767,312	5,224,995	195,301,627
<i>Baseline</i>	<b>2021</b>	265,492	1,815,399	5,350,770	201,142,587
<i>Forecast</i>	<b>2022</b>	276,762	1,898,972	5,540,070	208,286,623
	<b>2023</b>	282,502	1,941,085	5,635,851	211,873,718
+ 5 years	<b>2026</b>	303,065	2,044,240	5,899,838	221,286,830
+ 10 Years	<b>2031</b>	341,837	2,267,608	6,304,221	235,031,660
+ 15 years	<b>2036</b>	384,203	2,474,807	6,705,007	248,421,812
+ 20 years	<b>2041</b>	430,575	2,687,670	7,105,810	261,624,407
Compound Annual Growth Rate (CAGR)					
<b>2010 - 2019</b>		3.1%	2.0%	1.3%	1.7%
<b>2019 - 2020</b>		0.6%	-1.3%	-2.0%	-3.1%
<b>2020 - 2022</b>		3.9%	3.7%	3.0%	3.3%
<b>2022 - 2023</b>		2.1%	2.2%	1.7%	1.7%
<b>2021 - 2041</b>		2.4%	2.0%	1.4%	1.3%

Source: Woods & Poole Economics, Inc.; RS&H Analysis, 2023

### 2.3.2.3 Personal Income

Between CY 2010 thru CY 2019, the growth rate on personal income within the Prince William/Manassas County was 2.1 percent with the remaining Catchment Area counties at 2.5 percent. These growth rates were lower than the national trend which had a CAGR of 2.8 percent during the same time period.

Based on W&P data, throughout the Forecast Period, the personal income CAGR for Prince William/Manassas County is projected to be 3.2 percent which is higher than the remaining Catchment Area counties, the Commonwealth of Virginia, and the United States which are projected to have a CAGR of 2.9 percent, 2.3 percent, and 2.0 percent, respectively. This is a positive indicator for the area, as it suggests that individuals in the Prince William/Manassas area are likely to experience an increase in their personal income over the next two-decade period at a higher rate than the rest of the United States.

**Table 2A-4** depicts the historical and forecast of total personal income rates for the Prince William/Manassas County, the remaining Catchment Area counties, the Commonwealth of Virginia as a whole, and the entire United States.

**TABLE 2A-4 HEF CATCHMENT AREA – PERSONAL INCOME**

Personal Income in the 000's (In 2012 Dollars)					
	Year	Prince William/ Manassas	Catchment Area Counties Total	Virginia Total	U.S.
<i>Historical</i>	<b>2010</b>	\$ 22,578,277	\$ 148,908,794	\$ 381,469,332	\$ 13,145,590,848
	<b>2015</b>	\$ 24,915,764	\$ 168,011,760	\$ 425,028,849	\$ 15,207,371,341
	<b>2020</b>	\$ 28,803,439	\$ 191,691,281	\$ 482,988,169	\$ 17,825,517,052
<i>Baseline</i>	<b>2021</b>	\$ 29,562,295	\$ 194,913,454	\$ 495,608,858	\$ 18,412,493,489
<i>Forecast</i>	<b>2022</b>	\$ 30,282,374	\$ 204,682,432	\$ 499,945,810	\$ 18,166,519,026
	<b>2023</b>	\$ 31,286,190	\$ 210,930,106	\$ 512,752,489	\$ 18,563,688,896
	+ 5 years <b>2026</b>	\$ 34,537,221	\$ 230,494,199	\$ 552,434,301	\$ 19,851,596,580
	+ 10 Years <b>2031</b>	\$ 40,670,659	\$ 265,767,400	\$ 622,556,549	\$ 22,154,966,723
	+ 15 years <b>2036</b>	\$ 47,664,167	\$ 304,306,728	\$ 697,591,238	\$ 24,593,413,338
	+ 20 years <b>2041</b>	\$ 55,618,547	\$ 346,435,769	\$ 777,865,958	\$ 27,174,814,874
Compound Annual Growth Rate (CAGR)					
<b>2010 - 2019</b>		2.1%	2.5%	2.2%	2.8%
<b>2019 - 2020</b>		5.7%	3.1%	4.5%	5.5%
<b>2020 - 2022</b>		2.5%	3.3%	1.7%	1.0%
<b>2022 - 2023</b>		3.3%	3.1%	2.6%	2.2%
<b>2021 - 2041</b>		3.2%	2.9%	2.3%	2.0%

Source: Woods & Poole Economics, Inc.; RS&H Analysis, 2023

#### 2.3.2.4 Per Capita Personal Income

Similar to total personal income, historically per capital personal income between CY 2010 through CY 2019 for Prince William/Manassas County was below the rest of the Catchment Area counties, the Commonwealth of Virginia, and the United States with a CAGR of just 0.3 percent.

During the Forecast Period between CY 2021 through CY 2041, the per capita personal income for Prince William/Manassas County is projected to trend on par with the remaining Catchment Area counties, but slightly higher than the Commonwealth of Virginia and the United States with a CAGR of 1.7 percent. Nevertheless, the projected growth rates for the per capita personal income in the Catchment Area and the Commonwealth of Virginia indicate a positive trend that could translate to higher standards of living for residents of the Commonwealth over the next two decades.

It is worth noting that changes in economic conditions, government policies, and other factors could impact the growth rates for per capita personal income in the HEF Catchment Area, the Commonwealth of Virginia, and the United States. Even so, the projected growth rates provide valuable insights into the potential trajectory of income growth in these regions. **Table 2A-5** depicts the historical and forecasted per capita personal income for the Prince William/Manassas County, the remaining Catchment Area counties, the Commonwealth of Virginia as a whole, and the entire United States.

TABLE 2A-5 HEF CATCHMENT AREA – PER CAPITA PERSONAL INCOME

	Per Capita Personal Income (In 2012 Dollars)					
	Year	Prince William/ Manassas	Catchment Area Counties Total	Virginia Total	U.S.	
<i>Historical</i>	<b>2010</b>	\$ 49,207	\$ 64,739	\$ 47,541	\$ 42,497	
	<b>2015</b>	\$ 48,577	\$ 67,114	\$ 50,657	\$ 47,264	
	<b>2020</b>	\$ 53,080	\$ 73,102	\$ 55,924	\$ 53,770	
<i>Baseline</i>	<b>2021</b>	\$ 54,238	\$ 74,302	\$ 57,247	\$ 55,454	
<i>Forecast</i>	<b>2022</b>	\$ 55,433	\$ 77,880	\$ 57,573	\$ 54,507	
	<b>2023</b>	\$ 56,315	\$ 79,166	\$ 58,572	\$ 55,324	
+ 5 years	<b>2026</b>	\$ 59,148	\$ 83,057	\$ 61,604	\$ 57,991	
+ 10 Years	<b>2031</b>	\$ 64,314	\$ 89,654	\$ 66,790	\$ 62,697	
+ 15 years	<b>2036</b>	\$ 69,896	\$ 96,354	\$ 72,145	\$ 67,567	
+ 20 years	<b>2041</b>	\$ 75,981	\$ 103,249	\$ 77,717	\$ 72,646	
Compound Annual Growth Rate (CAGR)						
<b>2010 - 2019</b>		0.3%	1.1%	1.4%	2.1%	
<b>2019 - 2020</b>		4.8%	2.5%	4.1%	5.1%	
<b>2020 - 2022</b>		2.2%	3.2%	1.5%	0.7%	
<b>2022 - 2023</b>		1.6%	1.7%	1.7%	1.5%	
<b>2021 - 2041</b>		1.7%	1.7%	1.5%	1.4%	

Source: Woods & Poole Economics, Inc.; RS&H Analysis, 2023

### 2.3.3 Oil and Jet Fuel Prices.

The association between jet fuel prices and aviation demand is complex and can be influenced by a range of economic, political, and environmental factors. Jet fuel price is a critical factor in the aviation industry because it has a significant impact on airlines' operating costs and profitability. The demand for aviation fuel is driven by the level of air travel and the size of active airline fleets. In general, jet fuel prices tend to fluctuate in response to global oil prices, geopolitical tensions, and market supply and demand conditions. At the start of the COVID-19 Pandemic in April 2020, when demand was at a record low, gasoline fuel prices reached a price of \$1.03 per gallon.

Industry and economic changes across the world, such as the Russia-Ukraine War and the U.S.-Iran conflict related to the Israel-Hamas War, have caused instability in oil prices which saw a peak in CY 2022. Oil prices fell in CY 2023 and have remained stable into CY 2024 due to an increase in fuel production outside of OPEC countries such as the U.S. OPEC has announced that it will cut oil supply during the first quarter of 2024 which will likely trigger fuel prices to increase in the short-term.

When fuel prices are high, airlines often respond by reducing capacity or raising ticket prices to offset the increased costs. Conversely, when fuel prices are low, airlines may expand their operations or offer lower fares to attract more passengers.

**Table 2A-6** depicts the forecast of oil and jet fuel prices during the Forecast Period. The forecast years included in the table are based on the FAA’s most recent Aerospace Forecast published in May 2023 and consequently do not match the milestone years discussed throughout this document.

**TABLE 2A-6 FORECAST – FUEL AND OIL PRICE**

Comparison of Fuel and Oil Price Projections (2022 Dollars)			
Year	U.S. Refiner's Acquisition Cost (\$/Barrel) (a)	Crude Oil Prices (\$/Barrel) (b)	Jet Fuel Prices (\$/Gallon)
2023	\$84.29	\$92.00	\$2.71
2028	\$89.68	\$89.00	\$2.50
2033	\$98.57	\$92.00	\$2.48
2038	\$104.30	\$95.00	\$2.37
2043	\$112.70	\$98.00	\$2.29
<b>CAGR 2023-2043</b>	<b>1.5%</b>	<b>0.3%</b>	<b>-0.8%</b>

(a) Brent Spot Price (rounded)

(b) Monthly census of all U.S. refiners collecting the net acquisition costs and volumes of crude oil, both domestic and imported, on a corporate regional bases (not for individual refineries); data reported in 2023 FAA Aerospace Forecast

Source: U.S. Energy Information Administration; FAA Forecast 2023-2043

### 2.3.4 Average Airfares

As discussed in the previous section, volatile prices of oil and jet fuel eventually end up affecting the consumer, which in this case comes in the form of increased airfares. Airfare prices are volatile and can change by the minute due to travel demand, available capacity, seasonality, airlines’ costs and other factors. After airfares dropped significantly in CY 2020 due to decreased demand caused by the COVID-19 Pandemic, demand for travel began rebounding in CY 2022 and returned to and/or surpassed pre-pandemic levels in mid-CY 2023 at many US airports. The increase in travel is a welcome trend for the

airline industry which struggled to maintain profits; however, the law of supply and demand affects the customer as more demand drives higher fuel prices. Around the US, airfares have risen recently, particularly over the past 18 months. Both the rising costs of aviation fuel and airline debt following the COVID-19 Pandemic shutdown have impacted average ticket prices causing them to steadily increase since the start of CY 2022. Airfare prices in the long-term, however, are expected to decrease domestically at a CAGR of 0.3 percent during the planning period when adjusted for inflation in 2023 dollar values (Table 2A-7Error! Reference source not found.).

TABLE 2A-7 FORECAST – AVERAGE AIR FARES

Projected Domestic Fares (2023)			
Calendar Year	FAA Adjusted Yield (cents) (a)	FAA Average Trip Length (b)	FAA Fare (dollars) (c)
2024	15.95	1,008	\$160.77
2025	15.76	1,020	\$160.75
2030	15.42	1,033	\$159.28
2035	14.99	1,046	\$156.79
2040	14.53	1,059	\$153.87
2044	14.17	1,070	\$151.62
<b>CAGR 2024-2044</b>	<b>-0.6%</b>	<b>0.3%</b>	<b>-0.3%</b>

(a) FAA forecast of domestic aviation activity; yield (extrapolated)  
 (b) FAA forecast of domestic aviation activity; average trip length in miles.  
 (c) FAA yield multiplied by average trip length and divided by 100.  
 Source: FAA Aerospace Forecast 2023-2043

DCA and IAD are large hub airports in close proximity to HEF. In addition, Richmond International Airport (RIC) has also been incorporated into the analysis due to the close proximity and easy access from the cities and counties in the ECA. RIC is served by numerous Ultra Low-Cost Carriers (ULCC) including Spirit Airlines (Spirit) and Breeze Airways (Breeze). For HEF to be successful in adding commercial passenger service, the passenger trends at these three airports will be analyzed throughout this document to understand the available potential.

Since HEF historically has not ever had commercial passenger traffic and due to it is in close proximity to major airports such as DCA, IAD an RIC it would be expected that new regular passenger traffic would be provided by ULCC which have generally provide similar startup service in similar markets throughout the United States. Startup service offered by ULCC such as Avelo Airlines (Avelo) and Breeze, in similar markets as HEF, is to offer lower fares than traditional legacy airlines with unbundled air fares making passengers responsible for costs such as seat assignments and onboard catering.

**Table 2A-8** shows average airfare prices from 2021 to 2023 out of DCA and IAD, compared with Avelo’s systemwide average airfare which are 60.0 and 70.0 percent lower. In terms of yield, which account for stage length, Avelo recorded 11.15 cents compared to an average of 11.99 cents at IAD and DCA or 7.0 percent lower.

**TABLE 2A-8 HISTORICAL AVERAGE AIR FARE PRICES OF THE U.S., DCA, IAD, AND AVELO AIRLINES**

Domestic – Historic Average Gross Air Fares					
Year	DCA	IAD	DC Region Average	Avelo Airlines	% Difference Avelo/DC Region
2021	\$184.56	\$218.04	\$196.77	\$54.47	-69.3%
2022	\$222.47	\$277.70	\$239.74	\$88.50	-60.1%
2023	\$226.36	\$271.32	\$240.82	\$89.33	-62.9%

Source: U.S. DOT T-100;  
Compiled by RS&H, 2024

## 2.4 FORECAST OF COMMERCIAL PASSENGER SERVICES

Developing a forecast of commercial passenger services for an airport that currently does not have air carrier operations requires a different approach compared to those airports with existing passenger airline services. The first step was to develop a list of potential destinations from HEF with similar characteristics as those that are served as startup markets for ULCC and would be attractive to the residents of the Catchment Area and other neighboring counties and cities where commercial passengers would potentially originate when traveling from HEF. The additional counties and cities considered in what is defined as the Expanded Catchment Area (ECA) would include the counties/cities included in **Table 2A-9**.

**TABLE 2A-9 HEF EXPANDED CATCHMENT AREA**

Alexandria City
Arlington County
Clarke County
Culpeper County
Fairfax City
Fairfax County
Falls Church City
Fauquier County
Frederick County
Fredericksburg
Loudoun County
Madison County
Manassas City
Manassas Park
Prince William County
Rappahannock County
Spotsylvania County
Stafford County
Warren County
Winchester City

### 2.4.1 HEF Potential Airline Passenger Markets

When considering potential airline passenger markets from HEF, several factors come into play, including local demographics, nearby competing markets and attractions, business interests, and existing transportation infrastructure. Here are some potential passenger markets to consider:

- Tourism: This would include residents within the ECA traveling to tourist destinations on the East coast including Florida and North and South Carolina. It could also include tourists coming from other locations to visit the DC region, considering the wide array of tourist attractions including monuments, museums, and historical sites. Additionally, Virginia itself offers attractions such as

Shenandoah National Park, Charlottesville's wineries, and historical sites like Colonial Williamsburg, making leisure travel another potential market.

- **Business Travel:** Manassas Airport is situated within the Northern Virginia technology corridor, with many businesses and government contractors in the vicinity. Targeting business travelers for flights to key business destinations such as New York City, Boston, Chicago, Atlanta, and other major business hubs could be lucrative. The business travel market, however, would probably be composed of smaller companies that don't have dedicated agreements with the major airlines at IAD and DCA.
- **Regional Connectivity:** Offering flights to nearby regional airports within a few hundred miles could attract passengers looking for convenient connections to smaller cities and towns not served by major airports. Airlines considered for these services would include Cape Air and Southern Airways Express.
- **College Student Travel:** HEF is relatively close to several universities and colleges, including George Mason University. Providing flights catering to college students traveling to and from their hometowns or other college towns could be a viable market.
- **Charter:** Services to Caribbean destinations chartered by travel companies such as Apple Vacations could be attractive to residents of the Catchment Area and reduce the need for longer airport commutes and expensive car parking rates.

After reviewing numerous market factors and considering large network carriers such as American, low-cost carriers (LCC) including Southwest Airlines (Southwest) and JetBlue, ULCC's like Avelo, Allegiant and Breeze, and charter operators similar to Omni Air International, it was concluded that basing the forecast analysis on a ULCC model would be optimal given the Catchment Area's market saturation and highly diversified airline mix at IAD and DCA. The ULCC would have targeted consideration to leisure and tourism travel as a major component, government/military travel, student and charter travel as a less significant passenger components but none-the-less an important added segment to HEF's passenger profile.

We have assumed, based on operations of ULCC at similar markets to HEF that the majority of passengers would be O&D with minimal connectivity until the later years of the forecast as service and passenger preference at HEF matures. The large DC region metroplex has enough O&D passengers to satisfy ULCC break-even load factors without the need to rely on connecting passenger activity.

#### **2.4.1.1 Potential Primary Markets**

Potential primary markets were selected based on destinations serviced by ULCCs in key markets in the mid-Atlantic, Northeast, and Florida. These markets also have a strong passenger performance history from airports in the DC region. The Manassas market share percentages depict the number of passengers residing in HEF's Catchment Area. These market share percentages were observed to be particularly high to Florida destinations. Shown on **Table 2A-10**.

TABLE 2A-10 HEF PRIMARY MARKETS

City/State	Airport Code	Pax Per Day	Expanded Catchment Area	Manassas Market Share (%)
Orlando, FL	MCO	2,145.5	513.7	23.9%
Fort Lauderdale, FL	FLL	1,250.7	205.8	16.5%
Tampa, FL	TPA	985.1	140.8	14.3%
West Palm Beach, FL	PBI	510.2	108.3	21.2%
Fort Myers, FL	RSW	396.8	83.2	21.0%
Knoxville, TN	TYS	161.1	18.5	11.5%
Destin/Fort Walton, FL	VPS	103.5	21.3	20.6%
Lexington, KY	LEX	51.4	4.2	8.2%
Chattanooga, TN	CHA	46.9	5.1	10.9%
New, Haven, CT <sup>2</sup>	HVN	35.4	N/A	N/A

Source: US DOT O&D Survey; Airline Reporting Corporation (ARC 2023); RS&H Analysis, 2024

#### 2.4.1.2 Potential Secondary Target Markets – No Non-Stop Service from DC Region

The secondary markets were selected based on the largest O&D city-pair markets in year ending 3<sup>rd</sup> quarter of 2023 (latest available) served from DCA, IAD, or RIC without nonstop service. Airlines observe these types of destinations in a study called a gap analysis. Most markets have non-stop services from a specific airport or region which historically have had optimal operational and financial results for the airline and are governed by the laws of supply and demand. Sometimes gaps occur in the analysis where a potential market is overlooked. **Table 2A-11** shows secondary markets selected for potential services to HEF based on a lack of non-stop service.

TABLE 2A-11 HEF SECONDARY MARKETS

City/State	Airport Code	Pax Per Day	Manassas Market Share	Manassas Market Share (%)
Panama City, FL	ECP	93.9	12.6	13.5%
Bozeman, MT	BZN	84.7	15.8	18.6%
Daytona Beach, FL	DAB	39.4	11.4	29.0%
Springfield-Branson, MO	SGF	30.3	6.3	20.7%

Note: This table is derived from combining 2023 data from DCA, IAD, and RIC US DOT data

Source: US DOT O&D Survey; ARC 2023; RS&H Analysis, 2024

<sup>2</sup> Beginning July 12, 2024, Avelo will operate from HVN to IAD twice weekly.

### 2.4.1.3 Additional Florida Markets Considered – Existing Nonstop Service

Florida markets were researched in the HEF analysis as ULCCs tend to select markets with high tourism and considered vacation locations. Florida is a popular vacation destination because of its plentiful beaches, theme parks among other attractions. Florida is also home to many seasonal residents deemed “snowbirds” who travel to and from Florida during the winter months. In 2022, Florida received about 137.6 million visitors and 38 percent of those arrived by air.<sup>3</sup> Avelo currently serves 8 markets within Florida with Orlando International Airport (MCO) being one of their hubs or “focus cities”.

Six additional Florida airports that already have nonstop service from RIC, DCA, or IAD were analyzed and are shown in **Table 2A-12**.

**TABLE 2A-12 HEF FLORIDA MARKETS**

City/State	Airport Code	Pax Per Day	Manassas Market Share	Manassas Market Share (%)
Fort Lauderdale, FL	FLL	1,803.5	201.0	11.1%
Jacksonville, FL	JAX	749.84	68.3	9.1%
Pensacola, FL	PNS	164.0	25.2	15.4%
Sarasota, FL	SRQ	423.29	41.5	9.8%
Key West, FL	EYW	101.43	29.8	29.3%
Tallahassee, FL	TLH	62.29	8.2	13.2%

Note: This table is derived from combining 2023 data from DCA, IAD, and RIC  
 Source: US DOT O&D Survey; ARC 2023; RS&H Analysis, 2024; RS&H Analysis, 2024

Even though the Florida markets considered are key to the analysis, it is important to note that recent market data indicates increased capacity and the reduction of average fares by all U.S. airlines have impacted ULCCs disproportionately. Despite the oversaturation of airline seat capacity to Florida markets, this approach remains the most viable market strategy for ULCC from HEF.

### 2.4.1.4 Potential International Markets

International markets such as Cancun (CUN), Punta Cana (PUJ) and Montego Bay (MBJ) were also considered during the analysis given some ULCCs provide service to these destinations through tour operators.

After careful consideration, the primary markets served by ULCC as seen in **Table 2A-10** were chosen for the purposes of creating a market analysis. The selected primary markets (Core Destinations) have a robust demand from the population residing in the ECA and represent a good balance of tourism and business/other travelers from the region.

<sup>3</sup> Research FAQ. (n.d.). <https://www.visitflorida.org/resources/research/research-faq/>

## 2.4.2 HEF Market Analysis/Forecast Methodology

To better understand the potential target group of passengers that would choose HEF as their airport gateway from the DC region, a market analysis was conducted using U.S. DOT data, the FAA Terminal Area Forecast (TAF) and Airline Reporting Corporation (ARC) market locator data which will be discussed later in this section. The first step was to look at all enplaned passengers from IAD, DCA and RIC projected by the TAF from Federal Fiscal Year (FFY) 2022 through FFY 2041 matching the timeframe for the Forecast Period. The next step was to isolate all Origin & Destination (O&D) passengers from the DC region to single out only those passengers that started and ended their travel in IAD, DCA or RIC. To analyze the O&D percentage from the DC region, a historical trend of annual O&D percentages was pulled from the U.S. DOT T-100 database and U.S. DOT airline O&D survey (DB1B) from 2010 to 2023<sup>4</sup>. The annual historical O&D passengers were divided by the total enplaned passenger to calculate total DC region O&D passengers as can be seen in **Table 2A-13**.

**TABLE 2A-13 DC REGION HISTORICAL O&D PASSENGER PERCENT, 2010 - 2023**

IAD, DCA and RIC			
Year	O&D Enplaned Passengers	Total Enplaned Passengers	Total O&D Percent
2010	12,293,412	21,679,502	56.7%
2011	12,309,381	21,659,659	56.8%
2012	12,265,380	21,763,232	56.4%
2013	12,335,823	21,874,461	56.4%
2014	12,866,807	22,029,048	58.4%
2015	14,187,209	23,231,737	61.1%
2016	14,729,786	23,680,452	62.2%
2017	15,216,353	24,171,586	63.0%
2018	15,478,596	24,834,325	62.3%
2019	15,813,635	25,443,508	62.2%
2020	5,198,761	8,276,398	62.8%
2021	9,489,506	15,302,992	62.0%
2022	14,067,676	23,569,134	59.7%
2023	16,012,348	26,576,949	60.2%
<b>2010 -2023 Average:</b>			<b>60.0%</b>

Source: US DOT T-100; US DOT O&D Survey

For the historical trend, an average O&D passenger percentage was calculated at 60.0 percent. The trend included the anomalous COVID-19 Pandemic years of 2021 and 2022 which were included in the average percent calculation as not to ignore irregular exogenous events or economic shocks that will likely occur again within the Forecast Period. As the historical O&D percent of enplaned passengers is very stable in

<sup>4</sup> For U.S. DOT O&D survey, 4 quarters Year Ending 3<sup>rd</sup> Quarter were used (latest available data).

the DC region airports, the 60.0 percent was applied to total TAF enplaned passengers and kept flat throughout the Forecast Period as can be seen in **Table 2A-14**.

TABLE 2A-14 TOTAL DC REGION O&D ENPLANEMENT FORECAST, 2021 - 2041

2024 FAA TAF							
		IAD	DCA	RIC	TOTAL	O&D Percent	Total DC Region O&D Enplanements
<i>Actual</i>	2021	7,097,977	6,680,270	1,564,892	15,302,992	62.0%	9,489,506
	2022	10,112,551	11,496,552	2,009,677	23,569,134	59.7%	14,067,676
	2023	11,987,683	12,283,716	2,362,937	26,576,949	60.2%	16,012,348
<i>Forecast</i>	2024	12,887,960	12,260,183	2,527,131	27,675,274	60.0%	16,605,164
	2025	13,453,196	12,471,839	2,633,997	28,559,032	60.0%	17,135,419
	2026	13,809,967	12,657,817	2,681,025	29,148,809	60.0%	17,489,285
	2027	14,149,798	12,817,003	2,733,307	29,700,108	60.00%	17,820,065
	2028	14,494,027	12,969,275	2,787,840	30,251,142	60.0%	18,150,685
	2029	14,830,088	13,121,182	2,837,037	30,788,307	60.0%	18,472,984
	2030	15,166,234	13,274,155	2,887,977	31,328,366	60.0%	18,797,020
	2031	15,499,893	13,427,327	2,936,215	31,863,435	60.0%	19,118,061
	2032	15,835,229	13,558,627	2,988,338	32,382,194	60.0%	19,429,316
	2033	16,170,153	13,689,886	3,038,510	32,898,549	60.0%	19,739,129
	2034	16,503,738	13,819,066	3,088,457	33,411,261	60.0%	20,046,757
	2035	16,843,245	13,944,530	3,139,583	33,927,358	60.0%	20,356,415
	2036	17,189,786	14,066,468	3,194,224	34,450,478	60.0%	20,670,287
	2037	17,537,690	14,184,461	3,250,529	34,972,680	60.0%	20,983,608
	2038	17,886,917	14,298,889	3,308,383	35,494,189	60.0%	21,296,513
	2039	18,241,148	14,410,157	3,367,164	36,018,469	60.0%	21,611,081
	2040	18,600,688	14,515,059	3,429,086	36,544,833	60.0%	21,926,900
	2041	18,954,817	14,615,299	3,488,905	37,059,021	60.0%	22,235,413
	<b>CAGR 2023 - 2041</b>		<b>2.6%</b>	<b>1.0%</b>	<b>2.2%</b>	<b>1.9%</b>	

Source: FAA TAF; US DOT O&D Survey

The next step was to continue to segregate the DC region O&D passengers to only those passengers traveling to the Core Destinations. For that purpose, U.S. DOT T-100 data was used to calculate the percentage of DC region O&D passenger traveling only to the Core Destinations. It was estimated that the O&D from the DC region to the Core Destinations ranged between 13.0 percent to 14.0 percent of total DC region passengers. The O&D to Core Destination was then projected for the Forecast Period from 2023 to 2041 and grown at the same rate as total DC region O&D passengers, 1.8 percent. See **Table 2A-15**.

**TABLE 2A-15 TOTAL DC REGION O&D TO CORE DESTINATIONS, 2021 - 2041**

		<b>O&amp;D DC Region to Core Destinations</b>	<b>Percent DC Region to Core Dest/DC Region Total O&amp;D</b>
<i>Actual</i>	2021	1,312,760	14%
	2022	1,926,417	14%
	2023	2,115,274	13%
<i>Forecast</i>	2024	2,324,723	14%
	2025	2,398,959	14%
	2026	2,448,500	14%
	2027	2,494,809	14%
	2028	2,541,096	14%
	2029	2,586,218	14%
	2030	2,631,583	14%
	2031	2,676,529	14%
	2032	2,720,104	14%
	2033	2,763,478	14%
	2034	2,806,546	14%
	2035	2,849,898	14%
	2036	2,893,840	14%
	2037	2,937,705	14%
	2038	2,981,512	14%
	2039	3,025,551	14%
	2040	3,069,766	14%
	2041	3,112,958	14%

<b>CAGR 2023 - 2041</b>	<b>2.2%</b>
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Source: FAA TAF; US DOT O&D Survey

The last step in the identification of target passengers who could potentially use HEF as a gateway airport was to isolate DC region O&D passengers to the Core Destinations to those living in the ECA as defined in Section 1.4. The market analysis considered all the city pairs that were booked by passengers to the Core Destinations residing in the ECA. This data collection included the use of market locator data sourced from the Airline Reporting Corporation (ARC) for 2023. ARC is the clearing house for most airline tickets

purchased with credit cards in the U.S. and almost all carriers process their ticket sales via ARC. Credit cards are the most common form of payment for air travel today. Data based on the billing address of credit cards used to purchase airline tickets is a reliable source of information about the distribution of air travel demand in the HEF ECA. The credit card transaction analysis detailed the local originating demand that would most effectively be served from HEF. The ARC data was analyzed and the number of passengers per day each way (PDEW) was calculated for the Core Destinations.

The analysis further took the total O&D passenger numbers from the ECA passengers to the Core Destinations and grew them by 2.0 percent from 2023 thru 2041 as seen in **Table 2A-16**. The growth rate was selected because it represents the employment growth in the Catchment Area as seen in **Table 2A-4**. **Table 2A-17** summarizes the HEF Market Analysis from 2022 thru 2041.

**TABLE 2A-16 TOTAL CATCHMENT AREA PASSENGERS TO CORE DESTINATIONS PER DAY EACH WAY**

Year	2023 ARC Data to Core Destinations	Percent ARC ECA/DC Region O&D to Core Dest	Passengers Per Day Each Way (PDEW)
Actual 2023	401,838	19.0%	1,101
Forecast 2024	409,875	17.6%	1,123
2025	418,072	17.4%	1,145
2026	426,434	17.4%	1,168
2027	434,962	17.4%	1,192
2028	443,662	17.5%	1,216
2029	452,535	17.5%	1,240
2030	461,586	17.5%	1,265
2031	470,817	17.6%	1,290
2032	480,234	17.7%	1,316
2033	489,838	17.7%	1,342
2034	499,635	17.8%	1,369
2035	509,628	17.9%	1,396
2036	519,820	18.0%	1,424
2037	530,217	18.0%	1,453
2038	540,821	18.1%	1,482
2039	551,637	18.2%	1,511
2040	562,670	18.3%	1,542
2041	573,924	18.4%	1,572
<b>CAGR</b>			
<b>2023 - 2041</b>	<b>2.0%</b>		<b>2.0%</b>

Source: ARC 2023

TABLE 2A-17 SUMMARY OF HEF MARKET ANALYSIS, 2022-2041

HEF Market Analysis									
	Year	DC Region Enplanements	DC Region O&D %	DC Region O&D	Core Destinations	DC Region/ Core %	ECA Pax to Core Destinations	HEF catchment / Core %	
Forecast	2022	23,569,134	60%	14,067,676	1,926,417	14%	n/a	n/a	
	2023	26,576,949	60%	16,012,348	2,115,274	13%	401,838	19%	
	+ 5 years	2026	29,148,809	60%	17,489,285	2,448,500	14%	426,434	17%
	+ 10 Years	2031	31,863,435	60%	19,118,061	2,676,529	14%	470,817	18%
	+ 15 years	2036	34,450,478	60%	20,670,287	2,893,840	14%	519,820	18%
	+ 20 years	2041	37,059,021	60%	22,235,413	3,112,958	14%	573,924	18%
<b>CAGR</b>									
	<b>2023 - 2041</b>	2.1%		2.3%	2.3%		1.7%		

Source: US DOT T-100; US DOT O&D Survey (DB1B); ARC 2023

### 2.4.3 Forecast of PDEW and Daily Departures

Once the number of O&D enplaned passengers from the ECA were calculated, further analysis was conducted to pinpoint how many of those travelers would potentially choose HEF as their gateway airport. The first step was to look at PDEW from the ECA and estimate how many departures would that equal to if the Airport captured 100.0 percent of those passengers. By taking the forecast PDEW for the ECA and dividing them by average capacity of Avelo Boeing 737-800 (189 seats) and Boeing 737-700 (149 seats) aircraft, multiplied by a representative ULCC load factor (79.0 percent), the estimate would equal approximately 8.2 daily departures in 2025 and growing to approximately 11.8 departures in 2041. See **Table 2A-18**.

**TABLE 2A-18 FORECAST TOTAL DAILY DEPARTURES WITH 100% CAPTURE OF EXPANDED CATCHMENT AREA PASSENGERS**

Year	Passengers Per Day Each Way (PDEW)	Avelo 737-700/800 Blended Seat Capacity	Avelo Average Load Factor (%)	Daily Departures
2023	1,101	169	79.0%	8.2
2024	1,123	169	79.0%	8.4
2025	1,145	169	79.0%	8.6
2026	1,168	169	79.0%	8.8
2027	1,192	169	79.0%	8.9
2028	1,216	169	79.0%	9.1
2029	1,240	169	79.0%	9.3
2030	1,265	169	79.0%	9.5
2031	1,290	169	79.0%	9.7
2032	1,316	169	79.0%	9.9
2033	1,342	169	79.0%	10.1
2034	1,369	169	79.0%	10.3
2035	1,396	169	79.0%	10.5
2036	1,424	169	79.0%	10.7
2037	1,453	169	79.0%	10.9
2038	1,482	169	79.0%	11.1
2039	1,511	169	79.0%	11.3
2040	1,542	169	79.0%	11.5
2041	1,572	169	79.0%	11.8

Source: ARC 2023; Avelo

Note: Avelo seat capacity is based on average of Avelo fleet of 737-700 and 737-800.

Since not all passengers from the ECA will fly from HEF to the Core Destinations based on air carrier product preferences, airline mileage membership loyalty and other intangible factors, a further estimation was prepared to further refine how many PDEW HEF could conceivably be captured from the ECA.

For this approach, the analysis further narrowed-down the data at the zip code level to only the communities within a 15-to-20-mile proximity to Manassas (ECA Subset) flying to Core Destinations in 2023. Those communities are listed in **Table 2A-19**.

**TABLE 2A-19 ECA SUBSET COMMUNITIES WITH 15-20 MILE PROXIMITY TO MANASSAS**

ALDIE	FRONT ROYAL	PARIS
BEALETON	GAINESVILLE	PURCELLVILLE
BRISTOW	HAMILTON	QUANTICO
BROAD RUN	HAYMARKET	SPOTSYLVANIA
BRUNSWICK	LORTON	THE PLAINS
CENTREVILLE	MANASSAS	WARRENTON
CULPEPER	MIDDLEBURG	WINCHESTER
DEPLANE	MIDDLETOWN	WOODBIDGE
DUMFRIES	MIDLAND	WOODVILLE
FREDERICK	NEW MARKET	
FREDERICKSBURG	OCOCOQUAN	

Source: ARC 2023

It was calculated that the ECA Subset represented 31.0 percent of PDEW from the ECA to the Core Destinations. To further refine the analysis, a study was conducted to determine the number of departures that ULCCs typically operate from airports from which they launch service<sup>5</sup>. The study focused on new markets for Allegiant from January 2003 to March 2023, Avelo from April 2021<sup>6</sup> to March 2023, and Breeze from July 2021<sup>7</sup> to March 2023. Of the 320 markets in which these airlines launched services during the aforementioned time periods, the average number of daily departures was 0.7, equivalent to 4.6 weekly departures. These ULCC new market operational patterns are similar to what would be expected at HEF for their initial service in 2025.

Based on a historical analysis of ULCC business models related to new airport and market startup patterns, a 0.7 daily departures metric was selected for the first year of operations at HEF. This would represent approximately an 8.7 percent market share captured from the ECA to the Core Destinations. Based on the historical analysis of passenger growth on ULCC's at markets like HEF, it was projected that HEF will continue to experience a flat 8.7 percent market share of the ECA through 2041. A PDEW growth rate of 2.0 percent was selected based on W&P Catchment Area employment growth rate as seen on Table 1-3. Employment growth was selected as the key economic driver in forecasting passenger enplanements considering the direct impact that employment has on non-essential spending associated with leisure travel.

Based on this metric, daily departures at HEF are projected to grow from 0.7 daily departures in 2025 to 1.0 daily departures in 2041. See Table 2A-20. To support the limited growth in daily departures throughout the Forecast Period, an analysis was undertaken to look at the average departures per day in the 82 markets served by Allegiant in the past 10-years<sup>8</sup> (2014 -2023) where they have had consistent service excluding their operational bases of AZA, Orlando Sanford International Airport (SFB), Las Vegas Harry Reid International Airport (LAS) and St. Pete-Clearwater International Airport (PIE). It was concluded

<sup>5</sup> Study conducted using USDOT T-100 data via Diio Mi.

<sup>6</sup> Month in which Avelo started operations.

<sup>7</sup> Month in which Breeze started operations.

<sup>8</sup> Analysis conducted using USDOT T-100 data via Diio Mi.

that Allegiant averaged approximately 1.0 daily departure indicating that even after long-term services at an airport, ULCCs such as Allegiant do not have a long-term trend of high increases in frequencies.

**TABLE 2A-20 FORECAST OF HEF PDEW AND DAILY DEPARTURES**

Year	Passengers Per Day Each Way (PDEW)	% of Pax Captured by HEF	Passengers Per Day Each Way (PDEW) from HEF	Daily Departures from HEF
2023	1,101	n/a	n/a	0.0
2024	1,123	n/a	n/a	0.0
2025	1,145	8.7%	99.7	0.7
2026	1,168	8.7%	101.6	0.8
2027	1,192	8.7%	103.7	0.8
2028	1,216	8.7%	105.7	0.8
2029	1,240	8.7%	107.9	0.8
2030	1,265	8.7%	110.0	0.8
2031	1,290	8.7%	112.2	0.8
2032	1,316	8.7%	114.5	0.9
2033	1,342	8.7%	116.8	0.9
2034	1,369	8.7%	119.1	0.9
2035	1,396	8.7%	121.5	0.9
2036	1,424	8.7%	123.9	0.9
2037	1,453	8.7%	126.4	0.9
2038	1,482	8.7%	128.9	1.0
2039	1,511	8.7%	131.5	1.0
2040	1,542	8.7%	134.1	1.0
2041	1,572	8.7%	136.8	1.0

Source: ARC 2023; RS&H Analysis

The forecast of PDEW were further annualized through the Forecast Period. Overall, enplanements at HEF grow from 36,372 in 2025 to 49,931 equating to a CAGR of 2.0 percent throughout the Forecast Period. A comparison with the “Prorated Forecast 2024 – 2030” published in January 2024 and developed by Avports, LLC (AvPorts), the operator selected by HEF to assist them in the development of commercial passenger market, is included as part of this analysis. See **Table 2A-21**.

TABLE 2A-21 HEF ENPLANEMENTS FORECAST

Year	HEF Enplanements	Avports Enplanements
2025	36,372	585,000
2026	37,100	788,000
2027	37,842	843,000
2028	38,599	974,000
2029	39,371	1,096,000
2030	40,158	1,183,000
2031	40,961	
2032	41,780	
2033	42,616	
2034	43,468	
2035	44,338	
2036	45,224	
2037	46,129	
2038	47,051	
2039	47,992	
2040	48,952	
2041	49,931	

CAGR		
2025 - 2030	2.0%	15.1%
2025 - 2041	2.0%	n/a

Source: RS&H Analysis; Avports

#### 2.4.4 Forecast of Operations

To calculate operations at HEF, the total enplaned passenger forecast was combined with a projection of average load factors and average seat per departure in a mathematical formula to derive a forecast of scheduled passenger operations. As previously discussed, an average load factor was used representative of a ULCC load factor in 2023 equal to 79.0 percent. A proxy average seats per departure was calculated using the average capacity of Avelo Boeing 737-800 with 189-seats and Avelo Boeing 737-700 with 149 seats (average of 169 seats) and left flat throughout the Forecast Period.

The mathematical formula expressed below is used to calculate total annual operations at HEF.

$$\frac{\text{Enplanements}}{(\text{Avg Load Factors})(\text{Avg Seats per Departure})} (2) = \text{Operations}$$

Passenger aircraft operations at HEF are projected to increase from 545 in 2025 to approximately 748 in 2041. This produces a CAGR of 2.0 percent over the Forecast Period.

TABLE 2A-22 HEF OPERATIONS FORECAST

Year	RS&H Operations	Avports Operations
2025	545	4,000
2026	556	5,500
2027	567	6,100
2028	578	7,100
2029	590	8,100
2030	602	8,800
2031	614	
2032	626	
2033	638	
2034	651	
2035	664	
2036	677	
2037	691	
2038	705	
2039	719	
2040	733	
2041	748	

CAGR		
2025 - 2030	2.0%	17.1%
2025 - 2041	2.0%	n/a

Source: RS&H Analysis; Avports

### 2.4.5 Avelo LOI Scenario

In addition to the baseline scenario, the forecast model created for HEF also addressed an alternative forecast scenario of annual enplaned passengers and operations over the Forecast Period based on the number of daily flights as stated in the Letter of Intent (LOI) from Avelo to Avports dated February 14, 2024 (The Avelo LOI Scenario). The Avelo LOI Scenario assumes Avelo starting operations at HEF with up to 3 daily departures in May 2025 and up to 10 daily departures by December 2025 as stated in the LOI. In addition, the LOI states that Avelo will operate a mix of Boeing 737-700 and Boeing 737-800 aircraft with a maximum capacity of 189 passengers. Using the number of departures as stated in the LOI and growing them by 2.0 percent per year throughout the Forecast Period based on the W&P employment growth in the Catchment Area, the Avelo LOI scenario projects 3,088 operations in 2025 growing to 4,239 operations in 2041. As per the LOI, the Avelo LOI Scenario assumes a mix of Boeing 737-700 and Boeing 737-800 aircraft with an average ASPD of 169 seats based on current Avelo seat configurations for those two aircraft and kept flat throughout the Forecast Period. Using an 81.9 percent load factor (average load factor of Avelo to Florida markets in 2023) also kept flat throughout the Forecast Period, the Avelo LOI scenario projects 213,077 enplanements in 2025 growing to 293,272 enplanements in 2041 at a CAGR of 2.0 percent. See **Table 2A-23**.

**TABLE 2A-23 HEF FORECAST OF ENPLANEMENTS AND OPERATIONS – BASELINE, AVELO LOI SCENARIO**

Year	BASELINE		AVELO LOI SCENARIO	
	Enplanements	Operations	Enplanements	Operations
2025	36,372	545	213,707	3,088
2026	37,100	556	505,200	7,300
2027	37,842	567	515,304	7,446
2028	38,599	578	525,610	7,595
2029	39,371	590	536,122	7,747
2030	40,158	602	546,845	7,902
2031	40,961	614	557,782	8,060
2032	41,780	626	568,937	8,221
2033	42,616	638	580,316	8,385
2034	43,468	651	591,922	8,553
2035	44,338	664	603,761	8,724
2036	45,224	677	615,836	8,899
2037	46,129	691	628,153	9,077
2038	47,051	705	640,716	9,258
2039	47,992	719	653,530	9,443
2040	48,952	733	666,601	9,632
2041	49,931	748	679,933	9,825
<b>CAGR</b>				
2025-2030	2.0%	2.0%	20.7%	20.7%
2030-2035	2.0%	2.0%	2.0%	2.0%
2035-2041	2.0%	2.0%	2.0%	2.0%
2025 – 2041	2.0%	2.0%	7.5%	7.5%

Source: RS&H Analysis; USDOT T-100; Avelo LOI, February 13, 2024.

## 2.5 CRITICAL AIRCRAFT IDENTIFICATION

The FAA requires identification of existing and future critical/design aircraft for airport planning purposes. The term critical aircraft and design aircraft can be used interchangeably. The critical aircraft is the most demanding aircraft, or grouping of aircraft, using the airport regularly. Regular use is specifically defined in AC 150/5000-17, Critical Aircraft and Regular Use Determination, as 500 total annual operations, not counting touch-and-go landings.

Three parameters are used to classify the critical aircraft: Aircraft Approach Category (AAC), Airplane Design Group (ADG), and Taxiway Design Group (TDG). The AAC, depicted by a letter, relates to aircraft landing speeds. The ADG, depicted by a Roman numeral, relates to airplane wingspan and tail height. The TDG, classified by number, relates to the outer-to-outer main gear width and the distance between the cockpit and main gear. These parameters serve as the basis for design and construction of airport infrastructure. An accurate critical aircraft determination helps ensure facilities are developed to meet the proper needs of each portion of the airport.

The 2022 HEF Master Plan forecast identified the airport’s critical aircraft as a C-III. Since there was not a single aircraft type that met the FAA requirements of “regular use”, the determination was made by grouping aircraft with similar operational performance and/or physical dimensions with the Gulfstream V making up nearly half of those operations.

Based on the updated forecast for HEF that includes commercial service, an updated critical aircraft was determined for Runway 16L/34R, the main runway at HEF. The parallel runway, 16R/34L would not be able to accommodate commercial service operations operated by existing ULCC and therefore is not considered in the critical aircraft determination update. The most demanding aircraft used by existing ULCCs in the United States, including Avelo is the Boeing 737-800, ergo the future critical aircraft for Runway 16L/34R is a Boeing 737-800 (D-III) which is anticipated to have over 500 annual operations by 2025. See **Table 2A-24**.

**TABLE 2A-24 HEF CRITICAL AIRCRAFT DETERMINATION**

AAC/ADG	Representative Aircraft	TDG
D-III	Boeing 737-800	3

## 2.6 HEF TOTAL OPERATIONS COMPARED TO THE FAA TAF

The FAA has oversight responsibility to review and approve aviation forecast developed in conjunction with airport planning studies. FAA must approve sponsor forecasts before they can be used to prepare facility requirements in a master plan or before going forward with an environmental document that requires a forecast. The FAA uses a 10.0 percent threshold for the first 5 years and a 15.0 percent threshold for the subsequent 5-year period as a rule-of-thumb for accepting non-FAA forecasts as the basis for planning and environmental studies. If these stated thresholds are exceeded, the FAA Region office in which the airport is located, will forward the forecasts to FAA headquarters for review.

After developing the forecast of commercial passenger operations for HEF, total aircraft operations were consolidated by activity type (air carrier/air taxi, general aviation, and military) for comparison purposes with the FFY 2024 FAA TAF, the latest available TAF document produced and published by the FAA in January 2024. The results show HEF's forecast of total operations is within the 10.0 percent and 15.0 percent thresholds. See **Table 2A-25**.

**TABLE 2A-25**  
**BASE CASE FORECAST COMPARISON WITH FAA TAF 2024**

Category	2021		2026		2031		2041	
	Base Case	TAF 2024	Base Case	TAF 2024	Base Case	TAF 2024	Base Case	TAF 2024
Air Carrier & Air Taxi Operations	12,891	12,890	14,806	17,696	16,791	19,444	21,597	23,464
GA & Local GA Operations	84,162	84,162	89,293	84,986	94,736	86,650	106,638	90,153
Military Operations	2,596	2,050	2,596	2,050	2,596	2,050	2,596	2,050
Total Operations	99,649	99,649	106,854	104,732	114,744	108,144	131,985	115,667
GA Based Aircraft	410	372	415	397	424	422	436	472
Comparison with FAA TAF 2024 (percent different)								
Air Carrier & Air Taxi Operations	0.00%		16.3%		13.7%		8.0%	
GA & Local GA Operations	0.00%		5.1%		9.3%		18.3%	
Military Operations	0.00%		26.6%		26.6%		26.6%	
Total Operations	0.00%		2.0%		6.1%		14.1%	
GA Based Aircraft	0.00%		4.5%		0.5%		-7.6%	

Source: RS&H, 2022; FAA TAF, 2024

TABLE 2A-26  
AVIATION FORECASTS SUMMARY

	Compound Annual Growth Rate						
	<u>Base Yr. Level</u>	<u>Base Yr.+5yrs.</u>	<u>Base Yr.+10yrs.</u>	<u>Base Yr.+20yrs.</u>	<u>Base Yr. to +5</u>	<u>Base Yr. to +10</u>	<u>Base Yr. to +20</u>
	2021	2026	2031	2041	2026	2031	2041
<b>Enplanements</b>	<b>N/A</b>	<b>37,100</b>	<b>40,961</b>	<b>49,931</b>	<b>720.0%</b>	<b>189.0%</b>	<b>72.0%</b>
<b>Operations</b>							
<u>Itinerant</u>							
Air carrier	1	556	614	741	254.0%	90.0%	39.0%
Commuter/air taxi	12,890	14,250	16,177	20,849	2.0%	2.3%	2.4%
General aviation	37,396	39,676	42,094	47,383	1.2%	1.2%	1.2%
Military	2,425	2,425	2,425	2,425	0.00%	0.00%	0.00%
<u>Local</u>							
General aviation	46,766	49,617	52,642	59,255	1.2%	1.2%	1.2%
Military	171	171	171	171	0.00%	0.00%	0.00%
<b>TOTAL OPERATIONS</b>	<b>99,649</b>	<b>106,695</b>	<b>114,123</b>	<b>130,824</b>	<b>1.38%</b>	<b>1.37%</b>	<b>1.37%</b>
<b>Based Aircraft</b>							
Single Engine	312	314	319	324	0.13%	0.22%	0.19%
Multi Engine	51	51	52	55	0.00%	0.19%	0.38%
Jet Engine	27	30	32	35	2.13%	1.71%	1.31%
Helicopter	18	18	18	20	0.00%	0.00%	0.53%
Other	2	2	2	2	0.00%	0.00%	0.00%
<b>TOTAL</b>	<b>410</b>	<b>415</b>	<b>423</b>	<b>436</b>	<b>0.24%</b>	<b>0.31%</b>	<b>0.31%</b>

Source: RS&H Analysis, 2022-2024; FAA TAF, 2024

## *APPENDIX A*

## 2.1 BENCHMARKING AIRPORTS WITH ULTRA LOW-COST CARRIER (ULCC) SERVICE

Since HEF historically hasn't had commercial passenger traffic benchmarking airports that added ULCC service with a similar operational background to HEF, such as being in close proximity to a large-hub airport, is an effective way to gain a high-level insight into measures of added capacity and departures. However, it is important to note that each airport is unique in how commercial air traffic evolves as there is no unique formula for determining how passenger traffic will grow when compared to these benchmark airports. Each airport operates in its own geographic area, supported or burdened by its own policies, political environments, and/or other forms of limitations/requirements. The main objective in looking at these airports is to observe behavioral patterns from benchmarking metrics that are associated with growth patterns of daily departures and available seats at each airport based on the addition of ULCC service. Though these comparable airports may have other mainline full-service airlines, this section focuses on the impacts of the integration of ULCC service at these facilities.

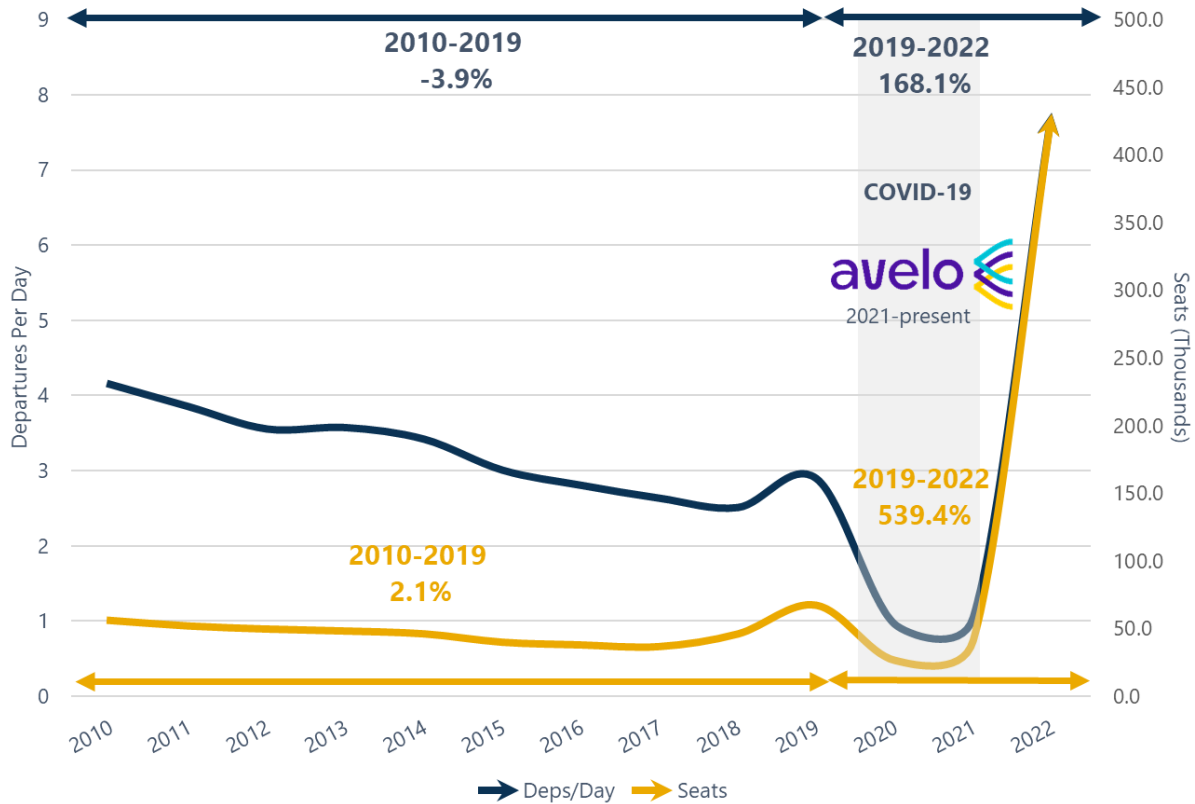
### 2.1.1 Tweed-New Haven Regional Airport (HVN)

HVN is defined as a non-hub primary service airport in the NPIAS which means it serves less than 0.05 percent of all passengers in the U.S. HVN is one of two commercial service airports in the state of Connecticut, the other being Bradley International Airport (BDL) which is located in the center of the state and serves the capital city of Hartford.

As can be seen in Error! Reference source not found., daily departures and available seats at HVN were on a downward trend with the exception of CY 2019 when American Airlines (American) increased service that year. American, like most airlines at HVN, decreased service in CY 2020 and CY 2021 due the COVID-19 Pandemic. American eventually ceased service at HVN in CY 2021. Avelo began service at HVN in CY 2021 and increased service significantly in CY 2022, ultimately establishing a hub at the airport. Daily departures and available seats increased to record levels at HVN with the introduction of Avelo, as seen in Error! Reference source not found.. Avelo initiated service at HVN to three destinations in CY 2021 and expanded to 17 destinations within two years, including Puerto Rico. Based on U.S. DOT T-100 data, load factors have also been the highest experienced by HVN with the introduction of Avelo, at 80.0 percent.

Between CY 2010 and CY 2019, prior to ULCC service, departures per day had a CAGR of -3.9 percent while available seats increased at a CAGR of 2.1 percent. Since Avelo began service in CY 2021, departures per day increased by 168.1 percent and available seats increased by 539.4 percent.

FIGURE 2A-1 HVN DEPARTURES PER DAY AND AVAILABLE SEATS



Source: DOT T-100; RS&H Analysis, 2023

### 2.1.2 Phoenix-Mesa Gateway Airport (AZA)

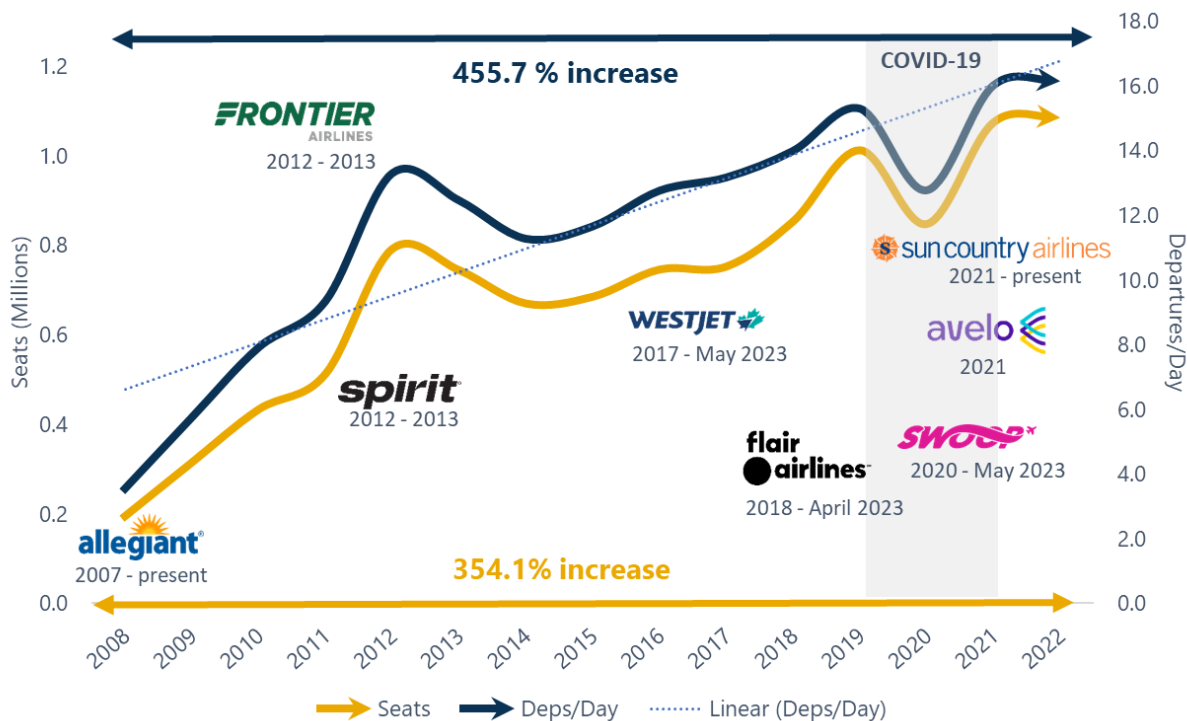
AZA is defined as a small-hub primary service airport in the NPIAS which means it accounts for 0.05 percent to 0.25 percent of total U.S. passengers. AZA is located approximately 20 miles southeast of Phoenix Sky Harbor Airport (PHX), a primary large-hub airport. Formally known as Williams Air Force Base, AZA began serving commercial passenger traffic in CY 2007 as a reliever airport to PHX.

As can be seen in Error! Reference source not found., daily departures and available seats at AZA have fluctuated due to airlines entering/exiting the market, increasing/decreasing service, and/or up gauging aircraft. Allegiant Airlines (Allegiant) began service in CY 2007 and was the first airline to offer commercial passenger service at AZA<sup>9</sup>. AZA is currently one of Allegiant’s focus cities. There was a significant increase in both departures per day and available seats from CY 2011 thru CY 2012 as a result of an increase in departures and destinations by Allegiant in addition to Spirit Airlines (Spirit) and Frontier Airlines (Frontier) entering the market with a combined 800 additional annual flights. Similar to the rest of the world, commercial passenger service decreased during the COVID-19 Pandemic. Enplanements and operations at AZA recovered quickly and surpassed pre COVID-19 Pandemic enplanement levels in CY 2022 due to

<sup>9</sup>Terminal Modernization | Phoenix-Mesa Gateway Airport. (n.d.). <https://www.gatewayairport.com/terminalmodernization#:~:text=Since%20the%20start%20of%20commercial,nearly%20two%20million%20passengers%20annually.>

quite a significant service increase by Allegiant and Swoop Airlines (Swoop), a Canadian based ULCC. With Canadian carriers WestJet, Swoop and Flair Airlines suspending service in CY 2023, AZA currently has 2 ULCC operators, Allegiant and Sun Country Airlines (Sun Country). Many ULCC airlines have initiated and ceased services at AZA, however, with Allegiant as an airline partner, AZA's seat capacity increased 354.1 percent from CY 2008 thru CY 2022 while daily departures increased by 455.7 percent in the same time period.

FIGURE 2A-2 AZA DEPARTURES PER DAY AND AVAILABLE SEATS



Source: DOT T-100; RS&H Analysis, 2023

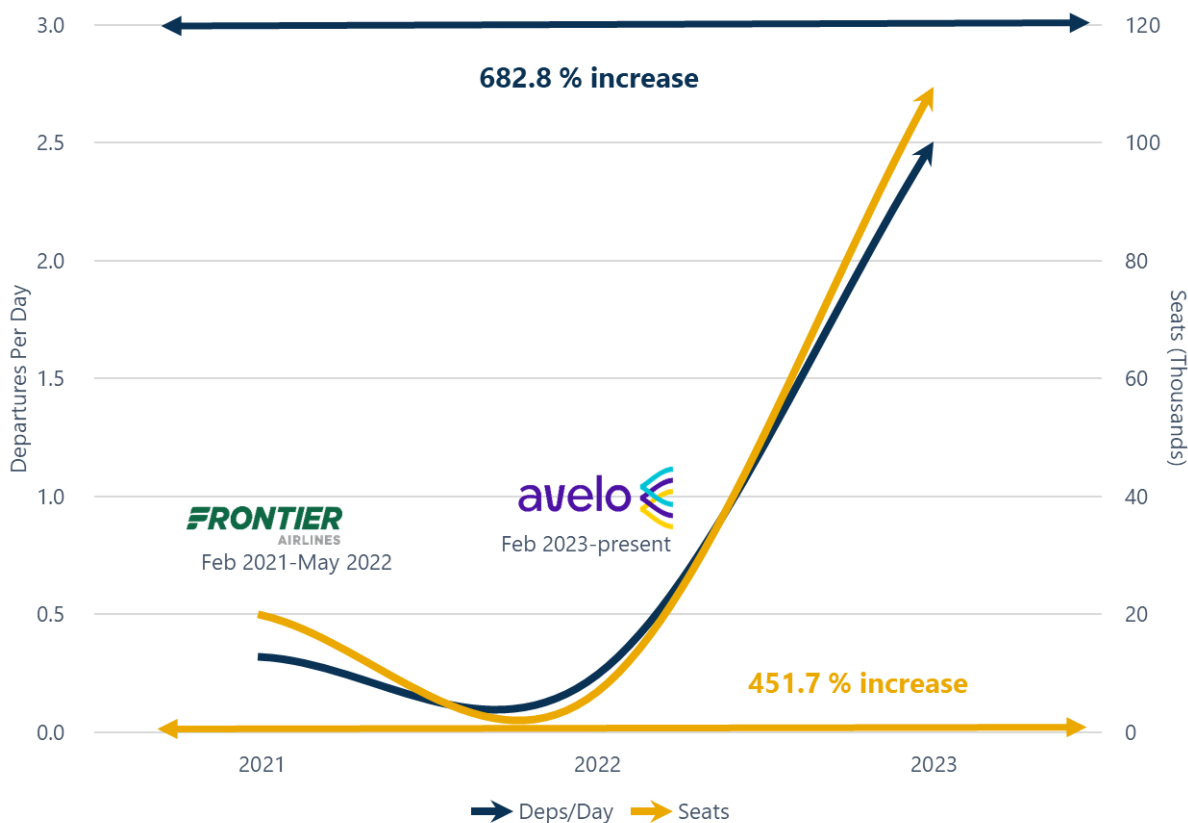
### 2.1.3 Wilmington Airport (ILG)

ILG opened for commercial service in 1947 and is classified as a non-hub primary service airport by the NPIAS. It is located 35 miles southwest of Philadelphia International Airport (PHL) and is the base for the Delaware Air National Guard.

Frontier served ILG between CY 2013 and CY 2015 and returned from CY 2021 through CY 2022. Avelo announced plans to serve ILG in FY 2022 and began service in February 2023 to 10 markets with over 600 annual flights as of September 2023. Between May 2022 and February 2023, there was no commercial passenger service available at ILG. Once Avelo began service, from CY 2021 thru September 2023<sup>10</sup>, departures per day at ILG increased by 682.8 percent while available seats increased by 451.7. See **Figure 2A-3** Error! Reference source not found..

<sup>10</sup> DOT T-100 data only has data up to September 2023. 2023 data was used for ILG because that is when the ULCC service began to grow.

FIGURE 2A-3 ILG DEPARTURES PER DAY AND AVAILABLE SEATS



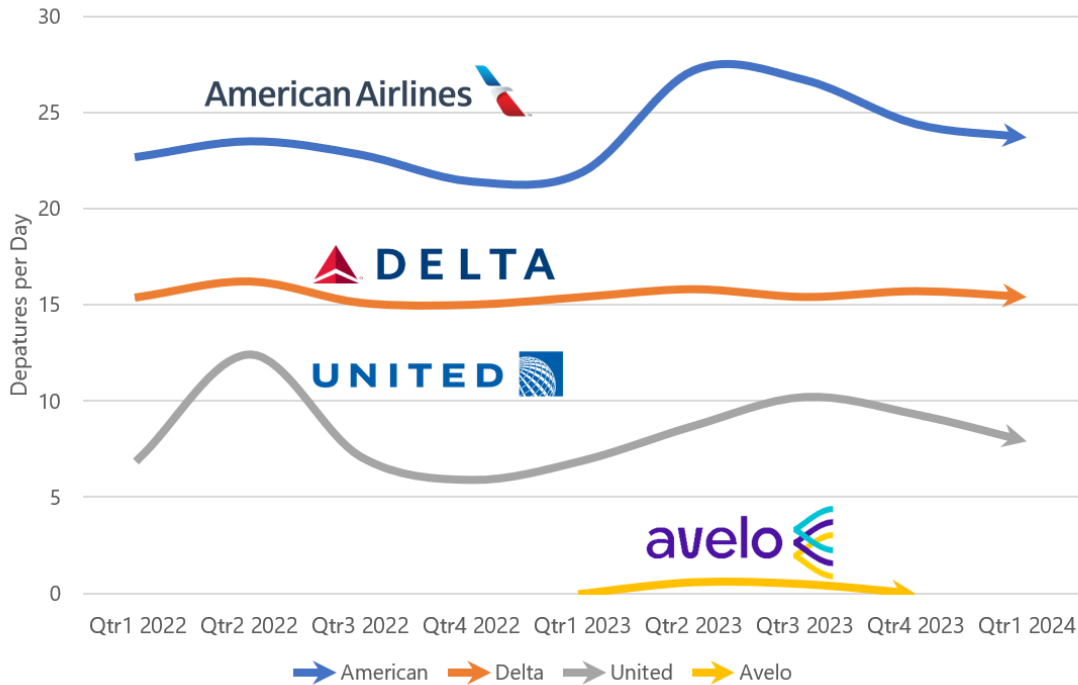
Source: DOT T-100; RS&H Analysis, 2023

### 2.1.4 Charlottesville-Albemarle Airport (CHO)

CHO welcomed its first commercial airline service, operated by Piedmont Airlines in 1955. CHO is classified as a non-hub primary service airport by the NPIAS. Throughout its history CHO has played a pivotal role in serving the transportation needs of Central Virginia. It is located 66 miles northeast of Richmond, the capital of the Commonwealth.

CHO historically operated services to large connecting hubs concentrating on a core of corporate travel activity with high yields. Avelo entered the market in May 2023 with two weekly services to MCO as an alternative to the network carriers. Avelo withdrew service in August 2023 after only five months of service achieving an average load factor of 60.3 percent. In addition to CHO, from the period between July 2023 and March 2024 Avelo left a further five markets where they operated twice weekly. Those markets included Mobile International Airport (BFM), Colorado Springs Airport (COS), Dayton International Airport (DAY), Chicago Midway Airport (MDW), and Memphis International Airport (MEM). Avelo also left Melbourne Orlando International Airport (MLB) where they operated 18 monthly departures.

FIGURE 2A-4 CHO DEPARTURES PER DAY



Source: DOT T-100; RS&H Analysis, 2023

### 2.1.5 Summary

The ULCC business model, which offers fewer services and amenities than the legacy airline model, is rapidly expanding in the U.S, however, it’s growth has slowed due to market saturation in some areas (such as Florida) and financial underperformance of two key ULCC airlines. The ULCC business model proved successful in Europe with airlines such as Ryanair which ranked as the third largest carrier in the world in terms of passengers carried<sup>11</sup> in CY 2022 and largest airline in the world by market capitalization (\$29.6 billion) in CY 2023<sup>12</sup>. The benchmarked airports in this report demonstrate the positive effect ULCC’s have at non and small-hubs when initiating service.

<sup>11</sup> Flight Global, December 2023

<sup>12</sup> Companies Market Cap, 2023

**Chapter 3**  
***Inventory and Facility Requirements***



**RS&H**

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*CHAPTER 3*

*INVENTORY AND FACILITY  
REQUIREMENTS*

### 3.1 INTRODUCTION

Future airport facility requirements, including the type, size, and quantity, are dependent on the future aviation activity levels projected in the aviation activity forecasts discussed in **Chapter 2 Aviation Activity Forecast**. The need for new or expanded facilities is often driven by capacity shortfalls that leave an airport unable to accommodate the forecasted growth using existing facilities. However, the requirements for new or improved facilities can also be driven by other circumstances, such as, updated standards adopted by the FAA or another regulatory agency, an evolving strategic vision for the airport, the replacement of outdated or inefficient facilities that are prohibitively costly to maintain or modernize, or the desire to introduce new services and facilities. These various circumstances can have a significant impact on future needs, and all have been considered in this analysis which presents an inventory of Manassas Regional Airport (HEF or Airport) facilities and infrastructure as well as their ability to accommodate forecast future demand. In this chapter, a list of specific requirements, recommendations, and best practices are made to inform development of facility alternatives that meet user needs throughout the 20-year planning horizon.

A Master Plan cannot be comprehensive without integrating sustainable thinking, and therefore, this plan incorporates four principles of airport sustainability (EONS):

- » Economic viability
- » Operational efficiency
- » Natural resource conservation
- » Social responsibility

Consideration of these airport sustainability principles is critical to the development of the facility alternatives analysis. The EONS principles will be described in more detail in **Section 3.2 Sustainability**.

Facility requirement determinations are quantitative and objectively determined by way of regulatory standards, modern industry guidance, and industry best practices. Most of this chapter is devoted to need assessments in the following functional areas of Manassas Regional Airport:

- » Airport Setting and Role
- » Sustainability
- » Environmental Conditions
- » Inventory of Key Financial Data
- » Planning Activity Levels
- » Meteorological Conditions
- » Airfield Design and Capacity
- » Airspace Analysis
- » Navigational Aids, Lighting, Signage, and Markings
- » GA Terminal
- » GA Aircraft Parking and Storage
- » Aviation Support Facilities
- » Landside Facilities
- » Deicing and Stormwater Facilities
- » Utilities
- » Security

HEF's goals and objectives for this project and the Airport include identifying solutions for the following areas and are described in a high-level throughout this chapter.

- » Vehicle access
- » Multimodal Pedestrian Access and AAM
- » Terminal Area
- » FBO Expansion
- » East Side Expansion
- » West Side Expansion
- » Runway Extension
- » Southwest Development Area

This chapter concludes with a section summarizing the key findings of the facility requirement assessments, which will be used to guide identification and evaluation of future development alternatives.

### 3.1.1 Strategic Visioning

The Airport updated its Strategic Plan in February 2022 which aligned the Airport's strategic operations plan with the Manassas City Council's 2025 Strategic Plan. Strategic Planning for airports projects a future vision for the Airport organization, determines strategies and objectives for the growth or prosperity of the organization (including the type of products and services it should provide), and defines how the vision and objectives can be accomplished. Manassas Regional Airport Strategic Plan 2022 – 2025 identified five strategic priorities which will be taken into consideration and shape development of the Master Plan. The five strategic priorities are as follows:

- **Operational Expansion & Improvement:** The Airport will create an exceptional, world-class experience for current and future aviation customers.
- **Business Growth & Economic Development:** The Airport will position itself for business growth and development through sound master planning, aggressive marketing efforts and strategic partnerships.
- **Innovation & Emerging Technology:** The Airport will take a leadership role in preparing for and supporting new Advanced Air Mobility (AAM) technology in the region.
- **Community Education & Partnerships:** The Airport will contribute to the community's learning environment by providing innovative and engaging opportunities about the aviation industry, including education and careers.
- **Sustainability & Organizational Excellence:** The Airport will operate in such a manner as to optimize revenue generation for continued growth while managing operating costs to create a strong bottom line and financial stability.

### 3.1.2 Airport Setting and Role

This section describes the following details about Manassas Regional Airport:

- » History
- » Classification and role within the National Plan of Integrated Airport Systems (NPIAS)
- » Hierarchy of ownership and control
- » Property and zoning
- » Facilities overview

### 3.1.2.1 Airport History

The following chronological list of events provides a brief history of the Airport's start and growth to its current state.<sup>1</sup>

- » **1930**- Manassas Town Council proposed that a landing strip be constructed along Virginia Route 234 near Manassas.
- » **1931**- A group of investors purchased almost 95 acres of land in the area currently known as Manaport Shopping Center along Route 234. The Airport was leased to the City of Manassas.
- » **1932**- The Airport officially opened on June 8.
- » **1945**- An additional 12.6 acres was purchased and several improvements were made at the airport. The City purchased the airport outright.
- » **1963**- 268 acres was purchased with federal, state, and local funds at a new airport location.
- » **1964**- The new airport was dedicated as the Manassas Municipal Airport on September 20. The airport had a single 3700' x 100' paved runway (16R-34L), a rotating beacon, maintenance hangar, office, and 30 T-Hangars.
- » **1968**- The Airport began an apron extension project.
- » **1974**- The Airport embarked on an apron extension, parallel taxiway strengthening, high speed exits, and 214-acre land acquisition.
- » **1980**-The West Complex was constructed and included 30 T-hangar units.
- » **1981**- A perimeter access road was developed and 20 additional acres of land were acquired.
- » **1992**- The City of Manassas undertook the first ever effort to "recycle" an air traffic control tower. The tower was from an airport near Denver, CO, where it was disassembled and shipped to Manassas. The tower was reassembled at the Airport and was dedicated on April 16.
- » **1996**- A modern Main Terminal Building was completed and dedicated in September.
- » **1997**-A new 5700' parallel runway, 16L-34R, and Taxiway Bravo were constructed.
- » **1998**- A new airfield lighting vault, segmented circle, and the 16L PAPIs were installed.
- » **2000**- Rehabilitation of Runway 16R-34L and Taxiway Alpha added a great improvement for pilots.
- » **2003**- The main runway, 16L-34R, and parallel Taxiway Bravo were rehabilitated and continuing for the next several years. This project included changing the right angle exits of the taxiways to an acute angle exit to enable aircraft to exit the runway at an easier and more efficient pace.

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<sup>1</sup> Manassas Regional Airport (2022) [https://www.manassasva.gov/airport/airport\\_history.php](https://www.manassasva.gov/airport/airport_history.php)

- » **2007**- The Airport completed its East Apron Expansion project, which included adding Taxilane Golf and new T-hangars. It also added 22 new tie downs to the current 88 tie-downs.
- » **2011**- An economic impact study was conducted; and it was determined that the Airport contributed more than \$234 million to its local economy.
- » **2012**- Manassas Regional Airport was identified as one of 84 National GA airports by the FAA. The Manassas Regional Airport completed Phase I of II of the Runway Extension Project, giving Runway 16L-34R a new distance of 6,200’.
- » **2014**- Phase II of the project was completed with the relocation of its Instrument Landing System (ILS), the realignment of Taxiway Kilo, and a bridge widening project for Taxiway Bravo and Runway 34R.
- » **2017**- Rehabilitated West Apron.
- » **2020**- Significant renovations and improvements completed on Runway 16R-34L which included fresh pavement, new PAPI’s, added airfield guidance signage, and new LED light fixtures.
- » **2021**- Construction of Taxiway Golf and Taxilane Yankee.

### **3.1.2.2 Airport Classification and Role**

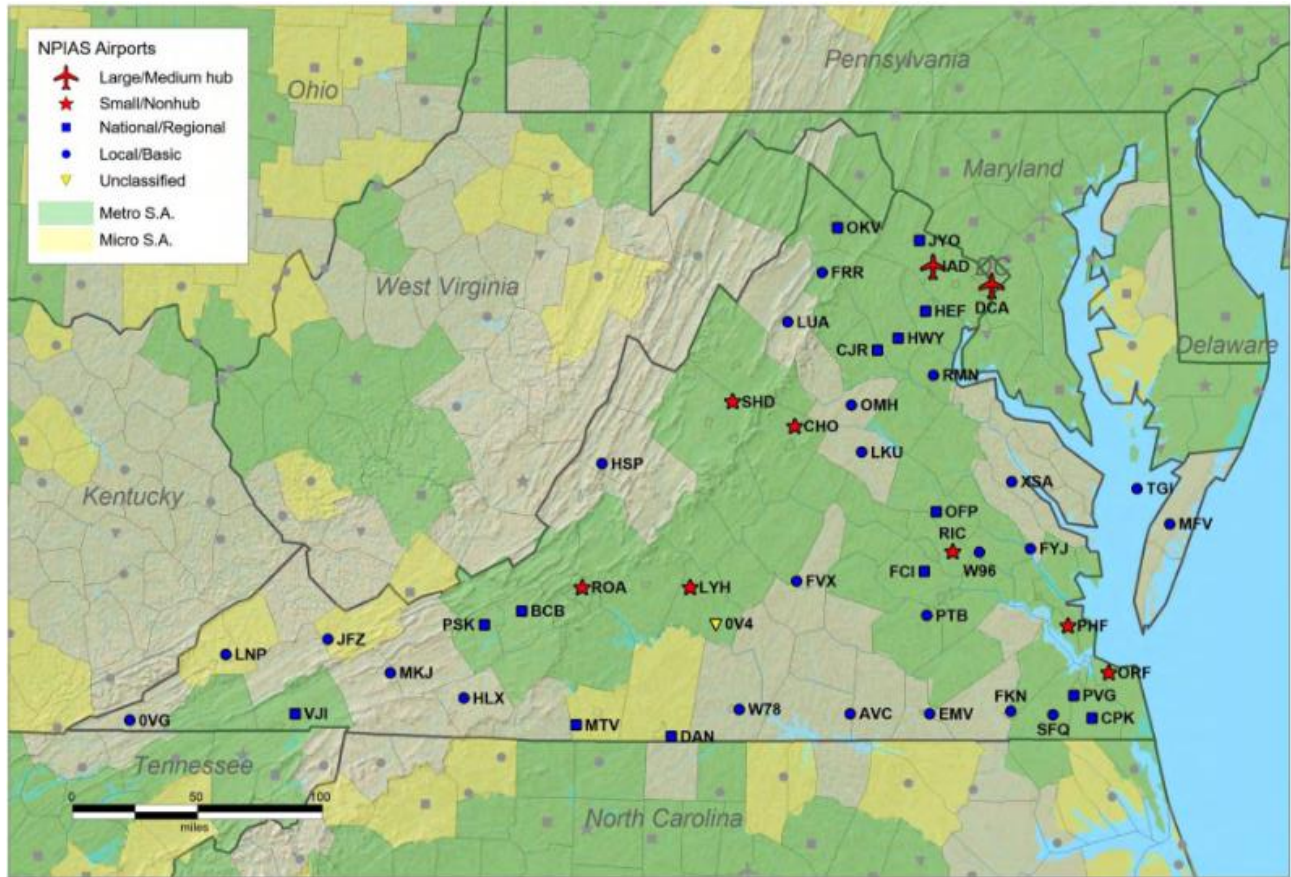
The following sections describe the Airport’s Federal Aviation Administration (FAA) classification and its role within the Commonwealth of Virginia.

### **3.1.2.3 NPIAS Role**

The Airport is classified in the FAA’s National Plan of Integrated Airport Systems (NPIAS) 2023-2027 Report as a public National Reliever airport. National reliever airports are defined as airports that are designated by the FAA to relieve congestion at Commercial Service airports and to provide improved general aviation (GA) access to the overall community. GA airports are public use airports that do not have scheduled service or has service scheduled with less than 2,500 passenger boardings each year.

**Figure 3-1** shows NPIAS airports in the Commonwealth of Virginia.

**FIGURE 3-1**  
**NPIAS AIRPORTS IN THE COMMONWEALTH OF VIRGINIA**



Source: FAA NPIAS FY 2021 – 2025

**3.1.2.4 State Role**

The 2019 Virginia Air Transportation System Plan (VATSP) Update classifies each of its 66 public-use airports based on their size and function. Manassas Regional Airport is classified as a Reliever Airport and identified as the designated reliever for Dulles International Airport (IAD). Reliever airports are general aviation airports located near or in larger metropolitan areas that are intended to reduce congestion at commercial service airports, providing comparable general aviation facilities and services typically found at a commercial service airport. They are recommended to meet a minimum of FAA Approach Category “C” design criteria to accommodate the full range of general aviation aircraft. An Aircraft Approach Category (AAC) C includes aircraft with approach speed of 121 knots or more but less than 141 knots. A precision instrument approach should be provided if feasible from a technical and financial perspective. Reliever airports are eligible for Air Carrier/Reliever discretionary funding from the Commonwealth Airport Fund.

**3.1.2.5 Airport Ownership and Control**

Manassas Regional Airport is governed by the City of Manassas and is overseen by the Manassas Regional Airport Commission (or “Commission”). The Commission is appointed by the Manassas City Council. The

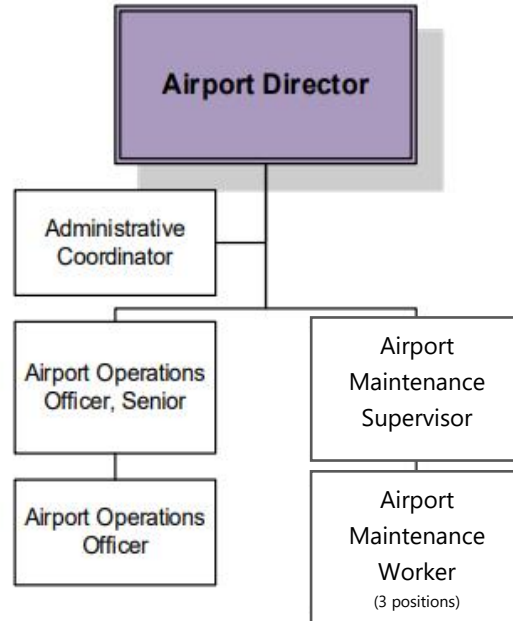
Manassas Regional Airport Commission made up of ten members of which two are from the County and are appointed to 4-year terms. The Airport Commission oversees activities at the Manassas Regional Airport, recommends approval of the Airport’s Capital Improvement Program (CIP) and manages its budget. The Airport is managed and operated by nine staff members led by an Airport Director. The Airport is home to two Fixed Based Operators (FBO), APP Jet Center and Chantilly Air FBO Jet Center, that provide fueling, on-site maintenance, ground handling and de-icing. **Figure 3-2** shows the Manassas Regional Airport organizational chart.

**FIGURE 3-2**  
**HEF ORGANIZATIONAL CHART**



## City of Manassas Organizational Structure

### Manassas Regional Airport



Source: City of Manassas, 2022

## 3.2 SUSTAINABILITY

The U.S. Environmental Protection Agency (EPA) describes sustainability as the basis of one guiding principle: “Everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment. To pursue sustainability is to create and maintain the conditions under which humans and nature can [co]exist in productive harmony to support present and future generations.” Unfortunately, sustainability is often misinterpreted and over-simplified as an inflexible protection of the natural environment at any cost. However, sustainable development under real-world conditions requires a comprehensive approach with consideration of many factors. The complex nature of securing a sustainable future is why government agencies across the globe, including the FAA, are supporting airport planning initiatives that incorporate sustainable approaches.

In 2015, the Virginia Department of Aviation (DOAV) developed a statewide Sustainability Management Plan (SMP) for its public-use airports within the Commonwealth of Virginia. According to the Virginia Airports SMP, airports in Virginia face an array of sustainability challenges and opportunities. The Virginia Airports SMP implements short and long-term initiatives that address sustainability across:

- » Economic Performance
- » Airport Community
- » Energy and Emission
- » Waste
- » Natural Resources

Integrated into an airport master plan, airports can promote greater financial, environmental, and community-oriented initiatives that support these goals and incorporate sustainable planning. The table below includes a list of recommended sustainability goals for HEF within each subcategory.

**TABLE 3-1**  
**SUSTAINABILITY CATEGORIES, SUBCATEGORIES, AND ASSOCIATED GOALS**

Category	Subcategory	Goals
<b>Economic Performance</b>	Air service and business development	<ol style="list-style-type: none"> <li>1. Increase user and tenant retention rates.</li> <li>2. Reduce costs of airport operations and, where feasible, costs of tenant operations.</li> <li>3. Attract additional aviation-related, on-airport businesses.</li> </ol>
	Non-aeronautical development	<ol style="list-style-type: none"> <li>1. Increase non-aeronautics-related revenue generation.</li> <li>2. Attract local businesses with potential ties to airport customers.</li> </ol>
	Asset management and resilience	<ol style="list-style-type: none"> <li>1. Incorporate resilience and adaptation design and construction practices into the development of facilities to mitigate risks to business, system, and community continuity.</li> <li>2. Integrate standardized sustainability and resilience measures into the airport's asset management system and everyday operations.</li> <li>3. Enhance the health, safety, economy, and security of the airport community by testing and reassessing preparedness and disaster recovery plans.</li> </ol>
<b>Airport Community</b>	Public outreach	<ol style="list-style-type: none"> <li>1. Increase public awareness of initiatives undertaken by the airport by engaging the local community/stakeholders.</li> <li>2. Enrich opportunities and the experience of citizens communicating feedback to the airport on issues of concern.</li> <li>3. Educate the community about the airport's value.</li> </ol>
	Airport workforce	<ol style="list-style-type: none"> <li>1. Promote employee satisfaction, retention, and workforce development.</li> <li>2. Promote Health and Safety of airport workforce.</li> <li>3. Engage employees in sustainable practices at the airport.</li> <li>4. Encourage the development of a sustainable airport community by engaging airport tenants and encouraging their use of sustainable practices and products.</li> </ol>
<b>Energy and Emissions</b>	Energy efficiency	<ol style="list-style-type: none"> <li>1. Reduce operating costs by decreasing electricity usage for all airport operating areas.</li> <li>2. Maximize efficiency of lighting systems.</li> <li>3. Reduce operating costs by decreasing usage of natural gas and other thermal fuel.</li> <li>4. Reduce greenhouse gas (GHG) emissions.</li> <li>5. Reduce light pollution.</li> </ol>
	Transportation fuels	<ol style="list-style-type: none"> <li>1. When feasible, switch to alternatively-powered ground vehicles operated at the airport.</li> <li>2. Increase customer and staff ridership of high-occupancy transportation to and from the airport, where available.</li> <li>3. Decrease fuel use by reducing field mowing requirements.</li> </ol>

Category	Subcategory	Goals
	Energy generation	1. Increase portion of airport’s electricity supplied by onsite renewable energy sources.
<b>Waste</b>	Waste management and recycling	1. Reduce Municipal Solid Waste (MSW) sent to landfills. 2. Increase the airport’s diversion rate through recycling and reuse. 3. Increase recycling of construction and demolition waste.
	Chemical and hazardous waste management	1. Find and use substitutes for products with lower environmental, health, and safety risks. 2. Implement a chemical tracking system to improve hazardous materials management. 3. Reduce chemical/oil spills by enhancing spill prevention and control measures. 4. Minimize hazardous waste generation. 5. Use the least number of hazardous waste handlers that meet the criteria for “acceptable” business.
<b>Natural Resources</b>	Stormwater management	1. Reduce water quality and quantity impacts from stormwater runoff. 2. Reduce sediment runoff from construction areas. 3. Reduce water quality risk from de-icing fluid runoff.
	Water efficiency	1. Reduce water use in areas directly under the control of the airport. 2. Encourage tenants, airport users, and employees to use water efficiently.

Source: Virginia Department of Aviation Sustainability Management Plan, Reliever and General Aviation-Regional Supplement, May 2016.

### 3.2.1 Economic Viability

Manassas Regional Airport is an integral part of the Virginia economy, supporting commerce and industry throughout the Commonwealth. The Airport’s financial health is of utmost importance to securing its long-term sustainability within the region. Airports are mandated under FAA Grant Assurances to be “as self-sustaining as possible under circumstances existing at the particular airport.” By using federal (Airport Improvement Program) AIP funds for capital projects, the Airport is contractually obligated to meet FAA grant assurances as mandated through federal statute Title 49 US Code §47107. As stated by the 2015 Airport Cooperative Research Program Report Synthesis 66 – Lessons Learned from Airport Sustainability Plans, “Unless an airport can ensure its economic viability, either through its own resources or through its governing body, the airport will cease to exist.” Manassas Regional Airport, while providing services and facilities for the public, must maintain a financial structure that optimizes revenue generation, minimizes overall costs, and provides funding suitable to cover necessary operating and capital costs. For these reasons, the Manassas Regional Airport Master Plan Update will focus on generating sustainable development solutions that seek to maximize economic viability without sacrificing EONS principles. This Master Plan Update develops a baseline inventory of the conditions and facilities which influence or impact the economic viability of Manassas Regional Airport. Economic viability is also a key evaluation criterion for development alternatives considered within this Master Plan Update.

### 3.2.2 Operational Efficiency

Operational efficiency and maximizing the usefulness of all resources and facilities are vital to the success of Manassas Regional Airport. Airfield runways and taxiways are determined based on aircraft performance requirements with design and implementation triggers dictated by FAA design standards and capacity driven implementation decisions. All remaining airport facility location and design decisions

are driven by varying degrees of FAA instruction and mandate, Airport leadership planning decisions, local politics, and private sector investments. To create sustainable and operationally efficient airport facilities at HEF, leadership must have a long-term land use vision that is reviewed and updated intermittently to account for changing circumstances. This chapter will establish that land use vision and a preferred 20-year development plan with operational efficiency as one of the key evaluation criteria.

### 3.2.3 Natural Resources

When not managed and maintained responsibly, natural resources can be exhausted. As owners and operators of a public service facility, the City of Manassas and Manassas Regional Airport understands it has a duty to promote policies which seek to protect and conserve natural resources to every reasonable degree. Acting on this duty occurs through policies and development which limit/reduce greenhouse gas emissions and any contaminating discharge into water systems, provide opportunities for development of energy efficient facilities, promote environmental stewardship practices, protect wildlife by humanely discouraging its presence on the airfield, and support industry transitions to renewable energy sources. This chapter will develop a baseline inventory of the conditions and facilities which influence or impact the natural resource conservation efforts by Manassas Regional Airport. Environmental impacts are also considered as a key evaluation criterion for development alternatives within this Master Plan Update.

### 3.2.4 Social Responsibility

As a public facility in the Metro Washington D.C. area and within the Commonwealth of Virginia, Manassas Regional Airport recognizes it has a duty to the surrounding communities to act in a socially responsible manner. In action, this translates into the following:

- » Abide by all federal, state, and local regulations and meet contractual FAA grant assurances
- » Maintain competitive rate and fee structure to support operating and capital expenses
- » Act ethically in all business and development decisions
- » Remain transparent with community stakeholders about airport related decisions
- » Make efforts to provide business and employment opportunities to the region
- » Ensure equal treatment of all persons and remain intolerant of discrimination in any form
- » Ensure the Airport has a Disadvantaged Business Enterprise (DBE) program plan per FAA Order 5100.38D and updated every three years
- » Use the Airport's standing within the community to support and advance positive community goals and values

This chapter will take into consideration these aspects of the Airport's role in being socially responsible during development and evaluation of all facility alternatives.

## 3.3 ENVIRONMENTAL CONDITIONS

The purpose of considering environmental factors in airport master planning is to help the Airport Sponsor thoroughly evaluate airport development alternatives and to provide information that will help expedite subsequent environmental processing. For a comprehensive description of the existing

environmental conditions at the Airport, environmental resource categories outlined in FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, were used as a guide that help identify potential environmental effects during the planning process.

FAA Order 1050.1F and FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions*, require the evaluation of airport development projects as they relate to specific environmental resource categories by outlining impacts and thresholds at which the impacts are considered significant. For some environmental resource categories, this determination can be made through calculations, measurements, or observations. However, other environmental resource categories require that the determination be established through correspondence with appropriate federal, state, and/or local agencies. A complete evaluation of the environmental resource categories identified in FAA Orders 1050.1F and 5050.4B is required during a categorical exclusion, environmental assessment, or environmental impact statement.

Future development plans at the Airport take into consideration environmental resources that are known to exist in the vicinity of the Airport. Early identification of these environmental resources helps avoid impeding development plans in the future.

This section provides an overview of resource categories defined in FAA Order 1050.1F, Chapter 4, as it applies to the environs at, and surrounding, the Airport. **Table 3-2** provides a summary of the environmental resource categories studied for the Master Plan Update. It is important to note that while the environmental analysis is included in this Master Plan Update, it is not in and of itself a NEPA document. Additional information regarding the environmental conditions at HEF is provided in **Appendix A**.

**TABLE 3-2**  
**SUMMARY OF ENVIRONMENTAL RESOURCE CATEGORIES STUDIED**

Environmental Resource	Description
Air Quality	The Airport is in "maintenance" for Ozone, and in "attainment" for all other National Ambient Air Quality Standards (NAAQS). See <b>Appendix A</b> for details.
Biological Resources	There is federal- and state-threatened, –endangered and candidate species, and migratory birds in the Airport area. There is no critical habitat at the Airport. See <b>Appendix A</b> for details.
Climate	There are greenhouse gas (GHG) emissions produced at the Airport. See <b>Appendix A</b> for details.
Coastal Resources	A portion of the Airport is within Virginia’s Coastal Zone Management Program, however, there are no Coastal Barrier Resource System (CBRS) segments within Airport property. See <b>Appendix A</b> for details.

Environmental Resource	Description
Department of Transportation Act, Section 4(f)	There are no Section 4(f) properties on Airport property. See <b>Appendix A</b> for details.
Farmlands	The Airport contains prime farmland and farmland of statewide importance. See <b>Appendix A</b> for details.
Hazardous Materials, Solid Waste and Pollution Prevention	<p>There are six Resource and Recovery Act (RCRA) Hazardous Waste Generators on Airport property.</p> <p>Solid waste generated at the Airport is disposed of at the Manassas Transfer Station.</p> <p>The Airport has a Virginia Pollutant Discharge Elimination System Permit (VPDES) General Permit (VAR050985). The City of Manassas also maintains an Oil Discharge Contingency Plan, an Integrated Spill Prevention, Control and Countermeasures (SPCC) Plan, and a Stormwater Pollution Prevention Plan (SWPPP) for the Airport. See <b>Appendix A</b> for details.</p>
Historical, Architectural, Archaeological and Cultural Resources	One historic resource located at the Airport. See <b>Appendix A</b> for details.
Land Use	Current land uses surrounding the Airport include Airport, Technology Community Mixed Use, Flexible Use Employment Center, Agricultural and Forestry, and Federal Property. See <b>Appendix A</b> for details.
Natural Resources and Energy Supply	Electricity and water are supplied to the Airport by the City of Manassas. Natural gas is provided by Washington Gas. See <b>Appendix A</b> for details.
Noise and Noise-Compatible Land Use	The Airport is zoned as an Airport District and is bordered by areas zoned as industrial to promote compatible development in and around the Airport. Areas bordering the Airport in Prince William County are zoned as Agricultural, Industrial, and Planned Business District. Noise contours are shown in <b>Appendix A</b> for details.
Socioeconomics, Environmental Justice, Children’s Environmental Health, and Safety Risks	The Airport is located within Manassas City, Census Tract 9104.2, Block Group 5. See <b>Appendix A</b> for details.

Environmental Resource	Description
Visual Effects	<p>Light emissions at the Airport currently result from airfield, building, access roadway, parking, and apron area lighting fixtures required for the safe and secure movement of people, vehicles, and aircraft.</p> <p>The visual resources and visual character of the Airport currently includes the air traffic control tower, fixed base operators, hangars, and maintenance buildings. See <b>Appendix A</b> for all Visual Effects details.</p>
Water Resources	<p>Airport property contains wetlands, floodplains, and surface waters.</p> <p>The Airport property is in the Rocky Branch-Broad Run watersheds.</p> <p>The Airport property does not contain any wild and scenic rivers. See <b>Appendix A</b> for all Water Resources details.</p>

Prepared by: RS&H, 2022

### 3.3.1 Floodplain Development Coordination

As part of the 2022 Airport Master Plan Update, the Airport asked RS&H to coordinate with required agencies regarding floodplain permitting for future airport development. The Airport requested RS&H to investigate streamlining permitting associated with a Conditional Letter of Map Revision (CLOMR) for development with floodplain impacts. RS&H coordinated with the Federal Emergency Management Agency (FEMA) as the CLOMR issuing agency and the City of Manassas as the local floodplain authority.

*The National Flood Insurance Program (NFIP)*, outlined in Title 44 of the Code of Federal Regulations (44 CFR), requires communities to adopt floodplain ordinances and sets minimum criteria to reduce losses associated with flooding. On April 27, 2022, RS&H held a discussion with the City Engineer to further review the necessity and requirements of a separate floodplain study for the Master Plan. The City Engineer is the local floodplain authority delegated by FEMA to implement the requirements of 44 CFR and other ordinances adopted by the City. The Engineer confirmed a separate study is necessary to reflect updated hydrology and estimate flood stages for comparison to FEMA’s effective elevations. Based on document review and agency coordination, the Airport can streamline FEMA floodplain permitting by submitting one CLOMR for phased future development. Additionally, a separate floodplain study is also required by the City for large and multi-phase projects. However, as-built LOMRs are required within six months of completing an individual or phase of a project unless the following phase of a project will begin within six months. The phases can then be combined into one LOMR.

## 3.4 SUMMARY OF KEY FINANCIAL DATA

This section provides an overview of key financial performance of HEF. Historical financial data is used to help projects anticipate finances during implementation planning for preferred development alternatives, as defined later in the Master Plan Update. The preferred development implementation plan is phased by specific projects which will be summarized in the Airport Capital Improvement Program (CIP) following alternatives evaluation. All data in this financial overview is reported in fiscal years (FY) according to the

HEF fiscal calendar which aligns with the City of Manassas Fiscal Year starting July 1st and ending June 30th.

### 3.4.1 Airport Revenues

Airport revenues are generated from three distinct revenue sources as follows: the operation of the airport, nonoperating sources (e.g. interest income), and contributions from grants from the Federal and State governments and other sources to be used for development of capital projects. Nonoperating revenues refers to non-airline revenues associated with the Airfield and Terminal Cost Centers, which are not paid by Signatory Airlines (e.g., revenue from aircraft parking other than Terminal Apron Fees, military use fees, all Terminal concessions, and Terminal Rents from non-airline tenants). As is common with most airports, wages and benefits accounts for the highest expense at HEF with services and supplies as the second highest expense. **Table 3-3** shows the Airport revenues and capital contributions at HEF from FY 2017 through FY 2021.

**TABLE 3-3**  
**HISTORICAL AIRPORT REVENUES AND CAPITAL CONTRIBUTIONS (FY 2017- FY 2021)**

Source	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
<b>Operating Revenues</b>					
Franchises and leases	\$1,663,878	\$1,519,148	\$1,853,911	\$1,951,260	\$2,145,378
Hangar rentals	\$617,029	\$950,664	\$963,623	\$985,510	\$923,943
Tie Downs & Other	\$283,329	\$251,014	\$308,001	\$433,918	\$196,570
Fuel sales	\$144,057	\$270,809	\$272,499	\$244,676	\$241,298
<b>Total operating revenues</b>	<b>\$2,707,481</b>	<b>\$2,991,636</b>	<b>\$3,398,035</b>	<b>\$3,615,365</b>	<b>\$3,507,188</b>
<b>Nonoperating revenues (expenses)</b>					
Wages and benefits	\$778,810	\$710,717	\$732,441	\$737,371	\$777,972
Services and supplies	\$564,305	\$521,968	\$677,501	\$590,701	\$636,366
Utilities	\$109,730	\$136,447	\$144,136	\$148,557	\$126,636
Security	\$85,348	\$86,855	\$91,131	\$85,621	\$91,877
FAA tower and misc.	\$134,764	\$139,681	\$169,458	\$153,119	\$161,712
<b>Total nonoperating revenues (expenses)</b>	<b>\$1,673,247</b>	<b>\$1,595,668</b>	<b>\$1,814,667</b>	<b>\$1,715,369</b>	<b>\$1,794,562</b>
<b>Total Revenues</b>	<b>\$1,034,234</b>	<b>\$1,395,968</b>	<b>\$1,583,368</b>	<b>\$1,899,996</b>	<b>\$1,712,626</b>

Source: HEF Financial Plans FY 2017- FY 2021, RS&H Compiled, 2022

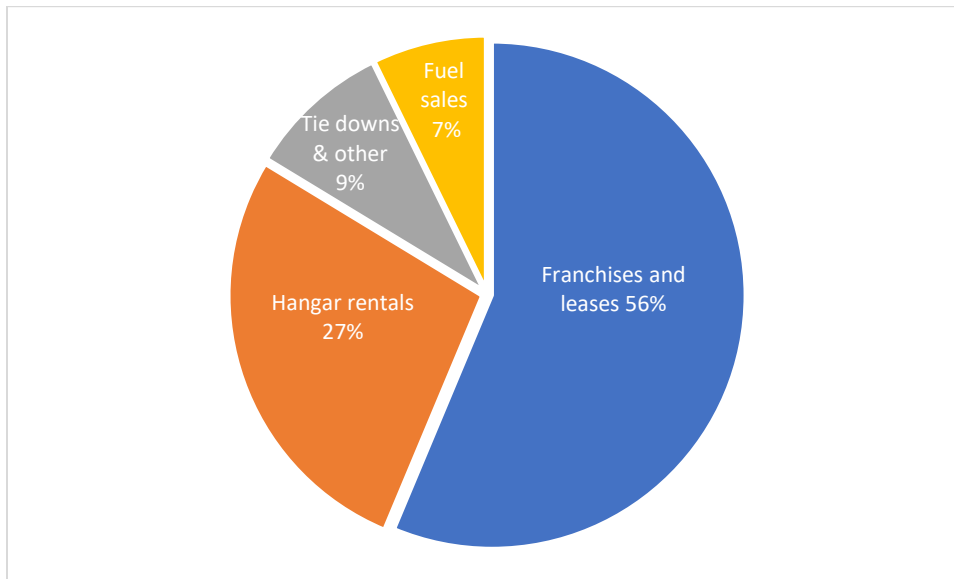
#### 3.4.1.1 Operating Revenues

Operating revenues at HEF, which totaled \$3.5 million in FY 2021, are divided into four categories:

- » Franchises and leases
- » Hangar rentals
- » Tie downs & other
- » Fuel sales

**Figure 3-3** shows each revenue category as an average percentage of operating revenue from FY 2017 through FY 2021. Over that time, franchises and leases were consistently the largest source of operating revenue averaging 56 percent of total operating revenue during the period. HEF rates for hangars and tie-down rentals are competitive and in line with regional peer GA airports in the vicinity.

**FIGURE 3-3**  
**AVERAGE OPERATING REVENUE AS A PERCENTAGE OF TOTAL REVENUE (FY 2017- FY 2021)**

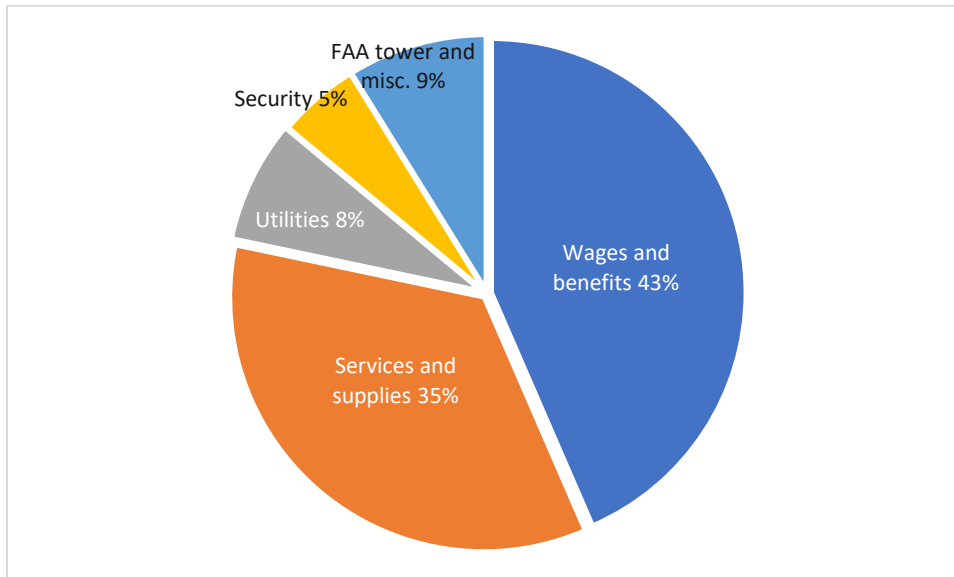


Source: HEF Financial Plans FY 2017- FY 2021, RS&H Compiled, 2022

### 3.4.1.2 Nonoperating Revenues

Nonoperating revenues are generated outside the operation of the Airport. Operating expenses include salaries and fringe benefit costs, utility costs, and other operating expenses. In FY 2021, operating revenue totaled \$2,507,188. Excluding depreciation, wages and benefits make up the largest source of nonoperating revenue from FY 2017 through FY 2021 (see **Figure 3-4**). Services and supplies were consistently the second largest source of nonoperating revenues. **Figure 3-4** shows each expense category as an average percentage of nonoperating revenue during the period.

**FIGURE 3-4**  
**AVERAGE NONOPERATING REVENUE AS A PERCENTAGE OF TOTAL NONOPERATING (FY 2017- FY 2021)**



Source: HEF Financial Plans FY 2017- FY 2021, RS&H Compiled, 2022

### 3.4.1.3 Airport Capital Expenditures

Capital expenditures are primarily funded by federal and state capital contributions and on occasion by the issuance of bonds. Additional match requirements are met by the Airport through its operating budget. **Table 3-4** shows historic total Airport capital expenditures between FY 2017 through FY 2021 by fiscal year. Much of this expense was funded through Federal AIP grants for recent large airfield projects.

**TABLE 3-4**  
**HISTORIC AIRPORT CAPITAL EXPENDITURES**

Source	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
Capital Expenditures	\$776,994	\$776,994	\$476,471	\$1,211,808	\$2,551,000

Source: HEF Financial Plans FY 2017- FY 2021, RS&H Compiled, 2022

### 3.4.1.4 Federal and State Grants

The Airport receives grants from various sources primarily for the planning, design, and construction of capital projects. The largest source of grants for all capital projects has been the Federal Government through the FAA Airport Improvement Program (AIP). Capital projects deemed eligible are 90 percent funded through FAA grants, with the remaining 10 percent funded either through grants from the Virginia Department of Aviation (DOAV) or by airport funds. On March 27, 2020, the Coronavirus Aid, Relief, and Economic Security (CARES) Act (H.R. 748, Public Law 116-136) was signed into law by the President and includes \$10 billion in funds to be awarded as economic relief to eligible airports in response to the COVID-19 pandemic. **Table 3-5** summarizes federal funding received for all major capital projects at HEF since 2010.

**TABLE 3-5  
FEDERAL GRANT AWARD HISTORY**

Fiscal Year	Grant Seq #	Project Description	Federal AIP Entitlement	CARES Act Local Matching Funds	Federal AIP Discretionary	Total Federal AIP Funds
2010	34	Extend Taxiway, Rehabilitate Taxiway	\$484,025	\$0	\$0	\$484,025
2010	33	Extend Runway - 16L-34R	\$927,062	\$0	\$0	\$927,062
2012	35	Extend Runway - 16L-34R	\$3,974,723	\$0	\$0	\$3,974,723
2013	39	Extend Runway - 16L-34R	\$600,000	\$0	\$0	\$600,000
2013	36	Rehabilitate Taxiway	\$877,390	\$0	\$0	\$877,390
2013	37	Rehabilitate Taxiway	\$1,735,645	\$0	\$0	\$1,735,645
2013	38	Extend Runway 16L-34R	\$3,099,245	\$0	\$0	\$3,099,245
2014	40	Extend Taxiway	\$1,541,804	\$0	\$0	\$1,541,804
2017	43	Rehabilitate Apron	\$1,723,834	\$0	\$0	\$1,723,834
2018	44	Construct Taxiway	\$263,500	\$0	\$0	\$263,500

Notes: FAA grant records do not differentiate entitlement and discretionary funding prior to 2010.  
Source: FAA Grant History Lookup Tool, 2022

In addition to AIP, funds are available through the State of Virginia which uses sales and use tax revenue created in the Department of the Treasury for a special non-reverting fund which is part of the Transportation Trust Fund known as the Commonwealth Airport Fund (CAF). The Commonwealth Transportation Board annually allocates 2.4 percent of the Transportation Trust Fund for the CAF. These funds are allocated by the Commonwealth Transportation Board to the Virginia Aviation Board (VAB). Funds are then allocated by the VAB through the DOAV to any Virginia airport, a governmental subdivision thereof, or a private entity to which the public has access for the purposes enumerated in Code of Virginia §5.1-2.16 or is owned or leased by the Metropolitan Washington Airports Authority.

The Airport Capital Improvement Program utilizes the CAF, through entitlement and discretionary funds, to provide funding for planning and engineering projects that focus on airport facility development. In general, these projects include master plan and airport layout plan studies, environmental studies, land acquisition, airside facility design and construction, and terminal building design and construction. **Table 3-6** shows historic DOAV grants for associated projects through 2021.

**TABLE 3-6**  
**HISTORIC ANNUAL DOAV GRANT TOTALS AND PERCENT OF ASSOCIATED PROJECT COST (2019-2021)**

Year	Project Number	Project Description	DOAV Grants
2019	CF0030-036	Relocate Localizer	\$10,391
2019	CF0030-38	Runway 16L-34R & Taxiway B Widening (Construction)	\$12,656
2019	CF0030-41	West Apron Rehabilitation Phase 1	\$1,225
2019	CF0030-42	West Corporate Development EA	\$829
2019	CF0030-43	West Apron Rehab Phase I (Construction)	\$15,323
2019	CS0030-33	Airfield Lighting Regulators	\$2,080
2019	CS0030-35	West Apron Rehabilitation (Middle Section) (Construction) non-AIP	\$871
2019	CS0030-37	Terminal Loop Road Rehab	\$44,396
2019	FE0030-30	Replace Taxiway B Directional Signs	\$4,653
2019	FM0030-29	Electrical Vault HVAC Repair	\$11,233
2019	MT0030-64	Airport Security Cameras Troubleshoot	\$6,761
2019	MT0030-65	Airfield Lighting Supplies	\$1,375
2019	MT0030-66	Boiler Pump Replacement	\$7,767
2019	PR0030-01	Aviation Promotional	\$1,346
2019	VS0030-22	Security Flood Gate Installation	\$15,165
2020	CF-0030-43	West Apron Rehabilitation Phase 1	\$7,816
2020	CF-0030-045	Taxiway 'G' & Taxilane 'Y' (Construction)	\$5,794
2020	CF-0030-044	Taxiway G/Taxilane Y (Design)	\$21,715
2020	CF-0030-046	Runway 16R-34L Rehabilitation (Design)	\$24,754
2020	PR0030-01	Aviation Promotional	\$7,924
2020	CS0030-38	Access Control (Gates) Fiber Optic Backbone	\$124,565
2020	VS0030-23	Security Cameras and Upgrades	\$40,673
2021	CF-0030-045	Construct Taxiway G/Taxilane Y Construction	\$274,466

Year	Project Number	Project Description	DOAV Grants
2021	CF-0030-046	Runway 16R-34L Rehabilitation (Design)	\$1,267
2021	CS-0030-039	Stormwater Pollution Prevention Plan and Spill	\$3,685
2021	MT0030-067	Main Terminal Building Roof (Specifications)	\$7,874
2021	MT0030-069	Terminal Building Roof Replacement (Construction)	\$34,750
2021	PR0030-003	Airport Promotion and Marketing	\$1,487
2021	CS00300-38	Access Controls (Gates) Fiber Optic Backbone	\$8,123

Source: DOAV Annual Self-Reporting of State Aviation funding Received 2019-2021, RS&H Compiled, 2022

### 3.4.1.5 Debt Coverage

Debt service is the annual payment of principal and interest on the City's bonds held by the Airport Commission on behalf of the Airport. **Table 3-7** shows HEF's debt coverage ratio (DCR) information from FY 2017 to FY 2021. The DCR demonstrates the revenue available to cover debt service payments and it is used as an element of determining creditworthiness by financial lenders. The DCR measures the ratio between available cash and debt service payments and it is used as an element of determining creditworthiness by financial lenders. Throughout the five-year period, HEF's DCR has been above an average of 4.8, indicating a positive cash flow and creditworthiness because it was above the typical minimum lending institution threshold of 1.0. This indicates the Airport had revenues far exceeding any debt obligations.

**TABLE 3-7**  
**AIRPORT DEBT COVERAGE (FY 2017- FY 2021)**

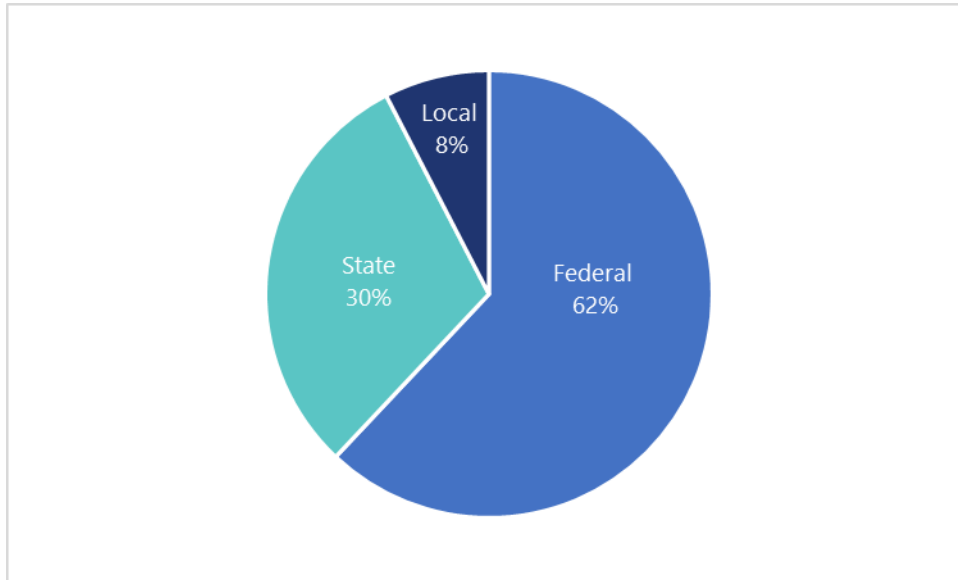
Debt Coverage	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
<b>Revenues &amp; Expenses</b>					
Operating revenues	\$2,707,481	\$2,991,636	\$3,398,035	\$3,615,365	\$3,507,188
Nonoperating revenues					
(expenses)	\$1,673,247	\$1,595,668	\$1,814,667	\$1,715,369	\$1,715,626
<b>Total revenues</b>	<b>4</b>	<b>8</b>	<b>8</b>	<b>6</b>	<b>2</b>
<b>Annual Debt Service</b>	<b>\$407,689</b>	<b>\$451,760</b>	<b>\$453,410</b>	<b>\$450,010</b>	<b>\$451,341</b>
<b>Debt Coverage Ratio</b>	<b>2.54</b>	<b>3.09</b>	<b>3.49</b>	<b>7.95</b>	<b>7.12</b>

Source: HEF Financial Plans FY 2017- FY 2021, RS&H Compiled, 2022

### 3.4.2 Existing Capital Improvement Program

HEF develops a CIP every year with the goal of meeting airport capital project needs. Total anticipated capital project funding over the FY 2022 to FY 2028 period is approximately \$44 million. **Figure 3-5** shows projected funding sources for the CIP. **Table 3-8** depicts the CIP projects for FY 2022 through FY 2028. The Airport's projected CIP is mostly funded from Federal and State funds.

**FIGURE 3-5**  
**AIRPORT PROJECTED CAPITAL FUNDING BY SOURCE (FY 2022- FY 2028)**



Source: Airport Records, RS&H Analysis, 2022

**TABLE 3-8**  
**EXISTING AIRPORT CIP PROJECTS (FY 2023- FY 2028)**

FY	Project Name	Federal Funding	State Funding	Local Funding	Total Funding
2023	City West T-Hangar Rehabilitation (Construction)	\$0	\$60,000	\$15,000	\$75,000
2023	East T-hangar Concrete Repair & Replacement (Construction)	\$0	\$0	\$5,570	\$5,570
2023	New FAA ATCT Phase 1 (Siting & EA)	\$712,500	\$22,500	\$15,000	\$750,000
2023	New Security Fence Installation	\$0	\$80,000	\$20,000	\$100,000
2023	Runway 16L-34R Rehabilitation (Design)	\$540,000	\$48,000	\$12,000	\$600,000
2023	Taxiway 'B' Rehabilitation & Widening (Construction)	\$4,500,000	\$400,000	\$100,000	\$5,000,000
2024	East Apron Rehabilitation (Design)	\$360,000	\$32,000	\$8,000	\$400,000
2024	New FAA ATCT Phase 2 (Design)	\$665,000	\$21,000	\$14,000	\$700,000
2024	South West T-hangar Alleyways Rehabilitation (Construction)	\$0	\$60,000	\$15,000	\$75,000
2024	Taxiways Z & E Concrete Pads Replacement	\$0	\$12,000	\$3,000	\$15,000
2025	Landside Paving Program - Terminal Parking Lot Rehabilitation	\$0	\$73,600	\$18,400	\$92,000

FY	Project Name	Federal Funding	State Funding	Local Funding	Total Funding
2025	Midfield Ditch Restoration (Design Study)	\$0	\$120,000	\$30,000	\$150,000
2025	New FAA ATCT Phase 3 (Construction)	\$8,122,500	\$256,500	\$171,000	\$8,550,000
2025	New Security Fence at Fuel Farm Installation	\$0	\$36,000	\$9,000	\$45,000
2025	Runway 16L-34R Rehabilitation (Construction)	\$4,500,000	\$400,000	\$100,000	\$5,000,000
2025	Tree Clearing/Obstruction Removal	\$0	\$24,000	\$6,000	\$30,000
2026	Land Acquisition South West of Airport	\$2,700,000	\$240,000	\$60,000	\$3,000,000
2026	Midfield Ditch Restoration (Construction)	\$0	\$400,000	\$100,000	\$500,000
2026	New Security Fence for Broad Run	\$0	\$80,000	\$20,000	\$100,000
2026	South East Airport Complex Site Development (Design)	\$360,000	\$32,000	\$8,000	\$400,000
2026	South West Hangar Redevelopment (Design)	\$0	\$160,000	\$40,000	\$200,000
2026	Taxilane X-Ray (Design)	\$135,000	\$12,000	\$3,000	\$150,000
2026	Taxiway X-Ray (Construction)	\$1,350,000	\$120,000	\$30,000	\$1,500,000
2026	Terminal Parking Lot Expansion (Design)	\$0	\$80,000	\$20,000	\$100,000
2027	East Apron Rehabilitation (Construction)	\$3,150,000	\$280,000	\$70,000	\$3,500,000
2027	Glen-Gerry Property Reimbursement	\$1,764,000	\$156,800	\$39,200	\$1,960,000
2027	North East Apron Expansion (Construction)	\$1,080,000	\$96,000	\$24,000	\$1,200,000
2027	North East Apron Expansion (Design)	\$90,000	\$8,000	\$2,000	\$100,000
2027	Runway 16L/34R Extension (Design)	\$360,000	\$32,000	\$8,000	\$400,000
2027	Terminal Parking Lot Expansion (Construction)	\$0	\$800,000	\$200,000	\$1,000,000
2027	Vertiport Development Planning Study	\$0	\$80,000	\$20,000	\$100,000
2028	Bypass Taxiway for Runways 16L & 16R (Design)	\$90,000	\$8,000	\$2,000	\$100,000
2028	Bypass Taxiway for Runways 16L & 16R (Construction)	\$2,700,000	\$240,000	\$60,000	\$3,000,000
2028	Fuel Farm Upgrades	\$0	\$400,000	\$100,000	\$500,000
2028	Install Backup Airfield and Terminal Generators	\$0	\$440,000	\$110,000	\$550,000
2028	Land Acquisition (34L RPZ)	\$270,000	\$24,000	\$6,000	\$300,000

FY	Project Name	Federal Funding	State Funding	Local Funding	Total Funding
2028	Runway 16L-34R Extension (Construction)	\$3,150,000	\$280,000	\$70,000	\$3,500,000
2028	South East Airport Complex Site Development (Construction)	\$4,500,000	\$400,000	\$100,000	\$5,000,000
2028	South West Hangar Redevelopment (Construction)	\$3,600,000	\$320,000	\$80,000	\$4,000,000

Source: Airport Records, RS&H Analysis, 2022

### 3.4.3 Current and Future Budget

Operating budgets have been prepared for expenses and revenues at HEF for FY 2022 and FY 2023. FY 2022 budgeted revenue is slightly over \$3.5 million and approximately \$2.6 million in expenses. Despite the impacts of the COVID-19 pandemic, FY 2022 operating revenues are forecast to increase. In addition, FY 2021 reflects that activity at HEF is returning to pre-pandemic levels with an increase in airport operations as presented in the Forecast chapter. Total operating revenues for FY 2023 are projected to be around \$3.6 million with operating expenses totaling around \$2.8 million. HEF's financial performance has outperformed budget estimates and indicates a continued strong financial profile.

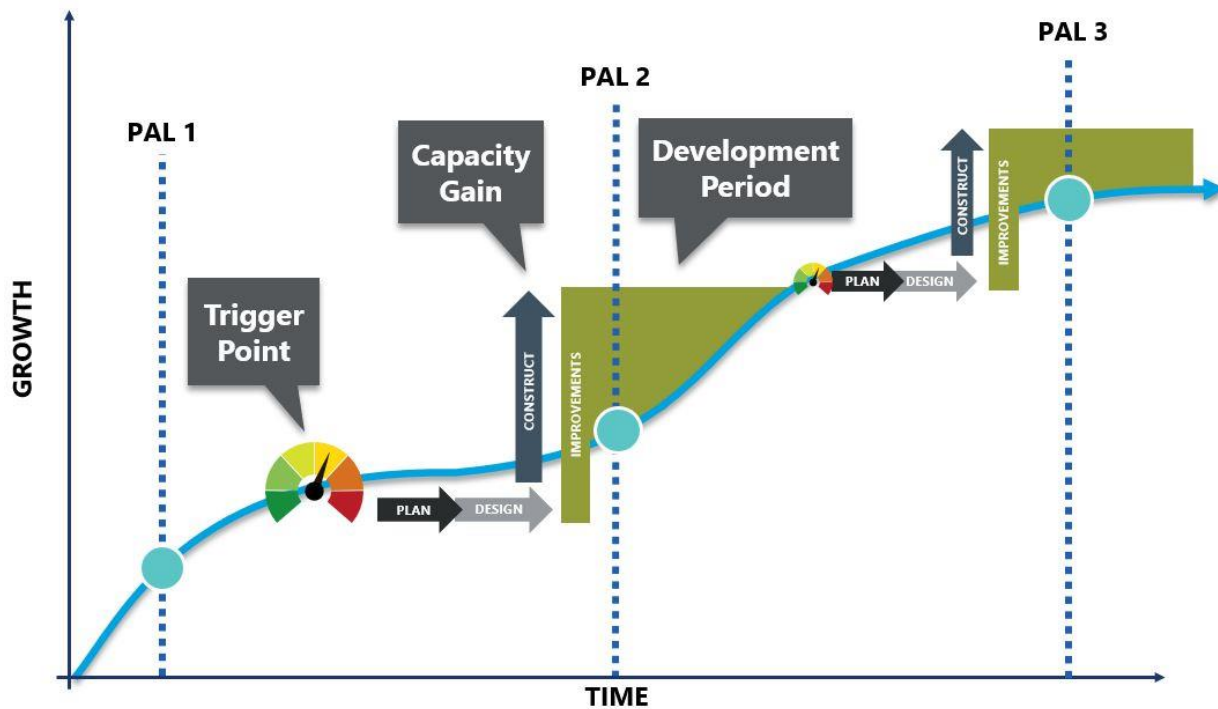
## 3.5 PLANNING ACTIVITY LEVELS

Airport facility requirements, including the type, size, and quantity, are in large part dependent upon the future aviation activity levels projected in the aviation demand forecasts discussed in **Chapter 2, Aviation Activity Forecast**. Necessary addition, upgrading, expansion, or sometimes even elimination of facilities can be driven by many factors including capacity constraints, updates to regulatory standards, or adjustments in HEF's strategic vision. Replacement of outdated or inefficient facilities that are cost prohibitive to maintain or modernize also inform facility needs.

The Manassas Regional Airport aviation demand forecast used demographic, economic, and geographic statistical analysis to derive a preferred forecast scenario that ultimately supports scenario-based growth. Although the forecast defines aviation activity milestones for the years 2026, 2031, and 2041, it is important to understand that facility requirements at Manassas Regional Airport are driven by levels of aircraft activity metrics such as enplanements, operations, or based aircraft, which may or may not coincide with those specific years. Therefore, to eliminate associations between demand levels and specific years, the levels of demand triggering facility improvements will be referred to from this point forward as Planning Activity Levels (PALs). PALs correlate with operational levels in each respective forecast year and, subsequently, are divided into three activity levels: PAL 1, PAL 2, and PAL 3.

**Figure 3-6** diagrams how and when PALs trigger the need for project planning, design, and implementation at certain demand levels, and the effect on overall facility capacity to meet user needs.

**FIGURE 3-6**  
**PLANNING LEVEL TRIGGER POINTS**



Source: RS&H, 2022

### 3.5.1 Aviation Demand Forecasts Review

The Base Case forecast provides the projected metrics that are necessary inputs in developing many of the Airport’s facility requirements. A short summary review of some of these metrics shows that Manassas Airport will continue to be an active reliever airport for the city of Manassas and Washington D.C. region. Specifically, a combination of air taxi and general aviation (GA) operations are anticipated to collectively increase each planning activity level (PAL), ultimately increasing the Airport’s annual total by more than 30,000 over the forecast horizon. The Airport’s based aircraft total is projected to increase by 26 aircraft from 2021-2041.

**TABLE 3-9**  
**BASE CASE FORECAST SUMMARY**

	Existing	PAL 1	PAL 2	PAL 3
<b>Enplanements</b>	-	-	-	-
<b>Operations</b>	99,649	106,144	113,514	130,088
Air Carrier	1	5	5	5
Air Taxi	12,890	14,250	16,177	20,849
Itinerant GA	37,396	39,676	42,094	47,383
Local GA	46,766	49,617	52,642	59,255
Military	171	171	171	171
<b>Based Aircraft</b>	410	415	423	436

Source: RS&H Analysis, 2022

### 3.6 METEOROLOGICAL CONDITIONS

Weather plays a significant role in influencing airport facility needs and design requirements. Ambient temperature, precipitation, wind, visibility, cloud ceiling, and atmospheric pressure are all climate factors that affect operational parameters and future facility needs.

An analysis of ten years of monthly weather station data from the National Oceanographic and Atmospheric Administration (NOAA) showed that July was the warmest month at Manassas Regional Airport with an average high temperature of 87 degrees Fahrenheit between 2011 and 2021. During that time, the month of July averaged one day of air temperatures exceeding 90 degrees.<sup>2</sup>

Comparatively, the coldest month on average was January, with an average low temperature of 24 degrees Fahrenheit. From 2011-2021, the month of January averaged 23 days with air temperatures at or below freezing (32 degrees).

#### 3.6.1 Runway Orientation and Wind Analysis

Runway wind coverage analysis was conducted using the FAA’s Airports GIS Wind Analysis Tool and considers 10 years of meteorological data (January 2011 through December 2020). Data for this tool is supplied by the National Climatic Data Center through the weather reporting station located in the city of Manassas, VA. The wind coverage analysis examines all-weather conditions, visual meteorological conditions (VMC), and instrument meteorological conditions (IMC).

The primary factor in determining runway orientation is the direction of prevailing winds. As stated in FAA AC 150/5300-13B, *Airport Design*, the primary runway should be orientated in the direction of the prevailing winds barring other considerations. FAA runway design standards recommend a runway with a runway design code (RDC) of C-III (Runway 16L-34R) provide a minimum of 95 percent wind coverage at a 16-knot crosswind, and slightly smaller runways (such as Runway 16R-34L), with a RDC of B-II provide a

<sup>2</sup> NOAA, Global Summary of Month Station Details (2022). [Global Summary of the Month Station Details: MANASSAS, VA US, GHCND:USC00445204 | Climate Data Online \(CDO\) | National Climatic Data Center \(NCDC\) \(noaa.gov\)](https://www.noaa.gov/global-summary-of-month-station-details/manassas-va-us)

minimum of 95 percent wind coverage at a 13-knot crosswind. With a C-III RDC, Runway 16L-34R meets the 95 percent threshold for VMC, IMC, and all-weather conditions at 16 knots. As a runway system, Runway 16L-34R and Runway 16R-34L meet the 13 knot crosswind requirements for VMC, IMC, and all-weather conditions.

**Table 3-10** shows the runway wind coverage percentages in VMC conditions. **Table 3-11** shows the runway wind coverage percentages in IMC conditions. **Table 3-12** shows the runway wind coverage percentages in all-weather conditions at HEF.

**TABLE 3-10**  
**RUNWAY WIND COVERAGE - VISUAL METEOROLOGICAL CONDITIONS**

VMC WIND DATA				
Runway	Crosswind Component			
	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 16L-34R	98.62%	99.51%	99.92%	99.99%
Runway 16R-34L	98.62%	99.51%	99.92%	99.99%

Source: NOAA National Climatic Data Center  
 VMC Weather Observations: 126,316  
 Station: 724036  
 Data Range: 2011-2020

**TABLE 3-11**  
**RUNWAY WIND COVERAGE - INSTRUMENT METEOROLOGICAL CONDITIONS**

IMC WIND DATA				
Runway	Crosswind Component			
	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 16L-34R	99.31%	99.69%	99.92%	99.96%
Runway 16R-34L	99.31%	99.69%	99.92%	99.96%

Source: NOAA National Climatic Data Center  
 IMC Weather Observations: 17,882  
 Station: 724036  
 Data Range: 2011-2020

**TABLE 3-12**  
**RUNWAY WIND COVERAGE - ALL WEATHER CONDITIONS**

ALL-WEATHER CONDITIONS WIND DATA				
Runway	Crosswind Component			
	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 16L-34R	98.69%	99.53%	99.92%	99.98%
Runway 16R-34L	98.69%	99.53%	99.92%	99.98%

Source: NOAA National Climatic Data Center  
 All-Weather Observations: 147,512  
 Station: 724036  
 Data Range: 2011-2020

### 3.7 AIRFIELD CAPACITY

Capacity, or throughput capacity, is defined as a measure of the maximum number of aircraft operations that can be accommodated on the airport in an hour. To determine airfield capacity and associated aircraft delays at a planning level, the methodology of FAA AC 150/5060-5, *Airport Capacity and Delay* is generally used. HEF is a two-runway system comparable to configuration number 2 depicted in FAA AC 150/5060-5, *Airport Capacity and Delay*. See Figure 2-7.

FAA uses the Annual Service Volume (ASV) as a reasonable estimate of an airport's annual operations capacity. **Table 3-13** shows a comparison of forecast aircraft operations and the estimated ASV ratio of the existing airfield. Calculation of the ASV includes considerations of factors such as runway configuration, weather, the percentage of large and heavy aircraft operations compared to total annual operations as the fleet mix, and the number of touch-and-go operations. The ASV of the existing runway configuration is estimated at 355,000 operations and significantly exceeds forecast operations levels therefore, no additional runway capacity will be necessary within the planning period. With both runways adequately serving the overall airport fleet mix of the future, planning for additional runway capacity should begin when the ASV ratio reaches 60 percent (213,000 operations).

**TABLE 3-13**  
**COMPARISON OF FORECAST OPERATIONS AND ANNUAL AIRFIELD CAPACITY**

	Existing 2021	Planning Activity Level		
		PAL 1	PAL 2	PAL 3
Forecast Operations	99,649	106,144	113,514	130,088
Existing ASV	355,000	355,000	355,000	355,000
ASV Ratio	28%	30%	32%	37%

Source: RS&H Analysis, 2022

FIGURE 3-7  
CAPACITY AND ASV FOR LONG RANGE PLANNING

NO.	Runway-use Configuration	Mix Index % (C+3D)	Hourly Capacity Ops/Hr		Annual Service Volume Ops/Yr
			VFR	IFR	
1.		0 to 20	98	59	230,000
		21 to 50	74	57	195,000
		51 to 80	63	56	205,000
		81 to 120	55	53	210,000
		121 to 180	51	50	240,000
2.		0 to 20	197	59	355,000
		21 to 50	145	57	275,000
		51 to 80	121	56	260,000
		81 to 120	105	59	285,000
		121 to 180	94	60	340,000
3.		0 to 20	197	62	355,000
		21 to 50	149	63	285,000
		51 to 80	126	65	275,000
		81 to 120	111	70	300,000
		121 to 180	103	75	365,000
4.		0 to 20	197	119	370,000
		21 to 50	149	113	320,000
		51 to 80	126	111	305,000
		81 to 120	111	103	315,000
		121 to 180	103	99	370,000
5.		0 to 20	295	62	385,000
		21 to 50	213	63	345,000
		51 to 80	171	65	285,000
		81 to 120	149	70	310,000
		121 to 180	129	75	375,000

\* Staggered threshold adjustments may apply, see paragraph 4-6.

\*\* Refer to paragraph 2-2.f.

## 3.8 AIRFIELD DESIGN

### 3.8.1 Airfield Configuration

The airfield configuration consists of two runways and 20 taxiways/taxilanes, **Figure 3-8** shows the FAA airport diagram. The Airport's primary runway, Runway 16L – 34R, is 6,200 feet long and 100 feet wide. It

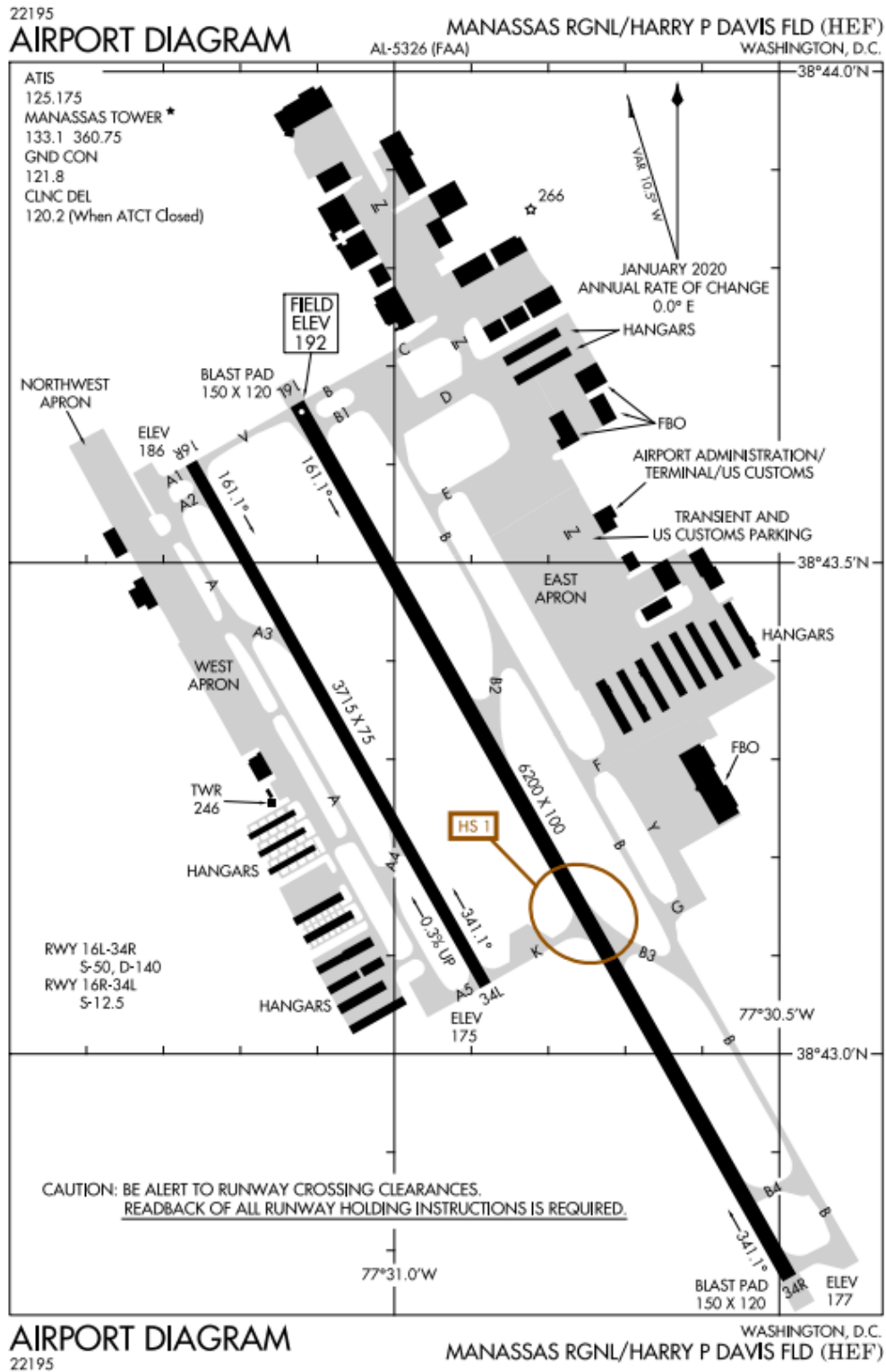
is separated from the centerline of parallel Taxiway B by 400 feet. The secondary runway, Runway 16R – 34L, is 3,715 feet long by 75 feet wide and it is separated from the centerline of parallel Taxiway A by 250 feet.

The purpose of a taxiway/taxilane system is to provide safe and efficient movement of aircraft to and from the aprons and runways. The taxiway/taxilane system at HEF consists of the following elements:

- Taxiway A is a full parallel taxiway on the west side of Runway 16R – 34L providing full access to the runway from the Northwest Apron, West Apron and associated hangars. Taxiway A extends in a northwest-southeast orientation. Taxiway A has five connector taxiways, all of which are located to the west of Runway 16R – 34L.
- Taxiway A-1 is a connector taxiway with access to the north end of Taxiway A from Runway 16R
- Taxiway A-2 is a connector taxiway with access to the north end of Taxiway A from Runway 16R
- Taxiway A-3 is a high-speed exit taxiway with access to Taxiway A and West Apron from Runway 16R
- Taxiway A-4 is a high-speed exit taxiway with access to Taxiway A and west hangars from Runway 34L
- Taxiway A-5 is a connector taxiway with access to the south end of Taxiway A from Runway 34L
- Taxiway B is a full parallel taxiway on the east side of Runway 16L – 34R providing full access to the runway from the Passenger Terminal, East Apron, and associated hangar facilities. Taxiway B extends in the northwest-southeast orientation. Taxiway B has four exit taxiways, all of which are located to the east side of Runway 16L – 34R.
- Taxiway B-1 is a connector taxiway with access to the north end of Taxiway B from Runway 16L.
- Taxiway B-2 is a high-speed exit taxiway with access to Taxiway B from Runway 34R.
- Taxiway B-3 is a high-speed exit taxiway with access to Taxiway B from Runway 16L.
- Taxiway B-4 is a connector taxiway with access to the south end of Taxiway B from Runway 34R.
- Taxilane C is a connector taxilane with access from Taxiway B to the Northeast Apron
- Taxilane D is a connector taxilane with access from Taxiway B to the Northeast and East Apron
- Taxilane E is a connector taxilane with access from Taxiway B to the East Apron
- Taxilane F is a connector taxilane with access from Taxiway B to the East Apron and T Hangars
- Taxilane G is a connector taxilane with access from Taxiway B to the Southeast Apron
- Taxilane Y is a connector taxilane with access from Taxiway G to the Southeast Apron and Taxiway F
- Taxilane Z is a connector taxilane providing access along the East Apron
- Taxiway V is a crossover taxiway oriented in an east-west direction providing access to the threshold of Runway 16L and Runway 16R
- Taxiway K is a crossover taxiway oriented in an east-west direction providing access to the threshold of Runway 34L and the midsection of Runway 16L-34R

All Airport taxiways allow for the efficient movement of aircraft. FAA design standards and non-standard conditions for HEF taxiways will be analyzed in **Section 3.8.4.**, Taxiway Design, of this chapter.

**FIGURE 3-8**  
**FAA AIRPORT DIAGRAM OF MANASSAS REGIONAL AIRPORT**



Source: Airport IQ 5010, 2022

### 3.8.2 Airfield Design Criteria

As is true of all federally obligated airports, FAA airfield design standards are designated by FAA approved critical aircraft<sup>3</sup>. These design standards include geometric standards as well as dimensional requirements, such as the distance between taxiways and runways, and the size of certain areas protecting the safety of aircraft operations and passengers, all designed to accommodate specific critical aircraft.

The FAA recently issued an update to the established guidance for airport design standards in FAA AC 150/5300-13B, Airport Design. This AC outlines design criteria for certain groups of aircraft depending on the Aircraft Approach Category (AAC), Airplane Design Group (ADG), and Taxiway Design Group (TDG). Engineering airfield surfaces to FAA design criteria is critical to maintaining an airfield environment that can safely accommodate the Airport's critical aircraft. Historically, C-III design criteria has guided airfield design at HEF. This has enabled the Airport to meet design standards for the Gulfstream V (existing C-III critical aircraft). However, with the recently issued AC, the parameter for airport design standards will be specified by AAC, ADG and TDG.

Taxiway design guidance is driven by the critical aircraft undercarriage dimensions including overall main gear width and cockpit to main gear distance. The future critical aircraft for HEF's primary runway, Gulfstream V, is a TDG-2B. The airfield configuration at HEF necessitates that Runway 16L-34R and the associated taxiway system will be evaluated based on their ability to accommodate C-III and TDG-2B design standards. Runway 16R-34L is designed to B-II standards as its critical aircraft identified in **Chapter 2, Aviation Activity Forecast** is a Citation Sovereign, TDG-1B. Therefore, the associated taxiway network will be evaluated based on its ability to accommodate TDG-1B.

The following sections discuss runway design requirements and taxiway design requirements.

### 3.8.3 Runway Design

An analysis of HEF runways must evaluate its ability to meet design standards and forecast demand. At a minimum, runways must have adequate length, width, and strength to meet FAA design standards for the critical aircraft. This section analyzes these specific runway criteria and makes recommendations based on forecasted need. Elements to be examined in this section include runway design group, designation, length, width, strength, runway separation requirements and runway protection zones.

#### 3.8.3.1 Runway Design Requirements

The Runway Design Code (RDC) of a runway is used by the FAA to determine the standards that apply to a specific runway and parallel taxiway to allow unrestricted operations by the design aircraft under desired meteorological conditions.<sup>4</sup>

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<sup>3</sup> The most demanding aircraft type, or grouping of aircraft with similar characteristics, that make regular use of the airport. Regular use is a minimum of 500 annual operations, excluding touch-and-go operations. An operation is a takeoff or landing. AC 150/5000-17, *Critical Aircraft and Regular Use Determination* provides FAA guidance on defining critical aircraft at an airport. (FAA, 2017)

<sup>4</sup> FAA AC 150/5300-13B, *Airport Design* (2022)

Runway 16L is the only precision runway at HEF coupled with an instrument landing system (ILS). Runways 16R, 34L, and 34R are non-precision runways. **Table 3-14** shows FAA instrument approach visibility minimums and equivalent runway visual range definitions. Based on existing ½ mile visibility minimums at HEF, the RDC for Runway 16L is C-III-2400. Runway 34R has an RNAV (GPS) approach with 1 mile visibility minimums. The RDC for Runway 34R is C-III-5000. As the secondary runway, Runway 16R-34L primarily accommodates general aviation operations by smaller piston and turboprop aircraft, but it is also capable of accommodating some smaller corporate jets. Runway 16R-34L has an RNAV (GPS) approach on each end with 1 mile visibility minimums, making it an RDC of B-II-5000.

**TABLE 3-14**  
**INSTRUMENT APPROACH VISIBILITY MINIMUMS**

Runway Visual Range (RVR)	Instrument Flight Visibility Category (Statute Miles)
5000	Not lower than 1 mile
4000	Lower than 1 mile but not lower than 3/4 mile
2400	Lower than 3/4 mile but not lower than 1/2 mile
1600	Lower than 1/2 mile but not lower than 1/4 mile
1200	Lower than 1/4 mile

Note: RVR values are not exact equivalents.  
Source: FAA AC 150/5300-13B, *Airport Design* (2022)

### 3.8.3.2 Runway Designation

Every runway has two associated directional headings. A true heading, or the direction toward which it is physically oriented that will not change unless the runway is realigned, and a magnetic heading, which is determined by the runway’s orientation relative to magnetic north. A runway’s magnetic heading is important because navigation equipment and instrument approaches are designed with respect to magnetic heading rather than a true heading. Due to the slow drift of the magnetic poles on the Earth’s surface, the magnetic bearing of a runway may change over time and a runway redesignation must occur.

Analysis conducted indicates that the rate of magnetic variance at HEF is 10.27° W ± 0.22° W as of February 2022. The current rate of change is 0° 0’ W per year. As shown in **Table 3-15**, neither Runway 16L-34R or Runway 16R-34L will require a runway designation revision within the next 100 years. It is industry standard that a runway designation be considered when the runway magnetic heading shifts more than 5° from the existing runway designation. However, HEF will not experience a runway magnetic heading shift.

**Table 3-15** shows the Airport’s runway designations and anticipated changes throughout the planning period.

**TABLE 3-15**  
**RUNWAY DESIGNATION**

Runway Designation	Existing			Future (2041)		
	Runway Heading	True Bearing	Magnetic Bearing	Magnetic Heading	Runway Heading	Runway Designation
Runway 16L	160°	150° 43' 4.08"	160° 16' 4.08"	160° 16' 4.08"	160°	Runway 16L
Runway 34R	340°	330° 43' 4.08"	340° 16' 4.08"	340° 16' 4.08"	340°	Runway 34R
Runway 16R	160°	150° 38' 14.28"	160° 11' 14.28"	160° 11' 14.28"	160°	Runway 16R
Runway 34L	340°	330° 38' 14.28"	340° 11' 14.28"	340° 11' 14.28"	340°	Runway 34L

Source: NOAA – National Centers for Environmental Information; RS&H Analysis, 2022

### 3.8.3.3 Runway Length Requirements

Runway length is determined by the greater requirement of the takeoff or landing performance characteristics of the existing and future design aircraft, or the composite family of airplanes as represented by the design aircraft. The takeoff length, including takeoff run, takeoff distance, and accelerate-stop distance, is typically the more demanding of the runway length requirements.

As described below, there are two primary means for determining the Airport’s recommended runway lengths:

**Guidance A** FAA Recommended Runway Length: This analysis provides a general estimated runway length guidance based on FAA Runway Design Matrix Tool and Advisory Circular 150/5325-4B performance graphs for composite aircraft groups, as adjusted for HEF mean maximum temperature, field elevation, difference in runway centerline elevations, and aircraft flight range of greater than 500 nautical miles.

**Guidance B** Critical Aircraft Planning Manuals (Performance Curves or Performance Tables): This analysis determines runway length required for specific aircraft models and engines based on data from the aircraft manufacturer, operator requirements, aircraft operating (payload) weights, flight range, historical environmental conditions, and field elevation.

General runway length analysis was computed based on FAA computer modeling software and Advisory Circular performance graphs for composite aircraft groups, as adjusted for HEF mean maximum temperature (87.0°F), field elevation (192.3 feet above mean sea level), and difference in runway centerline elevations (15 feet for Runway 16L-34R). **Table 3-16** provides the FAA recommended runway length requirements.

**TABLE 3-16**  
**RUNWAY LENGTH REQUIREMENTS**

Aircraft Category	FAA Recommended Runway Length
<b>Existing Runway 16L-34R Length</b>	<b>6,200'</b>
<b>Existing Runway 16R-34L Length</b>	<b>3,715'</b>
Small Airplanes with approach speeds of less than 50 knots	
Small Airplanes (< 12,500 lbs)	
100% of Fleet (< 10 seats)	3,600'
100% of Fleet (> 10 seats)	4,150'
Large Airplanes (12,501 lbs - 60,000 lbs)	
75% of Fleet @ 60% Useful Load	4,800'
75% of Fleet @ 90% Useful Load	6,600'
100% of Fleet @ 60% Useful Load	5,400'
100% of Fleet @ 90% Useful Load	8,150'
Large Airplanes (> 60,000 lbs)	
500 Mile Stage Length	5,340'
1,000 Mile Stage Length (e.g., Dallas, TX)	5,690'
1,500 Mile Stage Length (e.g., Salt Lake City, UT)	6,120'
Long Haul Stage Length	6,700'

Sources: FAA Advisory Circular 150/5325-4, Runway Length Requirements for Airport Design; FAA Airport Design Microcomputer Program 4.2D; RS&H Analysis, 2022

Runway 16R-34L is currently 3,700 feet long and is located on the west side of the airfield parallel to Runway 16L-34R. Runway 16R-34L is primarily intended for piston and turboprop aircraft operations, although its critical aircraft is the Citation Sovereign, a business jet. Guidance A was used to assess aircraft which operate on Runway 16R-34L, small piston and turboprop aircraft below 12,500 pounds and large airplanes between 12,501 pounds and 60,000 pounds. The analysis for piston and turboprop aircraft under 12,500 pounds produced a runway length requirement of approximately 3,600 feet. The subsequent analysis for aircraft between 12,501 pounds and 60,000 pounds found the FAA's runway length curves exceed the takeoff length requirement, 3,650 feet, found in the critical aircraft's Airport Planning Manual. Therefore, the current length of 3,715 feet should be adequate to accommodate regular piston, turboprop, and critical aircraft operations operating off Runway 16R-34L during the planning period.

Guidance B was used to assess large airplanes over 60,000 pounds. The Airplane Planning Manual of the critical aircraft family and larger business jets which operate out of HEF were also referenced. The analysis complimented with the Airport's Runway 16L-34R Aircraft Usage Matrix on file found that nearly all HEF's fleet mix can operate unrestricted using the airport's longest runway of 6,200 feet, however, some of the largest business jets at HEF cannot takeoff at maximum allowable weight (MTOW) during the highest temperatures experienced at HEF. **Table 3-17** identifies the fleet mix which fall into this category, their total operations based on CY 2020 FAA Offload data and required runway length at HEF during the

highest temperatures experienced at the airport. Runway length calculations for individual aircraft and pilot surveys for additional support for the runway extension are found in **Appendix B** of this Master Plan.

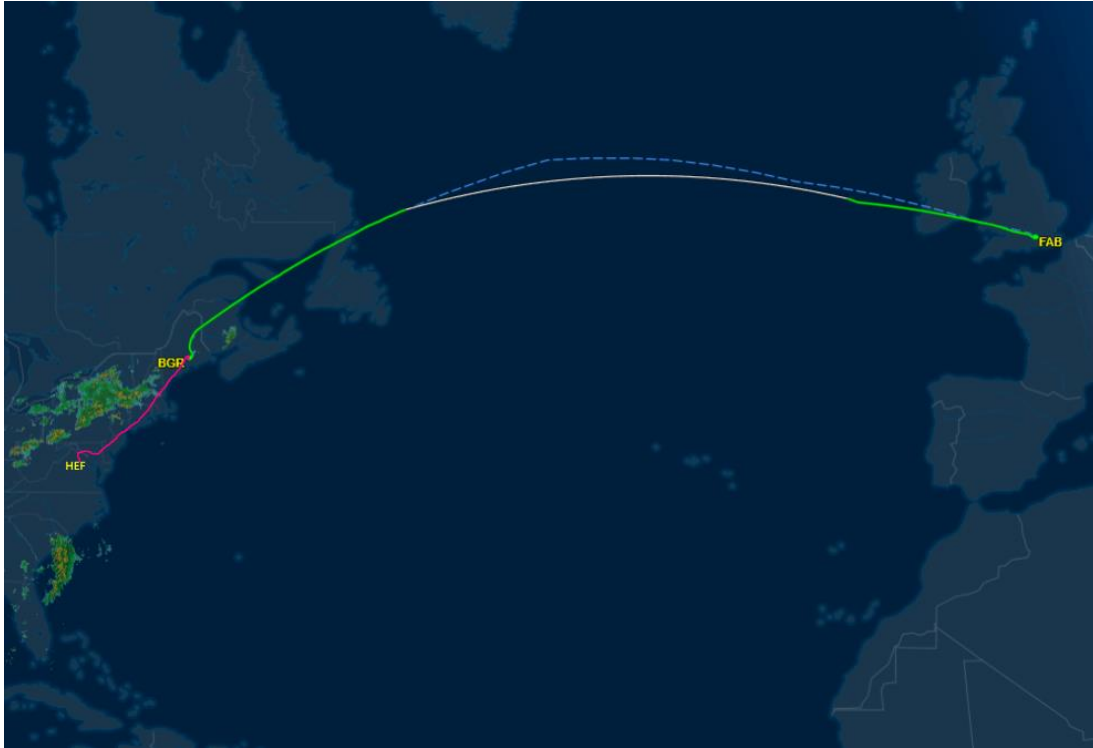
**TABLE 3-17**  
**BUSINESS/REGIONAL JET REQUIRED RUNWAY LENGTH AT MTOW**

ICAO Code	Model	AAC/ADG	2020 Operations	Runway Length
CL60	Challenger 650	C/II	306	7,550
E145	EMB/ERJ-145	C/II	2	6,476
LJ35/36	Learjet 35/36	D/I	21	6,404
LJ60	Learjet 60, 60XR	C/I	163	6,404
GLEX	Global 6000	B/III	8	6,464
GLF5	Gulfstream V	C/III	35	6,492
TOTAL			535	

Sources: FAA Offload Data; Runway Length Requirements for Airport Design; Airport Planning Manuals; RS&H Analysis, 2022

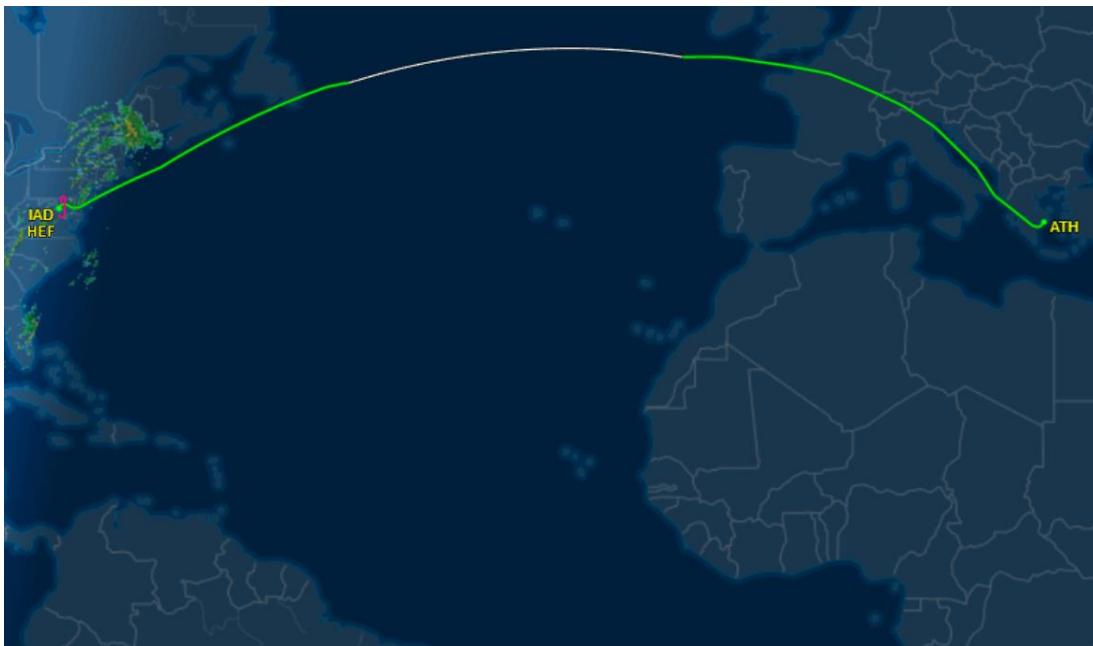
Historical data indicates over 500 operations by aircraft within the fleet mix and this number will continue to increase since business jet share for the Commonwealth and HEF is forecasted to increase over the planning period. There is evidence of larger business jets repositioning to an airport with a longer runway prior to embarking on long-haul trips, indicative of MTOW. **Figure 3-9** depicts a trip by a Challenger 600 repositioning from HEF to Bangor International Airport (BGR) prior to flying over 3,150 nautical miles to Farnborough, England (FAB/EGLF). BGR has one runway with a length of 11,440 feet. Additionally, **Figure 3-10** depicts a trip by a Gulfstream V repositioning from HEF to Washington Dulles (IAD) prior to flying over 4,500 nautical miles to Athens, Greece (ATH/LGAV). IAD has four runways with all runway lengths extending over 9,400 feet. Both flight operations occurred within the month of July and indicate the frequency of similar operations.

**FIGURE 3-9**  
**CL60 TRIP: HEF TO BGR TO FAB/ EGLF**



Source: Flightaware.com

**FIGURE 3-10**  
**GLF5 TRIP: HEF TO IAD TO ATH/LGAV**



Source: Flightaware.com

Consequently, the runway lengths at HEF are deemed inadequate to serve the current and forecast fleet mix for airplanes over 60,000 pounds. The runway length analysis resulted in a recommended runway length of approximately 6,700 feet, thus requiring a runway extension of 300 feet to Runway 16L-34R. An extension to Runway 16L-34R would impact the MALSF lighting and would require adjustment. The localizer is placed 1,300 feet from the runway end and therefore would likely remain in place with an extension. The Alternatives chapter will explore and incorporate change to runway lighting resulting from a runway extension.

### 3.8.3.4 Runway Widths

Runway 16L-34R is 100 feet wide with no paved shoulders. Runway 16R-34L is 75 feet wide with paved shoulders that are 12.5 feet wide. The Airport does currently mow its shoulders and stabilizes turf on the sides of both runways. FAA design standards recommend or require runway shoulders dependent upon the ADG of aircraft using the runway, to provide resistance to blast erosion and accommodate passage of maintenance and emergency equipment as well as the occasional aircraft veering from the runway. Per AC 150/5300-13B, *Airport Design*, paved shoulders on runways are not required for runways with critical aircraft designated as ADG-I, ADG-II, or ADG-III. In their place, guidance suggests using turf or stabilized soil treatments. Paved shoulders are required for runways accommodating ADG IV and higher aircraft and are recommended for runways with ADG-III as the critical aircraft. For this reason, it is recommended that the shoulders of Runway 16L-34R are paved as the critical aircraft, Gulfstream V, is an ADG-III aircraft.

**Table 3-18** shows the widths of Runway 16L-34R and 16R-34L both meet current FAA standards. As is true of all facility requirement tables within this chapter, facilities meeting FAA design standards are shown with a checkmark “✓” and unmet design standards are denoted by a bold “X”.

**TABLE 3-18**  
**RUNWAY WIDTH REQUIREMENTS**

Runway	Design Group	Width	Shoulder	Meets Requirements (✓)
16L-34R	ADG-III	100'	0'	✓ <sup>1</sup>
16R-34L	ADG-II	75'	12.5'	✓

Note: 1) Shoulders are not required for Runway 16L-34R but are recommended as ADG-III aircraft operations reach 500 operations annually.

Source: AC 150/5300-13B, *Airport Design*; RS&H Analysis, 2022

### 3.8.3.5 Runway Protection Zones

FAA defines Runway Protection Zones (RPZs) off runway ends to enhance the protection of people and property on the ground. The size of these zones varies according to design aircraft characteristics, visual approaches, and the lowest instrument approach visibility minimum defined for each runway. It is most desirable to have these areas clear of incompatible objects and owned by the Airport.

There are two RPZs for each runway end – a departure and an approach RPZ. HEF has instrument approaches for all runway ends and therefore each runway end has an approach RPZ, the larger and more limiting of the two. There are no declared distances at HEF so all RPZs begin at 200 feet from the end of

the usable pavement on each runway. **Table 3-19** lists dimensions and acreage of the most demanding RPZ (approach RPZ) for each runway end, and amount of acreage not owned by the Airport.

**TABLE 3-19**  
**RUNWAY PROTECTION ZONE REQUIREMENTS**

RPZ Measure	Runway			
	16L	34R	16R	34L
Length	2,500'	1,700'	1,000'	1,000'
Inner Width	1,000'	500'	500'	500'
Outer Width	1,750'	1,010'	700'	700'
Total Acreage	78.91	29.47	13.77	13.77
<b>Airport Owned (✓)</b>	<b>X</b> <b>(21.92 Acres)</b>	✓	✓	<b>X</b> <b>(3.71 Acres)</b>

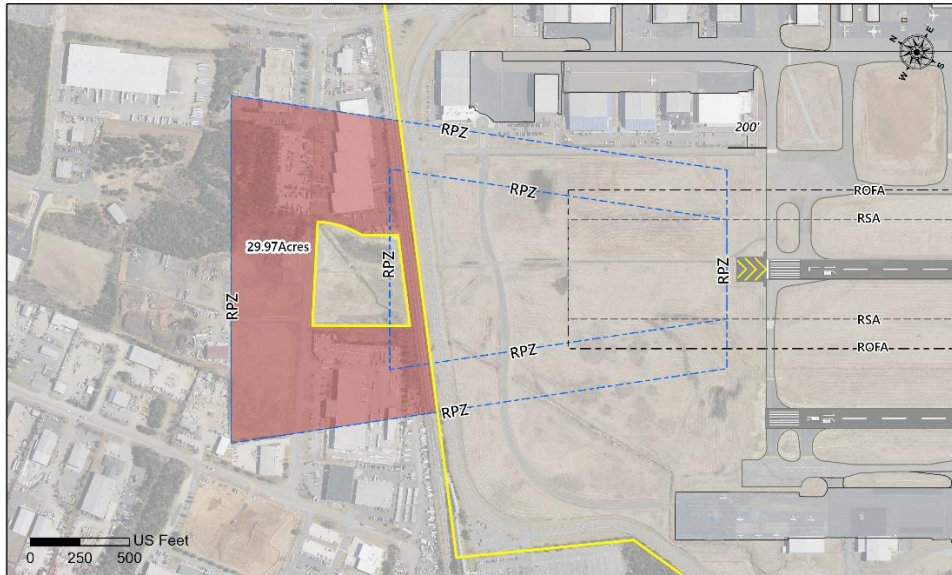
Source: AC 150/5300-13B, *Airport Design*; RS&H Analysis, 2022

As recommended, the existing RPZs are fully owned by the Airport on Runway 34R and Runway 16R. The approach RPZ for Runway 16L contains approximately 21.92 acres of off-Airport property and crosses a rail line. Runway 34L includes approximately 3.71 acres of off-Airport property.

In FAA RPZ guidance, transportation facilities but not limited to including public roads/highways were identified as examples of land uses in an RPZ that are incompatible. The intention of this guidance is to address the introduction of new or modified land uses, meaning that while the uses are defined as incompatible, mitigation is not immediately required for previously existing infrastructure. However, FAA does not support expansion of incompatible uses within the RPZs. The Airport should continue to regularly assess overall risk presented by the rail line and maintain communication with the FAA Regional Office and Airports District Office (ADO).

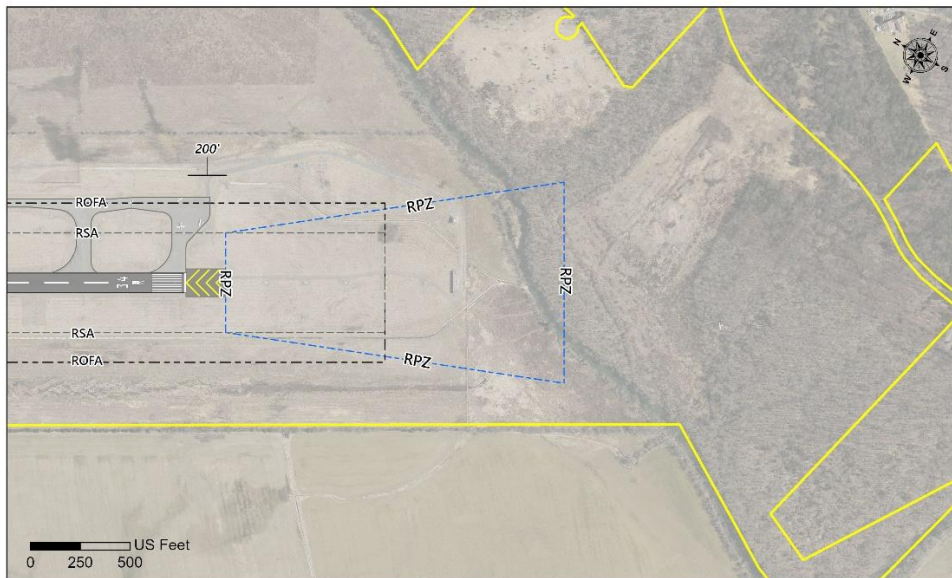
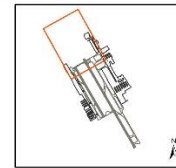
The approach RPZs for each runway end are shown in **Figure 3-11** and **Figure 3-12**. Portions of the RPZs outside the airport property boundary are highlighted in red along with their associated acreage. 21.92 acres on the approach end of Runway 16L and 3.71 acres on the approach end of Runway 34L are outside of the airport property boundary, however, the airspace over these areas are controlled through existing aviation easements. While this is not an immediate concern, the Airport should monitor the properties and attempt to acquire the remaining unowned land within each RPZ when practical.

**FIGURE 3-11**  
**RUNWAY 16L-34R RPZ EVALUATION**



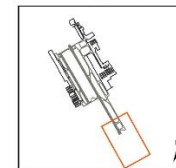
- Legend**
- Runway Protection Zones
  - Runway Safety Area
  - Runway Object Free Area
  - Property Line
  - RPZ Area Off-Airport Property

**Runway Protection Zones**  
 Runway 16L Approach = 2,500' x 1,000' x 1,750'  
 Runway 34R Departure = 1,700' x 500' x 1,010'



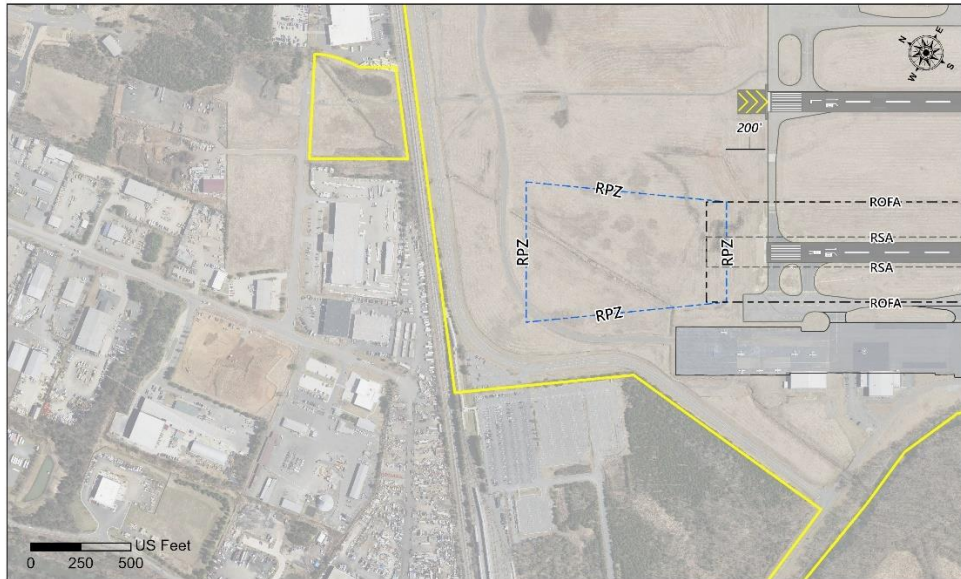
- Legend**
- Runway Safety Area
  - Runway Object Free Area
  - Runway Protection Zones
  - Property Line

**Runway Protection Zones**  
 Runway 16L Departure = 1,700' x 500' x 1,010'  
 Runway 34R Approach = 1,700' x 500' x 1,010'



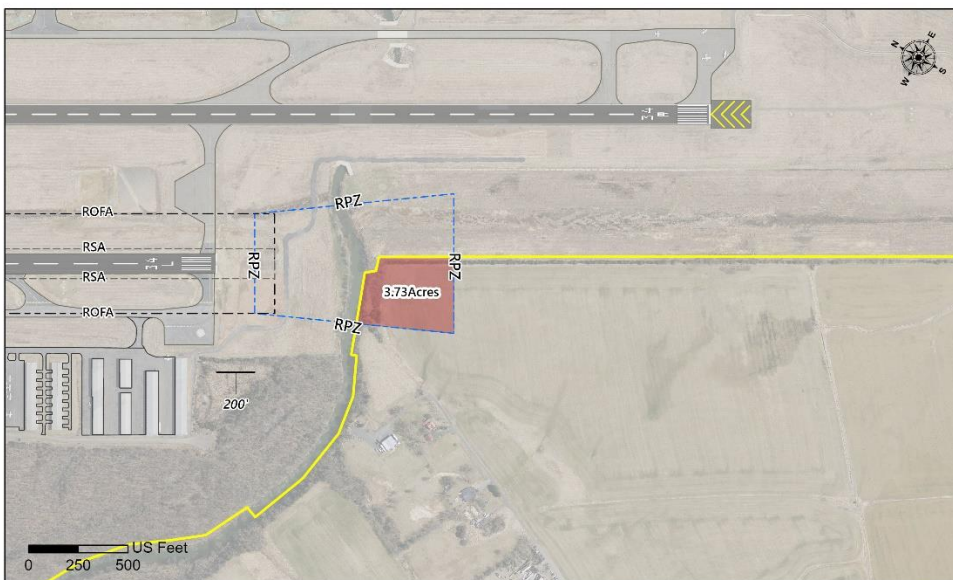
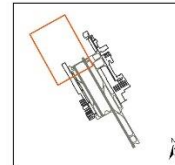
Source: RS&H Analysis, 2022

**FIGURE 3-12**  
**RUNWAY 16R-34L RPZ EVALUATION**



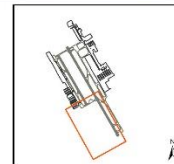
- Legend**
- Runway Protection Zones
  - Runway Safety Area
  - Runway Object Free Area
  - Property Line

**Runway Protection Zones**  
 Runway 16R Approach = 1,000' x 500' x 700'  
 Runway 34L Departure = 1,000' x 500' x 700'



- Legend**
- Runway Protection Zones
  - Runway Safety Area
  - Runway Object Free Area
  - Property Line
  - RPZ Area Off-Airport Property

**Runway Protection Zones**  
 Runway 16R Departure = 1,000' x 500' x 700'  
 Runway 34L Approach = 1,000' x 500' x 700'



Source: RS&H Analysis, 2022

### 3.8.3.6 Runway Geometric and Separation Standards

This section analyzes the existing runway geometric and separation distances against the dimensional standards that arise from the critical aircraft category designated for each runway. Compliance with FAA airport geometric and separation standards is intended to meet a minimum level of airport operational safety and efficiency.

#### Runway 16L-34R Design Standards

Runway 16L-34R was evaluated for geometric and separation deficiencies using C-III runway design criteria. **Table 3-20** compares the current FAA C-III design standards to existing conditions.

**TABLE 3-20**  
**RUNWAY 16L-34R DESIGN STANDARDS**

Airfield Components	C-III Requirement	Existing	Meets C-III Requirement
<b>Blast Pad Design</b>			
Runway blast pad width	140'	120' - 140'	X <sup>1</sup>
Runway blast pad length	200'	150' – 200'	X <sup>1</sup>
<b>Runway Separation</b>			
<i>Runway centerline to:</i>			
Holding position	250'	250'	✓
Parallel taxiway/taxilane centerline	400'	400'	✓
Parallel runway centerline	700'	750'	✓ <sup>2</sup>
Aircraft Parking Area	*485.5'	700'	✓
<b>Safety Areas</b>			
Runway Safety Area (RSA)			
Length beyond departure end	1,000'	1,000'	✓
Length prior to threshold	600'	600'	✓
Width	500'	500'	✓
Runway Object Free Area (ROFA)			
Length beyond runway end	1,000'	1,000'	✓
Length prior to threshold	600'	600'	✓
Width	800'	800'	✓
Runway Obstacle Free Zone			
Length beyond runway end	200'	200'	✓
Width	400'	400'	✓
Precision Obstacle Free Zone <sup>3</sup>			
Length	200'	200'	✓
Width	800'	800'	✓

Note: AC 150/5300-13B: Airport Design adjusts separation of aircraft parking area to allow aircraft parking outside of the TOFA

Note: 1) Runway 16L blast pad width and length do not meet C-III requirement

Note 2) Minimum separation standards for runway centerlines is dependent on simultaneous Visual Flight Rule operations. Simultaneous landings and takeoffs using VFR, the minimum separation between centerlines of parallel runways is 700 feet.

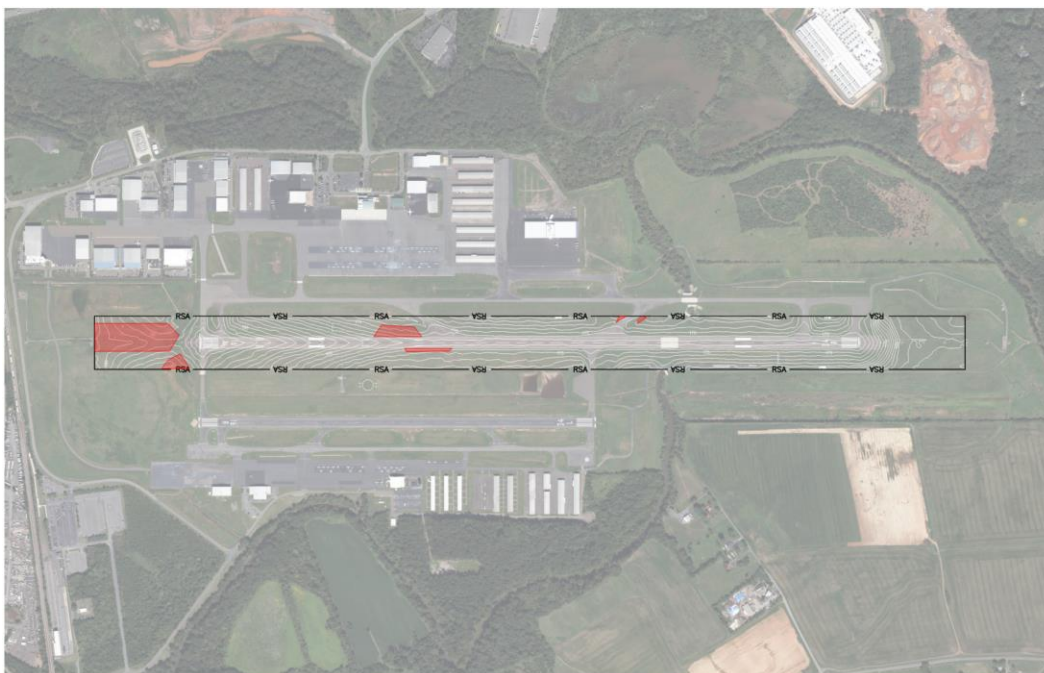
Note 3) The Precision Obstacle Free Zone only applies to Runway 16L

The only element that does not meet C-III geometric design standards is the blast pad width and length at the 16L approach end. The critical aircraft for 16L-34R is the Gulfstream V (ADG-III), therefore the design standards will need to be met.

The single hot spot on the airfield, HS-1 (see **Figure 3-8**), is located within the safety area of 16L-34R where Taxiway K and B3 intersect the runway. The FAA defines hot spot as a location on an airport movement area with a history of potential risk of a collision or runway incursion. Heightened attention by pilots, drivers, and controllers is necessary when maneuvering through a hot spot. As a result of the crown of Runway 16R-34L, inhibits a pilot's ability to locate Taxiway B3 while holding short on Taxiway K. The inability to locate Taxiway B3 introduces risk to surface operations. The Airport installed a new airfield guidance direction sign to Taxiway B3 so pilots holding short on Taxiway K can more easily locate Taxiway B3. From interviews with ATC, there have been no incursions at HS-1 in the last year. Alternatives will examine solutions to correct the hot spot intersection (HS-1).

From daily inspections and visual observations, a number of surface variations were found within the RSA. These surface variations can be found at the approach end of Runway 16L, near the Taxiway B2 intersection, and Taxiway B3 intersection. **Figure 3-13** depicts areas within the RSA with observed surface variations and/or drainage discrepancies which may impact the ability to support snow removal equipment, ARFF equipment, and passage of aircraft during dry conditions. These areas will require a topographic survey during the Runway 16L-34R rehabilitation design to determine solutions to mitigate the non-standard RSA conditions. The transverse and longitudinal grading of the RSA were assessed and found to be within grading standards found in FAA Advisory Circular 150/5300-13B, paragraph 3.16.6.

**FIGURE 3-13**  
**RWY 16L-34R SURFACE VARIATIONS**



Source: RS&H Analysis, 2022

## Runway 16L-34R Design Standards

**Table 3-21** compares FAA airport design standards to existing conditions for Runway 16R-34L using B-II runway design criteria. The B-II design criteria will be used as the standard as opposed to the B-II Small criteria as the critical aircraft for the runway is the Citation Sovereign.

**TABLE 3-21**  
**RUNWAY 16R-34L DESIGN STANDARDS**

Airfield Components	B-II Requirement	Existing	Meets B-II Requirement
<b>Blast Pad Design</b>			
Runway blast pad width	95'	n/a	✓
Runway blast pad length	150'	n/a	✓
<b>Runway Separation</b>			
<i>Runway centerline to:</i>			
Holding position	200'	200'	✓
Parallel Taxiway/Taxilane Centerline	240'	250'	✓
Parallel runway centerline		750'	✓ <sup>1</sup>
Aircraft Parking Area	302'	350'	✓
<b>Safety Areas</b>			
Runway Safety Area (RSA)			
Length beyond departure end	300'	300'	✓
Length prior to threshold	300'	300'	✓
Width	150'	150'	✓
Runway Object Free Area (ROFA)			
Length beyond runway end	300'	300'	✓
Length prior to threshold	300'	300'	✓
Width	500'	500'	✓
Runway Obstacle Free Zone (ROFZ)			
Length beyond runway end	200'	200'	✓
Width	400'	400'	✓
Precision Obstacle Free Zone			
Length	n/a	n/a	n/a
Width	n/a	n/a	n/a

Note: AC 150/5300-13B: Airport Design adjusts separation of aircraft parking area to allow aircraft parking outside of the TOFA. ROFZ is 120' wide for operations on runways by small aircraft with approach speeds of less than 50 knots. ROFZ is 250' wide for operations on runways by small aircraft with approach speeds of 50 knots or more. ROFZ is 400' wide for operations by large aircraft. Note 1) Minimum separation standards for runway centerlines is dependent on simultaneous Visual Flight Rule operations. Simultaneous landings and takeoffs using VFR, the minimum separation between centerlines of parallel runways is 700 feet.

### 3.8.4 Taxiway Design

This taxiway analysis addresses specific requirements relative to FAA design criteria and the ability of the existing taxiways to accommodate the current and projected demand. At a minimum, taxiways must

provide efficient circulation, be constructed to the proper strength, and meet FAA design standards to safely accommodate the design aircraft. Airport runways need to be supported by a system of taxiways that provide access between the runways and the aircraft parking and hangar areas. Taxiways are classified as:

- » Parallel Taxiway - Facilitate the movement of aircraft to and from the runway.
- » Exit Taxiway – Provide a means of entering and exiting the runway (does not include those taxiways designated as connector, parallel, or apron edge taxiway).
- » Crossover or Traverse Taxiway – Provide increased taxiway flexibility between two parallel taxiways.
- » Apron Taxiway or Connector- Provide primary aircraft access in an aircraft parking apron.

Classifications for HEF taxiways and taxilanes are shown in **Table 3-22**.

**TABLE 3-22**  
**TAXIWAY/TAXILANE CLASSIFICATIONS**

<b>Taxiway Designation</b>	<b>Taxiway Classification</b>
TWY A	Full Parallel Taxiway
TWY A1	Exit Taxiway
TWY A2	Exit Taxiway
TWY A3	Exit Taxiway
TWY A4	Exit Taxiway
TWY A5	Exit Taxiway
TWY B	Full Parallel Taxiway/Exit Taxiway
TWY B1	Exit Taxiway
TWY B2	Exit Taxiway
TWY B3	Exit Taxiway
TWY B4	Exit Taxiway
TWY C	Apron Taxiway
TWY D	Apron Taxiway
TWY E	Apron Taxiway
TWY F	Apron Taxiway
TWY G	Apron Taxiway
TWY V	Crossover Taxiway
TWY K	Crossover Taxiway
TXL Y	Apron Taxiway
TXL Z	Apron Taxiway

Source: AC 150/5300-13B, Airport Design; RS&H Analysis 2022

The goal of an effective taxiway system is to maintain traffic flow using taxi routing with a minimum number of points requiring a change in the airplane’s taxing speed. At HEF, there are a total of 20 taxiways, including taxiway connectors. Taxiway A serves as the parallel taxiway for Runway 16R-34L.

Taxiway A has two exit taxiways from Runway 16R-34L and three connector taxiways, all of which are located on the west side of the runway. Aircraft routing to and from the West Apron will use Taxiway A and associated connectors. Taxiway A is supported by two run up areas located near the thresholds for Runway 16R-34L. The run-up areas allow aircraft operators to perform the necessary high RPM flight checks in a designated area while also allowing aircraft to effectively sequence for departure or maintenance operations.

Taxiway B serves as the parallel taxiway for Runway 16L-34R and has six exit taxiways all of which are located on the east side of the runway. There is a run-up area near the end of Runway 16L and Runway 34R. Taxiways C, D, E, F and G provide access to hangars and parking positions on the East apron. Taxiways Y and Z allow aircraft to taxi through the East apron. Taxiway V serves as a crossover taxiway providing access to the approach end of Runway 16L and 16R. Taxiway K serves as a crossover taxiway providing access to the approach end of Runway 34L and mid-section of 34R. Taxiway K has a run-up area to allow aircraft operators to perform flight checks.

The Airport’s design aircraft determines taxiway design standards and dimensional criteria. Taxiway pavement width is determined by the TDG of the design aircraft. Separation standards are determined by the ADG of the design aircraft. Depending on demand, portions of an airfield may be designed for one specific aircraft type while other portions are designed for other aircraft types. These divisions of airfield design are dependent upon the role each facility plays at the Airport. The intent behind this FAA guidance is to avoid overdesign and/or under-design of airport facilities. At HEF, Runway 16L-34R and Taxiway B are the primary facilities serving a critical aircraft of a Gulfstream V. The FAA recommended design standards for ADG-III/ TDG-2B taxiways are provided in **Table 3-23**.

**TABLE 3-23**  
**TAXIWAY REQUIREMENTS: ADG-III/TDG-2B**

Taxiway Components	Taxiway Width	Taxiway Shoulder Width	Taxiway Safety Area Width	Taxiway Object Free Area Width	Centerline to Parallel Taxiway	Centerline to Parallel Taxilane	Centerline to Fixed or Movable Object	Taxiway Fillet Design
Requirement (ADG III, TDG 2)	35'	15'	118'	171'	144'	138'	85.5'	2
TWY B	✓	✓ <sup>1</sup>	✓	✓	-	✓	✓	✓
TWY C	✓	✓ <sup>1</sup>	✓	✓	✓	-	-	✓
TWY D	✓	✓ <sup>1</sup>	✓	✓	✓	-	-	✓
TWY E	✓	✓ <sup>1</sup>	✓	✓	✓	-	✓	✓
TWY F	✓	✓	✓	✓	✓	-	✓	✓
TWY G	✓	✓	✓	✓	✓	-	✓	✓
TWY K	✓	✓ <sup>1</sup>	✓	✓	✓	-	✓	✓
TWY V	✓	✓ <sup>1</sup>	✓	✓	✓	-	✓	✓

Note: 1) Paved taxiway shoulders are not required taxiway serving ADG-III or smaller aircraft, however, they are recommended by FAA.

Note 2) See section 4.7 in FAA Advisory Circular 150/5300-13B for fillet design dimensions

Source: AC 150/5300-13B, Airport Design; RS&H Analysis, 2022

At HEF, Runway 16R-34L and Taxiway A are the primary facilities serving pistons, turboprops, and the runway's critical aircraft, Citation Sovereign. TDG-2B aircraft regularly operate on Taxiway A to cross the airfield via Taxiways V and K, including a handful of jet aircraft based on the west side of the airfield (i.e., Cessna Citation); therefore, design standards for Taxiway A will reflect ADG-II/TDG-2B. The FAA recommended design standards for ADG-II/ TDG-2B taxiways are provided in **Table 3-24**.

**TABLE 3-24**  
**TAXIWAY REQUIREMENTS: ADG-II/TDG-2B**

Taxiway Components	Taxiway Width	Taxiway Shoulder Width	Taxiway Safety Area Width	Taxiway Object Free Area Width	Centerline to Parallel Taxiway	Centerline to Fixed or Movable Object	Taxiway Fillet Design
Requirement (ADG II, TDG 2B)	35'	15'	79'	124'	102'	55'	1
TWY A	✓	✓	✓	✓	✓	✓	✓ <sup>2</sup>

Note 1) See section 4.7 in FAA Advisory Circular 150/5300-13B for fillet design dimensions

Note 2) The Taxiway Edge Safety Margin (TESM) for the Citation Sovereign goes to the edge of pavement at TWY A intersection between TWY A4 and TWY A5.

Source: AC 150/5300-13B, Airport Design; RS&H Analysis, 2022

The non-movement area pavement was evaluated as ADG-III/TDG-2B taxilanes. Taxiways C, D, E, F and G are considered Taxilanes once inside the non-movement boundary. Taxilane Y extends from Taxilane F to Taxilane G along the southern end of the East apron. Taxilane Z extends across majority of the East apron and intersects Taxilanes C, D, and E. **Table 3-25** shows the requirements for Taxilanes designed to ADG-III/TDG-2B standards.

**TABLE 3-25**  
**TAXILANE REQUIREMENTS: ADG-III/TDG-2B**

Taxilane Components	Taxilane Width	Taxilane Shoulder Width	Taxilane Safety Area Width	Taxilane Object Free Area Width	Centerline to Parallel Taxiway	Centerline to Fixed or Movable Object
Requirement (ADG III, TDG 2B)	35'	15'	118'	158'	138'	79''
TXL C	✓	✓	✓	✓	✓	X
TXL D	✓	✓	✓	✓	✓	✓
TXL E	✓	✓	✓	✓	✓	✓
TXL F	✓	✓	✓	✓	✓	✓
TXL G	✓	✓	✓	✓	✓	✓
TXL Y	✓	✓	✓	✓	✓	✓
TXL Z	✓	✓	✓	✓	✓	✓

Source: AC 150/5300-13B, Airport Design; RS&H Analysis, 2022

The existing taxiways and associated connectors were compared to the design standards set forth in AC 150/5300-13B, Airport Design, to identify deficiencies. Currently, all the taxiways have turf shoulders which meet FAA standards. FAA guidance recommends that taxiway shoulders should be paved for all taxiways that serve ADG-III aircraft. Taxiway B rehabilitation project is currently in design and widening of the pavement was recently removed from the project scope. It is recommended that 15-foot paved shoulders

be considered for Taxiway B during subsequent rehabilitation projects. 15-foot paved shoulders are also recommended for Taxiways C, D, E, K and V, however, they all meet the design standards.

#### **3.8.4.1 Taxiway Deficiencies Summary**

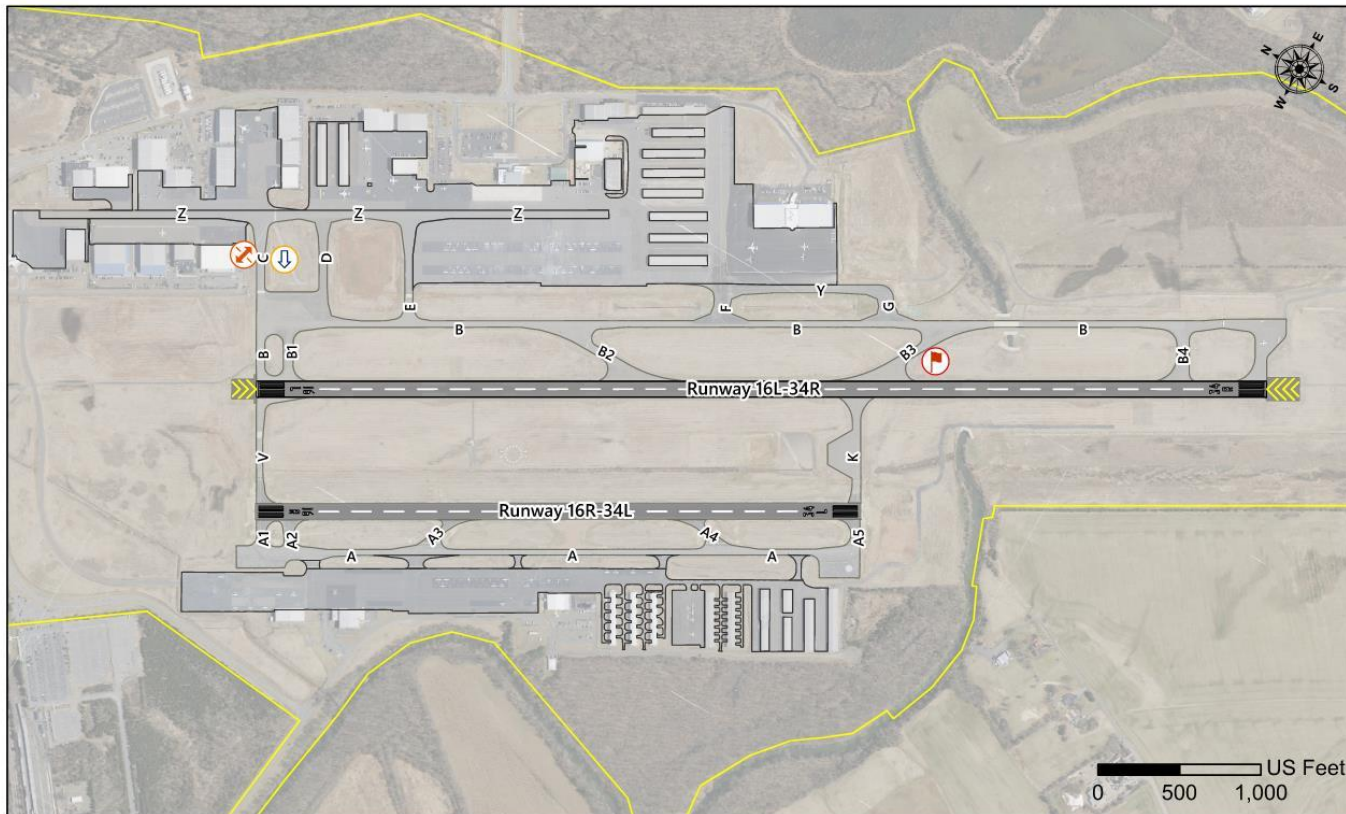
Analysis of the taxiways and taxilanes were conducted to determine if airfield deficiencies existed compared to current FAA design standards. The deficiencies found are described in this section. Some deficiencies are critical to safe operations and should be focused on during the planning period. Other deficiencies are less safety-critical and therefore are better candidates for deferral when they could be addressed in conjunction with major rehabilitation projects as appropriate. It is important to note that deviations from FAA standards stem from updated FAA standards and these differences are known to the FAA. The FAA typically takes the position that these taxiway deficiencies are best corrected as pavement reaches the end of its useful life and reconstruction is necessary.

- » **Taxiway B** lacks paved taxiway shoulders. While they are not required, it is recommended that they be constructed for improved safety. FAA guidance recommends paved shoulders for taxiways, taxilanes, and aprons accommodating ADG-III aircraft. A number of ADG-III aircraft have under-wing engines that overhang the shoulder. The critical aircraft at HEF, Gulfstream V, has engines in the tail section that do not overhang the shoulders therefore paved shoulders may not be as critical for the taxiway.
- » **Taxiway B** exit taxiways have an unusual naming convention. It is recommended that the taxiways be renamed from B1 to B6 during the next Taxiway B rehabilitation project.
- » **Taxiway C** lacks paved taxiway shoulders. While they are not required, it is recommended that they be constructed for improved safety. FAA guidance recommends paved shoulders for taxiways, taxilanes, and aprons accommodating ADG-III aircraft.
- » **Taxiway C** provides direct access from the apron to the runway, which is not recommended per Advisory Circular 150/5300-13B Section 4.3.5.1. Either the apron or runway entrance for Taxiway C is recommended to be offset so pilots must make a series of turns before entering the runway from the apron.
- » **Taxilane C**, Taxilane Object Free Area (TLOFA) separation standards are not met as the perimeter fence protrudes into the TLOFA. This discrepancy can be alleviated by offsetting the taxilane to the south to provide the required TLOFA without impact to the fence or moving the fence.
- » **Taxiway D** lacks paved taxiway shoulders. While they are not required, it is recommended that they be constructed for improved safety. FAA guidance recommends paved shoulders for taxiways, taxilanes, and aprons accommodating ADG-III aircraft.
- » **Taxiway E** lacks paved taxiway shoulders. While they are not required, it is recommended that they be constructed for improved safety. FAA guidance recommends paved shoulders for taxiways, taxilanes, and aprons accommodating ADG-III aircraft.
- » **Taxiway K** lacks paved taxiway shoulders. While they are not required, it is recommended that they be constructed for improved safety. FAA guidance recommends paved shoulders for taxiways, taxilanes, and aprons accommodating ADG-III aircraft.

- » **Taxiway K**, which includes an area with HS-1 in the airport diagram provides aircraft access to a high-speed taxiway, Taxiway B3. An elevated taxiway location sign has been placed in the areas to address concerns; however, this area will be reviewed in the alternative analysis process to ensure reasonable solutions have been worked and reviewed by Airport staff.
- » **Taxiway V** lacks paved taxiway shoulders. While they are not required, it is recommended that they be constructed for improved safety. FAA guidance recommends paved shoulders for taxiways, taxilanes, and aprons accommodating ADG-III aircraft.

In summary, a portion of the items identified are not deficiencies requiring immediate action due to any critical safety risk. Rather, many are the result of FAA design guidance updates occurring after the construction of certain areas of the airfield. The following chapter, **Airport Development Alternatives** will address the design recommendations previously mentioned. These airfield items are presented in **Figure 3-14**.

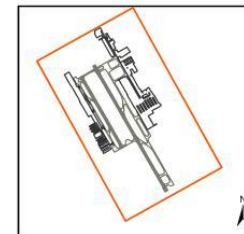
**FIGURE 3-14**  
**TAXIWAY DEFICIENCIES**



**Legend**

- Property Line
-  TLOFA Penetration
-  Line-of-Sight: Complex Runway-Taxiway Intersection
-  Direct Taxiing Access to Runways from Ramp Areas

**Taxiway Deficiencies**



Note: Standards in accordance with FAA AC 150/530-13B J.5.2

### 3.8.5 Runway Incursion Mitigation

In 2015, the FAA initiated a pilot program to improve runway safety at airports. The Runway Incursion Mitigation (RIM) program identified areas of increased risk of runway incursions at specific airfield intersections at an airport. The FAA has evaluated runway incursion data and has compiled a list of locations that have a higher-than-average frequency of runway incursions. Locations where three or more incursions occurred in a given year, or locations where more than 10 incursions occurred over the evaluation period were identified and published on the RIM Inventory List. HEF has no RIM locations at this time.

The FAA has also defined specific locations at airports as hot spots to help alert airport users of the locations of the airfield that may be confusing to pilots and lead to a higher risk of incursions. Hot spots and RIM locations are similar but not the same. Hot spots are identified based on local stakeholders and the user's perception of a location on the airfield whereas RIM locations are determined based on set standards established by the FAA. HEF has one identified hot spot at the intersection of Taxiway K and Taxiway B3.

Through the RIM program, the FAA has established geometry code keys, also referred to as "Geocodes", to catalog specific geometry conditions that may contribute to an increase in runway incursions. There is a total of 19 Geocodes. Each one describes a specific issue related to non-standard geometry. The analysis examined the Geocodes in relation to the HEF airfield. The following Geocodes are associated with each location as well as a description of how these issues increase the risk of runway incursions.

#### **Taxiway A3**

- » **Geocode 13-** Taxiway intersects runway at other than a right angle.

#### **Taxiway A4**

- » **Geocode 13-** Taxiway intersects runway at other than a right angle.

#### **Taxiway B**

- » **Geocode 8-** Direct taxiing access to runways from apron areas. The design increases the risk of a pilot inadvertently taxiing onto the runway by mistake because no decision-making process, in the form of directional input, is required by the pilot before entering the runway.

#### **Taxiway B2**

- » **Geocode 13-** Taxiway intersects runway at other than a right angle.

#### **Taxiway B3**

- » **Geocode 13-** Taxiway intersects runway at other than a right angle.

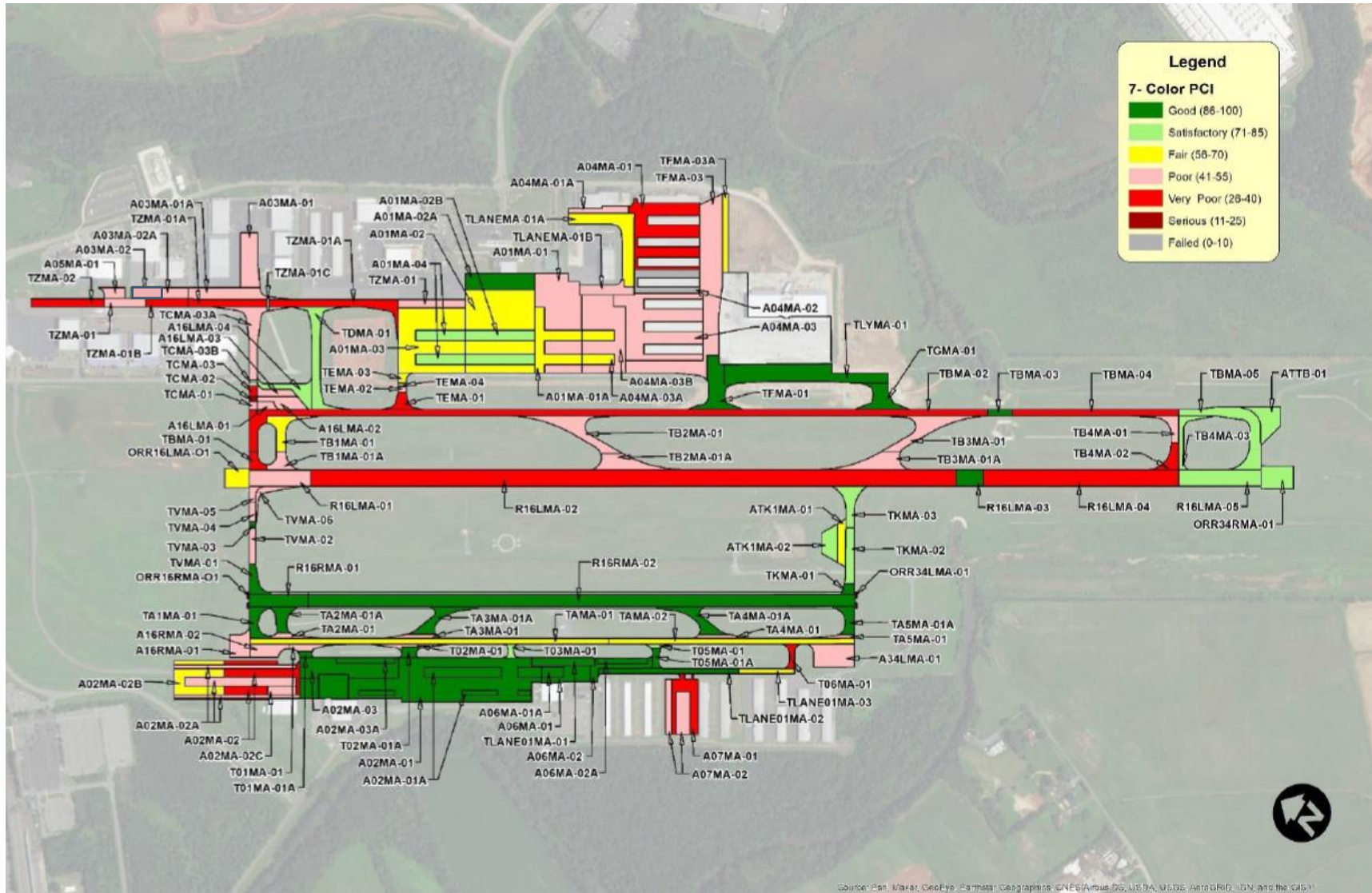
It is unrealistic to expect that all Geocodes at all these locations could be addressed. Associated facilities, such as the runways, taxiways, and apron environment are relatively fixed, and addressing every listed Geocode would entail significant capital investment to the degree it may be impractical. Instead, less costly, and more practical measures, such as education, signage, and marking enhancements may be more viable options to address those concerns. The following chapter will describe potential solutions for addressing the Geocodes at each location.

### 3.8.6 Pavement Condition

The DOAV conducted pavement inspections in October 2020 using the Pavement Condition Index (PCI) method as specified in ASTM D5340-20 and FAA AC 150/5380-6C. The PCI is a numerical rating scale from 0 to 100 that provides a measure of the pavement's functional surface condition. The overall area-weighted network PCI (AW PCI) for the HEF pavement network is 62, representing a "Fair" condition. The network are-weighted pavement age (AW Age) is 12 years. The DOAV report states pavement within the 56-70 range is considered "fair" and that the near-term maintenance and rehabilitation (M&R) needs may range from routine to major. The report also identifies a PCI of 60 on non-runway pavements as the 'trigger' for major M&R work.

Construction of new Taxiway G occurred in 2019 and rehabilitation of 16R-34L occurred in 2020. All five Taxiway A connector pavements, up to the runway holding position marking, were rehabilitated in 2020. Therefore, these surfaces were rated 'Good', meaning pavement has minor or no distresses and should require only routine maintenance. Majority of Runway 16L-34R, Taxiway B, Taxilane Z, hangar pavement on the East apron received a 'Very Poor' rating which means the pavement has predominantly medium- and high-severity distresses that cause considerable maintenance and operational problems. Near-term maintenance and rehabilitation needs will be major and intensive in nature and should be treated as soon as practical. **Figure 3-15** shows the Airport's PCI ratings from October 2020.

**FIGURE 3-15**  
**2020 AIRPORT PAVEMENT CONDITION REPORT**



Source: DOAV Pavement Management Update, 2021

## 3.9 NAVIGATIONAL AIDS, LIGHTING, SIGNAGE, MARKING, AND AIRSPACE

### 3.9.1 NAVAIDS

Navigational aids and lighting, often referred to as NAVAIDS, consist of equipment to help pilots locate the Airport. NAVAIDS can provide information to pilots about the aircraft's horizontal alignment, height above the ground, location of airport facilities, and the aircraft's position on the airfield. HEF features all three types of navigational aids (visual, electronic, and meteorological). The following narrative describes the three types of NAVAIDS as well as any deficiencies that currently exist at HEF.

Ownership and maintenance of some NAVAIDS are not always provided by the FAA. The Airport or Department of Aviation in some cases owns the NAVAIDS. However, at Manassas Regional Airport, the non-federal NAVAIDS are owned by the Airport. Airport staff and FAA personnel confirmed the NAVAIDS at the Airport are not owned and maintained by one entity. The Runway 34R MALSF, PAPIs and REILs are owned and maintained by the Airport. All other NAVAIDS on the Airport are owned and maintained by the FAA.

#### 3.9.1.1 Visual Aids and Electronic Aids

Visual aids at HEF include those specific to each runway and those that serve the entire airport. Electronic aids include devices and equipment used for aircraft instrument approaches.

The airfield lighting at Manassas Regional Airport is extended to both runways. Runway 16L-34R has high-intensity runway edge lights (HIRL). Runway 16L has Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) equipment. Runway 16L MALSR equipment does not meet the 3-inch frangibility requirement found in FAA Advisory Circular 150/5300-13B and Advisory Circular 150/5220-23A. The airport and FAA are aware of this non-standard condition and intend to resolve this issue during RWY 16L-34R rehabilitation. Each end of Runway 16L-34R has threshold lights. Runway 34R has a Medium Intensity Approach Lighting System with Sequenced Flashers (MALSF) and does not have touchdown zone lighting. Runway 16R-34L has Medium-Intensity Runway Edge Lighting (MIRL). Each end of Runway 16R-34L has Runway End Identifier Lighting (REIL).

The Airport's taxiway system meets the FAA standard with a minimum of medium-intensity taxiway lighting (MITL). Analysis of the other HEF navigational aids found the Airport does have an illuminated wind cone and a segmented circle. The traffic pattern indicators on the segmented circle indicate non-standard right turns for Runway 16R and Runway 34R.

The Airport's electronic aids include an airport beacon and Category I instrument landing system (ILS) equipped with a localizer and glideslope for Runway 16L. The Airport also has two four-light PAPI at Runway 16L-34R and two two-light PAPI at Runway 16R-34L. The Airport does not have distance measuring equipment (DME); however, the airport is pursuing this option with the FAA.

Visual and electronic aids, and their ownership status at HEF, are listed in **Table 3-26**. An “X” denotes a facility that the Airport does not have, and is recommended based on FAA Airport Design criteria, while the dashes indicate the NAVAIDs the Airport does not currently have.

**TABLE 3-26**  
**VISUAL AND ELECTRONIC NAVIGATIONAL AIDS**

NAVAID	Primary Runway		Parallel Runway		Ownership
	16L	34R	16R	34L	
<b>Visual Aids</b>					
Approach Lighting	MALSR	MALSF	REIL	REIL	FAA / Airport
Lighting System	HIRL	HIRL	MIRL	MIRL	Airport
Runway Markings	Precision	Non-Precision	Non-Precision	Non-Precision	Airport
Runway Wind Cone	Yes	Yes	Yes	Yes	Airport
Visual Slope Indicator	PAPI (P4L)	PAPI (P4L)	PAPI (P2L)	PAPI (P2L)	Airport
Rotating Beacon	Yes	Yes	Yes	Yes	Airport
Segmented Circle	Yes	Yes	Yes	Yes	Airport
<b>Electronic Aids (Approaches)</b>					
Glideslope	Yes	No	No	No	FAA
LOC	Yes	No	No	No	FAA
RNAV (GPS)	Yes	Yes	Yes	Yes	FAA
DME	-	-	-	-	-

Note: 1) A segmented circle is used by all runways. Abbreviations: PAPI=Precision Approach Path Indicator; P4L=PAPI 4 Light; P2L=PAPI 2 Light; MALSR=Medium Approach Light System with Runway Alignment Indicator Lights; MALSF=Medium Approach Light System with Sequenced Flashers; HIRL=High Intensity Runway Lighting; MIRL=Medium Intensity Runway Lighting  
Source: FAA Chart Supplements, 2022; FAA 5010 Form, 2022; RS&H Analysis, 2022

### 3.9.1.2 Meteorological Aids

Meteorological aids consist of equipment that reports weather conditions to users and tenants at an airport. Manassas Airport has a single meteorological aid, an Automated Weather Observation System (AWOS-3). Analysis of the existing equipment and the needs of the airport indicate that there are no deficiencies, and all meteorological aids are adequate through the planning period.

## 3.9.2 Airspace

This section contains a summary of the airspace surrounding Manassas Regional Airport, the responsibilities of various air traffic control facilities, and limitations imposed on the flight paths of individual aircraft by the geography and surrounding airspace. In addition, it describes the preferred runway uses, aircraft approaches and departures, special air traffic rules, and noise mitigation strategies.

The FAA controls airspace through several layers of air traffic control facilities. The Potomac Consolidated Terminal Radar Approach Control (TRACON) facility handles arriving aircraft during their initial descent towards HEF and departing traffic after they clear the Airport traffic pattern. The Air Traffic Control Tower (ATCT) located on the Airport is responsible for aircraft making their final approach before landing, ground operations, takeoff, and initial climb.

**Figure 3-16** depicts the airspace surrounding the Airport. South of the Airport there are two special use airspaces. These two special use airspaces are a DEMO Military Operating Area (MOA) and a Restricted Area (R-6608). A MOA is airspace where military operations are conducted frequently enough that a special designation is justified to ensure non-military pilots are aware of the potential for military aircraft activity. The MOA has been divided into three areas identified as DEMO 1, DEMO 2, and DEMO 3. Demo Areas 1, 2, and 3 are active six to ten times a year with two-to-four-hour blocks. When the DEMO areas are active, they are active from the surface up to 15,000 feet MSL. IFR arrivals and departures require extra coordination with Potomac TRACON. No practice approaches are authorized at this time due to minimized airspace. When the MOA is active during south flow operations IFR departures are given a heading from Potomac TRACON/Shenandoah East/Northwest bound. IFR arrivals during south flow are provided alternate missed approach instructions, weather permitting HEF ATC would keep the aircraft in the pattern, East of the Airport. When the MOA is active during north flow operations there is no change to IFR departures. Most aircraft enter ATC's airspace from the North or East of the airfield during IFR arrivals in North flow. There is not enough airspace to take aircraft East of the DEMO area coming from the South, therefore, all aircraft are vectored West and then brought in North of the Airport.

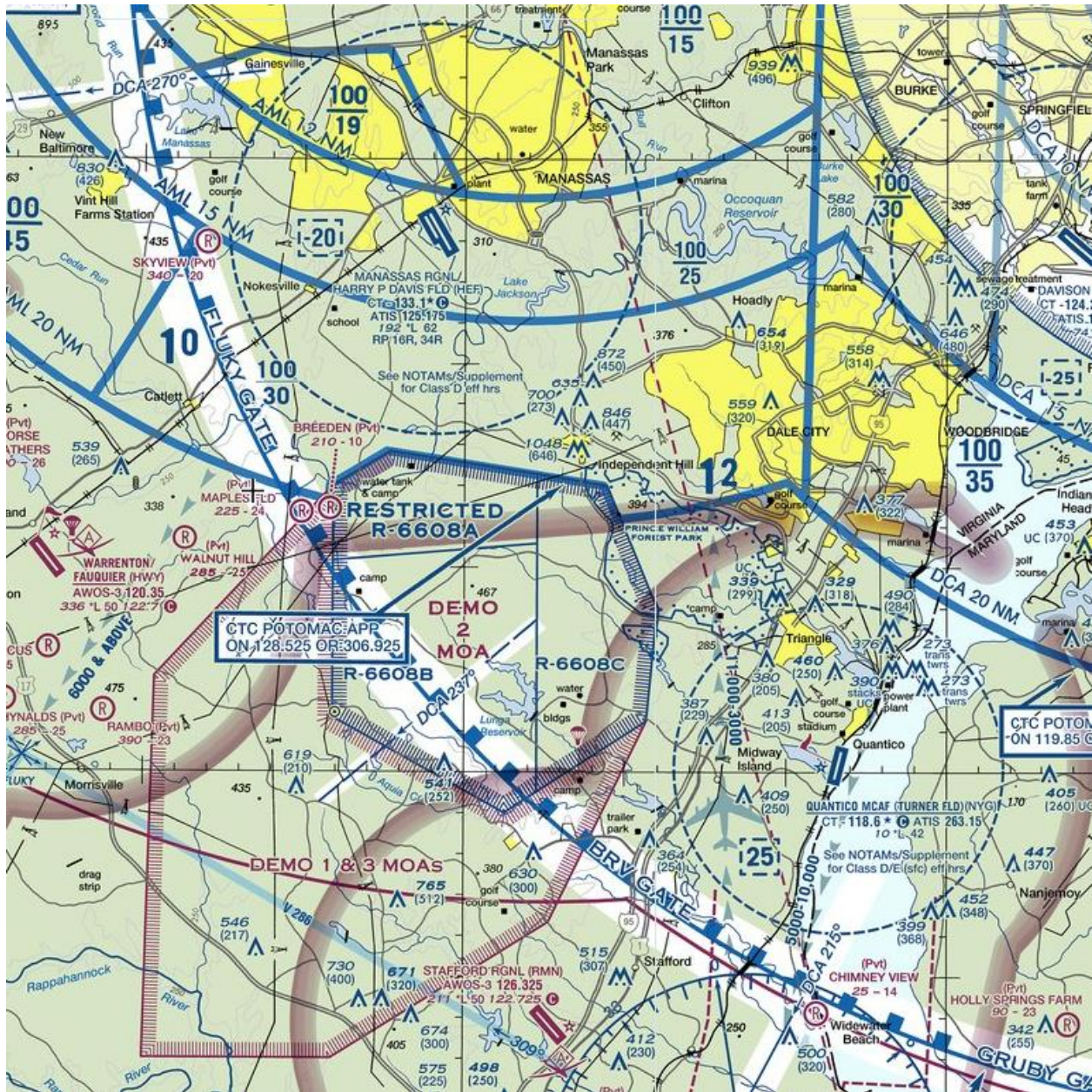
Restricted areas denote the existence of unusual, often invisible, hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Penetration of restricted areas without authorization from a controlling agency may be extremely hazardous to an aircraft and its occupants. R-6608 is divided into three areas identified as R-6608A, R-6608B, and R-6608C. These areas have been established as joint-use restricted airspace over MCB Quantico, extending from the earth's surface to 10,000 feet MSL.

The Airport itself lies within Class D airspace when the ATCT is operational (between the hours of 6:30 A.M. to 10:30 P.M. local time). The Class D airspace extends from the surface up to but not including 2,000 feet above the Airport's elevation. The airspace from 2,000 feet to 10,000 feet above the surface is Class B airspace which Washington Dulles International Airport (IAD) falls within. The Airport is also located within the Washington DC Metropolitan Special Flight Rule Area (SFRA). Special regulations apply to all aircraft operations from the surface to but not including flight level 180 in the Washington DC Metropolitan Area. When the ATCT is closed, pilots and vehicle operators that are approved to operate in the movement area will state their intentions on the common traffic advisory frequency (CTAF). IFR<sup>5</sup> clearance is available when the ATCT tower is closed through the Potomac TRACON. IFR clearance allows pilots to fly in instrument meteorological conditions (IMC) and maneuver their aircraft solely on referencing the instrumentation in the cockpit.

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<sup>5</sup> Instrument Flight Rules

**FIGURE 3-16**  
**AIRSPACE SURROUNDING MANASSAS AIRPORT**



Source: Skyvector.com, 2022

### 3.9.2.1 Instrument and Visual Flight Rules Procedures

Air traffic operations generally fall within one of two categories, those flying under Visual Flight Rules (VFR) and those under Instrument Flight Rules (IFR). Under VFR, aircraft operating in good visibility weather do so using “see and avoid” practices with other aircraft.

Aircraft flying under IFR are required to comply with routes and altitudes given by Air Traffic Controllers during all phases of flight. The controllers are then responsible for ensuring adequate separation between

aircraft, which may be flying in clouds, snow, or other conditions of poor visibility. Aircraft fly through the airport environment and to the runway using predetermined routes called Standardized Instrument Approach Procedures. The pilot’s ability to land during inclement weather is determined by a number of factors, including approach lighting, navigational aids, aircraft equipment, and pilot qualifications. **Table 3-27** shows the Instrument Approaches available at HEF.

**TABLE 3-27**  
**INSTRUMENT APPROACHES**

<b>Instrument Approaches</b>	<b>Minimum Visibility</b>	<b>Decision Altitude (AGL)(feet)</b>
<b>Runway 16L-34R</b>		
<b>Runway 16L</b>		
ILS or LOC	1/2 SM	200'
RNAV (GPS)	1/2 SM	250'
<b>Runway 34R</b>		
RNAV (GPS)	1 SM	442'
<b>Runway 16R-34L</b>		
<b>Runway 16R</b>		
RNAV (GPS)	1 SM	308'
<b>Runway 34L</b>		
RNAV (GPS)	1 SM	458'

Source: FAA Facility Directory, FAA.gov, 2022

Notes: All approaches listed are best approach available.

Definitions: AGL – Above Ground Level, DME – Distance Measuring Equipment, GPS – Global Positioning System, ILS – Instrument Landing System, LOC – Localizer, RNAV – Area Navigation, NM – Nautical Mile

### 3.9.3 Part 77 Objects Affecting Navigable Airspace

The airspace surrounding the Airport should be kept clear of obstructions to the furthest extent possible. Title 14 Code of Federal Regulations (CFR) Part 77, Objects Affecting Navigable Airspace keeps essential airspace free and clear of obstructions that could be hazardous to aircraft on an approach to an airport. For an object to be deemed an obstruction, it must penetrate at least one of the five sections of airspace defined by Part 77 as “imaginary surfaces.” The five sections of Part 77 airspace are broken out into the following surfaces: Primary Surface, Approach Surface, Transitional Surface, Horizontal Surface, and Conical Surface. A description of each surface along with their dimensions are listed below:

- » **Primary Surface** – This surface is centered on the runway, extending 200 feet beyond the edge of the runway. The width of the surface is dependent upon the type of approach to the runway. Since Runway 16L has an instrument landing approach, the primary surface width of Runway 16L-34R is 1,000 feet. The width of the primary surface for Runway 16R-34L is 500 feet.
- » **Approach Surface** – This surface is a sloped plane that begins at the edge of the Primary Surface and extends horizontal in the shape of a trapezoid. The slope horizontal length, and the width of

the surface are dependent upon the approach to the runway. Runway 16L is a precision instrument runway with an approach surface length of 50,000 feet and a width at the end of the surface of 16,000 feet. The first 10,000 feet of the approach surface has a slope of 50:1, while the remaining 40,000 feet has a slope of 40:1. The non-precision instrument approach on Runway 34R has a 34:1 slope and extends for a horizontal distance of 10,000 feet with an outer width of 3,500 feet. The approach surfaces for Runway 16R and 34L at Manassas Regional Airport are non-precision with 34:1 approach slopes. The inner width of the non-precision approach surfaces for Runways 16R and 34L have inner widths of 500 feet and extend for a horizontal distance of 10,000 feet and have outer widths of 3,500 feet.

- » **Transitional Surface** – This surface is a plane sloped at 7:1 from the primary surface and approach surfaces. The surface terminates when it intersects with the horizontal surface.
- » **Horizontal Surface** – This surface is a horizontal plane 150 feet above the airport elevation. The geometry of the surface is created by arcs centered on the edge of the primary surface with defined radii and then connected by tangents. The radius of the horizontal surface, based on the approaches at Manassas Airport, is 10,000 feet.
- » **Conical Surface** – This surface is a plane sloped at 20:1 extending upward from the periphery of the horizontal surface to 4,000 feet.

### 3.9.3.1 Departure Procedures and Airspace Obstructions

Departure procedures (DP) are preplanned IFR procedures that provide obstacle protection for aircraft departing from the airport. As of June 17, 2022, Manassas Airport has three approved DPs<sup>6</sup> as follows:

- » ARSENAL FIVE
- » GABBE THREE
- » HIICH TWO

FAA published airspace obstructions for Runway 16L-34R and Runway 16R-34L are detailed in **Table 3-28**.

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<sup>6</sup> These procedures are always subject to change, especially with consideration of airspace restructuring in the Washington Metroplex.

**TABLE 3-28**  
**AIRSPACE OBSTRUCTIONS**

<b>Runway</b>	<b>Obstruction</b>	<b>Height Above Ground Level (Feet)</b>	<b>Location</b>
16L	Trees	99'	1,247 ft. from end, 178 ft. left of centerline
	Trees	73'	1,810 ft. from end, 88 ft right of centerline
	Trees	84'	2,618 ft. from end, 4 ft left of centerline
	Trees	75'	3,414 ft from end, 14 ft right of centerline
	Trees	100'	3,703 ft from end, 145 ft left of centerline
	Trees	82'	4,193 ft from end, 1,343 ft left of centerline
	Trees	89'	4,677 ft from end, 313 ft right of centerline
34R	Poles	24'	518 ft from end, 595 ft right of centerline
	Trees	39'	1,759 ft from end, 448 ft left of centerline
	Trees	39'	1,859 ft from end, 828 ft right of centerline
	Trees	54'	2,548 ft from end, 828 ft left of centerline
	Trees	57'	2,653 ft from end, 1,082 ft right of centerline
16R	Trees	32'	119 ft from end, 437 ft from right of centerline
	Trees	29'	749 ft from end
	Trees	33'	745 ft from end, 85 ft right of centerline
	Trees	37'	588 ft from end, 536 ft right of centerline
	Trees	39'	1,573 ft from end, 249 ft left of centerline
34L	Poles	54'	877 ft from end, 616 ft left of centerline
	Trees	39'	1,573 ft from end, 249 ft left of centerline
	Trees	39'	1,752 ft from end, 187 ft right of centerline
	Tower/Trees	64'	2,563 ft from end, 182 ft left of centerline

Runway	Obstruction	Height Above Ground Level (Feet)	Location
	Trees	56'	2,563 ft from end, 250 ft right of centerline

Source: FAA Published Departure Procedure, RS&H 2022

### 3.10 PASSENGER TERMINAL

Passenger terminals are the interface between the public space and commercial aircraft. The passenger terminal connects landside facilities (e.g., public-access airport roads) and the airport sterile airside (e.g., aircraft apron and airfield). Understanding how this space and interface operate is key to evaluating the effectiveness of the existing terminal facility. The terminal provides space for ground transportation functions, ticketing and check-in, passenger and baggage screening, baggage claim, and passenger gate hold rooms. This section describes the existing conditions and facility requirements for the passenger terminal facility.

The terminal building programmatic requirements are estimated based upon airport terminal planning best practices and recommended methodologies, which are derived from various industry resources. Two reputable industry resources, the International Air Transportation Association (IATA) and the Airport Cooperative Research Program (ACRP), have developed rating systems that discuss methodologies and recommendations for determining level of service (LOS) for passenger terminals. The methodologies and best practices used for this analysis can be found within the following resources:

- » *Airport Passenger Terminal Planning and Design* – ACRP Report 25, Volumes 1 and 2, 2010
- » *Guidebook on General Aviation Facility Planning* – ACRP Report 113, 2014
- » *Resource Manual for Airport In-Terminal Concessions*, ACRP Report 54, 2011
- » *IATA Airport Development Reference Manual*, 12<sup>th</sup> Edition, 2022
- » FAA, AC 150/5360-13A, *Planning and Design Guidelines for Airport Terminal Facilities*, 2018

General aviation administrative/terminal facilities are required to meet the needs of pilots, passengers and visitors using the airport. However, no official FAA guidance exists on recommended or required sized of general aviation terminal buildings. ACRP Report 113: Guidebook on General Aviation Planning provides practical guidance to help determine the size of a GA terminal building. For planning a factor of 2.5 people (pilots and passengers) per peak-hour operation can be assumed. An area of 100 to 150 square feet of space per person is considered adequate to accommodate the peak hour traffic. Using these figures, the following formula can be used to provide the size for a GA terminal building for an ALP.

$$(\text{Peak-hour operations}) \times (2.5) \times (100 \text{ sf to } 150 \text{ sf}) = \text{Building square footage}$$

Analysis found the peak-hour operations at Planning Activity Level 3, 130,000 Annual Operations, is approximately 10 operations. After applying the prior formula, the Airport will need a 3,750 square foot

terminal building by PAL 3. The analysis found that the existing terminal building size is sufficient for operations during the forecast horizon.

### 3.10.1 Facilities

The HEF passenger terminal building is approximately 17,650 square-feet. The two-level facility was constructed in 1995 with functional areas which include a lobby, tenant offices, administrative offices, a flight school, pilot’s lounge, conference rooms, and restrooms. The terminal is primarily used for charter operations and international clearance. Majority of traffic out of the Airport are GA operations. The functional area size allocations and descriptions of the terminal building are outlined in **Table 3-29**.

**Figure 3-17** and **Figure 3-18** depict the lower and upper floor plan of the existing passenger terminal.

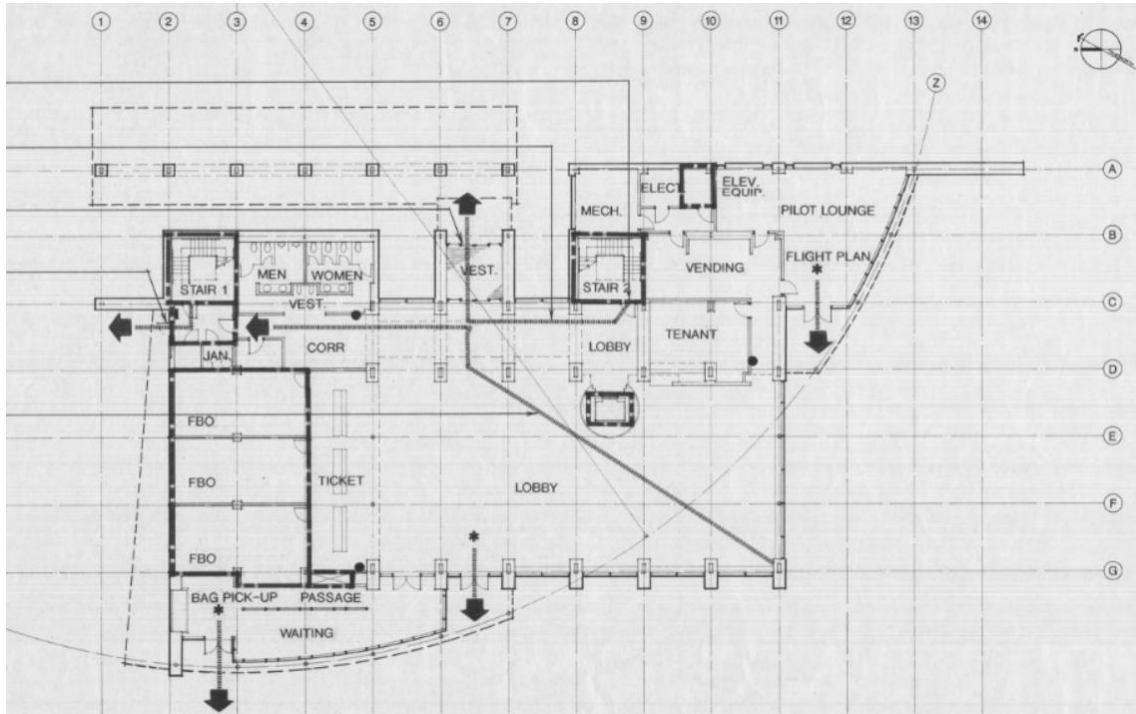
**TABLE 3-29**  
**TERMINAL BUILDING FUNCTIONAL AREAS**

Terminal Building Functional Areas	Existing Square Feet
Gross Floor Area	17,650
<b>Tenant Area</b>	
Tenant Offices	2,660
<b>Concession</b>	
Vending	1,040
<b>Public</b>	
Lobby	4,390
Vestibules	490
Conference Room	1,060
Restrooms	780
Waiting Area	960
Public Circulation	3,610
<b>Administration, Storage and Miscellaneous</b>	
Conference Rooms	730
Office(s)	950
Employee Lounge/Break Area	140
Storage	330
<b>Building Systems</b>	
Mechanical, Electrical, and Telecom Space	510
<b>Total</b>	<b>17,650</b>

Note: Numbers are rounded.

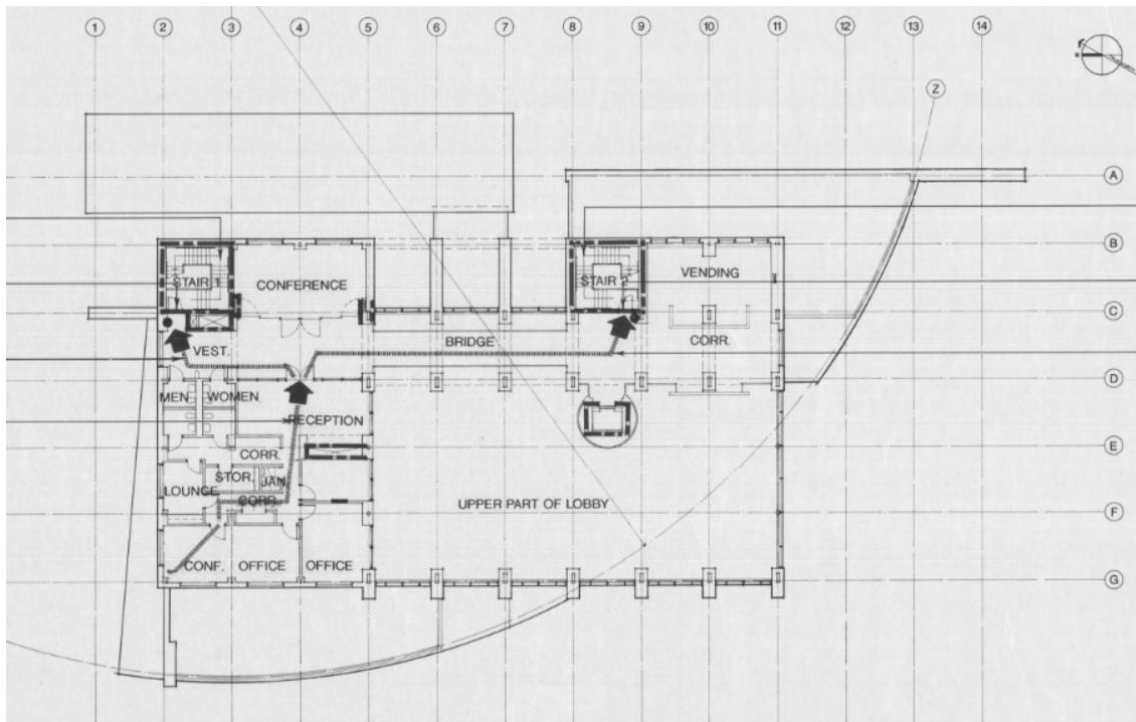
Source: RS&H Analysis, 2022

**FIGURE 3-17**  
**PASSENGER TERMINAL LOWER-LEVEL FLOOR PLAN**



Source: City of Manassas Record Drawings, 2022

**FIGURE 3-18**  
**PASSENGER TERMINAL UPPER-LEVEL FLOOR PLAN**



Source: City of Manassas Record Drawings, 2022

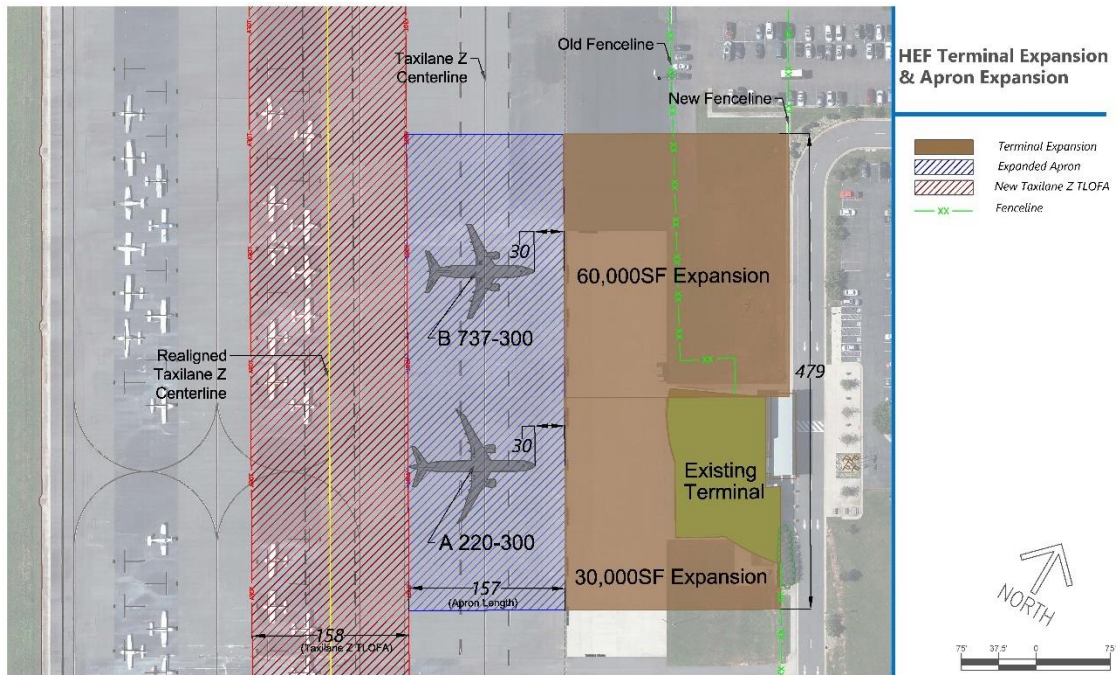
For future planning considerations, if the airport should desire to serve air carrier operations specified in Part 139 the terminal will require facility modifications in various areas to allow for passenger processing and baggage screening. In order to develop sound functional requirements for a terminal facility it is critical to obtain forecasts of passenger enplanements and aircraft activity. With this critical information outstanding, terminal modifications were derived from site observations and guidance established for airports serving scheduled air carrier operations. For passenger and baggage processing the primary elements which would require alteration or introduction in HEF's terminal include ticketing/check-in area, passenger screening, hold room, baggage screening system, baggage claim, airline offices and operations areas, and upgrade of building systems (e.g. mechanical, electrical, plumbing).

Introduction of air carrier traffic to HEF could also require terminal modifications towards the airside. Aircraft staging and method of passenger boarding will influence the terminal modifications. One method of passenger boarding with minimal terminal modifications is hardstand<sup>7</sup> boarding. Hardstand operations are typically done at airports that have gate capacity constraints or don't have the capability to accommodate a jet bridge on the terminal facility. While hardstand operations may limit terminal modifications there are several operational impacts which would need to be addressed. These impacts include but are not limited to security measures to provide a sterile corridor for passengers enroute to boarding, impact to tie-downs in front of the terminal, number of hardstands to allow for simultaneous boarding, and operational procedures during irregular operations (IROPS). Use of jet bridges is the boarding method most commonly experienced when boarding a passenger air carrier. This boarding method would require considerable modification to the terminal facility including procurement installation of a jet bridge, installation of access-controlled jet bridge doors, and additional infrastructure to operate the jet bridge. **Figure 3-19** depicts the spatial impacts to the terminal and surrounding areas with the introduction of air carrier operations

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<sup>7</sup> Hardstand operations: Areas on the airfield designated by the airport for air carrier parking and passenger loading/unloading.

**FIGURE 3-19**  
**TERMINAL EXPANSION CONCEPT**



Source: RS&H Analysis, 2022

### 3.11 GENERAL AVIATION AIRCRAFT PARKING AND STORAGE

This section outlines the requirements during the planning period for the general aviation (GA) facilities used for aircraft parking and storage. The GA facilities evaluated in this section include aircraft hangars, aircraft tie-downs, and apron. The analysis divides aircraft storage needs between transient and based aircraft.

#### 3.11.1 Transient Aircraft Parking

The apron areas are intended to accommodate based and transient aircraft parking. Transient aircraft typically require a greater area for shorter amounts of time (usually less than 24 hours). Based aircraft require a smaller area for longer amounts of time. Since parking configurations and spatial requirements for transient and based aircraft can vary, they have been analyzed separately.

Transient aircraft are those aircraft not based at HEF. The transient aprons, primarily used for transient aircraft, are located behind the terminal building, the two FBOs, and three locations on the West Apron if needed. The total area for transient apron space is approximately 340,000 square feet. For transient aircraft, consideration must be made for the aircraft parking area, taxiways leading into and out of the

parking positions, and circulation areas. In addition to the required parking area for the aircraft, taxilane object free area and aircraft clearances on all sides of the aircraft are included in the area requirements.

**Table 3-30** summarizes the weighted average parking apron requirements per itinerant aircraft by type. The analysis results in a weighted average of 13,000 square feet per fixed wing itinerant aircraft.

**TABLE 3-30**  
**ITINERANT AIRCRAFT PARKING APRON REQUIREMENTS PER AIRCRAFT**

Airplane Design Group	Average Length (ft)	Average Wingspan	Additional Clearances (ft)	TOFA Clearance (ft)	Average Parking Area Required (sf)	Fleet Mix	Weighted Average Parking (sf)
I	30	49	10	89	7,611	60%	4,567
II	60	79	10	110	16,020	30%	4,806
III	102	95	25	158	34,200	10%	3,420
					Weighted Average		12,793
					Weighted Average (rounded)		<b>13,000</b>

Source: ACRP Report 113, Guidebook on General Aviation Facility Planning (2014); RS&H Analysis, 2022

The annual itinerant operations ratio is forecasted to remain at the current ratio of 53% of total operations throughout the planning period. To calculate demand for itinerant fixed wing aircraft, the following assumptions were applied to the annual operations forecast developed in Chapter 1.

- » Itinerant Operations – 53% of total
- » Peak Month Itinerant Operations – 2021 Air Traffic Activity System (ATADS) Data referenced. Growth rate of annual itinerant operations applied for peak month itinerant operations
- » Peak Month Average Day (PMAD) Itinerant Operations – peak month itinerant operations divided by 31
- » PMAD Itinerant Aircraft – PMAD itinerant operations divided by 2 (1 aircraft performing one take-off and one landing)
- » Itinerant Aircraft Parking Stalls – Assumes 50% of itinerant aircraft on the ground at a given time and multiplied by 50% (itinerant percentage for apron storage)

**Table 3-31** summarized the itinerant aircraft parking demand based on the assumptions outlined above.

**TABLE 3-31**  
**ITINERANT AIRCRAFT PARKING APRON DEMAND**

Planning Level	Annual Operations	Annual Itinerant Operations	Peak Month Itinerant Operations	PMAD Itinerant Operations	Average Day Itinerant Aircraft	Itinerant Aircraft Parking Stalls
2021	99,649	52,712	5,271	170	85	21
PAL 1	106,144	56,356	5,636	182	91	23
PAL 2	113,514	60,701	6,070	196	98	24
PAL 3	130,088	70,662	7,066	228	114	28

Source: ACRP Report 113, Guidebook on General Aviation Facility Planning (2014); RS&H Analysis, 2022  
Note: Planning Activity Level (PAL)

The spatial requirements of the transient apron are based on ADG I, II, and III aircraft given the operations from the FAA Traffic Flow Management Systems count and site observations from airport staff. This does not prevent any larger aircraft from using the apron, rather it outlines the required space for multiple aircraft up to ADG-III parking simultaneously. Analysis shows transient apron parking is sufficient today; however, during the planning period there will be a deficiency of 30,400 square feet. The following chapter will explore alternatives and evaluate the transient apron requirement for PAL 3.

**Table 3-32** shows the transient apron requirements.

**TABLE 3-32**  
**TRANSIENT APRON REQUIREMENTS**

Transient Apron	Existing	PAL 1	PAL 2	PAL 3
<b>Transient Apron Requirement</b>	340,000	295,400	318,200	370,400
<b>Surplus / (Deficit)</b>		44,600	21,800	(30,400)

Source: ACRP Report 113, Guidebook on General Aviation Facility Planning (2014); RS&H Analysis, 2022

### 3.11.2 Based Aircraft Storage

The quantity and type of aircraft storage space is driven by many different factors including total number of based aircraft, fleet mix, local weather conditions, airport security, user preference, and other various market forces. This section outlines requirements for tie-downs, T-hangars, conventional box hangars, and corporate hangars. These storage types are general terms used to describe different aircraft storage sizes with different uses. The following outlines broad definitions for how each hangar space is programmed within the context of this Master Plan:

- » Tie-Downs – Uncovered defined locations on the apron with anchors to secure aircraft while parked at the Airport. These spaces are leased to based aircraft; primarily single-engine or light twin aircraft classified under ADG-I. If available some tie-down positions are used for itinerant operations. Airport staff conveyed based aircraft tie-down sizing on the airfield are airport specific

and sized for a Cessna 172 at 1,050 square feet. Planning period analysis will take this tie-down sizing into consideration.

- » T-hangars – This type of hangar is an individual storage unit for a small aircraft, usually a single-engine or light twin aircraft classified under ADG-I. The “T” designation corresponds to the overall shape of the unit as they are often arranged so single engine aircraft are “nested: to each other in alternating directions. The individual hangars are generally grouped into linear buildings containing multiple units in a row. Each T-hangar unit has an assumed size of 1,400 square feet with a door opening width of 42 feet. For a 10-unit nested T-hangar facility (14,000 square feet), approximately 65,000 square feet of airside land is required for development.
- » Conventional Hangar – Hangars larger than a T-hangar and potentially housing multiple smaller aircraft. A conventional hangar itself can range from 5,000 – 30,000 square feet. Additional space is required for apron frontage needs, landside/parking, buffers and safety area offsets, and other various site development elements. For this analysis the average size of a conventional hangar is approximately 5,000 square feet.
- » Corporate Hangar – Large hangars, containing one or more aircraft, with associated office space for flight crews, corporate passenger staging, and some maintenance. Corporate hangars alone typically range from 30,000 – 60,000 square feet, or more. In addition, incorporated office elements, landside area, and other site development aspects can vary greatly depending on owner preference. The average size of corporate hangars at the Airport is approximately 30,000 square feet.

The aviation activity forecast shows steady growth in based aircraft facilitating the need for additional storage. Of the five aircraft types, an increase in the number of based single engine, multi-engine, jet-engine and helicopters are forecasted. At PAL 3, an additional 26 aircraft above existing 2021 levels are projected to require storage accommodations, as shown in **Table 3-33**.

**TABLE 3-33**  
**BASED AIRCRAFT STORAGE**

<b>Based Aircraft</b>	<b>2021</b>	<b>PAL 1</b>	<b>PAL 2</b>	<b>PAL 3</b>
Single Engine	312	314	319	324
Multi Engine	51	51	52	55
Jet Engine	27	30	32	35
Helicopter	18	18	18	20
Other	2	2	2	2
<b>Total</b>	<b>410</b>	<b>415</b>	<b>423</b>	<b>436</b>

Source: RS&H Aviation Forecast, 2022

Using historical distributions of based aircraft at HEF and industry trends, the projected square footage for each aircraft storage type was determined at each PAL. It is assumed all based aircraft will be stored on a tie-down, T-hangar, conventional hangar, or corporate hangar. In 2022 tie-downs accommodated 141 of the Airport’s based aircraft (34%), T-hangars stored 210 of the Airport’s based aircraft (51%), 23 based aircraft were stored in conventional hangars (6%), and 36 based aircraft were stored in corporate hangars (9%).

**Table 3-34** assumes the same distribution for aircraft storage throughout the planning period. The analysis indicates that if the Airport retains the same distribution of aircraft between storage areas the Airport will need additional T-hangars and conventional hangars by PAL 1. By PAL 3, the Airport will need two additional T-hangar bays and three additional conventional hangars.

**TABLE 3-34**  
**BASED AIRCRAFT STORAGE AND PARKING REQUIREMENTS**

Storage Facility	Existing	PAL 1	PAL 2	PAL 3
<b>Tie-Downs (Spaces)</b>				
Spaces	193	141	144	148
Square Footage	202,700	157,500	151,200	155,400
Surplus / <b>(Deficit)</b>		45,200	51,500	47,300
<b>T-Hangar (Bays)</b>				
Hangar Structures	16	17	17	18
Hangar Bays	210	212	216	223
Square Footage	294,000	296,800	302,400	312,200
Surplus / <b>(Deficit)</b>		<b>(2,800)</b>	<b>(8,400)</b>	<b>(18,200)</b>
<b>Conventional Hangars</b>				
Hangars	23	25	25	26
Square Footage	115,000	125,000	125,000	130,000
Surplus / <b>(Deficit)</b>		<b>(10,000)</b>	<b>(10,000)</b>	<b>(15,000)</b>
<b>Corporate Hangars</b>				
Hangars	24	24	24	24
Square Footage	720,000	720,000	720,000	720,000
Surplus / <b>(Deficit)</b>		0	0	0

Note: Square footage has been rounded to the nearest hundred. Based aircraft tie-downs assumed to be 1,050 square feet. T-hangars are assumed to be 1,400 square feet. Conventional hangars assumed to be 5,000 square feet. Corporate hangars are assumed to be 30,000 square feet.

Source: RS&H Analysis, 2022

An additional analysis for based aircraft storage was completed as a result of the Airport's extensive hangar waitlist which is 120 people long and growing. Airport staff revealed although the waitlist is 120 people long, historically about a third of those on the waitlist will rent a hangar when one becomes available. Approximately 44 out of 120 on the wait list are currently on an airport tie-down. **Table 3-35** assumes the Airport has intentions to accommodate all 44 of 120 (36.67%) on the hangar waitlist currently on tie-downs during the planning period. This closely aligns with the historical statistic of a third (33%) of those on the waitlist who would rent a hangar once available. This shift in storage redistributes based aircraft storage to tie-downs accommodating 24% of the Airport's based aircraft, T-hangars storing 61% of the Airport's based aircraft, 6% of based aircraft stored in conventional hangars, and 9% of based aircraft stored in corporate hangars. With this analysis the Airport will need 56 additional T-hangar bays by PAL 3. The Airport would also need three additional conventional hangars given this storage breakdown.

TABLE 3-35  
BASED AIRCRAFT STORAGE AND PARKING REQUIREMENTS (STORAGE REDISTRIBUTION)

Storage Facility	Existing	PAL 1	PAL 2	PAL 3
<b>Tie-Downs (Spaces)</b>				
Spaces	193	104	106	109
Square Footage	300,000	157,500	111,300	114,500
Surplus / <b>(Deficit)</b>		142,500	188,700	185,500
<b>T-Hangar (Bays)</b>				
Hangar Structures	18	23	24	24
Hangar Bays	210	254	258	266
Square Footage	289,200	355,600	361,200	372,400
Surplus / <b>(Deficit)</b>		<b>(66,400)</b>	<b>(72,000)</b>	<b>(83,200)</b>
<b>Conventional Hangars</b>				
Hangars	23	24	25	26
Square Footage	115,000	120,000	125,000	130,000
Surplus / <b>(Deficit)</b>		<b>(5,000)</b>	<b>(10,000)</b>	<b>(15,000)</b>
<b>Corporate Hangars</b>				
Hangars	24	24	24	24
Square Footage	720,000	720,000	720,000	720,000
Surplus / <b>(Deficit)</b>		0	0	0

Note: Square footage has been rounded to the nearest hundred. Based aircraft tie-downs assumed to be 1,050 square feet. T-hangars are assumed to be 1,400 square feet. Conventional hangars assumed to be 5,000 square feet. Corporate hangars are assumed to be 30,000 square feet.

Source: RS&H Analysis, 2022

With consideration to aging facilities and the development trends occurring at HEF, it is reasonable to plan for space accommodations for additional T-hangars and conventional hangars on the west side as a result of the deficit within the planning period and the Airport's intent to shift more GA operations to the west side of the Airport. Although there is no facility requirement for additional corporate hangars, there are areas around the Airport which are prime for development of corporate facilities which can thus accommodate future based aircraft. Whether through land redevelopment or development of greenfield sites<sup>8</sup> the Airport will be able to support a number of facility configurations to support the based aircraft demand. Based aircraft storage during the planning period will be assessed in the Alternatives chapter of this Master Plan.

### 3.12 AVIATION SUPPORT FACILITIES

This section describes the location and condition of various support facilities important to the overall operation of the Airport. These facilities include hangars, FAA facilities, aircraft rescue and firefighting (ARFF), fixed based operators (FBOs), air charter, fuel facilities, deicing operations, and airport owned facilities.

<sup>8</sup> A greenfield site is land that has not been previously developed.

### 3.12.1 Fixed Based Operator and Aircraft Maintenance

Fixed Based Operators (FBOs) provide a range of aeronautical services that can include fueling, hangar facilities aircraft rental, aircraft maintenance, flight instruction and terminal facilities. FBO's are either full-service or limited-service in nature.

There are two full-service FBOs at the Airport. APP Jet Center is a full-service FBO which has 115,000 square feet of hangar space and offers on-site maintenance, planeside U.S. Customs and Immigration assistance, ground handling, de-icing, lavatory services, and 100LL/Jet-A fuel. The FBO is staffed 24 hours a day. APP Jet Center's operations expand into six facilities located in the center of the East apron. Landside access to APP Jet Center is gained via Wakeman Drive.

Chantilly Air Jet Center is the second of two full-service FBOs at the airport. It's the newest facility at the Airport with construction of the corporate hangar completed in 2021. The facility is comprised of 60,000 square feet of climate cooled hangar space, 11,000 square feet of private FBO, 15,000 square feet of rentable office space, tenant storage and workspace. The FBO offers on-site maintenance, conference rooms, de-icing, planeside U.S. Customs and Immigration assistance, 100LL/Jet-A fuel, ground handling, and on-site rental cars. The FBO is also home to ATP Flight School. Chantilly Air Jet Center is located on the East Apron and south of the city hangars. Landside access to Duncan Aviation and Chantilly Air Jet Center is gained from Skyview Terrace via Wakeman Drive.

For future planning purposes, consideration should be given to allocate land for future aviation services developments such as a third full service FBO or a large corporate hangar that can be used by transient aircraft. This consideration aligns with the airport's Strategic Plan and direction provided by airport management during Master Plan discussions.

### 3.12.2 General Aviation Hangars and Apron

The Airport has a variety of general aviation hangars on the east and west side of the airfield. There is a group of eight city owned T-Hangars on the south end of the East Apron. These T-hangars provide a total of 97 spaces for small aircraft storage. Additionally, there are nine individual box hangars owned by corporations located on the East Apron. The Airport has ten T-hangars on the West Apron which provide a total of 59 spaces for small aircraft storage. There is one additional box hanger on the West Apron. The conditions of the hangars range from newly built to poor condition. Since the 2002 Master Plan, three box hangars, two executive style hangars and one nested T-hanger has been constructed.

There are two locations that comprise the apron and tie-down spaces at the Airport. The first location is the East Apron which is the larger of the two aprons and typically houses the larger aircraft based at the Airport. The West Apron is the second of the two aprons and typically serves the smaller aircraft based at the Airport. When interviewed as part of the facility inventory and forecast process, some tenants demonstrated interest in additional hangar space as demand increases in the future.

The PCI conditions of the two apron locations range from good to poor as depicted in **Section 3.8.6**. The East apron's pavement condition is generally in fair to poor condition. Majority of the West apron is in

good condition except for the northern most section which pavement condition ranges from fair, poor, and very poor.

### 3.12.3 FAA Facilities

The FAA operates and maintains the Manassas Air Traffic Control Tower. The facility opened in 1992 after being disassembled at an airport near Denver, CO and being reassembled at the HEF. When the tower is in operation, air traffic controllers provide clearance and direction to aircraft and vehicles operating on the airfield. The tower is in operation between the hours of 6:30 A.M. to 10:30 P.M. local time. Personnel interviews noted the tower facility is aged and the staff continuously deal with heating/cooling inconsistencies during business hours. The facility needs rehabilitation/replacement. The following chapter will explore and incorporate the preferred site of the air traffic control tower.

### 3.12.4 Aircraft Rescue and Fire Fighting (ARFF)

The Airport does not currently have an on-site ARFF facility as it's not required due to the Airport not being a certified 14 CFR Part 139 airport. Although the Airport does not adhere to Part 139 ARFF standards, the Airport strives to follow Part 139 standards in other areas such as daily airfield inspections, emergency planning, wildlife management and security programs. The City of Manassas Fire and Rescue Department currently relies on structural firefighting truck, 2000 E-One, as the primary response vehicle to the Airport. The firefighting apparatus is currently stored in Hangar C-3 on the East apron.

Until mandated to meet requirements referenced in Part 139.315, 139.317, and 139.319, the City of Manassas Fire Department has taken steps to provide aircraft rescue and firefighting resources through an intergovernmental agreement with the Northern Virginia Emergency Response Agreement. This agreement provides additional structural firefighting equipment and responders to the Airport. The Prince William County Fire Department and other mutual aid Fire/Rescue agencies stand ready to supplement the Department. An ARFF apparatus from Dulles International is also available to provide support once requested by an Incident Commander.

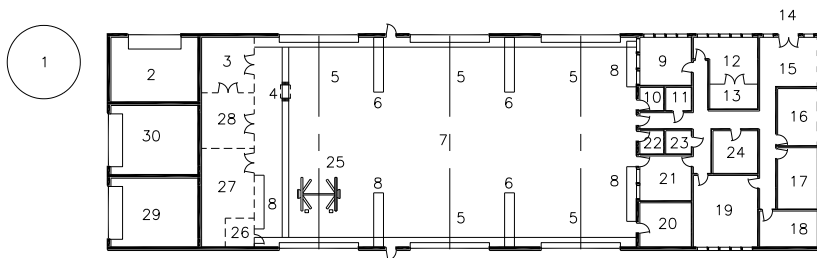
An ARFF Feasibility Study, dated September 2017, confirmed the need for an ARFF facility at the Airport. The study determined with existing agreements and apparatus equipment on-site, the Airport's emergency personnel would not be able to respond to an accident within the desired time of 2-3 minutes. With existing resources, it is reasonable to expect a total response time of 7 minutes from the time of notification. Such a response time is unacceptable and inadequate, especially when responding to an emergency that may be a fuel-fed fire or have critical injuries. This risk to safety has posed great concern to the Airport. The Airport has expressed the need for a "safety center", a facility with the capability to support ARFF services and public safety personnel. A facility with this purpose will be evaluated in the following chapter.

### 3.12.5 Maintenance Equipment Storage

There is one facility used for Airport maintenance equipment storage (MES) and repairs. The Airport's maintenance and equipment storage facility was constructed in 2006 and is approximately 8,000 square feet. The MES facility is located on the East apron just south of the passenger terminal. The MES is a two-level facility with an office, restrooms, and equipment on the lower level while additional storage is

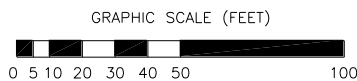
located on the upper level. The MES facility only has airside access which is gained either through two overhead garage doors or two entry/exit doors. AC 150/5220-18A, Building for Storage and Maintenance of Airport Snow and Ice Control Equipment and Materials, identifies a drive-through facility design as efficient for airports with small to medium equipment fleets, the MES facility itself is not built in a drive through configuration. Landside access is gained through an adjacent sliding gate which leads to Harry J Parrish Blvd. **Figure 3-20** shows an example of a maintenance/snow removal equipment (SRE) storage facility using a drive through design. **Figure 3-21** depicts the site plan for the Airport’s MES facility.

**FIGURE 3-20**  
**EXAMPLE OF DRIVE-THROUGH MAINTENANCE/SRE STORAGE FACILITY DESIGN**



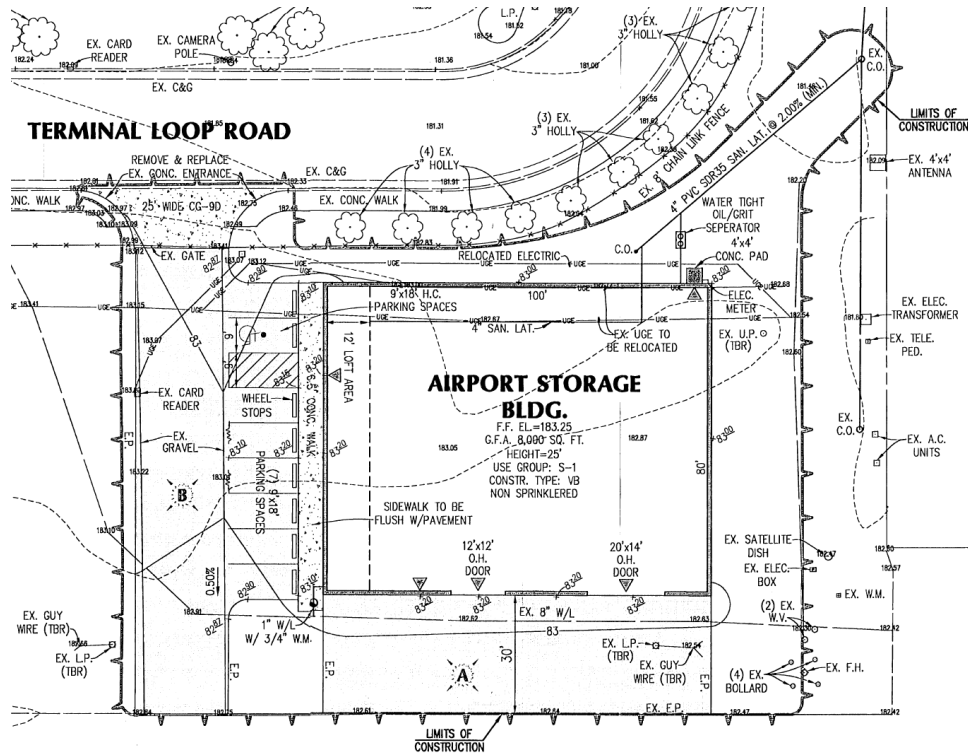
**LEGEND**

- |   |   |
|---|---|
| 1. LIQUID DEICER TANK                                     | 16. AIRPORT OPERATIONS MANAGER          |
| 2. HEATED SAND STORAGE                                    | 17. MEN'S REST ROOM/LOCKERS/SHOWERS     |
| 3. PARTS CLEANING/DEGREASER/<br>BLAST CABINET/PAINT BOOTH | 18. WOMEN'S REST ROOM/LOCKERS/SHOWERS   |
| 4. BRIDGE CRANE   | 19. CONFERENCE/BREAK ROOM & KITCHEN     |
| 5. EQUIPMENT PARKING                                      | 20. SPECIAL TOOLS                       |
| 6. SNOW REMOVAL EQUIPMENT STORAGE                         | 21. GARAGE SUPERVISOR'S OFFICE          |
| 7. VEHICLE WASH/STEAM BAY                                 | 22. WOMEN'S REST ROOM                   |
| 8. MECHANIC'S WORK BENCHES                                | 23. MECHANICAL ROOM (PHONE, ELECTRICAL) |
| 9. SNOW DESK  | 24. REFERENCE LIBRARY                   |
| 10. MEN'S REST ROOM                                       | 25. MAINTENANCE AREA                    |
| 11. MECHANICAL ROOM (HVAC)                                | 26. USED AUTOMOTIVE FLUID STORAGE       |
| 12. ELECTRICAL EQUIPMENT REPAIR                           | 27. LARGE/SMALL PARTS STORAGE           |
| 13. ELECTRICAL PARTS STORAGE                              | 28. MACHINE SHOP/WELDING AREA           |
| 14. BUILDING ENTRANCE                                     | 29. DRY DEICER STORAGE AREA             |
| 15. ADMINISTRATION/RECEPTION AREA                         | 30. UREA STORAGE AREA                   |



Source: AC 150/5220-18A, Building for Storage and Maintenance of Airport Snow and Ice Control Equipment and Materials, Figure 3-1, 2022

**FIGURE 3-21**  
**AIRPORT MAINTENANCE EQUIPMENT STORAGE FACILITY SITE PLAN**



Source: City of Manassas Record Drawings, 2022

The following list provides an inventory and average age of the Airport's maintenance and snow removal equipment:

**Snow Removal Equipment (SRE)**

- » 2017 Ford F250 (5 years)
- » 2019 Freightliner 108SD (3 years)
- » 2010 Ford Ranger (12 years)
- » 2005 Ford F450 (17 years)
- » 2016 Ford F250 (6 years)
- » 2019 T650 Bobcast Skid Steer (2 years)
- » 2002 New Holland TV140 (20 years)
- » 2019 Bobcast UTV (2 years)
- » 2014 New Holland T6040 (8 years)
- » 1974 Snowblast 2200-A (48 years)

- » 1999 Oshkosh Broom (23 years)

**Mowers**

- » 4 x Scag Zero Turn Mowers

As noted, a few of the Airport’s SRE is more than 20 years old. Therefore, it is recommended that the Airport plan to phase out older pieces as they become obsolete or unusable due to a lack of parts and program new replacement equipment purchases. A replacement of the Airport’s SRE should consider multi-function machines equipped with various combinations of plow, broom, and air blower. Multi-function machines provide added value in their efficiency and time reducing the process of taxiing equipment to and from the storage facilities. Multi-function pieces of equipment are larger and longer than single function pieces of equipment, therefore, the space allocated for them in MES facilities will increase. With new space and turning radius requirements associated with the format and size of these new machines, future Airport maintenance facilities should be configured to accommodate pull through bays using drive-through design building configuration (as shown in **Figure 3-20**) for all critical equipment including multi-function SRE.

**3.12.6 Fuel Farm/Fueling**

The fuel farm consists of three 15,000-gallon tanks of 100LL avgas and six jet-A fuel tanks with a capacity of 112,000 gallons. The two Fixed Based Operators, App Jet Center and Chantilly Jet Center, provide most of the fueling services at the Airport. Historical records from the Airport were used to assess how much of each fuel type was used in the peak month on an average day (PMAD). The analysis shows that the Airport, under baseline forecast demand, has adequate storage for both 100LL avgas and Jet-A fuels.

**Table 3-36** shows the fuel farm requirements for five days in the peak month of operations.

**TABLE 3-36**  
**FUEL FARM REQUIREMENTS**

	2021	Planning Activity Level		
		PAL 1	PAL 2	PAL 3
<b>Peak Month Average Day (PMAD) Operations</b>	332	354	378	434
<b>100LL</b>				
PMAD Operations	129	138	147	169
5 - Day Fuel Need (Gallons)	4,040	4,310	4,610	5,280
Available Storage (Fuel Facility) (Gallons)	45,000	45,000	45,000	45,000
Total Storage for 5 Day Need: Surplus/ (Deficit)	40,960	40,690	40,390	39,720
<b>Jet A</b>				
PMAD Operations	203	216	231	265
5 - Day Fuel Need (Gallons)	38,840	41,370	44,250	50,710
Available Storage (Gallons)	112,000	112,000	112,000	112,000
Total Storage for 5 Day Need: Surplus/ (Deficit)	73,160	70,630	67,750	61,290

Source: RS&H Analysis, 2022

With the shift of GA operations to the West Apron it is recommended that the Airport consider a secondary fuel farm and a self-serve fuel option on the west side. Enabling single-engine piston users to buy gas at a cheaper rate by fueling their own aircraft might incentivize them to use the Airport over other competing airports.

During discussions airport staff noted the current fuel farm's containment system is in need of repair and have expressed interest in exploring a truck staging area for the fuel farm in an effort to decrease congestion on Wakeman Drive. These items will be evaluated in the Airport Development Alternatives chapter.

### 3.12.7 Aircraft Wash Facilities

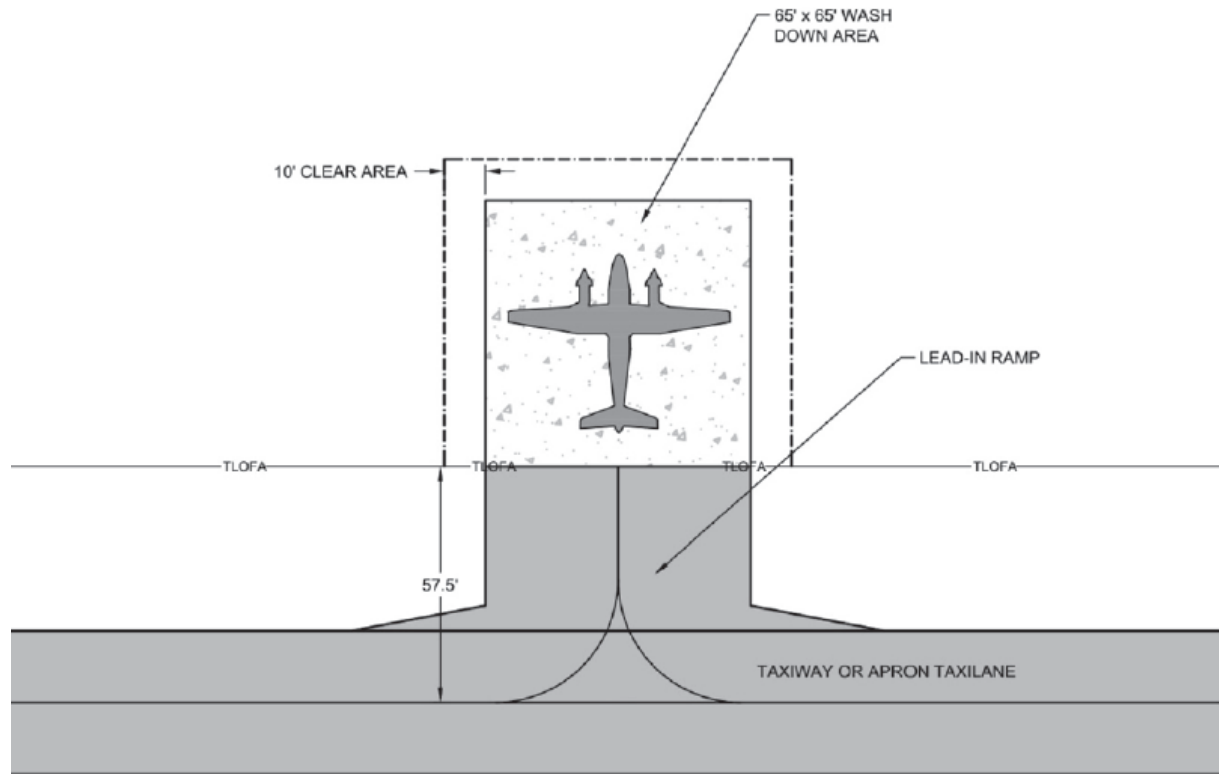
HEF does not have an aircraft wash rack facility, but this type of facility is generally desirable to small general aviation aircraft owners based at airports. Aircraft wash facilities can be financed/operated by the Airport, private investors, or a combination of both.

There are different styles of aircraft wash facilities possible at HEF. Wash facilities can be an open air, covered, or completely enclosed. When considering local climate, local environmental requirements, and cost, either an open air or covered facility are logical choices for the Airport. Open air has the advantage of size flexibility and cost savings, however, a covered structure benefits from reduced infiltration of precipitation into the drain and less runoff of grease and soaps around the pad. A covered facility also protects people and equipment from the sun and is relatively inexpensive to construct, although more expensive than an open-air concept. The downside of the covered facility is the inflexibility to accommodate aircraft larger than the size of structure.

It is recommended the facility be built to accommodate aircraft up to the size of a single engine or twin aircraft. A covered structure would need to be 70' by 70' across and 18-feet high. At this size, most general aviation aircraft based at the Airport would be able to use the facility. A wash facility is best located in proximity to small aircraft storage locations and near connections to water, sanitary sewer, electricity utilities. To easily collect fees for this service, a communication line would be required to serve a transaction system that accepts credit cards. The facility needs to be equipped with multiple hose bibs, as well as grease, oil, and sand separators to prevent discharge from entering the sanitary sewer drainage system. Additionally, the facility must be located outside of all taxilane object free areas, in a location that will not penetrate Part 77 surfaces, and away from all areas that may experience prop wash or jet blast.

**Figure 3-22** shows an example of wash rack design.

**FIGURE 3-22**  
**AIRPORT WASHRACK FACILITY EXAMPLE**



Source: ACRP Report 113, Guidebook on General Aviation Facility Planning, 2022

### 3.12.8 Advanced Air Mobility and Electric/Hybrid Aircraft Charging

Advanced Air Mobility (AAM) is expected to revolutionize segments of the aviation industry by enabling new ways of transporting goods and people in an environmentally sustainable and cost-effective way. The first AAM use cases will likely include cargo and medical transport services, with passenger transport following due to issues regarding safety, insurance, and cautious operating models. Regional and general aviation airports are likely to benefit from AAM in the mid-term by preserving or enhancing regional connectivity, making flights to smaller markets a possibility. The biggest challenge for AAM introduction is expected to be infrastructure. Infrastructure for AAM will have requirements both from the customer (passenger experience) and aircraft (operations) perspective. Airspace integration will be a key first step toward AAM operations at airports. Airports and air traffic control services will need to provide controlled airspace access to AAM aircraft, allowing them to operate safely and independently from each other. Once AAM aircraft are on the ground, they will need a place to drop-off and to board passengers while charging and servicing the aircraft. The AAM industry is built around the idea of time savings, therefore, the staging areas should be located such that taxi in and taxi out times for aircraft and walking distances for passengers are minimized, preferably in close proximity to passenger terminals or FBOs servicing business travelers. Landside staging facilities are also a possibility for AAM operations as many eVTOL manufacturers have published conceptual designs of future operations from rooftops of airport parking garages.

Future development and facility planning should consider the infrastructure, utilities, and space necessary for AAM staging and electric aircraft charging. Such facilities may begin to show demand over the planning horizon, especially by based electric training aircraft, transient aircraft, and electric vertical takeoff and landing (eVTOL) aircraft. Different energy vectors and technical solutions are being explored by the electric aircraft industry to deliver power to the electric powertrain. Electric charging of high-capacity batteries can be done by fixed ground chargers (also known as charging stations, recharge by mobile supercharge on batteries (truck or trailer), and recharge by battery swap on the ramp (batteries are recharged separately). Delivery options for Hydrogen or H<sub>2</sub> powered aircraft can be done from a hydrant system, from a tanker (truck), or swapping H<sub>2</sub> containers. Specific considerations on airport power infrastructure will vary based on current power capabilities and density of the expected electric aircraft traffic. It is recommended that with future development, the location and space necessary for staging and electric aircraft charging should be taken into consideration.

### 3.13 LANDSIDE FACILITIES

Airport landside facilities provide intermodal connections between the Airport and a variety of ground transportation modes. These facilities include regional access connections, on-airport circulation roadways, public and employee parking facilities, and rental car ready/return. These facilities are described briefly in the following sections.

#### 3.13.1 Airport Regional Access and Multimodal Transportation

Primary regional vehicular access to the Airport is provided via Interstate Highway 66 (I-66) to the north and Interstate Highway 95 (I-95) to the south which connect to Prince William Parkway (Route 234) to the east of the Airport. Route 234 provides access to Clover Hill Road then Harry J Parrish Boulevard leading to the terminal area entry. Secondary access is provided from Nokesville Road (Route 28) via Pennsylvania Avenue to Carolina Drive or Gateway Boulevard and leading onto Wakeman Drive. Access from the west of the Airport is available from Route 28 using Piper Lane and Observation Road.

The internal “on-airport” surface transportation routes consist of Piper Lane, Observation Road, Wakeman Drive, and Harry J Parrish Boulevard. Observation Road provides access to the Northwest District and West District. Wakeman Drive provides access to the Northeast District and East District.

The Virginia Department of Transportation (VDOT) has scheduled construction at the interchange between Route 234 and Clover Hill Road in 2025. Construction duration is expected to run for 12 months and is expected to improve operations and reduce delays for mainline through vehicles as well as the overall intersection. Access from Route 234 to the Airport during construction will be provided via Route 28 interchange.

Construction is currently underway on I-66 to install dynamic toll lanes. The toll lanes are anticipated to enhance mobility in the I-66 corridor and enhance transit services in the region. The toll lanes are scheduled to open in 2022 and will be operational during the weekdays. Inside the beltway, Westbound hours of operation will run from 3:00 P.M. to 7:00 P.M and Eastbound hours of operation will run from 5:30 A.M. to 9:30 A.M. Outside the beltway the toll lanes are in operation 24-hours a day in each direction.

These improvements will create opportunities for improved traffic flow not only on I-66, but also parallel routes leading to the Airport.

Observation Road Relocation is scheduled to commence construction in 2023. The road realignment will also include demolition of hangars and building facilities, draining, and grading improvement of 10 acres in the Northwest District.

During review of primary and secondary access routes to HEF, airport staff noted access corridors were adequate for airport vehicular traffic and conformed to their level of service and wayfinding expectations. In the alternatives analysis it is assumed the existing terminal access routes are sufficient for the planning period and no further improvements warranted.

### **3.13.1.1 Rail Access**

Rail access to the Airport comes by the Virginia Railway Express (VRE) Manassas Line. The Manassas line feeds into Broad Run Station which is located just off airport property to the northwest. The VRE Manassas line complements I-66 and US 50/29 for east-west regional travel by providing an alternative mode to travel by car. An expansion to Broad Run Station is scheduled to begin in 2024. Project details of the Broad Run Expansion project includes station platform modifications, parking expansion, maintenance, and storage facility (MSF) expansion, and an addition of a third main track. The objective of the Broad Run Expansion project is to accommodate growth in passenger boardings, parking demand associated with future service, and equipment storage needs as identified in the VRE System Plan 2040<sup>9</sup>. The third main track will run through the RPZ for Runway 16L like the two existing rail tracks.

### **3.13.1.2 Multimodal Transportation**

The City of Manassas has adopted the Manassas 2040 Comprehensive Plan which provides guidance on the city's shared vision related to land use, development, transportation, and community facilities through the year 2040. The Plan is conceptual but also practical in nature as it identifies the city's overarching goals and ultimately serves as planning policy for the future of Manassas. The Plan aims to advance the city's integrated, multimodal transportation system to offer residents, businesses, and visitors of all ranges a variety of mobility choices to access the city's major centers. The key transportation project which impacts the Airport is the VRE Broad Run Expansion project as depicted in **Figure 3-23**. Future road improvements with a bike network plan aimed at improving access to the airport were adopted by the Plan. **Figure 3-24** depicts the bicycle accommodations on all streets anticipated by the year 2040. The updated network improves upon the current imbalance in bike infrastructure that exists between the northern and southern portions of the city.

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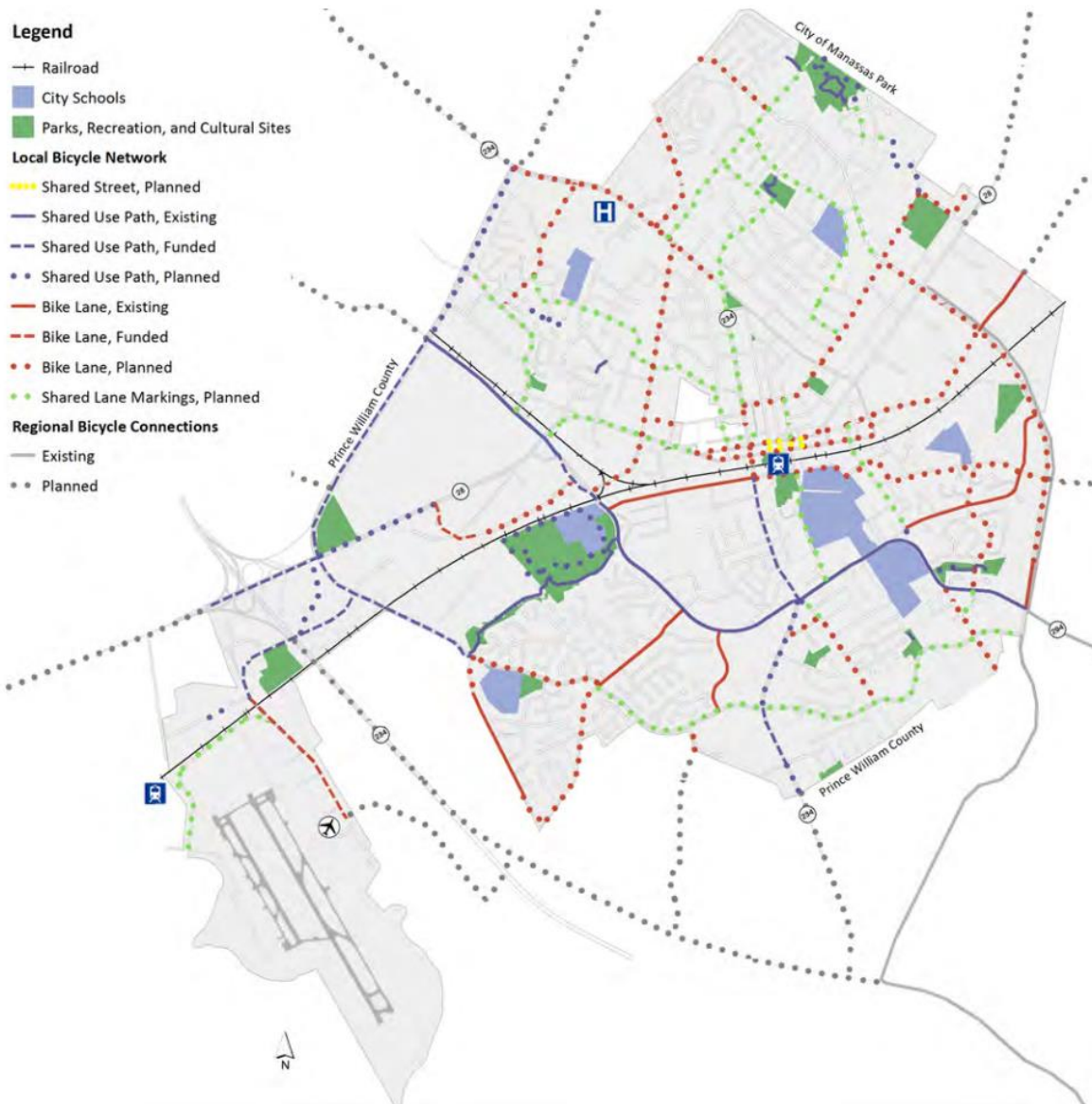
<sup>9</sup> VRE System Plan 2040 provides a framework for VRE system investments and actions VRE should pursue through 2040 to best meet regional travel needs.

**FIGURE 3-23**  
**MANASSAS KEY TRANSPORTATION PROJECTS**



Source: Manassas 2040 Comprehensive Plan

**FIGURE 3-24**  
**MANASSAS LONG-RANGE BIKE NETWORK PLAN**



Source: Manassas 2040 Comprehensive Plan

### 3.13.2 Terminal Area Landside

The terminal area landside at HEF serves a variety of users including airport and tenant employees, general aviation users, and rental car agencies. Observations by Airport staff indicate that nearly all vehicular traffic is privately owned vehicles and taxi service to HEF is limited. The layout for the landside terminal area landside can be seen in **Figure 3-25**.

**FIGURE 3-25**  
**AIRPORT TERMINAL LANDSIDE**



Source: RS&H Analysis, 2022

The terminal curb road is approximately 600 feet long with lanes, one for loading/unloading vehicles and the other for through vehicles. The terminal area lot has 119 parking spaces which includes 5 accessible parking spaces. The terminal area parking is free of charge for customers exclusively traveling to/from the Airport or have a business purpose at the Airport. There is a 48-hour limit for parking, however the Airport asks to be notified for extended durations. Given the nature of operations out of the terminal, the terminal parking lot has sufficient parking for the forecast period. Should the airport expand air carrier service during the planning period terminal parking will need to be further assessed to determine if expansion of the lot is warranted.

The landside area of the terminal is separated into quadrants with the terminal parking lot sited on the only developed quadrant. The three undeveloped quadrants provide an opportunity for development and will be further assessed in the following chapter.

### **3.13.2.1 Ground Transportation and Rental Car Services**

The Airport offers multiple options for ground transportation including on-site car rentals, local taxi service, and transportation network companies (TNCs). All ground transportation services need to be prearranged with local providers.

Rental car services are currently available through Hertz Rental Car. The Chantilly Jet Center also has Go rentals available. Reservations must be made ahead of arriving to the airport. The Hertz Rental Car service

is based at the APP Jet Center and can be accessed via the terminal area roadway, Harry J Parrish Boulevard. Hertz and Tesla entered a partnership in late 2021 that would see 100,000 electrical vehicles overhaul its rental fleet. Consideration should be made to implement infrastructure for new EV charging as Hertz's Tesla fleet expands across the country.

### 3.14 SECURITY

The Transportation Security Administration (TSA) has not required GA airports to implement security measures except as necessary to provide enhanced security for the Washington, D.C. metropolitan area. These facilities are located within the Washington, D.C. Metropolitan Special Flight Rules Area and gateway airports that are the last point of departure to Ronald Reagan Washington National Airport (DCA). Nevertheless, HEF has implemented security measures similar to those found throughout the nation's commercial service airports. Included in these measures to hinder security breaches are security fencing around most of the Air Operations Area (AOA) coupled with natural features (e.g. trees, creeks, vegetation), access-controlled vehicle gates, daily airfield inspections, landside and airfield signage, and public awareness programs for educating the aviation community on the safe and secure use of the facility. The airport does not have dedicated law enforcement or airport security on-site. For future planning considerations, if the airport should desire to serve air carrier operations specified in Part 139 the airport will need to enhance security measures to meet provisions found in its updated Airport Certification Manual (ACM) and Airport Emergency Plan (AEP).

### 3.15 EXISTING AND FUTURE LAND USE

Based on analysis from this Chapter, discussions with the Airport, and site observations parcels of land have been recommended to be controlled by the airport and some parcels of land have been identified to be released/dispositioned. Uncontrolled parcels of land within the RPZ should be acquired to have control over the land use of these areas. Runway 34L RPZ sits within a 50-acre parcel of land which the property owner and Airport have shown interest in exchanging. This 50-acre parcel sits in Prince William County and if acquired the land use is recommended to be converted to aeronautical land use.

An opportunity to expand the airport property to the Northwest has been identified just south of the VRE's Broad Run train station. The 8-acre parcel sits in Prince William County between Piper Lane and Observation Road and can be used for aeronautical or non-aeronautical land uses. Opportunities exist to incorporate the vacant 8-acre parcel currently zoned for General Business into the northwest development area.

In accordance with the airport's Strategic Plan, the Airport would like to continue expansion of corporate hangar development. An area of land within the airport property on the east side and just south of Broad Run Creek provides an opportunity for this corporate expansion. The most effective way to develop these areas will be further assessed in future development alternatives.

The airport has expressed interest in selling an 11-acre parcel and 14-acre parcel of land, approximately one mile south of RWY 34R threshold, as these areas have no intended use for the airport. Any release of

airport property must be coordinated with the FAA to determine the extent of Federal obligations associated with a parcel of land. Release of these property will be assessed and reflected accordingly in the Exhibit A property map and the Airport Layout Plan.

### 3.16 DEICING AND STORMWATER MANAGEMENT

Municipal stormwater runoff is regulated under the framework established by the Federal Clean Water Act. The Airport operates under a Virginia Pollutant Discharge Elimination System Permit (VDEPS) General Permit (VAR050985) for stormwater discharge associated with industrial activity. This permit expires on June 30, 2024. The City also maintains an Oil Discharge Contingency Plan, an Integrated Spill Prevention, Control and Countermeasures (SPCC) Plan, and a Stormwater Pollution Prevention Plan (SWPPP) for the Airport. These plans outline best management practices (BMPs) for controlling potential pollutant releases to the surrounding surface waters. These plans also provide detailed procedures to follow in the unlikely event of a spill to minimize potential effects to the surrounding environment.

There are eight regulated stormwater outfalls that exist throughout the airport property. These locations are monitored through quarterly visual inspection sampling. A minimum of one sample is collected from each stormwater outfall within the first 30 minutes but no more than 3 hours after (or as soon thereafter as practical) of when the runoff begins. Benchmark monitoring of stormwater discharges is done semiannually against the parameters of total suspended solids (TSS)<sup>10</sup> 100mg/L and total petroleum hydrocarbons (TPH)<sup>11</sup> 15 mg/L. Exceedance of a benchmark concentration does not constitute a violation of the general VPDES Permit for Discharges of Stormwater Associated with Industrial Activity and does not indicate that violation; however, it does signal that modifications may be necessary. Future regulations at the local, state, or federal level may set regulations for per- and polyfluoroalkyl substances (PFAS) and require monitoring by the Airport.

Deicing chemicals are used at the Airport in quantities less than 500 gallons during the deicing season (November – March). Airport tenants are responsible for their own deicing operations; therefore, deicing is covered under the tenants' SWPPPs. There may be instances where aircraft are deiced in Airport areas that drain to Airport outfalls. The Airport implements BMPs to minimize storm water exposure to deicing chemicals and subsequent contaminated runoff. The Airport reports deicing type and quantities, provided by tenants, to the Virginia Department of Environmental Quality (DEQ) on a biannual basis. Facility alternatives to manage deicing and stormwater will be identified within the following chapter.

### 3.17 UTILITIES

This section provides a summary of the existing utility infrastructure of the Airport. The Airport's primary developed area, including the terminal is served by main lines of utilities. This section will look at existing utilities and their general locations. The city is in process of updating its Utility Master Plan. In lieu of the

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<sup>10</sup> Total Suspended Solids (TSS) is the dry-weight of suspended particles, that are not dissolved, in a sample of water that can be trapped by a filter.

<sup>11</sup> Total Petroleum Hydrocarbons (TPH) is the sum of individual gasoline range organics and diesel range organics to be measured by EPA SW 846 Methods

final Utility Plan this section speaks to the existing utility runs. **Figure 3-26** shows approximate locations of water, sewage, gas, electrical and communication lines at the Airport.

### 3.17.1 Water

Water service at HEF is provided by the City of Manassas. Water lines to the Airport run along Observation Road, Harry J. Parrish Boulevard, James Payne Court, Aviation Lane, Skyview Terrace, and Wakeman Drive. The water lines that run to the terminal area are 8-inch distribution lines along Harry J. Parrish Boulevard. The lines that run along Wakeman Drive are 12-inch distribution lines and 8-inch distribution lines servicing the east side of the Airport. 6-inch and 10-inch distribution lines service the west side of the Airport along Observation Road. Distribution lines on James Payne Court and Aviation Lane vary between 6-inch and 8-inch lines. The city has plans for a future project to connect water lines on the east and west side of the airport to level water pressure seen at the end of the line. The connection tie-in will occur under the airfield.

### 3.17.2 Sewage

Sewage service at HEF is supplied by the City of Manassas. The sanitary sewer lines are made up of 10-inch pipes that runs along Piper Lane and Observation Road. There are sanitary sewer network lift stations near the ATCT on Observation Road and the southernmost end of Observation Road. A future project is expected to connect the east and west water lines to level pressure and will be located under the airfield.

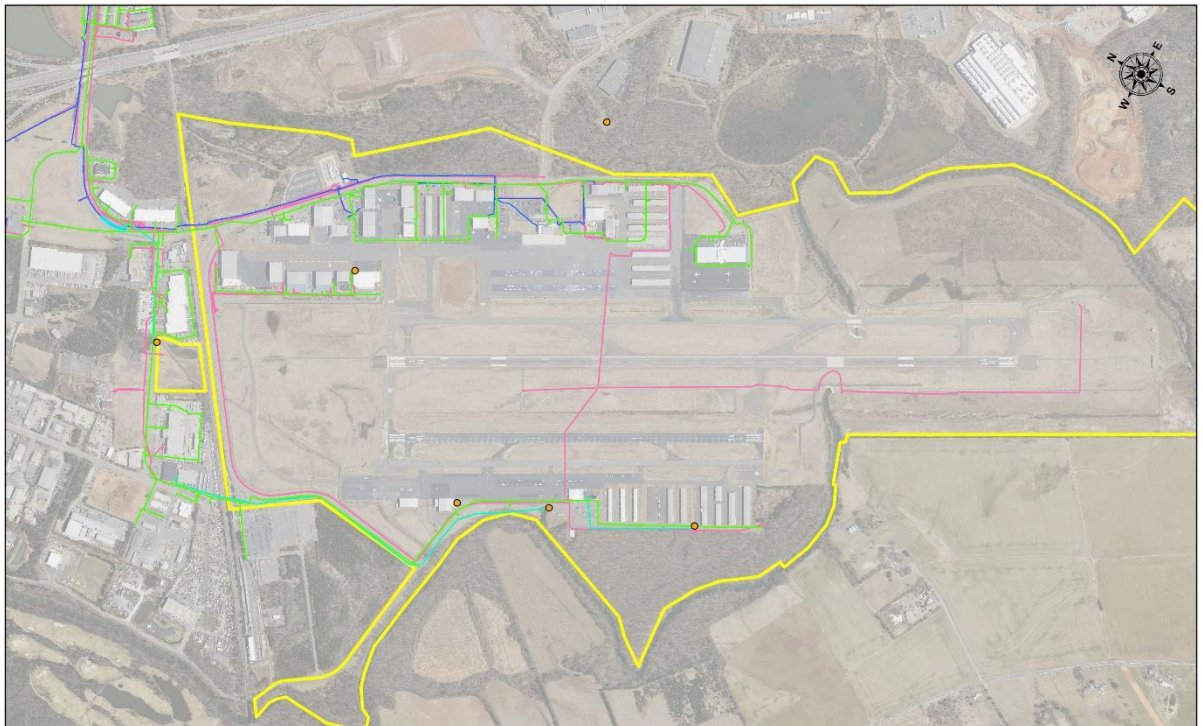
### 3.17.3 Gas

PLACEHOLDER UNTIL GAS UTILITY INFORMATION IS OBTAINED

### 3.17.4 Electricity

Electricity at HEF is supplied by the City of Manassas. The main electrical lines run underground along the southern part of Observation Road and along Wakeman Drive. An underground line also extends south of Wakeman Drive into Skyview Terrace. Electrical fiber lines also extend from Wakeman Drive into the terminal area from Harry J. Parrish Boulevard.

**FIGURE 3-26**  
**AIRPORT UTILITY LINES**



**Legend**

- Property Line
- Electrical Fiberlines
- Electrical Primary Lines
- Sanitary Sewer Network Structure
- Sanitary and Sewer Pressurized Main
- Water Main

**Airport Utility Lines**

0 1,000 2,000 US Feet

Source: City of Manassas GIS, RS&H Analysis, 2022

### 3.17.5 Communications

PLACEHOLDER UNTIL TELECOMMUNICATION UTILITY INFORMATION IS OBTAINED

### 3.18 FACILITY REQUIREMENTS SUMMARY

The following is a summary list of airport facility needs and improvement considerations through Planning Activity Level 3. These needs and considerations will be the basis for creation of development alternatives in the Airport Development Alternatives Chapter, which will be evaluated and refined through public process into a long-range preferred development plan for the planning period. A graphic representation of the facility requirements summary can be seen in **Figure 3-27**.

#### **Runways**

- » **Runway Protection Zones** – Acquire unowned RPZ land beyond Runways 16L and 34R within designated RPZ areas. This includes 21.92 acres for Runway 16L and 3.71 acres for Runway 34L. Acquiring land beyond current RPZs for all runways as practical is also recommended.
- » **Runway Shoulders** – Construction of paved runway shoulders for Runway 16L-34R is recommended as the runway serves over 500 ADG-III operations annually.
- » **Runway Blast Pad** – Construct runway blast pad with a width of 140 feet and length of 200 feet for Runway 16L-34R.
- » **Runway Pavement** – Address pavement rehabilitation for Runway 16L-34R
- » **Runway Length** – Extend Runway 16L-34R and preserve land to accommodate a runway extension
- » **Runway Safety Area** – Surface variations and drainage discrepancies are present in the RSA for RWY 16L-34R and should be addressed.

#### **Taxiways**

- » **Taxiway B** – It is recommended that paved shoulders be constructed for improved safety. Widening of the taxiway will be assessed. Address pavement rehabilitation for Taxiway B full length.
- » **Taxiways B2/B3** – It is recommended to fix drainage.
- » **Taxiway C** – It is recommended that paved shoulders be constructed for improved safety.
- » **Taxiway C** – Consider addressing direct apron to runway access. Correct fence line protrusion into TOFA.
- » **Taxiway D** – It is recommended that paved shoulders be constructed for improved safety.
- » **Taxiway E** – It is recommended that paved shoulders be constructed for improved safety.
- » **Taxiway K** – It is recommended that paved shoulders be constructed for improved safety. Alternatives will examine solutions to fix the hot spot intersection (HS 1)
- » **Taxiway V** – It is recommended that paved shoulders be constructed for improved safety.

#### **Aircraft Parking and Storage**

- » **Based aircraft storage** – By PAL 3 provide
  - Additional T-hangar structures
  - Additional conventional hangars

- » **Transient aircraft apron** – By PAL 3 provide an additional apron for transient aircraft parking

### **Navigational Aids and Lighting**

- » **Runway 16L-34R** – Enhance markings and lighting
- » **Runway 16L Glide Slope** – Relocate Glide Slope out of Runway 16L-34R ROFA
- » **Runway 34R MALSF lighting** – An extension of Runway 16L-34R will impact MALSF stations and is recommended to be relocated to meet current FAA standards.
- » **Runway 16L MALSR** – Does not meet the 3” frangibility requirements within the RSA. It is recommended to upgrade light bases to meet current FAA standards.

### **Landside**

- » **Terminal Area** – Find highest and best use of three vacant quadrants in terminal area.

### **Support Facilities**

- » **Air Traffic Control Tower** – The preferred ATCT site will be incorporated into the preferred development alternative.
- » **Aircraft Wash Facility** – Construct a 70’ by 70’ wash structure, preferably covered, that is 18-feet high (Accommodates aircraft up to the size required by a single engine or twin aircraft)
- » **Safety Center** – Site a new “safety center” with the intent to expedite emergency response, would provide storage for ARFF apparatus combined with a police office
- » **Fixed Based Operators** – Allocate land for a future full service FBO and/or corporate hangar that can be used by transient aircraft.
- » **Fuel Farm/Storage** – Examine a satellite fuel farm with allowances for airfield access and self-serve fuel option on the west side as well as bolster existing fuel farm containment.

### **Utilities**

- » **Future Expansion** – Expand natural gas, communication lines, water, sewer, and/or electrical lines from main lines to future development areas.
- » **Temperature Sensors** – Explore opportunities to install temperature sensors in runways and airfield bridges

### **Sustainability Initiatives**

- » **Vehicle Charging Stations** – Suggest implementing infrastructure for dedicated EV charging stations. Airport policies should be developed on where to locate these spaces within the total stock of available parking. It is recommended that they are dispersed across the overall stock as a percent allocation of total.
- » **Aircraft Charging Stations** – Consider the infrastructure, utilities, and space necessary for electric aircraft charging stations for Advanced Air Mobility technology.
- » **Airport energy sustainability** – Determine if sustainability efforts will include harvesting renewable energy.

### **Land Acquisition/Disposition**

- » **Northwest Land** – Explore opportunities to expand airport property to vacant land (8-acres) between Piper and Observation Road.
- » **Southwest Land** – Explore opportunities to expand airport property into 50-acre parcel south of Board Run creek.
- » **South Land Parcels** – Explore disposition of two parcels (11-acre and 14-acre) of airport owned land south of the Airport.
- » **RPZ Land** – As stated, acquire unowned land beyond Runways 16L and 34R within designated RPZ area. Acquiring land beyond current RPZ for Runway 16L-34R and 16R-34L is also recommended.

**FIGURE 3-27**  
**FACILITY REQUIREMENTS SUMMARY**

**Facility Requirements Summary**

**Runways** ●

- 1- Acquisition of all unowned land in RPZ areas
- 2- Construct paved shoulders (recommended)
- 3- Runway 16L blast pad does not align with design standards
- 4- Rehabilitate pavement on Runway 16L-34R
- 5- Preserve land for Runway 16L-34R extension (future)
- 6- Correct Runway 16L-34R surface variations, drainage and slope discrepancies present in the RSA

**Taxiways** ●

- 7- Rehabilitate and widen taxiway.
- 8- Address direct access to apron; address fence in TLOFA.
- 9- Construct paved shoulders (recommended)
- 10- Correct Hot Spot
- 11- Fix drainage on TWY B2/B3

**Aircraft Storage and Parking** ●

- 12- Construct T-hangars
- 13- Construct a conventional hangar
- 14- Construct additional transient aircraft apron space

**Navigational Aids and Lighting** ●

- 15- Relocation of Medium Intensity Approach Lighting System with Sequenced Flashers (MALSF) on Runway 16L-34R
- 16- Runway 16L MALSR does not meet the three inch frangibility requirement within the RSA.

**Landside** ●

- 17- Determine highest and best use for vacant quadrants in terminal area

**Support Facilities** ●

- 18- Relocation of Air Traffic Control Tower
- 19- Construct aircraft wash facility
- 20- Identify site for relocated safety center
- 21- Allocate land for a future full service FBO and/or corporate hangar
- 22- Evaluate opportunities for a satellite fuel farm and enhancement of existing fuel containment

**Utilities** ●

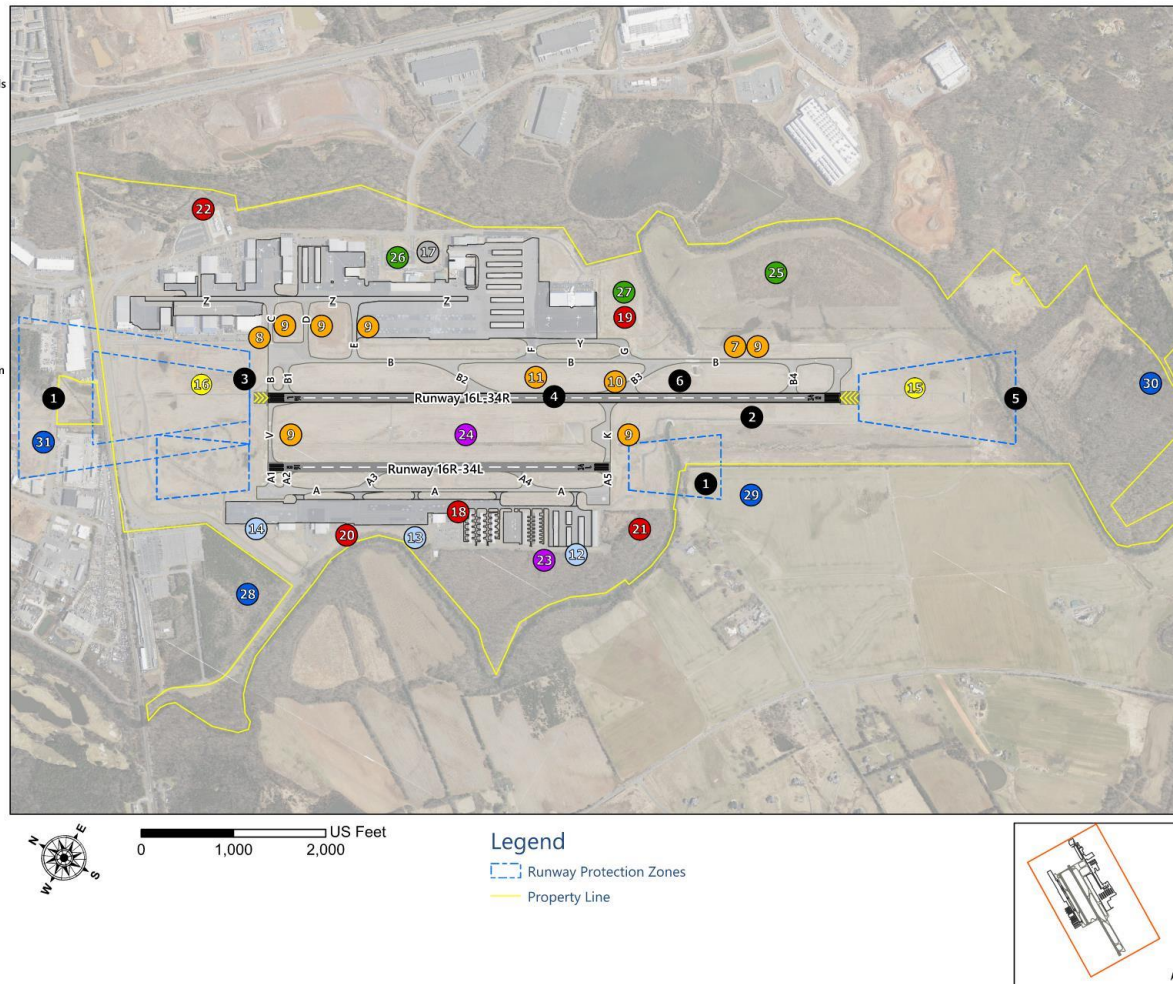
- 23- Expand utility lines
- 24- Assess temperature sensors for runways and bridges.

**Sustainability Initiatives** ●

- 25- Evaluate harvesting energy
- 26- Suggest planning for EV charging stations and infrastructure
- 27- Suggest planning for electric aircraft charging stations infrastructure

**Land Acquisition/Disposition** ●

- 28- Explore northwest vacant land opportunities (8-acres) between Piper and Observation Road
- 29- Explore southwest land opportunities (50- acre parcel) south of Board Run creek
- 30- Explore disposition of two parcels (11-acre and 14-acre) south of the Airport.
- 31- Acquire land below current RPZ for Runway 16L-34R and 16R-34L



Source: RS&H Analysis, 2022

***Chapter 4***  
***Alternatives***



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## Chapter 4 Alternatives

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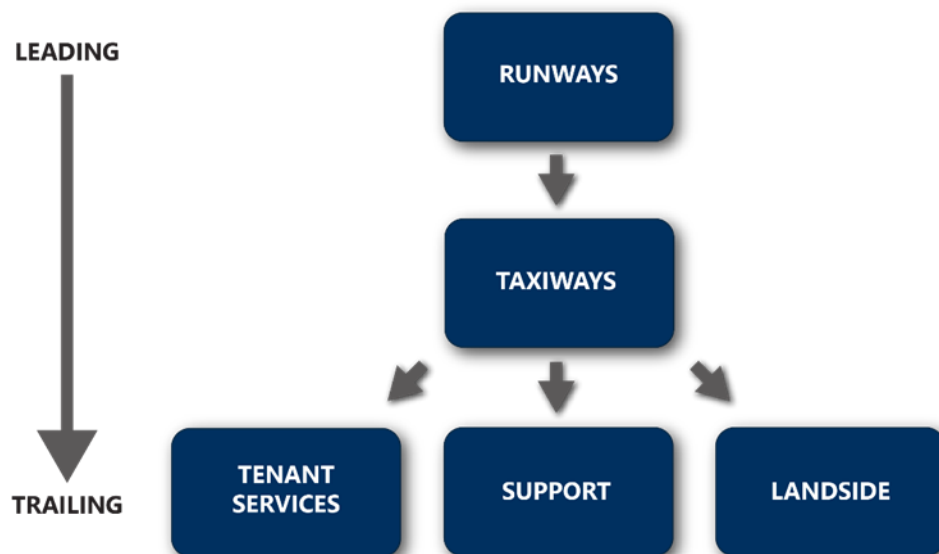
*CHAPTER 4*  
*ALTERNATIVES*

## 4.1 INTRODUCTION

This chapter identifies and evaluates facility development alternatives for Manassas Regional Airport based on the facility requirements determined in **Chapter 3, Inventory and Facility Requirements**. The goal of identifying and evaluating various development options is to ensure airport facilities are capable of meeting projected activity levels, make efficient and effective use of available airport land, meet FAA airfield design standards, and integrate with a preferred airport management strategy. Development alternatives in this chapter have been thoroughly analyzed, refined, and received input through stakeholder involvement to establish plans that reflect community values, Airport preferences, and the unique operational nature of Manassas Regional Airport.

As alternatives are developed, they follow a hierarchy of leading and trailing facility categories. Leading elements comprise of critical airport infrastructure and influence how trailing elements are developed. Leading elements are primary facilities that require significant amounts of land and/or capital investment to implement, and whose placement and configuration must take precedence when formulating alternatives. These critical airport infrastructure elements at HEF are runways and taxiways. Trailing elements are those whose placement and configuration are influenced and dependent on the leading elements. At HEF, the trailing elements include tenant services, support facilities, and landside facilities. Defining the division between leading and trailing elements allows the initial focus of analysis to be on determining solutions for those high cost, and more permanently affixed leading elements. The placement and decisions surrounding the leading elements typically influence the location and layout of the trailing elements. **Figure 4-1** displays the relationship between leading and trailing planning elements at Manassas Regional Airport.

**FIGURE 4-1**  
**AIRPORT PLANNING ELEMENTS**



Source: RS&H Analysis, 2023.

### 4.1.1 Alternative Development Process

The process of determining viable alternatives, and ultimately selecting the alternatives that will make up the preferred development plan, was performed in a series of interrelated steps which aligned with guidance from AC 150/5070-6B, *Airport Master Plan*, **Figure 4-2**.

The airport alternatives development approach was established into the following steps:

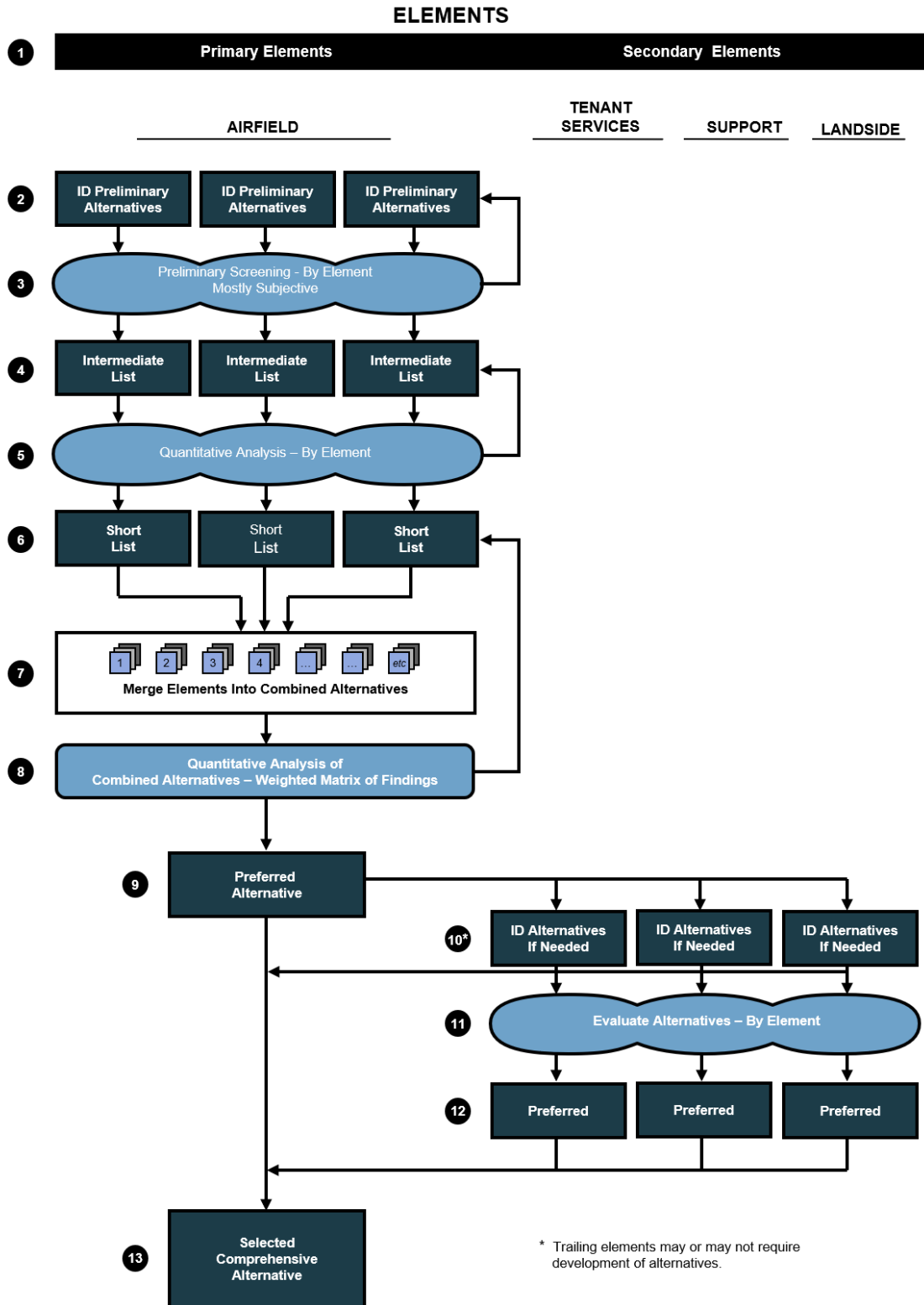
1. Define and evaluate existing airport land use patterns.
2. Define the alternatives evaluation criteria.
3. Obtain constraining factors such as environmental conditions and air space considerations.
4. Assemble an ultimate on-airport land use vision.
5. Create preliminary alternative concepts for each element to the facility requirements defined in Chapter 2.
6. Preliminary alternatives are then evaluated against the defined criteria with stakeholder input.
7. The result is a set of preferred alternatives that are carried forward into the implementation chapter where costs and needs are used to determine a logical phasing of projects.

Furthermore, development alternatives must be grounded by the Airport's vision for the future, meeting their community strategic plan, filling an established role in the National Plan of Integrated Airport Systems (NPIAS), and recognizing industry trends that may impact airport operators. For these reasons, ensuring that airport development options are weighed against the airport's Strategic Plan and Virginia Department of Aviation (DOAV) statewide Sustainability Management Plan (SMP) for its public-use airports within the Commonwealth of Virginia. Virginia's Airport SMPs sustainability initiatives are:

- » Economic Performance
- » Airport Community
- » Energy and Emissions
- » Waste
- » Natural Resources

The preferred development plan at Manassas Regional Airport is driven by its ability to meet or exceed HEF's sustainability goals within each of these initiative categories. **Table 3-1** within **Chapter 3, Inventory and Facility Requirements** lists their short- and long-term goals. The evaluation process included stakeholder input, which guided the refinement of each element of study. The result, as described in this chapter, is a set of preferred alternatives carried forward into the implementation phase of the Master Plan where costs and need are used to determine a logical phasing of projects.

FIGURE 4-2  
ALTERNATIVES ANALYSIS PROCESS



Source: AC 150/5070-6B – Airport Master Plan, RS&H, 2023.

### 4.1.2 Alternative Evaluation Criteria

The alternatives process must establish a set of evaluation criteria by which all facility development concepts can be measured. Throughout the alternative development process, evaluations are performed based on guidance provided in the Airport visioning process, aviation industry research, established planning best practices, and direct feedback from airport management and stakeholders. At a high level, each facility alternative is evaluated against the following criteria:

- » Operational safety and public safety
- » Operational efficiency
- » FAA airfield design standards for critical aircraft
- » Balance of airfield, terminal and landside facilities or target user groups needs met
- » Resolution of current issues
- » Adequate/appropriate level of service provided
- » Long-term facility requirements are met
- » Ease of implementation
- » Costs (capital and operating)
- » Flexibility and future expansion potential
- » Virginia's Airport SMPs sustainability initiatives

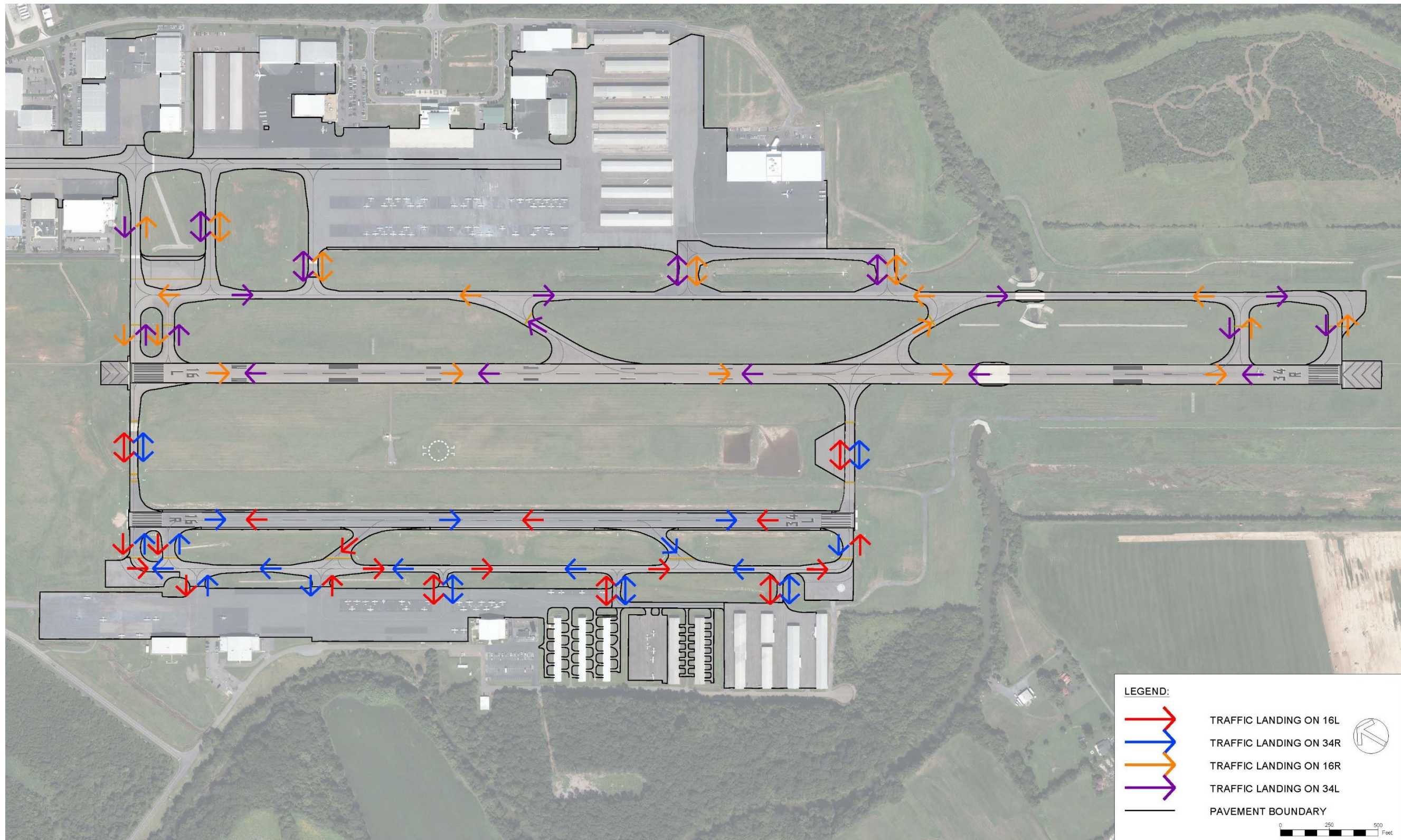
## 4.2 EXISTING LAND USE AND FUTURE LAND USE

Effective identification of land use is critical to identify where opportunities exist for land development or redevelopment. These decisions guide airport decisions over the long term in a way that maintains airport growth, service to the community, and minimizing costly counterproductive or inefficient development.

The Airport currently has a mix of general aviation (GA) facilities dispersed around the airport property, ranging from flight schools to FBOs servicing general aviation transient and charter jet traffic. With a dynamic and fast-paced environment which this mix of users generates, it is important to ensure that the flow of traffic on the airfield is organized, and that these facilities can provide services to their users efficiently and effectively. Currently, the airfield maintains two FBOs and a terminal facility on its East Apron. Corporate hangars are dispersed around the airfield, however, primarily located on the East Apron. T-hangars can be found situated between the Chantilly Jet Center FBO and the terminal facility on the East Apron, as well as at the southern end of the West Apron.

With this configuration of exiting land use, larger, turbine/jet aircraft tend to operate on Runway 16L-34R and park/stage on the east side of the airfield. Smaller, single-engine aircraft tend to operate on Runway 16R-34L. The Airport's vision for smaller, single-engine aircraft is to have them park/stage on the west side of the airfield. **Figure 4-3** displays the flow of the resulting aircraft ground traffic.

FIGURE 4-3  
AIRCRAFT GROUND FLOW DIAGRAM



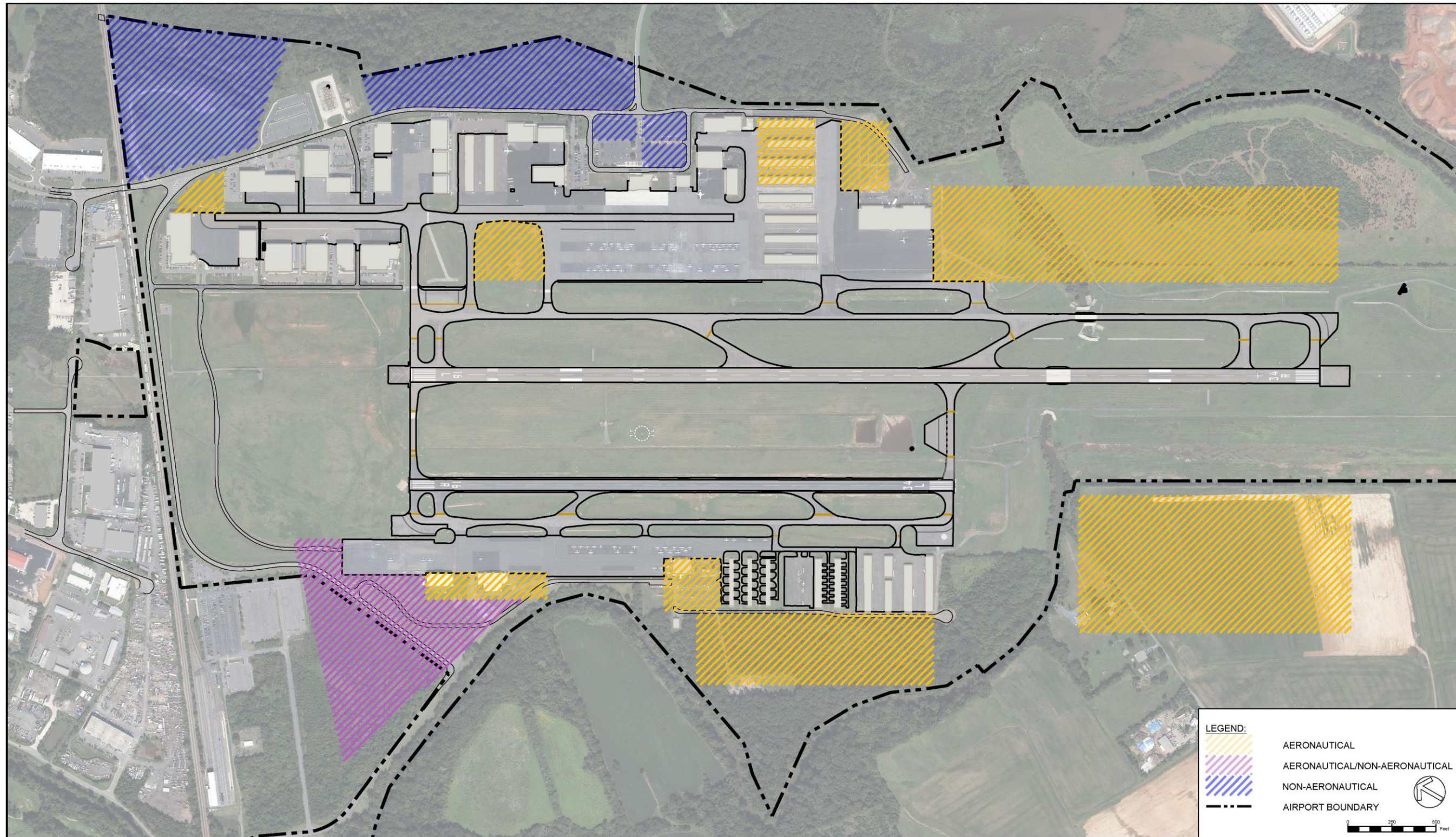
Source: RS&H Analysis, 2023.

As the Airport continues to develop, traffic at the Airport will continue to increase every year. To prevent any conflict arising from this growing congestion, as well as to prepare for the long-term development of the Airport, proper land use must be evaluated, then executed effectively. In order to minimize ground aircraft congestion, as well as to develop and redevelop the Airport in an orderly fashion, large and small aircraft traffic should be separated. To leverage current development, the Airport should focus on developing the west side of the airfield to primarily support single-engine and light twin aircraft while the east side of the field developed to support larger, jet/turbine aircraft. Currently, the majority of smaller aircraft tie-downs and T-hangars are located on the east side, which does not align with the Airport's vision. By catering to the Airport's vision, the land development/ redevelopment can be as efficient and useful as possible. A number of important conclusions were drawn during the facility requirements analysis in relation to land use patterns including:

*1. Development in the NW is most cost efficient compared to SE or SW areas.*

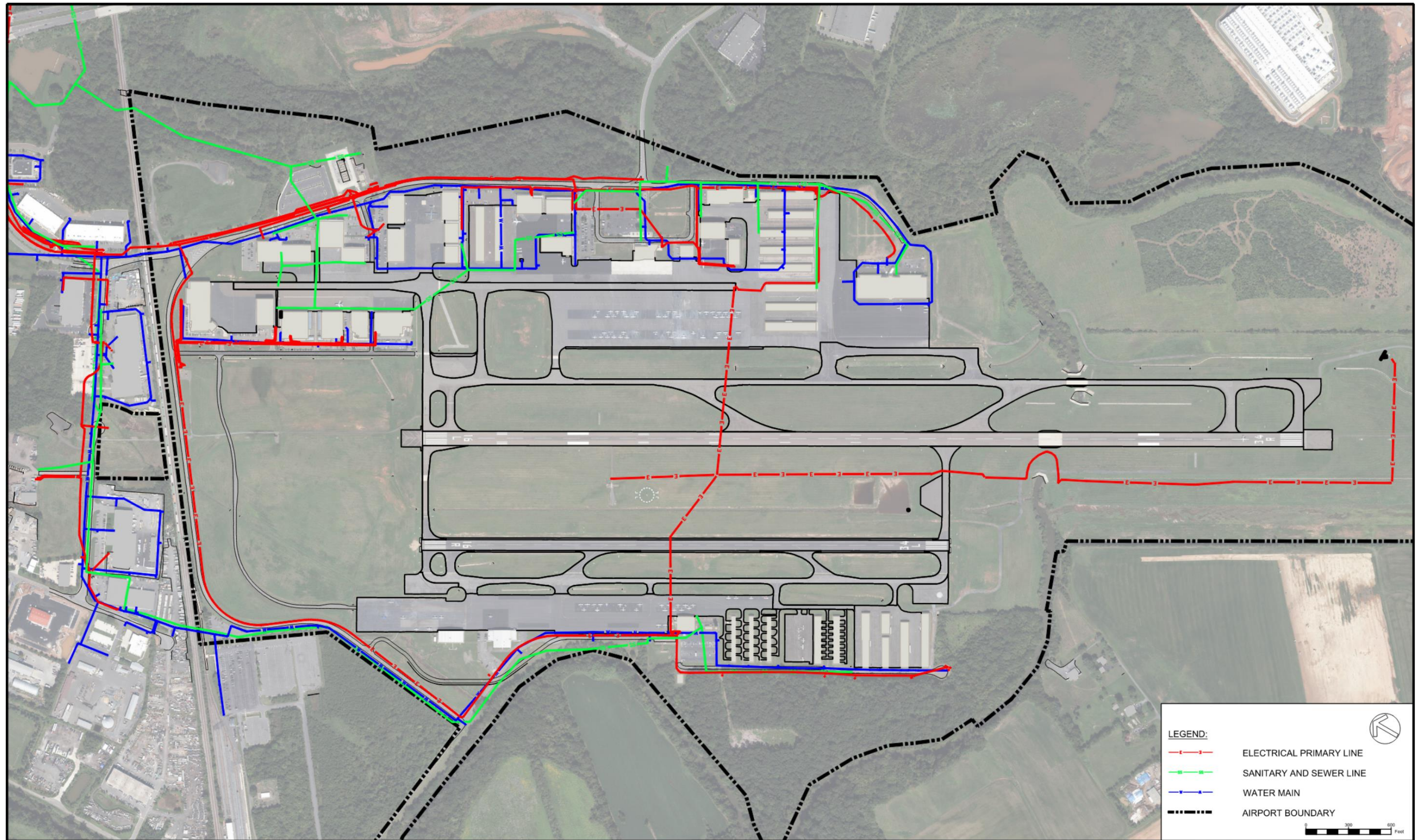
Multiple areas were considered for new development to support future growth. In this consideration, the areas of use are limited to those that follow airport design standards and promote access to the airfield to airport users. Once all areas in consideration met these criteria, the complexity of their construction must be considered. Installing new utility infrastructure, and contending with environmentally sensitive areas, can be an expensive and time-consuming process. By using the advantage of an established utility system, as well as avoiding environmentally sensitive areas, this plan will promote an orderly and effective facility development. **Figure 4-4** depicts all zones in consideration for future development, as well as their use for aeronautical and non-aeronautical development. In order to ensure compliance with environmental regulations and safeguard the ecosystem, it is essential to carefully consider appropriate NEPA triggers. This approach helps to avoid any violations of the law and minimizes the risk of environmental factors that could potentially harm both the on-site facilities and the aircraft utilizing them. Among these factors, utility infrastructure is critical to take into consideration prior to development. **Figure 4-5** depicts the current utility infrastructure at the Airport.

FIGURE 4-4  
DEVELOPMENT AND LAND USE OPPORTUNITY ZONES



Source: RS&H Analysis, 2023.

FIGURE 4-5  
AIRPORT UTILITIES



Source: RS&H Analysis, 2023.

Considering all airport and environmental development considerations, the most feasible area for future development is the northwest portion identified as aeronautical/non-aeronautical land use in **Figure 4-4**. This area can promote a mix of developments for the Airport and its users, is best integrated with existing utilities, and poses a lesser environmental impact than other undeveloped areas. This area is also in consideration for redevelopment, as the existing Observation Road will likely be realigned and there has been interest in development in this area already. This area is a prime candidate for development, and specific developments in this area will be evaluated in further sections in this and the following chapters.

*2. The west side of the airfield does not have pilot services/amenities which exist on the east side of the airfield.*

In development of the west side of the airport, the current utility of that side's facilities must be evaluated. The west side's biggest unrecognized need is the lack of pilot services and amenities. With no FBO to service fuel, conduct maintenance, provide airfield access to users, or provide restrooms, it is inconvenient for both based and transient aircraft to use the area. In order to incentivize the use of the area, as well as improve the quality of the Airport, facilities with pilot amenities should be implemented on the west side.

*3. Airport ARFF vehicles are located in an operationally inefficient location and does not allow for an adequate emergency response time.*

Currently, the Airport's ARFF vehicles are stored in Hangar C-3 on the East Apron. This is not an optimal long term storage option for the vehicle. From the September 2017 ARFF Feasibility Study, a timely response will require that the ARFF vehicle have its own facility, away from its current location. Regarding Part 139 airport standards, the current emergency response time of seven minutes is unacceptable and requires a new, properly sited ARFF facility.

*4. Runway 16L-34R would best serve larger aircraft operations by extending the runway.*

Majority of the fleet mix operating out of HEF can takeoff and land at the Airport at Maximum Takeoff Weight (MTOW). A growing amount of new users to HEF are using more modern, longer-range business jets that cannot takeoff at MTOW during the highest temperatures experienced at HEF. With monthly highs increasing and the expectation for continued traffic growth, specifically business jet traffic, a runway extension will be able to support the operations during the planning period without limiting payloads.

*5. Appropriately allocate apron and aircraft storage space to meet forecast demand in the planning period.*

The Airport recognizes the need for additional transient apron space and covered aircraft storage facilities in the form of T-hangars, conventional hangars, or corporate hangars. With the costly impact of development on the east side, the west side provides a better opportunity to support aircraft parking and storage. The final alignment of Observation Road will impact the extent and configuration of development. Therefore, this chapter will depict both alignments in consideration to convey the future facility need can be supported with either alignment.

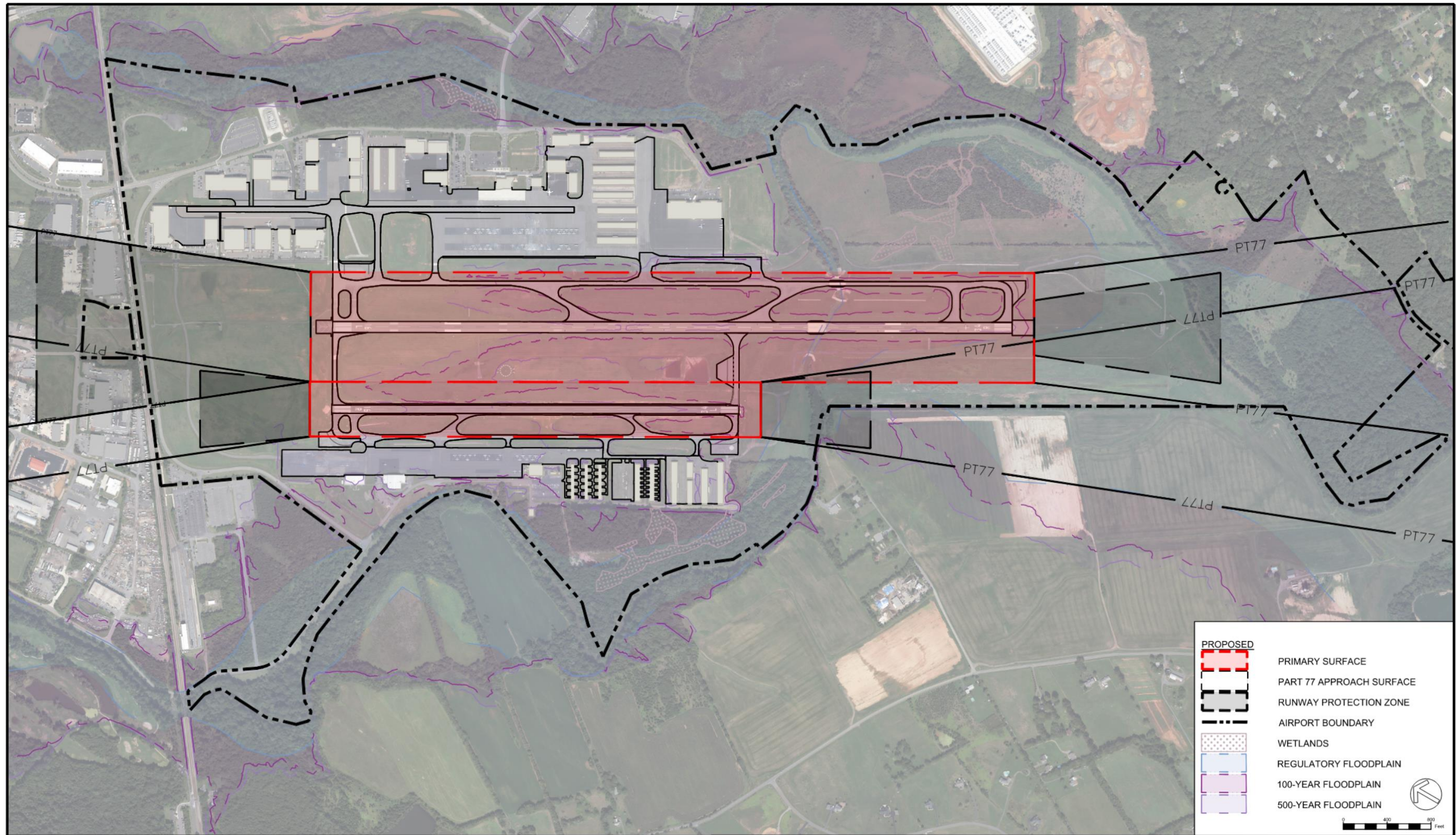
#### 4.2.1 FAA Airspace and Environmental Limitations

Every airport leverages unique advantages, disadvantages, and characteristics regarding its location and local and regional setting. Of these characteristics, the two that both cause and are subject to the greatest impact by the Airport are airspace and the environment.

FAA protected airspace that must be considered for any operations at the Airport include FAR Part 77 airspace and surfaces. These surfaces are also called “imaginary” surfaces. FAR Part 77 surfaces act to protect and promote air safety at and around the airport, as well as promote the efficient use of the facility. At HEF, the most prominent surfaces to impact the facility are the Building Restriction Line (BRL), primary surface, approach surface, and the Runway Protection Zone (RPZ). The BRL defines the area on the airfield where buildings and structures that are 35’ tall may be built, to mitigate risk for aircraft collision during normal operation. The primary surface is an imaginary surface that is defined by the runway centerline and expands out beyond the runway thresholds and runway edges to provide more protections from obstruction for aircraft using the runway. The only structures permitted in the primary surface are those which must be located in the area for the airport to function, such as runway lights and runway signs. All other structures, and aircraft not actively taxiing on, off, or across the runway must remain out of the primary surface. The approach surface protects aircraft from on and off airport obstructions and obstacles. Finally, the RPZ is an imaginary surface that resembles a trapezoid expanding away from the runway from the edge of the primary surface. The purpose of this area is to protect the ends of the runway from aircraft overrun or impact prior to the runway during an emergency event. Structures that are allowed in this area are heavily restricted due to the elevated risk of aircraft entering the zone.

The National Environmental Policy Act of 1969 (NEPA) serves as the forefront for environmental protections regarding land in and around airport property. NEPA provides guidelines for responsible development of land, as well as a method to involve public input regarding development decisions for airport projects. At HEF, the largest environmental factors that may impact development and operations would be wetlands and floodplains. The size, location, and proliferation of wetlands (wetland delineation) is critical to understand and document, as wetland can have major environmental impact on any construction site within it. **Figure 4-6** depicts airspace and environmental constraints which can hinder development.

FIGURE 4-6  
FAA AND ENVIRONMENTAL LIMITATIONS ON DEVELOPMENT

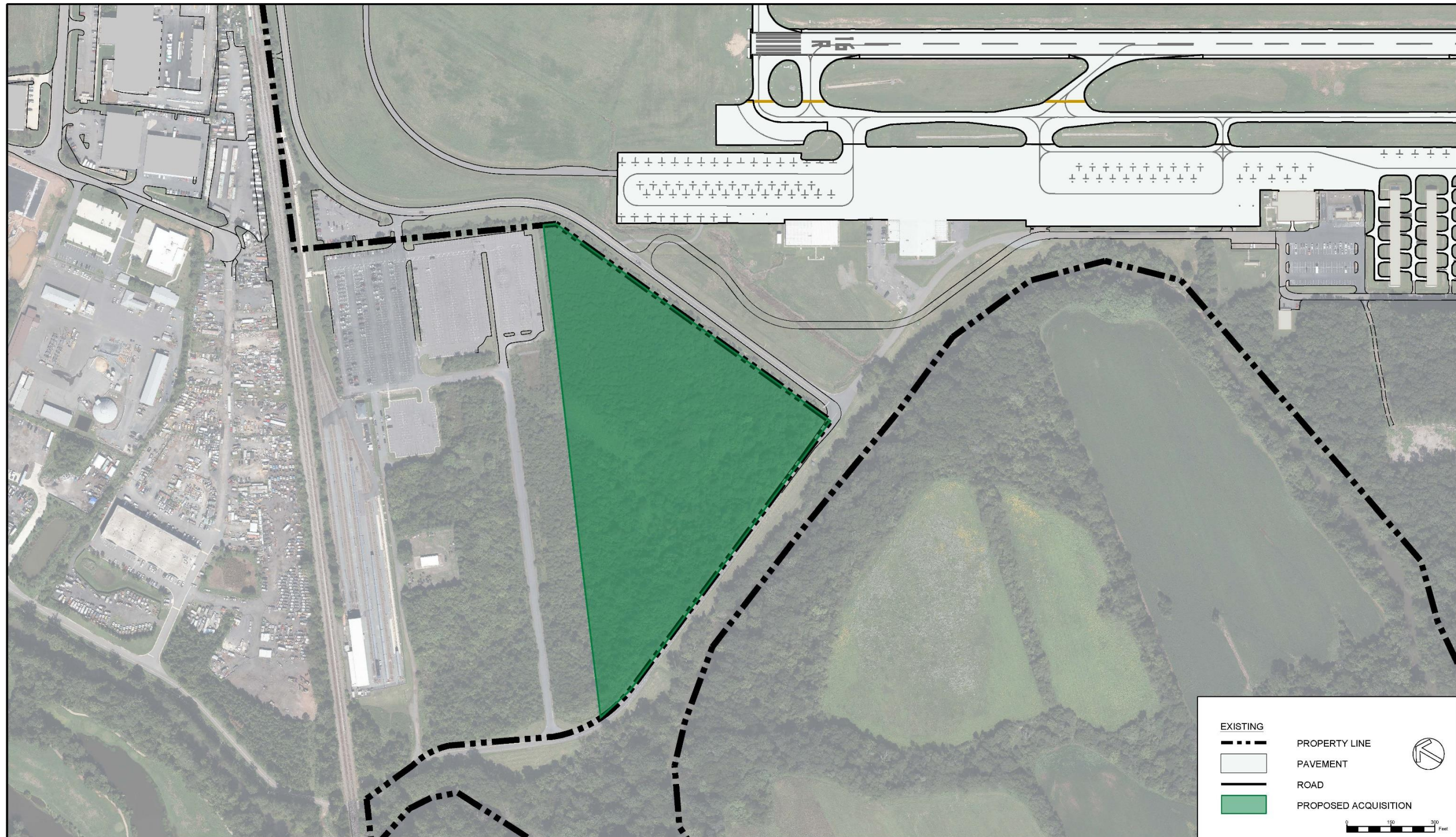


Source: RS&H Analysis, 2023.

### 4.3 RECOMMENDED LAND TO ACQUIRE

Alternatives assessed were developed with consideration of the existing airport boundaries and surrounding vacant land ideal for development to show necessary airfield design concepts consistent with that of forecasted demand. Land acquisition is proposed to allow for development opportunities for airport expansion during the planning period and prevent the development of incompatible uses adjacent to existing and planned airport improvements. The airport is located between two streams, Cannon Branch and Broad Run, therefore development opportunities off airport property to the east, west, and south without impacting existing floodplains is challenging. Off-airport property to the north is already developed with rail lines and industrial parks. The master planning team identified a 18-acre parcel of land to the northwest, within Prince William County, which enables development of future aeronautical and/or non-aeronautical facilities that are compatible with airport operations while also providing revenue to support the airport. The Aviation Support facility alternatives will consider this 18-acre parcel, depicted in **Figure 4-7**, to support future demand.

FIGURE 4-7  
PROPOSED LAND ACQUISITION



Source: RS&H Analysis, 2023.

## 4.4 AIRFIELD ALTERNATIVES

The Airport airfield is the leading facility planning element as it serves the primary purpose of the airport, providing safe passage of aircraft transitioning from ground to flight, and vice versa. All facilities are developed around the airfield and how they interface with it. Facilities are influenced by various factors, including terrain, prevailing meteorological conditions, aircraft performance requirements, the mix of aircraft at the airport, FAA design standards, as well as guidance and best practices. These considerations play a crucial role in shaping the design and functionality of the facilities to ensure optimal operations and safety. The runway count and orientation at HEF are adequate to serve forecasted demand over the planning period, however other airfield aspects are being investigated. Taking these impacts into consideration, the four focuses for airfield alternatives are to meet established FAA airfield geometry and design standards, to meet performance requirements for future operations, address known and anticipated operational safety concerns, and to serve future areas of facility development. The focus areas in this section will be development alternatives for the following airfield elements:

- » Runway 16L-34R Extension
- » Taxiway/Taxilane C Configuration
- » HS-1 (Runway Hotspot Intersection)

All airfield solutions will consider peak demand capacity constraints, primary users, and emerging trends. Every development option is always weighed against the option of taking no option as well.

### 4.4.1 Runway Alternatives

#### 4.4.1.1 Runway 16L-34R Extension

The analysis conducted for the runway extension concluded that the landing length of Runway 16L-34R is sufficient to accommodate the operations of existing and future design aircraft. However, it was determined that the takeoff length is insufficient to serve certain large business jets operating from HEF without imposing significant payload restrictions, particularly during summer conditions. The analysis identifies the need for a runway length providing a takeoff run available (TORA) of 6,700 feet, therefore, only alternatives extending available take off length by 500 feet were evaluated. The following Runway 16L-34R existing conditions and extension alternatives, and the resulting impacts, are evaluated in the following text. In section **4.4.1.2 Runway 16L-34R Extension Alternatives Evaluation**, the evaluation criteria for each alternative is outlined in detail, and section **4.4.1.3 Runway 16L-34R Extension Alternatives Summary** evaluates each alternative to determine a preferred alternative.

- » Existing Condition – No Action
- » Alternative 1 – 250' Extension on Each Runway Threshold
- » Alternative 2 – 500' Displaced Threshold (RWY 16L End)
- » Alternative 3 – 500' Extension (RWY 16L End)
- » Alternative 4 – 500' Extension (RWY 34R End)
- » Alternative 5 – 500' Displaced Threshold (RWY 34R End)

» **Existing Condition – No Action**

In the existing condition of Runway 16L-34R, there are potential operations that cannot be completed due to runway length being inadequate at MTOW and high temperature conditions, when aircraft takeoff performance is reduced. Maintaining the status quo with no changes to the runway may appear cost-effective initially, but it would come at a significant cost to the airport and its users. By limiting the operations of the largest and longest-range aircraft, the airport would impede its own growth, utility, and overall business. This restriction would have adverse effects on the airport's ability to attract and serve key stakeholders, ultimately hindering its potential for development and success.

» **Alternative 1 – 250' Extension on Each Runway Threshold**

Implementing 250-foot runway extensions on both runway thresholds would eliminate the need for decision-making regarding which threshold to extend and alleviate the associated challenges of extending the runway from either end. This alternative would involve the challenges of both threshold extensions and would require extensive additional work on surrounding taxiway infrastructure in order to efficiently use the new surface. **Figure 4-8, Figure 4-9, and Figure 4-10** depict this alternative and each threshold.

» **Alternative 2 – 500' Displaced Threshold (Runway 16L Threshold)**

A 500-foot extension on the Runway 16L threshold to provide a displaced threshold would provide more space for an aircraft's takeoff roll, while also limiting new airspace impacts of moving the runway. This alternative could also eliminate an existing issue of direct runway access from an aircraft apron via Taxiway/Taxilane C. **Figure 4-11 and Figure 4-12** depict this alternative and the Runway 16L threshold.

» **Alternative 3 – 500' Extension (Runway 16L Threshold End)**

A 500-foot extension on the Runway 16L threshold end would provide the airport operational flexibility without introducing an asymmetric airfield using displaced thresholds. This alternative would, as a tradeoff, introduce new airspace considerations for Part 77 and the RPZ. **Figure 4-13 and Figure 4-14** depict this alternative and the Runway 16L threshold.

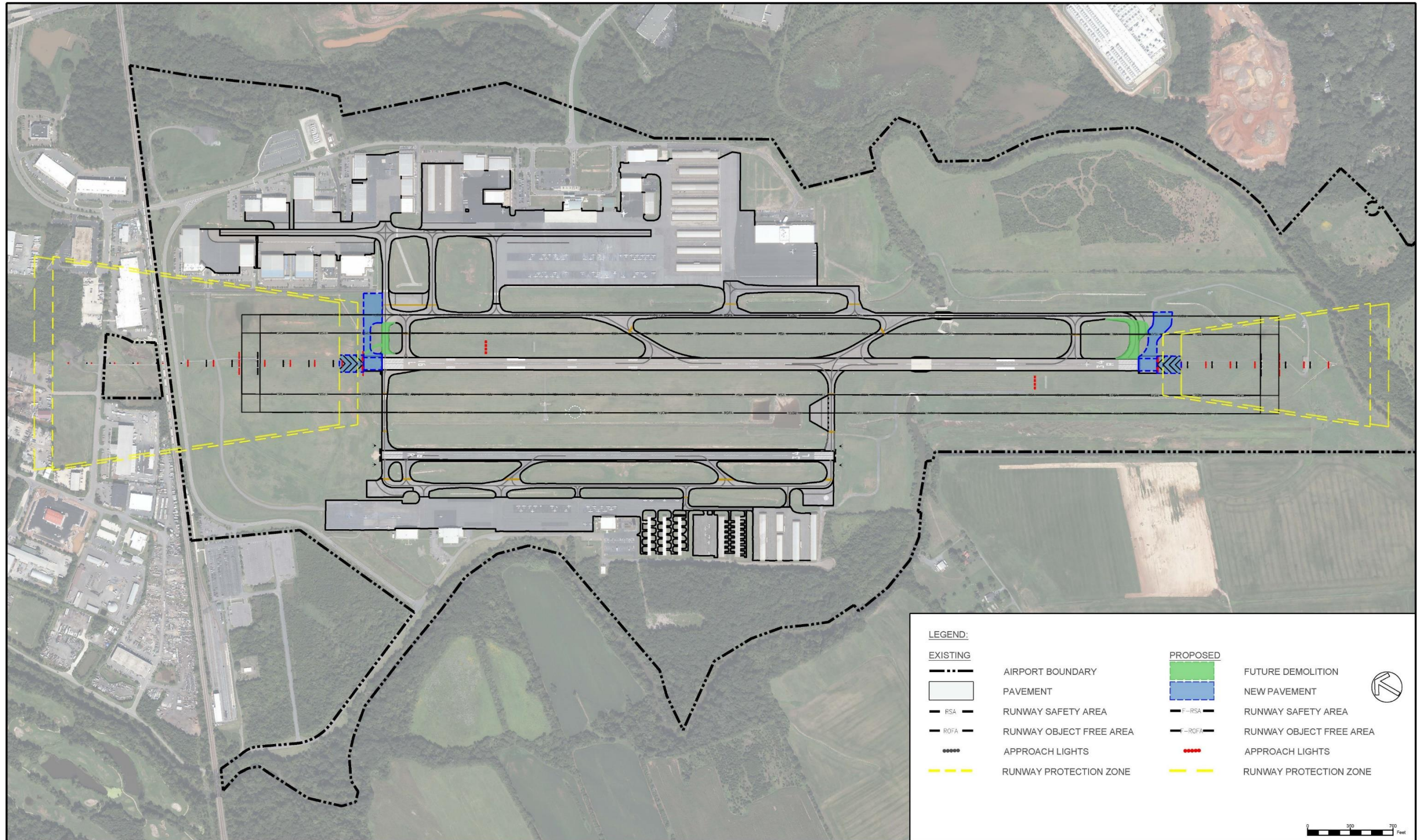
» **Alternative 4 – 500' Extension (Runway 34R Threshold)**

A 500-foot extension on the Runway 34R threshold would provide the airport operational flexibility without introducing an asymmetric airfield using displaced thresholds. This alternative would, as a tradeoff, introduce new land and environmental concerns. **Figure 4-15 and Figure 4-16** depict this alternative and the Runway 34R threshold.

» **Alternative 5 – 500' Displaced Threshold (Runway 34R Threshold End)**

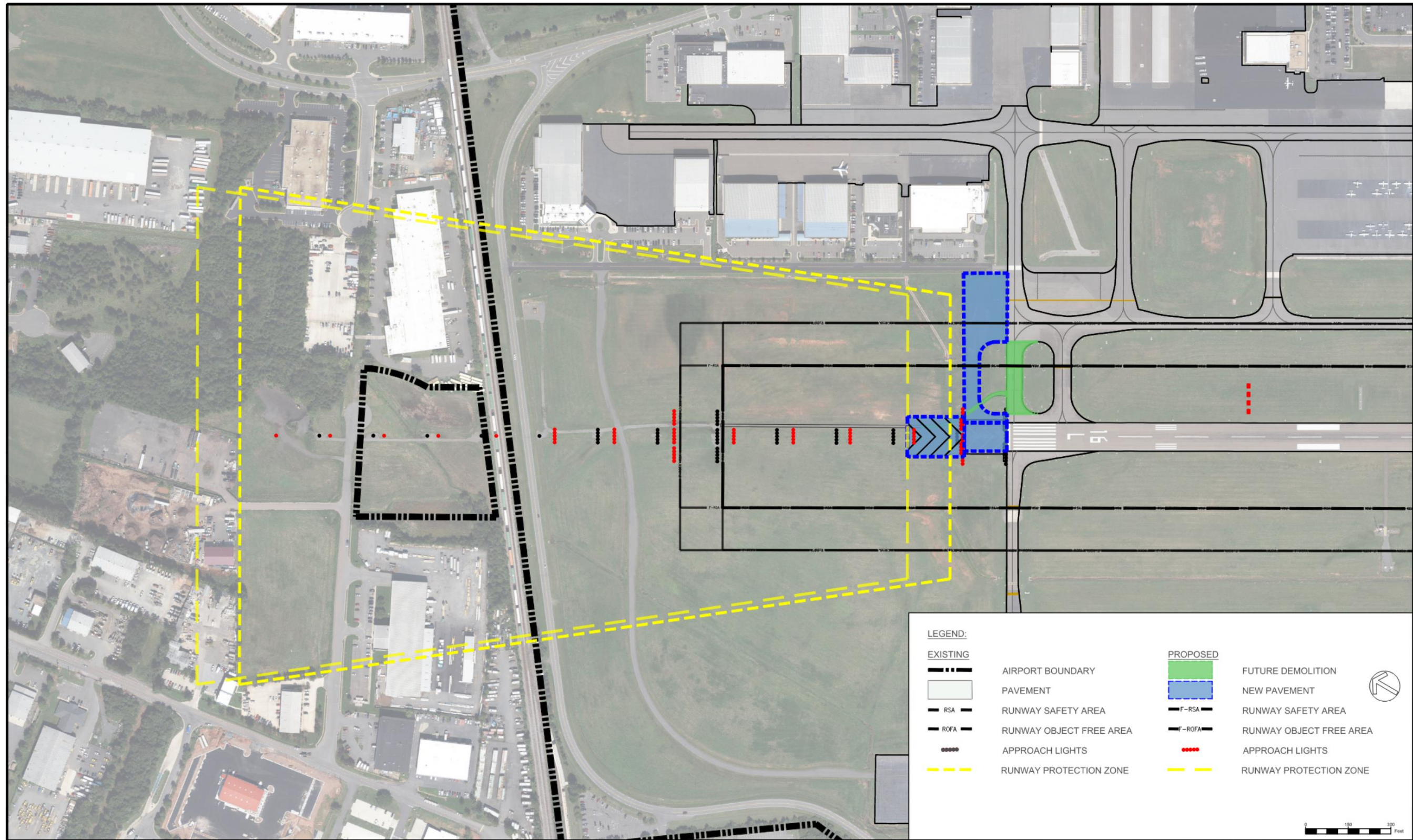
A 500-foot extension on the Runway 34R threshold end to provide a displaced threshold would provide additional more space for aircraft takeoff roll, while also limiting new airspace impacts by moving the runway. This alternative keeps the RPZ of the runway extension within the airport boundary. **Figure 4-17 and Figure 4-18** depict this alternative and the Runway 34R threshold.

FIGURE 4-8  
 ALTERNATIVE 1 – 250' EXTENSION OF BOTH RUNWAY THRESHOLDS



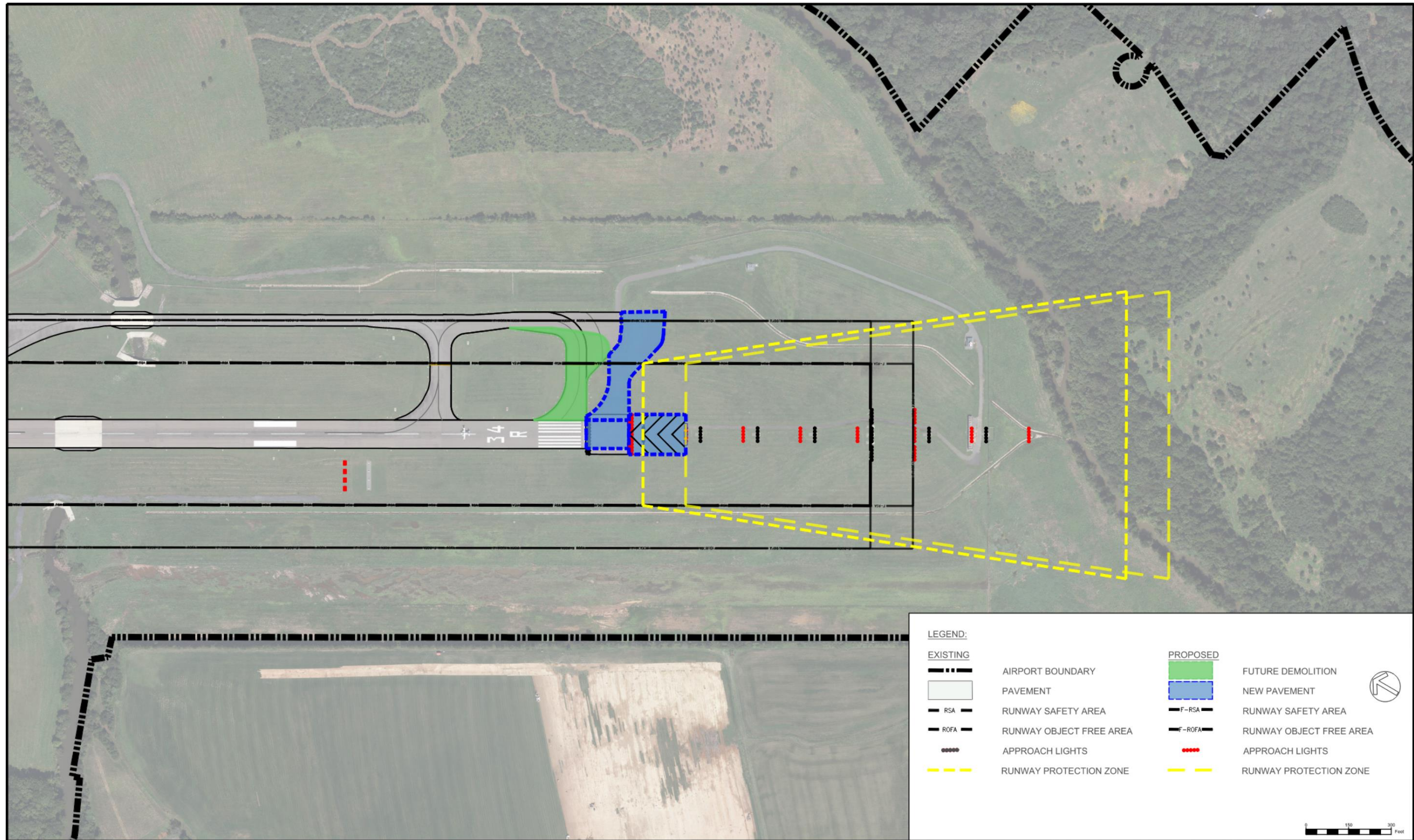
Source: RS&H Analysis, 2023

FIGURE 4-9  
 ALTERNATIVE 1 – 250' EXTENSION OF BOTH RUNWAY THRESHOLDS, 16L THRESHOLD VIEW



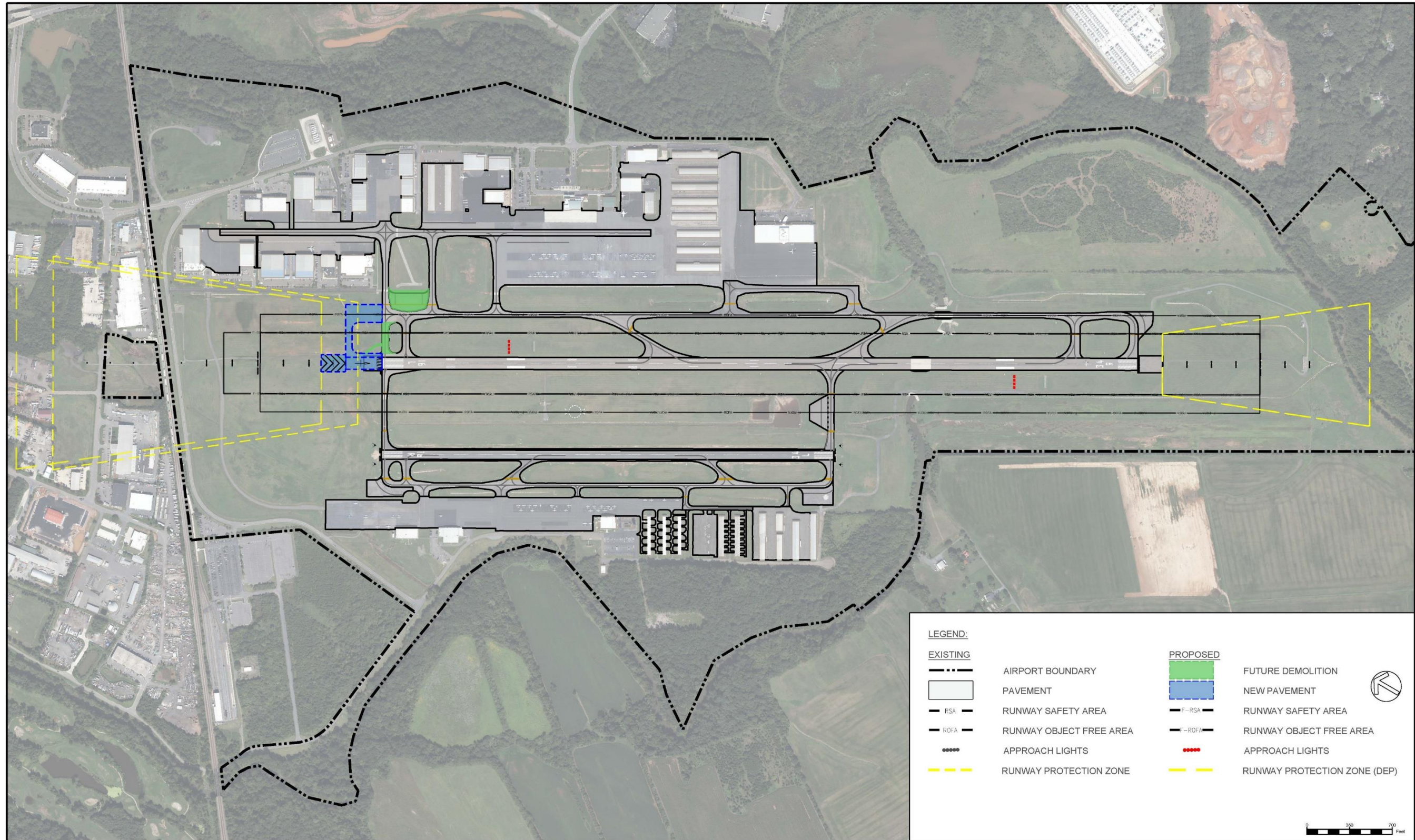
Source: RS&H Analysis, 2023

FIGURE 4-10  
 ALTERNATIVE 1 – 250' EXTENSION OF BOTH RUNWAY THRESHOLDS, 34R THRESHOLD VIEW



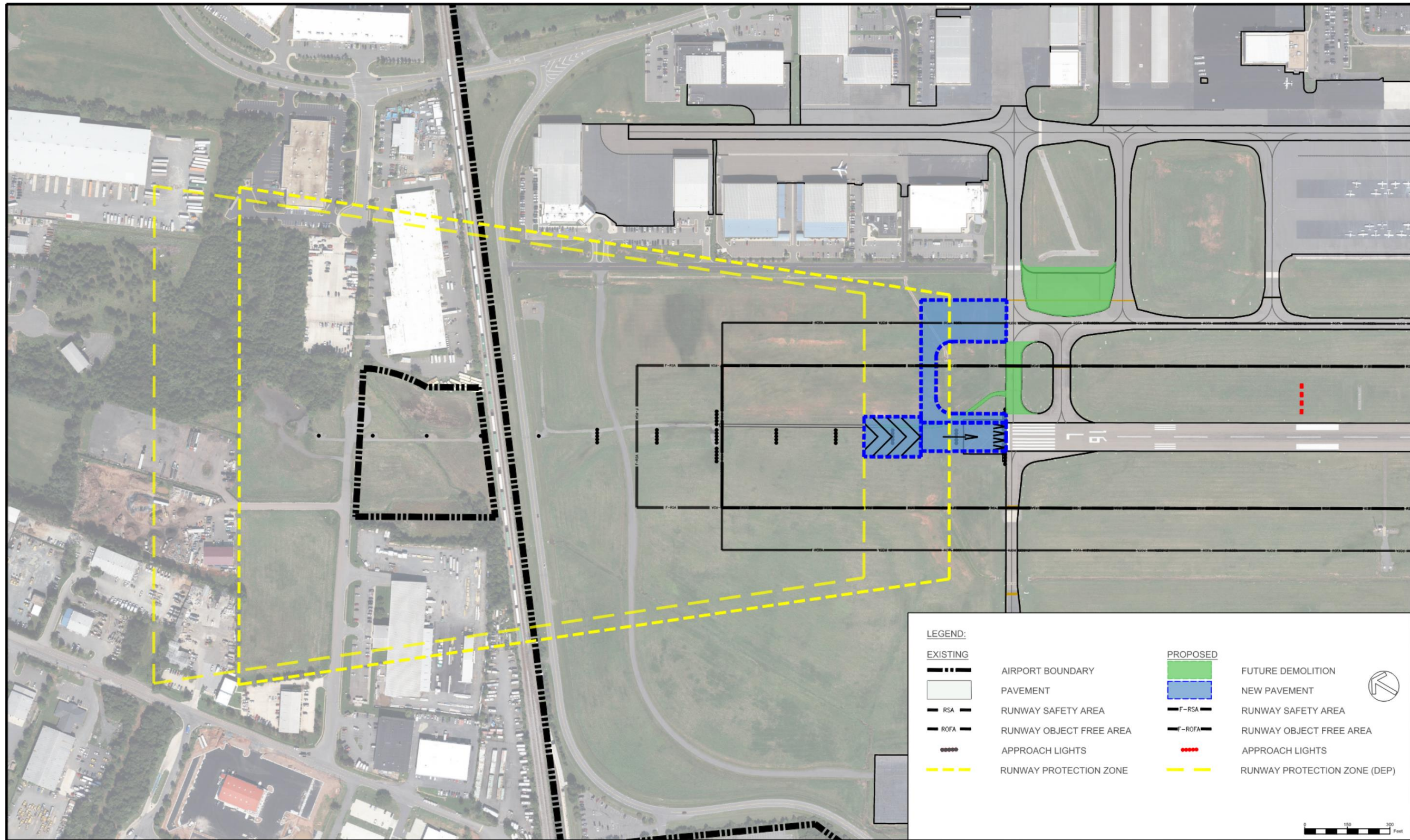
Source: RS&H Analysis, 2023

FIGURE 4-11  
 ALTERNATIVE 2 – 500' DISPLACED THRESHOLD (RUNWAY 16L THRESHOLD)



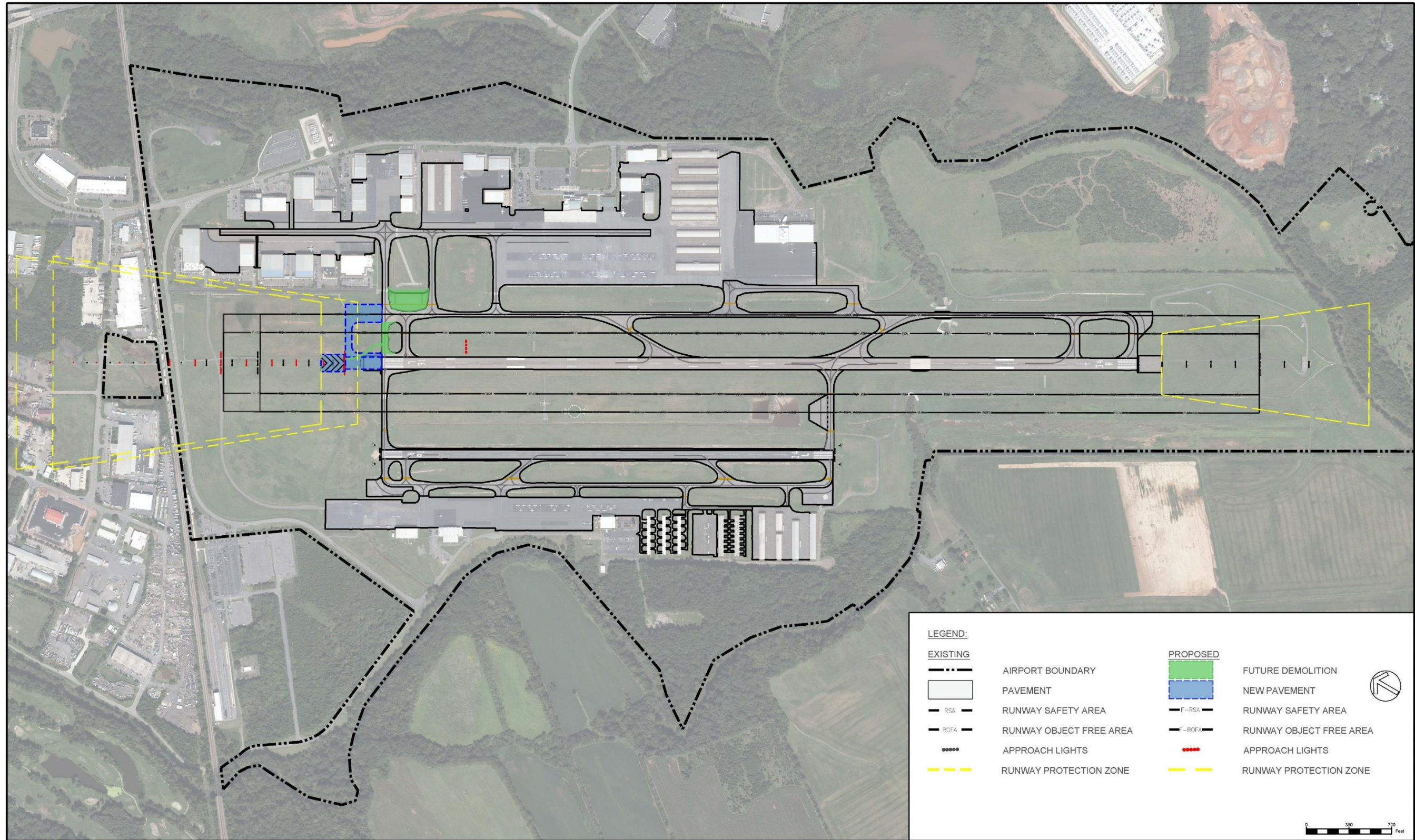
Source: RS&H Analysis, 2023

FIGURE 4-12  
 ALTERNATIVE 2 – 500' DISPLACED THRESHOLD (RUNWAY 16 THRESHOLD), 16L THRESHOLD VIEW



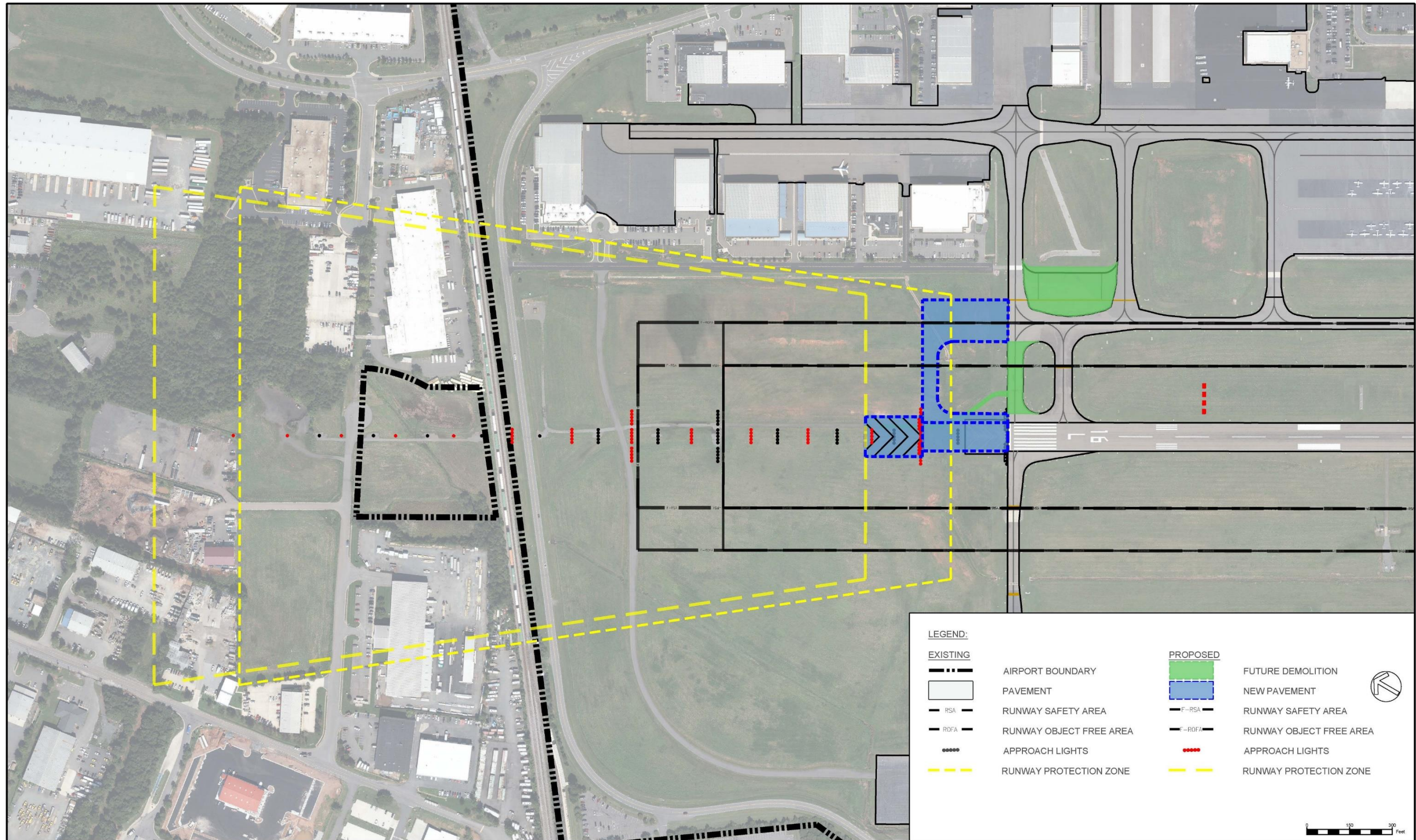
Source: RS&H Analysis, 2023

FIGURE 4-13  
 ALTERNATIVE 3 – 500' EXTENSION (RUNWAY 16L THRESHOLD)



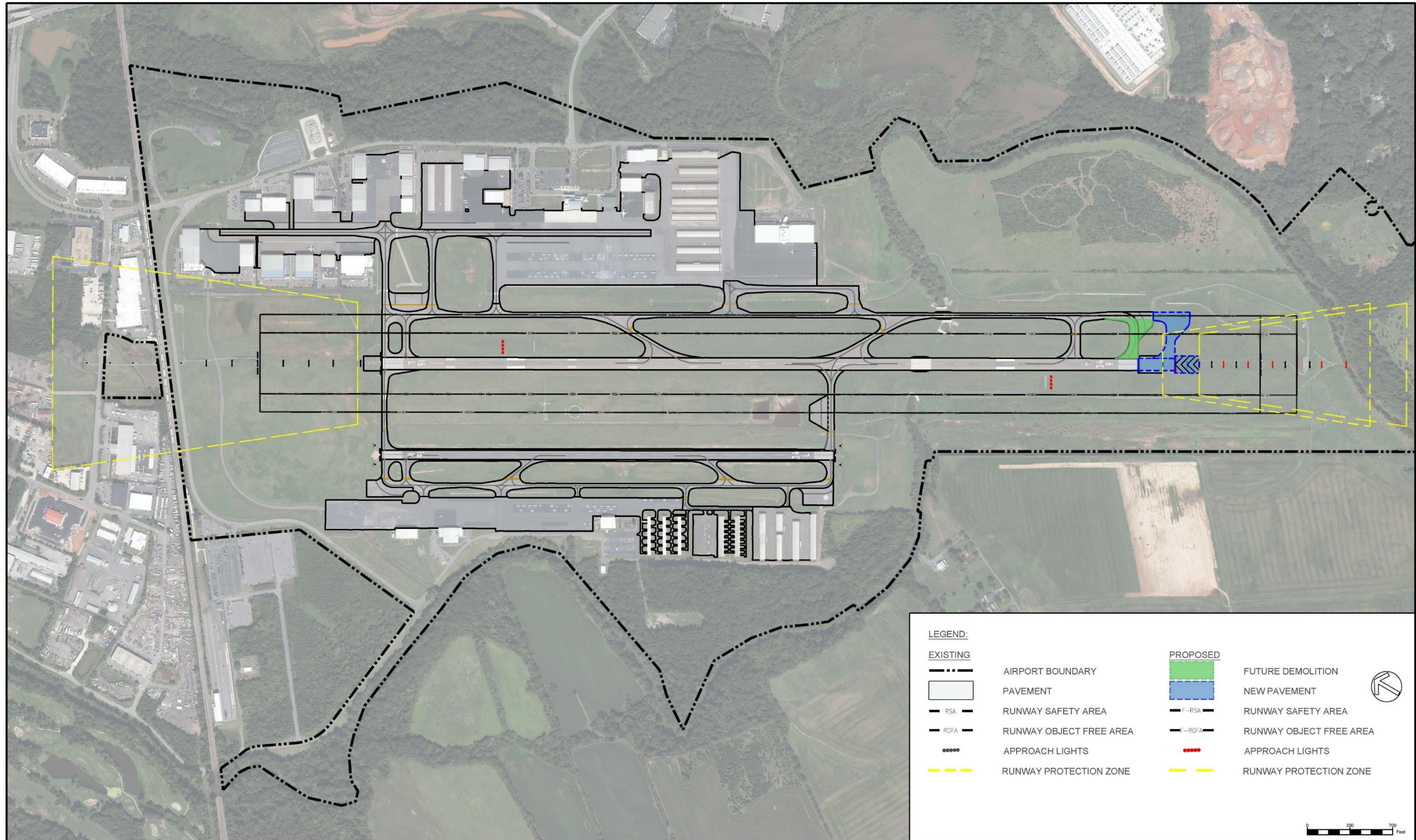
Source: RS&H Analysis, 2023

FIGURE 4-14  
 ALTERNATIVE 3 – 500' EXTENSION (RUNWAY 16L THRESHOLD), 16L THRESHOLD VIEW



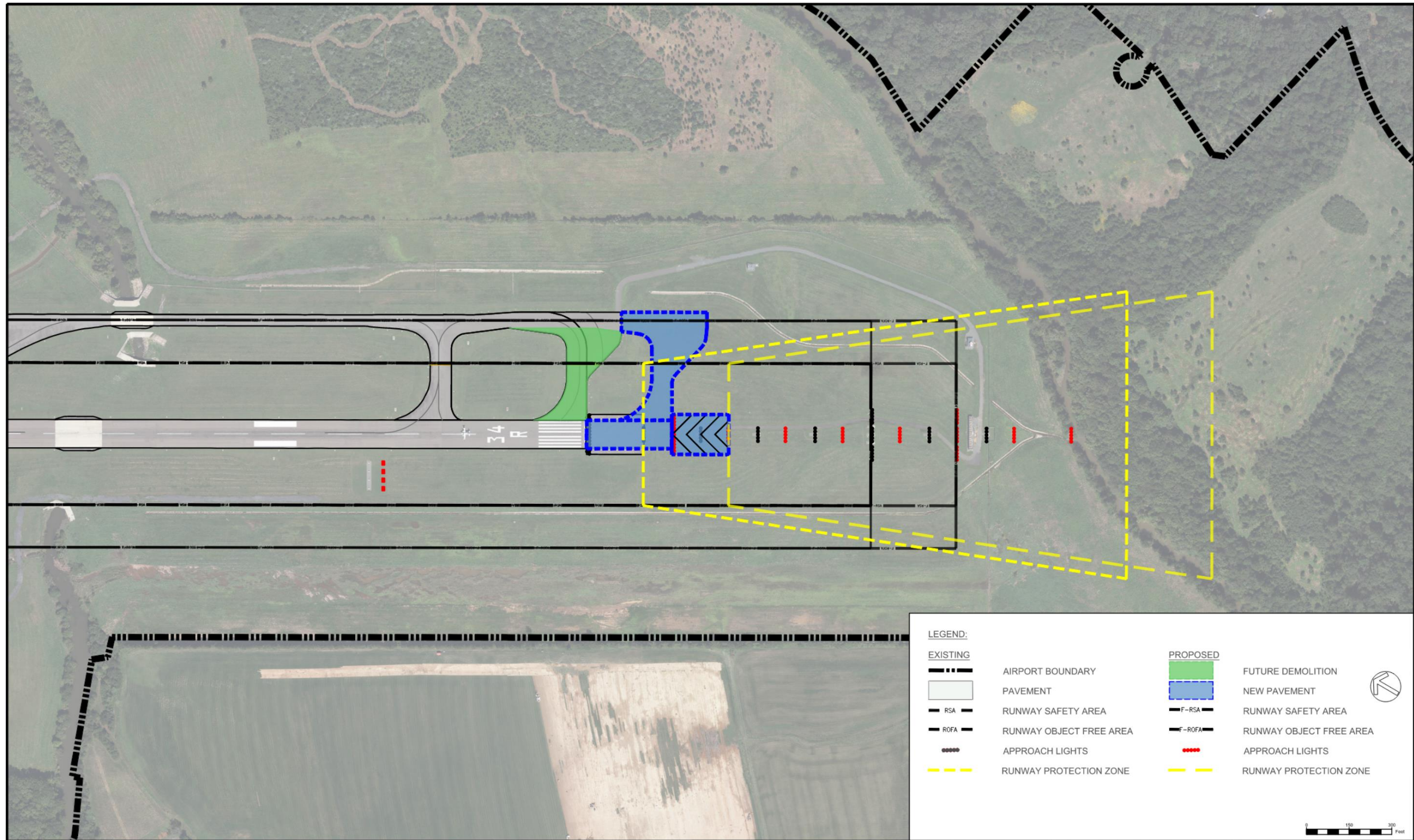
Source: RS&H Analysis, 2023

FIGURE 4-15  
ALTERNATIVE 4 – 500' EXTENSION (RUNWAY 34R THRESHOLD)



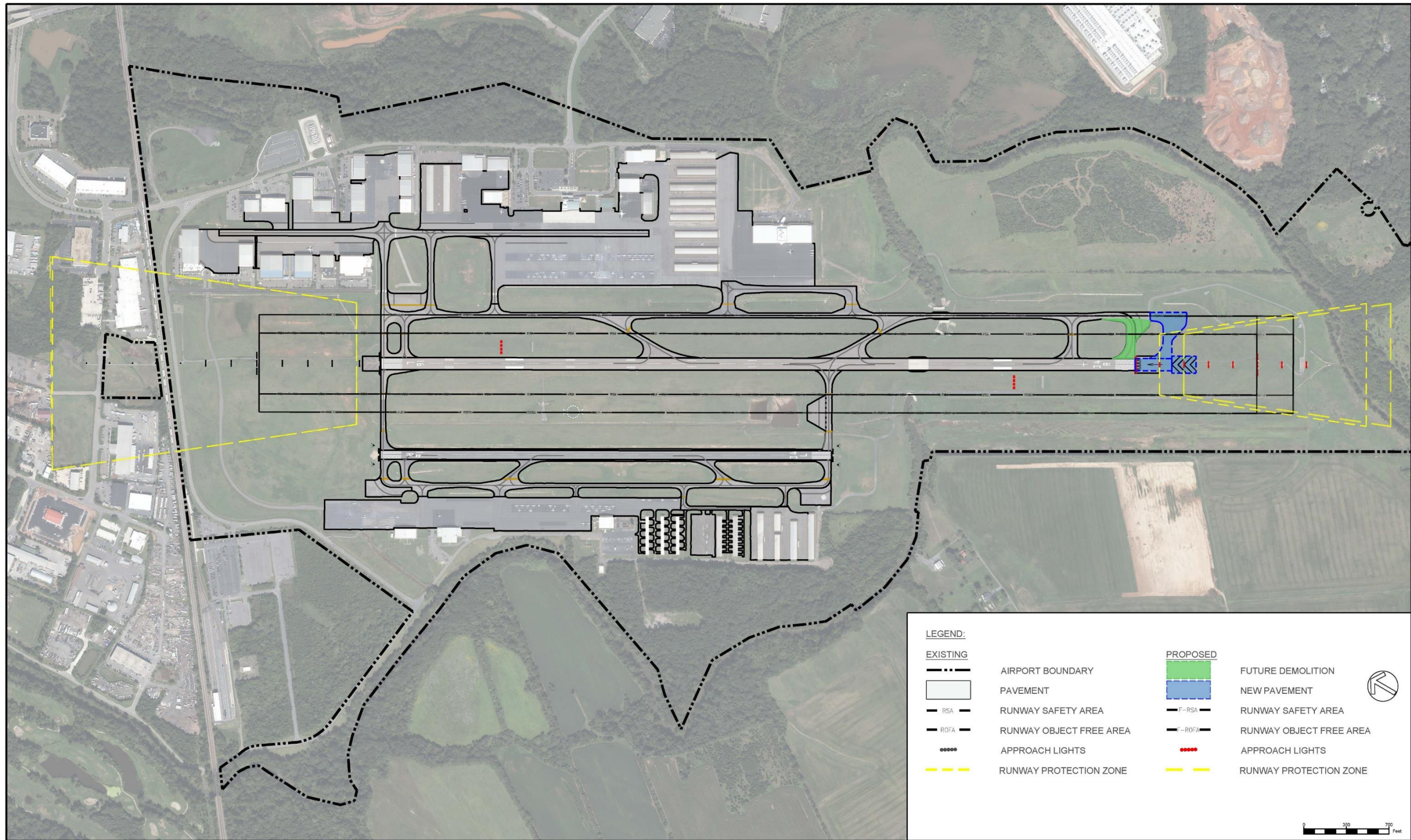
Source: RS&H Analysis, 2023

FIGURE 4-16  
 ALTERNATIVE 4 – 500' EXTENSION (RUNWAY 34R THRESHOLD), 34R THRESHOLD VIEW



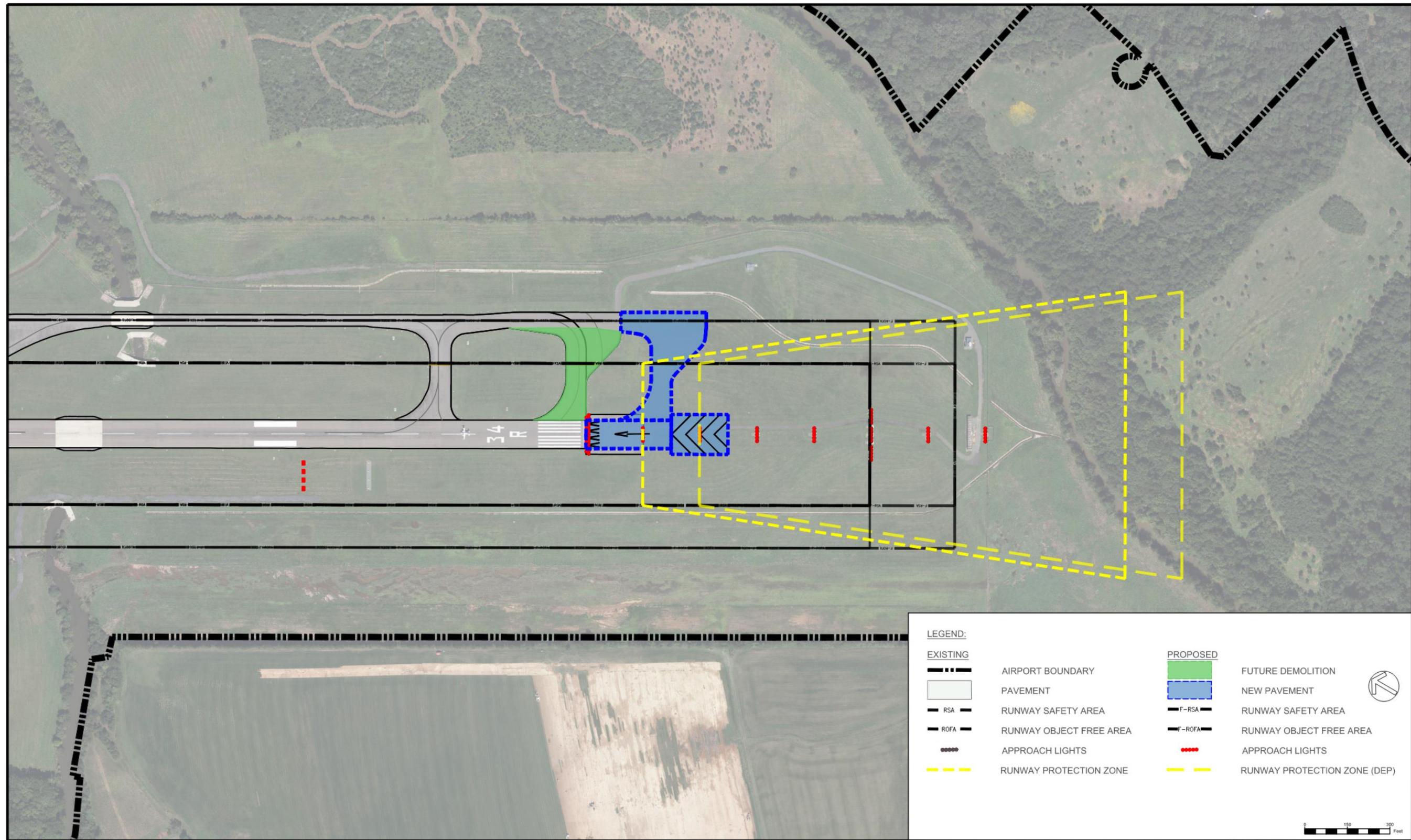
Source: RS&H Analysis, 2023

FIGURE 4-17  
 ALTERNATIVE 5 – 500' DISPLACED THRESHOLD (RUNWAY 34R THRESHOLD)



Source: RS&H Analysis, 2023

FIGURE 4-18  
 ALTERNATIVE 5 – 500' DISPLACED THRESHOLD (RUNWAY 34R THRESHOLD), 34R THRESHOLD VIEW



Source: RS&H Analysis, 2023

#### 4.4.1.2 Runway 16L-34R Extension Alternatives Evaluation

A 500-foot extension to the Runway 16L threshold end possesses challenging constraints including the presence of off-airport property land in Prince William County which would lie in the approach RPZ. Below the RPZ lies over one-acre of land owned by two separate owners. A 500-foot extension to this end of the runway would require the Airport to pursue control over the approach RPZ by ownership, possessing interest in the area through easements, or attempting to exercise eminent domain. Alternatively, extension of the Runway 34R threshold end, while not without its challenges, would not require such drastic measures to achieve the 6,700-foot runway length since the extended pavement and RPZ fall within airport property. For these reasons, alternatives extending the available takeoff pavement on the 34R threshold end appeared to be the most logical solution. A 250-foot extension on each threshold end, Alternative 1, was evaluated since the alternative met the criteria of extending the runway to 6,700 feet. This alternative ultimately has similar challenges as the 500-foot extension on the Runway 16L threshold end, Alternative 3, with less off-airport property falling under the RPZ.

Extending the allowable takeoff length for Runway 16L-34R south, 34R end, has a number of impacts that need to be addressed from the planning stage through design and implementation. NEPA requires that the Airport undergo an environmental assessment (EA) to understand the full environmental impacts of the development and ensure the public has an opportunity to review and comment on the evaluations. Additional requirements for a 500-foot extension for allowable takeoff length include environmental permitting and wetland mitigation, improvements to the future RSA, and the movement/replacement of existing navigational aids.

Based on available historical data most operations on Runway 16L-34R, approximately 56%, occur during north flow. Therefore, one alternative, Alternative 4, relocated the Runway 34R threshold 500-feet southeast. Another alternative, Alternative 5, extended the allowable takeoff pavement 500-feet southeast while Runway 34R threshold remained in place, resulting in a displaced threshold. The high-speed exit taxiway, Taxiway B3, would not require relocation in either of the alternatives since the taxiway is sited in the middle third of the runway to optimize runway capacity. Additionally, Taxiway B would be extended to reach the new threshold or edge of allowable takeoff run pavement of Runway 34R.

An evaluation of the three Runway 16L-34R extension alternatives and the existing (No Action) condition is provided below and shown in **Table 4-1**.

- » **Safety:** The safety of the runway and its users improves with length, especially during the higher temperature days experienced at the Airport.
- » **Operational Efficiency:** Extending the runway to a total TORA of 6,700 feet would improve the Airport's operational efficiency by meeting operating aircraft performance demands and limiting weight restrictions and stops at airports with longer length runways to refuel.
- » **Meets FAA Design Standards:** FAA design standards can be met when providing a total TORA of 6,700 feet.




- » **Effectively Serves Target User:** Currently, the runway effectively serves the majority of business jet traffic operating out of the Airport, however, if the runway were extended it would allow aircraft to operate out of the airport without weight restrictions. Extending the runway offers an additional advantage as it increases the Takeoff Run Available (TORA), which has the potential to attract greater general aviation and commercial air service. This extension could entice new or existing operators with a wider range of aircraft types to serve previously unserved markets, thereby enhancing the airport's overall connectivity and expanding its potential customer base.
- » **Resolves Current Issues:** In its current state, the runway does not provide the performance abilities needed by operators of heavier business jets during higher temperature days at the Airport. Extending the runway length TORA to 6,700' resolves this issue.
- » **Meets Long-Term Facility Needs:** Extending the runway would meet forecast near-term and long-term facility needs.
- » **Appropriate Level of Service:** Level of service is improved by extending the runway as it will limit operators repositioning to an airport with a longer runway to refuel prior to traveling to their final destination. Keeping the runway at its existing length maintains the Airport's existing level of service by maintaining the existing issues with service reliability as well as limiting the potential for increasing general aviation and commercial service traffic and markets available to the community.
- » **Ease of Implementation:** Alternative 4 and Alternative 5 can be implemented with generally the same degree of minimal operational impacts compared to Alternative 1, Alternative 2, and Alternative 3.
- » **Cost of Implementation:** Implementation costs for any runway extension is manageable when funded through available federal, state, and local financially supportive agencies. Associated costs for a runway extension include advanced planning studies, the NEPA process, land acquisition (for the extended RPZ), design, and construction.
- » **Flexible for Future Expansion:** A runway extension of 500' to the southeast maintains flexibility for future expansion of the airfield and runway without causing additional conflicts to previously developed land and roadways to the north.
- » **EONS Impact:** Impacts to EONS categories vary by each alternative. No action jeopardizes economic viability, operational efficiency, and community social responsibility factors. Extending the runway has the impact of changing the natural environment.

It is recommended that HEF plan to extend the runway to 6,700' within the near- to mid-term of the planning period. **Table 4-1** shows an evaluation of the runway extension alternatives.

**TABLE 4-1  
RUNWAY 16L-34R EXTENSION ALTERNATIVES EVALUATION MATRIX**

Evaluation Criteria	Runway Extension Alternatives					
	Existing (No Action)	Alt. 1 (250' Ext. Each End)	Alt. 2 (Displaced Threshold)	Alt. 3 (500' Ext. 16L End)	Alt. 4 (500' Ext. 34R End)	Alt. 5 (Displaced Threshold. 34R End)
Safety	Good	Good	Good	Good	Good	Good
Operational Efficiency	Fair	Poor	Poor	Poor	Good	Good
Meets FAA Design Standards	Fair	Good	Fair	Fair	Good	Good
Effectively Serves Target User	Fair	Fair	Poor	Fair	Good	Good
Resolves Current Issues	Poor	Poor	Poor	Fair	Good	Good
Meets Long-Term Facility Needs	Poor	Fair	Fair	Good	Good	Good
Appropriate Level of Service	Fair	Poor	Fair	Fair	Good	Good
Ease of Implementation	Good	Poor	Poor	Poor	Fair	Fair
Cost to Implement	Good	Poor	Fair	Poor	Fair	Fair
Flexible/Future Expansion	Good	Poor	Poor	Poor	Good	Fair
EONS Impact	Good	Poor	Poor	Poor	Fair	Fair

**Performance Legend**

Good	
Fair	
Poor	

Source: RS&H Analysis, 2022

#### 4.4.1.3 Runway 16L-34R Extension Alternatives Summary

After careful evaluation and comparison between current conditions (no change) and all alternatives, it has been determined that Alternative 4 – 500’ extension of the 34R threshold is the preferred alternative. This alternative provides the solution to the required 500’ additional runway surface, without restricting the use of this new surface by restricting its use to a displaced threshold or introducing declared distances. This alternative provides operational efficiency, and provides relative ease of environmental approval, construction, and future improvement.

#### 4.4.2 Taxiway/Taxilane Alternatives

##### 4.4.2.1 Taxiway/Taxilane C Configuration

Taxiways are the most important facility on the airport after runways, as they provide aircraft access to all facilities to and from the runway. **Chapter 3, Inventory and Facility Requirements** identifies some existing taxiway components that do not meet updated FAA design standards. An alternative analysis was prepared for the current site of Taxiway/Taxilane C. Taxiway/Taxilane C is the nearest taxing pavement to the east of Runway 16L threshold connecting operators to/from the primary runway. In between Taxilane C and Taxilane D, there is an aircraft hold pad so aircraft can do final checks before departure. In its current configuration, the taxiway does not meet FAA design standards in two notable ways:

- » **Direct Runway Access from Apron** – Taxiway/Taxilane C provides a direct path from an aircraft apron to the runway. This can lead to situations where pilots could lose situational awareness and inadvertently enter the runway, resulting in a runway incursion. This condition does not align with FAA design standards.
- » **TLOFA Penetration** - A fenceline and concrete drainage ditch penetrates Taxiway/Taxilane C’s taxilane object free area (TLOFA). Per AC 150/5500-13B – *Airport Design* a TLOFA is an area adjacent to the Taxiway Safety Area (TSA) that is clear of objects not fixed-by-function to provide vertical and horizontal wingtip clearance. The TLOFA protects aircraft surfaces, such as wingtips and tails, from damage when taxiing in a taxilane. Objects such as fencelines and concrete drainage ditches should not exist in TLOFAs, as they pose a collision risk to aircraft and does not align with FAA design standards.

Many alternatives were generated in order to address the issues at hand, ranging from no or very little action to rebuilding the entire taxiing pavement. Each alternative gave a unique perspective to solving these issues, while attempting to avoid generating new issues. The existing conditions and the eight alternatives generated are listed below with associated descriptions:

##### » **No Action**

As mentioned, the current configuration has two major issues regarding direct runway access from the apron and TLOFA penetration. This is not safe for current or future aircraft operations at the airport, and does not meet FAA design standards. By not changing this configuration, there will be no construction costs, but significant safety concerns remain.

» **Alternative 1 – Shift Taxiway/Taxilane C South**

The first alternative considered shifts taxiway/taxilane C south while maintaining all other infrastructure as is. This alternative is the simplest in principle, as it moves the taxilane as to not have direct access to the runway and outside of the TLOFA penetration. This alternative eliminates the run up area for aircraft preparing for departure however, this would pose a major operational impact for aircraft using the Airport. Aircraft will still need to runup and will cause congestion by doing so in taxiways that access the runway, blocking access for users ready to depart.

» **Alternative 2 – Shift Fence and Ditch Outside TLOFA, Install No-Taxi Island**

The second alternative shifts the TLOFA penetration itself, moving the fence and concrete ditch to the north. To fix the direct access from the apron to the runway, a no-taxi island is marked in the pavement area between taxilane C and taxiway C to interrupt the direct access. This alternative will also unfortunately eliminate the runup area due to the no-taxi island eliminating the required space for the runup area.

» **Alternative 3 – Shift Taxiway/Taxilane C South with Additional Runup Area**

The third alternative shifts taxiway/taxilane C to the south similar to Alternative 1, but in addition it incorporates a new portion of pavement to the north of taxiway/taxilane C dedicated to replacing the runup area that is eliminated with the taxiway/taxilane C shift. This eliminates one of the issues regarding Alternative 1, but it introduces additional construction for the surface and requires coordination with the ADO to alleviate risk of impacting the critical areas. This new surface is near many important areas, such as the movement area and the Precision Obstacle Free Zone (POFZ) which it abuts. Due to this level of complexity, it likely will not draw support from the ADO.

» **Alternative 4 – Eliminate Taxiway/Taxilane C and Replace Area with Development**

The fourth alternative would entirely eliminate taxiway/taxilane C, removing any runway access or TLOFA penetration as aircraft would no longer use the surface. This new area would be used for flight facility development for an aeronautical use. This alternative would entirely eliminate any of the major issues, but would also decrease the level of service provided in the area. Taxi times in the area would increase due to congestion, and flexibility for future development would be hampered.

» **Alternative 5 – Shift Fence and Ditch Outside TLOFA**

The fifth alternative shifts the TLOFA penetration itself, moving the fence and concrete ditch to the north. This alternative would not address the direct apron to runway access.

» **Alternative 6 – Shift Taxiway/Taxilane C South Minimum Distance for TLOFA Penetration Clearance**

The sixth alternative shifts taxiway/taxilane C south the minimum distance required to clear it of the TLOFA penetration. This solution does not address the direct access from apron to runway, meaning it does not meet FAA design standards. This also introduces a construction cost for a relatively small change to the airfield, which may be inefficient.

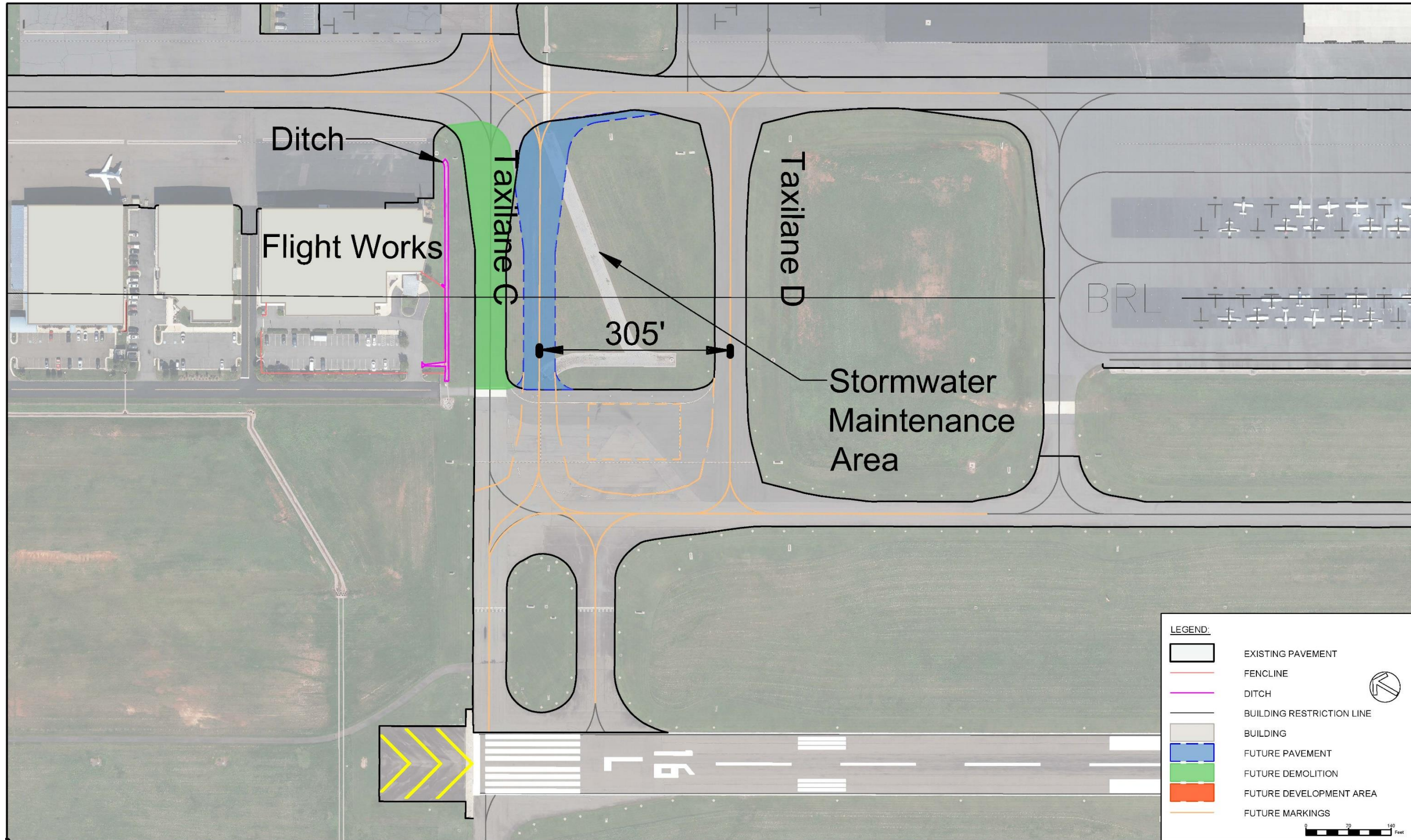
» **Alternative 7 – Redirect Taxiway/Taxilane C South and Shift Taxilane D South with Runup Area**

The seventh alternative introduces a curve on taxilane/taxiway C after its initial path, as to avoid the TLOFA penetration and to eliminate the direct apron access to the runway. To prevent the runup area from being eliminated as well, its current size is preserved as it is shifted to the south, and taxiway D is also shifted south the same amount. This solution is more expensive than most others due to taxiway D being shifted as well, and the somewhat abrupt curve may cause operational hiccups or loss of situational awareness for pilots used to the previous configuration.

» **Alternative 8 – Shift Taxiway/Taxilane C and TXL D South with Runup Area**

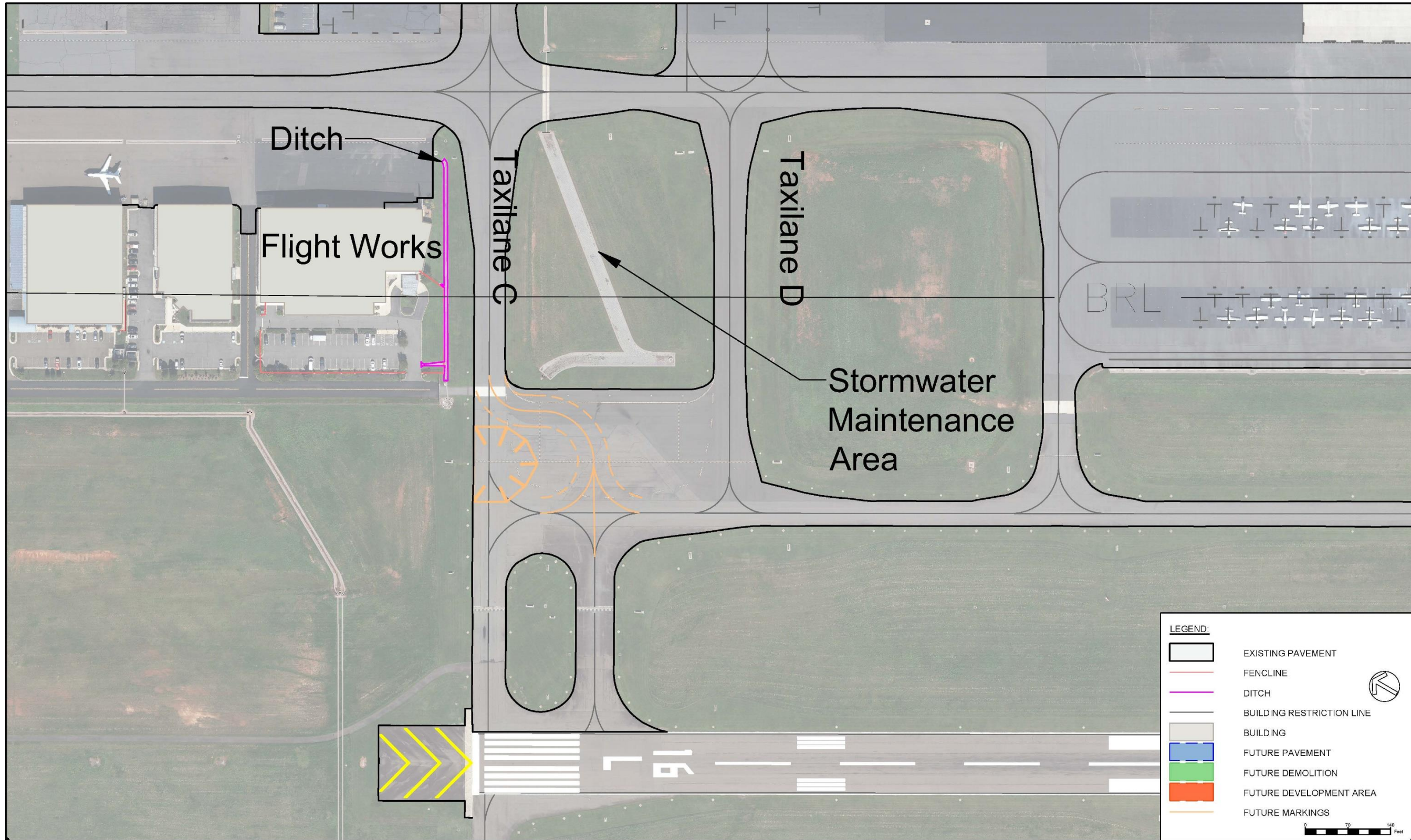
The eight alternative shifts taxiway/taxilane C, the existing runup area, and taxilane D to the south as to avoid the direct access to the runway from the apron, and to eliminate the TLOFA penetration. This will likely be the most expensive of the alternatives, as the entirety of the taxiway/taxilanes will be moved, needing extensive construction.

FIGURE 4-19  
 ALTERNATIVE 1 – SHIFT TAXIWAY/TAXILANE SOUTH W/ NO RUNUP AREA



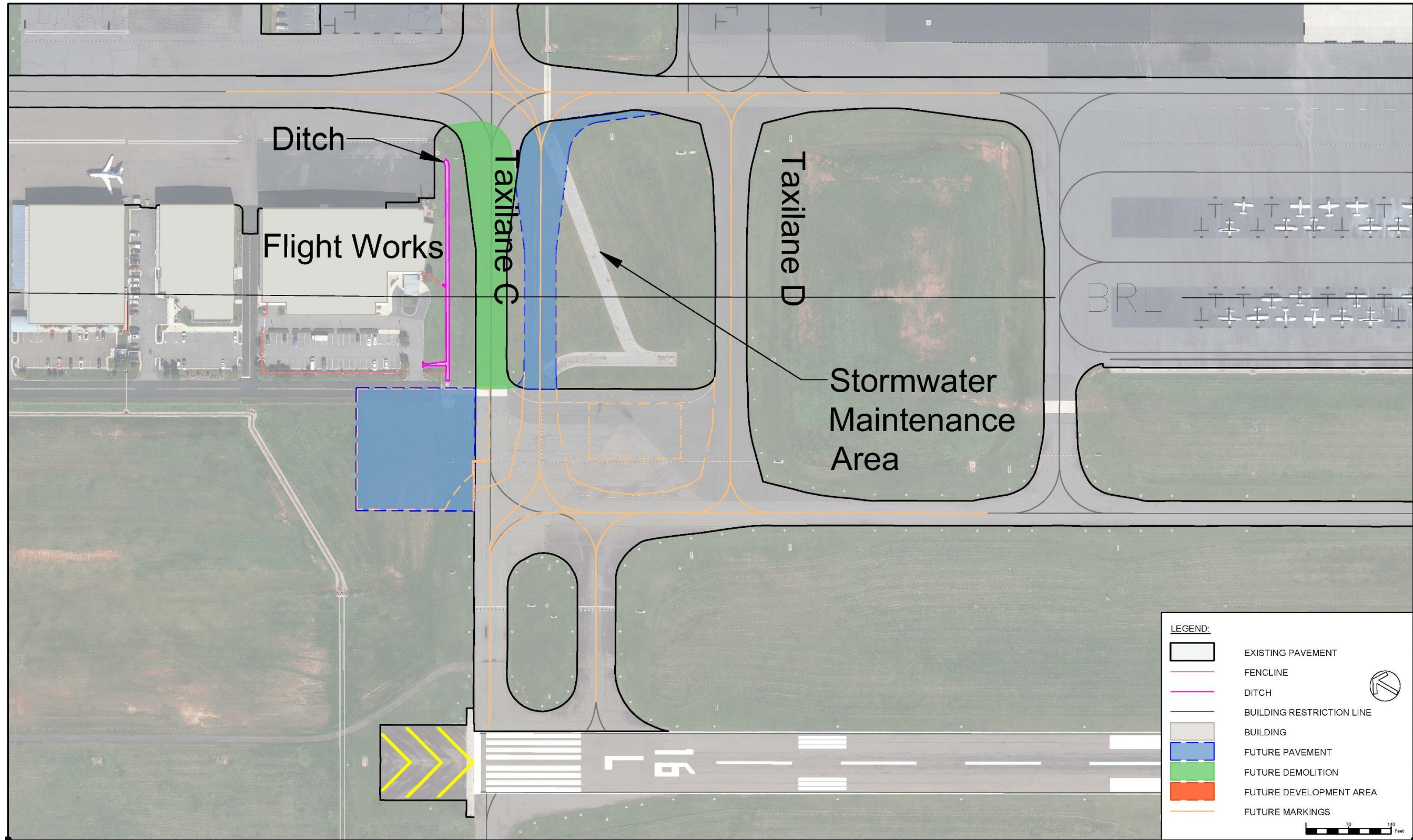
Source: RS&H Analysis, 2023

FIGURE 4-20  
 ALTERNATIVE 2 – SHIFT FENCE AND NO TAXI ISLAND W/ NO RUNUP AREA



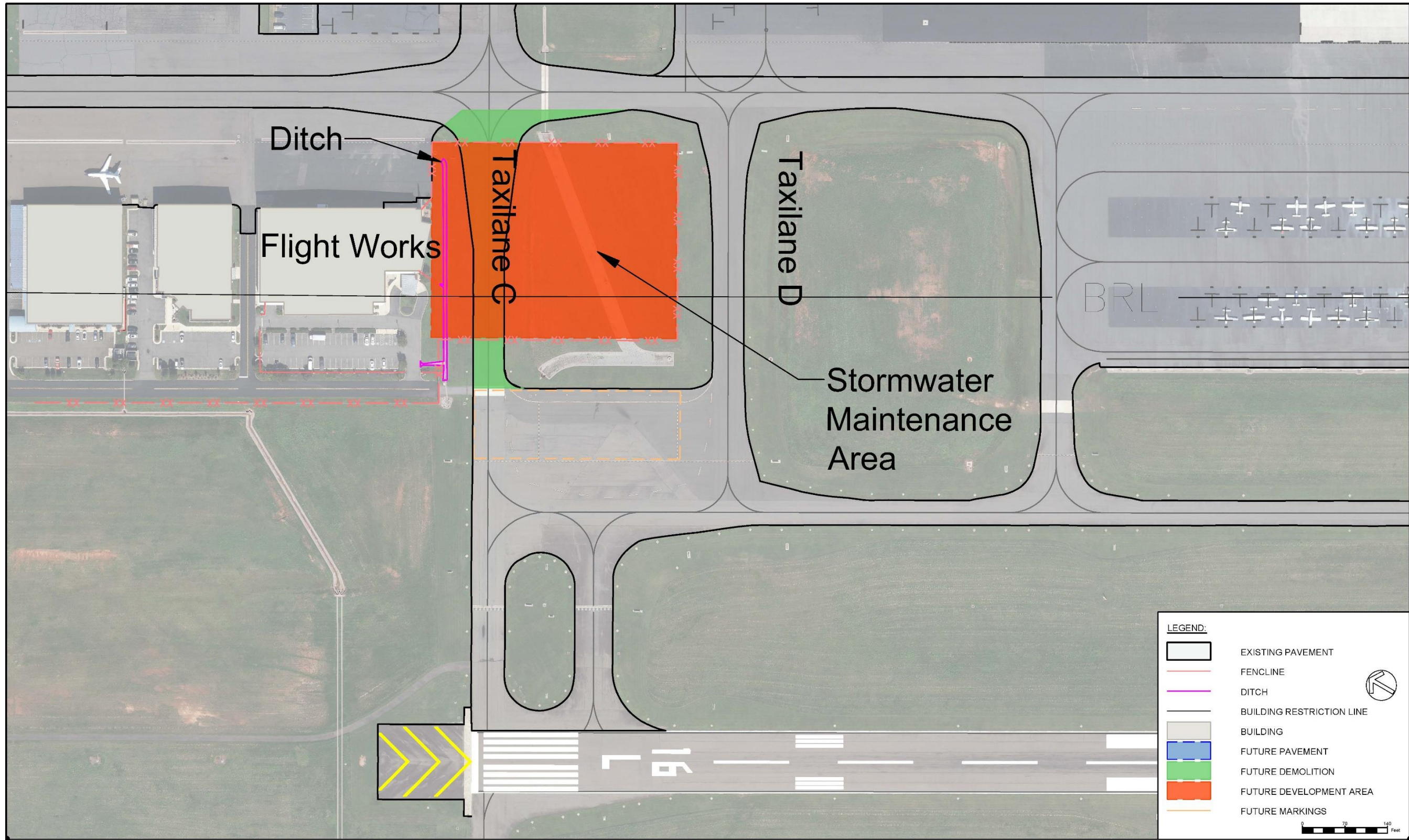
Source: RS&H Analysis, 2023

FIGURE 4-21  
 ALTERNATIVE 3 – SHIFT TAXIWAY/TAXILANE SOUTH W/ RUNUP AREA



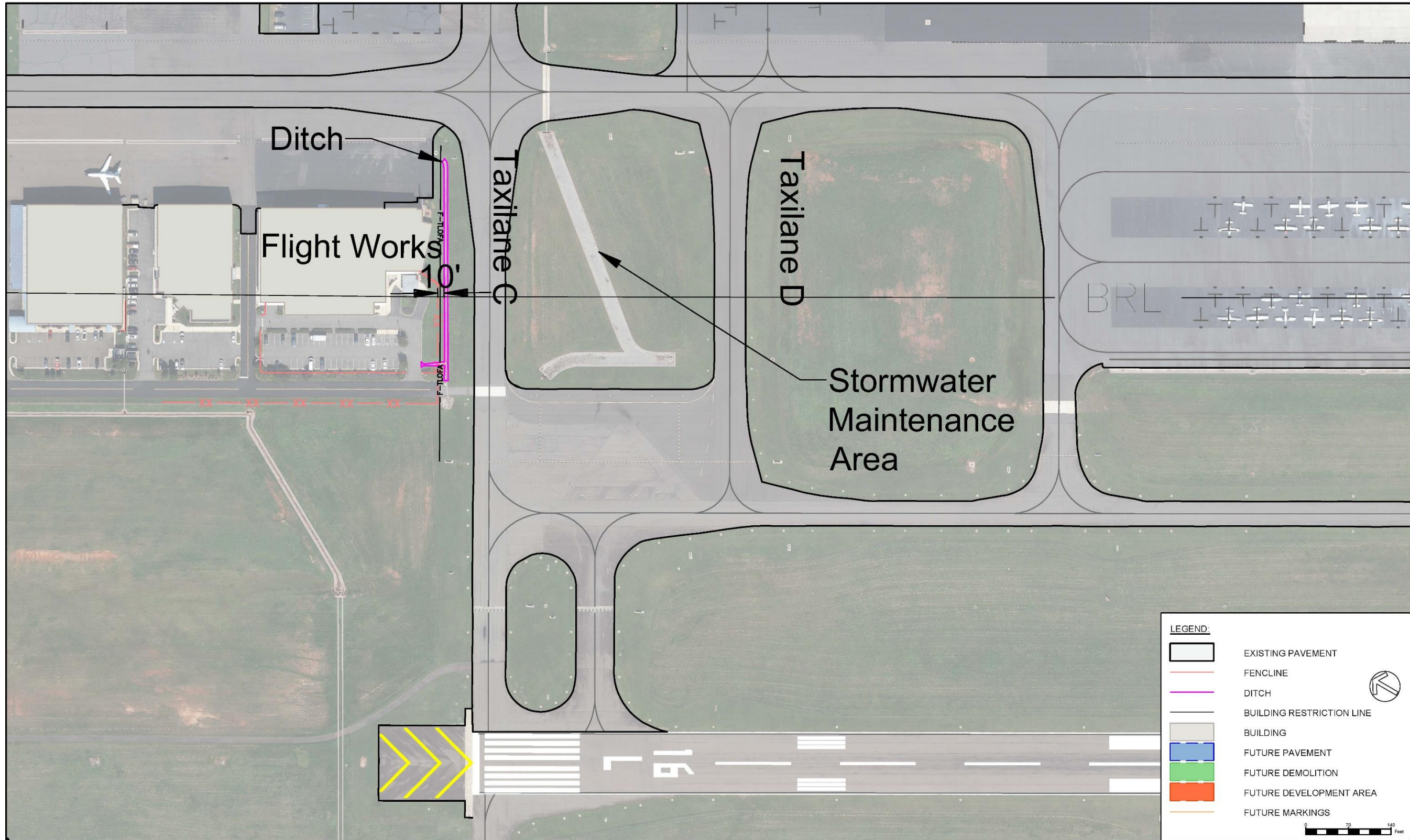
Source: RS&H Analysis, 2023

FIGURE 4-22  
 ALTERNATIVE 4 – DEMO TAXIWAY/TAXILANE & REPLACE WITH DEVELOPMENT



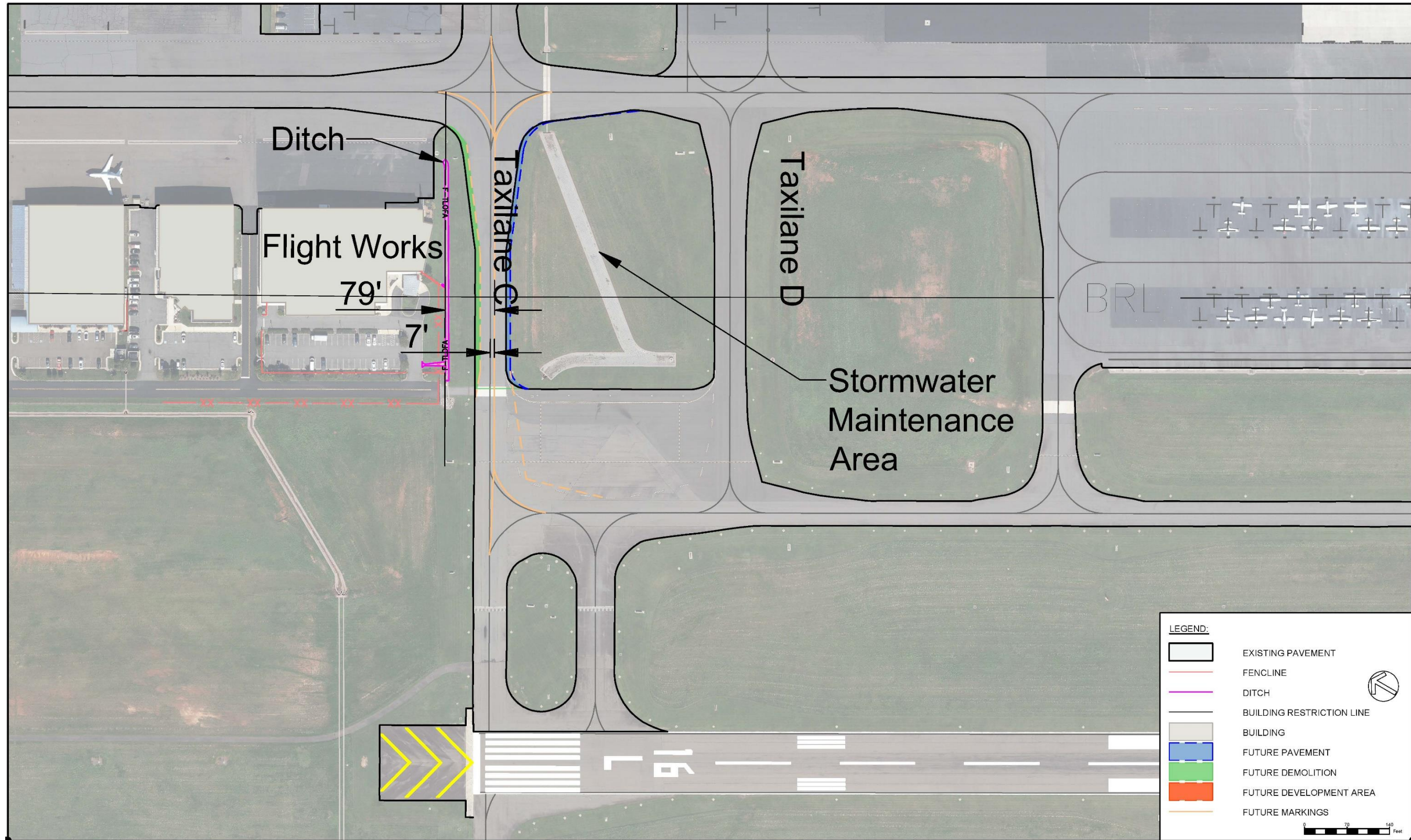
Source: RS&H Analysis, 2023

FIGURE 4-23  
 ALTERNATIVE 5 – SHIFT FENCE AND DITCH REMEDIATION



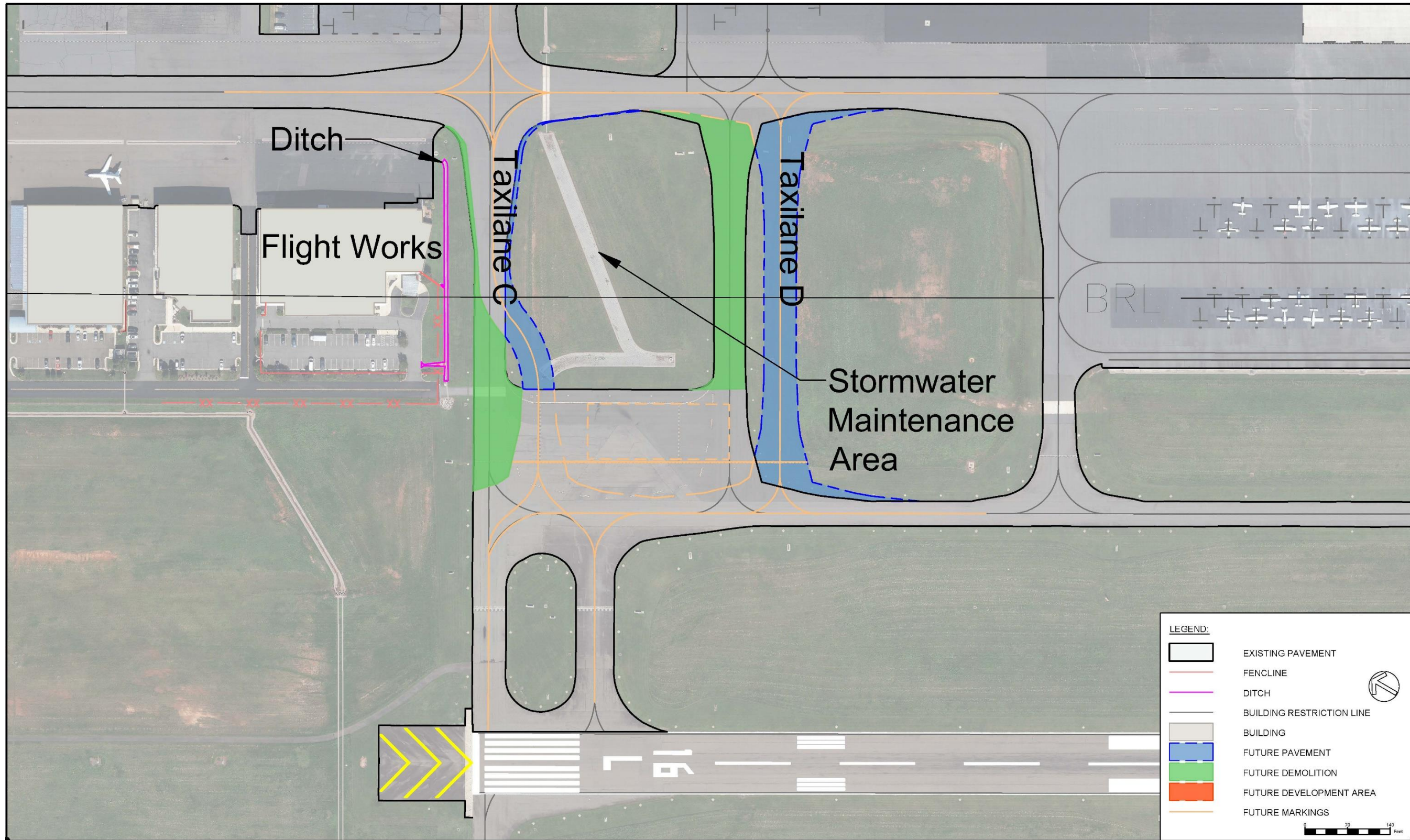
Source: RS&H Analysis, 2023

FIGURE 4-24  
 ALTERNATIVE 6 – SLIGHTLY SHIFT TAXIWAY/TAXILANE SOUTH



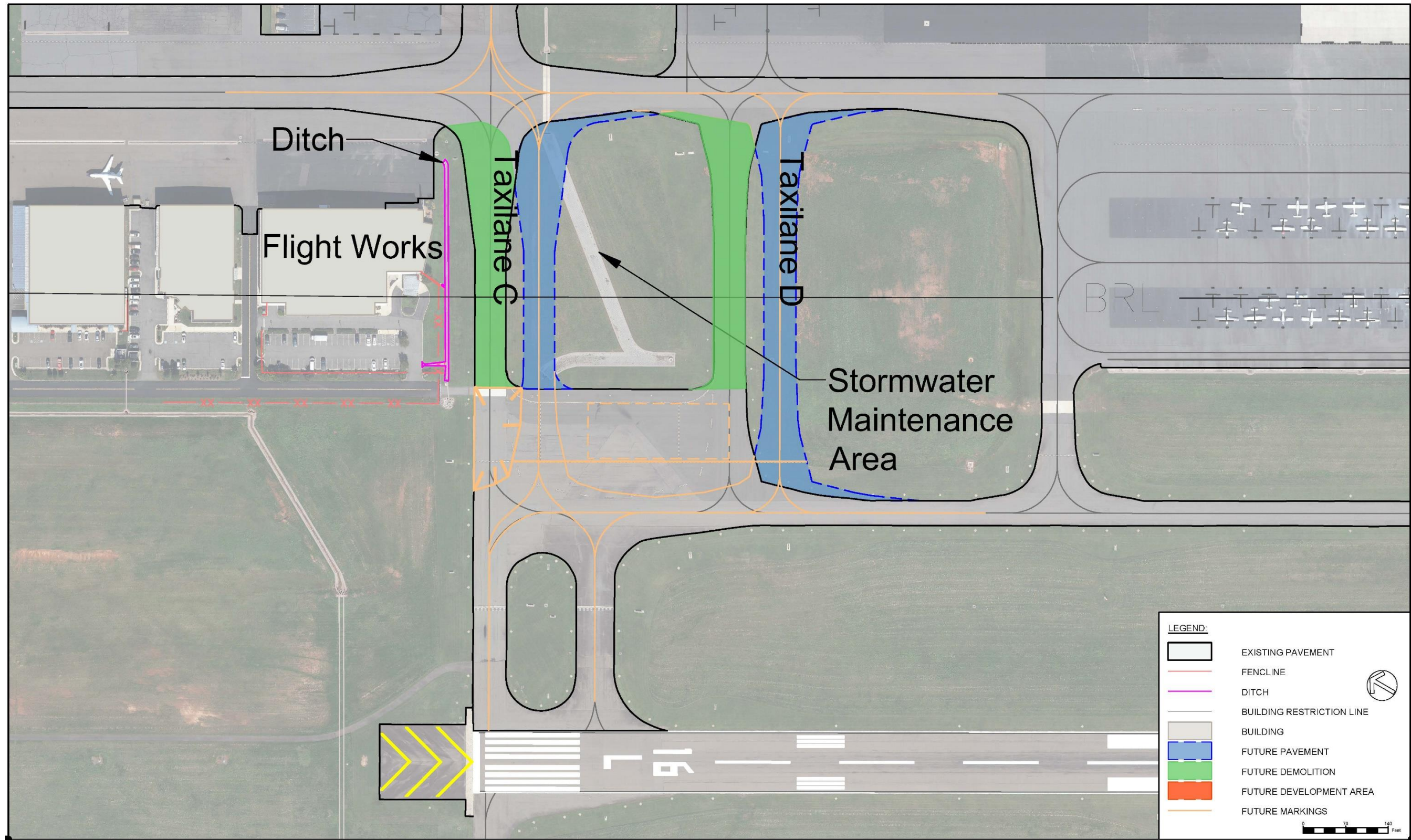
Source: RS&H Analysis, 2023

FIGURE 4-25  
 ALTERNATIVE 7 – SHIFT TXL C SOUTH OUT OF TLOFA AND TAXILANE D SOUTH WITH RUNUP AREA



Source: RS&H Analysis, 2023

FIGURE 4-26  
 ALTERNATIVE 8 – SHIFT TAXILANE C SOUTH AND SHIFT TAXILANE D SOUTH WITH RUNUP AREA


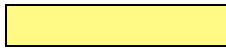



Source: RS&H Analysis, 2023

TABLE 4-2  
TAXIWAY/TAXILANE C & DIRECT RUNWAY ACCESS ALTERNATIVES EVALUATION MATRIX

Evaluation Criteria	Taxiway/Taxilane C & Direct RWY Access Alternatives								
	Existing (No Action)	Alt. 1 (Shift TWY/TXL South w/ no runup area)	Alt. 2 (Shift Fence and No Taxi Island w/ no runup area)	Alt. 3 (Shift TWY/TXL South w/ runup area)	Alt. 4 (Demo TWY/TXL & replace with development)	Alt. 5 (Shift Fence and ditch remediation)	Alt. 6 (Slightly Shift TWY/TXL South)	Alt. 7 (Shift TXL C South out of TLOFA and TXL D with runup area)	Alt. 8 (Shift TXL C South and shift TXL D South with runup area)
Safety	Yellow	Green	Green	Green	Red	Yellow	Yellow	Yellow	Green
Operational Efficiency	Green	Yellow	Red	Red	Red	Green	Green	Red	Green
Meets FAA Design Standards	Red	Green	Green	Yellow	Yellow	Red	Yellow	Yellow	Green
Effectively Serves Target User	Green	Yellow	Red	Green	Yellow	Green	Green	Red	Green
Resolves Current Issues	Red	Green	Yellow	Green	Green	Red	Yellow	Yellow	Green
Meets Long-Term Facility Needs	Yellow	Yellow	Red	Green	Green	Yellow	Yellow	Red	Yellow
Appropriate Level of Service	Green	Green	Red	Green	Red	Green	Green	Red	Yellow
Ease of Implementation	Green	Yellow	Yellow	Red	Yellow	Green	Red	Red	Yellow
Cost to Implement	Green	Yellow	Green	Red	Yellow	Green	Red	Red	Red
Flexible/Future Expansion	Green	Green	Green	Green	Yellow	Green	Green	Red	Yellow
EONS Impact	Green	Green	Green	Green	Yellow	Green	Green	Red	Yellow

**Performance Legend**

Good	
Fair	
Poor	

Source: RS&H Analysis, 2023

#### 4.4.2.2 Taxiway/Taxilane C Alternatives Summary

After careful consideration of safety, efficiency, cost, and feasibility for the Airport's current and future development, the preferred alternative selected was Alternative 8. This alternative was found to effectively serve target users on the east side by still providing a hold bay on the approach end of Runway 16L while eliminating the non-standard issues presented in the area. This alternative also allows for use of the island between Taxilane D and the tie-down apron as noted later in this chapter.

#### 4.4.3 HS-1 (Hotspot Intersection)

The FAA defines hot spots as a location on an airport movement area with a history of potential risk of a collision or runway incursion. The Airport has one hotspot, HS 1, located at the intersection of Runway 16L-34R, Taxiway K, and Taxiway B3. This intersection meets the definition of a hot spot due to pilots' ability to locate Taxiway B3 being reduced as a result of the crown of Runway 16L-34R. To better delineate the hotspot area the Airport has installed elevated signage and ATC routinely provides notice to pilots operating on associated intersections.

A line-of-sight analysis was completed at the Taxiway K, Runway 16L-34R, and Taxiway B3 intersection. While FAA AC 150/5500-13B does not provide specific guidance on line-of-sight at taxiway/runway intersections, it is reasonable to use some of the guidance on runway line-of-sight for this scenario. Section 3.8.1.1 states, "for runways...., ensure any point five (5) feet (1.5 m) above the runway centerline is mutually visible with any other point five (5) feet (1.5 m) above the runway centerline." Five (5) feet is considered to be the typical eye height of the pilot above the ground.

Using this eye height, a line is drawn from either end of the runway safety area (RSA). The line does not intersect the ground and clears any existing ground by just over two feet, meaning that a pilot at the Taxiway K runway hold line should be able to see a pilot on the opposite side of the runway at the Taxiway B3 hold line. The same analysis was completed using an eye height of 3.5 feet. This is the typical eye height used by the Federal Highway Administration (FHWA) in similar analyses. This line-of-sight analysis also does not intersect the ground, but only clears it by 0.55 feet. This also means that the lowest eye height that still clears the terrain is 2.95 feet. Any aircraft or vehicle with a pilot/driver eye height of less than 2.95 feet will not be able to see a vehicle/aircraft of the same eye height holding at Taxiway B3.

Additionally, due to the orientation of the intersection, a pilot holding on Taxiway K which is roughly perpendicular to Runway 16L-34R may have trouble seeing aircraft holding on Taxiway B3 as it is 39 degrees to the right of the Taxiway K centerline.

This analysis accounts for terrain and does not account for any other objects that could be obstacles to pilot's vision. As the intersection meets line-of-sight requirements outlined for a runway in the advisory circular, no changes to the pavement elevations or orientation will be depicted in the preferred development alternative. A comprehensive study of the hotspot is recommended for the Airport.

## 4.5 AVIATION SUPPORT FACILITIES

The configuration of airport support facilities is dependent upon the airfield layout and available land for airport development. After these considerations have been made, these facilities must be able to meet current and forecasted demand of Airport users. Most of the existing GA and Airport support (or Support) facilities are expected to meet the Airport's demand over the short-term (estimated at five years). However, at some point during the Master Plan 20-year horizon many are anticipated to need expansion, reconfiguration, and/or updates.

Airport support facility requirements demonstrated the current space allocated for ARFF equipment, airfield maintenance/snow removal equipment (SRE) facility, and administrative spaces are generally inadequate, but some inadequacies are present with the need for update in the near future.

As mentioned in **Section 4.2, Existing Land Use and Future Land Use**, the existing land use on the airport promotes that large, jet/turbine aircraft use the east side of the airfield and small, single-engine aircraft use the west side of the airfield. This is primarily due to existing facility location on the airfield; the two FBOs, the terminal, and the corporate hangars are primarily on the east side, while the lion share of small, single-engine operations are on the west side.

This section will focus its evaluation on these key support facilities:

- » Transient Parking Apron
- » Aircraft Hangars
- » ARFF/Safety Center
- » Electric Aircraft Charging
- » Airfield Maintenance/ Snow Removal Equipment (SRE) Facility

### 4.5.1 Transient Parking Apron

All of the land available for aeronautical development without significant environmental impact at Manassas Regional Airport is currently under lease with a tenant, with the exception of two facilities on the west side, previously leased by Dulles Aviation. However, there are areas of land with access to the airfield that are currently developed, and the oldest areas of the airport contain buildings that are nearing, or exceeding, their useful lives. The East Apron contains many older T-hangars and tie-downs which present opportunities for redevelopment under current and forecast market conditions. The West Apron contains the old Dulles Aviation facilities which are scheduled for demolition, old GA hangars, an air traffic control tower which has exceeded its useful life, and Observation Road which allow opportunities for development with the proposed realignment design in consideration. Previously in this chapter, **Figure 4-4** revealed general areas of the airport considered as either aeronautical use, non-aeronautical use, and both aeronautical and non-aeronautical uses. Only a few areas present opportunities during the planning period for development or redevelopment of aircraft hangars and transient apron space without being restricted by environmental factors.

**Table 4-3** shows calculation of the transient apron requirement provided within the Inventory and Facility Requirements chapter.

**TABLE 4-3**  
**TRANSIENT APRON REQUIREMENT**

Transient Apron	Existing	Planning Activity Level 3
<b>Transient Apron Requirement</b>	340,000	370,400
<b>Surplus / (Deficit)</b>		<b>(30,400)</b>

Source: RS&H Analysis, 2023

The facility requirements indicate that the transient apron space will not meet the demand of the Airport’s general aviation community and visitors during the planning period. Analysis of the transient apron showed a deficiency of 30,400 square feet by the end of the planning period. Non-inclusive of the No Action alternative, three alternative sites were generated in order to address the deficiency of transient apron space. Each alternative gave a distinctive viewpoint to solving the transient apron deficiency.

» **No Action**

In order to accommodate additional transient aircraft activity, particularly by corporate aircraft, an additional transient parking apron is needed. No action to support future aircraft activity can result in a diminished level of service and will not effectively serve users of the Airport. A cascading effect of no action may result in transient aircraft deferring to a nearby airport rather than HEF since HEF will lack the facilities to support transient aircraft, thus impacting airport revenue.

» **Alternative 1 – East Apron: Between Taxilane D and Taxilane E**

The first alternative took into account the preferred realignment of Taxilane C and Taxilane D to resolve the issue of the direct access to the runway and TLOFA intrusion as noted in **Section 4.3.2**. This alternative takes advantage of the island between Taxilane D and Taxilane E and converts the unused space to transient aircraft parking. The alternative is located at an ideal location near the vicinity of the primary transient parking apron identified in the AFD, close proximity to APP Jet Center FBO, and a perimeter gate for ease of access on and off the airfield.

» **Alternative 2 – West Apron: North Site**

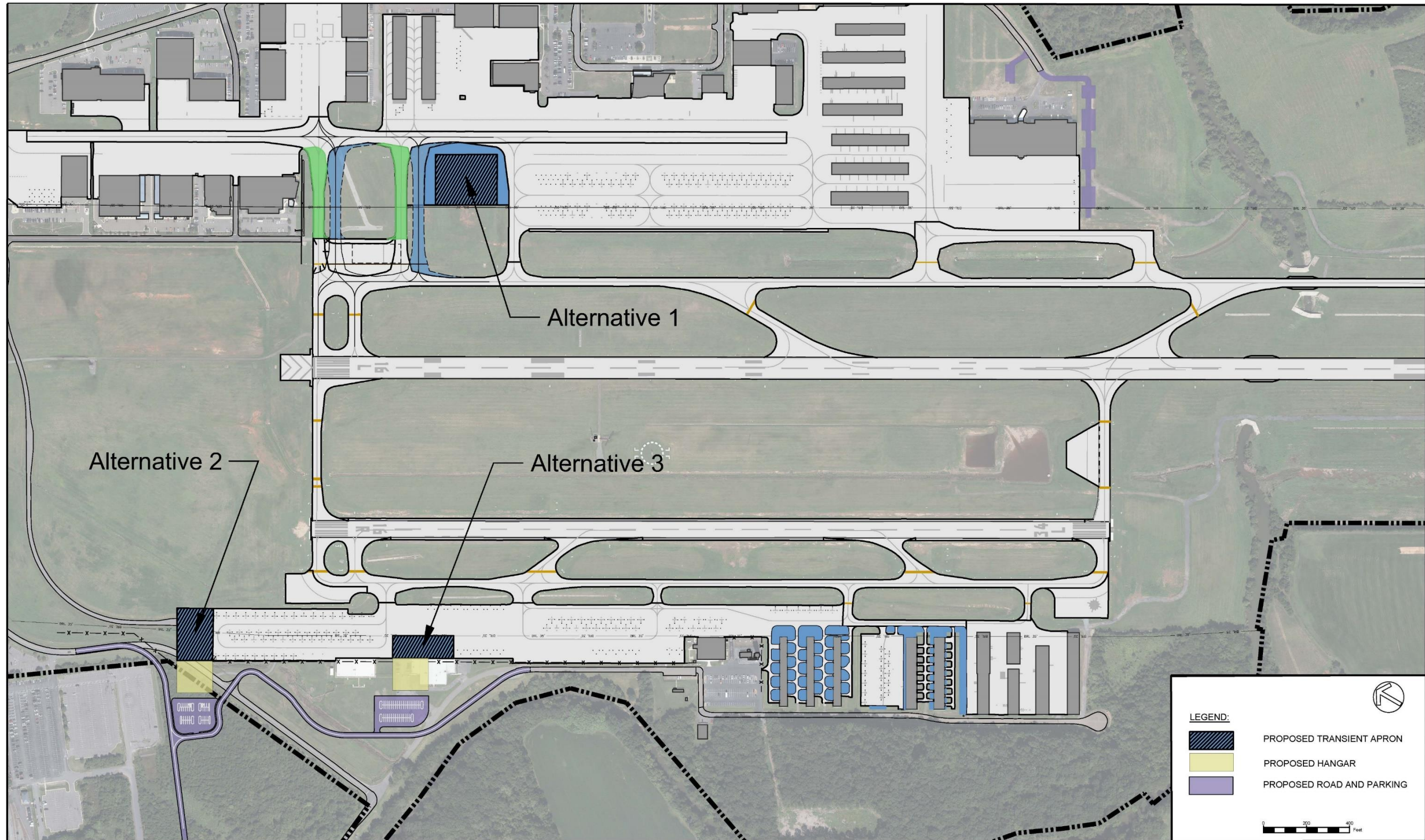
The second alternative assumes the West Apron is expanded north to meet the planning period deficiency. The alternative could occur with the standalone apron expansion or coincide with the development of new FBO space or satellite space on the West Apron to provide the requested pilot amenities missing on the west side. The latter option could require further realignment of Observation Road to provide space for a vertical facility and a parking lot.

» **Alternative 3 – West Apron: Central Site**

The final alternative assumes transient apron parking on the West Apron would be located in front of the previous Dulles Aviation facility. Similar to Alternative 2, this alternative can be a standalone

option, or it can coincide with development of new FBO space which provides needed pilot amenities. The latter option would not require further realignment of Observation Road as the proposed alignment of the road routes around the existing Dulles Aviation facilities and a proposed vertical facility.

FIGURE 4-27  
TRANSIENT APRON PARKING ALTERNATIVES



Source: RS&H Analysis, 2023

An evaluation of the three transient parking apron alternatives and the existing (No Action) condition is provided below and show in **Table 4-4**.

- » **Safety:** Safety to aviation operations falls to fair for the Alternative 1 due to its location between two Taxilanes. The latter alternatives were deemed safe as the transient parking apron were located on the perimeter or adjacent to taxiing aircraft and bears the same risk as the existing transient parking aprons.
- » **Operational Efficiency:** Majority of transient aircraft activity stage their aircraft on the East Apron due to its proximity to the two FBOs, terminal, and rental car facility. Ideally, the preferred site will provide similar access to amenities and services regularly used by transient customers.
- » **Meets FAA Design Standards:** All alternatives will meet FAA Design Standards.
- » **Effectively Serves Target User:** The target users are transient aircraft, in which HEF's case are currently and projected to continue be business jets. The greater part of business jet operation occur on the east airfield and the East Apron; therefore, the most effective site for a transient aircraft parking apron would be on the east side.
- » **Resolves Current Issues:** Each alternative will expand or modify the airfield to resolve the deficient transient parking apron need during the planning period.
- » **Meets Long-Term Facility Needs:** Alternative 1 exceeds the area needed during the planning period and provides additional support for transient traffic should the Airport and the flying public need it. The latter alternatives limits the transient parking to balance the deficiency in the planning period.
- » **Appropriate Level of Service:** No action diminishes the level of service the Airport intends to provide to the flying public due to the limitation in parking options. While each alternative should provide the appropriate level of parking needed, taxi time to each alternative site was factored into this assessment. Transient aircraft operators would prefer a short taxi time to park their aircraft. The two alternatives located centrally on the East and West Apron were graded fair while the alternative on the north end of the West Apron (longer taxi time) was graded as poor.
- » **Ease of Implementation:** Construction to resolve the non-standard issues on Taxilane C provides an opportunity for the addition of Alternative 1. Alternative 2 would require additional alignment of Observation Road and FBO facilities to support the transient parking apron.
- » **Cost of Implementation:** Implementation costs for any parking apron extension is manageable when funded through available federal, state, and local financially supportive agencies. There will likely be an economies of scale when including Alternative 1 into realignment of Taxilane C and Taxilane D construction scope.

- » **Flexible for Future Expansion:** Siting of an FBO facility at Alternatives 2 and 3 provides less flexibility for development in the case the Airport decides to develop new hangar facilities in the area. Alternative 1 simply transforms the grass between taxilanes to parking pavement which can be more easily repurposed if needed.
  
- » **EONS Impact:** Impacts to EONS categories vary by each alternative. Alternatives 1, 2, and 3 were rated fair as each action would have similar environmental and socioeconomic impacts. An FBO sited at Alternative 3 would require demolition of the vacant Dulles Aviation facility and potentially harmful substance remediation prior to construction.

TABLE 4-4  
TRANSIENT APRON ALTERNATIVES EVALUATION MATRIX

Evaluation Criteria	Transient Apron Alternatives			
	Existing (No Action)	Alt. 1 (East Apron: Between TXL D and TXL E)	Alt. 2 (West Apron: North Site)	Alt. 3 (West Apron: Central Site)
Safety	Good	Good	Good	Good
Operational Efficiency	Fair	Poor	Poor	Poor
Meets FAA Design Standards	Fair	Good	Fair	Fair
Effectively Serves Target User	Fair	Fair	Poor	Fair
Resolves Current Issues	Poor	Poor	Poor	Fair
Meets Long-Term Facility Needs	Poor	Fair	Fair	Good
Appropriate Level of Service	Fair	Poor	Fair	Fair
Ease of Implementation	Good	Poor	Poor	Poor
Cost to Implement	Good	Poor	Fair	Poor
Flexible/Future Expansion	Good	Poor	Poor	Poor
EONS Impact	Good	Fair	Fair	Fair

**Performance  
Legend**

Good	
Fair	
Poor	

Source: RS&H Analysis, 2023

## 4.5.2 ARFF Facility

Manassas Regional Airport is not certified as a 14 CFR Part 139 compliant airport and therefore is not required to have ARFF services onsite. The Airport does receive and is capable of receiving large aircraft which include the 30-seat Jetstream 41, 19-seat Gulfstream V, and 58-seat Q-400, and C-130 military aircraft. Currently the City of Manassas Fire and Rescue Department (The Department) is the lead agency in charge of providing ARFF services in the event of an incident or accident anywhere on airport property. Through established agreements, the Manassas Volunteer Fire Company, the Greater Manassas Volunteer Rescue Squad, and the Prince William County Department of Fire and Rescue supplements the Department's response to an emergency if needed.

The Department's primary response station, Station 21, is 2.9 miles away from the Airport's main response east gate. The Airport currently owns ARFF equipment which is located on airport property. One ARFF Unit, an E-One, capable of holding 3,000 gallons of water, 400 gallons of foam, and 460 pounds of Halotron. This unit is located in T-hangar C-3 on East Apron. The second ARFF apparatus is a quick response unit, a Ford F-550. With existing resources, it is reasonable to expect a total response time of seven minutes from the time of notification. The 2017 ARFF Feasibility Study determined with existing agreements and apparatus equipment on-site, the Airport's emergency personnel would not be able to respond to an accident within the desired time of 2-3 minutes. The Airport intends to meet the Index B requirements and response times from the proposed location.

The Airport has expressed interest in the proposed ARFF facility being a multi-use facility. The siting options take into consideration a standalone ARFF facility, an ARFF/Maintenance facility, ARFF/airport safety officer facility, and a safety center meeting room. Four alternative sites were generated in order to address the need for an on-site ARFF facility. Each alternative attempted to enhance response times by siting the proposed facility on the perimeter of the airfield or near a perimeter gate. The No Action option and the four alternatives generated are listed below with associated descriptions:

### » **No Action**

While not a requirement, having on-site ARFF service provides a safer airport for the flying community. The current agreements and emergency personnel responding to an accident at the Airport would not meet the desired emergency response time for an Index B airport. Therefore, no action by the Airport does not align with its strategic vision.

### » **Alternative 1 – East Apron: Corner of Wakeman Drive and Observation Road**

This alternative places the proposed ARFF facility in the northeast corner of airport property. The location sited between two corporate hangars and the corner of Wakeman Drive and Observation Road provides an opportunity for rapid response to an accident on the airfield or an incident off the airfield. While the location is a corporate pad site, the size and location of the parcel limits the extent of hangar development should a developer require a hangar over 15,000 square feet.

» **Alternative 2 – East Apron: West of Flightworks**

The second alternative positions the proposed ARFF facility just off the pavement of Taxiway B and Taxilane C at the end of James Payne Court and west of Flightworks. The proposed location is just out of the 16L Approach RPZ. Due to its proximity to Runway 16L-34R the design of the proposed ARFF facility will have significant height limitations which will need to be taken into consideration when positioning apparatus hold bay doors. Alternative Site 2 site would provide the quickest response to airfield accidents as it sits just off the north end of Taxiway B.

» **Alternative 3 – East Airfield: South of Flightworks**

The third alternative sits just south of Flightworks and north of Taxilane C. Given its location this site would provide a quick response time an airfield accident comparable to Alternative 2. This alternative is dependent on Taxilane C shifting south as assessed in Section 3.3.2 as the existing location would protrude into the TLOFA for Taxilane C. Since the preferred alternative for Taxilane C entails shifting the pavement, this alternative is a viable option for consideration.

» **Alternative 4 – West Apron: South End of Apron**

The final alternative is the only alternative which places the proposed ARFF facility on the west airfield. The proposed site sits towards the south end of the West Apron on pavement which currently holds unused tiedowns. This location should allow emergency response to meet the desired response time for accidents on the airfield; however, a majority of traffic uses the east side of the airport so the responding unit may have difficulty with traveling across both runways. This location may not be as effective as other alternatives when responding to off-airfield accidents due to its position on the West Apron. Future expansion may also be limited if T-hangars are constructed in the vicinity.

TABLE 4-5  
ARFF FACILITY EVALUATION MATRIX

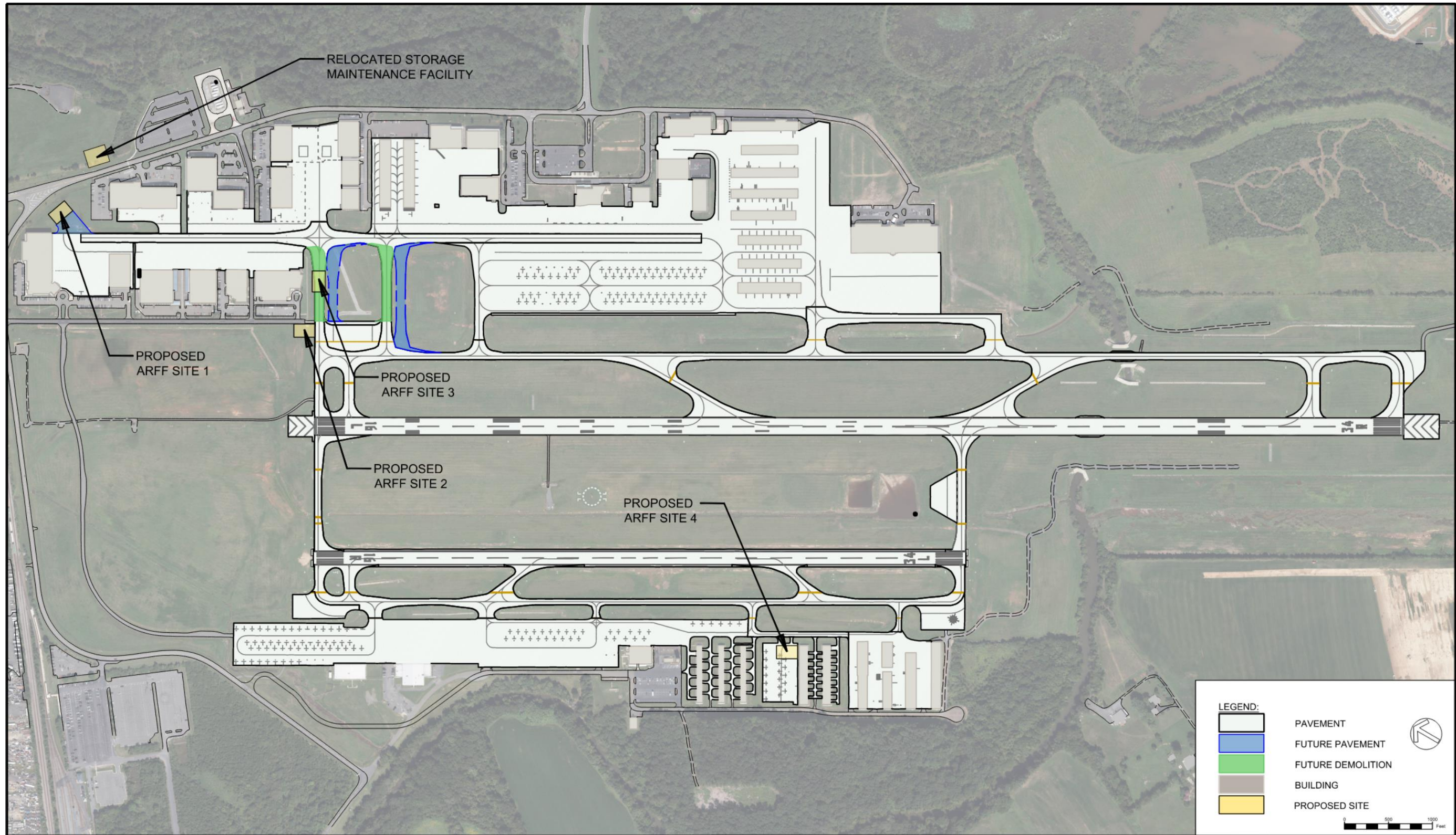
Evaluation Criteria	ARFF Alternatives				
	Existing (No Action)	Alt. 1 (Wakeman Dr. and Observation Rd.)	Alt. 2 (West of Flightworks)	Alt. 3 (South of Flightworks)	Alt. 4 (South end of West Apron – between T- hangars)
Safety	Yellow	Red	Green	Green	Green
Operational Efficiency	Yellow	Red	Green	Green	Yellow
Meets FAA Design Standards	Green	Green	Green	Green	Green
Effectively Serves Target User	Red	Green	Green	Green	Yellow
Resolves Current Issues	Red	Green	Green	Green	Green
Meets Long-Term Facility Needs	Red	Green	Green	Green	Yellow
Appropriate Level of Service	Red	Green	Green	Yellow	Yellow
Ease of Implementation	Green	Green	Yellow	Yellow	Yellow
Cost to Implement	Green	Yellow	Green	Green	Yellow
Flexible/Future Expansion	Green	Green	Yellow	Yellow	Yellow
EONS Impact	Green	Green	Green	Green	Green

**Performance  
Legend**

Good	
Fair	
Poor	

Source: RS&H Analysis, 2023

FIGURE 4-28  
ARFF ALTERNATIVES / PREFERRED MES SITE



Source: RS&H Analysis, 2023

### 4.5.3 Airfield Maintenance Equipment Storage (MES) / Snow Removal Equipment (SRE) Facility

There is one facility used for Airport maintenance equipment storage (MES) and repairs. The Airport's maintenance and equipment storage facility was constructed in 2006 and is approximately 8,000 square feet. The MES facility is located on the East apron just south of the passenger terminal. The MES is a two-level facility with an office, restrooms, and equipment on the lower level while additional storage is located on the upper level. The Airport intends to purchase new snow removal equipment (SRE) to efficiently combat the adverse conditions seen at the Airport during the snow season. The building is in good condition. However, as SRE equipment sizes continue to trend larger, the layout and orientation of the building create challenges to accommodate future needs. These challenges include providing adequate storage space and equipment maneuverability in the building. As well as pavement away from the movement area for snow and ice training and pavement marking training, a cost-effective consideration for the Airport and its maintenance staff. A parcel of land in the northeast corner of the airport property has been identified as the preferred site for future Airport maintenance facilities. This site allows efficient access to the airfield to respond to maintenance issues or snow and ice operations while allowing the opportunity to expand a maintenance facility to support future growth. **Figure 4-28** depicts the preferred site for the maintenance equipment storage facility.

#### » **No Action**

With current site of the MES facility the maintenance operations have no room for growth and introduction of new multi-function SRE, which are larger and longer than single function pieces of equipment, would be difficult to contain with the facility. The existing facility is not configured to accommodate pull through bays using drive-through design building configuration.

#### » **Northeast pad site**

The airport needs a larger MES/SRE facility that has room to safely park and maneuver existing and future multi-function snow removal equipment, pickup trucks, mowers, and other maintenance vehicles. The site is ideal to accommodate potential future expansion needs ranging from warehouse space, loading dock capabilities, concrete/asphalt pad for pavement marking testing and snow operations training. A future MES/SRE facility located at this site takes advantage of this strategic location as it provides quick access to perimeter roadway surrounding the airport and maintenance staff can quickly access the airfield by nearby airfield access points.

### 4.5.4 Hangars

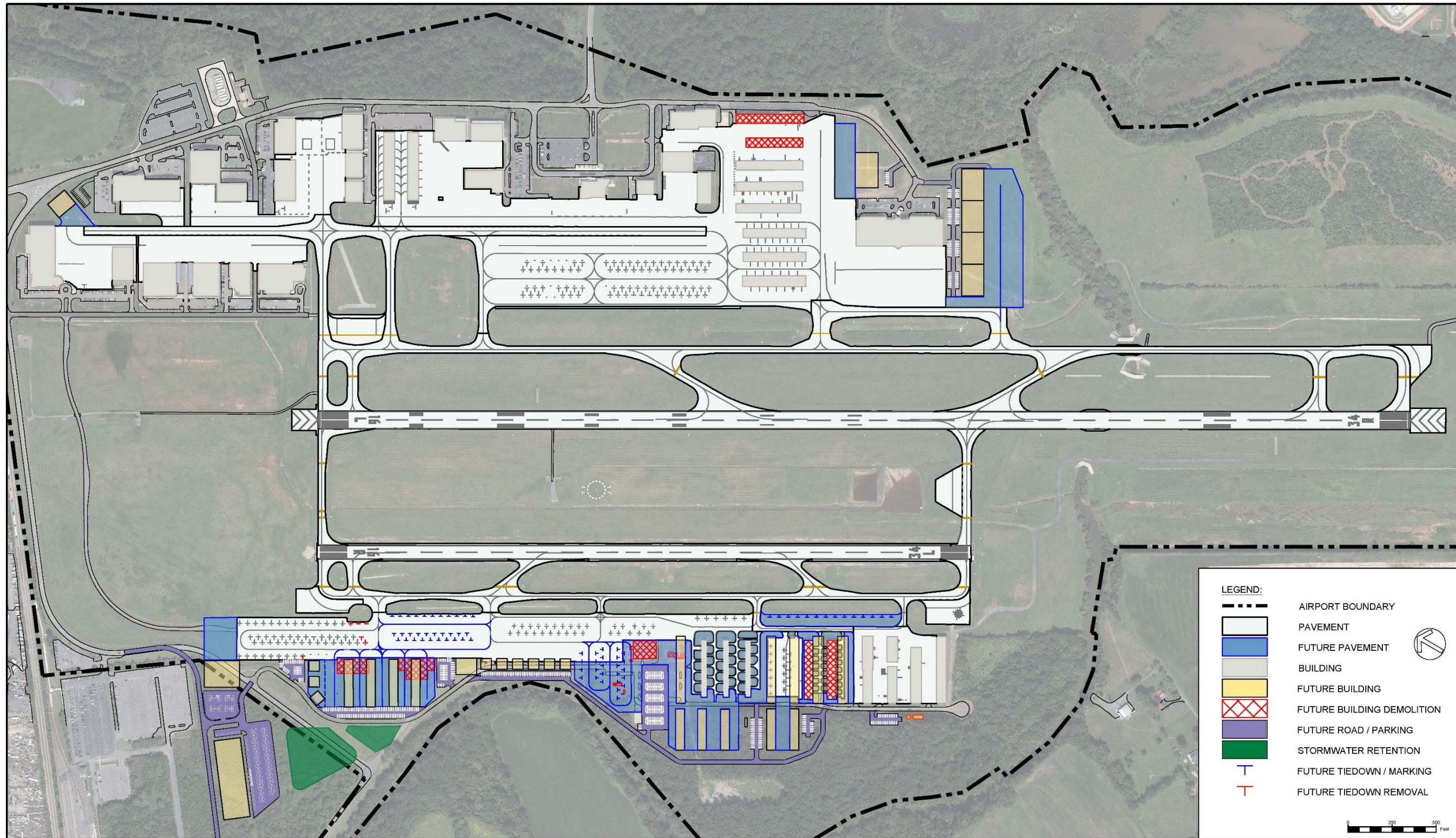
Manassas Regional Airport needs 56 additional T-hangar bays and three conventional hangars to accommodate PAL 3 forecast demand. However, given the available development areas and the Airport's vision the final breakdown of T-hangars, conventional hangars, and corporate may differ from the split noted in the previous chapter. The hangar development is ultimately triggered by demand.

Hangar designs can vary depending on developer/owner preferences, Airport minimum standards and

development requirements, and the size(s) of aircraft being stored. ACRP Report 113 describes the nested T-hangar configuration as one that is shorter and wider than the standard T-hangar. This type of configuration helps optimize the developable space and reduce the required taxiway pavements. The nested T-hangar design is common at HEF and airports across the nation. T-hangars can be standard size or customized based on hangar manufacturers. The standard T-hangar dimensions include 42 ft. on its widest side, down to 21 ft. on its shortest side, and 33 ft. deep.

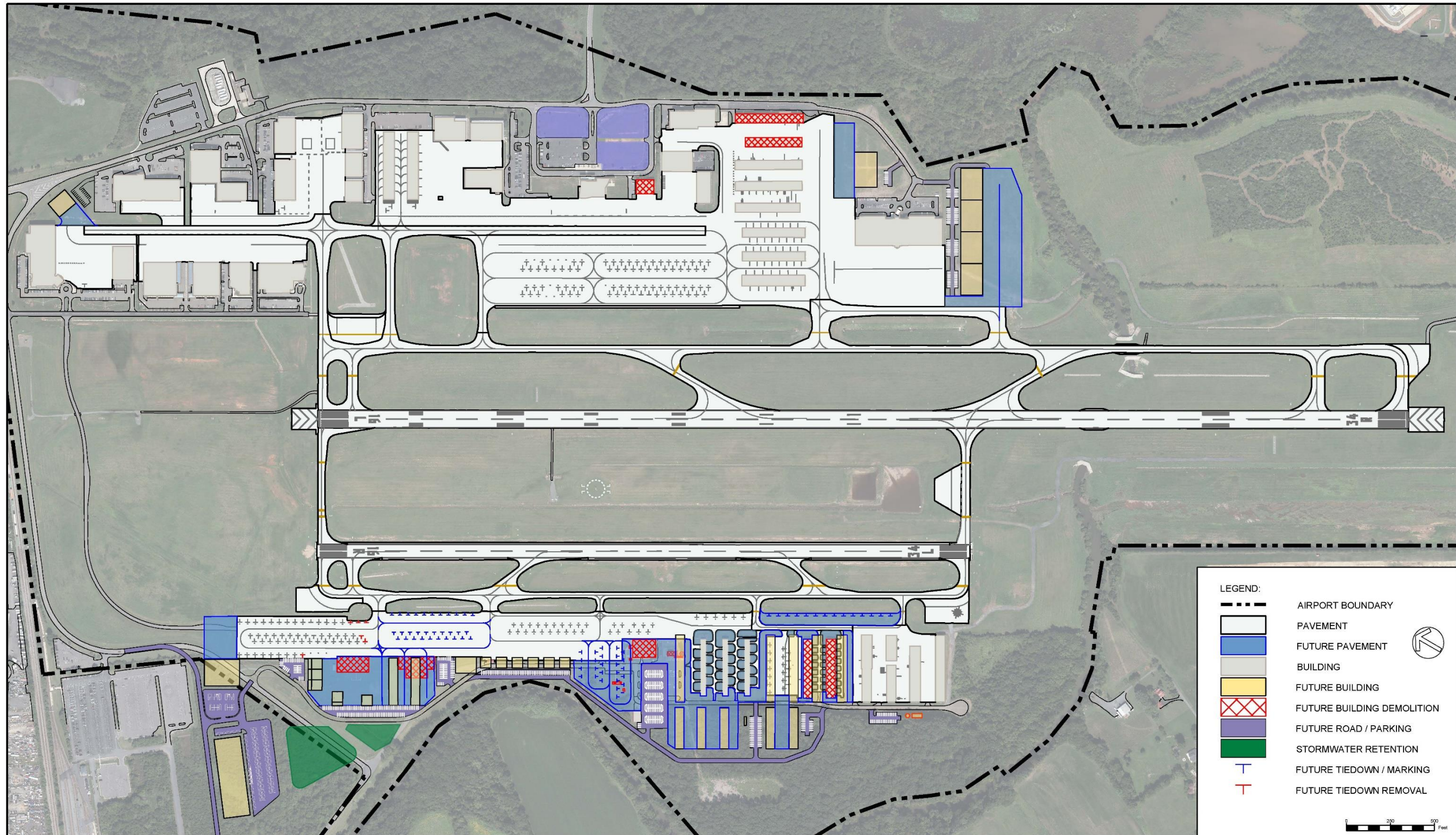
Overall, the footprints for all hangar facilities are much larger than just the building, as additional space is needed for airside and landside purposes. This includes protecting for taxiway object free areas. A building with 10 nested T-hangars would require approximately 65,000 sq. ft. of land. To be conservative and allow flexibility in hangar site design, a conventional hangar footprint would require approximately 50,000 sq. ft. of land and a corporate hangar would require approximately 90,000 sq. ft. As a result, large amounts of continuous acreage are highly desirable for GA development. **Figure 4-29** depicts significant development on the west side which primarily support general aviation storage. **Figure 4-30** depicts additional development opportunities with a realignment of Observation Road if the Airport and the City of Manassas were to agree to adjust the road geometry again to support general aviation and corporate hangars on the west side. Both exhibits assume acquisition of property in Prince William County discussed in **Section 4.3** to support forecasted growth at the airport.

FIGURE 4-29  
HANGAR DEVELOPMENT CONCEPT WITH FOCUS ON GA SUPPORT



Source: RS&H Analysis, 2023

FIGURE 4-30  
HANGAR DEVELOPMENT CONCEPT WITH ADDITIONAL DEVELOPMENT OPPORTUNITY



Source: RS&H Analysis, 2023

#### 4.5.5 Electric Aircraft Charging

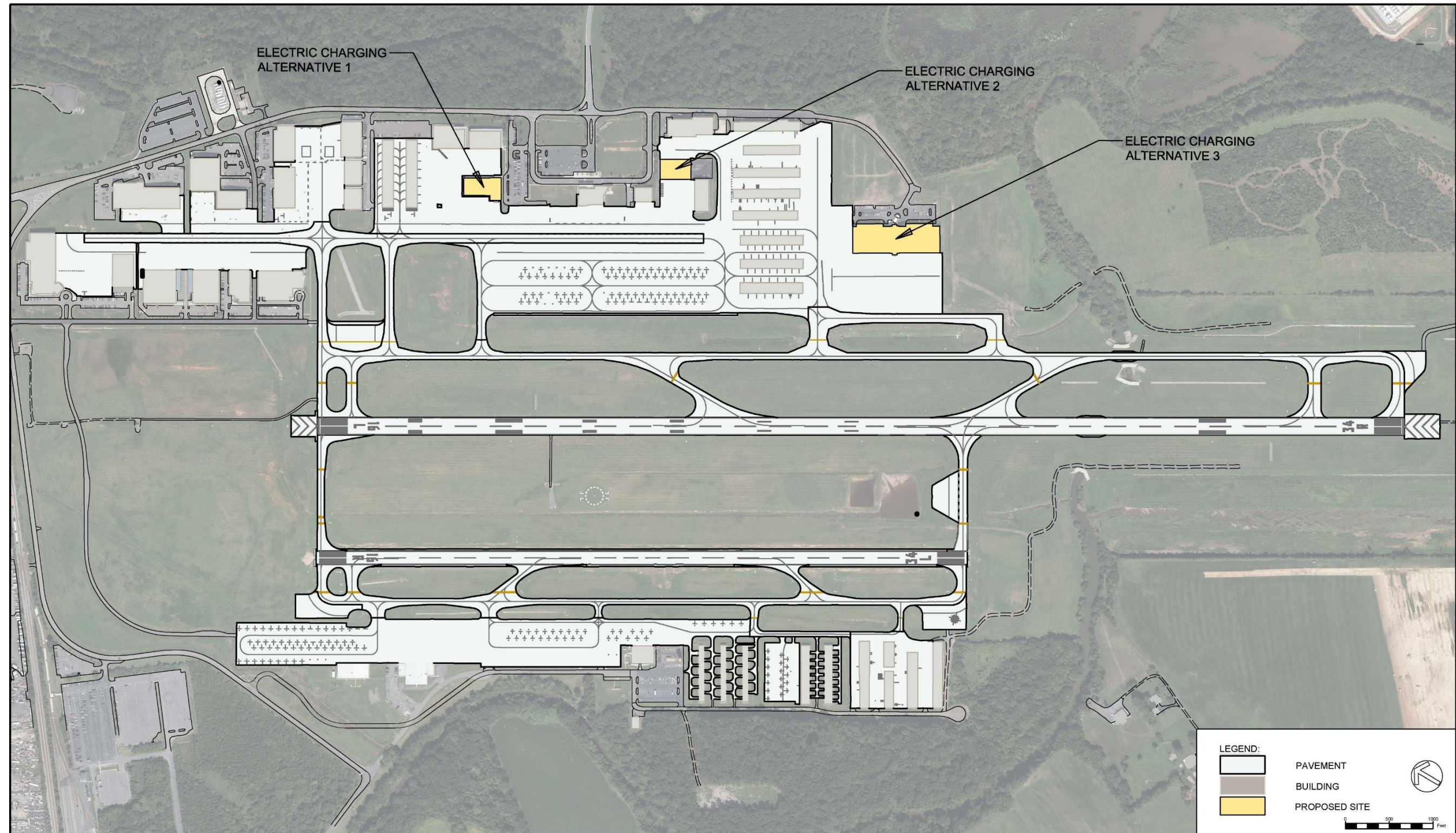
The advent of Advanced Air Mobility (AAM) and Urban Air Mobility (UAM) electric aircraft presents potential near-term need to integrate new charging facilities into airport facilities. This creates a need to understand the degree of impact as it relates to:

- » Ownership models
- » Impacts to airport financial policies
- » Early adopters and forecast demand
- » Size and location of charging infrastructure
- » Demand on existing utility infrastructure (transmission lines, transformers, substations, etc.)
- » Aircraft fleet, battery types, charge rates, and design (charge station versus battery swap)
- » Impacts to the economy and the environment
- » Impacts to airfield infrastructure

Preliminary review of HEF electrical utility infrastructure shows it to be sufficient to handle, at minimum, any potential small-scale near-term increase in electrical demand as result of aircraft charging stations.

There are two options for airports providing aircraft charging facilities. The investment can be made by the Airport or its tenants. In line with preferred Airport financial policies, the preferred HEF position is to allow FBOs or tenants to implement and provide this service on leaseholds. In this case, the most advantageous locations to service early adopters would be Chantilly Jet Center, APP Jet Center, and Electra Aero, as shown in **Figure 4-31**.

FIGURE 4-31  
POTENTIAL ELECTRIC AIRCRAFT CHARGING LOCATIONS



Source: RS&H Analysis, 2023

Under the preferred airport alternative, it is prudent to understand best practices when implementing aircraft charging stations. Some of the lessons learned from electric automobiles also translate into the aviation industry. The following sections will discuss best practices and implementation strategies to consider. These best practices will focus less on specific details of implementation such as types of charging stations, and more on overarching policies to ensure a variety of charging stations can be successfully implemented.

#### **4.5.5.1 Implementation and Best Practices**

- » Determine the target user at the airport and focus on customer level of service. This will help determine placement and proximity to desirable amenities by the targeted user. For example, if the charging station were placed immediately adjacent to App Jet Center and Chantilly Jet Center, the targeted user would most likely be transient aircraft. If the station were placed near Electra Aero, the targeted user would most likely be for based aircraft. Understanding what drives user behavior will help ensure investment in charging stations are maximized.
- » Make charging stations highly visible to promote them and protect them. Signing and marking electric charging stations helps promote their use while also protecting them from damage. If stationary, consider physical barriers such as bollards around the stations to ensure aircraft cannot accidentally hit them. Placing stations at the edges of apron and buildings is much safer than in open spans of pavement.
- » Seek out and join partnership networks to stay involved and current with electric aircraft trends. Electric aircraft and battery technology are burgeoning and remaining current with new information allows the Airport to promote the technology among those who may be early adopters such as airport tenants. Coordinating with DOAV, local economic development groups, and tenant stakeholder groups can provide avenues to technology information as well as supplemental funding opportunities.
- » Review and update airport policies as electric aircraft charging gains favor to ensure the Airport remains self-sufficient and meets federal grant assurances. This will require information about charging kilowatt-hours to accurately account for the impacts on Airport revenues. It would benefit the Airport greatly to require tenants to collect and provide that information, just as fuel sales information would be provided, so as the Airport may monitor and track overall use. At some point, the Airport may need to review and amend minimum standards, lease guidelines, development review guidelines, and/or Airport rates and charges fee structure.
- » Educate tenants and airport users about resources and opportunities. The EPA, peer airports, and industry leading charging station providers which are all excellent sources of information. The Airport can research and consider techniques for how to incentivize use, get ideas for implementing cost-savings measures (such as off-peak charging), and promoting airport sustainability practices. Having electric charging stations creates potential for FBOs to begin

integrating new ground electric handling equipment into the fleet as older equipment is removed from service.

When planning for electric aircraft, it's important to consider the effects on power for current airport operations, Strategic Plans, and long-term airport master plans. For the individual airport, the primary impact will stem from the increased electrical demand necessary to charge electric aircraft. The effects and necessary considerations will vary between airports of various sizes based on the type and density of traffic. During the planning process, along with the aviation facility requirements, aircraft-specific power supply requirements should be developed. Based on individual charging requirements, and assuming that future chargers will take 45 minutes for a full-charging cycle, the demand could grow to several megawatts.

Smaller all-electric general aviation aircraft can be charged in about 45 minutes with 40 to 60 kW chargers. Twenty of those aircraft charging simultaneously would have an electric demand of about 1 megawatt (MW: 800 to 1,200 kW). Small commuter aircraft demand an additional order of magnitude. An individual aircraft might need 400 to 600 kW to ensure charging times compatible with the typical aircraft turnaround time. At busy regional airports, power requirements might reach about 10 MW.

Currently, terminals consume 60 percent of the electricity at a typical airport, and airfields consume the remaining 40 percent. This balance could be significantly shifted with the emergence of electric aircraft, especially beyond the 2041 horizon.

Airport electric infrastructure is likely to be affected by the integration of electric aviation into the existing airport ecosystem. Increasing electrification across airport technology and infra-structure, coupled with the introduction of high-power fast charging for electric aircraft, could place a significant strain on the existing airport power grid. The Airport could experience one of two scenarios as it relates to integration of electric aircraft into its operations. The Airport's electrical infrastructure would be sufficient and not require an upgrade to its main electrical connection to the greater power grid. In this scenario the leaseholder would simply add the necessary airside equipment to support electric aircraft. The second scenario would result in the airport electrical infrastructure being insufficient to support the added equipment necessary to support electric aircraft operations. The following options would aid in addressing this issue:

- Smart power management at the airport to share the available capacity with other resources, which would include sharing existing power supply with other airside equipment (e.g., jet bridges) and defining prioritization rules.
- Working with energy providers to upgrade their electrical power supply.
- Developing local electric production at the airport, which could include a microgrid strategy to increase resiliency.

## 4.6 LANDSIDE

The landside component of the Airport and its associated road system are driven by the operation, design, and traffic of the terminal building it serves. As documented in **Chapter 3, Inventory and Facility Requirements**, the consistent growth expected at HEF will require additional landside resources to adequately serve the Airport's future needs. Development that must be considered landside will be in the terminal area, and specifically relates to the vacant quadrants in front of the terminal facility. The following section will review the terminal area improvements.

### 4.6.1 Terminal Area

The process of forming alternative landside concepts resulted in the creation of one alternative development option as the Airport plans for continued growth and the possibility of introducing scheduled air carrier service. This option has the ability to be refined or reorganized (as best as possible) from how development is shown in the alternative graphic. The terminal curb road has two lanes, one for loading/unloading vehicles and the other for through vehicles. The traffic in front of the terminal is in one direction in a counterclockwise movement. The terminal area lot has 119 parking spaces which includes 5 accessible parking spaces.

Currently, the parking area for the terminal is one portion of a lot divided into four sections. The other three sections in this lot are currently undeveloped. This presents a great opportunity to reserve this area for future landside parking, as the need for this area will likely arise soon. Pursuing development in any of the vacant parcels which does not involve increasing parking capacity will impact facility modifications to support expected growth. If the Airport receives scheduled air carrier service parking modifications will be needed to eliminate bottlenecks at the curb front which will occur. The parking lot will need modifications to accommodate for short-term parking, long-term parking, tenant and employee parking while considering expansion of rental ready-return and service area lots.

Expand on highest and best land use of the three vacant quadrants in terminal area. Currently, there is one parking area in the terminal area for the current terminal building. This parking lot is generally large enough for current traffic; however, the Airport will experience increased traffic, so will need the ability to expand in the near future.

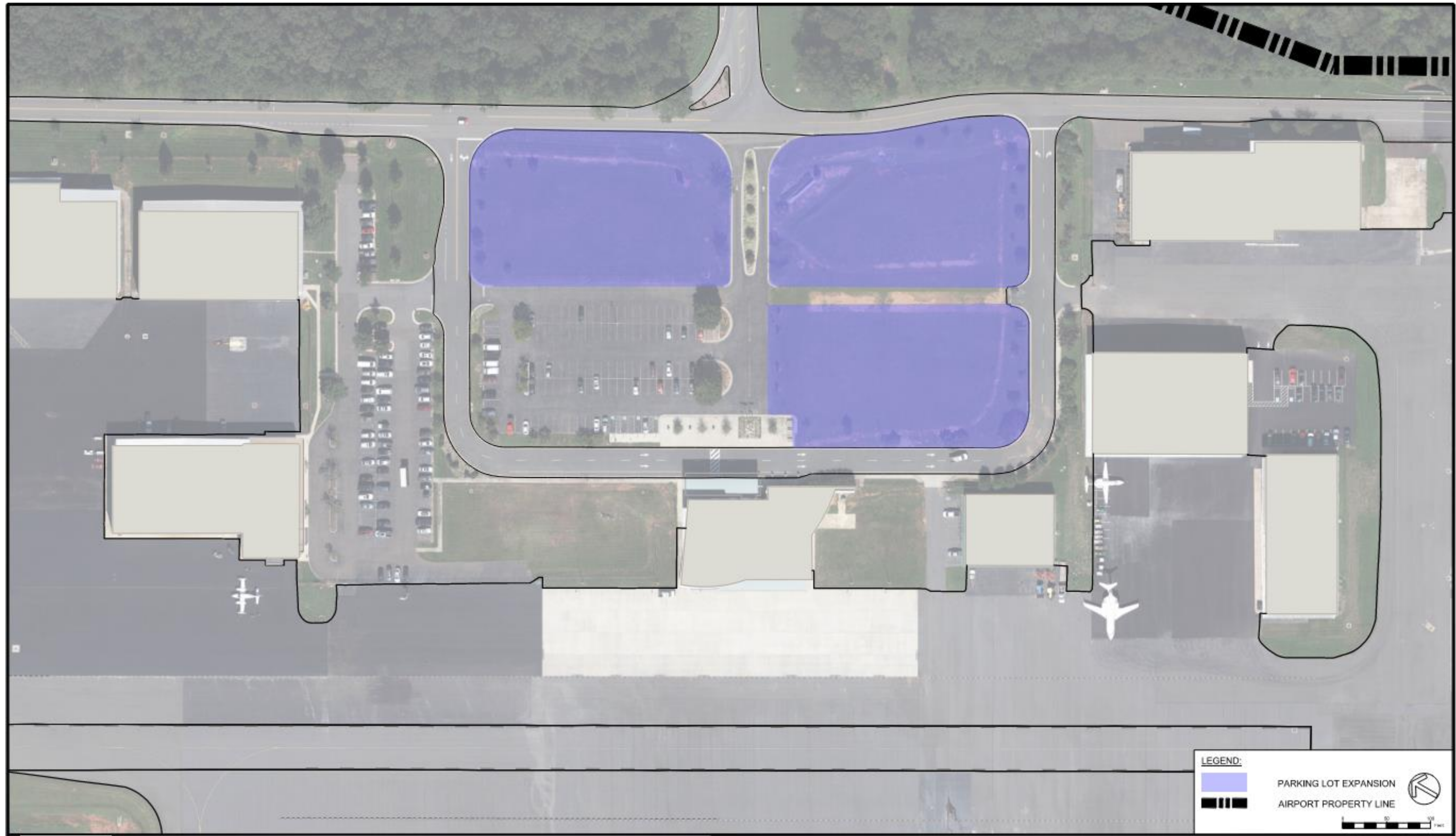
#### » **No Action**

With current landside use and access, there is no pressing capacity or congestion issue. This will become an issue with growth, or the introduction of air carrier operations, but keeping the surrounding areas undeveloped will allow for financial and construction flexibility for when the need becomes pressing.

#### » **Expand Parking Lot**

Taking proactive action, rather than reactive, to the approaching capacity limitation will facilitate seamless expansion and growth for the Airport, preventing an unnecessary "bottleneck" to the Airport's capacity growth. Each lot would be developed as the capacity need arises, as to not introduce undue construction and maintenance cost for unused lots.

FIGURE 4-32  
TERMINAL PARKING LOT EXPANSION



Source: RS&H Analysis, 2023

## 4.7 COMPREHENSIVE PREFERRED DEVELOPMENT

- Combination of all preferred facility development concepts over the planning period and beyond
- Graphic representation

***Chapter 5***  
***Implementation Plan and Financial Feasibility***



**RS&H**

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*CHAPTER 5*

*IMPLEMENTATION AND FINANCIAL  
FEASIBILITY*

## 5.1 INTRODUCTION

The preceding chapters of this Master Plan identified an aviation demand forecast and the future facilities needed to meet that forecast demand, as well as those needed to maintain sustainability/improve airport safety. This chapter identifies a financially feasible Capital Improvement Plan (CIP) to implement Master Plan recommendations over the planning period. The comprehensive CIP will be used to guide future airport development and position HEF to meet the established vision for ultimate facility development. The future investments identified in the Airport's CIP involve many interrelated components that must be identified and implemented in a coordinated manner.

This chapter begins by identifying potential sources for capital project funding. Consideration is given to historical airport funding trends and Federal Aviation Administration (FAA) funding guidance to establish achievable future funding expectations. This allows for realistic CIP sequencing with rough order-of-magnitude (ROM) costs based on reasonable design and construction estimations. The process results in a practical, fundable, and implementable plan that the Airport can use to guide project timing and budgeting for facility improvements to meet future development needs.

In summary, this chapter:

- » Provides an overview of project implementation process
- » Documents the Airport's approved 5-year CIP
- » Assesses the funding outlook from federal, state, and local sources based on historical trends
- » Presents airport financial trends and projections
- » Presents the updated 20-year CIP, including ROM cost estimates for all projects, including detailed project descriptions
- » Provides a phasing plan for the 5-year, 10-year, and 20-year planning horizons
- » Evaluates the feasibility of funding the updated 20-year CIP

### 5.1.1 Implementation Process

Enhancing airport infrastructure involves a detailed process that often begins years before construction starts. At HEF, the initial stages have already commenced to progress improvements to the airfield facilities, signifying a dedicated effort to upgrade facilities. The major implementation steps for a complex, federally funded Airport Improvement Program (AIP) projects are shown in **Figure 5-1** illustrating that work should commence a minimum of five years prior to the actual need for the facility. This lead-in time is usually very helpful for coordination with the FAA and/or Virginia Department of Aviation (DOAV) regarding funding, environmental entitlement, and other regulatory compliance requirements, as well as time to complete site or facility design, and time to complete facility construction.

**FIGURE 5-1**  
**TYPICAL STEPS TO COMPLETE AN AIRPORT PROJECT**

### Typical Steps Four Years Prior to Construction

- Identify the project in the approved Airport Layout Plan and consult with FAA Airports District Office (ADO)
- Submit 5-year CIP (*by February 1st*)
- Validate project justification and funding eligibility and identify funding sources
- Determine probable level of environmental review (*planning may need to begin much earlier if EIS required*)
- Determine if ALP and/or Exhibit 'A' need updating
- Identify required flight procedure modifications and need for aeronautical survey
- Coordinate with local officials and airport users on project plans

### Typical Steps Three Years Prior to Construction

- Refine project scope, cost estimates, and funding sources
- Determine if a Benefit/Cost Analysis or if FAA Letter of Intent (LOI) are necessary
- Determine if a reimbursable agreement is necessary for affected navigational aids (NAVAIDs)
- Initiate aeronautical survey as required
- Begin purchase or assembly of all necessary land for the project

### Typical Steps Two Years Prior to Construction

- Refine project scope
- Solicit professional design services
- Prepare preliminary design, site planning, and cost estimates
- Initiate reimbursable agreements and coordinate any NAVAID requirements with the FAA
- Complete aeronautical survey and submit requests for new/modified flight procedures with the FAA
- Submit a request for airspace review of projects under non-rulemaking authority (NRA)
- Begin Benefit/Cost Analysis if determined to be necessary (*projects seeking over \$5M discretionary*)
- Initiate environmental assessment or categorical exclusion documentation
- Coordinate with local officials and airport users on refined project scope and schedule

### Typical Steps One Year Prior to Construction

- Complete airspace study
- Complete project scope of work
- Complete environmental documentation
- Complete 90 percent design, plans, and specifications after FAA environmental findings are made
- Refine and update cost estimates
- Execute reimbursable agreements to support NAVAIDs, if relevant
- Prepare and coordinate Construction Safety Phasing Plan
- Initiate Safety Management Systems (SMS) process
- Secure all necessary local funding
- Secure environmental and other necessary permits

*(Figure continued next page)*

- Submit Benefit/Cost Analysis *(by March 1st)*
- Coordinate Safety Risk Management Panel with FAA-ATO or FAA-ARP, as necessary
- Finalize construction bidding, grant application, and grant acceptance schedules

### **Year of Construction**

- Complete 100 percent design, plans, and specifications
- Complete FAA environmental documentation for current fiscal year *(by January 15th)*
- Advertise and secure bids according to ADO schedule
- Submit grant applications *(by May 1st, if discretionary funds expected bid by April 1st)*
- Accept federal grants *(within 30 days of offer)*
- Coordinate with local officials and airport users on the progress and schedule
- Issue notice-to-proceed
- Monitor environmental mitigation requirements during construction
- Provide weekly inspection reports

### **After Construction**

- Submit final report and provide final test results *(within 60 days of construction end)*
- Close any accepted federal grants *(within 90 days of project acceptance)*
- Monitor environmental mitigation measures
- Submit final As-Built ALP and Exhibit 'A'

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Source: Federal Aviation Administration - "Steps to AIP Funding for Your Airport Project: Quick Reference Guide", September 2016; Adapted by RS&H, 2024.

### 5.1.2 NEPA Implementation Process

The environmental entitlement for projects within each development phase, which involves obtaining necessary approvals and permits in compliance with applicable federal rules and regulations, will need to be completed in advance of the design and construction to allow for project completion. FAA Order 1050.1F, *Policies and Procedures for Considering Environmental Impacts*, and 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airports*, require the evaluation of airport development projects as they relate to specific environmental impact categories.

Environmental Assessments (EAs) and Environmental Impact Statements (EISs) represent the most rigorous forms of environmental analysis, requiring a comprehensive assessment of impact categories in accordance with FAA Orders 1050.1F and 5050.4B. In contrast, Categorical Exclusions (CATEXs) demand evaluations of exceptional circumstances to confirm that projects, which usually have minimal environmental impacts, do not warrant more extensive analysis in EAs or EISs.

The ROM project costs incorporate allocations for environmental study and documentation related to CIP projects. For many included in the CIP, CATEXs are anticipated. However, if any project may cause an extraordinary circumstance (such as impacts to more than 0.5 acres of wetlands, threatened or endangered species, or known cultural resources), it would necessitate an EA. It's important to highlight that the final determination regarding the type of NEPA document required for each project, as well as its scope, rests with the FAA and would not occur until a refined scope for proposed improvements is developed as the need for the project draws nearer.

## 5.2 APPROVED 5-YEAR CAPITAL IMPROVEMENT PLAN

The Airport coordinates with DOAV and the FAA to maintain a 6-year CIP that identifies and prioritizes airport projects. A current CIP must be filed with DOAV for a sponsor to be eligible to receive entitlement or discretionary funds. **Table 5-1** depicts the current 5-year CIP for fiscal year (FY) 2024 to FY 2028, current as of July 1, 2024.<sup>1</sup> The Airport's 5-year CIP for HEF exceeds \$53.6 million.

The master planning process revisits the current CIP and aligns the Airport's capital program with the updated and FAA-approved forecast of future aeronautical activity. The updated CIP combines near-term projects already programmed and funded with new projects reflect the long-term needs for the Airport.

---

<sup>1</sup> The most current version of the CIP has undergone revisions and updates in planning sessions with airport staff and the FAA since the initiation of the master planning process. These revisions deviate from the information presented in **Table 3-8** Existing Airport CIP Projects (FY 2023-2028), as outlined in Chapter 2, *Inventory and Facility Requirements*.

TABLE 5-1  
APPROVED 5-YEAR CAPITAL IMPROVEMENT PLAN (2024-2028)

FAA FY	Project	Total Project Cost	Federal Funds	State Share	Local Share
<b>FY 2025</b>					
2025	Maintenance Facilities & Equipment, Security Capital Projects	\$550,000	\$0	\$408,000	\$142,000
2025	Air Traffic Control Tower	\$850,000	\$0	\$0	\$850,000
2025	Fuel Farm Upgrade	\$50,000	\$0	\$40,000	\$10,000
2025	West Hangar Redevelopment and Expansion	\$200,000	\$0	\$160,000	\$40,000
		<b>\$1,650,000</b>	<b>\$0</b>	<b>\$608,000</b>	<b>\$1,042,000</b>
<b>FY 2026</b>					
2026	Maintenance Facilities & Equipment, Security Capital Projects	\$360,000	\$0	\$276,000	\$84,000
2026	Air Traffic Control Tower	\$20,000,000	\$18,000,000	\$0	\$2,000,000
2026	Fuel Farm Upgrade	\$500,000	\$0	\$400,000	\$100,000
2026	Rehabilitation of Runway 16L-34R	\$10,000,000	\$9,000,000	\$800,000	\$200,000
		<b>\$30,860,000</b>	<b>\$27,000,000</b>	<b>\$1,476,000</b>	<b>\$2,384,000</b>
<b>FY 2027</b>					
2027	Maintenance Facilities & Equipment, Security Capital Projects	\$370,000	\$0	\$296,000	\$74,000
2027	Rehabilitation of Runway 16L-34R	\$10,000,000	\$9,000,000	\$800,000	\$200,000
2027	East Apron Rehabilitation	\$650,000	\$585,000	\$52,000	\$13,000
2027	Taxilane X-Ray (Design/Construct)	\$200,000	\$180,000	\$16,000	\$4,000
		<b>\$11,220,000</b>	<b>\$9,765,000</b>	<b>\$1,164,000</b>	<b>\$291,000</b>
<b>FY 2028</b>					
2028	Maintenance Facilities & Equipment, Security Capital Projects	\$595,000	\$0	\$476,000	\$119,000
2028	North East Apron and Taxilane Expansion	\$600,000	\$540,000	\$48,000	\$12,000
		<b>\$1,195,000</b>	<b>\$540,000</b>	<b>\$524,000</b>	<b>\$131,000</b>
<b>FY 2029</b>					
2029	North East Apron and Taxilane Expansion	\$3,500,000	\$3,150,000	\$280,000	\$70,000
2029	East Apron Rehabilitation	\$4,000,000	\$3,600,000	\$320,000	\$80,000
2029	Taxilane X-Ray (Design/Construct)	\$2,000,000	\$1,800,000	\$160,000	\$40,000
2029	Taxiway B Widening and Lightning	\$600,000	\$540,000	\$48,000	\$12,000
2029	New East Ramp Taxiway	\$500,000	\$450,000	\$40,000	\$10,000
		<b>\$10,600,000</b>	<b>\$9,540,000</b>	<b>\$848,000</b>	<b>\$212,000</b>
<b>Total 5-Year CIP (FY 2025-2029)</b>		<b>\$55,525,000</b>	<b>\$46,845,000</b>	<b>\$4,620,000</b>	<b>\$4,060,000</b>

Source: Airport Records, 2024; Prepared by RS&H, 2024

## 5.3 AIRPORT FUNDING OUTLOOK

Generally, airports are unable to meet all capital development funding needs from internal funding sources. Federal, state, local, and private funding often combine with airport funds and bond proceeds (supported by airport revenues and/or municipal support) to generate the funds required to undertake capital improvement projects. Federal funding sources, notably AIP grants, can be subject to modifications by Congress or oversight by other entities controlling those funds. At the state level, many states contribute grant funding to support local airport programs. Locally, funding sources often include airport sponsor funds, bond proceeds driven by airport revenues or municipal support, and occasionally, private contributions.

To create a funding plan that effectively addresses HEF's capital development needs, it is crucial to assess and integrate evaluations of available funds from each source, considering historical allocations or awards for capital projects at HEF. Moreover, since project eligibility criteria can differ across funding sources, adopting a diverse funding approach is instrumental in successfully financing capital improvement endeavors. Planning project funding requires careful consideration of available funds from different sources and their specific eligibility criteria. The provided analysis aids in identifying potential funding sources and evaluating the eligibility of each project element for various programs or funding sources. The analysis conducted during the development of this Master Plan has identified projects intended to enhance the existing 5-year CIP. This expansion extends the capital project and funding plan to cover the 20-year planning horizon. The subsequent subsections outline the key external funding sources intended to support the preferred development.

### 5.3.1 Federal Funding Outlook

The primary federal sources of funding available to the Airport are grants from the FAA's AIP and the 2021 Bipartisan Infrastructure Law (BIL). Once HEF becomes a Part 139-certificated facility and scheduled commercial passenger service begins, an application can be filed with the FAA to participate in the Passenger Facility Charge (PFC) program. By receiving federal funding for capital improvement projects, the Airport has an obligation to adhere to federal grant assurance requirements. These assurances obligate the Airport to comply with applicable federal law and guidance under the Code of Federal Regulations (CFR) Title 14, FAA Advisory Circulars, FAA Orders, and FAA Memos.

#### 5.3.1.1 Airport Improvement Program

Federal funding is accessible to airports through the AIP based on the airport category designated in the National Plan of Integrated Airport Systems (NPIAS) and the priority of the improvement as determined within the national priority ranking system. In the NPIAS classification, HEF is categorized as a National-level general aviation airport. This classification identifies the highest level of general aviation airports that are non-primary, and currently lacking commercial passenger air service, while offering high levels of activity of jet and multiengine aircraft.<sup>2</sup>

Based on HEF's NPIAS categorization as a reliever airport with a National role, recent HEF entitlement funding has been approximately \$150,000 per fiscal year. The introduction of scheduled commercial passenger service should elevate the NPIAS classification for HEF to a primary, non-hub commercial airport, which will qualify for a

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<sup>2</sup> Airport Categories, Federal Aviation Administration. Accessed: [https://www.faa.gov/airports/planning\\_capacity/categories](https://www.faa.gov/airports/planning_capacity/categories), July 2024

minimum of \$1.3 million annually based upon enplanement levels. Entitlement funds must be used within three fiscal years immediately following the year the funds were originally allocated.

In addition to annual entitlement funds, discretionary grants are offered through the AIP depending on the availability of funds and the FAA's assessment of need and priority ranking. Discretionary funding is based on a project's ranking in the National Priority List, as determined by the process found in FAA Order 5100.39A, *Airports Capital Improvement Plan*.

Since 2012, HEF has obtained discretionary funding for several projects. Grant awards have been primarily to improve airfield pavements, such as \$7.9 million in 2012 and 2013 for the extension of Runway 34R-16L, \$2.7 million for the rehabilitation of Runway 34L-16R, and more than \$13.6 million over the last 10 years to rehabilitate, extend or construct taxiways and taxilanes. Other projects include apron rehabilitation, runway and taxiway lighting and airfield guidance signage.

### **5.3.1.2 Bipartisan Infrastructure Law**

In November 2021, the Bipartisan Infrastructure Law (BIL) was signed by the President of the United States that included a reserve for airport development to be invested in various projects, including runways, taxiways, safety, and sustainability initiatives, as well as terminal, airport-transit connections, and roadway projects. The distribution of these funds is overseen by the FAA's Office of Airports (ARP). These investments are intended to enhance and improve the overall capabilities and facilities of airports across the country.<sup>3</sup> The BIL included three funding allocations for airports, two of which are available to the Port Authority for development at TOL, the Airport Improvement Grant and The Airport Terminal Program. The third funding allocation was reserved for FAA internal use for the rehabilitation and development of FAA-owned facilities. BIL funding sources are available for the five-year duration of federal fiscal years 2022 through 2026.

#### 5.3.1.2.1 Airport Improvement Grant

The Airport Improvement Grant, or AIG, allocates \$15 billion (or \$3 billion per year from 2022-2026) across all airports currently within the NPIAS, employing a comparable process and methodology to the AIP based on airport classification and passenger activity levels. The Airport has received \$763,000, \$844,000, and \$851,000 for FY2023 through FY2024, respectively, and anticipates annual allocations at similar levels through 2026.<sup>4</sup> The use of these funds follows the same use and eligibility parameters as AIP funding. The funds allocated through the BIL will remain available for obligation until the conclusion of the fourth fiscal year following their distribution. If any funds that are unobligated by the fifth fiscal year will be recovered by the FAA and repurposed for competitive grants. This ensures that the allocated funds are effectively used for infrastructure projects within the specified time frame, and any unused funds are redirected towards other deserving projects through a competitive grant process.

#### 5.3.1.2.2 FAA Contract Tower (FCT) Competitive Grant Program

As part of the BIL Airport Infrastructure improvement initiative, \$100 million has been allocated over five years starting in FY2022 through the FAA Contract Tower Competitive Grant Program. The program aims to enhance

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<sup>3</sup> Bipartisan Infrastructure Law - Airport Infrastructure. Accessed: <https://www.faa.gov/bil/airport-infrastructure>, July 2024

<sup>4</sup> Bipartisan Infrastructure Law Airport Infrastructure Grant Funding Amounts. Accessed: <https://www.faa.gov/general/bipartisan-infrastructure-law-airport-infrastructure-grant-funding-amounts>, July 2024

the safety and efficiency of air traffic control services by modernizing airport-owned air traffic control towers. As an airport-owned facility, improvements are eligible for FCT program funds.

#### 5.3.1.2.3 Airport Terminal Program

The Airport Terminal Program (ATP) allocates \$5 billion, or \$1 billion per year from 2022-2026, in supplemental discretionary funding opportunities specifically reserved for the development and improvement of airport passenger terminal facilities. This program requires a unique application process and maintains the same eligibility criteria as the Airport Improvement Program (AIP), but offers a greater federal share of project costs based on airport classification. Applications for each fiscal year begin with a Notice of Funding Opportunity (NOFO). As of this writing, ATP grants have been awarded through FY2024, the application period for FY2025 ATP grants has closed and applications are in review. ATP grant awards to date have surpassed \$2.9 billion.

Depending upon the location and proposed user improved areas, terminal modernization or upgrade projects included in the updated, 20-year CIP for HEF may be eligible for ATP discretionary grant funding.

#### **5.3.1.3 Passenger Facility Charges**

As mentioned, the introduction of commercial service at HEF will make the Airport eligible to participate in the PFC program. Under the PFC program, HEF will be able to collect \$4.50 per enplaned passenger and per flight segment. For a one-way trip, a maximum of two PFCs can be charged, and for a round trip, up to four PFCs can be charged, with a total cap of \$18.00 per round trip. PFC fees are collected by air carriers during ticket sales and remitted to the airport, less an administration fee of \$0.11 per collected PFC deducted.

Once approved by the FAA, PFC collections can be utilized to produce cash flow for airport capital programs, with project eligibility focused on preserving or enhancing safety, security, or capacity, reduce noise, or increase competition among air carriers. Projects funded by PFCs can include expansions to non-revenue terminal areas and equipment, runway upgrades, Aircraft Rescue and Firefighting (ARFF) equipment, baggage systems, gate improvements and boarding bridges, and noise abatement measures, among others. Additionally, revenues from PFC collections can be pledged as debt service to PFC-backed bond issuances. Participation in the PFC program will offer access to a new capital funding stream for HEF.

### 5.3.2 State Funding Outlook

The Commonwealth of Virginia offer a number of grant programs for public airports from funds authorized in the Code of Virginia:

- » Commonwealth Aviation Fund<sup>5</sup>: The Commonwealth Aviation Fund provides funding for capital planning and engineering projects that focus on airport facility development. The Commonwealth Aviation Fund is the source for state entitlement<sup>6</sup> and state discretionary funding. The amount of Commonwealth Aviation Fund funding available by state airport service role is determined by the formulas prescribed in the Code of Virginia.

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<sup>5</sup> Virginia Department of Aviation, Airport Program Manual, Accessed: [https://doav.virginia.gov/wp-content/uploads/Files/DocumentLibrary/Airport\\_Program\\_Manual.pdf#chapter-5](https://doav.virginia.gov/wp-content/uploads/Files/DocumentLibrary/Airport_Program_Manual.pdf#chapter-5), July 2024

<sup>6</sup> Funding eligibility is based upon airport role in the Vermont Air Transportation System (VATSP) and the NPIAS. Only Air Carrier airports are eligible for state entitlement funding.

For most federally funded projects, DOAV and the sponsor will each fund a share of eligible costs not covered by the federal participation. DOAV's funding portion is 80 percent of the non-federal share when state discretionary funds are involved. For most state-funded projects, DOAV and the sponsor will each fund a share of eligible costs. State participation percentages are based on the type of project undertaken and the state funding program used for the project

- » Aviation Special Fund: The Aviation Special Fund is accumulated from taxes, fees, etc., and funds programs offering airport maintenance, facility and equipment, security, and promotion projects.

To be eligible for state grant funding, airports are required to submit reports including: the annual based aircraft survey, annual certification of financial responsibility, annual self-reporting of state aviation funding received, and, for sponsors of air carrier airports, *Entitlement Utilization Report and Plan*.

Beyond discretionary and entitlement funding, the state administers the following additional grant programs:

- » Maintenance Program: The Maintenance Program provides funding for non-recurring maintenance to assist sponsors keep the facilities in a safe and economical operating condition. The program is designed to encourage and assist airport sponsors with the implementation of preventative maintenance programs that will extend the useful life of the facilities and reduce the frequency of their replacement or reconstruction. DOAV's Airport Services Division manages the program.

The state's participation rate for projects under the Maintenance Program varies, and ranges from 80 percent (except for AWOS equipment; fueling systems; terminal buildings; the purchase of maintenance equipment; and the maintenance of equipment) to 95 percent for sponsor-owned AWOS equipment. The state's participation in other maintenance projects is based ratios and calculations detailed in the Virginia Department of Aviation, *Airport Program Manual*.

- » Facilities and Equipment Program: The Facilities and Equipment Program provides funding for the installation of electronic communication, navigation, and information systems that enhance the safety of flight and the utilization of Virginia's air transportation system. The state's participation is dependent upon whether the system/equipment will be owned and maintained by the DOAV or the sponsor.
- » Voluntary Security Program: The Voluntary Security Program provides funding for projects to enhance the security of public-use general aviation airports in Virginia. The Voluntary Security Program funds 100 percent of projects to conduct security audits and develop security plans. For projects at airports certified as a Secure Virginia Airport<sup>7</sup>, the program funds 90 percent of eligible costs for the design and installation of security improvements that address deficiencies identified in plans and audits. For projects at airports not certified as a Secure Virginia Airport, the program funds 80 percent of eligible costs for those projects. DOAV will review security audits and plans and will review and approve engineering agreements, plans, and specifications for security improvements. When funds are not

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<sup>7</sup> Certification for general aviation airports requires an initial security audit conducted by an outside agency and publishing a security plan, which must be approved by DOAV.

available under the Voluntary Security Program, a sponsor may submit project requests under the Commonwealth Aviation Fund for consideration by the VAB.

Other state airport funding programs include the Aviation and Airport Promotion Program and the Governor’s New Airline Service Incentive Fund (for airlines), which was established in 2020.

### 5.3.3 Local Funding Outlook

As a department of the City of Manassas, the Airport receives annual general fund allocations for the operating budget to operate, staff, and maintain the facility. Primary operating revenues from financing airport operations are from rental income from tenant leases, hangar rentals, aircraft tie downs fees, and from fuel sales and flowage fees. Revenues are also generated from other miscellaneous user fees, such as annual operating permits, rental car company fees, among others.

The Airport’s largest annual operating expenses are services and supplies, wages and benefits, utilities, security, and the ATCT. **Table 5-2** shows recent historical revenues and expenses, and a conservative projection of operating financial performance for the 20-year planning period. Importantly, this projection follows the most current Airport Financial Plan<sup>8</sup>, which includes a pro forma through FY 2029, and extends the projection through 2039. The purpose of the projection is to present a baseline financial condition to assess the near, mid- and long-term financial feasibility of implementing ACIP presented in Section 5.4, *Airport Development Phasing and Funding Plan*. The projection assumes no substantial changes to the recent operating profile or users at HEF.

As indicated in the Airport Financial Plan, recent trends indicate strong financial performance, where revenues have well-exceeded expenses since 2017. The compound annual growth rate (CAGR) for total airport revenues during that period was 6.7 percent and operating expenses at 1.8 percent, helping the Airport continuously exceed the annual strategic goals of 100 percent of annual expenses and a debt coverage ratio of 1.5<sup>9</sup>.

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<sup>8</sup> *2022 Airport Financial Plan, Manassas Regional Airport (HEF)*, June 16, 2022.

<sup>9</sup> The debt coverage ratio is net revenues divided by debt service.

TABLE 5-2  
AIRPORT REVENUES AND EXPENSES - (HISTORICAL AND PROJECTED)

	FY 2017	FY 2018	Historical		FY 2021					
			FY 2019	FY 2020						
<b>Operating Revenues</b>										
Franchises and leases	\$1,663,878	\$1,519,148	\$1,853,911	\$1,951,260	\$2,145,378					
Hangar rentals	\$617,029	\$950,664	\$963,623	\$985,510	\$923,943					
Tie Downs & Other	\$283,329	\$251,014	\$308,001	\$433,918	\$196,570					
Fuel sales	\$144,057	\$270,809	\$272,499	\$244,676	\$241,298					
<b>Total Operating Revenues</b>	<b>\$2,707,481</b>	<b>\$2,991,636</b>	<b>\$3,398,035</b>	<b>\$3,615,365</b>	<b>\$3,507,188</b>					
<b>Expenses</b>										
Wages and benefits	\$778,810	\$710,717	\$732,441	\$737,371	\$777,972					
Services and supplies	\$564,305	\$521,968	\$677,501	\$590,701	\$636,366					
Utilities	\$109,730	\$136,447	\$144,136	\$148,557	\$126,636					
Security	\$85,348	\$86,855	\$91,131	\$85,621	\$91,877					
FAA tower and misc.	\$134,764	\$139,681	\$169,458	\$153,119	\$161,712					
<b>Total Operating Expenses</b>	<b>\$1,673,247</b>	<b>\$1,595,688</b>	<b>\$1,814,667</b>	<b>\$1,715,369</b>	<b>\$1,794,562</b>					
<b>Total Revenues</b>	<b>\$1,034,234</b>	<b>\$1,395,948</b>	<b>\$1,583,368</b>	<b>\$1,899,996</b>	<b>\$1,712,626</b>					
	FY 2025	FY 2026	FY 2027	FY 2028	Projected					
					FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	
<b>Operating Revenues</b>										
Franchises and leases	\$2,288,461	\$2,357,115	\$2,427,828	\$2,500,663	\$2,575,683	\$2,652,953	\$2,732,542	\$2,814,518	\$2,898,954	
Hangar rentals	\$1,007,329	\$1,037,549	\$1,068,675	\$1,100,735	\$1,133,757	\$1,167,770	\$1,202,803	\$1,238,887	\$1,276,054	
Tie Downs & Other	\$307,833	\$317,068	\$326,580	\$336,378	\$346,469	\$356,863	\$367,569	\$378,596	\$389,954	
Fuel sales	\$189,113	\$194,786	\$200,629	\$206,648	\$212,848	\$219,233	\$225,810	\$232,585	\$239,562	
<b>Total Operating Revenues</b>	<b>\$3,792,735</b>	<b>\$3,906,517</b>	<b>\$4,023,713</b>	<b>\$4,144,424</b>	<b>\$4,268,757</b>	<b>\$4,396,820</b>	<b>\$4,528,724</b>	<b>\$4,664,586</b>	<b>\$4,804,524</b>	
<b>Expenses</b>										
Wages and benefits	\$1,240,303	\$1,289,915	\$1,341,512	\$1,395,172	\$1,450,979	\$1,509,018	\$1,569,379	\$1,632,154	\$1,697,441	
Services and supplies	\$1,346,008	\$1,399,848	\$1,455,842	\$1,514,076	\$1,574,639	\$1,637,624	\$1,703,129	\$1,771,255	\$1,842,105	
Utilities	\$162,781	\$169,292	\$176,064	\$183,106	\$190,431	\$198,048	\$205,970	\$214,208	\$222,777	
Security	\$103,293	\$107,425	\$111,721	\$116,190	\$120,838	\$125,671	\$130,698	\$135,926	\$141,363	
FAA tower and misc.	\$241,456	\$251,115	\$261,159	\$271,606	\$282,470	\$293,769	\$305,519	\$317,740	\$330,450	
<b>Total Operating Expenses</b>	<b>\$3,093,841</b>	<b>\$3,217,595</b>	<b>\$3,346,299</b>	<b>\$3,480,150</b>	<b>\$3,619,356</b>	<b>\$3,764,131</b>	<b>\$3,914,696</b>	<b>\$4,071,284</b>	<b>\$4,234,135</b>	
<b>Total Revenues</b>	<b>\$698,894</b>	<b>\$688,923</b>	<b>\$677,414</b>	<b>\$664,274</b>	<b>\$649,400</b>	<b>\$632,689</b>	<b>\$614,028</b>	<b>\$593,302</b>	<b>\$570,388</b>	

TABLE 5-2 (CONTINUED)  
AIRPORT REVENUES AND EXPENSES - (PROJECTED)

	Projected					
	FY 2034	FY 2035	FY 2036	FY 2037	FY 2038	FY 2039
<b>Operating Revenues</b>						
Franchises and leases	\$2,985,922	\$3,075,500	\$3,167,765	\$3,262,798	\$3,360,682	\$3,461,502
Hangar rentals	\$1,314,336	\$1,353,766	\$1,394,379	\$1,436,210	\$1,479,296	\$1,523,675
Tie Downs & Other	\$401,652	\$413,702	\$426,113	\$438,896	\$452,063	\$465,625
Fuel sales	\$246,749	\$254,151	\$261,776	\$269,629	\$277,718	\$286,050
<b>Total Operating Revenues</b>	<b>\$4,948,659</b>	<b>\$5,097,119</b>	<b>\$5,250,033</b>	<b>\$5,407,534</b>	<b>\$5,569,760</b>	<b>\$5,736,852</b>
<b>Expenses</b>						
Wages and benefits	\$1,765,338	\$1,835,952	\$1,909,390	\$1,985,765	\$2,065,196	\$2,147,804
Services and supplies	\$1,915,789	\$1,992,421	\$2,072,117	\$2,155,002	\$2,241,202	\$2,330,850
Utilities	\$231,688	\$240,955	\$250,594	\$260,617	\$271,042	\$281,884
Security	\$147,018	\$152,899	\$159,015	\$165,375	\$171,990	\$178,870
FAA tower and misc.	\$343,668	\$357,414	\$371,711	\$386,579	\$402,043	\$418,124
<b>Total Operating Expenses</b>	<b>\$4,403,501</b>	<b>\$4,579,641</b>	<b>\$4,762,826</b>	<b>\$4,953,339</b>	<b>\$5,151,473</b>	<b>\$5,357,532</b>
<b>Total Revenues</b>	<b>\$545,159</b>	<b>\$517,478</b>	<b>\$487,206</b>	<b>\$454,194</b>	<b>\$418,287</b>	<b>\$379,321</b>

Source: Airport Records; RS&H Analysis, 2024

### **5.3.3.1 Customer Facility Charges**

Another source of generating local funding for the capital program at HEF are Customer Facility Charges (CFCs), which will become an option with the introduction of scheduled commercial passenger service. CFCs are a user fee applied to each rental car transaction and are collected by rental car agencies and passed on to the Airport sponsor similar to PFC program collection process. However, CFCs are regulated at the state level and implemented through local ordinance rather than overseen by the FAA. Revenues from CFC collections are primarily used for funding rental car facilities, associated infrastructure, and operational expenses, and can be utilized for debt service on CFC-backed bond issuances.

Similar to participation in the PFC program, the launch of commercial service and introduction of rental car services at HEF will make the Airport able to establish a CFC program. However, CFCs may not be appropriate or a good fit for HEF during the near term period when routes and destinations are in startup phase, and passenger volumes may be insufficient to produce high demand for rental car agencies or vehicles.

### **5.3.3.2 Issuance of Debt**

A review of existing Airport debt indicates a total principal and interest owed of about \$627,000, which will be retired in full in FY 2026.

**Table 5-3** presents a summary of recent historical annual debt service, and the Debt Coverage Ratio (DCR) for the Airport for the planning period. As shown, HEF's DCR is projected to improve through the planning period as the Airport pays down outstanding debt.

The DCR is a metric of net revenues to annual debt service, which assesses debt capacity and the ability of operating income to cover debt service payments. DCR is an integral metric used by lenders to evaluate creditworthiness. Typically, for long-term debt secured by revenues or PFCs, the standard minimum threshold accepted by lending institutions is 1.25. The DCR for the Airport has exceeded this minimum by more than 200% since 2017, indicating a strong financial position.

TABLE 5-3  
AIRPORT DEBT COVERAGE RATIO (HISTORICAL AND PROJECTED)

	FY 2017	FY 2018	Historical		
			FY 2019	FY 2020	FY 2021
<b>Category</b>					
Operating Revenues	\$2,707,481	\$2,991,636	\$3,398,035	\$3,615,365	\$3,507,188
Operating Expenses	(\$1,673,247)	(\$1,595,668)	(\$1,814,667)	(\$1,715,369)	(\$1,715,626)
<b>Net Revenues</b>	<b>\$1,034,234</b>	<b>\$1,395,968</b>	<b>\$1,583,368</b>	<b>\$1,899,996</b>	<b>\$1,791,562</b>
Annual Debt Service	(\$407,689)	(\$451,760)	(\$453,410)	(\$239,080)	(\$240,412)
<b>Debt Coverage Ratio (DCR)</b>	<b>2.54</b>	<b>3.09</b>	<b>3.49</b>	<b>7.95</b>	<b>7.45</b>

	FY 2025	FY 2026	FY 2027	FY 2028	Projected				
					FY 2029	FY 2030	FY 2031	FY 2032	FY 2033
<b>Category</b>									
Operating Revenues	\$3,792,736	\$3,906,517	\$4,023,713	\$4,144,424	\$4,268,757	\$4,396,820	\$4,528,724	\$4,664,586	\$4,804,524
Operating Expenses	(\$3,093,841)	(\$3,217,595)	(\$3,346,299)	(\$3,480,150)	(\$3,619,356)	(\$3,764,131)	(\$3,914,696)	(\$4,071,284)	(\$4,234,135)
<b>Net Revenues</b>	<b>\$698,895</b>	<b>\$688,922</b>	<b>\$677,414</b>	<b>\$664,274</b>	<b>\$649,400</b>	<b>\$632,689</b>	<b>\$614,028</b>	<b>\$593,302</b>	<b>\$570,388</b>
Annual Debt Service	(\$209,150)	(\$208,075)	\$0	\$0	\$0	\$0	\$0	\$0	\$0
<b>Debt Coverage Ratio (DCR)</b>	<b>3.34</b>	<b>3.31</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

	Projected					
	FY 2034	FY 2035	FY 2036	FY 2037	FY 2038	FY 2039
<b>Category</b>						
Operating Revenues	\$4,948,659	\$5,097,119	\$5,250,033	\$5,407,534	\$5,569,760	\$5,736,852
Operating Expenses	(\$4,403,501)	(\$4,579,641)	(\$4,762,826)	(\$4,953,339)	(\$5,151,473)	(\$5,357,532)
<b>Net Revenues</b>	<b>\$545,159</b>	<b>\$517,478</b>	<b>\$487,206</b>	<b>\$454,194</b>	<b>\$418,287</b>	<b>\$379,321</b>
Annual Debt Service	\$0	\$0	\$0	\$0	\$0	\$0
<b>Debt Coverage Ratio (DCR)</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

Source: Airport Records; RS&H Analysis, 2024

### 5.3.4 Airport Funding Outlook Summary

As shown in the approved 5-year CIP shown in **Table 5-1**, the Airport has identified a need for federal funding for eligible projects of more than \$46.8 million between 2025-2029. During the same period, State and Local share of those projects is identified at \$4.6 and about \$4.1 million, respectively. Federal participation is shown at 82 percent of the 5-year program, which is a significant increase over previous periods and is driven by a number of large projects described in the next section. These projects include a new Air Traffic Control Tower, improvements to Runway 16L-34R, North East Apron and taxiway expansion, rehabilitation of the East Apron, and construction of Taxiway X-Ray. Costs associated with these projects are included in the 20-Year CIP in **Table 5-5**.

Beyond 2028, as these larger projects are completed, levels of required funding support through the AIP and DOAV will adjust based on the next set of projects. Additionally, federal funds available to HEF will no longer benefit from the BIL AIG allocations or the terminals and ATCT grants, which ends in 2026. As implementation of the HEF capital program evolves, it is reasonable to anticipate that funding support could normalize at a lower level than the near term period.

Based on these assumptions, the funding outlook for HEF from federal, state, and Airport sources is estimated as shown in **Table 5-4**. Mid- and long-term funding outlook reflects modest increases in DOAV and Local share funds.

**TABLE 5-4**  
**ANTICIPATED FUNDING OUTLOOK BY SOURCE**

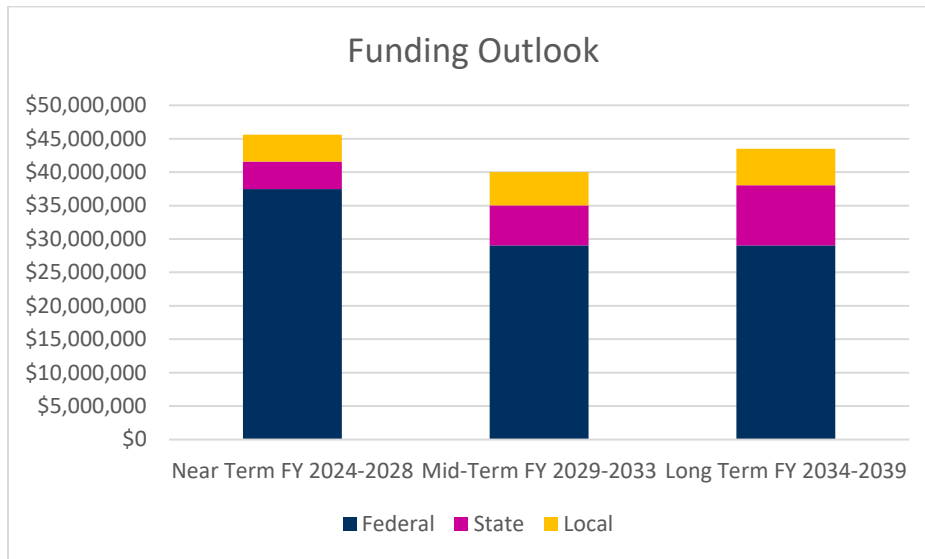
Funding Source	Near-Term	Mid-Term	Long-Term	Total
	FY 2024-2028	FY 2029-2033	FY 2034-2043	
Federal	\$37,485,000	\$29,025,000	\$29,025,000	\$95,535,000
State	\$4,100,000	\$6,000,000	\$9,000,000	\$19,100,000
Local	\$4,045,000	\$5,000,000	\$5,500,000	\$14,545,000
<b>Total</b>	<b>\$45,630,000</b>	<b>\$40,025,000</b>	<b>\$43,525,000</b>	<b>\$129,180,000</b>

Note: BIL funding concludes with FY 2026 allocations.  
Source: FAA; Airport Financial Records; RS&H Analysis, 2023

Drawing on the overview of funding sources outlined in this section, and under the assumption that no significant changes to FAA funding programs or state match participation occur, HEF might anticipate access to funding around \$130 million for the 20-year planning period. While the scope and timing of projects, availability of funds, and competition with other airports and their priorities will have an impact, this assumption is helpful for planning purposes to identify a baseline outlook of funding for the CIP.

As shown, funding levels for the mid- and long-term periods are estimated to increase overall with a shift in federal, state, and local shares. The funding outlook is illustrated in **Figure 5-1**.

**FIGURE 5-2**  
**ANTICIPATED FUNDING OUTLOOK BY SOURCE**



Source: RS&H Analysis, 2024

## 5.4 AIRPORT DEVELOPMENT PHASING AND FUNDING PLAN

This section outlines the airport development phasing and funding plan for the 20-year planning period, broken down to illustrate near-, mid-, and long-term phases. Each phase is ordered to complete smaller, enabling projects prior to larger projects, and follow implementation steps necessary to accomplish the objectives of the Airport. Each development phase aligns with aviation activity forecasts detailed in Chapter 1, *Aviation Activity Forecast*. The CIP by term and estimated costs is shown in **Table 5-5**.

The planning-level cost estimates provided for each project are ROM calculations that consider the gross areas of the project and multiply them by a realistic unit cost factor. Assumptions include adjustments over the 20-year period to account for construction cost inflation at five (5) percent annually. Design costs were estimated to be eight (8) percent of construction costs, and construction administration is included at six (6) percent of construction costs.

Finally, a contingency of 20 percent is included for all projects, which are intended to reflect scope, design, changes, permitting, and environmental study and documentation for every project. As described, the ROM estimates provide an approximation of costs and are valuable in the early planning stages to gauge the financial implications of the proposed projects. As the projects progress, more detailed and accurate cost estimates will be developed to refine the budgeting and funding requirements.

The following subsections offer descriptions of the projects outlined in the updated 20-year CIP. These projects are strategically organized according to the airport's priority, their capacity to enable further developments, and the accessibility of funding.

TABLE 5-5  
CAPITAL IMPROVEMENT PLAN (NEAR TERM)

Proj. No.	Project	Total Project Cost	Entitlement	FAA Participation Discretionary	BIL	Total Federal	PFC	Local Share	DOAV Share	Unfunded / Ineligible
<b>Phase I (2024-2028)</b>										
1	Realignment of Observation Road	\$4,892,204	\$0	\$0	\$2,458,000	\$2,458,000	\$0	\$0	\$218,489	\$2,215,715
2	Bridge Strengthening - Runway 16L/34R and Taxiway B (Design)	\$2,816,000	\$150,000	\$2,384,400	\$0	\$2,534,400	\$0	\$140,800	\$140,800	\$0
3	New FAA ATCT Phase 2 (Design)	\$2,737,600	\$300,000	\$0	\$2,300,720	\$2,600,720	\$0	\$136,880	\$0	\$0
4	New FAA ATCT Phase 3 (Construction)	\$38,100,000	\$1,000,000	\$3,429,000	\$31,766,000	\$36,195,000	\$0	\$1,905,000	\$0	\$0
5	Runway 16L-34R Reconstruction and Strengthening (Design)	\$1,112,000	\$0	\$1,000,800	\$0	\$1,000,800	\$0	\$22,240	\$88,960	\$0
6	Terminal Parking Lot Rehabilitation and Expansion	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
7	Terminal Building Expansion (north and south)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
8	Satellite Parking #1 Construction and New Entrance Road	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
9	Taxiway E Fillet Widening (Design and Construction)	\$1,740,000	\$0	\$1,566,000	\$0	\$1,566,000	\$0	\$34,800	\$139,200	\$0
10	Bridge Strengthening - Runway 16L/34R and Taxiway B (Construction)	\$32,384,000	\$0	\$29,145,600	\$0	\$29,145,600	\$0	\$647,680	\$2,590,720	\$0
11	Runway 16L-34R Reconstruction and Strengthening (Construction)	\$16,100,000	\$1,300,000	\$13,190,000	\$0	\$14,490,000	\$333,600	\$322,000	\$954,400	\$0
12	South West Hangar Redevelopment (Design)	\$1,229,000	\$0	\$995,490	\$0	\$995,490	\$0	\$22,122	\$88,488	\$122,900
13	East Ramp Strengthening, Reconfiguration, and Rehabilitation (Design and Construction) - Phase 1	\$7,000,000	\$0	\$5,670,000	\$0	\$5,670,000	\$0	\$126,000	\$504,000	\$700,000
14	Taxilane X (Design and Construction)	\$5,373,000	\$0	\$4,352,130	\$0	\$4,352,130	\$0	\$96,714	\$386,856	\$537,300
15	Maintenance Equipment Storage (MES)/Snow Removal Equipment (SRE) Facility (Design)	\$1,196,000	\$0	\$753,480	\$0	\$753,480	\$0	\$16,744	\$66,976	\$358,800
16	Maintenance Equipment Storage (MES)/Snow Removal Equipment (SRE) Facility (Construction)	\$15,840,000	\$1,300,000	\$8,679,200	\$0	\$9,979,200	\$0	\$221,760	\$887,040	\$4,752,000
17	Fuel Farm Upgrades (Design and Construction)	\$17,241,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$17,241,000
18	Install Backup Airfield Generators	\$550,000	\$445,500	\$0	\$0	\$445,500	\$0	\$9,900	\$39,600	\$55,000
19	Acquire Multi-function SRE (2)	\$1,774,000	\$854,500	\$742,100	\$0	\$1,596,600	\$0	\$35,480	\$141,920	\$0
20	South West Hangar Redevelopment (Construction)	\$17,941,000	\$0	\$14,532,210	\$0	\$14,532,210	\$0	\$322,938	\$1,291,752	\$1,794,100
21	West Apron Hangar Expansion - Phase 1 (Design)	\$1,960,000	\$0	\$1,587,600	\$0	\$1,587,600	\$0	\$35,280	\$141,120	\$196,000
22	Taxiway B Reconstruction and Strengthening (South of the Bridge)	\$12,400,000	\$0	\$10,654,440	\$0	\$10,654,440	\$561,733	\$236,765	\$947,061	\$0
23	Taxiway B Widening (Design)	\$435,000	\$0	\$391,500	\$0	\$391,500	\$0	\$8,700	\$34,800	\$0
<b>Total Short-Term</b>		<b>\$182,900,000</b>	<b>\$5,400,000</b>	<b>\$99,100,000</b>	<b>\$36,600,000</b>	<b>\$141,100,000</b>	<b>\$900,000</b>	<b>\$4,400,000</b>	<b>\$8,700,000</b>	<b>\$28,000,000</b>

Note: Totals shown are rounded.  
Source: RS&H Analysis, 2024

TABLE 5-5 (CONTINUED)  
CAPITAL IMPROVEMENT PLAN (MID-TERM)

Proj. No.	Project	Total Project Cost	FAA Participation			Total Federal	PFC	Local Share	DOAV Share	Unfunded / Ineligible
			Entitlement	Discretionary	BIL					
<b>Phase II (2029-2033)</b>										
24	West Apron Hangar Expansion - Phase 1 (Construction)	\$27,266,000	\$0	\$22,085,460	\$0	\$22,085,460	\$0	\$490,788	\$1,963,152	\$2,726,600
25	East Ramp Strengthening, Reconfiguration, and Rehabilitation (Design and Construction) - Phase 2	\$7,000,000	\$0	\$5,670,000	\$0	\$5,670,000	\$0	\$126,000	\$504,000	\$700,000
26	Taxiway B Widening (Construction)	\$5,756,000	\$1,318,000	\$3,564,396	\$0	\$4,882,396	\$331,115	\$108,498	\$433,991	\$0
27	Runway 16L/34R Widening (Design)	\$1,251,000	\$0	\$1,125,900	\$0	\$1,125,900	\$0	\$25,020	\$100,080	\$0
28	Runway 16L/34R Widening (Construction)	\$16,563,000	\$1,318,000	\$13,259,277	\$0	\$14,577,277	\$366,026	\$323,939	\$1,295,758	\$0
29	East Ramp Strengthening, Reconfiguration, and Rehabilitation (Design and Construction) - Phase 3	\$7,000,000	\$1,318,000	\$4,352,000	\$0	\$5,670,000	\$0	\$126,000	\$504,000	\$700,000
30	West Apron Hangar Expansion - Phase 2 (Design)	\$1,453,000	\$0	\$1,176,930	\$0	\$1,176,930	\$0	\$26,154	\$104,616	\$145,300
31	New East Ramp Taxiway (Design and Construction)	\$1,243,000	\$0	\$1,118,700	\$0	\$1,118,700	\$0	\$24,860	\$99,440	\$0
32	Expanded East Ramp and Taxilane between Taxiway Delta and Echo (Design)	\$576,000	\$0	\$518,400	\$0	\$518,400	\$0	\$11,520	\$46,080	\$0
33	Runway 16L/34R Extension (Design)	\$500,300	\$0	\$0	\$0	\$0	\$500,300	\$0	\$0	\$0
34	Taxilane C and Taxilane D Relocation (Design)	\$253,500	\$228,150	\$0	\$0	\$228,150	\$0	\$5,070	\$20,280	\$0
35	Taxilane C and Taxilane D Relocation (Construction)	\$3,360,000	\$1,089,850	\$1,934,150	\$0	\$3,024,000	\$0	\$67,200	\$268,800	\$0
36	West Apron Hangar Expansion - Phase 2 (Construction)	\$20,250,000	\$0	\$16,402,500	\$0	\$16,402,500	\$0	\$364,500	\$1,458,000	\$2,025,000
37	Expanded East Ramp and Taxilane between Taxiway Delta and Echo (Construction)	\$7,620,000	\$0	\$6,858,000	\$0	\$6,858,000	\$0	\$152,400	\$609,600	\$0
38	Glen-Gerry Property Reimbursement	\$1,960,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1,960,000
39	Runway 16L-34R Extension (Construction)	\$7,000,000	\$1,318,000	\$4,245,531	\$0	\$5,563,531	\$818,298	\$123,634	\$494,536	\$0
40	Vehicle Service Road (Design and Construction)	\$11,700,000	\$0	\$10,530,000	\$0	\$10,530,000	\$0	\$234,000	\$936,000	\$0
<b>Total Mid-Term</b>		<b>\$120,800,000</b>	<b>\$6,600,000</b>	<b>\$92,900,000</b>	<b>\$0</b>	<b>\$99,500,000</b>	<b>\$2,100,000</b>	<b>\$2,300,000</b>	<b>\$8,900,000</b>	<b>\$8,300,000</b>

Note: Totals shown are rounded.  
Source: RS&H Analysis, 2024

TABLE 5-5 (CONTINUED)  
CAPITAL IMPROVEMENT PLAN (LONG-TERM)

Proj. No.	Project	Total Project Cost	Entitlement	FAA Participation Discretionary	BIL	Total Federal	PFC	Local Share	DOAV Share	Unfunded / Ineligible
<b>Future (2034-2039)</b>										
41	East Apron T-hangar (Demolition)	\$1,462,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1,462,000
42	ARFF Station (Design)	\$2,125,000	\$0	\$1,338,750	\$0	\$1,338,750	\$0	\$29,750	\$119,000	\$637,500
43	ARFF Station (Construction)	\$28,160,000	\$1,780,647	\$15,634,531	\$0	\$17,415,178	\$516,860	\$387,004	\$1,548,016	\$8,292,942
44	Airport Master Plan Update	\$1,000,000	\$900,000	\$0	\$0	\$900,000	\$0	\$20,000	\$80,000	\$0
45	West Apron Hangar Expansion - Phase 3 (Design)	\$6,642,000	\$1,780,647	\$3,599,373	\$0	\$5,380,020	\$0	\$119,556	\$478,224	\$664,200
46	West Apron Hangar Expansion - Phase 3 (Construction)	\$92,410,000	\$2,614,910	\$72,237,190	\$0	\$74,852,100	\$0	\$1,663,380	\$3,000,000	\$12,894,520
47	8 Acre Land Acquisition - Prince William County	\$12,000,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$12,000,000
48	Parking Garage Construction	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
<b>Total Long-Term</b>		<b>\$143,800,000</b>	<b>\$7,100,000</b>	<b>\$92,900,000</b>	<b>\$0</b>	<b>\$100,000,000</b>	<b>\$600,000</b>	<b>\$2,300,000</b>	<b>\$5,300,000</b>	<b>\$36,000,000</b>
<b>Total Program (2024-2039)</b>		<b>\$447,500,000</b>	<b>\$19,100,000</b>	<b>\$284,900,000</b>	<b>\$2,500,000</b>	<b>\$340,600,000</b>	<b>\$3,600,000</b>	<b>\$9,000,000</b>	<b>\$22,900,000</b>	<b>\$72,300,000</b>

Note: Totals shown are rounded.

Source: RS&H Analysis, 2024

### 5.4.1 Projects Currently Underway

At the time of this Master Plan, one FY 2024 development project has been funded and is currently being completed. The project underway in FY 2024 is detailed below.

**a) Realignment of Observation Road – Construction (2024)**

Relocate parts of Observation Road to capture more usable airside land. The road has been deeded to the City as surplus property, so the project will be coordinated with the City's transportation program. With the increase in the amount of usable airside land, the airport could build hangars, ramps, etc.

**b) Bridge Strengthening – Runway 16L/34R and Taxiway B – Design (2024)**

The East Apron serves one FBO, corporate hangars, T-hangars, and the terminal. Most business jet operations occur on the east airfield and the East Apron. In preparation for commercial service introduction to the Airport, there will be an expansion of the terminal facility on the East Apron. This reconfiguration and strengthening will allow the terminal to accommodate aircraft operated by the airlines. This project will include restriping of the ramp to meet the required taxiway safety areas, aircraft parking areas and remain overnight (RON) spaces. This increased operations by scheduled airlines will require the pavement to be strengthened, reconfigured and rehabilitated.

**Figure 5-3** illustrates these projects underway at HEF.

FIGURE 5-3  
PROJECTS CURRENTLY UNDERWAY



**HEF DEVELOPMENT PHASING PLAN**

**PROJECTS CURRENTLY UNDERWAY**

- 1 Realignment of Observation Road
- 2 Bridge Strengthening - Runway 16L/34R and Taxiway B (Design)\*

\*\*\* Denotes project is not shown in graphic.

LEGEND	
EXISTING AIRPORT PROPERTY LINE	--- ---
NEW AIRFIELD/AIRSIDE PAVEMENT	Blue fill
PAVEMENT REMOVAL	Green cross-hatch
BUILDING DEMOLITION	Red cross-hatch
NEW ROADWAY	Purple fill
NEW BUILDING	Yellow fill
COMPLETED PROJECT	Grey fill



Source: Airport Records; RS&H Analysis, 2024

## 5.4.2 Near-term Development Projects

Near-term capital improvements encompass development projects slated to commence within the upcoming five-year period (FY 2024 to FY 2028). The provided list of near-term development projects is strategically phased based on priority, their capacity to enable further advancements, and the availability of funding. These projects' implementation aims to tackle capacity constraints while ensuring the overall viability and sustainability of the airport.

Near-term programmed development at HEF is shown as projects 1-23 in the following list and on **Figure 5-4** at the conclusion of this subsection.

### **1. Realignment of Observation Road – Construction (2024)**

Relocate parts of Observation Road to capture more usable airside land. The road has been deeded to the City as surplus property, so the project will be coordinated with the City's transportation program. With the increase in the amount of usable airside land, the airport could build hangars, ramps, etc.

### **2. Bridge Strengthening – Runway 16L/34R and Taxiway B – Design (2024)**

The East Apron serves one FBO, corporate hangars, T-hangars, and the terminal. Most business jet operations occur on the east airfield and the East Apron. In preparation for commercial service introduction to the Airport, there will be an expansion of the terminal facility on the East Apron. This reconfiguration and strengthening will allow the terminal to accommodate aircraft operated by the airlines. This project will include restriping of the ramp to meet the required taxilane safety areas, aircraft parking areas and remain overnight (RON) spaces. This increased operations by scheduled airlines will require the pavement to be strengthened, reconfigured and rehabilitated.

### **3. New FAA ATCT Phase 2– Design (2025)**

Design a replacement Airport Traffic Control Tower to be located west of the existing site. The existing tower is at the end of its useful life and the maintenance cost is steadily increasing. State grant funding was received in FY 2023 to complete a siting study for the new tower.

### **4. New FAA ATCT Phase 3 – Construction (2025)**

Construct a replacement Airport Traffic Control Tower to be located west of the existing site. The existing tower is at the end of its useful life and the maintenance cost is steadily increasing. State grant funding was received in FY 2023 to complete a siting study for the new tower.

### **5. Runway 16L-34R Reconstruction and Strengthening – Design (2025)**

The runway pavement has reached the end of its useful life as the last rehabilitation was performed over 20 years ago. The projected demand of scheduled commercial airline service will require the pavement to be reconstructed and strengthened to support scheduled commercial airline service. The project entails the repaving of 16L/34R, restriping of the runway, and the replacement of airfield signs and lights. In addition, this scope will include NAVAID service road realignment and blast pad redesign on the 16L approach end.

## **6. Terminal Parking Lot Rehabilitation, Expansion and Parking Garage - Design/Construction (2025) – PRIVATELY FUNDED AND CONSTRUCTED**

The program will be conducted in two segments. The first segment envisions a temporary modular facility designed for safety and speed to market followed by the future fully expanded terminal in its completed configuration. Avports Manassas' intent will be to optimize site development and construction phasing to minimize impacts to the interim operations, temporarily moving existing functionality and tenants as required to ensure continuous operations. The proposed interim terminal includes all "landside" functional areas for commercial passengers, from check-in to security and baggage handling, with those passengers then flowing into the existing terminal building to await boarding. This approach maximizes the visibility of the existing terminal building and provides a comfortable gate experience.

## **7. Terminal Building Expansion (North and South) (2025) - Design/Construction PRIVATELY FUNDED AND CONSTRUCTED**

This represents the second segment in the terminal development. The second segment incorporates the full build-out of all 25,000 ft<sup>2</sup> required by the franchise agreement, including 10,000 ft<sup>2</sup> of incremental space with a robust commercial concessions program centered around the technology and services we know today's guests and airlines demand. Capital expenditures are estimated to be between \$75 and \$125 million over the course of the Project, with most of those monies expended during years 1 to 4 as we prepare the Airport for commercial service.

## **8. Satellite Parking #1 Construction and New Entrance Road (2025) – Design/Construction PRIVATELY FUNDED AND CONSTRUCTED**

The area identified for Satellite Parking #1 is located east of the Airport and along Wakeman Drive. The area is currently wooded and has been subject to a previous environmental review in the EA West Corporate Development/East Parcel Development dated March 2018.

## **9. Taxiway E Fillet Widening Design and Construction (2025)**

The current dimensions of Taxiway E are inadequate according to design standards for the type of aircraft anticipated to operate commercial scheduled airline services at the airport. Given that the critical aircraft for this airport will fall under the Taxiway Design Group (TDG) 3 classification, the project aims to modify Taxiway E to conform to these standards. This will involve widening the taxiway's fillets. The project proposes to increase the width of Taxiway E from 40 feet to 50 feet. This expansion is necessary to provide the additional space required for the safe maneuvering of aircraft classified under TDG 3. In order to achieve this, it's essential to relocate the taxiway lights and signage. These adjustments will be made on both sides of the entrance off Taxiway E, ensuring that the necessary infrastructure remains functional and effective while also improving safety and compliance with design standards. This upgrade will likely enhance operational efficiency and safety for the aircraft and services utilizing this taxiway.

#### **10. Bridge Strengthening – Runway 16L/34R and Taxiway B – Construction (2025)**

The existing bridges on Runway 16L-34R and Taxiway B require some form of strengthening to support the weight of commercial aircraft operations. The bridges were built in the 1980s to support Boeing 737-200 and Gulfstream V aircraft. In the early 2010s the bridges were widened to the full width of the safety areas. Based on prior documentation, the maximum weight the existing bridges can support with regular use is 110,000 pounds by the 737-200. The Airport's critical aircraft maximum takeoff weight exceeds this weight limit, therefore necessitating the bridge strengthening project. This project will reinforce the bridges however the method of reinforcement is not known at this time.

#### **11. Runway 16L-34R Reconstruction and Strengthening – Construction (2026)**

The runway pavement has reached the end of its useful life as the last rehabilitation was performed over 20 years ago. The projected demand of scheduled commercial airline service will require the pavement to be reconstructed and strengthened to support scheduled commercial airline service. In addition, this scope will include NAVAID service road realignment and blast pad redesign on the 16L approach end.

#### **12. Southwest Hangar Redevelopment – Design (2026)**

The southwest side of the airport has two rows of hangars that are over 55 years old. There are two rows of the hangars that are a pole barn construction and have reached their useful life. These hangars need to be replaced with steel hangars and meet new FAA standards for separation. A drainage plan for this area needs to be developed as well as a phasing plan to redevelop this complex. This project would consist of development plan that would layout the redevelopment of the southwest side of the Airport and include phasing, hangar sizes and types, drainage improvements, cost estimates, survey and geotechnical investigation, and paving design.

#### **13. East Ramp Strengthening, Reconfiguration, and Rehabilitation – Design/Construction (2026) Phase 1**

The East Apron serves one FBO, corporate hangars, T-hangars, and the terminal. Most business jet operations occur on the east airfield and the East Apron. In preparation for commercial service introduction to the Airport, there will be an expansion of the terminal facility on the East Apron. This reconfiguration and strengthening will allow the terminal to accommodate aircraft operated by the airlines. This project will include restriping of the ramp to meet the required taxiway safety areas, aircraft parking areas and remain overnight (RON) spaces. This increased operations by scheduled airlines will require the pavement to be strengthened, reconfigured and rehabilitated.

#### **14. Taxilane X-Ray – Design/Construction (2026)**

This project entails building a Taxilane perpendicular to Taxilane Y in order to open the SE Corporate Pad Site (Lot B) for the development of Corporate Hangars. The project would include constructing a taxilane that is approximately 600 feet long and 50 feet wide. It is anticipated that the new taxilane would have edge reflectors instead of edge lights to save cost.

### **15. Maintenance Equipment Storage/Snow Remove Equipment Facility – Design (2026)**

Airport staff have identified the need to expand and relocate the Maintenance Equipment Storage (MES)/Snow Removal Equipment (SRE) Facility to accommodate new larger multi-use SRE building and provide a storage facility with a layout which meets the growing needs of the airport. The proposed facility would be located to the northeast corner of the airport on undeveloped land adjacent to Wakeman Drive within the AOA. The entire lot will be modified during construction to accommodate the proposed building, paved parking outside of the building, and work area during construction. This area provides the necessary room to provide pavement for snow removal training while expanding the storage capacity for essential maintenance equipment. The Airport intends to purchase new snow removal equipment (SRE) to efficiently accommodate required snow removal operations typically experienced during the snow season. The existing building is in a hangar on the south portion of the East Apron. The existing building is in good condition but is inadequate to accommodate new SRE equipment and will require relocation due to expansion of the terminal. Further the layout and orientation of the existing building creates challenges. These challenges include providing adequate storage space and equipment maneuverability in the building. As well as pavement away from the movement area for snow and ice training and pavement marking training, a cost-effective consideration for the Airport and its maintenance staff.

### **16. Maintenance Equipment Storage/Snow Remove Equipment Facility – Construction (2027)**

Refer to project number 15.

### **17. Fuel Farm Upgrades and Truck Staging Area - Design and Construction (2028)**

The fuel farm is approaching 25 years of age. There are approximately 3 million gallons of fuel that flow through the farm annually. As the fuel farm ages, the airport will need to upgrade and repair the facility. This may include expansion of the containment area and possible environmental regulation upgrades. This project is not in the Airport Layout Plan. This project also includes upgrading the pavement geometry to provide a staging area for fuel trucks.

### **18. Install Backup Airfield and Terminal Generators (2028)**

Purchase and install a back-up generator for the airfield lighting (80KW) system that includes runway 16L/34R and Taxiway B. This generator would also be a back-up for the PAPIs, wind cone, and the MALSR. A second generator would be purchased and installed for the airport terminal building (120KW). This generator would allow the terminal building to have continuing operations if electrical power was lost, as well as be used by the city for an emergency operations center if necessary.

### **19. Acquire Multi-function SRE (2)- (2028)**

During the planning period, the purchase of two pieces of multi-function snow removal equipment (SRE) such as combination plow and brooms is programmed to improve the ability of a single piece of equipment to respond to the diverse needs of snow operations. The airport's inventory of snow removal equipment are over 20 years old and need replaced.

## **20. Southwest Hangar Redevelopment – Design (2028)**

The southwest side of the airport has two rows of hangars that are over 55 years old. There are two rows of the hangars that are a pole barn construction and have reached their useful life. These hangars need to be replaced with steel hangars and meet new FAA standards for separation. A drainage plan for this area needs to be developed as well as a phasing plan to redevelop this complex. This project would consist of development plan that would layout the redevelopment of the southwest side of the Airport and include phasing, hangar sizes and types, drainage improvements, cost estimates, survey and geotechnical investigation, and paving design.

## **21. West Apron Hangar Expansion Phase 1 – Design (2028)**

This project involves expansion of the West Apron to accommodate hangar growth on the west side of the airport. Developing General Aviation (GA) facilities on the west side of the airport will allow separation of GA operations from air carrier and larger jet operations which will improve overall safety and efficiency within the airport operations area. The project will include two t-hangar facilities, five box hangars, and landside parking for the flying public.

## **22. Taxiway B Reconstruction and Strengthening (South of Bridge)**

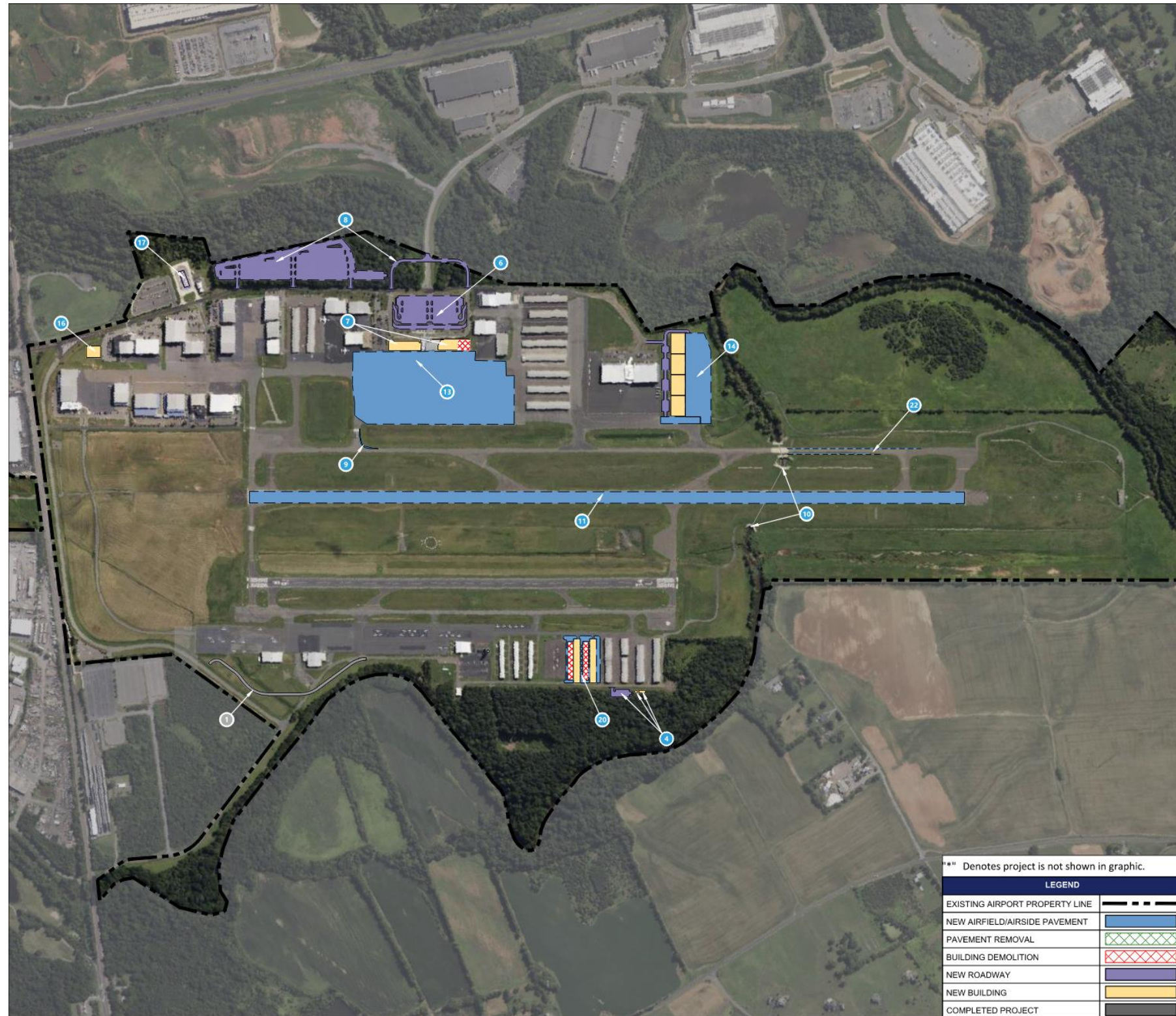
Taxiway B is a parallel taxiway, providing aircraft access for the full length of the primary runway (16L-34R) from the east apron areas. The taxiway has two high-speed exits along with connecting taxiways at both ends of the Runway. The Taxiway B pavement has reached the end of its useful life. The pavement will need to be strengthened to support scheduled commercial airline service. As part of this project, the strengthening will also include the concrete bridge section that traverses Broad Run Creek. The existing runway lights and signs will be replaced with LED lights and signs. The existing pavement grades will remain the same to promote proper drainage. Replacement markings will need to be applied throughout new pavement.

## **23. Taxiway B Widening – Design (2028)**

Taxiway B is a parallel taxiway, providing aircraft access for the full length of the primary runway (16L-34R) from the east apron areas. The taxiway has two high-speed exits along with connecting taxiways at both ends of the Runway. The width for Taxiway B will be widened from 40 feet to the recommended standard width of 50 feet as the critical aircraft's taxiway design group is 3. Infrastructure improvements such as electrical, grading, and drainage work needed to support pavement widening.

**Figure 5-4** illustrates near term capital projects at HEF.

FIGURE 5-4  
NEAR-TERM PROJECTS



### HEF DEVELOPMENT PHASING PLAN

#### PROJECTS CURRENTLY UNDERWAY

- 1 Realignment of Observation Road
  - 2 Bridge Strengthening - Runway 16L/34R and Taxiway B (Design)\*
- #### NEAR TERM (PAL 1) PROJECTS (2024-2028)
- 3 New FAA ATCT Phase 2 (Design)\*
  - 4 New FAA ATCT Phase 3 (Construction)
  - 5 Runway 16L-34R Reconstruction and Strengthening (Design)\*
  - 6 Terminal Parking Lot Rehabilitation and Expansion
  - 7 Terminal Building Expansion (north and south)
  - 8 Satellite Parking #1 Construction and New Entrance Road
  - 9 Taxiway E Fillet Widening (Design and Construction)
  - 10 Bridge Strengthening - Runway 16L/34R and Taxiway B (Construction)
  - 11 Runway 16L-34R Reconstruction and Strengthening (Construction)
  - 12 South West Hangar Redevelopment (Design)\*
  - 13 East Ramp Strengthening, Reconfiguration, and Rehabilitation - (Design and Construction) - Phase 1
  - 14 Taxiway X (Design and Construction)
  - 15 Maintenance Equipment Storage (MES)/Snow Removal Equipment (SRE) Facility - (Design)\*
  - 16 Maintenance Equipment Storage (MES)/Snow Removal Equipment (SRE) Facility - (Construction)
  - 17 Fuel Farm Upgrades (Design and Construction)
  - 18 Install Backup Airfield Generators\*
  - 19 Acquire Multi-function SRE (2)\*
  - 20 South West Hangar Redevelopment (Construction)
  - 21 West Apron Hangar Expansion - Phase 1 (Design)\*
  - 22 Taxiway B Reconstruction and Strengthening (South of the Bridge)
  - 23 Taxiway B Widening (Design)\*

\*\*\* Denotes project is not shown in graphic.

#### LEGEND

EXISTING AIRPORT PROPERTY LINE	---
NEW AIRFIELD/AIRSIDE PAVEMENT	Blue solid fill
PAVEMENT REMOVAL	Green cross-hatch pattern
BUILDING DEMOLITION	Red cross-hatch pattern
NEW ROADWAY	Purple solid fill
NEW BUILDING	Yellow solid fill
COMPLETED PROJECT	Grey solid fill



Source: RS&H, 2023

### 5.4.3 Mid-term Development Projects

Mid-term capital improvements encompass development projects slated to begin during the second five-year period of the planning phase (FY 2029 to FY 2033). The provided mid-term project list is strategically phased to reflect priority, include projects that enable further developments, and consider funding availability. Implementation of these projects is planned based on demand, with each project allocated to a specific year according to enabling projects and expected funding.

The mid-term programmed development at HEF is shown in the following list as projects 24-39 and on **Figure 5-5** at the conclusion of this subsection.

#### **24. West Apron Hangar Expansion Phase 1 – Construction (2029)**

Refer to project 21.

#### **25. East Ramp Strengthening, Reconfiguration, and Rehabilitation Design and Construction – Phase 2 (2029)**

Refer to project 13.

#### **26. Taxiway B Widening – Construction (2029)**

Taxiway B is a parallel taxiway, providing aircraft access for the full length of the primary runway (16L-34R) from the east apron areas. The taxiway has two high-speed exits along with connecting taxiways at both ends of the Runway. The width for Taxiway B will be widened from 40 feet to the recommended standard width of 50 feet as the critical aircraft's taxiway design group is 3. Infrastructure improvements such as electrical, grading, and drainage work needed to support pavement widening.

#### **27. Runway 16L/34R Widening – Design (2029)**

The width for Runway 16L-34R will be widened from 100 feet to the recommended standard width of 150 feet as the critical aircraft for the runway has a maximum certified takeoff weight greater than 150,000 lbs. Infrastructure improvements such as electrical, grading and drainage work needed to support pavement widening, depth of pavement rehabilitation, and method of bridge rehabilitation/strengthening.

#### **28. Runway 16L/34R Widening – Construction (2030)**

Refer to project 27.

#### **29. East Ramp Strengthening, Reconfiguration, and Rehabilitation Design and Construction – Phase 3 (2031)**

Refer to project 13.

#### **30. West Apron Hangar Expansion Phase 2 - Design (2031)**

This project involves further expansion, Phase 2, of the West Apron and realignment of Observation Road to accommodate box hangar development at the midpoint of the West Apron. Developing

General Aviation (GA) facilities on the west side of the airport will allow separation of GA operations from air carrier and larger jet operations which will improve overall safety and efficiency within the airport operations area. The project will include seven box hangars and landside parking for the flying public.

### **31. New East Ramp Taxiway – Design and Construction (2031)**

This project involves the design and construction of a new taxiway entrance onto the East Ramp from Taxiway B. With the arrival of scheduled service, the Airport will experience increased activity of larger aircraft on the East Ramp. In order to increase flow and efficiency, a second taxiway would need to be constructed to give pilots and air traffic control options when entering and exiting the east ramp. This project will be designed for ADG III aircraft, located south of Taxiway E and perpendicular to Taxiway B.

### **32. Expanded East Ramp and Taxilane between Taxiway Delta and Echo – Design (2031)**

This project will construct a new taxilane providing access between Taxiway D and Taxiway E. The new taxilane will enable aircraft to pass north and south on Taxilane Z without interfering with the aircraft parked on the FBO ramp. The new taxilane will allow additional area on the east ramp to be utilized for commercial service and provide the ability to have additional gates at the terminal building. It is not anticipated that this new taxilane will be used for commercial service aircraft so it will be constructed for ADG III.

### **33. Runway 16L-34R Extension (Design)\***

The previous 500-foot runway extension was completed in 2012. During the planning phase of the first runway extension, a runway length analysis was conducted that showed that it was justifiable to extend the runway 800 feet. The FAA at the time did not have the funds, and the Airport needed to update its ALP, so the runway was only extended 500 feet when there was justification for 800 feet. The additional 500-foot extension will give pilots an extra safety margin when they are landing in inclement weather or when there's snow or ice on the runway. The project will also result in a slight noise reduction for areas north of the airport as planes could pass at a higher altitude.

### **34. Taxilane C and Taxilane D Relocation – Design (2032)**

Taxiway/Taxilane C provides a direct path from an aircraft apron to the runway. This can lead to situations where pilots could lose situational awareness and inadvertently enter the runway, resulting in a runway incursion. Additionally, a fence line and concrete drainage ditch penetrates Taxiway/Taxilane C's taxilane object free area (TLOFA). This project shifts taxiway/taxilane C, the existing runup area, and taxilane D to the south as to avoid the direct access to the runway from the apron, and to eliminate the TLOFA penetration.

### **35. Taxilane C and Taxilane D Relocation – Construction (2032)**

Refer to project 34.

### **36. West Apron Hangar Expansion Phase 2 - Construction (2032)**

Refer to project 30.

### **37. Expanded East Ramp and Taxilane between Taxiway Delta and Echo – Construction (2032)**

This project will construct a new taxilane providing access between Taxiway D and Taxiway E. The new taxilane will enable aircraft to pass north and south on Taxilane Z without interfering with the aircraft parked on the FBO ramp. The new taxilane will allow additional area on the east ramp to be utilized for commercial service and provide the ability to have additional gates at the terminal building. It is not anticipated that this new taxilane will be used for commercial service aircraft so it will be constructed for ADG III.

### **38. Glen-Gerry Property Reimbursement**

Reimbursement from purchase of Glen-Gery property for non-aeronautical use in the Airport Safety Overlay District.

### **39. Runway 16L-34R Extension (Design)\***

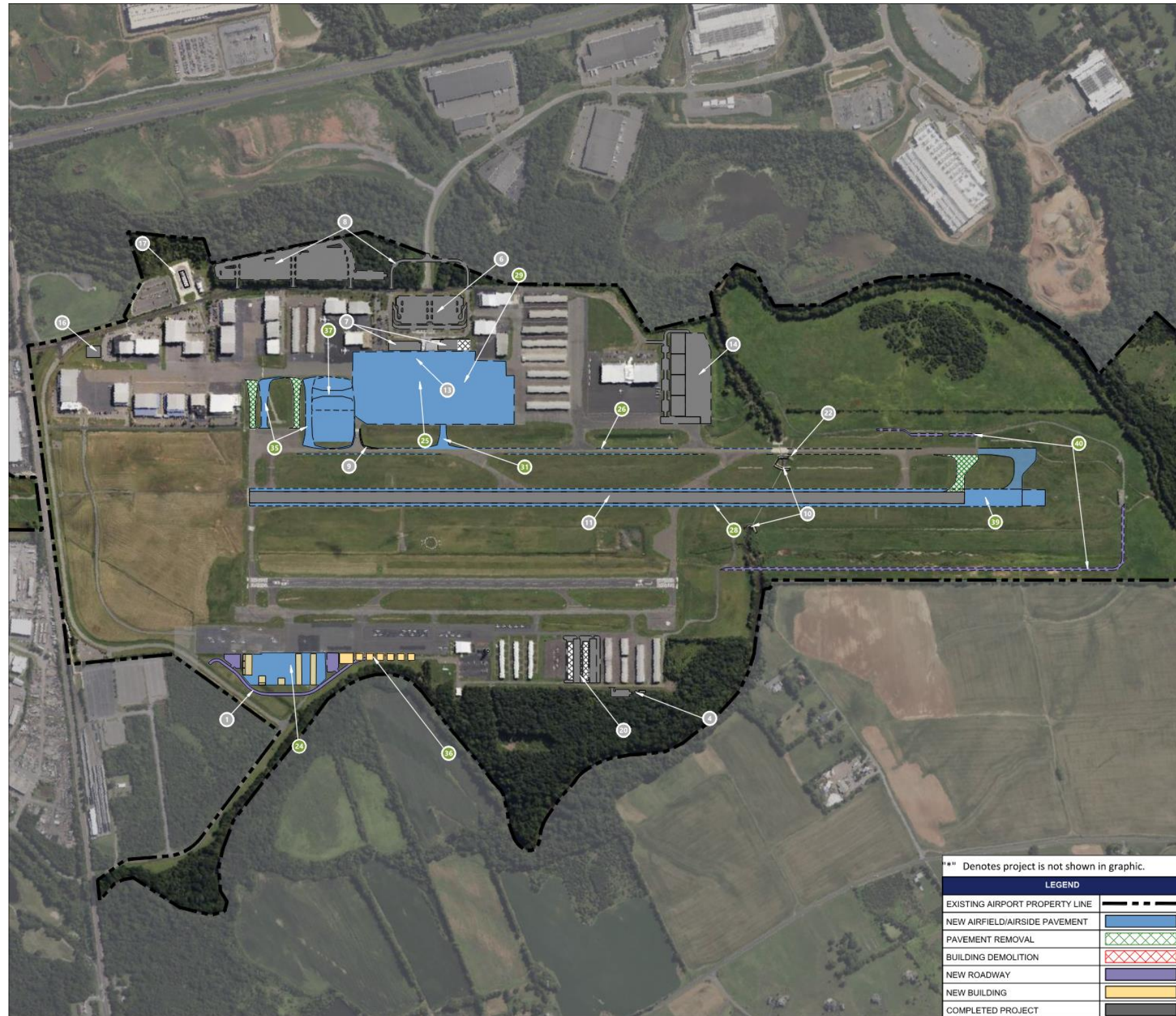
Refer to project 33.

### **40. Vehicle Service Road – Design and Construction (2033)**

This project addresses shortcomings in the dedicated Vehicle Service Road (VSR), where existing surfaces are either unpaved or below standard, forcing vehicles like Operations vehicles, SRE, and fuel trucks to access the airfield runway and taxiway surfaces. The project's primary goal is to design and construct improvements that establish safe and adequate routes for these vehicles, minimizing their dependence on airfield surfaces. Most of the vehicle service road development will focus on the southern end of the airport.

**Figure 5-5** illustrates mid-term capital projects at HEF.

FIGURE 5-5  
MID-TERM PROJECTS



Source: RS&H, 2024

### HEF DEVELOPMENT PHASING PLAN

#### PROJECTS CURRENTLY UNDERWAY

- 1 Realignment of Observation Road
- 2 Bridge Strengthening - Runway 16L/34R and Taxiway B (Design)\*
- NEAR TERM (PAL 1) PROJECTS (2024-2028)**
- 3 New FAA ATCT Phase 2 (Design)\*
- 4 New FAA ATCT Phase 3 (Construction)
- 5 Runway 16L-34R Reconstruction and Strengthening (Design)\*
- 6 Terminal Parking Lot Rehabilitation and Expansion
- 7 Terminal Building Expansion (north and south)
- 8 Satellite Parking #1 Construction and New Entrance Road
- 9 Taxiway E Fillet Widening (Design and Construction)
- 10 Bridge Strengthening - Runway 16L/34R and Taxiway B (Construction)
- 11 Runway 16L-34R Reconstruction and Strengthening (Construction)
- 12 South West Hangar Redevelopment (Design)\*
- 13 East Ramp Strengthening, Reconfiguration, and Rehabilitation - (Design and Construction) - Phase 1
- 14 Taxilane X (Design and Construction)
- 15 Maintenance Equipment Storage (MES)/Snow Removal Equipment (SRE) Facility - (Design)\*
- 16 Maintenance Equipment Storage (MES)/Snow Removal Equipment (SRE) Facility - (Construction)
- 17 Fuel Farm Upgrades (Design and Construction)
- 18 Install Backup Airfield Generators\*
- 19 Acquire Multi-function SRE (2)\*
- 20 South West Hangar Redevelopment (Construction)
- 21 West Apron Hangar Expansion - Phase 1 (Design)\*
- 22 Taxiway B Reconstruction and Strengthening (South of the Bridge)
- 23 Taxiway B Widening (Design)\*
- MID-TERM (PAL 2) PROJECTS (2029-2033)**
- 24 West Apron Hangar Expansion - Phase 1 (Construction)
- 25 East Ramp Strengthening, Reconfiguration, and Rehabilitation - (Design and Construction) - Phase 2
- 26 Taxiway B Widening (Construction)
- 27 Runway 16L-34R Widening (Design)\*
- 28 Runway 16L-34R Widening (Construction)
- 29 East Ramp Strengthening, Reconfiguration, and Rehabilitation - (Design and Construction) - Phase 3
- 30 West Apron Hangar Expansion - Phase 2 (Design)\*
- 31 New East Ramp Taxiway - Design and Construction (2031)
- 32 Expanded East Ramp and Taxilane between Taxiway Delta and Echo (Design)\*
- 33 Runway 16L-34R Extension (Design)\*
- 34 Taxilane C and Taxilane D Relocation (Design)\*
- 35 Taxilane C and Taxilane D Relocation (Construction)
- 36 West Apron Hangar Expansion - Phase 2 (Construction)
- 37 Expanded East Ramp and Taxilane between Taxiway Delta and Echo - (Construction)
- 38 Glen-Gerry Property Reimbursement\*
- 39 Runway 16L-34R Extension (Construction)
- 40 Vehicle Service Road (Design and Construction)

\*\*\* Denotes project is not shown in graphic.

LEGEND	
EXISTING AIRPORT PROPERTY LINE	---
NEW AIRFIELD/AIRSIDE PAVEMENT	Blue fill
PAVEMENT REMOVAL	Green cross-hatch pattern
BUILDING DEMOLITION	Red cross-hatch pattern
NEW ROADWAY	Purple fill
NEW BUILDING	Yellow fill
COMPLETED PROJECT	Grey fill



#### 5.4.4 Long-term Development Projects

Long-term capital improvements encompass development projects projected to initiate during the final ten years of the planning period (FY 2034 to FY 2039). Most projects in the long-term are focused on expansion of airside and landside pavements to support privately funded aeronautical development. The provided long-term project list is strategically phased to reflect priority, incorporate projects enabling further advancements, and consider funding availability. These projects' implementation is planned based on demand, with each project designated for a specific year according to enabling projects and expected funding.

The long-term programmed development at HEF is shown in the following list as projects 40-48 and on **Figure 5-6** at the conclusion of this subsection.

##### **41. East Apron T-hangar – Demolition (2034)**

This project involves the demolition of two T-hangar facilities located on the East apron, south of the Chantilly Maintenance Hangar, which have reached the end of their useful life. Removing these T-hangars will free up valuable space for a corporate hangar pad site. Additionally, hangar development on the West apron will help offset the loss of T-hangar storage on the airport's east side due to the demolition.

##### **42. ARFF Station – Design (2034)**

The Airport is currently not certified as a 14 CFR Part 139 compliant airport and therefore is not required to have ARFF services onsite. To support the introduction of scheduled commercial service, the FAA has identified the need for the Airport to construct an ARFF facility. Currently the City of Manassas Fire and Rescue Department (Department) responds to aircraft accidents and incidents at the Airport. Although the Airport maintains two ARFF vehicles, ARFF service is not currently available that would meet FAA Part 139 requirements. The current emergency response procedures require Department personnel to drive from the nearest fire station (2.9 miles away) to the airport and deploy the ARFF vehicles located in T-hangar C-3. The response time with the existing agreements in place will be improved by the construction of an on-airport ARFF facility. The preferred concept includes a new ARFF facility with 4 bays on the north side of Taxiway C. The area where the future building is proposed sits just outside the departure surface and near the building restriction line (BRL).

##### **43. ARFF Station –Construction (2034)**

The Airport is currently not certified as a 14 CFR Part 139 compliant airport and therefore is not required to have ARFF services onsite. To support the introduction of scheduled commercial service, the FAA has identified the need for the Airport to construct an ARFF facility. Currently the City of Manassas Fire and Rescue Department (Department) responds to aircraft accidents and incidents at the Airport. Although the Airport maintains two ARFF vehicles, ARFF service is not currently available that would meet FAA Part 139 requirements. The current emergency response procedures require Department personnel to drive from the nearest fire station (2.9 miles away) to the airport and deploy the ARFF vehicles located in T-hangar C-3. The response time with the existing agreements in place will be improved by the construction of an on-airport ARFF facility. The preferred concept includes a

new ARFF facility with 4 bays on the north side of Taxilane C. The area where the future building is proposed sits just outside the departure surface and near the building restriction line (BRL).

#### **44. Airport Master Plan Update (2035)**

Airport master plans are conducted approximately every 10 years and are necessary to inform the development of an FAA-approved forecast and Airport Layout Plan. These items enable FAA funding for Airport Improvement Program (AIP) eligible projects based on the forecast growth and timing for the runway extension.

#### **45. West Apron Hangar Expansion Phase 3 - Design (2036)**

This project involves final expansion, Phase 3, of the West Apron and additional realignment of Observation Road to accommodate new tie downs and T-hangar development at the south end of the West Apron. Developing General Aviation (GA) facilities on the west side of the airport will allow separation of GA operations from air carrier and larger jet operations which will improve overall safety and efficiency within the airport operations area. The project will include 13 tie downs, eight T-hangar facilities, and landside parking for the flying public.

#### **46. West Apron Hangar Expansion Phase 3 - Construction (2037)**

Refer to project 45.

#### **47. 8 Acre Land Acquisition – Prince William County (2040)**

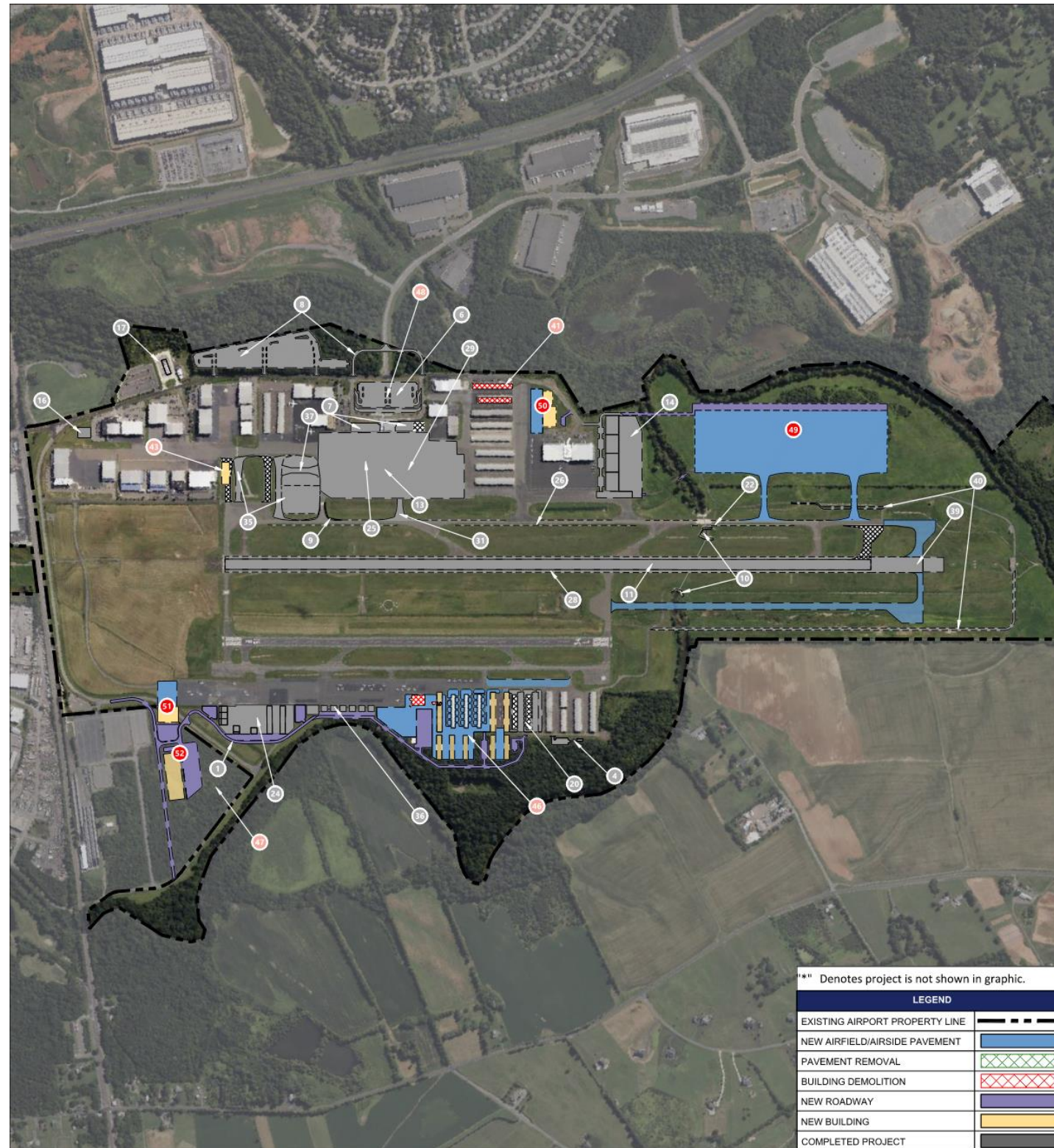
This involves a strategic land acquisition of approximately 8-acres in Prince William County, aimed at creating a contiguous airport area at the Northwest corner, between Observation Road and Piper Lane. The project seeks to improve control over compatible development, enhance airport access as potential AAM terminal facility, and provides opportunities to generate non-aeronautical revenue.

#### **48. Parking Garage Construction**

The existing terminal area parking lot has 119 parking spaces which includes 5 accessible parking spaces and is located on one portion of a lot divided into four sections. The other three sections in this lot are currently undeveloped. The vacant quadrants adjacent to the existing parking lot in front of the terminal is proposed to be converted to parking. The parking garage will be constructed in the vacant quadrants. The parking garage is expected to contain charging stations for electric and hybrid vehicles.

**Figure 5-6** illustrates long term capital projects at HEF.

FIGURE 5-6  
LONG-TERM PROJECTS



Source: RS&H, 2023

### HEF DEVELOPMENT PHASING PLAN

#### PROJECTS CURRENTLY UNDERWAY

- 1 Realignment of Observation Road
- 2 Bridge Strengthening - Runway 16L/34R and Taxiway B (Design)\*

#### NEAR-TERM (PAL 1) PROJECTS (2024-2028)

- 3 New FAA ATCT Phase 2 (Design)\*
- 4 New FAA ATCT Phase 3 (Construction)
- 5 Runway 16L-34R Reconstruction and Strengthening (Design)\*
- 6 Terminal Parking Lot Rehabilitation and Expansion
- 7 Terminal Building Expansion (north and south)
- 8 Satellite Parking #1 Construction and New Entrance Road
- 9 Taxiway E Fillet Widening (Design and Construction)
- 10 Bridge Strengthening - Runway 16L/34R and Taxiway B (Construction)
- 11 Runway 16L-34R Reconstruction and Strengthening (Construction)
- 12 South West Hangar Redevelopment (Design)\*
- 13 East Ramp Strengthening, Reconfiguration, and Rehabilitation - (Design and Construction) - Phase 1
- 14 Taxiway X (Design and Construction)
- 15 Maintenance Equipment Storage (MES) and Snow Removal Equipment (SRE) Facility (Design)\*
- 16 Maintenance Equipment Storage (MES) and Snow Removal Equipment (SRE) Facility - (Construction)
- 17 Fuel Farm Upgrades (Design and Construction)
- 18 Install Backup Airfield Generators\*
- 19 Acquire Multi-function SRE (2)\*
- 20 South West Hangar Redevelopment (Construction)
- 21 West Apron Hangar Expansion - Phase 1 (Design)\*
- 22 Taxiway B Reconstruction and Strengthening (South of the Bridge)
- 23 Taxiway B Widening (Design)\*

#### MID-TERM (PAL 2) PROJECTS (2029-2033)

- 24 West Apron Hangar Expansion - Phase 1 (Construction)
- 25 East Ramp Strengthening, Reconfiguration, and Rehabilitation - (Design and Construction) - Phase 2
- 26 Taxiway B Widening (Construction)
- 27 Runway 16L-34R Widening (Design)\*
- 28 Runway 16L-34R Widening (Construction)
- 29 East Ramp Strengthening, Reconfiguration, and Rehabilitation - (Design and Construction) - Phase 3
- 30 West Apron Hangar Expansion - Phase 2 (Design)\*
- 31 New East Ramp Taxiway - Design and Construction (2031)
- 32 Expanded East Ramp and Taxiway between Taxiway Delta and Echo (Design)\*
- 33 Runway 16L-34R Extension (Design)\*
- 34 Taxiway C and Taxiway D Relocation (Design)\*
- 35 Taxiway C and Taxiway D Relocation (Construction)
- 36 West Apron Hangar Expansion - Phase 2 (Construction)
- 37 Expanded East Ramp and Taxiway between Taxiway Delta and Echo - (Construction)
- 38 Glen-Gerry Property Reimbursement\*
- 39 Runway 16L-34R Extension (Construction)
- 40 Vehicle Service Road (Design and Construction)

#### LONG-TERM (PAL 3) PROJECTS (2034-2039)

- 41 East Apron T-hangar (Demolition)
- 42 ARFF Station (Design)\*
- 43 ARFF Station (Construction)
- 44 Airport Master Plan Update\*
- 45 West Apron Hangar Expansion - Phase 3 (Design)\*
- 46 West Apron Hangar Expansion - Phase 3 (Construction)
- 47 8 Acre Land Acquisition - Prince William County
- 48 Parking Garage Construction

#### BEYOND PLANNING PERIOD PROJECTS

- 49 South East Airport Complex Site Development (Construction)
- 50 East Apron Corporate Hangar Development
- 51 West Apron AAM Terminal Facility
- 52 West Apron Corporate Building

\*\* Denotes project is not shown in graphic.

LEGEND	
EXISTING AIRPORT PROPERTY LINE	---
NEW AIRFIELD/AIRSIDE PAVEMENT	Blue
PAVEMENT REMOVAL	Green hatched
BUILDING DEMOLITION	Red hatched
NEW ROADWAY	Purple
NEW BUILDING	Yellow
COMPLETED PROJECT	Grey



### 5.4.5 Notable Projects Recommended to Occur Beyond the Planning Period

Other projects have been identified for HEF that are anticipated for implementation beyond the 20-year planning period. ROM estimates are not included for these projects:

- » Southeast Airport Complex Site Development – Design
- » East Apron Corporate Hangar Development
- » West Apron AAM Terminal Facility
- » West Apron Corporate Building

## 5.5 CIP FUNDING NEED

A summary of CIP funding needs by planning period and funding sources is presented in **Table 5-6**. As shown, the total 20-year capital improvement plan program amounts to nearly \$448 million, includes costs for AIP-eligible projects, ineligible portions of those project costs where applicable, and ineligible projects. Near-, mid-, and long-term funding needs surpass \$183 million, \$121 million, and \$144 million, respectively.

**TABLE 5-6**  
**ANTICIPATED FUNDING BY SOURCE**

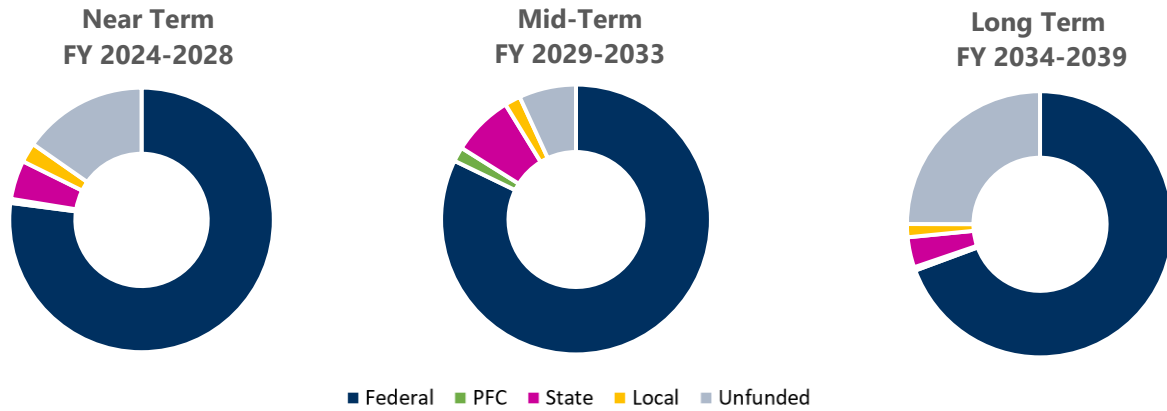
	Near Term FY 2024-2028	Mid-Term FY 2029-2033	Long Term FY 2034-2039	Total
<b>Funding Source</b>				
Entitlement	\$5,400,000	\$6,600,000	\$7,100,000	\$19,100,000
Discretionary	\$99,100,000	\$92,900,000	\$92,900,000	\$284,900,000
BIL AIG	\$2,500,000	\$0	\$0	\$2,500,000
BIL ATP/FTC	\$34,100,000	\$0	\$0	\$34,100,000
PFC	\$900,000	\$2,100,000	\$600,000	\$3,600,000
State Match	\$8,700,000	\$8,900,000	\$5,300,000	\$22,900,000
Local Share	\$4,400,000	\$2,300,000	\$2,300,000	\$9,000,000
<b>Total</b>	<b>\$155,100,000</b>	<b>\$112,800,000</b>	<b>\$108,200,000</b>	<b>\$376,100,000</b>
Unfunded / Ineligible <sup>1</sup>	\$28,000,000	\$8,300,000	\$36,000,000	\$72,300,000
<b>Total Need</b>	<b>\$183,100,000</b>	<b>\$121,100,000</b>	<b>\$144,200,000</b>	<b>\$448,400,000</b>

Notes: BIL funding concludes with FY 2026 allocations.  
Unfunded/ineligible project costs are based on planning-level, ROM and prorated costs.  
Source: RS&H Analysis, 2024

As shown in **Table 5-6**, overall implementation of the CIP will require substantial funding from federal and state funding partners. **Figure 5-7** illustrates how shares of funding evolve over the for the 20-year planning period, where reliance on Federal funding (AIP entitlement, AIP discretionary grants, and BIL funding) is a larger share of all funding needs in the first two periods, with steady participation by the DOAV on eligible projects, and the smallest portions being from the Airport and PFCs. Funds for ineligible

projects or ineligible portions of AIP-eligible projects are significant, but is a smaller share of needs during the mid-term period.

**FIGURE 5-7**  
**FUNDING NEED BY SOURCE BY TERM**



Source: RS&H Analysis, 2024

## 5.6 FUNDING AVAILABILITY AND FINANCIAL FEASIBILITY

The analysis presented in this chapter identifies funding sources for CIP projects through the 20-year planning period, and will require substantial federal and state funding to implement. To win grant awards from federal and state programs, it will be necessary to identify local/sponsor funding to compete well for discretionary grants. The following summarizes the outlook of funding availability by source:

### » HEF Funding

As described in previous sections, HEF operating performance is reliably producing annual net income that can be used to implement the CIP. Additionally, with defeasance of outstanding debt in 2026, the Airport will make even more cash flow available. The projection of airport financial performance indicates that more than \$4.8 million in net income generated during the 20-year planning period may be added to available cash reserves to fund the local share of AIP-eligible projects and leverage participation by the state.

Eligible projects in the near term may require a local share of more than \$4.3 million, which is driven by the largest the design and construction of a new FAA ATCT and the strengthening and reconstruction of Runway 16L-34R and bridge strengthening. The larger funding need is for wholly ineligible projects or ineligible portions of eligible projects. Local funding need for ineligible project costs for the near term is estimated to be nearly \$28 million, most of which is associated with fuel farm upgrades which is anticipated to be ineligible and design and construction of a combined maintenance equipment and snow removal equipment facility, which is only partially eligible.

For the 20-year period, the local share and ineligible project funding need is estimated to surpass \$77 million, with nearly \$8.8 million in local share and ineligible costs more than \$68.5 million. This need makes the feasibility of funding capital projects from Airport cash flow not realistic.

» **Entitlement Funds**

The HEF CIP applies AIP entitlement funds for AIP-eligible projects throughout the planning period, allocating anticipated annual amounts to 20 of the total 48 projects. As described, entitlement funding will increase with the introduction of passenger service to a minimum of \$1.3 million annually. In the CIP, entitlement funds have been allocated prior to estimating the funding amount from other sources, including BIL, discretionary, PFC, and state and local match funds, and reflect assumptions of project eligibility. The outlook for entitlement funding need in the near-term is about \$5.4 million based on the forecast of annual enplanements. A delay in the launch of passenger service will keep annual entitlement funds for HEF at the current level, which is \$150,000 annually, will delay implementation of certain CIP projects, and increase reliance on competitive discretionary grants.

» **Discretionary Grants**

Since 2010, TOL has received about \$18.4 million in discretionary AIP grants, which is approximately \$1.3 million annually. The CIP has identified a need for substantial discretionary grant funding support for the 20-year period, estimating the discretionary funding need at 64 percent of the total program through 2029. This level of need from AIP program discretionary grants is far beyond historic funding levels for the Airport and will be quite difficult to attain without quick, sustained success with the introduction of passenger service.

Importantly, there are a number of large projects where eligible funding is estimated to be in the range of \$10-20 million (e.g., Runway 16L-34R reconstruction, strengthening, and widening and vehicle service road), some of which are hangar projects. While certain hangar projects are AIP-eligible, they are not as competitive against airfield pavement improvements, and are most appropriately implemented when user demand reaches a critical mass to make them affordable. Therefore, while overall need for discretionary funds projects is high, priority will be given to runways, taxiways, and aprons. Despite the priority on airfield pavements, the availability of AIP discretionary funds and the competitiveness of important projects such as Runway 16L-34R and Taxiway B improvements will depend on the success of commercial passenger service. This makes decisions about timing and phasing of eligible airfield projects, and timeline for commercial service readiness and launch a pressing challenge.

» **PFC Revenues**

PFC funding will become a potential source of revenue for capital projects at HEF once commercial passenger service is in place. Based on the approved forecast of enplanements, PFC revenues could begin as soon as mid-2025 and grow to surpass \$500,000 annually if the market responds as hoped. Due to the uncertainty of commercial service and enplanement levels, the CIP applies projected PFC revenues beginning in 2025, but remains conservative as the Airport has several strategies for use of PFC funding including: reimbursement of the City's local share for

eligible projects; “pay-as-you-go”, where collections are used on active projects; impose only, which allows the collection of PFCs for three years and the use of those PFC funds in the subsequent 2-year period; and, for eligible debt service.

Participation in the PFC program presents an opportunity for HEF to improve cash flow for capital projects directly related to passenger service. While PFC funds are shown in the CIP for airfield pavement projects, the CIP reserves PFC fund collections because they have broader usability than the AIP for terminal buildings, baggage facilities, boarding bridges, and public, some non-revenue generating areas, and for revenue-generating spaces if they improve air carrier competition. Depending upon the impact of commercial service, it is advisable to preserve the use of PFC collection for terminal area improvements.

» **BIL Program Infrastructure Funds**

The Airport has pledged BIL AIG allocations from FY 2022-2024 to fund a portion of the cost to realign Observation Road on the northwest side of the airfield. HEF anticipates annual in BIL AIG allocations for the remaining program years (2025-2026) to be similar to previous years and intends to utilize those allocations to reimburse for the Airport’s share of the Observation Road project cost.

» **State Match Funds**

As described, the DOAV has a robust funding program and the CIP includes continuous and sizeable support from the DOAV for the implementation of the capital program. The generous match provision in DOAV funding program for eight (8) percent of eligible projects, not including other funding opportunities for recurring maintenance, facilities and equipment, and security projects is an important part the HEF CIP, and is programmed for \$8.7 million in the near term and \$8.9 million in each of the subsequent mid- and long-term periods. The programmed need for DOAV support is not small, but within the limits of the annual program cap of \$3 million annually per airport.

» **Other Funds**

The CIP includes three projects to improve terminal and terminal and remote parking are programmed in the near term and will be funded by Avports via agreement with the City. Beyond those projects, external funding sources will be important to help fund ineligible portions of AIP-eligible projects and ineligible projects. External funding can include private interests, other local, federal, or state funding programs.

Depending upon the financial performance of the Airport, and enplanement levels which impact AIP entitlement grant funding and PFC revenues, significant supplementary financial support will be needed to implement the planned CIP, especially in the near- and mid-term where ineligible project costs are high. If adequate funding is not available from these sources, initiation of certain projects may need to be deferred to later years, or the use of bond issuance or low interest loans or commercial notes may be utilized as the City has done in the past. The Airport has an opportunity to win some portion of total

funding through the BIL Airport Terminals Program/Federal Contract Tower Program to support the design and construction of a new ATCT.

### 5.6.1 Opportunities for Revenue Enplanement

As the Airport begins to implement the CIP in the near- and mid-term periods, identification of funding sources and revenue generation will become increasingly necessary to implement identified projects. As shown in the review of HEF's operating financial performance (see **Table 5-2**), the airport generates income from various sources, which are primarily facility rent, user fees, and fuel sales. These opportunities for enhancing revenues, if realized in the near- and mid-term periods could positively impact implementation of the HEF CIP by improving the airport's cash flow and fund availability for the local share of AIP-eligible and other projects

#### 5.6.1.1 Facility Rents

The largest source of Airport revenues is rental payments from leases with terminal, hangar, and other facility tenants. Since 2017, these revenues account for an average of 85 percent of total operating revenues annually, growing from about \$2.3 million in 2017 to budgeted levels of over \$3 million in 2023. It is these revenues that helped sustain the airport during the global COVID-19 pandemic, increasing while activity and revenues from some user fees declined during 2020 and 2021.

The CIP includes projects that will generate additional revenues through attracting new tenants and users for South West hangar redevelopment in the near term and a three-phase expansion of West Apron hangars anticipated for the mid- and long-term periods.

#### 5.6.1.2 Rates and Charges

Another approach to enhance revenues at HEF is to explore increases to certain rental rates and fees paid by tenants and aeronautical users. Airports generally revise fees, rates, and charges periodically, either on an annual basis or every few years to reflect increasing costs and market demand. These adjustments are influenced by local or regional economic indicators, such as the Consumer Price Index (CPI), to align with prevailing economic conditions. A snapshot of leasing and policy and rates and charges in place at the airport includes the following fees:

- » Hangar rent
- » Tie-down rent
- » Commercial operator permit fees (annual)
- » Fuel flowage fees
- » Terminal rent

When considering fee increases, the Authority should strive to strike a balance between covering the costs of providing facilities and maintaining competitiveness in the market. A rate-making methodology should be established that can demonstrate the link between costs and fee rates for airfield, terminal, apron, and fuel flowage fees, and periodic appraisals of hangar facilities can help re-set fair market values over time.

#### 5.6.1.3 Financial Performance and Competitiveness

When commercial service is established, the Airport will be able to begin tracking a metric that the airline industry monitors and compares across similar airports, which is Cost per Enplaned Passenger (CPE). CPE

is the average expense incurred by airlines per passenger for utilizing airport facilities and is a key indicator of the cost of operating at an airport.

A transparent rate-making methodology can provide context for the CPE metric, providing insights into operating costs and the rate and fee structure, which airports balance to remain competitive for air carrier services. Depending upon the rate methodology, airports like HEF with significant non-airline aeronautical revenues can utilize portions of these revenues to offset and reduce the airline rate base to yield a CPE that is competitive.

**Chapter 6**  
***Environmental Overview***



*CHAPTER 6*

*ENVIRONMENTAL OVERVIEW*

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## 6.1 INTRODUCTION

The purpose of considering environmental factors in airport master planning is to assist in evaluating future airport development, as well as provide information that will help expedite subsequent environmental processing. Federal Aviation Administration (FAA) Order 1050.1F, *Environmental Impacts: Policies and Procedures*, is the FAA's environmental guidance for aviation projects/actions to comply with NEPA. However, it is important to note that while the environmental analysis is included in this Master Plan Update, it is not in and of itself a National Environmental Policy Act (NEPA) document. Recent FAA guidance requires all planning processes to be completed prior to the start of NEPA documentation.

## 6.2 ENVIRONMENTAL ANALYSIS OVERVIEW

This section describes Section 743 of the FAA Reauthorization Act of 2024, NEPA, FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, FAA 1050.1F Desk Reference, and 2024 Council on Environmental Quality (CEQ) NEPA Implementing Regulations (40 CFR Parts 1500 – 1508).

### 6.2.1 Section 743 of the FAA Reauthorization Act of 2024

This section provides a brief overview of Section 743 of the FAA Reauthorization Act of 2024.

#### 6.2.1.1 Section 743 Project Description and Materials

Section 743 narrows the scope of the FAA's authority to regulate activities that: (1) "materially impact the safe and efficient operation of aircraft at, to, or from the airport," (2) "adversely affect the safety of people or property on the ground as a result of aircraft operations", or (3) "adversely affect the value of prior Federal investments to a significant extent." The FAA has land use authority over aeronautical portions of a project, whether or not those portions lie on regulated or non-regulated land. The FAA may not have jurisdictional authority over non-aeronautical portions of a project. The FAA retains jurisdiction over any property that was acquired with Federal assistance.

For projects where the FAA has approval authority, the City of Manassas (City) would complete a pen and ink change to the ALP, only if the Proposed Project was not already on the ALP, along with a detailed description of the Proposed Project. The revised ALP would be submitted to the FAA Washington ADO. The FAA will then review each project and provide input to the City where applicable. The FAA Eastern Region, including the Washington ADO, reviews an airport's Section 743 coordination process and may request supporting information from the City if they do not already have what is need to make a jurisdictional authority decision. For projects not subject to FAA approval, the City would notify the FAA of the project before proceeding. According to Section 743, the FAA has 45 days to assert jurisdiction or lose jurisdiction of that project.

#### **Airport Materials Needed for FAA Review under Section 743**

Below are the items that the City may need to provide to the FAA Washington ADO Program Manager if the FAA does not already have in their files.

1. A copy of the current ALP or draft ALP change that clearly identifies all the project components being included in the project and their respective locations at the airport. Be sure to use a call out on the exhibit to clearly show each project component.
2. A copy of the current on-Airport land use map.
3. A copy of the Exhibit A Property Map that compliant with FAA Airports (ARP) Standard Operating Procedure 3.0. This will show the funding source for each parcel or property on which the project components are planned to be constructed.
4. A copy of deeds or other conveyance documentation that shows the ownership of the land that each of the project components is planned to be constructed on.
5. Identify the source of funding for the Proposed Project.
6. A description of the Proposed Project in narrative form. Ideally this should be as close as possible to the Proposed Project description that would be used in the NEPA documentation.

The information can be transmitted in an email from the City to the FAA Washington ADO Program Manager. It is recommended that FAA Washington ADO EPS be copied on the transmittal too.

#### 6.2.1.2 FAA Review Process

When an airport development plan (ADP) project is ripe for FAA review, the request for FAA approval should be coordinated with the FAA Washington ADO Program Manager and Environmental Protection Specialist (EPS).

Based on coordination with various FAA ADOs, a more expedited Section 743 review, and a decision whether a NEPA document is needed can be explained in simpler terms.

1. If a project occurs anywhere aircraft move (runways, taxiways, apron, etc.) or associated safety areas (RSA, RPZ, TOFA etc.) or on Federally-obligated land, the FAA has ALP approval authority and NEPA documentation is needed. Project examples include a runway extension or grading improvements in an RSA.
2. If a project is anticipated to be federally funded (AIP, PFC, etc.), then NEPA documentation is needed. A project example would be interior terminal improvements paid for in part by federal funds.

Section 743 review is coordinated by the FAA Washington ADO Program Manager and EPS.

Projects that are proposed to occur within non-aeronautical, not Federally-obligated land at the Airport are not under Federal jurisdiction and do not need FAA approval (or NEPA review). To help the Airport make this determination, it needs to know how the land where the project would occur acquired? Was there any federal (FAA, Department of Defense (DOD), etc. funds involved? Deed information?). If so, the FAA has authority over land use. If not, the Airport notifies the FAA of a proposed project prior to commencement. As discussed earlier, the FAA has 45 days to respond, asserting jurisdiction or lose jurisdiction of that project.

Coordination with the FAA Washington ADO regarding the applicability of Section 743 on a project-by-project basis is highly recommended.

## 6.2.2 National Environmental Policy Act (NEPA)

NEPA was signed into law on January 1, 1970. NEPA ensures that federal agencies evaluate the potential environmental impacts of proposed projects. NEPA serves many valuable purposes, including:

- » Evaluating how proposed projects will be developed;
- » Understanding the environmental consequences of the proposed actions and their effect on local communities;
- » Evaluating reasonable alternatives to ensure due diligence;
- » Assessing measures that can be taken during the development of proposed actions to minimize environmental impacts.

Using the NEPA process, the FAA evaluates the potential environmental and related social and economic effects of a proposed project.

### 6.2.3 FAA Order 1050.1F, Environmental Impacts: Policies and Procedures

After the FAA informs the City that NEPA is required, the City, in coordination with the FAA Washington ADO, would acquire the FAA's recommendation regarding the type of NEPA documentation the project requires. According to FAA Order 1050.1F, there are three levels of NEPA documentation: Categorical Exclusion (CATEX), Environmental Assessment (EA), or Environmental Impact Statement (EIS).

#### 6.2.3.1 Categorical Exclusion (CATEX)

A CATEX refers to a category of actions that do not individually or cumulatively significantly affect the human environment and for which neither an EA nor an EIS is required. FAA Order 1050.1F paragraphs 5-6.1 through 5-6.6 describe actions that normally do not individually or cumulatively significantly affect the human environment. These actions are described under one of the following categories:

- » Administrative/ General (5-6.1): Actions that are administrative or general in nature.
  - Example: 5-6.1(p): Conditional approval of an ALP
- » Certification (5-6.2): Actions concerning issuance of certificates or compliance with certification programs.
  - Example: 5-6.2(e): Issuance of certificates and related actions under the Airport Certification Program
- » Equipment and Instrumentation (5-6.3): Actions involving installation, repair, or upgrade of equipment or instruments necessary for operations and safety.
  - Example: 5-6.3(f): Installation or replacement of engine generators used in emergencies.
- » Facility Siting, Construction, and Maintenance (5-6.4): Actions involving acquisition, repair, replacement, maintenance, or upgrading of grounds, infrastructure, buildings, structures, or facilities that generally are minor in nature.
  - Example: 5-6.4(a): Access road construction, and construction, relocation, or repair of entrance and service roadways that do not reduce the level of service on local traffic systems below acceptable levels.
- » Procedural (5-6.5): Actions involving establishment, modification, or application of airspace and air traffic procedures.

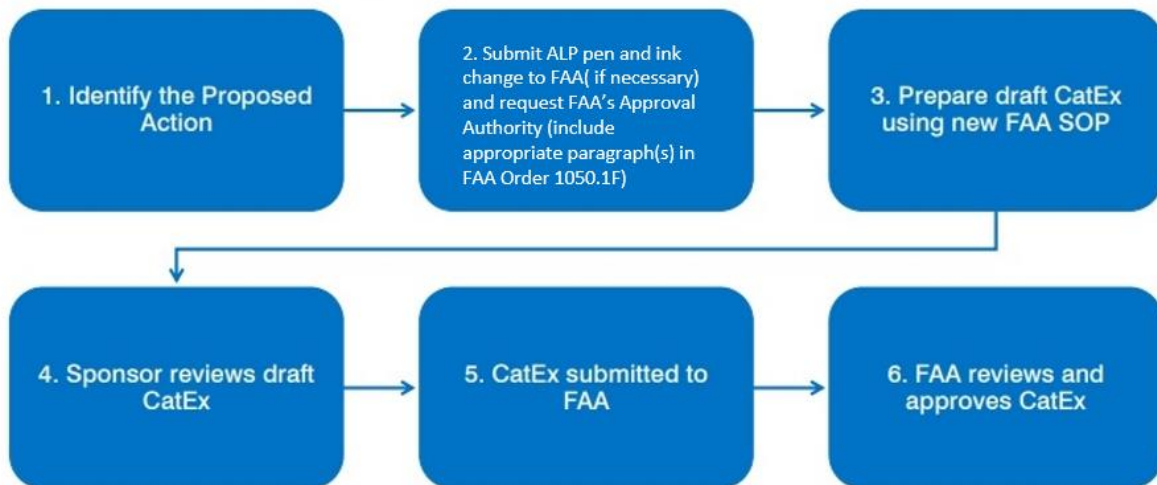
- Example: 5-6.5(j): Implementation of procedures to respond to emergency air or ground safety needs, accidents, or natural events with no reasonably foreseeable long-term adverse impacts.
- » Regulatory (5-6.6): Actions involving establishment of, compliance with, or exemptions to, regulatory programs or requirements.
  - Example: 5-6.6(a): All FAA actions to ensure compliance with Environmental Protection Agency aircraft emissions standards.

FAA Airport Standard Operating Procedure (SOP) 5.1, effective June 2, 2017,<sup>1</sup> describes two levels of information and documentation required for projects eligible for a CATEX:

- » Simple Written Record CATEX
- » Documented CATEX

For a simple written record CATEX, the project should meet the definition of a CATEX as described in FAA Order 1050.1F, paragraphs 5-6.1 through 5-6.6 and should not involve extraordinary circumstances, as described in FAA Order 1050.1F, paragraph 5-2. For a documented CATEX, the project would have actions where there is a greater potential for extraordinary circumstances or other reasons that warrant additional CATEX documentation in accordance with Order 1050.1F, paragraph 5-3b. As part of a documented CATEX, agency coordination may occur depending on a project’s potential impacts on environmental categories. A public involvement process does not typically occur as part of a CATEX. **Figure 6-1** shows the Steps for Completing a CATEX.

**FIGURE 6-1**  
**STEPS FOR COMPLETING A CATEX**



Note: According to 2024 CEQ Regulations and FAA Order 1050.1F.

<sup>1</sup> <https://www.faa.gov/airports/resources/sops/media/arp-SOP-510-catex.pdf>

### 6.2.3.2 Environmental Assessment (EA)

An EA is conducted to determine whether a proposed action has the potential to significantly affect the human environment. An EA must be prepared when the proposed action does not normally require an Environmental Impact Statement (EIS) and:

- » Does not fall within the scope of a CATEX (see FAA Order 1050.1F Paragraph 5-6, the FAA's Categorical Exclusions); or
- » Does fall within the scope of a CATEX, but there are one or more extraordinary circumstances (see FAA Order 1050.1F Paragraph 5-2, Extraordinary Circumstances).
  - Example: the proposed project impacts properties protected under the DOT Act, Section 4(f) (e.g., Airport project results in noise or land use impacts to publicly owned park).

An EA may be required if an action involves extraordinary circumstances. An extraordinary circumstance occurs when an action has the potential to have a significant environmental impact that requires further analysis. New CEQ guidance requires an EA to be no longer than 75 pages, not including pages with graphics or tables, projects will have 1 year to be completed once it has been placed on the Department of Transportation (DOT) Permitting Dashboard. The FAA lists proposed actions where extraordinary circumstances may exist, which include, but are not limited to: an adverse effect on cultural resources protected under the National Historic Preservation Act of 1966, as amended, 45 U.S.C. §300101 et seq; an impact on properties protected under Section 4(f); and an impact on natural, ecological, or scenic resources of federal, state, tribal, or local significance (e.g., federally listed or proposed endangered, threatened, or candidate species, or designated or proposed critical habitat under the Endangered Species Act, 16 U.S.C. §§ 1531-1544).

Depending on the potential environmental effects of a proposed action, there can be varying levels of EA documentation. For the Washington ADO and Eastern Region, these documents are:

- » Eastern Region Condensed EA, and
- » Full EA

A Condensed EA Form is disseminated by the FAA Washington Region to address a proposed action that may not be included within the designated CATEX categories but is not likely to involve extraordinary circumstances. A Full EA is NEPA documentation for a proposed action that has the potential to have extraordinary circumstances that can be mitigated. The FAA Washington ADO will determine which type of EA is the proper NEPA documentation for a proposed project at the Airport. **Figure 6-2** shows the EA Process.

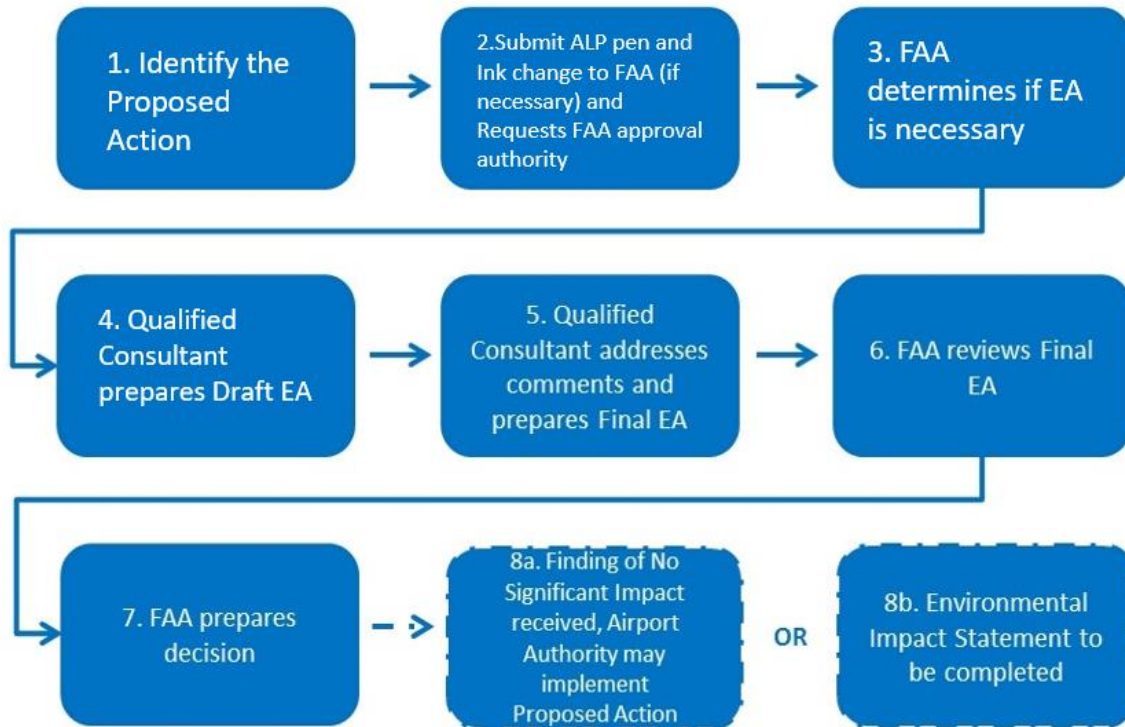
Some EA documents require technical studies and surveys to be completed in order to obtain an in-depth understanding of the project study area beyond what is available on web-based searches and historical information. Examples include but are not limited to wetlands delineations, Phase I ESA's, Biological species surveys, threatened and endangered species surveys, visual surveys, and simulations.

Agency coordination and public involvement are required as part of the EA process. According to FAA Order 1050.1F, paragraph 6-2.2b, "the FAA or applicant must involve the public, to the extent practicable, in preparing EAs. The appropriate level of public involvement for an EA is determined on a case-by-case basis and will vary based on the proposed action and the potential impacts." Coordination and consulting

with appropriate federal, state, tribal, and local officials must occur throughout the EA process to obtain information regarding potential environmental impacts.

Once a project has gone through the EA process and has been determined to have no potential for significant environmental impacts, the FAA issues a Finding of No Significant Impact (FONSI) or requires the completion of an Environmental Impact Statement (EIS).

**FIGURE 6-2  
EA PROCESS**



Note: According to 2024 CEQ Regulations and FAA Order 1050.1F.

### 6.2.3.3 Environmental Impact Statement (EIS)

Under NEPA, the FAA must prepare an EIS for actions significantly affecting the quality of the human environment. An EIS is a detailed written statement required under Section 102(2)C of NEPA when one or more environmental impacts would be significant, and mitigation measures cannot reduce the impact(s) below significant levels. Direct, indirect, and cumulative impacts must be considered when determining significance. According to FAA Order 1050.1F, the following are actions that normally require an EIS:

- » Location of a new commercial service airport in a Magnuson-Stevens Fishery Conservation and Management Act (MSA);;
- » A new runway to accommodate air carrier aircraft at a commercial service airport in an MSA; and
- » Major runway extension.

## 6.2.4 2024 CEQ NEPA Implementing Regulations (40 CFR Parts 1500 – 1508)

The Council on Environmental Quality (CEQ) is a division of the Executive Office of the President of the United States.<sup>2</sup> CEQ is responsible for developing procedures for federal agency implementation of NEPA. These procedures were initially promulgated in 1971 as guidelines and issued as regulations in 1978. In May 2024, CEQ comprehensively updated its NEPA regulations. These CEQ regulations became effective on July 1, 2024. Federal agencies, such as the FAA, are in the process of revising their NEPA implementing instructions to meet the requirements of the new regulations.

The complete 2024 CEQ update to the existing NEPA regulatory framework can be found on the Federal Register.<sup>3</sup> These changes substantially alter how the FAA implements NEPA; therefore, it is important that the City or its consultant review the updated guidance before beginning formal NEPA documentation.

## 6.3 ENVIRONMENTAL CONDITIONS

The purpose of considering environmental factors in airport master planning is to help the Airport Sponsor thoroughly evaluate airport development alternatives and to provide information that will help expedite subsequent environmental processing. For a comprehensive description of the existing environmental conditions at the Airport, environmental resource categories outlined in FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, and *FAA 1050.1F Desk Reference* were used as a guide that helped identify potential environmental effects during the planning process.

The FAA 1050.1F Desk Reference is a guidance document that provides explanatory guidance for environmental impact analysis performed to comply with the CEQ regulations set forth in CEQ 40 CFR. It is designed to complement the FAA Order 1050.1F and defines basic terms used throughout the Order. FAA anticipates an update to this desk reference will be completed in 2024. FAA Order 1050.1F requires the evaluation of airport development projects as they relate to specific environmental resource categories by outlining impacts and thresholds at which the impacts are considered significant. For some environmental resource categories, this determination can be made through calculations, measurements, or observations. However, other environmental resource categories require that the determination be established through correspondence with appropriate federal, state, and/or local agencies. A complete evaluation of the environmental resource categories identified in FAA Order 1050.1F is required during a categorical exclusion, environmental assessment, or environmental impact statement.

Future development plans at the Airport take into consideration environmental resources that are known to exist in the vicinity of the Airport. Early identification of these environmental resources helps avoid impeding development plans in the future.

This section provides an overview of resource categories defined in FAA Order 1050.1F, Chapter 4, and the 1050.1F Desk Reference as it applies to the environs at and surrounding the Airport. **Table 6-1** shows the potential environmental resource categories affected by each MPU identified project. **Table 6-2**

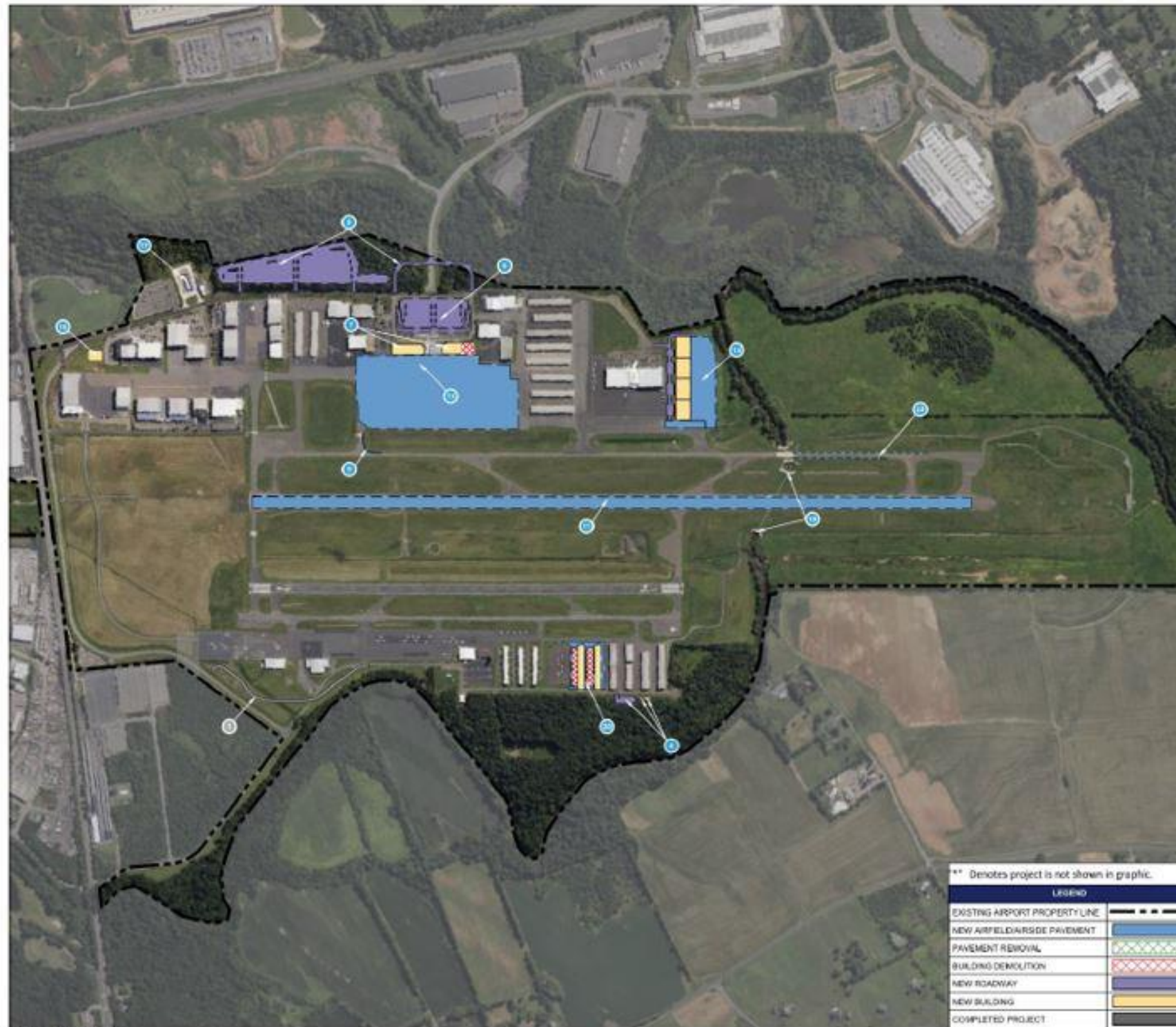
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<sup>2</sup> White House. (2021). *NEPA Modernization*. Retrieved January 2021 from: <https://www.whitehouse.gov/ceq/nepa-modernization/>.

<sup>3</sup> The May 2024 CEQ update to the existing NEPA regulatory framework can be found here: [Federal Register: National Environmental Policy Act Implementing Regulations Revisions Phase 2](#)

summarizes the environmental resource categories studied for the Master Plan Update. It is important to note that while the environmental analysis is included in this Master Plan Update, it is not in and of itself a NEPA document. **Figures 6-3, 6-4, and 6-5** show the Near-term, mid-term, and long-term projects expected at the Airport and identified through the Master Plan Update Process.

FIGURE 6-3 NEAR TERM PROJECTS



**HEF DEVELOPMENT PHASING PLAN**

**PROJECTS CURRENTLY UNDERWAY**

- 1 Realignment of Observation Road
- 2 Bridge Strengthening - Runway 16L/34R and Taxiway B (Design)\*

**NEAR TERM (PAL 1) PROJECTS (2024-2028)**

- 3 New FAA ATCT Phase 2 (Design)\*
- 4 New FAA ATCT Phase 3 (Construction)
- 5 Runway 16L-34R Reconstruction and Strengthening (Design)\*
- 6 Terminal Parking Lot Rehabilitation and Expansion
- 7 Terminal Building Expansion (north and south)
- 8 Satellite Parking #1, Construction and New Entrance Road
- 9 Taxiway E Fillet Widening (Design and Construction)
- 10 Bridge Strengthening - Runway 16L/34R and Taxiway B (Construction)
- 11 Runway 16L-34R Reconstruction and Strengthening (Construction)
- 12 South West Hangar Redevelopment (Design)\*
- 13 East Ramp Strengthening, Reconfiguration, and Rehabilitation - (Design and Construction) - Phase 1
- 14 Taxiway X (Design and Construction)
- 15 Maintenance Equipment Storage (MES)/Snow Removal Equipment (SRE) Facility - (Design)\*
- 16 Maintenance Equipment Storage (MES)/Snow Removal Equipment (SRE) Facility - (Construction)
- 17 Fuel Farm Upgrades (Design and Construction)
- 18 Install Backup Airfield Generators\*
- 19 Acquire Multi-Function SRE (2)\*
- 20 South West Hangar Redevelopment (Construction)
- 21 West Apron Hangar Expansion - Phase 1 (Design)\*
- 22 Taxiway B Reconstruction and Strengthening (South of the Bridge)
- 23 Taxiway B Widening (Design)\*

\*\* Denotes project is not shown in graphic.

LEGEND	
EXISTING AIRPORT PROPERTY LINE	--- ---
NEW AIRFIELD/ARSD PAVEMENT	Blue shaded area
PAVEMENT REMOVAL	Green hatched area
BUILDING DEMOLITION	Red hatched area
NEW ROADWAY	Yellow shaded area
NEW BUILDING	Orange shaded area
COMPLETED PROJECT	Grey shaded area



Source: RS&H, 2023



FIGURE 6-4 MID-TERM PROJECTS



Source: RS&H, 2024



### HEF DEVELOPMENT PHASING PLAN

#### PROJECTS CURRENTLY UNDERWAY

- 10 Realignment of Observation Road
- 11 Bridge Strengthening - Runway 16L/34R and Taxiway B (Design)\*

#### NEAR TERM (PAL 1) PROJECTS (2024-2028)

- 12 New FAA ATCT Phase 2 (Design)\*
- 13 New FAA ATCT Phase 3 (Construction)
- 14 Runway 16L/34R Reconstruction and Strengthening (Design)\*
- 15 Terminal Parking Lot Rehabilitation and Expansion
- 16 Terminal Building Expansion (north and south)
- 17 Satellite Parking #1 Construction and New Entrance Road
- 18 Taxiway E Fillet Widening (Design and Construction)
- 19 Bridge Strengthening - Runway 16L/34R and Taxiway B (Construction)
- 20 Runway 16L/34R Reconstruction and Strengthening (Construction)
- 21 South West Hangar Redevelopment (Design)\*
- 22 East Ramp Strengthening, Reconfiguration, and Rehabilitation - (Design and Construction) - Phase 1
- 23 Taxiway X (Design and Construction)
- 24 Maintenance Equipment Storage (MES)/Snow Removal Equipment (SRE) Facility - (Design)\*
- 25 Maintenance Equipment Storage (MES)/Snow Removal Equipment (SRE) Facility - (Construction)
- 26 Fuel Farm Upgrades (Design and Construction)
- 27 Install Backup Airfield Generators\*
- 28 Acquire Multi-function SRE (2)\*
- 29 South West Hangar Redevelopment (Construction)
- 30 West Apron Hangar Expansion - Phase 1 (Design)\*
- 31 Taxiway B Reconstruction and Strengthening (South of the Bridge)
- 32 Taxiway B Widening (Design)\*

#### MID-TERM (PAL 2) PROJECTS (2029-2033)

- 33 West Apron Hangar Expansion - Phase 1 (Construction)
- 34 East Ramp Strengthening, Reconfiguration, and Rehabilitation - (Design and Construction) - Phase 2
- 35 Taxiway B Widening (Construction)
- 36 Runway 16L/34R Widening (Design)\*
- 37 Runway 16L/34R Widening (Construction)
- 38 East Ramp Strengthening, Reconfiguration, and Rehabilitation - (Design and Construction) - Phase 1
- 39 West Apron Hangar Expansion - Phase 2 (Design)\*
- 40 New East Ramp Taxiway - Design and Construction (2031)
- 41 Expanded East Ramp and Taxiway between Taxiway Delta and Echo (Design)\*
- 42 Runway 16L/34R Extension (Design)\*
- 43 Taxiway C and Taxiway D Relocation (Design)\*
- 44 Taxiway C and Taxiway D Relocation (Construction)
- 45 West Apron Hangar Expansion - Phase 2 (Construction)
- 46 Expanded East Ramp and Taxiway between Taxiway Delta and Echo - (Construction)
- 47 Glen-Gerry Property Reacquisition\*
- 48 Runway 16L/34R Extension (Construction)
- 49 Vehicle Service Road (Design and Construction)

\*\* Denotes project is not shown in graphic.

LEGEND	
EXISTING AIRPORT PROPERTY LINE	--- ---
NEW AIRFIELD/AIRSIDE PAVEMENT	Blue fill
PAVEMENT REMOVAL	Green hatched
BUILDING DEMOLITION	Red hatched
NEW ROADWAY	Purple fill
NEW BUILDING	Yellow fill
COMPLETED PROJECT	Grey fill



FIGURE 6-5 LONG-TERM PROJECTS



**HEF DEVELOPMENT PHASING PLAN**

- PROJECTS CURRENTLY UNDERWAY**
  - 1 Relocation of Observation Pool
  - 2 Bridge Strengthening - Runway 10L/34R and Taxiway B (Design)\*
- NEAR-TERM (PAL 1) PROJECTS (2024-2028)**
  - 3 New FAA AOC Phase 2 (Design)\*
  - 4 New FAA AOC Phase 2 (Construction)
  - 5 Runway 10L-34R Reconstruction and Strengthening (Design)\*
  - 6 Terminal Parking Lot Rehabilitation and Expansion
  - 7 Terminal Building Expansion (north and south)
  - 8 Satellite Parking #1 Construction and New Entrance Road
  - 9 Taxiway I Riser Widening (Design and Construction)
  - 10 Bridge Strengthening - Runway 10L/34R and Taxiway B (Construction)
  - 11 Runway 10L-34R Reconstruction and Strengthening (Construction)
  - 12 South West Hangar Redevelopment (Design)\*
  - 13 East Ramp Strengthening, Reconfiguration, and Rehabilitation - (Design and Construction) - Phase 1
  - 14 Taxiway K (Design and Construction)
  - 15 Maintenance Equipment Storage (MES) and Snow Removal Equipment (SRE) Facility (Design)\*
  - 16 Maintenance Equipment Storage (MES) and Snow Removal Equipment (SRE) Facility (Construction)
  - 17 Fuel Farm Upgrades (Design and Construction)
  - 18 Infill Bridge Airfield Generator\*
  - 19 Acquire Multi-Function SRE (2)\*
  - 20 South West Hangar Redevelopment (Construction)
  - 21 West Apron Hangar Expansion - Phase 1 (Design)\*
  - 22 Taxiway B Reconstruction and Strengthening (South of the Bridge)
  - 23 Taxiway B Widening (Design)\*
- MID-TERM (PAL 2) PROJECTS (2029-2033)**
  - 24 West Apron Hangar Expansion - Phase 1 (Construction)
  - 25 East Ramp Strengthening, Reconfiguration, and Rehabilitation - (Design and Construction) - Phase 2
  - 26 Taxiway B Widening (Construction)
  - 27 Runway 10L-34R Widening (Design)\*
  - 28 Runway 10L-34R Widening (Construction)
  - 29 East Ramp Strengthening, Reconfiguration, and Rehabilitation - (Design and Construction) - Phase 3
  - 30 West Apron Hangar Expansion - Phase 2 (Design)\*
  - 31 New East Ramp Taxiway - Design and Construction (2031)
  - 32 Expanded East Ramp and Taxiway between Taxiway Delta and Echo (Design)\*
  - 33 Runway 10L-34R Extension (Design)\*
  - 34 Taxiway C and Taxiway D Relocation (Design)\*
  - 35 Taxiway C and Taxiway D Relocation (Construction)
  - 36 West Apron Hangar Expansion - Phase 2 (Construction)
  - 37 Expanded East Ramp and Taxiway between Taxiway Delta and Echo - (Construction)
  - 38 Glen-Gery Property Reimbursement\*
  - 39 Runway 10L-34R Extension (Construction)
  - 40 Vehicle Service Road (Design and Construction)
- LONG-TERM (PAL 3) PROJECTS (2034-2039)**
  - 41 East Apron T-Franger (Demolition)
  - 42 ARFF Station (Design)\*
  - 43 ARFF Station (Construction)
  - 44 Airport Master Plan Update\*
  - 45 West Apron Hangar Expansion - Phase 3 (Design)\*
  - 46 West Apron Hangar Expansion - Phase 3 (Construction)
  - 47 3 Acre Land Acquisition - Prince William County
  - 48 Parking Garage Construction
- BEYOND PLANNING PERIOD PROJECTS**
  - 49 South-East Airport Complex Site Development (Construction)
  - 50 East Apron Corporate Hangar Development
  - 51 West Apron AAM Terminal Facility
  - 52 West Apron Corporate Building

\*\* Denotes project is not shown in graphic.

LEGEND	
EXISTING AIRPORT PROPERTY LINE	--- ---
NEW AIRFIELD/OUTSIDE PAVEMENT	Blue fill
PAVEMENT REMOVAL	Green hatched
BUILDING DEMOLITION	Red hatched
NEW ROADWAY	Yellow fill
NEW BUILDING	Orange fill
COMPLETED PROJECT	Black fill



Source: RS&H, 2023  
**RS&H**

TABLE 6-1 SUMMARY OF ENVIRONMENTAL RESOURCE CATEGORIES WITH POTENTIAL IMPACTS

Airport Development Projects	YEAR	Air Quality	Biological Resources	Climate	Coastal Resources	DOT Act, Section 4(f)	Farmland	Hazardous Materials, Solid Waste, and Pollution Prevention	Historical, Architectural, Archeological, and Cultural Resources	Land Use	Natural Resources & Energy Supply	Noise and Noise-Compatible Land Use	Socioeconomics, Environmental Justice, and Children's Health and Safety Risks	Visual Effects	Water Resources	CATEX <sup>1</sup>	EA <sup>1</sup>	EIS <sup>1</sup>
<b>Near Term</b>																		
Realignment of Observation Road- Construction	2024	N	N	N	N	N	N	Y	N	N	Y	N	N	N	N	5-6.4(a)		
Bridge Strengthening- Runway 16L/34R & Taxiway B- Design	2024	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
New FAA ATCT Phase 2- Design	2025	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
New FAA ATCT Phase 3- Construction	2025	N	N	N	N	N	N	Y	N	N	N	N	Y	N	N		F	
Runway 16L/34R Reconstruction and Strengthening-Design	2025	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
Terminal Parking Lot Rehabilitation, Expansion and Parking Garage- Design and Construction	2025	N	Y	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(f)		
Terminal Building Expansion (North and South)- Design and Construction	2025	N	Y	N	N	N	N	Y	N	N	Y	N	Y	N	N	5-6.4(h)		
Satellite Parking 1 Construction and New Entrance Road- Design and Construction	2025	N	Y	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(a & f)		
Taxiway E Fillet Widening -Design and Construction	2025	N	N	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(e)		
Bridge Strengthening- Runway 16L/34R and Taxiway B- Construction	2025	N	N	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(e)		
Runway 16L/34 Reconstruction and Strengthening- Construction	2026	N	N	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(e)		
Southwest Hangar Redevelopment- Design	2026	N	Y	N	N	N	N	N	N	N	N	N	N	N	Y*	N/A		
East Ramp Strengthening, Reconfiguration, and Rehabilitation-Design and Construction Phase 1	2026	N	N	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(e)		
Taxilane X-Ray- Design and Construction	2026	N	N	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(e)		
Maintenance Equipment Storage/Snow Removal Equipment Facility- Design	2026	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
Maintenance Equipment Storage/Snow Removal Equipment Facility- Construction	2027	N	Y	N	N	N	N	Y	N	N	Y	N	Y	N	N	5-6.4(e)		
Fuel Farm Upgrades and Truck Staging Area- Design and Construction	2028	N	N	N	N	N	N	Y	N	N	Y	N	Y	N	N	5-6.4(f & u)		
Install Backup Airfield and Terminal Generators	2028	N	N	N	N	N	N	N	N	N	N	N	N	N	N			
Acquire Multi-function SRE (2)	2028	N	N	N	N	N	N	N	N	N	N	N	N	N	N	5-6.4(w)		

Airport Development Projects	YEAR	Air Quality	Biological Resources	Climate	Coastal Resources	DOT Act, Section 4(f)	Farmland	Hazardous Materials, Solid Waste, and Pollution Prevention	Historical, Architectural, Archeological, and Cultural Resources	Land Use	Natural Resources & Energy Supply	Noise and Noise-Compatible Land Use	Socioeconomics, Environmental Justice, and Children's Health and Safety Risks	Visual Effects	Water Resources	CATEX <sup>1</sup>	EA <sup>1</sup>	EIS <sup>1</sup>
Southwest Hangar Redevelopment- Design	2028	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N/A		
West Apron Hangar Expansion Phase 1- Design	2028	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
Taxiway B Reconstruction and Strengthening (South of Bridge)	2028	N	N	N	N	N	N	Y	N	N	Y	Y	Y	N	Y*	5-6.4(e)		
Taxiway B Widening- Design	2028	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
<b>Mid Term</b>																		
West Apron Hangar Expansion Phase 1-Construction	2029	N	Y	N	N	N	N	Y	N	N	Y	Y	Y	N	Y*	5-6.4(e&f)		
East Ramp Strengthening, Reconfiguration, Rehabilitation Phase 2- Design and Construction	2029	N	N	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(e)		
Taxiway B Widening- Construction	2029	N	N	N	N	N	N	Y	N	N	Y	Y	Y	N	Y*	5-6.4(e)		
Runway 16L/34R Widening- Design	2029	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
Runway 16L/34R Widening- Construction	2030	N	N	N	N	N	N	Y	N	N	Y	Y	Y	N	Y*	5-6.4(e)		
East Ramp Strengthening, Reconfiguration and Rehabilitation Phase 3- Design and Construction	2031	N	N	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(e)		
West Apron Hangar Expansion Phase 2- Design	2031	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
New East Ramp Taxiway- Design and Construction	2031	N	Y	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(e)		
Expanded East Ramp and Taxilane between Taxiway Delta and Echo- Design	2031	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
Runway 16L-34R Extension- Design	2032	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
Taxilane C and Taxilane D Relocation- Design	2032	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
Taxilane C and Taxilane D Relocation- Construction	2032	N	Y	N	N	N	N	Y	N	N	Y	Y	Y	N	N	5-6.4(e)		
West Apron Hangar Expansion Phase 2- Construction	2032	N	Y	N	N	N	N	Y	N	N	Y	Y	Y	N	Y*	5-6.4(e)		
Expanded East Ramp and Taxilane between Taxiway Delta and Echo- Construction	2032	N	Y	N	N	N	N	Y	N	N	Y	N	Y	N	N	5-6.4(e)		
Glen-Gerry Property Reimbursement	2033	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
Runway 16L/34R Extension- Design	2033	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
Vehicle Service Road- Design and Construction	2033	N	Y	N	N	N	N	Y	N	N	N	N	N	N	Y*	5-6.4(e)		
<b>Long Term</b>																		

Airport Development Projects	YEAR	Air Quality	Biological Resources	Climate	Coastal Resources	DOT Act, Section 4(f)	Farmland	Hazardous Materials, Solid Waste, and Pollution Prevention	Historical, Architectural, Archeological, and Cultural Resources	Land Use	Natural Resources & Energy Supply	Noise and Noise-Compatible Land Use	Socioeconomics, Environmental Justice, and Children's Health and Safety Risks	Visual Effects	Water Resources	CATEX <sup>1</sup>	EA <sup>1</sup>	EIS <sup>1</sup>
East Apron T-Hangar- Demolition	2034	N	N	N	N	N	N	Y	N	N	N	N	N	N	N		T	
ARFF Station- Design	2034	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
ARFF Station- Construction	2034	N	Y	N	N	N	N	Y	N	N	Y	Y	Y	N	N	5-6.4(f)		
Airport Master Plan Update	2035	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
West Apron Hangar Expansion Phase 3- Design	2036	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
West Apron Hangar Expansion Phase 3- Construction	2037	N	Y	N	N	N	N	Y	N	N	Y	Y	Y	N	Y*	5-6.4(f)		
8-Acre Land Acquisition- Prince William County	2040	N	Y	N	N	N	Y	N	N	Y	N	Y	N	Y	N		F	
Parking Garage Construction	2040	N	Y	N	N	N	N	Y	N	N	Y	Y	Y	N	Y*		F	
<b>Beyond Planning Period Projects</b>																		
Southeast Airport Complex Site Development- Design	N/A	N	N	N	N	N	N	N	N	N	N	N	N	N	Y*		F	
East Apron Corporate Hangar Development	N/A	N	Y	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(f)		
West AAM Terminal Facility	N/A	N	Y	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(f)		
West Apron Corporate Building	N/A	N	Y	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(f)		

Notes: - <sup>1</sup> To be verified with the FAA Washington ADO when project is "Ripe" for an FAA decision; \*- Wetlands OR Floodplains; F –Full, Standard EA; T – Templatized/ Condensed EA; N/A- Design projects not categorized under NEPA

**TABLE 6-2 SUMMARY OF ENVIRONMENTAL RESOURCE CATEGORIES STUDIED**

<b>Environmental Resource</b>	<b>Description</b>
Air Quality	The Airport is located in an area designated as “maintenance” for Ozone and “attainment” for all other National Ambient Air Quality Standards (NAAQS).
Biological Resources	Federal- and state-threatened, –endangered and candidate species and migratory birds are in the Airport area. There is no critical habitat at the Airport. See Section 1.3.2 for further details.
Climate	There are greenhouse gas (GHG) emissions (e.g., Carbon dioxide Nitrous Oxide, etc.) produced at the Airport.
Coastal Resources	A portion of the Airport is within Virginia’s Coastal Zone Management Program; however, there are no Coastal Barrier Resource System (CBRS) segments within the Airport property.
Department of Transportation Act, Section 4(f)	There are no Section 4(f) properties on Airport property. The closest Section 4(f) property to the Airport is Cannon Branch Earthwork Fort, located adjacent to the Airport property in the northeast section of the Airport.
Farmlands	The Airport property contains prime farmland and farmland of statewide importance soil types. However, because the Airport is located with a U.S. Census Bureau designated Urban Area, it is exempt from the Farmland Protection Policy Act (FPPA) and would not have to complete farmland conversion application.
Hazardous Materials, Solid Waste, and Pollution Prevention	<p>There are six Resource and Recovery Act (RCRA) Hazardous Waste Generators on Airport property.</p> <p>Solid waste generated at the Airport is disposed of at the Manassas Transfer Station.</p> <p>The City has a Virginia Pollutant Discharge Elimination System Permit (VPDES) General Permit (VAR050985). The City also maintains an Oil Discharge Contingency Plan, an Integrated Spill Prevention, Control and Countermeasures (SPCC) Plan, and a Stormwater Pollution Prevention Plan (SWPPP) for the Airport.</p>
Historical, Architectural, Archaeological and Cultural Resources	<p>There are no historic architectural resources located at the Airport. At a small portion of Airport property, a Phase I cultural resources survey previously completed in 2017. This survey did not identify any cultural resources. Additionally, a Phase I ESA was conducted in 2024 in a small southwest portion of the Airport for the Air Traffic Control Tower Replacement Environmental Assessment. This survey did not identify any cultural resource</p> <p>The closest National Register of Historic Places (NRHP)-listed resource is the Davis Beard House (10726 Bristow Road), about one-third mile west of the</p>

Environmental Resource	Description
	<p>Airport. Cannon Branch Fort (VDHR #155-5020) is a historic fort associated with the Civil War, which is potentially eligible for listing on the NRHP. The Fort is adjacent to Airport property in the northeast section of the Airport. Bristoe Station Heritage Park, a Prince Williams County Park, is located about 1 mile west of the Airport. Manassas Battlefield Park (Virginia Department of Historic Resources ID # 076-0271) is located about 6 miles northeast of the Airport.</p> <p>A Phase I archaeological survey was conducted for two portions of the Airport in 2017. One archaeological site, Site 44PW0729, has been identified within the Airport property, west of the Air Traffic Control Tower. This site has subsurface integrity and is interpreted as a campsite.</p>
Land Use	Current land uses surrounding the Airport include classifications such as Airport, Technology Community Mixed Use, Flexible Use Employment Center, Agricultural and Forestry, and Federal property.
Natural Resources and Energy Supply	Electrical power is provided by The City of Manassas through a cooperative agreement with Dominion Power. to the Airport. City of Manassas Utilities Department provides water and Prince William County Service Authority provides sewer services. Washington Gas provides natural gas.
Noise and Noise-Compatible Land Use	The Airport is zoned as an Airport District. It is bordered by areas zoned as industrial to promote compatible development in and around the Airport. Areas bordering the Airport in Prince William County are zoned as Agricultural, Industrial, and Planned Business District.
Socioeconomics, Environmental Justice, Children’s Environmental Health, and Safety Risks	The Airport is located within Manassas City, Census Tract 9104.2, Block Group 5 and surrounded by Manassas, VA and Census Tracts 9103.02, 9104.01, and Prince William County, VA and Census Tracts 9103.05, 9014.09, 9013.04, and 9013.03. Of the total population living within the census tract, about 45% are minority and 20% live below the poverty level. About 24% of the population is people 18 or younger. The closest school to the Airport is George C. Round Elementary School, located about 1 mile northwest of the Airport.
Visual Effects	<p>Light emissions at the Airport currently result from airfield, building, access roadway, parking, and apron area lighting fixtures required for the safe and secure movement of people, vehicles, and aircraft.</p> <p>The visual resources and visual character of the Airport currently include the air traffic control tower, fixed base operators, hangars, and maintenance buildings.</p>

Environmental Resource	Description
Water Resources	<p>Airport property contains wetlands. Palustrine wetland features are on the east side of the Airport. Floodplains, including 100- and 500-year floodplain, are features throughout Airport property and a regulatory floodway that is part of Broad Creek in the southwest area of the Airport. Surface waters at, and in the vicinity of, the Airport include Broad Run and Cannon Branch.</p> <p>The Airport property is in the Rocky Branch-Broad Run watersheds.</p> <p>The Airport property does not contain any wild and scenic rivers.</p>

Prepared by: RS&H, 2024

### 6.3.1 Air Quality

The U.S. Environmental Protection Agency (USEPA) sets NAAQS for certain air pollutants to protect public health and welfare through Section 109 of the Clean Air Act (CAA). The USEPA has identified the following six criteria air pollutants and has set NAAQS for them: Carbon Monoxide (CO), Lead (Pb), Nitrogen Dioxide (NO<sub>2</sub>), 8-Hour Ozone (O<sub>3</sub>), Particulate Matter (PM<sub>10</sub> and PM<sub>2.5</sub>), and Sulfur Dioxide (SO<sub>2</sub>).

Areas that violate one or more NAAQS of these pollutants are classified as “nonattainment” areas. States with “nonattainment” areas must develop a State Implementation Plan (SIP) demonstrating how the areas will be brought back into “attainment” of the NAAQS within designated timeframes. Areas where concentrations of the criteria pollutants are below (i.e., within) these threshold levels are classified as “attainment” areas. Areas with prior “nonattainment” status that have since transitioned to “attainment” are known as “maintenance” areas.

According to the United States Environmental Protection Agency (USEPA), the Airport, located in the City of Manassas, is in a “maintenance” area for O<sub>3</sub> and is in an “attainment” area for all other NAAQS.<sup>4</sup> As the USEPA requires, the Metropolitan Washington Air Quality Committee, which is made up of much of the Washington D.C., Maryland and Northern Virginia area, including Prince William County and the City of Manassas, has a SIP for the O<sub>3</sub> standard.<sup>5</sup> According to the Virginia Department of Environmental Quality (VDEQ), the Airport is within an emission control area for oxides of nitrogen (NO<sub>x</sub>) and volatile organic compounds (VOCs).<sup>6</sup> The FAA Federal Presumed to Conform Actions under General Conformity can be found in the Federal Register, Volume 72, No.145; section 2 lists specific federal actions related to airports that do not require detailed general conformity analyses under the Clean Air Act. This includes activities that are presumed to meet air quality standards and normally do not require further review. However, each project would require FAA Coordination to make the final determination on whether a project meets

<sup>4</sup> U.S. Environmental Protection Agency, Air Quality Green Book, Virginia. Accessed: [https://www3.epa.gov/airquality/greenbook/anayo\\_va.html](https://www3.epa.gov/airquality/greenbook/anayo_va.html), May 2024.

<sup>5</sup> Metropolitan Washing Council of Governments, Washington DC-MD-VA 2015 Ozone NAAQS Nonattainment Area Base Year 2017 Emissions Inventory (Updated on October 30,2020). Accessed: <https://www.mwcog.org/documents/2020/10/30/washington-dc-md-va-2015-ozone-naaqs-nonattainment-area-base-year-2017-emissions-inventory-updated-on-october-302020-air-quality-air-quality-conformity-ozone/>, May 2024.

<sup>6</sup> Virginia Legislative Information System, Administrative Code 9VAC5-20-206. Volatile organic compound and nitrogen oxides emissions control areas. Accessed: <https://law.lis.virginia.gov/admincode/title9/agency5/chapter20/section206/>, May 2024.

presumed to conform standards or if an air quality analysis including a Construction Emissions Inventory would be required.

### 6.3.2 Biological Resources

Biological resources include terrestrial and aquatic plant and animal species; game and non-game species; special status species; and environmentally sensitive or critical habitats. The following are relevant federal laws, regulations, Executive Orders (EOs), and guidance<sup>7</sup> that protect biotic communities:

- » Endangered Species Act (ESA) (16 U.S.C. §§ 1531-1544)
- » Bald and Golden Eagle Protection Act (16 U.S.C. §§ 668 et seq.)
- » Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801 et seq.)
- » Fish and Wildlife Coordination Act (16 U.S.C. § 661-667d)
- » Executive Order (EO) 13112, *Invasive Species* (64 FR 6183)
- » Marine Mammal Protection Act (16 U.S.C. § 1361 et seq.)
- » Migratory Bird Treaty Act (MBTA) (16 U.S.C. §§ 703 et seq.)
- » EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds* (66 FR 3853)
- » Council on Environmental Quality (CEQ) Guidance on Incorporating Biodiversity Considerations into Environmental Impact Analysis under NEPA; and
- » Memorandum of Understanding to Foster the Ecosystem Approach.

**Table 6-3** lists the three federally threatened, endangered or candidate species that have the potential to be found at the Airport.<sup>8</sup> According to the U.S. Fish and Wildlife Service (USFWS), there is no designated critical habitat at the Airport.<sup>9</sup> Although the Endangered Species Act does not protect state-protected species or habitats, NEPA documentation ensures that environmental analysis for airport actions addresses the potential effects on state-protected resources. The Virginia Department of Game and Inland Fisheries (VDGIF) Information System (VaFWIS) indicates that nine Commonwealth-listed species may occur within two miles of Airport property.<sup>10</sup> **Table 6-4** lists the twelve state-listed species with the potential to occur at the Airport.

The Broad Run Stream Conservation Unit is adjacent to the Airport on the west side. The Broad Run Stream Conservation Unit has a biodiversity ranking of B3, which represents a site of high importance. Natural heritage resources for the Brook floater and Yellow lance are associated with that Unit. The VDGIF also designates Broad Run as a “Threatened and Endangered Species Water” for the Brook floater.<sup>11</sup>

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<sup>7</sup> Due to the number of federal laws and EOs applicable to development plans, this section presents only the legal citations or references for those requirements in lieu of summarizing their requirements. See FAA’s 1050.1F Desk Reference for more.

<sup>8</sup> U.S. Fish and Wildlife Service, Information for Planning and Conservation (IPaC). Accessed: <https://ipac.ecosphere.fws.gov/location/WGTIE2AQFFBGXFI5WFTGGH7ZBY/resources#endangered-species>, May 2024.

<sup>9</sup> U.S. Fish and Wildlife Service, Information for Planning and Conservation (IPaC). Accessed: <https://ipac.ecosphere.fws.gov/location/WGTIE2AQFFBGXFI5WFTGGH7ZBY/resources#endangered-species>, May 2024.

<sup>10</sup> Virginia Department of Game and Inland Fisheries, Virginia Fish and Wildlife Information Service. Accessed: <https://services.dwr.virginia.gov/fwis/index.asp>, May 2024.

<sup>11</sup> Commonwealth of Virginia, Department of Environmental Quality, Letter RE: Federal Consistency Certification for the Manassas Regional Airport West Corporate Development and East Parcel Development, City of Manassas, and Prince William County, DEQ 17-061 F, October 24, 2017.

**TABLE 6-3 FEDERALLY LISTED SPECIES WITH THE POTENTIAL TO OCCUR IN OR AROUND AIRPORT PROPERTY**

Species Common Name	Species Scientific Name	Listing Status
Dwarf Wedgemussel	<i>Alasmidonta heterodon</i>	Endangered
Monarch Butterfly	<i>Danaus plexippus</i>	Candidate
Northern Long-eared Bat	<i>Myotis septentrionalis</i>	Federally Threatened
Tricolored Bat	<i>Perimyotis subflavus</i>	Proposed Endangered

Source: USFWS, 2024; Prepared by RS&H, 2024

The Migratory Bird Treaty Act (MBTA) prohibits the taking of any migratory birds, their parts, nests, or eggs except as permitted by regulations and does not require intent to be proven. According to the USFWS IPaC, there is the potential for five migratory bird species to be found at the Airport, see **Table 6-5** for a complete list.<sup>12</sup>

Essential Fish Habitat (EFH) are those waters and substrate necessary for fish spawning, breeding, feeding, and growth to maturity as defined under the MSA. The MSA also requires federal agencies to consult with NOAA Fisheries about actions that could damage EFH. The Airport is not located in an EFH area.<sup>13</sup>

**TABLE 6-4 STATE-LISTED SPECIES WITH THE POTENTIAL TO OCCUR IN OR AROUND AIRPORT PROPERTY**

Species Common Name	Species Scientific Name	Listing Status
Atlantic Sturgeon	<i>Acipenser oxyrinchus</i>	State Endangered / Federally Endangered
Northern long-eared bat	<i>Myotis septentrionalis</i>	State Threatened / Federally Threatened
Little Brown Bat	<i>Myotis lucifugus lucifugus</i>	State Endangered
Tricolored Bat	<i>Perimyotis subflavus</i>	State Endangered
Brook Floater	<i>Alasmidonta varicose</i>	State Endangered
Peregrine Falcon	<i>Falco peregrinus</i>	State Threatened
Loggerhead Shrike	<i>Lanius ludovicianus</i>	State Threatened
Henslow's Sparrow	<i>Ammodramus henslowii</i>	State Threatened
Migrant Loggerhead Shrike	<i>Lanius ludovicianus migrans</i>	State Threatened
Yellow Lance	<i>Elliptio lanceolata</i>	State Threatened
Wood Turtle	<i>Glyptemys insculpta</i>	State Threatened
Appalachian Grizzled Skipper	<i>Pyrgus Wyandot</i>	State Threatened

Source: VDGIF, 2024; Prepared by RS&H, 2024

<sup>12</sup> U.S. Fish and Wildlife Service, Information for Planning and Conservation (IPaC). Accessed: <https://ipac.ecosphere.fws.gov/location/WGTIE2AQFFBGXFI5WFTGGH7ZBY/resources#endangered-species>, May 2024.

<sup>13</sup> National Marine Fisheries Service, Essential Fish Habitat Mapper. Accessed: <https://www.habitat.noaa.gov/apps/efhmapper/>, May 2024.

**TABLE 6-5 POTENTIAL MIGRATORY BIRDS IN THE AIRPORT AREA**

Species Common Name	Species Scientific Name
Bald Eagle	<i>Haliaeetus leucocephalus</i>
Prairie Warbler	<i>Dendroica discolor</i>
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>
Rusty Blackbird	<i>Euphagus carolinus</i>
Wood Thrush	<i>Hylocichla mustelina</i>

Source: USFWS, 2024; Prepared by RS&H, 2024

### 6.3.3 Climate

Relevant federal laws, regulations, and EOs that relate to climate include:

- » CAA (42 U.S.C. §§ 7408, 7521, 7571, 7661 et seq.)
- » EO 13514, *Federal Leadership in Environment Energy and Economic Performance* (74 FR 52117);
- » EO 13653, *Preparing the United States for the Impacts of Climate Change* (78 FR 66817); and
- » EO 13693, *Planning for Federal Sustainability* (80 FR 15869).

Greenhouse gases (GHG) trap heat in the earth’s atmosphere. Naturally occurring and man-made GHGs primarily include water vapor, carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Activities that require fuel or power are the primary stationary sources of GHGs at airports. Aircraft and ground access vehicles not controlled by an airport typically generate more GHG emissions than airport-controlled sources.

Research has shown a direct correlation between fuel combustion and GHG emissions. In terms of U.S. contributions, the Government Accountability Office (GAO) reports that "domestic aviation contributes about three percent of total carbon dioxide emissions, according to EPA data, "compared with other industrial sources, including the remainder of the transportation sector (20 percent) and power generation (41 percent). The International Civil Aviation Organization (ICAO) estimates that GHG emissions from aircraft account for roughly three percent of all anthropogenic GHG emissions globally.<sup>14</sup>

Construction emissions are estimated based on these factors: construction schedule; the number of construction vehicles and/or equipment; the types of construction vehicles and/or equipment; types of fuel used to power the equipment and vehicles; vehicle and equipment hourly activity/vehicle miles traveled; construction materials used and their quantities; and the duration of construction.

In January 2023, the Council on Environmental Quality (CEQ) issued interim guidance, *National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change*, to assist agencies in analyzing greenhouse gas emissions (GHG) and climate change effects of a Proposed Project under NEPA. The FAA has not established a significance threshold for Climate impacts.

The CEQ identified Social Cost-Greenhouse Gases (SC-GHG) as the metric for assessing potential climate impacts and represents the monetary estimate of the effect associated with each additional metric ton of

<sup>14</sup> Melrose, Alan, *European ATM and Climate Adaptation: A Scoping Study*, ICAO Environmental Report, 2010. Accessed: [http://www.icao.int/environmental-protection/Documents/EnvironmentReport-2010/ICAO\\_EnvReport10-Ch6\\_en.pdf](http://www.icao.int/environmental-protection/Documents/EnvironmentReport-2010/ICAO_EnvReport10-Ch6_en.pdf), May 2021.

carbon dioxide released into the air (Interagency Working Group, 2021). The three GHGs<sup>2</sup> that are analyzed are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O), which represent more than 97% of U.S. GHG emissions. To calculate SC-GHG, the carbon dioxide equivalent (CO<sub>2</sub>e) must be calculated. The Interagency Working Group (IWG) determined the social cost of CO<sub>2</sub> (SC-CO<sub>2</sub>) through 2050 and assigned a monetary value<sup>3</sup> for each additional metric ton of CO<sub>2</sub> produced. SC-CO<sub>2</sub> is equivalent to SC-GHGs and represents the social costs of the total greenhouse gases converted to the CO<sub>2</sub>e equivalent. The SC-CO<sub>2</sub> helps weigh the benefits of climate mitigation against its costs.

### 6.3.4 Coastal Resources

The primary statutes, regulations, and EOs that protect coastal resources include:

- » Coastal Barrier Resources Act (16 U.S.C. § 3501 et seq.);
- » Coastal Zone Management Act (CZMA) (16 U.S.C. § 1451-1466);
- » National Marine Sanctuaries Act (16 U.S.C. §1431 et seq.);
- » EO 13089, *Coral Reef Protection* (63 FR 32701); and
- » EO 13547, *Stewardship of the Ocean, Our Coasts, and the Great Lakes* (75 FR 43021-43027).

Portions of Airport property are in Prince William County, within Virginia's Coastal Zone Management (CZM) Program, according to the Virginia Department of Environmental Quality (VDEQ).<sup>15</sup> The Virginia CZM Program has the following goals.<sup>16</sup>

- » "Goal 1: To protect and restore coastal resources, habitats, and species of the Commonwealth. These include, but are not limited to, wetlands, subaqueous lands and vegetation, beaches, sand dune systems, barrier islands, underwater or maritime cultural resources, riparian forested buffers, and endangered or threatened species.
- » Goal 2: To restore and maintain the quality of all coastal waters for human and ecosystem health through protection from adverse effects of excess nutrients, toxics, pathogens, and sedimentation.
- » Goal 3: To protect air quality.
- » Goal 4: To reduce or prevent losses of coastal habitat, life, and property caused by shoreline erosion, storms, relative sea level rise, and other coastal hazards in a manner that balances environmental and economic considerations.
- » Goal 5: To provide for sustainable wild fisheries and aquaculture.
- » Goal 6: To promote sustainable ecotourism and to increase and improve public access to coastal waters and shorefront lands compatible with resource protection goals.
- » Goal 7: To promote renewable energy production and provide for appropriate extraction of energy and mineral resources consistent with proper environmental practices.
- » Goal 8: To ensure sustainable development on coastal lands and support access for water-dependent development through effective coordination of governmental planning processes.

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<sup>15</sup> Virginia Department of Environmental Quality, CZM Boundaries. Accessed: <https://www.deq.virginia.gov/home/showpublisheddocument/4078/637461463603670000>, May 2024.

<sup>16</sup> Virginia Department of Environmental Quality, letter to National Oceanic and Atmospheric Administration, September 4, 2018. Accessed: <https://www.deq.virginia.gov/home/showpublisheddocument/13129/637776597193170000>, May 2024.

- » Goal 9: To avoid and minimize coastal and ocean resource use conflicts through research, planning, and a forum for coordination and facilitation among local, regional, state and federal government agencies, interest groups, and citizens.
- » Goal 10: To promote informed decision-making by maximizing the availability of up-to-date educational information, technical advice, and scientific data including the use of new tools such as marine spatial planning.”

The Virginia CZM Program also contains the Chesapeake Bay Preservation Act, which establishes resource protection areas (RPAs) around land at or near the shoreline that play a critical role in the water quality value. RPAs have a 100-foot vegetation buffer along streams or rivers to help protect water quality. See **Figure 6-6** for the Prince William County designated RPAs in and around Airport property. Although RPAs are shown within the limits of the City of Manassas, the City of Manassas does not recognize RPAs because it is not part of the Virginia CZM Program and, therefore, is not subject to the Chesapeake Bay Preservation Act, which establishes RPAs<sup>17</sup>. With regards to the RPA in the eastern portion of the Airport property, an on-site delineation of the Cannon Branch RPA within the eastern portion of the Airport property was reviewed and approved by Prince William County.



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<sup>17</sup> Chesapeake Bay Regulations/RPA's. Prince William Conservation Alliance. <https://www.pwconserve.org/issues/chesbay.html>  
Accessed June 2024

FIGURE 6-6 RESOURCE PROTECTION AREAS



**Legend**

-  Airport Property Boundary
-  Resource Protection Areas (RPA)



According to Prince William County, all creeks and streams in the County are subject to RPA buffers because they feed into the Potomac River and eventually to the Chesapeake Bay.<sup>18</sup> Any work within an RPA requires County review and approval. The County does not allow the following activities in an RPA:

- » New development
- » Parking lots
- » Clear-cutting trees
- » Filling and grading activities
- » Establishing Lawns

Additionally, no Coastal Barrier Resource System (CBRS) segments are within the Airport property.<sup>19</sup> The closest CBRS segment, St. Catherine Island (MD-56), is over 50 miles southeast of the Airport.

### 6.3.5 Department of Transportation, Section 4(f)

Relevant federal laws, regulations, and EOs that protect Section 4(f) resources include:

- » U.S. Department of Transportation (USDOT) Act, Section 4(f) (49 U.S.C. § 303.);
- » Land and Water Conservation Fund Act of 1965 (16 U.S.C. §§ 4601-4604 et seq.);
- » Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) – Section 6009 (49 U.S.C. § 303.); and
- » U.S. Department of Defense Reauthorization (Public Law (P.L.) 105-185, Division A, Title X, Section 1079, November 18, 1997, 111 Stat. 1916).

The USDOT Act, Section 4(f) provides that no project that requires the use of any land from a public park or recreational area, wildlife and waterfowl refuge, or historic site be approved by the Secretary of Transportation unless there is no viable alternative and provisions to minimize any possible harm are included in the planning. Similarly, the Land and Water Conservation Fund (LWCF) Act prevents the conversion of lands purchased or developed with Land and Water Conservation funds to non-recreation uses unless the Secretary of the Interior, through the National Park Service, approves the conversion. Conversion may only be approved if it is consistent with the comprehensive statewide outdoor recreation plan when the approval occurs. Additionally, the converted property must be replaced with other recreation property of reasonably equivalent usefulness and location and at least equal fair market value.

The closest Section 4(f) property to the Airport is Cannon Branch Earthwork Fort, located adjacent to the Airport property in the northeast section of the Airport.<sup>20</sup> The closest LWCF site to the Airport is Dean Park, located about 1.5 miles east of the Airport, which received about \$500,000 in LWCF funds in 2017.<sup>21</sup> Bristoe Station Heritage Park, a Prince Williams County Park, is located about 1 mile west of the Airport. Manassas Battlefield Park (Virginia Department of Historic Resources ID # 076-0271) is located about 6 miles northeast of the Airport. At a small portion of Airport property, a Phase I cultural resources survey

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<sup>18</sup> Prince William County, Resource Protection Areas. Accessed: <https://www.pwcva.gov/department/environmental-services/resource-protection-areas>, May 2024.

<sup>19</sup> U.S. Fish and Wildlife Service, Coastal Barrier Resources System Mapper. Accessed: <https://www.fws.gov/cbra/Maps/Mapper.html>, May 2024.

<sup>20</sup> City of Manassas, Parks, Recreation, and Culture, Map. Accessed: [https://www.manassasva.gov/Parks-Culture-Recreation/Parks/Map\\_Parks\\_11x17.pdf](https://www.manassasva.gov/Parks-Culture-Recreation/Parks/Map_Parks_11x17.pdf), March 2022.

<sup>21</sup> Land Water Conservation Fund, Virginia. Accessed: <https://lwcf.tplgis.org/mappast/>, March 2022.

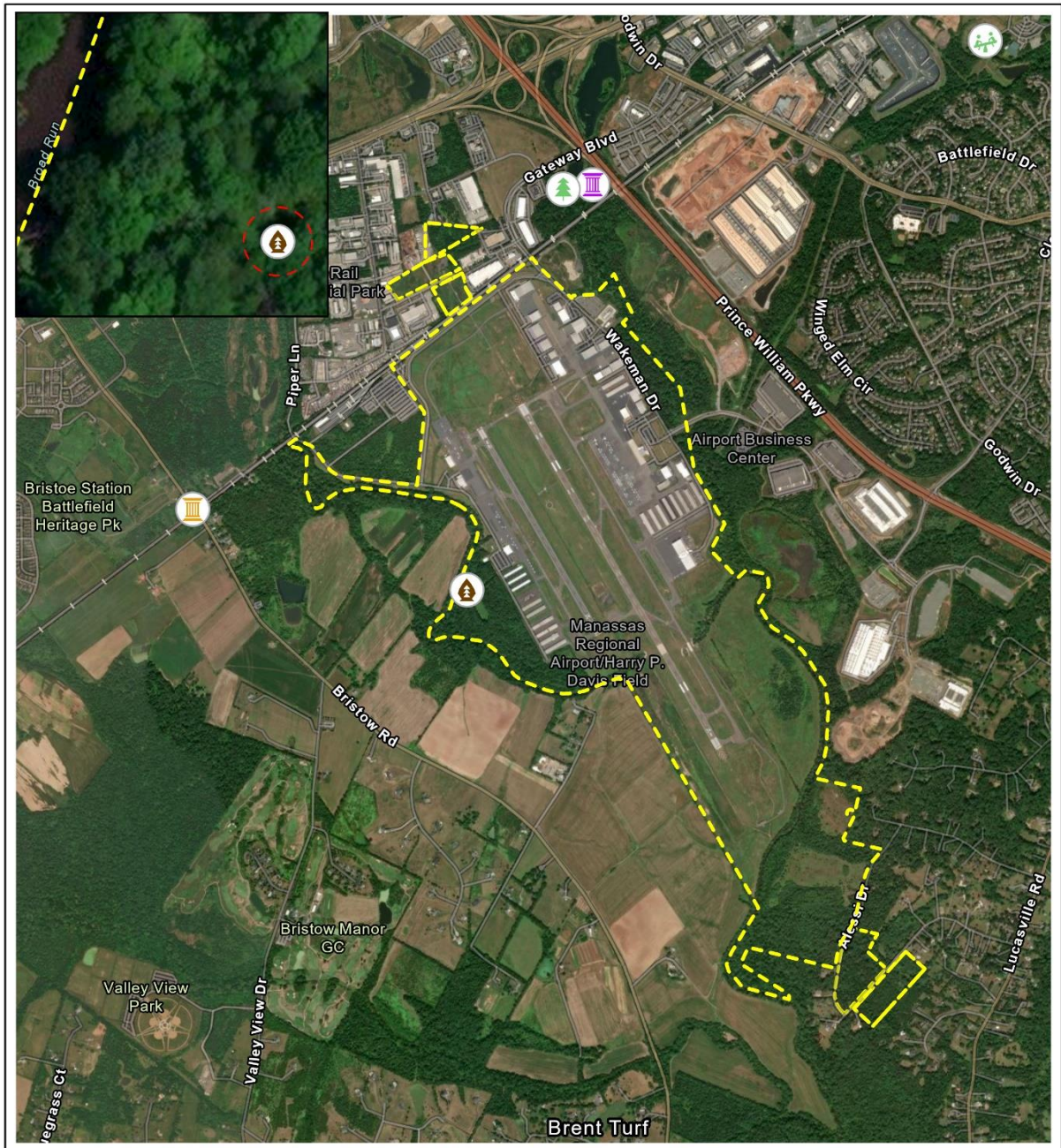
previously completed in 2017. This survey did not identify any cultural resources.<sup>22</sup> Additionally, a Phase I ESA was conducted in 2024 in a small southwest portion of the Airport for the Air Traffic Control Tower Replacement Environmental Assessment. This survey did not identify any cultural resource.<sup>23</sup> **Figure 6-7** shows Section 4(f) resources, as well as Section 6(f), Historical, and Archaeological sites.

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<sup>22</sup> Elizabeth Anderson Comer Archaeology. Phase I Cultural Survey. 2017.

<sup>23</sup> Mannik & Smith Group. Phase I Cultural Survey. 2024.





FIGURE 6-7 SECTION 4(F), SECTION 6(F), ARCHITECTURAL, ARCHAEOLOGICAL RESOURCES



Sources: NRHP 2024; LWCF2024; ESRI 2024; RS&H 2024

Legend

0 0.25 0.5 Mile

-  Archaeological Site
-  Section 4(f) Resource
-  Cannon Branch (VDHR# 155-5020)
-  Section 6(f) Resource
-  David Beard House (10726 Bristow Road)
-  20-Foot Buffer
-  Airport Property Boundary



### 6.3.6 Farmlands

The following statutes, regulations, and guidance pertain to farmlands:

- » Farmland Protection Policy Act (FPPA) (7 U.S.C. §§ 4201-4209); and
- » CEQ Memorandum on the Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing the National Environmental Policy Act (45 FR 59189).

The FPPA of 1981 regulates federal actions that have the potential to convert farmland to non-agricultural uses. The FAA requires consideration of “important farmlands,” which it defines as “all pasturelands, croplands, and forests (even if zoned for development) considered to be prime, unique, or statewide or local important lands.”<sup>24</sup>

According to the Natural Resource Conservation Service (NRCS), portions of Airport property contain soils classified as prime farmland and farmland of statewide importance (see **Figure 6-8**).<sup>25</sup> However, most Airport property is within an area that the U.S. Census Bureau (USCB) identifies as an urban area complex.<sup>26</sup> Under Section 523(10)(B) of the Farmland Protection Policy Act, land that the U.S. Census Bureau identifies as urbanized areas is not subject to the provisions of the Farmland Protection Policy Act. **Figure 6-8** shows an excerpt from the Urbanized Area Map with the Airport property outlined in yellow.

### 6.3.7 Hazardous Materials, Solid Waste, and Pollution Prevention

Federal laws, regulations, and EOs that relate to hazardous materials, solid waste, and pollution prevention include:

- » Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 U.S.C. §§ 9601-9765)
- » Emergency Planning and Community Right to Know Act (42 U.S.C. §§ 11001-11050);
- » Federal Facilities Compliance Act (42 U.S.C. § 6961);
- » Hazardous Materials Transportation Act (49 U.S.C. §§ 5101-5128);
- » Oil Pollution Prevention Act of 1990 (33 U.S.C. §§ 2701-2762);
- » Pollution Prevention Act (42 U.S.C. §§ 13101-13109);
- » Toxic Substances Control Act (TSCA) (15 U.S.C. §§ 2601-2697);
- » Resource Conservation and Recovery Act (RCRA) (42 U.S.C. §§ 6901-6992k);
- » EO 12088, *Federal Compliance with Pollution Control Standards* (43 FR 47707);
- » EO 12580, *Superfund Implementation* (52 FR 2923), (63 CFR 45871), and (68 CFR 37691);
- » EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management* (72 FR 3919); and
- » EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance* (74 FR 52117).

<sup>24</sup> Federal Aviation Administration, *1050.1F Desk Reference*, February 2020. Accessed: May 2024.

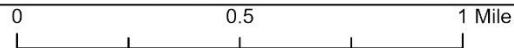
<sup>25</sup> Natural Resources Conservation Service, Web Soil Survey. Accessed: <https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>, May 2024.

<sup>26</sup> U.S. Census Bureau, 2010 Census – Urbanized Area Reference Map: Washington, DC – VA – MD. Accessed: [https://www2.census.gov/geo/maps/dc10map/UAUC\\_RefMap/ua/ua92242\\_washington\\_dc--va--md/DC10UA92242.pdf](https://www2.census.gov/geo/maps/dc10map/UAUC_RefMap/ua/ua92242_washington_dc--va--md/DC10UA92242.pdf), May 2024.

FIGURE 6-8 FARMLAND SOIL TYPES ON AIRPORT PROPERTY



Sources: ESRI 2024; RS&H 2024



Legend

- Prime Farmland
- Farmland of Local Importance
- Farmland of Statewide Importance
- Farmland of Unique Importance
- Not Prime Farmland
- Census Urban Area
- Airport Property Boundary



### 6.3.7.1 Hazardous Materials

In a regulatory context, the terms “hazardous wastes,” “hazardous substances,” and “hazardous materials” are defined as:

- » **Hazardous Wastes.** Subpart C of the RCRA defines hazardous wastes (sometimes called characteristic wastes) as solid wastes that are ignitable, corrosive, reactive, or toxic. Examples include waste oil, mercury, lead, or battery acid. In addition, Subpart D of the RCRA contains a list of specific types of solid wastes that the USEPA has deemed hazardous (sometimes called listed wastes). Examples include degreasing solvents, petroleum refining waste, or pharmaceutical waste.
- » **Hazardous Substances.** Section 101(14) of the CERCLA defines hazardous substances broadly and includes hazardous wastes, hazardous air pollutants, or hazardous substances designated as such under the Clean Water Act and TSCA and elements, compounds, mixtures, solutions, or substances listed in 40 CFR Part 302 that pose substantial harm to human health or environmental resources. Pursuant to the CERCLA, hazardous substances do not include any petroleum or natural gas substances and materials. Examples include ammonia, bromine, chlorine, or sodium cyanide.
- » **Hazardous Materials.** According to 49 CFR Part 172, hazardous materials are any substances commercially transported that pose unreasonable risk to public health, safety, and property. These substances include hazardous wastes and hazardous substances, as well as petroleum and natural gas substances and materials. As a result, hazardous materials represent hazardous wastes and substances. Examples include household batteries, gasoline, or fertilizers.

Aircraft fuel constitutes the largest quantity of hazardous substances stored and consumed at the Airport. Fuel is stored at the fuel farm on Airport property in aboveground storage tanks, and fuel trucks are used to fuel aircraft.

The USEPA identifies the following six RCRA hazardous waste generators on Airport property:<sup>27</sup>

- » Dulles Aviation Inc (Handler ID: VAD982704686) - No longer in operation at the Airport;
- » T Hangars of VA Inc (Handler ID: VAR000010157) - No longer in operation at the Airport;
- » Jet Services Inc (Handler ID: VAR000500199);
- » Leidos Inc. Hangar 2 (Handler ID: VAR000537852);
- » Asou Offsite (Handler ID: VAR000500389);
- » Colgan Air (Handler ID: VAR000504332) - No longer in operation at the Airport.

There are no Superfund sites on Airport property. The closest Superfund site to Airport property, Marine Corps Development Command (Site EPA ID: VA1170024722), is 23 miles southeast of the Airport.<sup>28</sup>

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<sup>27</sup> U.S. Environmental Protection Agency, Envirofacts, RCRA Info. Accessed: <https://www3.epa.gov/enviro/facts/rcrainfo/search.html>, May 2024.

<sup>28</sup> U.S. Environmental Protection Agency, Superfund, National Priorities List, Minnesota. Accessed: <https://www.epa.gov/superfund/search-superfund-sites-where-you-live#map>, May 2024.

### 6.3.7.2 Solid Waste

Solid waste generated at the Airport is taken to the Manassas Transfer Station, which is then transferred to the Prince William County Landfill.<sup>29</sup> The Manassas Transfer Station is about 4 miles east of the Airport, and the Prince William County Landfill is about 8 miles southeast of the Airport. An independent assessment of the Prince William County Landfill was conducted, and it is expected to reach capacity around 2065.<sup>30</sup>

### 6.3.7.3 Pollution Prevention

The Airport operates under a Virginia Pollutant Discharge Elimination System Permit (VPDES) General Permit (VAR050985) for stormwater discharge associated with industrial activity. On August 23, 2023, the State Water Control Board authorized the reissuance of the Small MS4 General Permit, making the existing permit effective through October 31, 2028.<sup>31</sup> The City of Manassas also maintains an Oil Discharge Contingency Plan, an Integrated Spill Prevention, Control and Countermeasures (SPCC) Plan, and a Stormwater Pollution Prevention Plan (SWPPP) for the Airport. These plans outline best management practices (BMPs) for controlling potential pollutant releases to the surrounding surface waters. These plans also provide detailed procedures to follow in the unlikely event of a spill to minimize potential effects on the surrounding environment.

## 6.3.8 Historical, Architectural, Archaeological, and Cultural Resources

The National Historic Preservation Act (NHPA) (54 U.S.C. §§300101 et seq.) establishes the Advisory Council on Historic Preservation (ACHP). The ACHP oversees federal agency compliance with the NHPA. The NHPA also established the National Register of Historic Places (NRHP) that the National Park Service (NPS) oversees. Other applicable statutes and EOs include:

- » American Indian Religious Freedom Act (42 U.S.C. § 1996)
- » Antiquities Act of 1906 (54 U.S.C. §§320301-320303)
- » Archeological and Historic Preservation Act (54 U.S.C. §§ 312501-312508)
- » Archeological Resources Act (16 U.S.C. §§ 470aa-470mm)
- » USDOT Act, Section 4(f) (49 U.S.C. § 303)
- » Historic Sites Act of 1935 (16 U.S.C. §§ 461-467)
- » Native American Graves Protection and Repatriation Act (25 U.S.C. §§ 3001-3013)
- » Public Building Cooperative Use Act (40 U.S.C. §§ 601a, 601a1, 606, 611c, and 612a4)
- » EO 11593, *Protection and Enhancement of the Cultural Environment* (36 FR 8921)
- » EO 13006, *Locating Federal Facilities on Historic Properties in Our Nation's Central Cities* (61 FR 26071)
- » EO 13007, *Indian Sacred Sites* (61 FR 26771)

<sup>29</sup> Manassas Virginia, Trash & Recycling, Manassas Transfer Station. Accessed: [https://www.manassasva.gov/public\\_works/trash\\_recycling/manassas\\_transfer\\_station.php](https://www.manassasva.gov/public_works/trash_recycling/manassas_transfer_station.php), May 2024.

<sup>30</sup> Prince William County Solid Waste Management, Accessed: <https://www.pwcva.gov/assets/2022-02/SWMP%20Presentation%20Web%20Feb22%20-website.pdf> June 2024.

<sup>31</sup> VDEQ. MS4 Stormwater Permits. <https://www.deq.virginia.gov/permits/water/ms4>, June 2024.

- » EO 13175, *Consultation and Coordination with Indian Tribal Governments* (65 FR 67249)
- » Executive Memorandum, Government-to-Government Relations with Native American Tribal Governments (April 29, 1994)
- » Executive Memorandum on Tribal Consultation (Nov. 5, 2009) (65 FR 67249); and
- » USDOT Order 5650.1, *Protection and Enhancement of the Cultural Environment*.

A Phase I archaeological survey was conducted for two portions of the Airport in 2017. One archaeological site, Site 44PW0729, has been identified within the Airport property, west of the Air Traffic Control Tower. This site has subsurface integrity and is interpreted as a campsite.<sup>32</sup> The site is associated with the Middle Archaic to the Late Woodland prehistoric period. It is considered potentially eligible for listing on the NRHP. Planning efforts have resulted in the placement of a 20-foot buffer around the site for any future development. See previous **Figure 6-7** for Archaeological and Historical Sites.

The closest National Register of Historic Places (NRHP)-listed resource is the Davis Beard House (10726 Bristow Road), about one-third mile west of the Airport.<sup>33</sup> Cannon Branch Fort (VDHR #155-5020) is a historic fort associated with the Civil War, which is potentially eligible for listing on the NRHP. The Fort is adjacent to Airport property in the northeast section of the Airport.

### 6.3.9 Land Use

Various statutes, regulations, and EOs relevant to land use include:

- » The Airport and Airway Improvement Act of 1982 and subsequent amendments (49 U.S.C. 47107(a)(10));
- » The Airport Improvement Program (49 U.S.C. 47106(a)(1));
- » The Airport Safety, Protection of Environment, Criteria for Municipal Solid Waste Landfills (40 CFR § 258.10); and
- » State and local regulations

The Airport is in the City of Manassas in Virginia. Land uses within the immediate vicinity of the Airport include Airport and Technology.<sup>34</sup> The Airport borders Prince William County, Virginia, with a separate land use plan. Land uses in Prince William County that borders the Airport include Community Mixed Use, Flexible Use Employment Center, Agricultural and Forestry, and Federal Property.<sup>35</sup>

Zoning in the City of Manassas classifies Airport property as IA – Airport District, I1 Light Industrial, and I2 Heavy Industrial, with surrounding land in the City of Manassas also classified as I1 and I2.<sup>36</sup> Zoning areas

<sup>32</sup> Phase I Archaeological Study for the Proposed West Corporate Development and East Parcel Development at Manassas Regional Airport, City of Manassas, Prince William County, Virginia, Elizabeth, Anderson Comer/Archaeology. Accessed June 2024.

<sup>33</sup> U.S. National Park Service, National Register of Historic Places. Accessed: <https://www.nps.gov/maps/full.html?mapId=7ad17cc9-b808-4ff8-a2f9-a99909164466>, May 2024.

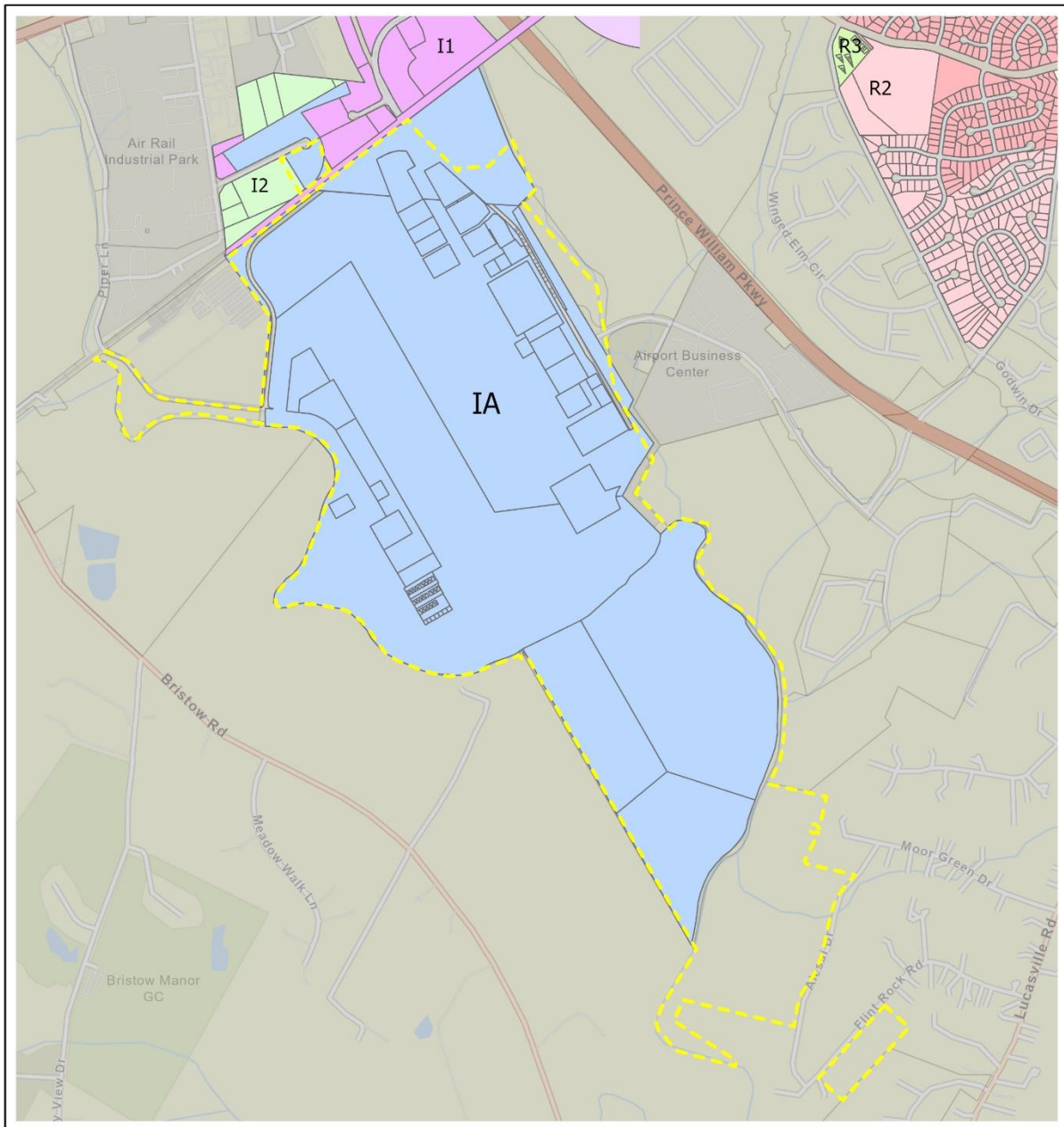
<sup>34</sup> City of Manassas, Manassas 2040, Chapter 3: Land Use, Adopted February 24, 2020. Accessed: <https://www.manassasva.gov/Community%20Development/Comp%20Plan/Chapter%203%20-%20Land%20Use%20web.pdf>, May 2024.

<sup>35</sup> Prince William County, Virginia, Pathway to 2040: Land Use. Accessed: [https://www.pwcva.gov/assets/2022-02/DRAFT\\_LRLU\\_3000\\_36x66%2020220201.pdf](https://www.pwcva.gov/assets/2022-02/DRAFT_LRLU_3000_36x66%2020220201.pdf), May 2024.

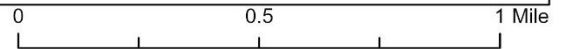
<sup>36</sup> City of Manassas, Manassas Zoning and Parcel Map App. Accessed: <https://cityofmanassas.maps.arcgis.com/apps/webappviewer/index.html?id=5435b6acfd274042a95914ad9ae97660>, May 2024.



**FIGURE 6-9 ZONING CLASSIFICATIONS ON AIRPORT PROPERTY AND SURROUNDING AREAS OF MANASSAS**



Sources: ESRI 2024; RS&H 2024

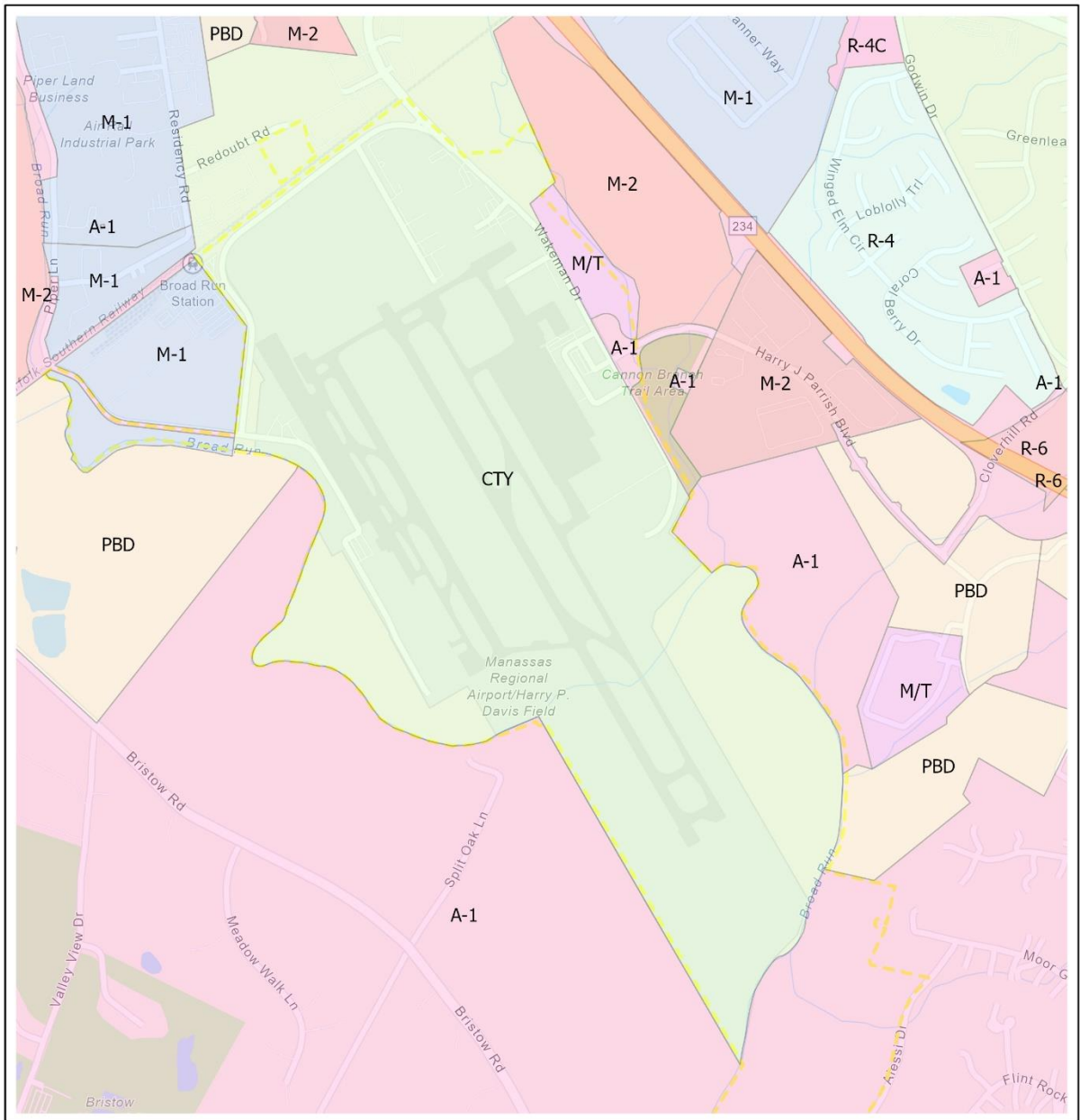


**Legend**

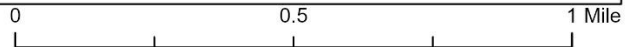
- I1: Light Industrial
  - I2: Heavy Industrial
  - IA: Airport District
  - R1: Low Density, Single Family Residential District
- R2: Moderate Density, Single Family Residential District
  - R2S: Small Lots, Single Family
  - R3: Townhouses
  - Prince William County
  - Airport Property



**FIGURE 6-10 ZONING CLASSIFICATIONS IN SURROUNDING AREAS OF PRINCE WILLIAM COUNTY**



Sources: Prince William County 2024; ESRI 2024; RS&H 2024



**Legend**

- A-1 Agricultural
- CTY City of Manassas
- M-1 Heavy Industrial
- M-2 Light Industrial
- M/T Industrial/Transportation
- PBD Planned Business District
- R-4 Suburban Residential Center
- R-4C Suburban Residential Cluster Development
- R-6 Suburban Residential
- Airport Property Boundary



### 6.3.11 Noise and Noise-Compatible Land Use

Statutes and EOs relevant to noise and noise-compatible land use include:

- » The Control and Abatement of Aircraft Noise and Sonic Boom Act of 1968 (49 U.S.C. § 44715)
- » The Noise Control Act of 1972 (42 U.S.C. §§ 4901-4918)
- » Aviation Safety and Noise Abatement Act of 1979 (49 U.S.C. § 47501 et seq.)
- » Airport and Airway Improvement Act of 1982 (49 U.S.C. § 47101 et seq.)
- » Airport Noise and Capacity Act of 1990 (49 U.S.C. §§ 47521-47534, §§ 106(g))
- » Section 506 of the FAA Modernization and Reform Act of 2012, *Prohibition on Operating Certain Aircraft Weighing 75,000 Pounds or Less Not Complying with Stage 3 Noise Levels* (49 U.S.C. §§ 47534); and
- » State and local noise laws and ordinances.

Day-Night Sound Level (DNL) is based on sound levels measured in relative intensity of sound (decibels or dB) on the “A-weighted scale” or dBA over a time-weighted average normalized to a 24-hour period.<sup>42</sup> DNL has been widely accepted as the best available method to describe aircraft noise exposure. The USEPA identifies the DNL as the principal metric for airport noise analysis. The FAA requires DNL as the noise descriptor for aircraft noise exposure analysis and noise compatibility planning. DNL levels are commonly shown as lines of equal noise exposure, like terrain contour maps, referred to as noise contours. All residential areas are considered compatible with cumulative noise levels below DNL 65 dB.

There are rural and residential land uses near the Airport. These areas are sensitive to aircraft noise associated with the Airport. However, most of the development around the Airport is industrial and commercial. The designated noise-sensitive area east and south of the Airport is not within the existing DNL 65 dBA noise contour. See **Figure 6-11** for existing 2019 noise contours at the Airport.

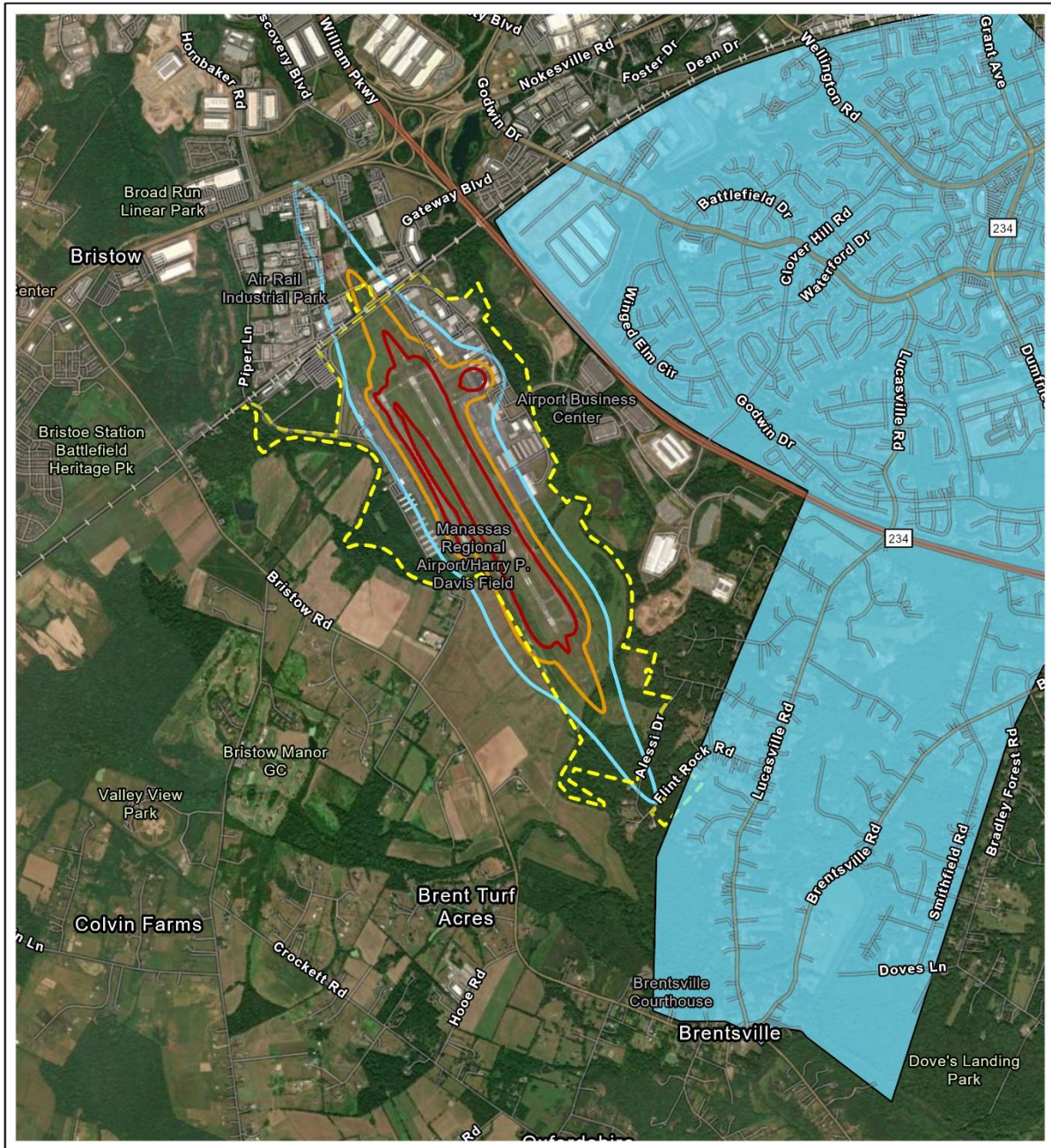
According to the City, the noise-sensitive area is designated by historically having the most concentration of noise comments.<sup>43</sup> The Airport has a voluntary noise program (i.e., FAA Part 150) that is comprised of suggestions for pilots to follow when it is safe and possible to do so. For flight training, instructors are recommended to teach their students the Airport’s noise abatement procedures, including pilots, during their biennial flight reviews. The Airport advises all flight operations that the preferred way to avoid the noise-sensitive area is to follow major roads and railroad tracks near the Airport, see **Figure 6-12 ,6-13, and 6-14**. A map of these routes is available on the Airport’s website and in the Airport Director’s Office. The Airport also has arrival and departure procedures that divert traffic around the noise-sensitive area. Additionally, it is recommended that fixed-wing aircraft with carbureted engines utilize a 2,200 RPM setting while in the traffic pattern for any of the runways. Aircraft with fuel injection engines should use 2,100 RPM. These power settings help minimize aircraft engine noise as well as reduce fuel consumption. Helicopter operations are advised to maintain as high an altitude as practical and conduct as much of their descent within the Airport boundary as safe flight operations allow. Maintenance engine run-ups in designated areas nearby FBO’s and hangars are restricted to 7:00 AM to 10:00 PM, daily. Operations conducted after these hours must be submitted to the Airport Director for written approval.<sup>44</sup>

<sup>42</sup> Federal Aviation Administration, *Technical Support for Day/Night Average Sound Level (DNL) Replacement Metric Research, Final Report*, June 14, 2011. Accessed: May 2024.

<sup>43</sup> Allabaugh, Richard, Airport Operations, Manassas Regional Airport. Personal Communication, May 2024.

<sup>44</sup> Manassas, Virginia, Airport, Noise Program. Accessed: [https://www.manassasva.gov/airport/noise\\_program.php](https://www.manassasva.gov/airport/noise_program.php), May 2024.

FIGURE 6-11 EXISTING AIRPORT NOISE CONTOURS



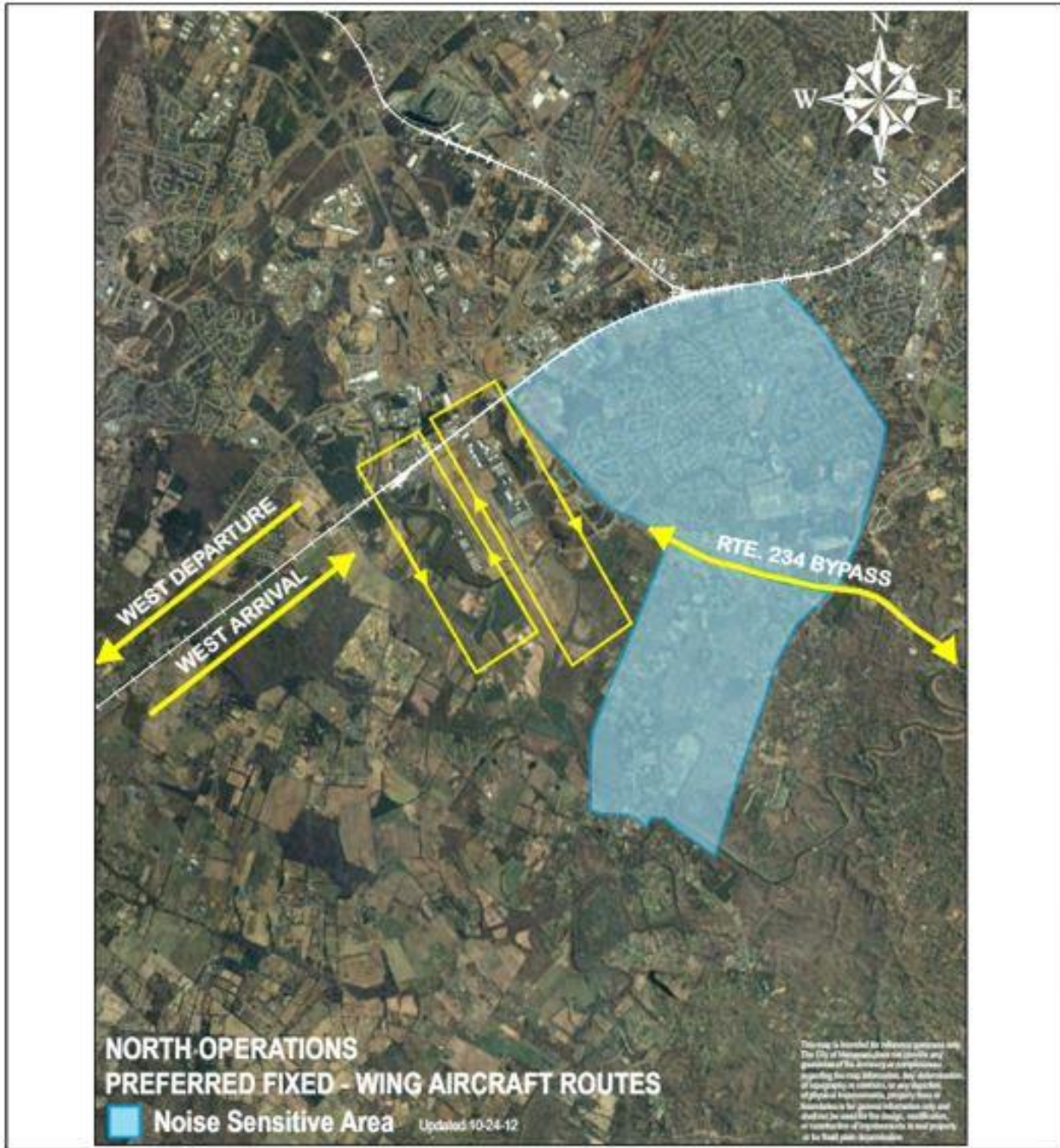
Sources: City of Manassas 2024; ESRI 2024; RS&H 2024

**Legend**

- 65 DNL
- 70 DNL
- 75 DNL
- Noise Sensitive Area
- Airport Property Boundary



FIGURE 6-12 NORTH OPERATIONS PREFERRED FIXED WING AIRCRAFT ROUTES AROUND NOISE SENSITIVE AREAS

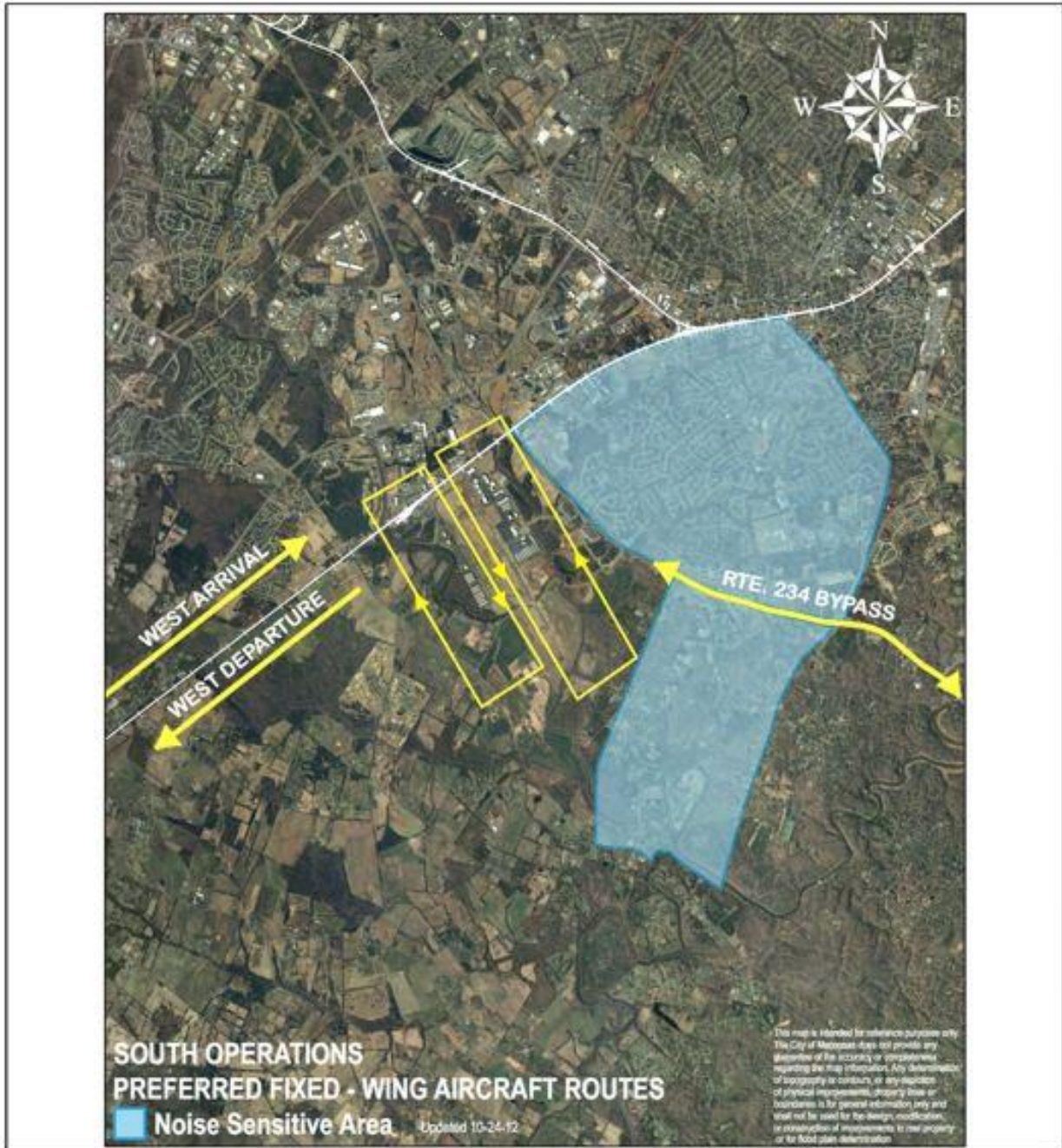


Legend

▭ Aircraft Traffic Patterns



FIGURE 6-13 SOUTH OPERATIONS PREFERRED FIXED WING AIRCRAFT ROUTES AROUND NOISE SENSITIVE AREAS



Legend


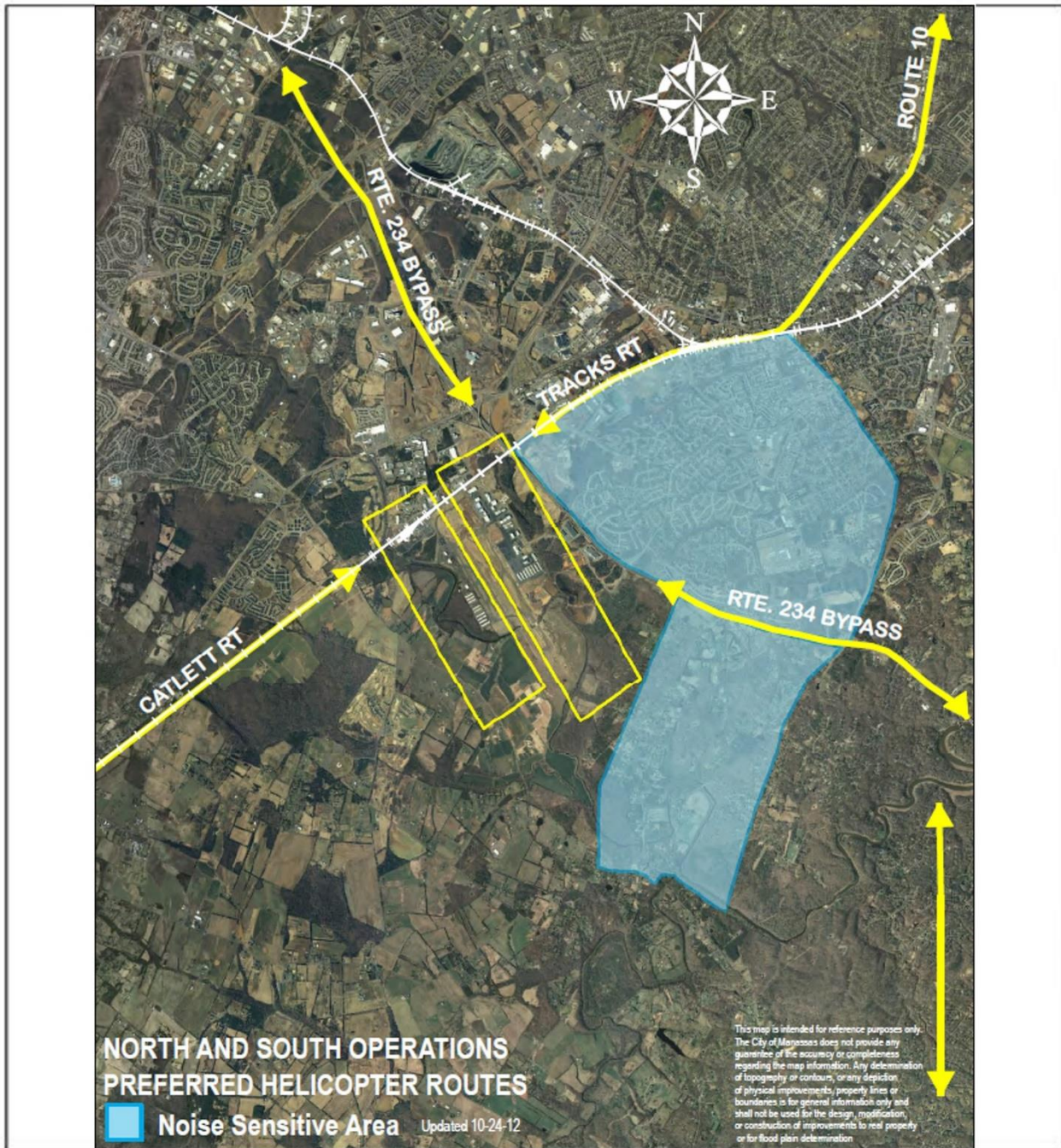
 Aircraft Traffic Patterns



FIGURE 6-14 NORTH AND SOUTH OPERATIONS PREFERRED HELICOPTER ROUTES AROUND NOISE SENSITIVE AREAS



Legend

▭ Aircraft Traffic Patterns



### 6.3.12 Socioeconomic, Environmental Justice, and Children’s Environmental Health and Safety Risks

The primary considerations of socioeconomic analysis are the economic activity, employment, income, population, housing, public services, and social conditions of the area. The Uniform Relocation Assistance and Real Property Acquisitions Policy Act of 1970 (42 U.S.C. § 61 et seq.), implemented by 49 CFR Part 24, is the primary statute related to socioeconomic impacts. Statutes, EOs, memorandums, and guidance that are relevant to environmental justice and children’s environmental health and safety risks include:

- » Title VI of the Civil Rights Act, as amended (42 U.S.C. §§ 2000d-2000d-7);
- » EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629);
- » Memorandum of Understanding on Environmental Justice and EO 12898;
- » USDOT Order 5610.2(a), *Environmental Justice in Minority and Low-Income Populations* (77 FR 27534);
- » CEQ Guidance: *Environmental Justice: Guidance Under the National Environmental Policy Act*;
- » Revised USDOT Environmental Justice Strategy (77 FR 18879); and
- » EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks* (62 FR 19885).

The Airport is located entirely within U.S. Census Tract 9104.2. This census tract was used to describe the Airport area’s socioeconomic and environmental justice characteristics compared to the City of Manassas and the State of Virginia (see **Table 6-6**).

**TABLE 6-6 SOCIOECONOMIC AND ENVIRONMENTAL JUSTICE CHARACTERISTICS**

Characteristic	Census Tract 9104.02	City of Manassas	Virginia
Total Population	6,112	42,772	8,631,393
Percent Minority	45.9%	60.9%	39.7%
Percent Living Below the Poverty Level	20.1%	14.9%	14.1%
Percent of the population below 18 Years of Age	23.9%	26.7%	19.1%
Total Housing Units	2,171	14,365	3,618,247
Persons per Household	2.25	3.0	2.4

Sources: U.S. Census Bureau, 2020 ACS 5-Year Estimates; U.S. Census Bureau, 2020 Decennial Census; Prepared by RS&H, 2024

Regarding children’s environmental health and safety risks, the closest school in Manassas to the Airport is George C. Round Elementary School, located about one-mile northwest of the Airport.<sup>45</sup> The school serves students in pre-kindergarten through fourth grade. The closest school in Prince William County is Victory Elementary School, about 2 miles northeast of the Airport. The school serves kindergarten through 5<sup>th</sup> grade.

<sup>45</sup> U.S. Environmental Protection Agency, NEPAassist, Schools. Accessed: <https://nepassisttool.epa.gov/nepassist/nepamap.aspx?wherestr=hef+airport>, May 2024.

### 6.3.13 Visual Effects

No federal statutory or regulatory requirement exists for adverse effects resulting from light emissions or visual impacts. FAA Order 1050.1F describes factors to consider within light emissions and visual resources/visual character. A project's potential impact from light emissions includes the annoyance or interference with normal activities and effects on the area's visual character due to light emissions, including the importance, uniqueness, and aesthetic value of the affected visual resources.

#### 6.3.13.1 Light Emissions

Various lighting features currently illuminate Airport facilities, such as the airfield (e.g., runways and taxiways), buildings, access roadways, automobile parking areas, and apron areas for the safe and secure movement of people and vehicles (e.g., aircraft, passenger cars, etc.). The closest light-sensitive area is a rural residential area about 1,200 feet southwest of Runway 34L.<sup>46</sup>

#### 6.3.13.2 Visual Resources and Visual Character

Structures at the Airport include, but are not limited to, fixed base operators, hangars, the air traffic control tower, and maintenance buildings. As previously described, the Airport is zoned as an Airport District. It is developed with a visual character that is consistent with this zoning. Some rural residential properties southwest of Runway 34L have a line of sight to Airport property; however, this line of sight is generally partially obscured by vegetation.

### 6.3.14 Water Resources

Water resources include wetlands, floodplains, surface waters, groundwater, and wild and scenic rivers. These resources typically function as a single, integrated natural system that is important in providing drinking water in supporting recreation, transportation and commerce, industry, agriculture, and aquatic ecosystems.

#### 6.3.14.1 Wetlands

Statutes and EOs that are relevant to wetlands include:

- » EO 11990, *Protection of Wetlands* (42 FR 26961);
- » Clean Water Act (33 U.S.C. §§ 1251-1387);
- » Fish and Wildlife Coordination Act (16 U.S.C. § 661-667d); and
- » USDOT Order 6660.1A, *Preservation of the Nation's Wetlands*.

The Clean Water Act defines wetlands as "...those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."<sup>47</sup> Wetlands have three necessary characteristics:

- » Water: the presence of water at or near the ground surface for a part of the year;

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<sup>46</sup> U.S. Environmental Protection Agency, NEPAassist. Accessed: <https://nepassisttool.epa.gov/nepassist/nepamap.aspx?wherestr=hef+airport>, May 1 2024.

<sup>47</sup> U.S. Environmental Protection Agency, Section 404 of the Clean Water Act. Accessed: <https://www.epa.gov/cwa-404/section-404-clean-water-act-how-wetlands-are-defined-and-identified>, June 2024.

- » Hydrophytic Plants: a preponderance of plants adapted to wet conditions; and
- » Hydric Soils: soil developed under wet conditions.

According to the USFWS National Wetland Inventory (NWI), wetlands are throughout the Airport property (see **Figure 6-15**).<sup>48</sup> Wetlands present at the Airport include Palustrine Forested and Palustrine Emergent wetlands, additionally, a 3.9 acre area on the west side of the Airport was surveyed for wetlands in April 2024. The survey showed no wetland features.

#### 6.3.14.2 Floodplains

Statutes and EOs that are relevant to floodplains include:

- » EO 11988, *Floodplain Management* (42 FR 26951);
- » National Flood Insurance Act (42 U.S.C. § 4001 et seq.); and
- » U.S. Department of Transportation (USDOT) Order 5650.2, *Floodplain Management and Protection*.

Floodplains are "...lowland areas adjoining inland and coastal water which are periodically inundated by flood waters, including flood-prone area of offshore islands." Floodplains are often referred to as the 100-year floodplain instead of the one percent chance of a flood occurring in any given year. The USDOT Order 5650.2 outlines the policies and procedures for ensuring that proper consideration is given to the avoidance and mitigation of adverse floodplain impacts in agency actions, planning programs, and budget requests. Therefore, the objective is to avoid, to the extent practicable, any impacts within the 100-year floodplain. FEMA defines a "regulatory floodway" as "the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height."<sup>49</sup>

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) encompassing the Airport, portions of the Airport are within the 100-year floodplain and floodway, as well as the 500-year flood area (see **Figure 6-16**).<sup>50</sup>

#### 6.3.14.3 Surface Waters

Statutes that are relevant to surface water include:

- » Clean Water Act (33 U.S.C. §§ 1251-1387);
- » Fish and Wildlife Coordination Act (16 U.S.C. § 661-667d); and
- » Rivers and Harbors Act (33 U.S.C. § 401 and 403).

Surface waters include areas where water collects on the ground's surface, such as streams, rivers, lakes, ponds, estuaries, and oceans.

<sup>48</sup> USFWS, National Wetlands Inventory. Accessed: <https://www.fws.gov/wetlands/data/mapper.HTML>, May 2024.

<sup>49</sup> Federal Emergency Management Agency, Glossary. Accessed: <https://www.fema.gov/about/glossary>, May 2024.

<sup>50</sup> FEMA, Flood Map Service Center, Flood Insurance Rate Map 51153C0159D (effective January 5, 1995), 51153C0157D (effective January 5, 1995). Accessed: <https://msc.fema.gov/portal/search#searchresultsanchor>, May 2024.

FIGURE 6-15 NWI WETLANDS AT AND IN THE VICINITY OF THE AIRPORT



**Legend**







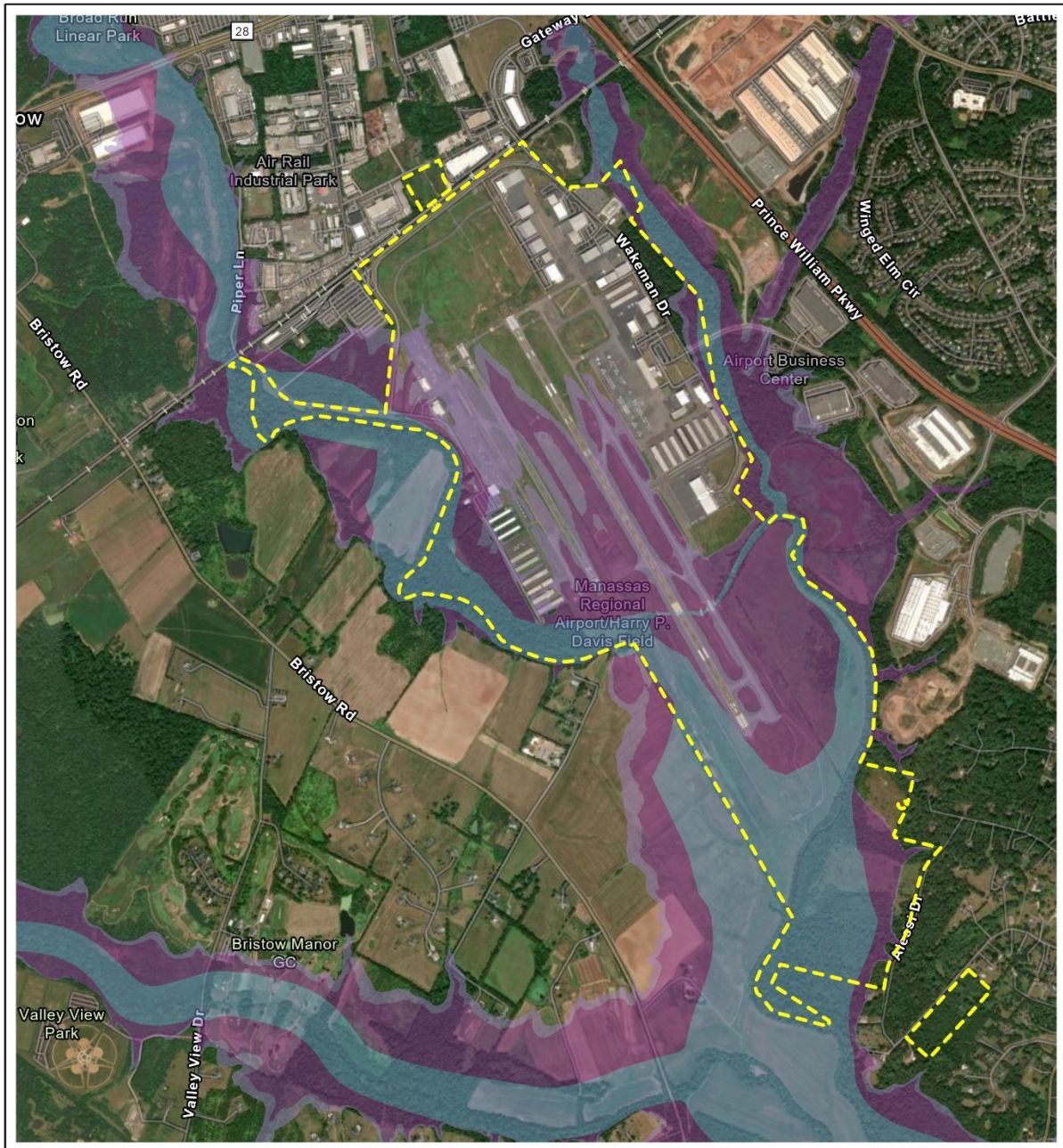
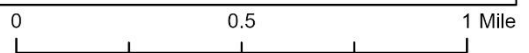
- |   |                                   |   |                           |
|---|-----------------------------------|---|---------------------------|
|  | Freshwater Emergent Wetland       |  | Other                     |
|  | Freshwater Forested/Shrub Wetland |  | Riverine                  |
|  | Freshwater Pond                   |  | Airport Property Boundary |



FIGURE 6-16 FLOODPLAINS



Sources: FEMA 2024; ESRI 2024; RS&H 2024



**Legend**

- Airport Property Boundary
- 100-year Floodplain
- Regulatory Floodway
- 500-year Floodplain



Broad Run is on Airport property and has been tunneled underneath Runway 16L-34R. Cannon Branch is on the eastern side of the Airport before it intersects Broad Run east of Runway 16L-34R (see **Figure 6-17**).<sup>51</sup>

#### 6.3.14.4 Groundwater

Statutes relevant to groundwater include:

- » Safe Drinking Water Act (42 U.S.C. §§ 300(f)-300j-26).

Groundwater is “subsurface water that occupies the space between sand, clay, and rock formations.”<sup>52</sup> The Airport is within the Rocky Branch-Broad Run watershed (HUC 12 ID: 020700100504).<sup>53</sup>

The City draws water from Lake Manassas, the primary water source, and if needed, the Prince William County Service Authority, which draws water from the Potomac River.<sup>54</sup> The City uses the Prince William County Service Authority during peak consumption periods or in emergencies. According to the Virginia Department of Health – Office of Drinking Water, there are two public groundwater wells near the Airport at Broad Run Golf (PWS ID: 6153264) and Bristow Manor Golf Club (PWS ID: 6153041).<sup>55</sup>

#### 6.3.14.5 Wild and Scenic Rivers

Statutes relevant to wild and scenic rivers include:

- » Wild and Scenic Rivers Act (16 U.S.C. §§ 1271-1278).

Wild and scenic rivers are “outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations.”<sup>56</sup> There are no wild and scenic rivers or river segments within the Airport property.<sup>57</sup> The closest wild and scenic river, the White Clay Wild and Scenic River is over 110 miles northeast of the Airport. The closest river on the Nationwide River Inventory (NRI) is Bull Run, located 7 miles northeast of the Airport.<sup>58</sup>

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<sup>51</sup> U.S. Environmental Protection Agency, NEPAassist, Water Features, Streams. Accessed: <https://nepassisttool.epa.gov/nepassist/nepamap.aspx?wherestr=hef+airport>, May 2024.

<sup>52</sup> Federal Aviation Administration, *1050.1F Desk Reference*, Section 14.4 Groundwater.

<sup>53</sup> U.S. Environmental Protection Agency, NEPAassist, Water Features, Watersheds (HUC 12). Accessed: <https://nepassisttool.epa.gov/nepassist/nepamap.aspx?wherestr=hef+airport>, May 2024.

<sup>54</sup> City of Manassas, Annual Water Quality Report – Reporting Year 2020. Accessed: <https://www.manassasva.gov/Electric-Water-Sewer/Water%20Quality%20Reports/2020%20CCR%20Web%20Ready.pdf>, May 2024.

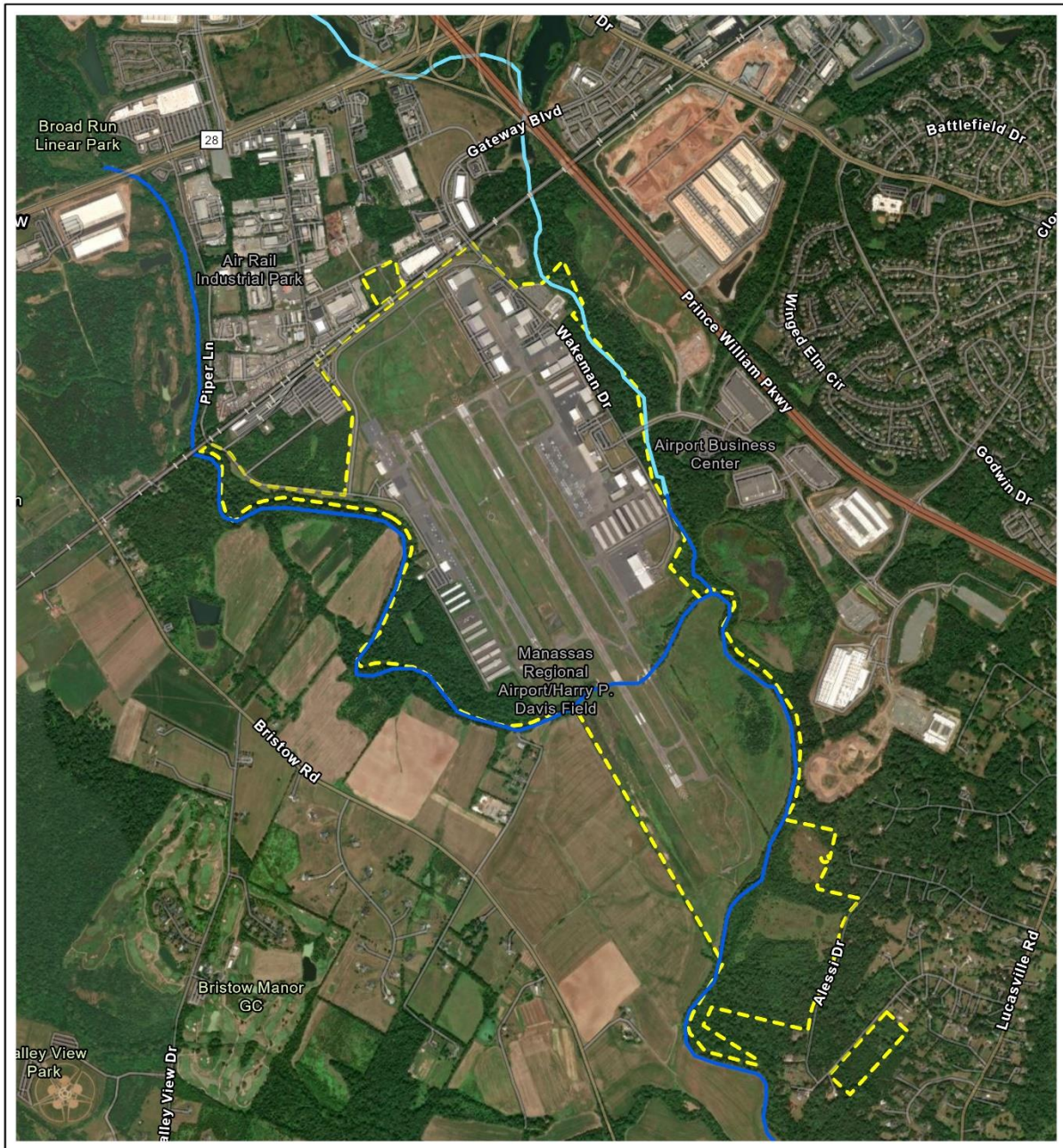
<sup>55</sup> Virginia Department of Health, Office of Drinking Water. Public Water System Database. Accessed: <https://www.vdh.virginia.gov/content/uploads/sites/14/2020/08/Water-07.21.2020.pdf>, May 2024.

<sup>56</sup> National Wild and Scenic Rivers System, About the WSR Act. Accessed: <https://www.rivers.gov/wsr-act.php>, May 2024.

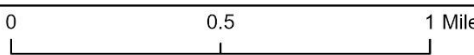
<sup>57</sup> U.S. Environmental Protection Agency, NEPAassist, Water Features, Wild and Scenic Rivers. Accessed: <https://nepassisttool.epa.gov/nepassist/nepamap.aspx?wherestr=Range+Regional+Airport%2C+Hibbing+MN>, May 2024.

<sup>58</sup> U.S. National Park Service, Interactive Map of Nationwide River Inventory. Accessed: <https://www.nps.gov/maps/full.html?mapId=8adbe798-0d7e-40fb-bd48-225513d64977>, May 2024.

FIGURE 6-17 SURFACE WATERS



Sources: NEPAassist 2024; ESRI 2024; RS&H 2024



**Legend**

- Cannon Branch
- Broad Run
- Airport Property Boundary



***Chapter 7***  
***Airport Layout Plan***  
***Narrative***



**RS&H**

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CHAPTER 7

*AIRPORT LAYOUT PLAN NARRATIVE*

## 7.1 INTRODUCTION

This chapter presents the Airport Layout Plan (ALP) drawing set, which has been produced as part of this Airport Master Plan process. The components of this chapter include the purpose of the ALP drawings, compliance with FAA design standards, and revisions to the ALP since the previous ALP update dated 2014. Additional sheets were added compared to the 2014 ALP set either because ALP requirements have changed since the 2014 ALP update was submitted to the FAA for approval, or by the direction of the Airport to show additional detail in areas not previously shown.

The ALP drawing set serves as a visual representation of the Airport's existing facilities and planned future development. It is also required by the FAA for Manassas Regional Airport capital projects to be considered for future federal AIP funding, and to be compliant with the Airport's Federal Grant Assurances. The Aviation Activity Forecast Update, preferred alternatives and the overall development plan that was derived in the Alternatives Chapter are included in the ALP, along with any other facility changes that have taken place since the last ALP update in 2014. The drawing set was prepared using several FAA guidelines and checklists, which included the following:

- » FAA Advisory Circular 150/5070-6B Change 2, *Airport Master Plans*
- » FAA ARP SOP 2.00 *Standard Procedure for FAA Review and Approval of Airport Layout Plans (ALPs)*
- » FAA ARP SOP 3.00 *Standard Procedure for FAA Review of Exhibit 'A' Airport Property Inventory Maps*

The ALP requires FAA approval, independent of the Master Plan. As such, the review of the ALP drawing set is accomplished through several intermediate steps, including reviews by the Airport, the FAA Airports District Office (ADO), and several other FAA offices involved in the associated airspace review.

The ALP drawing set serves several needs for the Airport, the City of Manassas, Prince William County, and the FAA. As presented in the FAA Advisory Circular 150/5070-6B, *Airport Master Plans*, there are five primary functions of the Airport Layout Plan (ALP) that defines its purpose:

- » FAA-approved ALPs are necessary to receive financial assistance under the terms of the Airport and Airway Improvement Act of 1982 (AIP). The maintenance of, and conformity to the plan is a grant assurance requirement upon which federal funds have been provided to HEF under the AIP program and previous programs. Previous programs include the 1970 Airport Development Aid Program (ADAP) and Federal Aid Airports Program (FAAP) of 1946.
- » The ALP creates a blueprint for airport development by depicting proposed facility improvements that are consistent with the strategic vision of the Airport sponsor. They also provide a guideline by which the sponsor can assure that development maintains Airport design standards and safety requirements and is consistent with airport and community land use plans.
- » The ALP serves as a public document that is a record of aeronautical requirements, both present and future, and as a reference for community deliberations on land use proposals and budget resource planning.
- » The approved ALP provides the FAA with a plan for airport development. This will allow compatible planning for FAA-owned facility improvements at the Airport and help the FAA to anticipate

budgetary and procedural needs. The approved ALP will also give the FAA the information it needs to ensure airspace is protected for planned facility or approach procedure improvements.

- » The ALP provides a working tool for use by the Airport sponsor, including planning and development, operations and maintenance.

## 7.2 AIRPORT COMPLIANCE WITH FAA DESIGN STANDARDS

The FAA provides airport design standards to ensure safe and efficient airport operations. The primary guidance is contained in FAA Advisory Circular 150/5300-13B, *Airport Design*. The master planning process also relies on numerous other FAA and Federal agency documents, including, but not limited to:

- » Federal Aviation Regulations Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*
- » FAA Advisory Circular 150/5340-30J, *Design and Installation Details for Airport Visual Aids*
- » FAA Advisory Circular 150/5340-1M Change 1, *Standards for Airport Markings*
- » FAA Order 8260.3E, Change 1, *United States Standard for Terminal Instrument Procedures (TERPS)*
- » FAA Order 8260.19I, *Flight Procedures and Airspace*
- » FAA Order 6850.2C, *Visual Guidance Lighting Systems*
- » FAA Order 5200.8, *Runway Safety Area Program*
- » Engineering Brief No. 75, *Incorporation of Runway Incursion Prevention into Taxiway and Apron Design*

## 7.3 MODIFICATION OF STANDARDS

Manassas Regional Airport has one modification to standard (MOS). The modification is for the east side of Taxiway B for 2,300 feet from Taxiway E to Taxiway G. The Taxiway Safety Area (TSA) for Airplane Design Group (ADG) III of 59 feet (118 ft wingspan) in this area has a FAA approved MOS of 44 feet (88 ft wingspan). The modification reference number is HEF\_2023\_33814 and was approved on March 29, 2023.

The previous Airport Master Plan identified no modification to standards. Since the previous master plan, the FAA has implemented FAA Order 5300.1G *Modifications to Agency Airport Design, Construction and Equipment Standards*, replacing Order 5300.1F. This order establishes the process for initiation, revision, coordination, and management of MOS applicable to airport design construction, and equipment procurement projects. Based on the type of modification to standard being submitted, additional Safety Risk Management panels may be required. In addition, any MOS should be submitted to the FAA prior to review and approval of an ALP. The proposed development within the 20-year planning period meets current FAA design standards and does not require any additional MOS to be filed.

## 7.4 AIRPORT LAYOUT PLAN HIGHLIGHTS AND MODIFICATIONS

This section highlights key elements and modifications that have been made since the Airport's 2014 ALP update. The modifications to the plan are based either on the Master Plan's analyses of identified future needs, changes related to the vision of the Airport, a change in FAA design criteria, or a combination of all

these factors. Enhancements and changes to the ALP set are detailed within this section as related to the future development within the master plan 20-year period.

## 7.4.1 Airfield Enhancements and Modifications

### Primary Runway Enhancement

Within Sheet 3, Airport Layout Plan Drawing depicts a future 500-foot extension to Runway 16L-34R to the south. Taxiway B, the parallel taxiway to Runway 16L-34R, would also be extended and include an entrance/exit taxiway connector at the new Runway 34R end. This runway extension will support heavier aircraft operations which have been weight constrained during higher temperature days experienced at HEF. The MALSF system for Runway 34R will need to be relocated, resulting in one set of lights being placed within Broad Run's Resource Protection Area (RPA); however, this placement is permitted by the City of Manassas due to the utility function. The width for Runway 16L-34R has been widened from 100 feet to the recommended standard width of 150 feet as the critical aircraft for the runway, B737-800, has a maximum certified takeoff weight (MTOW) greater than 150,000 lbs.<sup>1</sup> The MTOW of the B737-800 is 174,200 lbs, as a result the future pavement condition of Runway 16L-34R will be improved to support the critical aircraft.<sup>2</sup> These factors will impact dimensions for the runway protection zone (RPZ) and the necessary land for ground based navigational equipment. It is recommended that HEF ensure the current and future RPZ's are protected from any incompatible land uses as well as airspace penetrations.

### Taxilane/Taxiway Enhancement

The analysis completed under this study determined the existing Taxilane/Taxiway C provides direct access from the East Apron to the approach end of Runway 16L which is non-standard. The improvement shown to Taxilane/Taxiway C aims to improve airfield safety by mitigating the risk of runway incursions in this area. Taxilane D is displaced to the south to preserve a dedicated aircraft runup area which supports aircraft runups and circulation in the area. Per guidance in FAA Engineering Brief No. 89A, *Taxiway Nomenclature Convention*, to promote positive identification of parallel taxiways and associated connectors Taxiway B's connectors have been updated to reflect the appropriate number designations, B1 through B6. A new taxiway identified as Taxiway F coming off the high-speed exit, current Taxiway B2 and future Taxiway B3, connecting to the East Apron is depicted on the Airport Layout Plan Drawing to allow quick access to passenger terminal gates by arriving commercial aircraft. In alignment with guidance provided in Advisory Circular 150/5340-18G and Engineering Brief 89A, the introduction of future Taxiway F will cause for redesignation of existing Taxiway F to future Taxiway G. Existing Taxiway G will be redesignated to Taxiway H.

Existing Taxiway G, identified in the Airport Layout Drawing Plan as future Taxiway H, will be extended to provide access to future corporate hangar sites nearby. The last ALP update (2014) depicted a partial parallel taxiway, Taxiway M, to Runway 16L-34R. This Airport Layout Plan Drawing carries this vision forward and incorporates Taxiway M as an ultimate condition beyond the planning period. Taxiway M will limit runway crossings in the case an aircraft departing the West Apron needs the longer runway for departure. Taxiway M's construction will require bridge integrity consistent with the design standards

<sup>1</sup> AC 150/5300-13B – Airport Design; Appendix G Footnote #12

<sup>2</sup> FAA Aircraft Characteristics Database, Last update October 2023

used for Taxiway B and Runway 16L-34R, as it crosses over Broad Run. Other taxiway modifications include naming taxiways connecting Taxiway A to and through the West Apron. Taxiway Q, Taxiway R, Taxiway S, Taxiway T, Taxiway U, and Taxiway W are identified on the Airport Layout Plan Drawing. Taxiways J and L are depicted on the east side of the airport as an ultimate condition to provide access to future development area which is planned outside of the 20-year planning period.

#### 7.4.2 Terminal Area Modifications

In preparation for commercial service introduction to the airport, the Airport Layout Plan Drawing depicts an expansion of the terminal facility on the East Apron. With the introduction of passenger service this expansion will allow the terminal to accommodate required processing areas such as check-in area, checked baggage inspection systems (CBIS), baggage claim, security screening checkpoint, hold rooms, and concessionaire space.

In addition to the terminal expansion, the apron in front of the terminal and associated tie downs have been modified to support air carrier operations via hardstand, RON parking, and Deice Pad, and GA parking spots. Taxiway Z geometry has been modified in the Airport Layout Plan Drawing as existing Taxiway Z and significant number tie-down parking cannot be accommodated with the forthcoming commercial aircraft. In the future the lion share of GA tie-downs will be removed from the East Apron and relocated to the West Apron to accommodate future air carrier service on the East Apron.

#### 7.4.3 Landside Parking Expansion

To support the anticipated increase in passenger traffic additional landside parking is planned for the airport. The vacant quadrants adjacent to the existing parking lot in front of the terminal are proposed to be converted to parking. Remote parking is proposed on airport property just east of Wakeman Drive and north of Harry Parrish Boulevard.

#### 7.4.4 Tenant Development / Aircraft Storage

On the east side of the Airport, new transient apron space is shown south of Taxiway E. The transient apron space is sited between the two FBOs and in the vicinity of both the terminal and a perimeter access gate. Future Taxiway H provides access to future corporate hangar facilities. Two older T-hangar structures on the East Apron are depicted as demolished which could provide a development opportunity for revenue generating corporate development. The two demoed T-hangars are replaced by T-hangar development on the West Apron.

In alignment with the Strategic Plan and Airport Visioning within this Master Plan, aircraft hangars and tie-downs will be constructed on the West Apron to support the shift of GA aircraft operations to the west side of the airport. All future demand for aircraft hangars, transient aircraft parking, and tie-downs would be accommodated by tenant development under lease terms in accordance with Airport minimum standards and the Airport's development review process. Therefore, this Master Plan incorporated hangar development concepts into the Airport Layout Plan to meet the forecast demand. These concepts are preliminary, and all land development should be done in accordance with Airport policy and demand needs.

#### 7.4.5 Future Land Uses

The airport does not have an existing land use plan. Zoning classifications on airport property follow ordinances of the City of Manassas and Prince William County. Sheet 16, Future Airport Land Use Plan, shows the preferred land use for the 20-year planning period. Key changes in land use from the 2014 ALP includes the proposal for adjacent land acquisition in the airport's northwest quadrant serving both aeronautical and non-aeronautical purposes. In light of ongoing research and development in Advanced Air Mobility (AAM) within the region, particularly at the airport, buildings F3 and F4 are positioned to support development opportunities in this function. It is recommended that Airport staff coordinate with Prince William County planning staff on updating land use designations within airport property as needed, and when appropriate, changing the status of any newly acquired parcels. Over 20 acres of non-aeronautical airport property in the northeast quadrant was released in 2023 and therefore is reflected in Sheet 15 – Existing Land Use Plan and Sheet 16 – Future Land Use Plan.

#### 7.4.6 Maintenance Facility

Airport staff have identified the need to expand and relocate the Maintenance Equipment Storage (MES)/Snow Removal Equipment (SRE) Facility to accommodate new larger multi-use SRE equipment and provide a storage facility with a layout which meets the growing needs of the airport. Within Sheet 3, Airport Layout Plan Drawing the proposed facility is relocated to the northeast corner of the airport just west of Wakeman Drive. This area provides the necessary room to provide pavement for snow removal equipment while expanding the storage capacity for essential maintenance equipment.

#### 7.4.7 Aircraft Rescue and Firefighting (ARFF)

The facility requirements portion of this study identified the need for the airport to construct an ARFF facility on airport. At the time of this writing, the current emergency response procedures requires City of Manassas Fire and Rescue Department personnel to drive from the nearest fire station (2.9 miles away) to the airport and deploy the ARFF vehicles located in T-hangar C-3. The response time with the existing agreements in place will be improved by the construction of an ARFF facility. The preferred concept includes a new ARFF facility on the north side of displaced Taxiway C. The area where the future building is proposed sits just outside the departure surface and near the building restriction line (BRL). If a taller structure is desired, there may be a need to shift the facility further the east. Additional study should be conducted during pre-design of the ARFF facility to determine most efficient facility configuration while remaining compatible with critical areas.

#### 7.4.8 Air Traffic Control Tower (ATCT)

The existing air traffic control tower (ATCT) was initially built in Centennial, Colorado in the mid-1960s, before being dismantled and transported to its current location at the Airport in 1991. Despite its continued service, parts of the ATCT have aged considerably, with some components reaching 60 years old and beyond their expected useful life. This challenges the Airport's ongoing maintenance efforts to keep the ATCT operational and safe for air traffic control purposes. Therefore, the Airport Layout Plan Drawing depicts a new ATCT southwest of its current location just west of Observation Road. A siting analysis was conducted as a separate effort during the Master Plan, factoring in the 500-foot runway extension. This analysis led to the proposed height of the new ATCT at 120-feet AGL. With the siting analysis it was determined any vegetation/trees obstructing the new ATCT line of sight will be cleared.

## 7.5 AIRPORT LAYOUT PLAN DRAWINGS SHEETS

The airport layout plan set graphically illustrates the proposed development of the Airport over the 20-year planning period, while also providing general guidance for the ultimate vision. An ALP set is required by the FAA for an airport sponsor to be considered for future funding, and to be compliant with the airport's Federal Grant Assurances. The complete ALP set for Manassas Regional Airport consists of the following sheets, defined in the following subsections.

- » Sheet 1 – Cover Sheet
- » Sheet 2 – Airport Data Sheet
- » Sheet 3 – Airport Layout Plan Drawing
- » Sheet 4 – Terminal Area East
- » Sheet 5 – Terminal Area West
- » Sheet 6 – Airport Airspace
- » Sheet 7 – Airport Airspace and Conical Surface
- » Sheet 8 – Airport Airspace and Conical Surface – Obstruction Table
- » Sheet 9 – Inner Portion of the Approach Surface Runway 16L
- » Sheet 10 – Inner Portion of the Approach Surface Runway 34R (Existing)
- » Sheet 11 – Inner Portion of the Approach Surface Runway 34R (Future)
- » Sheet 12 – Runway Obstruction Tables
- » Sheet 13 – Inner Portion of the Approach Surface Runway 16R
- » Sheet 14 – Inner Portion of the Approach Surface Runway 34L
- » Sheet 15 – Land Use Plan (Existing)
- » Sheet 16 – Land Use Plan (Future)
- » Sheet 17 – Exhibit A – Airport Property Map
- » Sheet 18 – Exhibit A – Property Table
- » Sheet 19 – Environmental and Utility Considerations
- » Sheet 20 – Conceptual Development Phasing Plan

### 7.5.1 Sheet 1 – Cover Sheet

This sheet denotes the Airport name and an index chronicling the ALP drawing sheets contained in the drawing set. The sheet also provides an airport location and vicinity map, as well as a title block organized to include approval signatures and a history of ALP revisions.

### 7.5.2 Sheet 2 – Airport Data Sheet

This sheet provides data tables containing detailed information about the Airport's existing and anticipated conditions. This sheet also provides critical information about the Airport's runways and safety area dimensions. Major components on this sheet include:

- » Airport Data Table
- » Wind Rose Data
- » Declared Distances
- » Runway Data Table
- » Taxiway / Taxilane Data Table
- » Survey Monuments
- » Modification to Standards Table

### 7.5.3 Sheet 3 – Airport Layout Plan Drawing

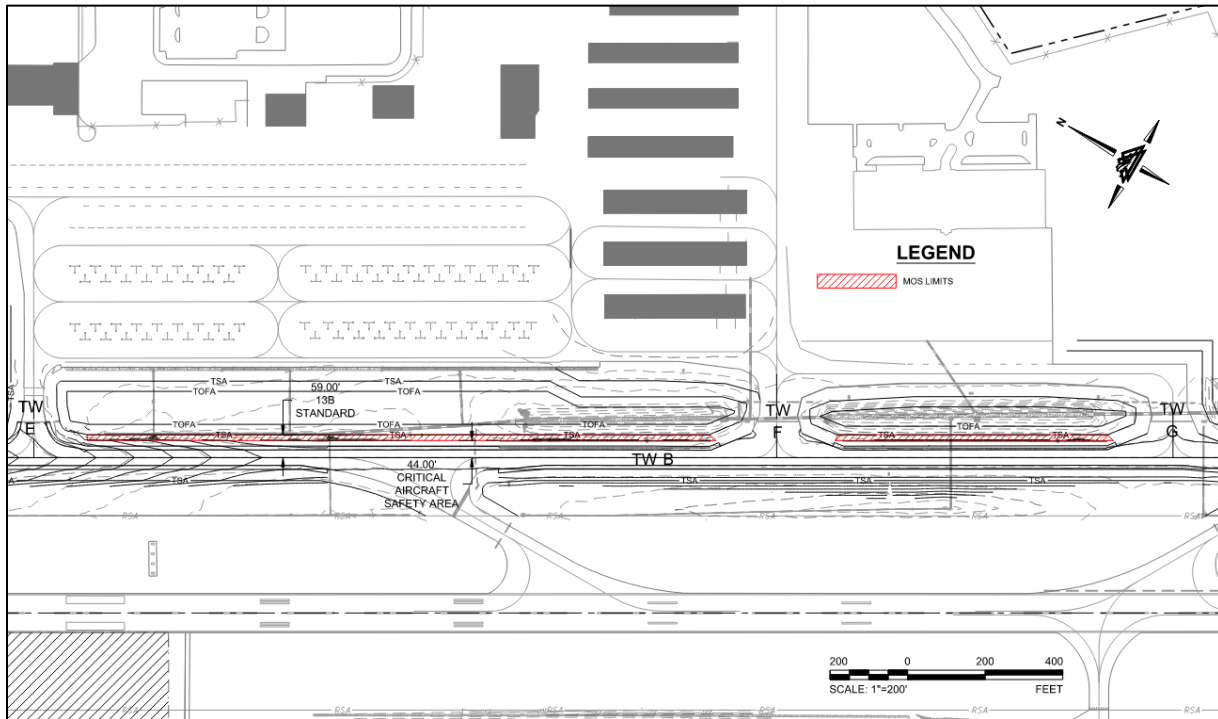
The Airport Layout Plan Drawing is a key document which serves as a graphic representation of existing and future Airport facilities. The future Airport facilities include those that are scheduled to be completed during the 20-year planning period to meet the forecast demand. Additionally, this sheet includes ultimate facility build-out, which are those outside the 20-year planning period. One of the primary purposes of this drawing is to depict those areas that future and ultimate facilities are planned to be constructed upon so the associated land can be reserved for their use.

The drawing also reflects changes to physical features on and in the vicinity of the Airport that may affect navigable airspace or the ability of the Airport to operate. Development shown on the ALP corresponds to the Airport's Capital Improvement Program (CIP) for the 20-year period. Specifically, the sheet depicts the limits of the Airport property interests and configuration of facilities in compliance with geometric design separation and clearance standards. It also includes airspace and navigational aid (NAVAID) facilities.

Additionally, the ALP provides dimensional data in line with FAA planning and design standards as specified in FAA Advisory Circular 150/5300-13B Airport Design and 150/5070-6B - Change 2, Airport Master Plans. This information assists ALP users in planning and ensuring sufficient spacing between proposed development and existing and future runways, taxiways, taxilanes, and their related airspace.

One area to note that does not meet FAA standards is the east side of Taxiway B, 2,300 feet between Taxiway E and Taxiway G. The Taxiway Safety Area (TSA) does not meet the critical aircraft's (Gulfstream G500) ADG-III taxiway design standard of 59 feet or 118 feet wingspan. The Modification to Standard is subject to review at any time if conditions originally justifying the MOS change, or if the FAA deems re-evaluation as being in the public's best interest.

**FIGURE 7-1**  
**MODIFICATION OF STANDARD LIMITS**



Source: HEF Airport Records, 2023

Per the FAA ARP SOP 2.00 *Standard Procedure for FAA Review and Approval of Airport Layout Plans (ALPs)* an approval block for the FAA approval stamp is also included on the Airport Layout Plan Drawing.

#### 7.5.4 Sheet 4 and 5 – Terminal Area Plan: East and West

The two East and West Terminal Area Plan sheets show additional detail of the existing and future areas of major general aviation operations and airfield enhancements. Key facilities shown on the Terminal Area Plans include:

- » Terminal Expansion
- » Apron configuration and aircraft parking positions
- » Future ARFF Facility
- » Future Maintenance Facility
- » Terminal Vehicle Parking Lot Expansion
- » New Air Traffic Control Tower
- » General Aviation Aircraft Hangars
- » Corporate Facilities

### 7.5.5 Sheet 6 through 8 – Airport Airspace Drawings

These scaled drawings identify obstacle identification surfaces. The surfaces define the limits of recommended land use control for the height of objects surrounding the Airport's 14 Code of Federal Regulations (CFR) Part 77 Imaginary Surfaces. A digital USGS map is used as the base map for the drawings in which each of the 14 CFR Part 77, Subpart C, Imaginary Surfaces (Primary, Approach, Transitional, Horizontal, and Conical) are depicted. These drawings depict the ultimate airspace configuration for the Airport.

The sheets also provide numerical data for all obstructions visually depicted in the plan view of the Airport Airspace Conical Surface drawing. Each obstruction is identified with a description, a top elevation, the surface the object is penetrating, the surfaces' elevation at the penetrating point, the amount of penetration, and a recommended disposition. Obstructions vary from vegetation to man-made objects. Some objects are defined as fixed-by-function, such as NAVAIDS, because of current siting requirements and the role they play in ensuring the safe navigation of flight. Obstructions include various types of vegetation, which can be mitigated through removal or trimming. The proposed disposition for vegetation located off airport property is listed to be trimmed but should be coordinated with the landowner to determine the proper mitigation. The proposed disposition for vegetation on airport property is listed to be trimmed or removed depending on the location or whether it is affected by future/ultimate improvements.

### 7.5.6 Sheet 9 through 14 – Runway Inner Approach Plan and Profile

Sheets 9 through 13 provide a plan and profile view of each of the Airport's runway approach surfaces. These sheets provide a more detailed view of the first 5,400 feet for the existing/future precision runway, Runway 16L, and the first 3,600 feet for the non-precision runways, Runway 34R and Runway 16R-34L. Obstructions are depicted in blue and identified with an object number. Additionally, the runway protection zone, navigational aids, airport boundary, natural features, roadways, and other applicable data is provided.

The obstruction analysis performed during this master plan study identified obstructions off each runway end, mainly vegetation. Due to the high density of trees around the Airport some of the obstructions are depicted by using the highest treetop within a 200-foot by 200-foot grid starting from each runway end. Runway 16L Inner Approach Surface depicts a cluster of trees due to the large volume of vegetation on this end of the airport. Vegetation obstructions on airport-property have been mitigated during the lifecycle of the Master Plan. Obstructions off airport property will require coordination with the landowner to determine the proper mitigation.

### 7.5.7 Sheet 15 – Land Use Plan (Existing)

The Existing Airport Land Use Plan depicts the existing land use for both on and off airport property. This drawing also depicts the City of Manassas Land Use, Prince William County Land Use, Aeronautical, Non-aeronautical, and airport operations areas (AOA) for the airport. The municipal boundaries for the airport are also depicted as the airport is located on the boundary of Prince William County and the City of Manassas. Noise contours developed from 2021 airport operations are depicted on Sheet 15.

### 7.5.8 Sheet 16 – Land Use Plan (Future)

The Future On-Airport Land Use Plan defines or re-establishes parcels of land within the airport property boundary to provide more specificity. The master plan process examined existing land uses and determined a strategic plan to utilize the parcels within the Airport property line most efficiently. The outcome expands the areas designated as aeronautical and non-aeronautical land use on the airport. In relation to ultimate land use, the southeast development area has been preserved for aeronautical development; however, given the anticipated demand the master plan team does not anticipate development in this area during the planning period. Sheet 16 also depicts noise contours based on 2021 airport operations. During the Master Plan study, the airport requested the development of a noise model using 2021 traffic data, and specifically including twelve daily operations of A321 aircraft and thirty-six daily operations of B737-800 aircraft. These modeled noise contours, identified as 'AC OPS' to represent Air Carrier Operations, are also displayed on Sheet 16.

### 7.5.9 Sheet 17 and 18 – Exhibit 'A' Airport Property Inventory Map

The Airport Property Map – Exhibit 'A', divided into separate sub sheets, depicts the airport property interests consistent with the Airport Layout Plan Drawing. This drawing documents past airport land acquisition, including fee-simple and easement tracts, and includes all those acquired, released, or sold since 2018. This sheet was developed in accordance with ARP SOP 3.00 *FAA Review of Exhibit 'A' Airport Property Inventory Maps*. Information on each of the existing parcels at HEF include:

- » Grantor (Selling Owner)
- » Type of interest acquired
- » Acreage
- » Type of conveyance instrument
- » Recording information
- » Federal Agreement (FAA Grant Number)
- » Type of Easement
- » Mineral and Mining Rights

The development of the Exhibit 'A' carried forward the previous Exhibit 'A' Airport Property Map, established in 2018. Since the previous Exhibit 'A' was developed, the FAA has updated the requirements for a compliant Exhibit 'A' to the current ARP SOP 3.00 standards. The changes in standards for a compliant Exhibit 'A' require additional information be presented for each parcel compared to prior years. This planning team used readily available sources to obtain the necessary information for this task, however, some information is still unknown.

Coordination with the local FAA ADO determined the parcels and easements that were purchased using Federal Grants. The remaining parcels are graphically depicted based on the information provided from the previous Exhibit 'A', City of Manassas or Prince William County Tax Parcel information.

#### 7.5.10 Sheet 19 – Environmental Considerations and Utilities

The Environmental Considerations drawing depicts water resources, such as wetlands and floodplains, in the vicinity of the Airport. The wetlands include surface waters, Broad Run Creek, running through the west and southern portion of airport property and Cannon Branch to the east of the airport property. The drawing also depicts existing and proposed utilities to support development.

#### 7.5.11 Sheet 20 – Conceptual Development Phasing Plan

The Conceptual Development Phasing plan provides a visual depiction of the proposed phasing of enhancements and additions over the course of the planning period, and demand driven development options that work to move towards the ultimate vision of the Airport. The phasing plan directly correlates with the implementation plan provided in the previous chapter. The sheet is intended to help visibly tie together the Airport's CIP to the timing and location of future projects and enhancements. Though all future development is not represented on the Airport's CIP, demand driven development, such as, hangars, are also represented over the course of the planning-period.

### 7.6 AIRPORT LAYOUT PLAN DRAWING SET

The Airport Layout Plan drawing set inserted as part of this report is a reduced-size version of the 24-inch by 36-inch drawings that have been reviewed and approved by the FAA, Virginia Department of Aviation, and the Airport.

*APPENDIX A*  
*ENVIRONMENTAL OVERVIEW*

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## 1.1 INTRODUCTION

The purpose of considering environmental factors in airport master planning is to assist in evaluating future airport development, as well as provide information that will help expedite subsequent environmental processing. Federal Aviation Administration (FAA) Order 1050.1F, *Environmental Impacts: Policies and Procedures*, is the FAA’s environmental guidance for aviation projects/actions to comply with NEPA. However, it is important to note that while the environmental analysis is included in this Master Plan Update, it is not in and of itself a National Environmental Policy Act (NEPA) document. Recent FAA guidance requires all planning processes to be completed prior to the start of NEPA documentation.

## 1.2 ENVIRONMENTAL ANALYSIS OVERVIEW

This section describes Section 743 of the FAA Reauthorization Act of 2024, NEPA, FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, FAA 1050.1F Desk Reference, and 2024 Council on Environmental Quality (CEQ) NEPA Implementing Regulations (40 CFR Parts 1500 – 1508).

### 1.2.1 Section 743 of the FAA Reauthorization Act of 2024

This section provides a brief overview of Section 743 of the FAA Reauthorization Act of 2024.

#### 1.2.1.1 Section 743 Project Description and Materials

Section 743 narrows the scope of the FAA’s authority to regulate activities that: (1) “materially impact the safe and efficient operation of aircraft at, to, or from the airport,” (2) “adversely affect the safety of people or property on the ground as a result of aircraft operations”, or (3) “adversely affect the value of prior Federal investments to a significant extent.” The FAA has land use authority over aeronautical portions of a project, whether or not those portions lie on regulated or non-regulated land. The FAA may not have jurisdictional authority over non-aeronautical portions of a project. The FAA retains jurisdiction over any property that was acquired with Federal assistance.

For projects where the FAA has approval authority, the City of Manassas (City) would complete a pen and ink change to the ALP, only if the Proposed Project was not already on the ALP, along with a detailed description of the Proposed Project. The revised ALP would be submitted to the FAA Washington ADO. The FAA will then review each project and provide input to the City where applicable. The FAA Eastern Region, including the Washington ADO, reviews an airport’s Section 743 coordination process and may request supporting information from the City if they do not already have what is need to make a jurisdictional authority decision. For projects not subject to FAA approval, the City would notify the FAA of the project before proceeding. According to Section 743, the FAA has 45 days to assert jurisdiction or lose jurisdiction of that project.

#### **Airport Materials Needed for FAA Review under Section 743**

Below are the items that the City may need to provide to the FAA Washington ADO Program Manager if the FAA does not already have in their files.

1. A copy of the current ALP or draft ALP change that clearly identifies all the project components being included in the project and their respective locations at the airport. Be sure to use a call out on the exhibit to clearly show each project component.
2. A copy of the current on-Airport land use map.
3. A copy of the Exhibit A Property Map that compliant with FAA Airports (ARP) Standard Operating Procedure 3.0. This will show the funding source for each parcel or property on which the project components are planned to be constructed.
4. A copy of deeds or other conveyance documentation that shows the ownership of the land that each of the project components is planned to be constructed on.
5. Identify the source of funding for the Proposed Project.
6. A description of the Proposed Project in narrative form. Ideally this should be as close as possible to the Proposed Project description that would be used in the NEPA documentation.

The information can be transmitted in an email from the City to the FAA Washington ADO Program Manager. It is recommended that FAA Washington ADO EPS be copied on the transmittal too.

#### 1.2.1.2 FAA Review Process

When an airport development plan (ADP) project is ripe for FAA review, the request for FAA approval should be coordinated with the FAA Washington ADO Program Manager and Environmental Protection Specialist (EPS).

Based on coordination with various FAA ADOs, a more expedited Section 743 review, and a decision whether a NEPA document is needed can be explained in simpler terms.

1. If a project occurs anywhere aircraft move (runways, taxiways, apron, etc.) or associated safety areas (RSA, RPZ, TOFA etc.) or on Federally-obligated land, the FAA has ALP approval authority and NEPA documentation is needed. Project examples include a runway extension or grading improvements in an RSA.
2. If a project is anticipated to be federally funded (AIP, PFC, etc.), then NEPA documentation is needed. A project example would be interior terminal improvements paid for in part by federal funds.

Section 743 review is coordinated by the FAA Washington ADO Program Manager and EPS.

Projects that are proposed to occur within non-aeronautical, not Federally-obligated land at the Airport are not under Federal jurisdiction and do not need FAA approval (or NEPA review). To help the Airport make this determination, it needs to know how the land where the project would occur acquired? Was there any federal (FAA, Department of Defense (DOD), etc. funds involved? Deed information?). If so, the FAA has authority over land use. If not, the Airport notifies the FAA of a proposed project prior to commencement. As discussed earlier, the FAA has 45 days to respond, asserting jurisdiction or lose jurisdiction of that project.

Coordination with the FAA Washington ADO regarding the applicability of Section 743 on a project-by-project basis is highly recommended.

## 1.2.2 National Environmental Policy Act (NEPA)

NEPA was signed into law on January 1, 1970. NEPA ensures that federal agencies evaluate the potential environmental impacts of proposed projects. NEPA serves many valuable purposes, including:

- » Evaluating how proposed projects will be developed;
- » Understanding the environmental consequences of the proposed actions and their effect on local communities;
- » Evaluating reasonable alternatives to ensure due diligence;
- » Assessing measures that can be taken during the development of proposed actions to minimize environmental impacts.

Using the NEPA process, the FAA evaluates the potential environmental and related social and economic effects of a proposed project.

### 1.2.3 FAA Order 1050.1F, Environmental Impacts: Policies and Procedures

After the FAA informs the City that NEPA is required, the City, in coordination with the FAA Washington ADO, would acquire the FAA's recommendation regarding the type of NEPA documentation the project requires. According to FAA Order 1050.1F, there are three levels of NEPA documentation: Categorical Exclusion (CATEX), Environmental Assessment (EA), or Environmental Impact Statement (EIS).

#### 1.2.3.1 Categorical Exclusion (CATEX)

A CATEX refers to a category of actions that do not individually or cumulatively significantly affect the human environment and for which neither an EA nor an EIS is required. FAA Order 1050.1F paragraphs 5-6.1 through 5-6.6 describe actions that normally do not individually or cumulatively significantly affect the human environment. These actions are described under one of the following categories:

- » Administrative/ General (5-6.1): Actions that are administrative or general in nature.
  - Example: 5-6.1(p): Conditional approval of an ALP
- » Certification (5-6.2): Actions concerning issuance of certificates or compliance with certification programs.
  - Example: 5-6.2(e): Issuance of certificates and related actions under the Airport Certification Program
- » Equipment and Instrumentation (5-6.3): Actions involving installation, repair, or upgrade of equipment or instruments necessary for operations and safety.
  - Example: 5-6.3(f): Installation or replacement of engine generators used in emergencies.
- » Facility Siting, Construction, and Maintenance (5-6.4): Actions involving acquisition, repair, replacement, maintenance, or upgrading of grounds, infrastructure, buildings, structures, or facilities that generally are minor in nature.
  - Example: 5-6.4(a): Access road construction, and construction, relocation, or repair of entrance and service roadways that do not reduce the level of service on local traffic systems below acceptable levels.
- » Procedural (5-6.5): Actions involving establishment, modification, or application of airspace and air traffic procedures.

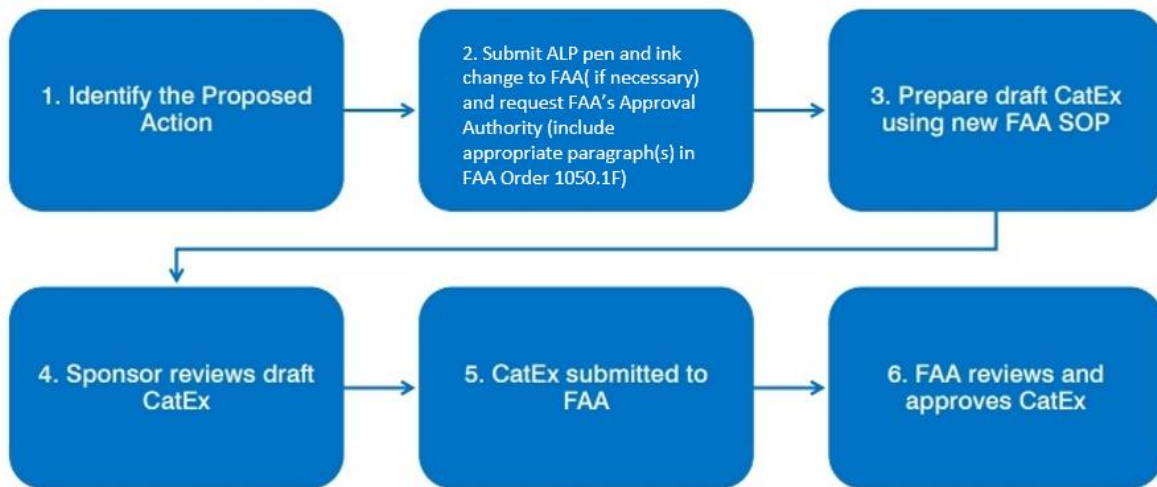
- Example: 5-6.5(j): Implementation of procedures to respond to emergency air or ground safety needs, accidents, or natural events with no reasonably foreseeable long-term adverse impacts.
- » Regulatory (5-6.6): Actions involving establishment of, compliance with, or exemptions to, regulatory programs or requirements.
  - Example: 5-6.6(a): All FAA actions to ensure compliance with Environmental Protection Agency aircraft emissions standards.

FAA Airport Standard Operating Procedure (SOP) 5.1, effective June 2, 2017,<sup>1</sup> describes two levels of information and documentation required for projects eligible for a CATEX:

- » Simple Written Record CATEX
- » Documented CATEX

For a simple written record CATEX, the project should meet the definition of a CATEX as described in FAA Order 1050.1F, paragraphs 5-6.1 through 5-6.6 and should not involve extraordinary circumstances, as described in FAA Order 1050.1F, paragraph 5-2. For a documented CATEX, the project would have actions where there is a greater potential for extraordinary circumstances or other reasons that warrant additional CATEX documentation in accordance with Order 1050.1F, paragraph 5-3b. As part of a documented CATEX, agency coordination may occur depending on a project’s potential impacts on environmental categories. A public involvement process does not typically occur as part of a CATEX. **Figure 1** shows the Steps for Completing a CATEX.

**FIGURE 1 STEPS FOR COMPLETING A CATEX**



Note: According to 2024 CEQ Regulations and FAA Order 1050.1F.

<sup>1</sup> <https://www.faa.gov/airports/resources/sops/media/arp-SOP-510-catex.pdf>

### 1.2.3.2 Environmental Assessment (EA)

An EA is conducted to determine whether a proposed action has the potential to significantly affect the human environment. An EA must be prepared when the proposed action does not normally require an Environmental Impact Statement (EIS) and:

- » Does not fall within the scope of a CATEX (see FAA Order 1050.1F Paragraph 5-6, the FAA's Categorical Exclusions); or
- » Does fall within the scope of a CATEX, but there are one or more extraordinary circumstances (see FAA Order 1050.1F Paragraph 5-2, Extraordinary Circumstances).
  - Example: the proposed project impacts properties protected under the DOT Act, Section 4(f) (e.g., Airport project results in noise or land use impacts to publicly owned park).

An EA may be required if an action involves extraordinary circumstances. An extraordinary circumstance occurs when an action has the potential to have a significant environmental impact that requires further analysis. New CEQ guidance requires an EA to be no longer than 75 pages, not including pages with graphics or tables, projects will have 1 year to be completed once it has been placed on the Department of Transportation (DOT) Permitting Dashboard. The FAA lists proposed actions where extraordinary circumstances may exist, which include, but are not limited to: an adverse effect on cultural resources protected under the National Historic Preservation Act of 1966, as amended, 45 U.S.C. §300101 et seq; an impact on properties protected under Section 4(f); and an impact on natural, ecological, or scenic resources of federal, state, tribal, or local significance (e.g., federally listed or proposed endangered, threatened, or candidate species, or designated or proposed critical habitat under the Endangered Species Act, 16 U.S.C. §§ 1531-1544).

Depending on the potential environmental effects of a proposed action, there can be varying levels of EA documentation. For the Washington ADO and Eastern Region, these documents are:

- » Eastern Region Condensed EA, and
- » Full EA

A Condensed EA Form is disseminated by the FAA Washington Region to address a proposed action that may not be included within the designated CATEX categories but is not likely to involve extraordinary circumstances. A Full EA is NEPA documentation for a proposed action that has the potential to have extraordinary circumstances that can be mitigated. The FAA Washington ADO will determine which type of EA is the proper NEPA documentation for a proposed project at the Airport. **Figure 2** shows the EA Process.

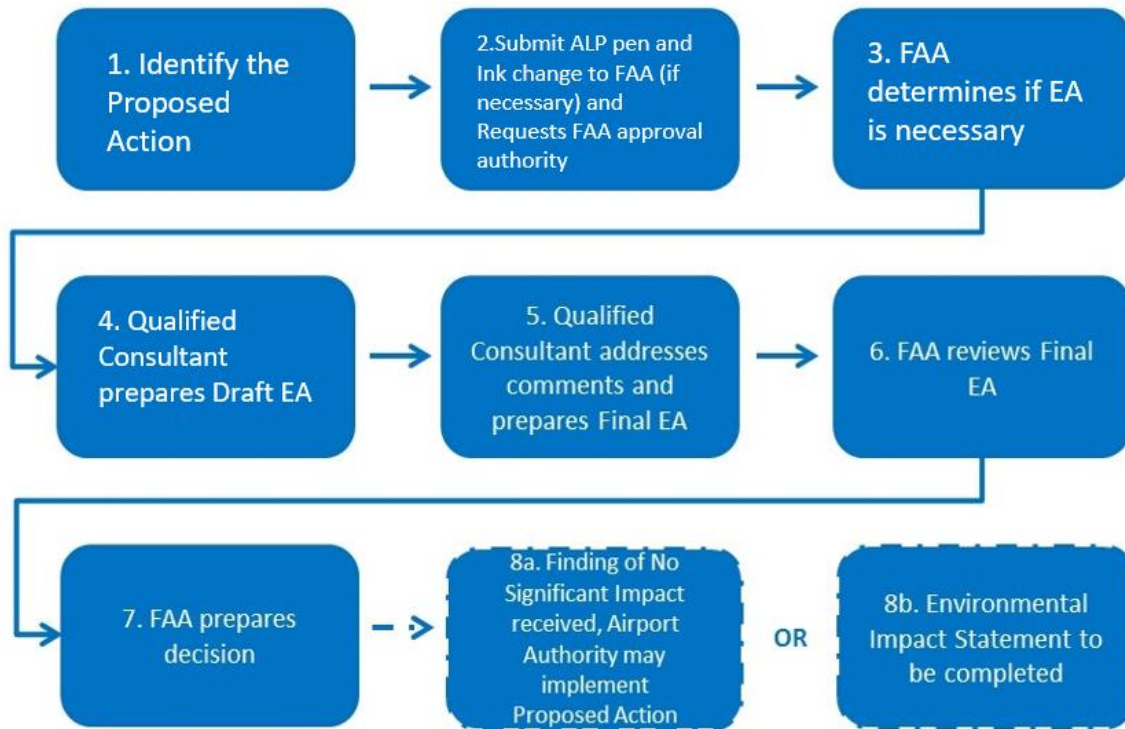
Some EA documents require technical studies and surveys to be completed in order to obtain an in-depth understanding of the project study area beyond what is available on web-based searches and historical information. Examples include but are not limited to wetlands delineations, Phase I ESA's, Biological species surveys, threatened and endangered species surveys, visual surveys, and simulations.

Agency coordination and public involvement are required as part of the EA process. According to FAA Order 1050.1F, paragraph 6-2.2b, "the FAA or applicant must involve the public, to the extent practicable, in preparing EAs. The appropriate level of public involvement for an EA is determined on a case-by-case basis and will vary based on the proposed action and the potential impacts." Coordination and consulting

with appropriate federal, state, tribal, and local officials must occur throughout the EA process to obtain information regarding potential environmental impacts.

Once a project has gone through the EA process and has been determined to have no potential for significant environmental impacts, the FAA issues a Finding of No Significant Impact (FONSI) or requires the completion of an Environmental Impact Statement (EIS).

**FIGURE 2 EA PROCESS**



Note: According to 2024 CEQ Regulations and FAA Order 1050.1F.

### 1.2.3.3 Environmental Impact Statement (EIS)

Under NEPA, the FAA must prepare an EIS for actions significantly affecting the quality of the human environment. An EIS is a detailed written statement required under Section 102(2)C of NEPA when one or more environmental impacts would be significant, and mitigation measures cannot reduce the impact(s) below significant levels. Direct, indirect, and cumulative impacts must be considered when determining significance. According to FAA Order 1050.1F, the following are actions that normally require an EIS:

- » Location of a new commercial service airport in a Magnuson-Stevens Fishery Conservation and Management Act (MSA);;
- » A new runway to accommodate air carrier aircraft at a commercial service airport in an MSA; and
- » Major runway extension.

## 1.2.4 2024 CEQ NEPA Implementing Regulations (40 CFR Parts 1500 – 1508)

The Council on Environmental Quality (CEQ) is a division of the Executive Office of the President of the United States.<sup>2</sup> CEQ is responsible for developing procedures for federal agency implementation of NEPA. These procedures were initially promulgated in 1971 as guidelines and issued as regulations in 1978. In May 2024, CEQ comprehensively updated its NEPA regulations. These CEQ regulations became effective on July 1, 2024. Federal agencies, such as the FAA, are in the process of revising their NEPA implementing instructions to meet the requirements of the new regulations.

The complete 2024 CEQ update to the existing NEPA regulatory framework can be found on the Federal Register.<sup>3</sup> These changes substantially alter how the FAA implements NEPA; therefore, it is important that the City or its consultant review the updated guidance before beginning formal NEPA documentation.

## 1.3 ENVIRONMENTAL CONDITIONS

The purpose of considering environmental factors in airport master planning is to help the Airport Sponsor thoroughly evaluate airport development alternatives and to provide information that will help expedite subsequent environmental processing. For a comprehensive description of the existing environmental conditions at the Airport, environmental resource categories outlined in FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, and *FAA 1050.1F Desk Reference* were used as a guide that helped identify potential environmental effects during the planning process.

The FAA 1050.1F Desk Reference is a guidance document that provides explanatory guidance for environmental impact analysis performed to comply with the CEQ regulations set forth in CEQ 40 CFR. It is designed to complement the FAA Order 1050.1F and defines basic terms used throughout the Order. FAA anticipates an update to this desk reference will be completed in 2024. FAA Order 1050.1F requires the evaluation of airport development projects as they relate to specific environmental resource categories by outlining impacts and thresholds at which the impacts are considered significant. For some environmental resource categories, this determination can be made through calculations, measurements, or observations. However, other environmental resource categories require that the determination be established through correspondence with appropriate federal, state, and/or local agencies. A complete evaluation of the environmental resource categories identified in FAA Order 1050.1F is required during a categorical exclusion, environmental assessment, or environmental impact statement.

Future development plans at the Airport take into consideration environmental resources that are known to exist in the vicinity of the Airport. Early identification of these environmental resources helps avoid impeding development plans in the future.

This section provides an overview of resource categories defined in FAA Order 1050.1F, Chapter 4, and the 1050.1F Desk Reference as it applies to the environs at and surrounding the Airport. **Table 1** shows the potential environmental resource categories affected by each MPU identified project. **Table 2** summarizes

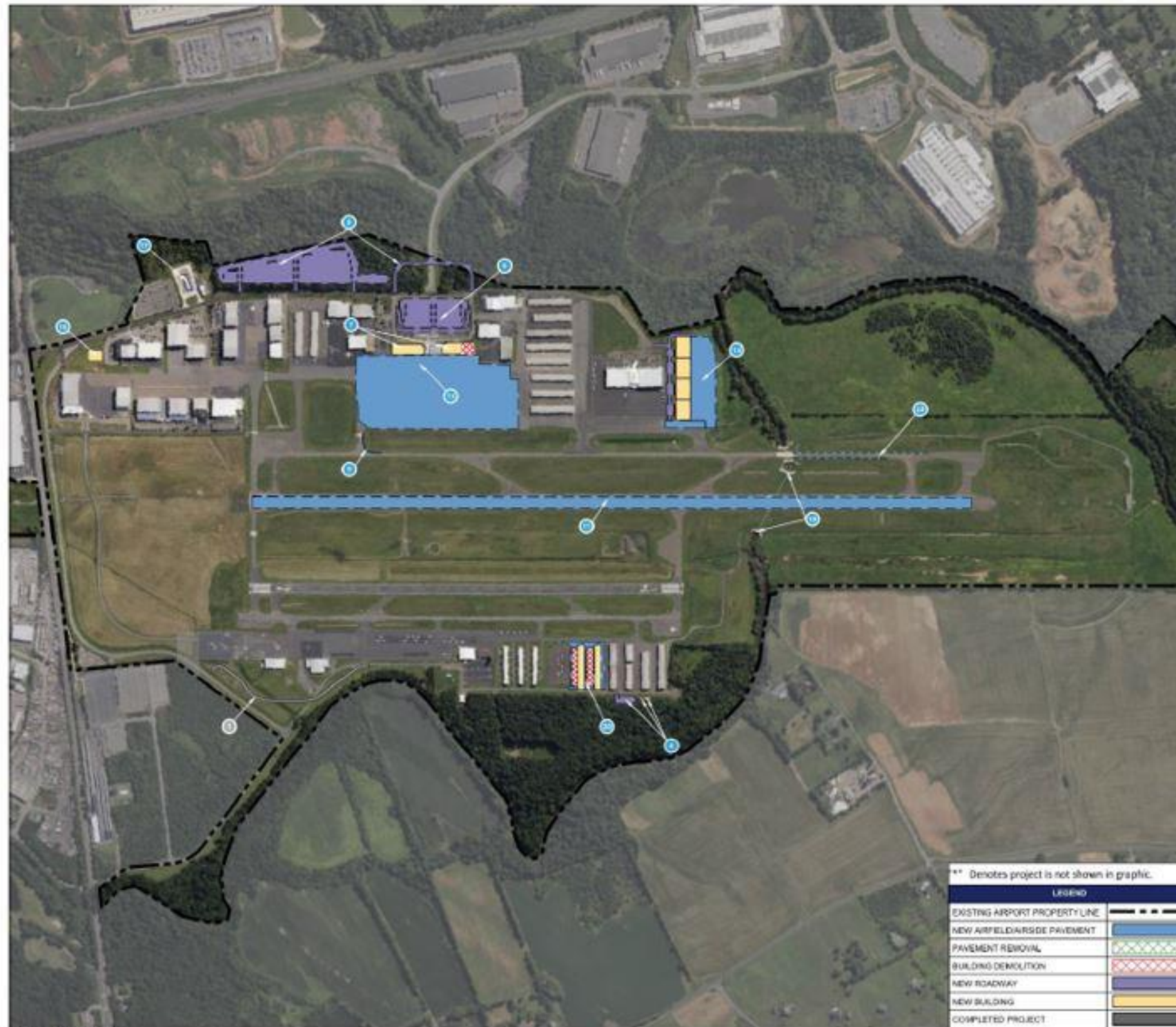
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<sup>2</sup> White House. (2021). *NEPA Modernization*. Retrieved January 2021 from: <https://www.whitehouse.gov/ceq/nepa-modernization/>.

<sup>3</sup> The May 2024 CEQ update to the existing NEPA regulatory framework can be found here: [Federal Register: National Environmental Policy Act Implementing Regulations Revisions Phase 2](#)

the environmental resource categories studied for the Master Plan Update. It is important to note that while the environmental analysis is included in this Master Plan Update, it is not in and of itself a NEPA document. **Figures 3, 4, and 5** show the Near-term, mid-term, and long-term projects expected at the Airport and identified through the Master Plan Update Process.

FIGURE 3 NEAR TERM PROJECTS



**HEF DEVELOPMENT PHASING PLAN**

**PROJECTS CURRENTLY UNDERWAY**

- 1 Relignment of Observation Road
- 2 Bridge Strengthening - Runway 16L/34R and Taxiway B (Design)\*

**NEAR TERM (PAL 1) PROJECTS (2024-2028)**

- 3 New FAA ATCT Phase 2 (Design)\*
- 4 New FAA ATCT Phase 3 (Construction)
- 5 Runway 16L-34R Reconstruction and Strengthening (Design)\*
- 6 Terminal Parking Lot Rehabilitation and Expansion
- 7 Terminal Building Expansion (north and south)
- 8 Satellite Parking #1, Construction and New Entrance Road
- 9 Taxiway E Fillet Widening (Design and Construction)
- 10 Bridge Strengthening - Runway 16L/34R and Taxiway B (Construction)
- 11 Runway 16L-34R Reconstruction and Strengthening (Construction)
- 12 South West Hangar Redevelopment (Design)\*
- 13 East Ramp Strengthening, Reconfiguration, and Rehabilitation - (Design and Construction) - Phase 1
- 14 Taxiway X (Design and Construction)
- 15 Maintenance Equipment Storage (MES)/Snow Removal Equipment (SRE) Facility - (Design)\*
- 16 Maintenance Equipment Storage (MES)/Snow Removal Equipment (SRE) Facility - (Construction)
- 17 Fuel Farm Upgrades (Design and Construction)
- 18 Install Backup Airfield Generators\*
- 19 Acquire Multi-Function SRE (2)\*
- 20 South West Hangar Redevelopment (Construction)
- 21 West Apron Hangar Expansion - Phase 1 (Design)\*
- 22 Taxiway B Reconstruction and Strengthening (South of the Bridge)
- 23 Taxiway B Widening (Design)\*

\*\* Denotes project is not shown in graphic.

LEGEND	
EXISTING AIRPORT PROPERTY LINE	---
NEW AIRFIELD/ARSD PAVEMENT	Blue
PAVEMENT REMOVAL	Green with diagonal lines
BUILDING DEMOLITION	Red with diagonal lines
NEW ROADWAY	Yellow
NEW BUILDING	Orange
COMPLETED PROJECT	Grey



Source: RS&H, 2023



FIGURE 4 MID-TERM PROJECTS



Source: RS&H, 2024



### HEF DEVELOPMENT PHASING PLAN

#### PROJECTS CURRENTLY UNDERWAY

- 10 Realignment of Observation Road
- 11 Bridge Strengthening - Runway 16L/34R and Taxiway B (Design)\*

#### NEAR TERM (PAL 1) PROJECTS (2024-2028)

- 12 New FAA ATCT Phase 2 (Design)\*
- 13 New FAA ATCT Phase 3 (Construction)
- 14 Runway 16L/34R Reconstruction and Strengthening (Design)\*
- 15 Terminal Parking Lot Rehabilitation and Expansion
- 16 Terminal Building Expansion (north and south)
- 17 Satellite Parking #1 Construction and New Entrance Road
- 18 Taxiway E Fillet Widening (Design and Construction)
- 19 Bridge Strengthening - Runway 16L/34R and Taxiway B (Construction)
- 20 Runway 16L/34R Reconstruction and Strengthening (Construction)
- 21 South West Hangar Redevelopment (Design)\*
- 22 East Ramp Strengthening, Reconfiguration, and Rehabilitation - (Design and Construction) - Phase 1
- 23 Taxiway X (Design and Construction)
- 24 Maintenance Equipment Storage (MES)/Snow Removal Equipment (SRE) Facility - (Design)\*
- 25 Maintenance Equipment Storage (MES)/Snow Removal Equipment (SRE) Facility - (Construction)
- 26 Fuel Farm Upgrades (Design and Construction)
- 27 Install Backup Airfield Generators\*
- 28 Acquire Multi-function SRE (2)\*
- 29 South West Hangar Redevelopment (Construction)
- 30 West Apron Hangar Expansion - Phase 1 (Design)\*
- 31 Taxiway B Reconstruction and Strengthening (South of the Bridge)
- 32 Taxiway B Widening (Design)\*

#### MID-TERM (PAL 2) PROJECTS (2029-2033)

- 33 West Apron Hangar Expansion - Phase 1 (Construction)
- 34 East Ramp Strengthening, Reconfiguration, and Rehabilitation - (Design and Construction) - Phase 2
- 35 Taxiway B Widening (Construction)
- 36 Runway 16L/34R Widening (Design)\*
- 37 Runway 16L/34R Widening (Construction)
- 38 East Ramp Strengthening, Reconfiguration, and Rehabilitation - (Design and Construction) - Phase 1
- 39 West Apron Hangar Expansion - Phase 2 (Design)\*
- 40 New East Ramp Taxiway - Design and Construction (2031)
- 41 Expanded East Ramp and Taxiway between Taxiway Delta and Echo (Design)\*
- 42 Runway 16L/34R Extension (Design)\*
- 43 Taxiway C and Taxiway D Relocation (Design)\*
- 44 Taxiway C and Taxiway D Relocation (Construction)
- 45 West Apron Hangar Expansion - Phase 2 (Construction)
- 46 Expanded East Ramp and Taxiway between Taxiway Delta and Echo - (Construction)
- 47 Glen Gerry Property Reacquisition\*
- 48 Runway 16L/34R Extension (Construction)
- 49 Vehicle Service Road (Design and Construction)

\*\* Denotes project is not shown in graphic.

LEGEND	
EXISTING AIRPORT PROPERTY LINE	---
NEW AIRFIELD/AIRSIDE PAVEMENT	Blue
PAVEMENT REMOVAL	Green
BUILDING DEMOLITION	Red
NEW ROADWAY	Purple
NEW BUILDING	Yellow
COMPLETED PROJECT	Grey

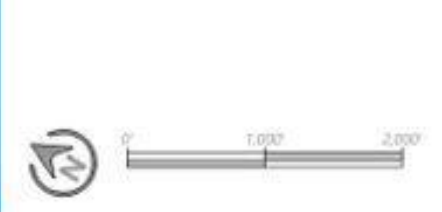


FIGURE 5 LONG-TERM PROJECTS



**HEF DEVELOPMENT PHASING PLAN**

- PROJECTS CURRENTLY UNDERWAY**
  - 1 Relocation of Observation Pool
  - 2 Bridge Strengthening - Runway 10L/34R and Taxiway B (Design)\*
- NEAR-TERM (PAL 1) PROJECTS (2024-2028)**
  - 3 New FAA AOC Phase 2 (Design)\*
  - 4 New FAA AOC Phase 2 (Construction)
  - 5 Runway 10L-34R Reconstruction and Strengthening (Design)\*
  - 6 Terminal Parking Lot Rehabilitation and Expansion
  - 7 Terminal Building Expansion (north and south)
  - 8 Satellite Parking #1 Construction and New Entrance Road
  - 9 Taxiway I Right Widening (Design and Construction)
  - 10 Bridge Strengthening - Runway 10L/34R and Taxiway B (Construction)
  - 11 Runway 10L-34R Reconstruction and Strengthening (Construction)
  - 12 South West Hangar Redevelopment (Design)\*
  - 13 East Ramp Strengthening, Reconfiguration, and Rehabilitation - (Design and Construction) - Phase 1
  - 14 Taxiway K (Design and Construction)
  - 15 Maintenance Equipment Storage (MES) and Snow Removal Equipment (SRE) Facility (Design)\*
  - 16 Maintenance Equipment Storage (MES) and Snow Removal Equipment (SRE) Facility (Construction)
  - 17 Fuel Farm Upgrades (Design and Construction)
  - 18 Infill Bridge Airfield Generator\*
  - 19 Acquire Multi-Function SRE (2)\*
  - 20 South West Hangar Redevelopment (Construction)
  - 21 West Apron Hangar Expansion - Phase 1 (Design)\*
  - 22 Taxiway B Reconstruction and Strengthening (South of the Bridge)
  - 23 Taxiway B Widening (Design)\*
- MID-TERM (PAL 2) PROJECTS (2029-2033)**
  - 24 West Apron Hangar Expansion - Phase 1 (Construction)
  - 25 East Ramp Strengthening, Reconfiguration, and Rehabilitation - (Design and Construction) - Phase 2
  - 26 Taxiway B Widening (Construction)
  - 27 Runway 10L-34R Widening (Design)\*
  - 28 Runway 10L-34R Widening (Construction)
  - 29 East Ramp Strengthening, Reconfiguration, and Rehabilitation - (Design and Construction) - Phase 3
  - 30 West Apron Hangar Expansion - Phase 2 (Design)\*
  - 31 New East Ramp Taxiway - Design and Construction (2031)
  - 32 Expanded East Ramp and Taxiway between Taxiway Delta and Echo (Design)\*
  - 33 Runway 10L-34R Extension (Design)\*
  - 34 Taxiway C and Taxiway D Relocation (Design)\*
  - 35 Taxiway C and Taxiway D Relocation (Construction)
  - 36 West Apron Hangar Expansion - Phase 2 (Construction)
  - 37 Expanded East Ramp and Taxiway between Taxiway Delta and Echo - (Construction)
  - 38 Glen-Gery Property Reimbursement\*
  - 39 Runway 10L-34R Extension (Construction)
  - 40 Vehicle Service Road (Design and Construction)
- LONG-TERM (PAL 3) PROJECTS (2034-2039)**
  - 41 East Apron T-Franger (Demolition)
  - 42 ARFF Station (Design)\*
  - 43 ARFF Station (Construction)
  - 44 Airport Master Plan Update\*
  - 45 West Apron Hangar Expansion - Phase 3 (Design)\*
  - 46 West Apron Hangar Expansion - Phase 3 (Construction)
  - 47 3 Acre Land Acquisition - Prince William County
  - 48 Parking Garage Construction
- BEYOND PLANNING PERIOD PROJECTS**
  - 49 South-East Airport Complex Site Development (Construction)
  - 50 East Apron Corporate Hangar Development
  - 51 West Apron AAM Terminal Facility
  - 52 West Apron Corporate Building



Source: RS&H, 2023  
**RS&H**

TABLE 1 SUMMARY OF ENVIRONMENTAL RESOURCE CATEGORIES WITH POTENTIAL IMPACTS

Airport Development Projects	YEAR	Air Quality	Biological Resources	Climate	Coastal Resources	DOT Act, Section 4(f)	Farmland	Hazardous Materials, Solid Waste, and Pollution Prevention	Historical, Architectural, Archeological, and Cultural Resources	Land Use	Natural Resources & Energy Supply	Noise and Noise-Compatible Land Use	Socioeconomics, Environmental Justice, and Children's Health and Safety Risks	Visual Effects	Water Resources	CATEX <sup>1</sup>	EA <sup>1</sup>	EIS <sup>1</sup>
<b>Near Term</b>																		
Realignment of Observation Road- Construction	2024	N	N	N	N	N	N	Y	N	N	Y	N	N	N	N	5-6.4(a)		
Bridge Strengthening- Runway 16L/34R & Taxiway B- Design	2024	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
New FAA ATCT Phase 2- Design	2025	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
New FAA ATCT Phase 3- Construction	2025	N	N	N	N	N	N	Y	N	N	N	N	Y	N	N		F	
Runway 16L/34R Reconstruction and Strengthening-Design	2025	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
Terminal Parking Lot Rehabilitation, Expansion and Parking Garage- Design and Construction	2025	N	Y	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(f)		
Terminal Building Expansion (North and South)- Design and Construction	2025	N	Y	N	N	N	N	Y	N	N	Y	N	Y	N	N	5-6.4(h)		
Satellite Parking 1 Construction and New Entrance Road- Design and Construction	2025	N	Y	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(a & f)		
Taxiway E Fillet Widening -Design and Construction	2025	N	N	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(e)		
Bridge Strengthening- Runway 16L/34R and Taxiway B- Construction	2025	N	N	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(e)		
Runway 16L/34 Reconstruction and Strengthening- Construction	2026	N	N	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(e)		
Southwest Hangar Redevelopment- Design	2026	N	Y	N	N	N	N	N	N	N	N	N	N	N	Y*	N/A		
East Ramp Strengthening, Reconfiguration, and Rehabilitation-Design and Construction Phase 1	2026	N	N	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(e)		
Taxilane X-Ray- Design and Construction	2026	N	N	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(e)		
Maintenance Equipment Storage/Snow Removal Equipment Facility- Design	2026	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
Maintenance Equipment Storage/Snow Removal Equipment Facility- Construction	2027	N	Y	N	N	N	N	Y	N	N	Y	N	Y	N	N	5-6.4(e)		
Fuel Farm Upgrades and Truck Staging Area- Design and Construction	2028	N	N	N	N	N	N	Y	N	N	Y	N	Y	N	N	5-6.4(f & u)		
Install Backup Airfield and Terminal Generators	2028	N	N	N	N	N	N	N	N	N	N	N	N	N	N			
Acquire Multi-function SRE (2)	2028	N	N	N	N	N	N	N	N	N	N	N	N	N	N	5-6.4(w)		

Airport Development Projects	YEAR	Air Quality	Biological Resources	Climate	Coastal Resources	DOT Act, Section 4(f)	Farmland	Hazardous Materials, Solid Waste, and Pollution Prevention	Historical, Architectural, Archeological, and Cultural Resources	Land Use	Natural Resources & Energy Supply	Noise and Noise-Compatible Land Use	Socioeconomics, Environmental Justice, and Children's Health and Safety Risks	Visual Effects	Water Resources	CATEX <sup>1</sup>	EA <sup>1</sup>	EIS <sup>1</sup>
Southwest Hangar Redevelopment- Design	2028	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N/A		
West Apron Hangar Expansion Phase 1- Design	2028	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
Taxiway B Reconstruction and Strengthening (South of Bridge)	2028	N	N	N	N	N	N	Y	N	N	Y	Y	Y	N	Y*	5-6.4(e)		
Taxiway B Widening- Design	2028	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
<b>Mid Term</b>																		
West Apron Hangar Expansion Phase 1-Construction	2029	N	Y	N	N	N	N	Y	N	N	Y	Y	Y	N	Y*	5-6.4(e&f)		
East Ramp Strengthening, Reconfiguration, Rehabilitation Phase 2- Design and Construction	2029	N	N	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(e)		
Taxiway B Widening- Construction	2029	N	N	N	N	N	N	Y	N	N	Y	Y	Y	N	Y*	5-6.4(e)		
Runway 16L/34R Widening- Design	2029	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
Runway 16L/34R Widening- Construction	2030	N	N	N	N	N	N	Y	N	N	Y	Y	Y	N	Y*	5-6.4(e)		
East Ramp Strengthening, Reconfiguration and Rehabilitation Phase 3- Design and Construction	2031	N	N	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(e)		
West Apron Hangar Expansion Phase 2- Design	2031	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
New East Ramp Taxiway- Design and Construction	2031	N	Y	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(e)		
Expanded East Ramp and Taxilane between Taxiway Delta and Echo- Design	2031	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
Runway 16L-34R Extension- Design	2032	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
Taxilane C and Taxilane D Relocation- Design	2032	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
Taxilane C and Taxilane D Relocation- Construction	2032	N	Y	N	N	N	N	Y	N	N	Y	Y	Y	N	N	5-6.4(e)		
West Apron Hangar Expansion Phase 2- Construction	2032	N	Y	N	N	N	N	Y	N	N	Y	Y	Y	N	Y*	5-6.4(e)		
Expanded East Ramp and Taxilane between Taxiway Delta and Echo- Construction	2032	N	Y	N	N	N	N	Y	N	N	Y	N	Y	N	N	5-6.4(e)		
Glen-Gerry Property Reimbursement	2033	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
Runway 16L/34R Extension- Design	2033	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
Vehicle Service Road- Design and Construction	2033	N	Y	N	N	N	N	Y	N	N	N	N	N	N	Y*	5-6.4(e)		
<b>Long Term</b>																		

Airport Development Projects	YEAR	Air Quality	Biological Resources	Climate	Coastal Resources	DOT Act, Section 4(f)	Farmland	Hazardous Materials, Solid Waste, and Pollution Prevention	Historical, Architectural, Archeological, and Cultural Resources	Land Use	Natural Resources & Energy Supply	Noise and Noise-Compatible Land Use	Socioeconomics, Environmental Justice, and Children's Health and Safety Risks	Visual Effects	Water Resources	CATEX <sup>1</sup>	EA <sup>1</sup>	EIS <sup>1</sup>
East Apron T-Hangar- Demolition	2034	N	N	N	N	N	N	Y	N	N	N	N	N	N	N		T	
ARFF Station- Design	2034	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
ARFF Station- Construction	2034	N	Y	N	N	N	N	Y	N	N	Y	Y	Y	N	N	5-6.4(f)		
Airport Master Plan Update	2035	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
West Apron Hangar Expansion Phase 3- Design	2036	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N/A		
West Apron Hangar Expansion Phase 3- Construction	2037	N	Y	N	N	N	N	Y	N	N	Y	Y	Y	N	Y*	5-6.4(f)		
8-Acre Land Acquisition- Prince William County	2040	N	Y	N	N	N	Y	N	N	Y	N	Y	N	Y	N		F	
Parking Garage Construction	2040	N	Y	N	N	N	N	Y	N	N	Y	Y	Y	N	Y*		F	
<b>Beyond Planning Period Projects</b>																		
Southeast Airport Complex Site Development- Design	N/A	N	N	N	N	N	N	N	N	N	N	N	N	N	Y*		F	
East Apron Corporate Hangar Development	N/A	N	Y	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(f)		
West AAM Terminal Facility	N/A	N	Y	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(f)		
West Apron Corporate Building	N/A	N	Y	N	N	N	N	Y	N	N	Y	N	Y	N	Y*	5-6.4(f)		

Notes: - <sup>1</sup> To be verified with the FAA Washington ADO when project is "Ripe" for an FAA decision; \*- Wetlands OR Floodplains; F –Full, Standard EA; T – Templatized/ Condensed EA; N/A- Design projects not categorized under NEPA

**TABLE 2 SUMMARY OF ENVIRONMENTAL RESOURCE CATEGORIES STUDIED**

<b>Environmental Resource</b>	<b>Description</b>
Air Quality	The Airport is located in an area designated as “maintenance” for Ozone and “attainment” for all other National Ambient Air Quality Standards (NAAQS).
Biological Resources	Federal- and state-threatened, –endangered and candidate species and migratory birds are in the Airport area. There is no critical habitat at the Airport. See Section 1.3.2 for further details.
Climate	There are greenhouse gas (GHG) emissions (e.g., Carbon dioxide Nitrous Oxide, etc.) produced at the Airport.
Coastal Resources	A portion of the Airport is within Virginia’s Coastal Zone Management Program; however, there are no Coastal Barrier Resource System (CBRS) segments within the Airport property.
Department of Transportation Act, Section 4(f)	There are no Section 4(f) properties on Airport property. The closest Section 4(f) property to the Airport is Cannon Branch Earthwork Fort, located adjacent to the Airport property in the northeast section of the Airport.
Farmlands	The Airport property contains prime farmland and farmland of statewide importance soil types. However, because the Airport is located with a U.S. Census Bureau designated Urban Area, it is exempt from the Farmland Protection Policy Act (FPPA) and would not have to complete farmland conversion application.
Hazardous Materials, Solid Waste, and Pollution Prevention	<p>There are six Resource and Recovery Act (RCRA) Hazardous Waste Generators on Airport property.</p> <p>Solid waste generated at the Airport is disposed of at the Manassas Transfer Station.</p> <p>The City has a Virginia Pollutant Discharge Elimination System Permit (VPDES) General Permit (VAR050985). The City also maintains an Oil Discharge Contingency Plan, an Integrated Spill Prevention, Control and Countermeasures (SPCC) Plan, and a Stormwater Pollution Prevention Plan (SWPPP) for the Airport.</p>
Historical, Architectural, Archaeological and Cultural Resources	<p>There are no historic architectural resources located at the Airport. At a small portion of Airport property, a Phase I cultural resources survey previously completed in 2017. This survey did not identify any cultural resources. Additionally, a Phase I ESA was conducted in 2024 in a small southwest portion of the Airport for the Air Traffic Control Tower Replacement Environmental Assessment. This survey did not identify any cultural resource</p> <p>The closest National Register of Historic Places (NRHP)-listed resource is the Davis Beard House (10726 Bristow Road), about one-third mile west of the</p>

Environmental Resource	Description
	<p>Airport. Cannon Branch Fort (VDHR #155-5020) is a historic fort associated with the Civil War, which is potentially eligible for listing on the NRHP. The Fort is adjacent to Airport property in the northeast section of the Airport. Bristoe Station Heritage Park, a Prince Williams County Park, is located about 1 mile west of the Airport. Manassas Battlefield Park (Virginia Department of Historic Resources ID # 076-0271) is located about 6 miles northeast of the Airport.</p> <p>A Phase I archaeological survey was conducted for two portions of the Airport in 2017. One archaeological site, Site 44PW0729, has been identified within the Airport property, west of the Air Traffic Control Tower. This site has subsurface integrity and is interpreted as a campsite.</p>
Land Use	Current land uses surrounding the Airport include classifications such as Airport, Technology Community Mixed Use, Flexible Use Employment Center, Agricultural and Forestry, and Federal property.
Natural Resources and Energy Supply	Electrical power is provided by The City of Manassas through a cooperative agreement with Dominion Power. to the Airport. City of Manassas Utilities Department provides water and Prince William County Service Authority provides sewer services. Washington Gas provides natural gas.
Noise and Noise-Compatible Land Use	The Airport is zoned as an Airport District. It is bordered by areas zoned as industrial to promote compatible development in and around the Airport. Areas bordering the Airport in Prince William County are zoned as Agricultural, Industrial, and Planned Business District.
Socioeconomics, Environmental Justice, Children’s Environmental Health, and Safety Risks	The Airport is located within Manassas City, Census Tract 9104.2, Block Group 5 and surrounded by Manassas, VA and Census Tracts 9103.02, 9104.01, and Prince William County, VA and Census Tracts 9103.05, 9014.09, 9013.04, and 9013.03. Of the total population living within the census tract, about 45% are minority and 20% live below the poverty level. About 24% of the population is people 18 or younger. The closest school to the Airport is George C. Round Elementary School, located about 1 mile northwest of the Airport.
Visual Effects	<p>Light emissions at the Airport currently result from airfield, building, access roadway, parking, and apron area lighting fixtures required for the safe and secure movement of people, vehicles, and aircraft.</p> <p>The visual resources and visual character of the Airport currently include the air traffic control tower, fixed base operators, hangars, and maintenance buildings.</p>

Environmental Resource	Description
Water Resources	<p>Airport property contains wetlands. Palustrine wetland features are on the east side of the Airport. Floodplains, including 100- and 500-year floodplain, are features throughout Airport property and a regulatory floodway that is part of Broad Creek in the southwest area of the Airport. Surface waters at, and in the vicinity of, the Airport include Broad Run and Cannon Branch.</p> <p>The Airport property is in the Rocky Branch-Broad Run watersheds.</p> <p>The Airport property does not contain any wild and scenic rivers.</p>

Prepared by: RS&H, 2024

### 1.3.1 Air Quality

The U.S. Environmental Protection Agency (USEPA) sets NAAQS for certain air pollutants to protect public health and welfare through Section 109 of the Clean Air Act (CAA). The USEPA has identified the following six criteria air pollutants and has set NAAQS for them: Carbon Monoxide (CO), Lead (Pb), Nitrogen Dioxide (NO<sub>2</sub>), 8-Hour Ozone (O<sub>3</sub>), Particulate Matter (PM<sub>10</sub> and PM<sub>2.5</sub>), and Sulfur Dioxide (SO<sub>2</sub>).

Areas that violate one or more NAAQS of these pollutants are classified as “nonattainment” areas. States with “nonattainment” areas must develop a State Implementation Plan (SIP) demonstrating how the areas will be brought back into “attainment” of the NAAQS within designated timeframes. Areas where concentrations of the criteria pollutants are below (i.e., within) these threshold levels are classified as “attainment” areas. Areas with prior “nonattainment” status that have since transitioned to “attainment” are known as “maintenance” areas.

According to the United States Environmental Protection Agency (USEPA), the Airport, located in the City of Manassas, is in a “maintenance” area for O<sub>3</sub> and is in an “attainment” area for all other NAAQS.<sup>4</sup> As the USEPA requires, the Metropolitan Washington Air Quality Committee, which is made up of much of the Washington D.C., Maryland and Northern Virginia area, including Prince William County and the City of Manassas, has a SIP for the O<sub>3</sub> standard.<sup>5</sup> According to the Virginia Department of Environmental Quality (VDEQ), the Airport is within an emission control area for oxides of nitrogen (NO<sub>x</sub>) and volatile organic compounds (VOCs).<sup>6</sup> The FAA Federal Presumed to Conform Actions under General Conformity can be found in the Federal Register, Volume 72, No.145; section 2 lists specific federal actions related to airports that do not require detailed general conformity analyses under the Clean Air Act. This includes activities that are presumed to meet air quality standards and normally do not require further review. However, each project would require FAA Coordination to make the final determination on whether a project meets

<sup>4</sup> U.S. Environmental Protection Agency, Air Quality Green Book, Virginia. Accessed: [https://www3.epa.gov/airquality/greenbook/anayo\\_va.html](https://www3.epa.gov/airquality/greenbook/anayo_va.html), May 2024.

<sup>5</sup> Metropolitan Washing Council of Governments, Washington DC-MD-VA 2015 Ozone NAAQS Nonattainment Area Base Year 2017 Emissions Inventory (Updated on October 30,2020). Accessed: <https://www.mwcog.org/documents/2020/10/30/washington-dc-md-va-2015-ozone-naaqs-nonattainment-area-base-year-2017-emissions-inventory-updated-on-october-302020-air-quality-air-quality-conformity-ozone/>, May 2024.

<sup>6</sup> Virginia Legislative Information System, Administrative Code 9VAC5-20-206. Volatile organic compound and nitrogen oxides emissions control areas. Accessed: <https://law.lis.virginia.gov/admincode/title9/agency5/chapter20/section206/>, May 2024.

presumed to conform standards or if an air quality analysis including a Construction Emissions Inventory would be required.

### 1.3.2 Biological Resources

Biological resources include terrestrial and aquatic plant and animal species; game and non-game species; special status species; and environmentally sensitive or critical habitats. The following are relevant federal laws, regulations, Executive Orders (EOs), and guidance<sup>7</sup> that protect biotic communities:

- » Endangered Species Act (ESA) (16 U.S.C. §§ 1531-1544)
- » Bald and Golden Eagle Protection Act (16 U.S.C. §§ 668 et seq.)
- » Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801 et seq.)
- » Fish and Wildlife Coordination Act (16 U.S.C. § 661-667d)
- » Executive Order (EO) 13112, *Invasive Species* (64 FR 6183)
- » Marine Mammal Protection Act (16 U.S.C. § 1361 et seq.)
- » Migratory Bird Treaty Act (MBTA) (16 U.S.C. §§ 703 et seq.)
- » EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds* (66 FR 3853)
- » Council on Environmental Quality (CEQ) Guidance on Incorporating Biodiversity Considerations into Environmental Impact Analysis under NEPA; and
- » Memorandum of Understanding to Foster the Ecosystem Approach.

**Table 3** lists the three federally threatened, endangered or candidate species that have the potential to be found at the Airport.<sup>8</sup> According to the U.S. Fish and Wildlife Service (USFWS), there is no designated critical habitat at the Airport.<sup>9</sup> Although the Endangered Species Act does not protect state-protected species or habitats, NEPA documentation ensures that environmental analysis for airport actions addresses the potential effects on state-protected resources. The Virginia Department of Game and Inland Fisheries (VDGIF) Information System (VaFWIS) indicates that nine Commonwealth-listed species may occur within two miles of Airport property.<sup>10</sup> **Table 4** lists the twelve state-listed species with the potential to occur at the Airport.

The Broad Run Stream Conservation Unit is adjacent to the Airport on the west side. The Broad Run Stream Conservation Unit has a biodiversity ranking of B3, which represents a site of high importance. Natural heritage resources for the Brook floater and Yellow lance are associated with that Unit. The VDGIF also designates Broad Run as a “Threatened and Endangered Species Water” for the Brook floater.<sup>11</sup>

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<sup>7</sup> Due to the number of federal laws and EOs applicable to development plans, this section presents only the legal citations or references for those requirements in lieu of summarizing their requirements. See FAA’s 1050.1F Desk Reference for more.

<sup>8</sup> U.S. Fish and Wildlife Service, Information for Planning and Conservation (IPaC). Accessed: <https://ipac.ecosphere.fws.gov/location/WGTIE2AQFFBGXFISWFTGGH7ZBY/resources#endangered-species>, May 2024.

<sup>9</sup> U.S. Fish and Wildlife Service, Information for Planning and Conservation (IPaC). Accessed: <https://ipac.ecosphere.fws.gov/location/WGTIE2AQFFBGXFISWFTGGH7ZBY/resources#endangered-species>, May 2024.

<sup>10</sup> Virginia Department of Game and Inland Fisheries, Virginia Fish and Wildlife Information Service. Accessed: <https://services.dwr.virginia.gov/fwis/index.asp>, May 2024.

<sup>11</sup> Commonwealth of Virginia, Department of Environmental Quality, Letter RE: Federal Consistency Certification for the Manassas Regional Airport West Corporate Development and East Parcel Development, City of Manassas, and Prince William County, DEQ 17-061 F, October 24, 2017.

**TABLE 3 FEDERALLY LISTED SPECIES WITH THE POTENTIAL TO OCCUR IN OR AROUND AIRPORT PROPERTY**

Species Common Name	Species Scientific Name	Listing Status
Dwarf Wedgemussel	<i>Alasmidonta heterodon</i>	Endangered
Monarch Butterfly	<i>Danaus plexippus</i>	Candidate
Northern Long-eared Bat	<i>Myotis septentrionalis</i>	Federally Threatened
Tricolored Bat	<i>Perimyotis subflavus</i>	Proposed Endangered

Source: USFWS, 2024; Prepared by RS&H, 2024

The Migratory Bird Treaty Act (MBTA) prohibits the taking of any migratory birds, their parts, nests, or eggs except as permitted by regulations and does not require intent to be proven. According to the USFWS IPaC, there is the potential for five migratory bird species to be found at the Airport, see **Table 5** for a complete list.<sup>12</sup>

Essential Fish Habitat (EFH) are those waters and substrate necessary for fish spawning, breeding, feeding, and growth to maturity as defined under the MSA. The MSA also requires federal agencies to consult with NOAA Fisheries about actions that could damage EFH. The Airport is not located in an EFH area.<sup>13</sup>

**TABLE 4 STATE-LISTED SPECIES WITH THE POTENTIAL TO OCCUR IN OR AROUND AIRPORT PROPERTY**

Species Common Name	Species Scientific Name	Listing Status
Atlantic Sturgeon	<i>Acipenser oxyrinchus</i>	State Endangered / Federally Endangered
Northern long-eared bat	<i>Myotis septentrionalis</i>	State Threatened / Federally Threatened
Little Brown Bat	<i>Myotis lucifugus lucifugus</i>	State Endangered
Tricolored Bat	<i>Perimyotis subflavus</i>	State Endangered
Brook Floater	<i>Alasmidonta varicose</i>	State Endangered
Peregrine Falcon	<i>Falco peregrinus</i>	State Threatened
Loggerhead Shrike	<i>Lanius ludovicianus</i>	State Threatened
Henslow’s Sparrow	<i>Ammodramus henslowii</i>	State Threatened
Migrant Loggerhead Shrike	<i>Lanius ludovicianus migrans</i>	State Threatened
Yellow Lance	<i>Elliptio lanceolata</i>	State Threatened
Wood Turtle	<i>Glyptemys insculpta</i>	State Threatened
Appalachian Grizzled Skipper	<i>Pyrgus Wyandot</i>	State Threatened

Source: VDGIF, 2024; Prepared by RS&H, 2024

<sup>12</sup> U.S. Fish and Wildlife Service, Information for Planning and Conservation (IPaC). Accessed: <https://ipac.ecosphere.fws.gov/location/WGTIE2AQFFBGXFI5WFTGGH7ZBY/resources#endangered-species>, May 2024.

<sup>13</sup> National Marine Fisheries Service, Essential Fish Habitat Mapper. Accessed: <https://www.habitat.noaa.gov/apps/efhmapper/>, May 2024.

**TABLE 5 POTENTIAL MIGRATORY BIRDS IN THE AIRPORT AREA**

Species Common Name	Species Scientific Name
Bald Eagle	<i>Haliaeetus leucocephalus</i>
Prairie Warbler	<i>Dendroica discolor</i>
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>
Rusty Blackbird	<i>Euphagus carolinus</i>
Wood Thrush	<i>Hylocichla mustelina</i>

Source: USFWS, 2024; Prepared by RS&H, 2024

### 1.3.3 Climate

Relevant federal laws, regulations, and EOs that relate to climate include:

- » CAA (42 U.S.C. §§ 7408, 7521, 7571, 7661 et seq.)
- » EO 13514, *Federal Leadership in Environment Energy and Economic Performance* (74 FR 52117);
- » EO 13653, *Preparing the United States for the Impacts of Climate Change* (78 FR 66817); and
- » EO 13693, *Planning for Federal Sustainability* (80 FR 15869).

Greenhouse gases (GHG) trap heat in the earth’s atmosphere. Naturally occurring and man-made GHGs primarily include water vapor, carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Activities that require fuel or power are the primary stationary sources of GHGs at airports. Aircraft and ground access vehicles not controlled by an airport typically generate more GHG emissions than airport-controlled sources.

Research has shown a direct correlation between fuel combustion and GHG emissions. In terms of U.S. contributions, the Government Accountability Office (GAO) reports that "domestic aviation contributes about three percent of total carbon dioxide emissions, according to EPA data, "compared with other industrial sources, including the remainder of the transportation sector (20 percent) and power generation (41 percent). The International Civil Aviation Organization (ICAO) estimates that GHG emissions from aircraft account for roughly three percent of all anthropogenic GHG emissions globally.<sup>14</sup>

Construction emissions are estimated based on these factors: construction schedule; the number of construction vehicles and/or equipment; the types of construction vehicles and/or equipment; types of fuel used to power the equipment and vehicles; vehicle and equipment hourly activity/vehicle miles traveled; construction materials used and their quantities; and the duration of construction.

In January 2023, the Council on Environmental Quality (CEQ) issued interim guidance, *National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change*, to assist agencies in analyzing greenhouse gas emissions (GHG) and climate change effects of a Proposed Project under NEPA. The FAA has not established a significance threshold for Climate impacts.

The CEQ identified Social Cost-Greenhouse Gases (SC-GHG) as the metric for assessing potential climate impacts and represents the monetary estimate of the effect associated with each additional metric ton of

<sup>14</sup> Melrose, Alan, *European ATM and Climate Adaptation: A Scoping Study*, ICAO Environmental Report, 2010. Accessed: [http://www.icao.int/environmental-protection/Documents/EnvironmentReport-2010/ICAO\\_EnvReport10-Ch6\\_en.pdf](http://www.icao.int/environmental-protection/Documents/EnvironmentReport-2010/ICAO_EnvReport10-Ch6_en.pdf), May 2021.

carbon dioxide released into the air (Interagency Working Group, 2021). The three GHGs<sup>2</sup> that are analyzed are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O), which represent more than 97% of U.S. GHG emissions. To calculate SC-GHG, the carbon dioxide equivalent (CO<sub>2</sub>e) must be calculated. The Interagency Working Group (IWG) determined the social cost of CO<sub>2</sub> (SC-CO<sub>2</sub>) through 2050 and assigned a monetary value<sup>3</sup> for each additional metric ton of CO<sub>2</sub> produced. SC-CO<sub>2</sub> is equivalent to SC-GHGs and represents the social costs of the total greenhouse gases converted to the CO<sub>2</sub>e equivalent. The SC-CO<sub>2</sub> helps weigh the benefits of climate mitigation against its costs.

### 1.3.4 Coastal Resources

The primary statutes, regulations, and EOs that protect coastal resources include:

- » Coastal Barrier Resources Act (16 U.S.C. § 3501 et seq.);
- » Coastal Zone Management Act (CZMA) (16 U.S.C. § 1451-1466);
- » National Marine Sanctuaries Act (16 U.S.C. §1431 et seq.);
- » EO 13089, *Coral Reef Protection* (63 FR 32701); and
- » EO 13547, *Stewardship of the Ocean, Our Coasts, and the Great Lakes* (75 FR 43021-43027).

Portions of Airport property are in Prince William County, within Virginia's Coastal Zone Management (CZM) Program, according to the Virginia Department of Environmental Quality (VDEQ).<sup>15</sup> The Virginia CZM Program has the following goals.<sup>16</sup>

- » "Goal 1: To protect and restore coastal resources, habitats, and species of the Commonwealth. These include, but are not limited to, wetlands, subaqueous lands and vegetation, beaches, sand dune systems, barrier islands, underwater or maritime cultural resources, riparian forested buffers, and endangered or threatened species.
- » Goal 2: To restore and maintain the quality of all coastal waters for human and ecosystem health through protection from adverse effects of excess nutrients, toxics, pathogens, and sedimentation.
- » Goal 3: To protect air quality.
- » Goal 4: To reduce or prevent losses of coastal habitat, life, and property caused by shoreline erosion, storms, relative sea level rise, and other coastal hazards in a manner that balances environmental and economic considerations.
- » Goal 5: To provide for sustainable wild fisheries and aquaculture.
- » Goal 6: To promote sustainable ecotourism and to increase and improve public access to coastal waters and shorefront lands compatible with resource protection goals.
- » Goal 7: To promote renewable energy production and provide for appropriate extraction of energy and mineral resources consistent with proper environmental practices.
- » Goal 8: To ensure sustainable development on coastal lands and support access for water-dependent development through effective coordination of governmental planning processes.

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<sup>15</sup> Virginia Department of Environmental Quality, CZM Boundaries. Accessed: <https://www.deq.virginia.gov/home/showpublisheddocument/4078/637461463603670000>, May 2024.

<sup>16</sup> Virginia Department of Environmental Quality, letter to National Oceanic and Atmospheric Administration, September 4, 2018. Accessed: <https://www.deq.virginia.gov/home/showpublisheddocument/13129/637776597193170000>, May 2024.

- » Goal 9: To avoid and minimize coastal and ocean resource use conflicts through research, planning, and a forum for coordination and facilitation among local, regional, state and federal government agencies, interest groups, and citizens.
- » Goal 10: To promote informed decision-making by maximizing the availability of up-to-date educational information, technical advice, and scientific data including the use of new tools such as marine spatial planning.”

The Virginia CZM Program also contains the Chesapeake Bay Preservation Act, which establishes resource protection areas (RPAs) around land at or near the shoreline that play a critical role in the water quality value. RPAs have a 100-foot vegetation buffer along streams or rivers to help protect water quality. See **Figure 6** for the Prince William County designated RPAs in and around Airport property. Although RPAs are shown within the limits of the City of Manassas, the City of Manassas does not recognize RPAs because it is not part of the Virginia CZM Program and, therefore, is not subject to the Chesapeake Bay Preservation Act, which establishes RPAs<sup>17</sup>. With regards to the RPA in the eastern portion of the Airport property, an on-site delineation of the Cannon Branch RPA within the eastern portion of the Airport property was reviewed and approved by Prince William County.



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<sup>17</sup> Chesapeake Bay Regulations/RPA's. Prince William Conservation Alliance. <https://www.pwconserve.org/issues/chesbay.html>  
Accessed June 2024

FIGURE 6 RESOURCE PROTECTION AREAS



**Legend**

-  Airport Property Boundary
-  Resource Protection Areas (RPA)



According to Prince William County, all creeks and streams in the County are subject to RPA buffers because they feed into the Potomac River and eventually to the Chesapeake Bay.<sup>18</sup> Any work within an RPA requires County review and approval. The County does not allow the following activities in an RPA:

- » New development
- » Parking lots
- » Clear-cutting trees
- » Filling and grading activities
- » Establishing Lawns

Additionally, no Coastal Barrier Resource System (CBRS) segments are within the Airport property.<sup>19</sup> The closest CBRS segment, St. Catherine Island (MD-56), is over 50 miles southeast of the Airport.

### 1.3.5 Department of Transportation, Section 4(f)

Relevant federal laws, regulations, and EOs that protect Section 4(f) resources include:

- » U.S. Department of Transportation (USDOT) Act, Section 4(f) (49 U.S.C. § 303.);
- » Land and Water Conservation Fund Act of 1965 (16 U.S.C. §§ 4601-4604 et seq.);
- » Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) – Section 6009 (49 U.S.C. § 303.); and
- » U.S. Department of Defense Reauthorization (Public Law (P.L.) 105-185, Division A, Title X, Section 1079, November 18, 1997, 111 Stat. 1916).

The USDOT Act, Section 4(f) provides that no project that requires the use of any land from a public park or recreational area, wildlife and waterfowl refuge, or historic site be approved by the Secretary of Transportation unless there is no viable alternative and provisions to minimize any possible harm are included in the planning. Similarly, the Land and Water Conservation Fund (LWCF) Act prevents the conversion of lands purchased or developed with Land and Water Conservation funds to non-recreation uses unless the Secretary of the Interior, through the National Park Service, approves the conversion. Conversion may only be approved if it is consistent with the comprehensive statewide outdoor recreation plan when the approval occurs. Additionally, the converted property must be replaced with other recreation property of reasonably equivalent usefulness and location and at least equal fair market value.

The closest Section 4(f) property to the Airport is Cannon Branch Earthwork Fort, located adjacent to the Airport property in the northeast section of the Airport.<sup>20</sup> The closest LWCF site to the Airport is Dean Park, located about 1.5 miles east of the Airport, which received about \$500,000 in LWCF funds in 2017.<sup>21</sup> Bristoe Station Heritage Park, a Prince Williams County Park, is located about 1 mile west of the Airport. Manassas Battlefield Park (Virginia Department of Historic Resources ID # 076-0271) is located about 6 miles northeast of the Airport. At a small portion of Airport property, a Phase I cultural resources survey

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<sup>18</sup> Prince William County, Resource Protection Areas. Accessed: <https://www.pwcva.gov/department/environmental-services/resource-protection-areas>, May 2024.

<sup>19</sup> U.S. Fish and Wildlife Service, Coastal Barrier Resources System Mapper. Accessed: <https://www.fws.gov/cbra/Maps/Mapper.html>, May 2024.

<sup>20</sup> City of Manassas, Parks, Recreation, and Culture, Map. Accessed: [https://www.manassasva.gov/Parks-Culture-Recreation/Parks/Map\\_Parks\\_11x17.pdf](https://www.manassasva.gov/Parks-Culture-Recreation/Parks/Map_Parks_11x17.pdf), March 2022.

<sup>21</sup> Land Water Conservation Fund, Virginia. Accessed: <https://lwcf.tplgis.org/mappast/>, March 2022.

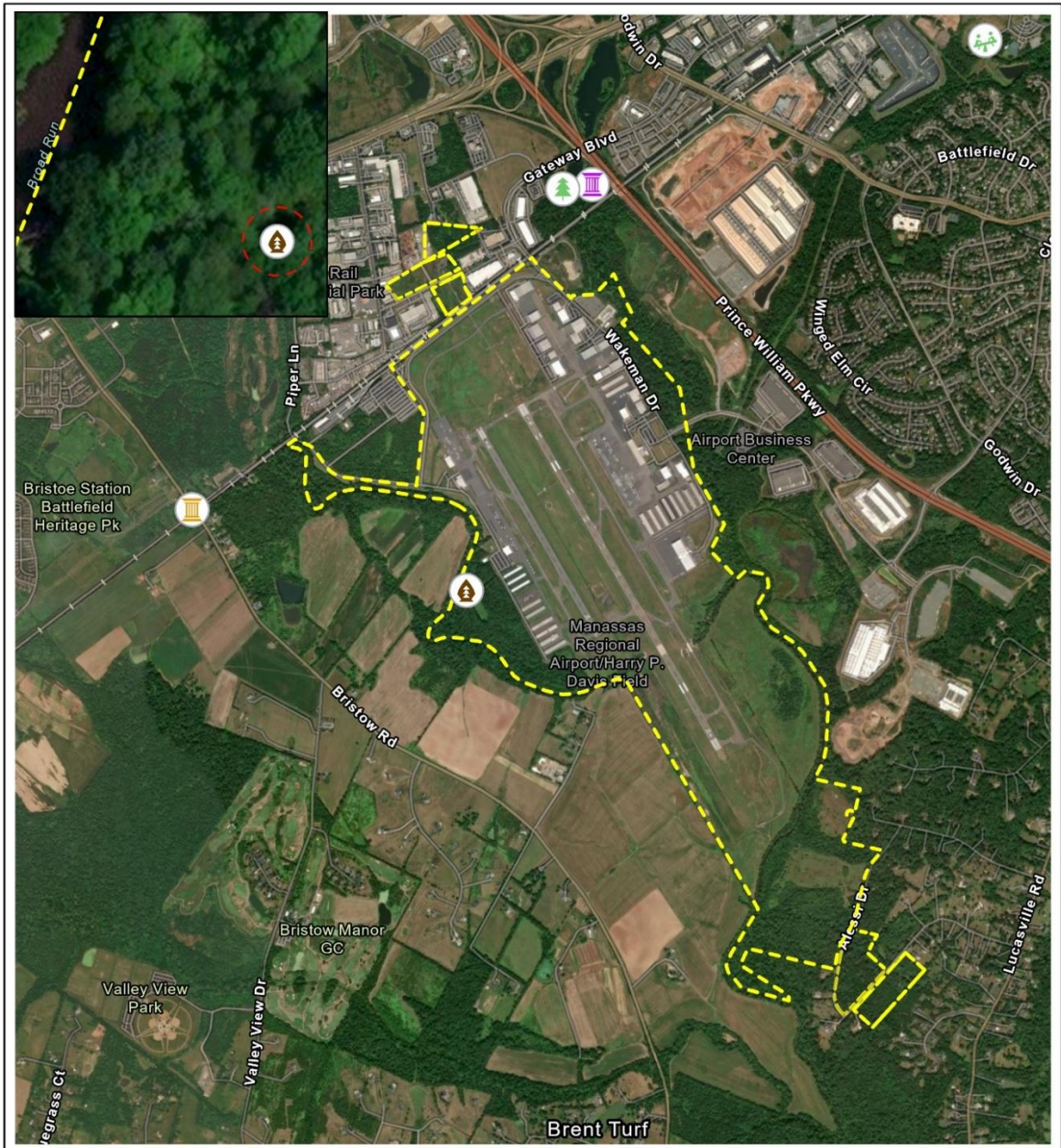
previously completed in 2017. This survey did not identify any cultural resources.<sup>22</sup> Additionally, a Phase I ESA was conducted in 2024 in a small southwest portion of the Airport for the Air Traffic Control Tower Replacement Environmental Assessment. This survey did not identify any cultural resource.<sup>23</sup> **Figure 7** shows Section 4(f) resources, as well as Section 6(f), Historical, and Archaeological sites.

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<sup>22</sup> Elizabeth Anderson Comer Archaeology. Phase I Cultural Survey. 2017.

<sup>23</sup> Mannik & Smith Group. Phase I Cultural Survey. 2024.

FIGURE 7 SECTION 4(F), SECTION 6(F), ARCHITECTURAL, ARCHAEOLOGICAL RESOURCES



Sources: NRHP 2024; LWCF2024;  
ESRI 2024; RS&H 2024

Legend

0 0.25 0.5 Mile

-  Archaeological Site
-  Section 4(f) Resource
-  Cannon Branch (VDHR# 155-5020)
-  Section 6(f) Resource
-  David Beard House (10726 Bristow Road)
-  20-Foot Buffer
-  Airport Property Boundary



### 1.3.6 Farmlands

The following statutes, regulations, and guidance pertain to farmlands:

- » Farmland Protection Policy Act (FPPA) (7 U.S.C. §§ 4201-4209); and
- » CEQ Memorandum on the Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing the National Environmental Policy Act (45 FR 59189).

The FPPA of 1981 regulates federal actions that have the potential to convert farmland to non-agricultural uses. The FAA requires consideration of “important farmlands,” which it defines as “all pasturelands, croplands, and forests (even if zoned for development) considered to be prime, unique, or statewide or local important lands.”<sup>24</sup>

According to the Natural Resource Conservation Service (NRCS), portions of Airport property contain soils classified as prime farmland and farmland of statewide importance (see **Figure 8**).<sup>25</sup> However, most Airport property is within an area that the U.S. Census Bureau (USCB) identifies as an urban area complex.<sup>26</sup> Under Section 523(10)(B) of the Farmland Protection Policy Act, land that the U.S. Census Bureau identifies as urbanized areas is not subject to the provisions of the Farmland Protection Policy Act. **Figure 8** shows an excerpt from the Urbanized Area Map with the Airport property outlined in yellow.

### 1.3.7 Hazardous Materials, Solid Waste, and Pollution Prevention

Federal laws, regulations, and EOs that relate to hazardous materials, solid waste, and pollution prevention include:

- » Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 U.S.C. §§ 9601-9765)
- » Emergency Planning and Community Right to Know Act (42 U.S.C. §§ 11001-11050);
- » Federal Facilities Compliance Act (42 U.S.C. § 6961);
- » Hazardous Materials Transportation Act (49 U.S.C. §§ 5101-5128);
- » Oil Pollution Prevention Act of 1990 (33 U.S.C. §§ 2701-2762);
- » Pollution Prevention Act (42 U.S.C. §§ 13101-13109);
- » Toxic Substances Control Act (TSCA) (15 U.S.C. §§ 2601-2697);
- » Resource Conservation and Recovery Act (RCRA) (42 U.S.C. §§ 6901-6992k);
- » EO 12088, *Federal Compliance with Pollution Control Standards* (43 FR 47707);
- » EO 12580, *Superfund Implementation* (52 FR 2923), (63 CFR 45871), and (68 CFR 37691);
- » EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management* (72 FR 3919); and
- » EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance* (74 FR 52117).

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<sup>24</sup> Federal Aviation Administration, *1050.1F Desk Reference*, February 2020. Accessed: May 2024.

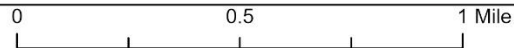
<sup>25</sup> Natural Resources Conservation Service, Web Soil Survey. Accessed: <https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>, May 2024.

<sup>26</sup> U.S. Census Bureau, 2010 Census – Urbanized Area Reference Map: Washington, DC – VA – MD. Accessed: [https://www2.census.gov/geo/maps/dc10map/UAUC\\_RefMap/ua/ua92242\\_washington\\_dc--va--md/DC10UA92242.pdf](https://www2.census.gov/geo/maps/dc10map/UAUC_RefMap/ua/ua92242_washington_dc--va--md/DC10UA92242.pdf), May 2024.

FIGURE 8 FARMLAND SOIL TYPES ON AIRPORT PROPERTY



Sources: ESRI 2024; RS&H 2024



Legend

- Prime Farmland
- Farmland of Local Importance
- Farmland of Statewide Importance
- Farmland of Unique Importance
- Not Prime Farmland
- Census Urban Area
- Airport Property Boundary



### 1.3.7.1 Hazardous Materials

In a regulatory context, the terms “hazardous wastes,” “hazardous substances,” and “hazardous materials” are defined as:

- » **Hazardous Wastes.** Subpart C of the RCRA defines hazardous wastes (sometimes called characteristic wastes) as solid wastes that are ignitable, corrosive, reactive, or toxic. Examples include waste oil, mercury, lead, or battery acid. In addition, Subpart D of the RCRA contains a list of specific types of solid wastes that the USEPA has deemed hazardous (sometimes called listed wastes). Examples include degreasing solvents, petroleum refining waste, or pharmaceutical waste.
- » **Hazardous Substances.** Section 101(14) of the CERCLA defines hazardous substances broadly and includes hazardous wastes, hazardous air pollutants, or hazardous substances designated as such under the Clean Water Act and TSCA and elements, compounds, mixtures, solutions, or substances listed in 40 CFR Part 302 that pose substantial harm to human health or environmental resources. Pursuant to the CERCLA, hazardous substances do not include any petroleum or natural gas substances and materials. Examples include ammonia, bromine, chlorine, or sodium cyanide.
- » **Hazardous Materials.** According to 49 CFR Part 172, hazardous materials are any substances commercially transported that pose unreasonable risk to public health, safety, and property. These substances include hazardous wastes and hazardous substances, as well as petroleum and natural gas substances and materials. As a result, hazardous materials represent hazardous wastes and substances. Examples include household batteries, gasoline, or fertilizers.

Aircraft fuel constitutes the largest quantity of hazardous substances stored and consumed at the Airport. Fuel is stored at the fuel farm on Airport property in aboveground storage tanks, and fuel trucks are used to fuel aircraft.

The USEPA identifies the following six RCRA hazardous waste generators on Airport property:<sup>27</sup>

- » Dulles Aviation Inc (Handler ID: VAD982704686) - No longer in operation at the Airport;
- » T Hangars of VA Inc (Handler ID: VAR000010157) - No longer in operation at the Airport;
- » Jet Services Inc (Handler ID: VAR000500199);
- » Leidos Inc. Hangar 2 (Handler ID: VAR000537852);
- » Asou Offsite (Handler ID: VAR000500389);
- » Colgan Air (Handler ID: VAR000504332) - No longer in operation at the Airport.

There are no Superfund sites on Airport property. The closest Superfund site to Airport property, Marine Corps Development Command (Site EPA ID: VA1170024722), is 23 miles southeast of the Airport.<sup>28</sup>

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<sup>27</sup> U.S. Environmental Protection Agency, Envirofacts, RCRA Info. Accessed: <https://www3.epa.gov/enviro/facts/rcrainfo/search.html>, May 2024.

<sup>28</sup> U.S. Environmental Protection Agency, Superfund, National Priorities List, Minnesota. Accessed: <https://www.epa.gov/superfund/search-superfund-sites-where-you-live#map>, May 2024.

### 1.3.7.2 Solid Waste

Solid waste generated at the Airport is taken to the Manassas Transfer Station, which is then transferred to the Prince William County Landfill.<sup>29</sup> The Manassas Transfer Station is about 4 miles east of the Airport, and the Prince William County Landfill is about 8 miles southeast of the Airport. An independent assessment of the Prince William County Landfill was conducted, and it is expected to reach capacity around 2065.<sup>30</sup>

### 1.3.7.3 Pollution Prevention

The Airport operates under a Virginia Pollutant Discharge Elimination System Permit (VPDES) General Permit (VAR050985) for stormwater discharge associated with industrial activity. On August 23, 2023, the State Water Control Board authorized the reissuance of the Small MS4 General Permit, making the existing permit effective through October 31, 2028.<sup>31</sup> The City of Manassas also maintains an Oil Discharge Contingency Plan, an Integrated Spill Prevention, Control and Countermeasures (SPCC) Plan, and a Stormwater Pollution Prevention Plan (SWPPP) for the Airport. These plans outline best management practices (BMPs) for controlling potential pollutant releases to the surrounding surface waters. These plans also provide detailed procedures to follow in the unlikely event of a spill to minimize potential effects on the surrounding environment.

## 1.3.8 Historical, Architectural, Archaeological, and Cultural Resources

The National Historic Preservation Act (NHPA) (54 U.S.C. §§300101 et seq.) establishes the Advisory Council on Historic Preservation (ACHP). The ACHP oversees federal agency compliance with the NHPA. The NHPA also established the National Register of Historic Places (NRHP) that the National Park Service (NPS) oversees. Other applicable statutes and EOs include:

- » American Indian Religious Freedom Act (42 U.S.C. § 1996)
- » Antiquities Act of 1906 (54 U.S.C. §§320301-320303)
- » Archeological and Historic Preservation Act (54 U.S.C. §§ 312501-312508)
- » Archeological Resources Act (16 U.S.C. §§ 470aa-470mm)
- » USDOT Act, Section 4(f) (49 U.S.C. § 303)
- » Historic Sites Act of 1935 (16 U.S.C. §§ 461-467)
- » Native American Graves Protection and Repatriation Act (25 U.S.C. §§ 3001-3013)
- » Public Building Cooperative Use Act (40 U.S.C. §§ 601a, 601a1, 606, 611c, and 612a4)
- » EO 11593, *Protection and Enhancement of the Cultural Environment* (36 FR 8921)
- » EO 13006, *Locating Federal Facilities on Historic Properties in Our Nation's Central Cities* (61 FR 26071)
- » EO 13007, *Indian Sacred Sites* (61 FR 26771)

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<sup>29</sup> Manassas Virginia, Trash & Recycling, Manassas Transfer Station. Accessed: [https://www.manassasva.gov/public\\_works/trash\\_recycling/manassas\\_transfer\\_station.php](https://www.manassasva.gov/public_works/trash_recycling/manassas_transfer_station.php), May 2024.

<sup>30</sup> Prince William County Solid Waste Management, Accessed: <https://www.pwcva.gov/assets/2022-02/SWMP%20Presentation%20Web%20Feb22%20-website.pdf> June 2024.

<sup>31</sup> VDEQ. MS4 Stormwater Permits. <https://www.deq.virginia.gov/permits/water/ms4>, June 2024.

- » EO 13175, *Consultation and Coordination with Indian Tribal Governments* (65 FR 67249)
- » Executive Memorandum, Government-to-Government Relations with Native American Tribal Governments (April 29, 1994)
- » Executive Memorandum on Tribal Consultation (Nov. 5, 2009) (65 FR 67249); and
- » USDOT Order 5650.1, *Protection and Enhancement of the Cultural Environment*.

A Phase I archaeological survey was conducted for two portions of the Airport in 2017. One archaeological site, Site 44PW0729, has been identified within the Airport property, west of the Air Traffic Control Tower. This site has subsurface integrity and is interpreted as a campsite.<sup>32</sup> The site is associated with the Middle Archaic to the Late Woodland prehistoric period. It is considered potentially eligible for listing on the NRHP. Planning efforts have resulted in the placement of a 20-foot buffer around the site for any future development. See previous **Figure 7** for Archaeological and Historical Sites.

The closest National Register of Historic Places (NRHP)-listed resource is the Davis Beard House (10726 Bristow Road), about one-third mile west of the Airport.<sup>33</sup> Cannon Branch Fort (VDHR #155-5020) is a historic fort associated with the Civil War, which is potentially eligible for listing on the NRHP. The Fort is adjacent to Airport property in the northeast section of the Airport.

### 1.3.9 Land Use

Various statutes, regulations, and EOs relevant to land use include:

- » The Airport and Airway Improvement Act of 1982 and subsequent amendments (49 U.S.C. 47107(a)(10));
- » The Airport Improvement Program (49 U.S.C. 47106(a)(1));
- » The Airport Safety, Protection of Environment, Criteria for Municipal Solid Waste Landfills (40 CFR § 258.10); and
- » State and local regulations

The Airport is in the City of Manassas in Virginia. Land uses within the immediate vicinity of the Airport include Airport and Technology.<sup>34</sup> The Airport borders Prince William County, Virginia, with a separate land use plan. Land uses in Prince William County that borders the Airport include Community Mixed Use, Flexible Use Employment Center, Agricultural and Forestry, and Federal Property.<sup>35</sup>

Zoning in the City of Manassas classifies Airport property as IA – Airport District, I1 Light Industrial, and I2 Heavy Industrial, with surrounding land in the City of Manassas also classified as I1 and I2.<sup>36</sup> Zoning areas

<sup>32</sup> Phase I Archaeological Study for the Proposed West Corporate Development and East Parcel Development at Manassas Regional Airport, City of Manassas, Prince William County, Virginia, Elizabeth, Anderson Comer/Archaeology. Accessed June 2024.

<sup>33</sup> U.S. National Park Service, National Register of Historic Places. Accessed: <https://www.nps.gov/maps/full.html?mapId=7ad17cc9-b808-4ff8-a2f9-a99909164466>, May 2024.

<sup>34</sup> City of Manassas, Manassas 2040, Chapter 3: Land Use, Adopted February 24, 2020. Accessed: <https://www.manassasva.gov/Community%20Development/Comp%20Plan/Chapter%203%20-%20Land%20Use%20web.pdf>, May 2024.

<sup>35</sup> Prince William County, Virginia, Pathway to 2040: Land Use. Accessed: [https://www.pwcva.gov/assets/2022-02/DRAFT\\_LRLU\\_3000\\_36x66%2020220201.pdf](https://www.pwcva.gov/assets/2022-02/DRAFT_LRLU_3000_36x66%2020220201.pdf), May 2024.

<sup>36</sup> City of Manassas, Manassas Zoning and Parcel Map App. Accessed: <https://cityofmanassas.maps.arcgis.com/apps/webappviewer/index.html?id=5435b6acfd274042a95914ad9ae97660>, May 2024.

that border the Airport in Prince William County are classified as A-1 Agricultural, M/T Industrial/Transportation, and PBD Planned Business District<sup>37</sup> (see **Figure 9** for Manassas Zoning and **Figure 10** for Prince William County Zoning).

### 1.3.10 Natural Resources and Energy Supply

Statutes and EOs that are relevant to natural resources and energy supply include:

- » Energy Independence and Security Act (42 U.S.C. § 17001 et seq.);
- » Energy Policy Act (42 U.S.C. § 15801 et seq.);
- » EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management* (72 FR 3919); and
- » EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance* (74 FR 52117).

Natural resources (e.g., water, asphalt, aggregate, etc.) and energy use (e.g., fuel, electricity, etc.) at an airport are a function of the needs of aircraft, support vehicles, airport facilities, support structures, and terminal facilities. Airport personnel and tenants regularly use consumable materials to maintain various airside and landside facilities and services. Those materials may include asphalt, concrete, aggregate for sub-base materials, various metals associated with such maintenance, and fuels associated with the operation of aircraft and vehicles.

Energy use at the Airport is primarily in the form of electricity required to operate Airport-related facilities (e.g., terminal building, hangars, airfield lighting) and fuel for aircraft, aircraft support vehicles/equipment, and Airport maintenance vehicles/equipment. Electrical power is necessary to keep the Airport operational and safe. Electrical power is provided by The City of Manassas through a cooperative agreement with Dominion Power to the Airport.<sup>38</sup> The City of Manassas Utilities Department provides water and Prince William County Service Authority provides sewer services.<sup>39</sup> Water is drawn from the Potomac River and Lake Manassas and is treated at either Fairfax Water's James J. Corbalis, Jr. Water Treatment Plant or the City of Manassas' water treatment plant.<sup>40</sup> Lake Manassas is located approximately seven miles northwest of the Airport and the Potomac River is about 18 miles southeast of the Airport. Washington Gas Company provides natural gas services to Prince William County and the City of Manassas.<sup>41</sup> None of the natural resources the Airport uses or has used are in rare or short supply.

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<sup>37</sup> Prince William County, County Mapper, Zoning. Accessed: <https://gisweb.pwcgov.org/webapps/CountyMapper/>, March 2024.

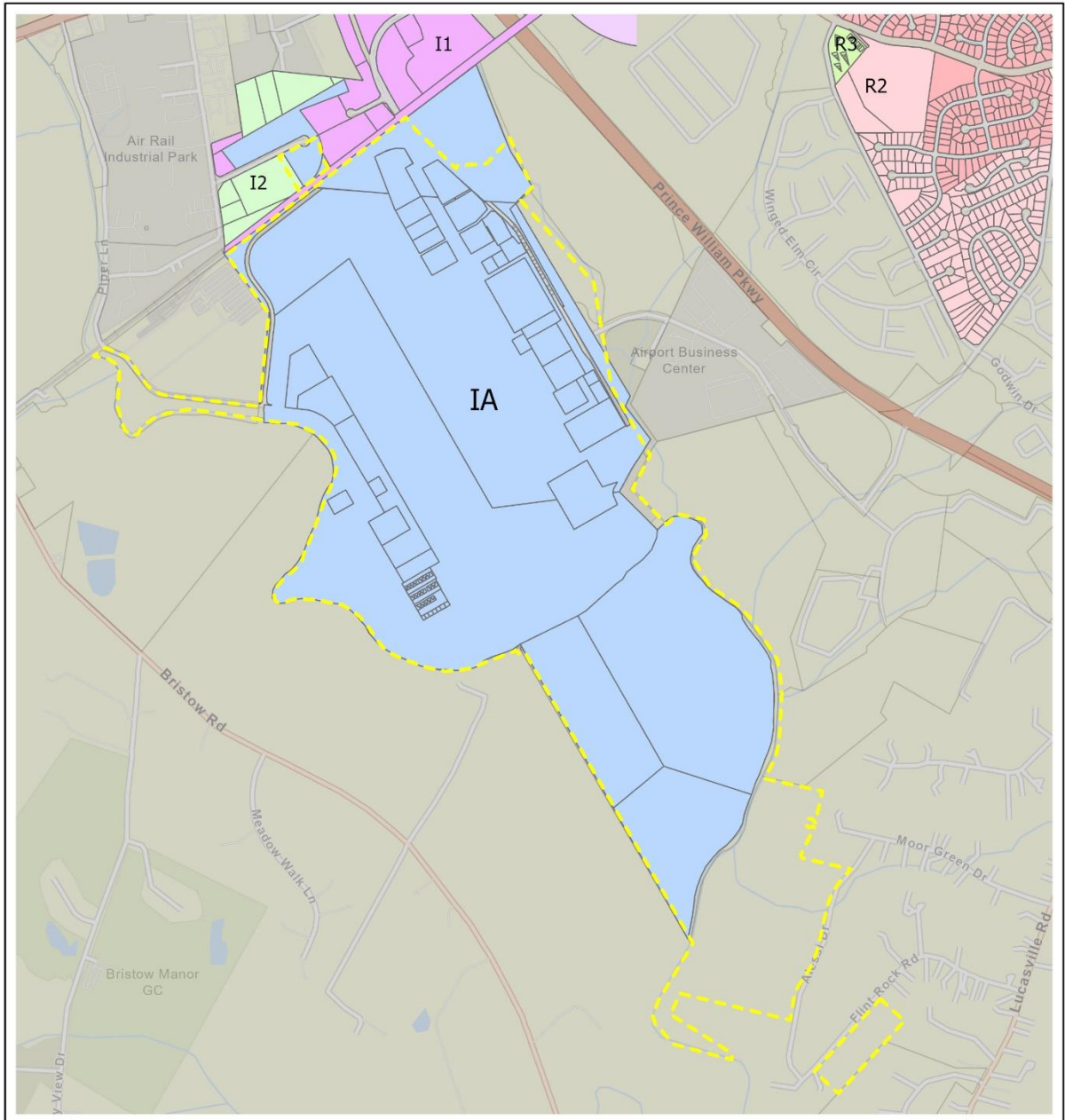
<sup>38</sup> Dominion Power. Service Territories. Accessed: <https://www.dominionenergy.com/economic-development/virginia/service-area-locator> June 2024.

<sup>39</sup> Prince William County. Service Authority. Accessed: <https://www.pwcsa.org/who-we-are/about-us> June 2024.

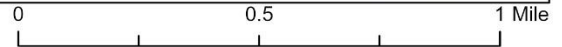
<sup>40</sup> Prince William County. Water Sources and Quality. Accessed: <https://www.pwcsa.org/water-quality-faq> June 2024.

<sup>41</sup> Washington Gas Company. Service Territory. Accessed: [https://www.washingtongas.com/services/contractors/service-territory? ga=2.159014714.1033685967.1719865293-2101091560.1719865293& gl=1\\*158str5\\* gcl au\\*MTY1ODAxODAxODAxOS4xNzE5ODY1Mjkz\\* ga\\*MjEwMTA5MTU2MC4xNzE5ODY1Mjkz\\* ga\\_399BRKZ9LL\\*MTcxOTg2NTI15My4xLjEuMTcxOTg2NTMyMy4zMC4wLjA](https://www.washingtongas.com/services/contractors/service-territory? ga=2.159014714.1033685967.1719865293-2101091560.1719865293& gl=1*158str5* gcl au*MTY1ODAxODAxODAxOS4xNzE5ODY1Mjkz* ga*MjEwMTA5MTU2MC4xNzE5ODY1Mjkz* ga_399BRKZ9LL*MTcxOTg2NTI15My4xLjEuMTcxOTg2NTMyMy4zMC4wLjA) June 2024.

**FIGURE 9 ZONING CLASSIFICATIONS ON AIRPORT PROPERTY AND SURROUNDING AREAS OF MANASSAS**



Sources: ESRI 2024; RS&H 2024

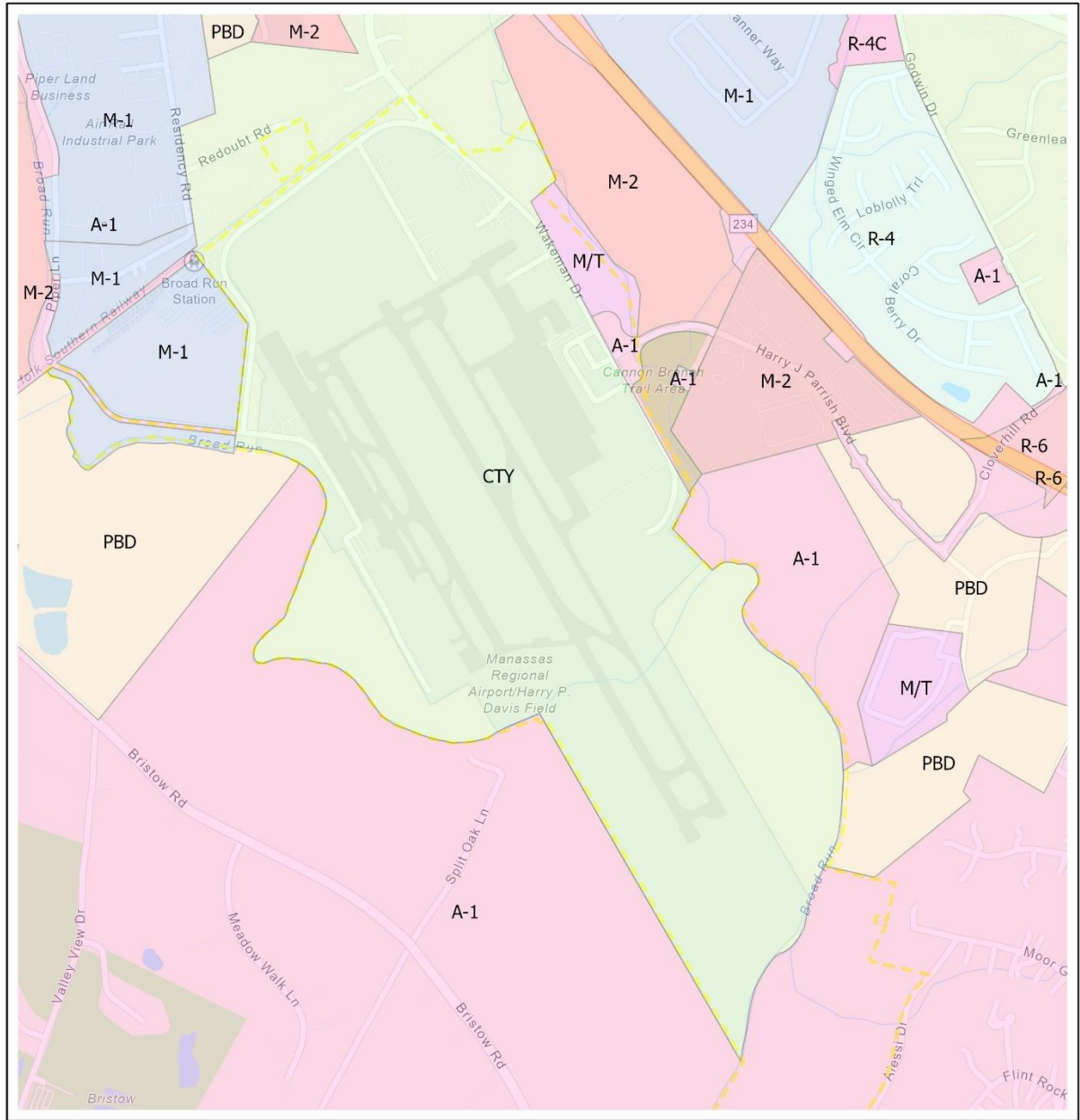


**Legend**

- I1: Light Industrial
- I2: Heavy Industrial
- IA: Airport District
- R1: Low Density, Single Family Residential District
- R2: Moderate Density, Single Family Residential District
- R2S: Small Lots, Single Family
- R3: Townhouses
- Prince William County
- Airport Property



**FIGURE 10 ZONING CLASSIFICATIONS IN SURROUNDING AREAS OF PRINCE WILLIAM COUNTY**



Sources: Prince William County 2024; ESRI 2024; RS&H 2024

**Legend**

- A-1 Agricultural
- PBD Planned Business District
- CTY City of Manassas
- R-4 Suburban Residential Center
- M-1 Heavy Industrial
- R-4C Suburban Residential Cluster Development
- M-2 Light Industrial
- R-6 Suburban Residential
- M/T Industrial/Transportation
- Airport Property Boundary



### 1.3.11 Noise and Noise-Compatible Land Use

Statutes and EOs relevant to noise and noise-compatible land use include:

- » The Control and Abatement of Aircraft Noise and Sonic Boom Act of 1968 (49 U.S.C. § 44715)
- » The Noise Control Act of 1972 (42 U.S.C. §§ 4901-4918)
- » Aviation Safety and Noise Abatement Act of 1979 (49 U.S.C. § 47501 et seq.)
- » Airport and Airway Improvement Act of 1982 (49 U.S.C. § 47101 et seq.)
- » Airport Noise and Capacity Act of 1990 (49 U.S.C. §§ 47521-47534, §§ 106(g))
- » Section 506 of the FAA Modernization and Reform Act of 2012, *Prohibition on Operating Certain Aircraft Weighing 75,000 Pounds or Less Not Complying with Stage 3 Noise Levels* (49 U.S.C. §§ 47534); and
- » State and local noise laws and ordinances.

Day-Night Sound Level (DNL) is based on sound levels measured in relative intensity of sound (decibels or dB) on the “A-weighted scale” or dBA over a time-weighted average normalized to a 24-hour period.<sup>42</sup> DNL has been widely accepted as the best available method to describe aircraft noise exposure. The USEPA identifies the DNL as the principal metric for airport noise analysis. The FAA requires DNL as the noise descriptor for aircraft noise exposure analysis and noise compatibility planning. DNL levels are commonly shown as lines of equal noise exposure, like terrain contour maps, referred to as noise contours. All residential areas are considered compatible with cumulative noise levels below DNL 65 dB.

There are rural and residential land uses near the Airport. These areas are sensitive to aircraft noise associated with the Airport. However, most of the development around the Airport is industrial and commercial. The designated noise-sensitive area east and south of the Airport is not within the existing DNL 65 dBA noise contour. See **Figure 11** for existing 2019 noise contours at the Airport.

According to the City, the noise-sensitive area is designated by historically having the most concentration of noise comments.<sup>43</sup> The Airport has a voluntary noise program (i.e., FAA Part 150) that is comprised of suggestions for pilots to follow when it is safe and possible to do so. For flight training, instructors are recommended to teach their students the Airport’s noise abatement procedures, including pilots, during their biennial flight reviews. The Airport advises all flight operations that the preferred way to avoid the noise-sensitive area is to follow major roads and railroad tracks near the Airport, see **Figure 12 , 13, and 14**. A map of these routes is available on the Airport’s website and in the Airport Director’s Office. The Airport also has arrival and departure procedures that divert traffic around the noise-sensitive area. Additionally, it is recommended that fixed-wing aircraft with carbureted engines utilize a 2,200 RPM setting while in the traffic pattern for any of the runways. Aircraft with fuel injection engines should use 2,100 RPM. These power settings help minimize aircraft engine noise as well as reduce fuel consumption. Helicopter operations are advised to maintain as high an altitude as practical and conduct as much of their descent within the Airport boundary as safe flight operations allow. Maintenance engine run-ups in designated areas nearby FBO’s and hangars are restricted to 7:00 AM to 10:00 PM, daily. Operations conducted after these hours must be submitted to the Airport Director for written approval.<sup>44</sup>

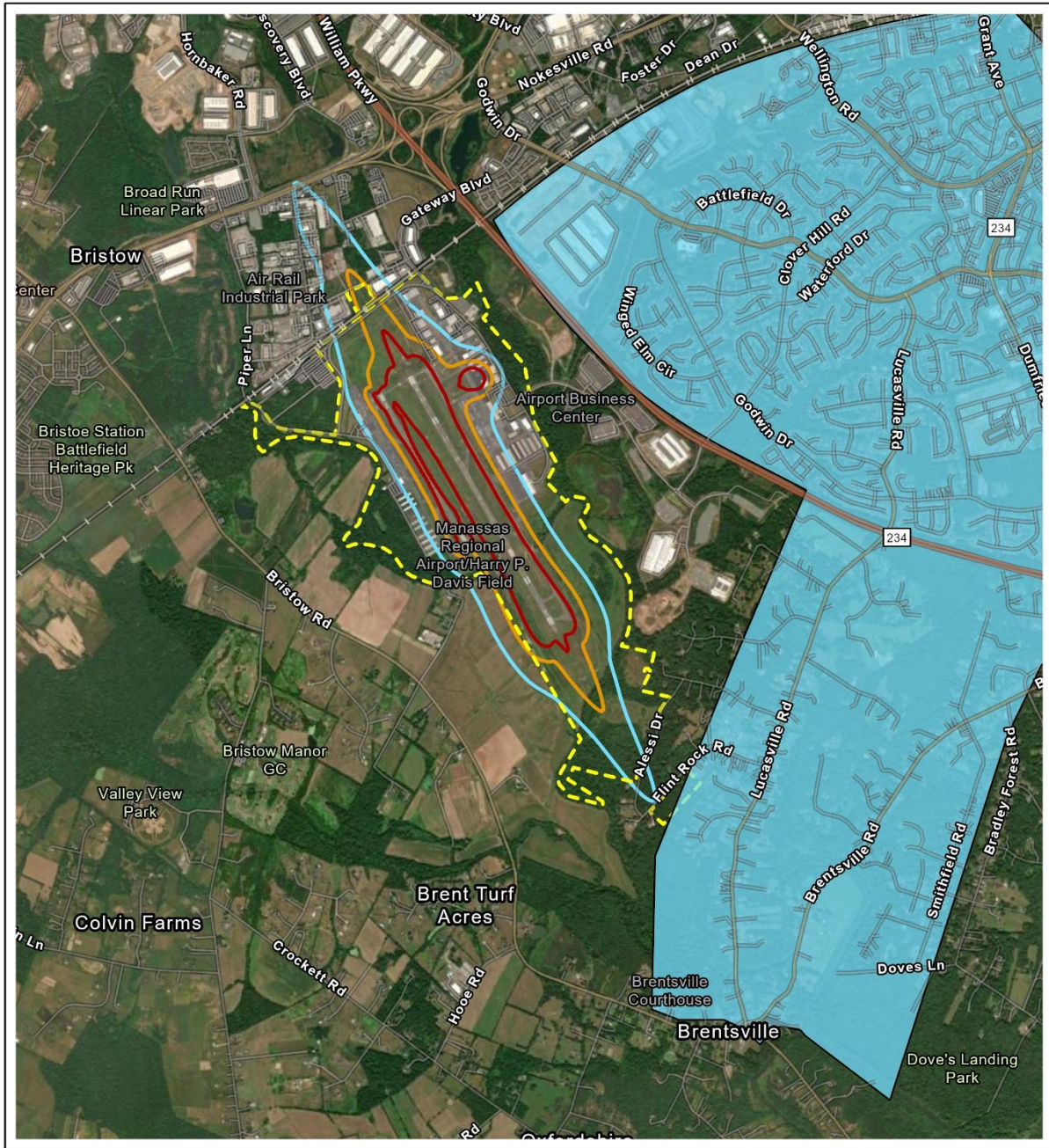
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<sup>42</sup> Federal Aviation Administration, *Technical Support for Day/Night Average Sound Level (DNL) Replacement Metric Research, Final Report*, June 14, 2011. Accessed: May 2024.

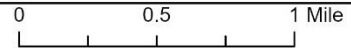
<sup>43</sup> Allabaugh, Richard, Airport Operations, Manassas Regional Airport. Personal Communication, May 2024.

<sup>44</sup> Manassas, Virginia, Airport, Noise Program. Accessed: [https://www.manassasva.gov/airport/noise\\_program.php](https://www.manassasva.gov/airport/noise_program.php), May 2024.

FIGURE 11 EXISTING AIRPORT NOISE CONTOURS



Sources: City of Manassas 2024; ESRI 2024; RS&H 2024

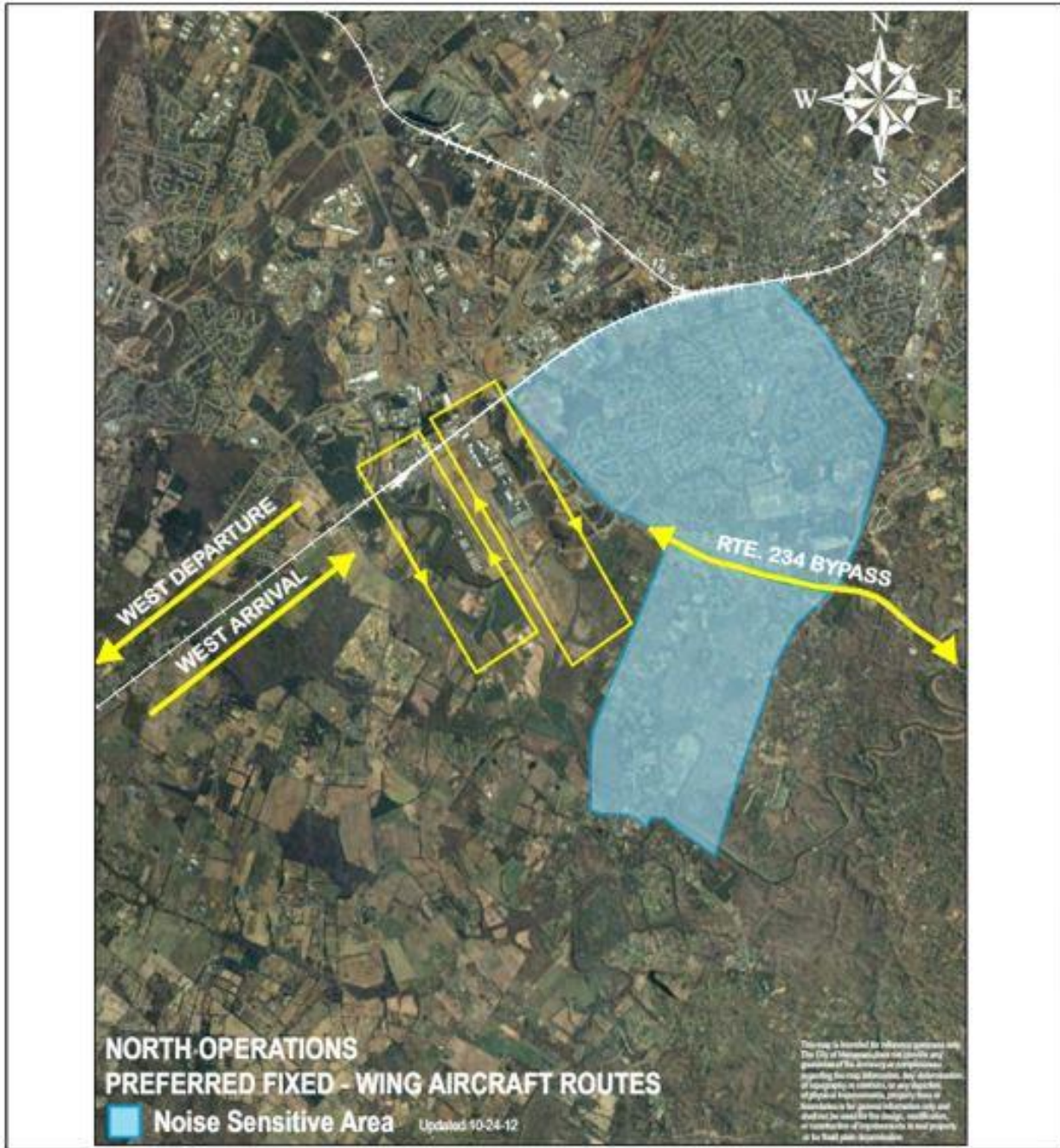


Legend

- 65 DNL
- 70 DNL
- 75 DNL
- Noise Sensitive Area
- Airport Property Boundary



FIGURE 12 NORTH OPERATIONS PREFERRED FIXED WING AIRCRAFT ROUTES AROUND NOISE SENSITIVE AREAS

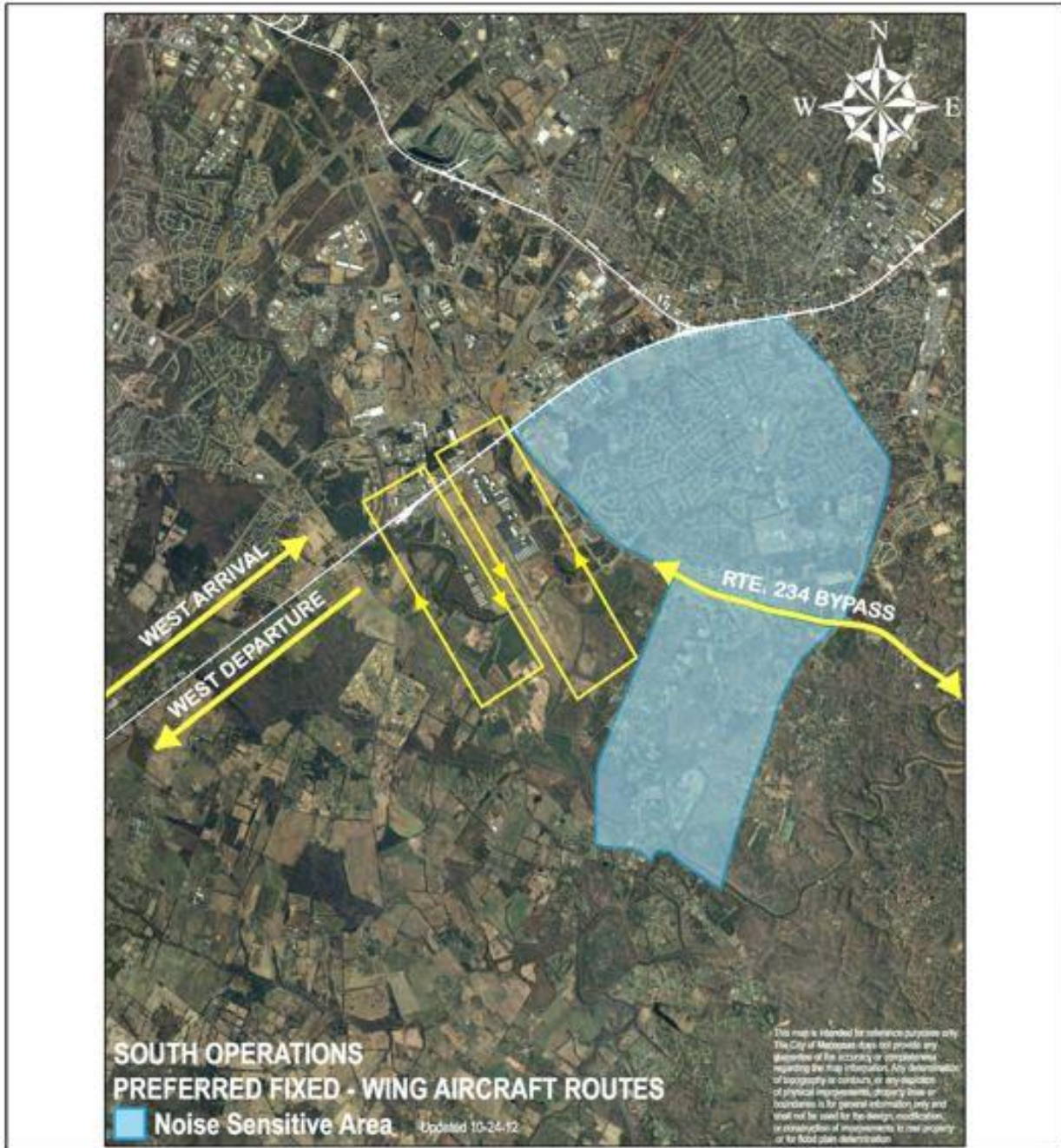


Legend

□ Aircraft Traffic Patterns



FIGURE 13 SOUTH OPERATIONS PREFERRED FIXED WING AIRCRAFT ROUTES AROUND NOISE SENSITIVE AREAS



Legend


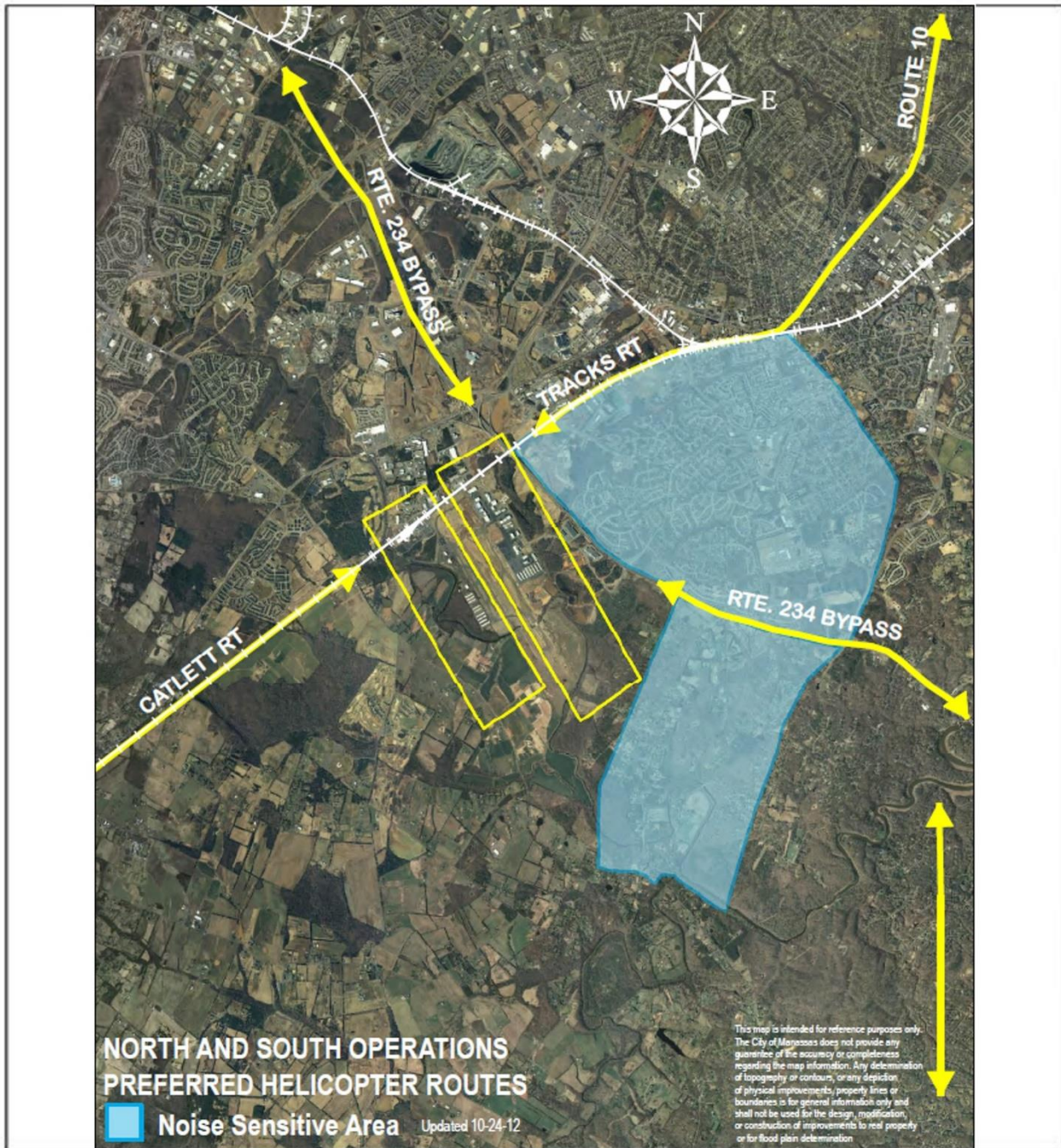
 Aircraft Traffic Patterns



FIGURE 14 NORTH AND SOUTH OPERATIONS PREFERRED HELICOPTER ROUTES AROUND NOISE SENSITIVE AREAS



Legend

□ Aircraft Traffic Patterns



### 1.3.12 Socioeconomic, Environmental Justice, and Children’s Environmental Health and Safety Risks

The primary considerations of socioeconomic analysis are the economic activity, employment, income, population, housing, public services, and social conditions of the area. The Uniform Relocation Assistance and Real Property Acquisitions Policy Act of 1970 (42 U.S.C. § 61 et seq.), implemented by 49 CFR Part 24, is the primary statute related to socioeconomic impacts. Statutes, EOs, memorandums, and guidance that are relevant to environmental justice and children’s environmental health and safety risks include:

- » Title VI of the Civil Rights Act, as amended (42 U.S.C. §§ 2000d-2000d-7);
- » EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629);
- » Memorandum of Understanding on Environmental Justice and EO 12898;
- » USDOT Order 5610.2(a), *Environmental Justice in Minority and Low-Income Populations* (77 FR 27534);
- » CEQ Guidance: *Environmental Justice: Guidance Under the National Environmental Policy Act*;
- » Revised USDOT Environmental Justice Strategy (77 FR 18879); and
- » EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks* (62 FR 19885).

The Airport is located entirely within U.S. Census Tract 9104.2. This census tract was used to describe the Airport area’s socioeconomic and environmental justice characteristics compared to the City of Manassas and the State of Virginia (see **Table 6**).

**TABLE 6 SOCIOECONOMIC AND ENVIRONMENTAL JUSTICE CHARACTERISTICS**

Characteristic	Census Tract 9104.02	City of Manassas	Virginia
Total Population	6,112	42,772	8,631,393
Percent Minority	45.9%	60.9%	39.7%
Percent Living Below the Poverty Level	20.1%	14.9%	14.1%
Percent of the population below 18 Years of Age	23.9%	26.7%	19.1%
Total Housing Units	2,171	14,365	3,618,247
Persons per Household	2.25	3.0	2.4

Sources: U.S. Census Bureau, 2020 ACS 5-Year Estimates; U.S. Census Bureau, 2020 Decennial Census; Prepared by RS&H, 2024

Regarding children’s environmental health and safety risks, the closest school in Manassas to the Airport is George C. Round Elementary School, located about one-mile northwest of the Airport.<sup>45</sup> The school serves students in pre-kindergarten through fourth grade. The closest school in Prince William County is Victory Elementary School, about 2 miles northeast of the Airport. The school serves kindergarten through 5<sup>th</sup> grade.

<sup>45</sup> U.S. Environmental Protection Agency, NEPAassist, Schools. Accessed: <https://nepassisttool.epa.gov/nepassist/nepamap.aspx?wherestr=hef+airport>, May 2024.

### 1.3.13 Visual Effects

No federal statutory or regulatory requirement exists for adverse effects resulting from light emissions or visual impacts. FAA Order 1050.1F describes factors to consider within light emissions and visual resources/visual character. A project's potential impact from light emissions includes the annoyance or interference with normal activities and effects on the area's visual character due to light emissions, including the importance, uniqueness, and aesthetic value of the affected visual resources.

#### 1.3.13.1 Light Emissions

Various lighting features currently illuminate Airport facilities, such as the airfield (e.g., runways and taxiways), buildings, access roadways, automobile parking areas, and apron areas for the safe and secure movement of people and vehicles (e.g., aircraft, passenger cars, etc.). The closest light-sensitive area is a rural residential area about 1,200 feet southwest of Runway 34L.<sup>46</sup>

#### 1.3.13.2 Visual Resources and Visual Character

Structures at the Airport include, but are not limited to, fixed base operators, hangars, the air traffic control tower, and maintenance buildings. As previously described, the Airport is zoned as an Airport District. It is developed with a visual character that is consistent with this zoning. Some rural residential properties southwest of Runway 34L have a line of sight to Airport property; however, this line of sight is generally partially obscured by vegetation.

### 1.3.14 Water Resources

Water resources include wetlands, floodplains, surface waters, groundwater, and wild and scenic rivers. These resources typically function as a single, integrated natural system that is important in providing drinking water in supporting recreation, transportation and commerce, industry, agriculture, and aquatic ecosystems.

#### 1.3.14.1 Wetlands

Statutes and EOs that are relevant to wetlands include:

- » EO 11990, *Protection of Wetlands* (42 FR 26961);
- » Clean Water Act (33 U.S.C. §§ 1251-1387);
- » Fish and Wildlife Coordination Act (16 U.S.C. § 661-667d); and
- » USDOT Order 6660.1A, *Preservation of the Nation's Wetlands*.

The Clean Water Act defines wetlands as "...those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."<sup>47</sup> Wetlands have three necessary characteristics:

- » Water: the presence of water at or near the ground surface for a part of the year;

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<sup>46</sup> U.S. Environmental Protection Agency, NEPAassist. Accessed: <https://nepassisttool.epa.gov/nepassist/nepamap.aspx?wherestr=hef+airport>, May 1 2024.

<sup>47</sup> U.S. Environmental Protection Agency, Section 404 of the Clean Water Act. Accessed: <https://www.epa.gov/cwa-404/section-404-clean-water-act-how-wetlands-are-defined-and-identified>, June 2024.

- » Hydrophytic Plants: a preponderance of plants adapted to wet conditions; and
- » Hydric Soils: soil developed under wet conditions.

According to the USFWS National Wetland Inventory (NWI), wetlands are throughout the Airport property (see **Figure 15**).<sup>48</sup> Wetlands present at the Airport include Palustrine Forested and Palustrine Emergent wetlands, additionally, a 3.9 acre area on the west side of the Airport was surveyed for wetlands in April 2024. The survey showed no wetland features.

### 1.3.14.2 Floodplains

Statutes and EOs that are relevant to floodplains include:

- » EO 11988, *Floodplain Management* (42 FR 26951);
- » National Flood Insurance Act (42 U.S.C. § 4001 et seq.); and
- » U.S. Department of Transportation (USDOT) Order 5650.2, *Floodplain Management and Protection*.

Floodplains are "...lowland areas adjoining inland and coastal water which are periodically inundated by flood waters, including flood-prone area of offshore islands." Floodplains are often referred to as the 100-year floodplain instead of the one percent chance of a flood occurring in any given year. The USDOT Order 5650.2 outlines the policies and procedures for ensuring that proper consideration is given to the avoidance and mitigation of adverse floodplain impacts in agency actions, planning programs, and budget requests. Therefore, the objective is to avoid, to the extent practicable, any impacts within the 100-year floodplain. FEMA defines a "regulatory floodway" as "the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height."<sup>49</sup>

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) encompassing the Airport, portions of the Airport are within the 100-year floodplain and floodway, as well as the 500-year flood area (see **Figure 16**).<sup>50</sup>

### 1.3.14.3 Surface Waters

Statutes that are relevant to surface water include:

- » Clean Water Act (33 U.S.C. §§ 1251-1387);
- » Fish and Wildlife Coordination Act (16 U.S.C. § 661-667d); and
- » Rivers and Harbors Act (33 U.S.C. § 401 and 403).

Surface waters include areas where water collects on the ground's surface, such as streams, rivers, lakes, ponds, estuaries, and oceans.

<sup>48</sup> USFWS, National Wetlands Inventory. Accessed: <https://www.fws.gov/wetlands/data/mapper.HTML>, May 2024.

<sup>49</sup> Federal Emergency Management Agency, Glossary. Accessed: <https://www.fema.gov/about/glossary>, May 2024.

<sup>50</sup> FEMA, Flood Map Service Center, Flood Insurance Rate Map 51153C0159D (effective January 5, 1995), 51153C0157D (effective January 5, 1995). Accessed: <https://msc.fema.gov/portal/search#searchresultsanchor>, May 2024.

FIGURE 15 NWI WETLANDS AT AND IN THE VICINITY OF THE AIRPORT



**Legend**







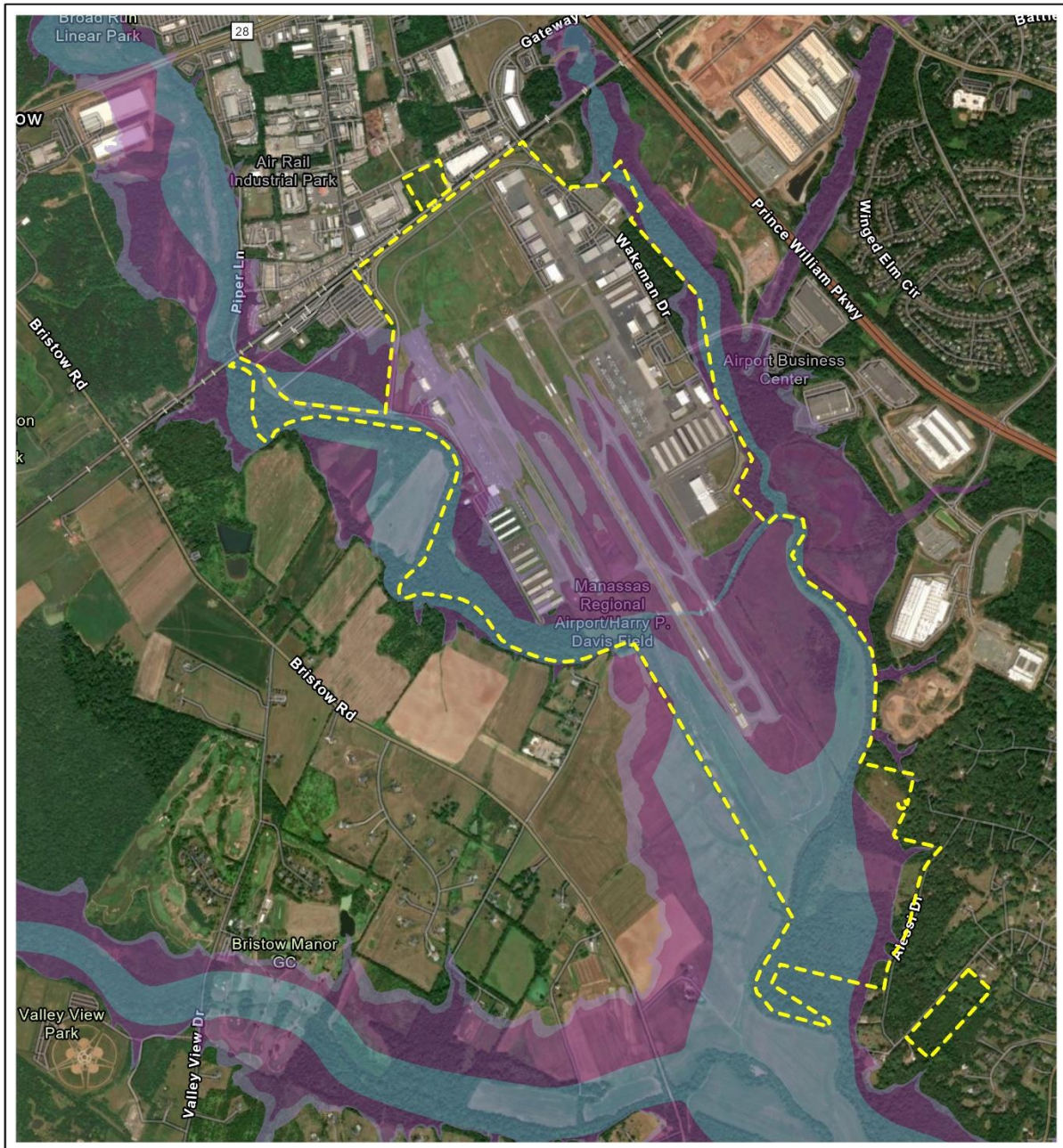
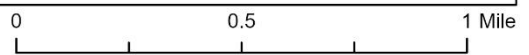
- |   |   |
|---|---|
|  Freshwater Emergent Wetland       |  Other                     |
|  Freshwater Forested/Shrub Wetland |  Riverine                  |
|  Freshwater Pond                   |  Airport Property Boundary |



FIGURE 16 FLOODPLAINS



Sources: FEMA 2024; ESRI 2024; RS&H 2024



**Legend**

- Airport Property Boundary
- 100-year Floodplain
- 500-year Floodplain
- Regulatory Floodway



Broad Run is on Airport property and has been tunneled underneath Runway 16L-34R. Cannon Branch is on the eastern side of the Airport before it intersects Broad Run east of Runway 16L-34R (see **Figure 17**).<sup>51</sup>

#### 1.3.14.4 Groundwater

Statutes relevant to groundwater include:

- » Safe Drinking Water Act (42 U.S.C. §§ 300(f)-300j-26).

Groundwater is “subsurface water that occupies the space between sand, clay, and rock formations.”<sup>52</sup> The Airport is within the Rocky Branch-Broad Run watershed (HUC 12 ID: 020700100504).<sup>53</sup>

The City draws water from Lake Manassas, the primary water source, and if needed, the Prince William County Service Authority, which draws water from the Potomac River.<sup>54</sup> The City uses the Prince William County Service Authority during peak consumption periods or in emergencies. According to the Virginia Department of Health – Office of Drinking Water, there are two public groundwater wells near the Airport at Broad Run Golf (PWS ID: 6153264) and Bristow Manor Golf Club (PWS ID: 6153041).<sup>55</sup>

#### 1.3.14.5 Wild and Scenic Rivers

Statutes relevant to wild and scenic rivers include:

- » Wild and Scenic Rivers Act (16 U.S.C. §§ 1271-1278).

Wild and scenic rivers are “outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations.”<sup>56</sup> There are no wild and scenic rivers or river segments within the Airport property.<sup>57</sup> The closest wild and scenic river, the White Clay Wild and Scenic River is over 110 miles northeast of the Airport. The closest river on the Nationwide River Inventory (NRI) is Bull Run, located 7 miles northeast of the Airport.<sup>58</sup>

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<sup>51</sup> U.S. Environmental Protection Agency, NEPAassist, Water Features, Streams. Accessed: <https://nepassisttool.epa.gov/nepassist/nepamap.aspx?wherestr=hef+airport>, May 2024.

<sup>52</sup> Federal Aviation Administration, *1050.1F Desk Reference*, Section 14.4 Groundwater.

<sup>53</sup> U.S. Environmental Protection Agency, NEPAassist, Water Features, Watersheds (HUC 12). Accessed: <https://nepassisttool.epa.gov/nepassist/nepamap.aspx?wherestr=hef+airport>, May 2024.

<sup>54</sup> City of Manassas, Annual Water Quality Report – Reporting Year 2020. Accessed: <https://www.manassasva.gov/Electric-Water-Sewer/Water%20Quality%20Reports/2020%20CCR%20Web%20Ready.pdf>, May 2024.

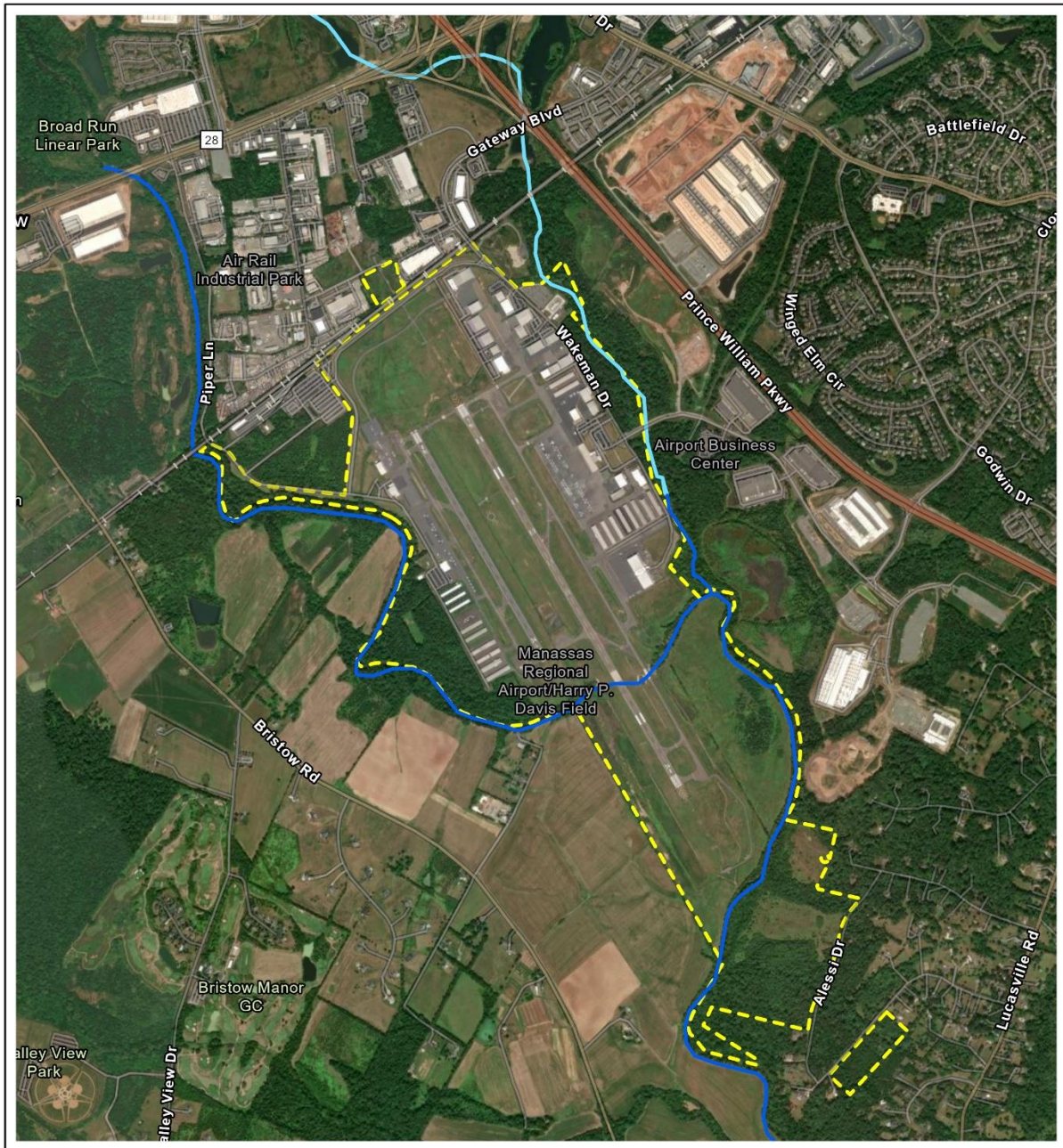
<sup>55</sup> Virginia Department of Health, Office of Drinking Water. Public Water System Database. Accessed: <https://www.vdh.virginia.gov/content/uploads/sites/14/2020/08/Water-07.21.2020.pdf>, May 2024.

<sup>56</sup> National Wild and Scenic Rivers System, About the WSR Act. Accessed: <https://www.rivers.gov/wsr-act.php>, May 2024.

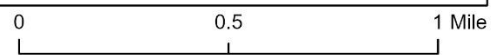
<sup>57</sup> U.S. Environmental Protection Agency, NEPAassist, Water Features, Wild and Scenic Rivers. Accessed: <https://nepassisttool.epa.gov/nepassist/nepamap.aspx?wherestr=Range+Regional+Airport%2C+Hibbing+MN>, May 2024.

<sup>58</sup> U.S. National Park Service, Interactive Map of Nationwide River Inventory. Accessed: <https://www.nps.gov/maps/full.html?mapId=8adbe798-0d7e-40fb-bd48-225513d64977>, May 2024.

FIGURE 17 SURFACE WATERS



Sources: NEPAassist 2024; ESRI 2024; RS&H 2024



**Legend**

- Cannon Branch
- Broad Run
- Airport Property Boundary



*APPENDIX B*

*RUNWAY LENGTH ANALYSIS*

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## 1.1 INTRODUCTION

Airplanes today operate in a variety of different environments and available field lengths. However, the suitability of those runway lengths is governed by the existing and forecast fleet mix, critical aircraft operational requirements, and the following variables:

- Airport elevation above mean sea level
- Mean maximum temperature
- Wind velocity
- Aircraft operating weights
- Takeoff and landing flap settings
- Effective runway gradient
- Runway surface conditions (dry, wet, contaminated, etc.)
- Operational use
- Presence of obstructions within the vicinity of the approach and departure path, and
- Locally imposed noise abatement restrictions and/or other prohibitions

The runway system at HEF is comprised of Runway 16R-34L with a length of 3,715 feet and Runway 16L-34R with a length of 6,200 feet. A runway length analysis was conducted for 16R-34L and found the existing length of 3,715 feet was adequate to accommodate critical aircraft operations operating on the runway during the planning period. According to FAA guidance, Advisory Circular 150/5325-4B, Runway Length Requirements for Airport Design, the “design objective for a primary runway is to provide a runway length for all airplanes that will regularly use it without causing operational weight restrictions”.

Given FAA guidance and an initial runway length analysis, Runway, 16L-34R, was selected as the primary runway to accommodate aircraft types operating at HEF. Justification for any runway length to meet the needs of turbine aircraft would require regular use on the order of a minimum of 500 annual itinerant operations. The suitability of available runway length at HEF was previously evaluated in the FAA approved 2002 Master Plan Update. Based upon the critical aircraft at the time, Learjet 60, a runway length between 6,400 and 6,500 feet was recommended. Despite the results of the runway length analysis, the City of Manassas elected to pursue a 500-foot extension providing a length of 6,200 feet as depicted on the ALP at the time.

To evaluate the length of Runway 16L-34R, it was necessary to determine the future critical aircraft’s runway length requirements in the absence of weight restrictions based on the FAA runway design criteria outlined in FAA AC 150/5325-4B – *Runway Length Requirements for Airport Design*.

## 1.2 RUNWAY LENGTH REQUIREMENTS FOR AIRPORT DESIGN

Advisory Circular 150/5325-4B provides the following five-step process to determine runway length requirements associated with the airport’s existing and future critical aircraft. The five steps include:

1. Identify the list of critical design aircraft that will make regular use of the proposed runway for an established period of at least five years.
2. Identify airplanes or family of airplanes that will require the longest runway lengths at maximum certified takeoff weight (MTOW).
3. Using Table 1-1 of AC 150/5325-4B and the airplanes identified in Step #2, determine the method that will be used for establishing the recommended runway length based upon useful load and service needs of critical design aircraft or family of aircraft.
4. Select the recommended runway length from among the various runway lengths generated in Step 3 using the process identified in Chapters 2, 3 or 4 of the Advisory Circular, as applicable.
5. Apply any necessary adjustment (i.e. pavement gradient, pavement conditions, etc.). Based upon this methodology, runway length requirements for Runway 16L-34R was determined.

### 1.2.1 Step 1 - Identification of Critical Design Aircraft

The AC provides the definition of critical design airplanes as the “listing of airplanes (or a single airplane) that would result in the longest recommended runway length”. Therefore, to complete Step 1, the FAA approved Aviation Activity Forecast and specific aircraft operations were assessed to develop a ten-year turbojet fleet mix.

For the purpose of this analysis, the following assumptions were made based upon information obtained from users and historical data:

1. The airport will continue to be classified as a general aviation reliever airport for Washington Dulles International Airport (IAD).
2. The number of ultra high-net worth individuals is expected to grow at rates exceeding those of previous years, creating new entrants into the market that can purchase a business jet or charter a flight. The business jet market is also being driven by a growing interest in long-range travel as borders continue to open around the world, with large jets offering the opportunity to fly further.<sup>1</sup>
3. Larger business-jet operations at HEF will continue to grow as forecasted in the Aviation Activity Forecast and aligns with the FAA’s Terminal Area Forecast as total operations at tower airports are forecasted to grow.
4. HEF’s historic jet fleet mix for 2021 operations provided the baseline data for the types and frequency of operations (**Table 1**). Average annual turbojet operations growth of 2.9% aligns with the FAA Aerospace Forecast 2022-2042.<sup>2</sup>
5. The more demanding aircraft currently operating at HEF incur operational constraints. There is evidence that some aircraft carry less than desirable fuel, passengers, payload, etc. to effectively

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<sup>1</sup> Business Airport International; *How Large Cabin Bizjets are Driving Change in Business Aviation*: <https://www.businessairportinternational.com/features/how-an-increasing-demand-for-larger-cabin-bizjets-is-driving-changes-in-aircraft-design.html>

<sup>2</sup> FAA Aerospace Forecast Fiscal Years 2022-2042: [https://www.faa.gov/sites/faa.gov/files/2022-06/FY2022\\_42\\_FAA\\_Aerospace\\_Forecast.pdf](https://www.faa.gov/sites/faa.gov/files/2022-06/FY2022_42_FAA_Aerospace_Forecast.pdf)

operate on the primary runway on higher temperature days. See **Section 1.3.2 – Operator Surveys** which substantiates these operations.

TABLE 1  
10-YEAR TURBOJET FLEET MIX

Turbojet ICAO Code	Aircraft Name	AAC-ADG	MTOW	Year													
				2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
C25B	Citation CJ3	B-II	13,870	419	254	464	478	492	507	522	538	554	571	588	606	624	
E55P	Phenom 300	B-II	17,968	208	141	400	412	424	437	450	464	478	492	507	522	538	
CL60	Challenger 601/650	C-II	48,200	421	306	360	371	382	394	406	418	431	444	457	471	485	
C525	Citation CJ1	B-I	10,600	310	217	326	336	346	357	368	379	390	402	414	427	440	
C56X	Citation Excel	B-II	20,000	261	170	252	260	268	276	285	294	303	312	322	332	342	
LJ60	Learjet 60	C-I	22,750	196	163	246	254	262	270	278	287	296	305	314	324	334	
CL30	Challenger 300	B-II	38,850	239	186	242	250	258	266	274	282	291	300	309	318	328	
C560	Citation Encore	B-II	16,830	240	124	232	239	246	254	262	270	278	287	296	305	314	
C550	Citation II	B-II	14,800	306	174	230	237	244	252	260	268	276	285	294	303	312	
H25B	Hawker 800	C-II	28,000	261	151	220	227	234	241	248	256	264	272	280	289	298	
E50P	Phenom 100	B-I	10,582	510	132	214	221	228	235	242	250	258	266	274	282	291	
BE40	Beechjet 400	B-I	15,780	240	201	200	206	212	219	226	233	240	247	255	263	271	
GLF4	Gulfstream IV/ G450	D-II	73,900	245	116	198	204	210	217	224	231	238	245	253	261	269	
FA50	Falcon 50	B-II	40,780	130	101	178	184	190	196	202	208	215	222	229	236	243	
C510	Citation Mustang	B-I	8,645	195	105	170	175	181	187	193	199	205	211	218	225	232	
LJ45	Learjet 45	C-I	21,500	127	49	152	157	162	167	172	177	183	189	195	201	207	
SF50	SF50 Vision Jet	A-I	6,000	95	109	152	157	162	167	172	177	183	189	195	201	207	
C68A	Citation Latitude	B-II	30,800	163	73	126	130	134	138	143	148	153	158	163	168	173	
C750	Citation X	B-II	36,100	87	75	114	118	122	126	130	134	138	143	148	153	158	
F900	Falcon 900 EX	B-II	49,000	149	47	108	112	116	120	124	128	132	136	140	145	150	
C501	Citation I	B-I	11,850	68	63	100	103	106	110	114	118	122	126	130	134	138	
PC24	Pilatus PC-24	A-II	18,000	21	65	88	91	94	97	100	103	106	110	114	118	122	
C680	Citation Sovereign	B-II	30,300	102	54	88	91	94	97	100	103	106	110	114	118	122	
CL35	Challenger 350	C-II	40,600	89	52	86	89	92	95	98	101	104	108	112	116	120	
E135	Embraer ERJ-135	C-II	41,888	77	84	84	87	90	93	96	99	102	105	109	113	117	
GLF5	Gulfstream V/G500	C-III	90,500	52	35	80	83	86	89	92	95	98	101	104	108	112	
F2TH	Falcon 2000/EX	B-II	42,400	186	41	80	83	86	89	92	95	98	101	104	108	112	
C25A	Citation CJ2	B-II	12,300	104	49	78	81	84	87	90	93	96	99	102	105	109	
EA50	Eclipse 500	A-I	5,950	105	43	72	75	78	81	84	87	90	93	96	99	102	
HDJT	Honda Jet	B-I	9,038	73	50	66	68	70	73	76	79	82	85	88	91	94	
C25C	Citation CJ4	B-II	17,110	51	42	66	68	70	73	76	79	82	85	88	91	94	
PRM1	Beech 390 Premier I	B-I	12,500	38	15	62	64	66	68	70	73	76	79	82	85	88	
E545	Embraer Legacy 450	B-II	35,759	18	14	62	64	66	68	70	73	76	79	82	85	88	
G150	Gulfstream G150	C-II	26,100	29	6	54	56	58	60	62	64	66	68	70	73	76	
LJ75	Learjet 75	C-II	21,500	52	16	34	35	37	39	41	43	45	47	49	51	53	
GLF3	Gulfstream III	C-II	69,700	48	47	34	35	37	39	41	43	45	47	49	51	53	
LJ35	Learjet 35	D-I	18,000	25	21	32	33	34	35	37	39	41	43	45	47	49	
C650	Citation III	C-II	22,000	64	13	32	33	34	35	37	39	41	43	45	47	49	

<b>G280</b>	Gulfstream G280	C-II	39,600	18	17	32	33	34	35	37	39	41	43	45	47	49
<b>GLEX</b>	Global 6000/Express	B-III	99,500	8	8	30	31	32	33	34	35	37	39	41	43	45
<b>ASTR</b>	Astra 1125	C-II	35,650	49	24	30	31	32	33	34	35	37	39	41	43	45
<b>C25M</b>	Citation M2	B-I	10,700	74	76	28	29	30	31	32	33	34	35	37	39	41
<b>C55B</b>	Citation Bravo	B-II	14,800	7	10	22	23	24	25	26	27	28	29	30	31	32
<b>LJ40</b>	Learjet 40	C-I	21,000	10	4	20	21	22	23	24	25	26	27	28	29	30
<b>FA20</b>	Falcon 2000/EX	B-II	28,660	21	4	20	21	22	23	24	25	26	27	28	29	30
<b>GLF6</b>	Gulfstream G650	D-III	99,600	3	0	20	21	22	23	24	25	26	27	28	29	30
<b>LJ31</b>	Learjet 31	C-I	15,500	47	13	18	19	20	21	22	23	24	25	26	27	28
<b>GALX</b>	Galaxy 1126	D-II	35,650	42	14	18	19	20	21	22	23	24	25	26	27	28
<b>LJ55</b>	Learjet 55	C-I	19,500	9	16	16	17	18	19	20	21	22	23	24	25	26
<b>C700</b>	Citation Longitude	B-II	39,500	0	4	16	17	18	19	20	21	22	23	24	25	26
<b>GA6C</b>	G600	D-III	91,600	0	2	16	17	18	19	20	21	22	23	24	25	26
<b>FA10</b>	Falcon 10	B-I	18,740	33	8	12	13	14	15	16	17	18	19	20	21	22
<b>E550</b>	Embraer Legacy 500	C-II	38,360	7	7	10	11	12	13	14	15	16	17	18	19	20
<b>CRJ2</b>	CRJ-200	C-II	53,000	12	5	8	9	10	11	12	13	14	15	16	17	18
<b>FA7X</b>	Falcon 7X	B-III	70,000	17	9	6	7	8	9	10	11	12	13	14	15	16
<b>LJ70</b>	Learjet 70	C-II	21,750	4	4	6	7	8	9	10	11	12	13	14	15	16
<b>H25C</b>	Hawker 1000	B-I	31,100	8	11	6	7	8	9	10	11	12	13	14	15	16
<b>GL5T</b>	Global 5000	B-III	92,500	12	8	6	7	8	9	10	11	12	13	14	15	16
<b>SBR1</b>	Z-143	B-I	20,000	51	18	4	5	6	7	8	9	10	11	12	13	14
<b>E145</b>	Embraer ERJ-145	C-II	48,480	0	2	4	5	6	7	8	9	10	11	12	13	14
<b>E190</b>	Embraer 190	C-III	105,359	3	1	4	5	6	7	8	9	10	11	12	13	14
<b>H25A</b>	Bae HS 125	C-I	20,503	0	3	4	5	6	7	8	9	10	11	12	13	14
<b>WW24</b>	1124 Westwind I	C-I	23,500	11	14	2	3	4	5	6	7	8	9	10	11	12
<b>GL7T</b>	Global 7500	B-III	106,250	0	0	2	3	4	5	6	7	8	9	10	11	12
<b>LJ25</b>	Learjet 25	C-I	15,000	0	0	2	3	4	5	6	7	8	9	10	11	12
<b>LJ24</b>	Learjet 24	C-I	13,000	0	0	2	3	4	5	6	7	8	9	10	11	12
<b>Total</b>				<b>6,450</b>	<b>3,886</b>	<b>6,146</b>	<b>6,359</b>	<b>6,575</b>	<b>6,802</b>	<b>7,034</b>	<b>7,273</b>	<b>7,519</b>	<b>7,773</b>	<b>8,034</b>	<b>8,304</b>	<b>8,578</b>

Source: FAA Offload Data ; RS&H Analysis

### 1.2.2 Step 2 – Aircraft Requiring the Longest Runway Length at MTOW

Step 2 of FAA AC 150/5325-4B states: “identify the airplanes that will require the longest runway length at maximum certificated takeoff weight (MTOW). The methodology found in this step is based on the MTOW of the aircraft types operating on a regular basis (minimum of 500 annual operations). **Table 1** provides the fleet mix operations forecast and MTOW. The Advisory Circular groups aircraft into three weight categories”

- » Small aircraft – MTOW 12,500 pounds or less. Aircraft in this category can range from ultralight to small turboprop aircraft. Aircraft within the small aircraft category were not evaluated as the runway lengths at HEF allow these aircraft to takeoff at MTOW without weight restrictions.
- » Large aircraft – MTOW over 12,500 pounds but less than 60,000 pounds. This group is further categorized by “75 percent of fleet” and “100 percent of fleet”. The Challenger 300, Citation Excel, and Citation I are small and mid-size business jets within the “75 percent of fleet” category which operate at HEF. Aircraft in the “100 percent of fleet” category operating at HEF include the Citation X, Learjet 60 and Falcon 900.
- » Individual large Airplanes – MTOW over 60,000 pounds. When MTOW of the operating aircraft is over 60,000 pounds, the recommended runway length is determined by referencing performance charts in each airplane manufacturer’s Airport Planning Manual (APM).

The fleet mix depicted in **Table 1** confirms the majority of jet aircraft operating at HEF fall within large aircraft category with a MTOW over 12,500 pounds but less than 60,000 pounds.

### 1.2.3 Step 3 – Airplane Weight Categorization for Runway Length Requirements

Step 3 of FAA AC 150/5325-4B directs airport sponsors to use Table 2 and the airplanes identified in Step 2 to determine the method that will be used for establishing the recommended runway length. The required runway length will be determined by a family grouping of large airplanes as determined by charts within the guidance.

**TABLE 2**  
**AIRPLANE WEIGHT CATEGORIZATION FOR RUNWAY LENGTH REQUIREMENTS**

Airplane Weight Category Maximum Certificated Takeoff Weight (MTOW)		Design Approach	Location of Design Guidelines	
12,500 pounds (5,670 kg) or less	Approach Speeds less than 30 knots	Family grouping of small airplanes	Chapter 2; Paragraph 203	
	Approach Speeds of at least 30 knots but less than 50 knots	Family grouping of small airplanes	Chapter 2; Paragraph 204	
	Approach Speeds of 50 knots or more	With Less than 10 Passengers	Family grouping of small airplanes	Chapter 2; Paragraph 205 Figure 2-1
		With 10 or more Passengers	Family grouping of small airplanes	Chapter 2; Paragraph 205 Figure 2-2
Over 12,500 pounds (5,670 kg) but less than 60,000 pounds (27,200 kg)		Family grouping of large airplanes	Chapter 3; Figures 3-1 or 3-2 <sup>1</sup> and Tables 3-1 or 3-2	
60,000 pounds (27,200 kg) or more or Regional Jets <sup>2</sup>		Individual large airplane	Chapter 4; Airplane Manufacturer Websites (Appendix 1)	

**Note**<sup>1</sup>: When the design airplane's APM shows a longer runway length than what is shown in figure 3-2, use the airplane manufacturer's APM. However, users of an APM are to adhere to the design guidelines found in Chapter 4.

**Note**<sup>2</sup>: All regional jets regardless of their MTOW are assigned to the 60,000 pounds (27,200 kg) or more weight category.

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

To determine the proper runway length for aircraft that have a greater MTOW than 12,500 pounds but less than 60,000 pounds, and are not regional jets, airport sponsors group similar aircraft together based on performance characteristics and operating weights. This grouping of aircraft is referred to as a family. The runway length recommended for this type of aircraft is then determined based on this family grouping. For this size of aircraft, FAA guidance groups them into the "75 percent fleet" and "100 percent fleet" mix. The breakdown of these aircraft operating at HEF over the next five years is divided into each of these groups in Table 3 and Table 4.

TABLE 3  
75 PERCENT OF FLEET MIX

Aircraft Name	AAC-ADG	MTOW	Year					
			2021	2022	2023	2024	2025	2026
Beechjet 400	B-I	15,780	200	206	212	219	226	233
Citation I	B-I	11,850	100	103	106	110	114	118
Beech 390 Premier I	B-I	12,500	62	64	66	68	70	73
Citation M2	B-I	10,700	28	29	30	31	32	33
Falcon 10	B-I	18,740	12	13	14	15	16	17
Citation Excel	B-II	20,000	252	260	268	276	285	294
Challenger 300	B-II	38,850	242	250	258	266	274	282
Citation Encore	B-II	16,830	232	239	246	254	262	270
Falcon 50	B-II	40,780	178	184	190	196	202	208
Citation Sovereign	B-II	30,300	88	91	94	97	100	103
Falcon 2000/EX	B-II	28,660	20	21	22	23	24	25
Citation Latitude	B-II	30,800	126	130	134	138	143	148
Citation Bravo	B-II	14,800	22	23	24	25	26	27
Learjet 45	C-I	21,500	152	157	162	167	172	177
Learjet 40	C-I	21,000	20	21	22	23	24	25
Learjet 31	C-I	15,500	18	19	20	21	22	23
Challenger 350	C-II	40,600	86	89	92	95	98	101
Citation III	C-II	22,000	32	33	34	35	37	39
Learjet 35	D-I	18,000	32	33	34	35	37	39
<b>75% Fleet Mix Total</b>			<b>1,902</b>	<b>1,965</b>	<b>2,028</b>	<b>2,094</b>	<b>2,164</b>	<b>2,235</b>

TABLE 4  
100 PERCENT OF FLEET MIX

Aircraft Name	AAC-ADG	MTOW	Year					
			2021	2022	2023	2024	2025	2026
Hawker 1000	B-I	31,100	6	7	8	9	10	11
Citation X	B-II	36,100	114	118	122	126	130	134
Falcon 900 EX	B-II	49,000	108	112	116	120	124	128
Falcon 2000/EX	B-II	42,400	80	83	86	89	92	95
Learjet 60	C-I	22,750	246	254	262	270	278	287
Learjet 55	C-I	19,500	16	17	18	19	20	21
Challenger 601/604/605/650	C-II	48,200	360	371	382	394	406	418
Hawker 800	C-II	28,000	220	227	234	241	248	256
Astra 1125	C-II	35,650	30	31	32	33	34	35
Galaxy 1126	D-II	35,650	18	19	20	21	22	23
<b>100% Fleet Mix Total</b>			<b>1,198</b>	<b>1,239</b>	<b>1,280</b>	<b>1,322</b>	<b>1,364</b>	<b>1,408</b>

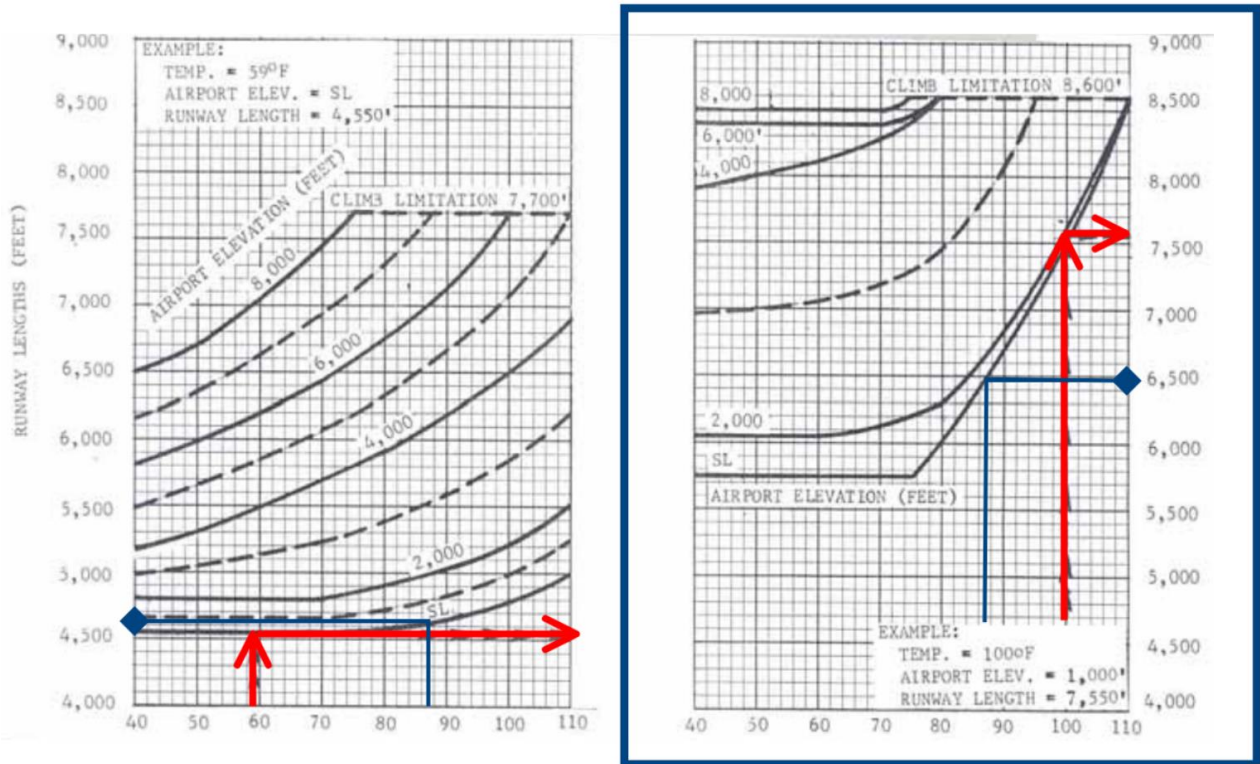
## 1.2.4 Step 4 – Select Recommended Runway Length

According to this analysis, the airport experienced 1,902 operations in the 75 percent fleet mix in 2021 with a projected 2,235 operations by 2026. The airport experienced 1,198 operations in the 100 percent fleet mix in 2021 with a projected 1,408 operations by 2026.

The 75 percent fleet mix contains most of the aircraft operations in 2021 and the forecasted five years. The aircraft that require the longest runway lengths at MTOW are in the 100 percent fleet mix. Therefore, the 75 percent fleet mix and 100 percent fleet mix were analyzed to determine the required runway length. The recommended length for 75 percent and 100 percent groups of airplanes is found in Chapter 3 of FAA AC 150/5325-4B – specifically in Figure 3-1 and Figure 3-2 respectively.

The 75 percent fleet mix and 100 percent fleet mix are further divided by a 60 percent useful load and 90 percent useful load. For the aircraft to operate with a lower useful load (60 percent), either the aircraft must operate at a lighter takeoff weight, requiring less cargo and passengers, or the aircraft must fly shorter distances in order to operate with a lower useful load. Consequently, aircraft operating with a 60 percent useful load, would be restricted to a limited number of markets before having to stop for refueling at a certain point in the journey. From operator surveys conducted on-airport (results of which are shared in Section 2.3.2) and flight tracking software, there is evidence confirming the existing runway length has resulted in payload restrictions during takeoff and flying shorter distances to refuel. The business aviation market in the DC area is experiencing significant growth, accompanied by a notable increase in flights exceeding 1,000 NM out of HEF. This trend suggests that business jet operations requiring a higher useful load of 90 percent will continue to increase in the planning period. Consequently, the analysis of runway length is best suited for the 90 percent useful load curve, making it the most suitable approach. Research conducted in this Master Plan update showed that this ability is necessary to meet the needs of the aircraft using HEF over the next 20-years and will also allow for flexibility in the GA fleet to serve larger aircraft. As noted in the Inventory and Facility Requirement Chapter the mean maximum temperature at the airport is 87 degrees Fahrenheit and field elevation is 192.3 feet above mean sea level. These respective reference points in the 75 percent of fleet mix and 100 percent fleet mix tables were utilized in determining the unadjusted runway length.

**FIGURE 1**  
**75 PERCENT FLEET MIX AT 60 AND 90 PERCENT USEFUL LOAD**



**Mean Daily Maximum Temperature of Hottest Month of the Year in Degrees Fahrenheit**

**75 percent of feet at 60 percent useful load**

**75 percent of feet at 90 percent useful load**

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

The blue line in Figure 1 represents the analysis completed as part of the master plan effort. The red line was included in the Advisory Circular for reference. Analysis of the 75 percent of fleet mix at 60 percent useful load resulted in a recommended runway length of 4,600 feet. Analysis of the 75 percent of fleet mix at 90 percent useful load resulted in a recommended runway length of 6,500 feet.

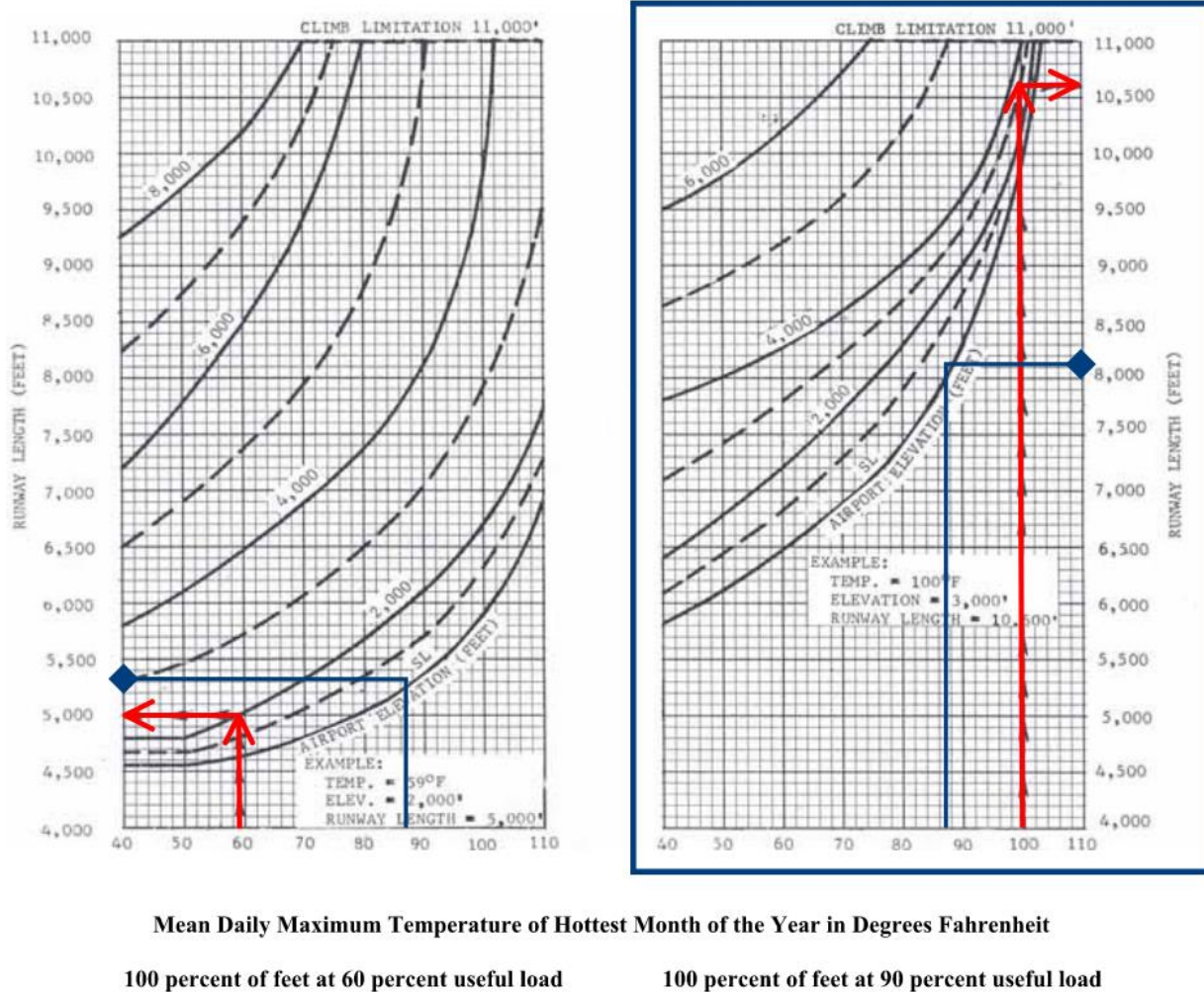
**TABLE 5**  
**75 PERCENT FLEET MIX UNADJUSTED RUNWAY LENGTH**

Accommodated Fleet	60% Useful Load	90% Useful Load
75% (Figure 3-1)	4,600'	6,500'

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

**FIGURE 2**  
**100 PERCENT OF THE FLEET AT 60 AND 90 PERCENT USEFUL LOAD**

**Figure 3-2. 100 Percent of Fleet at 60 or 90 Percent Useful Load**



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

The blue line in Figure 2 represents the analysis completed as part of the master plan effort. The red line was included in the Advisory Circular for reference. Analysis of the 100 percent of fleet mix at 60 percent useful load resulted in a recommended runway length of 5,300 feet. Analysis of the 100 percent of fleet mix at 90 percent useful load resulted in a recommended runway length of 8,100 feet.

**TABLE 6**  
**100 PERCENT FLEET MIX UNADJUSTED RUNWAY LENGTH**

Accommodated Fleet	60% Useful Load	90% Useful Load
100% (Figure 3-2)	5,300'	8,100'

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

### 1.2.5 Step 5 – Apply Necessary Adjustments

The final step to determine the required runway length is to apply any necessary adjustments to the runway lengths in Step 4. For the purposes of takeoff length, one adjustment must be applied to the unadjusted runway length. The runway gradient must be factored into the required runway length. To calculate the runway grade adjustment, both runway end elevations must be known. The runway lengths obtained from Step 4 are increased at a rate of 10 feet for each foot of elevation difference between the high and low points of the runway centerline. Based on the high and low points on Runway 16L-34R, the unadjusted lengths were increased by 150 feet.

**TABLE 7**  
**UNADJUSTED RUNWAY LENGTH**

Large Airplanes between 12,500 lbs and 60,000 lbs	Unadjusted Runway Length	Gradient Adjustment	Wet Conditions
75% fleet mix at 60% useful load	4,600'	4,750'	5,463'
<b>75% fleet mix at 90% useful load</b>	<b>6,500'</b>	<b>6,650'</b>	<b>7,000'</b>
100% fleet mix at 60% useful load	5,300'	5,450'	5,550'
<b>100% fleet mix at 90% useful load</b>	<b>8,100'</b>	<b>8,250'</b>	<b>8,250'</b>

Note: The runway lengths obtained from Tables 3-1 and 3-2 are increased at a rate of 10 feet for each foot of elevation difference between the high and low points of the runway centerline. The runway length for turbojet-powered airplanes obtained from the "60 percent useful load" tables are increased by 15 percent or up to 5,500 feet, whichever is less for wet conditions. The runway lengths for turbojet-powered airplanes obtained from the "90 percent useful load" curves are increased by 15 percent or up to 7,000 feet, whichever is less for wet conditions.

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

Based on both 75 percent and 100 percent fleet mix at 90% useful load, which are justified since there are over 500 operations in each category, HEF's primary runway is shorter than needed to adequately accommodate the critical aircraft users in both categories. To verify the analysis from the general curves and ensure a future extension is needed at HEF, a sample of individual aircraft manufacturer manuals for aircraft known to operate at HEF were reviewed for specific runway length needs. The required takeoff lengths and projected operations for the next five years are shown in **Table 8**.

**TABLE 8**  
**CRITICAL DESIGN AIRCRAFT FOR RUNWAY LENGTH RECOMMENDATIONS**

Aircraft Name	MTOW (LBS)	Takeoff Length at HEF	Total Operations		
			2021	2026	2031
<b>Embraer/ERJ-145</b>	48,480	6,476'	4	9	14
<b>Learjet 35</b>	18,000	6,404'	32	39	49
<b>Learjet 60</b>	22,750	6,404'	246	287	334
<b>Global 6000/Express</b>	99,500	6,464'	30	35	45
<b>Gulfstream 500</b>	90,500	6,642'	80	95	112
<b>Total</b>			<b>392</b>	<b>465</b>	<b>554</b>

Note 1: Individual Airport Planning Manuals referenced

Note 2: Airport Temperature: 87° F

Note 3: Airport Elevation: 192.3' MSL

Note 4: Effective Runway Gradient: 150 ft

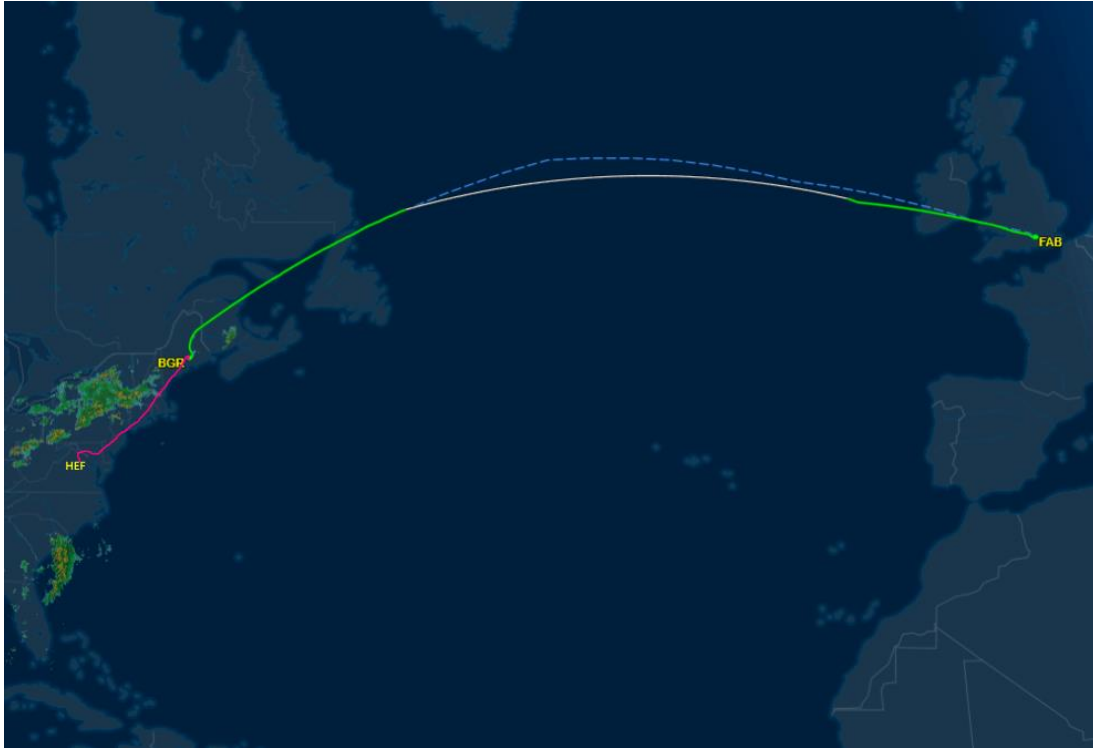
Additional details on the recommended runway length of 6,500 feet is provided in **Section 2.4 – Recommended Runway Length**.

## 1.3 CORRESPONDING VERIFICATION

### 1.3.1 Flight Tracking

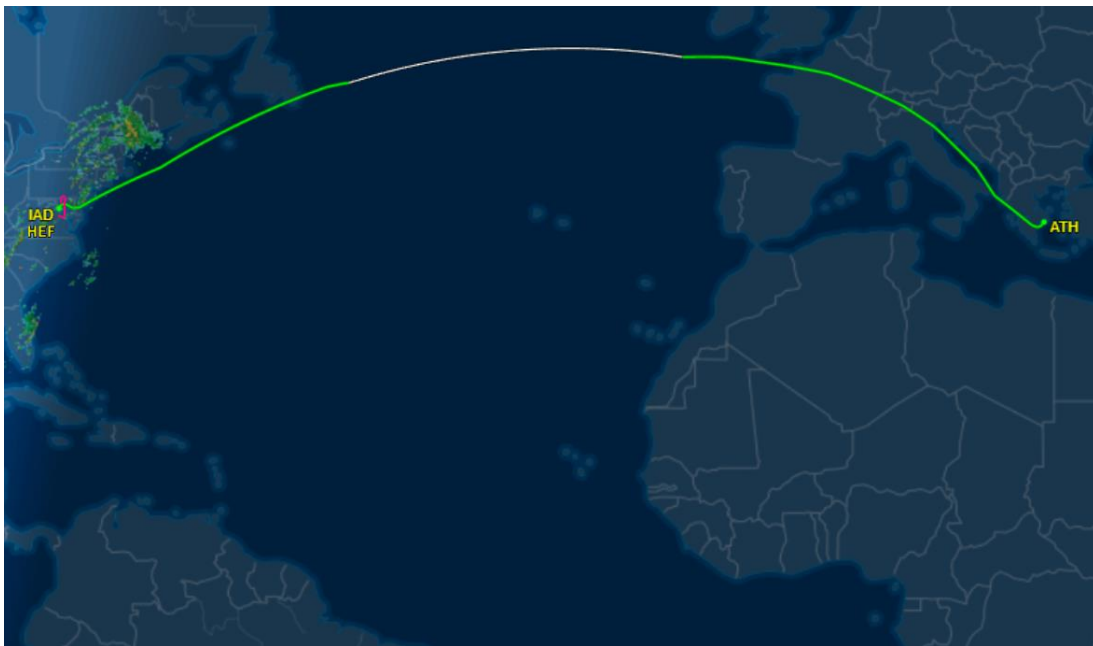
There is evidence of larger business jets repositioning to an airport with a longer runway prior to embarking on long-haul trips, indicative of MTOW. **Figure 3** depicts a trip by a Challenger 600 repositioning from HEF to Bangor International Airport (BGR) prior to flying over 3,150 nautical miles to Farnborough, England (FAB/EGLF). BGR has one runway with a length of 11,440 feet. Furthermore, **Figure 4** depicts a trip by a Gulfstream V repositioning from HEF to Washington Dulles (IAD) prior to flying over 4,500 nautical miles to Athens, Greece (ATH/LGAV). IAD has four runways with all runway lengths extending over 9,400 feet. Both flight operations occurred within the month of July and are indicative of summertime density altitudes resulting in restricted payloads.

**FIGURE 3**  
**CL60 TRIP: HEF TO BGR TO FAB/EGLF**



Source: Flightaware.com

**FIGURE 4**  
**GLF5 TRIP: HEF TO IAD TO ATH/LGAV**



Source: Flightaware.com

### 1.3.2 Operator Surveys

To support the need for the runway extension Airport staff conducted operator surveys of business jets to identify aircraft that have operated with restricted payloads or stopped to refuel due to the current runway length at HEF. Operators were asked to provide the number of annual operations to the best of their ability, however not all operations data was submitted to the Airport staff. Airport staff primarily focused survey efforts to the two FBOs and corporate tenants located on-airport. The results of the operator surveys are depicted in **Figure 5** and **Figure 6**.

**FIGURE 5**  
**CHANITILLY AIR – HEF RUNWAY LENGTH SURVEY**

**Manassas Regional Airport Runway Length Survey**

1. Please list the aircraft currently operated by you or your company out of Manassas Regional Airport, along with the aircraft's tail number:
  - N256GG: CL-300
  - N278PC: CL-300
  - N949MC: CL-605
  - N57MH: CL-605
  - N686GD: G-650
  - N614GG: CJ1
  - N881JJ: G-450
  - N881MJ: LR-45
  - N26NG: PC-12
2. What is the typical stage length (nm) flown out of Manassas Regional Airport for the aircraft listed above?
  - 1500-2000 NM average
3. What is the maximum stage length (nm) for the aircraft listed above?
  - 7500 NM
4. Have you experienced constrained (i.e. reduced payload for takeoff) operations while operating out of Manassas Regional Airport? Please provide more details on those constraints:
  - Yes- Summertime density altitudes restrict climb gradients for 16L/ 34R. Runway lengths restrict max fuel for Heavy category aircraft operated by Chantilly Air (G-650/ G-450).
5. Identify the number of annual operations at Manassas Regional Airport that required a reduced payload for takeoff because of the current runway length:
  - Approximately 10-12 operations a year have restricted payload for takeoff because of current runway length. Particularly in our Gulfstreams- international trip planning is restricted based off fuel capacity for necessary climb gradient.
6. Have you experienced an intermediate stop to refuel due to reduced payload constraints operating out of Manassas Regional Airport? Please provide more details on these instances:
  - Yes- see previous description.

Please provide your contact information in the event we have follow-up questions for you:

Name: Timothy Sullivan	Company: Chantilly Air, Inc.
E-mail: timsullivan@chantillyair.com	Phone: (571)370-9400

Source: HEF Operator Survey

**FIGURE 6**  
**FLIGHTWORKS – HEF RUNWAY LENGTH SURVEY**

**Manassas Regional Airport Runway Length Survey**

1. Please list the aircraft currently operated by you or your company out of Manassas Regional Airport, along with the aircraft's tail number: Challenger 605 N110CP
2. What is the typical stage length (nm) flown out of Manassas Regional Airport for the aircraft listed above? 1,000-3,000nm
3. What is the maximum stage length (nm) for the aircraft listed above? 4,000nm
4. Have you experienced constrained (i.e. reduced payload for takeoff) operations while operating out of Manassas Regional Airport? Please provide more details on those constraints: Yes, when it is hot or snowing, we have to restrict the amount of fuel or sometimes make a fuel stop.
5. Identify the number of annual operations at Manassas Regional Airport that required a reduced payload for takeoff because of the current runway length: About 12 or so per year
6. Have you experienced an intermediate stop to refuel due to reduced payload constraints operating out of Manassas Regional Airport? Please provide more details on these instances:  
This has only happened a few times in this aircraft. I do not have specific trips that I remember at this time.

Please provide your contact information in the event we have follow-up questions for you:

Name: Diego Bustamante	Company: FlightWorks
E-mail: diegob7@gmail.com	Phone: 240-505-1505

Source: HEF Operator Survey

## 1.4 RECOMMENDED RUNWAY LENGTH

The recommended future runway length is 6,700 feet (500-foot extension) as this length allows for an extension while limiting impact to environmental resources in conjunction with allowing more business jets to operate out of HEF without payload restrictions. Data supporting the recommended runway length is detailed in this section.

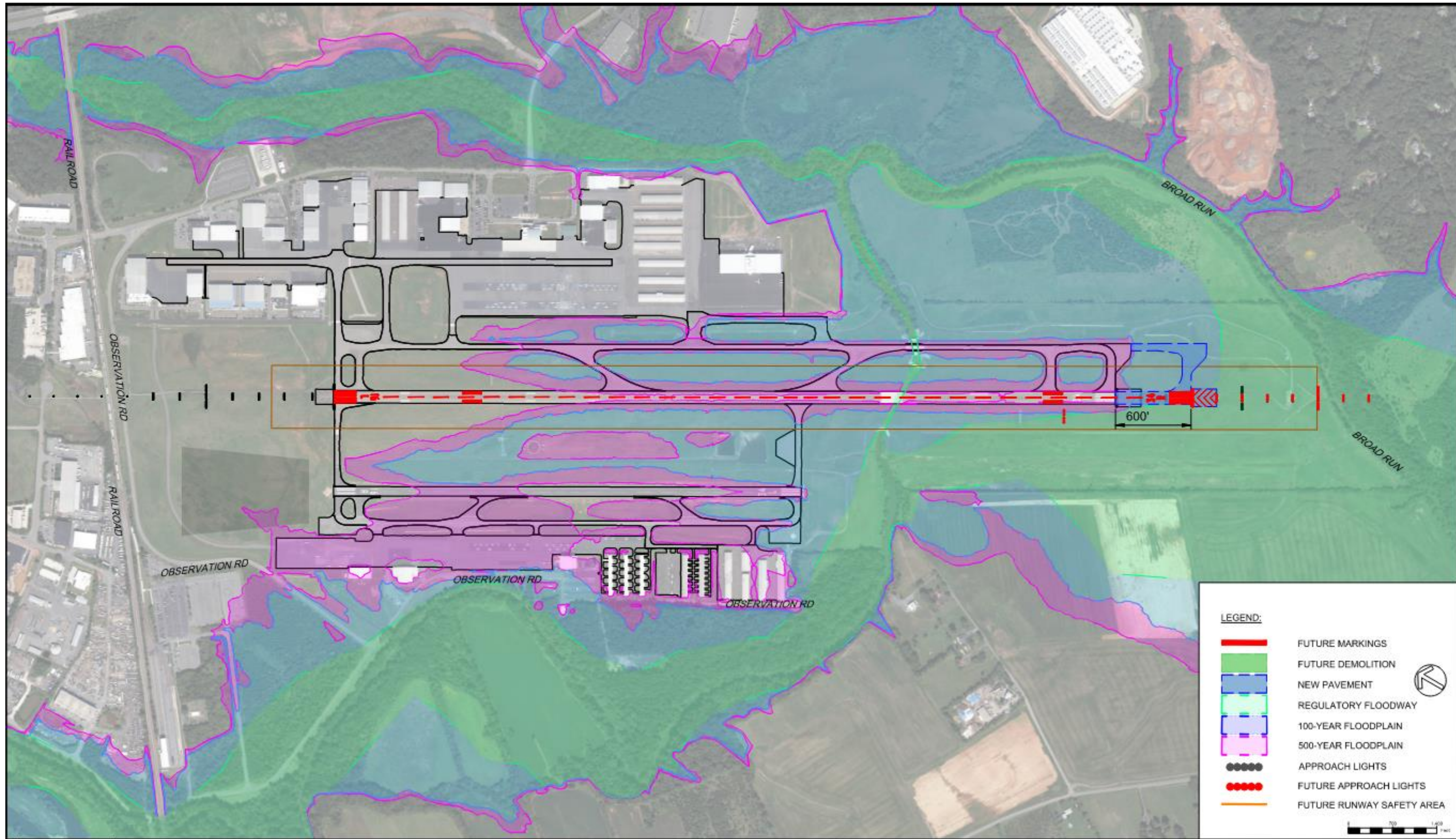
After following guidance in Advisory Circular 150/5325-4B, Section 2.2.5 reveals a maximum runway length of 8,250 feet can be rationalized for Runway 16L-34R. A final length of 8,250 feet would require an extension of 2,050 feet to accommodate the 100 percent fleet mix at 90% useful load that are restricted from operating at MTOW under hot weather conditions. The presence of Observation Road and Broad Run impose limitations on the possible length and direction of a runway extension. Airspace to the north and HEF's location in relation to the Washington DC Metropolitan Special Flight Rule Area (SFRA), as detailed in *Working Paper 2*, constrains the direction of an extension. The primary length constraint is attributed to the proximity of the extended runway's Runway Safety Area (RSA) to the surface variations presented by Broad Run. An RSA is defined as an area surrounding the runway consisting of a prepared surface suitable for reducing the risk of damage to aircraft in the event of an undershoot, overshoot, or excursion from the runway. RSA's must be cleared and graded with no potentially hazardous ruts, humps, depressions, or other surface variations while being capable of supporting Snow Removal Equipment, ARFF equipment, and the occasional aircraft without causing major damage to the aircraft. Considering the need to minimize significant airspace impact to the north, **Figure 7** depicts the maximum runway extension which could exist without the proposed RSA being impacted by Broad Run.

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) encompassing the Airport, currently Runway 16L-34R sits within the 500-year floodplain while the 100-year floodplain and regulatory floodway fall just outside of the Runway 34R blast pad. Preliminary investigation of a maximum 600-foot extension to Runway 16L-34R indicates approximately 124,700 square feet of the extended pavement (runway, blast pad, and taxiway) would fall in the 100-year floodplain. Approximately 27,300 square feet of the extended pavement (runway and blast pad) would fall in the regulatory floodway with the 600-foot extension. Executive Order (EO) 11988, *Floodplain Management*, and EO 13690, *Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input*, 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 floodway development where there is a practicable alternative.

Alternatively, a 500-foot extension to Runway 16L-34R was assessed since a runway length of 6,700 feet would accommodate a significant portion of business jets that have been payload restricted during hot weather conditions, reference **Table 8**, while limiting impacts to environmental resources. Although this alternative does impact environmental resources, it will have less environmental impact than a length of 6,800-feet. When considering the four principles of airport sustainability; Economic Viability, Operational Efficiency, Natural Resource Conservation, and Social Responsibility a runway length of 6,700 feet embodies the recommended and preferred runway length for Runway 16L-34R. A 6,700-foot runway meets the needs of 75 percent of the fleet at 90 percent useful load after gradient adjustments and all of

the 100 percent fleet mix at 60 percent useful load during the planning period while enhancing the level of service the airport provides to the flying public. The master plan Alternatives Chapter considered several established criteria and recommended a plan to meet the recommended runway length of 6,500-feet for Runway 16L-34R.

FIGURE 7  
 RUNWAY 16L-34R: 6,800 FT LENGTH



Source: RS&H Analysis

*APPENDIX C*  
*SUSTAINABILITY INITIATIVES*

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# 1 INTRODUCTION

This addendum to the Manassas Airport Master Plan Update 2022, presents common elements of successful airport sustainability programs and evaluates opportunities for Manassas Regional Airport (HEF, or Airport) to improve its sustainability performance.

FAA document AC 150-5070-6B, "Airport Master Plans" identifies a trend towards a greater focus on sustainability in airport master plans, and lists some common ways that airports seek to make their operations and services more sustainable through the master planning process. These include:

- » Maximizing linkages with public transportation to reduce private vehicle trips to the airport
- » Promoting recycling and waste minimization
- » Increasing energy efficiency
- » Using alternative and renewable energy sources
- » Seeking to reduce airport related emissions (i.e., criteria pollutants and greenhouse gas emissions)
- » Facilitating airport-related community and economic development, and
- » Increasing community engagement in the airport planning and development process.

Increasing public pressure and regulatory trends driven by climate change are creating both challenges and opportunities for airports, which are responding by working to increase the sustainability of their operations, as well as their resilience to climate impacts and other disruptions. The FAA's 2050 Net-Zero Climate Challenge, Airports Council International (ACI)'s net zero by 2050 goal, and Virginia's low emissions vehicle program (HB 1965) requirements to phase out the sale of gas and diesel vehicles by 2035 are examples of factors pushing airports to improve the sustainability of their operations.

Additionally, extreme weather events related to climate change can have the potential to cause power outages, flooding, and other disruptions, requiring resiliency planning to ensure continuity of operations.

## 1.1 Sustainability Benefits

Sustainability and resilience planning and preparation are gaining traction in the aviation sector. Integrating sustainability efforts, goals, and initiatives into a master plan offers a wide range of benefits to airports' economic, environmental, and social productivity and efficiency. Some of these benefits include increased competitiveness, reduced operating and life-cycle costs, greater utilization of assets, reduced environmental footprint, optimization of new and better technologies, improved benefits to and greater support from the community, and improved recruitment and retention of top talent, among others. Many of these benefits are interconnected, and the implementation of one sustainable practice can lead to multiple cross-sectional improvements.

For example, implementing energy-efficient lighting and HVAC systems can help reduce energy costs, while water-saving measures such as low-flow toilets and faucets can help reduce water bills. Not only do these efforts lead to cost-saving benefits, but they also reduce environmental footprint and can often lead to greater support from the community.

Overall, implementing sustainable practices can help airports reduce costs, improve their public image, comply with regulations, reduce their environmental impact, and improve the health and well-being of the surrounding community.

## 1.2 Resources and Guidance Documents

There are several resources that provide guidance for airports seeking to become more sustainable.

### 1.2.1 Airport Cooperative Research Program

The Airport Cooperative Research Program (ACRP) has published several reports related to airport sustainability including ACRP Report 80, “Guidebook for Incorporating Sustainability into Traditional Airport Projects”, ACRP Synthesis 10, “Airport Sustainability Practices”, and ACRP Synthesis 33 “Airport Climate Adaptation and Resilience”.

- » **ACRP’s Report 80, “Guidebook for Incorporating Sustainability into Traditional Airport Projects”** covers the necessary strategies and approaches to successfully incorporate sustainability into traditional airport projects. The report highlights two necessary elements in such efforts—a strong commitment to sustainability and a sustainability plan—before covering the time, budget, scope, and feasibility aspects of incorporating sustainability.
- » **ACRP’s Synthesis 10, “Airport Sustainability Practices”** lists and defines relevant environmental, economic, and social practices as they relate to airports’ operations and projects. This synthesis can be especially useful in the development of an airport’s sustainable practices and implementation, detailing specific and relevant initiatives for each category.
- » **ACRP’s Synthesis 33 “Airport Climate Adaptation and Resilience”** lists adaptation and reliance activities that can be undertaken at airports, outlining the process of Identify, Assess, Develop, Implement, and Monitor relating to risks and system modifications.

### 1.2.2 Virginia Airports Sustainability Management Plan

The 2016 Virginia Airports Sustainability Management Plan (VASMP) provides a framework for Virginia airports that engage in sustainability planning. Funded by FAA, the VASMP’s mission is to “cultivate an advanced and sustainable aviation system that is safe, secure, and provides for economic development, promote aviation awareness and education, and provide the safest and most efficient flight services for the Commonwealth leadership and state agencies”.

The Plan begins by identifying operational, development, and financial trends that may become threats to Virginia’s airports. The operational threats include larger aircraft sizes, aging of airport equipment and infrastructure, and reduced air travel demand for smaller airports. Development threats are listed as limited developable land, lagging demand, and difficulty accessing funding. The only financial threat listed is a decrease in fuel sales and hangar rental revenue. To combat these trends, VASMP identifies five sustainability focus areas for Virginia airports: Economic Performance, Airport Community, Energy and Emissions, Waste, and Natural Resources. The plan also proposes generalized sustainability goals which can be customized by individual airports.

**1.2.3 Sustainable Aviation Guidance Alliance Database**

The Sustainable Aviation Guidance Alliance (SAGA) Database was founded and led by a broad volunteer coalition of like-minded aviation interests. The mission behind this alliance was to consolidate existing information about sustainability in relation to airports and the aviation industry. It has five main components that make it a valuable tool to parties seeking to implement sustainable efforts into airport practices and projects: Share, Learn, Search, Plan, and Measure.

Share encompasses the addition of sustainable practices to the existing list, the editing of data, and the distributing of documents, links, and case studies. Learn refers to the offered ability to acquire shared materials on the database and find practical applications and methods for implementation. Search allows users to specifically seek sustainable practices that are meaningful and useful to the specific needs of an airport. Plan provides a framework to assist users in starting, implementing, improving, and maintaining sustainable practices. Measure provides guidance on how to measure progress in sustainability.

The SAGA database is particularly valuable for identifying sustainability best management practices (BMPs) that have been utilized by other airports. The BMPs can be a source of ideas for projects and initiatives that could potentially be implemented at HEF to improve its sustainability performance.

**2 ELEMENTS OF A SUSTAINABILITY PROGRAM**

Successful sustainability programs tend to share common elements that ensure the program has a clear direction and goals, data about the operational characteristics of the organization are available, goals have been formalized, initiatives have been developed to meet the goals, and an implementation plan is in place. These elements include a vision statement, focus areas, baseline data, SMART goals and targets, strategic initiatives, and implementation. This section will explain the meaning of each element and evaluate HEF’s status or performance relative to the element.

**2.1 Vision Statement**

Vision is the embodiment of what an organization aspires to be and is a catalyst for moving forward. A sustainability vision statement helps define what sustainability means to the airport and establish overall direction for its sustainability program. Once the vision is in place, goals and initiatives can be developed that align with the vision.

Sustainability can be defined in different ways, and the Vision that the Airport develops should be tailored to its needs and priorities. One common definition of sustainability is the Triple Bottom Line concept that shows sustainability at the intersection of environmental, economic, and social responsibility. In the aviation sector, many airports have adopted a modified version of the triple bottom line known as EONS (Economic Vitality, Operational Efficiency, Natural Resources, and Social Responsibility) which emphasizes the importance of efficient operations.

**FIGURE 1  
EONS SUSTAINABILITY FRAMEWORK**



Manassas Regional Airport has the following vision statement:

*“The Vision of the Manassas Regional Airport is to be a world class, innovative, thriving aviation gateway for the greater Washington, DC area, providing global access and economic opportunity for our customers and our community.”*

This statement contains elements that relate to the EONS framework. For example, “global access” and “customers and our community” speak to the Social Responsibility benefits contributed by the airport, while “economic opportunity” speaks to the Economic Vitality aspect of EONS. HEF’s vision statement does not address Natural Resource Conservation or Operational Efficiency.

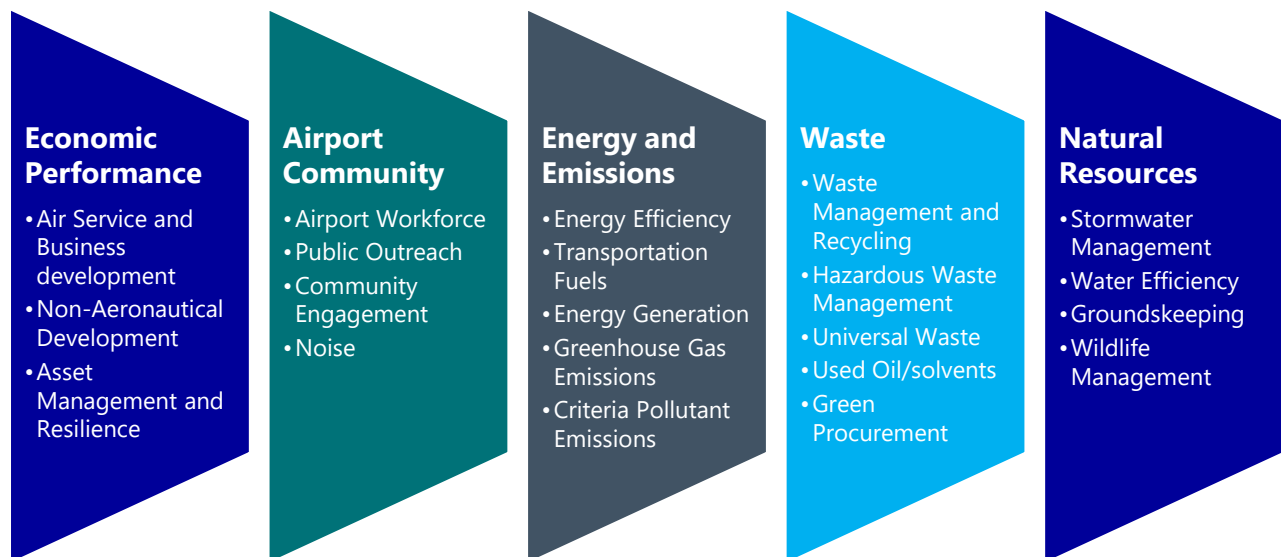
The Airport should consider developing a Sustainability Vision Statement that specifically establishes the direction for its sustainability program. The Sustainability Vision should align with the Airport’s overall vision while focusing on aspirations related to the four pillars of the EONS framework.

## 2.2 Focus Areas

Sustainability focus areas identify the Airport’s priorities and establish the scope of its efforts. Focus areas guide the development of goals and initiatives throughout an airport sustainability plan, and their selection should reflect an airport’s values. Some examples of focus areas include customer service, resource optimization, operational excellence, and financial stewardship.

The VASMP includes examples of focus areas that could be adopted by the Airport. These are economic performance, airport community, energy and emissions, waste, and natural resources. Each have their associated subcategories, as shown in **Figure 2**. In practice, different airports define focus areas and subcategories to meet their individual needs and priorities.

**FIGURE 2**  
**EXAMPLE FOCUS AREAS AND RELEVANT SUB-CATEGORIES**



## 2.3 Baseline

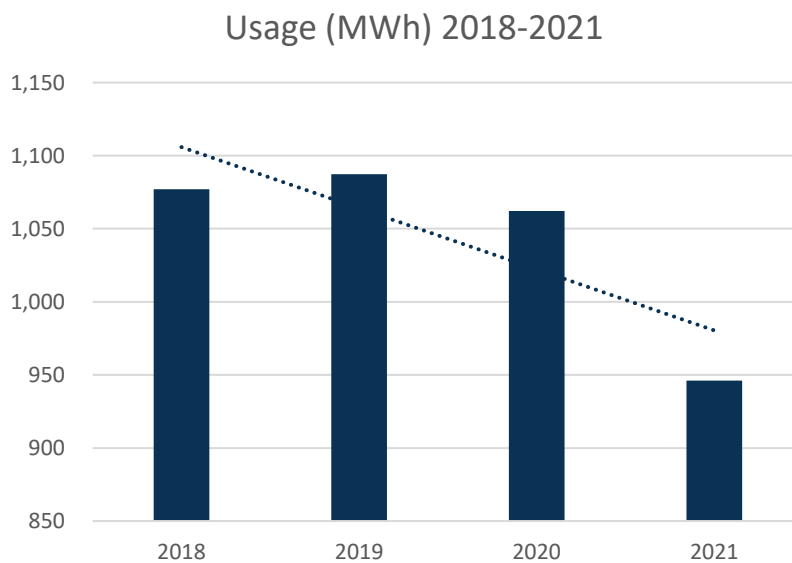
A baseline establishes current sustainability performance and provides a reference point for measuring future efforts. Because many airports' sustainability data is siloed in various departments, developing a baseline is a useful exercise that reveals the current performance of airport operations and provides data to calibrate the goals, develop initiatives, and measure progress against during the implementation phase. The baseline should include relevant operational data related to the airport's chosen focus areas. Typically, it would address energy usage in facilities, fleet fuel usage, and waste minimization as well as economic, social, and natural resources/environmental performance. Often, a sustainability baseline will also include a greenhouse gas (GHG) emissions inventory and/or a climate resilience element. The baseline is usually developed for a recent calendar year. It may also include several years of data in order to establish trends.

While extensive sustainability data collection and analysis is outside the scope of the master planning effort, a limited preliminary baseline was developed for operational categories in which data was readily available.

### 2.3.1 Electricity Usage

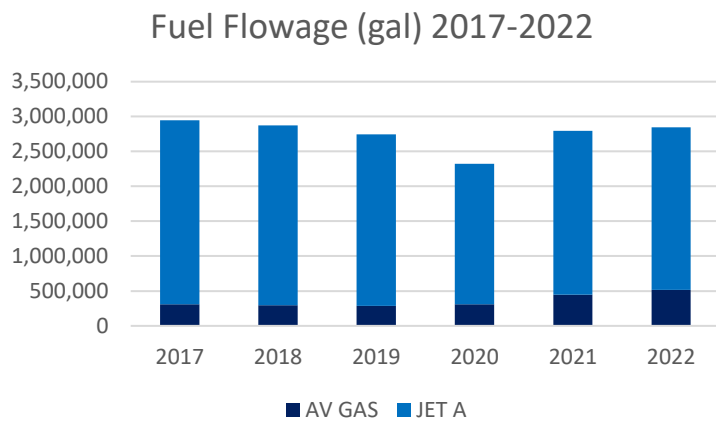
A Baseline for the airport's electricity usage was developed from utility bills provided by the airport. The analysis shows a generally declining trend in electricity consumption at the airport from 1,077 megawatt

**FIGURE 3**  
**ELECTRICITY CONSUMPTION AT MANASSAS AIRPORT, 2018-2021**



hours (MWh) in 2018 to 946 MWh in 2021. Electricity consumption decreased despite operations increasing from 79,930 in 2018 to 105,617 in 2021. While energy use can vary from year to year due to weather and other factors, this trend may also reflect energy conservation measures and efficiency upgrades at the Airport. At the same time, the average rate the Airport is paying for electricity has increased, so costs increased despite the lower consumption.

**FIGURE 4**  
**FUEL FLOWS AT MANASSAS REGIONAL AIRPORT, 2017-2022**



### 2.3.2 Fuel Flowage

**Figure 3** reflects fuel flowage data<sup>1</sup> at HEF Regional Airport from the years 2017 to 2022. Totals for 2022 included 2,845,161 gallons of fuel, 82% of which was Jet A fuel and 18% of which was Aviation Gasoline. Data was not available for Gasoline and Diesel fuel used for ground-operated vehicles. From 2017, HEF has experienced a 66% increase in Aviation Gas flowage, and a 12% decrease in Jet A fuel. Overall, the airport experienced a 3% decrease in fuel flowage between the years of 2017 and 2022.

### 2.3.3 Waste Management

The management and disposal of waste at an airport has considerable impacts on finances, operations, environmental well-being, and the airport’s relationship with the community. Its significance was identified by the FAA in the FAA Modernization and Reform Act of 2012. Section 133 of the Act requires airports undertaking a master plan to also complete a recycling plan that includes and addresses the following:

- » Minimization of solid waste generation
- » Operational and maintenance requirements of the waste management program
- » Review of waste management contracts
- » A solid waste audit
- » Feasibility of solid waste recycling
- » Potential cost savings from changes or revenue generation

In 2013, the FAA prepared and published Recycling, Reuse and Waste Reduction at Airports: A Synthesis Document to assist airports in the development of these recycling programs. This document outlines types and sources of airport waste and provides guidance on establishing a comprehensive waste reduction and recycling program. The full Recycling, Reuse and Waste Reduction Plan for HEF can be found in Appendix X. The plan recommends HEF perform a waste audit as a first step to improving its waste diversion and provides a list of actions that could be implemented at the Airport.

Currently, Manassas Regional Airport has four 8-yard dumpsters, and each tenant at the airport has their own dumpster. Trash generated at the facility is collected once weekly. Hazardous material, such as batteries, are properly disposed of by the city. Each department/division at the airport manages their own waste, as there is no designated official in charge of overseeing waste management. There is currently no

<sup>1</sup> Fuel Flowage and Aircraft Operations January 2023 Update, Accessed May 2023 at <https://legistarweb-production.s3.amazonaws.com/uploads/attachment/pdf/1739651/FuelOperations - Fiscal - January 2023 Update.pdf>

recycling program in place at the Airport, as the previous recycling program was suspended due to lack of optimization.

## 2.4 Goals and Targets

Goals translate the Airport’s vision into well-defined, tangible objectives for improving sustainability performance in each of the focus areas. The VASMP distinguishes between goals, which are more qualitative and general, and targets, which have specific metrics and timelines associated with them. Goals are introduced in the requirements section of the Manassas Regional Airport Masterplan. This section explains how the Airport can translate its goals into actionable targets.

Targets should be Specific, Measurable, Achievable, Relevant, and Timely (SMART). The SMART criteria for targets are defined as follows:

- » **Specific** - the target is clearly defined and unambiguous
- » **Measurable** – it is possible to measure performance against the goal (either quantitatively by using an appropriate metric, or by qualitatively assessing whether the goal has or has not been met)
- » **Achievable** – the target is aspirational, but also has a realistic possibility of being met
- » **Relevant** – the target is clearly related to the Airport’s vision, focus areas and priorities
- » **Timely** – the target includes a future date at which progress will be evaluated

A few of the goals identified in the Requirements section of the Master Plan are shown below in **Table 1** beside drafted examples of how they can be adjusted to be SMART. The target percentages and timeframes are for demonstration only; HEF should consider calibrating its own SMART goals based on alignment with Federal, State and Local sustainability targets, what is considered feasible in light of the baseline analysis, and the Airport’s priorities and level of ambition. **Error! Reference source not found.** shows examples of potential SMART Targets for the Airport’s consideration and refinement.

**TABLE 1**  
**EXAMPLES OF SMART TARGETS FOR HEF**

Focus Area	Goal	Example SMART Target
Economic Performance	Increase user and tenant retention rates	Increase user and tenant retention rates by 10% relative to a 2021 baseline by 2030.
	Reduce cost of airport operations	Reduce airport operational costs by 5% relative to a 2021 baseline by the year 2030.
Airport Community	Increase public awareness of initiatives	Develop a community engagement plan for sustainability at the Airport by 2025 and begin reporting about sustainability initiatives on the Airport website by 2030.
	Promote health and Safety of Airport workforce	Develop an employee wellness program and provide incentives for employees to participate by 2025.

Focus Area	Goal	Example SMART Target
Energy and Emissions	Reduce Greenhouse Gas Emissions	Join the ACA Carbon Accreditation program, develop a GHG emissions inventory, and set goals for GHG emissions reduction by 2025. Recommend aligning with the City of Manassas and regional GHG emissions reduction goal of 50% GHG reduction by 2030 and 80% reduction by 2050. <sup>2</sup>
	Switch to alternatively powered ground vehicles operated at the airport	Conduct a fleet and equipment study to determine opportunities to switch ground vehicles to alternative fuels by 2025.
Waste	Reduce municipal solid waste sent to landfills	Conduct a waste audit to identify recycling opportunities and set waste reduction targets by 2025.
	Minimize hazardous waste generation	Set targets to reduce hazardous waste generation and identify safer alternatives to commonly used hazardous products by 2025.
Natural Resources	Reduce sediment runoff from construction areas	Require all construction projects to be appropriately permitted for stormwater and erosion control under federal and Virginia law and have a site-specific Stormwater Pollution prevention plan (SWPPP) in place for each project by 2025.
	Reduce water use in areas directly under the control of the airport	Reduce indoor water consumption by 5% by the year 2030.

**2.5 Initiatives**

Once goals are in place, the next step is to develop specific initiatives to improve the airport’s sustainability performance and achieve the established goals and targets. Sustainability initiatives may take many forms and could include planning documents, policies, training, communications and engagement efforts, incentives, and capital projects. Listed below are recommended sustainable initiatives for HEF. Because the Airport is in the early stages of developing a sustainability program, the recommended initiatives at this point are primarily planning documents and studies.

» **Airport Sustainability Plan**

Development of a standalone Airport Sustainability Plan would involve collaborative workshops and engagement with airport staff, who would contribute their expertise and become invested in the success of the plan. Typically, the plan would include a detailed baseline to quantify the airport’s usage of electricity, fuels, water, and other resources as well as waste generation and recycling data, building characteristics etc. Once the baseline is established, airport staff would revisit and expand the limited goals recommended in the Master Plan and tie them to the baseline data. Goals would be established in each focus area and would become the guides for project development. Projects would also be distributed among focus areas and would be designed to collectively meet the goals.

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<sup>2</sup> City of Manassas Phase 1 Sustainability Plan webpage, Accessed May 2023 at [https://www.manassasva.gov/community\\_development/planning\\_and\\_zoning/phase\\_one.php](https://www.manassasva.gov/community_development/planning_and_zoning/phase_one.php)

» **Vulnerability Assessment and Adaptation Plan**

A Vulnerability Assessment and Adaptation Plan (VAAP) is useful for airports in several ways. First, it helps to identify potential vulnerabilities that may affect airport operations and the safety of passengers and staff. By conducting a vulnerability assessment, an airport can develop strategies to mitigate these vulnerabilities and reduce the impact of potential hazards. Second, an adaptation plan can help an airport to prepare for future challenges and uncertainties. With the changing climate and increasing frequency and intensity of extreme weather events, it is important for airports to plan and prepare for the potential impacts of these hazards. A VAAP evaluates an airport's susceptibility to various hazards, such as extreme weather events, natural disasters, or security threats. It involves identifying the airport's critical assets, evaluating the risks associated with potential hazards, determining the exposure and sensitivity of the assets to the threats, evaluating the assets or operations adaptive capacity, and identifying potential measures to minimize the impact of these hazards on the airport's operations.

» **Electrification Study**

As society moves towards the increasing electrification of transportation, with a state mandate for all new cars sold in Virginia to be electric by 2035, there is a need to forecast and understand the growth of electric vehicles (EVs) at the airport including the electrical supply capacity and EVSE that will be needed to support them. The types of EVs that could potentially be involved include personal vehicles, ground support equipment (GSE), and cargo delivery vehicles, as well as electric vertical takeoff and landing aircraft (eVTOLs). The power demands to charge some of these vehicle types can be significant and could require updating utility electric service to the airport as well as switchboards, transformers, and other equipment. Space for additional switchgear and EVSE could also be an issue when building out the infrastructure needed to support greater numbers of EVs. An electrification study would involve surveying airport stakeholders (rental car companies, aviation companies, cargo companies, power utility, VADOT, etc.) about their plans for EV expansion and developing a forecast of the number of vehicles the Airport should plan to support and the electrical demand that will be required. The study would result in a prioritized list of initiatives to design and install needed upgrades to support expected EV charging demand. It would also identify funding sources to support their design and construction.

» **GHG Inventory and ACA Certification**

A GHG Inventory establishes an organization's carbon footprint by identifying sources of greenhouse gas emissions associated with its operations and quantifying the amounts released in a given year. Completing a GHG Inventory is the first step to managing carbon emissions and allows future emissions reductions to be measured by comparing them to the emissions in the baseline year. The Airport Carbon Accreditation (ACA) program, administered by Airports Council International (ACI) provides a framework for airports to gain public recognition, enhance energy efficiency, and increase awareness through measurement, management, reduction, and offset of greenhouse gas (GHG) emissions. Level 1 accreditation under the ACA program requires mapping an airport's carbon footprint (i.e., conducting a GHG Inventory). Completing a GHG Inventory in accordance with ACA guidance would allow HEF to enter the ACA program, receive recognition for its sustainability

commitment and efforts, and develop the information needed to measure and reduce GHG emissions going forward.

## 2.6 Implementation

A sustainability implementation plan details processes and tools to help facilitate the integration of sustainability into planning, design, construction, and operations, as well as capture sustainability outcomes and track key performance indicators (KPIs).

Implementation requires managing, budgeting, scheduling, and securing funding to realize planned sustainability projects. It also involves tracking project metrics to ensure they perform as expected and reporting on results. This section describes common elements of an implementation strategy for sustainability projects, including management, budget, schedule, funding, metrics, and reporting. Successful implementation of sustainability projects often requires overcoming internal and external barriers. These may stem from resistance to change; organizational protocols or operating procedures; conflicting interests and priorities; a lack of training, education, or awareness; insufficient funding, or regulatory obstacles.

Managing project implementation requires identifying roles and responsibilities for project managers and other individuals involved in the project.

A schedule should be developed to guide project implementation, funding, tracking, and reporting. The schedule will allow the airport to plan investments and sequence projects to take advantage of funding opportunities and extend investments, while prioritizing returns.

To support implementation, KPIs should be established for the sustainability program. KPIs should be chosen to be relevant to focus areas and planned projects. The airport should track and internally report the KPIs annually as projects are implemented and adjust project execution as needed if they show desired performance is not being achieved.

## 3 FUNDING SOURCES

Sustainable efforts and trends have become increasingly prevalent in the aviation industry over recent decades, with federal, state, and local funding opportunities presenting themselves for airports to partake in sustainable culture. These funding sources provide airports with the opportunity to adopt sustainable practices and their benefits.

The FAA administers grant programs that could potentially fund several of the recommended initiatives and sustainability measures, in addition to necessary infrastructure upgrades. Please note that the discussed FAA funding is for the year 2023, and grant programs could either undergo changes or not be reauthorized in the following years. However, the Bipartisan Infrastructure Law (BIL) allocates funding through 2026, and it is probable that comparable programs will be accessible in 2024 and the years that follow.

In compliance with statutory criteria and Executive Order 14008, "Tackling the Climate Crisis at Home and Abroad" (86 FR 7619), the FAA intends to finance initiatives that are consistent with the President's greenhouse gas emissions goals, enhance energy efficiency, encourage financially responsible land utilization and efficient transportation planning, promote the development of terminals that are compatible with the use of sustainable aviation fuels and technologies, boost climate resilience, use sustainable and less emission-intensive pavement and building materials as much as possible, and reduce pollution. **Table 2** shows FAA funding opportunities and applicable initiatives recommended in this section.

**TABLE 2**  
**POTENTIAL FAA FUNDING OPPORTUNITIES**

FAA Funding Opportunities	Description	Applicable Initiatives
<b>Zero Emission Vehicle (ZEV) Program</b>	Provides grants for any National Plan of Integrated Airport Systems (NPIAS) airport to replace or convert on-road vehicles for zero emission vehicles.	Electrification Study and SMP Implementation / EVSE
<b>Sustainability Program</b>	Provides funding for developing sustainability plans as stand-alone documents or for inclusion in airport Master Plans	Airport Sustainability Plan Development; GHG Inventory if completed as part of Plan
<b>Energy Supply, Redundancy, and Microgrids Program</b>	Provides grants to improve reliability and efficiency of the power supply, prevent power disruptions, acquire and install electrical generators, separate the main power supply, and construct or modify facilities to install a microgrid.	VAAP project implementation (redundant utility service, generator upgrade, etc.)
<b>Energy Efficiency Program</b>	Provides two sequential funding types: <ol style="list-style-type: none"> <li>1. Energy assessments to identify measures to reduce energy consumption across airport operations.</li> <li>2. Eligible projects to acquire or construct equipment, including hydrogen equipment and related infrastructure, that will increase energy efficiency at the airport.</li> </ol>	Airport Sustainability Plan Project Implementation for energy efficiency projects

*APPENDIX D*

*AIRPORT RECYCLING, REUSE, AND WASTE  
REDUCTION PLAN*

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## 1.1 INTRODUCTION

In September 2014, the Federal Aviation Administration (FAA) provided guidance for preparing airport recycling, reuse, and waste reduction plans as an element of a master plan or master plan update.<sup>1</sup> This guidance was in response to the *FAA Modernization and Reform Act* (FMRA) of 2012<sup>2</sup> that added a requirement for all master plans and master plan updates to include a plan for “recycling and minimizing the generation of airport solid waste” to be consistent with the local recycling laws. Additionally, in January 2015, the FAA provided guidance<sup>3</sup> about how airport planning should include plans for “recycling and minimizing the generation of airport solid waste” and “master plans address issues related to solid waste recycling and waste minimization.”

This report describes the Manassas Regional Airport’s (HEF or Airport) existing solid waste generation and recycling activity and identifies opportunities to increase the Airport’s recycling efforts in order to reduce waste deposited in local landfills. In reviewing the Airport’s existing solid waste and recycling activity, efforts were made to:

- » Review the current waste management sources
- » Review local recycling programs and practices
- » Review the feasibility of recycling efforts at the Airport
- » Review waste hauler management contracts
- » Identify potential recycling opportunities for cost savings or revenue generation
- » Identify a plan to minimize solid waste generation at the Airport

### 1.1.1 Facility Description

The Airport is classified as a reliever airport within the National Plan of Integrated Airport Systems (NPIAS) located approximately three miles southwest of the City of Manassas in Prince William County, Virginia. As described in **Chapter 1 of this MPU, Aviation Activity Forecast**, the Airport had 99,649 operations in 2021 and is forecasted to have 130,088 operations by the planning year 2041. This forecast increase in operations would result in increased municipal solid waste generation at the Airport.

### 1.1.2 Types and Distribution of Solid Waste at Airports

There are several types of solid waste generated at airports, and the following types of solid waste are included in this solid waste recycling plan:

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<sup>1</sup> FAA Memorandum, *Guidance on Airport Recycling, Reuse, and Waste Reduction Plans*, [https://www.faa.gov/sites/faa.gov/files/airports/environmental/airport\\_recycling/airport-recycling-reuse-waste-reduction-plans-guidance.pdf](https://www.faa.gov/sites/faa.gov/files/airports/environmental/airport_recycling/airport-recycling-reuse-waste-reduction-plans-guidance.pdf), Accessed: October 2022.

<sup>2</sup> 49 United State Code (U.S.C), §§ 132 and 133.

<sup>3</sup> FAA Advisory Circular, 150/5070-6B, Change 2 to Airport Master Plans, [https://www.faa.gov/documentlibrary/media/advisory\\_circular/150-5070-6b-change-2-consolidated.pdf](https://www.faa.gov/documentlibrary/media/advisory_circular/150-5070-6b-change-2-consolidated.pdf) Accessed: January 2023.

- » **Municipal Solid Waste (MSW):** This type of waste usually includes everyday items, such as glass bottles, aluminum, paper products, etc.
- » **Construction and Demolition Debris:** This type of debris usually includes concrete, wood, metals, bricks, asphalt, and other items associated with construction and demolition activities.
- » **Compostable:** This type of waste is considered green waste (e.g., tree clippings, weeds, grass clippings, leaves, etc.) and food waste.
- » **Deplaned Waste:** This type of waste is removed from the passenger aircraft and includes items, such as newspapers, plastic cups, utensils, food waste, unconsumed food, etc.

The FAA’s 2013 Recycling Synthesis report<sup>4</sup> identified seven main airport waste streams that are present at airports: terminals, airfields, cargo hangars, aircraft, airport construction, flight kitchens, and administrative offices (see Table 1).

Waste at the Airport is generated by its tenants, fixed based operators (FBO), passengers, airport staff, and the airfield.<sup>5</sup>

An airport’s waste management is complex and involves many components. For example, an airport has multiple tenants, agreements, different operating requirements, and disposal processes that contribute to the Airport’s waste stream. The Airport’s waste stream can be divided into two main categories: areas where the Airport has direct control and areas where the Airport has indirect control (see Table 1).

**Table 1**  
**Airport Waste Stream Areas**

Area of Direct Control	Area of Indirect Control
Terminal – Pre-Security (excluding concessions)	Cargo Hangars
Terminal – Post-Security (excluding concessions)	Flight Kitchens
Airfield	Concessions
Airport Offices	Aircraft Maintenance Hangars

Source: (FAA, 2014)

Waste streams in an area of direct control (i.e., the terminal) can be influenced by Airport management. Areas of indirect control would benefit from in-place recycling and waste management infrastructure at the Airport. **Figure 1** identifies aeronautical and nonaeronautical activities and their associated waste streams. **Figure 1** further explains the waste streams by identifying the associated inputs and outputs for the activity.

<sup>4</sup> Federal Aviation Administration, *Recycling, Reuse, and Waste Reduction at Airports – A Synthesis Document*. FAA Office of Airports. April 24, 2013, <https://www.faa.gov/airports/resources/publications/reports/environmental/media/recyclingsynthesis2013.pdf>. Accessed: October 2022.

<sup>5</sup> Airfield waste is typically generated during construction projects and waste items can range from concrete or asphalt to signage and old lighting.

**Figure 1**  
**Airport Waste Streams**



(FAA, 2014)

# 1.2 EXISTING AIRPORT WASTE MANAGEMENT

## 1.2.1 Manassas Regional Airport Waste Management and Recycling

The primary goal of waste management at the Airport is to keep the Airport clean and to minimize Foreign Object Debris (FOD) and wildlife attractants (e.g., open trash bins) at the Airport. The Airport has four dumpsters, and each tenant at the Airport has their own dumpster. Refer to **Figure 2** for an example of a typical MSW dumpster at the Airport. Trash is collected weekly for the Airport (e.g., terminal). Airport tenants coordinate with waste disposal services to determine how often their waste is collected. The City of Manassas properly disposes of any hazardous material (e.g., batteries).. There is no designated official in charge of waste management at the Airport, therefore, each department or division at the Airport manages its own waste.

**Figure 2**  
**MSW Dumpster at the Airport**



Sources: Manassas Regional Airport 2022, RS&H 2022.

The Airport currently does not operate a recycling program nor requires tenants or contractors to recycle. The Airport previously had recycling bins in the terminal, which were collected by the City of Manassas. However, the Airport no longer receives recycling collection services from the City, and it therefore became the responsibility of the Airport to dispose of the recycled material at a site located across town. Another issue with the former recycling program was passengers cross-contaminating non-recyclable waste into recycling bins, therefore making it difficult for the Airport to properly separate recyclable

material from non-recyclable waste. The Airport administration considered these factors regarding recycling and decided it was best to suspend their recycling program at the Airport. The Airport does recycle construction debris, which is brought to the staging location on the northeast side of the Airport. Airport tenants decide their involvement in recycling programs.

## 1.3 LOCAL RECYCLING PROGRAMS

### 1.3.1 City of Manassas Recycling Program

The City of Manassas does not have a mandatory recycling program.<sup>6</sup> However, the City of Manassas strongly encourages businesses and residents to participate in recycling activities. In 2020, the City of Manassas had a 56% recycling rate, recycling 30,588 tons of material compared to 24,142 tons of trash.<sup>7</sup>

### 1.3.2 Prince William County Recycling Program

Prince William County requires businesses and residents to participate in recycling activities.<sup>8</sup> Prince William County Code of Ordinances specifies the requirement of reporting a businesses' refuse, recycling, yard waste, and food waste activities on an annual basis to Prince William County's Department of Public Works.<sup>9</sup> Prince William County allows the recycling of cardboard, mixed paper (i.e., newspaper, office paper), aluminum, and plastic bottles.<sup>10</sup> However, Styrofoam and glass containers cannot be recycled. Prince William County in 2020 had a 33.5% recycling rate with 180,695 total recycled tons and 518,533 total MSW tons.<sup>11</sup>

### 1.3.3 Commonwealth of Virginia Recycling Program

The Virginia Department of Environmental Quality requires that each county, city, town, or regional authority is required to establish and maintain a recycling program.<sup>12</sup> Regions within Solid Waste Planning Units (SWPUs) with populations less than 100 people per square mile or unemployment rates greater than 50% must have a 15% recycling rate. . For all other SWPUs, the required recycling rate is 25%.

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<sup>6</sup> City of Manassas, Solid Waste Management Plan. Accessed: <https://files4.1.revize.com/manassasva/Public%20Works/Trash%20&%20Recycling/Manassas%20SWMP%20FINAL%202021.pdf>, October 2022.

<sup>7</sup> City of Manassas, Trash and Recycling Statistics. Accessed: [https://www.manassasva.gov/public-works/trash\\_recycling/trash\\_and\\_recycling\\_statistics.php](https://www.manassasva.gov/public-works/trash_recycling/trash_and_recycling_statistics.php), October 2022.

<sup>8</sup> Prince William County, Recycling. Accessed: <https://www.pwcva.gov/department/solid-waste-management/recycling-prince-william>, October 2022.

<sup>9</sup> Prince William County, Virginia. (2022, October 17). Sec. 22-169. - Nonresidential and refuse removal reporting. Retrieved from municode: [https://library.municode.com/va/prince-william-county/codes/code-of-ordinances?nodeId=CH22RE\\_ARTVIIRE](https://library.municode.com/va/prince-william-county/codes/code-of-ordinances?nodeId=CH22RE_ARTVIIRE)

<sup>10</sup> Prince William County, Recycling. Accessed: <https://www.pwcva.gov/assets/202208/PWC%20Guide%20to%20Recycling%20Single%20Stream%20FINAL%20new%20website.pdf>, October 2022.

<sup>11</sup> Virginia Department of Environmental Quality, Virginia Annual Recycling Summary Report. Accessed: <https://www.deq.virginia.gov/home/showpublisheddocument/12688/637738737851330000>, October 2022.

<sup>12</sup> Virginia Department of Environmental Quality, Mandatory Recycling Rates for Localities. Accessed: <https://www.deq.virginia.gov/land-waste/recycling/statewide-recycling-programs/virginia-recycling-mandates>, October 2022.

# 1.4 REVIEW OF WASTE HAULER CONTRACTS

The Airport is currently contracted with American Disposal Services, Inc. The Airport’s waste hauler monthly fee since June 2021 has been about \$461 per month or about \$5,538 annually (see Table 2). Tenants at the Airport are able to manage their own MSW receptacles and develop their own contracts with their choice of waste haulers in the local community. American Disposal Services, Inc. conducts weekly pick-ups for dumpsters managed by the Airport. Tenants at the Airport determine their own pick-up schedule with their specific waste hauler.

**Table 2**  
**Municipal Solid Waste Hauler Costs**

Monthly Cost	\$461
Dumpster Size	Four 8-yard
Frequency of Service	Weekly
Annual Cost	\$5,538

Source: Manassas Regional Airport 2022, RS&H 2022.

# 1.5 RECYCLING FEASIBILITY AT THE AIRPORT

The Airport does have the opportunity to develop a recycling program that would reduce the amount of waste that would be sent to a landfill. The Airport could restart recycling efforts by recycling commonly found items at an airport that are identified in Table 3.

To help address the issues that were present during the Airport’s previous recycling program, the Airport could do the following:

- » Public outreach and education.
- » Establish multi-stream recycling bins throughout the Airport.
- » Reestablish recycling pick up.

The Airport could conduct a waste assessment to determine the Airport’s waste composition and identify areas of opportunity for reducing the Airport’s waste. Table 4 illustrates the various approaches to a waste assessment at an airport.

# 1.6 PLAN TO MINIMIZE SOLID WASTE GENERATION

As the Airport continues to grow in the future. Airport management can take actions to improve and limit the solid waste generated at the Airport. The Airport has identified the desire for tenants at the Airport to establish a barrier and lock each dumpster to prevent illegal dumping (e.g., non-Airport waste brought to dumpster). The Airport could develop a Recycling/Waste Reduction Program.

**Table 3**  
**Commons Recyclable Materials Found at Airports**

What	Where											
	Public Terminals	Ticketing	Security Gates	Food Service Areas	Offices	Cargo Shipping	Maintenance Areas	Airport Grounds	Aircraft	Airfield Ramps	Construction Areas	Concessionaires, Retailers, Rental Cars Facilities
Corrugated Carboard				X	X	X	X		X			X
Mixed Paper	X	X	X	X	X	X	X	X	X	X		X
Newspaper	X	X	X		X				X			
Glass	X	X	X	X	X	X	X		X			
Aluminum Cans	X	X	X	X	X	X	X		X			
Plastic Bottles	X	X	X	X	X	X	X		X			
Pallets						X						
Food Waste & Cooking Oil	X			X	X							
Organics/Green Waste								X				
Electronics					X							
Used Tires							X					
Used Oils							X					
Scrap Metal						X	X				X	
Concrete											X	
Lumber											X	
Batteries					X							
Toner Cartridges					X							X
Plastic (non-bottles)						X	X					X

(EPA, 2009)

**Table 4**  
**Water Assessment Approaches**

Strengths	Limitations
<p><b>Records Examination</b></p> <ul style="list-style-type: none"> <li>• Provides weights and volumes of waste generated.</li> <li>• Tracks major potential waste from the point of origin.</li> <li>• Identifies the expensive or valuable components of an organization’s waste.</li> <li>• Documents financial benefits of reuse and recycling including total revenues and avoided disposal costs.</li> <li>• Requires the least time and effort.</li> <li>• Establishes baseline for metrics.</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of quantitative data for specific waste components.</li> <li>• Does not provide qualitative data on how or why wastes are generated.</li> <li>• Substantial effort necessary to collect and analyze data.</li> </ul>
<p><b>Facility Walk-Through</b></p> <ul style="list-style-type: none"> <li>• Requires less time and effort than waste sorts.</li> <li>• Allows first-hand examination of facility operations.</li> <li>• Provides qualitative information about major waste components and waste-generating processes.</li> <li>• Reveals waste reduction activities.</li> <li>• Develops appreciation of logistics and obstacles tenants encounter in their efforts to recycle.</li> </ul>	<ul style="list-style-type: none"> <li>• Limited identification of wastes generated.</li> <li>• Multiple attempts may be necessary for comprehensive evaluation.</li> <li>• Relies on estimates of waste generation.</li> </ul>
<p><b>Waste Sort</b></p> <ul style="list-style-type: none"> <li>• Provides quantitative data on total waste generation and specific waste components.</li> <li>• Allows problem solving and design of recycling programs to be site specific.</li> </ul>	<ul style="list-style-type: none"> <li>• Requires more time and effort than other approaches.</li> <li>• Multiple attempts may be necessary for comprehensive evaluation.</li> <li>• Does not provide qualitative data on how or why wastes are generated.</li> </ul>

Source: (ICAO, 2018)

Under the Airport's Rules and Regulations (3.03 Environmental Pollution and Sanitation), tenants must follow the following:

- a. Each Person while on Airport property shall conduct his/her activities thereon in such a manner as not to cause littering or any other form of environmental pollution.
- b. No Person shall dispose of garbage, papers, refuse, or other forms of trash, including cigarettes, cigars and matches, except in receptacles provided for such purpose.
- c. No Person shall dispose of any fill or building materials or any other discard or similar waste materials on Airport property, except as approved in writing by the Airport Director. No liquids shall be placed in storm drain or other systems which will result in water pollution having passed through such drain or system.

Sustainable Aviation Guidance Alliance<sup>13</sup>(SAGA) created a database with numerous practices that can be implemented at an airport to reduce solid waste generation and create new sustainable practices.

The Airport Cooperative Research Program (ACRP) *Synthesis 92 Airport Waste Management and Recycling Practices* (ACRP, 2018) identified effective practices for reducing waste that could be implemented at an airport.

- » Food Donation
- » Back-of-House [Tenant] Composting
- » Office/Workplace Recycling for Employees
- » Terminal Recycling for Passengers
- » Environmentally Preferred Purchasing
- » Tenant and Service Provider Contracting Designed to Increase Diversion
- » Training for Employees and Tenants
- » Strong [Recycling] Signage
- » Measuring and Monitoring of Metrics

The Airport could follow the FAA's Ten Steps for Creating and Implementing an Effective Airport Recycling and Waste Reduction Program for creating and implementing a recycling program.

1. Management Commitment
2. Program Leadership
3. Waste Identification
4. Waste Collection and Hauler
5. Waste Management Plan Development
6. Education and Outreach
7. Monitor and Refine Program
8. Performance Monitoring
9. Promote Success

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<sup>13</sup> Sustainable Aviation Guidance Alliance. Accessed: <http://www.airportsustainability.org/sustainable-practices>, January 2023

## 10. Continuous Improvement

If a recycling/waste reduction program is re-established, the following actions can be considered for potential implementation at the Airport:

- » **Reposition Recycling Bins** – Reestablish recycling and strategically reposition recycling bins so passengers are given adequate opportunity to recycle. Recycling stations should be abundant in all areas of the terminal.
- » **Increase Water Bottle Refill Station** – Establish water bottle refill stations to decrease use of single use plastics in the terminal.
- » **Optimize Cleaning** – Optimize cleaning processes and manage the chemical cleaning process to reduce the need for harmful cleaning chemicals.
- » **Recycle/Reuse Construction-Materials** – Continue to recycle construction materials and expand upon this program by including materials such as pallets/spools, deicers (road salt, sodium formate, sand), green waste, and construction debris.
- » **Recycle Deplaned Waste** – Increase coordination with aeronautical users to help increase the recycling rate of deplaned waste. Although the recycling of deplaned waste is dependent on the individual aeronautical user, proper recycling infrastructure can provide a greater opportunity to increase the recycling rate.
- » **Green Concession Program** – Require concessionaires to participate in all relevant recycling initiatives at the Airport (i.e., food donations, composting, environmental planning) Additionally, concessionaires could implement biodegradable containers.
- » **Organic Waste Management** – Evaluate the feasibility of sending organic waste to an anaerobic digester to produce methane.
- » **Reduce/Recycle Cargo Waste** – Evaluate how to help reduce/recycle cargo waste, which is mainly composed of cardboard, and plastic packaging materials.
- » **Mandate Recycling at the Airport** – As much as possible, update leases to require tenants to recycle or compost at the airport, as well as to establish required sustainability practices.
- » **Education and Awareness Efforts** – Post signage above each receptacle describing what is and is not acceptable in the recycling stream and provide training for employees and tenants.
- » **Conduct a Waste Audit** – Conduct a waste audit in order to analyze the most recent waste stream. Information from the new waste audit can be used to adjust waste management practices where it is deemed necessary.

## 1.7 CONCLUSION

The Airport has multiple waste streams that include the airfield, fixed-based operators, aircraft maintenance hangars, cargo hangars, and concessions. The composition and management of these waste streams vary by location and whether they are under direct or indirect control. Reference the FAA's Ten Steps for Creating and Implementing an Effective Airport Recycling / Waste Reduction Program and performing a waste audit, the Airport would be able to set and monitor goals, implement policies, and identify areas for increased recycling efforts, which would allow the Airport to determine cost savings and reduce the Airport's contribution to landfills. A formal recycling program, potentially led by a recycling

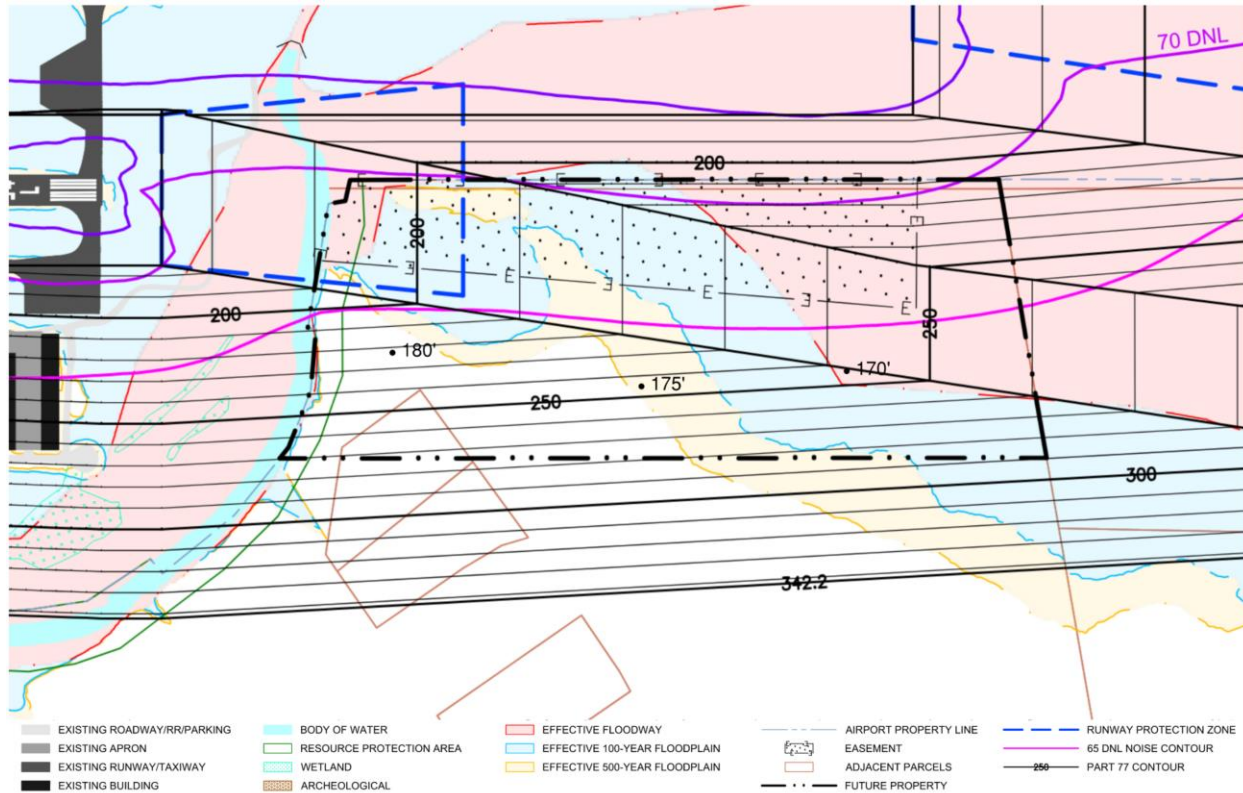
coordinator, can establish the process for reaching waste reduction goals. This plan could result in the establishing of strategic initiatives, implement policies, and the identification areas for increased recycling and reuse efforts. Additionally, the plan could also create an education plan for the Airport's staff, tenants, and contractors.

*APPENDIX E*  
*SOUTHWEST QUADRANT LAND*  
*ACQUISITION*

# MEMORANDUM:

This memo provides a summary of elements essential to preserving and protecting the airport environs, specifically in relation to Runway 34L approach end and the parcel of land in consideration for donation to the Airport. The memo also provides a high-level framework for potential development. **Figure 1** depicts the Runway Protection Zone (RPZ), floodplains, Part 77 imaginary surface, and noise contours over the 50-acre parcel identified as "future property".

Figure 1  
HEF SW Quadrant



## Runway Protection Zone

3.7 acres of the "future property" area falls under the runway protection zone (RPZ) for Runway 34L approach end. Per FAA guidance congregation of people and new construction of building or other improvement obstructions are not permitted in an RPZ and therefore development in this parcel is not permitted. There is currently an aviation easement for the 3.7 acres outside of airport property.

## Floodplain

Due to the airport's location between Broad Run and Cannon Branch, a large portion of the 50-acre site is within regulated flood hazard areas. 14.5 acres is in the effective floodway, 17.8 acres is in the 100-year floodplain, and 7.1 acres is in the 500-year floodplain. The Base Flood Elevation within the site is approximately 175 feet.

## Part 77 Imaginary Surfaces

The “future property” parcel sits under the non-precision approach surface and transitional surface which range from 200 feet to 290 feet within the parcel. Any proposed construction/alterations within the “future property” with heights up to or exceeding this level would be determined a hazard and thus objectionable. A notice of proposed construction or alteration (FAA Form 7460) would need to be formally submitted prior to development in the area.

## Noise

Approximately 24-acres of the “future property” parcel sits within the 65 to 70 DNL contour. Non-Aeronautical compatible land uses within the 65 DNL include Commercial, Industrial and Agricultural use. Most commercial and industrial uses, especially those associated with the airport, are good neighbors to airports. Agricultural land is compatible with airport operations if the use is not a wildlife attractant. Prince William County’s zoning classification for the 50-acre parcel is Agricultural.

## Overview

Per FAA guidance in Advisory Circular 150/5300-13C, “All existing and planned airport elements including the following should be on airport property. (A) Object Free Areas, (B) Runway Protection Zones, (C) Areas under Part 77 imaginary surfaces out where the surfaces obtain a height of at least 35 feet above the primary surface, and (D) Areas, other than those which can be adequately controlled by zoning, easements, or other means to mitigate potential incompatible uses.” Therefore, as a prevention and mitigation technique, acquisition of the land is recommended to eliminate the chance of the landowner developing conflicting land use. Acquisition of the property would essentially limit future incompatible uses.

Approximately 17-acres of the “future property” area is usable for development without requiring mitigation actions as this area does not fall under the RPZ, effective floodway, and 100-year floodplain. 34.8 acres can be used for development; however, flood storage mitigation on-site or elsewhere on airport property would be needed for development in the 100-year floodplain (17.8 acres).

A floodplain analysis would be required to codify impacts to flood elevations prior to development in the “future property” area. Based on the floodplain depicted in **Figure 1**, any development in the area identified as an effective floodway or 100-year floodplain would require floodplain mitigation to minimize impacts on the existing floodplain boundaries and flood elevations. Encroachment on the floodway requires a Conditional Letter of Map Revision (CLOMR) with FEMA prior to construction. The proximity of usable land to the effective floodway presents an opportunity to use a portion of the land for floodwater storage to compensate for floodplain impacts to development in the southeast site or northwest parcel south of Broad Run Station if acquired. Both sites sit partially in the 100-year floodplain; therefore, a floodplain analysis will be required to determine the extent of compensation needed to develop either site. The dirt excavated from the “future property” area can also be repurposed and used as fill at either site to bring the grade above the base flood elevation.

Planning and development in the “future property” is eligible for AIP grant reimbursement with the caveat that improvements are related to enhancing airport safety, capacity, security, and environmental concerns. Professional services necessary for eligible projects (such as planning, surveying, and design) are also eligible. Improvements for commercial enterprises or industrial park development would not be eligible for AIP reimbursement. As a reliever GA airport an AIP grant could reimburse 90-95 percent of eligible project costs. The appraised value of the donated land can be considered as the airport sponsor’s local contribution to a development project in the “future property” area, southeast site, or northwest site south of Broad Run Station. Although this local contribution can only be used for one development of

aeronautical purpose, this flexibility allows the Airport to pursue necessary development in areas outside of the "future property".

Reimbursement for an access bridge to the airport would need to show justification related to enhancing airport safety, capacity, security, or environmental concerns. Improvements beyond those related to enhancing airport safety, capacity, security, or environmental concerns would be in-eligible for AIP funding and could be transmitted to the landowner if the two parties (the Airport and landowner) agree. If a development project used for aeronautical purposes occurs, environmental studies, traffic study, and FEMA coordination may best be served completed through the Airport as AIP funds can be used to reimburse associated costs. Also, due to familiarity and prior agency coordination, the Airport may assist in streamlining the permit process.